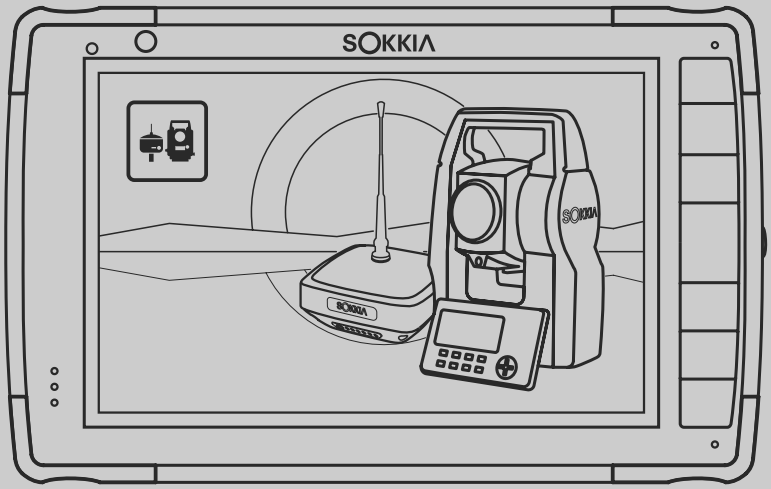
SOKKIA

Sokkia Field

Data Collection Software

Help

Sokkia Field



Sokkia Field

Help



Version: 10.0
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Software EULA / Service Terms / Service Plan

The following agreements apply to the access and use of the Topcon/Sokkia web-based services and/or the Topcon /Sokkia software that you have acquired the right to use:

I. WEB SERVICES TERMS

II. SOFTWARE END USER LICENSE AGREEMENT

III. SOFTWARE SERVICE PLAN

I. Web Services Terms

Updated: March 1, 2025

These Web Services Terms (the "Terms") are between Topcon Positioning Systems, Inc. or one of its Affiliates ("Topcon") and the individual or entity accepting its terms and conditions ("Customer") by clicking the "I Accept" button, by creating an account, or by logging in.

BY CLICKING THE "I ACCEPT" BUTTON OR INITIATING USE OF THE SERVICE CUSTOMER AGREES TO THE FOLLOWING TERMS GOVERNING THE USE OF THE SERVICE.

IF AN INDIVIDUAL IS ACCEPTING THIS AGREEMENT ON BEHALF OF A COMPANY OR OTHER ENTITY, SAID INDIVIDUAL REPRESENTS THAT HE/SHE HAS THE AUTHORITY TO BIND SUCH ENTITY. TOPCON RESERVES THE RIGHT TO IMMEDIATELY TERMINATE OR SUSPEND THE SERVICE FOR FAILURE TO COMPLY WITH THE TERMS OF THIS AGREEMENT.

IN THE EVENT OF ANY CONFLICT BETWEEN THE TERMS AND CONDITIONS OF THIS AGREEMENT AND THE TERMS AND CONDITIONS OF ANY OTHER AGREEMENT BETWEEN THE PARTIES RELATING TO THE ACQUISITION OF A SUBSCRIPTION TO THE SERVICE, INCLUDING TOPCON'S STANDARD TERMS OF PURCHASE, THIS AGREEMENT SHALL CONTROL.

1. Definitions. As used in this Agreement:

1.1. "Affiliate" means an entity that controls, is controlled by or is under common control with another entity, where "control" refers to ownership or the right to direct more than 50% of the outstanding shares or securities representing the right to vote for the election of directors or other managing authority of another entity.

1.2. "Agreement" means the Terms, which may be updated by Topcon from time to time in its sole discretion, and the applicable Purchase Certificate.

1.3. "Applicable Privacy Laws" means, in relation to any Personal Information that is processed in the provision of the Services, the applicable legislation on the protection of identifiable individuals.

1.4. "Content" means the audio and visual information, documents, software, products and services contained or made available to Customer in the course of using the Service.

1.5. "Customer Data" means all data submitted, stored, posted, displayed, or otherwise transmitted by or on behalf of Customer or any User and received and processed by the Service.

1.6. "Effective Date" means the earlier of: (a) the Subscription start date described in the Purchase Certificate, or (b) the date a Subscription is activated.

1.7. "Intellectual Property Rights" means unpatented inventions, patent applications, patents, design rights, copyrights, trademarks, service marks, trade names, domain name rights, mask work rights, know-how and other trade secret rights, and all other intellectual property rights, derivatives thereof, and forms of protection of a similar nature anywhere in the world.

1.8. "Personal Information" means any information that by itself or in combination does or can identify a specific individual or as defined in the Applicable Privacy Laws.

1.9. "Privacy Statements" means the Topcon privacy statements/policies available at: https://www.topconpositioning.com.

1.10. "Purchase Certificate" means each Topcon software/service purchase certificate, purchase confirmation or other order document acknowledging and/or confirming Customer's purchase or renewal of a Subscription.

1.11. "Security Incident" means a breach of security leading to the accidental or unlawful destruction, loss, alteration, unauthorized disclosure of, or access to, personal data transmitted, stored or otherwise processed.

1.12. "Sensitive Information" means any confidential or personal information that is protected by law and that requires the highest level of access control and security protection, whether in storage or in transit.

1.13. "Service" means the Topcon service to which Customer has purchased access/use as specified in the relevant Purchase Certificate.

1.14. "Subscription" means the right to access the Service, subject to applicable Usage Limit, purchased by a Customer for the applicable Term under the terms of the Agreement. Subscriptions must be activated within 1-year of purchase, or shall otherwise expire with no refund available.

1.15. "Term" means the initial term of a Subscription or any renewal term for the Service as set forth on the applicable Purchase Certificate or renewal confirmation.

1.16. "Terms of Use" means the terms of use governing the use of the website through which Customer accesses the applicable Service.

1.17. "Usage Limits" means the specific number of Users, licenses and license configurations specifically ordered and paid for by Customer as described in the Purchase Certificate(s) associated with a Subscription. Usage Limits may be increased subject to a separate written agreement in writing.

1.18. "User(s)" means Customer's employees, representatives, consultants, contractors or agents who are authorized to use the Service.

2. Agreement; Order of Precedence. The Agreement governs the use by Customer and its Users of the subject Service. In the event of a conflict between a Purchase Certificate and the Terms, the Terms will take precedence, except for any matter that the Terms expressly permit to be established or modified in a Purchase Certificate. Customer agrees that the terms of this Agreement supersede the terms of any purchase order issued by Customer.

3. Service Access License Grant and Restrictions.

3.1. Access License Grant. Topcon hereby grants to Customer a non-exclusive, non-transferable, right to access and use the Service during the Term, solely for Customer's own internal business purposes. All rights not expressly granted to Customer are reserved by Topcon and its licensors.

3.1.1. Educational License. If Customer has acquired a Subscription as an Educational LicenseCustomer can use and access the Service only for academic research projects. This explicitly excludes projects which are contracted to Customer by any third party for a fee, or projects that are done in collaboration with a third party that is funding the research in whole or in part.

3.1.2. Not for Resale License. Dealers may acquire Not for Resale (NFR) Subscriptions to the Service subject to the Topcon NFR policy in effect at the time of purchase. NFR Subscriptions may only be used for demonstration purposes.

3.1.3. Trial License. Trial licenses are available. Use of the Service under a trial license is limited to evaluation and trial (non-commercial) use for the limited period identified by Topcon at the time of acquisition.

3.2. Restrictions. Customer shall not (i) license, sublicense, sell, resell, transfer, assign, distribute or otherwise commercially exploit or make available to any third party any Content or the Service in any way that is deemed by Topcon to be outside of the intended use of the Service; (ii) modify or make derivative works based upon the Service or the Content; (iii) create Internet "links" to the Service or "frame" or "mirror" any Content on any other server or wireless or Internet-based

device; (iv) access the Service for purposes of monitoring its availability, performance or functionality, or for any other benchmarking or competitive purposes; or (v) reverse engineer or access the Service or its underlying code in order to (a) build a competitive product or service, (b) build a product using similar ideas, features, functions or graphics of the Service, or (c) copy any ideas, features, functions or graphics of the Service. Customer shall not loan, or share its passwords, or allow third party access to the Service or any related materials without prior written authorization from Topcon.

Customer shall not: (i) send spam or otherwise duplicative or unsolicited messages in violation of applicable laws; (ii) send or store infringing, obscene, threatening, libelous, or otherwise unlawful or tortious material, including material harmful to children or violative of third party privacy rights; (iii) send or store material containing software viruses, worms, Trojan horses or other harmful computer code, files, scripts, agents or programs; (iv) interfere with or disrupt the integrity or performance of the Service or the data contained therein; or (v) attempt to gain unauthorized access to the Service or its related systems or networks.

4. Customer Responsibilities. Customer is responsible for all activity occurring under its Subscriptions and shall abide by all applicable local, state, national and foreign laws, treaties and regulations in connection with its use of the Service, including those related to data privacy, international communications and the transmission of technical or personal data. Customer shall: (i) notify Topcon immediately of any unauthorized use of any password or account or any other known or suspected breach of security; (ii) report to Topcon immediately and use reasonable efforts to stop immediately any copying or distribution of Content that is known or suspected by Customer or its Users to be in violation of the restrictions in Section 3.2; and (iii) not impersonate another user or provide false identity information to gain access to or use the Service.

Customer expressly consents to the provision and collection of location-based information in connection with the use and operation of the Service. Customer hereby represents that any Personal Information uploaded or otherwise made available through the Service has been collected and processed in a lawful and legitimate manner, in accordance with the requirements of Applicable Privacy Laws. Customer shall clearly and conspicuously, and upon a regular and ongoing basis, notify all customers and Users of the Service that location information is gathered and processed in connection with the operation of the Service. Such information is processed and managed as described in Section 18 below.

5. Modifications and Availability/Security.

5.1. Modifications. Topcon reserves the right, in its sole discretion, to make changes to this Agreement, the Terms of Use, Privacy Statements and other published policies, including, without limitation, changes required to comply with applicable law. It is Customer's responsibility to regularly check the applicable Topcon website for updates. Topcon shall undertake reasonable efforts to provide prior notice of any such changes. Customer's continued use of the Services after their implementation constitutes acceptance of relevant changes. Topcon may make new applications, tools, features or functions available from time to time through the Service, the use of which may be conditioned on Customer's agreement to additional terms.

5.2. Availability/Security. During the Term Topcon will use commercially reasonable efforts to ensure that the Service is available to Customer at all times (other than during the times which Topcon may conduct scheduled maintenance and times of unavailability due to Force Majeure events and/or third-party conduct or services). Topcon will use commercially reasonable efforts to prevent unauthorized access to Customer Data by third parties (except where such access is required by applicable law or an order of a court of competent jurisdiction). From time-to-time Topcon may connect to the Topcon web-based license manager to validate Customer's right to use the Service and/or any other related activities.

6. Ownership.

6.1. Topcon. As between Topcon and Customer, all right, title and interest in the Service and Software, and all suggestions, ideas and feedback proposed by Customer regarding the Service and Software, including all Intellectual Property Rights in each of the foregoing, belong to and are retained solely by Topcon or its licensors, as applicable. Customer hereby does and will irrevocably assign to Topcon all evaluations, ideas, feedback and suggestions made by Customer to Topcon regarding the Service and Software (collectively, "Feedback") and all Intellectual Property Rights in the Feedback. The Topcon name and logo, the Service name and logo, and the product names associated with the Service are trademarks of Topcon and no right or license is granted to use them.

6.2. Customer Data. As between Topcon and Customer, all right, title and interest in the Customer Data and all Intellectual Property Rights therein, belong to and are retained solely by Customer. Customer, not Topcon, shall have sole responsibility for the accuracy, quality, integrity, legality, reliability, appropriateness, and intellectual property ownership or right to use of all Customer Data, and Topcon shall not be responsible or liable for the deletion, correction, destruction, damage, loss or failure to store any Customer Data.

6.2.1. License to Customer Data. Customer hereby grants to Topcon a limited, non-exclusive, royalty-free, world-wide license to use the Customer Data and perform all acts with respect to the Customer Data as may be necessary for Topcon to provide the Service to Customer, subject to compliance by Topcon with its confidentiality obligations under Section 13 (Confidentiality).

7. Third-Party Features.

7.1. Google Maps. As part of the Service, Topcon has licensed, and pursuant to the Terms, sublicenses to Customer for Customer's use, certain map services ("Map Services") from Google. Access to and use of the Map Services is subject to the following terms and conditions which are agreed to by Customer:

7.1.1. Use of Google Maps is subject to the then-current Google Maps/Google Earth Additional Terms of Service at https://maps.google.com/help/terms_ maps.html and Google Privacy Policy at https://www.-google.com/policies/privacy/.

7.1.2. Unless Google specifically agrees in writing, Customer will not: (a) copy, modify, create a derivative work of, reverse engineer, decompile, translate, disassemble, or otherwise attempt to extract any or all of the source code of the Map Services (except to the extent such restriction is expressly prohibited by applicable law); (b) sublicense, transfer, or distribute any of the Map Services; (c) sell, resell, or otherwise make the Services available as a commercial offering to a third party; or (d) access or use the Map Services: (i) for High Risk Activities; (ii) in a manner intended to avoid incurring Fees; (iii) for activities that are subject to the International Traffic in Arms Regulations (ITAR) maintained by the United States Department of State; (iv) on behalf of or for the benefit of any entity or person who is legally prohibited from using the Services; or (v) to transmit, store, or process Protected Health Information (as defined in and subject to HIPAA).in

7.1.3. Customer agrees not to, and not to allow third parties to use the Services:

7.1.3.1. to violate, or encourage the violation of, the legal rights of others (for example, this may include allowing Customer End Users to infringe or misappropriate the intellectual property rights of others in violation of the Digital Millennium Copyright Act);

7.1.3.2. to engage in, promote or encourage illegal activity;

7.1.3.3. for any unlawful, invasive, infringing, defamatory or fraudulent purpose (for example, this may include phishing, creating a pyramid scheme or mirroring a website);

7.1.3.4. for any Customer Applications related to sexual content, services, or paraphernalia (for example, escort services, erotic massage services, pornographic images, or sex-related devices);

7.1.3.5. to intentionally distribute viruses, worms, Trojan horses, corrupted files, hoaxes, or other items of a destructive or deceptive nature;

7.1.3.6. to interfere with the use of the Services, or the equipment used to provide the Services, by customers, authorized resellers, or other authorized users;

7.1.3.7. to disable, interfere with or circumvent any aspect of the Services;

7.1.3.8. to generate, distribute, publish or facilitate unsolicited mass email, promotions, advertisements, or other solicitations ("spam"); or

7.1.3.9. to use the Services, or any interfaces provided with the Services, to access any other Google product or service in a manner that violates the terms of service of such other Google product or service.

7.1.4. Data Use, Protection, and Privacy. To provide the Map Services through the Service, Google must receive and collect data from end users and Topcon, including search terms, IP addresses, and latitude/longitude coordinates. Customer acknowledges and agrees that Google and its Affiliates may use and retain this data to provide and improve Google products and services, subject to the Google Privacy Policy at https://www.google.com/policies/privacy/.

7.1.5. Certain components of the Services (including open source software) are subject to third-party copyright and other Intellectual Property Rights, as specified in: (a) the Google Maps/Google Earth Legal Notices at https://www.-google.com/help/legalnotices_maps.html; and (b) separate, publicly-available third-party license terms, which Google will provide to Customer on request.

7.2. Autodesk and Bentley Accessibility. The Service allows Customer to access Customer's Autodesk and Bentley accounts/services from within the Service.

7.2.1. Process. In order to access Customer's Autodesk and Bentley accounts/services from within the Service Customer enters and saves its Autodesk/Bentley account information (username/password) and the URL to the applicable Autodesk/Bentley repository (the "Account Info") into the Data Manager within the Service and is processed and managed as described in Section 18 below. When Customer directs the service to access to the relevant Autodesk/Bentley account the Account Info is deployed to allow access. The Account Info is stored in the Data Manager and Customer may change or delete the Account Info at its discretion. If the user no longer has access to either, then the connection will fail.

7.2.2. Disclaimer. Customer acknowledges and agrees that any Autodesk and/or Bentley services/solutions are being provided to you by third parties and not by Topcon. Customer further acknowledges and agrees that its access or use of any such services is not governed by this Agreement but instead would be governed by such third-party suppliers' terms of use, license agreement or other like agreement. TOPCON MAKES NO REPRESENTATIONS OR WARRANTIES CONCERNING THE THIRD- PARTY SERVICE OF ANY SORT. TOPCON CANNOT AND SHALL NOT BE RESPONSIBLE FOR, AND EXPRESSLY DISCLAIMS ANY LIABILITY, OF ANY KIND, IN CONNECTION WITH CUSTOMER'S ACCESS TO ANY THIRD-PARTY SOFTWARE/SERVICES, OR CUSTOMER'S USE (OR ANY USER'S USE) THEREOF, INCLUDING, BUT NOT LIMITED TO CUSTOMER'S ACCESS AND USE OF ITS AUTODESK AND/OR BENTLEY ACCOUNTS/SERVICES IN CONNECTION WITH THE SERVICE.

8. Fees and Payment; Renewal.

8.1. Fees and Payment. Fees are exclusive of all taxes, levies, or duties imposed by taxing authorities, and Customer shall be responsible for payment of all such taxes, levies, or duties, excluding only United States (federal or state) taxes based solely on Topcon's income. Customer shall pay all fees or charges to Customer's account as set forth in the applicable Purchase Certificate in accordance with the fees, charges, and billing terms in effect at the time a fee or charge is due and payable. Topcon charges and collects in advance for use of the Service. All payment obligations are non-cancelable, and all amounts paid are nonrefundable. Topcon reserves the right to modify its fees and charges and to introduce new charges at its discretion. Unless Topcon in its discretion determines otherwise, entities will be billed in U.S. dollars. Overdue amounts are subject to interest of 1.0% per month on any outstanding balance, or the maximum permitted by law, whichever is less, plus all expenses of collection.

8.2. Excess Data Storage/Transfer/Processing Fees. Customer may be provided disk storage space and/or data transfer/processing services in connection with a Subscription. Additional storage and transfer/processing plans may be available for purchase upon the execution of a separate agreement. Topcon reserves the right to establish or modify its general practices and limits relating to storage and processing of Customer Data.

8.3. Automatic Renewal; Billing. The Service provides Customer with the option to automatically renew a Subscription by allowing Topcon to charge the credit card that Customer has authorized for billing. The automatic renewal option Topcon will automatically renew the subject Subscription for a term of equal length to the immediately preceding Term and bill Customer's credit card at the then current fee schedule no earlier than 30 days prior to the end of the subject Term. The automatic renewal option will be activated upon initial activation and can be disabled at any time at Customer's discretion. Customer is responsible for providing accurate and current payment information. Topcon shall not be responsible for any gaps in the Service if a Customer fails to renew or does not keep payment information updated.

9. Term and Termination.

9.1. Term. This Agreement commences on the Effective Date and will remain in in effect for the Term, unless renewed through the purchase of a new Term or automatic renewal as described in Section 8.3 above.

9.2. Termination for Cause. Either party may terminate a Subscription for cause (i) on 30 days' written notice to the other party of a material breach if such breach remains uncured at the expiration of such period (or immediately if the material breach is not capable of being remedied); or (ii) immediately upon written notice if the other party becomes the subject of a petition in bankruptcy or any other proceeding relating to insolvency, receivership, liquidation, or an assignment for the benefit of creditors. In addition, Topcon may terminate a Subscription, on written notice in the event (A) Customer fails to pay any amounts due hereunder, and such failure continues more than 10 days after written notice by Topcon; or (B) Customer infringes Topcon's Intellectual Property Rights, including without limitation through use of a Service in excess of the license to use or access granted in this Agreement, including any limitation on scope, nature, type, term, purpose, consumption, or users. Customer is solely responsible for its actions and the actions of its Users.

9.3. Discontinuation of Service/Termination for Convenience. Topcon may discontinue a Service in whole or in part, and/or terminate this Agreement with or without notice for any reason at any time. In the event the Service is

discontinued, or this Agreement is terminated during the Term by Topcon other than for cause under Section 9.2 above by, Customer shall be entitled to be reimbursed in an amount equal to the amount of fees paid by Customer for the number of full months remaining in the then current Term. For example, assuming that Customer have advanced payment for a full 1-year Term, if Topcon terminates the Service in the 7th month of the 1-year term Customer would be entitled to be reimbursed for the amounts paid for the remaining 5 months of the Term. Such reimbursement shall not be available for instances where a Subscription is not activated within 1 year of the date of purchase.

9.4. Effect of Termination or Expiration. On termination or expiration of a Subscription and/or a Purchase Certificate, Customer's rights of access to the subject Service will terminate and Customer will immediately cease to use the Service. Topcon will make any Customer Data stored in the Service available on request by Customer in the format in which it is stored in the Service for 60 days following the effective date of termination. After such 60-day period, Topcon will have no obligation to maintain or provide any Customer Data and may thereafter, unless legally prohibited, delete all Customer Data in its systems or otherwise in its possession or under its control.

10. Warranties. Mutual Warranties. Each party represents and warrants that it has the legal power and authority to enter into this Agreement and (ii) its acceptance of and performance under this Agreement will not breach any oral or written agreement with any third party or any obligation owed by it to any third party.

11. Disclaimer of Warranties.

USE OF THE SERVICE IS AT CUSTOMER'S SOLE RISK. CUSTOMER ACCEPTS THE SERVICE ON AN "AS-IS" AND "AS- AVAILABLE BASIS". TOPCON, ITS LICENSORS AND WIRELESS SERVICE PROVIDERS MAKE NO REPRESENTATION, WARRANTY, OR GUARANTY AS TO THE RELIABILITY, TIMELINESS, QUALITY, SUITABILITY, TRUTH, AVAILABILITY, ACCURACY OR COMPLETENESS OF THE SERVICE OR ANY CONTENT. TOPCON AND ITS LICENSORS DO NOT REPRESENT OR WARRANT THAT (A) THE USE OF THE SERVICE WILL BE SECURE, TIMELY, UNINTERRUPTED OR ERROR-FREE OR OPERATE IN COMBINATION WITH ANY OTHER HARDWARE, SOFTWARE, SYSTEM OR DATA, (B) THE SERVICE WILL MEET CUSTOMER'S REQUIREMENTS OR EXPECTATIONS, (C) ANY STORED DATA WILL BE ACCURATE OR RELIABLE, (D) THE QUALITY OF ANY PRODUCTS, SERVICES, INFORMATION, OR OTHER MATERIAL PURCHASED OR OBTAINED BY CUSTOMER THROUGH THE SERVICE WILL MEET CUSTOMER'S REQUIREMENTS OR EXPECTATIONS, (E) ERRORS OR DEFECTS WILL BE CORRECTED, OR (F) THE SERVICE OR THE SERVER(S) THAT MAKE THE SERVICE AVAILABLE ARE FREE OF VIRUSES OR OTHER HARMFUL COMPONENTS. THE SERVICE AND ALL CONTENT IS PROVIDED TO CUSTOMER STRICTLY ON AN "AS IS" BASIS. ALL CONDITIONS, REPRESENTATIONS AND WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY RIGHTS, ARE HEREBY DISCLAIMED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW BY TOPCON AND ITS LICENSORS.

THE SERVICE(S) MAY BE SUBJECT TO LIMITATIONS, DELAYS, AND OTHER PROBLEMS INHERENT IN THE USE OF THE INTERNET AND ELECTRONIC/WIRELESS COMMUNICATIONS. TOPCON IS NOT RESPONSIBLE FOR ANY DELAYS, DELIVERY FAILURES, OR OTHER DAMAGES RESULTING FROM SUCH PROBLEMS.

12. Indemnification. CUSTOMER SHALL INDEMNIFY AND HOLD TOPCON, ITS LICENSORS AND EACH SUCH PARTY'S SUBSIDIARIES, AFFILIATES, OFFICERS, DIRECTORS, EMPLOYEES, ATTORNEYS AND AGENTS HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, COSTS, DAMAGES, LOSSES, LIABILITIES AND EXPENSES (INCLUDING ATTORNEYS' FEES AND COSTS) ARISING OUT OF OR IN CONNECTION WITH: (I) ANY ALLEGATION THAT USE OF THE CUSTOMER DATA INFRINGES, MISAPPROPRIATES OR VIOLATES THE PRIVACY OR INTELLECTUAL PROPERTY RIGHTS OF, OR HAS CAUSED HARM TO, A THIRD PARTY; (II) A BREACH BY CUSTOMER OR CUSTOMER'S USERS OF ANY TERM, OBLIGATION AND/OR COVENANT UNDER THIS AGREEMENT; OR (III) ANY USE OR MISUSE OF THE SERVICE.

13. Confidentiality.

13.1. Confidential Information. "Confidential Information" means any and all non-public information disclosed by one party (the "Disclosing Party") to the other party (the "Receiving Party") in any form or medium, whether oral, written, graphical or electronic, pursuant to this Agreement, that is designated confidential or proprietary, or that a reasonable person should understand is confidential or proprietary. Confidential Information includes, but is not limited to the terms of this Agreement, information related to either party's technology, products, know-how, trade secrets, whether or not patentable or copyrightable, specifications, customers, business plans, pricing information, promotional and marketing activities, finances and other business affairs, Topcon products and anything else created or developed by Topcon in connection with this Agreement and the Services. Customer will not remove or destroy any proprietary markings or restrictive legends placed upon or contained in the Service and/or related materials.

13.2. Nondisclosure Obligations. The Receiving Party will not use the Confidential Information of the Disclosing Party for any purpose other than as necessary to fulfill its obligations or to exercise its rights under this Agreement, and by Topcon to improve the Service (the "Purpose"). The Receiving Party will not disclose Confidential Information of the Disclosing Party to any third party; provided that the Receiving Party may disclose Confidential Information to its partners, officers, directors, employees, contractors, Affiliates, agents, advisors, or representatives who need access to such Confidential Information for the Purpose and who are subject to written confidentiality obligations at least as stringent as the obligations set forth in this Section 13. Each party accepts responsibility for the actions of its partners, officers, directors, employees, contractors, Affiliates, agents, advisors and representatives, and will protect the other party's Confidential Information in the same manner as it protects its own valuable confidential information, but with no less than reasonable care. The Receiving Party will promptly notify the Disclosing Party upon becoming aware of a breach or threatened breach hereunder and will cooperate with any reasonable request of the Disclosing Party in enforcing its rights.

13.3. Exceptions to Confidential Information. "Confidential Information" does not include information which: (i) is known by the Receiving Party prior to receipt from the Disclosing Party, without any obligation of confidentiality; (ii) becomes known to the Receiving Party directly or indirectly from a source other than one having an obligation of confidentiality to the Disclosing Party; (iii) lawfully becomes publicly known or otherwise publicly available, except through a breach of this Agreement; or (iv) is independently developed by the Receiving Party without use of or access to the Disclosing Party's Confidential Information. The Receiving Party may disclose Confidential Information pursuant to the requirements of applicable law, legal process or government regulation, but only after it notifies the Disclosing party (if legally permissible) to enable the Disclosing party to seek a protective order or otherwise to contest such required disclosure, at Disclosing Party's expense.

13.4. Injunctive Relief. The Parties agree that any unauthorized disclosure of Confidential Information may cause immediate and irreparable injury to the Disclosing Party and that, in the event of such breach, the Disclosing Party will be entitled, in addition to any other available remedies, to immediate injunctive and other equitable relief, without bond and without the necessity of showing actual monetary damages.

14. Use of Aggregate or Anonymized Data. Notwithstanding anything else in this Agreement or otherwise, Topcon may, in accordance with Applicable Privacy Laws, monitor use of the Service by its customers and use the data in the aggregate in the pursuit of its legitimate commercial interests, including for industry analysis, benchmarking, analytics, and marketing. Customer agrees that Topcon may collect, use and disclose such information that does not incorporate Customer Data or Personal Information, or otherwise identify Customer or its Users.

15. Limitation of Liability.

IN NO EVENT WILL TOPCON BE LIABLE TO CUSTOMER OR ANY THIRD PARTY FOR ANY TORT, CONTRACT OR ANY OTHER LIABILITY ARISING IN CONNECTION WITH THE USE OF THE SERVICE, THE WEBSITE, OR ANY TOPCON WEBSITE, OR RELIANCE ON ANY INFORMATION OR SERVICES PROVIDED BY TOPCON, INCLUDING BUT NOT LIMITED TO THE USE OR INABILITY TO USE THE SERVICE, OR FOR ANY CONTENT OBTAINED FROM OR THROUGH THE SERVICE, ANY INTERRUPTION, INACCURACY, ERROR OR OMISSION (REGARDLESS OF CAUSE) IN THE CONTENT, REGARDLESS OF THE FORM OF ACTION, INCLUDING, WITHOUT LIMITATION, FOR ANY LOSS OF PROFITS, GOODWILL, USE, DATA OR OTHER INTANGIBLE LOSSES, OR ANY DIRECT, INDIRECT, SPECIAL, CONSEQUENTIAL, INCIDENTAL OR PUNITIVE DAMAGES WHATSOEVER, EVEN IF TOPCON HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

UNDER NO CIRCUMSTANCES, INCLUDING BUT NOT LIMITED TO A NEGLIGENT ACT, WILL TOPCON OR ITS AFFILIATES, AGENTS, EMPLOYEES, OR LICENSORS (INCLUDING THIRD PARTY PROVIDERS) BE LIABLE FOR ANY DAMAGES OF ANY KIND THAT RESULT FROM (i) THE USE, UNAUTHORIZED USE OR THE INABILITY TO USE THE SERVICE; (ii) THE TIMELINESS, DELETION, MIS-DELIVERY, OR FAILURE TO STORE ANY CUSTOMER DATA; OR (iii) UNAUTHORIZED ACCESS TO OR ALTERATION OF CUSTOMER DATA.

IN ADDITION, WITHOUT LIMITING THE FOREGOING, IN ALL EVENTS THE REMEDIES AVAILABLE TO CUSTOMER SHALL BE LIMITED TO THE GREATER OF THE AMOUNT PAID BY CUSTOMER TO TOPCON FOR THE RIGHT TO USE THE SERVICE FOR THE THEN CURRENT TERM OR $100.

Certain states and/or jurisdictions do not allow the exclusion of implied warranties or limitation of liability for incidental, consequential or certain other types of damages, so the exclusions set forth above may not apply to Customer.

16. Force Majeure. Any delay in or failure of performance by Topcon under this Agreement shall not be considered a breach of this Agreement if and to the extent caused by events beyond the reasonable control of Topcon , including, but not

limited to, acts of God, embargoes, governmental restrictions, strikes, riots, terrorist attacks, wars, or other military action, civil disorders, rebellion, fires, floods, vandalism, power outages, or sabotage.

17. Local Laws and Export Control.

The Service provides services and uses software and technology that may be subject to United States export controls administered by the U.S. Department of Commerce, the United States Department of Treasury Office of Foreign Assets Control, and other U.S. agencies. Customer agree that the site shall not be used, and none of the underlying information, software, or technology may be transferred or otherwise exported or re-exported to countries as to which the United States maintains an embargo (collectively, "Embargoed Countries"), or to or by a national or resident thereof, or any person or entity on the U.S. Department of Treasury's List of Specially Designated Nationals or the U.S. Department of Commerce's Table of Denial Orders (collectively, "Designated Nationals"). The lists of Embargoed Countries and Designated Nationals are subject to change without notice. By using the Service, Customer represent and warrant that Customer are not located in, under the control of, or a national or resident of an Embargoed Country or Designated National. Customer agrees to comply strictly with all U.S. export laws and assume sole responsibility for obtaining licenses to export or re-export as may be required.

Topcon and its licensors make no representation that the Service is appropriate or available for use in other locations. If Customer uses the Service from outside the United States of America, Customer is solely responsible for compliance with all applicable laws, including without limitation export and import regulations of other countries. Any diversion of the Content contrary to United States law is prohibited.

18. Data Protection and Security.

18.1. As between Topcon and Customer, Customer is the data controller of the Personal Information included in the Customer Data and Topcon shall process Personal Information only as a data processor in order to perform its obligations under this Agreement and according to the Customer´s final instructions (as set out in this Agreement or provided later in writing), and its Privacy Statement and the Applicable privacy Laws. In the event of a conflict between the terms of this Agreement and the Privacy Statements, the terms of this Agreement will control with respect to the Service being purchased under this Agreement.

18.2. Solely in connection with its obligation under this Agreement , Topcon may, from time to time, maintain, process and use Personal Information collected by Customer. Customer represents and warrants that it has the authority to provide the Personal Information to Topcon for processing as contemplated by this Agreement. If any applicable law requires a data subject to receive notice of or to provide consent to the processing and/or transfer of his/her Personal Information, Customer will provide such notice and obtain such consent from the applicable data subjects. Customer only will provide Topcon with the Personal Information necessary for Topcon to perform its obligations under this Agreement (excluding any Sensitive Information which are not requested for this Services). .

18.3. Topcon has implemented and will maintain and follow appropriate technical and organizational measures intended to protect Personal Information against accidental, unauthorized or unlawful access, disclosure, damage, alteration, loss, or destruction. Notwithstanding the above, Customer is responsible for its secure use of the Service, including securing its account authentication credentials, protecting the security of Personal Information when in transit to and from the Service and taking any appropriate steps to securely encrypt or backup any Personal Information uploaded to the Service.

18.4. If Topcon becomes aware of a Security Incident, Topcon will (1) promptly notify Customer of the Security Incident in writing by any means (provided that such notification may be delayed as required by a law enforcement agency); (2) take reasonable steps to address and prevent any (further) Security Incident; (3) at Customer's request and cost, take commercially reasonable steps to assist Customer in complying with its obligations under Applicable Privacy Laws pertaining to responding to a Security Incident; and (4) when required under the Applicable Privacy Laws, comply with its obligations pertaining to a Security Incident. Topcon's obligation to report or respond to a Security Incident under this Section is not an acknowledgement by Topcon of any fault or liability with respect to the Security Incident. Customer must notify Topcon promptly about any possible misuse of its accounts or authentication credentials or any security incident related to the Service.

18.5. Topcon may transfer Personal Information to its Affiliates entities in connection with the performance of its obligations under this Agreement. For a list of Topcon locations, please see company locations found at https://www.topconpositioning.com. Customer authorizes Topcon (where applicable) to transfer Personal Information to and process it in the United States or any other country as set forth above, which may not have the same level of data protection as the country from which the Personal Information originated and represents and warrants that it has obtained the consent of its Users, where applicable, as required by Applicable Privacy Laws.

18.6. Topcon will abide by Applicable Privacy Laws pertaining to any relevant individual's exercise of his or her rights to access, correct, or object to the processing of Personal Information. Notwithstanding the foregoing, unless otherwise required by Applicable Privacy Laws, Topcon will promptly notify Customer if Topcon receives such a request from a data subject. Topcon will provide reasonable assistance to Customer to facilitate Customer's ability to respond to such request.

18.7. Customer consents to Topcon engaging third party sub-processors to process the Personal Information for the permitted purpose. Topcon maintains an up-to-date list of its sub-processors which is available upon request to dpo@topcon.com.

18.8. Following termination or expiry of the Service, Topcon will, where required by Applicable Privacy Laws and at the option of the Customer, return to Customer or securely delete all Personal Information processed in connection with the Service. This requirement shall not apply to the extent that Topcon is required by applicable law to retain some or all of the Personal Information, or Personal Information it has archived on back-up systems, in which event Topcon shall securely isolate and protect from any further processing except to the extent required by such law.

18.9. If there is new guidance or a change in the Applicable Privacy Laws that renders all or part of the Service and/or this Agreement illegal, Topcon may notify Customer of such modifications to this Section 18 as it reasonably deems necessary. If the Customer does not wish to accept the new terms in this Section 18, the Customer may terminate this Agreement within 15 days of the date such notice is given.

18.10. Notice. Topcon may give notice by means of a general notice on the Service, electronic mail to Customer's email address on record in the Customer Account, or by written communication sent by first class mail or pre-paid post to Customer's address on record in the Customer Account. Such notice shall be deemed to have been given upon the expiration of forty-eight (48) hours after mailing or posting (if sent by first class mail or pre-paid post) or twelve (12) hours after sending (if sent by email). Customer may give notice to Topcon (such notice shall be deemed given when received by Topcon) at any time by letter, delivered by internationally recognized overnight delivery service or first-class postage prepaid mail, to Topcon "TAP Notice" at Via Cernaia 2, Turin, 10122, Italy; with a copy via email to Legalnotices_POC@topcon.com.

19. Assignment; Change in Control. This Agreement may not be assigned by Customer without the prior written approval of Topcon. Any purported assignment in violation of this section shall be void. Any actual or proposed change in control of Customer that results or would result in a direct competitor of Topcon directly or indirectly owning or controlling 50% or more of Customer shall entitle Topcon to terminate this Agreement for cause immediately upon written notice.

20. General. This Agreement shall be governed by and construed and enforced in accordance with the laws of the State of California, without regard to conflicts of laws provisions. If for any reason any provision of this Agreement, or a portion thereof, shall be unenforceable, that provision shall be enforced to the maximum extent permissible so as to affect the intent of this Agreement, and the remainder of this Agreement shall continue in full force and effect. Any action concerning this Agreement shall take place in state or federal courts located in Alameda County, California. This Agreement constitutes the entire agreement between us and Customer with respect to the Service and it supersedes all prior or contemporaneous communications, agreements and understandings between Topcon and Customer with respect to the subject matter hereof. No joint venture, partnership, employment, or agency relationship exists between Customer and Topcon as a result of this agreement or use of the Service. The failure of Topcon to enforce any right or provision in this Agreement shall not constitute a waiver of such right or provision unless acknowledged and agreed to by Topcon in writing. A printed version of this Agreement shall be admissible in judicial or administrative proceedings.

II. Software End User License Agreement

Updated: March 1, 2025

IMPORTANT: PLEASE READ CAREFULLY. The software product provided or made available to you by Topcon Positioning Systems, Inc. ("Topcon") along with its associated manuals and documentation, if any (collectively, the "Software") is owned by Topcon and your use is subject to the terms and conditions of this Software End User License Agreement ("Agreement") set forth below. The Software is intended for use on and/or as embedded in a personal computer or Topcon product upon which the Software is intended to be installed and used (each a "Device"). If you are entering into this Agreement on behalf of a company or other legal entity, you represent that you have the authority to bind such entity to these terms and conditions, in which case the terms "you" or "your" shall refer to such entity. If you do not have such authority, or if you do not agree with these terms and conditions, you may not use the Software. Topcon also reserves the right to immediately terminate this Agreement for failure to comply with the terms provided herein.

By clicking the "ACCEPT" button below, and/or or by installing or using the Software or any Device in which the Software is embedded, you agree to be bound by the terms and conditions of this Agreement. If you do not agree, you will not be authorized to use the Software.

1. Grant of License to Software. If you have installed, purchased or otherwise received Software from Topcon or as embedded in a Device, Topcon grants you a personal, non-exclusive, non-transferable (except as expressly set forth herein) license for the applicable Term (as defined below) to use the Software under the terms stated herein and in any case only with a single Device running a validly licensed copy of the operating system for which the Software was designed (e.g., Linux, Android, iOS, Windows). "Term" means the time period during which you may use the Software associated with the applicable Topcon part number assigned to the Software license you acquired and/or as set forth in the applicable purchase confirmation. Licenses are either "perpetual", in which case the Term is unlimited, or "subscription", in which case the Term is the period of the subscription purchase (e.g., 1 year, 3, years, etc.). The Term shall commence on the earlier of: (i) the date set forth in the applicable purchase confirmation or (ii) the date you initially activate the Software.If you have acquired the product as an educational license, you can use the Software only for academic research projects. This explicitly excludes projects which are contracted to you by any third party for a fee, or projects that are performed in collaboration with a third party that is funding the research in whole or in part.

2. Restrictions on Use and Transfer. You may not: (i) copy, modify, adapt, translate, create derivative works of, reverse engineer, decompile, or disassemble the Software; (ii) remove, modify or hide or otherwise make unreadable or non-viewable any notice, legend, advice, watermark trademark, service mark, or other designation contained on the Software, component thereof, documentation, or output therefrom; (iii) distribute registered copies of the Software to third parties, including, without limitation, rent, lease, or lend the Software to third parties; (iv) install or access, or allow the installation or access of, the Software over the Internet, including, without limitation, use in connection with a webhosting or similar service, or make the Software available to third parties via the Internet on your computer system or otherwise; (v) use or export the Software outside of the country of installation or purchase for any reason; (vi) use, permit the use, or use the Software in violation of any U.S. Federal, state, or local laws or regulations or any foreign law or regulation, including laws regarding intellectual property rights in or laws or regulations regarding the trading or exchange of securities or concerning the Software. Unless local law provides otherwise, you may not assign, give or transfer a perpetual or subscription license to the Software to another individual or entity, without the prior written consent of Topcon.

Topcon shall be entitled to audit your use of the Software in relation to compliance with this Agreement, upon reasonable notice and on reasonable terms and report such use to its licensors.

3. Pass-Through of Open Source Terms. Notwithstanding the foregoing license grant and restrictions, you acknowledge that certain components of the Software may be covered by so-called "open source" software licenses ("Open Source Components"), which means any software licenses approved as open source licenses by the Open Source Initiative or any substantially similar licenses, including without limitation any license that, as a condition of distribution of the software licensed under such license, requires that the distributor make the software available in source code format. The Software includes a text file listing the Open Source Components. To the extent required by the licenses covering Open Source Components, the terms of such licenses will apply to such Open Source Components in lieu of the terms of this Agreement. To the extent the terms of the licenses applicable to Open Source Components prohibit any of the restrictions in this Agreement with respect to such Open Source Component, such restrictions will not apply to such Open Source Component. To the extent the terms of the licenses applicable to Open Source Components require Licensor to make an offer to provide source code or related information in connection with the Software, such offer is hereby made. Any request for source code or related information should be directed only to: Topcon via email at OSinquiry@topcon.com.

4. Termination. This Agreement is effective until expiration of the Term or terminated as provided herein. You may terminate the license at any time by destroying the Software and related documentation. Without prejudice to any other rights of Topcon, Topcon may terminate your license if you fail to comply with the terms and conditions of this Agreement. In such event, you must destroy all copies of the Software in your possession.

5. Safety. IMPROPER USE OF A TOPCON PRODUCT CAN LEAD TO INJURY TO PERSONS OR PROPERTY AND/OR MALFUNCTION OF THE PRODUCT. THE PRODUCT SHOULD ONLY BE REPAIRED BY AUTHORIZED TOPCON WARRANTY SERVICE CENTERS. USERS SHOULD REVIEW AND HEED THE SAFETY WARNINGS IN THE DOCUMENTATION ACCOMPANYING THE PRODUCT.

6. Ownership of the Software. The Software is owned by Topcon and its respective licensors and is protected by United States and international copyright laws and other intellectual property laws.

7. Professional Use. The Software is designed to be used by a professional. The user is required to be a professional surveyor or have a good knowledge of surveying and be familiar with the safe use of such products, in order to understand the user instructions before operating the Software.

8. Maintenance/Support. Maintenance and support services are available through the Topcon Software Service Plan (the "Service Plan").

a. Perpetual Licenses. For perpetual licenses, Topcon agrees to provide maintenance and support services as described in and pursuant to the Service Plan to you for a period of 1 year from the date of commencement of the Term, at no additional charge. Following the first year, and for successive years thereafter, in order to receive continued maintenance and support service, you must pay the applicable Service Plan fee at the start of each annual period as set forth by Topcon. The current Service Plan is set forth in Section III below. t. Service Plan terms and conditions are subject to change from time to time as determined by Topcon and updated term as and conditions would be applicable at the time of renewal.

b. Subscription Licenses. The Service Plan is included with subscription licenses at no additional charge and shall be available for the relevant Term.

9. Crash; Bug Reporting and Feedback. The Software provides you with the ability to report performance issues/feedback and suggestions to Topcon. In the event that you chose to report any performance issues to Topcon the Software will gather the relevant job file and Device and Software settings and save to a file that you may forward to Topcon. Such information and feedback shall be used by Topcon to develop, provide and improve Topcon's products and services, resolve bugs and faults, and to facilitate the provision of Software updates, product development, management and support and other services to you (if any) related to the Software. You hereby grant to Topcon a perpetual license to use, perform, copy, modify of the information that you supply to Topcon under the process and for the purposes described in this Section 9.

10. Analytics; Use of Aggregate/Anonymized Data. The Software is enabled to share anonymized usage data with Topcon from time to time via the internet. Topcon uses such data in the aggregate, with anonymized usage data provided by other users, in the pursuit of its legitimate commercial interests, including for industry analysis, benchmarking, analytics, product/service improvement and development. You agree that Topcon may collect, use and disclose such information that does not incorporate personal information or otherwise identify you or your users. You may disable the analytics gathering functionality in the "About" page in the Software.

11. Disclaimers. YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT TO THE EXTENT PERMITTED BY APPLICABLE LAW, USE OF THE SOFTWARE AND ANY FEATURES/SERVICES PERFORMED BY OR ACCESSED THROUGH THE SOFTWARE IS AT YOUR SOLE RISK AND THAT THE ENTIRE RISK AS TO SATISFACTORY QUALITY, PERFORMANCE, ACCURACY AND ERROR IS WITH YOU.

THE SOFTWARE AND RELATED FEATURES ARE PROVIDED "AS IS." TOPCON MAKES NO PROMISES, REPRESENTATIONS OR WARRANTIES, WHETHER EXPRESSED OR IMPLIED, REGARDING OR RELATING TO THE SOFTWARE AND RELATED FEATURES (INCLUDING, WITHOUT LIMITATION, THAT THE SOFTWARE WILL BE ERROR-FREE OR AVAILABLE FOR USE AT ALL TIMES) OR CONTENT THEREIN OR TO ANY OTHER MATERIAL FURNISHED OR PROVIDED TO YOU PURSUANT TO THIS AGREEMENT OR OTHERWISE, AND TOPCON SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO SAID MATERIALS OR THE USE THEREOF. TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, THE UNIFORM COMMERCIAL CODE OR OTHER UNIFORM LAWS SHALL NOT APPLY TO THIS AGREEMENT.

TOPCON DOES NOT WARRANT THAT THE FUNCTIONS CONTAINED IN, OR SERVICES PERFORMED OR PROVIDED BY THE SOFTWARE WILL MEET YOUR REQUIREMENTS, THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR-FREE OR OPERATE IN COMBINATION WITH ANY OTHER HARDWARE, SOFTWARE, SYSTEM OR DATA, THAT ANY SERVICES/FEATURES WILL CONTINUE TO BE AVAILABLE, THAT THE SOFTWARE OR SERVICES/FEATURES WILL BE CORRECTED, OR THAT THE SOFTWARE WILL BE COMPATIBLE OR WORK WITH ANY THIRD-PARTY SOFTWARE, APPLICATIONS OR THIRD-PARTY SERVICES.

12. Trademarks. The Topcon name, the Topcon logo, and the product names associated with the Service are trademarks of Topcon and no right or license is granted to use them. Product and company names mentioned herein may be trademarks of their respective owners.

13. Third-Party Features. The Software includes features/services available under license from certain third parties ("Third-Party Features"). Topcon does not guarantee the ongoing availability of any Third-Party Features, which are subject to immediate termination at the discretion of Topcon. In the event that any Third-Party Feature is terminated you shall have no further right to access/use the subject feature under this Agreement and your access to such Third-Party Feature may be permanently disabled. Notifications of availability/termination of Third-Party Features may be posted from time to time on the Topcon website.

12.1. Bing Maps Feature. Microsoft Bing maps feature. Additional End User Terms relating thereto are found below in Appendix A.

12.2. RealDWG Feature.You are hereby notified that Autodesk, Inc. 111 McInnis Parkway, San Rafael, CA 94903 ("Autodesk") is a third-party beneficiary to this Agreement. Such provisions are made expressly for the benefit of Autodesk and are enforceable by Autodesk in addition to Topcon.

13. Limitation of Liability. TOPCON, ITS DISTRIBUTORS, LICENSORS AND SUPPLIERS SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS OR OMISSIONS CONTAINED IN THE SOFTWARE, ITS DOCUMENTATION AND/OR FEATURES. TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, IN NO EVENT SHALL TOPCON , ITS DISTRIBUTORS, LICENSORS, OR SUPPLIERS BE LIABLE UNDER ANY CLAIM, DEMAND OR ACTION ARISING OUT OF OR RELATING TO THE SOFTWARE, ITS USE, INSTALLATION OR THEIR PERFORMANCE OR LACK THEREOF UNDER THIS AGREEMENT FOR ANY SPECIAL, INDIRECT, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES, WHETHER OR NOT THEY HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH CLAIM, DEMAND OR ACTION. UNDER NO CIRCUMSTANCES, INCLUDING BUT NOT LIMITED TO A NEGLIGENT ACT, WILL Topcon OR ITS AFFILIATES, AGENTS, EMPLOYEES, DISTRIBUTORS, SUPPLIERS OR LICENSORS BE LIABLE FOR ANY DAMAGES OF ANY KIND THAT RESULT FROM (i) THE USE OR THE INABILITY TO USE THE SOFTWARE AND/OR ANY FEATURES THEREOF (INCLUDING THIRD PARTY FEATURES/SERVICES; (ii) THE TIMELINESS, DELETION, MIS-DELIVERY, OR FAILURE TO STORE ANY DATA, COMMUNICATIONS OR SETTINGS; (iii) THE COST OF GETTING SUBSTITUTE GOODS AND SERVICES; OR (iv) UNAUTHORIZED ACCESS TO OR ALTERATION OF YOUR TRANSMISSIONS OR DATA EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN ADDITION, WITHOUT LIMITING THE FOREGOING, IN ALL EVENTS THE REMEDIES AVAILABLE TO YOU SHALL BE LIMITED TO THE GREATER OF THE AMOUNT PAID BY YOU TO TOPCON FOR THE RIGHT TO USE THE SOFTWARE OR $100.

14. Indemnification. YOU SHALL INDEMNIFY AND HOLD TOPCON, ITS DISTRIBUTORS, LICENSORS AND SUPPLIERS AND THEIR RESPECTIVE AGENTS, OFFICERS, MANAGERS, EMPLOYEES AND MEMBERS HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DEMANDS, SUITS, JUDGMENTS AND EXPENSES (INCLUDING REASONABLE LEGAL FEES AND EXPENSES) ARISING OUT OF OR RELATING TO: (A) THE BREACH BY YOU OF YOUR OBLIGATIONS UNDER THIS AGREEMENT; (B) YOU VIOLATION OF ANY LAW< REGULATION OR THIRD- PARTY RIGHTS; AND/OR (C)INTELLECTUAL PROPERTY MISAPPROPRIATION OR INFRINGEMENT CLAIMS BY ANY THIRD PARTY BASED ON, OR RELATING TO, YOUR USE OF THE SOFTWARE. YOU AGREE TO GIVE TOPCON PROMPT NOTICE OF SUCH CLAIMS AND TO PERMIT TOPCON TO CONTROL THE DEFENSE OR SETTLEMENT THEREOF.

15. Export Control. You may not use or otherwise export or re-export the Software except as authorized by United States law and the laws of the jurisdiction(s) in which the Software was obtained. In particular, but without limitation, the Software may not be exported or re-exported (a) into any U.S. embargoed countries or (b) to anyone on the U.S. Treasury Department's list of Specially Designated Nationals or the U.S. Department of Commerce Denied Person's List or Entity List. By using the Software, you represent and warrant that you are not located in any such country or on any such list. You also agree that you will not use the Software for any purposes prohibited by United States law, including, without limitation, the development, design, manufacture or production of missiles, nuclear, chemical or biological weapons.

16. Government End Users. If the Software is supplied to or purchased by or on behalf of the United States Government, then the Software is deemed to be a Commercial Item, as that term is defined in 48 C.F.R. -2.101, consisting of Commercial Computer Software and Commercial Computer Software Documentation, as such terms are used in 48 C.F.R. -12.212 or 48 C.F.R. -227.7202, as applicable. Consistent with 48 C.F.R. -12.212 or 48 C.F.R. -227.7202-1 through 227.7202-4, as applicable, such Commercial Computer Software and Commercial Computer Software Documentation are licensed to U.S. Government end users (a) only as Commercial Items and (b) with only those rights as are granted to all other end users pursuant to the terms and conditions set forth in this Agreement.

17. Website; Other Statements. No statement contained at the Topcon website (or any other web site) or in any other advertisements or Topcon literature or made by an employee or independent contractor of Topcon shall modify this Agreement.

18. Privacy Policy. At all times personally identifiable information will be treated in accordance with Topcon's Privacy Policies, which can be viewed at: https://www.topconpositioning.com.

19. General. This Agreement may be amended, modified, superseded, or canceled, at any time by Topcon. This Agreement shall be governed by and construed and enforced in accordance with the laws of the state of California, without regard to conflicts of laws provisions. Any action concerning this Agreement shall take place in the state or federal courts located in San Francisco, California. If for any reason any provision of this Agreement, or a portion thereof, shall be unenforceable, that provision shall be enforced to the maximum extent permissible so as to affect the intent of this Agreement, and the remainder of this Agreement shall continue in full force and effect. This Agreement constitutes the entire agreement between us and you with respect to the Software and it supersedes all prior or contemporaneous communications, agreements and understandings between Topcon and you with respect to the subject matter hereof. In the event of any conflict between the terms and conditions of this Agreement and the terms and conditions of any other agreement between the parties relating to the acquisition of a license to the Software or support thereof, including Topcon's standard terms of

purchase, the terms and conditions of this Agreement shall control. No joint venture, partnership, employment, or agency relationship exists between you and Topcon as a result of this agreement or use of the Service. The failure of Topcon to enforce any right or provision in this Agreement shall not constitute a waiver of such right or provision unless acknowledged and agreed to by Topcon in writing. A printed version of this Agreement shall be admissible in judicial or administrative proceedings.

Appendix A

MICROSOFT BING MAPS END USER MINIMUM TERMS

Microsoft has licensed the Services (defined below) to Topcon. By using the Software, you accept these terms. If you do not accept them, do not use the Software.

1. Definitions.

"Asset" means one of any of the following classes: vehicle, device or another mobile object.

"Content" means the maps, images and other data and third-party content that Bing Map licensors are authorized to access via the Services.

"Premium Services" means, collectively, the Bing Maps Distance Matrix API, Bing Maps Isochrone, Bing Maps Snap to Road API and Bing Maps Truck Routing API.

"Services" means the Bing Maps Platform APIs (except Premium Services) to be provided by Microsoft.

2. License. Topcon provides you a license to access the Services (except Premium Services) from within the Software provided by Topcon only.

3. Additional Restrictions.

You may overlay administrative boundaries or other map content provided in the Software, provided that you do not use the Software for:

(1) loading additional map content layers of any kind;

(2) editing or creating map content. For avoidance of doubt, simple annotations such as a line, arrow, polygon or circle to highlight an area are allowed and not considered to be map content under this restriction; and

(3) executing any spatial query other than proximity (find the nearest), point-in-polygon, distance between two points or as provided by the find

and route services. For avoidance of doubt, Software may not perform Geofences, buffers or query a spatially enabled database.

4. General Restrictions. Microsoft does have some restrictions on your use of the Software supplied by Topcon. In using the Services provided with the Software, you may not:

(a) Upload or incorporate any content to the Services via the Software, or use the Software to display or use any content:

- for which you do not have all necessary permissions from the copyright holder(s);
- which includes nudity or is obscene, indecent, pornographic;
- which is intended to exploit minors in any way;
- which incites, advocates, or expresses hatred, bigotry, racism, or gratuitous violence; or
- which is intended to threaten, stalk, defame, defraud, degrade, victimize, or intimidate an individual or group of individuals for any reason, including on the basis of age, gender, disability, ethnicity, sexual orientation, race, or religion, or to incite or encourage anyone else to do so.

(b) Copy, store, archive, or create a database of the Content.

(c) Use Content, including geocodes, other than in conjunction with the Software.

(d) Present or alert a user to individual maneuvers of a route in any way that is synchronized with the user's sensor-based position along the route (e.g. turn by turn navigation that tracks the user's position using GPS and communicates a maneuver as the user approaches the location for such maneuver).

(e) Change, obscure, or minimize any logo, trademark, copyright or other notice of Microsoft or its suppliers, or digital watermarks in the Content; except that we may make alternative logo, trademark and copyright attribution requirements available for use with small maps or on small devices; if available you will find them here: http://go.microsoft.com/fwlink/?LinkID=229258.

(f) Use the Services for business asset tracking, fleet management, or dispatch including, without limitation, to monitor or track the location or movement of Asset(s), including to provide guidance based on the position or routing of multiple objects tracked using GPS or other sensor- generated methods.

(g) Use Content other than in combination with the Services and not separately.

(h) Use Content that consists of points of interest data to generate sales leads information in the form of ASCII or other text-formatted lists of category-specific business listings which (i) include complete mailing address for each business; and (ii) contain a substantial portion of such listings for a particular country, city, state or zip code region.

(i) Transmit, sell, license or deliver any infringing, defamatory, offensive, or illegal products, services or materials.

(j) Violate any applicable U.S. Export Administration Regulations or end user, end-use and destination restrictions issued by U.S. and other governments. The Services are subject to U.S. export jurisdiction.

(k) Use the Services in any way that threatens the integrity, performance or reliability of the Services including performance or stress testing, or in any manner that works around any technical limitations in the Services.

(l) Syndicate, redistribute, resell or sublicense access to the Services or Content on a standalone basis.

(m) Falsify or alter any unique referral identifier in, or assigned to, a Software, or otherwise obscure or alter the source of queries coming from a Software.

(n) Reverse engineer, decompile or disassemble the Services, except and only to the extent that applicable law expressly permits, despite this limitation.

(o) Integrate road maps from the Services with road maps supplied by any third party. You may not replace aerial imagery from the Services with imagery supplied by any other mapping platform.

(p) Use the Services or Content with a vehicle's dashboard, or a device connected to a vehicle's dashboard, systems or sensors, except that the device may be connected to the vehicle power source for charging purposes.

(q) Use bird's eye aerial imagery (if it is made available through the Bing Maps Platform APIs) to reveal latitude, longitude, altitude or other metadata.

(r) Save, download, print, distribute, transmit or manipulate bird's eye imagery, or offer others that ability, through your Software.

(s) Use bird's eye imagery of the United States, Canada, Mexico, New Zealand, Australia, and/or Japan if you are a government entity.

(t) Use Content from Ordnance Survey.

5. Intellectual Property and Reservation of Rights. All rights to the Services and the Content, including rights of use, not specifically granted under these End User Minimum Terms or your agreement with Topcon are reserved by Microsoft and its suppliers. Except as set forth in your agreement with your Topcon, these End User Minimum Terms do not grant Microsoft any right or license to any Software or your intellectual property, including intellectual property that you licensed from third parties. Except for material that Microsoft may license to you, Microsoft does not claim ownership of the content you post

or otherwise provide to us, which is hosted by Microsoft or a third-party hosting provider on Microsoft's behalf, related to the Services (called a "Submission"). However, by posting or otherwise providing your Submission (and for the avoidance of doubt, where Microsoft hosts content on your behalf including by a third party hosting provider, this constitutes a Submission, but where you host or a third party hosts content on your behalf, other than Microsoft or a third party hosting provider on behalf of Microsoft, this does not constitute a Submission), you are granting to Microsoft free permission to use, copy, distribute, display, publish, transcode and otherwise modify your Submission, each in connection with the Services, and sublicense these rights to others in order to provide the Services. For every Submission you make, you must have all rights necessary for you to grant the permissions in this section.

6. Additional Rights and Restrictions for End Users.

(i) Support or SLA. Microsoft does not provide any support or SLA directly to end users for Software provided to an end user by Topcon.

(ii) Termination Rights. Microsoft reserves the right terminate access to the Software to any end user who is in breach of any restriction included in these End User Terms or Topcon's terms with you related to use of the Services, and who fails to cure such breach within thirty (30) days after written notice thereof.

(iii) No Warranty by Microsoft to End Users. Microsoft does not make any representation or warranty (express, implied, statutory, or otherwise) with respect to the Services or otherwise.

III. Software Service Plan

Updated: March 1, 2025

The following terms and conditions describe and apply to the Topcon Software Service Plan (the "Service Plan") for Software licensed to you by Topcon:

1. Term.

a. Perpetual Licenses. For perpetual licenses to the Software, the Service Plan is provided on an annual basis subject to the payment of applicable fees. For the first year following the purchase of a perpetual license the Service Plan will be included free of charge. Thereafter, the Service Plan shall automatically renew for successive one (1) year periods upon the same terms and conditions as set forth herein in exchange for the payment of the applicable annual support fee (the "Service Plan Fee") unless either party provides notice of its intent not to renew no later than thirty (30) days prior to the expiration of the then current term. If neither party issues a notice of non-renewal, then Topcon, or one of its resellers, may issue an invoice for the payment of the applicable annual Service Plan Fee, which shall be due and payable thirty (30) days from the date of the invoice.

b. Subscription Licenses. For Subscription licenses to the Software, the Service Plan (as may be updated from time to time) will be available throughout the period of the subscription.

2. Services. The Service Plan includes the following services:

2.1. Updates/Upgrades. Free Upgrades and/or Updates to the Software, if such Upgrades and/or Updates, the use of which shall be subject to the terms and conditions of the license agreement relating to the Software. "Upgrade" means a new version of the Software that adds substantial new features and functionality in addition to the original functional characteristics of the Software and is generally designated by a change in the version number to the left of the decimal point (e.g., Version 1.1 to Version 2.1). "Updates" as used herein means bug fixes, corrections, and enhancements to the Software that are made available by Topcon to its customers at no additional fee. Some Updates and Upgrades may require more advanced or larger capacity equipment and/or third-party software. Meeting other equipment and software compatibility requirements shall be solely your responsibility. Updates do not include any software that Topcon licenses separately such as major upgrades that contain substantive new features or functionality not provided by the Software originally licensed by you. Topcon shall take commercially reasonable steps to correct and/or provide workarounds for programming defects in the Software reported by your designated contacts to Topcon, if Topcon, in its sole discretion, recognizes them as having a detrimental effect on the operation of the Software.

2.2. Error Support. Error Support as described in Exhibit B.

3. Training. Training is not provided as part of the Service Plan. Training is available subject to separate mutually acceptable terms and conditions.

4. Topcon Enterprise. Perpetual licenses shall be entitled to a single-user subscription to the Topcon Enterprise web service, conditioned on your acceptance of and compliance with the then current Service Plan terms and conditions.

5. Your Responsibilities.

5.1. Contacts. You shall provide Topcon with the names and contact information for the permitted number of your designated contacts for the Service Plan. You may change such designated contacts from time to time and shall provide notice to Topcon upon making such changes. Your designated contacts shall familiarize themselves with the use and operation of the Software and review the accompanying product documentation.

5.2. Cooperation. You shall reasonably cooperate with Topcon to enable Topcon to effectively perform its obligations hereunder and you shall provide Topcon access to their systems, software, data, etc., as may be reasonably requested by Topcon to perform the services.

5.3. Compliance. You shall remain in full compliance with all license agreements applicable to the Software.

6. Charges. Service Plan Fees are described in an order form or applicable Topcon price/fee schedules. All invoices for shall be paid within 30 days of the date of invoice. Service Plan Fees do not cover any support services related to third party software programs, which may be required to run the Software. If a Service Plan expires and is not renewed within 60 days, Topcon may charge an additional reinstatement fee.

7. Exclusions. The Service Plan does not include, and Topcon shall have no obligation to respond to or resolve, problems arising from, related to or caused by:

7.1. Matters excluded from the definition of “Errors” in Exhibit B.

7.2. Your failure to perform a material obligation under Section 5, above.

7.3. Provision, installation and/or support of new versions and/or enhancements to Third-party Software. “Third-party Software” is any software that is not developed by Topcon and includes without limitation, operating system software, word processing, spreadsheet, and reporting and/or database software.

7.4. Performing the installation and configuration of the Software or Updates and Upgrades to the Software.

7.5. Upgrading hardware on the system on which you use the Software to an unsupported hardware configuration.

7.6. If you are using Topcon products that require Third-party Software, you must remain current on maintenance requirements for all such products for as long as the Software is in use to assure the integrity of the Software. You acknowledge that cancellation of the Service Plan as to any one system may cause incompatibilities with related products, and performance of the Software could be adversely affected. Similarly, you also acknowledge that Updates or any Upgrades to the Software may require upgrades to Third-party Software, hardware or other equipment.

7.7. Topcon shall not be responsible for any problems arising from repair of the Software if the failure, as reasonably determined by Topcon, is directly a result of:

7.7.1. Third-party Software or third-party equipment or supplies you are using that are not supplied by Topcon.

7.7.2. Misuse or neglect of the Software including, but not limited to, failure to perform scheduled data backups using a prudent method of media rotation.

7.7.3. Anyone other than a member of Topcon’s staff making any alteration to the Software or to the system files, without the guidance or direction of Topcon, which adversely affects the Software.

7.7.4. Your negligence, abuse, misapplication or use of the Software other than for its intended purpose.

7.7.5. The inappropriate use of Third-party Software that adversely affects the Software and but for such inappropriate use, the Software would not be affected as determined on a case-by-case basis.

7.7.6. Changes to the operating system, hardware or environment that adversely affect the Software as determined on a case-by-case basis.

Topcon reserves the right to charge additional fees at its then standard rates for services performed in connection with reported incidents that are later determined to have been due to problems described in Section 7.7 or for services that extend beyond the scope of this Service Plan. Such services shall be supplied at Topcon’s, or the involved Topcon dealer’s, then current rates plus reasonable expenses. Notwithstanding the foregoing, Topcon has no obligation to perform support services in connection with issues resulting from hardware or software not supplied by Topcon.

8. Software Modifications. Any unauthorized modifications that you make to the Software, including any modifications to any licensed Third-party Software included with or embedded in the Software, will render any obligations under this Service Plan null and void. Topcon will not be liable, in any respect, for any such unauthorized modifications or any errors, losses or damage resulting from such modifications.

9. Warranty; Disclaimer of Warranties; Limitation of Liability.

9.1. Warranty. Topcon represents, warrants and covenants that the services provided hereunder will be performed by qualified and skilled personnel in a workmanlike manner.

9.2. Disclaimer. TOPCON DOES NOT AND CANNOT WARRANT THE PERFORMANCE OR RESULTS OBTAINED BY YOU IN RECEIVING THE SERVICES, OR THAT THE SERVICES WILL MEET YOUR REQUIREMENTS. EXCEPT AS EXPRESSLY SET FORTH HEREIN, TOPCON EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES WITH RESPECT TO THE SERVICE PLAN, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

9.3. LIMITATION OF LIABILITY. IN NO EVENT WILL TOPCON BE LIABLE TO YOU FOR ANY LOSS OF PROFITS, LOSS OF USE, BUSINESS INTERRUPTION, LOSS OF DATA, COST OF COVER OR OTHER INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE DELIVERY OF SERVICES OR ANY DELAY IN DELIVERY OF THE SERVICES. EXCEPT FOR LIABILITY ARISING FROM A VIOLATION OF A PARTY'S CONFIDENTIALITY OBLIGATIONS SET FORTH HEREIN, AND/OR WILLFUL MISCONDUCT AND GROSS NEGLIGENCE. TOPCON'S MAXIMUM AGGREGATE LIABILITY (WHETHER IN CONTRACT OR IN TORT OR UNDER ANY OTHER FORM OF LIABILITY) FOR DAMAGES OR LOSS, HOWSOEVER ARISING OR CAUSED, SHALL IN NO EVENT EXCEED THE SERVICE PLAN FEES FOR THE ANNUAL TERM DURING WHICH SUCH LIABILITY ARISES.

10. Confidentiality. All Confidential Information (as defined below) that is disclosed by either party (a "disclosing party") to the other (a "receiving party") in relation to this Service Plan or the relationship created by this Service Plan shall be held in strict confidence by the receiving party and only used in connection with this Service Plan. Any disclosure or provision of Confidential Information to the receiving party shall be made in reliance on this promise. "Confidential Information" means all information related to a party that such party identifies as confidential or proprietary and discloses to the other party which relates to their past, present or future research, development, technology, know—how, business activities and programs, financial information and patient information. Confidential Information shall also include any unannounced product (s) or service(s) of either party, and any other information or materials provided to a receiving party and designated by the disclosing party as confidential or proprietary. Information communicated orally shall be considered Confidential Information if such information is confirmed in writing as being Confidential Information within a reasonable time after the initial disclosure. Confidential Information shall not, however, include any information which (i) was publicly known and made generally available in the public domain prior to the time of disclosure by the disclosing party; (ii) becomes publicly known and made generally available after disclosure by the disclosing party to the receiving party through no action or inaction of the receiving party; (iii) is already in the possession of the receiving party at the time of disclosure by the disclosing party as shown by the receiving party's files and records immediately prior to the time of disclosure; (iv) is obtained by the receiving party from a third party without a breach of such third party's obligations of confidentiality; (v) is independently developed by the receiving party without use of or reference to the disclosing party's Confidential Information, as shown by documents and other competent evidence in the receiving party's possession; or (vi) is required by law to be disclosed by the receiving party, provided that the receiving party gives the disclosing party prompt written notice of such requirement prior to such disclosure and assistance in obtaining an order protecting the information from public disclosure. The parties do not wish to receive any Confidential Information that is not necessary to achieve the purpose of this Service Plan.

Each party agrees that it shall take reasonable measures to protect the secrecy of and avoid disclosure and unauthorized use of the Confidential Information of the other party. Without limiting the foregoing, each party shall take at least those measures that it takes to protect its own most highly confidential information and warrants and represents on their own behalf that all of their own officers, employees, and agents who have access to Confidential Information of the other party are aware of (or will, prior to their being given access to any Confidential Information under this Service Plan, be made aware of) the terms of this Service Plan so that they may sufficiently protect the considerable interest of the other party's Confidential Information.

Each party acknowledges and agrees that it may suffer irreparable injury not compensable by money damages and therefore may not have an adequate remedy at law in the event of an unauthorized use or disclosure of Confidential Information in breach of the provisions of this Service Plan. Accordingly, a disclosing party shall be entitled to injunctive relief to prevent or curtail any such breach, threatened or actual, by a receiving party. The foregoing shall be in additional and without prejudice to such other rights as each party may have at law or in equity.

The parties agree that the terms of this Section shall survive the termination of this Service Plan.

11. Miscellaneous.

The obligations of either party under this Service Plan may be impacted by conditions beyond the control of such party or its agents, including but not limited to, acts of God, acts of any public enemy, fire, flood, epidemic or quarantine restrictions, strikes, riots or civil commotion, freight or other embargoes, and weather conditions. This Service Plan will be governed by and interpreted in accordance with the laws of the State of California and the parties agree to attorn to the jurisdiction of the courts therein. Topcon shall support the latest version of the Software. If you choose not to install the latest version of the Software, Topcon reserves the right to reasonably limit the scope of the services provided. You may not assign, in whole or in part, any of your rights or obligations under this Service Plan without the prior written consent of Topcon. This Service Plan (together with any exhibits or attachments referred to herein) sets forth the entire understanding of the parties with respect to the subject matter of this Service Plan, and supersedes all prior agreements, proposals, negotiations, representations or communications relating to the subject matter. Any amendment to this Service Plan must be in writing signed by both parties. The waiver or failure of either party to exercise in any respect any right provided for in this Service Plan shall not be deemed a waiver of any further right under this Service Plan.If any provision of this Service Plan is invalid, illegal or unenforceable under any applicable statute or rule of law, it is to that extent to be deemed omitted. The remainder of the Agreement shall be valid and enforceable to the maximum extent possible.

Exhibit A

Topcon Software Service Plan Overview

Key Benefits

Online access to:

Documentation and technical resources

Knowledge base of common resolutions

Product upgrades and updates

At a Glance

Feature	Services
Length of Service Plan	Perpetual License: Annual (following balance of year of purchase of Software (renewed annually) Subscription License: Service Plan available during subscription term
Upgrades and Updates	Included
Products Supported	Topcon Project Software, Topcon Digital Layout
Access	Web App: myTopconNOW!, available at the Apple App Store and Google Play

Exhibit B

Customer Support

1. Definitions.

1.1. "Error" means a failure of the Software to substantially conform to the applicable Software documentation made available by Topcon.

The term "Error" does not include, and Topcon shall have no obligation to resolve problems arising from, related to or caused by: (i) feature requests or product enhancement requests; (ii) altered or modified Software or any portion of the Software incorporated with or into other software; (iii) negligence, abuse, misapplication or use of the Software other than as specified in the applicable Topcon documentation or as otherwise suggested or recommended by Topcon; (iv) accidents, acts of nature or other causes beyond the reasonable control of Topcon; (v) failure to timely install all Updates made available by Topcon; (vi) changes to the operating system, hardware or environment which have not been reviewed with Topcon and that adversely affect the Software; or (vii) versions of the Software that are more than one major release older

than the then-current version. By way of example, when Software version 3.x is commercially available, Topcon will discontinue support of Software version 1.x. Service Plans do not include diagnosis at or travel to any facilities other than Topcon premises, or re-creation of data lost for any reason whatsoever. For Topcon's efforts to address any of the foregoing or other problems caused by Customer's or any Third-party Software or products, Topcon will be entitled to time and materials compensation from Customer at its then standard rates for services.

1.2. "Major Error" is any Error that either fully or repeatedly or substantially impairs the use or operation of the Software by Customer or Customer's customers.

1.3. "Minor Error" is any Error that is outside of the Major Error definition.

2. Error Support Responsibilities.

2.1. Customer Responsibilities. Customer will be responsible for providing Level 1 and 2 support for the Software to its customers and Customer may contact Topcon time to time by phone or email to efficiently address such issues.

2.1.1. Level 1. Customer will be responsible for direct customer interface and problem isolation and determination to the extent possible.

2.1.2. Level 2. Customer will be responsible for problem resolution, to the extent that Customer can resolve the problem with reference to information and resources made available to Customer by Topcon.

2.2. TPS Responsibilities. Topcon will provide Customer with Level 1 and Level 2 supplementary support on an as needed basis for Customer. Topcon shall have no obligation to provide any support to Customer's customers or end users.

2.2.1. During the Term of this Service Plan, should Topcon be notified by Customer of any reproducible Errors in the Software, Topcon shall promptly take appropriate measures and use reasonable efforts to correct such Errors and to provide such corrections in accordance with the process set forth below:

Major Error Response	Correction
During Topcon normal business hours Topcon shall provide acknowledgment of the Error and a description of a course of action within twenty-four (24) business hours of notification by Customer.	Topcon shall employ best efforts to provide a work-around or patch within seven (7) business days.
Minor Error Response	Correction
Topcon acknowledgment and description of course of action within five (5) business days of notification by Customer.	Topcon shall employ best efforts to provide a work around or patch within fourteen (14) business days.

Topcon Positioning Group Privacy Statement

Your privacy and trust are important to us and this Privacy Statement (“Statement”) provides important information about how Topcon (“Topcon”, “we” or “us”) handles personal information. This Statement describes which personal data we collect through our websites, applications, products, software, or service that links to such websites, applications, products and/or software as well as through our sales and marketing activities (collectively, our “Services”) and the purpose why we collect and process (“collect” or “process”) your personal information.

The subject of data protection is personal data (hereinafter “personal data” or “personal information”), which is all information relating to an identified or identifiable natural person; this includes, for example, names or identification numbers.

Topcon is committed to complying with applicable privacy regulations (“Applicable Laws”) and we have adopted the requirements of these Applicable Laws in our practices regarding the management of personal data in our daily business. Applicable Laws include, but are not limited to, Europe’s General Data Protection Regulation (“GDPR”) as well as Australia’s Federal Privacy Act 1988, the Australian Privacy Principles (“APP”), the California Consumer Privacy Act (“CCPA”) the UK Data Protection Act 2018 (“UK DPA”) and Canada’s Personal Information Protection and Electronic Documents Act (“PIPEDA”) and substantially similar applicable provincial legislation in Canada.

Please read this Statement carefully and contact our Data Protection Officer (dpo@topcon.com) if you have any questions about our privacy practices or your personal information choices. Additional information is also available at the Topcon Privacy Center at https://www.topconpositioning.com

It is important that you check back often for updates to this Statement. A current version of this Statement is always accessible on our website.

This Statement was last updated on **December 9, 2020**.

1. What Information about You is Collected by Topcon?

Topcon may request and/or collect certain personal information from you whenever you interact with us, make use of a Service, when you enter personal information on our website or provide us with personal information in any other way including your name, address, email address, telephone number, etc., as well as information related to customer satisfaction surveys, customer purchasing habits, warranty information and/or other purchasing information or other information volunteered by you. Topcon may also collect other technical information such as your IP address, MAC address, internet service provider, computer operating platform, web browser, geolocation and other similar information. We also collect personal data such as name, surname, email and phone number of the relevant contact person of your company. If you work as an individual, we will also collect payment information such as bank information and Tax ID/VAT number. Topcon limits the collection of personal information to that which is necessary for the purposes identified by it at

or prior to the time at which such information is collected. You are under no obligation to provide any personal information to Topcon. However, the information Topcon learns from customers helps us personalize and improve the experience at Topcon's websites. If you don't provide such information, some features of Topcon's websites may not be available to you.

Where your information obtained by us will be subject to the APP, you may be entitled to use a pseudonym when interacting with our Services. We also collect personal information from third parties such as our partners, service providers, and publicly available websites, to offer Services we think may be of interest and to help us maintain data accuracy and provide and enhance the Services.

We do not knowingly collect or use personal information from children under the age of 13, and we will not do so in the future without first obtaining verifiable consent from a parent or legal guardian. Should a child whom we know to be under the age of 13 send individual identifying information to us, we will only use that information to respond directly to the child, seeking parental consent or to provide parental notice.

2. Name and Contact Details

Topcon Positioning Systems Inc., a California corporation (7400 National Drive, Livermore, CA 94550 United States), its affiliates (including Topcon America Corporation) and controlled joint ventures (see company locations on https://www.topconpositioning.com/) are the controller(s) of your personal data. Your location and your relationship with the Topcon group will be key to identify the relevant Topcon entities acting as controller or processor of your personal information.

3. How Does Topcon Handle Your Personal Data?

1. Topcon collects, obtains, uses and provides personal information in an appropriate manner.
2. Topcon makes best efforts to ensure personal data to be precise and up-to-date.
3. Topcon takes necessary and appropriate measures to manage personal data including protecting personal data against unauthorized access, loss, leak and damage.
4. Topcon complies with its obligations under the Applicable Laws by keeping personal data up to date; by storing and destroying it securely; by not collecting or retaining excessive amounts of data; by protecting personal data from loss, misuse, unauthorized access and disclosure and by ensuring that appropriate technical measures are in place to protect personal data. In determining data retention periods, Topcon takes into consideration local laws, contractual obligations, and the expectations and requirements of our customers
5. Topcon complies with laws, regulations and the guidelines for them as well as internal rules on personal information.
6. When contracting the handling of personal data to a third party, Topcon only entrusts to a contractor who meets the requirements based on Topcon’s internal rules. Topcon manages such contractors in an appropriate manner.
7. Topcon remains up to date towards any change of the Applicable Laws.

4. What is the Purpose and Legal Basis of Processing Personal Information?

We collect, use, disclose, transfer, and store personal information when needed to provide our Services and for our operational and business purposes as described in this Statement.

Topcon ensures that, in the process of providing its products and services, it will obtain only personal data necessary to carry out its business through the Topcon business entities for the purposes of use (as described below).

Topcon may process your personal information for the following purposes and legal basis:

Purpose	Nature of Processing	Legal Basis/Purpose
Sales of Services	Sales process and managing contractual relationships related to our Services	Provision of Services and/or or the performance of a contract
Use of Services	Performance and use of Services, planning, development, manufacturing, installation, support, training and maintenance of machines and equipment, providing and distributing information such as information on Services, contact about warranty, service and sales issues.	Provision of Services and/or performance of a contract
Marketing and Communication	Information communication and information processing services and advertising and holding campaigns, exhibits and other events to promote Products as well as deliver and suggest tailored content such as news, research, reports, and business information and to personalize your experience with our Services and providing and distributing brochures, materials and samples of Products.	Consent; Topcon's and your legitimate interest to send/receive relevant marketing communications. Marketing communications allow opt out from receipt of direct marketing purposes. If for some reason, your efforts to opt out were unsuccessful please email Topcon at stopcontact@topcon.com to unsubscribe. Please note that in some countries, you may be required to opt in to receive these communications.

Improvement of our website	Personalizing your experience at our websites; selectively sending you information that may be of interest to you; contests and sweepstakes; market research and online surveys; automatic monitoring of statistical information to determine how Topcon's websites are being used.	Improving, maintaining websites. Making use of the websites as easy and efficient as possible
Improvement of the Services	Conducting surveys on Services and analysis of the results	Improving, developing, optimizing Services and user experience Services
Compliance/Regulatory	Exercising rights and fulfilling obligations provided by and required by laws and regulations, assisting in an investigation, in connection with any legal proceeding, to protect and defend our rights and property, or the rights or safety of third parties, to enforce this Privacy Statement, or agreements with third parties or for fraud/crime-prevention purposes.	Compliance with legal obligations
Application Process	We collect personal data relating to job applicants in connection with our employment application/recruiting process. In instances where personal data is collected in connection with a specific open position, we will store the subject personal data for no more than 30 days following the date on which the subject opening is no longer available. In instances where personal data is collected that is not specifically associated to an open position, we will store the subject personal data for no more than 180 days. Should we wish to keep your personal information on file longer for consideration for future suitable employment opportunities with us we will ask for your consent, which, if given, can be withdrawn at any time.	Consent

5. Cookies and Analytics

5.1. Cookies

We store so-called "cookies" in order to offer you a comprehensive range of functions and to make the use of our websites more convenient. "Cookies" are small files that are stored on your computer with the help of your internet browser. If you do not wish the use of "cookies", you can prevent the storage of "cookies" on your computer by making the appropriate settings in your internet browser. Please note that this may limit the functionality and range of functions of our offer.

In particular, we use the following cookies:

Google Analytics - to monitor and analyze traffic coming to the site and page visits while on the site

MixPanel - to anonymously analyze visitor interactions with the site for site troubleshooting and design improvement

Pardot - to record user submitted contact information for the purposes of fulfilling requested product information, dealer follow-ups, and trial software requests

These cookies cannot identify you as a person. In any case, the use of cookies is justified on the basis of our legitimate interest in a demand-oriented design and the statistical evaluation of our website and the fact that your legitimate interests do not outweigh Art 6 para. 1 lit. f) GDPR.

5.2. Google Analytics

We use Google Tag Manager, web analysis services of Google Inc. ("Google"). Google uses "cookies", which are text files placed on your device, to help the website analyze your use of https://www.top-conpositioning.com/. We also use MixPanel (upgraded version of Google Analytics) to record the site actions of end-users who have created logins on our support site, https://www.topconpositioning.com/support.

The information generated by the cookie about your use of our Site (including your shortened IP address) will be transmitted to and stored by Google on servers in the United States. Google will use this information to evaluate your use of our websites, to compile reports on website activity for website operators and to provide other services associated with the use of our Site and services related to the use of the internet. Google may also transfer this information to third parties if this is required by law or if third parties process this data on behalf of Google.

For more information about how Google uses your information, please see Google's Privacy Policy:

https://www.google.com/policies/privacy/

You can disable Google Analytics by using a browser add-on if you do not want the website analysis. You can download the browser add-on here: http://tools.google.com/dlpage/gaoptout?hl=en.You can object to the use of Google Analytics.

Google Analytics is used on the basis of our legitimate interest in a demand-oriented design, statistical evaluation and efficient advertising of our Site and the fact that your legitimate interests do not outweigh, Art 6 para. 1 f) GDPR.

6. Processing of Sensitive Personal Data

We do not process any sensitive personal data (e.g. health or religious data) from you unless we have previously received for your written consent or as otherwise permitted or required by Applicable Law.

7. Sharing Your Personal Data

Your personal data will be shared, or will likely be shared, within the following entities:

* **Our Group of Companies** and we have made sure that the entire Topcon Group respect the Applicable Laws, in so far as they are relevant, and only share your personal information within the Topcon Group if this is legitimate, e.g. because there are necessary intra-group agreements in place or because it serves internal administrative purposes in which case we will weigh up your conflicting interests in accordance with the Applicable Laws.

* **Third party service providers** which have been thoroughly selected based on their compliance with the Applicable Laws, in so far as they are relevant and only when to fulfill the services they provide to us, such as software, system, and platform support; direct marketing services; cloud hosting services; advertising; data analytics; and order fulfillment and delivery. Our third-party service providers are not permitted to share or use personal information we make available to them for any other purpose than to provide services to us. We will enter into the necessary legal agreements with the third-party service providers in order to secure your personal information.

* **Business Partners** - Topcon may share personal information with business partners in order to improve your experience with Topcon and for Topcon's marketing purposes. Topcon may share non-personal aggregate data about sales, customers, visitors to the site and related site information with third parties. We will enter into the necessary legal agreements with our business partners in order to secure your personal information.

We do not sell your personal information to or with any other third parties.

8. GDPR, UK DPA and APP Specific Terms

Your Rights and Your Personal Data under GDPR, UK DOA and APP

The GDPR, UK DPA and APP afford you certain rights in respect of your personal data. There are differences in respect of the GDPR, UK DPA and APP, however, generally, you have the following rights with respect to your personal data.

To assert one of the below rights please contact us under the relevant contact address stated in clause 2.

Right of access

You have the right to request from us access to the processed personal data concerning you to the extent of Art 15 GDPR, UK DPA and the APP at any time.

Right to rectification of incorrect data

You have the right to request from us the immediate rectification of the personal data concerning you, if these are incorrect.

Right to erasure

Under the requirements set out in Art 17 GDPR and the UK DPA you have the right to request from us the erasure of the personal data concerning you. These requirements especially provide a right to erasure where the personal data are no longer necessary in relation to the purposes for which they were collected or otherwise processed, the personal data have been unlawfully processed, you object to the processing or the personal data has to be erased for compliance with a legal obligation in the EU or Member State law to which the we are subject. Regarding the period for which the personal data will be stored please refer to No. 13 of this data protection Statement.

Right to restriction of processing

You have the right to request us to restrict the processing according to Art 18 GDPR and the UK DPA. This right especially exists when the accuracy of the personal data is contested between the user and us, for a period enabling us to verify the accuracy of the personal data, in the case that the data subject who has a right to erasure opposes the erasure of the personal data and requests the restriction of their use instead, for the case that we no longer need the personal data for the purposes of the processing, but they are required by the data subject for the establishment, exercise or defence of legal claims as well as if the successful exercise of an objection between us and the user is still controversial.

Right to data portability

You have the right to receive the personal data concerning you which you have provided to us in a structured, commonly used and machine-readable format according to Art 20 GDPR and the UK DPA.

Right to object

Pursuant to Art 21 GDPR and the UK DPA, you have the right to object, on grounds relating to your particular situation, at any time to processing of personal data concerning you which is based on lit e) or f) of Art 6 para. 1 GDPR. We will no longer process your personal data unless we demonstrate compelling legitimate grounds for the processing which override your interests, rights and freedoms or for the establishment, exercise or defence of legal claims.

Right to lodge a complaint

You also have the right to lodge a complaint with the responsible supervisory authority in the Member State of your habitual residence, place of work or place of the alleged infringement if you consider that the processing of personal data relating to you infringes the GDPR and the UK DPA.

A list of all European data protection authorities can be found here: http://ec.europa.eu-/justice/article29/structure/data-protection-authorities/index_en.htm.

For the UK, complaints can be made at the ICO - https://ico.org.uk/make-a-complaint/

To the extent the APP applies to your personal information collected by Topcon:

- You may contact Topcon at any time if you have any questions or concerns about this Statement or about the way in which your personal information has been handled.
- You may make a complaint about privacy to the relevant privacy officer (see clause 2).

- The privacy officer will first consider your complaint to determine whether there are simple or immediate steps which can be taken to resolve the complaint. We will generally respond to your complaint within a week.
- If your complaint requires more detailed consideration or investigation, we will acknowledge receipt of your complaint within a week and endeavour to complete our investigation into your complaint promptly. We may ask you to provide further information about your complaint and the outcome you are seeking. We will then typically gather relevant facts, locate and review relevant documents and speak with individuals involved.
- In most cases, we will investigate and respond to a complaint within 30 days of receipt of the complaint. If the matter is more complex or our investigation may take longer, we will let you know.
- If you are not satisfied with our response to your complaint, or you consider that Topcon may have breached the APP, the UK DPA or GDPR, and you have the right to make a complaint to the relevant data protection authority.
- Contact information for the Office of the Australian Information Commissioner can be found here: https://www.oaic.gov.au/

9. Canadian Specific Terms (residents of Canada only)

Opt-in consent to receive electronic messages

We may, with your express opt-in consent, send you information about products or services that may be of interest to you, including information on current activities, general announcements, upcoming products and services, changes to our products or services, and upcoming events. These communications may be sent in various ways, including by email, by text message by another form of electronic message and through the Services. If you choose to sign up to receive information about products or services that may be of interest to you, we will collect and use your contact information, including your email address, for this purpose.

You may withdraw your consent to this use of your personal information by contacting us at dpo@topcon.com.

You may also opt out of receiving commercial electronic messages to your electronic address by using the unsubscribe mechanism that will be included in each electronic message we send you. Even if you opt-out of receiving marketing communications, we may send certain service communications, such as confirmations or security announcements, by email, through the Services, or by text message or by another form of communications.

If you send an email to us, or provide us feedback through the Services, we will collect your email address and the full content of your email, including attached files, and other information you provide. We may also use and display your full name and email address when you send an email notification to a friend through the Services (such as in an invitation).

Additional Protection of Personal Information

The only employees who are granted access to your Personal Information are those with a business 'need-to-know' or whose duties reasonably require such information.

Right of access and correction of Personal Information

To the extent provided by PIPEDA and substantially similar provincial Applicable Laws, you have the right to request from us access to and the correction of Personal Data concerning you. To initiate the request process please send an email to dpo@topcon.com indicating that you wish to make a request.

We may request that you provide sufficient identification to permit access to the existence, use or disclosure of your Personal Information or any correction thereto. Any such identifying information shall be used only for this purpose. We will attempt to respond to each of your written requests not later than thirty (30) days after receipt of such requests. We will advise you in writing if we cannot meet your requests within this time limit. A reasonable administration fee may be charged to supply the information. The approximate cost of the administration fee will be communicated to the individual prior to releasing the information.

Cross-border transfers of Personal Information

Please note that we may transfer information, including Personal Information, to a jurisdiction that does not have the same data protection laws as Canada, as further outlined in clause 10 below. Such information may become accessible to courts, law enforcement and national authorities in the jurisdiction(s) where it is stored. If you do not want your information to be transferred or stored outside Canada, you should not provide us with any Personal Information.

10. Cross-border Personal Data Transfer and Storage of Your Personal Data

Topcon is a global organization, and your personal information may be, or is likely to be, stored and processed outside of your home country. We take steps to ensure that the information we collect is processed according to this Statement and the requirements of applicable law wherever the data is located. Regardless of location, Topcon handles personal data as described in this Statement.

Topcon has networks, databases, servers, systems, support, and help desks located throughout our offices around the world. We collaborate with third parties such as cloud hosting services, suppliers, and technology support located around the world to serve the needs of our business, workforce, and customers. We take appropriate steps to ensure that personal information is processed, secured, and transferred according to applicable law. In some cases, we may need to disclose or transfer your personal information within Topcon or to third parties in areas outside of your home country. The areas in which these recipients are located will vary from time to time, but may include the United States of America, Canada, Japan, Netherlands, Germany, Belgium, France, Spain, Italy, the United Kingdom, Ireland, Portugal, Australia and other countries where Topcon has a presence or uses contractors.

When we transfer personal information from the European Economic Area or Canada to other countries in which applicable laws do not offer the same level of data privacy protection as in your home country, we take measures to provide an appropriate level of data privacy protection. In other words, your rights and protections remain with your personal information. For example, we use approved contractual clauses, multiparty data transfer agreements, intragroup agreements, and other measures designed to ensure that the recipients of your personal information protect it. If you would like to know more about our data transfer practices, please contact our Data Protection Officer.

11. How Long Do We Keep Your Personal Information?

We erase or make your personal information anonymous as soon as they are no longer required for the purposes for which we have collected or used them in accordance with this Statement. As a rule, we store your personal data for the duration of the usage or contractual relationship plus a reasonable period of time in which we keep backups after deletion.

12. Security and Safety Measures

Topcon takes data security seriously, and we use appropriate technologies and procedures to protect personal information. Our information security policies and procedures are closely aligned with widely accepted international standards and are reviewed regularly and updated as necessary to meet our business needs, changes in technology, and regulatory requirements.

13. Links to Other Websites

Topcon's websites may contain links to other websites. These third-party websites have their own privacy policies, including cookies, and we encourage you to review them. They will govern the use of personal information that you submit, or which is collected by cookies whilst visiting these websites. This Statement does not apply to third party websites and any personal data you provide to third party websites is at your own risk.

14. Consent/ Acknowledgment

By using or supplying personal information through a Topcon website, you signify your agreement and/or your acknowledgment to the terms and conditions of this Statement. If you do not agree to these terms and conditions, please do not disclose any personal information through a Topcon website.

Introduction

Sokkia Field is an application that includes data collection, stakeout functionality, and computations, offering hardware support for Sokkia GNSS and Optical products.

Activation

After successful installation of the application on your device, the Activation wizard will guide you through the activation process. Mind the following:

- Sokkia Field can be activated at the time of installation directly from your PC.
- After installing an update to Sokkia Field, the application needs to be activated again.
- If the activation is canceled, Sokkia Field will run in Demo mode. Demo mode, allows user to store up to ten points and create a road of one hundred meters in length.

Start using Sokkia Field

At this point, Sokkia Field has been successfully configured and a new project can be created. The user-friendly interface will provide intuitive settings and a simple approach to managing tasks.

Click  (the Home button) in the right part of the title bar to open the Home screen for the default project.

On each subsequent Sokkia Field start, the Connections dialog will run with the current project selections.

Product Activation

Step 1 - Product Activation (Select Type)

Product activation is a license validation procedure performed with the help of the Activation wizard. Activation wizard supports two types of activation: *Online* and *Offline*.

To activate the Sokkia Field:

- Select the Online to activate the Sokkia Field using a connection to the Internet.
- Select the Offline to activate the Sokkia Field without Internet connection.

The Activation wizard offers *Online* activation by default.

Online Activation

If you select the *Online* activation, you must do it using credentials for your Topcon Group account.

1. Log in to your Topcon Group account. More...
   - If you don't have a Topcon Group account, you will have an option to create it.
2. Enter the license details. More...
3. Continue the procedure of activation with the License Agreement dialog. More...
4. View the activation results. More...

Offline Activation

If you select the *Offline* activation, do the following:

1. Enter the license details. More...
2. Continue the procedure of activation with the License Agreement dialog. More...
3. View the activation results. More...

Step 2 - Sokkia Authorization (Online Activation)

The dialog is displayed if you have selected the *Online* activation.

To log in to your Topcon Group account:

- Click **Login** to open the Topcon's single sign-on Web page to enter your credentials.
- Enter your user name (email address) and password in the respective fields then click **Sign On**.
- Web login pop-up window closes and you proceed to the Step 3 - License Details.

> **Note:** When the account administrator of your company is adding you to the user list using your email, a temporary password will be generated and sent to you by Sokkia. If you log in for the first time, you will be prompted to change password.

- If you forgot or lost the password, click **Forgot Password** and enter your email address. You will receive an email with password reset instructions.
- If you are a company account administrator but do not have the company account, click **Register here** button. More...

Create Account

To create your company account:

- After clicking **Register here**, you will be redirected to the Topcon single sign-on page where you can register a new account with your valid email address.
- Enter your valid email address and click **Next**.
- Find an email message with *Topcon Verification Code* in your email inbox and enter it in the **Security Code** field and click **Submit**.
- In the **Create a new Topcon ID** dialog, enter your contact information and setup password to create your account.

Step 2 - Product Activation (Offline Activation)

The dialog is displayed if you have selected the *Offline* activation.

This type of activation is based on your Device ID. Enter your license information provided your company account administrator to enable the use of the licensed modules of Sokkia Field.

Enter the license details in one of the two ways:

1. Enter **Serial Number** and **Activation Code** manually in the respective fields.
   - Alternatively, click the **Import** button to insert the information from the license file you may receive.
2. Click **Next** to validate the serial number and activation code and to accept the License Agreement.

Step 3 - License Details

Enter the license details:

- Enter the **Serial Number** from the purchase certificate.
- The **Device ID** will show the identical number of the controller which was requested by the Application wizard.
- Click **Next** to validate the serial number and to accept the License Agreement.

Step 4 - License Agreement

You have the choice of accepting or rejecting the agreement. The activation of the application is conditional to your selecting the **Accept** check box.

- If you accept the agreement, click the **Activate** button to activate Sokkia Field and review the Product Activation results.
- If you do not accept the agreement and close the dialog, Sokkia Field will not be activated and will act as a limited demo version until a product activation serial number and code is purchased and used to activate the application.

Product Activation Results

The **Product Activation** dialog displays information about your **License Type** and its **Expiration Date**, and also a list of activated Sokkia Field modules and **Expiration Date** for each **Module**. On the controller, the Activation wizard generates a file in which the information about the activation is stored. This information is needed when starting the Sokkia Field on the device.

Click the **Activate** button to add new licenses if required. You will be prompted to start new activation. More...

Click **Done** or  to close the dialog.

Home Screen

Note: Before starting your work with Sokkia Field, refer to the Introduction section to get general information about the software product.

Title Bar

The title bar of the home screen displays:

- The name of the project that is currently opened.
- Associated icons (status indicators and control buttons). More...
- icon that opens a menu containing additional options specific to the current screen. More...

Client Area (Task Icons)

Client area displays up to 12 task icons. Actually displayed task icons depend on the connected device. You can customize the client area contents by clicking and selecting Configure Menus.

Click an icon to start the task or to open the task folder:

	Project To manage projects.
	Configure To configure various project settings and Sokkia Field components and options.
	Archive To exchange data between the current project and other projects and external files.



Points
To edit existing points and add new points manually.



Edit
To edit existing project data.



Calculate
To calculate coordinate geometry tasks.



CAD
To show the current project data and to create or edit objects on the map.



Connect
To connect GNSS / optical device(s) and to establish communications with network service provider.



Setup
To set up surveying: GNSS survey or Optical (Total Station) survey. *Not available for Digital Level configuration.*



Measure
To conduct a survey: GNSS survey or Optical survey. *Not available for GNSS static and Digital Level configuration.*



Two Peg Test
To perform the Two Peg Test for a Level survey. *Not available for onboard.*



Level Run
To set up a Level survey in running mode. *Not available for onboard.*



Stakeout
To stake different objects.



Photos
To use applications that are pre-installed on the same device as the Sokkia Field.

Title Bar Associated Icons and Buttons

	Provides access to Sokkia Field Help and to the options that are specific to the currently opened dialog (see more).
	Blinks over the  button and indicates that Sokkia Field has an update ready to download and install. Click the icon and choose **Software Updates** to open the Available updates dialog and start updating.
	Blinks over the  button and indicates that the current position is detected within the avoidance zone during survey and stakeout.
	Indicates the power status of the controller battery.
	Overlays the battery and indicates the charging process of the controller battery from external power source.

Indicates the connection status with the device. Not available for onboard. You can connect / reconnect with the device in the Connections dialog. If the device is disconnected, the indicator is gray. When connecting, it turns rotating yellow, then green, and finally turns into the image of the connected device:



-  - blinking icon: GNSS type instrument is activating, stable icon: GNSS type instrument is activated.
-  /  - GNSS type instrument which obtains correction information.
-  - Optical type instrument is activated.
-  - Digital Level type instrument is activated.
-  - Fuson Positioning mode is activated.
-  /  /  /  - GNSS type instrument in Fusion Positioning ™ mode which obtains correction information.

	GNSS type instrument is the current device type when Fusion Positioning ™ mode is activated. To switch to the Optical device, click the button.
	Optical type instrument is the current device type when Fusion Positioning ™ mode is activated. To switch to the GNSS device, click the button.
	Opens Settings for current dialog.
EDM	Opens the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work. (Available in the Optical Survey configuration.)
	Opens Home Screen dialog.

	Saves changed data and closes current dialog.
	Saves changed data and opens Home Screen dialog.
	Returns to a previous dialog.
	Closes current dialog.
	Closes Sokkia Field. Accessible from Home Screen dialog only. A confirmation prompt will display to prevent accidental action.

Menu Options

Click the button to open a menu of options specific to the current dialog. Every dialog in Sokkia Field has this button in the top left corner. The dialog menu, opened by clicking the button, always contains the Help option and may contain some additional options.

The following options can be selected from the menu of the Home Screen and sections accessible in the Client Area:

- Click *Help* to access help files.
- Click *Get support!* to view or change existing local support team contacts. These are usually the contacts of a local dealer. To change displayed contacts, click and select Configure Contacts.
- Click *Topcon Keyboard* to enable or disable the Sokkia Field's built-in on-screen keyboard to type in application dialogs. Activated feature is marked with .
- Click *Configure Menus* to show / hide functions in the menus. More...
- Click *Activate Modules* to perform a license activation with the help of the Activation wizard. More...
- Click *Minimize* to minimize the application window to a button on the taskbar.
- Click *Software Updates* to check whether any updates are available for Sokkia Field. More...

- Click *Maintenance Request* to view software maintenance data and contact support for assistance. More...
- Click *About* to view general information about the Sokkia Field software. More...

Configure Contacts

To add your local support team contacts that can be used for future assistance requests.

> **Note:** Typically, your local Sokkia dealer has already provided the contact details in this dialog.
>
> The user can view the contacts by clicking  on the Home Screen and selecting *Get support!* from the menu that opens. Additionally, the user can change and reconfigure the support contacts displayed by clicking  in the *Get support!* dialog and selecting *Configure contacts*.

To add a contact:

- **QR** - click the **Load** button to add an image file with QR code of the support contact. This QR code will be displayed for quick communication, for example when scanning it with your mobile phone.
- **E-Mail** - enter an email address of the support contact. This address will be used in email application for establishing communication with support contact via email.
- **Phone** - enter a phone number of the support contact. This number will be dialed by phone application for establishing communication with support contact via voice call.

In the **Active** column, check the box  to keep the corresponding contact method active. Clear the box to save the corresponding contact data but keep this contact method inactive.

Use the radio button switch to select your primary method of communication with the contact.

Click  to save the contact and contact methods or click  to close the dialog without saving.

On-screen Keyboard

To enable / disable the Sokkia Field's built in on-screen keyboard open the Home Screen, click , then click **Sokkia Keyboard** feature in the dialog menu. Activated feature is marked with .

You can also enable the on-screen keyboard and select keyboard layouts you want to use in the Keyboard tab of the Global Settings dialog.

If enabled, the on-screen keyboard pops-up automatically when you click on a field that requires manual input of text or numbers.

- To switch between keyboard layouts use buttons in the Keyboard dialog title bar:
  - abc / 123 - switch between full keyboard and numeric keypad.
  - QWZ / QWE / AZE / РУС - switch between full keyboard layouts.

- When working with the QWZ / QWE / AZE layouts, you can enter characters that are non-specific to the English alphabet: for example, the È, Ü, ß characters. Long press (tap and hold) on the letter and choose the character by sliding your pointer to the appeared letter of your choice.
- When entering data into the point code fields, you can use additional quick entry buttons between the entry field and the main keyboard. These buttons display the last used codes or existing codes corresponding to the characters entered, as well as their descriptions.
- Once you've finished typing the text you want, click  to paste that text into the field where you opened the on-screen keyboard.

If the on-screen keyboard is disabled, the keyboard configured in the controller operating system is used.

Configure Menus

This dialog enables you to change the contents of the Home Screen or the folders within it. Maximum of 12 (twelve) menu items can be shown on the screen. If there are more than twelve items, only first twelve of them will be shown.

To configure Home Screen content:

- Highlight the name of a desired Home screen's item. The other panel will show the contents of the corresponding folder. By default, the full contents of all the folders displays.
- If you want to hide a rarely or never used item in a folder, clear the box next to the respective item's name. To restore the item in the folder, check the respective box.

  Note: An alternative way to check and clear items is using the item's context menu.

- Use  and  icons to move the highlighted name up and down in the list to change the order of icons.

- You can cut a selected item by clicking  and paste it above another selected item with .
- To rename an item, click  and enter a new name. Alternatively, double-click the item's name.
- If required, click  to create password and protect editing of your menu configuration. More...
- Click  to store the changes and open the modified Home Screen.

Click the  button to open a menu with load, save and reset options for Home Screen configurations.

- Select **Load...** to open Load Menu dialog and load a previously saved Home Screen configuration.
- Select **Save As...** to open Save Menu dialog and save the current Home Screen configuration.
- Select **Reset To Default** to restore the current Home Screen configuration to its default view.

Available Updates

This dialog shows available updates detected by Sokkia Field. The dialog consists of two parts - upper part shows general update info and info about available features updates. The bottom part shows info about available software version for update, or, if none, current version info. The date and time of the last update check also displays.

- Click the **Check** button to perform the check for all updates (features and program versions).
- Click the **Apply** button to start updating.

Note: Sokkia Field automatically detects available updates (Internet connection is required).

The blinking icon  in the top left corner indicates that Sokkia Field has an update ready to download and install. Click the icon and choose **Software Updates** to open this dialog and start updating.

Maintenance Request

To view software maintenance information and contact support for assistance.

Check the current status and expiration date of your license.

From this dialog, you can contact the support team for assistance, having all the necessary information on software maintenance at hand.

- Scan the displayed QR code with your mobile phone to contact support.

The maintenance information is displayed and may be requested by a support representative:

- **Serial Number** - the serial number of the software license.
- **Account E-Mail** - the email address used in activation of the software.
- **Installed features** - the list of installed software modules and their expiration dates provided by the software license.



About Sokkia Field

This dialog displays the information about the installed Sokkia Field software.

- The name of the installed software.
- The version and build numbers of the installed software.
- The date of the software installation.
- Software activation status.
- The **ID** of the device where the software is installed.

Click the **Privacy Policy** button to open the Privacy Policy dialog and read the privacy policy of the company.

Click the **Support Info** button to open Collect Support Info dialog and generate support data file for Sokkia Field support team.

Click the **Free Space** button to view the amount of free space in the controller's storage.

Check the box **Share analytic data with Sokkia** to provide Sokkia with automatically collected non-personalized data about application activities for better analysis of user demands and new features development.

Privacy Policy

To display the Privacy Policy of Topcon Positioning Systems, Inc.

- Read the Privacy Policy of Topcon Positioning Systems, Inc.
- If required, use **Select All** and **Copy** commands in the dialog context menu to copy the entire text to clipboard.
- Click  to return to the About Sokkia Field dialog.

Collect Support Info

To collect the information needed for support into an archive file.

> **Note:** To ensure the maximum of useful data is collected, check the **Port Data Logging** box in Global Settings dialog to log the data exchange between Sokkia Field and the connected device before starting the project.

1.  Review the destination folder for saving the target archive file. If required, click  to open Select Path dialog and change the destination folder.
2. In the **Support info file name** field enter the name of the target archive file. The name of the current project displays by default.
3. In the comment area, add any comments which may help the support team to resolve your issue. This information will be saved in the target archive file as a text file.
4. If required, select the **Upload support info via internet** check box to transfer the archive file to the support team.
   - Optionally, you can check the **Delete after upload** box to remove the packed file from you device once it is uploaded.
5. Click  or the **OK** button to save the archive file and (if selected) to upload it to via the Internet. The warning may display if the comment area left empty. The information about created support file displays upon completion with an option to close the dialog.

Browse Files dialog

To navigate to a file / folder location and to perform a file operation. The actual title of this dialog depends on the path from which it is called.

 displays the full path to the currently open folder.

- Use an icon to:
  -  - open pop-up menu and quick jump to one of the following folders:
    - **Default** - folder to save Sokkia Field files by default;
    - **Recent** - folder used recently for this file operation;
    - **Sokkia Documents** - folder set by user to save Sokkia Field files;

  - **My Computer** - 'This PC'/'My Computer' default location on a computer;
  - **My Pictures** - folder used to store picture files on a computer by default.

-  - navigate up one folder (i.e., go one level up).
-  - create a new folder.
-  - switch the display mode for the list of files to the detailed view.
-  - switch the display mode for the list of files to the icon view.

- Select the **Type** of files from the drop-down list to display the files in the list for the current folder.

- The context menu simplifies file management with the following commands:
  - **Open** - immediately opens a highlighted file / folder.
  - **Delete** - immediately deletes a highlighted file / folder.
  - **Rename** - changes name for a highlighted file / folder.
  - **Select All** - highlights all files in the list.
  - **Select All Below** - highlights a currently highlighted file and all the files in the list displayed below.
  - **Select Multiple** - highlights multiple files by sequential clicking on file names.
  - **Cancel Selection** - removes highlight from all highlighted files in the list.

- Enter the **Name** of the file or highlight the desired file in the list.
- Click  to perform the operation or  to cancel the operation.

Point Check

If a point exists and you try to save another point with the same name, a dialog displays a prompt that the point already exists.

1. Displays the offsets of the point you are trying to save from the point that is saved.
2. This dialog enables you to:
   - **Overwrite** the existing point coordinates;
     - **Keep code(s)** including codes / code description / string / control codes / attributes etc. already assigned to the point being overwritten;

- **Rename** the point and save it with another name (you can replace suggested name with a custom one but your naming pattern will be kept for the next points);
- **Store as check point** to save the measured point as a check point for existing point. Note that the option is disabled when editing a point measured using the pole measurement method.
- Additional storing options related to specific routines may become available when saving point with an already existing name.

3. If you select to store the point as a check point, you can enable using it in weighted averaging positions. To do this, check **Use in weighted average**. More...

   The **Don't ask in this session** check box is available when you selected the **Store as check point** check box. If the **Don't ask in this session** box is checked, Sokkia Field will not display the Point Check dialog during current session; on attempt to store a point with the name that already exists, the point will be stored as the check point for existing point.

   The **Correct Base** check box is displayed and enabled, when:

   - A user works in the RTK survey;
   - The **Store as Check Point** radio button is selected;
   - The existing point was measured from another base station, or manually entered or imported to the project.

   The **Correct Base** option allows you to correct the existing Base coordinates or obtain a new Base coordinates, when the Base is installed at an imprecise position. The known coordinates of the existing point are not replaced by the measured coordinates, and they are used to correct or calculate the current coordinates of the Base station. The *Raw Data* dialog displays such Base station as "**Ph. Center Coords (Corrected)*".

   When the user closes the Topo dialog, the application recomputes the coordinates of all points using the new Base coordinates.

Code Collision Resolver

To choose the point code(s) in case of point codes difference when overwriting an existing point with a new one or creating a check point.

This dialog displays when saving a new point with the name of a point already existing in the current project and the point code(s) of a new point differs from the point code(s) of a point to be overwritten.

- The **Code Collision** group displays:
  - **Old codes:** - point code(s) presented in an existing point going to be overwritten or stocked with a check point.

  - **New codes:** - point code(s) assigned to a new point that will overwrite or will be saved as a check point for an existing point.

- Select an action to choose codes for the point that will be saved in the current project:
  - **Use old** - keep the old code(s) shown in the **Old codes:** field.
  - **Merge** - keep the old code(s) shown in the **Old codes:** field and add new codes shown in **New codes:** field.
  - **Accept new** - delete the old code(s) shown in the **Old codes:** field and add new codes shown in **New codes:** field.

Click  to accept the chosen action, save the point with selected code(s) and close the dialog.

Click  to save the point with old code(s) and close the dialog.

List of Suffixes / Prefixes

To add or edit suffixes and prefixes for Topo point names.

- **Add** - clicking on the button opens the Add Suffix/Prefix dialog, where you can add a new suffix or prefix.
- **Edit** - clicking on the button opens the Add Suffix/Prefix dialog, where you can edit a highlighted suffix or prefix. This button will be enabled if you highlight any existing suffix or prefix in the list.
- **Delete** - click the button to remove a highlighted suffix or prefix from list. This button will be enabled if you highlight any existing suffix or prefix in the list.

Add Suffix/Prefix

In the **Suffix/Prefix** field you can type in a new name or edit the existing name of the suffix or prefix for Topo Point.

Enter Password

To set up or to remove password protection lock for the selected settings.

- Enter a password in the **Enter Password** field; and confirm it in the **Confirm Password** field to set up password for password protection lock. Click on the  /  indicator to show / hide the password data you are entering. Click

 to lock the selected settings with a password.

- To remove password protection lock, enter your current password in the **Enter Password** field and click  to confirm password protection lock removal.
- Click  to exit the dialog without changing password protection lock settings.

Project

To organize, create, modify and manage Sokkia Field project files:

Projects include all data collected in surveys of different configurations. After the installation, Sokkia Field only contains and opens the default project.

This dialog displays the current project name in the title bar.



New Project
To create a new project.



Open Project
To make a selected project current.



Delete Project
To delete a selected project from data storage.



Project Info
To display information about the current project.



Project Photos
To display all photos / images of the current project.



Save Project As
To copy the current project with a new name and to make the copied project current or to export the current project to another format.



Copy Project
To copy the current project with a new name.

New Project

The new project creation process is performed with the help of a Wizard.

1. New Project:
   -  indicates the folder in which this project will be created. The last specified file path is retained.
   - Enter a **Name** for the project.

     Note: The project name must be no longer that 63 characters. Additionally, it cannot contain any of the following symbols: , ? * " / / | < >

   - Optionally, in **Created by**, enter any identifier of the person creating the project.
   - Optionally, in **Comments**, enter a description for the project.
   - **Current Date** displays the date and time when the project is being created.
   - Click Browse if required to save the New Project file in a folder different from that  indicates.

     Note: Working directly with projects on remote storage, such as cloud or network drive, can lead to instability and data loss. If you use a **OneDrive**  folder on your controller to store Sokkia Field projects, long tap (right click) the folder with projects in Windows Explorer and select *Always keep on this device*. Ensure the folder and all project files and folders in this folder have a white tick on green background  in their OneDrive status. See details on how to configure OneDrive.

   - Click  at this step if you want the new project to use the settings from the last opened project as the default settings. The new project becomes the current project, and the Home Screen dialog displays with the project name in the title area.

     Note: Clicking  during any of the following steps creates the new project with the settings that were configured in all the previous steps (including the opened one). Clicking  on any of the following steps closes the dialog and cancels new project creation.

- Click **Next** to proceed.

2. Project Configuration:
   - Select a configuration for Optical and / or GNSS survey. Click the **Select from Library** button to choose one of configurations stored in the Configuration Library or create a new configuration.
   - Click the **Edit** button to change parameters of the selected GNSS Configuration and / or Optical Configuration.

     Note: A survey configuration is a set of parameters that does not depend upon the project. A configuration can be used by different projects.

   - Optionally, you can save the current survey configuration to the Configuration Library. Click  and choose **Save GNSS config to the library** to save the current GNSS survey configuration, choose **Save Optical config to the library** to save the current optical survey configuration.
   - Click **Next** to proceed or **Back** to return to the previous dialog.

3. Coordinate System:
   - Configure the **Coordinate System** settings required for the project. More...
   - Click **Next** to proceed or **Back** to return to the previous dialog.

4. Shared Data:
   - Configure the **Shared data** file and settings. More...
   - Click **Next** to proceed or **Back** to return to the previous dialog.

5. Units:
   - Specify the **Units** for the project. More...
   - Click **Next** to proceed or **Back** to return to the previous dialog.

6. Display:
   - Configure the **Display** parameters for coordinates, directions, slopes and positions on roads. More...
   - Click **Next** to proceed or **Back** to return to the previous dialog.

7. Alarms:
   - Set **Alarms** for various situations. More...
   - Click  to finish a new project creation and return to Home Screen dialog or **Back** to return to the previous dialog.

Note: The title bar of the Home Screen dialog will display the created project name.

Open Project

To change the current project and open another project from previously saved projects.

Note: After launching, Sokkia Field always opens the last used project.

The Open Project dialog displays:

- **Current Project:** - the name of a project that is currently open.
- **Project Name** - the list of the most recent projects:
  - Sokkia Field projects have the **.mjf* file extension and can be identified by the  icon.
  - By default, the list displays projects in the order of last opening. If required, click the **Project Name** header to sort projects in the alphabetical order, click again to return to the order by date.
- The **Created** and **Modified** fields display the date and time when the highlighted project was created and last modified, respectively.
-  - the path to a folder where the highlighted project is located. By default, the project files are stored in the *<program_folder>/Projects* folder.

Note: When opening Sokkia Field project files created in previous Sokkia Field versions, a user may get the respective warning. The project file will be upgraded, and the original file will be preserved.

1. To open a project from the list of recent projects:
   - Highlight the name of a project in the list.
   - Click  to open highlighted project and return to the Home Screen dialog that will display the opened project name.

2. To open a project (**.mjf* Sokkia Field project file or **.mjfzip* Sokkia Field project package) located in a specific folder:

> **Note:** Working directly with projects on remote storage, such as cloud or network drive, can lead to instability and data loss. If you use a **OneDrive** folder on your controller to store Sokkia Field projects, long tap (right click) the folder with projects in Windows Explorer and select *Always keep on this device*. Ensure the folder and all project files and folders in this folder have a white tick on green background in their OneDrive status. See details on how to configure OneDrive.

- Click the **Browse** button to navigate to the desired file.
- Highlight a project file and click to open a project and return to the Home Screen dialog that will display the opened project name.

How to configure OneDrive on the controller

If you use OneDrive cloud service to store Sokkia Field project files you need to properly configure the file synchronization between the OneDrive folder on your controller and OneDrive cloud. To reduce the risk of data loss and have a possibility to operate offline, Sokkia Field must have local access to saved project files. Configure your OneDrive folder to always keep all project files and folders on the controller.

You can do such configuration by instructing OneDrive to always keep all OneDrive files and folders on the controller or by selecting only project folders and files.

1. To instruct OneDrive to keep all stored files and folders on the controller:
   - Find and click the **OneDrive** cloud icon in notification area of Windows task bar in the bottom right corner of the screen.
   - Open **OneDrive Settings** - click the *gear* icon in the top right corner of the OneDrive window and select *Settings*.
   - Go to the **Sync and back up** tab, scroll the content and expand the **Advanced settings** section.
   - In the **Files On-Demand** group, click the **Download all files** button and confirm the action.
   - All files in the cloud will be copied to the OneDirve folder in the controller and will automatically sync to the cloud.
   - Wait until the process is done, open OneDrive folder in Windows Explorer and ensure all Sokkia Field project files and folders have in their OneDrive status.

2. To instruct OneDrive to keep stored project files and folders on the controller:
   - Open Windows Explorer and navigate to your OneDrive folder.
   - Long tap (right click) the folder where the projects are stored.
   - In the context menu, select *Always keep on this device*, a tick near the item in menu confirms the selection.
   - All files and folders in the selected folder will be copied to the OneDirve folder in the controller and will automatically sync to the cloud.
   - Wait until the process is done and ensure all Sokkia Field project files and folders in the selected folder have in their OneDrive status.

Note: Any project files or folders that are stored in your OneDrive folder and accessed by Sokkia Field should not have , or OneDrive statuses. The only correct status is .



Delete Project

To delete a project from data storage.

Note: To delete the current project, open another project to make the current project available for deletion.

The Delete Project dialog displays:

- **Current Project:** - the name of a project that is currently open.
- **Project Name** - the list of the most recent projects:
  - Sokkia Field projects have the **.mjf* file extension and can be identified by the icon.
  - By default, the list displays projects in the order of last opening. If required, click the **Project Name** header to sort projects in the alphabetical order, click again to return to the order of last opening.
- The **Created** and **Modified** fields display the date and time when the highlighted project was created and last modified, respectively.

-  - the path to a folder where the highlighted project is located. By default, the project files are stored in the *<program_folder>/Projects* folder.

1. To delete a project using the list of recent projects:
   - Highlight the name of a project in the list.
   - Click  to delete highlighted project and return to the Project Menu dialog. A confirmation prompt will display prior to the deletion to prevent accidental action.

2. To delete a project file (**.mjf* Sokkia Field project file, **.mjfzip* Sokkia Field project package, **.mjf.bak* Sokkia Field project backup, **.tsj* TopSURV project file, or **.tsj.bak* TopSURV project backup) located in a specific folder:
   - Click the **Browse** button to navigate to the desired file.
   - Select a project file and click  to delete and return to the Delete Project dialog.
   - If required, repeat the routine to delete another project file.
   - Click  to close the Delete Project dialog and return to the Project Menu dialog.



Project Info

To review the detailed information about the current project.

The information pane displays the following project related data:

- *Path* - the location folders where the current project file resides
- *Number of Points* - the number of all points of all types stored in the Points List for the current project.
- *Points*
  - *First* - the name of the first point in the Points List sorted by point name.
  - *Last* - the name of the last point in the Points List sorted by point name.
- *Project size on disk* - the amount of storage occupied by the current project file in kB.

- *Project created* - the date and the time when the current project was created.

- *Project modified* - the date and the time when the current project was last modified.

- *Survey Configurations*
  - *GNSS Configuration* - the name of the GNSS survey configuration.
  - *Optical Configuration* - the name of the optical survey configuration.

- *Coordinate Systems*
  - *Projection* - the name of CS projection.
  - *Use Grid to Ground* - 'Yes' or 'No' status for transformation to ground coordinates in survey.
  - *Geoid Model* - the name of geoid model.

- *Units of Measurement*
  - *Distance Unit* - the distance unit for any length values.
  - *Distance Precision* - the number of decimal places in length values.
  - *Coordinate Northing / Easting Precision* - the number of decimal places in horizontal coordinate values.
  - *Coordinate Elevation Precision* - the number of decimal places in elevation values.
  - *Angle Unit* - the unit for angular measurement values.
  - *Angle Precision* - the number of decimal places in angular measurement values.
  - *Cogo Angle Unit* - the unit in calculations of angular values.
  - *Cogo Angle Precision* - the number of decimal places in calculations of angular values.
  - *Temperature* - the temperature unit for the raw measurements.
  - *Pressure* - the pressure unit for the raw measurements.

- *Display Settings*
  - *Coord Type* - the type of coordinate system.
  - *Plane Coord Order* - the order of coordinate values to display.
  - *Geod. Az. Origin* the reference direction used to display computed azimuth values.
  - *Display Direction As* - shows either bearing or azimuth used to display directions.
  - *Display CL Pos As* - the format to display stationing the center line.

- *Survey Sessions*
  - *Session Name* - the name of a GNSS survey session.

- *TS Version*
  - *Model* - the model of connected total station.
  - *SN* - the serial number of connected total station.
  - *ROM* - the version of ROM installed in connected total station.
  - *EDM* - the version of EDM installed in connected total station.

Click to return to the previous dialog. Click to close the dialog and return to the Home Screen.

Project Photos

To view and manage photos or images added to point(s) in the current project.

The photo pane displays thumbnails of all photos / images with corresponding point name and order number of a picture attached to that point (starts from *#000*). Clicking on a thumbnail opens the Photo tab of the Edit Point dialog, where you can edit the photo / image.

Click to close the dialog and return to the Project Menu. Click to close the dialog and return to the Home Screen.

Save Project As

To copy the current project with a new name or export the current project to another file type.

1. To copy the current project with a new name and make the saved project current:
   - displays the path to the current folder. Use the dialog icons to navigate to the desired folder to record the new file. More...

     Note: Working directly with projects on remote storage, such as cloud or network drive, can lead to instability and data loss. If you use a **OneDrive** folder on your controller to store Sokkia Field projects, long tap (right click) the folder with projects in Windows Explorer and select *Always keep on this device*. Ensure the folder and all project files and folders in this folder have a white tick on green background in their OneDrive status. See details on how to configure OneDrive.

   - Ensure either **.mjf* Sokkia Field Project or **.mjfzip* Sokkia Field Project package type selected in **Type** drop-down list.

- Enter the name of a new file in the **Name** field.
- Click  to perform the operation and return to the Home Screen dialog. Now, the current project is a copied project.

2. To export the current project to another file type:
   -  displays the path to the current folder. Use the dialog icons to navigate to the desired folder to save the new file. More...
   - Select a file type from the **Type** drop-down list:
     - **.mjf* Sokkia Field Project
     - **.mjfzip* Sokkia Field Project package
     - **.tp3* 3DMC project
     - **.mxl* Sokkia MaXML file
     - **.mxlzip* Sokkia MaXML package
   - Enter the name of a new file in the **Name** field.
   - Click  to perform the operation and return to the Home Screen dialog.



Copy Project

To copy the current project to a new file.

-  displays the path to the current folder. Use the dialog icons to navigate to the desired folder to save the new file. More...
- Select either **.mjf* Sokkia Field Project or **.mjfzip* Sokkia Field Project package type in **Type** drop-down list.
- Enter the name of a new file in the **Name** field.
- Click  to perform the operation and return to the Home Screen dialog.

Settings

To configure various settings of Sokkia Field components and options:



Survey
To create or to edit a survey configuration.



Coordinate System
To set a coordinate system for the project and to perform the Grid to Ground transformation.



Global
To configure Sokkia Field software interface parameters and options applied through all the projects.



Backup
To set up regulars backups of your project and to create a one-time full backup.



Units
To set default units to be used in the project.



Display
To customize the displaying of values in the project.



Alarms
To configure alarm parameters.



Codes
To configure code, quick code and control code settings in the project.



Stake Reports
To create and to manage configurations of stakeout reports.

For the Optical configuration, the following options are also available:



Instrument
To set current weather conditions around the instrument for calculating the atmospheric correction of measured distances and to configure tilt sensor for the robotic total station.



Classes
To display info about existing classes of measurements for optical instruments and to create a custom list of such classes.

Project Configuration

Project Configuration is a set of parameters that control a survey, define communication between devices, measure and store points. Two configuration types are displayed for the opened Sokkia Field project:

- **Optical Configuration** field:  "*Name*" is the current configuration for the optical survey.
- **GNSS Configuration** field:  "*Name*" is the current configuration for the GNSS survey.

To edit the current configuration, click the **Edit** button.

> **Note:** Changes you made to the current survey configuration via the **Edit** button in the Project Configuration dialog will be kept in the current project (and other projects created based the current project). These changes will not be propagated to default survey configuration templates available in the library. If you want to make changes directly to a survey configuration template, click **Edit** it in the Configuration Library dialog.

To start using other configuration, click the Select from Library button.

Both types of configurations can be selected for one project. They will be used with the device selected upon Connections: GNSS or Optical.

Fusion Positioning ™ mode is available for selection only when using any GNSS continuous and Robotic optical configurations for one project. Fusion Positioning ™ mode implies simultaneous connection with both GNSS receiver and optical robot. In this mode you don not need to connect/disconnect with the current device.

To save the current configuration to the library, click  in the top left corner and select either

- **Save GNSS config to the library** option to save the current GNSS configuration

  or

- **Save Optical config to the library** option to save the current Optical configuration.

The saved configuration will be automatically set as current configuration for the opened project.

After selecting the survey configurations for your project, click  to store settings and return to the Home screen. These settings will be used every time you start a survey in the current project. They also will be set as defaults for new projects.

Click  to return to the Home screen without saving. You will be prompted to confirm undoing changes to Project configuration.

Configuration Library

The **Configuration Library** dialog presents a list of available survey configurations: names and types. Every survey type has a default configuration with the name of *My* followed by the survey type (e.g. *My RTK*). Survey configurations are stored in the *Styles.tsstyles* file in the Sokkia Field folder.

To set an existing survey configuration as current configuration for the project, double-click the required configuration from the drop-down list. You can modify the parameters of current configuration using the **Edit** button in the Project Configuration dialog.

You can customize the list of the configurations to include only ones you need:

- Highlight the name of the configuration.
- Click the **Delete** button to remove the configuration from the list.
- Click the **Edit** button to modify the highlighted configuration to suit your survey preferences.

> **Note:** Changes you made to the current survey configuration via the **Edit** button in the Project Configuration dialog will be kept in the current project (and other projects created based the current project). These changes will not be propagated to default survey configuration templates available in the Configuration Library. If you want to make changes directly to a survey configuration template, click **Edit** it in this dialog.

- Click the **Add** button to create a new configuration based on the highlighted name and type.

Creating / editing a survey configuration is accomplished with the help of GNSS Configuration and Optical Configuration wizards.

List of Main Survey Configuration Dialogs

Find the information on main dialogs used in a survey configuration wizard. The dialog will only open during a survey configuration that uses the settings from this dialog. Some additional dialogs open in certain survey configurations depending on the equipment and communications you are using.

GNSS survey configuration

- Receiver Make - to specify the GNSS receiver manufacturer (rover / base / static) and enable GNSS raw data file logging for post processing.
- Base Receiver - to select and configure the base receiver.
- Base PP Setup - to configure GNSS raw data file logging for the base / static receiver.
- Base Radio - to select a device the base receiver uses to transmit corrections.
- Rover Receiver - to select and configure the rover receiver and peripheral devices attached to the rover receiver.
- Rover Radio - to select a device the rover receiver uses to receive corrections.
- TILT ™ Settings - to configure the electronic level and setup automatic tilt correction for TILT ™ enabled rover receiver.
- Rover PP Setup - to configure GNSS raw data file logging for the rover receiver.
- Occupation Times - to set the occupation time for GNSS raw data file logging.
- Topo Survey - to configure the GNSS solution, measurement and precision parameters for point collection in topo survey.
- Auto Topo Survey - to configure the point saving criteria for automatic collection of points with rover receiver.
- Stake Settings - 1 - to configure distance tolerances and moving direction assistance in stakeout.
- Stake Settings - 2 - to configure the GNSS solution, measurement and precision parameters for point collection in stakeout.
- Grade Stake Marking - to configure marking of the grade stake with the skyward rounding of the cut/fill decimal values to an even number.
- Staked Point Icon - to select a visible symbol and coloring for staked points on the map.
- Point Naming - to define automatic point naming rules or point name suggestions for measured and staked points.
- Tracking - to select satellite systems and satellite signals to be used for position computation.
- - to configure advanced signal processing mainly related to environmental conditions.
- Miscellaneous - to configure miscellaneous options mainly related to user experience patterns and user interface feedback.

Optical survey configuration

- Instrument - to specify the model and manufacturer of the instrument, connected peripheral, and height of the instrument tripod and reflector(s) rod(s).
- Connection Mode - to configure the connection method of the controller to the instrument.

- Search / Track - to configure how the robotic total station searches and tracks a target.
- Survey Settings - 1 - to enable Direct/Reverse measurement and configure the related parameters.
- Survey Settings - 2 - to select target(s), aiming assistance, and combination of parameters to measure.
- Stake Settings - 1 - to configure distance tolerances and moving direction assistance in stakeout.
- Stake Settings - 2 - to configure transition to the next design point in stakeout.
- Grade Stake Marking - to configure marking of the grade stake with the skyward rounding of the cut/fill decimal values to an even number.
- Staked Point Icon - to select a visible symbol and coloring for staked points on the map.
- Point Naming - to define automatic point naming rules or point name suggestions for measured and staked points.
- Miscellaneous - to configure miscellaneous options mainly related to user experience patterns and user interface feedback.

Receiver Make

In this dialog you can enter the name of the vendor which developed the GNSS receiver for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP Static
- PP Kinematic
- PP DGPS

Base Receiver

In this dialog you can configure the base receiver for the following GNSS survey types:

- RTK/Skybridge
- Real Time DGPS
- PP Static
- PP Kinematic
- PP DGPS

Base Radio / Rover Radio / Repeater Radio

In this dialog you can select the type, model and output port of the base or rover radio for GNSS survey types, or rover receiver radio if you configure it as the radio repeater. The list of radios displays only the models supported by selected receiver, and it is ordered according to their popularity of use.

Note: After changing the receiver model in a configuration, radio parameters will be set to default. It is recommended that you always check these parameters when you make such changes.

Select the respective survey type:

- Network RTK/Skybridge
- Network RTK/Skybridge: NMEA
- RTK/Skybridge: for Base Receiver
- RTK/Skybridge: for Rover Receiver
- RTK/Skybridge: for PPP Network Radio
- Network DGPS
- Real Time DGPS: for Base Receiver
- Real Time DGPS: for Rover Receiver
- Autonomous/SBAS/PPP: for receiving PPP corrections
- Repeater Configuration

Rover Receiver

In this dialog you can configure the rover receiver for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP Kinematic
- PP DGPS

Post Processing Setup

In this dialog you can enter information for the raw data logging for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge: for Base receiver
- RTK/Skybridge: for Rover receiver
- Network DGPS
- Real Time DGPS: for Base receiver
- Real Time DGPS: for Rover receiver
- PP Static
- PP Kinematic: for Base receiver
- PP Kinematic: for Rover receiver
- PP DGPS: for Base receiver
- PP DGPS: for Rover Receiver

Occupation Times

In this dialog you can set occupation time for receiver raw data logging for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- PP Static
- PP Kinematic
- PP DGPS

Topo Survey / Stake Settings - 2

In this dialog you can configure parameters that will be used during a real-time topo survey and stakeout procedure for the following GNSS survey types:

- Network RTK/Skybridge Topo Survey
- Network RTK/Skybridge Stake Settings - 2
- RTK/Skybridge Topo Survey
- RTK/Skybridge Stake Settings - 2
- Network DGPS Topo Survey
- Network DGPS Stake Settings - 2
- Real Time DGPS Topo Survey

- Real Time DGPS Stake Settings - 2
- Autonomous/SBAS/PPP Topo Survey
- Autonomous/SBAS/PPP Stake Settings - 2
- PP Kinematic Topo Survey
- PP DGPS Topo Survey

Auto Topo Survey

In this dialog you can configure parameters for auto-storing positions in the dynamic survey for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP Kinematic
- PP DGPS

Stake Settings - 1

In this dialog you can configure parameters that will be used during a GNSS stakeout for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP Kinematic
- PP DGPS

Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters) for the following survey types:

- Optical:
  - Conventional
  - Robotic
  - Motorized

- GNSS:
  - Network RTK/Skybridge
  - RTK/Skybridge
  - Network DGPS
  - Real Time DGPS
  - Autonomous/SBAS/PPP

Staked Point Icon

In this dialog you can define the icon for staked points to display on the map for the following survey types:

- Optical:
  - Conventional
  - Robotic
  - Motorized
- GNSS:
  - RTK/Skybridge
  - Network RTK/Skybridge
  - Network DGPS
  - Real Time DGPS
  - Autonomous/SBAS/PPP

Point Naming

In this dialog you can set an increment / decrement of the Topo points number when adding a new point and set the parameters for storing staked points for the following survey types:

- Optical:
  - Conventional
  - Robotic
  - Motorized
  - Level
- GNSS:
  - Network RTK/Skybridge
  - RTK/Skybridge
  - Network DGPS
  - Real Time DGPS
  - Autonomous/SBAS/PPP

Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver and used in position calculations.

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP Static
- PP Kinematic
- PP DGPS

Advanced

In this dialog you can change the advanced signal processing parameters for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP DGPS

Miscellaneous

In this dialog you can customize the Sokkia Field user interface for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge
- Network DGPS
- Real Time DGPS
- Autonomous/SBAS/PPP
- PP Static
- PP Kinematic
- PP DGPS

Instrument

Select the instrument model for your survey. See the dialog's details for the respective instrument type:

- Conventional
- Robotic
- Motorized
- Level

Connection Mode

Specify the connection for the instrument. See the dialog's details for the respective instrument type:

- Conventional
- Robotic
- Motorized
- Level

Search / Track

In this dialog, you configure signal tracking settings for the total station. See the details for the respective instrument type:

- Robotic
- Motorized

Survey Settings - 1

In this dialog, you configure settings for total station setup and survey.

See the details for the respective instrument type:

- Conventional
- Robotic
- Motorized

Survey Settings - 2

In this dialog, you configure more settings for total station setup and survey.

See the details for the respective instrument type:

- Conventional
- Robotic
- Motorized

Stake Settings - 1

In this dialog, you configure settings for stakeout with total station.

See the details for the respective instrument type:

- Conventional
- Robotic
- Motorized

Stake Settings - 2

In this dialog, you configure more settings for stakeout with total station.

See the details for the respective instrument type:

- Conventional
- Robotic
- Motorized

Measurement Modes

Configure the presets for the **Precise** and **Quick** measurement modes to be used in a survey or stakeout routine performed with a Robotic instrument.

Note that the measurement modes are configured independently:

- for a survey - in the Survey Settings dialog.
- for a stakeout routine - in the Stake Settings dialog.

Miscellaneous

In this dialog, you configure the parameters that are specific to a survey routine. See the details for the respective instrument type:

- Conventional
- Robotic
- Motorized
- Level

GNSS Configuration

To create a GNSS configuration or edit an existing configuration for the following GNSS survey types:

- Network RTK/Skybridge configuration, learn more about Network RTK/Skybridge
- RTK/Skybridge configuration, learn more about RTK/Skybridge
- Network DGPS configuration, learn more about Network DGPS
- Real Time DGPS configuration, learn more about Real Time DGPS
- Autonomous/SBAS/PPP configuration, learn more about Autonomous/SBAS/PPP
- PP Static configuration, learn more about PP Static
- PP Kinematic configuration, learn more about PP Kinematic
- PP DGPS configuration, learn more about PP DGPS

Network RTK/Skybridge Survey

Network Real Time Kinematic is similar to RTK survey but it implies that the Rover receives correction data from operating RTK reference station networks. The rover uses these corrections and computes high accuracy coordinates.

Skybridge ™ assumes that the Precise Point Positioning (PPP) engine works as a backup to the main RTK engine. If the rover receiver stops obtaining corrections from the base and RTK solution is lost, Skybridge ™ smoothly switches to the current PPP solution.

Precise Point Positioning (PPP) is a centimeter level positioning engine that combines dual frequency code and carrier phase measurements by GNSS receiver and data on precise orbits and clocks of navigation satellites. PPP corrections data is broadcast to customer receivers in two ways:

- Lband - direct broadcasting from a satellite;
- NTRIP - Topnet Live broadcasting over the Internet, typical connection using cellular modem and SIM card data link.

Skybridge ™ is not enabled by default. For more information on using Skybridge ™ and PPP see Precise Point Positioning (PPP).

1. Network RTK/Skybridge: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that is displayed in the Configurations Library dialog.
2. In the field **Type** select the *Network RTK/Skybridge* configuration.
3. In the **Corrections** field, select the type of correction data that will be used for survey:
   - *VRS* - to receive Virtual Reference Station data.
   - *Single Base* - to receive RTK corrections from a single base.
   - *MAC* - to use Master-Auxiliary Concept data.
   - *FKP* - to use network area corrections.
4. In the **Protocol** field, select the way of transmitting and receiving correction data: *NTRIP 2.0/1.0*, *NTRIP 1.0*, *TCP/IP*, *CSD (data call)*.
5. Optionally, you can configure the rover receiver for connection using an external cell modem which already has its own settings for connection with NTRIP server. To activate this option, select the **External NTRIP Config** from the dialog menu that displays by clicking  in the top left corner. This option is enabled for *VRS* corrections via *NTRIP 2.0/1.0* / *NTRIP 1.0* protocol. This option eliminates the use of the field controller's cellular communications for receiving corrections.
6. Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

2. Network RTK/Skybridge: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Rover receiver from the list in the **Rover** fields.
   - If you want to work without real receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.
   - If you want to use real network connection parameters (you will specify them in the further steps of this wizard), leave the **Network Simulation** option unchecked. If you want to simulate the network connection, select the **Network Simulation** option.
2. Select the **Post Processing** check box to store a raw data file (**.tps*) for the base and the rover receivers.
3. Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

3. Network RTK/Skybridge: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. **Enable Skybridge ™** check box. This functionality is applicable to **GNR5**, **GRX3**, **GCX3** receivers. Check this box to enable Precise Point Positioning (PPP) in survey and receive PPP corrections data. The main RTK engine and the backup PPP engine work in Network RTK survey. Skybridge ™ smoothly switches from RTK to PPP and back from PPP to RTK in situations when RTK solution is temporarily lost. Read more about starting and managing survey with Skybridge ™ enabled.

   > **Note: GCX3** receiver only supports PPP over NTRIP using the field controller's Internet connection.

   - Specify the source of PPP corrections data in the drop-down list next to the check box: select either *Starpoint ™ Lband* for Lband satellite down link, *Starpoint ™ Network* for NTRIP connection over the Internet, or *Beidou B2b* for PPP service provided by Beidou geosynchronous orbit (GEO) satellites. For **GNR5** receiver with firmware 5.6 or later, *Galileo HAS* corrections distributed through the Galileo signal (E6-B) are also available.
     - If required, click  to open the Starpoint ™ Lband dialog and select a specific Lband satellite manually.

5. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
6. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.

7. The software allows you to connect the different external devices to the rover. To configure the ports and to select the external device(s) type, click the **Peripherals** button. The Peripherals dialog is opened.
8. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking  in the top left corner.
9. Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

4. Network RTK/Skybridge: Rover Radio

To select and configure the cellular modem for receiving differential corrections. The dialog content depends on the rover receiver model.

Select the device, either *Receiver* or *Controller* to which the modem is connected.

To configure the cellular modem:

1. In the **Type** field, select which type of Cellular Modem you will use: *Internal Cellular* or *External Cellular*.
2. In the **Model** field, select model of the external modem.
3. For *External Cellular*, specify the **Baud** rate for the **Port** to which the modem is connected.

> **Note:** Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration"*. See here how to resolve the issue.

4. If required, click **Defaults** to return all the communication parameters to the default settings.
5. Click **Next** to specify the Internet address as required.

> **Note:** If you selected the *External NTRIP Config* option in the Configuration dialog, you can specify the **Baud** rate, the **Parity**, the number of **Data** bits and the number of **Stop** bits to establish connection between the rover receiver and external cell modem. In this case, the external modem has its own settings for connection to NTRIP server, and you cannot edit them in the Sokkia Field.

5. Network RTK/Skybridge: Internet Address

To configure settings for Internet connection:

Select the required connection from the **Label** column by clicking on its name.

- If there are no connections, create it by clicking the **Add** button. More...
- If you need to modify the connection parameters - IP address, credentials or just the connection's name - select it and click the **Edit** button. More...
- To remove a connection that you do not need, select it and click the **Delete** button.

From the menu that appears after clicking  (located in the top left corner), the following options are available:

- **Keep credentials with the project**:
  - the option is checked: when the project is copied and opened on another device, the **User ID** and **Password** values will be preserved and can be used on that device.
  - the option is unchecked: when the project is copied and opened on another device, the **User ID** and **Password** values will be empty (that is, they will not be copied with the project).
- **Show credentials when connecting**: login and password will be displayed in the Network tab of the Connection dialog when connecting to the server / caster.
- **Use GPUID**: Sokkia Field will send GPUID message to SAPOS Germany. More...

Click **Next** to proceed with the next step of the configuration wizard.

6. Network RTK/Skybridge: Login Info

This screen is only shown when you previously (the Configuration step of the wizard) selected to receive corrections from a *Single base* via *TCP/IP*.

1. Enter **User ID** and **Password** that will be used for logging in to the selected server.
2. Click **Next** to continue with the configuration process.

7. Network RTK/Skybridge: GPUID Info

If required, enter your **Id** information for SAPOS Germany to check if you are using the reference network of SAPOS for cadastre or for engineering measurements.

8. Network RTK/Skybridge: Position for GGA

The dialog is displayed when the following parameters are selected for the configuration:

1. Corrections type: *VRS*;
2. Protocol: *NTRIP 2.0/1.0*, *NTRIP 1.0*, *TCP/IP*;
3. The cell modem of a controller is used for communication with a network server.

This dialog allows you to specify the coordinates to include in a GGA message when connecting to a network server. These coordinates can be obtained automatically from the connected rover receiver or specified manually:

- If the **Automatic Rover Pos** check box is selected, then the GGA message will include actual coordinates of the rover receiver.
- If the **Automatic Rover Pos** check box is not selected, the GGA message will include the coordinates specified by a user. This can be done in the corresponding pane in one of the following ways:
  a. Click  to select the point on the map. The point position values appear in the coordinate fields.
  b. Click  to select the point from the list of points in the project. The point position values appear in the coordinate fields.
  c. Enter the coordinate values in the edit fields.

Select the **Remind when connecting to VRS mount point** check box to display a warning about the type of position you have selected for GGA. This warning will be displayed every time a connection between the rover and a network server is established.

The warning can have the following messages:

- "Rover position for NTRIP caster in GGA is automatic and uses current coordinates." - if you have **Automatic Rover Pos** selected.
- "Rover position for NTRIP caster in GGA is specified manually in settings." - if you have specified a fixed position for GGA.

> **Note:** Selecting a correct position for GGA message may be crucial for your survey results.

9. Network RTK/Skybridge: Modem Dialup

To set up cellular modem dial-up, select your mobile operator using the **Country** and the **Provider** drop-down lists. For some operators, all the configuration parameters will be filled automatically;

for the others, you should specify the values manually:

- Enter the **Dialup Number** required to set up the Internet connection. If the automatically filled number does not work, try the most common values:
  - *99#
  - *99***1#
  - *99**1*1#
- Enter the **User ID** and **Password** to connect to your cellular operator.
- Enter the **PIN** code if needed.
- Enter the **APN** name if needed.

To reset the entered values, click the **Defaults** button.

Click **Next** to proceed to the next step of configuration.

10. Network RTK/Skybridge: Rover PP Setup

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. Enter information for the raw data logging in the rover receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking  or  (when *Automatic* was selected in the **Start Log** field) in the Topo or Auto Topo dialogs. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field, you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *Network RTK/Skybridge* configuration is 1 second.

   Note: Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. **Start Log**: If you select *Manual*, to start raw data logging click  in the Topo or Auto Topo dialogs. If you select *Automatic*, the data logging is automatically started after clicking  in the Topo or Auto Topo dialogs.

5. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
6. **Log Corrections**: If the check box is selected, the base receiver correction data will be saved on the rover side. Depending on which modem is used, it will be saved in:
   - the current **.tps* file, if you are using the receiver modem (except **GRX1** receiver),

     Note: Saving the base receiver correction data on the rover side is not available for **GRX5** receiver if the cell modem connected to the receiver is used to receive corrections.

   - the *correctionsN.bin* file in *Projects*/*<current project name>* folder, if you are using the cell modem connected to the controller or the cell modem connected to **GRX1** receiver.

     Note: New *correctionsN.bin* file will start to record each time Sokkia Field reconnects to the receiver or the connected receiver reconnects to the correction data source. Each new file has the name *correctionsN.bin* where N is a counter of newly created file (examples: *corrections1.bin*, *corrections2.bin*).
7. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Rover AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   Note: This option is unavailable for **GRX1** and **GRX2** receivers.
8. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   This option is available only for **GRX1** and **GRX2** receivers.
9. Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

11. Network RTK/Skybridge: Occupation Times

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. In this dialog you can change the default settings of the occupation time for the various observation conditions and GNSS receiver type. After starting the logging of the raw data, the software will analyze the observation conditions and show the remaining time. The start value of the

remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

> **Note:** The remaining time is displayed in the normal view of Topo survey dialogs when logging GNSS raw data. To have the remaining time displayed in the map view, select the **Rem Time** value to display it in a customizable data field. More...

Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

12. Network RTK/Skybridge: Topo Survey

During a real-time stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

> **Note:** Click  to open the dialog pop-up menu and choose SureTopo ™ Settings to enable automatic filtering of randomly appearing anomalous RTK coordinates with SureTopo ™, the Topcon proprietary method.

In the **Precise** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.
4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

> **Note:** Every survey parameter can be changed with the help of the ⚙ button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

13. Network RTK/Skybridge: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic Network RTK survey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
   - *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

Note: To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

14. Network RTK/Skybridge: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

15. Network RTK/Skybridge: Stake Settings - 2

During a stakeout procedure you can select two independent ways to save staked out points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

Note: Click  to open the dialog pop-up menu and choose SureTopo ™ Settings to enable automatic filtering of randomly appearing anomalous RTK coordinates with SureTopo ™, the Topcon proprietary method.

In the **Precise** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.

   Note: If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

   Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.

   Note: If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

   Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Note: Every survey parameter can be changed with the help of the ⚙ button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

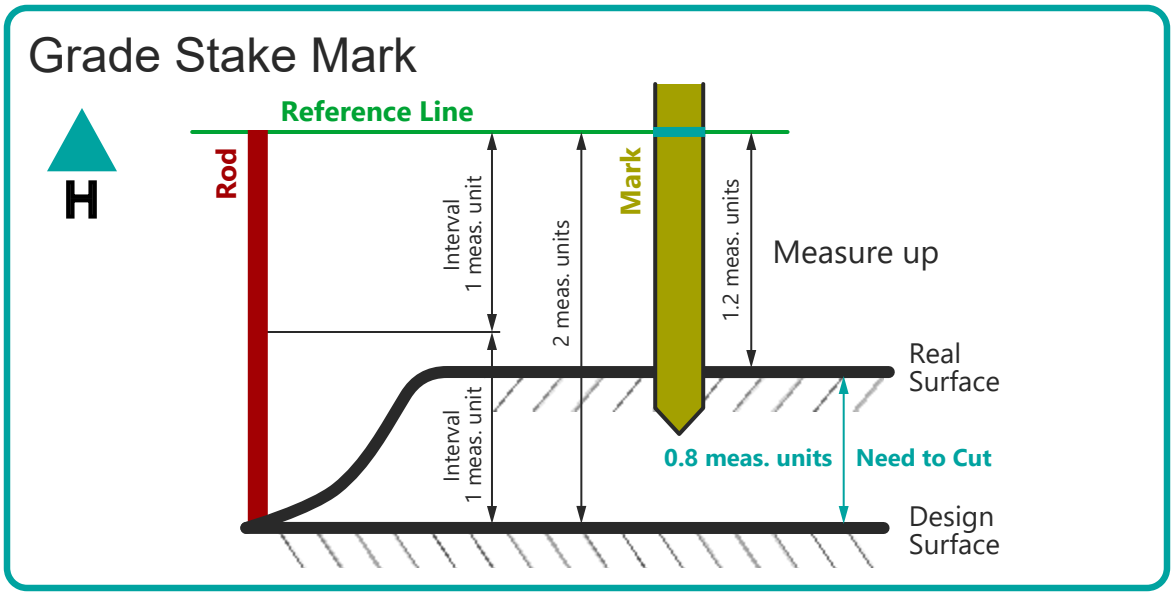
16. Network RTK/Skybridge: Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next**. The wizard will open the next dialog to create the *Network RTK/Skybridge* configuration.

17. Network RTK/Skybridge: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

18. Network RTK/Skybridge: Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

> **Note:** Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.

- *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
- *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
- *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
- *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
- *Range Start* - any entered value that starts the range for naming staked out points one by one.

- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:

  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

19. Network RTK/Skybridge: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click  to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with . Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys)	*B3*	*B1C, B2b*
	Note: Beidou *B3* signal is tracked by default by **GRX5** receiver.		
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone, DGPS and RTK solutions.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support selected signals.

20. Network RTK/Skybridge: Advanced

In this dialog you can select the signal processing parameters and RTK setting:

1. From **RTK Position**, select the method of RTK corrections definition:
   - *Extrapolation* (sometimes described as asynchronous) - the RTK engine will extrapolate the base station's carrier phase measurements to the current epoch (note that the truth carrier phases measured at the base cannot be transmitted and received at the rover instantly). The final positioning accuracy may be somewhat lower due to additional extrapolation errors, which may be up to a few millimeters vertical and horizontal for a one second extrapolation time.
   - *Matched Epoch* (sometimes described as synchronous) - the RTK engine does not extrapolate the base station's carrier phases in position computation. Instead, the engine will either compute a delayed position or simply output the current stand-alone position (while waiting for new RTCM/CMR messages from the base station). Note that the delayed position is computed for the time (epoch) to which the last received base station's carrier phase measurements correspond. Accuracies achievable in delay mode are normally on a level with those of post-processing kinematic.

   > **Note:** The selection of RTK corrections definition method is not available for **GRX5** receiver, the *Extrapolation* is applied automatically.

2. By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath and C/A carrier phase multipath. This option is useful for collecting raw data near from metallic objects, or trees and high buildings.
3. When using the GNSS receiver in conditions with a high level of external interference to satellite tracking, you can check the **Interference Environment** box. This feature works with receivers with firmware 5.6 or later and can reduce the impact of external wide-band interferences, including swept-frequency or pulsed interferences. When enabled, the interference detection pattern is expanded and automatic mitigation algorithms are adjusted. Slight degradation in the SNR may occur in the absence of external interference, so only enable this feature when operating in truly persistent interference environments.
4. If the GNSS receiver is collecting raw data in high-vibration environment, we recommend to select **High-Vibration Environment (QLL)** to enable Quartz Lock Loop technology to minimize the vibration-induced impact on acquisition and tracking capabilities of the GNSS receiver. (This setting is not available for **GRX5** receiver).
5. From the **Base Station Make** drop-down list, select the manufacturer of the Base receiver to designate Base Make (IGS Class) used by the rover receiver to account for GLONASS biases. (This setting is not available for **GRX5** receiver. The **GRX5** rover always uses *Automatic Detection* and applies default GLONASS corrections if automatic detection failed.)
   - The default setting *Automatic Detection* allows the rover receiver to use the information transmitted by the base. The message 1033 of the RTCM format contains this information.

- If the Base station does not transmit the manufacturer name of the Base receiver, you need to select the corresponding manufacturer name from the drop-down list.

  Note: Incorrect name of the Base receiver manufacturer can result in a Float solution.

6. Optionally, you can select the settings of the RTK engine. To do this, select the RTK Settings option from the dialog menu that displays by clicking  in the top left corner.
7. Click **Next**. The wizard will open the final dialog to create the *Network RTK/Skybridge* configuration.

21. Network RTK/Skybridge: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Get signal quality and operator name**: when selected, the signal quality indicator and operator name will be displayed in the Network tab of the Connections dialog.
6. **Auto-disconnect from caster**: when selected (by default), an automatic disconnection from the server is performed when you disconnect from the receiver. In order to hold rover-to-server connection after disconnecting Sokkia Field from rover, you should clear the check box.

   Note: If the *TCP/IP* protocol was selected in the first step of configuration wizard, this option is displayed as **Auto-disconnect from server**.

7. **Restart Epoch Counter if Solution changes**: when selected, counting epochs stops if the specified solution is lost and will resume after the specified solution is found.
8. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

RTK/Skybridge Survey

Real-Time Kinematic survey implies usage of a pair of receivers operating simultaneously and a radio link established between the two receivers. One of the receivers (a Base) is located at a fixed point with known coordinates. The base receiver transmits correction data via a radio link. The rover uses double difference for code and carrier phase measurements from base and rover and ambiguity fixing to compute high-accuracy coordinates in real time.

Skybridge ™ assumes that the Precise Point Positioning (PPP) engine works as a backup to the main RTK engine. If the rover receiver stops obtaining corrections from the base and RTK solution is lost, Skybridge ™ smoothly switches to the current PPP solution.

Precise Point Positioning (PPP) is a centimeter level positioning engine that combines dual frequency code and carrier phase measurements by GNSS receiver and data on precise orbits and clocks of navigation satellites. PPP corrections data is broadcast to customer receivers in two ways:

- Lband - direct broadcasting from a satellite;
- NTRIP - Topnet Live broadcasting over the Internet, typical connection using cellular modem and SIM card data link.

Skybridge ™ is not enabled by default. For more information on using Skybridge ™ and PPP see Precise Point Positioning (PPP).

1. RTK/Skybridge: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *RTK/Skybridge* configuration.
3. Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

2. RTK/Skybridge: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Base receiver and Rover receiver from the list in the **Base** and **Rover** fields.
   If you will work without receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.
2. Select the **Post Processing** check box to store a raw data file (**.tps*) for the base and the rover receivers.

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

3. RTK/Skybridge: Base Receiver

To configure the base receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   Note: USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the base receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From **RTK Format** drop-down list, select the data format for transmitting differential corrections by the base receiver radio modem. Make sure the rover receiver(s) can accept and process the correction format set on the base receiver.
5. From the **Antenna** drop-down list, select the type of the base receiver antenna used.
6. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.

   Note: The antenna height for a base receiver should not exceed the RTK protocol limits:
   - For *RTCM 3.x* - 6.5535m Mark-to-ARP.
   - For *RTCM 2.3* - 26.2144m Mark-to-ARP.
   - For *RTCM 2.1/2.2* - 26.2144m Mark-to-L1PC.
   - For *CMR* - 8.192m Mark-to-L1PC.

7. If needed to transmit data from different ports of the base receiver to several rovers, you need activate the **Multiple Ports** option. To do this, click the **Peripherals** button. The Peripherals dialog is opened. Here you can select the number of ports to use for base output.
8. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking ☰ in the top left corner.
9. Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

4. RTK/Skybridge: Base PP Setup

This dialog is opened if you select the **Post Processing** check box in the Receiver Make dialog. Enter information for the raw data logging in the base receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking the **Start Base** button in the Start Base dialog. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *RTK/Skybridge* configuration is 1 second.

   > **Note:** Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Base AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   > **Note:** This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   > This option is available only for **GRX1** and **GRX2** receivers.

7. Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

5. RTK/Skybridge: Base Radio

To select and configure the base radio for transmitting differential corrections. The dialog content depends on the base receiver model and the selected radio.

> **Note:** The base radio modem is always connected to receiver.

To configure the radio modem:

1. In the **Type** field, select which type of Radio Modem you will use: *Internal Radio*, or *Internal Cellular*, or *External Radio*, or *External Cellular*.
2. In the **Model** field, select model of the modem. The built-in *Long-Range Bluetooth* module in **GSX2**, **GCX2**, **GCX3**, **GRX3**, **GRX5** receivers does not require any additional settings.
3. Depending on the selected radio, specify communication parameters for the receiver **Port** that the radio is connected to: the **Baud** rate, and also the **Parity**, the number of **Data** bits and the number of **Stop** bits required for some radios.

   > **Note:** Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration"*. See here how to resolve the issue.

4. If required, click **Defaults** to return all the communication parameters to the default settings.
5. Click **Next** to specify the base and rover modem radio parameters as required.

6. RTK/Skybridge: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From **RTK Format** list, select the format for the differential corrections data, which the rover radio modem will receive.

   Note: GNSS receivers with firmware 5.5 or later support automatic format detection of incoming differential corrections. You can use the *Auto* format for such rover receiver.

5. **Enable Skybridge ™** check box. This functionality is applicable to **GNR5**, **GRX3**, **GCX3** receivers. Check this box to enable Precise Point Positioning (PPP) in survey and receive PPP corrections data. The main RTK engine and the backup PPP engine work in RTK survey. Skybridge ™ smoothly switches from RTK to PPP and back from PPP to RTK in situations when RTK solution is temporarily lost. Read more about starting and managing survey with Skybridge ™ enabled.

   Note: GCX3 receiver only supports PPP over NTRIP using the field controller's Internet connection.

   - Specify the source of PPP corrections data in the drop-down list next to the check box: select either *Starpoint ™ Lband* for Lband satellite down link, *Starpoint ™ Network* for NTRIP connection over the Internet, or *Beidou B2b* for PPP service provided by Beidou geosynchronous orbit (GEO) satellites. For **GNR5** receiver with firmware 5.6 or later, *Galileo HAS* corrections distributed through the Galileo signal (E6-B) are also available.
     - If required, click  to open the Starpoint ™ Lband dialog and select a specific Lband satellite manually.

6. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
7. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
8. The software allows you to connect the different external devices to the rover. To configure the ports and to select the external device(s) type, click the **Peripherals** button. The Peripherals dialog is opened.
9. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking  in the top left corner.
10. Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

7. RTK/Skybridge: Rover Radio

To select and configure the rover radio for receiving differential corrections. The dialog content depends on the previously selected base radio, rover receiver model and the selected rover radio.

Select the device, either *Receiver* or *Controller* to which the modem is connected.

To configure the radio modem:

1. In the **Type** field, select which type of Radio Modem you will use: *Internal Radio*, or *Internal Cellular*, or *External Radio*, or *External Cellular*.
2. In the **Model** field, select model of the modem. The built-in *Long-Range Bluetooth* module in **GSX2**, **GCX2**, **GCX3**, **GRX3**, **GRX5** receivers does not require any additional settings.
3. Depending on the selected radio, specify communication parameters for the receiver **Port** that the radio is connected to: the **Baud** rate, and also the **Parity**, the number of **Data** bits and the number of **Stop** bits required for some radios.

   > **Note:** Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration"*. See here how to resolve the issue.

4. If required, click **Defaults** to return all the communication parameters to the default settings.
5. Click **Next** to specify the base and rover modem radio parameters as required.

8. RTK/Skybridge: Rover PP Setup

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. Enter information for the raw data logging in the rover receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking  or  (when *Automatic* was selected in the **Start Log** field) in the Topo or Auto Topo dialogs. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field, you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *RTK/Skybridge* configuration is 1 second.

> **Note:** Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. **Start Log**: If you select *Manual*, to start raw data logging click  in the Topo or Auto Topo dialogs. If you select *Automatic*, the data logging is automatically started after clicking  in the Topo or Auto Topo dialogs.
5. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
6. **Log Corrections**: If the check box is selected, the base receiver correction data will be saved on the rover side. Depending on which modem is used, it will be saved in:
   - in the current tps file, if you are using the receiver radio modem (except **GRX1** receiver),

     > **Note:** Saving the base receiver correction data on the rover side is not available for **GRX5** receiver if the radio modem connected to the receiver is used to receive corrections.

   - in the *correctionsN.bin* files in *Projects*/*<current project name>* folder, if you are using the radio modem connected to the controller or the radio modem connected to **GRX1** receiver.

     > **Note:** New *correctionsN.bin* file will start to record each time Sokkia Field reconnects to the receiver or the connected receiver reconnects to the correction data source. Each new file has the name *correctionsN.bin* where N is a counter of newly created file (examples: *corrections1.bin*, *corrections2.bin*).

7. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Rover AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   > **Note:** This option is unavailable for **GRX1** and **GRX2** receivers.

8. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   > This option is available only for **GRX1** and **GRX2** receivers.

9. Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

9. RTK/Skybridge: Occupation Times

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. In this dialog you can change the default settings of the occupation time for the various observation conditions and GNSS receiver type. After starting the logging of the raw data, the software will analyze the observation conditions and show the remaining time. The start value of the remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

> **Note:** The remaining time is displayed in the normal view of Topo survey dialogs when logging GNSS raw data. To have the remaining time displayed in the map view, select the **Rem Time** value to display it in a customizable data field. More...

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

10. RTK/Skybridge: Topo Survey

During a real-time stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

> **Note:** Click  to open the dialog pop-up menu and choose SureTopo ™ Settings to enable automatic filtering of randomly appearing anomalous RTK coordinates with SureTopo ™, the Topcon proprietary method.

In the **Precise** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.

4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

   Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

   Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Note: Every survey parameter can be changed with the help of the ⚙ button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

11. RTK/Skybridge: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic RTK survey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
   - *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

> **Note:** To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

12. RTK/Skybridge: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

13. RTK/Skybridge: Stake Settings - 2

During a stakeout procedure you can select two independent ways to save staked out points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking , and the **Quick** way will be activated by clicking .

> **Note:** Click  to open the dialog pop-up menu and choose SureTopo ™ Settings to enable automatic filtering of randomly appearing anomalous RTK coordinates with SureTopo ™, the Topcon proprietary method.

In the **Precise** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...

2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.

> **Note:** If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.

> **Note:** If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click  and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Note: Every survey parameter can be changed with the help of the  button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

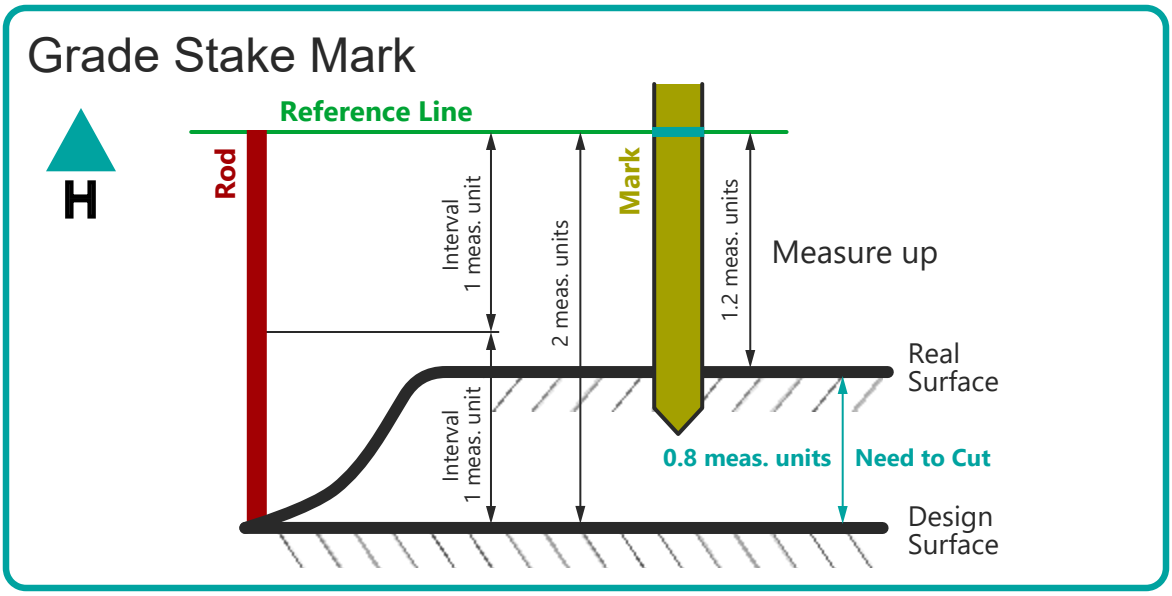
14. RTK/Skybridge: Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

15. RTK/Skybridge: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

16. RTK/Skybridge: Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

> **Note:** Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.

- *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
- *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
- *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
- *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
- *Range Start* - any entered value that starts the range for naming staked out points one by one.

- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:

  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

17. RTK/Skybridge: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click ☰ to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with ✔. Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys) **Note:** Beidou *B3* signal is tracked by default by **GRX5** receiver.	*B3*	*B1C, B2b*
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone, DGPS and RTK solutions.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

18. RTK/Skybridge: Advanced

In this dialog you can select the signal processing parameters and RTK setting:

1. From **RTK Position**, select the method of RTK corrections definition:
   - *Extrapolation* (sometimes described as asynchronous) - the RTK engine will extrapolate the base station's carrier phase measurements to the current epoch (note that the truth carrier phases measured at the base cannot be transmitted and received at the rover instantly). The final positioning accuracy may be somewhat lower due to additional extrapolation errors, which may be up to a few millimeters vertical and horizontal for a one second extrapolation time.
   - *Matched Epoch* (sometimes described as synchronous) - the RTK engine does not extrapolate the base station's carrier phases in position computation. Instead, the engine will either compute a delayed position or simply output the current stand-alone position (while waiting for new RTCM / CMR messages from the base station). Note that the delayed position is computed for the time (epoch) to which the last received base station's carrier phase measurements correspond. Accuracies achievable in delay mode are normally on a level with those of post-processing kinematic.
2. You can control the maximum number of satellites to be included in the RTCM or CMR messages, transmitted by a modem of the base receiver. To do this, check the **Base Sat Limit** and enter a satellites number starting from 6.
3. By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath and C/A carrier phase multipath. This option is useful for collecting raw data near from metallic objects, or trees and high buildings.
4. When using the GNSS receiver in conditions with a high level of external interference to satellite tracking, you can check the **Interference Environment** box. This feature works with receivers with firmware 5.6 or later and can reduce the impact of external wide-band interferences, including swept-frequency or pulsed interferences. When enabled, the interference detection pattern is expanded and automatic mitigation algorithms are adjusted. Slight degradation in the SNR may occur in the absence of external interference, so only enable this feature when operating in truly persistent interference environments.
5. If the GNSS receiver is collecting raw data in high-vibration environment, we recommend to select **High-Vibration Environment (QLL)** to enable Quartz Lock Loop technology to minimize the vibration-induced impact on acquisition and tracking capabilities of the GNSS receiver. (This setting is not available for **GRX5** receiver).
6. From the **Base Station Make** drop-down list, select the manufacturer of the Base receiver to designate Base Make (IGS Class) used by the rover receiver to account for GLONASS biases. (This setting is not available for **GRX5** receiver. The **GRX5** rover always uses *Automatic Detection* and applies default GLONASS corrections if automatic detection failed.)
   - The default setting *Automatic Detection* allows the rover receiver to use the information transmitted by the base. The message 1033 of the RTCM format contains this information.
   - If the base station does not transmit the manufacturer name, manually select the base man-

ufacturer name from the drop-down list.

> **Note:** Incorrect name of the Base receiver manufacturer can result in a Float solution.

7. Optionally, you can select the settings of the RTK engine. To do this, select the RTK Settings option from the dialog menu that displays by clicking ☰ in the top left corner.
8. Click **Next**. The wizard will open the final dialog to create the *RTK/Skybridge* configuration.

19. RTK/Skybridge: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout Sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Restart Epoch Counter if Solution changes**: when selected, counting epochs stops if the specified solution is lost and will resume after the specified solution is found.
6. **Auto-disconnect from Long-Range Bluetooth**: when selected (by default), an automatic disconnection from Long-Range Bluetooth base is performed by the rover receiver when you disconnect Sokkia Field from the **GSX2**, **GCX2**, **GCX3**, **GRX3**, **GRX5** receiver in an RTK survey. In order to hold base-rover Long-Range Bluetooth connection after disconnecting Sokkia Field from rover, you should clear the check box.
7. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

RTK/Skybridge: PPP Network Radio

This dialog opens if **Enable Skybridge ™** is selected and **Network** is chosen for receiving PPP corrections in the Receiver Settings dialog.

To configure the cellular modem connection to the Internet provider:

- Select either *Receiver*, or *Controller* depending on the available cellular modem to communicate with Internet provider.

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

RTK/Skybridge: Internet Address for PPP

This dialog opens if **Enable Skybridge ™** is selected and **Network** is chosen for receiving PPP corrections in the Rover Receiver dialog.

To choose or create Internet connection required to receive PPP corrections:

Select the connection to receive PPP corrections via NTRIP broadcast over the Internet from the **Label** column by clicking on its name.

- If there is no such connection, create it by using IP address and port, login, and password from your Starpoint ™ subscription email and clicking the **Add** button. More...
- If you need to modify the connection parameters - IP address, credentials or just the connection's name - select it and click the **Edit** button. More...
- To remove a connection that you do not need, select it and click the **Delete** button.

From the menu that appears after clicking  (located in the top left corner), the following options are available:

- **Keep credentials with the project**:
  - the option is checked: when the project is copied and opened on another device, the **User ID** and **Password** values will be preserved and can be used on that device.
  - the option is unchecked: when the project is copied and opened on another device, the **User ID** and **Password** values will be empty (that is, they will not be copied with the project).
- **Show credentials when connecting**: login and password will be displayed in the Network tab of the Connection dialog when connecting to the server / caster.

Click **Next** to proceed with the next step of the configuration wizard.

RTK/Skybridge: PPP Network Radio Dialup

This dialog opens if **Enable Skybridge ™** is selected and **Network** is chosen for receiving PPP corrections in the Rover Receiver dialog, and **Receiver** modem is selected to connect to the Internet in the PPP Network Radio dialog.

To set up cellular modem dial-up, select your mobile operator using the **Country** and the **Provider** drop-down lists. For some operators, all the configuration parameters will be filled automatically;

for the others, you should specify the values manually:

- Enter the **Dialup Number** required to set up the Internet connection. If the automatically filled number does not work, try the most common values:
  - *99#
  - *99***1#
  - *99**1*1#
- Enter the **User ID** and **Password** to connect to your cellular operator.
- Enter the **PIN** code if needed.
- Enter the **APN** name if needed.

To reset the entered values, click the **Defaults** button.

Click **Next** to proceed to the next step of configuration.

Network DGPS Survey

Network Differential GPS survey implies that the Rover receives corrections based on pseudo-range data from operating DGPS reference station networks. The rover uses these corrections to improve accuracy of computed coordinates.

1. Network DGPS: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *Network DGPS* configuration.
3. In the **Corrections** field, select the type of correction data that will be used for survey:
   - *VRS* - to receive Virtual Reference Station data.
   - *Single Base* - to receive corrections from a single base.
   - *FKP* - to use network area corrections.
4. In the **Protocol** field, select the way of transmitting and receiving correction data: *NTRIP 2.0/1.0*, *NTRIP 1.0*, *TCP/IP*, *CSD (data call)*.
5. Optionally, you can configure the rover receiver for connection using an external cell modem which already has its own settings for connection with NTRIP server. To activate this option, select the **External NTRIP Config** from the dialog menu that displays by clicking  in the top left corner. This option is enabled for *VRS* corrections via *NTRIP 2.0/1.0* / *NTRIP 1.0* protocol. This option eliminates the use of the field controller's cellular communications for receiving corrections.
6. Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

2. Network DGPS: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Rover receiver from the list in the **Rover** fields.
   If you will work without receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.
2. Select the **Post Processing** check box to store a raw data file (**.tps*) for the rover receiver.
3. Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

3. Network DGPS: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
5. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
6. The software allows you to connect the different external devices to the rover. To configure the ports and to select the external device(s) type, click the **Peripherals** button. The Peripherals dialog is opened.
7. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking  in the top left corner.
8. Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

4. Network DGPS: Rover Radio

To select and configure the cellular modem for receiving differential corrections. The dialog content depends on the rover receiver model.

Select the device, either *Receiver* or *Controller* to which the modem is connected.

To configure the cellular modem:

1. In the **Type** field, select which type of Cellular Modem you will use: *Internal Cellular* or *External Cellular*.
2. In the **Model** field, select model of the external modem.
3. For *External Cellular*, specify the **Baud** rate for the **Port** to which the modem is connected.

> **Note:** Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration"*. See here how to resolve the issue.

4. If required, click **Defaults** to return all the communication parameters to the default settings.
5. Click **Next** to specify the Internet address as required.

> **Note:** If you selected the **External NTRIP Config** option in the Configuration dialog, you can specify the **Baud** rate, the **Parity**, the number of **Data** bits and the number of **Stop** bits to establish connection between the rover receiver and external cell modem. In this case, the external modem has its own settings for connection to NTRIP server, and you cannot edit them in the Sokkia Field.

5. Network DGPS: Internet Address

To configure settings for Internet connection:

Select the required connection from the **Label** column by clicking on its name.

- If there are no connections, create it by clicking the **Add** button. More...
- If you need to modify the connection parameters - IP address, credentials or just the connection's name - select it and click the **Edit** button. More...
- To remove a connection that you do not need, select it and click the **Delete** button.

From the menu that appears after clicking  (located in the top left corner), the following options are available:

- **Keep credentials with the project**:
  - the option is checked: when the project is copied and opened on another device, the **User ID** and **Password** values will be preserved and can be used on that device.
  - the option is unchecked: when the project is copied and opened on another device, the **User ID** and **Password** values will be empty (that is, they will not be copied with the project).
- **Show credentials when connecting**: login and password will be displayed in the Network tab of the Connection dialog when connecting to the server / caster.
- **Use GPUID**: Sokkia Field will send GPUID message to SAPOS Germany. More...

Click **Next** to proceed with the next step of the configuration wizard.

6. Network DGPS: Login Info

This screen is only shown when you previously (the Configuration step of the wizard) selected to receive corrections from a *Single base* via *TCP/IP*.

1. Enter **User ID** and **Password** that will be used for logging in to the selected server.
2. Click **Next** to continue with the configuration process.

7. Network DGPS: GPUID Info

If required, enter your **Id** information for SAPOS Germany to check if you are using the reference network of SAPOS for cadastre or for engineering measurements.

8. Network DGPS: Position for GGA

The dialog is displayed when the following parameters are selected for the configuration:

1. Corrections type: *VRS*;
2. Protocol: *NTRIP 2.0/1.0*, *NTRIP 1.0*, *TCP/IP*;
3. The cell modem of a controller is used for communication with a network server.

This dialog allows you to specify the coordinates to include in a GGA message when connecting to a network server. These coordinates can be obtained automatically from the connected rover receiver or specified manually:

- If the **Automatic Rover Pos** check box is selected, then the GGA message will include actual coordinates of the rover receiver.

- If the **Automatic Rover Pos** check box is not selected, the GGA message will include the coordinates specified by a user. This can be done in the corresponding pane in one of the following ways:

  a. Click  to select the point on the map. The point position values appear in the coordinate fields.

  b. Click  to select the point from the list of points in the project. The point position values appear in the coordinate fields.

  c. Enter the coordinate values in the edit fields.

Select the **Remind when connecting to VRS mount point** check box to display a warning about the type of position you have selected for GGA. This warning will be displayed every time a connection between the rover and a network server is established.

The warning can have the following messages:

- "Rover position for NTRIP caster in GGA is automatic and uses current coordinates." - if you have **Automatic Rover Pos** selected.
- "Rover position for NTRIP caster in GGA is specified manually in settings." - if you have specified a fixed position for GGA.

> **Note:** Selecting a correct position for GGA message may be crucial for your survey results.

9. Network DGPS: Modem Dialup

To set up cellular modem dial-up, select your mobile operator using the **Country** and the **Provider** drop-down lists. For some operators, all the configuration parameters will be filled automatically; for the others, you should specify the values manually:

- Enter the **Dialup Number** required to set up the Internet connection. If the automatically filled number does not work, try the most common values:
  - *99#
  - *99***1#
  - *99**1*1#
- Enter the **User ID** and **Password** to connect to your cellular operator.
- Enter the **PIN** code if needed.
- Enter the **APN** name if needed.

To reset the entered values, click the **Defaults** button.

Click **Next** to proceed to the next step of configuration.

10. Network DGPS: Rover PP Setup

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. Enter information for the raw data logging in the rover receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking  or  (when *Automatic* was selected in the **Start Log** field) in the Topo or Auto Topo dialogs. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field, you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *Network DGPS* configuration is 1 second.

   > **Note:** Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. **Start Log**: If you select *Manual*, to start raw data logging click  in the Topo or Auto Topo dialogs. If you select *Automatic*, the data logging is automatically started after clicking  in the Topo or Auto Topo dialogs.
5. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
6. **Log Corrections**: If the check box is selected, the base receiver correction data will be saved on the rover side. Depending on which modem is used, it will be saved in:
   - the current **.tps* file, if you are using the receiver modem (except **GRX1** receiver),

     > **Note:** Saving the base receiver correction data on the rover side is not available for **GRX5** receiver if the cell modem connected to the receiver is used to receive corrections.

   - the *correctionsN.bin* file in *Projects*/*<current project name>* folder, if you are using the cell modem connected to the controller or the cell modem connected to **GRX1** receiver.

> **Note:** New *correctionsN.bin* file will start to record each time Sokkia Field reconnects to the receiver or the connected receiver reconnects to the correction data source. Each new file has the name *correctionsN.bin* where N is a counter of newly created file (examples: *corrections1.bin*, *corrections2.bin*).

7. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Rover AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   > **Note:** This option is unavailable for **GRX1** and **GRX2** receivers.

8. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   > This option is available only for **GRX1** and **GRX2** receivers.

9. Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

11. Network DGPS: Occupation Times

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. In this dialog you can change the default settings of the occupation time for the various observation conditions and GNSS receiver type. After starting the logging of the raw data, the software will analyze the observation conditions and show the remaining time. The start value of the remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

> **Note:** The remaining time is displayed in the normal view of Topo survey dialogs when logging GNSS raw data. To have the remaining time displayed in the map view, select the **Rem Time** value to display it in a customizable data field. More...

Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

12. Network DGPS: Topo Survey

During a real-time stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *Network DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.
4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   > **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click  and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the average mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *Network DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m

and 0.400 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

> **Note:** Every survey parameter can be changed with the help of the ⚙ button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

13. Network DGPS: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic Network DGPS survey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.

- *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

> **Note:** To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

14. Network DGPS: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

15. Network DGPS: Stake Settings - 2

During a stakeout procedure you can select two independent ways to save staked out points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *Network DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.

   > **Note:** If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   > **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click  and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the average mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *Network DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.

> **Note:** If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

> **Note:** Every survey parameter can be changed with the help of the ⚙ button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

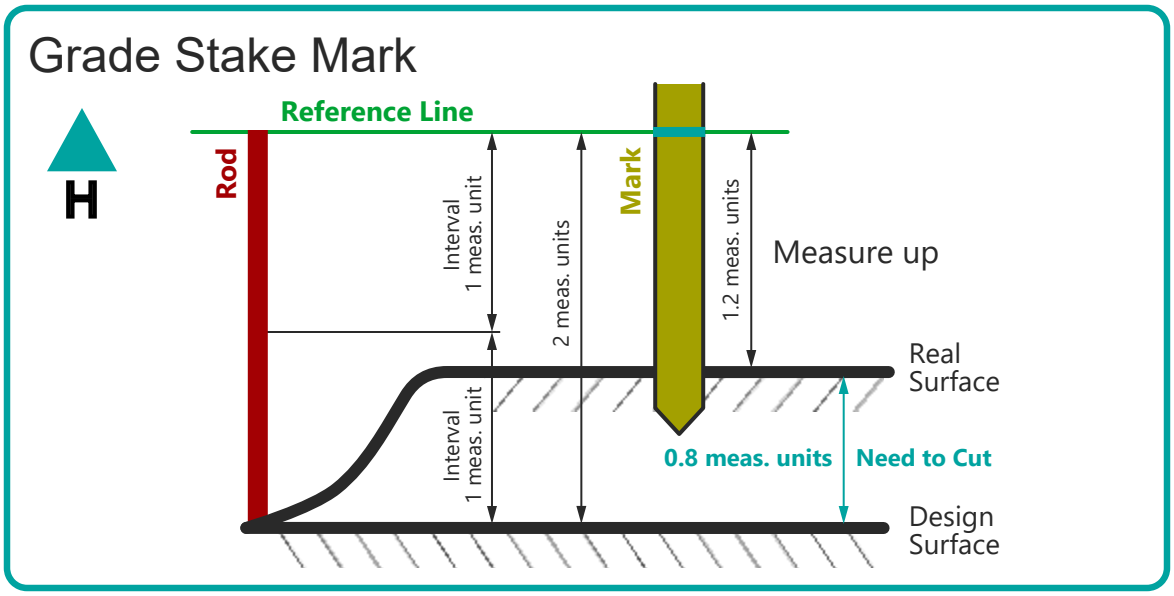
16. Network DGPS: Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next**. The wizard will open the next dialog to create the *Network DGPS* configuration.

17. Network DGPS: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

18. Network DGPS: Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

Note: Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.

- *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
- *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
- *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
- *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
- *Range Start* - any entered value that starts the range for naming staked out points one by one.

- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:

  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

19. Network DGPS: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click ☰ to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with ✔. Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys)	*B3*	*B1C, B2b*
	Note: Beidou *B3* signal is tracked by default by **GRX5** receiver.		
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone and DGPS solutions.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

20. Network DGPS: Advanced

In this dialog you can select the signal processing parameters:

1. By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath and C/A carrier phase multipath. This option is useful for collecting raw data near from metallic objects, or trees and high buildings.
2. When using the GNSS receiver in conditions with a high level of external interference to satellite tracking, you can check the **Interference Environment** box. This feature works with receivers with firmware 5.6 or later and can reduce the impact of external wide-band interferences, including swept-frequency or pulsed interferences. When enabled, the interference detection pattern is expanded and automatic mitigation algorithms are adjusted. Slight degradation in the SNR may occur in the absence of external interference, so only enable this feature when operating in truly persistent interference environments.
3. If the GNSS receiver is collecting raw data in high-vibration environment, we recommend to select **High-Vibration Environment (QLL)** to enable Quartz Lock Loop technology to minimize the vibration-induced impact on acquisition and tracking capabilities of the GNSS receiver. (This setting is not available for **GRX5** receiver).
4. Click **Next**. The wizard will open the final dialog to create the *Network DGPS* configuration.

21. Network DGPS: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout Sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Get signal quality and operator name**: when selected, the signal quality indicator and operator name will be displayed in the Network tab of the Connections dialog.
6. **Auto-disconnect from caster**: when selected (by default), an automatic disconnection from the server is performed when you disconnect from the receiver. In order to hold rover-to-server connection after disconnecting Sokkia Field from rover, you should clear the check box.

> **Note:** If the *TCP/IP* protocol was selected in the first step of configuration wizard, this option is displayed as **Auto-disconnect from server**.

7. **Restart Epoch Counter if Solution changes**: when selected, counting epochs stops if the specified solution is lost and will resume after the specified solution is found.
8. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

Real Time DGPS Survey

Real Time Differential GPS implies usage of a pair of receivers operating simultaneously and a radio link established between the two receivers. One of the receivers (a Base) is located at a fixed point with known coordinates. The base receiver transmits correction data via a radio link to the rover receiver. The rover uses pseudo-range measurements from base and rover to compute code-differential position in real time.

1. Real Time DGPS: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *Real Time DGPS* configuration.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

2. Real Time DGPS: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Base receiver and Rover receiver from the list in the **Base** and **Rover** fields.
   If you will work without receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.
2. Select the **Post Processing** check box to store a raw data file (**.tps*) for the base and the rover receivers.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

3. Real Time DGPS: Base Receiver

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the base receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From **DGPS Format** drop-down list, select the data format for transmitting differential corrections by the base receiver radio modem.
5. From the **Antenna** drop-down list, select the type of the base receiver antenna used.
6. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
7. If needed to transmit data from different ports of the base receiver to several rovers, you need activate the **Multiple Ports** option. To do this, click the **Peripherals** button. The Peripherals dialog is opened. Here you can select the number of ports to use for base output.
8. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking ☰ in the top left corner.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

4. Real Time DGPS: Base PP Setup

This dialog is opened if you select the **Post Processing** check box in the Receiver Make dialog.

1. **File Name***:* You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking the **Start Base** button in the Start Base dialog. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.

2. **Log To**: In this field you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *Real Time DGPS* configuration is 1 second.

   > **Note:** Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Base AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   > **Note:** This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   > This option is available only for **GRX1** and **GRX2** receivers.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

5. Real Time DGPS: Base Radio

To select and configure the base radio for transmitting differential corrections. The dialog content depends on the base receiver model and the selected radio.

To configure the radio modem:

1. In the **Type** field, select which type of Radio Modem you will use: *Internal Radio*, or *Internal Cellular*, or *External Radio*, or *External Cellular*.
2. In the **Model** field, select model of the modem. The built-in *Long-Range Bluetooth* module in **GSX2**, **GCX2**, **GCX3**, **GRX3**, **GRX5** receivers does not require any additional settings.
3. Depending on the selected radio, specify communication parameters for the receiver **Port** that the radio is connected to: the **Baud** rate, and also the **Parity**, the number of **Data** bits, the number of **Stop** bits required for some radios.

> **Note:** Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration"*. See here how to resolve the issue.

4. If required, click **Defaults** to return all the communication parameters to the default settings.
5. Click **Next** to specify the base and rover modem radio parameters as required.

6. Real Time DGPS: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From **DGPS Format** list, select the format for the differential corrections data, which the rover radio modem will receive.
5. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
6. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
7. The software allows you to connect the different external devices to the rover. To configure the ports and to select the external device(s) type, click the **Peripherals** button. The Peripherals dialog is opened.
8. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking ☰ in the top left corner.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

7. Real Time DGPS: Rover Radio

To select and configure the rover radio for receiving differential corrections. The dialog content depends on the previously selected base radio, rover receiver model and the selected rover radio.

Select the device, either *Receiver* or *Controller* to which the modem is connected.

To configure the radio modem:

1. In the **Type** field, select which type of Radio Modem you will use: *Internal Radio*, or *Internal Cellular*, or *External Radio*, or *External Cellular*.
2. In the **Model** field, select model of the modem. The built-in *Long-Range Bluetooth* module in **GSX2**, **GCX2**, **GCX3**, **GRX3**, **GRX5** receivers does not require any additional settings.
3. Depending on the selected radio, specify communication parameters for the receiver **Port** that the radio is connected to: the **Baud** rate, and also the **Parity**, the number of **Data** bits and the number of **Stop** bits required for some radios.

   > **Note:** Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration"*. See here how to resolve the issue.

4. If required, click **Defaults** to return all the communication parameters to the default settings.
5. Click **Next** to specify the base and rover modem radio parameters as required.

8. Real Time DGPS: Rover PP Setup

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. Enter information for the raw data logging in the rover receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking  or  (when *Automatic* was selected in the **Start Log** field) in the Topo or Auto Topo dialogs. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field, you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.

3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *Real Time DGPS* configuration is 1 second.

   Note: Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. **Start Log**: If you select *Manual*, to start raw data logging click  in the Topo or Auto Topo dialogs. If you select *Automatic*, the data logging is automatically started after clicking  in the Topo or Auto Topo dialogs.
5. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
6. **Log Corrections**: If the check box is selected, the base receiver correction data will be saved on the rover side. Depending on which modem is used, it will be saved in:
   - in the current tps file, if you are using the receiver radio modem (except **GRX1** receiver),

     Note: Saving the base receiver correction data on the rover side is not available for **GRX5** receiver if the radio modem connected to the receiver is used to receive corrections.

   - in the *correctionsN.bin* files in *Projects*/*<current project name>* folder, if you are using the radio modem connected to the controller or the radio modem connected to **GRX1** receiver.

     Note: New *correctionsN.bin* file will start to record each time Sokkia Field reconnects to the receiver or the connected receiver reconnects to the correction data source. Each new file has the name *correctionsN.bin* where N is a counter of newly created file (examples: *corrections1.bin*, *corrections2.bin*).

7. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Rover AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   Note: This option is unavailable for **GRX1** and **GRX2** receivers.

8. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

> This option is available only for **GRX1** and **GRX2** receivers.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

9. Real Time DGPS: Occupation Times

This dialog is opened if you have selected the **Post Processing** check box in the Receiver Make dialog. In this dialog you can change the default settings of the occupation time for the various observation conditions and GNSS receiver type. After starting the logging of the raw data, the software will analyze the observation conditions and show the remaining time. The start value of the remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

> **Note:** The remaining time is displayed in the normal view of Topo survey dialogs when logging GNSS raw data. To have the remaining time displayed in the map view, select the **Rem Time** value to display it in a customizable data field. More...

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

10. Real Time DGPS: Topo Survey

During a real-time stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *Real Time DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.
4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. The default values are 0.25 m and 0.400 m, respectively.
5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *Real Time DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. The default values are 0.25 m and 0.400 m, respectively.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Note: Every survey parameter can be changed with the help of the  button from any Topo and Stake dialogs in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

11. Real Time DGPS: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic Real Time DGPSsurvey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.

- *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
- *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

> **Note:** To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

12. Real Time DGPS: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.

- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

13. Real Time DGPS: Stake Settings - 2

During a stakeout procedure you can select two independent ways to save staked out points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *Real Time DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.

   > **Note:** If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   > **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click  and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *Real Time DGPS* configuration *All* and *DGPS* solution types will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.

   Note: If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Note: Every survey parameter can be changed with the help of the ⚙ button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

14. Real Time DGPS: Grade Stake Marking

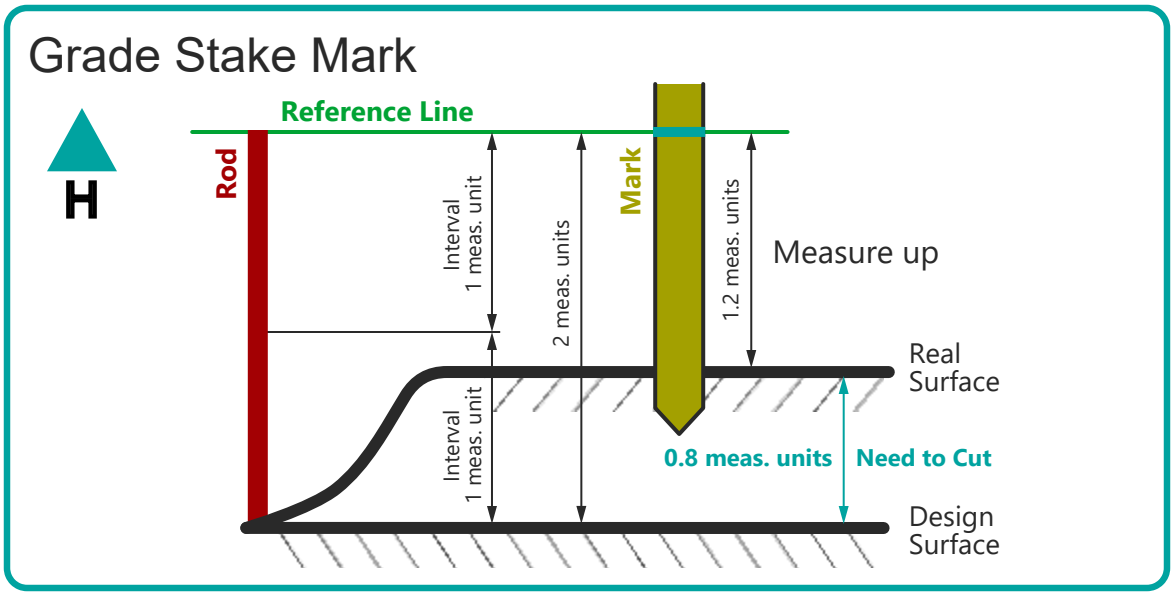
This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.

3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

15. Real Time DGPS: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for

staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

16. Real Time DGPS: Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

Note: Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click  in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.
  - *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
  - *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
  - *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
  - *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
  - *Range Start* - any entered value that starts the range for naming staked out points one by one.
- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:
  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

17. Real Time DGPS: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

Note: Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click ☰ to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with ✔. Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys)	*B3*	*B1C, B2b*
	Note: Beidou *B3* signal is tracked by default by **GRX5** receiver.		
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone and DGPS solutions.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

18. Real Time DGPS: Advanced

In this dialog you can select the signal processing parameters:

1. By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath and C/A carrier phase multipath. This option is useful for collecting raw data near from metallic objects, or trees and high buildings.
2. When using the GNSS receiver in conditions with a high level of external interference to satellite tracking, you can check the **Interference Environment** box. This feature works with receivers with firmware 5.6 or later and can reduce the impact of external wide-band interferences, including swept-frequency or pulsed interferences. When enabled, the interference detection pattern is expanded and automatic mitigation algorithms are adjusted. Slight degradation in the SNR may occur in the absence of external interference, so only enable this feature when operating in truly persistent interference environments.
3. If the GNSS receiver is collecting raw data in high-vibration environment, we recommend to select **High-Vibration Environment (QLL)** to enable Quartz Lock Loop technology to minimize the vibration-induced impact on acquisition and tracking capabilities of the GNSS receiver. (This setting is not available for **GRX5** receiver).

Click **Next**. The wizard will open the final dialog to create the *Real Time DGPS* configuration.

19. Real Time DGPS: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout Sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Restart Epoch Counter if Solution changes**: when selected, counting epochs stops if the specified solution is lost and will resume after the specified solution is found.
6. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

Autonomous/SBAS/PPP Survey

Autonomous/SBAS implies that the rover receiver uses differential pseudorange correction data transmitted from SBAS (Satellite - Based Augmentation Systems) service.

Precise Point Positioning (PPP) is a centimeter level positioning engine that combines dual frequency code and carrier phase measurements by GNSS receiver and data on precise orbits and clocks of navigation satellites. PPP corrections data is broadcast to customer receivers in two ways:

- Lband - direct broadcasting from a satellite;
- NTRIP - Topnet Live broadcasting over the Internet, typical connection using cellular modem and SIM card data link.

PPP is not enabled by default. For more information on using PPP see Precise Point Positioning (PPP).

1. Autonomous/SBAS/PPP: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *Autonomous/SBAS/PPP* configuration.
3. Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

2. Autonomous/SBAS/PPP: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Rover receiver from the list in the **Rover** fields.
   If you will work without receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

3. Autonomous/SBAS/PPP: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External**

Receiver box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

> **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. **Enable PPP** check box. This functionality is applicable to **GNR5**, **GRX3**, **GCX3** receivers. Check this box to enable Precise Point Positioning (PPP) in survey and receive PPP corrections data. Read more about starting and managing survey with Starpoint ™ enabled.

> **Note: GCX3** receiver only supports PPP over NTRIP using the field controller's Internet connection.

   - Specify the source of PPP corrections data in the drop-down list next to the check box: select either *Starpoint ™ Lband* for Lband satellite down link, *Starpoint ™ Network* for NTRIP connection over the Internet, or *Beidou B2b* for PPP service provided by Beidou geosynchronous orbit (GEO) satellites. For **GNR5** receiver with firmware 5.6 or later, *Galileo HAS* corrections distributed through the Galileo signal (E6-B) are also available.
     - If required, click ... to open the Starpoint ™ Lband dialog and select a specific Lband satellite manually.

5. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
6. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
7. The software allows you to connect external devices to the rover. To configure the ports and to select the external device(s) type, click the **Peripherals** button. The Peripherals dialog is opened.
8. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking ☰ in the top left corner.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

4. Autonomous/SBAS/PPP: SBAS Setup

To configure the use of SBAS stallites:

1. From the **SBAS type** drop-down list, select the satellite system whose satellites will be used in DGPS solution. Satellites of the selected system will be automatically selected in the list of all SBAS satellites. Select *Any Available* to use most available SBAS satellites from all satellite systems. Select *Custom* to manually pick the desired satellites to be used from the list of SBAS satellites.
2. For *Custom* selection in the **SBAS Type** drop-down list, manually select the boxes near the PRN numbers of the desired satellites.

   Note: All satellites can be selected. The satellite most available from those selected will be used in DGPS solution.

   - *PRN #*, *Name* and *Type*: These columns list all possible SBAS PRN numbers with the respective names of the satellites and types of satellite systems.
3. Enable / disable the use of ionospheric corrections from the SBAS satellite when computing positions. It is recommended to use ionospheric corrections.
   - *None*: ionospheric corrections are not used;
   - *Apply if avail*: use ionospheric corrections if available;
   - *Use sat only if avail*: use only the satellites for which ionospheric corrections are available.
4. Check the **Allow unhealthy SVs** box to also use SBAS satellites that are marked as unhealthy in DGPS solution. Clear the check box to only use SBAS satellites that are marked as healthy.
5. Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

5. Autonomous/SBAS/PPP: Topo Survey

During a real-time stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *Autonomous/SBAS/PPP* configuration *All* and *DGPS* solution types will be considered. More...

2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.
4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   > **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *Autonomous/SBAS/PPP* configuration *All* and *DGPS* solution types will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   > **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

6. Autonomous/SBAS/PPP: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic Autonomous/SBAS survey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
   - *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

Note: To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

7. Autonomous/SBAS/PPP: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

8. Autonomous/SBAS/PPP: Stake Settings - 2

During a stakeout procedure you can select two independent ways to save staked out points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *Autonomous/SBAS/PPP* configuration *All* and *DGPS* solution types will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.

3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.

   Note: If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *Autonomous/SBAS/PPP* configuration *All* and *DGPS* solution types will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.

   Note: If the **Average** value is more than 1 measurement during the stake procedure the application recalculates RMS (in the both planes) while logging new measurements.

3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

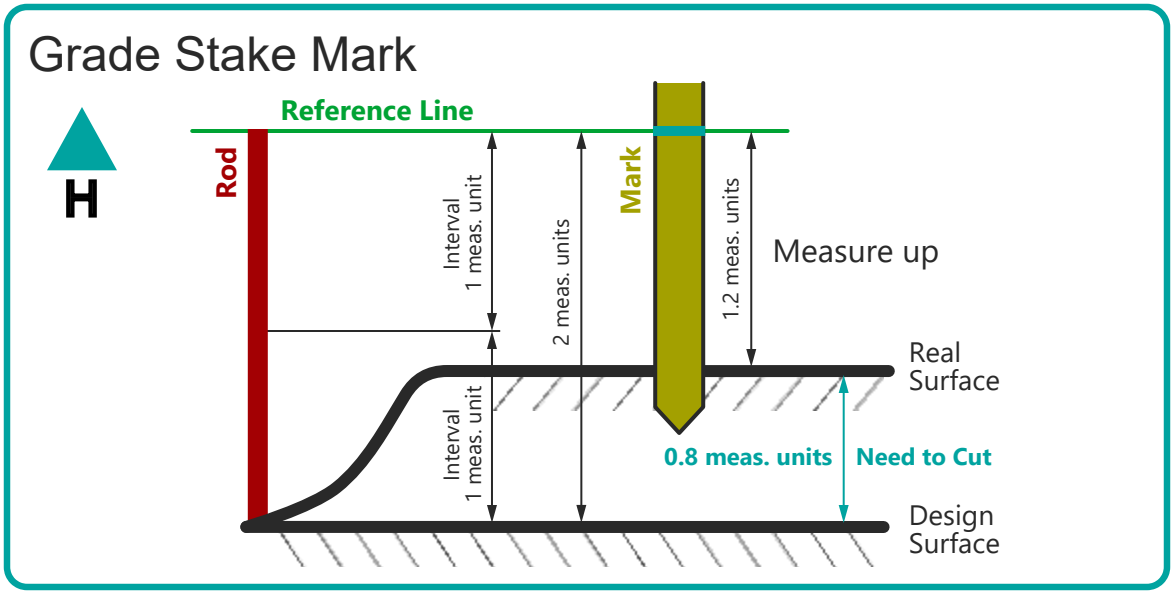
9. Autonomous/SBAS/PPP: Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

10. Autonomous/SBAS/PPP: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective  button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

11. Autonomous/SBAS/PPP: Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

> **Note:** Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.

- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have pre-defined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.
  - *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
  - *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
  - *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
  - *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
  - *Range Start* - any entered value that starts the range for naming staked out points one by one.

- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:

  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";

- for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

12. Autonomous/SBAS/PPP: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click ☰ to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with ✔. Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys) **Note:** Beidou *B3* signal is tracked by default by **GRX5** receiver.	*B3*	*B1C, B2b*
SBAS	*L1CA, L5*		

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone and DGPS solutions.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

13. Autonomous/SBAS/PPP: Advanced

In this dialog you can select the signal processing parameters:

1. By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath and C/A carrier phase multipath. This option is useful for collecting raw data near from metallic objects, or trees and high buildings.
2. When using the GNSS receiver in conditions with a high level of external interference to satellite tracking, you can check the **Interference Environment** box. This feature works with receivers with firmware 5.6 or later and can reduce the impact of external wide-band interferences, including swept-frequency or pulsed interferences. When enabled, the interference detection pattern is expanded and automatic mitigation algorithms are adjusted. Slight degradation in the SNR may occur in the absence of external interference, so only enable this feature when operating in truly persistent interference environments.
3. If the GNSS receiver is collecting raw data in high-vibration environment, we recommend to select **High-Vibration Environment (QLL)** to enable Quartz Lock Loop technology to minimize the vibration-induced impact on acquisition and tracking capabilities of the GNSS receiver. (This setting is not available for **GRX5** receiver). (This setting is not available for **GRX5** receiver).

Click **Next**. The wizard will open the final dialog to create the *Autonomous/SBAS/PPP* configuration.

14. Autonomous/SBAS/PPP: Miscellaneous

To configure miscellaneous settings for Autonomous/SBAS survey:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout Sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Restart Epoch Counter if Solution changes**: when selected, counting epochs stops if the specified solution is lost and will resume after the specified solution is found.
6. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

Autonomous/SBAS/PPP: Rover Radio

This dialog opens if **Enable Starpoint ™** is selected and **Network** is chosen for receiving PPP corrections in the Receiver Settings dialog.

To configure the cellular modem connection to the Internet provider:

- Select either *Receiver*, or *Controller* depending on the available cellular modem to communicate with Internet provider.

Click **Next**. The wizard will open the next dialog to create the *Autonomous/SBAS/PPP* configuration.

Autonomous/SBAS/PPP: Internet Address

This dialog opens if **Enable Starpoint ™** is selected and **Network** is chosen for receiving PPP corrections in the Autonomous/SBAS/PPP: Rover Receiver dialog.

To choose or create Internet connection required to receive PPP corrections:

Select the connection to receive PPP corrections via NTRIP from network mount points from the **Label** column by clicking on its name.

- If there is no such connection, create it by using IP address and port, login, and password from your Starpoint ™ subscription email and clicking the **Add** button. More...
- If you need to modify the connection parameters - IP address, credentials or just the connection's name - select it and click the **Edit** button. More...
- To remove a connection that you do not need, select it and click the **Delete** button.

From the menu that appears after clicking  (located in the top left corner), the following options are available:

- **Keep credentials with the project**:
  - the option is checked: when the project is copied and opened on another device, the **User ID** and **Password** values will be preserved and can be used on that device.
  - the option is unchecked: when the project is copied and opened on another device, the **User ID** and **Password** values will be empty (that is, they will not be copied with the project).
- **Show credentials when connecting**: login and password will be displayed in the Network tab of the Connection dialog when connecting to the server / caster.

Click **Next** to proceed with the next step of the configuration wizard.

Autonomous/SBAS/PPP: Modem Dialup

This dialog opens if **Enable Starpoint ™** is selected and **Network** is chosen for receiving PPP corrections in the Receiver Settings dialog, and **Receiver** modem is selected to connect to the Internet in the Rover Radio dialog.

To set up cellular modem dial-up, select your mobile operator using the **Country** and the **Provider** drop-down lists. For some operators, all the configuration parameters will be filled automatically; for the others, you should specify the values manually:

- Enter the **Dialup Number** required to set up the Internet connection. If the automatically filled number does not work, try the most common values:
  - *99#
  - *99***1#
  - *99**1*1#
- Enter the **User ID** and **Password** to connect to your cellular operator.
- Enter the **PIN** code if needed.
- Enter the **APN** name if needed.

To reset the entered values, click the **Defaults** button.

Click **Next** to proceed to the next step of configuration.

PP Static Survey

Using this type you can configure one GNSS receiver to collect raw data (**.tps*) file on a measured point. An individual file will be created for each new measured point. You can select where to store the file: in the GNSS receiver or in the controller. Measured points saved in the project's raw data during a static PP survey have coordinates computed for a standalone position. To obtain more accurate coordinates of measured points, import the collected raw data files to post-processing software.

1. PP Static: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *PP Static* configuration.
3. Click **Next**. The wizard will open the next dialog to create the *PP Static* configuration.

2. PP Static: Receiver Make

1. If you will work with real GNSS receiver, select the vendor which developed the receiver from the list in the **Base** field.
   If you will work without a receiver, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.
2. Click **Next**. The wizard will open the next dialog to create the *PP Static* configuration.

3. PP Static: Static Receiver

To configure the static receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   Note: USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the static receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From the **Antenna** drop-down list, select the type of the static receiver antenna used.
5. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
6. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking in the top left corner.
7. Click **Next**. The wizard will open the next dialog to create the *PP Static* configuration.

4. PP Static: Base PP Setup

Enter information for the raw data logging in the base receiver.

1. **File Name***:* You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking the **Start Occupations** button in the Static Occupation dialog. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *PP Static* configuration is 15 seconds.

   > **Note:** Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Base AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

> **Note:** This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

> This option is available only for **GRX1** and **GRX2** receivers.

7. Click **Next**. The wizard will open the next dialog to create the *PP Static* configuration.

5. PP Static: Occupation Times

In this dialog you can change the default settings of the occupation time for the different observation conditions and GNSS receiver type. To start logging data, in the Static Occupation dialog click the **Start Occ** button. The software will analyze the observation conditions and show the remaining time. The start value of the remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

Click **Next**. The wizard will open the next dialog to create the *PP Static* configuration.

6. PP Static: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click ☰ to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with ✔. Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys) **Note:** Beidou *B3* signal is tracked by default by **GRX5** receiver.	*B3*	*B1C, B2b*
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone solution.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

7. PP Static: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Beep on storing points**: by default this is turned on to beep each time the point is stored.

PP Kinematic Survey

Post Processing Kinematic implies two receivers. One is fixed on a control point with known coordinates. Another receiver is moving along some trajectory. Using this type you can configure both GNSS receivers to collect raw data (**.tps*) file. You can select where to store the file: in the GNSS receiver or in the controller. To obtain the precise coordinates of the measured points, import the collected raw data files to post-processing software.

1. PP Kinematic: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *PP Kinematic* configuration.
3. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

2. PP Kinematic: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Base receiver and Rover receiver from the list in the **Base** and **Rover** fields.
   If you will work without receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.
2. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

3. PP Kinematic: Base Receiver

To configure the base receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the base receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From the **Antenna** drop-down list, select the type of the base receiver antenna used.
5. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
6. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking ☰ in the top left corner.
7. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

4. PP Kinematic: Base PP Setup

Enter information for the raw data logging in the base receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking the **Start Base** button in the Start Base dialog. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *PP Kinematic* configuration is 5 seconds.

> **Note:** Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Base AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

> **Note:** This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

> This option is available only for **GRX1** and **GRX2** receivers.

7. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

5. PP Kinematic: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

> **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.

4. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
5. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
6. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking  in the top left corner.
7. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

6. PP Kinematic: Rover PP Setup

Enter information for the raw data logging in the rover receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking  or  (when *Automatic* was selected in the **Start Log** field) in the Topo or Auto Topo dialogs. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field, you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *PP Kinematic* configuration is 5 seconds.

   Note: Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Rover AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   Note: This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   This option is available only for **GRX1** and **GRX2** receivers.

7. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

7. PP Kinematic: Occupation Times

In this dialog you can change the default settings of the occupation time for the various observation conditions and GNSS receiver type. After starting the logging of the raw data, the software will analyze the observation conditions and show the remaining time. The start value of the remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

Note: The remaining time is displayed in the normal view of Topo survey dialogs when logging GNSS raw data. To have the remaining time displayed in the map view, select the **Rem Time** value to display it in a customizable data field. More...

Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

8. PP Kinematic: Topo Survey

During stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *PP Kinematic* configuration, *All* type solution will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.
4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In

the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.015 m and 0.030 m, respectively.

> **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

> **Note:** Every survey parameter can be changed with the help of the  button from any Topo and Stake dialog in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

9. PP Kinematic: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic survey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
   - *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 5 seconds.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

> **Note:** To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

10. PP Kinematic: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *PP Kinematic* configuration.

11. PP Kinematic: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective  button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

12. PP Kinematic: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click ☰ to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with ✔. Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys) **Note:** Beidou *B3* signal is tracked by default by **GRX5** receiver.	*B3*	*B1C, B2b*
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

> **Note:** Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone solution.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

13. PP Kinematic: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout Sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

PP DGPS Survey

Post Processing Differential GPS implies using two receivers. One is fixed on a control point with known coordinates. Another receiver is moving along some trajectory. Using this method, you can configure both GNSS receivers to collect raw data (**.tps*) file. You can select where to store the file: in the GNSS receiver or in the controller. To obtain the sub meter accuracy, import the collected raw data files to post-processing software.

1. PP DGPS: Configuration

To add / edit a new configuration:

1. Enter the **Name** for the configuration that will be displayed in the Configurations Library dialog.
2. In the field **Type** select the *PP DGPS* configuration.
3. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

2. PP DGPS: Receiver Make

1. If you will work with real GNSS receivers, select the vendor which developed the Base receiver and Rover receiver from the list in the **Base** and **Rover** fields.

   If you will work without receivers, select the **Simulation Mode** check box. You can set the simulation parameters in the **Setup** -> Simulator.

2. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

3. PP DGPS: Base Receiver

To configure the base receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the base receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From the **Antenna** drop-down list, select the type of the base receiver antenna used.
5. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
6. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking  in the top left corner.
7. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

4. PP DGPS: Base PP Setup

Enter information for the raw data logging in the base receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking the **Start Base** button in the Start Base dialog. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.
3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *PP DGPS* configuration is 5 seconds.

   Note: Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Base AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   Note: This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   This option is available only for **GRX1** and **GRX2** receivers.

7. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

5. PP DGPS: Rover Receiver

To configure the rover receiver:

1. The **External Receiver** box is enabled for a controller that has an internal GNSS receiver. You can select a connection with the internal GNSS receiver or any external GNSS receiver. If the controller does not have a GNSS receiver or the software is installed on the computer, the **External Receiver** box is always checked. The connection to the external receivers can be *Bluetooth* and cable *USB / Serial*. For **GNR5** and **GRX5** receivers, you can also select *Wi-Fi* connection.

   > **Note:** USB interface and USB cable can be used to establish serial communication between controller and some GNSS receivers (such as **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5**). Select *USB / Serial* for such connection. More...

2. From the **Receiver Model** list, select the model of the rover receiver you are using and enter its **Serial Number**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
4. From the **Antenna** drop-down list, select the type of the rover receiver antenna used.
5. Enter the antenna height and set the type of height measurement (vertical or slant). To do this, click the **Antenna Height** button and select *Edit* from the drop-down menu. The Antenna Setup dialog is opened. Here you can edit the antenna type, the value of the antenna height, and the type of height.
6. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available.

   To do this, select the Receiver Setting option from the dialog menu that displays by clicking  in the top left corner.
7. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

6. PP DGPS: Rover PP Setup

Enter information for the raw data logging in the rover receiver.

1. **File Name**: You can select the way of creating of the file name:
   - *Default* - the name of the **.tps* file will be set automatically,
   - *User Defined* - the name of the **.tps* file will be set by you after clicking  or  (when *Automatic* was selected in the **Start Log** field) in the Topo or Auto Topo dialogs. The Raw Data Logging dialog will be opened, where you can enter the file name and select the folder in which to save the file.
2. **Log To**: In this field, you can select the device where the raw data will be stored: in *Receiver* or in *Controller*.

3. **Logging Rate**: Select the data logging interval in seconds. The default value for the *PP DGPS* configuration is 5 seconds.

   Note: Any logging rate slower than 1 second must be an integer. Logging rates faster than 1 second are limited to the following values: in the receiver - 0.05, 0.1, 0.2, 0.25, 0.5, in the controller - 0.5 seconds.

4. In the **Min SVs** field, specify the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).

5. Select the **Use AFRM** check box to enable Automatic File Rotation Mode (AFRM). In this mode the receiver will close the current **.tps* file and open a new one according to a schedule defined by File *Rotation Period* . This parameter you can specify in the Config: Rover AFRM dialog. The **Use AFRM** option is only available when **Log To** is set to *Receiver*.

   Note: This option is unavailable for **GRX1** and **GRX2** receivers.

6. **Sound volume**: Specify the volume of sound which will be played when logging raw data: the receiver will beep each time its saves an epoch to file.

   This option is available only for **GRX1** and **GRX2** receivers.

7. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

7. PP DGPS: Occupation Times

In this dialog you can change the default settings of the occupation time for the various observation conditions and GNSS receiver type. After starting the logging of the raw data, the software will analyze the observation conditions and show the remaining time. The start value of the remaining time is equal of the initialization time for the given observation conditions. (This feature is unavailable for use with **GRX5** receiver).

Note: The remaining time is displayed in the normal view of Topo survey dialogs when logging GNSS raw data. To have the remaining time displayed in the map view, select the **Rem Time** value to display it in a customizable data field. More...

Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

8. PP DGPS: Topo Survey

During stationary survey you can select two independent ways to save measured points to the current project: **Precise** and **Quick**. In the Topo dialog or Stake dialog, the **Precise** way will be activated by clicking  , and the **Quick** way will be activated by clicking .

In the **Precise** area you can set the following parameters:

1. **Solution**: for the *PP DGPS* configuration, *All* type solution will be considered. More...
2. **Measure Continuously**: select the check box to log measurements continuously and stop them manually when required.
3. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If needed, you can change the default number (3) of measurements.
4. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

   > **Note:** In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click  and select the respective menu item.

5. **Auto Store**: select the check box to enable auto-storing positions for the averaging mode.

In the **Quick** area you can set the following parameters:

1. **Solution**: for the *PP DGPS* type *All* types solutions will be considered. More...
2. **Average**: the field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number (1) of measurements.
3. **Precision**: select the check box to consider the threshold of the horizontal (**HRMS**) and vertical (**VRMS**) precisions of measurement to store the position. Measurements and their further averaging will be performed until specified horizontal and vertical precision values are reached. In the general case, the number of measurements required for reaching specified precision can be greater than the number of epochs specified in the **Average** field. The default values are 0.25 m and 0.400 m, respectively.

Note: In the Advanced Epoch Filtering dialog you can filter out individual measurements so they would not be used them in averaging. To call the dialog, click ☰ and select the respective menu item.

Note that even if the **Precision** option is checked, Sokkia Field will wait for the number of averaged epochs specified in the **Average** field. This applies to both Precise and Quick modes.

Note: Every survey parameter can be changed with the help of the  button from any Topo and Stake dialogs in GNSS mode.

Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

9. PP DGPS: Auto Topo Survey

To configure parameters for auto-storing positions in the dynamic survey:

1. **Solution**: from the drop-down list, select the solution type for each position computation as required. More...

2. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
   - *Stop and go*: a point is stored automatically after the GNSS antenna movement stops for a specified time interval.

3. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

> **Note:** To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

4. Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

10. PP DGPS: Stake Settings - 1

To configure the settings for stakeout performed using a GNSS receiver.

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance** - enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented in the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference** - select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Click **Next**. The wizard will open the next dialog to create the *PP DGPS* configuration.

11. PP DGPS: Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective  button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

12. PP DGPS: Tracking

To select satellite constellations and configure satellite signals to be tracked by the receiver.

Select the respective check boxes to enable tracking. Note that GPS constellation is always selected.

Check the **Extended Compatibility** box to track extra signals from satellites in addition to the default ones. Review the table below for signals reference.

> **Note:** Enabling the **Extended Compatibility** signal tracking option is not required for standard surveys and may be useful for some troubleshooting routines.

Click  to open the dialog menu and enable or disable the **Triple Frequency** feature to track more signals from satellites in addition to the default ones. Activated feature is marked with . Review the table below for signals reference.

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GPS	*L1CA, L1P, L2P*	*L5*	*L1C, L2C*

GNSS System	Signals Tracked by Default	Triple Frequency	Extended Compatibility
GLONASS	*L1CA, L2CA* (*L1CA, L1P, L2P* - in legacy receivers)	*L3*	*L1P, L2P* (*L2CA* - in legacy receivers)
Galileo	*E1, E5a*	*E6*	*E5b, E5ab*
BeiDou	*B1, B2, B2a* (*B1, B1C, B2, B2a* - in PPP surveys)	*B3*	*B1C, B2b*
	Note: Beidou *B3* signal is tracked by default by **GRX5** receiver.		
SBAS	*L1CA, L5*		
QZSS	*L1CA, L2C*	*L5*	*L1C, L1CB*
NavIC	*L5A*		

Note: Enabling the **Extended Compatibility** and / or **Triple Frequency** signal tracking options generates higher CPU load in the receiver and depletes its battery quicker.

Note: The constellations and signals you have selected in this step of the wizard will be used for position computation in Standalone solution.

The configuration selected for tracking and positioning will work properly if you're using the hardware and firmware which support the selected signals.

13. PP DGPS: Advanced

In this dialog you can select the following signal processing parameters:

1. By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath and C/A carrier phase multipath. This option is useful for collecting raw data near from metallic objects, or trees and high buildings.
2. When using the GNSS receiver in conditions with a high level of external interference to satellite tracking, you can check the **Interference Environment** box. This feature works with receivers with firmware 5.6 or later and can reduce the impact of external wide-band interferences, including swept-frequency or pulsed interferences. When enabled, the interference detection pattern

is expanded and automatic mitigation algorithms are adjusted. Slight degradation in the SNR may occur in the absence of external interference, so only enable this feature when operating in truly persistent interference environments.

3. If the GNSS receiver is collecting raw data in high-vibration environment, we recommend to select **High-Vibration Environment (QLL)** to enable Quartz Lock Loop technology to minimize the vibration-induced impact on acquisition and tracking capabilities of the GNSS receiver. (This setting is not available for **GRX5** receiver).
4. Click **Next**. The wizard will open the final dialog to create the *PP DGPS* configuration.

14. PP DGPS: Miscellaneous

In this dialog you can you to customize the user interface:

1. **Display coordinates after measurement**: when selected, computed coordinates are displayed automatically after a GNSS measurement is performed and before the point coordinates are stored into the database.
2. **Prompt for antenna height**: when selected, prompts for a height of the antenna before a point is stored.
3. **Stakeout Sound**: when selected, a sound in Stakeout indicates as the point is staked.
4. **Beep on storing points**: by default this is turned on to beep each time the point is stored.
5. **Prompt for Survey Session**: when selected, the pop-up menu for Topo mode will contain the Survey Session command. Click the command to open a wizard for creating a Survey Session, where the measured points will be recorded. Also starting  and stopping  raw data logging in surveys with post processing will open the prompt Survey Session dialog where you can quickly review or change the name of the current session.

Other Settings for GNSS Surveys

Find the description of configurations and settings of external devices, modems and the information on specific parameters for GNSS survey configurations:

Receiver Settings

To configure additional features of the selected GNSS receiver.

This dialog opens by clicking  in the top left corner of the Base Receiver / Static Receiver and Rover Receiver dialogs of the survey configuration wizard.

- **Turn Charger Mode Off** check box. When a GNSS receiver uses an external power supply and the receiver charger mode is turned on, the charger also supplies power to the receiver's battery. To allow the receiver to use an external power supply without charging its internal batteries, select the **Turn Charger Mode Off** check box.
- **Base Movement Detection** check box. This feature is available for **GRX5** receiver and can be activated on the *base receiver* that transmits RTK or DGPS corrections in RTCM 3.x / RTCM 3.x MSM3 format. Check the box to instruct the base receiver to transmit alert data to the rover side when unexpected motion is detected. If you also use **GRX5** as a rover receiver, you can be alerted about such events and received corrections will be filtered accordingly. You can configure the reception of base movement alerts in the Alarms dialog.

Click  to save settings or  to return to the previous dialog without saving.

Antenna Setup

To set up the GNSS antenna:

1. Select the desired model of the Sokkia **Antenna** (available models depend on the selected GNSS receiver).
2. In the **Height** panel you can view / edit:
   - the value of the antenna height (**Antenna** field),
   - the method used to measure the antenna height (**Meas as** field):
     -  *Vertical* - measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.
     -  *Slant* - measured from the ground point to the antenna slant height measure mark (SHMM).

     Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

      **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...
   - the value of the adapter height in the **Adapter** field (adapter - an additional device which can be set between a GNSS receiver and a rod). Not applicable if *Slant* method is used to measure the antenna height.

3. For the external GNSS antenna you can enter its **Serial Number**.
4. Click ☰ to open the dialog menu for additional settings used in specific configurations:
   - **Use relative calibrations** option (available for **base** receiver antenna setup if *Unknown* antenna model is selected) - select to use relative antenna calibrations (the default is the use of absolute calibrations).
   - **Relative calibrations on Base** option (used for **rover** receiver antenna setup in specific configurations when the **Use relative calibrations** option is selected for the corresponding base) - select it for correct calculation of the height of the ground point, where the **rover** is installed.
   - **Transmit as if zero offset antenna** option (available for **base** receiver antenna setup) - select it if the warning: "Your rover firmware does not recognize the base antenna. Make sure that height of measured points is correct" has been received. More...
5. Click ✓ to save the settings.

Config: Base AFRM

This dialog is opened if you have selected the **Use AFRM** check box in the Base PP Setup dialog. You can specify the Automatic File Rotation Mode (AFRM) mode parameters in the dialog:

- **Rotation period, s** - the duration time of each created **.tps* file;
- **Count** - the number of created **.tps* file(s). If the box next to the field is not checked, the number of files is unlimited.

Auto Remove Old Files check box - if selected, the receiver automatically removes log files with the earliest creation time/date when there is no free disk space available for recording data.

Click **Next**. The wizard will open the next dialog.

Config: Rover AFRM

This dialog is opened if you have selected the **Use AFRM** check box in the Rover PP Setup dialog. You can specify the Automatic File Rotation Mode (AFRM) mode parameters in the dialog:

- **Rotation period** - the duration time in minutes of each created **.tps* file;
- **Count** - the number of created **.tps* file(s). If the box next to the field is not checked, the number of files is unlimited.

Auto Remove Old Files check box - if selected, the receiver automatically removes log files with the earliest creation time / date when there is no free storage space available for recording new files in current rotation.

Click **Next**. The wizard will open the next dialog.

Raw Data Logging

Enter the **File Name** for the **.tps* file in which to log raw data.

TILT ™ Settings

To configure automatic tilt correction features for TILT ™ or Dynamic TILT ™ enabled GNSS receivers.

This dialog is available for **GRX5**, **GRX3** receivers that use their own built-in GNSS antenna. Any external GNSS antenna disables all tilt correction features.

- **Show eLevel** - to show / hide the electronic bubble level. With the check box selected, the bubble level indicator is shown in the GNSS survey and stake dialogs and makes it possible to use the electronic level as a pole inclination informer or filter. Tilt compensation works with this check box selected or deselected if it is enabled by **Compensate** radio button.

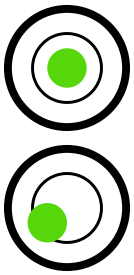
  > **Note:** To ensure proper operation of the electronic bubble level, mount the controller and GNSS receiver on the pole with the GNSS receiver LEDs and controller screen facing you.

- **Auto Store After** - to activate or deactivate the auto store option. With the check box selected, Sokkia Field automatically measures and then saves a point if the pole tilt value was less than *1°* during the time interval longer than the specified **Auto Store After** value (2 seconds by default). With the check box cleared, points are not stored automatically by the pole tilt value criterion. This feature is disabled for Auto Topo surveys.

- **Pole tilt handling** selector defines how the tilt correction features will work:
  - **Compensate** radio button - to activate Tilt Compensation. When enabled and the pole is tilted from the vertical axis, Sokkia Field will calculate the offset of the GNSS antenna phase center in the horizontal plane, for each GNSS epoch. These offset values are used for obtaining the true coordinate of the measured ground point. The value selected in the **Compensate** field defines the maximal inclination angle to compensate.

    >  **Note:** In *Fusion Positioning*™ mode, automatic tilt compensation is available for the rod with an attached prism and a GNSS receiver with Dynamic TILT ™ / TILT ™ compensation technology when measuring with a robotic total station. More...

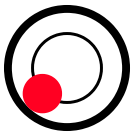
Enabled **Compensate** mode:



Green Bubble

The bubble is within the external circle when value in of the tilt pole angle is in the range from zero to the value in the **Compensate** field. The external circle radius depends on the value, selected in the **Compensate** field:

- if the value in the **Compensate** field is less than *6°*, the internal circle has the radius equal to value in the **Compensate** field, and the external circle is fixed to *6°*;
- if the value in the **Compensate** field is more than *6°*, the internal circle radius is fixed to *1°* and the external circle is equal to the value in the **Compensate** field.



Red Bubble

The bubble touches the external circle when the value of the tilt pole angle exceeds the value in the **Compensate** field.

Note: The accuracy of measurements using TILT ™ begins to deteriorate beyond *15°* of compensation for **GRX3** receiver and it is recommended not to set exceeding values. **GRX5** receiver is not subject to loss of accuracy with compensations greater than *15°* and can compensate for tilts up to *60°*.

Note: GNSS topo points measured with the **Compensate** mode enabled have the  icon in the **Properties** column (the Points dialog).

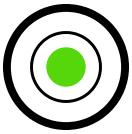
- **Filter** radio button - Sokkia Field controls the maximum allowable tilt angle of the pole. The inclination compensation is off in filter mode. When the filter is used and the specified tilt angle is exceeded, the GNSS epoch counter stops and point saving is disabled until the current tilt angle is less than the specified value.



Note: In *Fusion Positioning*™ mode, tilt filtering (prohibit saving points if the rod is tilted more than the allowed threshold) is available for the rod with an attached prism and a GNSS receiver with Dynamic TILT ™ / TILT ™ compensation technology when measuring with a robotic total station. More...

- **Disabled** radio button - to turn off the electronic tilt correction and filter mode, inclination of pole is being measured and inclination angle can be viewed.

  Enabled **Filter** mode or **Disabled** mode:

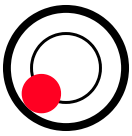
  Green Bubble

  The bubble is within the internal circle when the value of the tilt pole angle is in the range from 0 to the value, selected in the **Filter** field.

  Blue Bubble

  The bubble is between the internal and external circle when the value of the tilt pole angle is in the range from the value, selected in the **Filter** field to *6°* for Filter mode, or in the range from *1°* to *6°* for Disabled mode.

  Red Bubble

  The bubble touches the external circle when the value of the tilt pole angle is *6°* or more.

  Note: To show the current inclination angle, click on any customizable data field in *Map View*. The Select Value to Display dialog is opened. Select the *Tilt Angle* from the list and click  to display its value during the survey.

- **Calibrate** - to open the Calibrate Level and Compass dialog for **GRX3** receiver. Current calibration status is shown near the button. **GRX5** receiver does not require calibration.

  Calibration is required:

  Dark Gray Bubble and Warning

  The bubble is dark gray and the waring sign is displayed. Calibration of level and / or compass is required. Long tap the bubble and select **Calibrate** to open the Calibrate Level and Compass dialog.

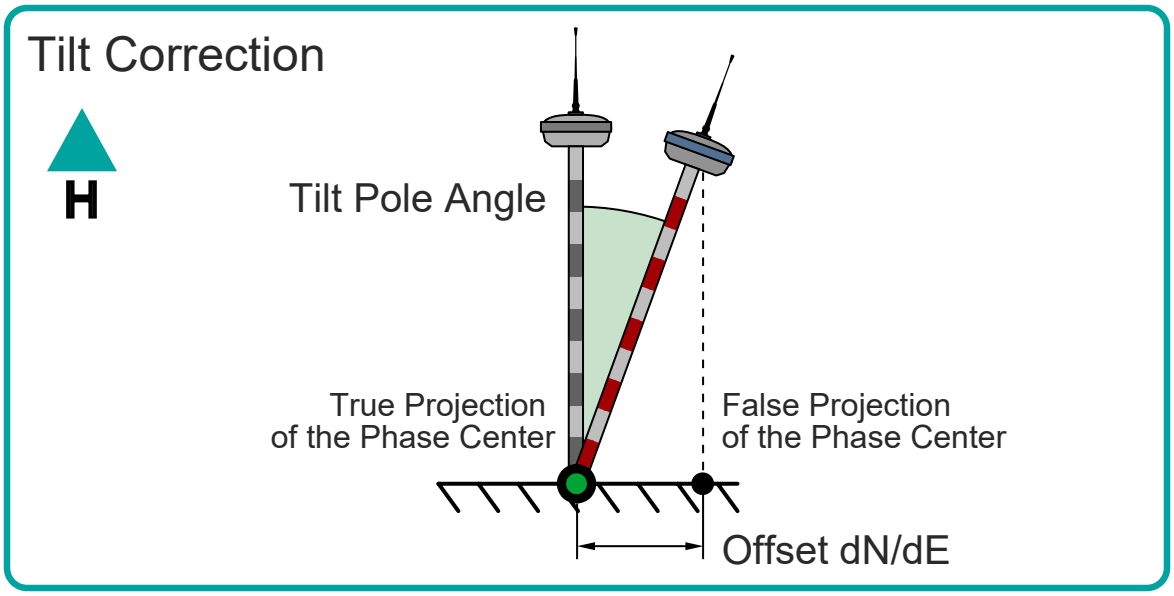
Note: GNSS topo points measured with the **Compensate** mode enabled have the  icon in the **Properties** column (the Points dialog).

Tilt Compensation

Automatic tilt compensation is available for GNSS receivers equipped with HIMU (Hybrid Inertial Measurement Unit). **GRX3** GNSS receiver supports built-in TILT ™ compensation technology, **GRX5** supports built-in Dynamic TILT ™ compensation technology.

Note: In *Fusion Positioning*™ mode, automatic tilt compensation is available for the rod with an attached prism and a GNSS receiver with Dynamic TILT ™ / TILT ™ compensation technology when measuring with a robotic total station. More...

The user can activate tilt compensation in the TILT ™ Settings dialog for Topo and Stake GNSS surveys. The data obtained from the HIMU is used to calculate the offset of the GNSS antenna phase center in the horizontal plane, for each GNSS epoch. These offsets values are used for obtaining the true coordinates of measured ground points. The offset values are calculated if the current tilt angle does not exceed the value in the **Compensate** field.



When the current inclination angle exceeds the value in the **Compensate** field, the epoch counter will be paused and the software forbids saving the point coordinates for these angles. The epoch counter resumes once the current inclination angle returns to the limits set in the **Compensate** field. When the current inclination angle exceeds *30°* for **GRX3** or *60°* for **GRX5** receiver, tilt compensation will be automatically deactivated.

Note: The  icon next to the electronic bubble in *Topo* / *Auto Topo* / *Stake* dialogs (Map View) indicates that a received epoch does not contain enough GNSS data for calculating tilt compensation. This could be a temporary loss or degradation of the GNSS solution.

Additional information on setting up and operating features of tilt compensation:

- Tilt Compensation for **GRX3** GNSS receiver:
  - Magnetic interference indicator;
  - Level and compass calibration.

- Dynamic Tilt Compensation for **GRX5** GNSS receiver:
  - Dynamic TILT ™ operating and alignment on the go.

Calibrate Level and Compass

Tilt compensation technology in **GRX3** GNSS receiver requires the HIMU calibration procedure before starting to use tilt compensation in the field. See also when level and compass recalibration is required.

The procedure consists of the following steps:

1. Calibrate the electronic level of the receiver in the **Level** field. More...
2. Calibrate the magnetic compass of the receiver in 3D in the **Compass** field. More...
3. Calibrate the magnetic compass of the receiver in the horizontal plane in the **Compass Alignment** field. More...

Three calibrations are performed independently and one after another. After all three calibrations are finished, the receiver HIMU is ready to use.

Note: After you performed the calibration, its parameters will be automatically saved into the receiver. It means that the saved calibration will be used even after you turn off the receiver and turn it on again.

Below are general recommendations on carrying out the calibration of the HIMU:

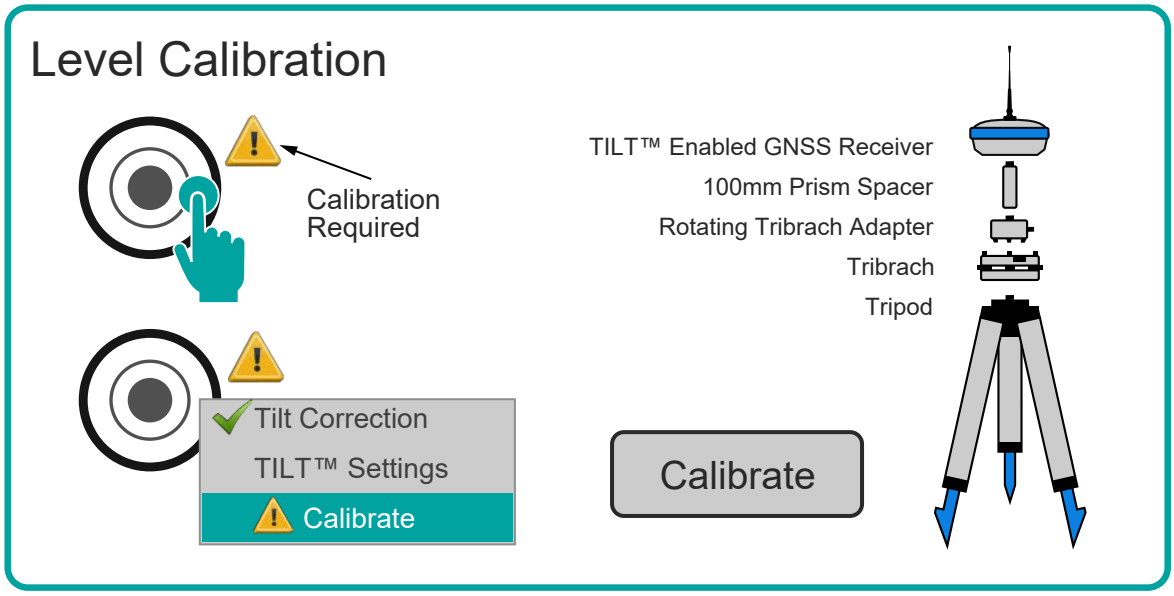
- The calibration is performed in the field after the receiver has tracked the satellites and determined a position.
- The controller is connected to the receiver via Bluetooth or Wi-Fi.
- Before calibration it is necessary to turn on and / or attach all equipment which will be used for the survey. For RTK survey, receive the corrections data using the desired modem and obtain the Fixed solution.

- if you use UHF or FH modem, connect the radio antenna; after that, turn on the radio modem;
- if you will use additional batteries for the survey, attach the removable battery;
- do not use an external power source.

If the calibration data are no longer valid, the icon appears near the electronic bubble in the *Topo* / *Auto Topo* / *Stake* dialogs (when *Map* or *Normal* view is selected). The epoch counter will be paused and the software forbids saving point coordinates. You need to perform the calibration procedures for the electronic level and the magnetic compass in 3D and the horizontal plane.

Calibrate Level

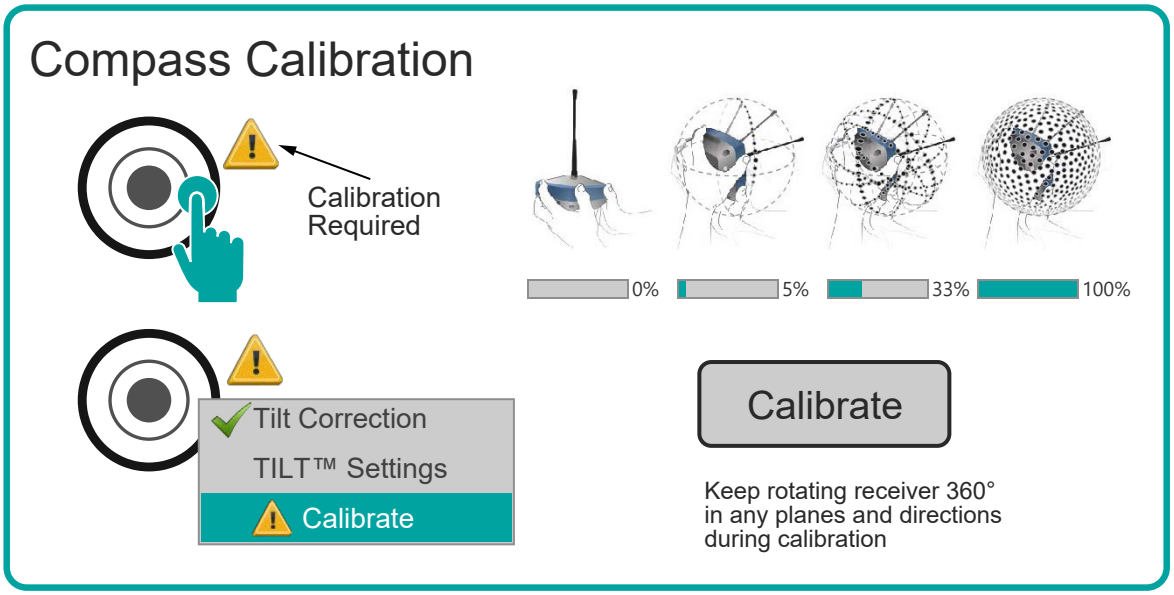
To take an accurate level and compass reading, you need to perform the electronic level calibration procedure. To calibrate the level using Sokkia Field:



1. Set a tripod with a universal tribrach and tribrach adapter. Level the tribrach. Set the receiver on a trigger adapter with 100 mm aluminum prism spacer. Eliminate any vibrations during the calibration. The receiver will track the satellites and determine a position.
2. Click the **Calibrate** button in the *Level* field.
3. Wait (up to 30 seconds) until Sokkia Field displays one of the following messages:
   - *Calibration has completed* - the calibration parameters are saved and the receiver is ready to use;
   - *Calibration has failed* - you need to perform the procedure again.

Calibrate Compass

To take an accurate compass reading, you need to perform the compass calibration procedure for each location before starting the survey. Make sure to calibrate the level before calibrating the compass. To calibrate the compass using Sokkia Field:



1. Hold the receiver flat with the GNSS antenna pointed up.
2. Click the **Calibrate** button in the *Compass* field.
3. Rotate the receiver 360° in any planes and directions so that the position of the receiver antenna's phase center during rotation would fill the entire sphere around the receiver. Progress bar in Sokkia Field will reflect the process of filling the sphere in percent.
4. The calibration process will be completed as soon as the whole sphere is filled. This can be indicated by the following message displayed:
   - *Calibration has completed* - the calibration parameters are saved and the receiver is ready to use.

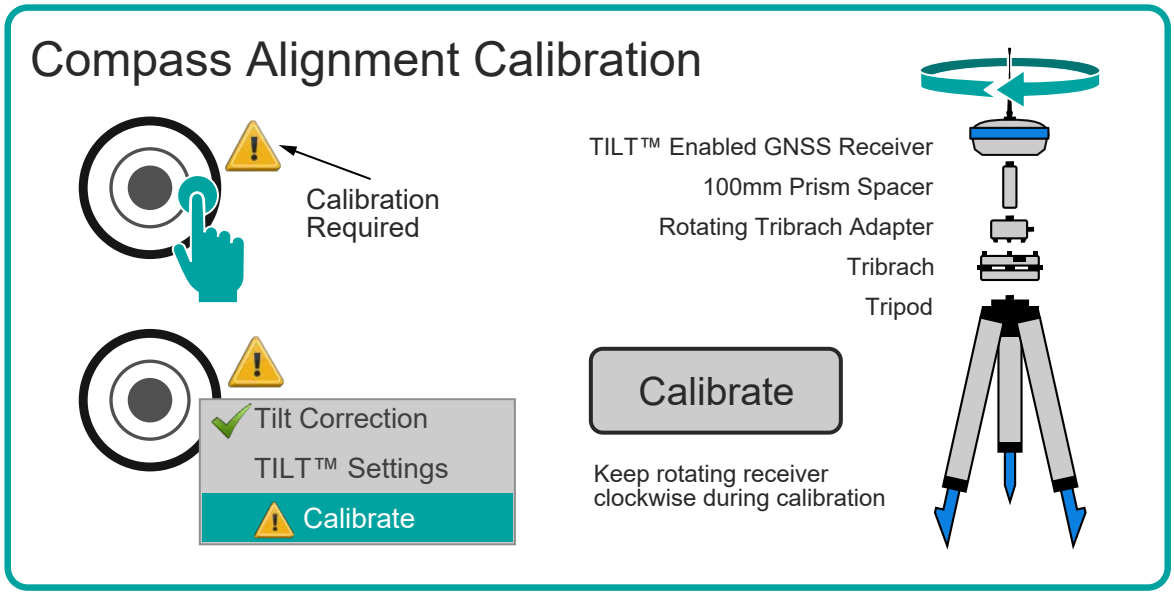
   If you stop rotating the receiver during the calibration procedure, the calibration will finish with error after 2 minutes of leaving the receiver still (without movement) and the following message will be displayed:

   - *Calibration has failed* - you need to perform the procedure again.

Calibrate Compass Alignment

To take accurate compass reading, you need to perform the compass calibration procedure in the horizontal plane for each location before starting the survey. First, perform the calibration of the

level and calibration of the compass, then calibrate compass alignment. To calibrate the compass alignment using Sokkia Field:



1. Set a tripod with a universal tribrach and tribrach adapter. Level the tribrach. Set the receiver on a trigger adapter with 100 mm aluminum prism spacer. Maximum accuracy of calibration is possible when the receiver is orthogonal to the horizontal plane. Eliminate any vibrations during the calibration.
2. Click the **Calibrate** button in the *Compass Alignment* field.
3. Turn the receiver clockwise in the horizontal plane. The indicator will show how many turns are left until the calibration process is finished. If you have not made any turns for 2 minutes, calibration routine automatically stops.
4. When you turn the receiver necessary number of times, Sokkia Field will display one of the following messages:
   - *Calibration has completed* - the calibration parameters are saved and the receiver is ready to use;
   - *Calibration has failed* - you need to perform the procedure again.

When Level and Compass Recalibration is Required

You will need to recalibrate the electronic level and compass of TILT ™ enabled GNSS receiver:

- If the receiver has been off for a long time.
- If the receiver is used for the first time.
- If the survey location changes frequently.
- If the receiver took a shock such as being dropped.
- If the temperature changes on 10 degrees or more.

- If the receiver was transported by a car or airplane.
- If the receiver was near a strong magnetic object or material, such as a permanent magnet, electromagnet, electric transformer, AC power supply, etc.
- After loading new firmware.
- After clearing the NVRAM.

Magnetic Interference Indicator

TILT ™ compensation technology in **GRX3** GNSS receiver allows the user to obtain correct pole tip position regardless of pole tilt within supported angle. TILT ™ compensation technology uses magnetometer data and changing of the external magnetic field can influence magnetic compass accuracy.

Sokkia Field displays the warning indicator of external magnetic field status in the *Topo* / *Auto Topo* / *Stake* surveys and can display the external magnetic field value in a customizable data field shown in *Map View*:

- If the value of the external magnetic field is in the range from abnormal value to a unacceptable value, the  icon appears and starts blinking. The epoch counter will be paused and the software forbids saving point coordinates in these conditions. **Wait** will be displayed.
- If the value of the external magnetic field is more than the critical value, the  icon is displayed continuously. The epoch counter will be paused and the software forbids saving point coordinates in these conditions. **Wait** will be displayed
- To show the text information about magnetic field, click on any customizable data field in *Map View*. The Select Value to Display dialog is opened. Select the *Magnetic Field* from the list and click  to display its value during the survey.

If you need to perform a survey in magnetic interference, we recommend you to deactivate tilt **Compensate** and activate tilt **Filter** feature.

Dynamic TILT ™ operating and alignment on the go

Dynamic TILT ™ compensation technology (DTILT) in **GRX5** GNSS receiver is immediately ready for operation and allows the user to obtain correct pole tip position regardless of pole tilt within supported angle. To enable Dynamic TILT ™ compensation, select **Compensate** mode in the TILT ™ Settings dialog.

Note: If **Compensate** mode is not enabled in the TILT ™ Settings dialog, Dynamic TILT ™ operates like a standard electronic level and does not affect measured coordinates and saved points. You can use **Filter** mode to simply prevent a point from being saved if the pole angle exceeds the allowed tilt.

Sokkia Field displays an indicator of Dynamic TILT ™ compensation status in the *Topo* / *Auto Topo* / *Stake* surveys and can display the Dynamic TILT ™ compensation status in a customizable data field shown in *Map View*. To show the text information, click on any customizable data field in *Map View*. The Select Value to Display or Select Stakeout Value dialog is opened. Select the *Dynamic Tilt State* from the list and click  to display it during survey or stakeout.

While working with **Compensate** mode enabled, keep an eye on the indicators near the electronic bubble level and take the corresponding actions as necessary:

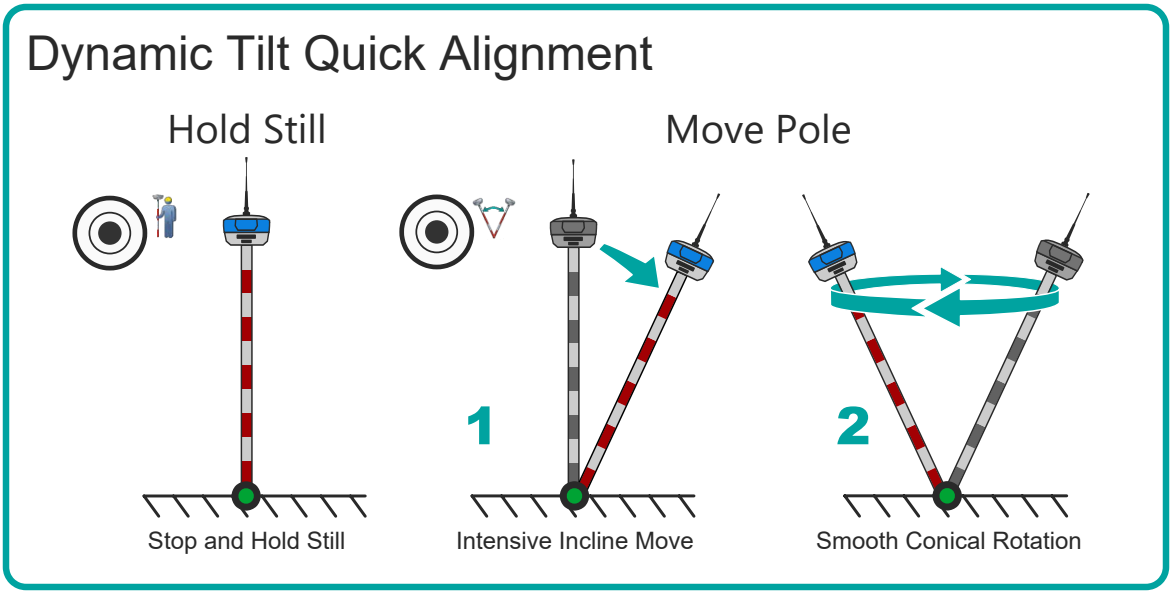
	**Hold Still** Dynamic TILT ™ waits for a stable GNSS solution and a momentary stationary state of the receiver to start quick alignment. It is necessary to *hold the pole steady and approximately vertical* (precise vertical orientation is not required). If a GNSS solution is obtained and steady position is detected, the Hold Still indicator is changed to the Move Pole indicator and Dynamic TILT ™ enters the quick alignment state.
	**Move Pole** Perform *one intensive pole incline move* in any direction, then proceed with a *smooth conical rotation of the pole around the tip* until Dynamic TILT ™ enters the Ready state.
none	**Ready** Hold Still or Move Pole indicators go out and no other Dynamic TILT ™ indicators appear, you can measure and store points using Dynamic TILT ™ compensation if **Compensate** mode is enabled in the TILT ™ Settings dialog.

Error

An error occurred and Dynamic TILT ™ is reinitializing. If this indicator does not disappear within a few seconds, click ☰ to open the dialog menu and select *Setup* - *Reset TILT* ™ to force manual reinitialization of Dynamic TILT ™ compensation.

Note: The **Compensate** mode of Dynamic TILT ™ in **GRX5** receiver is currently not fully compatible with the SureTopo ™ method of GNSS outliers filtering in RTK. The use of SureTopo ™ can trigger multiple Dynamic TILT ™ realignments. You can configure and enable the **Filter** mode in the TILT ™ Settings dialog for pole tilt handling when SureTopo ™ is enabled.

After enabling **Compensate** mode in the TILT ™ Settings dialog and obtaining a stable GNSS solution, perform the quick alignment of the HIMU on the go:



Dynamic TILT ™ may reenter the Hold Still / Move Pole state if the GNSS signal quality significantly degrades or the GNSS solution becomes unavailable for several seconds. When operating conditions are restored and the pole movements in the Move Pole state are redone, Dynamic TILT ™ reenters the Ready state.

In the event of significant pole impacts or falls, Dynamic TILT ™ automatically resets or may require manual reinitialization. After reinitialization, the quick alignment must be redone.

Note: Manual reinitialization is also recommended at the beginning of a new survey or stakeout session after a significant pause or when environmental conditions change abruptly.

Other statuses of Dynamic TILT ™ compensation that can appear in a customizable data field in *Map View*:

- **Initialization** - the initialization of Dynamic TILT ™ algorithms before operation;
- **Ready (Reckoning)** - Dynamic TILT ™ detects the loss of the GNSS solution in use and is reckoning the coordinates for a period of time, waiting for the solution to be restored;
- **eLevel only** - Dynamic TILT ™ operates in electronic level mode, the **Compensate** mode is not enabled in the TILT ™ Settings dialog, the **Show eLevel** check box is selected in the TILT ™ Settings dialog;
- **Disabled** - Dynamic TILT ™ features are completely disabled, the **Compensate** mode is not enabled in the TILT ™ Settings dialog, the **Show eLevel** check box is not selected in the TILT ™ Settings dialog.

Advanced Epoch Filtering

To configure filtering options of GNSS measurements (epochs) based on specified thresholds for RMS and PDOP values.

Filtering for **Precise** and **Quick** measurement modes is configured separately.

- Check the **RMS** box to enable filtering by RMS value and enter the desired threshold values for **Horizontal** and **Vertical** RMS.
- Check the **PDOP** box to enable filtering by PDOP value and select the desired threshold value from the drop-down list.

Epochs with values exceeding the specified threshold will not be used in averaging of measurements if the respective filtering is enabled.

SureTopo ™ Settings

SureTopo ™ is the Topcon proprietary patent-pending method to detect and filter out randomly appearing anomalous RTK coordinates resulting in storing of a point with shifted coordinates. Such anomalies occur more often in challenging environment conditions. When enabled, this method works automatically in RTK / Network RTK survey, requires minimum to none user involvement, works under hard conditions with default or even relaxed RTK survey settings and prevents spending long time in waiting for initialization of RTK engine with stricter settings.

SureTopo ™ detects and filters out anomalous RTK coordinates right in survey and Sokkia Field stores a point with accurate coordinates with nearly zero chance to accept anomaly with shifted coordinates. No post-processing and no manual point filtering required. SureTopo ™ uses automatically recorded series of RTK coordinates for a point, automatically resets both GNSS tracking and RTK engine between records and processes these coordinates with the proprietary filtering algorithm before Sokkia Field stores a point to the current project.

Note: Keep the GNSS antenna in a fixed position when surveying a point. Alternatively, use a GNSS receiver with TILT ™ (Topcon Inertial Leveling Technology) feature.

Note: SureTopo ™ is currently not fully compatible with the **Compensate** mode of Dynamic TILT ™ in **GRX5** receiver and can trigger multiple Dynamic TILT ™ realignments. You can configure and enable the **Filter** mode of Dynamic TILT ™ in the TILT ™ Settings dialog for pole tilt handling when SureTopo ™ is enabled.

To enable or disable SureTopo ™ for anomalous RTK coordinates filtering:

- Choose the measurement mode(s) where SureTopo ™ should be enabled or disabled.
  - Check the **Precise** box ☑ to enable SureTopo ™ for point storing in Precise mode. Clear the box ☐ to disable SureTopo ™ for point storing in Precise mode.
  - Check the **Quick** box ☑ to enable SureTopo ™ for point storing in Quick mode. Clear the box ☐ to disable SureTopo ™ for point storing in Quick mode.
- Specify SureTopo ™ parameters to be used in **Precise** and / or **Quick** point storing mode(s) separately. The received RTK coordinates will be compared in pairs and will form groups of coincided coordinates according to these parameters. SureTopo ™ will analyze these groups to detect if there are anomalies in received RTK coordinates.

  Note: SureTopo ™ parameters for *topo survey* and *stakeout* are enabled, configured, and saved separately.

  - **Horizontal Tolerance** - enter the tolerated horizontal coordinate dispersion to consider two coordinate sets coincided. The default value *0.1 m* works in most of the surveys when RTK fixed solution is obtained.
  - **Vertical Tolerance** - enter the tolerated vertical coordinate dispersion to consider two coordinate sets coincided. The default value *0.2 m* works in most of the surveys when RTK fixed solution is obtained.
  - **Number of matches** - enter the number of coincided coordinates required to form a group of coincided coordinates for SureTopo ™ analysis:
    - Enter *2* to greatly reduce a chance of storing a point with shifted coordinates. Applying this value takes less time to store a point.
    - Enter *3* to virtually remove a chance of storing a point with shifted coordinates. This value sacrifices time required to store a point for result reliability.
    - Entering a value higher than *3* may further improve filtering reliability.

> **Note:** Formation of groups with coincided RTK coordinates by SureTopo ™ displays in real time along with epoch counter when storing a point.

- Check the **Show residuals after measurements** box to calculate and display the Weighted Average data when storing a point surveyed using the SureTopo ™ method.
- Click  to apply the selected SureTopo ™ settings and return to the Topo Survey dialog. Click  to return to the previous dialog without changes to the settings.
- SureTopo ™ Settings can be changed during survey. From the Topo, X-Sect, Find Station dialogs, click  and in the open Topo Survey dialog click  and choose **SureTopo ™ Settings**. In this case, the SureTopo ™ settings can also be quickly reset by using the **Defaults** button:
  - SureTopo ™ is disabled  for both **Precise** and **Quick** measurement modes;
  - **Horizontal Tolerance**: *0.1 m*;
  - **Vertical Tolerance**: *0.2 m*;
  - **Number of matches**: *3*.

RTK Settings

To enable and configure advanced parameters of the RTK engine.

> **Note:** For **GRX5** receiver, the applicable settings in this dialog are **Ambiguity fix level** and **Correction Period**.

- **Ambiguity fix level** - to select the level of confidence for ambiguity resolution; that is, for getting a fixed RTK solution: *Extra-low*, *Low*, *Medium*, *High*, and *<Don't Set>*.

  These levels correspond to different probabilities of correct ambiguity resolution. During a GNSS survey in the RTK mode, when selected confidence level is achieved, the corresponding position will be marked as a fixed RTK solution (although some of the ambiguities - usually a small part of them - may remain float). The higher the confidence level is specified, the lower probability of getting a false fixed solution is, but the longer the integer ambiguity search time is.

  If the *<Don't Set>* value is selected, the level that was previously set in the receiver will be used (i.e., the level set before the controller with current project was connected).

- **Correction Period** - to set the time period (in seconds) at which the RTK base receiver transmits correction messages and the RTK rover uses the received corrections when calculating the RTK solution. The default value used in Sokkia Field RTK configurations is 2 seconds.

- **Dosed correction output** - with the check box selected, the base receiver will automatically adapt the size of broadcast RTCM 3.x messages containing satellite observation data to fit the radio bandwidth. If the total size of correction data for one epoch exceeds the radio bandwidth, the output of satellite observation data is partially skipped by one or more epochs. If the output has been skipped, only the most recent observations are broadcast.
- **Accept noisy observables** - with the check box selected, the RTK engine will use less rigid thresholds for computing RTK solution. This parameter allows the user to speed up the ambiguity fixing procedure, but it also decreases the reliability of the ambiguity resolution. This parameter can be used for abnormal survey conditions only:
  - When a rover receiver gets VRS corrections from a network, we recommend to select the mode for a poor VRS network geometry when the receiver is located at the boundary of the VRS coverage area and the nearest physical station is located at a great distance.
  - When a rover receiver gets the correction from another receiver, we recommend to select the mode when the rover receiver is located close to metallic objects, high building and trees.

- **Set IF Baseline** - with the check box selected, the RTK engine will use the ionosphere-free combination when the baseline length is greater than or equal to the entered value.
- **Set PDOP Mask** - with the check box selected, the rover receiver will not compute the RTK position if the computed PDOP exceeds the specified threshold value.
- **Set QZSS L2C bias** - with the check box selected, Sokkia Field sends the specified QZSS L2C bias value to the GNSS receiver to reduce deterioration of positioning accuracy due to the mismatch of L2C signal carriers. The bias is added to the QZSS L2C carrier phase data in RTCM 3.x messages. This function works when QZSS is selected for tracking and the connected GNSS receiver has firmware version 5.2.3 or later.

Solution Types

Review the list of possible solution types.

- *No Solution* - receiver cannot produce a solution (not enough satellites or incorrect antenna model);
- *DION* - positions are extrapolated by the DION engine when a number of tracked satellites is insufficient for positions computation;
- *Autonomous* - autonomous positions are calculated when differential corrections are not available;
- *DGPS* (Code-differential) - positions are calculated using the pseudo-range measurements from base and rover receivers;
- *Float* (RTK) - positions are calculated by RTK engine using the carrier phase measurements from base and rover receivers. Integer ambiguities, however, are not fixed (their float estimates are used instead);
- *Spectrum Float* (RTK) - the same as *Float* but positioning accuracy is degraded;

- *Fixed* (RTK) - positions are calculated by RTK engine using the carrier phase measurements from Base and Rover receivers. Integer ambiguities are fixed;
- *Spectrum Fixed* (RTK) - the same as *Fixed* but positioning accuracy is degraded;
- *CPPP* (Convergence Point Precise Positioning) - a convergence stage of calculation of autonomous coordinates of a single receiver, when using dual frequency code and carrier phase measurements and also the data on precise orbits and clocks of navigation satellites;
- *PPPL* (Point Precise Positioning Low) - positions are calculated using dual frequency code and carrier phase measurements of a single GNSS receiver and also the data on precise orbits and clocks of navigation satellites but positioning accuracy is degraded;
- *PPPN* (Point Precise Positioning Normal) - positions are calculated using dual frequency code and carrier phase measurements of a single GNSS receiver and also the data on precise orbits and clocks of navigation satellites. Integer ambiguities, however, are not fixed (their float estimates are used instead);
- *PPPF* (Point Precise Positioning Full) - positions are calculated using dual frequency code and carrier phase measurements of a single GNSS receiver and also the data on precise orbits and clocks of navigation satellites. Integer ambiguities are fixed.

> **Note:** The *CPPP*, *PPPL*, *PPPN* and *PPPF* solution types are available for **GNR5**, **GRX3**, **GCX3** receivers with valid Starpoint ™ (Starpoint2 / Starpoint Pro) subscription, if either Skybridge ™ or Starpoint ™ functionality is activated in the Rover Receiver dialog. More information about Precise Point Positioning (PPP) in Sokkia Field.

Precise Point Positioning (PPP)

To prepare, configure, and start a GNSS survey with PPP enabled.

Precise Point Positioning (PPP) is a centimeter level positioning engine that combines dual frequency code and carrier phase measurements by GNSS receiver and data on precise orbits and clocks of navigation satellites. PPP corrections data is broadcast to customer receivers in following ways:

- Lband - direct broadcasting from a satellite;
- NTRIP - Topnet Live broadcasting over the Internet via NTRIP protocol, typical connection using cellular modem and SIM card data link;
- Beidou B2b - direct broadcasting from Beidou geosynchronous orbit (GEO) satellites;
- Galileo HAS - direct broadcasting from Galileo satellites via E6-B signal.

Sokkia Field supports PPP engine in specific GNSS survey configurations:

- Automomous / SBAS / PPP survey configuration (Starpoint ™ enabled, PPP solution available);
- Network RTK / Skybridge ™ survey configuration (Skybridge ™ enabled, RTK and PPP solutions

available);
- RTK / Skybridge ™ survey configuration (Skybridge ™ enabled, RTK and PPP solutions available).

Prerequisites for enabling PPP in GNSS receiver and Sokkia Field

- GNSS receiver with PPP support: **GNR5**, **GRX3**, **GCX3** with firmware version 5.4 or later. Open the Receiver Info dialog to view connected receiver's details (to open, click  >  >  > ).

  > **Note: GCX3** receiver only supports PPP from the Internet via NTRIP protocol using the field controller's Internet connection.

- Valid Option Authorization File (OAF) loaded into GNSS receiver (click  >  >  >  to view OAF file loaded into the connected GNSS receiver).
  - *VPPP (Topnet Global)* option for PPP corrections data broadcast via Lband satellite down link,
  - *VPPP (Topnet Global)*, *SPPP (Topnet Live Source)* and *CRYP (Corrections Encryption)* options for PPP corrections data broadcast over the Internet via NTRIP.

- Valid Starpoint ™ subscription: *Starpoint2* (GPS / GLONASS satellites data), *Starpoint Pro* (GPS / GLONASS / Galileo / BeiDou satellites data).
- Stable Internet connection with access to Topnet Live via NTRIP protocol during survey for PPP corrections data broadcast over the Internet.

How to enable PPP in Sokkia Field

Create a GNSS survey configuration and pay attention to the PPP related dialogs and settings listed below:

In Automomous / SBAS / PPP survey configuration:

- In the Rover Receiver dialog, check the **Enable Starpoint ™** box.
- Depending on OAF, subscription, and available communications, select how PPP data should be received: **Starpoint ™ Lband** or **Starpoint ™ Network**:
  - **Starpoint ™ Lband** - PPP corrections data received via Lband satellite down link.
    - If required, click  to open the Starpoint ™ Lband dialog and select a specific Lband satellite manually.

- **Starpoint ™ Network** - PPP corrections data received from the Internet via NTRIP protocol. Additional dialogs open later to setup this connection:
  - In the Rover Radio dialog, choose a cellular modem for connection to the Internet.
  - In the Internet Address dialog, configure the Topnet Live connection using IP address and port, login and password from your Starpoint ™ subscription email.
  - In the Modem Dialup dialog (opens, if **Receiver** modem is selected to connect to the Internet in the Rover Radio dialog), set up dial-up connection to the Internet provider.

- **Beidou B2b** - PPP corrections from Beidou geosynchronous orbit (GEO) satellites.
- **Galileo HAS** (available for **GNR5** receiver with firmware 5.6 or later) - PPP corrections from Galileo High Accuracy Service (HAS) received via E6-B signal.

- In the **Solution** fields of Topo Survey / Auto Topo Survey / Stake Settings dialogs, select *PPPF and PPPN* as desired solution type. More about solution types.
- In the Tracking dialog, ensure the constellations covered in Starpoint ™ subscription are selected.

In Network RTK / Skybridge ™ survey configuration:

- In the Network RTK/Skybridge: Configuration dialog, that starts the survey configuration, select *NTRIP 1.0/2.0* or *NTRIP 1.0* protocol to be able to receive PPP corrections from the Internet. This is not required to receive PPP corrections via Lband satellite down link.
- In the Rover Receiver dialog, check the **Enable Skybridge ™** box.
- Depending on OAF, subscription, and available communications, select how PPP corrections data should be received: **Starpoint ™ Lband** or **Starpoint ™ Network**:
  - **Starpoint ™ Lband** - PPP corrections data received via Lband satellite down link.
    - If required, click  to open the Starpoint ™ Lband dialog and select a specific Lband satellite manually.

  - **Starpoint ™ Network** - PPP corrections data received from the Internet via NTRIP protocol.
    - In the Rover Radio dialog, choose a cellular modem for connection to the Internet.
    - In the Internet Address dialog, configure the Topnet Live connection using IP address and port, login and password from your Starpoint ™ subscription email.
    - In the Modem Dialup dialog, (opens, if **Receiver** modem is selected to connect to the Internet in the Rover Radio dialog), set up dial-up connection to the Internet provider.

- In the Position in GGA dialog, check the **Automatic Rover Pos** box.
- In the **Solution** fields of Topo Survey / Auto Topo Survey / Stake Settings dialogs, select *Fixed, PPPF, PPPN* as desired solution type. More about solution types.
- In the Tracking dialog, ensure the constellations covered in Starpoint ™ subscription are selected.

In RTK / Skybridge ™ survey configuration:

- In the Rover Receiver dialog, check the **Enable Skybridge ™** box.
- Depending on OAF, subscription, and available communications, select how PPP corrections data should be received: **Starpoint ™ Lband** or **Starpoint ™ Network**:
  - **Starpoint ™ Lband** - PPP corrections data received via Lband satellite down link.
    - If required, click ... to open the Starpoint ™ Lband dialog and select a specific Lband satellite manually.
  - **Starpoint ™ Network** - PPP corrections data received from the Internet via NTRIP protocol.
    - In the PPP Network Radio dialog, choose a cellular modem for connection to the Internet.
    - In the Internet Address for PPP dialog, configure the Topnet Live connection using IP address and port, login and password from your Starpoint ™ subscription email.
    - In the Rover Modem Dialup for PPP dialog, (opens, if **Receiver** modem is selected to connect to the Internet in the PPP Network Radio dialog), set up dial-up connection to the Internet provider.
- In the **Solution** fields of Topo Survey / Auto Topo Survey / Stake Settings dialogs, select *Fixed, PPPF, PPPN* as desired solution type. More about solution types.
- In the Tracking dialog, ensure the constellations covered in Starpoint ™ subscription are selected.

Starting and managing survey with PPP enabled

Connect Sokkia Field to the rover receiver using a survey configuration with enabled PPP.

Note: If "*Connected receiver does not support Starpoint ™*" warning is displayed after Sokkia Field established connection to the GNSS receiver, ensure:
• the actual connected GNSS receiver matches to the model configured in Sokkia Field;
• the Option Authorization File (OAF) is valid.

To control the current PPP status:

- Check your Starpoint ™ subscription in the System tab of the Status dialog (to open, click  >  > ):

- *Starpoint ™ Subscription* - the field can display the following values:
  - *N/A* - the subscription is absent or the date of the subscription is expired;
  - *Not Ready* - the current subscription is not ready. The subscription expiration date also displays.
  - *Ready* - the current subscription properly works. The subscription expiration date also displays.

- If you are using **Starpoint ™ Network** to receive PPP corrections data via NTRIP broadcast over the Internet, check your current connection status in the Network tab of the Connection dialog (to open, click >):
  - Internet Connection;
  - Mount Points Request;
  - NTRIP Caster Connection.

- If you are using **Starpoint ™ Lband** to receive PPP corrections data via Lband satellite down link, check the current Lband status in the System tab of the Status dialog (to open, click > >):
  - *Lband Link* - quality of the Lband link;
  - *Lband Satellite* - name of the current satellite;
  - *Lband Signal Quality* - received power level, in dB;
  - *Lband SNR* - current signal to noise ration, in dBHz.

  Note: If required, you can change connected Lband satellite manually from the Rover Receiver dialog in survey configuration wizard by clicking ... next to the drop-down list with enabled **Starpoint ™ Lband**.

- If you are using **Beidou B2b** to receive PPP corrections data from Beidou geosynchronous orbit (GEO) satellites, check the current Beidou B2b link status in the System tab of the Status dialog (to open, click > >):
  - *Beidou B2b Link* - quality of the Beidou B2b link.

- If you are using **Galileo HAS** to receive PPP corrections data via E6-B signal from Galileo satellites, check the current Galileo HAS link status in the System tab of the Status dialog (to open, click > >):
  - *Galileo HAS Link* - quality of the Galileo HAS link.

- If you are using RTK/Skybridge or Network RTK / Skybridge ™ survey configuration, check the current Skybridge ™ status in the System tab of the Status dialog (to open, click  >  > ):
  - *Skybridge ™ Status* - the field can display the following values:
    - *Unknown* - unknown status;
    - *Rover Not Ready* - the rover receiver is not ready to work in the Skybridge ™ mode: please check the receiver options, Starpoint ™ subscription and satellite tracking;
    - *No PPP or RTK corrections* - the rover receiver does not obtain PPP correction data from network mount point / Lband satellite and / or RTK correction data from network mount point / RTK base station; the rover is not ready to work in the Skybridge ™ mode;
    - *Base Estimation* - the rover receiver performs estimation of Network or RTK base station precise position in ITRF 2020 coordinate system; percentage complete is displayed, the rover is not ready to work in the Skybridge ™ mode until base estimation is completed;
    - *Ready* - the rover receiver is ready to work in the Skybridge ™ mode;
    - *Ready. Transmitted coords* - the rover receiver is ready to work in the Skybridge ™ mode. The PPP engine uses the precise coordinates of current RTK base station, which are transmitted in RTK corrections by Topnet Live correction service.

- Monitor the current PPP solution right in status panel of Topo, Auto Topo, and Stake dialogs during survey:
  -  - PPP engine supplies the current solution, the receiver obtains PPP corrections data from Lband satellite. (Available for GNSS survey configurations with activated Skybridge ™ or Starpoint ™ in the Rover Receiver dialog). More about solution types.
    -  - current solution is Convergence PPP stage;
    -  - current solution is PPP Low (this solution can be obtained in rare cases where the GNSS receiver obtains PPP corrections from the source, for example a specific local mount point, that does not support Starpoint2 / Starpoint Pro subscription standards);
    -  - current solution is PPP Normal;
    -  - current solution is PPP Full.

  - If you are using RTK / Skybridge ™ or Network RTK / Skybridge ™ survey configuration, check the current Skybridge ™ status right in status panel of Topo, Auto Topo, and Stake dialogs during survey:
    -  - the Skybridge ™ status is unknown, point saving with current PPP solution is disabled;

-  - the rover receiver is not ready to work in the Skybridge ™ mode, point saving with current PPP solution is disabled;
-  - the rover receiver is ready to work in the Skybridge ™ mode, point saving with current PPP solution is enabled.

To start Automomous / SBAS survey (**Starpoint ™** enabled):

The GNSS receiver starts to obtain PPP corrections data after Sokkia Field with PPP enabled Automomous / SBAS survey configuration is connected to the receiver and the receiver is connected to the source of PPP corrections: Lband satellite down link or NTRIP broadcast over the Internet.

The initial PPP solution at the start of survey is Convergence PPP (CPPP). More about solution types. This stage may take about 10-30 minutes. After the convergence stage is over, PPP Normal (PPPN) solution is obtained meaning the RMS came down enough. PPP Full (PPPF) solution becomes available if **Starpoint ™ Lband** is used to obtain PPP corrections data and after the RMS comes down further.

Use the PPP Known Pt Init functionality to save time on PPP convergence in upcoming survey work. Prepare the PPP seeding point at the survey site and use it every time to instantly converge PPP.

> **Note:** Obtained PPP solution remains usable for up to 8 minutes after connection to Lband or NTRIP broadcast is lost.

To start RTK / Skybridge ™ or Network RTK / Skybridge ™ survey (**Skybridge ™** enabled):

The main RTK engine and the backup PPP engine work simultaneously in RTK / Network RTK survey. GNSS rover receiver starts to obtain both RTK and PPP corrections data after Sokkia Field is connected to the rover receiver, base to rover connection is established and the rover receiver is connected to the source of PPP corrections: Lband satellite down link or NTRIP connection over the Internet.

The survey starts with obtained RTK solution. More about solution types. The PPP engine works in background and Skybridge ™ initiates *Base Estimation* routine. Check the current Skybridge ™ readiness status by the indicator () in the status panel. Alternatively, open the System tab of the Status dialog (click  >  > ) to view more details. *Base Estimation* stage may take about 20-35 minutes. After *Base Estimation* is done, the Skybridge ™ status

switches to *Ready*, Sokkia Field saves the base station to the current project, and the PPP engine is ready to substitute the RTK solution with PPP solution.

If the rover receiver is obtaining RTK corrections from Topnet Live correction service, the precise coordinates of current RTK base station can be received in RTK correction data. In this case, *Base Estimation* stage is significantly shorter (usually less than a minute) and the Skybridge ™ status switches to *Ready. Transmitted coords* indicating that PPP engine is ready to substitute the RTK solution with PPP solution.

Note: Usually, Skybridge ™ performs *Base Estimation* routine only once for the same base in survey. You may exit Sokkia Field, create new projects from a project where *Base Estimation* has been performed, turn off the rover receiver, even make pause for a night. Skybridge ™ will be ready to virtually instantly supply the PPP solution upon reconnection. To use already acquired Base Estimation data in the newly created project, open the Project tab of the Global Settings dialog (click  >  > ) and specify that the *Base Estimation* should be imported into a new project.

When the rover receiver is obtaining RTK corrections data from the base, only the RTK engine supplies the current solution. If the rover receiver stops obtaining corrections from the base and RTK solution is lost, Skybridge ™ smoothly switches to the current PPP solution.

At this moment, you may see a period of PPP Normal (PPPN) solution allowing user to save measurements to the project's database and continue surveying. PPP Full (PPPF) solution becomes available if **Starpoint ™ Lband** is used to obtain PPP corrections data and after the RMS comes down further. When the reception of RTK corrections data is restored and RTK Fixed solution is obtained, Skybridge ™ smoothly switches from PPP to RTK engine and only the RTK engine continues to supply the current solution.

Note: In situation the Skybridge ™ status is *Base Estimation* (base estimation routine is in progress) and the rover receiver stops obtaining corrections from the Network / RTK base (RTK solution is lost), the PPP engine displays the CPPP stage.

PPP Known Pt Init

To prepare and use a seeding point at the survey site for virtually instant PPP convergence in upcoming survey work.

PPP seeding significantly reduces time spent in PPP convergence stage to obtain PPPN or PPPF solutions when starting a regular GNSS survey on a specific site. A surveyor can obtain a PPP seeding point for the survey site spending time once for obtaining PPPN or PPPF solution after the

standard PPP convergence stage and then use this point any time to start a new PPP survey on this site or to resume a survey if a PPP solution loss occurred. A suitable PPP seeding point should be found and reliably marked on the ground, then accurately surveyed with obtained PPPN or PPPF solution (coordinate averaging is also recommended) and stored as a known point in the current project. Alternatively, the local seeding point with precise coordinates can be imported to the Sokkia Field project from an external source. Such point can be used as the PPP seeding point in subsequent survey sessions or imported in new Sokkia Field projects for virtually instant PPP convergence on this site. Depending on the field site layout and survey tasks, multiple PPP seeding points can be prepared and used for PPP known point initialization.

This dialog provides a quick start of the PPP survey from the obtained PPP seeding point through PPP known point initialization without spending a sensible amount of time in waiting for a standard PPP convergence required to obtain a PPP solution.

Open this dialog when working in *Autonomous/SBAS/PPP* survey configuration with enabled PPP by clicking  in the Topo dialog and selecting the **PPP Known Pt Init** command in the dialog menu.

- Specify the prepared PPP seeding point in the **Point** field. Select a point from the map  or from the list  of points in the project.

  Note: Ensure the prepared PPP seeding point has the precise coordinates in the latest realization of WGS-84 and actual for the current epoch. No PPP solution is obtained when performing the PPP known point initialization on a prepared point with non-accurate coordinates.

- Deploy the GNSS antenna exactly on the prepared seeding point on the ground.

  Note: Keep the GNSS antenna in a fixed position during PPP known point initialization. Alternatively, use a GNSS receiver with the TILT ™ feature.

- Click the **Calibrate** button to let the PPP engine keep and use the prepared seeding point's known coordinates and converge in about 5-6 seconds.
- Wait the PPP known point initialization finishes with obtained PPPN or PPPF solution and proceed with surveying.
- Repeat the PPP known point initialization on the prepared seeding point any time the PPP engine needs to converge.

Starpoint ™ Lband

To select Lband satellite manually or to specify Lband satellite that will be used to receive PPP corrections.

- With the default parameter *Auto*, Sokkia Field automatically chooses the required geostationary Lband satellite to receive PPP corrections.
- Select a geostationary satellite to receive PPP corrections from the **Satellite** drop-down list. Choose from *AORE*, *AORW*, *IOR*, *POR*, *25E*, *143.5E*, *98W*.
- Select *User Defined* from the **Satellite** drop-down list to enter satellite parameters manually, if required. Enter *Frequency*, choose *Symbol Rate*, enter *Service ID* and *Scrambler Vector*.

Click  to apply entered settings and return to the previous dialog. Click  to discard any changes made and return to the previous dialog.

Peripherals for the Base Receiver

Select the **Multiple Ports** check box, and then select the number of ports to use for base output if required.

Additional dialogs will appear later in the wizard sequence to setup parameters for each port.

Peripherals for the Rover Receiver

In this dialog you can select how to work with peripherals of the rover receiver:

- Select the **Controller NMEA** check box to have NMEA messages (*GGA* and *GMP*; read more here) outputted to an external device via selected port of the field controller / PC. To configure the output, do the following:
  - Click the **CS** button next to the **Controller NMEA** check box. In the dialog that will open, select a UTM projection and configure other related parameters. Finish configuration by clicking  in the dialog.

    Note: If *None* is selected in the **Projection** field, the GMP message will not be outputted.

  - Click the  button next to the **Controller NMEA** check box. In the dialog that will open, set up necessary parameters. More...

- Select the **NMEA Ports** check box to configure the output of the NMEA messages. Select the number of ports from the drop-down list that appears and click . The appeared wizard will allow you to setup parameters for each port and specify NMEA messages for output. More...
- Select the **Multiple Ports** check box and then select the number of available ports in the rover receiver that will receive corrections. Additional dialogs will appear later in the wizard sequence to setup parameters for each port. This functionality is available for RTK and RT DGPS configurations.
- Select the **Depth Finder** check box to configure a depth sounder or cable locator. Click **Parameters** to specify settings. More...
- Select the **External Laser** check box to configure the laser device that can be connected either directly to the Controller or through the Receiver. Click **Parameters** to specify settings. More...
- Select the **Use Repeater** check box to configure the repeater that can be connected either directly to the Controller or through the Receiver. Click **Parameters** to specify settings. This functionality is available for *RTK/Skybridge* and *Real Time DGPS* survey configurations. More...

NMEA Output Settings

In GNSS survey: to configure your controller to output NMEA messages (*GGA* and *GMP*) to an external recipient via selected port.

- *GGA* to output data on time, position, and positioning;
- *GMP* to output GNSS map projection fix data.

In optical survey: to configure your controller to output *pseudo GGA* messages to an external recipient via selected port.

This dialog allows you to configure the controller port and settings that Sokkia Field will use to output these messages.

- **Interval** in which the application will output the messages (up to 0.1 sec).
- **Port** to which NMEA data will be outputted.

- **Baud** rate.
- Data frame parameters: **Parity**, **Stop** and **Data** bits.

In optical survey, check the **Include Date** box to add current date and time to outgoing pseudo GGA stream in the following format: *$GPGGA,YYMMDDHHMMSS*. Clear the box to output pseudo GGA messages as is - the date is not provided.

Finish configuration of communication parameters by clicking .

Configure NMEA Output

To configure the *NMEA Messages* for output:

1. Select the check boxes near the types of messages as required. More...
2. Select the **Set GP as Receiver Talker ID** check box to instruct the receiver to use "GP" as Talker ID in appropriate NMEA sentences generated. This enables support of Google Maps that cannot recognize default "GN" or "GL" as Talker IDs in these messages.
3. Enter the **Interval** in seconds in which the application will output the messages (up to 0.1 sec.).

List of NMEA messages

The following *NMEA Messages* are available for output:

- *GSA* to output the operation mode of the GNSS receiver, the satellite used for positioning, and DOP.
- *GLL* to output data on the current latitude/longitude and positioning mode.
- *VTG* to output the traveling direction and velocity.
- *GRS* to output the residual error of distance for each satellite. This is used to support RAIM.
- *ZDA* to output the UTC, day, month, year, and local time zone.
- *GST* to output the statistics of position errors.
- *GNS* to output data on time, position, and positioning of GPS+GLONASS (GNSS).
- *GGA* to output data on time, position, and positioning.
- *GSV* to output the number of satellites, satellite number, elevation angle, azimuthal angle, and SNR.
- *HDT* to output the direction (heading).
- *P_ATT* to output attitude parameters.
- *RMC* to output time, date, position, course and speed data provided by a GNSS navigation receiver.
- *ROT* to output rate of turn.
- *GMP* to output GNSS map projection fix data.

Depth Finder

Note: If needed, select **Simulation Mode** to test and demonstrate depth sounder functionality. No real data will be measured with the depth finder when using simulation mode. A simulated depth value can be entered manually in the Simulation Setup dialog for GNSS survey or Optical survey.

Configure device parameters:

- In the **Device Type** drop-down list, select the desired device: *Cable Locator* or *Depth Sounder*.
- Configure parameters that are specific to the selected device type.

Click the item below to expand the details:

Cable Locator

1. Select the **Model** of the cable locator.
2. Specify **Connection setting** - *Bluetooth* or *COM*. In case of a COM connection, specify necessary port, parity, data, baud and stop rates to connect to the device.

   See also:
   How to configure the SPX RD8000 cable locator

Depth Sounder

- Select the **Model** of the depth sounder.

  Note: When connecting a depth sounder of **Generic NMEA** type, take into account that Sokkia Field supports *DBT* (Depth below transducer) and *DPT* (Depth including offset, versions 2.0 and 3.0) NMEA data messages. The preferred message frequency is *1 Hz* (one per second).

- Set the **Max Depth Age** in seconds. This value shows the maximum age of the last depth measurement which can be used in positioning calculation in conjunction with GNSS or optical measurements.
- Configure **Connection setting**: *Bluetooth* or *COM*. If a COM connection is selected, additionally specify:
  - COM port number,
  - baud rate,
  - frame parameters: **Parity**, **Stop** and **Data** bits.

When the configuration is used, the depth sounder icon is displayed in the status bar of any measurement dialog.



- Gray ship - a depth finder is not connected to the controller;
- Color ship with question mark - a depth finder is connected to the controller but it is not transmitting any data;
- Color ship with green curves - a depth finder is connected to the controller and it is transmitting data.

The *Depth* and *Low Freq Depth* parameters are available when a depth finder is connected. The *Low Freq Depth* parameter is applicable, if a dual-frequency depth sounder is selected. Dual frequency units can operate high and low frequency sonar simultaneously and output two independent depth measurements.

You can set up the real-time output of measured depth to a customizable data field in the bottom part of the map view during Topo GNSS or Topo Optical survey.

Note: To have the parameter's value displayed in a customizable data field during Topo survey, click the desired data field and select the desired parameter in the Select Value to Display dialog.

The *Depth* and *Low Freq Depth* parameters are also included in stake reports. The *Depth* (high frequency) parameter is used to compute elevation and cut / fill to the surface of the bottom.

How to configure SPX RD8000 cable locator

To establish a communication between Sokkia Field and external SPX RD8000 cable locator, do the following steps:

1. Select *Cable Locator* in the **Device Type** drop-down list of the Depth Finder dialog (GNSS Config: Rover Receiver / Optical Config: Instrument dialog -> Click the **Peripherals** button -> select the **Depth Finder** check box -> click the **Parameters** button).
2. Select *SPX RD8000* in the **Model** drop-down list of the *Depth Finder* dialog.
3. The connection between Sokkia Field and external SPX RD8000 cable locator can be established via *Bluetooth* only.
4. Click  to save these settings.
5. Click . Click the **Connect** button on the *Connections* dialog.
6. When connection between Sokkia Field and the GNSS receiver / total station is established, Sokkia Field will try to connect to cable locator. The *Select Depth Finder* dialog is shown.
7. Before setting the first connection, you need to configure the SPX RD8000 cable locator:
   - Press  to switch on the device;
   - Press  to open the device menu and use  and  to find the *BT* menu (this menu contains Bluetooth options). The device screen displays the current menu in the bottom left corner.
   - Press  to open the BT menu:

- Select *ON* in the menu using ⇧ and ⇩. Press ƒ to save the selection. The Bluetooth module is switched on.
- Select *PROT* in the menu using ⇧ and ⇩. Press ⩚ to open the *PROT* sub menu.

  Select *ASCII* in the menu using ⇧ and ⇩. Press ƒ to save the selection. The Bluetooth protocol is selected.
- Select *CLASS* in the menu using ⇧ and ⇩. Press ⩚ to open the *CLASS* sub menu.

  Select "*2*" in the menu using ⇧ and ⇩. Press ƒ to save the selection. The Bluetooth class is selected.
- Select *PAIR* in the menu using ⇧ and ⇩. Press ⩚ to open the PAIR sub menu.

  Select *BT-PC* in the menu using ⇧ and ⇩. Press ƒ to start the Bluetooth pairing procedure. Immediately click the **Refresh** button on the *Select Depth Finder* dialog of Sokkia Field.

- Until the Bluetooth symbol is blinking on the device screen, the *Select Depth Finder* dialog displays the Bluetooth name of the SPX RD8000 cable locator. The Bluetooth name of this device is "*RD8K_????*", where "*????*" is ID of cable locator, displayed during device start-up in the bottom left corner of the device screen.
- Select the Bluetooth name of cable locator in the dialog list and click the **Select** button.
- The *Bluetooth Pin* dialog is opened. Check the **BT PIN** and click the **Connect** button.
- The Bluetooth pairing is performed and then SPX RD8000 cable locator is ready to communicate with Sokkia Field. In this case:
  - The Bluetooth symbol is "ON" on the device screen.
  - The Depth Finder icon is displayed in the status panel of the *Topo* dialog. That means that depth finder (in this case SPX RD8000 cable locator) is connected to the controller but it is not transmitting any data;
  - The **Depth** field is not appeared in the *Topo* dialog.

Note: Before establishing the Bluetooth pairing, the **Initial Setup** button (*Bluetooth Pin* dialog) is grey. It means that Sokkia Field does not have information about cable locator communication properties. After establishing the Bluetooth pairing:
• Sokkia Field has all required information about the cable locator. The *Select Depth Finder* dialog always displays the Bluetooth name of the SPX RD8000 cable locator. To start the next connection with the locator, click the **Connect** button.
• The **Initial Setup** button will be enabled.

Note: If you want to establish connection with another SPX RD8000 cable locator, you need to remove all information about connection to the previous SPX RD8000 cable locator and to perform the Bluetooth pairing with a new cable locator. Click the **Initial Setup** button to remove all information about connection to the previous device. After closing the dialog and clicking the **Refresh** button, the *Select Depth Finder* dialog does not display the Bluetooth name of the SPX RD8000 cable locator.

Note: The cable locator can save information about connection to a single device only. If you try to use other controller for connection to the cable locator, the measured data will be not transmitted from the cable locator to Sokkia Field. In this case, after pressing , the error code "BT005" is displayed in the bottom left corner of the device screen. Please perform Bluetooth pairing procedure with Sokkia Field.

Note: If the Bluetooth protocol is not **ASCII**, the measured data will be not transmitted from the cable locator to Sokkia Field. In this case, after pressing , the error code "BT008" is displayed in the bottom left corner of the device screen. Please select **ASCII** protocol and repeat the measurement.

8. To start a measurement, press . After that, the Bluetooth symbol  is blinking on the device screen until the end of single measurement. After finishing the measurement:
   - The Bluetooth symbol  is "ON".
   - The **Depth** field displays the depth data.
   - The Depth Finder icon is displayed  in the status panel of the *Topo* dialog.

Laser Configuration

To configure the external laser:

1. Select the laser **Manufacturer**. Currently Sokkia Field supports MDL, Leica and Laser Technology, Inc.
2. For the Laser Technology you can select the **Model** of the instrument.
3. Select the **Type** of laser measurement system if it uses Encoding or not.
4. If required, enter the inline offset (not the mount height) value for the laser in the **Mount Offset** field.

5. In the **Device** field, select *Receiver* if the external laser is connected with the receiver, or select *Controller* if the external laser is connected with the controller.
6. Specify communication parameters for the receiver **Port** that the laser is connected to: **Baud** rate, **Parity**, the number of **Data** bits, the number of **Stop** bits.

Repeater Configuration

To configure the receiver's internal radio modem or an external radio modem as a repeater to increase the range between the base and other rover receiver(s).

- In the **Model** field, select the modem.
- In the **Connect Type** field, select *Receiver* if a modem is connected with the receiver, or select *Controller* if an external modem is connected with the controller.
- In the **Model** field, select the modem.
- Depending on the selected radio, specify communication parameters for the receiver **Port** that the radio is connected to: the **Baud** rate, and also the **Parity**, the number of **Data** bits and the number of **Stop** bits required for some radios.
- Click **Next** to continue the repeater configuration:
  - For *Digital UHF*, *Digital UHF II*, see Repeater Radio Parameters.
  - For *RE-S1*, see Repeater Radio Parameters.
  - For *Satel*, *SRL-35*, see Repeater Radio Parameters.

Position for GGA

The dialog is displayed when the following parameters are selected for the configuration:

1. Corrections type: *VRS*;
2. Protocol: *NTRIP 2.0/1.0*, *NTRIP 1.0*, *TCP/IP*;
3. The cell modem in the controller is used for communication with a network server.

In this dialog you can enter any fixed coordinates to include them in the NMEA GGA message for the following GNSS survey types:

- Network RTK/Skybridge
- Network DGPS

Output Radio

Depending on NMEA ports number you selected in configuration, the dialog title includes a digit: for example, "Output Radio1", "Output Radio2", etc. This means that in this step you are configuring the respective NMEA output port.

1. Select port type for output: *A*, *Modem A*, *Bluetooth*.
2. Specify communication parameters for the port:

- **Baud** rate.
- Data frame parameters: **Parity**, **Stop** and **Data** bits.

Click **Next** to set up NMEA output for this port.

Login Info

This screen is only shown when you previously (the Configuration step of the wizard) selected to receive corrections from a *Single base* via *TCP/IP*.

In this dialog you can configure the login information for the following GNSS survey types:

- Network RTK/Skybridge
- Network DGPS

RTK/Skybridge: Base and Rover Radio Parameters

To configure radio parameters for base or rover receiver. The dialog content depends on the receiver model and the selected radio.

Click the desired modem type to open an instruction on how to configure modem parameters:

1. Internal Radio:
   - Digital UHF / Digital UHFII
   - R2 Lite UHF
   - FH 915 Plus / R2 Lite FH
   - Satel
   - Alinco
   - Alinco (Digital)
2. Internal Cellular
   - Auto, Digital UHF I/II GSM,FH915 + GSM, General Internal GSM, Satel GSM,
   - Digital UHF CDMA
3. External Radio
   - RE-S1
   - Satel, SRL-35, R4T-BT

- TR-35

4. External Cellular
   - Generic CDMA for rover
   - Generic GSM, MultiTech GSM, Siemens TC35

Click **Next**. The wizard will open the next dialog to create the *RTK/Skybridge* configuration.

Real Time DGPS: Base and Rover Radio Parameters

To configure radio parameters for base or rover receiver. The dialog content depends on the receiver model and the selected radio.

Click the desired modem type to open an instruction on how to configure modem parameters:

1. Internal Radio:
   - Digital UHF / Digital UHFII
   - FH 915 Plus
   - Satel
2. Internal Cellular
   - Auto, Digital UHF I/II GSM,FH915 + GSM, General Internal GSM, Satel GSM,
   - Digital UHF CDMA
   - TCP/IP
3. External Radio
   - RE-S1
   - Satel, SRL-35, R4-BT
   - TR-35
4. External Cellular
   - Generic CDMA for rover
   - Generic GSM, MultiTech GSM, Siemens TC35

Click **Next**. The wizard will open the next dialog to create the *Real Time DGPS* configuration.

Internal and External radio modem parameters

The type of the dialog is dependent upon the selected modem type for the base or radio receiver. Click the desired modem type to open an instruction how to configure modem parameters:

1. Internal Radio:
   - Digital UHF / Digital UHFII
   - FH 915 Plus / R2 Lite FH
   - Satel
   - Alinco

- Alinco (Digital)
- R2 Lite UHF

2. External Radio
   - RE-S1
   - Satel, SRL-35
   - TR-35

Radio Parameters for Digital UHF / Digital UHF II and TRL-35

In this dialog you can configure internal radio modem *Digital UHF* and *Digital UHF II*, external modem TRL-35.

- Select the output **Power** value for the radio modem.
- Select an appropriate operation **Protocol** for data transmitting / receiving:
  - *Simplex* protocol is ArWest's proprietary protocol. This protocol is used for Digital UHF and TRL-35 radio modem.
  - *PDL* protocol can selected for any modem types.
  - *TrimTalk* protocol is Trimble protocol and it can be used for any modem types.
  - *Satel 3AS* protocol is Satel protocol without Free Channel Scan (FCS). The protocol can be used for Digital UHF II only.
  - *Satel 3AS FCS* protocol is Satel protocol with Free Channel Scan (FCS). The protocol can be used for Digital UHF II only.

- Select the type of **Modulation** for the radio modem. The modulation type is defined by the modem type and the selected protocol:
  - you can select between *DBPSK* and *DQPSK* modulation for Digital UHF and TRL-35 radio modems with *Simplex* protocol;
  - you can select *GMSK* modulation for Digital UHF and TRL-35 radio modems with *PDL* and *TrimTalk* protocol;
  - you can select between *GMSK* and *4FSK* for Digital UHF II radio modem with *PDL* protocol;
  - you can select *GMSK* for Digital UHF II and TRL-35 radio modems with *TrimTalk* protocol;
  - you can select *4FSK* for Digital UHF II radio modem with *Satel 3AS* / *Satel 3AS FCS* protocol.

- In the **Spacing** field you can select:
  - *12.5 kHz* to provide more jam-resistant communication with low baud rate (4800 bps for *GMSK* and 9600 bps for *4FSK*)
  - *25 kHz* to provide communication with high baud rate (9600 bps for *GMSK* and 19200 bps for *4FSK*)
  - *Do not set* to keep the previous setting of the Spacing parameter.

    The parameter depends on the chosen protocol, modulation type and link rate.

- In the **Scrambling** field you can select:

- *On* or (1-255) to activate Scrambling option - more robust data communication over high interference areas.
- *Off* to deactivate the Scrambling option.
- *Do not set* to keep the previous setting of the Scrambling option.

Scrambling option depends on the selected protocol and modem type:

- for the *Simplex* protocol you can activate, or deactivate, or stay previous Scrambling setting for Digital UHF and TRL-35 radio modems. To activate the option you need select a seed for pseudorandom sequence generator (the value from 1 to 255).
- for the *PDL* protocol you can activate, or deactivate, or stay previous Scrambling setting for Digital UHF, Digital UHF II and TRL-35 radio modems.
- for the *Trim Talk* protocol this option is:
  - automatically set for Digital UHF II radio modem;
  - saved previous Scrambling setting for Digital UHF and TRL-35 radio modems .

- for the *Satel* protocol this option is automatically switched on for Digital UHF II radio modem.

- In the **FEC** field (Forward Error Correction) you can select:
  - *On* to activate the technique to control errors in data transmission over unreliable or noisy communication channels.
  - *Off* to deactivate the FEC option.
  - *Do not set* to keep the previous setting of the FEC option.

  FEC option depends on the selected protocol and modem type:

  - for the *Simplex* protocol you can activate, or deactivate, or stay previous FEC setting for Digital UHF and TRL-35 radio modems.
  - for the *PDL* protocol you can activate, or deactivate, or stay previous FEC setting for Digital UHF, Digital UHF II radio and TRL-35 modems.
  - for the *Trim Talk* protocol this option is:
    - automatically switched off for Digital UHF II radio modem;
    - saved previous FEC setting for Digital UHF and TRL-35 radio modems.

  - for the *Satel* protocol you can activate, or deactivate, or stay previous FEC setting for Digital UHF II radio modem.

If this dialog was opened by clicking **Config <selected modem>**; command from the pop-up menu of the Status or **Topo** or **Auto Topo** or **Stake <objects >** dialog; it contains:

- **Channel** field displays the channel which was used in the previous session with this modem of the connected receiver. To see all available channels of the modem, click the **Get Channels** button.
- **Get Channels** button. Click it to obtain all available channels of the modem.

- **Start** button. Click it to start transmitting or receiving of the correction data.
- **Stop** button. Click it to stop transmitting or receiving of the correction data.

Click ☰ to open the dialog menu with additional options:

- *Shutdown Radio* - select the option if it is required to restart the radio modem. After the shutdown, the radio can be started by clicking the **Start Radio** button.
- *Factory Reset Modem* - select the reset the radio modem to factory default settings. This may be required if you need to return to settings recommended by the manufacturer, or in case the radio does not operate for some reason.

Parameters for FH 915 Plus, R2 Lite FH, RE-S1 and Satel TR9

In this dialog you can configure *FH 915 Plus*, *R2 Lite FH*, *RE -S1* and *Satel TR9* radio modem. Also you can configure *RE-S1* radio as repeater.

- Select the output **Power** value for the radio modem.
- Select the **Channel** number to set the one from ten channel to transmit data. In the corresponding rover receiver you need to select the given channel number.
- Set the operation **Protocol.** Select *FH915 Plus* protocol when the receiver will be used as repeater.
- Select the **Location** to adjust the frequency range depending on the country.

If this dialog was opened by clicking **Config <selected modem>**; command from the pop-up menu of the Status or **Topo** or **Auto Topo** or **Stake <objects >** dialog; it contains:

- **Channel** field. It displays the channel which was used in the previous session with this modem of the connected receiver. This line contains information about channel frequency, channel spacing and maximum transmitter output power for the channel (for the base modem only). To see all available channels of the modem, click the **Get Channels** button.
- **Get Channels** button. Click it to obtain all available channels of the modem.
- **Start** button. Click it to start transmitting or receiving of the correction data.
- **Stop** button. Click it to stop transmitting or receiving of the correction data.

Click ☰ to open the dialog menu with additional options:

- *Shutdown Radio* - select the option if it is required to restart the radio modem. After the shutdown, the radio can be started by clicking the **Start Radio** button.
- *Factory Reset Modem* - select the reset the radio modem to factory default settings. This may be required if you need to return to settings recommended by the manufacturer, or in case the radio does not operate for some reason.

Radio Parameters for Satel and SRL-35

In this dialog you can configure *Satel* radio modem. Also you can configure *SRL-35* radio as repeater.

Note: To configure the **Satel TR9** modem, see the Parameters for FH 915 Plus, R2 Lite FH, RE-S1 and Satel TR9 dialog. It opens automatically if this modem is selected as the receiver's modem.

- Select the output **Power** value for the base receiver modem (transmitter).

- Select an appropriate operation **Protocol** for data transmitting / receiving:
  - *Satel 3AS* protocol is Satel protocol.
  - *PDL 4FSK* protocol with 4FSK modulation.
  - *PDL GMSK* protocol with GMSK modulation.
  - *TrimTalk (P)* protocol is TrimTalk protocol, which you need to select for working with any rovers receivers (not Trimble) with the TrimTalk protocol.
  - *TrimTalk (T)* protocol is TrimTalk protocol, which you need to select for working with Trimble rovers receivers with the TrimTalk protocol.
  - Depending on specific modem model and configuration, more protocols may be available for selection: *PacCrest FST*, *SOUTH*, *Satel 8FSK*, *Satel 16FSK*, *RTCM SC135*.

- In the **FEC** field (Forward Error Correction) you can select:
  - *On* to activate the technique to control errors in data transmission over unreliable or noisy communication channels.
  - *Off* to deactivate the FEC option.
  - *Do not set* to keep the previous setting of the FEC option.

- If the *Satel 3AS* protocol is selected, you can activate or deactivate the *Free Channel Scan* option in the **FCS** field.

If this dialog was opened by clicking **Config <selected modem>**; command from the pop-up menu of the Status or **Topo** or **Auto Topo** or **Stake <objects >** dialog; it contains:

- **Channel** field displays the channel which was used in the previous session with this modem of the connected receiver. To see all available channels of the modem, click the **Get Channels** button.
- **Get Channels** button. Click it to obtain all available channels of the modem.
- **Start** button. Click it to start transmitting or receiving of the correction data.
- **Stop** button. Click it to stop transmitting or receiving of the correction data.

Click  to open the dialog menu with additional options:

- *Shutdown Radio* - select the option if it is required to restart the radio modem. After the shutdown, the radio can be started by clicking the **Start Radio** button.
- *Factory Reset Modem* - select the reset the radio modem to factory default settings. This may be required if you need to return to settings recommended by the manufacturer, or in case the radio does not operate for some reason.

Parameters for Alinco

In this dialog you can configure *Alinco* radio modem.

- Select the output **Power** value for the base modem (transmitter).
- Select the **Channel** number to set the one from ten channel to transmit data. In the corresponding rover receiver you need to select the given channel number.
- If required, click **Defaults** to return all the modem parameters to the default settings.

Parameters for Alinco (Digital)

In this dialog you can configure Alinco (Digital) radio modem.

- Select the output **Power** value for the base modem (transmitter).
- Select the **Channel** number to set one of the ten channel for data transmitting. You must select the same channel in the corresponding rover receiver.
- In the **Channel Auto** field you can activate or deactivate an option for detecting other signals in the selected channel. If you set *On*, the base modem (transmitter) will check whether there is a signal in the same channel from other transmitter. If the base modem receives any signal in the channel, it will switch to the next channel from the selected channel, and will check for other signals again. If no signals are detected here then the base modem starts transmitting the signal in this channel. The base modem can check no more than four channels. When this option is selected on the base receiver, you need to activate it at the rover side as well. If you set *Off*, the base modem will transmit data in the selected channel only.
- Select a desired value in the **User Code** field. There are two conditions for establishing communication between base modem (transmitter) and rover modem (receiver): both modems use the same channel, and the same User Code is set for both modems. The value in the **User Code** field can be from "0" to "511". To cancel the discernment function, set "0" for the rover modem.
- From the **Buffer Mode** drop-down list, select the buffer memory size and operation mode.
- If required, click **Defaults** to return all the modem parameters to the default settings.

If this dialog was opened by clicking **Config <selected modem>** command from the pop-up menu of the Status or **Topo** or **Auto Topo** or **Stake <objects >** dialog, it contains:

- **Start** button. Click it to start transmitting or receiving of the correction data.
- **Stop** button. Click it to stop transmitting or receiving of the correction data.

Click ☰ to open the dialog menu with additional options:

- *Shutdown Radio* - select the option if it is required to restart the radio modem. After the shut-down, the radio can be started by clicking the **Start Radio** button.
- *Factory Reset Modem* - select the reset the radio modem to factory default settings. This may be required if you need to return to settings recommended by the manufacturer, or in case the radio does not operate for some reason.

Parameters for R2 Lite UHF

In this dialog you can configure internal radio modem R2 Lite UHF.

1. Select the type of **Modulation** for the radio modem.
   - *DQPSK* modulation;
   - *GMSK* modulation;
   - *4FSK* modulation.

2. Select an appropriate operation **Protocol** for data transmitting / receiving. The protocol type is defined by the modem type and the selected modulation:
   - *TPS* protocol is Topcon protocol and it can be used for *DQPSK* modulation only;
   - *PDL* protocol can be used for *GMSK* and *4FSK* modulation;
   - *TrimTalk* protocol is a Trimble protocol used for *GMSK* modulation only;
   - *Satel 3AS* protocol is a Satel protocol without Free Channel Scan (FCS) and it can be used for *4FSK* modulation only;
   - *Satel 3AS FCS* protocol is a Satel protocol with Free Channel Scan (FCS) and it can be used for *4FSK* modulation only.
   - *RTCM SC135* protocol is an RTCM protocol used for *4FSK* modulation only.

3. Select the output **Power** value for the base radio modem.

4. In the **Scrambling** field you can select:
   - *On* or (1-255) to activate Scrambling option - more robust data communication over high interference areas.
   - *Off* to deactivate the Scrambling option.
   - *Do not set* to keep the previous setting of the Scrambling option.

   Scrambling option depends on the selected modulation and protocol:

- for the *GMSK* modulation and *Trim Talk* protocol this option is automatically set.
- for the *4FSK* modulation and *Satel 3AS* / *Satel 3AS FCS* / *RTCM SC135* protocols this option is automatically switched off.

5. In the **FEC** field (Forward Error Correction) you can select:
   - *On* to activate the technique to control errors in data transmission over unreliable or noisy communication channels.
   - *Off* to deactivate the FEC option.
   - *Do not set* to keep the previous setting of the FEC option.

   FEC option depends on the on the selected modulation and protocol:
   - for the *GMSK* modulation and *Trim Talk* protocol this option is automatically switched off.

If this dialog was opened by clicking **Config <selected modem>**; command from the pop-up menu of the Status or **Topo** or **Auto Topo** or **Stake <objects >** dialog; it contains:

- **Channel** field displays the channel which was used in the previous session with this modem of the connected receiver. This line contains information about channel frequency, channel spacing and maximum transmitter output power for the channel (for the base modem only). To see all available channels of the modem, click the **Get Channels** button.
- **Get Channels** button. Click it to obtain all available channels of the modem.
- **Start** button. Click it to start transmitting or receiving of the correction data.
- **Stop** button. Click it to stop transmitting or receiving of the correction data.

Click ☰ to open the dialog menu with additional options:

- *Shutdown Radio* - select the option if it is required to restart the radio modem. After the shutdown, the radio can be started by clicking the **Start Radio** button.
- *Factory Reset Modem* - select the reset the radio modem to factory default settings. This may be required if you need to return to settings recommended by the manufacturer, or in case the radio does not operate for some reason.

Internal and External cellular modem parameters

The type of the dialog is dependent upon the selected modem type for the base or radio receiver. Click the desired modem type to open an instruction how to configure modem parameters:

- GSM modems;
- CDMA modems.

Connection Parameters for internal and external GSM modems

In this dialog you can configure base and rover cellular modems to transmit corrections from base to rover via direct call using Circuit Switched Data (CSD) in GSM cellular network.

For *Base* radio:

1. Enter the **PIN** of the Base modem SIM card.
2. Optionally, you can select the bearer service type for base cellular modem. To do this, select the *Show Bearer Service* option from the dialog menu that displays by clicking ☰ in the top left corner.
3. From the list in the **Bearer Service** field you can select the bearer service type for base cellular modem in the CSD mode. By default, *Do not set* is selected.

For *Rover* radio:

1. Enter the **PIN** of the Rover modem SIM card.
2. In the **Base Phone Number** field, enter the base receiver phone number that will be used for the correction transmission.
3. The desired base phone number you can select from the **Phone number list** field. To add the base phone number to the **Phone number list** press the *Add* button. To remove any phone number from the field, select the desired phone number and press the *Delete* button.
4. Optionally, you can select the bearer service type for rover cellular modem. To do this, select the *Show Bearer Service* option from the dialog menu that displays by clicking ☰ in the top left corner.
5. From the list in the **Bearer Service** field you can select the bearer service type for rover cellular modem in the CSD mode. By default, *Do not set* is selected.

If this dialog was opened by clicking **Config <selected modem>** command from the pop-up menu of the Status dialog, it also contains:

- The **Port** field, where you can select or view a port receiver to which the external modem is connected.
- The **Type** field displays the type of the selected modem.
- Two buttons:
  - **Dial** - click it to start connection
  - **Hangup** - click it to finish connection.

Rover CDPD Parameters

In this dialog you can set the IP address of the base modem for *CDPD* rover modem.

1. Enter the CDPD address of the base radio in the **Base CDPD Address** field.
2. The desired base CDPD address you can select from the **IP Addresses list** field. To add the CDPD address to the **IP Addresses list** press the *Add* button. To remove any base CDPD address from the field, select the desired phone number and press the *Delete* button.

   If this dialog was opened by clicking **Config** <**selected modem**> command from the pop-up menu of the Status dialog, it also contains:

   - **Port** field, where you can select or view a port receiver to which the external modem is connected.

Modem Dialup

In this dialog you can configure internal / external cellular modem of the receiver for the following GNSS survey types:

- Network RTK/Skybridge
- RTK/Skybridge: for Base and Rover receivers (GSM CSD)
- RTK/Skybridge: for Base receivers (CDMA)
- RTK/Skybridge: for receiving PPP corrections
- Network DGPS
- Real Time DGPS: for Base and Rover receivers (GSM CSD)
- Autonomous/SBAS/PPP: for receiving PPP corrections

Radio Parameters for internal CDMA modem

In this dialog you can configure internal cellular modem for CDMA modem of the base receiver:

1. Enter the **Dialup Number** needed to make the Internet connection.
2. Enter the **User ID** for the server.
3. Enter the **Password** to login to the server with the entered *User ID*.

To set the values to default, click the **Defaults** button.

Configuration CDMA modem

In this dialog you can check the settings for Internet connection of the base / rover CDMA modem and start or finish connection.

- The **Type** field displays the type of the selected modem.
- In the **Connected to** field you can select whether the base or rover receiver will be connected to the modem.
- The **Port** field, where you can select or view a port receiver to which the external modem is connected.
- In the **Base Address** field you can check the Internet Address that will be used for the connection.

  To check or set the parameters, click the  or  icon in the right corner of the dialog. More...

  To stop the communication, click the **Disconnect** button.

Radio Parameters for AirLink CDMA (MUDP)

In this dialog you can configure external cellular modem *AirLink CDMA(MUDP)*:

1. Enter an Internet **Address to Add** that will be used for the connection between the base and several rovers using UDP protocol.
2. The desired server address you can select from the **Ip Address list** field. To add the entered address to the **IP Address list**, press the *Add* button. To remove any address from the **IP Address list**, select a desired address and press the *Delete* button.

Register Modem

AirLink GPRS and AirLink CDMA modems require registration.

To register the modem:

1. Select **Provider**.
2. Enter *Register Information*: **Net ID**, **Password** and **Phone Number**.
3. Click the **Defaults** button to set the default data.
4. Click the **Register** button to pass registration.

Internet Address

To configure settings for Internet connection for the following GNSS survey types:

- RTK/Skybridge: for Rover receiver with CDMA modem
- RTK/Skybridge: for receiving PPP corrections
- Network RTK/Skybridge
- Network DGPS
- Autonomous/SBAS/PPP: for receiving PPP corrections

Internet Address

In this dialog you can configure settings for Internet connection of the rover CDMA modem:

1. Select the required connection from the **Label** column by clicking on its name. If there are no connections, create it by clicking the **Add** button. More...
   - If you need to modify the connection parameters - IP address, credentials or just the connection's name - select it and click the **Edit** button. More...
   - To remove a connection you do not need, select it and click the **Delete** button.
2. Click **Next** to proceed with the next step of the configuration wizard.

Internet Connect Configuration

In this dialog you can configure parameters for a dialup Internet connection:

1. Enter the **Dialup Number** needed to make the Internet connection.
2. Enter the **User ID** for the server.
3. Enter the **Password** to login to the server with the entered *Used ID*.
4. Enter the **PIN** number for the server

   To start the communication, click the **Connect** button.

   To stop the communication, click the **Disconnect** button.

Configure Radio

This dialog contains the settings for the radio modem or cell modem. The **Type** field tells us what the selected radio type is (it is got from the *Configure->Survey->GNSS Configuration*)

The rest of the controls on this dialog depend on the type of radio that was selected.

More detailed information about parameters of the radio and cell modems may be found here.

Base Radio Parameters for internal TCP/IP modem: Login Info

In this dialog you need to enter the login information:

1. Enter a **Password** and **User ID** to login the selected server.
2. Optionally, you can lock / unlock the password in this dialog. To do this, select the Lock Credentials option from the dialog menu that displays by clicking ☰ in the top left corner. If you use this option the **Password** field will display "**Locked**".
3. To unlock the password, click ☰ in the top left corner, select the Lock Credentials option and type in the password in the **Enter Password** field.
4. Click **Next** to continue customizing the internal TCP/IP modem.

GPUID Info

This dialog opens if you selected the **Use GPUID** command in the ☰ menu of the Internet Address dialog for Network RTK or the Internet Address dialog for Network DGPS surveys.

Select the survey, you configure:

- Network RTK/Skybridge
- Network DGPS

Add / Edit Internet Address

To enter the details of connection to an NTRIP caster (TCP/IP server).

- Enter connection's name in the **Label** field.
- Enter Web or IP address (including the connection port).

  > **Note:** For Web or IP address, the port can be specified after a colon (':') or a slash ('/'), for example:
  > 10.56.68.32:8068 or 10.56.68.32/8068.

- Check the **TLS** box ☑ if caster (server) uses TLS (SSL) certificate to secure Internet connections and transactions through data encryption. This check box is selected automatically when port 443 is entered with Web or IP address.

> **Note:** If security certificate is not validated when establishing connection, a prompt appears with an option to skip validation and still connect to this caster (server).

> **Note:** Secured TLS (SSL) connection is not available if a receiver's internal cell modem connects to the caster (server).

- Enter credentials in the **Login** and **Password** fields for authorized connection to an NTRIP caster.
- Click ☰ in the top left corner and select the Lock Credentials option from the dialog menu to password-protect entered login and password from viewing and editing. If you use this option, **Login** and **Password** fields will display **Locked** . To restore visibility and possibility of editing, deselect the Lock Credentials option and enter protection password.

Click ✔ to save changes made to connection, or click ✖ to discard.

Rover GPRS Parameters

In this dialog you can set the IP address of the base modem for *AirLink GPRS* rover device model.

1. Enter the GPRS address of the base in the **Base GPRS Address** field.
2. The desired base GPRS address you can select from the **IP Addresses list** field. To add the GPRS address to the **IP Addresses list** press the *Add* button. To remove any base GPRS address from the field, select the desired phone number and press the *Delete* button.

Rover CDMA Parameters

In this dialog you can set the IP address of the base modem for *AirLink CDMA* rover device model.

1. Enter the CDMA address of the base radio in the **Base CDMA Address** field.
2. The desired base CDMA address you can select from the **IP Addresses list** field. To add the CDMA address to the **IP Addresses list** press the *Add* button. To remove any base CDMA address from the field, select the desired phone number and press the *Delete* button.

How to resolve modem communication with *Auto* baud rate

Sometimes during modem connection, for the "*Auto*" baud rate selection of the modem, the baud rate could not be set. The software displays an error message for this case: *"Modem baud rate could*

not be determined automatically. Please run TRU (see Help for details) or specify baud rate in configuration".

To resolve the issue, you need to do one of the following:

- In Sokkia Field: Run GNSS survey configuration wizard and proceed to the Base radio / Rover radio dialogs and in the **Baud** field, select desired value instead of *Auto*.
- In TRU:
  - Disconnect Sokkia Field from the receiver.
  - Run TRU and connect TRU to the receiver.
  - Click the *Modem Driver* icon, right click on the *Modems* dialog and select **Scan for hardware changes** command from the context menu.
  - Disconnect TRU from the receiver.
  - Run Sokkia Field and continue your work.

Optical Configuration

Sokkia Field provides the wizard for creating configurations for optical survey type: using conventional, robotic and motorized total stations, as well as levels.

To create an optical configuration:

1. Enter the **Name** for the configuration. The name you set will be displayed in the Configurations Library dialog.
2. Select the necessary configuration type in the **Type** field:
   - *Robotic* - survey can be performed by one person with a robotic total station. View configuration steps...
   - *Motorized* - two-person surveying with a robotic total station. View configuration steps...
   - *Conventional* - standard survey with a total station and reflectors. View configuration steps...
   - *Level* - leveling with a digital level. View configuration steps...

Optical Configuration: Robotic

- *Robotic* - a survey that can be performed by one person with a motorized instrument.

To create a configuration for the robotic instrument, complete the following steps:

1. Select the *Robotic* configuration type and enter the configuration name.
2. Select the instrument: Instrument dialog.
   - If necessary, configure peripherals: Peripherals and Depth Finder dialogs.
3. Select connection mode: Connection Mode, Cable and Radio dialogs.
4. Select the tracking mode and adjust its settings: Search/Track dialog.

5. Configure survey settings: Survey Settings - 1 and Survey Settings - 2 dialogs.
   - Select prism configurations; customize or create your own, if necessary.
6. Configure additional survey settings: Survey Settings - 3 dialog.
7. Set up auto-topo parameters: Auto Topo dialog.
8. Specify parameters for a monitor routine: Monitor Options dialog.
   - If required, configure communication settings: Comm Settings.
9. Configure data output parameters: Topo Output Config dialog.
   - If required, configure communication settings: Comm Settings.
10. Configure stake settings: Stake Settings - 1 and Stake Settings - 2 dialogs.
11. Specify stake marking: Grade Stake Marking dialog.
12. Configure additional stake settings: Stake Settings - 3 dialog.
13. Choose staked point icon: Staked Point Icon dialog.
14. Configure point naming: Point Naming dialog.
15. Configure miscellaneous parameters: Miscellaneous dialog.

Click **Next >>** to proceed to the next step of configuration wizard.

Instrument

Select the total station that will be used in the survey:

> **Note:** To simulate a survey, select the **Simulation Mode** check box.

1. Select the **Manufacturer** of the instrument.
2. Select the **Model** of the instrument. Note that the models shown in the list correspond to the chosen type of survey.

Specify default values for the height of reflector and instrument:

- **Foresight HR** - the foresight prism height (measured from the optical center of the foresight prism to the ground point).
- **Backsight HR** - the backsight prism height (measured from the optical center of the backsight prism to the ground point).

Note that the default height of reflector you defined here can be overwritten during field work in any *Survey* or *Stake* dialog by entering a new value in the **HR** field.

If you use a custom prism and **Height Type** for this prism is *Top of pole*, measure and enter the prism height accordingly.

Click **Peripherals** to configure available peripherals in the respective dialogs. More...

Click **Next >>** to proceed to the next step of configuration wizard.

Connection Mode

Specify how the instrument - a total station (TS) - communicates with the field controller and to a remote controller (RC).

- **Initial TS Connection**: Select one of the following connection types:
  - *Cable*
  - *Bluetooth TS*
  - *Bluetooth TS via GNSS*
  - *RC Bluetooth*
  - *Wi-Fi*

  The set of available values depends on the instrument model. For example:

  - Sokkia *DX-i (Live Video)* supports connection via Wi-Fi and Bluetooth.
  - Sokkia *iX* series supports the *Bluetooth TS via GNSS* connection. This connection type assumes, a GNSS reciever's Long-Range Bluetooth module acts as a proxy modem to connect to TS extending connection range. Note that only receivers that features the Long-Range Bluetooth communication can be used for this connection type. Learn about how to connect to a TS via a GNSS receiver.

  > **Note:** If you selected the *DX-i (Live Video)*, make sure that the total station is configured in the *External link* mode.

Click **Next >>** to proceed to the next step of configuration wizard.

DX-i Connection Mode

Specify how *DX-i (Live video)* total station communicates with the field controller.

This dialog is a specific form of the Connection Mode dialog and opens while configuring a survey with *DX-i (Live video)* total station.

> **Note:** The total station should have the *External Link* mode activated. Refer to the instrument's documentation.

TS Connection: Select one of the following connection types form the drop-down list:

- *Bluetooth* - to connect the controller to the total station over Bluetooth.
- *Wi-Fi* - to connect the controller to the total station over Wi-Fi.

If *Wi-Fi* connection is selected, additional configuration is required:

- *Use existing Wi-Fi network* - the total station and the controller should be connected to the same existing Wi-Fi network.
- *Use controller hosted Wi-Fi network* - the total station connects to the Wi-Fi network running on the controller. Sokkia Field will start the new Wi-Fi network on the controller (SSID: Sokkia Field, SSID password: 12345678). Configure the TS to connect to this network.

- **RC**: Specify how a remote controller is connected:
  - Choose *RC* to use remote control unit or *None* if no remote control unit used.
    - Check the **RC-Handle attached** box if the remote control unit is equipped with a RC-handle (for example, RC-5RH).

Click **Next >>** to proceed to the next step of configuration wizard.

Search / Track

Configure tracking settings for the total station.

- **Search Area** - the angle of searching or tracking, in degrees, for the vertical (**Vert**) and horizontal planes (**Hz**).
- **Turning Speed** of the total station in degrees per second.
- **Tracking Measurement** - available to specific models only. This option sets the angle display for auto tracking:
  - *Fixed Averaging* - during auto tracking, the angle value is averaged and then fixed. It remains fixed until the target moves again. This mode is recommended when measuring an object at rest.
  - *Standard* - during auto tracking, the angle value is constantly corrected by the image sensor. This mode is recommended when measuring an object in motion.

Click **Next >>** to proceed to the next step of configuration wizard.

Survey Settings - 1

To configure settings for total station setup and survey.

- **Measurement Method** - method of side-shot measurements: *Direct* or *Direct/Reverse*.
  - *Direct* - the measurement to a single point is taken using the direct position of the total station.
  - *Direct/Reverse* - the measurement to a single point is taken using one direct and one reverse measurement (i.e., plunge - flip and rotate the total station by 180 degrees to get the reverse

measurement). These two measurements constitute a measurement set. This measurement method is used to eliminate the vertical circle centering errors.

The settings below are applicable if the *Direct/Reverse* measurement method is selected.

- **Tolerances** panel - set acceptable deviation values for the horizontal and vertical angles and distance:
  - **Hz** - horizontal angle in angular seconds;
  - **Dist.** - distance in project units;
  - **VA** - vertical angle in angular seconds.

- **Search After Turn** - select the action that the TS will perform after a turn:
  - *None* - TS turns and waits;
  - *Search and Aim* - TS turns and aims the target;
  - *Search and Track* - TS turns, aims and starts to track the target.

- **Auto accept measurement** - check the box to automatically accept measurements in the set, you still need to confirm saving the entire set and measured point. If cleared, you need to confirm each measurement within the set, as well as saving the entire set and measured point.

- **Measure reverse distance** - check the box to perform slope distance measurement in reverse mode. This option reduces the distance measurement errors. If cleared, the slope distance is measured in direct mode only.

Note: Parameters you defined here for the total station can be changed later while measuring by clicking  in the title bar of total station setup and survey dialogs.

Click **Next >>** to proceed to the next step of configuration wizard.

Survey Settings - 2

To configure settings for total station setup and survey:

- **Measurement Type**: select the order and the type of the measurements in one set:
  - *HA* - horizontal angle;
  - *VA* - vertical angle;
  - *SD* - slope distance;
  - *HD* - horizontal distance;
  - *VD* - vertical distance.

- **BS Target** (backsight target) and **FS Target** (foresight target)- select one of the available target configurations from the respective drop-down list. Click the ... button to add or modify target configurations in the Targets dialog.

  Note: The backsight target is applicable to backsight measurements only. More...

- **Guide** - set the necessary mode for the guide, or disable it (*Point Guide On*, *Laser Pointer On* or *Off*). (Available for specific instruments only.)
- **Guide Power** - set the power mode for the guide (*Low* or *High*). (Available for specific instruments only.)
- **Continuous Distance (Non-Prism)** - select the check box to continuously measure the distance when the target is set to *Non-Prism*. (Available for specific instruments only.)
- **Auto Target**: select the check box to enable automatic searching, locking and saving the measurements. These steps will be performed after clicking the **Save** button during the survey. (Available for specific instruments only.)

Note: Parameters you defined here for the total station can be changed later while measuring by clicking  in the title bar of total station setup and survey dialogs.

Click **Next >>** to proceed to the next step of configuration wizard.

Survey Settings - 3

Configure the parameters of the **Precise** and **Quick** measurement modes which are used in robotic total station setup and survey. Note that these settings for stakeout are configured separately.

Set up the measurement modes parameters as necessary:

1. In the **Precise** panel, configure storing positions:
   - From the **EDM Mode** drop-down list, select the sensitivity to use for the distance measurements. The actual choice of values depend on the TS connected. By default, it is set to the value producing the most accurate measurement.
   - Select the **Meas Continuously** check box to log measurements continuously and stop them manually when required.
   - The **Average** field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number of measurements.

    - If **Meas Continuously** is enabled, the logging immediately stops to store the point.
    - If **Meas Continuously** is disabled, the **Average** position is calculated to store the point.
  - Select the **Auto Store** check box to enable auto-storing positions for the average mode.
2. In the **Quick** panel, configure fast auto-storing positions:
  - From the **EDM Mode** drop-down list, select the sensitivity to use for the distance measurements. The actual choice of values depend on the TS connected. By default, it is set to the value producing the quickest result.
  - In the **Average** field, if needed, you can change the default number of measurements required for storing positions.

Note: Parameters you defined here for the total station can be changed later while measuring by clicking  in the title bar of total station setup and survey dialogs.

Click **Next >>** to proceed to the next step of configuration wizard.

Auto Topo

To configure parameters for auto-storing positions in the robotic survey:

1. **Method**: from the drop-down list, select the method for automatic storing a point to the project:
   - *By time*: a point is stored automatically after the specified time interval.
   - *By time and slope distance*: a point is stored automatically when two criteria are met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By time or slope distance*: a point is stored automatically when one of two criteria is met:
     - after the specified time interval;
     - upon reaching the specified slope distance from the previous stored point.

   - *By horizontal distance*: a point is stored automatically upon reaching the specified horizontal distance from the previous stored point.
   - *By slope distance*: a point is stored automatically upon reaching the specified slope distance from the previous stored point.
   - *By elevation*: a point is stored automatically upon reaching the specified elevation difference from the previous stored point.
   - *Stop and go*: a point is stored automatically:
     - the prism movement stops for a specified time interval for prism target type;
     - the robotic instrument is constantly aimed at the static target for a specified time interval for non-prism and sheet target types.

2. Enter the criteria value(s) for the selected method:
   - **Time interval** in seconds. Default value is 1 second.
   - **Hor Dist interval**, **Slope Dist interval**, **Elevation interval** in current measurement units. Default value is equal to 15 meters.
   - **Delay** in seconds for *Stop and Go*. Default value is 3 seconds.

Note: To make auto topo points and their coordinates viewable in the project, open the Points dialog (click > > to open), click / in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click > > to open).

Click **Next >>** to proceed to the next step of configuration wizard.

Monitor Options

To configure the parameters to be used in the Monitor sessions.

- **Log To**: select *None*, *File*, or *COM* for data output.
- **Output Type**: specify the type of data to be written to output (*Raw Data* or *Coordinates*).
- **Output Format**: specify the format for data output:
  - *FC-5*, *FC-6/GTS-7* or *GTS-6* for raw data output;
  - *GGA* and *Text* for coordinates output.
- If logging to a *COM* port is selected, click ... next to the **Comm Settings** field to configure the port settings in the Comm Setting dialog.
- If logging to *File* is selected, you can change the location and name of the output file by clicking the ... button next to **File Name**.

The default file name is *Monitor*, and the extension depends on the output format you have selected.

- **Search After Turn**: select the check box to if you want the instrument to search for a prism after the instrument automatically turns to the next point in a monitor routine.
- **Meas Method**: choose measurement method for a monitor routine: *Direct* or *Direct/Reverse*.
- **Sets**: specify the required number of *Direct/Reverse* measurements. Each measurement set consists of one direct and one reverse measurements.

Select the **Store As Check Point** check box to store the measurements as Check Points to the original points in the monitor list; otherwise, they will be stored as normal points.

Click **Next >>** to proceed to the next step of configuration wizard.

Topo Output Config

To configure the data output parameters in *Topo* and *Auto Topo* surveys.

- **Log To**: select *None*, *File*, or *COM* for data output.
- **Output Type**: specify the type of data to be written to output (*Raw Data* or *Coordinates*).
- **Output Format**: specify the format for data output:
  - *FC-5*, *FC-6/GTS-7* or *GTS-6* for raw data output;
  - *GGA* and *Text* for coordinates output.
- If logging to a *COM* port is selected, click ... next to the **Comm Settings** field to configure the port settings in the Comm Setting dialog.
- If logging to *File* is selected, you can change the location and name of the output file by clicking the ... button next to **File Name**.

The default file name is *Topo*, and the extension depends on the output format you have selected.

Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 1

To configure settings for stakeout performed with the total station:

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance**: enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *Instrument Reference* - the top of the screen is oriented towards the total station;
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented to the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference**: select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during the stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

> **Note:** Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 2

To continue configuring settings for stakeout performed with the total station.

- **Turn to Design Point** - select the method that helps to turn the TS toward the next design point:

- *None* - the total station does not assist in turning the instrument to the next design point;
- *Display HA only* - the total station displays the calculated horizontal angle value and you will turn the instrument by this angle;
- *Display HA/VA* - the total station displays the calculated horizontal and vertical angle values and you will turn the instrument by these angles;
- *Automatic HA only* - the total station will automatically rotate to the calculated horizontal angle after storing the staked point;
- *Automatic HA/VA* - the total station will automatically rotate to the calculated horizontal and vertical angles after storing the staked point.

- **Search After Turn** - select the action that the TS will perform after an *automatic* turn:
  - *None* - TS turns and waits;
  - *Search and Aim* - TS turns and aims the target;
  - *Search and Track* - TS turns, aims and starts to track the target.

- **Guide** - set the necessary mode for the guide or disable it (*Point Guide On*, *Laser Pointer On*, *Off*).

Note: some options are available for specific models only.

- **Auto Target**: select the check box to enable automatic searching, locking and saving the measurements. These steps will be performed after clicking the **Save** button during the stakeout routine. (Available for specific instruments only.)

Note: Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

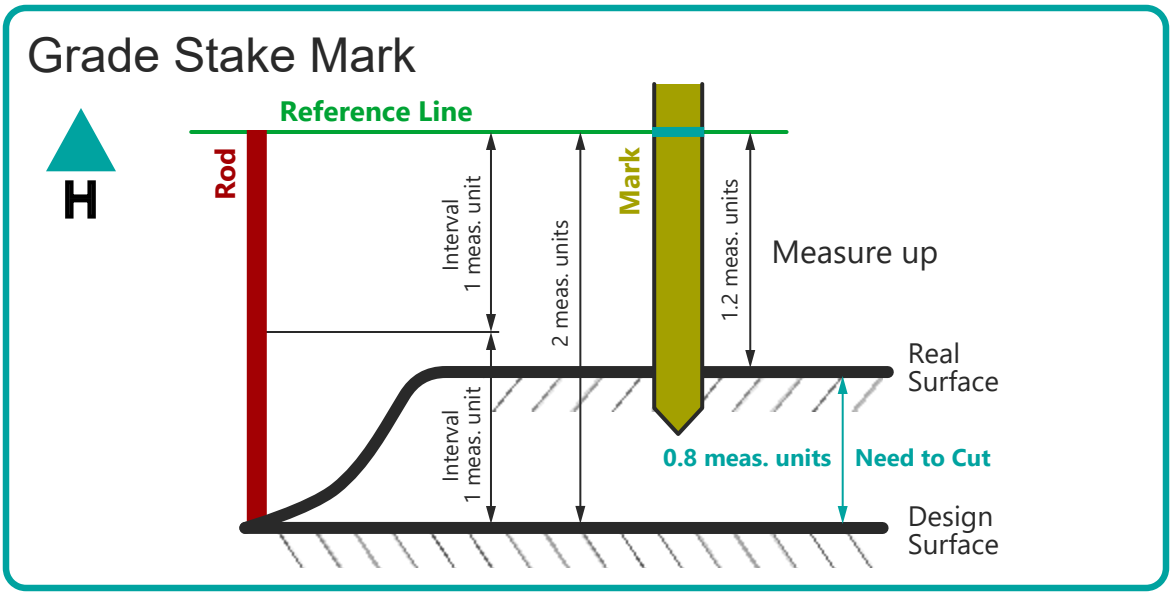
Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 3

Configure the parameters of the **Precise** and **Quick** measurement modes which are used in stakeout with robotic total station. Note that these settings for total station setup and survey are configured separately.

Set up the measurement modes parameters as necessary:

1. In the **Precise** panel, configure storing positions:
   - From the **EDM Mode** drop-down list, select the sensitivity to use for the distance measurements. The actual choice of values depend on the TS connected. By default, it is set to the value producing the most accurate measurement.
   - Select the **Meas Continuously** check box to log measurements continuously and stop them manually when required.
   - The **Average** field allows you to set a specific number of measurements for logging and average them for storing the position. If required, you can change the default number of measurements.
     - If **Meas Continuously** is enabled, the logging immediately stops to store the point.
     - If **Meas Continuously** is disabled, the **Average** position is calculated to store the point.
   - Select the **Auto Store** check box to enable auto-storing positions for the average mode.
2. In the **Quick** panel, configure fast auto-storing positions:

- From the **EDM Mode** drop-down list, select the sensitivity to use for the distance measurements. The actual choice of values depend on the TS connected. By default, it is set to the value producing the quickest result.
- In the **Average** field, if needed, you can change the default number of measurements required for storing positions.

Note: Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective  button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

Click **Next >>** to proceed to the next step of configuration wizard.

Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the

names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

> **Note:** Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have pre-defined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.
  - *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
  - *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
  - *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).

- *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
- *Range Start* - any entered value that starts the range for naming staked out points one by one.

- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:

  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

Click **Next >>** to proceed to the next step of configuration wizard.

Miscellaneous

Customize the user interface configuration and program behavior during a survey:

- **Display coordinates after measurement**: if selected, computed coordinates are displayed automatically after a TS measurement is performed and before the point coordinates are stored into the database.
- **Apply Earth Curvature and Refraction**: if selected, the computed heights for Earth Curvature (Vertical Distance) and slope distances and vertical angles are corrected for atmospheric refraction.
- **Prompt for Rod Height**: if selected, a prompt for a height of the Rod (Target) appears before a point is stored.
- **Right/Left Rod to TS**: if selected, the right and left directions are shown relative to Rod to TS line.
- **Stakeout Sound**: if selected, a sound in Stakeout indicates as the point is staked.
- **Stake Surface Leveling Tone**: if selected, a tone in stakeout indicates that you are approaching the level of the surface.
- **Beep on Storing Points**: if selected, a sound beeps each time the point is stored.
- **VA Zero at Level/Horizontal**: this is not selected by default and VA is set to zero at Zenith. When the check box is selected, VA is set to zero at the Level / Horizontal direction. Only specific total stations allow Sokkia Field to set this value. For this reason, ensure that this option is set to the same value in the total station.

- **Use Horizontal Angle Left**: if selected, the horizontal angle measurements are shown in a counterclockwise (Left) direction. If this check box is not selected, the horizontal angle measurements are shown in a clockwise (Right) direction.
- **Automatically display BS Setup**: if selected, the Backsight dialog will be displayed automatically when you attempt to access any of the dialogs involving total station observations.
- **Hold Offset Measurement**: if selected, the dialog to measure an offset point with the help of the selected offset tool displays automatically after each measurement.
- **Remember Occ/BS if set**: if selected, you will not have to set the Backsight for total station observations once it has been set.
- **Warn if measurement is in reverse face**: if selected, the warning is displayed when a measurement is in progress and the TS is in the reverse face mode.
- **Prompt for Traverse Advance**: if selected, the prompt "Do you want to move the instrument now" displays when measuring traverse point. Click **Yes** to instantly open the Backsight dialog and select a new occupation point and backsight point. Click **No** to select a new occupation point and backsight point manually later.

Click ✔ to finish the configuration.

Optical Configuration: Motorized

- *Motorized* - a two-person survey performed with a motorized instrument.

To create a configuration for the motorized instrument, complete the following steps:

1. Select the *Motorized* configuration type and enter the configuration name.
2. Select the instrument: Instrument dialog.
3. Select connection mode: Connection Mode and Cable dialogs.
4. Select the tracking mode and adjust its settings: Mode and Search/Track dialogs.
5. Configure survey settings: Survey Settings - 1 and Survey Settings - 2 dialogs.
   - Select prism configurations; customize or create your own, if necessary.
6. Configure stake settings: Stake Settings - 1 and Stake Settings - 2 dialogs.
7. Specify stake marking: Grade Stake Marking dialog.
8. Choose staked point icon: Staked Point Icon dialog.
9. Configure point naming: Point Naming dialog.
10. Configure miscellaneous parameters: Miscellaneous dialog.

Click **Next >>** to proceed to the next step of configuration wizard.

Instrument

Select the total station that will be used in the survey:

1. Select the **Manufacturer** of the instrument.
2. Select the **Model** of the instrument. Note that the models shown in the list correspond to the chosen type of survey.

Specify default values for the height of reflector and instrument:

- **Foresight HR** - the foresight prism height (measured from the optical center of the foresight prism to the ground point).
- **Backsight HR** - the backsight prism height (measured from the optical center of the backsight prism to the ground point).

Note that the default height of reflector you defined here can be overwritten during field work in any *Survey* or *Stake* dialog by entering a new value in the **HR** field.

If you use a custom prism and **Height Type** for this prism is *Top of pole*, measure and enter the prism height accordingly.

Click **Next >>** to proceed to the next step of configuration wizard.

Connection Mode

Specify how the instrument - a total station (TS) - communicates with the field controller.

- **Initial TS Connection**: Select *Cable* or *Bluetooth TS*.

Click **Next >>** to proceed to the next step of configuration wizard.

Mode

Set the tracking mode (turning parameters) for a servo-motor driven total station.

- **Auto Tracking**:
  - *Auto Tracking* - the total station will track the reflector while you move from point to point.
  - *Auto Aiming* - the instrument will find the prism in the region that you pre-defined.
  - *None* - disables the automatic operation program for the total station.

Note that some of the above listed options are available for specific models only.

Click **Next >>** to proceed to the next step of configuration wizard.

Search / Track

Configure tracking settings for the total station. Note that if **Auto Tracking** was specified for a motorized instrument as *None* in the Mode dialog, only some of the listed options will be available.

- **Search Area** - the angle of searching or tracking, in degrees, for the vertical (**Vert**) and horizontal planes (**Hz**).
- **Turning Speed** of the total station in degrees per second.
- **Tracking Measurement** - available to specific models only. This option sets the angle display for auto tracking:
  - *Fixed Averaging* - during auto tracking, the angle value is averaged and then fixed. It remains fixed until the target moves again. This mode is recommended when measuring an object at rest.
  - *Standard* - during auto tracking, the angle value is constantly corrected by the image sensor. This mode is recommended when measuring an object in motion.

Survey Settings - 1

To configure settings for total station setup and survey.

- **Measurement Method** - method of side-shot measurements: *Direct* or *Direct/Reverse*.
  - *Direct* - the measurement to a single point is taken using the direct position of the total station.
  - *Direct/Reverse* - the measurement to a single point is taken using one direct and one reverse measurement (i.e., plunge - flip and rotate the total station by 180 degrees to get the reverse measurement). These two measurements constitute a measurement set. This measurement method is used to eliminate the vertical circle centering errors.

The settings below are applicable if the *Direct/Reverse* measurement method is selected.

- **Tolerances** panel - set acceptable deviation values for the horizontal and vertical angles and distance:
  - **Hz** - horizontal angle in angular seconds;
  - **Dist.** - distance in project units;
  - **VA** - vertical angle in angular seconds.

- **Search After Turn** - select the action that the TS will perform after a turn:
  - *None* - TS turns and waits;
  - *Search and Aim* - TS turns and aims the target;
  - *Search and Track* - TS turns, aims and starts to track the target.

- **Auto accept measurement** - check the box to automatically accept measurements in the set, you still need to confirm saving the entire set and measured point. If cleared, you need to confirm each measurement within the set, as well as saving the entire set and measured point.

- **Measure reverse distance** - check the box to perform slope distance measurement in reverse mode. This option reduces the distance measurement errors. If cleared, the slope distance is measured in direct mode only.

Note: Parameters you defined here for the total station can be changed later while measuring by clicking  in the title bar of total station setup and survey dialogs.

Click **Next >>** to proceed to the next step of configuration wizard.

Survey Settings - 2

To configure settings for total station setup and survey:

- **Measurement Type**: select the order and the type of the measurements in one set:
  - *HA* - horizontal angle;
  - *VA* - vertical angle;
  - *SD* - slope distance;
  - *HD* - horizontal distance;
  - *VD* - vertical distance.

- **BS Target** (backsight target) and **FS Target** (foresight target)- select one of the available target configurations from the respective drop-down list. Click the  button to add or modify target configurations in the Targets dialog.

  Note: The backsight target is applicable to backsight measurements only. More...

- **Guide** - set the necessary mode for the guide, or disable it (*Point Guide On*, *Laser Pointer On* or *Off*). (Available for specific instruments only.)
- **Guide Power** - set the power mode for the guide (*Low* or *High*). (Available for specific instruments only.)

- **EDM Mode**: select the sensitivity to use for the distance measurements (*Fine*, *Rapid* / *Coarse*, or *Tracking*). (Displayed values vary depending on the instrument model.)
- **Auto Target**: select the check box to enable automatic searching, locking and saving the measurements. These steps will be performed after clicking the **Save** button during the survey. (Available for specific instruments only.)

Note: Parameters you defined here for the total station can be changed later while measuring by clicking  in the title bar of total station setup and survey dialogs.

Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 1

To configure settings for stakeout performed with the total station:

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance**: enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *Instrument Reference* - the top of the screen is oriented towards the total station;
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented to the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference**: select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during the stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

Note: Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 2

To continue configuring settings for stakeout performed with the total station.

- **Turn to Design Point** - select the method that helps to turn the TS toward the next design point:
  - *None* - the total station does not assist in turning the instrument to the next design point;
  - *Display HA only* - the total station displays the calculated horizontal angle value and you will turn the instrument by this angle;
  - *Display HA/VA* - the total station displays the calculated horizontal and vertical angle values and you will turn the instrument by these angles;
  - *Automatic HA only* - the total station will automatically rotate to the calculated horizontal angle after storing the staked point;
  - *Automatic HA/VA* - the total station will automatically rotate to the calculated horizontal and vertical angles after storing the staked point.

- **Search After Turn** - select the action that the TS will perform after an *automatic* turn:
  - *None* - TS turns and waits;
  - *Search and Aim* - TS turns and aims the target;
  - *Search and Track* - TS turns, aims and starts to track the target.

- **Guide** - set the necessary mode for the guide or disable it (*Point Guide On*, *Laser Pointer On*, *Off*).

> **Note:** some options are available for specific models only.

- **Auto Target** - select the check box to enable automatic searching, locking and saving the measurements. These steps will be performed after clicking the **Save** button during the stakeout routine. (Available for specific instruments only.)

> **Note:** Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

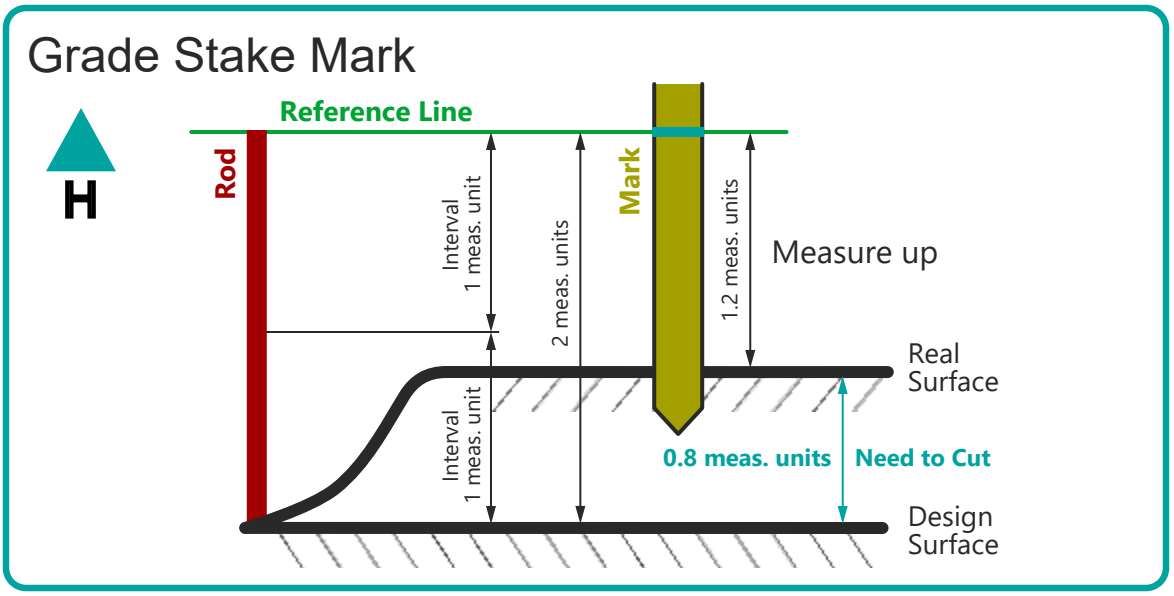
Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next >>** to proceed to the next step of configuration wizard.

Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.

- Click the respective  button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

Click **Next >>** to proceed to the next step of configuration wizard.

Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

> **Note:** Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click  in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:

- to measure and store such a point or
- to cancel the measurement at current position.

The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.
  - *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
  - *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
  - *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
  - *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
  - *Range Start* - any entered value that starts the range for naming staked out points one by one.
- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:
  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

Click **Next >>** to proceed to the next step of configuration wizard.

Miscellaneous

Customize the user interface configuration and program behavior during a survey:

- **Display coordinates after measurement**: if selected, computed coordinates are displayed automatically after a TS measurement is performed and before the point coordinates are stored

into the database.

- **Apply Earth Curvature and Refraction**: if selected, the computed heights for Earth Curvature (Vertical Distance) and slope distances and vertical angles are corrected for atmospheric refraction.
- **Prompt for Rod Height**: if selected, a prompt for a height of the Rod (Target) appears before a point is stored.
- **Right/Left Rod to TS**: if selected, the right and left directions are shown relative to Rod to TS line.
- **Stakeout Sound**: if selected, a sound in Stakeout indicates as the point is staked.
- **Stake Surface Leveling Tone**: if selected, a tone in stakeout indicates that you are approaching the level of the surface.
- **Beep on Storing Points**: if selected, a sound beeps each time the point is stored.
- **VA Zero at Level/Horizontal**: this is not selected by default and VA is set to zero at Zenith. When the check box is selected, VA is set to zero at the Level / Horizontal direction. Only specific total stations allow Sokkia Field to set this value. For this reason, ensure that this option is set to the same value in the total station.
- **Use Horizontal Angle Left**: if selected, the horizontal angle measurements are shown in a counterclockwise (Left) direction. If this check box is not selected, the horizontal angle measurements are shown in a clockwise (Right) direction.
- **Automatically display BS Setup**: if selected, the Backsight dialog will be displayed automatically when you attempt to access any of the dialogs involving total station observations.
- **Hold Offset Measurement**: if selected, the dialog to measure an offset point with the help of the selected offset tool displays automatically after each measurement.
- **Remember Occ/BS if set**: if selected, you will not have to set the Backsight for total station observations once it has been set.
- **Warn if measurement is in reverse face**: if selected, the warning is displayed when a measurement is in progress and the TS is in the reverse face mode.
- **Prompt for Traverse Advance**: if selected, the prompt "Do you want to move the instrument now" displays when measuring traverse point. Click **Yes** to instantly open the Backsight dialog and select a new occupation point and backsight point. Click **No** to select a new occupation point and backsight point manually later.

Click  to finish the configuration.

Optical Configuration: Conventional

- *Conventional* - a standard survey with a total station and reflectors.

To create a configuration for the conventional instrument, complete the following steps:

1. Select the *Conventional* configuration type and enter the configuration name.
2. Select the instrument: Instrument dialog.
3. Select connection mode: Connection Mode and Cable dialogs.
4. Configure survey settings: Survey Settings - 1 and Survey Settings - 2 dialogs.
   - Select prism configurations; customize or create your own, if necessary.
5. Configure stake settings: Stake Settings - 1 and Stake Settings - 2 dialogs.
6. Specify stake marking: Grade Stake Marking dialog.
7. Choose staked point icon: Staked Point Icon dialog.
8. Configure point naming: Point Naming dialog.
9. Configure miscellaneous parameters: Miscellaneous dialog.

Click **Next >>** to proceed to the next step of configuration wizard.

Instrument

Select the total station that will be used in the survey:

1. Select the **Manufacturer** of the instrument.
2. Select the **Model** of the instrument. Note that the models shown in the list correspond to the chosen type of survey.

Specify default values for the height of reflector and instrument:

- **Foresight HR** - the foresight prism height (measured from the optical center of the foresight prism to the ground point).
- **Backsight HR** - the backsight prism height (measured from the optical center of the backsight prism to the ground point).

Note that the default height of reflector you defined here can be overwritten during field work in any *Survey* or *Stake* dialog by entering a new value in the **HR** field.

If you use a custom prism and **Height Type** for this prism is *Top of pole*, measure and enter the prism height accordingly.

> **Note:** To simulate a survey, select *Manual Mode* in the **Manufacturer** field. In this mode, no measurements are performed. All the data is entered manually in the Manual Entry dialog automatically opened when a measurement is initiated.

Click **Next >>** to proceed to the next step of configuration wizard.

Manual Entry (TS)

To manually enter the measurement data when the total station is set to *Manual Mode* in the Instrument dialog during Conventional survey configuration.

- **HA** - enter the horizontal angle value.
- **VA** - enter the vertical angle value.
- **SD** - enter the slope distance value.

Connection Mode

Specify how the instrument - a total station (TS) - communicates with the field controller.

- **Initial TS Connection**: Select *Cable* or *Bluetooth TS*.

Click **Next >>** to proceed to the next step of configuration wizard.

Survey Settings - 1

To configure settings for total station setup and survey.

- **Measurement Method** - method of side-shot measurements: *Direct* or *Direct/Reverse*.
  - *Direct* - the measurement to a single point is taken using the direct position of the total station.
  - *Direct/Reverse* - the measurement to a single point is taken using one direct and one reverse measurement (i.e., plunge - flip and rotate the total station by 180 degrees to get the reverse measurement). These two measurements constitute a measurement set. This measurement method is used to eliminate the vertical circle centering errors.

The settings below are applicable if the *Direct/Reverse* measurement method is selected.

- **Tolerances** panel - set acceptable deviation values for the horizontal and vertical angles and distance:
  - **Hz** - horizontal angle in angular seconds;
  - **Dist.** - distance in project units;
  - **VA** - vertical angle in angular seconds.

- **Measure reverse distance** - check the box to perform slope distance measurement in reverse mode. This option reduces the distance measurement errors. If cleared, the slope distance is measured in direct mode only.

Note: Every survey parameter you defined here can be changed later from any Survey dialog in Optical mode by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

Survey Settings - 2

To configure settings for total station setup and survey:

- **Measurement Type**: select the order and the type of the measurements in one set:
  - *HA* - horizontal angle;
  - *VA* - vertical angle;
  - *SD* - slope distance;
  - *HD* - horizontal distance;
  - *VD* - vertical distance.

- **BS Target** (backsight target) and **FS Target** (foresight target)- select one of the available target configurations from the respective drop-down list. Click the  button to add or modify target configurations in the Targets dialog.

  Note: The backsight target is applicable to backsight measurements only. More...

- **Guide** - set the necessary mode for the guide, or disable it (*Point Guide On*, *Laser Pointer On* or *Off*). (Available for specific instruments only.)
- **Guide Power** - set the power mode for the guide (*Low* or *High*). (Available for specific instruments only.)

- **EDM Mode**: select the sensitivity to use for the distance measurements (*Fine*, *Rapid* / *Coarse*, or *Tracking*). (Available for specific instruments only, displayed values vary depending on the instrument model.)

Note: Parameters you defined here for the total station can be changed later while measuring by clicking  in the title bar of total station setup and survey dialogs.

Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 1

To configure settings for stakeout performed with the total station:

- **Horizontal Distance Tolerance** and **Vertical Distance Tolerance**: enter the distance tolerance values when the graph switches to a bull's eye in stakeout.
- **Compass Orientation** - select an orientation for the top of the screen during stakeout. The on-screen compass arrow will point to the location you are staking relative to this orientation:
  - *Instrument Reference* - the top of the screen is oriented towards the total station;
  - *North* - the top of the screen is oriented north;
  - *Moving Direction* - the top of the screen is oriented to the direction of the current movement;
  - *Moving Dir + North* - is similar to the *Moving Direction* option, but the screen will but the screen will be re-oriented north when you are within three meters of the design point;
  - *Point / Azimuth (Bearing)* - if you select this orientation type, the **Orient Pt** / **Orient Az** (**Orient Brg**) toggle button will be displayed in the Stake Point dialog or the Reference Info dialog will be opened before stakeout. Here you can define a point or a direction to orient the screen top.
- **Display Reference**: select an object from the drop-down list, and the direction to this object will be indicated with the icon  in compass as a reference orientation during the stakeout.
- **Include previous staked design points** - check the box to be able to select and re-stake already staked points.

> **Note:** Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking  in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

Stake Settings - 2

To continue configuring settings forstakeout performed with the total station.

- **Turn to Design Point** - select the method that helps to turn the TS toward the next design point:
  - *None* - the total station does not assist in turning the instrument to the next design point;
  - *Display HA only* - the total station displays the calculated horizontal angle value and you will turn the instrument by this angle;
  - *Display HA/VA* - the total station displays the calculated horizontal and vertical angle values and you will turn the instrument by these angles.

- **Guide** - set the necessary mode for the guide or disable it (*Point Guide On*, *Laser Pointer On*, *Off*). (Available for specific instruments only.)

Note: Every stakeout parameter you defined here for the total station can be changed later from any stake object setup dialog by clicking in the title bar.

Click **Next >>** to proceed to the next step of configuration wizard.

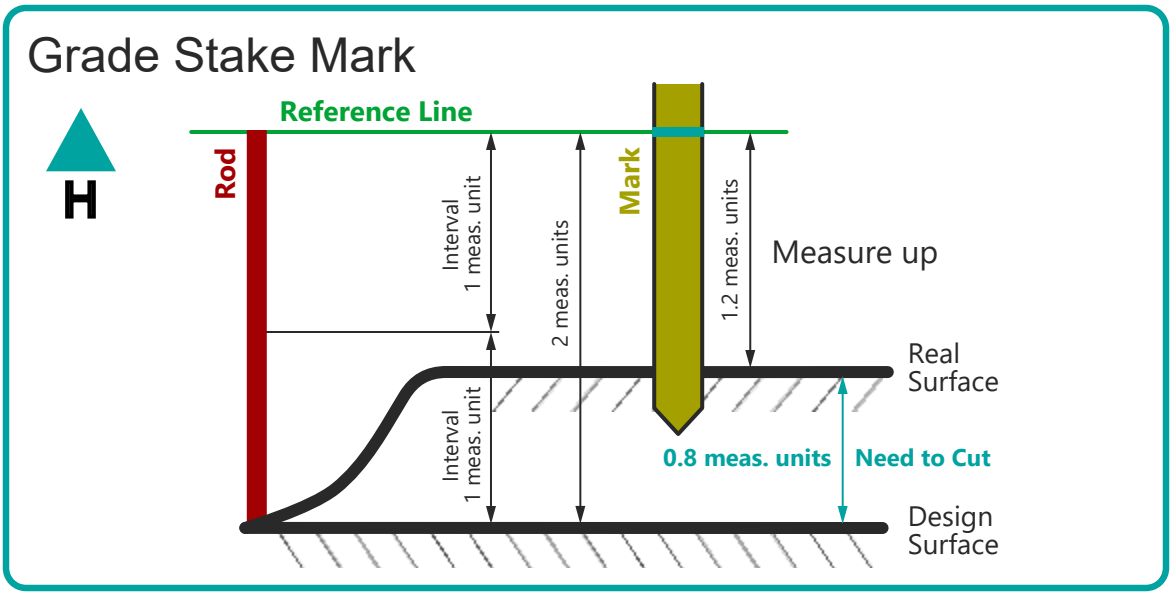
Grade Stake Marking

This dialog allows you to mark the grade stake with the skyward rounding of the cut/fill decimal values to an even number of feet (or meters).

To configure the marking settings:

1. In the **Working stake length** field, enter the working length of the stake.
2. In **Top spacing** field, enter a value of top reserve part of the stake for marking.
3. In **Bottom spacing** field, enter a value of bottom reserve part of the stake for marking.
4. In **Cut/Fill interval** field, enter an even number you want the cut/fill to round to.

Example:
If the cut is 0.8 and the bottom spacing is 0.5, we will round up to a cut of 2.0 (assuming the 1.0 interval) and place the mark at 1.2 above the ground; see below:



Click **Next >>** to proceed to the next step of configuration wizard.

Staked Point Icon

To define how staked points will be displayed on the map.

Check the **Use icon for staked point** box to enable a special icon for staked points to display them on maps. Clear the box to disable the use of special icon for staked points.

If the use of special icon for staked points on maps is enabled, select an icon symbol and color:

- Click the **Icon** button to open the Select Symbol dialog and choose a special icon for staked points on maps.
- Check the **Use tolerance colors** box to select different icon colors for staked points that are inside and outside of the distance tolerance threshold defined in the Stake Settings dialog for GNSS configuration or in the Stake Settings dialog for Optical configuration. Clear the box to use a single color for all the staked points.
  - Click the respective  button(s) to open the Select Color dialog and choose either the desired **Color** for all staked points or different colors for staked points **In Tolerance** and for staked points **Out of Tolerance**.
- Displayed icon and color(s) for staked points on maps reflect entered settings.

Click **Next >>** to proceed to the next step of configuration wizard.

Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

> **Note:** Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.

- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have pre-defined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

  The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.
  - *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
  - *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
  - *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
  - *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
  - *Range Start* - any entered value that starts the range for naming staked out points one by one.

- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:

  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";

- for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

Click **Next >>** to proceed to the next step of configuration wizard.

Miscellaneous

Customize the user interface configuration and program behavior during a survey:

- **Display coordinates after measurement**: if selected, computed coordinates are displayed automatically after a TS measurement is performed and before the point coordinates are stored into the database.
- **Apply Earth Curvature and Refraction**: if selected, the computed heights for Earth Curvature (Vertical Distance) and slope distances and vertical angles are corrected for atmospheric refraction.
- **Prompt for Rod Height**: if selected, a prompt for a height of the Rod (Target) appears before a point is stored.
- **Right/Left Rod to TS**: if selected, the right and left directions are shown relative to Rod to TS line.
- **Stakeout Sound**: if selected, a sound in Stakeout indicates as the point is staked.
- **Stake Surface Leveling Tone**: if selected, a tone in stakeout indicates that you are approaching the level of the surface.
- **Beep on Storing Points**: if selected, a sound beeps each time the point is stored.
- **VA Zero at Level/Horizontal**: this is not selected by default and VA is set to zero at Zenith. When the check box is selected, VA is set to zero at the Level / Horizontal direction. Only specific total stations allow Sokkia Field to set this value. For this reason, ensure that this option is set to the same value in the total station.
- **Use Horizontal Angle Left**: if selected, the horizontal angle measurements are shown in a counterclockwise (Left) direction. If this check box is not selected, the horizontal angle measurements are shown in a clockwise (Right) direction.
- **Automatically display BS Setup**: if selected, the Backsight dialog will be displayed automatically when you attempt to access any of the dialogs involving total station observations.
- **Hold Offset Measurement**: if selected, the dialog to measure an offset point with the help of the selected offset tool displays automatically after each measurement.
- **Remember Occ/BS if set**: if selected, you will not have to set the Backsight for total station observations once it has been set.
- **Warn if measurement is in reverse face**: if selected, the warning is displayed when a measurement is in progress and the TS is in the reverse face mode.
- **Prompt for Traverse Advance**: if selected, the prompt "Do you want to move the instrument now" displays when measuring traverse point. Click **Yes** to instantly open the Backsight dialog

and select a new occupation point and backsight point. Click **No** to select a new occupation point and backsight point manually later.

Click  to finish the configuration.

Optical Configuration: Level

- *Level* - leveling with a digital level.

To create a level configuration, complete the following steps:

1. Select the *Level* configuration type and enter the configuration name.
2. Select the instrument: Instrument dialog.
3. Select connection mode: Connection Mode and Cable dialogs.
4. Configure point naming: Point Naming dialog.
5. Configure miscellaneous parameters: Miscellaneous dialog.

Click **Next >>** to proceed to the next step of configuration wizard.

Instrument

Select the digital level that will be used in the survey:

1. Select the **Manufacturer** of the instrument.
2. Select the **Model** of the instrument. Note that the models shown in the list correspond to the chosen type of survey.

To use a *Level* type instrument in the manual mode:

1. Choose *Manual Mode* in the **Manufacturer** list.
2. Specify necessary parameters:
   - **Meas Type** - select *1 Wire*, or *3 Wire* if using stadia marks.
   - **Stadia Const** - enter the stadia interval, a fixed, integer ratio of the distance observed between stadia marks to the distance to a target.
     The option is available when *3 Wire* is selected in **Meas Type**.

Click **Next >>** to proceed to the next step of configuration wizard.

Connection Mode

Specify how the instrument - a digital level (DL) - communicates with the field controller.

- **Initial DL Connection**: Select *Cable* or *Bluetooth DL*.

Click **Next >>** to proceed to the next step of configuration wizard.

Point Naming

To specify the parameters for naming a new point.

When adding a new point, its automatically suggested name can be formed by applying an increment or decrement to its sequential number, and adding prefixes or suffixes. You can form the names for all points in such a way, except for stacked points when their naming method is not *Next Stake Point*.

Note: Initial point names for different type of points can be defined in the Names tab of the Global Settings dialog. Also you can continue point names incrementation from the previous project, select the **Continue Point Name Numbering** in the Project tab of the Global Settings dialog. These settings are applied to all your survey configurations.

To configure point naming and other parameters, use the *Point* panel:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.
- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

The desired range is specified in the **Range** field.

To set parameters for storing staked points, use the *Staked Point* panel:

- In the **Name As** field, select a method to set the number for the first staked point. The initial point name can be set to:
  - *Design Point* - the name of the design point. In this case, the staked data will be added directly to the design point and can be viewed in the Cut Sheet tab of the Edit Point dialog.
  - *Next Stake Point* - the initial name of the staked point is defined in the field **Stake** in the Names tab of the Global Settings dialog.
  - *Design Pt Prefix* - the name of the design point with a prefix that can be entered in the editable field (for example, "stk_01", where "stk_" is the prefix).
  - *Design Pt Suffix* - the name of the design point with a suffix that can be entered in the editable field (for example, (for example, "01_stk", where "_stk" is the suffix).
  - *Design Pt+Constant* - the name of the design point with the specified numerical constant added to it. For example, if the constant specified is "1000", and the design point number is "100", the staked point would be named "1100" (that is, 100+1000). If the design point number is alphanumeric, the constant is appended to the name. For example, for a design point named "ALPHA", the corresponding staked out point will be named "ALPHA1000".
  - *Range Start* - any entered value that starts the range for naming staked out points one by one.
- The **Note** can be set to either *Design Point* name, *Design Pt Prefix*, *Design Pt Suffix*, *Station & Offset* or *None*. If the *Station & Offset* option is selected, an edit box for entering an alphanumeric prefix is displayed, pre-filled with the default value:
  - for the United States, this prefix is "Sta.";
  - for the international markets the prefix is "SP.";
  - for the Korean/Japanese markets the prefix is "NO."

  With the *Station & Offset* option selected, depending on the choice of the prefix, Sokkia Field automatically generates one note for each stakeout point: "Sta.5+5.5R5.0", "SP.505.5R5.0", or "NO.5+5.5R5.0", respectively.

Click **Next >>** to proceed to the next step of configuration wizard.

Miscellaneous

Customize the user interface configuration and program behavior during a survey:

- **Display coordinates after measurement**: if selected, computed coordinates are displayed automatically after a measurement is performed and before the point coordinates are stored into the database.

- **Apply Earth Curvature and Refraction**: if selected, the computed heights for Earth Curvature (Vertical Distance) and slope distances and vertical angles are corrected for atmospheric refraction.
- **Stakeout Sound**: if selected, a sound in Stakeout indicates as the point is staked.
- **Stake Surface Leveling Tone**: if selected, a tone in stakeout indicates that you are approaching the level of the surface.
- **Beep on Storing Points**: if selected, a sound beeps each time the point is stored.
- **Hold Vertical Offset**: if selected, this is used to hold the Vertical Offset between measurements.

Click  to finish the configuration.

Other Settings for Optical Surveys

Find the description of configurations and settings of external devices, prisms and the information on specific parameters for optical survey configurations.

Cable

Configure the settings necessary for your instrument to communicate with an external device connected via *Cable*:

- **Baud** rate.
- Data frame parameters: **Parity**, **Stop** and **Data** bits.

Click **Default** to reset communication port parameters to default ones.

Comm Settings

Specify the COM port parameters to communicate with an external device:

- The COM **Port** number to which data will be logged to.
- **Baud** rate.
- Data frame parameters: **Parity**, **Stop** and **Data** bits.

Radio

Specify the communication parameters for the Total Station that is connected via *Radios* (selected in Connection Mode dialog):

1. Select the **Type** of the radio: *Satel*, *Pacific Crest*, or *Generic*.
2. Configure **Radio Communication Settings**: Baud (baud rate), Parity, Data (number of the data bits), and Stop (number of the stop bits).
3. If *Satel* or *Pacific Crest* is selected, click the **Configure Radio** button to configure the parameters of the radio.

Configuration: Radio Param

Configure the parameters for the radio modem. Note that the set of parameters depends on the radio modem type selected in Radio dialog.

Click the item below to expand the details:

Satel

- **Model**: choose the radio modem model.
- **Channel**: select the channel number.
- **Frequency**: if required, specify a custom frequency to override the default value set by selected **Channel**.
  The option is not displayed if the *2Asx* model is is selected
- **PCC Mode**: select modulation type defined by the modem type and selected protocol:
  - *No PCC* - use Satel 3As modulation.
  - *PCC 4-FSK* - use PDL 4-level FSK modulation.
  - *PCC GMSC* - use PDL GMSK modulation.
  - *Auto* - modulation type will be selected by modem.
- **FEC**: enable or disable forward error correction. To use modem's current value, select *Do not set*.

  To reset configured parameters for the radio modem and return to its default settings, click **Default**.

Pacific Crest

- Specify **Channel** number and **Sensitivity**.
- To reset configured parameters for the radio modem and return to its default settings, click **Default**.

Peripherals

To connect peripheral devices while performing survey with a robotic total station.

- Select the **Depth Finder** check box to use a cable locator or depth sounder while performing a survey. Click the **Parameters** button to specify device settings in the Depth Finder dialog.
- Select the **Pseudo GGA output** check box to enable output of pseudo GGA message to selected port. This message transfers northing, easting, and elevation coordinate values from the controller to the connected instrument. Click the **Parameters** button to specify output port and port communication settings in the NMEA Output Settings dialog for such message.

Click  to save settings and return to the previous dialog. Click  to return to the previous dialog without changes to the peripheral settings.

Targets

To view and manage target configurations available for selection and usage and to add custom targets.

1. To review target configurations and to select a new target configuration to use in measurements:
   - The list displays available target configurations based on available types of targets: *Prism*, reflective *Sheet*, reflectorless *Non-Prism* (supported target types depend on the configured instrument model):
     - predefined prisms configurations of specific prism models (*ATP1 360*, (*ATP2 360*, *A6 360*, *A7 360*, *Builder Series 360*, *SCET T-MP360*), generic prisms configurations (*0 Offset*, *-30 Offset*);
     - predefined sheet configuration with *0 Offset*;
     - predefined non-prism configuration with *0 Offset*;
     - user-created (custom) configurations of any target type.

   - Every target configuration stores the target specific parameters:
     - **Name** - the model name for predefined specific prism configurations, the target type for predefined sheet and reflectorless configurations, or the user entered name for custom target configurations.
     - **Constant** (prism constant, or P.C.) - the parameter of the *Prism* characterizing the difference between the reflection plane and the center of the prism. Prism constant is a given property of the particular prism model; the value is specified on the prism body or in prism's instruction manual. For *Sheet* and *Non-Prism* targets, the added offset distance in mm along the observation line from the physical surface of the target to the actual target point.
     - **Fusion Positioning™ antenna offset** - is the offset between horizontal optical axis of the prism and antenna reference point (ARP).

- **Height Type** - the method how the height of the prism is measured in Sokkia Field.
- **Center Offset** - the distance from bottom of prism to its center.
- **360 Prism** - indicates if a 360-degree prism is used in this configuration (Yes or No status).
- **Aperture** - the value for the *Prism* or *Sheet* reflector's aperture size in mm.

- The currently used target configuration is marked with  near its name.
- Click on a target configuration to highlight it and select it to use in measurements.
- Click  or  to change the position of selected target configuration in the list.

2. To view, add, edit, or delete specific target configuration:

> **Note:** Predefined target configurations are non-editable, you can only view target details.

- Highlight a target configuration and click the **View** / **Edit** button to open the Edit Target dialog and view the details of predefined target configuration or view and edit the target parameters for custom target configuration.
- Click the **Add** button to open the New Target dialog, enter parameters of a new user-defined target and create a custom target configuration.
- Click the **Delete** button to delete a highlighted target configuration from the list.

> **Note:** All deleted predefined target configurations can be restored by clicking  and selecting *Restore Predefined Targets* in the dialog menu.

Click  to open the dialog menu with additional options:

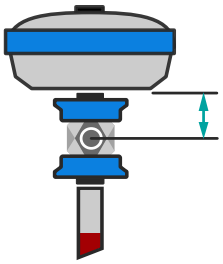
- **Restore Predefined Targets** - returns all previously deleted predefined target configurations to the list.
- **Import Targets** - replaces the current list of target configurations with one from an external file (**.xml*) previously exported from Sokkia Field.
- **Export Targets** - saves the current list of target configurations to a file (**.xml*) that can be imported to Sokkia Field if necessary.

Click  to save the current target configurations and return to the previous dialog. Click  to close the dialog without saving changes.

New Target / Edit Target

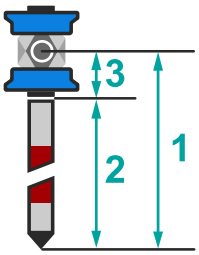
To review detailed information about the selected target; to create a new custom target, or to modify parameters of an existing custom target.

1. Review detailed information about the selected target:
   - **Name** - the name of the target configuration.
   - **Target Type** - the type of target used in this configuration, either *Prism*, reflective *Sheet*, or reflectorless *Non-Prism*.
   - **Constant** (prism constant, or P.C.) - the parameter of the *Prism* characterizing the difference between the reflection plane and the center of the prism. Prism constant is a given property of the particular prism model; the value is specified on the prism body or in prism's instruction manual. For *Sheet* and *Non-Prism* targets, the added offset distance in mm along the observation line from the physical surface of the target to the actual target point.
   - **Fusion Positioning ™ antenna offset** - the distance from the optical center of the prism to the GNSS antenna reference point. See picture below:



Note: Review the detailed information on how to set the antenna height in a single custom equipment setup ready for both Fusion Positioning ™ and standard GNSS surveys.

   - **Height Type** - the option specifies the method how you will measure the height of the prism for your routines. See picture below:



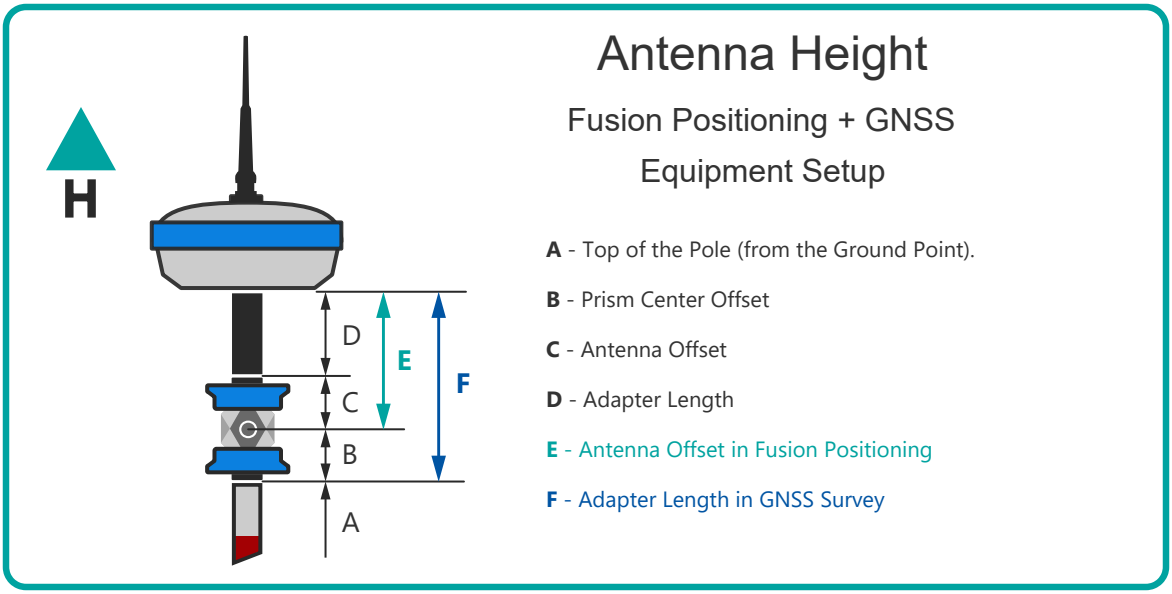
     - *Center of Prism* - in a survey, you will enter the direct height from the pole tip to the center of the prism **(1)** (measured manually, e.g. by a tape). If the Center of Prism method is used, the **Center Offset** field is disabled.
     - *Top of Pole* - in a survey, you will enter only the pole's length **(2)**. The fixed value of prism's center offset (the distance from bottom of prism to its center) will be automatically added to this height. If the *Top of Pole* method is used, you must specify this value **(3)** in the **Center Offset** field.
   - **360 Prism** - if this check box is selected, it indicates that a 360-degree prism is used in the configuration.
   - **Aperture** - the value for the *Prism* or *Sheet* reflector's aperture size in mm. Make sure the correct value is entered in this field. If incorrect aperture size is specified the tracking algorithms may produce errors.

2. Create or edit a custom target configuration:
   - Specify the **Name** for a new target configuration.
   - Select the **Target type** for this target configuration.
   - Enter or modify the selected target type related parameters (described above) as necessary.
   - Click ✓ to save the target configuration and return to the Targets dialog. Click ✗ to close the dialog without saving changes.

How to set the antenna height for simultaneous Fusion Positioning ™ and GNSS

To review the detailed information on how to set the antenna height in a single custom equipment setup ready for both Fusion Positioning ™ and standard GNSS surveys.

Sokkia Field provides the method to configure a single set of custom equipment ready for use in all types of surveys, no disassembling and no settings changing required when switching between survey types.



Actual equipment setup (*distance values are used as an example*):

- **A** - top of the pole (*2m from the ground point*).
- **B** - center offset (*0.05m - the distance from the top of the pole to the center of the reflector, can be measured manually if unknown*).
- **C** - antenna offset (*0.055m - the distance from the center of the reflector to the adapter's screw fastening, can be measured manually if unknown*).
- **D** - adapter length (*0.1m*).

- **E** - Fusion Positioning ™ antenna offset (*0.155m*) is calculated as a sum of **C** (antenna offset) **+ D** (adapter length).
- **F** - offset for standard GNSS survey that should be entered as an antenna adapter (*0.205m*) is calculated as a sum of **B** (center offset) **+ C** (antenna offset) **+ D** (adapter length).

Antenna height in standard GNSS survey

For a standard GNSS survey, the antenna height value and the adapter length should be properly set up.

In the Rover Receiver dialog of the GNSS survey configuration wizard, click the **Ant Height** button and select **Edit**. In the open Antenna Setup dialog, enter:

- **Antenna** - the **A** value (*2m*).
- **Meas as** - *Vertical*.
- **Adapter** - the **F** value (*0.205m*). Do not enter the D value (adapter length).

Antenna height in Fusion Positioning ™ survey

For a Fusion Positioning ™ survey, the correct antenna height value should be set via custom prism creation.

In the Survey Settings dialog of the optical survey configuration wizard, select your *Prism* configuration as **FS Target** and click . In the open Targets dialog, click **Add** to create the required custom prism configuration. In the open New Target / Edit Target dialog, enter:

- **Name**, **Target Type**, **Constant**, **360 prism**, **Aperture** - predefined values for the used prism model.
- **Fusion Positioning ™ antenna offset** - the **E** value (*0.155m*).
- **Height Type** - *Top of Pole*. Do not select Center of Prism.
- **Center Offset** - the **B** value (*0.05m*).

Properly configured antenna height in Sokkia Field delivers precise results with single equipment setup in both Fusion Positioning ™ and standard GNSS surveys.

Fusion Positioning ™

Fusion Positioning ™ mode allows you to record the coordinates of points measured by a GNSS receiver and a total station into a project. This feature can only be enabled for robotic total stations

operating with a prism. When using this mode, Sokkia Field connects to both a GNSS receiver and a robotic total station.

In Fusion Positioning ™, two survey configurations are simultaneously used - GNSS survey and Optical TS Robotic survey. Depending on the specifics of the field work, you can select a GNSS receiver or a robotic total station by clicking the  /  button in the title bar and instantly switch between devices.

To enable **Fusion Positioning ™**, configure GNSS and optical surveys and select the appropriate check box in the Connections dialog.

When you activate the Fusion Positioning ™, you can:

- Perform resection with new features. More...
- Use automatic tilt correction for the rod with an attached prism and a Dynamic TILT ™ / TILT ™ enabled GNSS receiver.
- Quickly search for a prism without aiming by clicking the **Fusion Lock**  button.
- Load the geo-referenced web maps for the Total Station measurements to the opened project (activate in the Backgrounds tab of the Map Properties dialog).

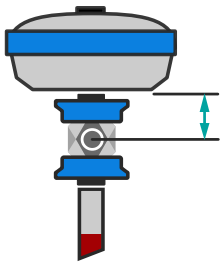
The **Fusion Lock** button  is available in the Tools Panel during Robotic TS surveys if either localization is performed, or Grid to Ground transformation is selected, or a Grid coordinate system is used. Clicking this button automatically turns the Robotic Total Station to the reflector. To search the reflector, the software uses the coordinates of the occupation point (where the Robotic Total Station is set) and current coordinates in WGS-84 coordinate system of a point where the rod (with GNSS antenna and reflector) is set.

If you use a Dynamic TILT ™ / TILT ™ enabled GNSS receiver (**GRX5** or **GRX3**) you can enable automatic tilt compensation and measure points with a robotic total station, you can enable automatic tilt compensation or tilt filtering (prohibit saving points if the rod is tilted more than the allowed threshold). To enable tilt compensation or filtering, click  to open the dialog menu and select TILT Settings from the **Setup** sub-menu. In the open dialog, select the corresponding **Compensate** or **Filter** radio button. Alternatively, long tap (right click) the electronic bubble level  and enable or disable **Tilt Correction** in the context menu or open the TILT Settings dialog. If the tilt compensation is enabled, Sokkia Field applies the offset calculated in real time based on the data measured by the HIMU sensor in the GNSS receiver to the point coordinates calculated from the robotic total station measurement and saves the point.

Note: You can view TILT related data in customizable data fields in *Map View* when using a total station during Fusion Positioning ™ survey or stakeout. Click on any customizable data field and select the desired TILT parameter in the open Select Value to Display or Select Stakeout Value dialog.

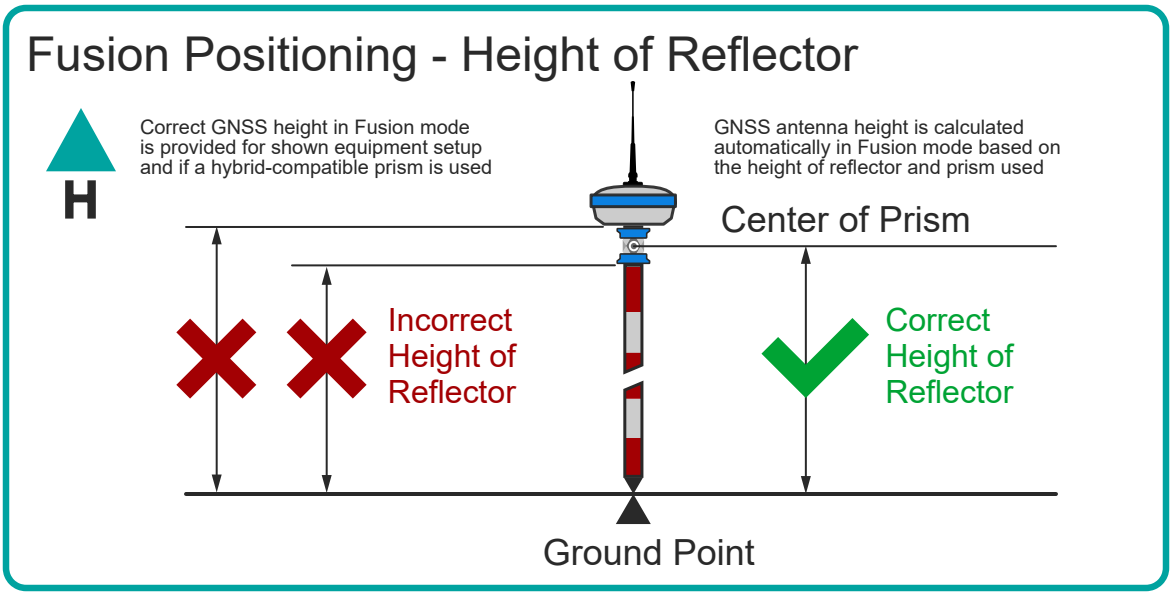
Height of Reflector and GNSS Antenna in Fusion Positioning ™

To simultaneously work with a GNSS receiver and a robotic total station in the field, you install both the GNSS receiver (antenna) and the prism on the pole. In this configuration, Sokkia Field must know *Height of reflector* and GNSS *Antenna height* to deliver accurate coordinates. When using Fusion Positioning ™ mode on a daily basis with permanent equipment in a standard configuration (a prism supporting Fusion Positioning ™ mode is attached to a pole and a GNSS receiver (antenna) is attached to the top of prism, you need to correctly specify the prism model and the height of reflector (HR).

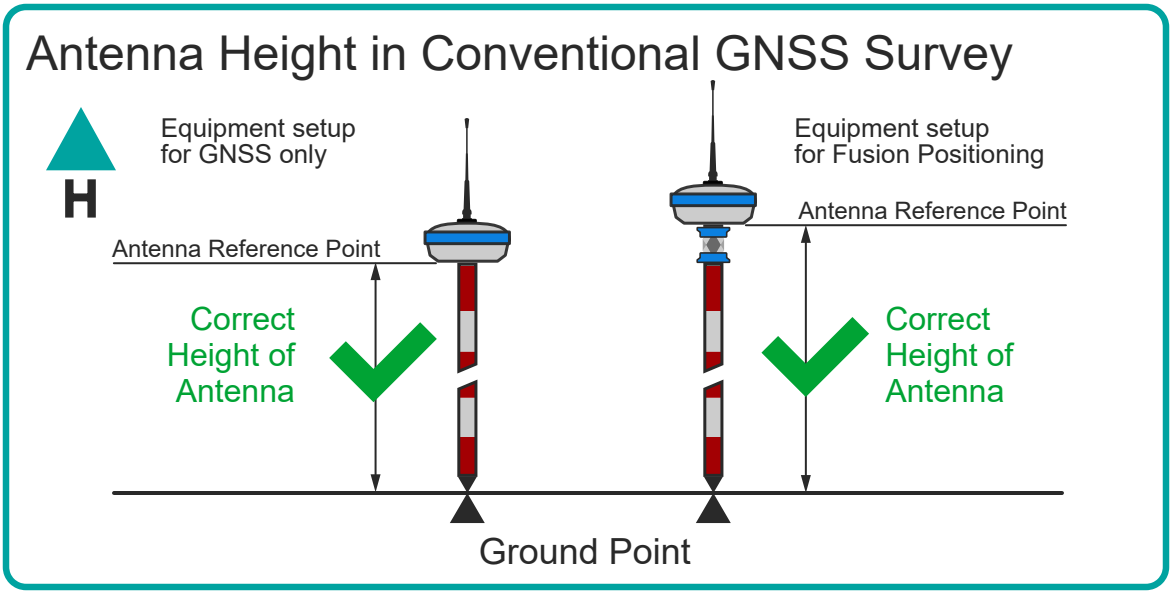


A prism supports Fusion Positioning ™ if the prism parameter **Fusion Positioning ™ antenna offset** is known to Sokkia Field. You can view supported prism models with their parameters in the Targets dialog. You can also create a custom prism model and enter the prism parameter **Fusion Positioning ™ antenna offset** by measuring this offset (distance from the optical center of the prism to the GNSS antenna reference point) manually.

In Fusion Positioning ™ mode, Sokkia Field automatically calculates the height of GNSS antenna based on the height of reflector and the **Fusion Positioning ™ antenna offset** parameter of compatible prism. In Fusion Positioning ™ mode, the GNSS antenna height specified in the GNSS survey configuration is not used. See the picture below:



A conventional GNSS survey with disabled Fusion Positioning ™ mode uses the GNSS antenna height specified in the GNSS survey configuration. Thus, Sokkia Field allows you to use a single equipment setup in conventional GNSS surveys and in Fusion Positioning ™ mode. In this case, add the pole length and prism length when specifying the antenna height in your GNSS survey configuration. See the picture below:



If custom equipment is used, the height of reflector for Fusion Positioning ™ mode and the antenna height for conventional GNSS surveys can be adjusted by entering parameters of a custom prism and a GNSS antenna adapter. Find out more on how to set the antenna height in a custom equipment setup ready for both Fusion Positioning ™ and conventional GNSS surveys.



Coordinate System

To set up the coordinate system in the current project.

- From the **Projection** drop-down list, select a projection to be used. Initially the list is empty.

  Click ... to open Pre Defined CS dialog and add desired projections to the list of projection in the current project.
- Select the **Use Grid / Ground** check box to enable transformation to ground coordinates for surveying. Click ... to open the Grid / Ground Parameters dialog and set transformation parameters. After applying the coordinate system with selected **Use Grid / Ground**, the coordinate system in the current project will be Ground. Learn more about Grid to Ground Transformation in Sokkia Field.
- From the **Datum** drop-down list, select the datum for the specified projection.

  If NAD27 datum is selected, you can use one of the following:

  - *Predefined parameters* - the application will apply parameters NAD27 from the its own database for transformation between NAD27 and NAD83_NO_TRANS datums.
  - *NADCON* - the application will apply the Federal standard (NADCON program) for NAD27 to NAD83_NO_TRANS datum transformations.

  If ATS77(CSRS), NAD27(CSRS) or NAD83(CSRS) datum is selected, you can use one of the following:

  - *Predefined parameters* - the application will apply parameters NAD27(CSRS) from its own database for transformation between NAD27(CSRS) datum and NAD83_NO_TRANS datums.
  - *File(N/A)* - the application will apply datum data from the file provided by user. Click ... to select a desired **.gsb* datum file.

> **Note:** The NAD83 datum has three independent realizations in Sokkia Field with respect to the WGS84 datum: NAD83, NAD83(ITRF96) and NAD83_NO_TRANS. More...

Click ... to add a custom datum, datum obtained by the rover from a base station, or datum obtained from third party sources (for example, *NTv2* datum). More...

- Select **Geoid** from the drop-down list. The project will refer to the selected geoid file to convert ellipsoidal heights to elevations. Click ... to add the geoid to the list. More...
- Click to apply the specified coordinate system to the current project and open Home Screen.

Click to open the dialog menu with additional options:

- Advanced NTv2 Options - to select the datum transformation direction. This feature is available when ATS77(CSRS), or NAD27(CSRS), or NAD83(CSRS) datum is selected, or NTv2 custom datum is added, and you specified a desired **.gsb* file for datum transformation.
- **Show Legacy CS** - to include some legacy CS in the list of CS available in the Pre-Defined CS dialog (expand the *_Legacy* node there). Activated feature is marked with .
- **Download Projections** - to open the Projections dialog where you can browse, download and install projections at any time via the Internet.
- **Download Datums** - to open the Datums dialog where you can browse, download and install datums at any time via the Internet.

Pre-Defined CS

To add a desired projection to the list of available projections.

The dialog contains a list of cataloged projections divided by regions, that can be added to the list of available projections in the Coordinate System dialog for further use in Sokkia Field.

In the **Pre-Defined** panel:

- Click the region node to expand the tree of available projections, and use the scroll bar to view the full list of projections.
- Highlight the name of the desired projection.
- Use to select the chosen projection in the Pre-Defined panel and insert it into the Active panel.
- Repeat the steps to add other projections.
- Create a custom projection and add it to the list of pre-defined ones by clicking the **Custom** button. More...

In the **Active** panel:

- View all active projections.
- Use  in the **Active** panel to delete a highlighted projection from the panel, if required.

Click  to add projections listed in the **Active** panel to the drop-down list in the Coordinate System dialog.

Click  to open the dialog menu with additional options:

- **Show Legacy CS** - to include some legacy CS in the **Pre-Defined** panel (expand the *_Legacy* node). Activated feature is marked with .
- **Download Projections** - to open the Projections dialog where you can browse, download and install projections at any time via the Internet.

Custom Projections

To display and manage custom projections.

Besides projections that are predefined in Sokkia Field, it is possible to use custom grid projections. Custom projections can be of the following types:

- User-defined projections with manually entered parameters.
- Projections obtained by GNSS rover receiver along with corrections data from the base station.

  These projections are marked with  in the list.

  > **Note:** The GNSS rover receiver can obtain projection / datum parameters from the base station when a Network RTK/Skybridge configuration is used and the RTCM 3.* format is selected for data corrections.

The dialog contains a list of custom (user-defined and obtained by rover) projections.

- Click **Add** to open the Custom Projection dialog, create a new custom projection and add it to the list.
- Click **Edit** to open the Custom Projection dialog and change the parameters of the highlighted projection. This can be done for user-defined projections only.
  - If a projection obtained by rover is highlighted, the **Edit** button is displayed as **View**. The parameters of projection obtained by rover are read-only.

- Click **Delete** to remove the highlighted projection from the list of available custom projections.

Custom Projection

To create a new custom projection, edit an existing custom projection, or view a projection obtained by rover.

- Enter a **Name** for the projection.
- Select a **Type** from the drop-down list of sample projections.
- Select a **Datum** from the drop-down list of available datums, or click ... to open the Custom Datums dialog and create a custom one and add it to the list of available datums.
- Enter a **Region** to which the projection belongs. If no region is specified, it will be added to the Global list.
- Enter a description (**Note**) for the projection.
- Click **Next** to enter the new projection specifications depending on the selected sample projection type. More...

Custom Projection - 2

To specify geodetic parameters of the custom projection.

Depending on the type of projection, you are prompted to fill in some of the following fields.

- Enter the latitude (*Lat0*) and longitude (*Lon0*) of a point chosen as the origin on the central meridian of the custom projection.
- Enter the false Easting (*East0* or *E0*) and Northing (*North0* or *N0*) of the origin for the projection. These constant values are added to all negative Eastings and Northings to get only positive values of Easting and Northing.
- Enter the *Scale* that sets a constant scale factor along the central meridian of the custom projection.
- Enter the longitude of *Central Meridian* for the projection.
- Enter the North and South latitudes bounding the area of the custom projection (*NorthLat* and *SouthLat*).
- Enter the azimuth of the axis (*AxisAzimuth*) for the projection.
- Select from the drop-down list where the projection *Origin* is located.

Note: The Latitudes are positive for the Northern Hemisphere, and negative for the Southern Hemisphere. The Longitudes are positive for Eastern directions and negative for Western directions from the GMT line.

Click  to save the projection and add it to the list of available projections. Click **Back** to return to the Custom Projection dialog.

Grid / Ground Parameters

To specify transformation parameters and link Grid and Ground coordinate systems in the current project.

Learn more about Grid to Ground Transformation in Sokkia Field.

- In **Parameters**, select a set of parameters to enter: *Scale Factor*, *Average Project Height* (more...) or *Origin Point* (more...).
  - For the **Scale Factor** set of parameters:
    - Enter a **Combined Scale Factor** to be used in the transformation.
    - Select a **Direction** of the scale factor (either *Ground to Grid* or *Grid to Ground*), depending on which information you have.
    - Enter an **Azimuth** / **Bearing Rotation** angle. Click  to open the Compute Rotation dialog and calculate the rotation from bearings / azimuths on Grid and Ground. Azimuths / Bearings in turn can be calculated in the Compute Azimuth / Bearing dialog based on existing points and lines.
    - Enter **Offsets** of the origin along the North and East axes. These offsets are from the Geodetic North -> Ground North.
  - For the **Average Project Height** set of parameters:
    - Enter a **Map Scale Factor** from *Ellipsoid to Grid* to be used in the transformation.
    - Enter an **Azimuth** / **Bearing Rotation** angle. Click  to open the Compute Rotation dialog and calculate the rotation from bearings / azimuths on Grid and Ground. Azimuths / Bearings in turn can be calculated in the Compute Azimuth / Bearing dialog based on existing points and lines.
    - Enter a desired **Average Project Height** value to be used in the transformation.
    - Enter **Offsets** of the origin along the North and East axes. These offsets are from the Geodetic North -> Ground North.
  - For the **Origin Point** set of parameters:
    - In the **Origin Point** field, specify an origin point of the transformation which has coordinates in Grid coordinate system. Enter a point name manually, or select from the map  or from the list  of points in the project.

- The **Combined Scale Factor** from *Grid to Ground* is displayed after specifying the origin point with grid coordinates. You can change the scale factor value for the current origin point, if required.
- Enter an **Azimuth** / **Bearing Rotation** angle. Click ... to open the Compute Rotation dialog and calculate the rotation from bearings / azimuths on Grid and Ground. Azimuths / Bearings in turn can be calculated in the Compute Azimuth / Bearing dialog based on existing points and lines.
- Manually enter **Ground Point** horizontal coordinate values matching those of the specified origin point.

- The resulting combined scale factor is displayed at the bottom of the dialog for reference purposes.
- Click  to perform calculation and link Grid and Ground coordinate systems in the current project.

Grid to Ground Transformation

Sokkia Field supports two methods for setting the relation between Grid and Ground coordinate systems. One method performs scaling and rotation relative to some point of the project. The other method performs scaling and rotation relative to the origin of the Grid coordinate system.

To get started with transformation:

- Click the Configure icon  and then the Coordinate System icon .
- Select the desired **projection** through which the link will be found with some Ground coordinate system. Only after selecting the **projection**, the option of Grid to Ground transformation will become available.
- To activate the Grid / Ground transformation select the **Use Grid / Ground** check box .
- Click ... to open the Grid / Ground Parameters dialog and select a desired transformation parameters set (either *Origin Pt*, *Avg Proj Ht*, or *Scale Factor*) and enter corresponding values for this set.

Find out more:

Creating Ground Projection Relative to a Point

Creating Ground Projection Relative to the Origin of Grid System

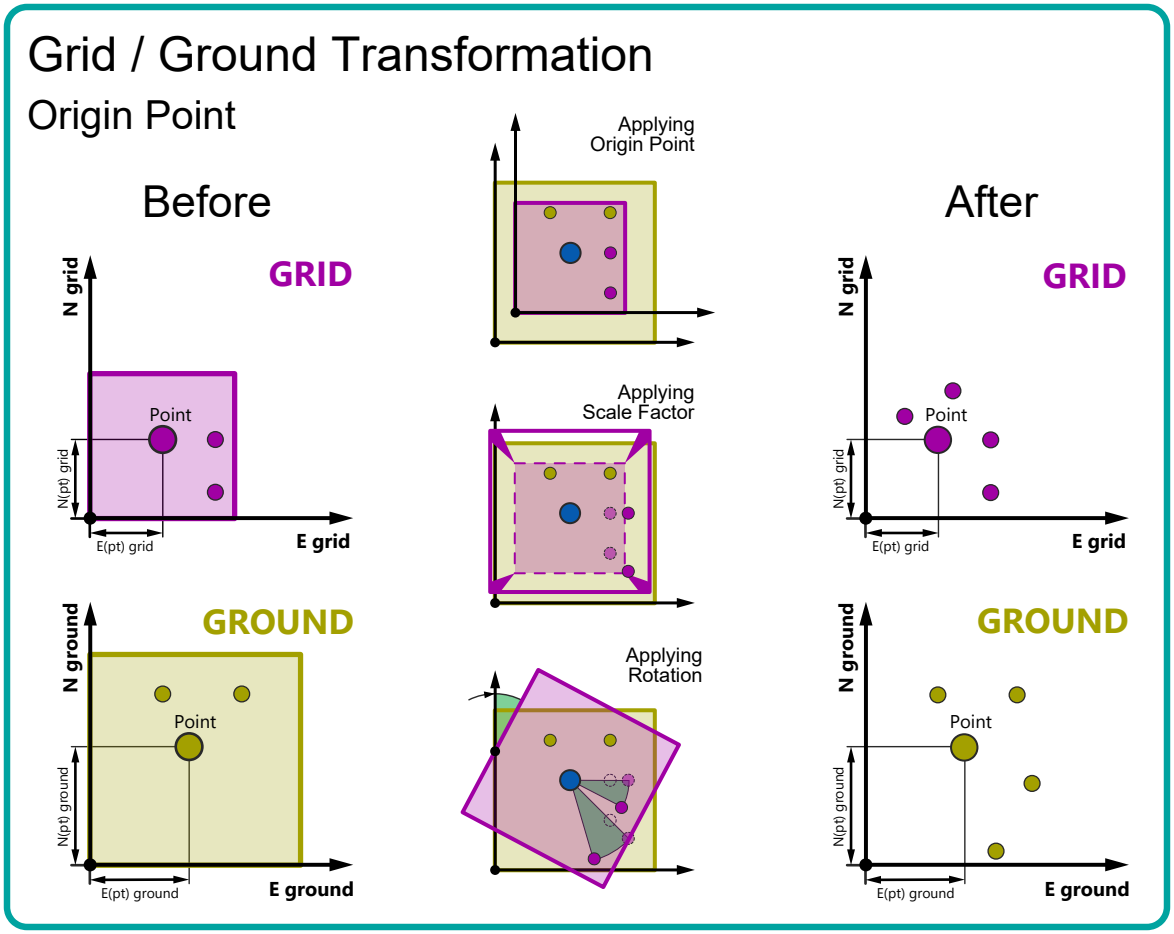
Parameters of transformation from the Grid to Ground coordinates can be used in GNSS stake of road points. For example, to stake a point at the distance of 100 meters from some point, you have

to create a ground coordinate system, which will work as a base coordinate system in GNSS stake calculation. To do this, select the corresponding Grid and enter the average height of a desired portion of the road. The created ground coordinate system enables you to stake points at special distances in the grid system.

Creating Ground Projection Relative to a Point

If you know the coordinates of a point in both coordinate systems (Grid and Ground) and also rotation of these systems, then to find the relation between Grid and Ground coordinate systems, select *Origin Pt* from the **Parameters** drop-down list in the Grid / Ground Parameters dialog.

This method calculates an offset vector in the horizontal plane between coordinates of a point (called the origin point) in the grid and ground coordinate systems and computes the ground coordinates from the grid coordinates using this offset. Sokkia Field applies a grid to ground scale factor for the selected origin point. If a rotation angle is present between these coordinate systems, Sokkia Field rotates grid coordinate system around selected origin point. See the picture below:



After determining the relation between both coordinate systems, Sokkia Field automatically calculates ground coordinates from the grid coordinate system and vice versa. The user can select the desired coordinate system or even switch between grid and ground coordinate systems at any time using the **Coord Type** drop down list in the Display dialog and work with grid and ground points in a single network of points on the map.

Look at an example of using this method below:

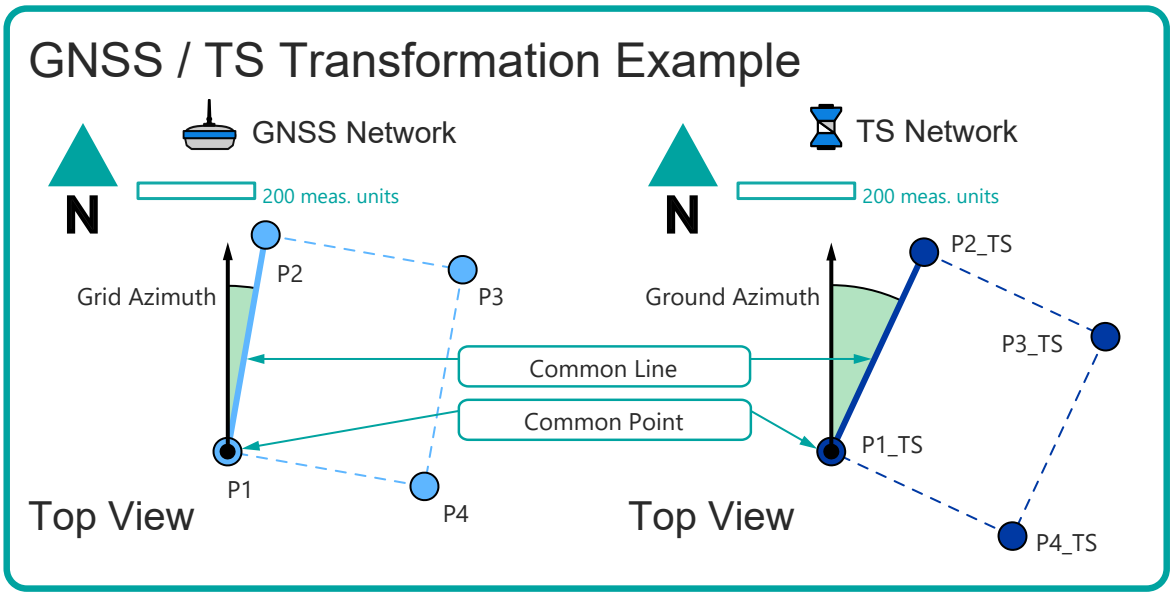
The current Sokkia Field project contains two sets of measured points:

- One network of points measured by a rover GNSS receiver in Grid coordinate system obtained from a reference station.
- Another network of points measured by a total station in the Ground coordinate system with the arbitrary choice of zero BS azimuth.

These networks have:

- A common point - the point P1 of the GNSS network and point P1_TS of the TS network. This point is the origin point for our transformation.
- A common line - the line between P1 and P2 points of the GNSS network, and the line between P1_TS and P2_TS of the TS network. The azimuths of this line in different networks will be used for calculation of the rotation angle between both coordinate systems.

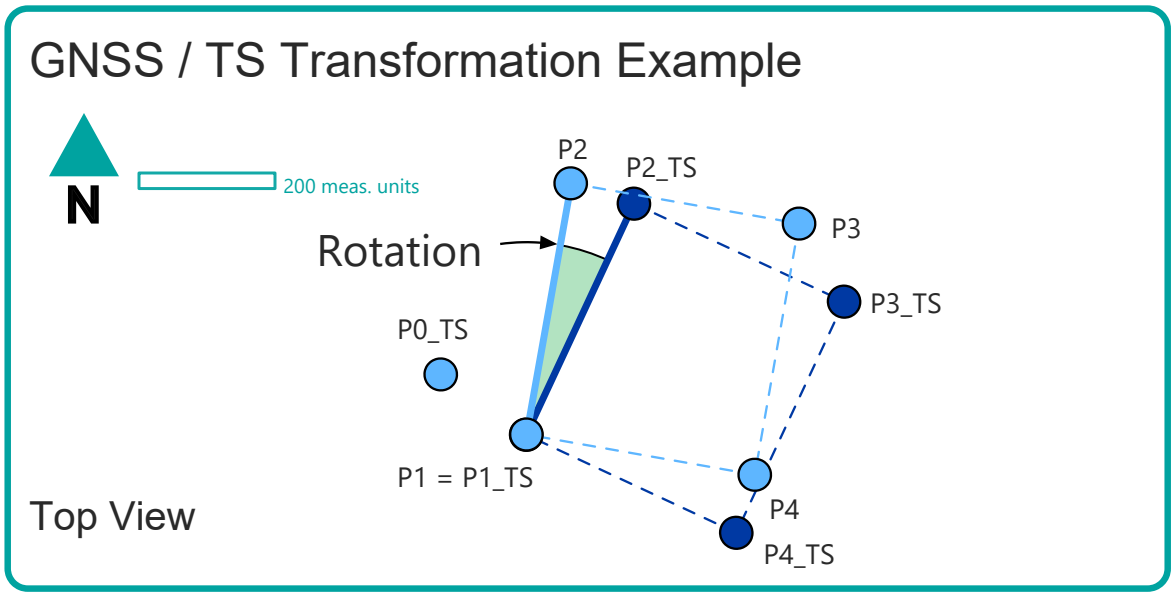
See two Map views for the different networks:



To perform Grid / Ground transformation for these networks:

- Click , select the Grid system obtained by rover from a reference station in the **Projection** field of the Coordinate System dialog.
- Check the **Use Grid / Ground** box to use this transformation, and press ... to open the Grid / Ground Parameters dialog.
- Select *Origin Pt* in the **Parameters** field to activate this method.
- Select the origin point in the Grid coordinate system (P1 point) from the list.
- Remove the coordinates of the selected point in the fields **North** and **East** of the **Ground Pt** group which Sokkia Field automatically fills with Grid coordinates.
- Manually enter the values of the Ground coordinates of the origin point (in our example, the coordinates of point P1_TS).
- Clicking in the Grid / Ground Parameters dialog:
  - Calculates a combined scale factor for this point.
  - Combines the GNSS point with the TS point. After that, the GNSS point will have horizontal coordinates of the corresponding TS point in the Ground coordinate system, and the TS point will have horizontal coordinates of the corresponding GNSS point in the Grid coordinate system.
  - Performs the grid / ground transformation taking into account the scale factor.

The Map displays the networks either in the Ground or Grid coordinate system, depending on the choice in the **Coord Type** drop-down list in the Display dialog:

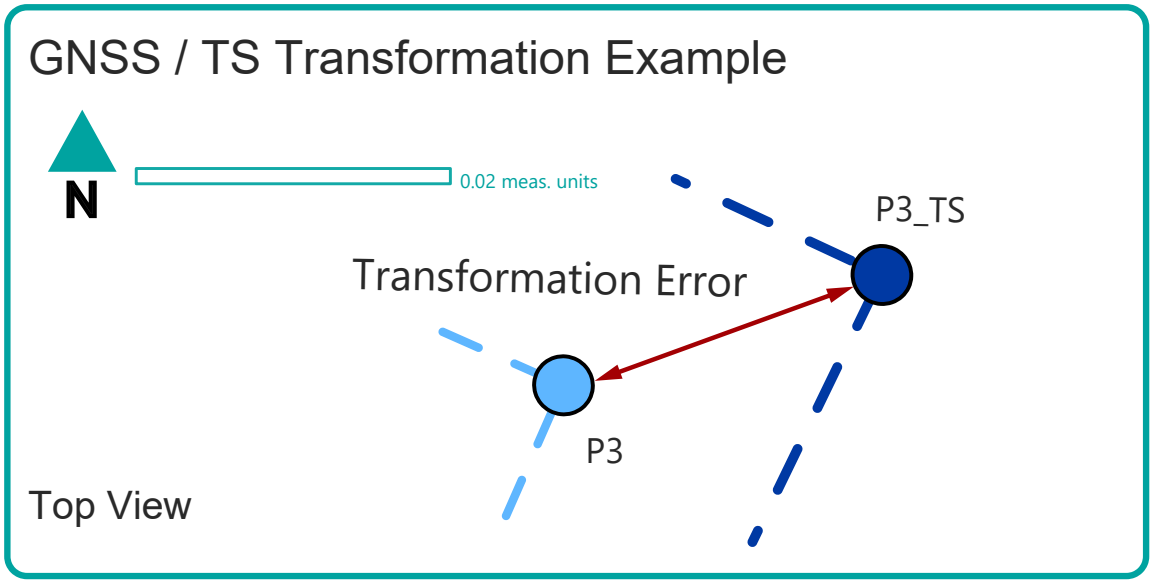


To take into account the rotation between these two networks in the grid / ground transformation:

- As we see from Map View for the different networks, the grid azimuth is set by direction of the line P1 - P2, and the ground azimuth is set by direction of the same line in ground coordinate system (the line P1_TS - P2_TS). Sokkia Field calculates the corresponding azimuth when you

select the start and end points of the line.

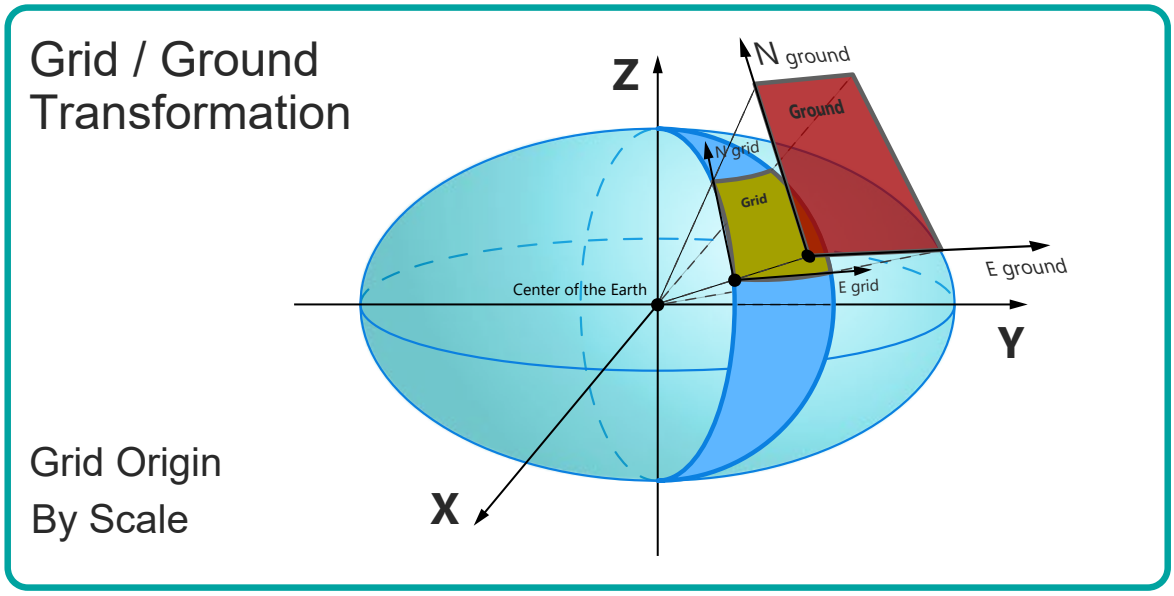
- Click ... in the **Azimuth Rotation** field. The Compute Rotation dialog calculates rotation angle between two directions.
  - Click the **Compute** button in the **Ground** line. In the open Compute Azimuth dialog, select points that define the common line in the Ground coordinate system from the list (points P1_TS and P2_TS) and calculate ground azimuth.
  - Click the **Compute** button in the **Grid** line. In the open Compute Azimuth dialog, select points that define the common line in the Grid coordinate system from the list (points P1 and P2) and calculate grid azimuth.
  - The final rotation angle between two coordinate systems for our example is displayed in the **Rotation** field. Click ✓ to save the rotation calculation.
- The Grid / Ground Parameters dialog now contains required values to calculate the relation between the Grid and Ground coordinate systems. Click ✓ to calculate.
- The Grid to Ground transformation is successfully performed. Below is the picture that displays an error of transformation taking into account the scale factor and rotation for the given example:

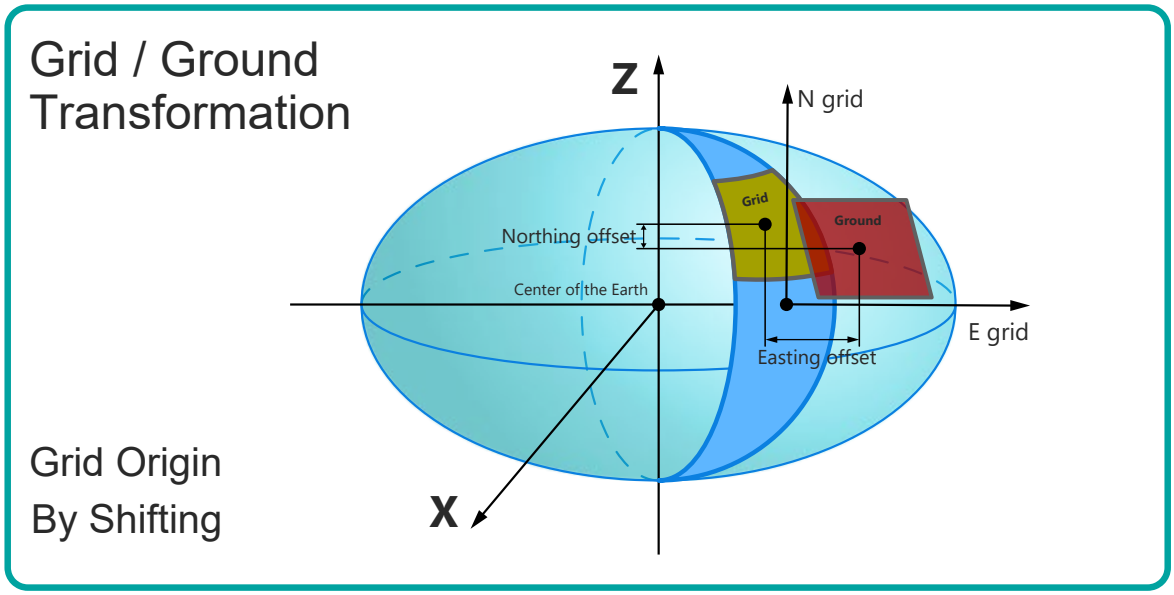


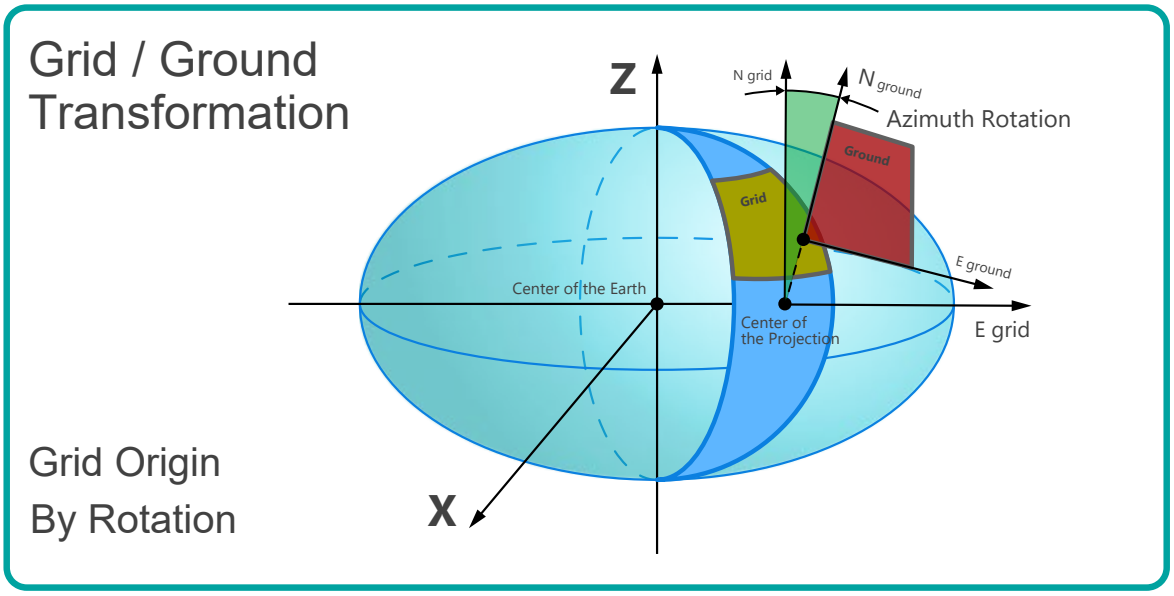
Creating Ground Projection Relative to the Origin of Grid System

If you know the value of the **scale factor** between grid and ground coordinate systems or the **average height** of the network, then, in the Grid / Ground Parameters dialog, you can select *Scale Factor* or *Avg Proj Ht* in the **Parameters** field.

This method calculates plane ground coordinates by scaling, offsetting, and rotating grid coordinates. Find below the graphic explanation of transformation by scaling only, by shifting only, and by rotating only:







To find a relation between Grid and Ground coordinate systems:

- If the scale factor is known, select *Scale factor* in the Grid / Ground Parameters dialog, enter a desired value, and select the correct **direction** (*Grid to Ground* or *Ground to Grid*) for this value.
- If the average height of the network is known, select *Avg Proj Ht* in the **Parameters** field of the Grid / Ground Parameters dialog and enter a desired value of the height in the **Avg Proj Ht** field.

  The Scale Factor will be automatically calculated from: *Scale_Factor = (1 + Avg Proj Ht / Mean_Earth_Radius)*, where *Mean_Earth_Radius* = 6371000.0 m

- In both cases you can enter the **rotation** and **offsets**:
  - If the angle of rotation is known, enter this value into the **Azimuth Rotation** field. Sokkia Field performs rotation of the Ground relative to the origin of the Grid coordinate system.
  - To shift the Ground system from the selected Grid, enter the desired plane offsets into the **North** and **East** fields.

    The final coordinates in the Ground will be calculated from: *Nground = Ngrid + Northing_Offset* and *Eground = Egrid + Easting_Offset*.

Compute Rotation

To calculate rotation from azimuth / bearing on Ground and Grid.

- Enter the **Grid** azimuth / bearing and **Ground** azimuth / bearing manually or click the Compute button to calculate azimuth / bearing by points or by segment in the project to define the respective direction.

- The **Rotation** field displays the calculated azimuth / bearing rotation angle based on direction values in the **Grid** and **Ground** fields.
- Click  to accept the rotation angle and return to the previous dialog with its value.

Compute Azimuth / Bearing

To compute the azimuth / bearing by two points or by segment that define the direction.

- Click the toggle button and choose how to define the direction either by **Segment**, or **From Point** to point.
  - If **Segment** is chosen:
    - Click  to open the Select Object From Map dialog and specify the required segment. It can be an existing linework segment or a segment between any two points.
  - If **From Point** is chosen:
    - In the **From Point** field, define the start point to calculate direction. Enter a point name manually, or select from the map  or from the list  of points in the project.
    - In the **To Point** field, define the end point to calculate direction. Enter a point name manually, or select from the map  or from the list  of points in the project.
- Enter an angle value in the **Add to Azimuth** / **Add to Bearing** field to be added to the final calculation, if required.
- The **Azimuth** / **Bearing** field displays the calculated direction.
- Click  to accept the calculated direction and return to the previous dialog with its value.

Custom Datums

To display and manage custom datums.

Besides datums that are predefined in Sokkia Field, it is possible to use the custom ones. Custom datums can be of the following types:

- User-defined datums with manually entered parameters.
- Datums obtained by GNSS rover receiver along with corrections data from the base station.

  These datums are marked with  in the list.

> **Note:** The GNSS rover receiver can obtain projection / datum parameters from the base station when a Network RTK/Skybridge configuration is used and the RTCM 3.* format is selected for data corrections.

- Datums created from files obtained from third party sources, such as *NTv2* datums.

> **Note:** The third-party component **NTv2 datum files** must be selected in Sokkia Field installer. Reinstall Sokkia Field if necessary.

The **Custom Datums** dialog contains a list of custom (user-defined, obtained by rover, third-party) datums.

- Click **Add** to open the Custom Datum dialog, create a new custom datum and add it to the list.
- Click **Edit** to open the Custom Datum dialog and change the parameters of the highlighted datum. This can be done for user-defined and third-party datums.
  - If a datum obtained by rover is highlighted, the **Edit** button is displayed as **View**. The parameters of datum obtained by rover are read-only.
- Click **Delete** to remove the highlighted datum from the list of available custom datums.

Custom Datum

To create a new custom datum, edit an existing custom datum, view a datum obtained by rover.

- Enter a **Name** for the datum.
- Select an **Ellipsoid** from the drop-down list of available ellipsoids, or click ... to open the Custom Ellipsoids dialog and create a custom one and add it to the list of available ellipsoids.
- Select a coordinates transformation **Method**, choose *NTv2* to use an NTv2 datum file.

> **NTv2 datum files** component should be selected in Sokkia Field installer. Reinstall Sokkia Field if necessary.

- Enter a description (**Note**) for the datum.
- Select an **Alias** for a new datum.
- Click **Next** to enter transformation parameters to convert from WGS84 to the new datum. More...

Custom Datum - 2

To specify coordinates transformation parameters of the custom datum.

Sokkia Field uses the seven-parameters Helmert Transformation Strict Formula for datum transformation.

Note: If *NTv2* is selected in the **Method** field of the Custom Datum dialog, this dialog allows the user to browse for the desired NTv2 regional **.gsb* file for datum transformation and displays NTv2 meta data for reference. No additional settings are required, enter a name for custom datum, browse for a desired NTv2 datum file, and click ✔ to save the new datum to the list of available datums.

To manually create a custom datum:

- In **Offsets**, enter the Datum to Space (WGS84) offsets: dX, dY, dZ.
- In **Rotations**, enter the Datum to Space (WGS84) rotations: rX, rY, rZ, in seconds.
- In **Pivot Pt**, enter the coordinates of the pivot point X0, Y0, Z0 (available if *Molodensky (with Pivot Point)* method of coordinates transformation is selected in the Custom Datum dialog.
- Enter the **Scale** in parts per million (ppm).
- Select the **Direction** of coordinates transformation.

Click ✔ to save the datum and add it to the list of available datums. Click **Back** to return to the Custom Datum dialog.

NTv2 Datum Direction / Advanced CSRS Options

In this dialog you can choose the transformation direction for the custom NTv2 datum or transformation direction between ATS77(CSRS), NAD 27(CSRS) or NAD 83(CSRS) and NAD83_NO_TRANS datums.

Open this dialog by clicking ☰ in the Coordinate System dialog and select **Adavanced NTv2 Options** from the dialog menu, after selecting the required **.gsb* datum file.

NAD83 Datum Details

The NAD83 datum has eight independent realizations in Sokkia Field with respect to the WGS84 datum: NAD83(2011), NAD83(CORS96), NAD83(CSRS 1997), NAD83(CSRS), NAD83(ITRF96), NAD83

(MA11), NAD83(PA11) and NAD83_NO_TRANS. The original intent was for WGS84 and NAD83 to be identical. The mathematical definition of the ellipsoids (WGS84 and GRS80) differs slightly due to the choice of defining constants and number of significant figures. The maximum discrepancy between a Cartesian X,Y,Z coordinate projected onto both ellipsoids is 0.1 mm at 45 degrees latitude. So consider the ellipsoids to be identical.

There is some confusion between the WGS84 and NAD83 datums. When NAD83 was first realized in 1986, it used the same control stations as WGS84, some of which were Doppler stations, which were accurate to about one meter. Consider the datums to be identical.

Since this time, there have been several realizations of WGS84, the latest being WGS84 (G1150), which was performed using data from IGS tracking stations collected during GPS Week 1150. Recent studies have shown that WGS84 (G1150) is essentially identical to the International Terrestrial Reference Frame of 2000 (ITRF00). Also, during this time there have been no new realizations of NAD83.

What this means is that WGS84 and NAD83 can no longer be considered identical and are in fact different by more than one meter. This is because the WGS84 datum has been updated over time, using GPS while the NAD83 datum has remained constant since 1986. However, most software manufacturers still consider WGS84 to be identical with NAD83.

To be compatible with other manufacturers, Sokkia provides transformation parameters from WGS84 to NAD83 where all the parameters are zero. This means WGS84 equals NAD83. This set of datum transformation parameters is called NAD83_NO_TRANS.

Sokkia also provides another set of datum transformation parameters called NAD83 which reflects the updates to WGS84. These parameters are taken from the National Geodetic Survey.

Sokkia only uses the first seven parameters, three translations, three rotations, and scale.

Custom Ellipsoids

To display and manage custom ellipsoids.

Besides ellipsoids that are predefined in Sokkia Field, it is possible to use custom ellipsoids. Custom ellipsoids can be of the following types:

- User-defined ellipsoids with manually entered parameters.
- Ellipsoids obtained by GNSS rover receiver along with corrections data from the base station.

  These ellipsoids are marked with  in the list.

> **Note:** The GNSS rover receiver can obtain projection / datum parameters from the base station when a Network RTK/Skybridge configuration is used and the RTCM 3.* format is selected for data corrections.

The dialog contains a list of custom (user-defined and obtained by rover) ellipsoids.

- Click **Add** to open the Custom Ellipsoid dialog, create a new custom ellipsoid and add it to the list.
- Click **Edit** to open the Custom Ellipsoid dialog and change the parameters of the highlighted ellipsoid. This can be done for user-defined ellipsoids only.
  - If an ellipsoid obtained by rover is highlighted, the **Edit** button is displayed as **View**. The parameters of ellipsoid obtained by rover are read-only.
- Click **Delete** to remove the highlighted ellipsoid from the list of available custom ellipsoids.

Custom Ellipsoid

To create a new custom ellipsoid, edit an existing custom ellipsoid, or view an ellipsoid obtained by rover.

- Enter a **Name** for the ellipsoid.
- Change the values of ellipsoid semi-major equatorial axis (**A**) and inverse flattening (**1/F**).

> **Note:** By default, the *A* and *1/F* fields contains the values for the most common reference ellipsoid defined by WGS84.

- Enter a description (**Note**) for the ellipsoid.

Click  to save the ellipsoid and add it to the list of available ellipsoids. Click  to return to the Custom Ellipsoids dialog without saving.

Geoids List

To display and manage geoids.

Geoid is the physical reference surface of the Earth. Its shape reflects the distribution of mass inside the Earth. Geoid undulations are important for converting GNSS-derived ellipsoidal height differences to orthometric height differences (elevations).

The dialog contains a list of installed geoids and displays the *Name*, *Full Path* and *Type* of geoid file.

- Initially, the **Geoid List** is empty.
- Click**Add** to open the Add Geoid dialog and add a new geoid to the list.

> **Note:** Install geoid files on the disk prior to adding geoids to the list. Essential regional geoid files can be installed into the *Geoids* folder during Sokkia Field installation. Alternatively, you can download and install geoids at any time via the Internet right from this dialog. Click  and select **Download Geoids** from the dialog menu to open the Geoids dialog where you can browse geoids by regions and select desired geoids for downloading and installing to Sokkia Field.

- Click **Edit** to open the Edit Geoid dialog and change the data file of the highlighted geoid.
- Click **Remove** to remove the highlighted geoid from the list.

Add / Edit Geoid

To add a new geoid to the list of installed geoids or to change the geoid file of already installed geoid.

Select a geoid file in local storage and view the geoid boundaries. Once selected, the geoid file appears in the Geoids List dialog.

- From the **Format** drop-down list, select a format of the desired geoid file.

> **Note:** The default format is the Geoid File Format (**.gff*) but some regional geoid files may have different formats. Make sure you select the correct geoid file **Format** for the geoid you are adding.

- Click Browse to navigate to the desired file in the selected geoid format and select it.
  - After selecting a geoid, the file path is displayed in the field .
  - After selecting a geoid, you can see the boundary of the geoid application: the longitudes and latitudes of the north-west  and south-east  corners of the geoid boundary.
- Click  to add the selected geoid to the list of installed geoids.

Download Geoids / Datums / Projections

To download geoids / datums / projections via the Internet to local storage.

This dialog contains a list of cataloged geoids, datums or projections available for download via the Internet for further use in Sokkia Field.

In the **Remote** panel:

- Browse expandable nodes and use the scroll bar to view the full list of available items.
- Highlight the desired item.
- Use  to insert the highlighted item into the **Download** panel for further download. You can insert a whole group of geoids, all geoid models from this group will be loaded.
- Repeat the steps to add more items.

In the **Download** panel:

- Review all the items chosen to download.
- Use  to delete a highlighted item from the **Download** panel, if required.
- Click  to download the items shown in the **Download** panel and to add them to Sokkia Field.



Global Settings

To configure Sokkia Field software interface parameters and options applied through all the projects. The availability of settings depends on the controller type.

To apply all changed settings and open the Home Screen dialog, click . To close the dialog and keep settings unchanged, click .

Configuration settings are available in four tabs:

- Main tab
- Theme tab
- Project tab
- Names tab
- Shared Data tab
- Keyboard tab

1. In the **Main** tab:

   - Select the **Port Data Logging** check box to log the data exchange between Sokkia Field and the connected device. Changing the status of the **Port Data Logging** check box will force you to reconnect the device after you click .
   - Select the **Enable Project History** check box to store the field measurements on the project to the *jobhistory.xml* file. The default file location: */Sokkia Field/Projects/<project_name>*.

   - Choose desired date and time representation formats from the corresponding drop-down lists. Select *Regional* option to match date and time representation formats with the operational system. Your current choice with actual date and time displays under drop-down lists.
   - Select the **Maps proxy** check box to apply the operational system's proxy settings for the connection to Web Map Services or Web Feature Services required to enable web maps. If you are not sure about whether this option is required for your network, please contact your system administrator.

   - Select the **Custom MyDocuments folder** check box to define a location of custom folder for data storage. With the **Custom MyDocuments folder** check box selected, click  to open the Select new MyDocuments folder dialog and choose a new folder for data storage. Clear the check box to reset the data storage location to the default folder.

   - Select a desired language for Sokkia Field interface and help from the **Select Language** drop-down list. This drop-down list is available, if you selected additional languages in Sokkia Field installation.

2. In the **Theme** tab:

   - Select the **Use Bold Font** check box to display the text in bold font style.

   - Select the **Full Screen** check box to switch in full screen mode.

   - Select the **Button Sound** check box to enable sound effects when you click any functional button.

3. In the **Project** tab:

   - Set parameters for automatic importing to a new project from the current project:

- **Localization**:
  - Select *Never import* to create new projects without importing localization.
  - Select *Always import* to automatically import localization.
  - Select *Prompt to import* to choose each time if you want to import localization.

- **Global Code Library**:
  - Select *Never import* to create new projects without importing all codes from the library.
  - Select *Always import* to automatically import all codes from the library.
  - Select *Prompt to import* to choose each time if you want to import all codes from the library.

- **Backsight Setup**:
  - Select *Never import* to create new projects without importing backsight setup settings.
  - Select *Always import* to automatically import backsight setup settings.
  - Select *Prompt to import* to choose each time if you want to import backsight setup settings.

- **Quick Codes**:
  - Select *Never import* to create new projects without importing quick codes.
  - Select *Always import* to automatically import quick codes.
  - Select *Prompt to import* to choose each time if you want to import quick codes.

- **Base Estimation**:
  - Select *Never import* to create new projects without importing base estimation data.
  - Select *Always import* to automatically import base estimation data.
  - Select *Prompt to import* to choose each time if you want to import base estimation data.

- Select the **Continue Point Name Numbering** check box to continue point names incrementation from the previous project.
  - **Example:** the name of the final point in previous project is "84"; the increment value is "9"; the name of the new project's start point will be "93".

  > **Note:** The point naming incrementation step is defined in the Point Naming dialog of the survey configuration wizard.

  If the check box is cleared, the initial point name will be suggested as the name for the first point of a certain type. You can customize initial names for points of different types in the Names tab.

4. In the **Names** tab:

Specify initial point names that Sokkia Field will automatically suggest for different types of points in the project.

An incrementation will be added to the name of each new point of the same type. The point naming incrementation step is defined in the Point Naming dialog of the survey configuration wizard. If the **Continue Point Name Numbering** box is selected in the Project tab, the initial automatically suggested point name in a new project is an incrementation of the name of the last point of that type in the last open project.

In the **Initial Point Names** field group, enter the desired starting names for each type of points:

- **Topo** - points saved to the project as a result of survey with GNSS receiver including offset points calculated on the fly during GNSS point collection.
- **Auto Topo** - automatically saved points when working in GNSS Auto Topo and Robotic TS Auto Topo modes.
- **Stake** - staked points if the **Next Stake Point** method is selected for naming staked points in the Point Naming dialog of the survey configuration wizard.
- **Cogo** - points whose coordinates are calculated using the Calculate functions.
- **Design** - points added by the user on the map or created by manually entering coordinates.
- **RTK Base** - points with reference coordinates of the DGPS / RTK base stations and points of the static GNSS occupation.
- **Occupation** - points where the total station is set up to take measurements.
- **Sideshot** - points saved to the project as a result of survey with an optical instrument. These may be points measured by total station, digital level, tape, etc. including offset points calculated on the fly from measured points.
- **TS Observation** - specific points resulted from an observation by a total station, for example a total station backsight point, or points generated from image scan.

5. In the **Shared Data** tab:

   Select the shared data file and shared data types that should be used in the current project.

   Shared data is available for use across all the projects and users of that shared data file without direct importing in the current project.

   The **Shared Data File** field displays the current file (**.mxl* / **.mxlzip* / **.xml* / **.gc3*) used to provide shared data to the current project. An empty field means that the shared data file is not in use.

   - Click **Browse** to open the Select Shared Data File dialog and select the desired file (**.mxl* / **.mxlzip* / **.xml* / **.gc3*) containing the shared data. After selection, the **Shared Data File** field displays the selected file.
     - Delete the contents of the field from the context menu (right click or tap and hold) to not use the shared data file.

> **Note:** The default folder to store shared data file is *<User Documents>\Sokkia Field\SharedData*. Do not select operation system UAC-protected folders to create and store shared data files. Sokkia Field will prohibit saving to such folders and display the respective warning.

- Check the **Use Control Points** box to use points in the shared data file as external control points  in the current project without importing them.

> **Note:** To show / hide external control points  from the shared data file on the Map views, check / clear the **External Control Points** box in the Points tab of the Map Properties dialog (click  >  >  to open).

- Check the **Use Code Library** box to use codes from the shared data file's library of codes in the current project.

> **Note:** Points and codes in the shared data file can have the same names as those in the current project. In this case, such points and codes from the shared data are not displayed in the project, points and codes from the project take precedence over them. If a point or code from the shared data file is used in the current project (for example, a code from the shared data file is assigned to a project point, or an external control point is used to create a line in the current project), the project instantly creates a local copy of that code or point with the same name.

- Click the **Manage Shared Data** button to add data from the current project to the currently selected shared data file or delete data from the currently selected shared data file. Points, codes and localization data are supported.
- Click the **Create Shared Data** button to create a new shared data file (supported formats: **.mxl* / **.mxlzip*). Specify a destination folder, enter a new file name in the New Shared Data file dialog, then add desired data from the current project. After finished, the file is created and selected, the **Shared Data File** field displays the new shared data file.

6. In the **Keyboard** tab:

   Select the typing method:

   - Select the **Sokkia Keyboard** check box to enable typing with the built-in on-screen keyboard. It displays automatically when editing values.
     If the **Sokkia Keyboard** check box is unchecked, the built-in on-screen keyboard will not

display, no matter which keyboard layouts are selected in the **Keyboard type** list. In this case, the typing method is determined by the operating system.

- In the **Keyboard type** list you can select the *QWERTY*, *AZERTY*, *QWERTZ* or *Cyrillic* keyboard layouts for the built-in on-screen keyboard. See details on how to use the on-screen keyboard.

Set actions for physical **F1** and **F2** keys of the controller:

- From the **F1/F2 TS functions** drop down fields, select the desired action for corresponding key of the controller for Optical survey configuration and connected total station. Select *Unassigned* to no longer perform the previously assigned action.
- From the **F1/F2 GNSS functions** drop down fields, select the desired action for corresponding key of the controller for GNSS survey configuration and connected GNSS receiver. Select *Unassigned* to no longer perform the previously assigned action.

> **Note:** The actions bound to **F1** and **F2** keys are performed only in dialogs where the same actions can be initiated from the user interface.

Backup

To configure regular automatic backups of your project, and to create one-time backup of current Sokkia Field settings, license, and project(s).

1. In the **Project Backup** tab:
   Configure regular automatic backups of your current project.

   - Select the **Custom backup folder** check box to define a location of custom folder for backup storage. With **Custom backup folder** check box selected, click ... to open the Select backup target folder dialog and choose a new folder for backup storage. Clear the check box to reset the backup storage to the default *Sokkia Field/Projects/<project_name>/Backups* folder.

   - From the **Frequency** drop-down list, select an interval for regular automatic backups. Choose *Never* to stop creating automatic backups.

   - In the **Backups to save from today** field, set maximum quantity of stored backup files for one current day. Sokkia Field will create backup file with frequency, specified in the **Frequency** field, overwriting older file and maintaining backup files quantity.

   - In the **Days to keep** field, you can set how many working days (days when backups were created) the backup file(s) will be kept.
     - **Example:** You set 10 files in the **Backups to save from today** field, 3 days in the **Days to keep** field, and surveyor worked three days with software (let say Monday, Wednesday and Friday), the *Backups* folder will contain the following files in the end of Friday:
       - one backup file on Monday (the last backed up file);
       - one backup file on Wednesday (the last backed up file);
       - ten backup files on Friday.

   - Click  to save the automatic regular backup configuration and open the Home Screen dialog. To close the dialog and keep the automatic regular backup configuration unchanged, click .

2. In the **Full Backup** tab:
   Create one-time backup of current Sokkia Field settings, license, and project(s).

- Select the **Include all projects from the project folder** check box to create the one-time backup of all projects stored in Sokkia Field project folder. Clear the check box to include only the current project into the one-time backup.

- In the **Backup file path** field define a location of a folder and the **.7z* backup archive file name. To change the default location and / or backup file name, click ... to open the Select backup file path dialog and choose a new folder and / or file name for the one-time backup.

- Click the **Create Backup** button, Sokkia Field will prompt to close and restart to create one-time full backup **.7z* archive file.

  Note: To restore Sokkia Field from the one-time full backup file, run the Sokkia Field Installer and select the **Restore from backup** option.



Units

To set different units and precisions for how Sokkia Field will display various numerical values in dialogs.

- Distance (including area and volume)
- Angle
- Coordinate precision
- Other

On the **Distance** tab, select as required:

- **Distance unit** for any length values. That can be Meters; *IFeet* - (1 International ft = 0.3048 m); *US Feet* (1 US survey ft = 1200/3937 m); *IFeet* and Inches, *US Feet and Inches* (the latter two are calculated by taking into account that 1 ft = 12 in), *IChains* (1 International ch = 66 International ft) or *US Chains* (1 US survey ch = 66 US survey ft).

Note: If the selected units are US feet, linear values can be entered as meters or international feet by appending "m" or "if" to the entered value. If the selected units are in meters, then a linear value in US feet or international feet can be entered by appending "f" or "if" to the end of the entered value. If the selected units are in international feet, linear values can be entered as meters or US feet by appending "m" or "f" to the entered value. The appended characters "m", "f", or "if" are case insensitive. In other words, enter "M", "F", or "IF".

Note: When using *IFeet and Inches* or *US Feet and Inches* the following format is observed: f.iix, where f is feet, ii is inches and x is 1/8th of an inch.

- **Distance precision** for the number of decimal places in length values. To display only integers, select "0" . To display 4 decimal places, select "0.1234".
- **Area unit** for area values. That can be Sq. Meters, Sq. IFeet, or Sq. USFeet.
- **Volume unit** for volume values. That can be Cubic Meters, Cubic IFeet, Cubic USFeet, Cubic IYards, or Cubic USYards.

On the **Angle** tab, select as required:

- **Meas angle unit** for values of the measured values. That can be *DMS*, represented as ddd mm ss.sss (the full circle contains 360 degrees), *DD.ddddd* decimal degrees format, *Grads (Gons)* - the full circle contains 400 grads (gons), or *Mils* (1 Mil = 1 Milliradian = 1/1000 of a Radian).

Note: Azimuth can be entered as two points separated by "-", "," or ";". Specific angles can be entered as three points separated by "-", "," or ";". For instance a value of 100-101 indicates the Azimuth from Point 100 to Point 101.

- **Meas angle precision** for the number of decimal places in angular values. To display only integers, select "0" . To display 4 decimal places, select "0.1234".
- **Calc angle unit** for angular values in Calculation tasks. In addition to *Angle unit* settings, that also can be *Radians* (the full circle contains 2*PI radians); or *Mils* (1 Mil = 1 Milliradian = 1/1000 of a Radian).
- **Calc angle precision** for the number of decimal places in angular values in Calculation tasks. To display only integers, select "0" . To display 4 decimal places, select "0.1234".

On the **Coordinate** tab, select as required:

- **Northing/Easting precision** for the number of decimal places in Northing/Easting coordinates. To display only integers, select "0" . To display 4 decimal places, select "0.1234".
- **Lat/Lon units** for the specifying of Latitude and Longitude coordinates format.

- **Lat/Lon precision** for the number of decimal places in latitude / longitude seconds.
- **Height precision** for the number of decimal places in ellipsoidal heights and elevations. To display only integers, select "0" . To display 4 decimal places, select "0.1234".

On the **Other** tab, select if necessary:

- **Temperature unit** only for the raw measurements. That can be Celsius (C) or Fahrenheit (F).
- **Pressure unit** only for the raw measurements. That can be mmHg, hPa, inHg or mbar.



Display

To customize the displaying of values in the project.

- **Coordinate Type** to view coordinates for the coordinate system type selected: *Ground*, *Grid*, *Datum (Lat/Lon/Ell ht)*, *WGS84 (Lat/Lon/Ell ht)*, *Datum(X/Y/Z)* or *WGS84(X/Y/Z)*.
- **Plane Coordinate Order** to display: *Northing, Easting, Height* or *Easting, Northing, Height*.
- **Geodetic Azimuth Origin** to display the azimuth computed from reference directions: either *North*, *South*, *East*, or *West*.
- **Direction** to view directions as bearings or azimuths.
- **Display slope as** sets how the slope will be displayed and specified: as gradient - *1 : Run (X)* or *Run (X) : 1*, *Percentage (%)* or *Angle)*.
- **Station Prefix** select a desired format for station naming by picking a prefix from the drop-down list. The ... button opens the List of Station Prefixes where you can view, edit existing and create your own prefixes for stations.
- **CL Position** select a desired format to display stationing the centerline:
  - 1234.000 - as Chainage, the distance to the station along the centerline.
  - 12+34.000 - as US Station (American format), when using 100 units as a full station plus a remainder.
  - 1+234.000 - as EU Station (Euro format), when using 1000 units as a full station plus a remainder.
  - 1/234.000 - as SWE Station (Swedish format), when using 1000 units as a full station and a slash before a remainder.
  - *Japanese Custom* - set a custom format for Japanese market. If the format is selected, the *Station Length* row is added in the dialog.
  - *Custom* - set a custom format. If the format is selected, the *Station Length* row is added in the dialog.

- **Station Length** to specify the stationing of the centerline, when the *Custom* / *Japanese Custom* format is selected.

List of Station Prefixes

To view and edit predefined station prefixes and to create and manage your own prefixes.

The dialog displays the list of currently existed station prefixes. By default, the list contains pre-defined prefixes.

- To edit a station prefix, select in the list click **Edit**. The Edit Prefix for Station dialog opens.
- To add a custom prefix, click **Add**. The Add Prefix for Station dialog opens.
- To delete a prefix, highlight it in the list and click **Delete**.

Click ✔ to save changes to station prefixes and close the dialog. Click ✖ to return to the previous dialog without saving.

Add / Edit Prefix for Station

To change an existing station prefix or to add a new station prefix.

- Enter the desired prefix.

After entering the prefix, click ✔ to return to the List of Station Prefixes and click ✔ there to save changes to the project.

Alarms

To configure alert conditions and alert signals.

The dialog contains four tabs:

1. On the **Main** tab you can select:
   - **Audible Alarm** to enable audible alarms. The alert will sound automatically when an alert situation occurs.
   - **Avoidance Alarm** to enable the blinking notification in survey dialogs, if a TS or a GNSS measurement is performed in an area marked as avoided.
   - **RTCM 3.x Coordinate Systems** to enable a warning that the coordinate system is set by reading the RTCM messages. This option will work when a GNSS device is selected.

2. On the **Controller** tab you can select:

- **Power Alarm** to play an audible alert sound if the remaining battery charge in controller falls below 15%.
- **Memory Alarm** to play an audible alert sound when low storage space is detected in the controller.

3. On the **GNSS** tab you can select:
   - **Power Alarm** to play an audible alert sound if the remaining battery charge in connected receiver falls below 15%.
   - **Memory Alarm** to play an audible alert sound when low storage space is detected in the connected receiver.
   - **Radio Link** to play an audible alert sound if poor radio link is detected.
   - **Fix-Float** to play an audible alert sound if Fixed solution dropped to Float solution.
   - **Base Changed** to play an audible alert sound if the rover began to receive correction data from another real or virtual base station.
   - **Sound on Auto Store** to play an audible alert sound on auto saving a point when the **Auto Store After** feature is enabled in the TILT ™ Settings.
   - **Tilt Calibration Alarm** to display a warning in case the tilt module requires calibration. If tilt correction is *on*, the warning is shown when either level or compass alignment is not calibrated. If tilt correction is *off*, only level calibration is checked, and the respective warning is shown, if necessary.
   - **Base Power Alarm** to display a warning and play an audible alert sound on the rover side if the remaining battery charge in base receiver falls below 15%. Available if base and rover receivers are running firmware 5.6 or later.
   - **Base Movement Alarm** to display a warning and play an audible alert sound on the rover side if the RTK or DGPS base unexpectedly changed its position during survey session.

     Note: Base Movement Alarm is available for Sokkia **GRX5** rovers. The base must be the **GRX5** receiver configured to transmit unexpected motion alert data. Configure the base to transmit RTK or DGPS corrections in RTCM 3.x / RTCM 3.x MSM3 format and check the **Base Movement Detection** box in the Receiver Settings dialog that opens from the Base Receiver dialog in the RTK/Skybridge or Real Time DGPS survey configuration wizard.

4. On the **Optical** tab you can select:
   - **Power Alarm** to play an audible alert sound if the remaining battery charge in connected optical instrument falls below 15%.
   - **Track** to play an audible alert sound if the target is lost in automatic tracking mode for connected optical instrument.
   - **Grid/Ground Warning** to enable a warning when a grid coordinate system is set.

Click  to observe information about the controller and connected device alert statuses.

After making the required changes, click  to save changes and open the Home screen. Click  to close the dialog without saving changes.



Code Options

To configure code, quick code and control code settings in the current project.

This dialog allows you to configure how Sokkia Field handles point codes, quick codes and control codes usage across the project.

To apply all changed settings and open the Home Screen dialog, click . To close the dialog and keep settings unchanged, click .

From the dialog menu that displays by clicking  in the top left corner, open the Symbols dialog to configure the size and scale of custom symbols on maps.

Code configuration settings are available in four tabs:

- Quick Codes tab
- Settings tab
- Prompts tab
- Persistence tab

1. In the **Quick Codes** tab:

   The **Quick Codes** tab allows you to simplify and speed up adding necessary codes to surveyed points by setting up quick codes groups.

   Quick Code is a group of semi-transparent buttons displayed on a survey map. Each button has its own set of point codes assigned to it. Clicking any of these buttons during survey measures a point in Quick mode and automatically applies assigned code(s) to a stored point.

   - The tab displays the list of existing quick codes groups.
     - To show a quick codes group on the map during survey, click to the left of its name. The currently used group is marked with . Only one group can be shown at a time.

Note: To switch between existing quick codes groups during survey, click  in the top left corner in any survey dialog, open **Quick Codes** sub-menu and select another quick codes group name to display on the map the quick code buttons of that group.

- To create a new quick codes group, click the **Add** button to open the Quick Codes Group dialog.
- To edit an existing group of quick codes, highlight it in the list and click the **Edit** button to open the Quick Codes Group dialog.
- To delete, highlight a group in the list and click the **Delete** button.

2. In the **Settings** tab:

   The **Settings** tab allows you to configure general settings for codes.

   - In **Default New Type**, set the default type for creating a new code. If set to either *Point*, *Line*, or *Area* a new code of the selected type is created and added on the fly when storing a point. If set to *Prompt*, the Code dialog opens each time if a new code is entered when storing point.
   - In **Data Entry**, set the preferred entry mode between *Notes* and *Codes* to be suggested in survey dialogs.
   - Check the **Code with Description** box to show the code name with code description when choosing a code from drop-down list of available codes. With the check box cleared, only code names are visible in drop-down lists of codes.
   - Check the **Allow Custom Control Codes** box to define and use customized control codes. Note, that Sokkia Field will not interpret such control codes.

3. In the **Prompts** tab:

   The **Prompts** tab allows you to configure prompts when setting codes for points being stored.

   In the **Prompt for Code in** field, check the respective box for the type of operation where you want to open the Point Attributes dialog and set the code before storing a point. This feature can be activated separately for:

   - GNSS Survey;
   - Optical Survey;
   - Stakeout;
   - Calculate Routines and Snap Toolbar.

4. In the **Persistence** tab:

   The **Persistence** tab allows you to configure the applying of previous point code(s) to next points.

During a survey routine, you can specify one or several codes for the point you measured (Point Attributes). If you want to repeat these codes for your next measured points, check the respective boxes in the **Persistence** tab. The same is for notes - you can make a note persistent for all consequent points.

Check the respective boxes to set the necessary persistence:

- **Codes** - allows to keep the codes for the next measured points.
  - **Multi-codes** - allows to keep the multi-codes (Multiple Codes) for the next measured points.
  - **Attributes** - allows to keep the attribute (Attributes) values so the next measured points with the same code retain current attributes.
  - **Custom Control Codes** - allows to keep the custom control codes for the next measured points. The option is only available when the **Allow Custom Control Codes** is checked in the Settings tab.
- **Notes** - when checked, the note you have entered for the measured point (Note tab) will be used by default for the subsequent (next measured) points.

Quick Codes Group

To create a new quick codes group or to edit an existing quick codes group.

This dialog allows you to create or edit a quick codes group, select the layout and number of buttons in a group and set codes for every button of a group.

- In the **Group name** field, enter a name for a new quick codes group being created or review a name of an existing quick codes group being edited.
- From the drop-down list to the right, select the quantity and layout for buttons positions on the screen over the map. The selected layout related to button quantity and positions on the survey map is displayed below.
- Check the box  on every button you plan to use in this quick codes group considering its position on the survey map. Clear the box  on unclaimed buttons.
- Click  on every selected  button to open the Multiple Codes dialog and assign codes to this button.

Click  to save the created or edited quick codes group, click  to return to the Quick Codes tab of the Code Options dialog without saving.

Multiple Codes

To review, add, replace or delete codes for the selected button of the quick codes group.

- Click **Add** to add another code to the button. More...
- Click **Edit** to replace the code highlighted in the list. More...
- Click **Delete** to delete a highlighted code from the button.

Click  to save the codes for the selected button of the quick codes group, click  to return to the Quick Codes Group dialog without saving.

Symbols

To configure the scale and size of displayed custom symbols for specific points or points with specific code or layer.

The values entered in this dialog affect the size of all the custom symbols displayed on maps in the current project.

- **Scalable symbols** - in the **Size** field, specify the size of scalable custom symbols on the map. All scalable custom symbols will be normalized (scaled up or shrunk to) to the specified size when displayed.
- **Non-scalable symbols** - in the **Proposed Scale 1:** field, specify the scale for non-scalable custom symbols, assuming the initial size of non-scalable symbol size is 1 mm. The displayed size of symbols with cleared **Scalable** box will depend on the specified scale.

Click  to save the custom symbols display settings, click  to return to the Code Options dialog without saving.



Stake Reports Configurations List

To display and manage configurations of stakeout reports.

Sokkia Field supports five predefined types of stake reports and offers default configurations for each of them:

- Line/Arc
- Point
- Road

- Slope
- Surface

A user can create new configurations or copy, edit, or delete existing configurations for any type of stake reports. Each type of stake reports supports multiple configurations for various project tasks.

- Review the list of available configurations for stake reports with their respective type.
  - Click the **Configuration** column header to sort existing stake report configurations by their name.
  - Click the **Type** column header to sort existing stake report configurations by the type of stake report.

- Click the **Delete** button to delete a highlighted stake report configuration from the list. A confirmation prompt displays to avoid accidental deletion.

- Click the **Edit** button to open the Report Config dialog and change a highlighted report configuration.

- Click the **Copy** button to open the Report Config dialog and create a copy of the highlighted report configuration.

- Click the **Add** button to open the Report Config dialog and create a new stake report configuration based on highlighted report configuration type.

Click  to save all the changes made to stake report configurations and return to the previous dialog. Click  to save all the changes made to stake report configurations and return to the Home Screen. Click  to discard all the changes made to stake report configurations and return to the previous dialog.

Report Configuration

To create or edit a configuration for stake reports.

- In the **Name** field, enter or edit a name of report configuration. Modifying a name is unavailable for editing default configurations.
- In the **Report Type** field, select a type of the report from the drop-down list. Changing a type of the report is unavailable when you perform either copying of an existing report configuration or modifying of any default configuration.
- Select / clear the corresponding check boxes left of the items in the list to include / exclude the corresponding information to / from the report. Use the scroll bar to view the entire list. By default all the items are included.

- Use  and  arrow buttons to change the order of displayed information in the report.
- Click the **Edit** button or just click the item to open a field and edit the item name as required.
- Click the **Tolerances** button to open the Report Tolerances dialog and specify the threshold value of precision for stakeout point(s).

Click  to save all the changes made to the stake report configuration and return to the Stake Reports Configurations List dialog. Click  to discard all the changes made to the stake report configuration and return to the Stake Reports Configurations List dialog.

Report Tolerances

To specify threshold values of precision for Northing, Easting and / or Elevation of stakeout point(s) in the report:

- Select the respective check box(es) to set a threshold value of precision for the corresponding coordinate.
- Enter a desired threshold value of precision in the current linear units for each selected coordinate.

Click  to save all the changes made to the stake report configuration and return to the Report Configuration dialog. Click  to discard all the changes made to the stake report configuration and return to the Report Configuration dialog.

You can review the result in the "In Tolerance" column of the stakeout report:

- "Yes" - if the final accuracy of the stakeout point is less than the entered threshold value.
- "No" - if the final accuracy of the stakeout point is greater than the entered threshold value.
- "No tolerance set" - if neither of the check boxes was selected.



Instrument Settings

To set current weather conditions around the instrument for calculating the atmospheric correction of measured distances and to configure tilt sensor for the robotic total station.

1. In the **Temperature / Pressure** tab, set current weather conditions:
   - Enter the value of the **Temperature** in the current units.
   - Enter the value of the air **Pressure** in the current units.
   - Enter the value of the relative **Humidity** in the current units.
   - **PPM** is automatically calculated and shows the relative distance error for provided weather conditions.

   - **Get from TS** button appears and is active only when Sokkia Field is connected to an instrument supporting this functionality. Click this button to load values from the instrument memory.
   - **Send to TS** button appears and is active only when Sokkia Field is connected to an instrument supporting this functionality. Click this button to record the entered values to the instrument memory. For unsupported instruments, a message shown in the dialog will prompt you to manually enter these values in the instrument.

2. In the **Config** tab, configure tilt sensor (this tab is available for robotic total stations supporting this functionality):
   - **Tilt** - activate or deactivate the tilt sensors in the total station:
     - **HV-On** to activate in horizontal and vertical planes.
     - **V-On** to activate in vertical plane.
     - **Off** to deactivate.

   - **Send to Instrument** button - click to save the tilt sensor setting to the total station.



Classes

The dialog displays the list of the classes for optical measurements. Each class has a specified number of measurements of horizontal angle / vertical angle / distance (**Sets** panel) and tolerances of angle and distance measurements (**Tolerances** panel):

- **Name** - name of the class;
- **HA Sets** - defines the set number of horizontal angle (HA) measurements. You can select either direct, or single direct and reverse, or multiple direct and reverse measurements of HA from the list;
- **VA Sets** - defines when the vertical angle (VA) will be measured. You can select either vertical angle measurement for direct measurements only, or for first direct and reverse measurements, or for all direct and reverse measurements of HA;
- **Dist Sets** - defines when the distance will be measured. You can select either do not measure the distance, or perform the distance measurement for first direct measurements only, or for first direct and reverse measurements, or for all direct or all direct and reverse measurements;

- **Num Dist** - defines the number of measurements for distance determination. You can select either one, or multiple measurements. Only the first distance measurement is used to calculate the position. The remainder is just recorded;
- **HA Diff.** - defines the tolerance value in the horizontal plane. The field is available for one or more (than one) direct and reverse measurements of the HA;
- **HA Diff. (r+l)** - defines the tolerance value of the collimation error in the vertical plane (vertical index error). The field is available for one or more direct and reverse measurements of the HA;
- **HA Diff (r-l)** - defines the tolerance value of the oscillation of the collimation error in the horizontal plane. The field is available for one or more direct and reverse measurements of the HA;
- **VA Diff.altitude** - defines the tolerance value in the vertical plane. This field is available when VA is measured either for one direct and reverse measurements or for all direct and reverse measurements of HA;
- **SD Diff.InSet** - defines the tolerance value for the repeated distance measurements during one set. The field is available when the value of the **Num Dist** parameter is more than 1;
- **SD Diff.b/wSet** - defines the tolerance value for the repeated distance measurements during several sets. The field is available when the value in the field **Dist Sets** is either 1DR, or D, or RD.

In this dialog, you can:

- Select a class in the list.
- Use  /  buttons to move the selected class up or down the list.
- Click **Add** to open the Add Classes dialog and create a new custom class. Parameters of the class highlighted in the list will be suggested for the new custom class.
- Click **Edit** to open the Edit Classes dialog and edit the highlighted class. You can edit any created custom class and *Sokkia Default* from the predefined classes.
- Click **View** to view parameters of the highlighted predefined class.
- Click **Delete** to delete a created custom class from the list of classes.

Add Classes

To create a new custom class based on the selected class.

- Enter the **Name**. The automatically suggested name is the name of the selected class with "*copy*" at the end.
- Select a combination of measurement **Sets** for the created class.
- Enter **Tolerances** values applicable to the selected combination of sets.
- Click  to save the new class in the list and return to the Classes dialog.

Click  to open the dialog menu with additional options:

- **Class Combination** - select how Sokkia Field updates the values in **Tolerances** fields after changing the combination of **Sets** in custom classes. If enabled, the predefined values for the current combination of sets are automatically restored. If disabled (the default state), the user entered values are kept. Activated feature is marked with ✔.

Edit Classes

To edit selected custom class or *Sokkia Default* class, or to view parameters of selected predefined class.

> **Note:** Predefined classes have non-editable parameters. They are displayed for viewing purposes only. Select a predefined class in the Classes dialog and click **Add** to create a copy of predefined class and modify the class parameters to suit your needs.

- The **Name** field shows the name of selected class. Edit the name manually if required.
- Change a combination of measurement **Sets** for the selected class.
- Enter **Tolerances** values applicable to the selected combination of sets.
- Click ✔ to save changes in the custom class and return to the Classes dialog.

Click ☰ to open the dialog menu with additional options:

- **Class Combination** - select how Sokkia Field updates the values in **Tolerances** fields after changing the combination of **Sets** in custom classes. If enabled, the predefined values for the current combination of sets are automatically restored. If disabled (the default state), the user entered values are kept. Activated feature is marked with ✔.

Archive

To exchange current project data with other projects, other files in supported formats, and cloud services.



To Project
To export data from the current project to another project.



From Project
To import data to the current project from another project.



To File
To export data from the current project to a file.



From File
To import data from a file to the current project.

To Project

Sokkia Field supports export of selected data from the current project to another project file and allows a user to choose types of exported data, filter out particular objects, and configure specific exporting parameters.

Select Project

To select or create a project file for exporting data from the current project.

The Select Project dialog displays:

- **Current Project:** - the name of a project that is currently open.
- **Project Name** - the list of the most recent projects:

  - Sokkia Field projects have the **.mjf* file extension and can be identified by the  icon.
  - By default, the list displays projects in the order of last opening. If required, click the **Project Name** header to sort projects in the alphabetical order, click again to return to the order by date.
- The **Created** and **Modified** fields display the date and time when the highlighted project was created and last modified, respectively.
-  - the path to a folder where the highlighted project is located. By default, the project files are stored in the *<program_folder>/Projects* folder.

1. To create a new project file to export data from the current project:
   - Click the **New** button to open the New Project dialog and create a new project file and configure a new project parameters.
   - After a new project file creation and project configuration, the Export To Project dialog opens to proceed with export configuration.
2. To select an existing project file from the list of recent projects:
   - Highlight the name of a project in the list.
   - Click  to use highlighted project as the target file and open the Export To Project dialog to proceed with export configuration.
3. To select an existing project file located in a specific folder:
   - Click the **Browse** button to navigate to the desired file.
   - Select a project file type to be used as the target file type from the **Type** drop-down list:
     - **.mjf* Sokkia Field Projects
     - **.mjfzip* Sokkia Field Project Package
     - **.mjf.bak* Sokkia Field Project Backups
     - **.tsj* TopSURV Job Files
     - **.tsj.bak* TopSURV Job Backups
   - Highlight a project file to be used as the target file and click  to open the Export To Project dialog to proceed with export configuration.

Export to Project

To include or exclude from exporting specific types of available data in the current project and to configure general exporting parameters.

> **Note:** The types of data actually displayed in this dialog depend on the contents of the current project.

- Review the list of available data types in the current project eligible to export.
- Select check box(es) near the data type(s) to be included in export. Clear check box(es) near the data type(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted item. The context menu also simplifies multiple data types highlighting with the following commands:
  - **Select All** - highlights all data types in the list.
  - **Select All Below** - highlights a currently highlighted data type and all the data types in the list displayed below.
  - **Select Multiple** - highlights multiple data types by sequential clicking on data type names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the data types in export. Click the **Unselect All** button to exclude all the data types from export.

- Check the **Use filters** box if you plan to apply filters for objects to be exported. With the check box selected, the Filters dialog will display to choose and configure filtering options. Clear the box to skip filtering objects in export. The **Use filters** check box is deactivated, if no data types eligible to filtering are selected.

- Click the **Settings** button to open the Settings dialog and choose how to save exported points in the target project: either as design points or as control points.

- Depending on the data type(s) chosen for export and the **Use filter** check box selection, click either ✔ to proceed with target data generation or **Next** to proceed with target data configuration.
- Click **Back** to return to the Select Project dialog.

Settings

To save exported points from the current project either as design points or as control points in the target project.

- From the **Export Points As** drop-down list select:
  - **Control Points** - the points with coordinates, known from the catalog. These are used for localization.
  - **Design Points** - the points used as targets for staking.
- Click  to apply the selected settings and return to the Export to Project dialog. Click  to return to the previous dialog without changes to the settings.

 From Project

Sokkia Field supports import of selected data from another project file to the current project and allows a user to choose types of imported data, filter out particular objects, and configure specific importing parameters.

Select Project

To select a project file for importing data to the current project.

The Select Project dialog displays:

- **Current Project:** - the name of a project that is currently open.
- **Project Name** - the list of the most recent projects:
  - Sokkia Field projects have the **.mjf* file extension and can be identified by the  icon.
  - By default, the list displays projects in the order of last opening. If required, click the **Project Name** header to sort projects in the alphabetical order, click again to return to the order by date.
- The **Created** and **Modified** fields display the date and time when the highlighted project was created and last modified, respectively.
-  - the path to a folder where the highlighted project is located. By default, the project files are stored in the *<program_folder>/Projects* folder.

1. To select an existing project file from the list of recent projects:

   - Highlight the name of a project in the list.
   - Click  to use highlighted project as the source file and open the Import from Project dialog to proceed with import configuration.

2. To select an existing project file located in a specific folder:

   - Click the **Browse** button to navigate to the desired file.
   - Select a project file type to be used as the source file type from the **Type** drop-down list:
     - **.mjf* Sokkia Field Projects
     - **.mjfzip* Sokkia Field Project Package
     - **.mjf.bak* Sokkia Field Project Backups
     - **.tsj* TopSURV Job Files
     - **.tsj.bak* TopSURV Job Backups
   - Highlight a project file to be used as the source for import and click  to open the Import from Project dialog to proceed with import configuration.

Import from Project

To include or exclude from importing specific types of available data in a source project and to configure general importing parameters.

> **Note:** The types of data actually displayed in this dialog depend on the contents of a source project.

- Review the list of available data types in a source project eligible to import.
- Select check box(es) near the data type(s) to be included in import. Clear check box(es) near the data type(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted item. The context menu also simplifies multiple data types highlighting with the following commands:
  - **Select All** - highlights all data types in the list.
  - **Select All Below** - highlights a currently highlighted data type and all the data types in the list displayed below.
  - **Select Multiple** - highlights multiple data types by sequential clicking on data type names.
  - **Cancel Selection** - removes all highlights in the list.

- Click the **Select All** button to include all the data types in import. Click the **Unselect All** button to exclude all the data types from import.

- Check the **Use filters** box if you plan to apply filters for objects to be imported. With the check box selected, the Filters dialog will display to choose and configure filtering options. Clear the box to skip filtering objects in import. The **Use filters** check box is deactivated, if no data types eligible to filtering are selected.

- Click the **Settings** button to open the Settings dialog and choose how to save imported points in the current project: either as design points or as control points.

- Depending on the data type(s) chosen for import and the **Use filter** check box selection, click either ✓ to proceed with importing data to the current project or **Next** to proceed with import configuration.
- Click **Back** to return to the Select Project dialog.

Settings

To save imported points to the current project either as design points or as control points.

- From the **Import Points As** drop-down list select:
  - **Control Points** - the points with coordinates, known from the catalog. These are used for localization.
  - **Design Points** - the points used as targets for staking.
- Click ✓ to apply the selected settings and return to the Import from Project dialog. Click ✗ to return to the previous dialog without changes to the settings.

Select Region(s) to Import

To select region(s) from a source file to be included in import.

This dialog displays if **Regions** were selected as a data type included in import in either the Import from project dialog, or the Data Selection dialog.

- Review the list of available regions.
- Select check box(es) near the region name(s) to be included in import. Clear check box(es) near the region name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted region(s). The context menu also simplifies multiple regions highlighting with the following commands:

  - **Select All** - highlights all regions in the list.
  - **Select All Below** - highlights a currently highlighted region and all the regions in the list displayed below.
  - **Select Multiple** - highlights multiple regions by sequential clicking on region names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the regions in import. Click the **Unselect All** button to exclude all the regions from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Background Image(s) to Import

To select background image(s) from a source file to be included in import.

This dialog displays if **Background Images** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available background images.
- Select check box(es) near the background image name(s) to be included in import. Clear check box(es) near the background image name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted background image(s). The context menu also simplifies multiple background images highlighting with the following commands:
  - **Select All** - highlights all background images in the list.
  - **Select All Below** - highlights a currently highlighted background image and all the background images in the list displayed below.
  - **Select Multiple** - highlights multiple background images by sequential clicking on background image names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the background images in import. Click the **Unselect All** button to exclude all the background images from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Field Report(s) to Import

To select field report(s) from a source file to be included in import.

This dialog displays if **Field Reports** were selected as a data type included in import in the Data Selection dialog.

- Review the list of available field reports.
- Select check box(es) near the field report name(s) to be included in import. Clear check box(es) near the field report name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted field report(s). The context menu also simplifies multiple field reports highlighting with the following commands:
  - **Select All** - highlights all field reports in the list.
  - **Select All Below** - highlights a currently highlighted field report and all the field reports in the list displayed below.
  - **Select Multiple** - highlights multiple field reports by sequential clicking on field report names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the field reports in import. Click the **Unselect All** button to exclude all the field reports from import.
- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Plane(s) to Import

To select plane object(s) from a source file to be included in import.

This dialog displays if **Planes** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available plane objects.
- Select check box(es) near the plane name(s) to be included in import. Clear check box(es) near the plane name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted plane(s). The context menu also simplifies multiple planes highlighting with the following commands:
  - **Select All** - highlights all planes in the list.
  - **Select All Below** - highlights a currently highlighted plane and all the planes in the list displayed below.

  - **Select Multiple** - highlights multiple planes by sequential clicking on plane names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the planes in import. Click the **Unselect All** button to exclude all the planes from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Surface(s) to Import

To select surface object(s) from a source file to be included in import.

This dialog displays if **Surfaces** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available surface objects.
- Select check box(es) near the surface name(s) to be included in import. Clear check box(es) near the surface name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted surface(s). The context menu also simplifies multiple surfaces highlighting with the following commands:
  - **Select All** - highlights all surfaces in the list.
  - **Select All Below** - highlights a currently highlighted surface and all the surfaces in the list displayed below.
  - **Select Multiple** - highlights multiple surfaces by sequential clicking on surface names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the surfaces in import. Click the **Unselect All** button to exclude all the surfaces from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Road(s) to Import

To select road object(s) from a source file to be included in import.

This dialog displays if **Roads** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available road objects.
- Select check box(es) near the road name(s) to be included in import. Clear check box(es) near the road name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted road(s). The context menu also simplifies multiple roads highlighting with the following commands:
  - **Select All** - highlights all roads in the list.
  - **Select All Below** - highlights a currently highlighted road and all the roads in the list displayed below.
  - **Select Multiple** - highlights multiple roads by sequential clicking on road names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the roads in import. Click the **Unselect All** button to exclude all the roads from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Road String Set(s) to Import

To select road string(s) from a source file to be included in import.

This dialog displays if **Road String Sets** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available road strings.
- Select check box(es) near the road string name(s) to be included in import. Clear check box(es) near the road string name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted road string(s). The context menu also simplifies multiple road strings highlighting with the following commands:
  - **Select All** - highlights all road strings in the list.
  - **Select All Below** - highlights a currently highlighted road string and all the road strings in the list displayed below.
  - **Select Multiple** - highlights multiple road strings by sequential clicking on road string names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the road strings in import. Click the **Unselect All** button to exclude all the road strings from import.

- Click **Next** to proceed with import configuration.

- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select X-section Set(s) to Import

To select x-section set object(s) from a source file to be included in import.

This dialog displays if **X-section Sets** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available x-section set objects.
- Select check box(es) near the x-section set name(s) to be included in import. Clear check box(es) near the x-section set name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted x-section set(s). The context menu also simplifies multiple x-section sets highlighting with the following commands:
  - **Select All** - highlights all x-section sets in the list.
  - **Select All Below** - highlights a currently highlighted x-section set and all the x-section sets in the list displayed below.
  - **Select Multiple** - highlights multiple x-section sets by sequential clicking on x-section set names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the x-section sets in import. Click the **Unselect All** button to exclude all the x-section sets from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select V.Alignment(s) to Import

To select vertical alignment(s) from a source file to be included in import.

This dialog displays if **Vertical Alignments** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available vertical alignments.
- Select check box(es) near the vertical alignment name(s) to be included in import. Clear check box(es) near the vertical alignment name(s) to be excluded from import.

- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted vertical alignment(s). The context menu also simplifies multiple vertical alignments highlighting with the following commands:
  - **Select All** - highlights all vertical alignments in the list.
  - **Select All Below** - highlights a currently highlighted vertical alignment and all the vertical alignments in the list displayed below.
  - **Select Multiple** - highlights multiple vertical alignments by sequential clicking on vertical alignment names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the vertical alignments in import. Click the **Unselect All** button to exclude all the vertical alignments from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select H.Alignment(s) to Import

To select horizontal alignment(s) from a source file to be included in import.

This dialog displays if **Horizontal Alignments** were selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the list of available horizontal alignments.
- Select check box(es) near the horizontal alignment name(s) to be included in import. Clear check box(es) near the horizontal alignment name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted horizontal alignment(s). The context menu also simplifies multiple horizontal alignments highlighting with the following commands:
  - **Select All** - highlights all horizontal alignments in the list.
  - **Select All Below** - highlights a currently highlighted horizontal alignment and all the horizontal alignments in the list displayed below.
  - **Select Multiple** - highlights multiple horizontal alignments by sequential clicking on horizontal alignment names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the horizontal alignments in import. Click the **Unselect All** button to exclude all the horizontal alignments from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Point List(s) to Import

To select point list(s) from a source file to be included in import.

This dialog displays if **Point Lists** was selected as a data type included in import in either the Import from Project dialog, or the Data Selection dialog.

- Review the table of available point lists.
- Select check box(es) near the point list name(s) to be included in import. Clear check box(es) near the point list name(s) to be excluded from import.
- Use the context menu in the table with **Check** / **Uncheck** commands applicable to highlighted point list(s). The context menu also simplifies multiple point lists highlighting with the following commands:
  - **Select All** - highlights all point lists from the table.
  - **Select All Below** - highlights a currently highlighted point list and all the point lists in the table displayed below.
  - **Select Multiple** - highlights multiple point lists by sequential clicking on point list names.
  - **Cancel Selection** - removes all highlights in the table.
- Click the **Select All** button to include all the point lists in import. Click the **Unselect All** button to exclude all the point lists from import.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Filters

To select and apply filters to the objects in a source data file included in import to the current project.

This dialog displays when the **Use Filters** option was selected for import in the Import From Project or From File dialog.

> **Note:** The set of the filters actually available for use depends on the object type(s) selected for import in the Import From Project or From File dialog and the chosen source file format.

- The list of available filters:

  - Filter data by Date/Time - specifies time range for the objects to be imported.
  - Filter points by Names range -specifies name(s) of the points to be imported.

- Filter points by Point types - specifies type(s) of the points to be imported.
- Filter points by Codes - specifies code(s) to import the points having that code(s).
- Filter data by Layer - specifies layer(s) to import the objects belonging to that layer(s) only.
- Filter Custom Symbols - specifies custom symbol(s) to import the points having that custom symbol(s).

- To choose filters for objects included in import.

  - Select / clear appropriate check boxes in the **Available Filters** list to use / skip filter(s). To use / skip all the filters in the list, click the **Select All** / **Unselect All** button. Use commands from the context menu:
    - **Select All** - highlights all filters in the list.
    - **Select All Below** - highlights a currently highlighted filter and all the filters in the list displayed below.
    - **Select Multiple** - highlights multiple filters by sequential clicking on filter names.
    - **Cancel Selection** - removes all highlights in the list.
    - **Check** - selects check boxes next to highlighted filters.
    - **Uncheck** - clears check boxes next to highlighted filters.

  - Click **Next** to proceed and configure parameters of each chosen filter. The import configuration will continue if no filters used.
  - Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Filter by Time

To specify a time range for the objects from a source file to be imported to the current project.

This dialog displays if **Filter by Date/Time** was selected in the Filters dialog.

- Click **Today** radio button to import objects that have been created today.
- Click **Yesterday** radio button to import objects that have been created yesterday.
- Click **Time range** radio button to import objects created in the specific time interval:
  - Enter starting date and time for the time interval in the **From:** field. Type by keyboard or use arrows to change a highlighted value.
  - Enter ending date and time for the time interval in the **To:** field. Type by keyboard or use arrows to change a highlighted value.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with import configuration.

- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Points Range Filter

To specify names and / or name ranges for the points in a source file to be imported to the current project.

This dialog displays if **Filter points by Names range** was selected in the Filters dialog.

- Enter point names and / or name ranges in the **Point names range** text field.
  - Use either comma (**,**') or semicolon (**;**') symbols to separate individual point names and / or ranges of names. Use minus '**-**' symbol between point names to form a range. Put point names containing minus '**-**' symbol in quotation marks, for example **"Pointname-1"**.
  - Type names and / or name ranges by keyboard.
  - Use the context menu with **Cut**, **Copy**, **Paste**, **Delete**, **Select All** commands to edit text.
  - **Paste** a prepared list with point names and / or name ranges from clipboard.
- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Point Type(s) to Import

To specify type(s) of the points in a source file to be imported to the current project.

This dialog displays if **Filter points by Point types** was selected in the Filters dialog.

> **Note:** At least one point type should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select point type(s) in the **Point types** list to include into the import filter.
  - Select check box(es) near the point type(s) to be included in import. Clear check box(es) near the point type(s) to be excluded from import.

- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted point type(s). The context menu also simplifies multiple point types highlighting with the following commands:
  - **Select All** - highlights all point types in the list.
  - **Select All Below** - highlights a currently highlighted point type and all the point types in the list displayed below.
  - **Select Multiple** - highlights multiple point types by sequential clicking on point type names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the point types in import. Click the **Unselect All** button to exclude all the point types from import.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Codes

To specify code(s) to import the source file's points having that code(s).

This dialog displays if **Filter points by Codes** was selected in the Filters dialog.

> **Note:** At least one code should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select point code(s) in the **Code(s)** list to include into the import filter.
  - Select check box(es) near the code(s) to be included in import. Clear check box(es) near the code(s) to be excluded from import.

    > **Note:** To include / exclude points without code, check / clear the box near the *No Codes* item.

  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted code(s). The context menu also simplifies multiple codes highlighting with the following commands:
    - **Select All** - highlights all codes in the list.
    - **Select All Below** - highlights a currently highlighted code and all the codes in the list displayed below.

    - **Select Multiple** - highlights multiple codes by sequential clicking on code names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include all the codes in import. Click the **Unselect All** button to exclude all the codes from import.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Layers

To specify layer(s) from a source file to import the objects belonging to that layer(s) only.

This dialog displays if **Filter data by Layer** was selected in the Filters dialog.

> **Note:** At least one layer should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select layer(s) in the **Layer(s)** list to include the objects belonging to that layer(s) into the import filter.
  - Select check box(es) near the layer(s) to be included in import. Clear check box(es) near the layer(s) to be excluded from import.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted layer(s). The context menu also simplifies multiple layers highlighting with the following commands:
    - **Select All** - highlights all layers in the list.
    - **Select All Below** - highlights a currently highlighted layer and all the layers in the list displayed below.
    - **Select Multiple** - highlights multiple layers by sequential clicking on layer names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include the objects from all the layers in import. Click the **Unselect All** button to exclude the objects from all the layers from import.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Custom Symbol(s) to Import

To specify custom symbol(s) to import the source file's points having that custom symbol(s) in the point style attribute.

This dialog displays if **Filter Custom Symbols** was selected in the Filters dialog.

> **Note:** At least one custom symbol should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select custom symbol(s) in the **Symbol(s)** list to include the point(s) having that custom symbol (s) into the import filter.

  - Select check box(es) near the custom symbol(s) to be included in import. Clear check box(es) near the custom symbol(s) to be excluded from import.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted custom symbol(s). The context menu also simplifies multiple custom symbols highlighting with the following commands:
    - **Select All** - highlights all custom symbols in the list.
    - **Select All Below** - highlights a currently highlighted custom symbol and all the custom symbols in the list displayed below.
    - **Select Multiple** - highlights multiple custom symbols by sequential clicking on custom symbol names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include all the custom symbols in import. Click the **Unselect All** button to exclude all the custom symbols from import.

- Click **Next** to apply the settings and continue with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.



To File

To export data from the current project to an external file.

Sokkia Field supports export of multiple types of data from the current project to files in many external formats. This dialog allows a user to select types of exported data, choose a format of the target file(s), and configure exporting parameters. Depending on the types of data to be exported and the target format chosen, the dialog offers various combinations of export configuration options.

- Use the **Data** drop-down list to select a type of data in the current project to export. Choose *Multiple* to include all the types of data supported by the exporting format.

- Use the **Format** drop-down list to select a target file format. The actual file formats available in the list depend on the type of data chosen for exporting.

- Review and set up configuration options available for specific combinations of selected data type and target format:

  - **Select file units** check box:
    Check the **Select file units** box if you plan to change distance and / or angular measurements units for exported data. With the check box selected, the File Units dialog will display later in export configuration. Clear the box to leave distance and angular measurements units unchanged.

  - **Use filters** check box:
    Check the **Use filters** box if you plan to apply filters for objects to be exported. With the check box selected, the Filters dialog will display to choose and configure filtering options later in export configuration.

  - **X-sections as Zones** check box:
    Check the **X-sections as Zones** box to save x-sections as zones to the target file. With the check box cleared, x-sections will not be exported.

  - **Export areas as lines** check box:
    Check the **Export areas as lines** box to save areas as lines to the target file. With the check box cleared, areas will not be exported.

  - **Append points to existing file** check box:
    Check the **Append points to existing file** box to append source points data to the points

data in existing target file. (You will need to select and overwrite an existing file in compatible format later. New points data will append to the end of data already recorded in that file.) With the check box cleared, the existing file will be completely overwritten, if chosen as the target file.

-  **Export Code as Notes** check box:
  Check the **Export Code as Notes** box to write point codes data to the text note for points in the target file. With the check box cleared, point codes data will not be exported.

-  **Custom Code Style** check box:
  Check the **Custom Code Style** box to activate the **Code Style** button, open the Code Style dialog and use a customized style for point code data items and their output order in the target file. With the check box cleared, the format specific code style is used in the target file.

- Configure the **ASCII file properties** for exporting in **.txt* or **.csv* formats:
  -  Check the **Use quotes for text values** box to add quotation marks to text values in target data. With the check box cleared, quotation marks will not be added.
  -  Check the **Use type for attributes** box to add a type of code field to a field name in exported point codes attributes: *NAME.TYPE$VALUE*. Clear the box to export code field names without including a type of code field: *NAME$VALUE*.

-  **Custom attributes** check box:
  Check the **Custom attributes** box if you plan to customize the list of attributes included in export. With the check box selected, the Custom Attributes dialog will display later in export configuration. Clear the box to leave the list of attributes unchanged.

-  **Order by point name** check box:
  Check the **Order by point name** box to add points data to the target file sorted by point names in ascending order. Clear the box to add points data to the target file sorted by the date and time of point addition to the current project, from older to newer.

-  **Do not export code attributes** check box:
  Check the **Do not export code attributes** box to remove point code attributes from target data. In this case, alphanumeric points will be renumbered starting from the number displayed. (By default, Sokkia Field will continue numbering from the last existing point number in source data). Clear the box to include point code attributes in target data.

- **GNSS points as SP** check box:
  Check the **GNSS points as SP** box to save GNSS points to the target file as manually entered points (Store Points).

- **Control codes as notes** check box:
  Check the **Control codes as notes** box to save control codes as text notes to the target file. This option applies to the *TDS (*.RAW)* target file format. With the check box selected, you can make the target file compatible with Field Book (FBK) standards: check the **FBK compatible** box. With the **Control codes as notes** box cleared, the **Code Style** button is available to open the Code Style dialog and customize a style for point code data items and their output order in the target *TDS (*.RAW)* file.

- **Notes as surface codes** check box:
  Check the **Notes as surface codes** box to save point notes of exported points as surface codes of points in the target file. This option applies to the *Topcon GT Finland (*.GT)* target file format and is enabled by default. With the **Notes as surface codes** box cleared, point notes will remain point notes in the target *Topcon GT Finland (*.GT)* file.

- **Attributes** and **Attribute Names** check boxes:
  Check the **Attributes** box to include point code attributes values for source points to target data. This option applies to the *Field Book(*.fbk)* target file format. With the **Attributes** box selected, you can also include attribute names to target data: check the **Attribute Names** box. With the **Attributes** box cleared, point code attributes values and attribute names will be excluded from target data.

- Configure the **PDF** output for *Stake Reports* or *Field Reports* selected as the data type with *PDF (*.pdf)* used as the target file format:
  - Check the **Combine to one PDF** box to create a single file with all selected reports. Clear the box to create separate files for each selected report.
  - From the **Orientation** drop-down list, select either *Portrait* or *Landscape* page orientation for the target PDF file(s).

- **Code style** button:
  Click the **Code Style** button to open the Code Style dialog and customize a style for point code data items and their output order in the target file.

- **Settings** button:
  Click the **Settings** button to open the Settings dialog and customize the export parameters that are specific for native AutoCAD (*.dwg, *.dxf) formats.

- Click **Next** to proceed with the further export configuration.
- Click  to return to the Archive Menu dialog. Click  to open the Home Screen.

Code Style

To select, create, or edit a style for point code data items and their output order in supported file formats.

The created or edited style defines types of point code data items and their order to be used in data records in the target file.

The left **Available** pane contains data items that can be added to a style. The right **Order** pane contains data items used in a style in the displayed order.

1. To select and apply an existing code style for the target file:

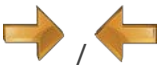
   - From the **Style** drop-down list, select a style for point codes. Sokkia Field offers four predefined styles: *Sokkia*, *Carlson*, *Eagle Point*, and *GeoPAK*. The *Sokkia* code style applies by default.
   - Review the right **Order** pane to ensure the selected style is correct.
   - Click the **Separators** button to open the Separators dialog and customize data items separators for the code style displayed in the **Style** field.
   - Click the **Control Codes** buttons to open the Control Codes dialog and customize control codes output for the code style displayed in the **Style** field.
   - Click the  button to apply the style currently displayed in the **Style** field and return to the To File dialog.

2. To customize an existing code style:

   - From the **Style** drop-down list, select a style for point codes to customize.
   - Group the data items for the selected code style in the right **Order** pane.
   - Highlight data item(s) and click  /  to move highlighted data items between two panes.
   - The context menu simplifies multiple data items highlighting with the following commands:
     - **Select All** - highlights all data items in the list.
     - **Select All Below** - highlights a currently highlighted data item and all the data items in the list displayed below.
     - **Select Multiple** - highlights multiple data items by sequential clicking on data item names.
     - **Cancel Selection** - removes all highlights in the list.

- Click  to change position of highlighted data item(s) in the **Order** pane and match with the desired output order of data items in data records.
- Click the **Separators** buttons to open the Separators dialog and customize data items separators for the code style displayed in the **Style** field.
- Click the **Control Codes** buttons to open the Control Codes dialog and customize control codes output for the code style displayed in the **Style** field.
- Click the **Save** button to apply the changes to a code style displayed in the **Style** drop-down list. The overwriting confirmation prompt will display to prevent an accidental action.

3. To create a new code style and add its name to the **Style** drop-down list:

- Type a name for a new style in the **Style** field.
- Group the data items for a new code style in the right **Order** pane.
- Highlight data item(s) and click  to move highlighted data items between two panes.
- The context menu simplifies multiple data items highlighting with the following commands:
  - **Select All** - highlights all data items in the list.
  - **Select All Below** - highlights a currently highlighted data item and all the data items in the list displayed below.
  - **Select Multiple** - highlights multiple data items by sequential clicking on data item names.
  - **Cancel Selection** - removes all highlights in the list.
- Click  to change position of highlighted data item(s) in the **Order** pane and match with the desired output order of data items in data records.
- Click the **Separators** buttons to open the Separators dialog and customize data items separators for the code style displayed in the **Style** field.
- Click the **Control Codes** buttons to open the Control Codes dialog and customize control codes output for the code style displayed in the **Style** field.
- Click the **Save** button to create a new style and add its name to the **Style** drop-down list.

4. To delete an existing code style and remove its name from the **Style** drop-down list:

- From the **Style** drop-down list, select a style for point codes to delete.
- Click the **Delete** button to delete a code style displayed in the **Style** drop-down list. The deletion confirmation prompt will display to prevent an accidental action.

Separators

To display and customize the current data items separators for the code style selected in the Code Style dialog.

> **Note:** The 'Space' symbol is displayed as '•' in the data fields for better readability.

- The dialog displays the name of a currently selected code style in the top left part of the screen.
- Review the currently used data items separators for a selected style. Sokkia Field offers default data items separators for each predefined code style.
- Enter new separator symbol(s) in the field(s) with corresponding data item name(s), if required.
- The **General Prefix** field contains a symbol that delimits the code information from the rest of information on a point in data records.
- Click  to apply the displayed data items separators to a selected code style and return to the Code Style dialog. Click  to discard any changes made to separators and return to the Code Style dialog.

Control Codes

To display and customize the control codes output for the code style selected in the Code Style dialog.

> **Note:** The 'Space' symbol is displayed as '•' in the data fields for better readability.

- The dialog displays the name of a currently selected code style in the top left part of the screen.
- Review the currently used control codes for a selected style. Sokkia Field offers default control codes for each predefined code style.
- Enter new control code(s) in the field(s) with corresponding control code name(s), if required.
- Click  to apply the displayed control codes to a selected code style and return to the Code Style dialog. Click  to discard any changes made to control codes and return to the Code Style dialog.

Settings for AutoCAD (*.dwg / *.dxf)

To customize the export settings that are specific for native AutoCAD (*.dwg / *.dxf) formats.

Note: The actual settings displayed depend on chosen data type(s) to be included in the target file.

- Select a Point Style from the **Point Style** drop-down list:
  - **AutoCAD Points**: includes only point coordinates.
  - **AutoCAD Points with Text Fields**: includes point coordinates with text fields for point name, elevation, codes, attributes.
  - **Carlson Point Blocks**: includes points and descriptions for them and outputs points data as block references.
  - **TopSURV Point Blocks**: includes point name, elevation, codes, strings, attributes and outputs points data as block references.

- Select a Line Style from the **Line Style** drop-down list:
  - **AutoCAD Lines**: includes only line coordinates.
  - **AutoCAD Lines with Text Fields**: includes line coordinates with text fields for line name, elevations, codes, attributes.
  - **TopSURV Line Blocks**: includes line name, elevations, codes, strings, attributes and outputs lines data as block references.

- Check the **Use 3D coordinates** box to export elevations with plane coordinates. With the check box cleared, elevations will not be exported.

- Check the **Use text font height** box to manually enter the height of text fonts in CAD units. Leave the box cleared to use 'auto' settings for the height of text fonts in the AutoCAD (*.dwg / *.dxf) target file.

- Click  to apply the displayed settings to the AutoCAD (*.dwg, *.dxf) target file and return to the To File dialog. Click  to discard any changes made to the settings and return to the To File dialog.

File Units

To select measurement unit(s) for distance and / or angular values used in target data.

This dialog displays if the **Select file units** box was checked in the To File dialog or in the From File dialog.

Note: The actual settings displayed and measurement units available depend on chosen data type(s) and source and target file(s) formats.

- From the **Distance units** drop-down list, select a distance measurement unit for target data.
- From the **Angle units** drop-down list, select an angular measurement unit for target data.

- Click **Next** to apply the measurement units to target data and proceed with target data configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Sessions

To select session(s) in the current project containing raw data to be included in export.

This dialog displays if **Raw Data** was selected as a data type and *GNSS-Pro(*.DLF)* as a target format in the To File dialog.

Note: Each of the selected sessions will be exported as a separate *.DLF* file with the name of the respective session. Semicolons in the file name will be automatically replaced with the underscore symbols ("_").

- Review the list of available sessions.
- Select check box(es) near the session name(s) to be included in export. Clear check box(es) near the session name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted session. The context menu also simplifies multiple roads highlighting with the following commands:
  - **Select All** - highlights all sessions in the list.
  - **Select All Below** - highlights a currently highlighted session and all the sessions in the list displayed below.
  - **Select Multiple** - highlights multiple sessions by sequential clicking on session names.
  - **Cancel Selection** - removes all highlights in the list.

- Click the **Select All** button to include all the sessions in export. Click the **Unselect All** button to exclude all the sessions from export.
- Select the **Indirect** check box(es) for session(s) that were performed with the indirect observation method to match correctly with the *GNSS-Pro(*.DLF)* format.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Data Selection

To include or exclude from exporting specific types of available data in the current project.

This dialog displays if *Multiple* was selected as a data type included in export in the To File dialog.

> **Note:** The types of data actually displayed in this dialog depend on the contents of the current project and the chosen export format.

- Review the list of available data types with numbers of objects corresponding to each data type.
- Select check box(es) near the data type(s) to be included in export. Clear check box(es) near the data type(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted item.
- Check the **Visible background drawings** box to also export data from the existing drawings in the current project that are set to **On** in the Backgrounds tab of the Map properties dialog. Data types in existing drawing(s) are added to the list of available data types. The dialog will open later to select specific drawing(s) for export. (The **Visible background drawings** check box is active only if such drawings exist in the current project.)
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Point List(s) to Export

To select point list(s) from the current project to be included in export.

This dialog displays if **Point Lists** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the table of available point lists.
- Select check box(es) near the point list name(s) to be included in export. Clear check box(es) near the point list name(s) to be excluded from export.
- Use the context menu in the table with **Check** / **Uncheck** commands applicable to a highlighted point list. The context menu also simplifies multiple point lists highlighting with the following commands:
  - **Select All** - highlights all point lists from the table.
  - **Select All Below** - highlights a currently highlighted point list and all the point lists in the table displayed below.
  - **Select Multiple** - highlights multiple point lists by sequential clicking on point list names.
  - **Cancel Selection** - removes all highlights in the table.
- Click the **Select All** button to include all the point lists in export. Click the **Unselect All** button to exclude all the point lists from export.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select H.Alignment(s) to Export

To select horizontal alignment(s) from the current project to be included in export.

This dialog displays if **Horizontal Alignments** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available horizontal alignments.
- Select check box(es) near the horizontal alignment name(s) to be included in export. Clear check box(es) near the horizontal alignment name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted horizontal alignment. The context menu also simplifies multiple horizontal alignments highlighting with the following commands:
  - **Select All** - highlights all horizontal alignments in the list.
  - **Select All Below** - highlights a currently highlighted horizontal alignment and all the horizontal alignments in the list displayed below.

  - **Select Multiple** - highlights multiple horizontal alignments by sequential clicking on horizontal alignment names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the horizontal alignments in export. Click the **Unselect All** button to exclude all the horizontal alignments from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select V.Alignment(s) to Export

To select vertical alignment(s) from the current project to be included in export.

This dialog displays if **Vertical Alignments** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available vertical alignments.
- Select check box(es) near the vertical alignment name(s) to be included in export. Clear check box(es) near the vertical alignment name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted vertical alignment. The context menu also simplifies multiple vertical alignments highlighting with the following commands:
  - **Select All** - highlights all vertical alignments in the list.
  - **Select All Below** - highlights a currently highlighted vertical alignment and all the vertical alignments in the list displayed below.
  - **Select Multiple** - highlights multiple vertical alignments by sequential clicking on vertical alignment names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the vertical alignments in export. Click the **Unselect All** button to exclude all the vertical alignments from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

X-section Set(s) to Export

To select x-section set(s) from the current project to be included in export.

This dialog displays if **X-section Sets** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available x-section sets.
- Select check box(es) near the x-section set name(s) to be included in export. Clear check box(es) near the x-section set name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted x-section set. The context menu also simplifies multiple x-section sets highlighting with the following commands:
  - **Select All** - highlights all x-section sets in the list.
  - **Select All Below** - highlights a currently highlighted x-section set and all the x-section sets in the list displayed below.
  - **Select Multiple** - highlights multiple x-section sets by sequential clicking on x-section set names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the x-section sets in export. Click the **Unselect All** button to exclude all the x-section sets from export.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Road String Set(s) to Export

To select road string set(s) from the current project to be included in export.

This dialog displays if **Road String Sets** were selected as a data type included in export in either the Export To Project dialog, or the Data Selection dialog.

- Review the list of available road string sets.
- Select check box(es) near the road string name(s) to be included in export. Clear check box(es) near the road string name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted road string. The context menu also simplifies multiple road strings highlighting with the following commands:
  - **Select All** - highlights all road strings in the list.
  - **Select All Below** - highlights a currently highlighted road string and all the road strings in the list displayed below.

  - **Select Multiple** - highlights multiple road strings by sequential clicking on road string names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the road strings in export. Click the **Unselect All** button to exclude all the road strings from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Road(s) to Export

To select road object(s) from the current project to be included in export.

This dialog displays if **Roads** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available road objects.
- Select check box(es) near the road name(s) to be included in export. Clear check box(es) near the road name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted road. The context menu also simplifies multiple roads highlighting with the following commands:
  - **Select All** - highlights all roads in the list.
  - **Select All Below** - highlights a currently highlighted road and all the roads in the list displayed below.
  - **Select Multiple** - highlights multiple roads by sequential clicking on road names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the roads in export. Click the **Unselect All** button to exclude all the roads from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Road(s) (Find Station Survey) to Export

To select find station survey(s) from the current project to be included in export.

This dialog displays if **Roads Survey** was selected as a data type included in export in the To File dialog or in the Data Selection dialog.

- Review the list of available find station surveys.
- Select check box(es) near the find station survey name(s) to be included in export. Clear check box(es) near the find station survey name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted find station survey. The context menu also simplifies multiple find station surveys highlighting with the following commands:
  - **Select All** - highlights all find station surveys in the list.
  - **Select All Below** - highlights a currently highlighted find station survey and all the find station surveys in the list displayed below.
  - **Select Multiple** - highlights multiple find station surveys by sequential clicking on find station survey names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the find station surveys in export. Click the **Unselect All** button to exclude all the find station surveys from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Road(s) (X-section Survey) to Export

To select x-section survey(s) from the current project to be included in export.

This dialog displays if **X-section Survey** was selected as a data type included in export in either the Export to Project dialog, or the Data Selection dialog.

- Review the list of available x-section surveys.
- Select check box(es) near the x-section survey name(s) to be included in export. Clear check box(es) near the x-section survey name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted x-section survey. The context menu also simplifies multiple x-section surveys highlighting with the following commands:
  - **Select All** - highlights all x-section surveys in the list.
  - **Select All Below** - highlights a currently highlighted x-section survey and all the x-section surveys in the list displayed below.
  - **Select Multiple** - highlights multiple x-section surveys by sequential clicking on x-section survey names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the x-section surveys in export. Click the **Unselect All** button to exclude all the x-section surveys from export.

- Click **Next** to proceed with export configuration.

- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Surface(s) to Export

To select surface object(s) from the current project to be included in export.

This dialog displays if **Surfaces** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available surface objects.
- Select check box(es) near the surface name(s) to be included in export. Clear check box(es) near the surface name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted surface(s). The context menu also simplifies multiple surfaces highlighting with the following commands:
  - **Select All** - highlights all surfaces in the list.
  - **Select All Below** - highlights a currently highlighted surface and all the surfaces in the list displayed below.
  - **Select Multiple** - highlights multiple surfaces by sequential clicking on plane names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the surfaces in export. Click the **Unselect All** button to exclude all the surfaces from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Plane(s) to Export

To select plane object(s) from the current project to be included in export.

This dialog displays if **Planes** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available plane objects.
- Select check box(es) near the plane name(s) to be included in export. Clear check box(es) near the plane name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted plane(s). The context menu also simplifies multiple planes highlighting with the following commands:

  - **Select All** - highlights all planes in the list.
  - **Select All Below** - highlights a currently highlighted plane and all the planes in the list displayed below.
  - **Select Multiple** - highlights multiple planes by sequential clicking on plane names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the planes in export. Click the **Unselect All** button to exclude all the planes from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Field Report to Export

To select field report(s) from the current project to be included in export.

This dialog displays if **Field Reports** were selected as a data type included in export in either the To File or the Data Selection dialog.

- Review the list of available reports.
- Select check box(es) near the report(s) to be included in export. Clear check box(es) near the report(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted report. The context menu also simplifies multiple reports highlighting with the following commands:
  - **Select All** - highlights all reports in the list.
  - **Select All Below** - highlights a currently highlighted report and all the reports in the list displayed below.
  - **Select Multiple** - highlights multiple reports by sequential clicking on reports.
  - **Cancel Selection** - removes all highlights in the list.
- For *MaXML (*.mxl)* target format, click  /  to change the position of highlighted report(s) in the list and match with the desired output order of reports in the target file.
- Click the **Select All** button to include all the field reports in export. Click the **Unselect All** button to exclude all the field reports from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Stake Report to Export

To select stake report(s) from the current project to be included in export.

This dialog displays if **Stake Reports** were selected as a data type included in export in either the To File or the Data Selection dialog.

- Review the list of available stake reports with their respective type of report.
- Select check box(es) near the report(s) to be included in export. Clear check box(es) near the report(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted report. The context menu also simplifies multiple reports highlighting with the following commands:
  - **Select All** - highlights all reports in the list.
  - **Select All Below** - highlights a currently highlighted report and all the reports in the list displayed below.
  - **Select Multiple** - highlights multiple reports by sequential clicking on reports.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the reports in export. Click the **Unselect All** button to exclude all the reports from export.
- If **.PDF* was chosen as the target file format and the **Combine to one PDF** box was checked in the To File dialog, click  /  to change the position of highlighted report(s) in the list and match with the desired output order of reports in the target file.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Background Drawing(s) to Export

To select background drawings from the current project and include their data in export.

This dialog displays if **Multiple** were selected as a data type included in export in the To File dialog and the **Visible background drawings** box was checked in the Data Selection dialog.

> **Note:** Only the drawings that are set to **On** in the Backgrounds tab of the Map properties dialog are available for selection.

- Review the list of available drawings.
- Select check box(es) near the drawing name(s) to be included in export. Clear check box(es) near the drawing name(s) to be excluded from export.

- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted drawing. The context menu also simplifies multiple drawings highlighting with the following commands:
  - **Select All** - highlights all drawings in the list.
  - **Select All Below** - highlights a currently highlighted drawing and all the drawings in the list displayed below.
  - **Select Multiple** - highlights multiple drawings by sequential clicking on drawing names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the drawings in export. Click the **Unselect All** button to exclude all the drawings from export.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Background Image(s) to Export

To select background image(s) from the current project to be included in export.

This dialog displays if **Background Images** were selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available background images.
- Select check box(es) near the background image name(s) to be included in export. Clear check box(es) near the background image name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted background image. The context menu also simplifies multiple background images highlighting with the following commands:
  - **Select All** - highlights all background images in the list.
  - **Select All Below** - highlights a currently highlighted background image and all the background images in the list displayed below.
  - **Select Multiple** - highlights multiple background images by sequential clicking on background image names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the background images in export. Click the **Unselect All** button to exclude all the background images from export.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Scanning Session(s) to Export

To select scanning session(s) from the current project to be included in export.

This dialog displays if **Scanning Data** was selected as a data type included in export in either the Export to Project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available scanning sessions.
- Select check box(es) near the scanning session name(s) to be included in export. Clear check box(es) near the scanning session name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted scanning session. The context menu also simplifies multiple scanning sessions highlighting with the following commands:
  - **Select All** - highlights all scanning sessions in the list.
  - **Select All Below** - highlights a currently highlighted scanning session and all the scanning sessions in the list displayed below.
  - **Select Multiple** - highlights multiple scanning sessions by sequential clicking on scanning session names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the scanning sessions in export. Click the **Unselect All** button to exclude all the scanning sessions from export.
- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Region(s) to Export

To select region(s) from the current project to be included in export.

This dialog displays if **Regions** were selected as a data type included in export in either the Export to project dialog, or the To File dialog, or the Data Selection dialog.

- Review the list of available regions.
- Select check box(es) near the region name(s) to be included in export. Clear check box(es) near the region name(s) to be excluded from export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted region. The context menu also simplifies multiple regions highlighting with the following commands:
  - **Select All** - highlights all regions in the list.
  - **Select All Below** - highlights a currently highlighted region and all the regions in the list displayed below.

  - **Select Multiple** - highlights multiple regions by sequential clicking on region names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the regions in export. Click the **Unselect All** button to exclude all the regions from export.

- Click **Next** to proceed with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Exchange Menu.

Filters

To select and apply filters to the project objects included in export.

This dialog displays when the **Use Filters** option was selected for export in the To File or Export to Project dialog.

> **Note:** The set of the filters actually available for use depends on the object type(s) selected for export in the Export to Project or Data Selection dialog and the chosen export format.

- The list of available filters:

  - Filter data by Date/Time - specifies time range for the objects to be exported.
  - Filter points by Names range - specifies name(s) of the points to be exported.
  - Filter points by Point types - specifies type(s) of the points to be exported.
  - Filter points by Codes - specifies code(s) to export the points having that code(s).
  - **Filter by Tolerances** - exports staked points and specifies threshold values of precision for Northing, Easting and / or Elevation for staked points. *Yes* / *No* threshold matching status along with staked points will be included in export. More information about tolerance in stakeout reports. (*Available for Cut Sheet Standard / User Defined target formats.*)
  - Filter data by Layer - specifies layer(s) to export the objects belonging to that layer(s) only.
  - Filter Custom Symbols - specifies custom symbol(s) to export the points having that custom symbol(s).
  - Filter Stake Reports by Type - specifies a type of stake reports to be exported.

- To choose filters for objects included in export.

  - Select / clear appropriate check boxes in the **Available Filters** list to use / skip filter(s). To use / skip all the filters in the list, click the **Select All** / **Unselect All** button. Use commands from the context menu:

- **Select All** - highlights all filters in the list.
- **Select All Below** - highlights a currently highlighted filter and all the filters in the list displayed below.
- **Select Multiple** - highlights multiple filters by sequential clicking on filter names.
- **Cancel Selection** - removes all highlights in the list.
- **Check** - selects check boxes next to highlighted filters.
- **Uncheck** - clears check boxes next to highlighted filters.

- Click **Next** to proceed and configure parameters of each chosen filter. The export configuration will continue if no filters used.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Filter by Time

To specify a time range for the objects from the current project to be exported.

This dialog displays if **Filter by Date/Time** was selected in the Filters dialog.

- Click **Today** radio button to export objects that have been created today.
- Click **Yesterday** radio button to export objects that have been created yesterday.
- Click **Time range** radio button to export objects created in the specific time interval:
  - Enter starting date and time for the time interval in the **From:** field. Type by keyboard or use arrows to change a highlighted value.
  - Enter ending date and time for the time interval in the **To:** field. Type by keyboard or use arrows to change a highlighted value.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Points Range Filter

To specify names and / or name ranges for the points in the current project to be exported.

This dialog displays if **Filter points by Names range** was selected in the Filters dialog.

- Enter point names and / or name ranges in the **Point names range** text field.

- Use either comma (**,**) or semicolon (**;**) symbols to separate individual point names and / or ranges of names. Use minus '**-**' symbol between point names to form a range. Put point names containing minus '**-**' symbol in quotation marks, for example **"Pointname-1"**.
- Type names and / or name ranges by keyboard.
- Use the context menu with **Cut**, **Copy**, **Paste**, **Delete**, **Select All** commands to edit text.
- **Paste** a prepared list with point names and / or name ranges from clipboard.
- Add points from the map  or from the list  of points in the project.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Point Type(s) to Export

To specify type(s) of the points in the current project to be exported.

This dialog displays if **Filter points by Point types** was selected in the Filters dialog.

> **Note:** At least one point type should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select point type(s) in the **Point types** list to include into the export filter.
  - Select check box(es) near the point type(s) to be included in export. Clear check box(es) near the point type(s) to be excluded from export.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted point type(s). The context menu also simplifies multiple point types highlighting with the following commands:
    - **Select All** - highlights all point types in the list.
    - **Select All Below** - highlights a currently highlighted point type and all the point types in the list displayed below.
    - **Select Multiple** - highlights multiple point types by sequential clicking on point type names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include all the point types in export. Click the **Unselect All** button to exclude all the point types from export.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with export configuration.

- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Codes

To specify code(s) to export the current project's points having that code(s).

This dialog displays if **Filter points by Codes** was selected in the Filters dialog.

> **Note:** At least one code should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select point code(s) in the **Code(s)** list to include into the export filter.
  - Select check box(es) near the code(s) to be included in export. Clear check box(es) near the code(s) to be excluded from export.

    > **Note:** To include / exclude points without code, check / clear the box near the *No Codes* item.

  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted code(s). The context menu also simplifies multiple codes highlighting with the following commands:
    - **Select All** - highlights all codes in the list.
    - **Select All Below** - highlights a currently highlighted code and all the codes in the list displayed below.
    - **Select Multiple** - highlights multiple codes by sequential clicking on code names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include all the codes in export. Click the **Unselect All** button to exclude all the codes from export.

- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Layers

To specify layer(s) from the current project to export the objects belonging to that layer(s) only.

This dialog displays if **Filter data by Layer** was selected in the Filters dialog.

> **Note:** At least one layer should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select layer(s) in the **Layer(s)** list to include the objects belonging to that layer(s) into the export filter.
  - Select check box(es) near the layer(s) to be included in export. Clear check box(es) near the layer(s) to be excluded from export.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted layer(s). The context menu also simplifies multiple layers highlighting with the following commands:
    - **Select All** - highlights all layers in the list.
    - **Select All Below** - highlights a currently highlighted layer and all the layers in the list displayed below.
    - **Select Multiple** - highlights multiple layers by sequential clicking on layer names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include the objects from all the layers in export. Click the **Unselect All** button to exclude the objects from all the layers from export.
  - Click the  button and open the Layers dialog to add, edit, or delete layers in the current project, if required.
- Click **Next** to apply the settings to the filter and proceed to customize other filter(s) or to continue with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Custom Symbol(s) to Export

To specify custom symbol(s) to export the current project's points having that custom symbol(s) in the point style attribute.

This dialog displays if **Filter Custom Symbols** was selected in the Filters dialog.

Note: At least one custom symbol should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Select custom symbol(s) in the **Symbol(s)** list to include the point(s) having that custom symbol (s) into the export filter.

  - Select check box(es) near the custom symbol(s) to be included in export. Clear check box(es) near the custom symbol(s) to be excluded from export.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted custom symbol(s). The context menu also simplifies multiple custom symbols highlighting with the following commands:
    - **Select All** - highlights all custom symbols in the list.
    - **Select All Below** - highlights a currently highlighted custom symbol and all the custom symbols in the list displayed below.
    - **Select Multiple** - highlights multiple custom symbols by sequential clicking on custom symbol names.
    - **Cancel Selection** - removes all highlights in the list.
  - Click the **Select All** button to include all the custom symbols in export. Click the **Unselect All** button to exclude all the custom symbols from export.

- Click **Next** to apply the settings and continue with export configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Type of Stake Reports to Export

To specify a type of stake reports from the current project to be included in export.

This dialog displays if **Filter Stake Reports by Type** was selected in the Filters dialog.

Note: One type of stake reports should be used when applying this filter. To skip this filter, clear the filter's corresponding check box in the Filters dialog.

- Review the list of available types of stake reports.
- Select the check box near the type of stake reports to be included in export.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted report.

- Click **Next** to proceed with export configuration.

- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Custom Attributes

To customize data attributes and their output order for exporting to ESRI Shape (*.shp) and ESRI Shape zipped (*.zip) formats.

This dialog displays if the **Custom attributes** box was checked in the To File dialog.

- From the **File Style** field, configure the attributes to be exported and define their order in a data record.
  - Select a file style for the chosen format from the **File Style** drop-down list. By default, Sokkia Field offers predefined style(s) for each supported format.
  - Click the **Edit** button to open the Custom Style dialog and modify the file style currently displayed in the **File Style** drop-down list.
  - Click the **Add** button to open the Custom Style dialog and create a new file style and add it in the **File Style** drop-down list.
  - Click the **Delete** button to delete the file style currently displayed in the **File Style** drop-down list. A confirmation prompt will display to prevent accidental deletion.
- Click **Next** to apply the selected data attributes and their output order and proceed with target data configuration. Click  to apply the selected data attributes and their output order and proceed with target data generation.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Text File Format

To customize data fields and their output in a text-based format used in exporting or importing.

> **Note:** The actual title of this dialog may differ depending on formats used in exporting / importing. The availability of customization options depends on the used format specifications.

- From the **Delimiter** field, select a symbol to be used as a data delimiter in data records between data fields. Choose from **space**, **comma**, **tabulation** symbols or select **other** and use the drop-

down list with more symbols available.

- Check the **Header in first row** box to:
  - For data export: add the header to an exported file according to the **File Style** settings.
  - For data import: parse the first line in an importing file as a header. If the header has been parsed successfully, the file will load according to this header. Otherwise, the first line will be skipped and the file will load according to the **File Style** settings.

- From the **File Style** field, configure the data fields to be exported / imported and define their order in a data record.
  - Select a file style for the chosen format from the **File Style** drop-down list. By default, Sokkia Field offers predefined style(s) for each supported text-based format.
  - Click the **Edit** button to open the Custom Style dialog and modify the file style currently displayed in the **File Style** drop-down list.
  - Click the **Add** button to open the Custom Style dialog and create a new file style and add it in the **File Style** drop-down list.
  - Click the **Delete** button to delete the file style currently displayed in the **File Style** drop-down list. A confirmation prompt will display to prevent accidental deletion.
- Click the **Preview** button to open the *File Preview* dialog showing the first few lines of the selected external file as a raw text preview to check the file format and the presence of data fields, their order, and used delimiter.

- Click **Next** to apply the selected data content and data representation and proceed with export / import configuration. Click  to apply the selected data fields and their output order and proceed with target data generation.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Custom Style

To create or edit a style for data items and their output order in supported file formats.

The created or edited style defines types of data fields and their order to be used for data records in a file.

The left **Available** pane contains data items that can be added to a style. The right **Order** pane contains data items used in a style in the displayed order. Move data items between two panes to customize a style.

- Highlight data item(s) and click  /  to move data item(s) to another pane.
- The context menu simplifies multiple data items highlighting with the following commands:
  - **Select All** - highlights all data items in the list.
  - **Select All Below** - highlights a currently highlighted data item and all the data items in the list displayed below.
  - **Select Multiple** - highlights multiple data items by sequential clicking on data item names.
  - **Cancel Selection** - removes all highlights in the list.
- Click  /  to change position of highlighted data item(s) in the **Order** pane and match with the desired output order of data items in a data record.
- Click  to store to a style the selected data items and their output order displayed in the right **Order** pane and return to the previous dialog. Click  to discard changes and return to the previous dialog.

To Format

To choose a file name and / or destination for the exported project data.

- Ensure the required export format is selected in the **Type** field to filter out and display existing files in that format in an open folder. (The **Type** field is not shown when exporting assumes creation of a set of various files in a chosen folder).
-  displays the path to the current folder. Use the dialog icons to navigate to or create the desired folder to save the exported file(s). More...
- Enter a desired file name in the **Name** field. (The **Name** field is not shown when exporting assumes creation of a set of various files in a chosen folder).
- Click  to accept the entered file name and / or the destination folder for exported project data and proceed with export configuration. The prompt to overwrite the file(s) displays if you're trying to use the already existing file name(s). If required, click  to discard the entered data and return to the previous dialog.

Coordinate System

To display the coordinate system of source data, to modify the coordinate system to be used in target data, and to choose a coordinate type for target data.

- Review the information about the coordinate system used in source data.
- Modify **Projection**, **Grid / Ground** parameters, **Datum**, **Geoid Model** to be used in target data, if required. (This option is not available for some target formats). Find out more on configuring coordinate systems.

- Select a coordinate type from **Coord Type** drop-down list to be used in target data. Choose from:
  - Ground
  - Grid
  - Datum (Lat/Lon/Ell ht)
  - Datum (Xc/Yc/Zc)

- Click **Next** to apply the coordinate system settings and proceed with target data configuration.
- Click  to apply the coordinate system settings to target data and proceed with target data generation.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Note: When target is a file in Cut Sheet User Defined text format:
• If a geoid is selected in the **Geoid Model** field, and it covers the area where the source points are located, points' height will be elevation (orthometric height) in target data.
• If no geoid is selected, or it does not cover the desired area, points' height will be ellipsoidal height.

Units Format

To select the format(s) of coordinates representation in the target file(s).

Note: The actual settings displayed depend on chosen coordinate system and source and target file(s) formats.

- From the **Format (lat/lon)** drop-down list, select degrees representation format in Latitude and Longitude.

- From the **Plane coordinates precision** drop-down list, select fractal length (precision) for plane coordinates from 0.0 to 0.00000000.
- From the **Elevation precision** drop-down list, select fractal length (precision) for height from 0.0 to 0.00000000. The field is not displayed if Datum (Xc/Yc/Zc) is selected as coordinate type.

- Click  to apply the selected format(s) of coordinates representation and proceed with target data generation.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Export Status

To export data from the current project to a file in the selected format and to display the exporting results.

This dialog displays after completing the export configuration procedure and finishes the export showing the information about exporting process results.

> **Note:** Depending on the data you selected to export, the export process may take some time. Monitor the process status displayed in the dialog and wait until the export procedure completes.

- The export progress bar shows the overall completion of export process.
- The information pane display all the types of exported objects with their respective quantity.
- If export process finished with errors, the list of errors also displays.
- The current process status and general export result (e.g successful, with errors, canceled) displays under the information pane.

Click the **Close** button to return to the Archive Menu. Click  to open the Home Screen dialog.



From File

To import data from an external file to the current project.

Sokkia Field supports import of multiple types of data from many external formats to the current project. This dialog allows a user to select types of imported data, choose a format of the source

file(s), and configure importing parameters. Depending on the types of data to be imported and the source format chosen, the dialog offers various combinations of import configuration options.

- Use the **Data** drop-down list to select a type of data in an external file to import. Choose *Multiple* to include all the types of data available for import from the source file.
- Use the **Format** drop-down list to select a source file format. The actual file formats available in the list depend on the type of data chosen for importing.
- Review and set up configuration options available for specific combinations of selected data type and source format:
  -  **Select file units** check box:
    Check the **Select file units** box if you plan to change distance and / or angular measurements units for imported data. With the check box selected, the File Units dialog will display later in import configuration. Clear the box to leave distance and angular measurements units unchanged.
  -  **Select Layer** check box:
    Check the **Select Layer** box if you plan to add imported objects to a particular layer in the current project. With the check box selected, the Select Layer for Imported Objects dialog will display later in import configuration. Clear the box to import objects without adding them to a particular layer in the current project.
  -  **Select Point List** check box:
    Check the **Select Point List** box if you plan to add imported points to a particular point list in the current project. With the check box selected, the Select Point List for Imported Points dialog will display later in import configuration. Clear the box to import points without adding them to a particular point list of the current project.
  -  **Use Legacy Localization** check box:
    Check the **Use Legacy Localization** box to enable the Legacy Mode for horizontal localization. The Legacy Mode is recommended for importing localization data created in all versions of TopSURV, Pocket 3D, 3D-Office and versions 1.x of MAGNET Tools and MAGNET Field. Find out more on Legacy Mode.
  -  **Use Notes as Code** check box:
    Check the **Use Notes as Code** box if you want the data stored in a point's **Note** field to be written into the **Code** field. This option can be useful for 3DMC file formats if points were originally exported with the **Export Code as Notes** check box selected in the To File dialog.

- **X-sections with catch points** check box:
  Check the **X-sections with catch points** box to include in import cross sections that have catch points. With the check box cleared, cross sections with catch points will not be imported.

- **Merge X-sections** check box:
  Check the **Merge X-sections** box to merge cross sections in imported data. With the check box cleared, cross sections will be imported as is.

- **Settings** button:
  Click the **Settings** button and open the Settings dialog to customize more importing parameters for selected combination of imported data type and source file format.

Note: "Bentley Infrastructure Model (**.icm.dgn*)", "MicroStation (**.dgn*)", "PDF (**.pdf*)", "Civil 3D", "MAP Exchange", "AutoCAD Drawing (**.dwg*)", "AutoCAD DXF (**.dxf*)" graphic data is imported as vector image backgrounds and then can be used in Sokkia Field projects as backgrounds (Edit > Background > Drawings).

- Click **Next** to proceed with the further import configuration.
- Click to return to the Archive Menu dialog. Click to open the Home Screen.

Settings

To customize the import settings for specific data types and source file formats.

- Review and set up configuration options available for specific combinations of selected data type and source format:

  - **Import points as** drop-down list:

    From the **Import points as** drop-down list, specify how to save imported points to the current project, either as *Design Points* (the points used as targets for staking) or *Control Points* (the points with fixed coordinates, known from the catalog).

    > **Note:** Only points whose coordinates are specified in the source file get the control point property  after import as *Control points* into the project. Points calculated by Sokkia Field during import are always imported as *Design points*.

  - **Import meshes as** drop-down list:
    From the **Import Meshes As** drop-down list, specify how to imports vertices, edges and faces defining the shape of a polyhedral object. Import them either as *Linework* or *Surfaces*.

  - **Import blocks as points** drop-down list:
    From the **Import blocks as points** drop-down list, specify whether blocks should be imported as points. Choose from *None*, *APL blocks only* or *All*.

  -  **Import text** check box:
    Check the **Import text** box to import text data from the source file. With the check box cleared, text data will not be imported.

  -  **Import nameless lines as background drawing** check box:
    Check the **Import nameless lines as background drawing** box to import the corresponding data from the source file as a background drawing. With the check box cleared, all such lines from the source file will be stored as a set of the lines within a project.

  -  **Import intersection points** check box:
    Check the **Import intersection points** box to create intersection points of nameless lines imported as a background drawing. With the check box cleared, no intersection points of such lines will be created. The **Import nameless lines as background drawing** box should be checked to make this selection active.

- **Import nameless points as background drawing** check box:
  Check the **Import nameless points as background drawing** box to import the corresponding data from the source file as background drawing. With the check box cleared, all such points from the source file will be stored as a set of the points within a project.

- **Explode Hatches** check box:
  Check the **Explode Hatches** box to import the lines in the drawing that form the hatching grid to a separate layer with an option to make this layer and hatches invisible on maps via the Layers dialog. With the check box cleared, hatches are imported as a non-editable hatched area of the drawing.

- **Merge straight line segments** check box:
  Check the **Merge straight line segments** box to import straight line segments as a single line. With the check box cleared, straight line segments are imported as is (segments are not merged).

- **Import lines with points** check box:
  Check the **Import lines with points** box to create end points and segment transition points for imported lines. With the check box cleared, no end points and transition points of imported lines will be created.

- **Import Invisible Triangles** check box:
  Check the **Import Invisible Triangles** box to import points outside of the boundary (that are not displayed in the design file) as joined to triangles. With the check box cleared, points outside of the boundary will not be imported.

- **Page** field:
  In the **Page** field, enter a page number in the source **.PDF* file to import data from.

- Click to apply the selected settings and return to the From File dialog. Click to return to the previous dialog without changes to the settings.

Select Layer for Imported Objects

To choose a layer in the current project for objects imported from an external file.

This dialog displays if the **Select Layer** box was checked in the From File dialog.

- Review the list of existing layers in the current project.
- Click the  button and open the Layers dialog to add, edit, or delete layers in the current project, if required.
- Select the check box near a layer to add imported points and other objects to that layer.
- Click **Next** to add imported points and other objects to the selected layer and proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Select Point List for Imported Points

To select a point list in the current project or to create a new point list in which to save the imported points.

This dialog displays if the **Select Point List** box was checked in the From File dialog when importing points from external file.

- Review the table of point lists in the current project.
- Select the check box near the point list name where imported points should be added.
- To add imported points to a new point list, check the **New Point List** list box and enter a name for this point list.
- Click **Next** to add imported points to the selected point list and proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

From Format

To choose a source file to import data to the current project.

- Ensure the required import format is selected in the **Type** field to filter out and display existing files in that format in an open folder.
-  displays the path to the current folder. Use the dialog icons to navigate to the desired folder and select the source file for import. More...
- The **Name** field displays a selected file name. This file will be used as a source file for import.

- Click  to accept the displayed file as a source file for importing and proceed with import. If required, click  to interrupt a source file selection and return to the previous dialog.

Data Selection

To include or exclude from importing specific types of available data in a source file.

Note: The types of data actually displayed in this dialog depend on the contents of a source file.

- Review the list of available data types with numbers of objects corresponding to each data type.
- Select check box(es) near the data type(s) to be included in import. Clear check box(es) near the data type(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to a highlighted item.

- Click **Next** to proceed with import configuration.
- Click  to cancel the import configuration and open the Import Status dialog.

List of Imported Objects

To display the list of objects of chosen type in the source file and to select specific object(s) for import.

- Check the boxes near the appropriate object(s) to include them in import.

Select Layer(s) to Import

To select layer(s) from a source file to be included in import.

This dialog displays if importable objects with **Layer** attribute present in source file in the Data Selection dialog. Objects will be imported only from layers that are selected in this dialog. Objects on deselected layers will not be imported.

- Review the list of available layers and verify if there are any importable objects belonging to a particular layer.
- Click the **Layer** or **Used** headers to sort layers by the corresponding criteria, if required.

- Select check box(es) near the layer name(s) to be included in import. Clear check box(es) near the layer name(s) to be excluded from import.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted layer(s). The context menu also simplifies multiple layers highlighting with the following commands:
  - **Select All** - highlights all layers in the list.
  - **Select All Below** - highlights a currently highlighted layer and all the layers in the list displayed below.
  - **Select Multiple** - highlights multiple layers by sequential clicking on layer names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the layers in import. Click the **Select Used** button to include the layers which have importable objects. Click the **Unselect All** button to remove highlight from all layers.

- Click **Next** to proceed with import configuration.
- Click **Back** to return to the previous dialog. Click  to close the dialog and return to the Archive Menu.

Duplicate Object

To manage objects having duplicate name in source and target data.

The dialog displays when an object of the same type and having the same name exists in both source and target files.

> **Note:** This dialog is also used if an object is found in the source file that requires a name but does not have one. In this case, the only available option to import such object is to enter its name manually in the **Name:** field. Alternatively you can skip import of objects without names.

> **Note:** The actual title of this dialog may differ depending on the object type whose duplicate name or missing name was detected.

In the upper part, the dialog displays the data type and the name of a duplicate object detected.

The **Delta** part of the dialog displays the coordinates delta values between the two detected objects with similar name.

- Select an action for the object with detected duplicate name in the **Actions** part of the dialog:
  - Select **Overwrite?** to overwrite an object in the target file with the new object. This option is unavailable for objects being a part of others existing objects in the target file.

  - Select **Merge?** to merge an object in the target file with the object in the source file having the same type and name. This option is available for such objects as layers, etc.
  - Select **Rename?** to save an imported object with a new name in the target file. Enter a new name in the **Start Name** field. By default, the Sokkia Field naming rules apply.
  - Select **Prefix?** to save an imported object using its name with a prefix. Enter a desired prefix in the corresponding field.
  - Select **Suffix?** to save an imported object using its name with a suffix. Enter a desired suffix in the corresponding field.
- Choose, how to distribute the selected action among detected objects with duplicate names:
  - Click **Yes** to apply the selected action to an object with detected duplicate name and proceed with data exchange.
  - Click **Yes To All** to apply the selected action to all the objects of the same type with detected duplicate name and proceed with data exchange.
  - Click **Skip** to remove an object with detected duplicate name from data exchange and proceed.
  - Click **Skip To All** to remove all objects of the same type with detected duplicate name from data exchange and proceed.
  - Click  to remove all objects with detected duplicate name from data exchange and proceed.

Import/Export Results

To display the warning messages of problems occurred during the import or export process.

Note: This dialog doesn't display if no problems during the import or export process occurred.

- Review the list of detected problems in importing or exporting process.
- Click  to close the dialog and display the Import or Export Status dialog.

Import Status

To import data to the current project and to display the importing results.

This dialog displays after completing the import configuration procedure and finishes the import showing the information about importing process results.

Note: Depending on the data you selected to import, the import process may take some time. Monitor the process status displayed in the dialog and wait until the import procedure completes.

- The import progress bar shows the overall completion of import process.
- The information pane displays all the types of exported objects with their respective quantity.
- If import process finished with errors, the list of errors also displays.
- The general import result (e.g successful, with errors, canceled) displays under the information pane.

Note: After finishing the import from a PDF file, the **Transform** button will be available to start the Drawing Transformation dialog.

Click the **Close** button to return to the Archive Menu. Click  to open the Home Screen dialog.

Shared Codes

To update codes in the Shared Data file.

This dialog adds user-selected codes from the project to the Shared Data file or removes user-selected codes from the Shared Data file.

- Review available codes in the **Project Data** list and **Shared Data** list.

- To add a code from the project to the Shared Data file, highlight the desired code in the **Project Data**.

  Note: A code from the project added to the Shared Data file retains the code type, layer, style, and attributes. Codes of the added points are automatically added to the Shared Data file. Use this dialog only when you need to add code to the Shared Data file, but do not need to add points with this code.

  - Click the **Select All** button to highlight all codes in the **Project Data**. Click the **Unselect All** button to remove highlight from all the codes in the **Project Data**.
  - Use the context menu to simplify multiple codes highlighting with the following commands:
    - **Select All** - highlights all codes in the list.
    - **Select All Below** - highlights a currently highlighted code and all the codes in the list displayed below.

  - **Select Multiple** - highlights multiple codes by sequential clicking on code names.
  - **Cancel Selection** - removes all highlights in the list.

- Click  to add highlighted code(s) to the Shared Data file. A prompt to overwrite displays when trying to add a code with the name that is already present in the **Shared Data** list.

- To delete a code from the Shared Data file, highlight the desired code in the **Shared Data**.
  - Use the context menu to simplify multiple codes highlighting with the following commands:
    - **Select All** - highlights all codes in the list.
    - **Select All Below** - highlights a currently highlighted code and all the codes in the list displayed below.
    - **Select Multiple** - highlights multiple codes by sequential clicking on code names.
    - **Cancel Selection** - removes all highlights in the list.

  - Click the **Delete** button to remove highlighted code(s) from the Shared Data file.

    Note: When a code is deleted from the Shared Data file, points in Shared Data file with this code remain in the Shared Data file but lose this code and all its properties. To delete these points from the Shared Data file, do it in the Shared Points dialog.

- Click **Next** to keep the selection and open the Shared Points dialog to update points in the Shared Data file.
- Click  to immediately update the Shared Data file and close the dialog.
- Click  to close the dialog, no data in the Shared Data file will be updated.

Shared Points

To update points in the Shared Data file.

This dialog adds user-selected project points to the Shared Data file or removes user-selected points from the Shared Data file.

- Review available points in the **Project Data** list and **Shared Data** list.

- To add a project point to the Shared Data file, highlight the desired point in the **Project Data**.

Note: A project point added to the Shared Data file retains all the point attributes - point style, layer, code, custom symbol. The code of the added point is automatically added to the code library in the Shared Data file.

- Click the **Select All** button to highlight all points in the **Project Data**. Click the **Unselect All** button to remove highlight from all the points in the **Project Data**.
- Use the context menu to simplify multiple points highlighting with the following commands:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.

- Click  to add highlighted point(s) to the Shared Data file. A prompt to overwrite displays when trying to add a point with the name that is already present in the **Shared Data** list.

- To delete a point from the Shared Data file, highlight the desired point in the **Shared Data**.
  - Use the context menu to simplify multiple points highlighting with the following commands:
    - **Select All** - highlights all points in the list.
    - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
    - **Select Multiple** - highlights multiple points by sequential clicking on point names.
    - **Cancel Selection** - removes all highlights in the list.

  - Click the **Delete** button to remove highlighted point(s) from the Shared Data file.

    Note: When a point is deleted from the Shared Data file, codes of the deleted point remain in the code library in the Shared Data file. To delete these codes from the Shared Data file, do it in the Shared Codes dialog.

- Click **Back** to keep the selection and open the Shared Codes dialog to update code library in the Shared Data file.
- Click **Next** to keep the selection and open the Shared Localization dialog to update localization data in the Shared Data file. If the project and currently used shared data file do not contain localization data, the **Next** button is not displayed.
- Click  to immediately update the Shared Data file and close the dialog.
- Click  to close the dialog, no data in the Shared Data file will be updated.

Shared Localization

To update localization data in the Shared Data file.

Note: To use a localization previously saved in the Shared Data file, open the Localization dialog then click  to open the dialog menu and select **Import from Shared Data**. After finishing the import, the localization from the shared data is applied to your current project.

This dialog adds localization data from the current project to the Shared Data file or removes existing localization data from the Shared Data file.

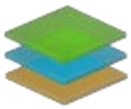
- Review if localization is present in the **Project Data** list and **Shared Data** list.
- To add a localization to the Shared Data file, highlight it in the **Project Data** and click  to add the localization data to the Shared Data file. A prompt to overwrite displays when trying to add a localization if localization data already exists in the **Shared Data** list.
- To remove a localization from the Shared Data file, highlight it in the **Shared Data** and click the **Delete** button
- Click **Back** to keep the selection and open the Shared Points dialog to update points in the Shared Data file.
- Click  to immediately update the Shared Data file and close the dialog.
- Click  to close the dialog, no data in the Shared Data file will be updated.

Edit

To create manually new objects and edit and configure existing objects and data in the current project.



Codes
To edit existing codes and add new codes manually.



Layers
To edit existing layers and add new layers manually.



Linework
To edit existing linework objects and add new linework objects manually.



Areas
To edit existing areas and add new areas manually.



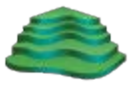
Point Lists
To edit existing point lists and add new point lists manually.



Raw Data
To edit raw data and re-compute coordinates.



Background
To manage backgrounds, to configure and perform background transformations.



Surfaces
To edit existing surfaces and add new surfaces manually.



Sessions
To configure and edit session plans for automatic raw data logging by GNSS receiver. This icon is displayed, if the **Post Processing** check box is selected in the Receiver Make dialog.



Roads
To edit existing roads and add new roads and road elements manually.



Reports
To manage field reports and stake reports.



Planes
To edit existing planes and add new planes manually.



Points

To display a list of points in the current project and to select, add, edit, or delete points.

The *Points: <Coordinate Type>* dialog contains a list of points available in the current project. The list provides you with the basic information about every point: a point's type and name, coordinates, codes and note. The title of the dialog shows the type of the coordinates displayed. The icon near the point name indicates the point type that is the method the point is determined. Learn more about the icon description for the points.

To view and manage a list of points of the current project:

- Click  to open the **Filters** drop-down menu and to select and apply one or more filters to the displayed list of points. If any filter(s) from this menu are already applied to the list of points, the button is greened: . The green mark  near the filter in the drop-down menu indicates that this filter is applied. Several filters can be applied simultaneously. To clear an applied filter, click it again. To clear all the applied filters select the **Reset All** command. The list of available filters:
  - By Range - specify the range(s) of point names to display in the list.
  - By Code - select the code(s) to display only the points having that code(s).
  - By Code String - specify the code string to display only the points having that string.

  - By Radius - specify the circle to display only the points residing inside that circle.
  - By Name - specify the point name or a part of the point name to display only the matching points.
  - By Layer - select the layer to display only the points residing this layer.
  - By Time - specify the time or time range of adding point to the project to display only the matching points.
  - By Type - select the point type(s) to display only the points of that type(s).

- Expand the **Sort** drop-down menu to select a criterion for the project points sorting in the list and choose the output order: either *Ascending* or *Descending*:
  - *By Name* - the list is sorted by point names.
  - *By Time* - the list is sorted by the time of adding point to the project.
  - *By Nearest* - the list is sorted by the distance from the current controller position (this option is available when current position is supplied to Sokkia Field).
  - *By Code* - the list is sorted by point codes.
  - *By Type* - the list is sorted by point types.

- Expand the **Find** drop-down menu and select a criterion to find a point:
  - By Range - specify the range(s) of point names to find in the list.
  - By Code - select the code(s) to find the points having that code(s).
  - By Code String - specify the code string to find the points having that string.
  - By Radius - specify the circle to find the points residing inside that circle.
  - By Name - specify the point name or a part of the point name to find the matching points.
  - By Layer - select the layer to find the points residing this layer.

- Click **Find Next** to highlight the next point in the list that satisfies the entered criterion of a previous Find.

- Highlight desired point(s) in the list. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.

- Click **Delete** to remove the highlighted point(s) from the project.
- Click **Edit** to edit point parameters of the highlighted point(s) in the Edit Point dialog or in the Editing Multiple Points dialog.

Note: The **Delete** button is disabled and the **View** button is displayed instead of the **Edit** button if a non-editable external control point  is highlighted. The View Point dialog for external control point displays point data as read-only. If project points and external control points are highlighted simultaneously, clicking the **Delete** or **Edit** buttons apply respective commands only to the project points.

- Click **Add** to create a new point in the Add Point dialog.
- Click  to view or change the current coordinate type, coordinate order and other geodetic parameters. More...

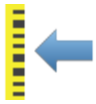
Click  to open the dialog menu with additional options:

- **Setup Columns** - to customize the arrangement of data columns in the list of points. More...
- **PTL Mode** - to enable / disable the PTL (Point-To-Line) mode. When enabled , the *From Point* and *To Point* columns appear in the list to show the reference line. If a point has PTL data, its horizontal coordinates are displayed as offsets from the specified reference line (along line and left / right offset).
- **Recompute** - to recompute the point coordinates after editing the point's raw data (if the recomputation was not performed in Raw Data).

Note: The point coordinates are displayed in red, when:
- point coordinates are defined in WGS-84 or any Datum, but the coordinate system of the project is Ground;
- point coordinates are defined in Ground, but the coordinate system of the project is WGS-84 or any Datum;
- point coordinates are outside of the table datum;
- point coordinates are outside of the table projection;
- on coordinate entry error.

Point Icons Description

	GNSS topo point

	Auto topo point
	GNSS offset point
	Total station offset point
	Foresight point by total station
	Foresight point by digital level
	Backsight point by total station
	Backsight point by digital level
	Sideshot point by total station
	Sideshot point by digital level
	Offset point from a topo point by pole measurement
	Design point (calculated by Sokkia Field or imported from a file or another project)
	Staked point during "Stake Point" procedure
	Staked point during "Stake Line" procedure

	Calculated point (the point coordinates were calculated using the Calculate functions)
	Taped point (the point coordinates were calculated by Tape Dimension)
	Manual point (the point coordinates were entered manually)
	External control point (the point stored in the Shared Data File)
	Scan point (the point coordinates were measured during Scanning)
	Accessory point (not the real point included in the project) whose coordinates were calculated automatically to form another object in the project

Point Properties Icons Description

	RTK base station / GNSS static occupation
	Optical survey occupation point
	Point with photo note
	Control point (the known point with fixed coordinates)
	GNSS point measured with enabled TILT ™ and tilt compensation is applied

Setup Columns

To customize the arrangement of columns in the list of points:

To customize the arrangement of columns in the list of points.

- Highlight the necessary items in the **Available** field or the **Selected** field.
  - Use the context menu in the list to simplify multiple items highlighting with the following commands:
    - **Select All** - highlights all items in the list.
    - **Select All Below** - highlights a currently highlighted item and all the items in the list displayed below.
    - **Select Multiple** - highlights multiple items by sequential clicking on item names.
    - **Cancel Selection** - removes all highlights in the list.
- Click  /  to move the necessary items between the fields.
- Click  /  to arrange the items in the **Selected** field in the desired order.
- Click  to save the selected order of columns and return to the Points dialog. Click  to close the dialog and return to the Points dialog without saving.

Point Filters

To show only specific points in the current listings or to find / select specific points filtered by specific criteria.

Click  in the dialog's title bar to open the **Filters** drop-down menu and to select and apply one or more filters to the displayed list of points. If any filter(s) from this menu are already applied to the list of points, the button is greened: . The green mark  near the filter in the drop-down menu indicates that this filter is applied. Several filters can be applied simultaneously. To clear an applied filter, click it again. To clear all the applied filters select the **Reset All** command. The list of available filters:

- By Range - specify the range(s) of point names to display in the list or to find / select specific points.
- By Code - select the code(s) to display or to find / select only the points having that code(s).
- By Code String - specify the code string to display or to find / select only the points having that string.
- By Radius - specify the circle to display or to find / select only the points residing inside that circle.

- By Name - specify the point name or a part of the point name to display or to find / select only the matching points.
- By Layer - select the layer to display or to find / select only the points residing this layer.
- By Time - specify the time or time range of adding point to the project to display or to find / select only the matching points.
- By Type - select the point type(s) to display or to find / select only the points of that type(s).

Point Filter By Range

To specify names and / or name ranges for the points to be displayed or found / selected.

- Enter point names and / or name ranges in the **Range of Points** text field.
  - Use either comma (**,**') or semicolon (**;**') symbols to separate individual point names and / or ranges of names. Use minus '**-**' symbol between point names to form a range. Put point names containing minus '**-**' symbol in quotation marks, for example **"Pointname-1"**.
  - Type names and / or name ranges by keyboard.
  - Use the context menu with **Cut**, **Copy**, **Paste**, **Delete**, **Select All** commands to edit text.
  - **Paste** a prepared list with point names and / or name ranges from clipboard.
- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Code

To specify the code(s) to display or find / select only the points having that code(s).

All the codes existing in the current project and their descriptions are listed in the table.

- Select point code(s) in the list. Only points with the selected code(s) will be displayed or found / selected.
  - Select check box(es) near the point code(s) to display or find / select such points.

    Note: To include / exclude points without code, check / clear the box near the *No Codes* item.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted code(s). The context menu also simplifies multiple codes highlighting with the following commands:

- **Select All** - highlights all codes in the list.
- **Select All Below** - highlights a currently highlighted code and all the codes in the list displayed below.
- **Select Multiple** - highlights multiple codes by sequential clicking on code names.
- **Cancel Selection** - removes all highlights in the list.

- Click the **Select All** button to include all the codes into the filter. Click the **Unselect All** button to exclude all the codes.

- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Code String

To specify the code and code string(s) to display or find / select only the points having that code and code string(s).

- Select a point code in the **Code** drop-down list to display strings in that code in the table below. This drop-down list contains only the code(s) with strings.

  - Select check box(es) near the point code string(s) of the point code to display or find / select only such points.
  - Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted code string(s) of the selected code. The context menu also simplifies multiple code strings highlighting with the following commands:
    - **Select All** - highlights all code strings in the list.
    - **Select All Below** - highlights a currently highlighted code string and all the code strings in the list displayed below.
    - **Select Multiple** - highlights multiple code strings by sequential clicking on code string names.
    - **Cancel Selection** - removes all highlights in the list.

- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Radius

To specify the circle to display or find / select only the points residing inside that circle.

- Select the **Point** either by entering it manually or by selecting it from the map  or list . This will be the center of the circle.
- Enter the **Radius** (distance) around the selected point in the current units.

- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Name

To specify a point name or a part of the point name for the points to be displayed or found / selected.

- In the **Point** field, enter the point name or a part of the name to display or find / select in the current point listings.
  - Select the **Match entire name** radio button when entering the whole point name in the **Point** field.
  - Select the **Match partial name** radio button when entering a part of the point name in the **Point** field.

- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Layer

To specify layer(s) for displaying or finding / selecting only the points belonging to that layer(s).

- Click a column header to sort the list of layers in ascending  or descending  order based on that header. Click the **View** button below to reset sorting.
- Highlight the layer(s) to display or find / select only the points having that layer(s) in their point's attributes.
- Use the context menu in the list to simplify multiple layers highlighting with the following commands:

- **Select All** - highlights all layers in the list.
- **Select All Below** - highlights a currently highlighted layer and all the layers in the list displayed below.
- **Select Multiple** - highlights multiple layers by sequential clicking on layer names.
- **Cancel Selection** - removes all highlights in the list.

> **Note:** Click on layer's property in the list (*Visibility*, *Lock*, or *Color*) to instantly modify the highlighted layer's property. Alternatively, use respective context menu commands to instantly change the highlighted layer's properties as well as to set this layer as *Default* layer. Learn more about the layer properties.

- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Time

To specify a time range for the points to be displayed or found / selected.

- Click **Today** radio button to display or find / select only the points created today.
- Click **Yesterday** radio button to display or find / select only the points created yesterday.
- Click **Time range** radio button to display or find / select only the points created in the specific time interval:
  - Enter starting date and time for the time interval in the **From:** field. Type by keyboard or use arrows to change a highlighted value.
  - Enter ending date and time for the time interval in the **To:** field. Type by keyboard or use arrows to change a highlighted value.

- Click  the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Point Filter By Type

To specify point type(s) for the points to be displayed or found / selected in the current point listings.

- Select point type(s) in the list of point types. Only points of the selected type(s) will be displayed or found / selected in point listings.

Note: *Auto Topo* points, *Scanned* points and *Staked Design* points are filtered out from point listings by default. For displaying points of these types, this filter should be enabled with respective point types selected.

- Select check box(es) near the point type(s) to include such points in the filter criteria. Clear check box(es) near the point type(s) to hide such points from the filter criteria.
- Use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted point type(s). The context menu also simplifies multiple point types highlighting with the following commands:
  - **Select All** - highlights all point types in the list.
  - **Select All Below** - highlights a currently highlighted point type and all the point types in the list displayed below.
  - **Select Multiple** - highlights multiple point types by sequential clicking on point type names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to include all the point types in the filter criteria. Click the **Unselect All** button to exclude all the point types from the filter criteria.

- Click  to apply the settings and to enable this filter criteria.
- Click  to close the dialog without enabling this filter.

Add Point

To manually add a point to the current project and to enter the point properties.

Create a point and define point properties on several tabs:

- Point tab - to enter parameters of the point being created.
- Style tab - to display and edit a layer and graphic style for the point.
- PTL (Point-To-Line) tab - to review or to add PTL (Point to Line) data for the point.
- Photo tab - to review, shot, add, edit, export, or remove photos or image files for the point.
- Extra Info tab - to review additional information about the point.

After entering the point data, click  to save the new point in the current project and return to the previous dialog. If the entered name already exists in the project, the Point Check dialog opens on saving to handle names conflict. Click  to return to the previous dialog without saving.

Edit Point

To edit or view the selected point data and properties.

Note: If this dialog is opened for an external control point , the dialog title changes to **View Point** and point data is read-only.

Review and edit the existing point and related data on several tabs. Actual tabs displayed depend on the properties of the point:

- Point tab - to display and edit parameters of the selected point.
- Style tab - to display and edit a layer and graphic style for the point.
- PTL (Point-To-Line) tab - to review or to add PTL (Point to Line) data for the point.
- Cut Sheet tab - to display staked point(s) data for the selected design point.
- Check Points tab - to display check point(s) data for the selected point.
- WA (Weighted Average) tab - to display and manage a list of measurements of the selected point that can be used in the Weighted Average coordinates calculation.
- Photo tab - to review, shot, add, edit, export, or remove photos or image files for the point.
- Extra Info tab - to review additional information about the point.

Click  to open the dialog menu with additional options:

- **Create Field Report** - to generate a field report on selected point.
- **Export Text Sheet** - to export the selected point data from Check Points tab and WA (Weighted Average) tab to check sheet format (**.txt*).

After editing the point data, click  to save the edited point in the current project and return to the previous dialog. If the modified point name belongs to another point in the project, the Point Check dialog opens on saving to handle names conflict. Click  to return to the previous dialog without saving.

Point tab

To display and edit parameters of the existing point or to add a new point.

- Name of the **Point**. You can type a name of new point or modify a name of selected point. If the entered name already exists in the project, the Point Check dialog opens on saving to handle

names conflict.

- Code and attribute information for the point.
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.
  - Enter any additional information about the point in the **Note** field.

- The coordinates are displayed in the format of currently used coordinate system. For a new point you can manually enter coordinates in the current coordinate system.
- If required, select the **Control Point** check box to add a new point as a control point  with fixed coordinates.

Code String

The code string is a specifying parameter for a code that allows you to group points with one code into different linework objects or areas, depending on the used code type and the value of the code string. Usually, the code string value is a number of the object entered by the user. The code string separates one surveyed line / area from the next one. Start to measure first line and assign the code string "1" to stored points. When you want to measure another line change the code string from "1" to "2" and continue storing points. These points will be considered in application as the second separated line and shown on the map accordingly. While surveying, you can extend previously measured linework / area by assigning the code and string of that linework / area to new stored points.

Also, the code string can be assigned manually to existing points with code of Line or Area type. When processing points, Sokkia Field will be able to create linework / area from points with a code that has one string, and not take into account points with the same code, but with a different string.

Control Codes

The control code is a special type of code that can be used together with the code of Line or Area type and the same code-string by Sokkia Field and other point-processing applications for the interpretation of the survey results. Up to two control codes can be specified for a point that will be used to form linework or area. Assign a code of the Line or Area type, add a code string to form a specific polyline or area object, use a control code to define the role of this point in this linework or area, and select where to add the next segment to the current linework or area.

The list of available positions for the next segment in the current linework or area:



Add to End
After saving the new point with code string and control code, a new segment will connect the end point of the corresponding linework to the saved point.



Add to Start
After saving the new point with code string and control code, a new segment will connect the saved point to the start point of the corresponding linework.



Insert
After saving the new point with code string and control code, the closest existing segment of the corresponding linework will be split into two segments by the saved point.

Control codes can be added to points with code of Line or Area type and code string right in survey. Also, a control code can be assigned manually to existing points with code of Line or Area type and code string. Sokkia Field will be able to create linework / area from these points based on the role defined in the control code.

The list of available control codes:



Line Point
Indicates the start of the line segment in the linework along the direction. This is the empty control code added by default to points with code of Line or Area type.



Arc Start (**AS**)
Indicates the start of an arc. Arc parameters are determined by the presence of additional points in the line. These points can create the line segment with the arc start point which will act as the tangent to the arc.



Arc End (**AE**)
Indicates the end of an arc. Arc parameters are determined by the presence of additional points in the line. These points can create the line segment with the arc end point which will act as the tangent to the arc.



Circle Edge (**CE**)
When this code is applied to the first point of a three-point linework, this point and next two points define the edge of the circle.



Circle Radius (**CR**)
When this code is applied to the first point of a two-point linework, it indicates the center of a circle. The second point will define the radius of the circle.



Rectangle (**R**)
When this control code is applied to the third point of a three-point linework, this results in the automatic creation of a fourth point of a parallelogram whose diagonal is specified by the first and the third point.



Close (**C**)
When this code is applied to a point, it closes the linework with each next point.



Arc End & Start (**AE,S**)
When this dual control code is applied to a point, it indicates the end of one arc and the start of another arc.



Arc End & Close (**AE,C**)
When this dual control code is applied to a point, it indicates the end of the arc and closes the linework by the line segment connecting this point to the start point of the linework.



Arc End & Gap (**AE,E**)
When this dual control code is applied to a point, it indicates the end of the arc and the start of the gap segment in the linework along the direction.



Line Gap (**E**)
Indicates the start of the gap segment in the linework along the direction.



Custom selection
When the user entered a non-supported control code. This is possible if *Allow Custom Control Codes* check box is selected in the Settings tab of the Code Options dialog. In this case, Sokkia Field will not interpret this control code.

Note: If only one point is between the arc start and end points, the arc is formed such that all the three points lie on the arc. If there are two, or more than two points, between the points with the AS and AE control codes, the points are all connected by straight line segments.

Style tab

To display and edit a layer and graphic style for the selected point.

- Define the **Layer** where the point resides. Select an existing layer quickly from the drop-down list or click ... to manage layers in the current project. More...
  - Check the **Use layer from code** box to define the layer the point is on as the layer of point code. If you later change the code for this point, the layer will change accordingly. If the point is not assigned a code or the check box is cleared, the setting from the **Layer** field is applied.

    Note: If a point is assigned multiple codes, that point is simultaneously on the layers of all assigned codes. You can view these layers in the Extra Info tab of the Edit Point dialog.

- Define the **Point Style** for drawing on the map. By default, style parameters are defined by the code of the point: *<By Code>*. Clicking on ... opens the Point Symbols dialog, where you can select a symbol for this point. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for this symbol. The preview panel displays the current style.

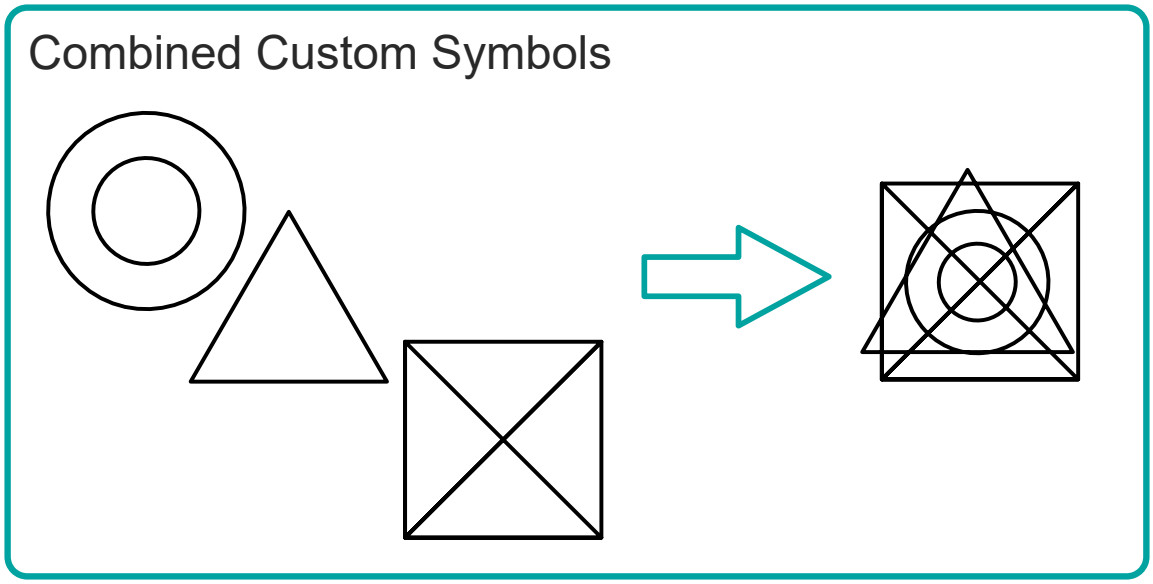
Point Symbols

To add or modify the graphical symbol to display and identify the selected point on maps in Sokkia Field.

Two symbol types are available - symbols and custom symbols:

- In the **Symbol** group, you can view and select any symbol from the predefined list of symbols. Click the ... button, to open the Select Symbol dialog for selection of a predefined symbol.
- In the **Custom Symbol** group, you can view and add any symbol available in the Shared Data file.
- By default, the symbol of the point is defined by the symbol attributed to the layer (*<By Layer>*).
- If the point uses the predefined symbol only, the point symbol is this predefined symbol.
- If the point uses the predefined symbol and custom symbol, the point symbol is this custom symbol.

- It is possible to use several custom symbols for a point. The final symbol will be displayed as the sum of the selected custom symbols:



The **Custom symbol** list displays the data on added custom symbols:

- **Custom Symbol** - custom symbol name;
- **View** - custom symbol plot;
- **Scalable** - if selected, the custom symbol is displayed on the map using the scale defined in the Symbols dialog. You can open this dialog by clicking ☰ in the top left corner of the Code Options dialog and selecting the **Custom Symbols**.
- **X scale** / **Y scale** - the individual scale of the custom symbol (X, Y axis or both) on maps.
- **Rotation** - the individual angle of the custom symbol clockwise rotation.

  You can edit these values (except **Scalable**) in the Edit Custom Symbol dialog.

To manage the **Custom symbol** list:

- Click **Delete** to stop using the highlighted symbol as the custom symbol of the selected point.
- Click **Edit** to view / edit custom symbol properties (scale and rotation) in the Edit Custom Symbol dialog.
- Click **Add** to add a custom symbol that will be displayed for the point. Clicking the **Add** button opens the Select Custom Symbol dialog. It is possible to add several custom symbols for a point.
- Click **Set Primary** when two or more custom symbols are added. Clicking on the button moves the highlighted symbol over the others. The name of this symbol will be assigned to the combined symbol. If the custom symbol *<By Layer>* or *<By Code>* is added, this custom symbol is always **Set Primary**.

After adding or changing point symbols, click  to attach the entered data to the point and return to the previous dialog for saving the selected point with attached data. Click  to return to the previous dialog without saving.

Select Symbol

To select a predefined symbol for layer, code or point:

- Pick the necessary symbol from the list. You can pick only one symbol from the predefined list and a symbol assigned *By Code* or *By Layer*.
- When required, click the **Set As Default** button to use the picked symbol as the default symbol.
- Confirm selection by clicking .

To select a symbol and immediately confirm the selection, just double-click (double-tap) on the necessary list item.

Select Custom Symbol

To select a custom symbol for layer, code or point:

- Pick the necessary symbol from the list. You can pick only one symbol from the custom symbol list and a symbol assigned *By Code* or *By Layer*.
- Confirm selection by clicking . The Add / Edit Custom Symbol dialog will open to review the selected custom symbol properties.

  The **Origin** column can display:

  - *Library* for custom symbols from the Shared Data file.
  - *Project* for custom symbols are saved in the current Sokkia Field project.

Note: Sokkia Field will copy custom symbol(s) from the Shared Data file to the current project if this custom symbol was selected for layer, code or point.

Add / Edit Custom Symbol

To review the custom symbol properties when adding it to point, layer, or code and to edit custom symbol properties when adding it to an individual point.

- **Name**, **Description**, **Scalable** - are read-only properties.Depending on the **Scalable** check box status, the custom symbol will be displayed on the map using either *scalable* or *non-scalable* setting defined in the Symbols dialog. You can open this dialog by clicking ☰ in the top left corner of the Code Options dialog and selecting the **Custom Symbols**.
- **X Scale**, **Y Scale**, **Rotation** - define the individual scale of the custom symbol (X, Y axis or both) and set the required rotation. This properties are editable for individual points. Preview pane reflects the values you input on-the-fly.

  > **Note:** For a custom symbol that has the **Scalable** box checked, the scale you set in this dialog will be combined with the size defined in the Symbols dialog. You can open this dialog by clicking ☰ in the top left corner of the Code Options dialog and selecting the **Custom Symbols**.

- Click ... next to the **Name** field to replace the currently selected custom symbol with another one in the Select Custom Symbol dialog.

PTL tab

To review or to add PTL (Point to Line) data for the selected point. (Available when the PTL mode is enabled).

> **Note:** To add PTL data to manually created new point, enable **PTL Mode** by clicking ☰ in the Points dialog and click the **Add** button to create a point with PTL coordinates. To automatically calculate PTL data for surveyed points, click ☰ in any survey dialog to open the dialog menu, expand the **Setup** sub-menu and set up and enable PTL mode.

- Specify the reference line to calculate PTL offsets. In **Start reference point** and **End reference point**, enter respective point names manually, or select from the map  or from the list  of points in the project. The specified **Start reference point** is an origin point for calculation of PTL data.
- Set **PTL Offsets** in the current distance units:

- In **Along line**, set the distance along the line from the Start Reference Point.
- In **Offset**, select either *Right* or *Left* offset and set the distance in a direction perpendicular to the line.

- **Elevation**/**Ellipsoidal Ht**/**Z** is either the elevation (for *Ground* and *Grid* coordinate type) or ellipsoidal height (for *WGS84(Lat/Lon/Ell ht)* coordinate type) or value of the Z coordinate (for *WGS84 (X/Y/Z)* coordinate type) of the current point.

Note: The information presented in the PTL tab for surveyed PTL points is not editable.

Cut Sheet tab

To display staked point(s) data for the selected design point. (Available only for staked design points).

The table displays the *Name* of the staked point, the *dN*, *dE*, and *dH* vector of the staked point from the design point, the *Coordinates* of the staked point and any *Notes* associated with the staked point.

Check Points tab

To display check point(s) data for the selected point. (Available only for recorded points that have been surveyed several times and these re-measurements were saved as check points to the selected recorded point).

The list displays the *Name* of the check point, the *dN*, *dE*, and *dH* vector of the check point from the recorded point, the *Coordinates* of the check point and any *Notes* associated with the check point.

Note: To add measurements to an existing point as check points, make a measurement and select this point name when saving it. In the open Point check dialog, select the **Store as check point** option.

Weighted Average (WA) tab

To display and manage a list of measurements of the selected point that can be used in the calculation of weighted average coordinates for that point.

Review the type of instrument used for these measurements: *Optical* or *GNSS*.

Note: The Weighted Average tab is displayed for the point that has been measured several times by the same instrument type.

Review the *N*, *E* and *H* residuals, *Horizontal Status* and *Vertical Status* of each measurement (whether this measurement is used in calculating of horizontal and vertical weighted average coordinates), and *Note* for the measurement.

Note: To add measurements to an existing point for weighted average coordinates calculation, make a measurement and select this point name when saving it. In the open Point check dialog, select **Store as check point** with the **Use in weighted average** box checked.

Check or clear the boxes near *Horizontal Status* and *Vertical Status* of measurement to include or exclude the respective coordinates obtained from this measurement in calculation of weighted average coordinates of the selected point. Displayed residuals are updated accordingly. The measurement used in calculation of WA coordinates is marked with , the measurement excluded from calculation of WA coordinates is marked with .

Photo tab

To review, shot, add, edit, export, or remove photos or image files for the selected point.

The Photo tab title contains the number of attached images to the point.

1. To review and manipulate photos / images attached to the point:

   - The **Photo** panel displays a currently attached image (if any). The name of the field also contains the sequential number of this image and the total number of attached images to this point.
   - Click  and  to browse through all attached images.
   - Click on an image to display the image in full screen. Click on an image again to return to the dialog mode.
   - Click  to open the Sketch dialog where you can modify an image open in the **Photo** panel using the built-in image editor.
   - Click  to quickly save the open image as a **.JPG* file to a local storage. The generated file name will be as: *100_000.jpg*, where *100* is a point's name and *000* is a sequential number of this image among all attached images to this point.

2. To add or remove a photo or image file to / from the point:
   - Click  to open the Image Capture dialog and make a photo (the field controller should be equipped with a camera). The Compass Calibration dialog may open and prompt you to calibrate the compass before taking a photo (if not already calibrated). The captured image will be displayed in the **Photo** panel and attached to the point.

     Note: Click  button in the title bar of the Image Capture dialog to open the Camera Setting dialog and set up embedding time stamp, coordinates, and direction right into photos.

   - Click  to open the Select Image File dialog, where you can select an image (**.bmp*, **.jpg*, **.png*, **.tif*, **.tiff*) file. The selected image file will be displayed in the **Photo** panel and attached to the point.
   - Click  to remove the photo / image displayed in the **Photo** panel from being attached to the point. This action doesn't delete the file from the storage.

Extra Info tab

To review additional information about the selected point.

The tab displays read-only information related to the point coordinates and possible dependencies on this point in the current project:

- *Stored Coord Type* - the coordinate system type used to create this point.
- *Stored Coordinates* - the point coordinates in the coordinate system at the time of creation of this point.
- *Convertible to Current Display CS* - the possibility to convert the point's original coordinates to the coordinate system type used in the current project (*Yes* or *No*).
- *Grid Scale Factor* - the scale factor applied at this point coordinates to convert grid distances to ground distances. (Available if *Projection* is selected in the Coordinate system dialog.)
- *Time* - the date and time of the point creation (timestamp).
- *Point Layer(s)* - the layer or layers to which the point belong, along with layer's *visibility*, *lock*, *default* statuses.
- *Referenced in* / *Used as* / *Has Dependent Points* / *Measured for i-Construction Surface* / *Read Only (special point imported from certain Japanese road files)* - the point usage in specific objects or functions that prevent the point from being deleted (*Yes* or *No*).

If required, click  to save the displayed information to a text (**.txt*) file.

Point Attributes

To review, add, or edit code and code attributes for the selected point as well as style, photo, and note properties.

The dialog name also contains the selected point's name.

Review and edit code, code attributes and point properties for the selected point on several tabs:

- Name tab - to set the currently surveyed point name and to configure further point naming and survey range.
- Code tab - to set code and code attributes for the selected point.
- Multi-Code tab - to display, add and manage all codes, code strings and attributes of the selected point.
- Style tab - to display and edit a layer and graphic style for the selected point.
- Photo tab - to review, shot, add, edit, export, or remove photos or image files for the selected point.
- Note tab - to review or to enter the text note for the selected point.

After adding or changing code attributes and / or properties on respective tabs, click  to attach the entered data to the point and return to the previous dialog for saving the selected point with attached data. Click  to return to the previous dialog without saving.

Name tab

To set the currently surveyed point name and to configure further point naming and survey range.

This tab is available when the Point Attributes dialog is called during survey.

In the **Point** field, enter a name of the point being surveyed. This name will be applied to the next saved point. Sokkia Field suggests the name according to the Point Naming defined in survey configuration. If required, change the current point naming settings right in this tab.

Specify the parameters for naming a new point. When adding a new point, its name can be formed by using an increment or decrement to its sequential number, and adding prefixes or suffixes.

To configure point naming and other parameters:

- **Increment Point Number**: the increment / decrement value. If you select "0" in the field, the next point number will remain unchanged. The Point Check dialog will be opened for saving such point. You can save this point as a check point or use any other saving option.

- **Prefix/Suffix**: a prefix or suffix to form the name of a point. If your project does not have predefined values of the prefix or suffix, you can create these values in the List of Suffixes / Prefixes dialog and use in other projects. To open this dialog, click ... in the **Prefix/Suffix** field.

  Example:
  *The number in the **Point** field of the Topo dialog is 200. You specified "-1" in the **Increment Point Number** field and use "_FLD" Suffix. The number of the next point will be "199_FLD".*

- **Measure nearest point**: if this check box is selected, then the following will occur during a survey:
  - When measuring a point within the specified range, the Objects near selected point dialog will be displayed listing all the points within the range.
  - On attempt to measure a point out of specified range, a respective warning will be shown. A user will be asked to choose whether he wants:
    - to measure and store such a point or
    - to cancel the measurement at current position.

    The desired range is specified in the **Range** field.

Code tab

To add or edit code and code attribute.

- Select a **Code** from the drop-down list. The Code list shows all the codes available in the project. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
- Select a Code String for the code of the line or area type.
- If required, select up to two Control Codes from the **Ctrl Code** drop-down lists. The control code is a special type of code that can be used together with the code of Line or Area type and the same code-string by some graphic tools for the interpretation of the survey results.
- The attribute table lists all available attributes for the code and allows you to enter / select its value. The table is empty if the code selected from the **Code** drop-down list has no attributes.
  - Click the **Props** button to open the Attribute Ranges dialog, which displays the valid ranges for the attributes for the selected code.
  - Click the **Repeat** button to set the previous saved value.
  - Click the **Default** button to set the default value.
- Click the **Multiple Codes** button to open the Multi-Code tab and add several codes to the selected point.

Attribute Ranges

To display the details of code attributes for the selected code.

The dialog displays the name of the selected code.

The table below the code name displays a list of attributes associated with this code as well as their type, min / max values, default value, status (required: yes or no). The actual columns displayed in the table depend on the type of the attribute highlighted.

Multi-Code tab

To review, add, replace or delete all codes, code strings and attributes for the selected point. (Available for points with multiple codes).

- Click **Add** to add another code to the selected point. More...
- Click **Edit** to replace the code highlighted in the list. More...
- Click **Delete** to delete the highlighted code from the list.

Note tab

To review or to enter the text note for the selected point.

- Enter any additional information about the point in the **Note** field.

Select Points From List

To select points from the list of currently available points.

1. View and manage the list of the points available in the current project:
   - Click  to open the **Filters** drop-down menu and to select and apply one or more filters to the displayed list of points. If any filter(s) from this menu are already applied to the list of points, the button is greened: . The green mark  near the filter in the drop-down menu indicates that this filter is applied. Several filters can be applied simultaneously. To clear an applied filter, click it again. To clear all the applied filters select the **Reset All** command. The list of available filters:
     - By Range - specify the range(s) of point names to display in the list.
     - By Code - select the code(s) to display only the points having that code(s).
     - By Code String - specify the code string to display only the points having that string.
     - By Radius - specify the circle to display only the points residing inside that circle.

- By Name - specify the point name or a part of the point name to display only the matching points.
- By Layer - select the layer to display only the points residing this layer.
- By Time - specify the time or time range of adding point to the project to display only the matching points.
- By Type - select the point type(s) to display only the points of that type(s).

- Expand the **Sort** drop-down menu to select a criterion for points sorting in the list and choose the output order: either *Ascending* or *Descending*:
  - *By Name* - the list is sorted by point names.
  - *By Time* - the list is sorted by the time of adding point to the project.
  - *By Nearest* - the list is sorted by the distance from the current controller position (this option is available when current position is supplied to Sokkia Field).
  - *By Code* - the list is sorted by point codes.
  - *By Type* - the list is sorted by point types.

- Expand the **Find** drop-down list and select an option to find a point:
  - By Range - specify the point names and / or name ranges to find the matching points.
  - By Code - select the code(s) to find the points having that code(s).
  - By Code String - specify the code string to find the points having that string.
  - By Radius - specify the circle to find the points residing inside that circle.
  - By Name - specify the point name or a part of the point name to find the matching points.
  - By Layer - select the layer to find the points residing this layer.
  - From Map - select points manually from the map.
- Click **Find Next** to find the next point in the list that satisfies the entered criteria of a previous Find.

2. Select points from the list and return to the previous dialog with your selection:
   - Highlight desired point(s) in the list. Use context menu to highlight multiple points:
     - **Select All** - highlights all points in the list.
     - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
     - **Select Multiple** - highlights multiple points by sequential clicking on point names.
     - **Cancel Selection** - removes all highlights in the list.
   - Click  to select highlighted points and return to the previous dialog. Click  to return to the previous dialog without selection.

Click  to open the dialog menu with additional options:

- Select **Edit Points** to open the Points dialog for managing points in the current project.

Editing Multiple Points

To set an attribute in all selected points at once.

The point attributes supported:

- Layer and style
- Codes
- Note

Editing Multiple Points (start)

- Select either Layer and style, Codes, or Note attribute to set.
- Click **Next** to proceed. Click **Back** or  to close **Editing Multiple Points** without saving.

Editing Layer and style attribute

- **Layer** field:
  - Review current layer for selected points. *<Multiple values>* text displays if selected points are on different layers. Keep this value, if selected points must stay on their current layers.
  - Click  to add, remove or modify layer(s) in the current project in the Layers dialog, if necessary.
  - Choose a layer from the drop-down list for all selected points.

- Check the **Use layer from code** box to define the layer of each selected point as the layer of its point code. If you later change the code for this point, the layer will change accordingly. If the point is not assigned a code or the check box is cleared, the setting from the **Layer** field is applied.

  Note: If a point is assigned multiple codes, that point is simultaneously on the layers of all assigned codes. You can view these layers in the Extra Info tab of the Edit Point dialog.

- **Point Style** field:
  - Review current point style (symbol and color) for selected points. *<By Code>* text displays if selected points have either default or different styles. Keep this value, if selected points must keep their current style.
  - Click  to choose a point symbol in the Points Symbols dialog for all selected points.

  - Click **Color** to choose a color in the Select Color dialog for all selected points.
  - Style preview is shown if a common symbol and color is chosen for all selected points.

- Click **Next** to proceed or **Back** to return to the previous dialog. Click  to close **Editing Multiple Points** without saving.

Editing Codes attribute

- Review the code list pane. The code list displays **Code name**, **Code description**, **Code string**, Control Code 1 (**Ctl1**), Control Code 2 (**Ctl2**), **Is common** status.
- Click radio button to show in the code list pane:
  - common codes currently set in all selected points (**Is common** status: *Yes*);
  - all used codes within selected points range (**Is common** status: *Yes* and *No*).

- Click **Add** to add a new code to all selected points in the Codes dialog.
- Click **Remove** to remove highlighted code from all selected points.
- Click **Apply to all** to apply highlighted code with **Is common** status: *No* to all selected points. **Is common** code status will change from *No* to *Yes*.
- Click **Edit code string** to edit highlighted code with **Is common** status *Yes* in the Codes dialog.
- Click **Remove All** to delete all codes displayed in the code list pane from all selected points.

- Click **Next** to proceed or **Back** to return to the previous dialog. Click  to close **Editing Multiple Points** without saving.

Editing Note attribute

- The **Note text** pane displays the current note set in all selected points. The *<Mutiple values>* text displays if selected points have different notes. The blank space displays if there is no note set in any of the points selected.
- Type your own note or modify the current one in the **Note text** pane. Delete text from the **Note text** pane to remove a note from all selected points.

- Click **Next** to proceed or **Back** to return to the previous dialog. Click  to close **Editing Multiple Points** without saving.

Editing Multiple Points (finish)

- Review the confirmation message about changes in attribute you've made.
- Click  to store modified attribute and close **Editing Multiple Points**.
- Click **Back** to return to the previous dialog.
- Click  to discard changes and close **Editing Multiple Points**.

When necessary, start **Editing Multiple Points** from the beginning to set another attribute in all selected points.

Selected Point

To review information on a selected point.

The dialog displays the detailed data about the selected point:

- *Point* - the point name;
- *Coordinates* - the point's three coordinates (values presented in selected coordinate type for the current project);
- *Code* - the point's code (if assigned);
- *Use in Surface* - *Yes* if the point is eligible for using as a point of a surface, *No* if the point is excluded from using as a point of surface;
- *Layer* - the layer of the point.

Click  to return to the previous dialog.



Code - Attributes

To display codes and attributes of code used in the current project and to select, add, edit, or delete codes and attributes of code.

The dialog contains a list of **Codes** used in the current project, a list of **Attributes** for each code, and a set of tools for editing codes and attributes.

- Click **Add** to create a new Code or Attribute for the highlighted code (depending on the list to which the button belongs).
- Click **Edit** to change the properties of the highlighted Code or Attribute (depending on the list to which the button belongs).

- Click **Delete** to delete the Code or Attribute (depending on the list to which the button belongs).

> **Note:** The code cannot be deleted if a point with this code exists in the current project.

Click  to open the dialog menu with additional options:

- **Export To File** - opens the To File dialog with *Code Library* selected as a data type for exporting.
- **Edit Quick codes** - opens the Quick Codes tab of the Code Options dialog.

Code

To create a new code or edit the selected code.

Review or enter the code details:

- The **Name** of the code.
- The **Description** for the code.
- Determine the **Layer** for the points having this code. Select an existing layer from the drop-down list or click the  button to open the Layers dialog for layer management.

> **Note:** For a point to be on the layer specified for its code, the **Use layer from code** box must be checked in the Point Style settings (this is the default setting for points). If this check box is cleared, the point is on the layer specified in the **Layer** field in the Point Style settings.

- The **Type** of the objects that the code describes: *Point*, *Line* or *Area*. Each type has associated properties that can be viewed and edited on the tabs in the bottom part of the dialog. Actually displayed tabs depend on the selected code type.
  - *Point* - set a symbol and color for points having this code.
  - *Line* - set a style, thickness, and color for drawing lines whose node points have this code (available for codes of line and area types).
  - *Area* - set a filling style, color and transparency for drawing areas whose node points have this code (available for codes of area type).
  - *Attribute* - configure the pop-up request for this code with added attributes when surveying: at the beginning of a line / area (*Start*), at every node point along the line / area (*Each Node*), or to apply the code without pop-up request (*Don't Prompt*) (available for codes of line and area type).
  - *Surface* - set up how to use objects (points, linework objects, and areas) having this code when creating a surface. See details on how the Use in Surface property of a point code works when creating a surface.

After entering the code data, click  to save the code in the current project and return to the previous dialog. Click  to return to the previous dialog without saving.

Code Symbol

To add or modify the graphical symbol to display and identify points having the selected code and the *<by code>* property for point symbol.

The dialog lists two different symbol types:

- **Symbol** panel, where you can view and select any symbol from the predefined list of symbols.

  Click the  button, to open the Select Symbol dialog for selection of a predefined symbol.
- **Custom Symbol** panel, where you can view and add any symbol available in the Shared Data file.

By default, the symbol for the code will be defined by the symbol attributed to the layer (*<by layer>*).

- If the code uses the predefined symbol only, the code symbol is this predefined symbol.
- If the code uses the predefined symbol and custom symbol, the code symbol is this custom symbol.

The custom symbol panel has the following not editable columns:

- **Custom Symbol** - custom symbol name;
- **View** - custom symbol plot;
- **Scalable** - depending on this check box status, the custom symbol will be displayed on the map using either *scalable* or *non-scalable* setting defined in the Symbols dialog. You can open this dialog by clicking  in the top left corner of the Code Options dialog and selecting the **Custom Symbols**.
- **X scale** / **Y scale** - the individual scale of the custom symbol (X, Y axis or both).
- **Rotating** - the angle for clockwise rotation.

The following functionality is available:

- **Delete** - click to stop using the highlighted symbol as the custom symbol of the selected code.
- **View** - click to view custom symbol properties (scale and rotation) in the Edit Custom Symbol dialog.
- **Add** - click to add the custom symbol for the selected code. Clicking the **Add** button opens the Select Custom Symbol dialog. It is possible to use only one custom symbol. If the custom symbol for the selected code already exists, the **Add** button will be renamed to the **Change** button.

- **Change** - click to change the used custom symbol. Clicking the **Change** button opens the Select Custom Symbol dialog, where you can select another symbol instead of the currently used symbol.

Attributes

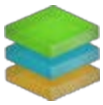
To create a new attribute or edit the selected attribute.

Depending on the code, some attributes are read-only except their default value.

Review or enter the attribute details:

- The **Name** of the attribute.
- The **Required** check box. If selected, this attribute is obligatory for the selected code. If deselected, this attribute can be skipped for the selected code.
- The **Type** of the attribute. *Text*, *Bool, Date-Time, Integer, Menu* or *Real Number*. Each type has its own data parameter with editable value.
  - *Text:* Select, if the attribute value is an alpha-numeric string. Set the maximum number of characters you can enter.
  - *Bool:* Select if the attribute value is Boolean (false / true).
  - *Date-Time:* Use the current date and time for the code attribute or enter a specific predefined date and time using the drop-down calendar.
  - *Integer:* Select if the attribute value is an integer number. Set the minimum and the maximum values of the attribute.
  - *Menu:* Select this to assign a list of values to the attribute.
    - Enter the desired value in the field and add it to the list with the **Add** button. Repeat to add more values.
    - To remove a value from the list, select the value from the list and click .
    - Check the **Sort list** box to output entered values in ascending order. With the check box deselected the output order of values remains as these values were initially entered.
    - You can add a sub-list of values to any value in the list by highlighting the desired item and clicking the **Edit** button. In the open **Submenus** dialog, add a list of values that will be linked to the value selected from main list.
  - *Real Number:* Select if the attribute value is a real number. Set the minimum and maximum values of the attribute.
- The **Default** value for the code attribute. This value will be suggested by default when adding the code with this attribute. You can also leave this field empty even if the **Required** check box is selected.

After entering the attribute data, click  to save the attribute in the selected code and return to the previous dialog. Click  to return to the previous dialog without saving.

 Layers

To display a list of layers in the current project and to select, add, edit, or delete layers.

The dialog contains a list of layers in the project, and a set of tools for managing and editing layers. The list displays the name, color, visibility and lock status of each layer, whether the layer contains objects, and the groups to which the layer may belong.

The preview panel displays layers and their objects according to the arrangement of layers on your project's 2D map. This arrangement can be set manually and doesn't depend on sorting of the list of layers.

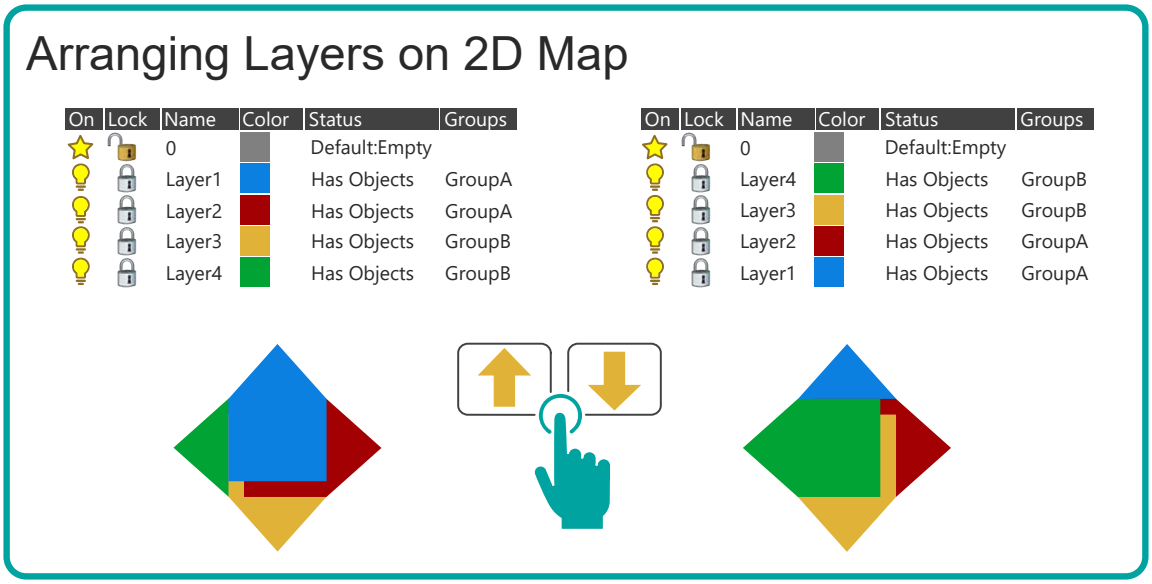
To quickly edit essential layer properties, highlight a layer in the list and use the desired tool:

- Click  or  in the **On** column to toggle the visibility of the respective layer on maps. The icon  marks the visible layer. The icon  marks the invisible layer. The respective star icons  /  are used for the layer that is set as default layer. Objects on invisible layers are hidden in the preview panel.
- Click  or  in the **Lock** column to toggle the locked status of the respective layer on maps. The icon  marks the unlocked layer. The icon  marks the locked layer. Activated lock status prevents objects on that layer from being selected (and therefore modified or deleted) by clicking on them in the map.
- To select a color for objects in this layer, click a colored square in the **Color** column and choose the desired one in the Select Color dialog.

  > **Note:** To get a color of their layer, objects must have their color set to *Layer*. This is the default color setting for points, lines and areas created in the project.

- To quickly sort the layers in the list by values of the specific column, click the desired column's title. Such sorting applies to the list only and disables buttons to change the order of layers to display on map. The default sorting of the list is by name.
- To change the layers order to display on the Map in 2D mode, click the **View** button and use either

 or  button to move the highlighted layer up or down in the order. If the **View** button is activated, the list of layers and preview panel display the layers in their order on the 2D map. Once you've set up the desired order, click on a column header to deactivate the **View** button and return to the list of layers sorted by that column. Setting the layer order in the 2D map is useful when the project contains overlapping objects and can simplify selection of objects on the top layer in dense 2D maps:



Note: If an object has a layer defined by the **Use layer from code** feature, as well as multiple codes and a graphic style *<By Layer>*, the style of this object is taken from the layer that is higher in order, from any code of this object.

- Click **Groups** to define layer groups in the Groups dialog, where you can create new groups of layers, delete existing layer groups or add or remove specific layers to /from a group.
- Click **Add** to create a new layer in the **Add Layer** dialog. The dialog contains three tabs, where you can configure all properties of the new layer:
  - Layer tab - general layer data (name, visibility, lock status, description);
  - Style tab - graphic style of representing points, lines and areas on maps;
  - Avoidance tab - avoidance zones, entering which will trigger visual alert during survey and stakeout.
  - Groups tab - layer groups to which the layer belongs or to which it can be added.

- Click **Edit** to view or change the properties of the highlighted layer in the **Edit Layer** dialog. The dialog contains four tabs where you can access all layer properties:
  - Layer tab - general layer data (name, visibility, lock status, description);
  - Style tab - graphic style of representing points, lines and areas on maps;

- Objects tab - list of objects on the layer (view only);
- Avoidance tab - avoidance zones, entering which will trigger visual alert during survey and stakeout.
- Groups tab - layer groups to which the layer belongs or to which it can be added.

- Click **Delete** to remove the highlighted layer(s) from the project. The default layer cannot be deleted.

> **Note:** If there are objects on a layer, you will be prompted to delete the layer and its objects. You cannot completely delete a layer that contains non-deletable objects such as occupation points, etc. The following objects: *codes*, *regions*, *roads*, *surfaces* and *planes* will not be deleted but moved to the default layer. You can delete them individually.

- Right click (long tap) on a layer in the list to open the context menu:
  - **Show** - makes highlighted hidden layer(s) visible on maps. In this case, the icon  stands in the **On** column.
  - **Hide** - makes highlighted visible layer(s) invisible on maps. In this case, the icon  stands in the **On** column.
  - **Lock** - makes highlighted unlocked layer(s) locked on maps. In this case, the icon  stands in the **Lock** column. Activated locked status prevents selection of objects on this layer by clicking them on maps.
  - **Unlock** - makes highlighted locked layer(s) unlocked on maps. In this case, the icon  stands in the **Lock** column. Activated unlocked status allows you to select objects on this layer by clicking them on maps.
  - **Set as Default** - makes the highlighted layer current (default). All objects that have no particular reference to a specific layer are placed to that layer. Default layer is marked with a star icon  in the **On** column and *Default* is shown in the **Status** column.

    > **Note:** If an object was created on a default layer and the default layer is then changed to another layer, the object remains on the layer that was the default when the object was created.

  - **Select All** - highlights all layers in the list.
  - **Select All Below** - highlights a currently highlighted layer and all the layers in the list displayed below.
  - **Select Multiple** - highlights multiple layers by sequential clicking on layer names.

- **Cancel Selection** - removes all highlights in the list.

Click  to open the dialog menu with additional options:

- **Purge All** - to delete all layers that have no objects on them.

Groups

To display a list of layer groups in the current project and to add, edit, or delete layer groups.

Layers can be arranged into layer groups defined by the user based on arbitrary criteria, making it easier to navigate, search, and view layers, and allowing you to instantly change the visibility status of all layers in a group on the map. A layer can be included in multiple groups. This dialog allows you to view and manage such groups and instantly set the  *visible* or  *invisible* status for all layers in the desired group at once.

The dialog contains a list of layer groups in the project, and a set of tools for managing and editing layer groups. The list displays the name, visibility status, and included layers for each layer group.

The preview panel displays layer groups and objects on their layers in horizontal plane.

- Click  /  /  in the **On** column to toggle on or off the visibility of all layers in the respective group on maps. Objects on invisible layers are hidden in the preview panel.
  - The icon  indicates that all layers in the group are visible.
  - The icon  indicates that all layers in the group are invisible.
  - The icon  indicates that the group includes both visible and invisible layers.

  > **Note:** The visibility is a layer property. Changing the visibility of the layer group changes the visibility of all layers in this group. Thus the visibility status of other layer groups can be affected if there are layers included in multiple groups.

- To quickly sort the layer groups by name of visibility status, click the corresponding column's header. To restore the initial order of groups (the order in which groups were added), click the **View** button.
- Click **Add** to create a new layer group in the Layers in Group dialog.
- Click **Edit** to modify the highlighted layer group in the Layers in Group dialog.
- Click **Delete** to delete the highlighted layer group. Layers included in the deleted group are not deleted.

- Right click (long tap) on a layer in the list to open the context menu:
  - **Show** - makes invisible layer(s) in the highlighted group visible on maps. In this case, the icon  stands for the group in the **On** column.
  - **Hide** - makes visible layer(s) in the highlighted group invisible on maps. In this case, the icon  stands for the group in the **On** column.
  - **Edit** - opens the Layers in Group dialog for the highlighted group.
  - **Delete** - deletes the highlighted layer group. Layers included in the deleted group are not deleted.

Layers in Group

To add a new group of layers to the project or modify an existing group of layers.

You can create a layer group without including any layers into it, and add layers to this group later. You can add a layer to any number of groups.

- **Group Name** - enter a name for the new layer group you are creating, or change the name of an existing group if necessary.
- **Description** - enter a description for the new layer group you are creating, or change the description of an existing group if necessary.
- This dialog displays two panels with layers:
  - **Available Layers** - the list of available layers in the project that can be added to the layer group;
  - **Group Layers** - the list of layers included in the layer group.

- To include or exclude a layer from the group:
  - Highlight the desired layer name(s) in one panel and click  /  to move highlighted layer(s) to another panel.
  - The context menu simplifies multiple layers highlighting with the following commands:
    - **Select All** - highlights all layers in the list.
    - **Select All Below** - highlights a currently highlighted layer and all the layers in the list displayed below.
    - **Select Multiple** - highlights multiple layers by sequential clicking on layer names.
    - **Cancel Selection** - removes all highlights in the list.

After adding or changing the layer group, click  to save the layer group and return to the Groups dialog. Click  to return to the previous dialog without saving.

Layer tab

To display and edit parameters of the existing layer or to add a new layer.

- In the **Name** field, enter a desired name of the layer.
- In the **Visibility** field, click the **ON** button to make this layer visible. The icon  stands to mark the visible layer. Click the **OFF** button to make this layer invisible. The icon  stands to mark the invisible layer.
- In the **Lock** field, click the **ON** button to make this layer locked. The icon  stands to mark the locked layer. Activated lock status prevents objects on that layer from being selected (and therefore modified or deleted) by clicking on them in the map. Click the **OFF** button to make this layer unlocked. The icon  stands to mark the unlocked layer.
- Enter any additional information about the layer in the **Note** field.

After adding or changing the layer on respective tabs, click  to save the layer and return to the Layers dialog. Click  to return to the previous dialog without saving.

Style tab

To display and edit the layer graphic style used to represent points, lines, and areas on maps.

The graphic style defined here will be applied to points, lines and areas on the selected layer if these objects have their style defined as *By Layer*. This style is default for created lines and areas in the project and can be overridden manually in the style properties of specific object.

- In the **Point Style** group, select a symbol of points on the layer. Click the  button, to open the Layer Symbol dialog and choose a predefined or custom symbol.
- In the **Line Style** group, select a graphic style for lines and **Width** of lines in points.
- In the **Area Style** group, select a fill style (pattern) and fill **Transparency** of areas.
- Click **Color** to select a color of objects on the layer.

After adding or changing the layer on respective tabs, click  to save the layer and return to the Layers dialog. Click  to return to the previous dialog without saving.

Layer Symbol

To add or modify a graphical symbol for displaying points on the selected layer.

Two symbol types are available - symbols and custom symbols:

- In the **Symbol** group, you can view and select any symbol from the predefined list of symbols.

  Click the  button, to open the Select Symbol dialog for selection of a predefined symbol.
- In the **Custom Symbol** list, you can view and select a custom symbol from the Shared Data file.

When a custom symbol is added to the **Custom Symbol** list, this symbol will be used for the layer.

The **Custom symbol** list displays the data on added custom symbol:

- **Custom Symbol** - custom symbol name;
- **View** - custom symbol plot;
- **Scalable** - if selected, the custom symbol is displayed on the map using the scale defined in the Symbols dialog. You can open this dialog by clicking  in the top left corner of the Code Options dialog and selecting the **Custom Symbols**.
- **X scale** / **Y scale** - the individual scale of the custom symbol (X, Y axis or both) on maps.
- **Rotation** - the individual angle of the custom symbol clockwise rotation.

To manage the **Custom symbol**:

- Click **Delete** to stop using the listed symbol as the custom symbol for points on the selected layer.
- Click **View** to view the custom symbol properties (scale and rotation) in the Edit Custom Symbol dialog.
- Click **Change** to select a different custom symbol in the Select Custom Symbol dialog instead of the current symbol.

After adding or changing a layer symbol, click  to attach the entered data to the layer and return to the previous dialog for saving the selected layer with attached data. Click  to return to the previous dialog without saving.

Objects tab

To view a list of objects on the selected layer.

This tab displays the number of objects of different types on the selected layer. Click the expandable nodes to view the names of specific objects of each type:

- Point(s);
- Line(s);
- Area(s);
- Region(s);
- Contour Lines(s);
- Road(s);
- Surface(s);
- Plane(s);
- Code(s).

After adding or changing the layer on respective tabs, click  to save the layer and return to the Layers dialog. Click  to return to the previous dialog without saving.

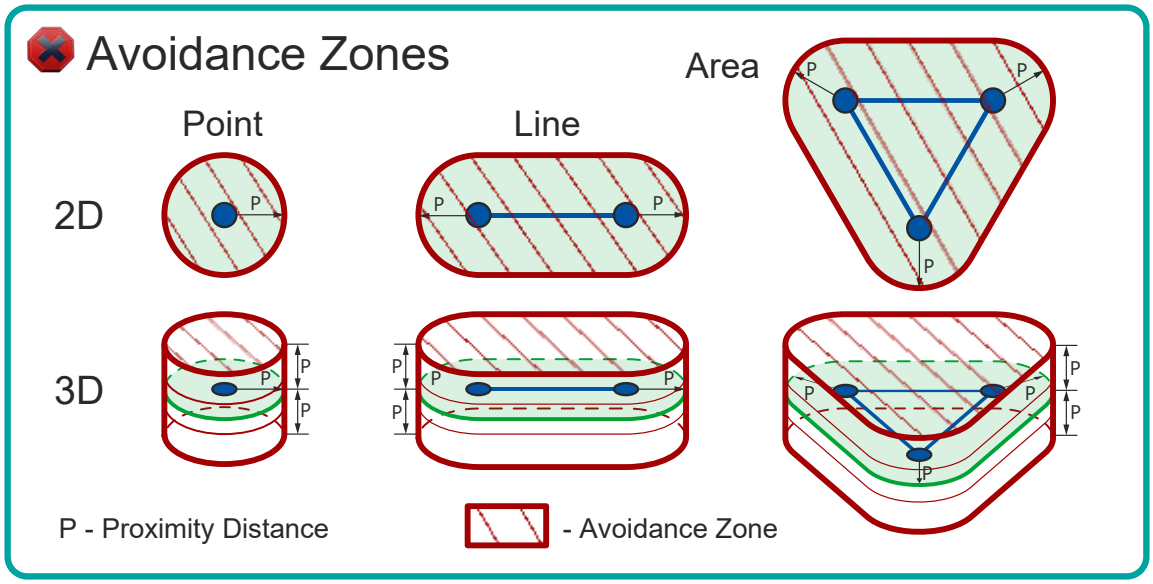
Avoidance tab

To set up avoidance zones around objects on the selected layer, entering which will trigger visual alert during survey and stakeout.

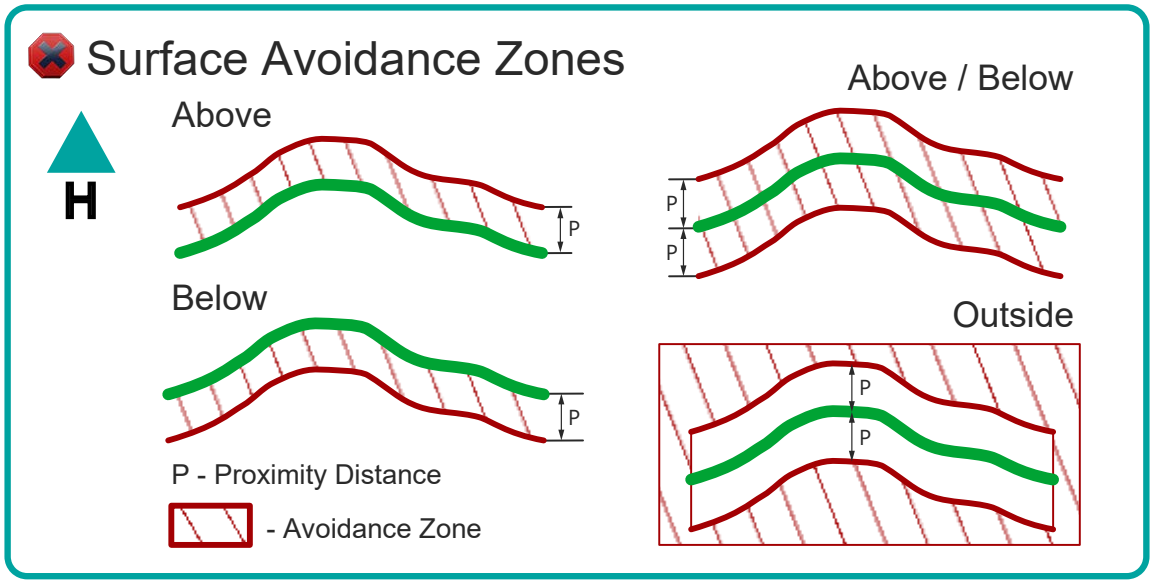
The notification icon  in the top left corner begins to blink when your current position is detected within an avoidance zone during survey or stakeout. Avoidance zones are created around objects (*points*, *linework*, *areas*, *surfaces*) on the selected layer according to user-specified parameters:

- In the **Avoidance** group, set up avoidance zones created around *points*, *linework* and *areas* on the selected layer:
  - select **OFF** to switch off the avoidance zones linked to points, linework and areas;
  - select **2D** to enable avoidance zones in the horizontal plane only;
  - select **3D** to enable avoidance zones in the horizontal and vertical planes.

- In the **Proximity** field, specify the avoidance zone boundary around *points*, *linework*, *areas* or above / below / outside *surfaces*. The zone boundary is defined by the proximity distance:



- In the **Surface** group, select where to place the avoidance zone relative to surfaces on the selected layer in the vertical plane:



  - select **OFF** to switch off the avoidance zones linked to surfaces;
  - select **Above** to place the avoidance zone above surfaces;
  - select **Below** to place the avoidance zone below surfaces;
  - select **Above / Below** to place the avoidance zone above and below surfaces;
  - select **Outside** to make the avoidance zone outside surfaces at a certain distance above and below them.

After adding or changing the layer on respective tabs, click  to save the layer and return to the Layers dialog. Click  to return to the previous dialog without saving.

Groups tab

To view the groups the layer is included in, to add the layer to an existing group or remove it from the group.

This tab displays two panels with layer groups:

- **Available Groups** - the list of available layer groups in the project to which the layer can be added;
- **Layer Groups** - the list of layer groups the layer is included in.

> **Note:** You can create a new group of layers in the Layers in Group dialog, open the Groups dialog and click **Add**.

To include or exclude the layer from a group:

- Highlight the desired group name(s) in one panel and click  /  to move highlighted group(s) to another panel.
- The context menu simplifies multiple layer groups highlighting with the following commands:
  - **Select All** - highlights all layer groups in the list.
  - **Select All Below** - highlights a currently highlighted layer group and all the groups in the list displayed below.
  - **Select Multiple** - highlights multiple layer groups by sequential clicking on group names.
  - **Cancel Selection** - removes all highlights in the list.

After adding or changing the layer on respective tabs, click  to save the layer and return to the Layers dialog. Click  to return to the previous dialog without saving.

Linework

To display a list of linework objects in the current project and to select, add, edit, or delete linework objects.

The dialog contains a list of current project's linework objects and two preview panels for the highlighted linework in the horizontal and vertical planes. To view the currently highlighted linework in a larger screen, double-click one of the preview panels.

- Click **Edit** to edit the properties of the highlighted linework:
  - Points in Line tab;
  - Linework Style tab.

- Click **Add** to create a new linework:
  - Points in Line tab;
  - Linework Style tab.

- Click **Delete** to delete the highlighted linework object(s) from the project.
- From the **Join** drop-down menu, choose an option to merge two and more separate linework objects:
  - *Join Selection* - the option is enabled when two and more separate linework objects are highlighted in the list. Selecting the option starts merging of these lines.
  - *From Map* - selecting this option opens the Select Lines dialog, where you manually select lines for merging on the map.

    Note: The application will merge two separate linework objects if these linework objects have ONE common point.

Click  to open the dialog menu with additional options:

- **Edit Points** - to open the Points dialog for managing points in the current project.

Points in Line tab

To add a new linework or to edit the selected linework.

The list on the left contains the points with their codes that compose the linework, and the plan view on the right displays the line image. The point highlighted in the list is marked with a yellow

circle on the plan view.

To form the line from existing points:

- If required, change the **Name** of the line.

- From the **Add Points** drop-down menu, choose an option to add point(s) from the project to the end of the list of linework points:
  - *All* - add all the points from the current project.
  - By Range - add points by specifying point name range(s).
  - By Code - add points by point code name(s).
  - By Code String - add points by code string.
  - By Radius - add points which reside in a particular circle.
  - By Name - add points by name or by part of name.
  - By Layer - add points which belong to a particular layer.
  - From Map - add points manually from the map.
  - From List - add points manually from the list of points in the project.

- Highlight desired point(s) in the list. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- Use  and  to move the highlighted point(s) up or down in the ordering.
- To remove the highlighted point(s) from the linework, highlight the point(s) and click .
- To obtain information about one point, highlight the point and click .
- To obtain information about the linework, remove highlights from all the points and click .
- The icon next to the graphical panel shows the control code from the linework package for the highlighted point. Click the icon and, if required, select another control code.

Learn more about the point icons description.

Click  to open the dialog menu with additional options:

- Select **Edit Points** to open the Points dialog for managing points in the current project.
- Select **Calculate Points** to open the Create Points dialog and calculate additional points for the linework.

After adding or changing the linework on respective tabs, click  to save the linework and return to the previous dialog. Click  to return to the previous dialog without saving.

Linework Style tab

To display and edit a layer and graphic style for the selected linework.

By default, the graphic style is defined by the layer of the linework: *<By Layer>*.

- Define the **Layer** where the linework resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
  - Check the **Use layer from code** box to define the layer the linework is on as the layer of code of line or area type of this linework. If you later change the code of line or area type for points of this linework, the layer of the linework will change accordingly. If the check box is cleared, the setting from the **Layer** field is applied.

    Note: If points of the linework have no code of line or area type, this feature is not available and the setting from the **Layer** field is applied.

- Define the **Line Style** and the **Width** of lines in points for drawing on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the line drawing. The preview panel displays the current style.

After adding or changing the linework on respective tabs, click  to save the linework and return to the previous dialog. Click  to return to the previous dialog without saving.

Selected Line

To review information on a selected line.

The dialog displays the detailed data about the selected line:

- *Line* - the line name;
- *Code* - the line's code (if assigned);
- *String* - the line's string (if assigned);
- *Length* - the 2D length of the line;

- *Length except gaps* - the 2D length of the line, gap segments are excluded from length calculation (displayed if the line includes gaps);
- *Height* - the elevation of the line (displayed if the line's start and end points have the same elevation);
- *Surface* - the status of the 'Use in Surface' property of code;
- *Layer* - the layer of the line.
- *Type* - the type of segment (displayed for segments on vector background).
- *Start / End point coordinates* - the coordinates of start and end point (displayed for segments on vector background).

Click  to return to the previous dialog.



Area

To display a list of areas in the current project and to select, add, edit, or delete areas.

1. The dialog contains a list of current project's areas and two preview panels for the highlighted area in the horizontal and vertical planes. To view the currently highlighted area in a larger screen, double-click the preview.
   - Click **Edit** to edit the properties of the highlighted area:
     - Points in Area tab;
     - Area Style tab.

   - Click **Add** to create a new area:
     - Points in Area tab;
     - Area Style tab.

   - Click **Delete** to delete the highlighted area(s) from the project.

2. If this dialog opened to make an existing area selection from the list of areas to use it in another Sokkia Field dialog, the functionality is limited to area selection only.
   - Highlight an existing area in the list of project's areas and click  to confirm the selection of the highlighted area. Or click  to return to the previous dialog without selection.

Click  to open the dialog menu with additional options:

- **Edit Points** - to open the Points dialog for managing points in the current project.

Points in Area tab

To add a new area or to edit the selected area.

The list on the left contains the points with their codes that compose the area, and the plan view on the right displays the area image. The point highlighted in the list of points is marked with a yellow circle on the plan view.

To form the area from existing points:

- If required, change the **Name** of the area.

- From the **Add Points** drop-down menu, choose an option to add point(s) from the project to the end of the list of area points:
  - *All* - add all the points from the current project.
  - By Range - add points by specifying point name range(s).
  - By Code - add points by point code name(s).
  - By Code String - add points by code string.
  - By Radius - add points which reside in a particular circle.
  - By Name - add points by name or by part of name.
  - By Layer - add points which belong to a particular layer.
  - From Map - add points manually from the map.
  - From List - add points manually from the list of points in the project.
  - From Line - add all the points from a linework object.

- Highlight desired point(s) in the list. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- Use  and  to move the highlighted point(s) up or down in the ordering.
- To remove the highlighted point(s) from the area, highlight the point(s) and click .
- To obtain information about one point, highlight the point and click .
- To obtain information about the area, remove highlights from all the points and click .
- The icon next to the graphical panel shows the control code from the area package for the highlighted point. Click the icon and, if required, select another control code.

Learn more about the point icons description.

Click  to open the dialog menu with additional options:

- Select **Edit Points** to open the Points dialog for managing points in the current project.
- Select **Calculate Points** to open the Create Points dialog and calculate additional points for the area.

After adding or changing the area on respective tabs, click  to save the area and return to the previous dialog. Click  to return to the previous dialog without saving.

Area Style tab

To display and edit a layer and graphic style for the selected area.

By default, the graphic style is defined by the layer of the area: *<By Layer>*.

- Define the **Layer** where the area resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
- Define the **Line Style** and the **Width** of area boundary lines in points for drawing on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the boundary line drawing. The preview panel displays the current style.
- Define the **Area Style** (pattern) and the **Transparency** of area background fill on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the background fill. The preview panel displays the current style.

> **Note: Area Style** (pattern) affects the area selection on the map. Assigning any **Area Style** other than blank allows the user to select the area by clicking anywhere within area boundary. Otherwise, you must click the boundary to select the area. You can also use 100% transparency to select the area by clicking anywhere within area boundary and have no visible background fill of the area.

After adding or changing the area on respective tabs, click  to save the area and return to the previous dialog. Click  to return to the previous dialog without saving.

Selected Area

To review information on a selected area.

The dialog displays the detailed data about the selected area:

- *Line* - the name of the area;
- *Code* - the area's code (if assigned);
- *String* - the area's string (if assigned);
- *Perimeter* - the total 2D length of all the segments that outline the area;
- *Area* - the calculated value of the area in 2D;
- *Height* - the elevation of the area (displayed if all the area's points have the same elevation);
- *Surface* - the status of the 'Use in Surface' property of code;
- *Layer* - the layer of the area.

Click  to return to the previous dialog.



Point Lists

To display point lists in the current project and to select, add, edit, or delete point lists.

The *Point Lists* dialog contains a table of existing point lists in the project and two preview panels for the highlighted point list in the horizontal and vertical planes. To view the currently highlighted point list in a larger screen, double-click one of the preview panels.

- Click **Edit** to open the Edit Point List dialog and modify the highlighted point list.
- Click **Add** to open the Add Point List dialog and create a new point list.
- Click **Delete** to remove the highlighted point list(s) from the project.

> **Note:** Deleting a point list from the current project doesn't delete project's points included in this point list.

Click  to open the dialog menu with additional options:

- **Edit Points** - to open the Points dialog for managing points in the current project.

Add / Edit Point List

To review and modify the selected point list or to create a new point list.

The list on the left contains the points with their codes that compose the point list, and the plan view on the right displays the point list image. The point highlighted in the list of points is marked with a yellow circle on the plan view.

To form the point list from existing points:

- If required, change the **Name** of the point list.

- From the **Add Points** drop-down menu, choose an option to add point(s) from the project to the end of the point list:
  - *All* - add all the points from the current project.
  - By Range - add points by specifying point name range(s).
  - By Code - add points by point code name(s).
  - By Code String - add points by code string.
  - By Radius - add points which reside in a particular circle.
  - By Name - add points by name or by part of name.
  - By Layer - add points which belong to a particular layer.
  - From Map - add points manually from the map.
  - From List - add points manually from the list of points in the project.

- Highlight desired point(s) in the list. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- Use  and  to move the highlighted point(s) up or down in the ordering.
- To remove the highlighted point(s) from the area, highlight the point(s) and click .
- To obtain information about one point, highlight the point and click .

Learn more about the point icons description.

Click  to open the dialog menu with additional options:

- Select **Edit Points** to open the Points dialog for managing points in the current project.

After adding or changing points for the selected point list, click  to save the point list and return to the previous dialog. Click  to return to the previous dialog without saving.

Raw Data

All the raw data collected is displayed in a table of this dialog. When a row is selected, the column titles display the type of data only for the selected row.

The Raw data dialog displays all measurements that have been made in the project. If the surveyor measured one point several times, all these measurements are displayed for the point. Besides, you can see coordinates of base station for the rover receiver.

The Raw Data list includes information about the following:

- *Name*: Point name and icon displaying the point type. Learn more about the icon descriptions for the raw data records.
  - **[×]** symbol near the point name indicates that this point and associated measurement were deleted by user.
  - **[▼]** symbol near the point name indicates that this measurement associated to the point was overwritten by user with a new measurement.
- *Type*: The column displays the type of GNSS or Optical measurements.

For GNSS measurements you can see the following types:

- *Reset GNSS* type indicates that RTK engine was reset manually or automatically. RTK engine is automatically reset when Sokkia Field is disconnected from the receiver.
- *Topo* type means that a point was measured in Topo mode when PP or DGPS or RTK configurations are selected.
- *Auto Topo* type means that trajectory points were measured when PP or DGPS or RTK configurations are selected.
- *Find Station* type indicates that for the measured point, a station on road central line or horizontal alignment and offset to this station are calculated.
- *Static Occ* type indicates that the occupation was measured in the PP Static configuration.
- *Az Dist Ht* type indicates that the coordinates of this point were calculated from one measured point and distance and angle measurements from this point to the offset point.
- *Line* type indicates that the coordinates of this point were calculated from two measured points and additional distance offsets measurements.
- *2 Distance* type indicates that the coordinates of this point were calculated using distances to the point from two known points.
- *Laser Offset* type indicates that the coordinates of this point were calculated using distances and angle measurements to the point from a laser rangefinder.
- *Mark Coords* type indicates that the surveyor used this project to start a Base receiver. The coordinates of a Ground Point are displayed in the dialog.
- **Mark Coords (Corrected)* type indicates that the surveyor measured the base station position in the Topo mode. The initial coordinates of a Ground Point were recalculated.

- *Ph. Center Coords* type indicates that the rover receiver obtained a correction data from a base station. The coordinates of a antenna phase center of the base station are displayed in this dialog.
- **Ph. Center Coords (Corrected)* type indicates that the surveyor measured the base station position in the Topo mode. The initial coordinates of a antenna phase center of the base station were recalculated.
- *Text* indicates a raw note made in the field during the survey.

For the optical measurements you can see the following types:

- *Coord* type refers to TC occupation point.
- *HV* type indicates that the measurements of the horizontal and vertical angles have been made for initial direction.
- *HVS* type indicates that the measurements of the horizontal and vertical angles and slope distance have been made for initial direction.
- *HDVD* type indicates that the following measurement type was selected: *horizontal distance* and *vertical distance*.
- *BrgAZ* type indicates the initial direction.
- *MLM* type indicates that the missing line measurement has been made (the application emulated the total station measurement from one point to another by actually measuring these two points from the third point).
- *1Wire /3 Wire* type indicates the type of the digital level instrument used for the survey.

- *Codes*: Codes for the point, also the Strings associated with the codes if the String display is selected.
- *Epoch count*: The values displays number of measurements used to obtain the average of point position.
- *HI/HR/Ant Ht*: For the Optical mode - the height of the instrument or height of the reflector; for GNSS mode - the antenna height.
- *Coordinates (North /East/ Elevation;dN/dE/dU)*: The Coordinates of the Base are displayed and the vectors to the base from the rover of the collected points. The vectors are only displayed for the points collected with fixed solutions. The TS point coordinates.
- *Solution Type, PDOP, H/V RMS, number of GPS, GLONASS, Galileo, BDS, SBAS, QZSS, and NavIC Satellites*: For points collected in GNSS mode.
- *Notes*: The short note for the point.
- *Session Name*: The name of session where the point is recorded.
- *Local Time*: It is the controller's date and time when the point was stored. For points collected in GNSS mode, it is the time of the epoch whose coordinates are stored or the time of the last accepted epoch when averaging.

The buttons available in this dialog allow to perform the following:

- Expand the **Find** drop-down list and select an option to find a point:
  - By Code - select the code(s) to find the points having that code(s).
  - By Name - specify the point name or a part of the point name to find the matching points.

- Click **Find Next** to find and highlight the next point in the list that satisfies the same conditions as the previous Find.
- Click **First / Last** to move the cursor and highlight the first or last point.
- Click **Edit** or double click on a line in the list to see and edit the data in a separate dialog. Depending on the selected raw data record the respective *Edit Raw Data* dialog opens for:
  - GNSS survey;
  - TS survey;
  - DL survey.

Note: After saving all changes in corresponding tabs of the *Edit Raw Data* dialog, Sokkia Field recalculates the point coordinates. If coordinates of the base are changed, the prompt to restart the base opens before using this base for new measurements.

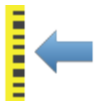
Note: To recover the deleted point, select it and click the **Edit** button. Click **Yes** in the *Deleted point* dialog. Before recovering a point to the project's data base you can edit name, code and other point parameters.

Click ☰ to open the dialog menu with additional options:

- **Project Info**: displays the *Project Info* dialog. More...
- **Show Raw GNSS**/**Show Raw TS**: If the GNSS mode is active, the GNSS raw data is displayed by default. If you want to display the TS raw data in the list, select this menu. Similarly, if you are using the Optical mode, the TS raw data is displayed and optionally the GNSS raw data.
- **Angle Sets Report**: This menu item is displayed only in TS mode and when the project contains angle sets which have been acquired. Click the option to open the Angle Sets Report Setup Selection dialog and generate the Angle Sets Report.

Icon Descriptions for Raw Data

	GNSS engine was reset
	RTK base station
	Static occupation in the *PP Static* configuration

	GNSS topo point
	GNSS auto topo point
	GNSS offset point
	TS occupation point
	Direction to BS azimuth
	Backsight point measured by total station
	Point measured by total station
	Pole measurement (offset from a measured point)
	Backsight point measured by digital level
	Sideshot point measured by digital level
	Foresight point measured by digital level
	Staked point measured by digital level
	Taped point: the point coordinates were calculated by tape dimension from a reference line with left offset

	Taped point: the point coordinates were calculated by tape dimension from a reference line with right offset
	Indicates that a raw note was created in the field during the survey
	Control measurement (Check Point) for total station
	Missing line (remote distance) measurement (MLM)

Measurement Properties Icons Description

	Measured with TILT ™ enabled GNSS receiver, tilt compensation is not applied
	Measured with TILT ™ enabled GNSS receiver, tilt compensation is applied

Edit Raw Data (GNSS)

To review or edit the selected GNSS raw data record.

The dialog contains the following tabs, depending on the record type:

- The **Marks Coords** tab is shown, if GNSS base station was started in the current project. The tab displays the coordinates of the mark point. To use the relative antenna calibration data for the base GNSS antenna, select the **Relative calibrations** check box. You can edit the following parameters:
  - Base station name (**Point**);
  - **Code**;
  - Mark point coordinates in the current coordinate system of the project;
  - Antenna Type (**Ant Type**);
  - Antenna Height (**Ant Ht**);
  - Method used to measure the antenna height:
    - *Vertical* - measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver;

- *Slant* - measured from the ground point to the antenna slant height measure mark (SHMM);

Optionally, you can open the **Edit Points** dialog. To do this, select the **Edit Points** option from the pop-up menu opened using the  icon in the top left corner.

- The **PC Coords** tab is shown, if the GNSS base station was run out of the project. The tab displays the coordinates of the phase center of the base antenna. To use the relative antenna calibration data for the base GNSS antenna, select the **Relative calibrations** check box. You can edit:
  - The coordinates of the phase center in the current coordinate system of the project;
  - The name of the base station.

  Optionally, you can:

  - Open the **Edit Points** dialog;
  - Save the coordinates of the phase center for L1 frequency as a base point in the current project.

  To do it, select the corresponding option from the pop-up menu opened using the  icon in the top left corner.

- The **Convert L1PC to Mark Coords** tab is shown if you selected the **Save as Base Point** option from pop-up menu of the **PC Coords** tab. To use the relative antenna calibration data for the base GNSS antenna, select the **Relative calibrations** check box. In this tab you can create a base point with:
  - the coordinates of the phase center of the base station, if you use *Unknown* antenna type and zero value of antenna height;
  - the coordinates of the mark point, if you use known antenna type and antenna height values for the base antenna station.

- The **Corrected Base** tab is shown, if the surveyor performed the Correct Base procedure.
  - Select the **Mark coords** radio button to display coordinates of the corrected base mark point. Click **Save As Point** to add a new point to the project with correct base mark point coordinates.
  - Select the **PC coords** radio button to display coordinates of the corrected base L1 phase center. Click **Save As Point** to add a new point to the project with correct base L1PC coordinates.

- The **Topo** tab is shown if the surveyor measured point in the Topo mode using a GNSS rover receiver. You can edit the following parameters:
  - **Point** name;
  - **Code**;

- Antenna Type (**Ant Type**);
- Antenna Height (**Ant Ht**);
- Method used to measure the antenna height:
  - *Vertical* - measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver;
  - *Slant* - measured from the ground point to the antenna slant height measure mark (SHMM);
- Value of the adapter height (**Adapter** - an additional device which can be set between a GNSS receiver and a rod);
- Description during the survey (**Note**);
- **Ordered segment** - special flag to control the order of cross section segments in post-processing.

- The **Auto Topo** tab is shown if the surveyor measured point in the Auto Topo mode (on the trajectory) using a GNSS rover receiver. You can edit the following parameters:
  - **Point** name;
  - **Code**;
  - Antenna Type (**Ant Type**);
  - Antenna Height (**Ant Ht**);
  - Method used to measure the antenna height:
    - *Vertical* - measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver;
    - *Slant* - measured from the ground point to the antenna slant height measure mark (SHMM);
  - Value of the adapter height (**Adapter** - an additional device which can be set between a GNSS receiver and a rod);
  - Description during the survey (**Note**).

- The **Data** tab is shown, if the surveyor measured point in Topo or Auto Topo mode. The tab displays the following uneditable parameters for the measured topo and auto-topo point:
  - Information about reference station (the reference station identifier, the physical reference station identifier, base station name, method used to measure the antenna height, antenna height, antenna type);
  - Type of measurement;
  - Vector coordinates (*dN*, *dE*, *dH*);
  - Local Time;
  - Averaged values of *PDOP*, *H RMS* / *V RMS*, number of GPS, GLONASS, Galileo, BDS, SBAS, QZSS, and NavIC Satellites;
  - Session name;
  - Name of Mount Point.

- The **Epochs** tab is shown, if the surveyor measured point in Topo or Autopo modes and used averaging of number measurements for storing the position. The tab displays the following uneditable parameters for each measurement (epoch), which were logged for this point:
  - *PDOP*, *H RMS* / *V RMS*;
  - Vector coordinates (*dN*, *dE*, *dH*);
  - Solution type;
  - Number of GPS, GLONASS, Galileo, BDS, SBAS, QZSS, and NavIC Satellites;
  - Local time;

  - For **GRX3** receiver, the following TILT ™ parameters are displayed: *Tilt Used*, *Magnetic Declination*, *Magnetic Field*, *Tilt X*, *Tilt Y*, *Heading*, *Tilt X RMS*, *Tilt Y RMS*, *Heading RMS*, *Level Calibration*, *Compass Calibration*, *Compass Alignment*.

    For **GRX5** receiver, the following Dynamic TILT ™ parameters are displayed: *Tilt Used*, *Tilt State*, *Tilt Mode*, *Tilt X*, *Tilt Y*, *Heading*, *Tilt X RMS*, *Tilt Y RMS*, *Heading RMS*.

- The **Find Station** tab is shown, if the surveyor calculated the distance from the measured or existing point to the road, and the offset of the point from the center line of the road. You can edit the following parameters:
  - **Point** name;
  - **Code**;
  - Antenna Type (**Ant Type**);
  - Antenna Height (**Ant Ht**);
  - Method used to measure the antenna height:
    - *Vertical* - measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver;
    - *Slant* - measured from the ground point to the antenna slant height measure mark (SHMM);
  - Value of the adapter height (**Adapter** - an additional device which can be set between a GNSS receiver and a rod);
  - Description during the survey (**Note**).

- The **Data** tab for **Find Station** type is shown, if the surveyor calculated the distance from the beginning of the road to the projection of the point to the road, and the offset of the point from the center line of the road. This tab displays the results of measurements and calculation. You can view the following parameters:
  - *Station* position;
  - *Offset* of the measurement point from the station;
  - Offset vector coordinates (*dN*, *dE*, *dH*);
  - *Local Time*;
  - Values of *PDOP*, *H RMS* / *V RMS*, number of GPS, GLONASS, Galileo, BDS, SBAS, QZSS, and NavIC Satellites;

  - Session name;
  - Name of Mount Point.

- The **Point** and **Offsets** tabs are shown if the surveyor performed an offset from the two measured points. You can edit the following values:
  - On the **Point** tab:
    - Name of the offset **Point**;
    - **Code** of the offset point;
    - **Note** of the offset point.
  - On the **Offsets** tab:
    - **Start Point** and **End point**;
    - **Forward** / **Backward** - the distance from the end point, along the line between start and end points;
    - **Right** / **Left** - the distance from the end point, perpendicular to the line between start and end points;
    - **Up** / **Down** - the height offset from the end point.

- The **Tape Dimension** tab is shown if the surveyor used the tape measurements, relative to two known points. You can edit the following parameters:
  - **Point** name;
  - **Code** of the point;
  - The direction (**Right** or **Left**) and the measured distance;
  - Description during the survey (**Note**).

- The **Ref Line** tab is shown if the surveyor used the tape measurements that are relative to two known points. You can edit the reference points name.

After adding or changing the data on respective tabs, click  to update the raw data record and return to the previous dialog. Click  to return to the previous dialog without saving.

Edit Raw Data (Total Station)

To review or edit the selected total station raw data record.

The dialog contains the following tabs, depending on the record type:

- The **Occ Pt** tab displays the information about the occupation point. You can edit all the following parameters:
  - **Point** name;
  - **Code**;
  - Height of instrument (**HI**);

- **Scale** factor;
- **Note**.

- The **Obs Data** tab is shown, if the surveyor computed the coordinates of the occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates (**Resection** mode). The tab displays all measurements from the station to known point:
  - **Point**: the name of the point;
  - **Res HA**: Difference of each HA measurement within the set from the average of all the HA's in the set;
  - **Res VA**: Difference of each VA measurement within the set from the average of all the VA's in the set;
  - **Res SD**: Difference of each SD measurement within the set from the average of all the SD's in the set;
  - **H**: Check mark indicates that the horizontal coordinates of the point are used in the calculation;
  - **V**: Check mark indicates that the vertical coordinate of the point is used in the calculation;
  - **HA**, **VA**, **SD**: Check marks indicate that the Horizontal angle, Vertical angle and the Slope Distance are used in resection;
  - **HR**: The height of reflector;
  - **HA**: Horizontal Angle measurement within the corresponding set;
  - **VA**: Vertical Angle measurement within the corresponding set;
  - **SD**: Slope Distance measurement within the corresponding set;
  - **Set**: The number and type of measurement within the corresponding set.
  - The tab also displays the standard deviation of the occupation point coordinates and the scale factor.

- The **Meas Data** tab is shown, if the surveyor computed the coordinates of the occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates (**Resection** mode). The tab displays default values for measurement accuracy for **Distance**, **PPM**, **Horizontal** and **Vertical** Angles.

- The **Benchmark** tab is shown, if the surveyor computed the vertical coordinate of the occupation point, where the instrument is set up, by performing benchmark measurement and creating a new occupation point from the current occupation and updated height (by using *Rename* height update method). In this case, the **Plane Crd Source** field displays the name of the point from which the horizontal coordinates are taken. You can select another point to take the horizontal coordinates for the occupation.

- The **Obs Information** tab is shown, if the surveyor used **Set Collection** for the sideshots measuring. The tab displays the air conditions around the instrument for calculating the atmospheric correction of measured distances. You can view the following parameters:

- **Temperature**;
- **Pressure**;
- **Humidity**;
- **PPM**.

You can edit:

- The type of the **Weather** (*Sunny*; *Cloudy*; *Rainy*; *Snowy*);
- The type of the **Wind** (*Calm*; *Gentle breeze*; *Moderate breeze*; *Fresh breeze*; *Moderate gale*);
- The **Surveyor** name;
- The **Instrument Number**.

- The **BS** tab displays the information about the reference direction of total station survey. You can edit:
  - **BS Point** name;
  - BS azimuth (**BS Az**) - typically, a user enters the reference line azimuth value manually when sets the instrument up; in some cases, it may be required to have this value updated.
  - Reflector height (**HR**);
  - Prism configuration (**P.C.**);
  - Field **Note**.

- The **Data** tab is shown for BS measurement. The tab displays the initial settings for this measurement. You can view the following parameters:
  - **HA Error** - error in the horizontal angle measurements;
  - **HD Error** - error in the horizontal distance measurements;
  - **Type** - the type of the measurement;
  - **HA/VA** - the start value of the horizontal and vertical angles;
  - **SD** - slope distance from the station to measured point;
  - **Target Type** - the type of used reflector;
  - **PC** - prism constant;
  - **HR** - height of reflector;
  - **BS HC** - the horizontal circle on the instrument;
  - **BS Az** - the azimuth to the backsight point location;
  - **Local Time** - the time of the measurement.

- The **BS Check** tab is shown if the surveyor took the control measurement to the current backsight point.

- The **Side Shot** tab is shown if the surveyor measured a single point (sideshot). You can edit all the following parameters:
  - **Point** name;
  - **Code**;
  - **HR** - height of reflector;
  - **PC** - prism constant;

  - **Note**;
  - **Ordered segment** - special flag to control the order of cross section segments in post-processing.

- The **Data** tab is shown for the sideshot. The tab displays the result of measurements. You can view the following parameters:
  - **Type** - the type of the measurement;
  - **HA** - horizontal angle;
  - **VA** - vertical angle;
  - **SD** - slope distance from the station to measured point;
  - **Target Type** - the type of used reflector;
  - **PC** - prism constant;
  - **HR** - height of reflector;
  - **Local Time** - the time of the measurement.

- The **PTL** tab displayed, if the surveyor activated the PTL mode before survey. To activate the PTL mode you need to do the following: click the  icon in the *Topo* / *Find Station* / *Stake* / *Set Collection* dialogs and select **Setup** -> **PTL Mode**. The PTL tab displays the coordinates of the measured point defined through the two reference points. The line trace through these points is set as one axis and its perpendicular as another. You can view these parameters only.

- The **Meas Data** tab is shown, if the surveyor computed the coordinates of the occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates (**Resection** mode). The tab displays default values for measurement accuracy for **Distance**, **PPM**, **Horizontal** and **Vertical** Angles.

- The **Find Station** tab is used for the identification of the station by computing the distance from the beginning of the road to the projection of the measured point to the road, and the offset of the measured point from the center line of the road. More... You can edit the following parameters:
  - **Point** name;
  - **Code**;
  - Height of reflector (**HR**);
  - Prism configuration (**P.C.**);
  - Note.

- The **Data** tab shown for **Find Station**, if the surveyor calculated the distance from the beginning of the road to the projection of the measured point to the road, and the offset of the measured point from the center line of the road. This tab displays the results of measurements and calculation. You can view the following parameters:

- **Station** position;
- **Offset** of the measurement point from the station;
- **Type** - the type of the measurement;
- **HA** - horizontal angle;
- **VA** - vertical angle;
- **SD** - slope distance from the Total Station to measured point;
- **Target Type** - the type of used reflector;
- **PC** - prism constant;
- **HR** - height of reflector;
- **Local Time** - the time of the measurement.

- The **MLM** tab is shown, if the surveyor performed a missing line measurement and saved the result to the Raw Data database. More... The tab displays the start and end point of the missing line measurement. You can edit names of these points.

- The **Data** tab is shown, if the surveyor performed a missing line measurement and saved the result to the Raw Data database. This tab displays the missing line measurement results. You can view these parameters.

- The **Tape Dimension** tab is shown, if the surveyor used the tape measurements, relative to two known points. You can edit the following parameters:
  - **Point** name;
  - **Code**;
  - The direction **Right** or **Left** and the measured distance.

- The **Ref Line** tab is shown, the surveyor used the tape measurements, relative to two known points. You can edit the reference points name.

After adding or changing the data on respective tabs, click  to update the raw data record and return to the previous dialog. Click  to return to the previous dialog without saving.

Edit Raw Data (Digital Level)

To review or edit the selected digital level raw data record.

The dialog contains the following tabs, depending on the record type:

- The **BS** tab is shown, if the surveyor take the Backsight measurement to the current point. You can edit the following parameters:
  - **Point** name;
  - **Code**;

- **Note**.

- The **FS** tab is shown, if the surveyor take the Foresight measurement to the current point. You can edit the following parameters:
  - **Point** name;
  - **Code**;
  - **Note**.

- The **Side Shot** tab is shown, if the surveyor take the measurement to a point. You can edit the following parameters:
  - **Point** name;
  - **Code**;
  - **Note**.

- The **Meas** tab is shown, if the surveyor take the Backsight / Foresight measurement or Sideshot measurement to a point.

  You can edit the following measurements if using a 1 Wire instrument:

  - **Middle Wire** - the height of the middle wire;
  - **Distance** - the horizontal distance measurement between the level and the rod.
  - **Vertical Offset** - a vertical constant.

  You can edit the following measurements if using a 3 Wire instrument:

  - **Top Wire** - the height of the middle wire;
  - **Middle Wire** - the height of the middle wire;
  - **Bottom Wire** - the height of the bottom wire;
  - **Vertical Offset** - a vertical constant.

- The **Data** tab is shown for DL measurements. This tab displays the results of measurements and calculation. You can view the following parameters:
  - *Type* of the instrument (*1 Wire* or 3 *Wire*);

    When using a 1 Wire instrument:

  - *Mid Wire* - the height of the middle wire;
  - *Hor Dist* - the horizontal distance measurement between the level and the rod;
  - *V. Off* - a vertical constant.

    When using a 3 Wire instrument:

  - *Top Wire* - the height of the top wire;
  - *Mid Wire* - the height of the middle wire;
  - *Btm Wire* - the height of the bottom wire;

- *Hor Dist* - the calculated horizontal distance between the level and the rod;
- *V. Off* - a vertical constant.

After adding or changing the data on respective tabs, click  to update the raw data record and return to the previous dialog. Click  to return to the previous dialog without saving.

Angle Sets Report Setup Selection

An angle set is a group of total station observations at the occupation point taken at the same time and constitutes a measurement to a point. This group can have a number of different foresight and backsight sequences.

The Setup Selection dialog displays a list of all occupations in the project which have angle sets associated with them. The *Occupation* column displays the points where the occupations were set up. The *#sets* column displays the number of angle sets taken at the occupation. The *HI* column displays the instrument height of the occupation.

To generate an angle sets report:

- Select the check boxes associated with the occupations which should be included to the report.
- To select all the occupations in the list, click **Select All**.
- To clear all selections of occupations, click **Clear All**.
- Click the **Report** button to generate the Angle Sets Report.

Angle Sets Report

To display and save the information on the individual angle sets for the occupations.

- Review detailed information on the individual angle sets for the occupations selected in the Angle Sets Report Setup Selection dialog.
- Click  to save the generated report to a **.txt* file. The file will be saved to the *Report* folder.



Background

To add and remove backgrounds to the current project, to configure and perform background transformation.



Drawings
To manage the list of available vector background images.



Images
To manage the list of available raster background images.



WMS
To manage records about WMS (Web Map Service) providers from whose servers raster web map images can be loaded onto the map.



WFS
To manage records about WFS (Web Feature Service) providers from whose servers geometrical objects can be loaded as vector background onto the map.



Background Drawings

To display, manage, and transform background drawings in the current project.

- The left pane displays the list of names of available drawings.
- The right pane displays the preview of highlighted drawing in the horizontal plane.
- Click the **Properties** button to open the Drawing Properties dialog and display layers and number of elements in the highlighted drawing.
- Click the **Transform** button to open the Drawing Transformation dialog, where you can select a transformation type to link the highlighted background drawing to the coordinate system of the project.
- Click the **Delete** button to remove the highlighted drawing from the list of background drawings of the current project.

Note: To use an imported drawing as background, select the corresponding check box(es) in the Settings dialog before importing the file to the project.

Note: To show / hide a drawing on the Map, select / deselect its check box in the Backgrounds tab of the Map Properties dialog.

Click to return to the previous dialog. Click to return to the Home Screen.

Drawing Properties

Review the properties of the selected background drawing.

- The **Layer** pane displays the list of layers in the background drawing.
- The **Background Drawing contains:** field displays the quantity of objects in the background drawing:
  - *Points*
  - *Lines*
  - *Arcs*

Click to return to the Background Drawings dialog.



Drawing Transformation

Select the transformation type to convert the selected background drawing from the coordinates in the drawing to the currently used coordinate system. Sokkia Field offers three transformation types:

- By Matching Line - to select a common line on the background drawing and in the current project to transform coordinates in the background drawing to the currently used coordinate system.
- By Matching Point - to select a common point on the background drawing and in the current project to transform coordinates in the background drawing to the currently used coordinate system. Additionally, you enter rotate angle and scale values for the background drawing transformation.
- By Plotting Scale - to assign a point in the project as the origin point in the background drawing (depending on the drawing, this could be (0,0), (0,0,0), insertion point or just top left point in the

drawing) to transform coordinates in the background drawing to the currently used coordinate system. Additionally, you can specify rotation around origin point and scaling of the background drawing.

Drawing Transformation *By Matching Line*

For this type of transformation, Sokkia Field performs the following operations:

- moves the background drawing so that the start point of the line in the background drawing receives coordinates of the start point of the line in the project, this point becomes the origin point of the transformation;
- rotates the background drawing around the origin point, the rotation angle is an angle between the selected line in the background drawing and the selected line in the project;
- scales the background drawing; the scale factor is calculated as ratio of line length in the project to line length in the background drawing.

Specify start and end points of the matching line in the background drawing and start and end points of the matching line in the current project:

- Click  in the **Line Length** field of the *Drawing* panel to open the Select Object From Map dialog.
  - Select the desired line in the background drawing:
    - Click the desired line. The line is highlighted in red and arrows indicate the line direction.
    - The start of the line is the origin point, the end of the line defines the line's length and direction.
    - Optionally, long tap (right click) the highlighted line to use the **Reverse Direction** command from the context menu and swap start and end points.

    Alternatively select any two points in the background drawing to define the line:
    - Use the Snap toolbar and displayed lines of the background drawing to define the start point of the line. The first orange dot confirms the start point selection. This point is the origin point.
    - Use the Snap toolbar and displayed lines of the background drawing to define the end point of the line. The second orange dot confirms the end point selection. This point defines the line's length and direction. The line is highlighted in red and arrows indicate the line direction.
    - Optionally, long tap (right click) the highlighted line to use the **Reverse Direction** command from the context menu and swap start and end points.

- Click  to save the selection. The Select Object From Map dialog is closed and the **Line Length** field displays the length of the selected line.

- In the *Project Data* panel, specify start and end points of the line in the project:
  - **Start Point**. The start point of the line from the project is used as the origin point of the transformation. You can select the start point from the map  or from the list  of points in the project, or you can measure its coordinates by clicking  (for GNSS device type) or  (for optical device type).
  - **End Point**. The end point of the line in the project is used to calculate rotation angle and scale of the transformation. This point can be set in the same way: by selecting from the map, from the list of points in the project, or by measuring its coordinates.

    Alternatively, specify the length and direction of the line in the project by switching the **End Point** button to **Line Length** and entering the desired line's length and **Azimuth** (or **Bearing** depending on direction settings in the Display dialog) values. Enter the direction value manually or click  to calculate from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

- Click the **Next** button to open the Transformation Results dialog with calculated relationship between coordinates in the background drawing and the coordinate system used in the project.

Drawing Transformation *By Matching Point*

For this type of transformation, Sokkia Field performs the following operations:

- moves the background drawing so that the matching point in the background drawing receives coordinates of the matching point in the project, this point becomes the origin point of the transformation;
- rotates the background drawing around the origin point, the user can specify a rotation angle;
- scales the background drawing, the user can specify a scale factor.

Select a matching point in the background drawing and a matching point in the project, also specify rotation angle and scale factor:

- Click  in the **Select an Origin Point** field of the *Drawing* panel to open the Select Object From Map dialog.
  - Use the Snap toolbar and displayed lines of the background drawing to define the matching point. The orange dot confirms the matching point selection.
  - Click  to save the selection. The Select Object From Map dialog is closed and the **Select an Origin Point** field displays "*Point Selected*".

- In the **Origin Point** field, specify the point in the current project. You can select it from the map  or from the list  of points in the project, or you can measure its coordinates by clicking  (for GNSS device type) or  (for optical device type).

- In the **Rotation** field, enter the value of the rotation angle. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing project points and lines.

- In the **Scale Factor** group, select distance measurement units from the drop-down lists and enter values for the scale ratio between the background drawing (left field) and the current project (right field). These values should be greater than 0. The *Calculated scale factor* value displays below.

- Click the **Next** button to open the Transformation Results dialog with calculated relationship between coordinates in the background drawing and the coordinate system used in the project.

Drawing Transformation *By Plotting Scale*

For this type of transformation, Sokkia Field performs the following operations:

- moves the background drawing so that the origin point in the background drawing (depending on the drawing this could be (0,0), (0,0,0), insertion point or just top left point in the drawing) receives coordinates of the selected point in the project, this point becomes the origin point of the transformation;
- rotates the background drawing around the origin point of the transformation, the user can specify a rotation angle;
- scales the background drawing, the user can specify a scale factor.

Select an origin point in the project, also specify rotation angle and scale factor:

- In the **Origin Point** field, specify the point in the current project. You can select it from the map  or from the list  of points in the project, or you can measure its coordinates by clicking  (for GNSS device type) or  (for optical device type).

- In the **Rotation** field, enter the value of the rotation angle. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing project points and lines.

- In the **Scale Factor** group, select distance measurement units from the drop-down lists and enter values for the scale ratio between the background drawing (left field) and the current project (right field). These values should be greater than 0. The *Calculated scale factor* value displays below.

- Click the **Next** button to open the Transformation Results dialog with calculated relationship between coordinates in the background drawing and the coordinate system used in the project.

Transformation Results

To review and store the calculated transformation of the background drawing between coordinates in the drawing and the current project's coordinate system.

The left pane of the dialog displays the transformation parameters and calculated data:

- *Background:* - coordinates of *start point* or coordinates of *start and end points of the line* on the background drawing that match with coordinates on the site and are used in transformation calculation.
- *On site:* - coordinates of *start point*, or coordinates of *start and end points of the line*, or coordinates of *start point, direction and length of the line* on the site that match with coordinates on the background drawing and are used in transformation calculation.
- *Transformation parameters:*
  - *Offset* - offset between two coordinate systems;
  - *Scale Factor* - scale factor between two coordinate systems;
  - *Rotation* - rotation angle between two coordinate systems.

The right pane of the dialog displays a graphical representation of the transformation in a horizontal plane.

Click the  **Report** button to save displayed transformation results into a **.txt* file.

Click the **Save** button to store the calculated transformation of the background drawing in the project's database and open the Background Drawings dialog. Click  to return to the Drawing Transformation dialog without storing the results.

Background Images

To add, display, transform, and remove background images in the current project.

- The dialog lists available background images along with image file name and location, file format, and linear units. Learn more about background images in Sokkia Field.
- Click the **Add** button to open the Add Image dialog and browse for a new image file. Supported image file formats are TIFF (**.tif*,**.tiff*), JPEG (**.jpg*, **.jpeg*), PNG (**.png*) or BITMAP (**.bmp*). Note that the Image Properties dialog displays prior to adding a file with background image to the current project.

  Note: When you add a background image, Sokkia Field saves a link to the image file, as well as geo-reference parameters for this file. Added image is available in all projects on the controller. Deleting a background image makes it unavailable for all projects.

- Click / to change position of highlighted data item(s). The Map dialog displays the background images in the order corresponding to the order shown in this list: the last image in the list is the top image on the map.
- Click the **Properties** button to open the Image Properties dialog and display the properties of the highlighted image with an option to change the geo-reference parameters.
- Click the **Transform** button to open the Background Image Transformation dialog, where you can select a transformation type to link the pixel coordinates of highlighted background drawing to the coordinate system of the project.
- Click the **Delete** button to remove the highlighted image from the list of background images of the current project.

Note: To show / hide a background image on the Map, select / deselect its check box in the Backgrounds tab of the Map Properties dialog.

Click to save all the changes made to the order of background images included in the list and return to the previous dialog. Click to discard changes and return to the previous dialog.

Background Image Types

Any TIFF (**.tif*,**.tiff*), JPEG (**.jpg*, **.jpeg*), PNG (**.png*) or BITMAP (**.bmp*) raster images are supported. The images must have geo-referenced data to be positioned correctly as backgrounds on the map screen.

> **Note:** The geo-referenced data defines the relationship between pixels coordinates of the image and real datum / grid / ground / local coordinates.

GeoTIFF images already feature embedded geo-referenced data that is automatically recognized, while the others use a separate file which defines the geographic location of the image. This file is called a World File. Sokkia Field generates the World File for selected background image without geo-referenced data after performing the Background Image Transformation.

A World File contains information about the size of the corresponding image and the coordinates of the geo-reference point (the upper left corner of the image) in the coordinate system of the project. The World File must have the file name extension associated with the image format (**.tfw*, **.jgw*, **.pgw* or **.bpw*) and should be located in the same folder as the image file.

Image Properties

Review the properties and modify geo-reference parameters of the selected background image.

- **File Name** - the name of the background image file.
- **File Path** - the storage location of the background image file.
- **File Type** - the format of the background image file.
- **Projection** - the projection for the coordinates in the World File for the background image. From the drop-down list you can specify either *Current* or *UTM* projection for these coordinates.
- **Units** - the units of measure for handling geo-reference information of the image (origin point coordinates and scale). From the drop-down list you can specify these units (for example, select *Degrees* if origin point coordinates in World File are specified in the Lat/Lon format or *Meters* if origin point coordinates in the World File are specified in the N,E format.
- **Use World File** - the check box defines whether the image needs a World File to be plotted correctly or not. This check box can be deselected only for GeoTIFF images.

Click  to save changes and return to the Background Images dialog. Click  to discard changes and return to the Background Images dialog.

Background Image Transformation

Select the transformation type to convert the selected background image from the pixel coordinates to the currently used coordinate system. Sokkia Field offers three transformation types:

- By Matching Line - to select a common line in the background image and in the current project to transform the pixel coordinates of background image to the currently used coordinate system.
- By Matching Point - to select a common point in the background image and in the current project to transform the pixel coordinates of background image to the currently used coordinate system. Additionally, you enter rotate angle and scale values for the background image transformation.
- By Plotting Scale - to select a point in the project as the top left pixel (0,0) of the background image. Additionally, you enter rotate angle and scale values for the background image transformation.

Note: All types of background image transformations use a height of 0 for project points needed to calculate the transformation.

Background Image Transformation *By Matching Line*

For this type of transformation, Sokkia Field performs the following operations:

- moves the background image so that the start point of the line on the background image receives coordinates of the start point of the line in the project, this point becomes the origin point of the transformation;
- rotates the background image around the origin point, the rotation angle is an angle between the selected line on the background image and the selected line in the project;
- scales the background image; the scale factor is calculated as ratio of line length in the project to line length in the background image.

Specify start and end points of the matching line in the background image and start and end points of the matching line in the current project:

- Click  in the **Line Length** field of the *Background Image* panel to display the selected background image.

- Select the start point of the line in the background image:
  - Click and activate the start point button  then click on a desired place of the background image to select a start point of the line.
  - The first red dot confirms the start point selection. This point is the origin point.
- Select the end point of the line in the background image:
  - Click and activate the end point button  then click on another desired place of the background image to select an end point of the line.
  - The second red dot confirms the end point selection. This point defines the line's length and direction. The defined matching line is highlighted in red.
- Click  to save the selection, the **Line Length** field displays the length of the selected line.

- In the *Project Data* panel, specify start and end points of the line in the project:
  - **Start Point**. The start point of the line from the project is used as the origin point of the transformation. You can select the start point from the map  or from the list  of points in the project, or you can measure its coordinates by clicking  (for GNSS device type) or  (for optical device type).
  - **End Point**. The end point of the line in the project is used to calculate rotation angle and scale of the transformation. This point can be set in the same way: by selecting from the map, from the list of points in the project, or by measuring its coordinates.

    Alternatively, specify the length and direction of the line in the project by switching the **End Point** button to **Line Length** and entering the desired line's length and **Azimuth** (or **Bearing** depending on direction settings in the Display dialog) values. Enter the direction value manually or click  to calculate from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

- Click the **Save** button to save the calculated transformation parameters between coordinates in the background image and the coordinate system used in the project. The transformation parameters are written to the ESRI World File stored with the background image file in the same folder.

Background Image Transformation *By Matching Point*

For this type of transformation, Sokkia Field performs the following operations:

- moves the background image so that the matching point in the background image receives coordinates of the matching point in the project, this point becomes the origin point of the transformation;
- rotates the background image around the origin point, the user can specify a rotation angle;
- scales the background image, the user can specify a scale factor.

Select a matching point in the background image and a matching point in the project, also specify rotation angle and scale factor:

- Click  in the **Select an Origin Point** field of the *Background Image* panel to display the selected background image.
  - Define the desired matching point in the background image:
    - Click and activate the  button then click on a desired place of the background image to define the matching point.
    - The red dot confirms the matching point selection.
  - Click  to save the selection, the **Select an Origin Point** field displays "*Point Selected*".
- In the **Origin Point** field of the *Project Data* panel, specify the matching point in the current project. You can select it from the map  or from the list  of points in the project, or you can measure its coordinates by clicking  (for GNSS device type) or  (for optical device type).
- In the **Rotation** field, enter the value of the rotation angle. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing project points and lines.
- In the **Scale Factor** group, select distance measurement units from the drop-down lists and enter values for the scale ratio between the background image (left field) and the current project (right field). These values should be greater than 0. The *Calculated scale factor* value displays below.
- Click the **Save** button to save the calculated transformation parameters between coordinates in the background image and the coordinate system used in the project. The transformation parameters are written to the ESRI World File stored with the background image file in the same folder.

Background Image Transformation *By Plotting Scale*

For this type of transformation, Sokkia Field performs the following operations:

- moves the background image so that the top left pixel (0,0) of the background image receives coordinates of the selected point in the project, this point becomes the origin point of the transformation;
- rotates the background image around the origin point, the user can specify a rotation angle;
- scales the background image, the user can specify a scale factor.

Select an origin point in the project, also specify rotation angle and scale factor:

- In the **Origin Point** field, specify the point in the current project. You can select it from the map  or from the list  of points in the project, or you can measure its coordinates by clicking  (for GNSS device type) or  (for optical device type).

- In the **Rotation** field, enter the value of the rotation angle. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing project points and lines.

- In the **Scale Factor** group, select distance measurement units from the drop-down lists and enter values for the scale ratio between the background image (left field) and the current project (right field). These values should be greater than 0. The *Calculated scale factor* value displays below.

- Click the **Save** button to save the calculated transformation parameters between coordinates in the background image and the coordinate system used in the project. The transformation parameters are written to the ESRI World File stored with the background image file in the same folder.



WMS Records

To add, edit, and remove records of WMS (Web Map Service) and WMTS (Web Map Tiled Service) providers.

The dialog displays the list of the Web Map Services, from where the application can download selected geo-referenced raster image layers. The downloaded data is saved in the application's cache memory.

Note: Sokkia Field also offers OSM © and Bing ™ predefined web maps that can be configured in the Web Map Layers dialog accessible from the Backgrounds tab of the Map Properties dialog.

This dialog allows you to:

- **Add** - click the button to open the Add / Edit Record dialog and add required data for a new WMS record.
- **Edit** - click the button to open the Add / Edit Record dialog and modify required data for an existing WMS record.
- **Delete** - click the button to delete the selected WMS record from the list. Click **Yes** to confirm deletion or **No** to cancel. The Map dialog still displays the map image(s) from the deleted WMS record until the image is stored in the application's cache.
- **Clear Cache** - click the button to delete all downloaded web maps from the application's cache memory. Click **Yes** to confirm deletion or click **No** to cancel. If the corresponding record remains in the dialog but all web maps are deleted from the application's cache, the application will start downloading web map data again. The amount of occupied cache memory for downloaded map data is shown in the **Total tiles cache size:** field.
- Change the order of WMS records in the list. Click  /  to change position of highlighted data item(s). The Map dialog displays the downloaded WMS map images in the order corresponding to the order shown in this list: the last image in the list is the top image on the map.

Note: To show / hide downloaded raster images from a WMS record on the Map, select / deselect the **Web Map** check box with the chosen web map in the Backgrounds tab of the Map Properties dialog. Detailed configuration of WMS output to the map is available in the Web Map Layers dialog.

Note: Downloaded map images that have not been used for more than 1 month will be automatically updated once a user requests a stored image (tile) and there is an Internet connection available.

Click  to save all the changes made to the order of WMS records included in the list and return to the previous dialog. Click  to discard changes and return to the previous dialog.

Add / Edit Record

To add or edit a record with WMS (Web Map Service) or WFS (Web Feature Service) provider data.

Enter data for your WMS / WFS server provider:

- **Title** - enter the name of the WMS / WFS service provider.
- **URL** - insert the URL of the WMS / WFS service provider used to log in and download map tiles. This field should not be empty.
- Enter the **Login** and **Password** to log in to WMS / WFS service, if required. Click / button to show / hide password.

Click to save entered data and return to the previous dialog. Click to discard changes and close the dialog.



WFS Records

To add, edit, and remove records of WFS (Web Feature Service) providers.

The dialog displays the list of the Web Feature Services, from where the application can download geometrical geo-referenced objects that can be used as standard vector backgrounds on the map for surveying and staking. The downloaded data is saved in the application's cache memory.

This dialog allows you to:

- **Add** - click the button to open the Add / Edit Record dialog and add required data for a new WFS record.

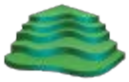
  > **Note:** Currently, you can add and use only one WFS record.

- **Edit** - click the button to open the Add / Edit Record dialog and modify required data for an existing WFS record.
- **Delete** - click the button to delete the selected WFS record from the list. Click **Yes** to confirm deletion or **No** to cancel. The Map dialog still displays the map object(s) from the deleted WFS record until the data is stored in the application's cache.
- **Clear Cache** - click the button to delete all downloaded web maps from the application's cache memory. Click **Yes** to confirm deletion or click **No** to cancel. If the corresponding record remains in the dialog but all web maps are deleted from the application's cache, the application will start downloading web map data again. The amount of occupied cache memory for downloaded map data is shown in the **Total tiles cache size:** field.

- Change the order of WFS records in the list. Click  /  to change position of highlighted data item(s). The Map dialog displays the downloaded WFS vector objects in the order corresponding to the order shown in this list: the last object in the list is the top object on the map.

Note: To show / hide downloaded vector objects from a WFS record on the Map, select / deselect the **Web Map** check box with the chosen web map in the Backgrounds tab of the Map Properties dialog. Detailed configuration of WFS output to the map is available in the Web Map Layers dialog.

Click  to save all the changes made to the order of WFS records included in the list and return to the previous dialog. Click  to discard changes and return to the previous dialog.



Surfaces

To display a list of surfaces in the current project and to select, add, edit, or delete surfaces.

The dialog contains a list of surfaces in the current project and a preview panel for the highlighted surface in the horizontal plane. To view the currently highlighted surface in a larger screen, double-click the preview.

- Click **Edit** to open the Surface Properties dialog and review or edit the name, layer, graphic style and contour lines of highlighted surface.
- Click **Add** to open the Create Surface dialog and create a new surface from points, point lists, linework objects, areas.
- Click **Delete** to delete the highlighted surface(s) from the project.



Create Surface

To calculate and create a new surface from points, point lists, linework objects, areas.

Note: Read more information on how Sokkia Field uses points, linework objects, and areas in surface wireframe calculation depending on code and the *Use in Surface* code property.

The **Input List** on the left contains the objects that are used to calculate the surface position and triangulated wireframe and the plan view on the right displays the surface preview in the horizontal plane. The object highlighted in the list is also marked on the plan view. The  /  button can be used to toggle the plan view.

- Populate the **Input list** with points and /or other objects to use them in calculating the surface position and wireframe.
  - From the  drop-down menu, select a type of object(s) to be added to the **Input List**:
    - Choose **Points** to add points to the **Input Data** list for calculating the surface position and wireframe:
      - Click the **Add Points** button to open and use the Point Selection drop-down menu with the following commands:
        - *All* - add all the points from the current project.
        - By Range - add points by specifying point name range(s).
        - By Code - add points by point code name(s).
        - By Code String - add points by code string.
        - By Radius - add points which reside in a particular circle.
        - By Name - add points by name or by part of name.
        - By Layer - add points which belong to a particular layer.
      - Alternatively, add points from the map  or from the list  of the project points.
      - Click  in the top left corner and select Edit Points to view and manage points in the project.
    - Choose **Point List** to add all the points from point list(s) to the **Input List** for calculating the surface position and wireframe:
      - Enter a point list name and click  next to the entered name.
      - Alternatively, add point list(s) from the catalog  of the point lists.
      - Click  in the top left corner and select Edit Point Lists to view and manage point lists in the project.
    - Choose **Linework** to add linework object(s) to the **Input List** for calculating the surface position and wireframe:
      - Enter a linework object name and click  next to the entered name.
      - Alternatively, add linework object(s) from the map  or from the list  of existing linework objects.

- Click  in the top left corner and select Edit Linework to view and manage linework in the project.

- Choose **Area** to add area(s) to the **Input List** list for for calculating the surface position and wireframe:
  - Enter an area name and click  next to the entered name.
  - Alternatively, add area(s) from the map  or from the list  of the project areas.
  - Click  in the top left corner and select Edit Areas to view and manage areas in the project.

- Review the **Input List**, remove points and / or other objects from the list:
  - From the  drop-down menu, select a type of object(s) to be displayed in the **Input List**.
  - Highlight an object name and click  next to the list to remove highlighted object(s) from the list.
  - Use the context menu to simplify multiple objects highlighting with the following commands:
    - **Select All** - highlights all objects displayed.
    - **Select All Below** - highlights a currently highlighted object and all the objects displayed below.
    - **Select Multiple** - highlights multiple objects by sequential clicking on object names.
    - **Cancel Selection** - removes all highlights from objects displayed.
  - To obtain information about one point, highlight the point and click .

- Check the **Custom boundary** box and click the activated **Edit Boundary** button to open the dialog to customize the automatically generated outer boundary of the surface.

  Note: The **Custom Boundary** option is disabled if the area that defines the outer boundary of the surface is added to the **Input List**. More...

- You can also have the application to generate surface contour lines along with the new surface.

  Open the Contours Settings dialog from the dialog menu by clicking  in the top left corner and set up contouring for the surface being created.
- In the **Results** tab, review the details of surface calculation according to currently added data in the **Input List** and click  to save the data to a **.txt* file if required:

- *2D Area* - the area occupied by the surface in the horizontal plane;
- *3D Area* - the sum of the areas of all the triangles that form the wireframe of the surface;
- *Num Edges*, *Num Triangles*, *Num Points* - the number of respective elements in the measured surface wireframe;
- *Omitted Points* - points added to the **Input List** but not used in the wireframe calculation;
- *Max / Min Coordinates* - extreme coordinate values of the calculated surface.

- The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

- The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

- After all desired objects are added and arranged and the plan view displays the desired triangulated wireframe, click  in the dialog title bar to accept the shown surface and enter the name, layer and graphic style for this surface:
  - **Info** tab:
    - Edit the **Surface Name** if required.
    - Review extreme surface coordinates and surface area information in 2D and 3D.

  - **Style** tab:
    - Define the **Layer** where the surface resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
    - Click the **Color** button to open the Select Color dialog, where you can select a color for the surface wireframe drawing on 2D map.

      Note: Choose the representation style of surfaces in 3D maps in the 3D tab of the Map Properties dialog.

  - Click  to accept the name, layer and graphic style and create the new surface. Click  to return to the **Input List** and review the surface calculation.

How the 'Use in Surface' property of code affects the surface creation

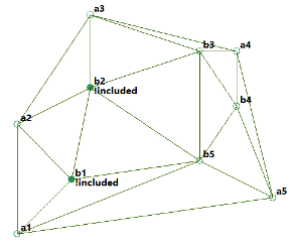
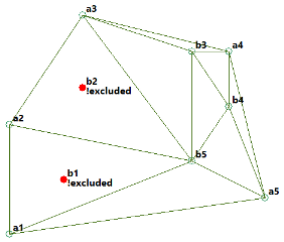
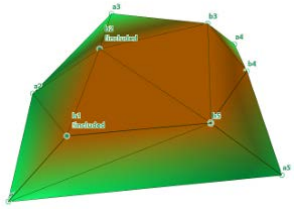
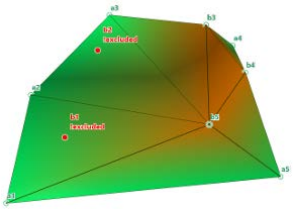
Points, lines, and areas can be added to the **Input List** of objects used to create a new surface and calculate its triangulated wireframe in the Create Surface dialog. Codes of point type, line type or

area type applied to respective objects feature the *Use in Surface* property of the code along with code type specific parameters of this property (*Breakline* for line type and *Exclusion Area* for area type). The status of the *Use in Surface* code property affects how a new surface is calculated.

Note: Review and change the status of the *Use in Surface* property in the Code dialog (to open, click > > , highlight the desired code in the list and click the **Edit** button).

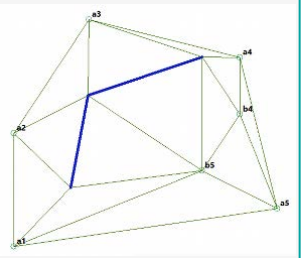
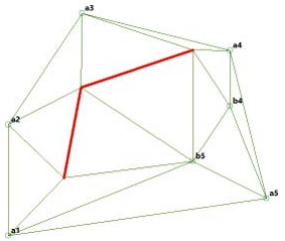
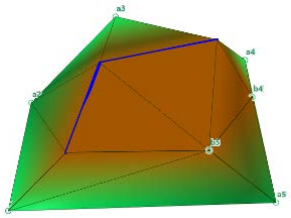
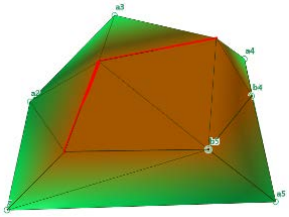
Point

When *points* (*b1* and *b2*) with point type code are added to the **Input List** of objects for a new surface creation, these points are either used in the triangulated wireframe calculation or not, depending on the state of the *Use in surface* property:

2D map view		3D map view	
☑ Use in Surface	☐ Use in Surface	☑ Use in Surface	☐ Use in Surface
			

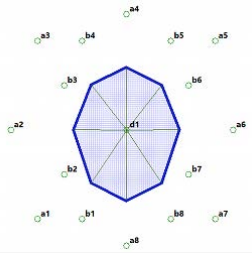
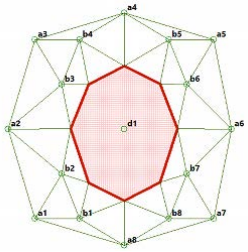
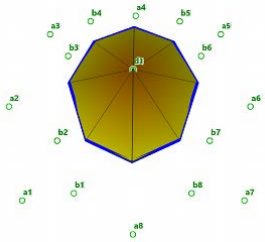
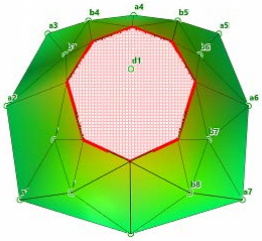
Linework

When *linework objects* with line type code are added to the **Input List** of objects for a new surface creation, these linework objects are always used as breaklines, regardless of the *Use in Surface* and *Breakline* statuses:

2D map view		3D map view	
☑ Use in Surface ☑ / ☐ Breakline	☐ Use in Surface	☑ Use in Surface ☑ / ☐ Breakline	☐ Use in Surface
			

Area

When *area* with area type code is added to the **Input List** of objects for a new surface creation, this area either defines the outer boundary of the triangulated wireframe, or defines an exclusion area that is excluded from the triangulated wireframe calculation:

2D map view		3D map view	
☑ / ☐ Use in Surface ☑ / ☐ Breakline ☐ Exclusion Area	☑ Use in Surface ☑ Breakline ☑ Exclusion Area	☑ / ☐ Use in Surface ☑ / ☐ Breakline ☐ Exclusion Area	☑ Use in Surface ☑ Breakline ☑ Exclusion Area
			

The **Input List** in the Create Surface dialog displays the information on how the added object is used in the surface.

- **Points** added to the list shows their *Surface flags*:
  - *<none>* - the point has no codes or point has a code of any type and the *Use in Surface* property is enabled.
  - *Excluded* - the point has a code of any type and the *Use in Surface* property is disabled.
  - *Break line* - the point has a code of line or area type and the *Breakline* status of the *Use in Surface* property is enabled.
  - *Exclusion Area* - the point has a code of area type and the *Breakline* and *Exclusion Area* statuses of the *Use in Surface* property are enabled.

- **Linework objects** added to the list are always breaklines.

- **Areas** added to the list shows their *Type*:
  - *<none>* - the area has no code or the area has a code of area type and the *Exclusion Area* status of the *Use in Surface* property is disabled.
  - *Exclusion* - the area has a code of area type and the *Exclusion Area* status of the *Use in Surface* property is enabled.

Edit Boundary

To customize an automatically generated boundary for the surface that is being created.

The list on the left contains the points that form the outer boundary of the horizontal projection of the surface and the plan view on the right displays the surface in the horizontal plane. The point highlighted in the list is marked with a yellow circle on the plan view. The  /  button can be used to toggle the plan view.

You can change the current boundary by removing or adding points and changing the order of the points that form the boundary. All changes are shown in the plan view on the right.

- Highlight desired point(s) in the list. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- Use  and  to move the highlighted point(s) up or down in the ordering.
- To remove the highlighted point(s) from the boundary, highlight the point(s) and click .
- To obtain information about one point, highlight the point and click .

- To add another surface point to the list of boundary points click  and select the desired point from the list of all points of the current surface.
- To visually customize the boundary, click  to open the map view of the surface boundary:
  - Boundary points are selected and shown as yellow circles, the current boundary is shown as a red line.
  - Click on a deselected surface point to select it, click on a selected point to deselect it.
  - Visually draw the boundary red line by sequentially selecting desired boundary points.
  - Click  to close the map view and keep the currently shown boundary, click  to close the map view and cancel boundary changes made in the map view.
- When ready, click  to save the customized boundary of the surface and return to the Create Surface dialog. Click  to close the dialog without saving.

  Note: Saving the custom boundary fixes the surface's boundary. If you need to add points outside the saved custom boundary to the current surface after the custom boundary is saved, clear the **Custom boundary** check box in the Create Surface dialog.

Contours Settings

To define the surface contouring parameters and to generate contour lines along with the new surface.

- Check the **Create Surface Contours Automatically** box to create contour lines for the surface being created. With the cleared check box, contours are not created together with the new surface.

  Note: You can add contours to an existing surface at any time later with more options available, in the Contour Surface dialog accessible from the Surface Properties dialog or in the Calculate Surface section.

- In the **Contour Interval** field, enter a height interval between contours.
- Define the layer and graphic style for the contour lines:
  - Define the **Layer** where the contour(s) reside. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project. Initially, generated contours are placed in the layer of the surface.

- Define the **Color** of the contour lines. Click the button to open the Select Color dialog, where you can select a color for the contour line drawing. To make contour lines the wire-frame color of the new surface, check the **Color From Surface** box.
- Define the **Line Style** and **Width** in points for drawing contour lines on the map from the respective drop-down lists. Initially, contours have the style and width of lines in the surface wire-frame.

Click  to save contouring parameters of the new surface and return to the Create Surface dialog. Click  to close the dialog without saving.

Surface Properties

To review information about the selected surface and edit name, layer, graphic style of the surface and contour lines.

- **Info** tab:
  - Edit the **Surface Name** if required.
  - Review extreme surface coordinates and surface area information in 2D and 3D.

- **Style** tab:
  - Define the **Layer** where the surface resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
  - Click the **Color** button to open the Select Color dialog, where you can select a color for the surface wireframe drawing on 2D map. The preview panel displays the current color.
  - Define the **Line Style** and **Width** in points for drawing lines of the surface wireframe on the 2D map from the respective drop-down lists.

    Note: Choose the representation style of surfaces in 3D maps in the 3D tab of the Map Properties dialog.

- **Contours** tab:
  - The **Elevation** list on the left contains height values where surface contours were generated. The list is empty if the contours do not exist.
  - The preview panel on the right displays the surface contour lines drawn at highlighted elevation(s) in the horizontal plane.
  - Click the **Calculate** button to open the Contour Interval tab of the Contour Surface dialog and generate new contours for the selected surface.

> **Note:** After generating new contours for the selected surface, the currently existing contours are automatically deleted.

- Click  to erase highlighted contour(s).
- Click  to view information about highlighted contour line in the Selected contour dialog.
- Click the **Change Style** button to open the Contour Style dialog and change the layer and graphic style of highlighted contour(s).

> **Note:** To apply a single style to all contours of the selected surface, click the **Select All** button, then the **Change Style** button.

- Click the **Select All** button to highlight all contours in the list. Use context menu in the list to highlight multiple contours:
  - **Select All** - highlights all contours in the list.
  - **Select All Below** - highlights a currently highlighted contour and all the contours in the list displayed below.
  - **Select Multiple** - highlights multiple contours by sequential clicking on contour elevations.
  - **Cancel Selection** - removes all highlights in the list.

After changing the surface properties, click  to save the surface and return to the previous dialog. Click  to return to the previous dialog without saving.

Contour Style

To review and change the layer and graphic style of the selected contour(s).

- Define the **Layer** where the contour(s) reside. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project. Initially, generated contours are placed in the layer of the surface.
- Define the **Line Style** and **Width** in points for drawing contour lines on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the contour line drawing. The preview panel displays the current style.

Click to save changes in layer and graphic style for selected contour(s) and close the dialog.

Click to return to the previous dialog without saving.

Selected Contour

To review information on a selected surface contour line.

The dialog displays the detailed data about the selected contour:

- *Surface* - the name of the surface the contour belongs;
- *Elevation* - the height value where the contour is created;
- *Length* - the total length of the contour line;
- *Layer* - the layer of the contour;
- *Visibility* - the status of visibility of the contour line on maps.

Click to return to the previous dialog.



Sessions

To configure and edit session plans for automatic raw data logging by GNSS receiver.

> **Note:** This dialog is available when the **Post Processing** feature was enabled in the Receiver Make dialog during survey configuration.

- The **Sessions** panel contains the list of existing sessions along with their scheduling data:
  - *Site* - the name of the site where the receiver will be placed for the survey;
  - *Type* of survey - either *Static* or *Kinematic*;
  - *Start Day* and *Start Time* - the day of week and the local time when the receiver will start to collect satellite raw data to the **.tps* file;
  - *End Day* and *End Time* - the day of week and the local time when the receiver will close the **.tps* file.

- Manage sessions in the **Session** panel:
  - Click the **Add** button in the **Sessions** panel to open the Session Setup dialog and create a new session.
  - Click the **Edit** button in the **Sessions** panel to open the Session Setup dialog and modify the

highlighted session.
    - Click  in the **Sessions** panel to delete the highlighted session.

- The **Receivers** panel contains a list of abstract receivers, each of which can be assigned an individual session plan constructed from sessions in the **Session** panel.
    - Click the **Add** button in the **Receivers** panel to add a new abstract receiver. Give a descriptive name to the receiver being added to the list, easing the task of controlling multiple-receiver surveys.
    - Click  in the **Receivers** panel to delete either highlighted receiver, or highlighted session from the **Receivers** list.
    - Select the **Sleep mode after session ends** check box to put receiver(s) into sleep mode after session ends and before the next session starts.

- Assign session(s) to a receiver.
    - Check the box  near the desired receiver in the **Receivers** panel.
    - Highlight the desired session in the **Sessions** panel then click . Repeat if you need to assign more sessions to the same receiver. Up to three sessions can be assigned to a receiver.
    - Expand the receiver node to see sessions added to this receiver.

> **Note:** The session plan need to be loaded on to your connected GNSS receiver in the PP Sessions dialog.

Click  to save changes and return to the previous dialog. Click  to return to the previous dialog without saving.

Session Setup

To schedule and configure a session which can then be loaded into the receiver to automatically start logging data.

Specify the parameters for the session:

1. In **Site Name**, the name of the site where the receiver will be placed for the survey.
2. Select the **Type** of survey, either static or kinematic.
3. In **Start Time**, the day of week and the local time when the receiver will start the survey.
4. In **End Time**, the day of week and the local time when the receiver will end the survey.
5. In **Interval**, the time between successive epochs logged to the raw data file.

6. In **Min SVs**, the minimum number of tracked satellites to log an epoch. Epochs containing fewer satellites will not be logged to the **.tps* GNSS raw data file. (This feature is unavailable for use with **GRX5** receiver).
7. Select the **Antenna Type** from the drop-down list.
8. The measured **Antenna Height** and type (*Vertical* or *Slant*) of measurement.

Click ✔ to save the session and to return to the Sessions dialog.



Roads & Trenches

Edit the road or trench properties and design new roads or trenches.



Roads and Trenches
To edit existing roads and trenches and to create a new road or trench.



Horizontal
To edit existing horizontal alignments and to create a new one.



Vertical
To edit existing vertical alignments and to create a new one.



Templates
To edit existing cross section templates and to create a new one.



X-Sections
To edit existing cross section sets and to create a new set.



String Set
To edit existing road string sets and to create a new set.



Equation Set
To edit existing station equation sets and to create a new set.



Regions
To edit existing regions and to create a new one.



Roads & Trenches

To display a list of roads in the current project and to select, add, edit, or delete roads.

The dialog contains a list of roads in the project and two preview panels showing the center line of highlighted road in the horizontal and vertical planes. To view the currently highlighted road in a larger screen, double-click one of the preview panels.

- Click **Edit** to open the Edit Road / Trench dialog and modify the highlighted road.
- Click **Add** to open the Add Road / Trench dialog and create a new road.
- Click **Delete** to remove the highlighted road(s) from the project.
- Click **Points** to open the Road Points dialog to view points of highlighted road (stations, transitions and extremes).

Note: When editing or deleting a road or a road element (horizontal / vertical alignment, template / x-section / x-section set), you may get a message that the respective object "is read-only and cannot be edited". This happens if you are working with a project that was originally created in Kantoku 3D software and had road / road elements imported from RSM XML format. (RSM stands for Road Shape Management.)

Click  to open the dialog menu with additional options:

- **Import Road(s) From Project** - to copy roads from another project. More...
- **Import Road(s) From File** - to import road data from a file. More...
- **Export Road(s) To Project** - to copy roads to another project. More...
- **Export Road(s) To File** - to create a road data file. More...

Add / Edit Road / Trench

To edit the selected road or to create a new road in the current project.

The dialog has two tabs:

- **Alignment** - this tab defines a road name, layer, alignments and stationing;
- **Surface** - this tab defines road surface.

In the **Alignment** tab, enter or edit general data and alignment data for the road:

- **Name** - enter a name of the road.
- **Layer** - define the layer where the road resides. Select an existing layer quickly from the drop-down list or click ... to open the Layers dialog and manage layers in the current project.
- **Hz Align** - specify the horizontal alignment of the road. Select an existing horizontal alignment quickly from the drop-down list or click ... to open the Horizontal Alignment dialog and select from the detailed list with previews.
- **Vt Align** - specify the vertical alignment of the road. Select an existing vertical alignment quickly from the drop-down list or click ... to open the Vertical Alignment dialog and select from the detailed list with previews.
- **Start** - the start station of the road, determined by the start station of the horizontal alignment.
- **Station Interval** - enter the stationing interval on the road.

In the **Surface** tab, enter or edit surface data for the road:

- Set **X-Sec Set** by clicking the toggle button to define the road surface by x-section set.
  - Quickly select an existing x-section set from the drop-down list or click ... to open the X-Section Set dialog and manage x-section sets in the current project.
- Set **String Set** by clicking the toggle button to define the road surface by road string set.
  - Quickly select an existing road string set from the drop-down list or click ... to open the String Set dialog and manage road string sets in the current project.
  - **Working Corridor** - set the **Left** and **Right** side limits along the road alignment to use this corridor when staking the road which surface is defined by road string set. Only cross section segment points that are within these limits will be available for selection when setting up the road alignment stakeout. To set any side of the corridor to the left of the road center line, use negative distance values. Positive values mean the corridor's side is to the right from the center line, and 0 is the center line. Note that the **Left** side location value is always less than the

Right side location value. To disable the **Working Corridor** feature, keep both **Left** and **Right** fields blank.

Click  to open the dialog menu with additional options:

- Select **Calculate Points** to open the Calculate Points dialog to generate points in the current project from the entered road parameters.
- Select **Create Road from Line** to select an existing linework in the Linework dialog and automatically fill in the parameters (*Name*, *Layer*, *Hz Align*, *Vt Align*) from that linework for a new road being created.

After entering parameters for a new road or modifying an existing road, click  to save the road to the project and return to the previous dialog. Click  to return to the previous dialog without saving.

Road Name Check

To quickly rename a road being created in case of a name conflict.

This dialog opens automatically and allows you to enter a different name for the road you are creating and other names for the alignments of that road when assigned names conflict with names already in use.

- Check the message showing which name is causing the name conflict.
- Enter a new name in the **Rename** field and click  to accept this name on the go. Click  to return to the previous dialog and revise the road creation parameters.

Calculate Points

To calculate and create points along the road center line - stations, left / right station offsets and / or transition points.

- In the **Points to Generate** group, check the boxes near desired types of points to calculate and create:
  - Centerline Points - check the box to create points at specified interval on the center line of the road, later you will be prompted to name these points.

  - Points Right of Centerline - check the box to create points at specified interval to the right of the center line of the road, later you will be prompted to name these points and enter a right offset.
  - Points Left of Centerline - check the box to create points at specified interval to the left of the center line of the road, later you will be prompted to name these points and enter a left offset.

- Transition Points - click the button to open the dialog where you can select the desired transition points. The stations of these points will be used in addition to the stations on the entered interval to calculate and create points of selected type(s). If the check box on the **Transition Points** button is unchecked ☐, no points on transition stations will be created. If the box is checked ☑, points will be created on stations of selected transition points.
  - In the **Prefix / Suffix** drop-down list, choose whether to use a prefix or suffix in the names of points created on transition stations. Enter the desired prefix or suffix if this option is selected.

- In the **Station Interval** field, enter the stationing interval along the road at which points of selected type(s) will be calculated and created. By default, it is the value set for the selected road on the Alignment tab of the Add / Edit Road dialog.

Click **Next** to continue and enter parameters for the selected types of points or ✖ to cancel the current calculation of points.

Transition Points

The following **Transition Point Types** are available to select:

- **Horz end point** - the node points between elements of a horizontal alignment;
- **Horz midpoint on curve** - the middle points on circular curves of a horizontal alignment;
- **Vert end point** - the node points between elements of a vertical alignment;
- **Vert high point** - the highest points on crest sections of a vertical alignment;
- **Vert low point** - the lowest points on sag sections of a vertical alignment.

Check the box ☑ near the desired transition point type to select it. Alternatively, use the context menu in the list with **Check** / **Uncheck** commands applicable to highlighted item(s). The context menu also simplifies multiple items highlighting with the following commands:

- **Select All** - highlights all items in the list.
- **Select All Below** - highlights a currently highlighted item and all the items in the list displayed below.

- **Select Multiple** - highlights multiple items by sequential clicking on item names.
- **Cancel Selection** - removes all highlights in the list.

Click  to confirm the selection and exit from the dialog.

Centerline Points

To assign a name, code, and point list to the generated points on the center line of selected road.

- In the **First Point** field, enter a name for the first generated point on the center line.
- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- In the **Prefix / Suffix** drop-down list, choose whether to use a prefix or suffix in the names of created points on the center line. Enter the desired prefix or suffix if this option is selected.
- Check the **Save Points To Point List** box to add created points on the center line to a point list in the project. If this option is enabled, enter a point list name either an existing one or a new one.

Click **Next** to enter parameters for other selected types of points or click  to calculate points along the road if parameters are entered for all selected points types.

Click **Back** to return to the previous dialog or  to cancel the current calculation of points.

Right / Left Offset Points

To enter an offset and assign a name, code, and point list to the generated points to the right or left from the center line of selected road.

- In the **First Point** field, enter a name for the first generated point to the right or left from the center line.
- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- In the **Prefix / Suffix** drop-down list, choose whether to use a prefix or suffix in the names of created points to the right / left of the center line. Enter the desired prefix or suffix if this option is selected.
- Check the **Save Points To Point List** box to add created offset points from the center line to a point list in the project. If this option is enabled, enter a point list name either an existing one or a new one.

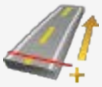
- In the **Offsets** group, define the right or left offset relative to the center line:
  - From the drop-down list **Type**, select *Surface Offset* to calculate the height of generated right / left offset point as the height of road surface at that offset point plus manually entered vertical offset distance. Alternatively, select *Flat Offset* to calculate the height of generated right / left offset point as the height of center line at that offset point station plus manually entered vertical offset distance.
  - To add a vertical offset to the generated point, select the direction with the **Up** / **Down** toggle button and enter the desired value.
  - In the **Right** / **Left** field, enter distance for the right or left offset from the center line of selected road.

Click **Next** to enter parameters for other selected types of points or click  to calculate points along the road if parameters are entered for all selected points types.

Click **Back** to return to the previous dialog or  to cancel the current calculation of points.

Road Points

To view stations, transition points (start and end points of all elements in horizontal and vertical alignments) and height extremums of the selected road.

	**Start Sta** - the start station of the road
	**End Sta** - the end station of the road
	**Sta** - the station of the road
	**Hz Line EP** - the end point of the straight line of the horizontal alignment
	**Hz Arc EP** - the end point of the left circular curve of the horizontal alignment
	**Hz Arc EP** - the end point of the right circular curve of the horizontal alignment
	**Hz Spiral EP** - the end point of the left spiral of the horizontal alignment
	**Hz Spiral EP** - the end point of the right spiral of the horizontal alignment
	**Hz Arc MP** - the middle point of the circular curve of the horizontal alignment
	**Vt Line EP** - the end point of the grade of the vertical alignment

	**Vt Parabola EP** - the end point of the parabola of the vertical alignment
	**Vt Arc EP** - the end point of the arc of the vertical alignment
	**Vt High Pt** / **Vt Low Pt** - the high / low extremes on crest / sag sections of the vertical alignment

The table displays stations and calculated coordinates of road points in the current coordinate system. The preview panel displays the highlighted point (in the table) at the road central line in the horizontal and vertical planes. Click  /  to hide / show the preview panel.

Click the **Filter** button to open the Filter Road Points dialog, where you can select desired types of the road points to show them in this dialog. If the check box on the **Filter** button is unchecked (), all types of road points will be shown in the table. If the check box on the **Filter** button is checked (), this means that the filter is enabled and only selected types of road points will be shown in the table.

If the horizontal alignment contains Intersection Point (IP) element(s), you can view the number of the IP element in the horizontal alignment and identify the part of the compound curve to which the road point belongs. To do this, select the **Show IP Numbers** option from the dialog menu that displays by clicking  in the top left corner. This number will be shown in the *Type* column of the table:

- The number IP#1-2 means that this point is in the second (outgoing) part of the compound curve in the first intersection point element.
- The number IPC#2-1 means that this point is in the first (incoming) part of the compound curve in the second intersection point and this compound curve contains spiral(s).
- The number IP#1 / IPC#1 is used for the middle point of the circular curve in the first intersection point element, this point separates incoming and outgoing parts of the compound curve.

Filter Road Points

To filter the road points by their type and display them in the Road Points dialog.

- Check the boxes near desired types of road points. These points will be displayed in the list of road points.
  - **Horz end point** - the node points between elements of a horizontal alignment;
  - **Horz midpoint on curve** - the middle points on circular curves of a horizontal alignment;
  - **Start and End** - the start and end points of a road;
  - **Stations** - the stations of a road with a given interval;
  - **Vert end point** - the node points between elements of a vertical alignment;
  - **Vert high point** - the highest points on crest sections of a vertical alignment;
  - **Vert low point** - the lowest points on sag sections of a vertical alignment.

- Click ✔ to save your selection and return to the Road Points dialog.



Horizontal Alignment

To manage horizontal alignments in the current project.

The horizontal alignment defines the road center line position. The *Hz Align* dialog contains a list of horizontal alignments in the project and a preview panel showing the highlighted alignment in the horizontal plane. To view the currently highlighted horizontal alignment in a larger screen, double-click the preview panel.

- Click **Edit** to open the Edit Horizontal Alignment dialog and modify the highlighted horizontal alignment.
- Click **Add** to open the Add Horizontal Alignment dialog and create a new horizontal alignment.
- Click **Delete** to remove the highlighted horizontal alignment(s) from the project.

Note: When editing or deleting a road or a road element (horizontal / vertical alignment, template / x-section / x-section set), you may get a message that the respective object "is read-only and cannot be edited". This happens if you are working with a project that was originally created in Kantoku 3D software and had road / road elements imported from RSM XML format. (RSM stands for Road Shape Management.)

Add / Edit Horizontal Alignment

To edit the selected horizontal alignment or to create a new horizontal alignment in the current project.

The dialog title displays the name of the horizontal alignment.

The dialog has two tabs:

- **Start Pt** - this tab defines a horizontal alignment name, start point and stationing;
- **Elements** - this tab defines a chain of different geometric elements that form a horizontal alignment.

In the **Start Pt** tab, enter or edit general data and the start point of horizontal alignment:

- **Align Name** - enter a name of the horizontal alignment.
- **Start Point** - specify the horizontal coordinates by point to start the alignment. Enter a point name manually, or select from the map  or from the list  of points in the project.

  > **Note:** If you have entered a new point name, the software will prompt you to manually enter this point's known horizontal coordinates and any elevation value in the Add Point dialog.

  - **North** / **East** - the horizontal coordinates of start point. You can manually enter horizontal coordinates for the horizontal alignment start if the **Start Point** field is left blank or you have added a new point name.

- **Start** - enter a start station of the horizontal alignment. This station will be used as the road start station.
- **Equation Set** - specify an equation set if you need to apply the station equation to this horizontal alignment. Quickly select an existing equation set from the drop-down list or click  to open the Station Equation Set dialog to create or manage equation sets in the current project.

The **Elements** tab displays a list of geometric elements in the order in which they form the selected horizontal alignment from start to end. Start and end stations of the highlighted element are shown below the list. The preview panel displays the highlighted element position along the horizontal alignment. To view the currently highlighted element in a larger screen, double-click the preview panel. Click  /  to hide / show the preview panel.

The ordered list of elements displays information about each of them:

- *Element* - the icon and the name of the element:
  - *Line* -  straight line;
  - *Curve* -  left circular curve /  right circular curve;
  - *E Spiral* -  left Euler spiral /  right Euler spiral;
  - *CP Spiral* -  left Cubic Parabola spiral /  right Cubic Parabola spiral;
  - *I-Sect Point* -  intersection point element.

- *Length* - the length of the element. This column will be displayed for all elements.
- *Azimuth* - the azimuth at the beginning of the element. This column will be displayed for all elements.
- *Radius* - the radius of the circular curve or intersection point (the radius of the circular curve in the intersection point element), also the radius of Euler spiral or Cubic Parabola spiral (the radius of spiral is the radius at the end of the 'entering turn' spiral or at the beginning of the 'exiting turn' spiral).
- *North* and *East* - the plane coordinates of the intersection point.
- *A1* - the spiral constant 1 of the 'entering turn' spiral (Tangent-Spiral to Spiral-Curve) in the intersection point element. The spiral constant is the square root of the product of the length and the radius of the spiral.
- *A2* - the spiral constant 2 of the 'exiting turn' spiral (Curve-Spiral to Spiral-Tangent) in the intersection point element. The spiral constant is the square root of the product of the length and the radius of the spiral.

To create or edit a chain of geometric elements that form this horizontal alignment:

- Click **Add** to select an element type from the drop-down menu and add this element to the end of the list of elements: (Line, Curve, E Spiral, CP Spiral or Intersection Point).
- Click **Insert** to select an element type from the drop-down menu and insert before the highlighted element in the list (Line, Curve, E Spiral, CP Spiral or Intersection Point).
- Click  to change parameters of the highlighted element.
- Click  to remove the highlighted element from the horizontal alignment.
- Click **Equations** to open the Add / Edit Station Equation Set dialog to edit an equation set selected in the **Equation Set** field of the **Start Pt** tab or to create a new station equation set for the horizontal alignment.

Click  to open the dialog menu with additional options:

- Edit Points - opens the dialog to view and manage points in the project.

After entering parameters for a new horizontal alignment or modifying an existing horizontal alignment, click  to save the horizontal alignment to the project and return to the previous dialog.

Click  to return to the previous dialog without saving.

Line Element

To add / insert a new line element to the horizontal alignment or to modify an existing line element.

- Enter the **Length** of the line element.
- Check the **Tangent to previous item** box to automatically make the current element tangent to the previous element of the horizontal alignment. With the check box cleared, manually enter the **Azimuth** (or **Bearing** if bearing is selected to output directions) of the line or click  to calculate the value from two points in the project or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

  > **Note:** Use caution when manually setting the azimuth (bearing), since road elements are usually tangential to each other. When changing the direction of an element, the direction of the chain of subsequent tangent elements in the horizontal alignment is recalculated. Non-tangent elements retain their initial direction.

- The preview panel displays the element in the horizontal plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

Curve Element

To add / insert a new circular curve element to the horizontal alignment or to modify an existing circular curve element.

Open the illustration of curve parameters used in Sokkia Field.

- Enter the **Radius** of the curve or one of the two parameters unambiguously defining the radius: *Chord Angle* or *Curve Angle*.
- Enter the **Length** of the curve element or one of four parameters unambiguously defining the curve length: *Chord*, *Tangent*, *Middle Ordinate* (the distance from the chord midpoint to the curve midpoint), *Delta* (the angle between the radii to the start and end points of curve), or *External* (the distance from the curve midpoint to the point of intersection).
- Check the **Tangent to previous item** box to automatically make the current element tangent to the previous element of the horizontal alignment. With the check box cleared, manually enter the tangent in **Azimuth** (or **Bearing** if bearing is selected to output directions) or click  to calculate the value from two points in the project or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

  > **Note:** Use caution when manually setting the azimuth (bearing), since road elements are usually tangential to each other. When changing the direction of an element, the direction of the chain of subsequent tangent elements in the horizontal alignment is recalculated. Non-tangent elements retain their initial direction.

- Select the direction of **Turn**. The *Right* value stands for clockwise direction, the *Left* value for counterclockwise direction from the start point.
- The preview panel displays the element in the horizontal plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

Euler Spiral Element

To add / insert a new Euler spiral element to the horizontal alignment or to modify an existing Euler spiral element.

- Select the **Direction** of movement along the spiral:
  - **TS** (traverse - spiral) to **SC** (spiral - circular curve) (entering the turn)
  - **CS** (circular curve - spiral) to **ST** (spiral - traverse) (exiting the turn)
  - **CS** (circular curve - spiral) to **SC** (spiral - circular curve)

  Open the illustration of spiral types used in Sokkia Field.
- Enter the **Radius** of the circular curve at the **Start** point or one of the two parameters unambiguously defining the radius (*Chord Angle* or *Curve Angle*), when the **CS** (circular curve - spiral) to **ST** (spiral - traverse) or **CS** (circular curve - spiral) to **SC** (spiral - circular curve) is selected in the **Direction** field.
- Enter the **Radius** of the circular curve at the **End** point or one of the two parameters unambiguously defining the radius (*Chord Angle* or *Curve Angle*), when the **TS** (traverse - spiral) to **SC** (spiral - circular curve) or **CS** (circular curve - spiral) to **SC** (spiral - circular curve) is selected in the **Direction** field.
- Enter either the **Length** of the spiral element or **Spiral Constant**. Spiral Constant is the square root of the product of the length and the radius of the spiral.
- Check the **Tangent to previous item** box to automatically make the current element tangent to the previous element of the horizontal alignment. With the check box cleared, manually enter the tangent in **Azimuth** (or **Bearing** if bearing is selected to output directions) or click  to calculate the value from two points in the project or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

  > **Note:** Use caution when manually setting the azimuth (bearing), since road elements are usually tangential to each other. When changing the direction of an element, the direction of the chain of subsequent tangent elements in the horizontal alignment is recalculated. Non-tangent elements retain their initial direction.
- Select the direction of **Turn**. The *Right* value stands for clockwise direction, the *Left* value for counterclockwise direction from the start point.
- The preview panel displays the element in the horizontal plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

Cubic Parabola Spiral Element

To add / insert a new Cubic Parabola spiral element to the horizontal alignment or to modify an existing Cubic Parabola spiral element.

- Select the **Direction** of movement along the spiral:
  - **TS** (traverse - spiral) to **SC** (spiral - circular curve) (entering the turn)
  - **CS** (circular curve - spiral) to **ST** (spiral - traverse) (exiting the turn)
  - **CS** (circular curve - spiral) to **SC** (spiral - circular curve)

  Open the illustration of spiral types used in Sokkia Field.
- Enter the **Radius** of the circular curve at the **Start** point or one of the two parameters unambiguously defining the radius (*Chord Angle* or *Curve Angle*), when the **CS** (circular curve - spiral) to **ST** (spiral - traverse) or **CS** (circular curve - spiral) to **SC** (spiral - circular curve) is selected in the **Direction** field.
- Enter the **Radius** of the circular curve at the **End** point or one of the two parameters unambiguously defining the radius (*Chord Angle* or *Curve Angle*), when the **TS** (traverse - spiral) to **SC** (spiral - circular curve) or **CS** (circular curve - spiral) to **SC** (spiral - circular curve) is selected in the **Direction** field.
- Enter either the **Length** of the spiral element or **Spiral Constant**. Spiral Constant is the square root of the product of the length and the radius of the spiral.
- Check the **Tangent to previous item** box to automatically make the current element tangent to the previous element of the horizontal alignment. With the check box cleared, manually enter the tangent in **Azimuth** (or **Bearing** if bearing is selected to output directions) or click  to calculate the value from two points in the project or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

  > **Note:** Use caution when manually setting the azimuth (bearing), since road elements are usually tangential to each other. When changing the direction of an element, the direction of the chain of subsequent tangent elements in the horizontal alignment is recalculated. Non-tangent elements retain their initial direction.

- Select the direction of **Turn**. The *Right* value stands for clockwise direction, the *Left* value for counterclockwise direction from the start point.
- The preview panel displays the element in the horizontal plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

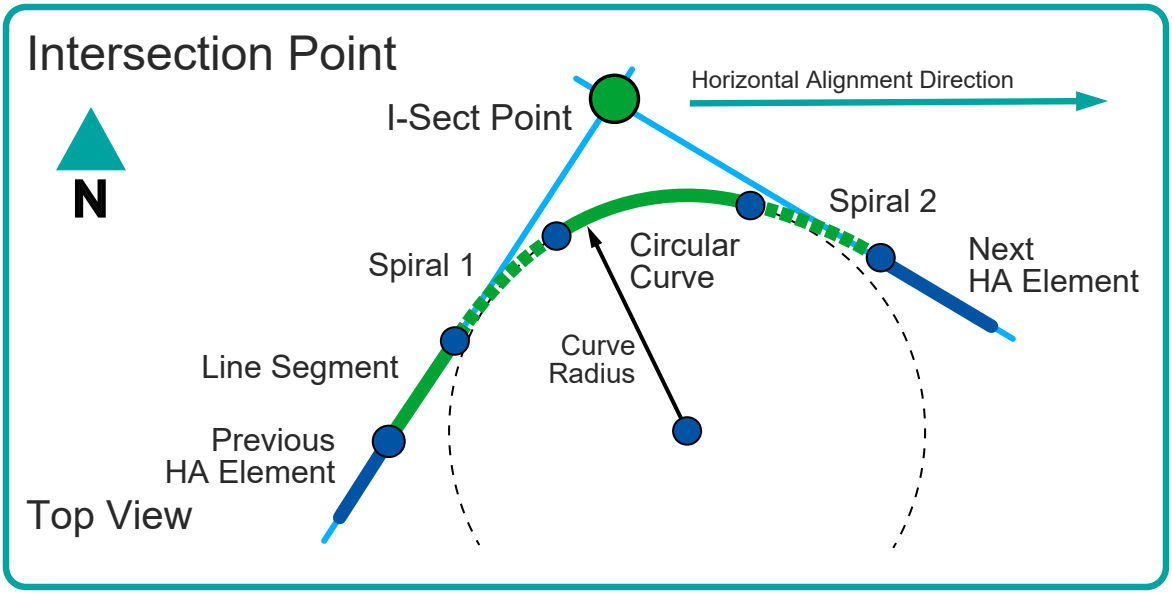
Intersection Point Element

To add / insert a new intersection point element to the horizontal alignment or to modify an existing intersection point element.

The intersection point element is a compound curve placed between two intersecting elements of horizontal alignment (HA).

Note: The HA element after the Intersection Point element should not be tangent to the HA element before the Intersection Point element.

The Intersection Point element normally consists of a straight line segment, which is usually tangent to the previous HA element, an optional 'entering turn' spiral, a circular curve, and an optional 'exiting turn' spiral, which is tangent to the next HA element.



Note: It's possible to include an Intersection Point element to the horizontal alignment at any time. Use the **Add** button on the Element tab of the Edit Horizontal Alignment dialog to add the intersection point after the last element in horizontal alignment, or use the **Insert** button to insert the intersection point before the highlighted element. The compound curve is created from the Intersection Point element after both HA elements (before and after the Intersection Point element) are defined.

To create a compound curve:

- In the **Point** field, specify the intersection point of previous and next HA elements. Enter a point name manually, or select from the map  or from the list  of points in the project. Alternatively, enter manually plane coordinates (**North** and **East**) of the intersection point in the respective fields.
- The **North** and **East** fields display the plane coordinates of the intersection point; they cannot be changed if an existing point is selected.
- Enter the **Radius** of the circular curve or one of the two parameters unambiguously defining the radius: **Chord Angle** or **Curve Angle**.
- Enter either the **Length** or **Spiral Constant** for 'entering turn' spiral 1 connecting line segment to circular curve and 'exiting turn' spiral 2 connecting circular curve to next HA element. Spiral Constant is the square root of the product of the length and the radius of the spiral.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.



Vertical Alignment

To manage vertical alignments in the current project.

The vertical alignment defines the changes in the elevation of the road center line. The *Vt Align* dialog contains a list of vertical alignments in the project and a preview panel showing the highlighted alignment in the vertical plane. To view the currently highlighted vertical alignment in a larger screen, double-click the preview panel.

- Click **Edit** to open the Edit Vertical Alignment dialog and modify the highlighted vertical alignment.
- Click **Add** to open the Add Vertical Alignment dialog and create a new vertical alignment.
- Click **Delete** to remove the highlighted vertical alignment(s) from the project.

Note: When editing or deleting a road or a road element (horizontal / vertical alignment, template / x-section / x-section set), you may get a message that the respective object "is read-only and cannot be edited". This happens if you are working with a project that was originally created in Kantoku 3D software and had road / road elements imported from RSM XML format. (RSM stands for Road Shape Management.)

Add / Edit Vertical Alignment

To edit the selected vertical alignment or to create a new vertical alignment in the current project.

When creating a new vertical alignment, the preliminary dialog prompts you to specify:

- **Name** - enter a name of the new vertical alignment.
- **Val Type** - select how you want to specify the elements that will form this vertical alignment:
  - *Length & Grade* - the vertical alignment is a chain of graded lines / curves that have known lengths and known grades at their transitions.
  - *Station & Elevation* - the vertical alignment uses PVI (point of vertical intersection) stations with known elevation and usually is a chain of tangential vertical curves calculated around these PVI stations.

Click  to save the name and type of vertical alignment and proceed to the main dialog to add or edit vertical alignment parameters and elements.

The dialog has two tabs:

- **Start Pt** - this tab defines a vertical alignment name, start point and stationing;
- **Elements** - this tab defines a chain of different geometric elements that form a vertical alignment.

In the **Start Pt** tab, enter or edit general data and the start elevation of vertical alignment:

- **Align Name** - enter a name of the vertical alignment. This field is read-only when creating a new vertical alignment, the name of which was specified in the preliminary dialog.
- **Start Point** (available for vertical alignments of *Length & Grade* type) - specify an elevation at the start station of vertical alignment by an elevation of a point. Enter a point name manually, or select from the map  or from the list  of points in the project.

  > **Note:** If you have entered a new point name, the software will prompt you to manually enter this point's known elevation value in the Add Point dialog.

- **Elev** - enter an elevation at the start station of vertical alignment. If you use the **Start Point** and vertical alignment of *Length & Grade* type, the elevation is taken from the specified start point.
- **Start** - enter a start station of vertical alignment.
- **Equation Set** - specify an equation set if you need to apply the station equation to this vertical alignment. Quickly select an existing equation set from the drop-down list or click  to open the Station Equation Set dialog to create or manage equation sets in the current project.

The **Elements** tab displays a list of geometric elements in the order in which they form the selected vertical alignment from start to end. Start and end stations of the highlighted element are shown below the list. The preview panel displays the highlighted element position along the vertical alignment. To view the currently highlighted element in a larger screen, double-click the preview panel.

Click  /  to hide / show the preview panel.

The ordered list of elements of *Length & Grade* vertical alignment displays information about each element:

- *Element* - the icon and the name of the element:
  - *Vertical Grade* -  line with a constant vertical grade;
  - *Arc* -  line with different start and end vertical grades, the grade change is calculated as a circular arc;
  - *Parabola* -  line with different start and end vertical grades, the grade change is calculated as a parabola.
- *Length* - the length of the element. For the **Arc** element, the *Arc Radius* is listed;
- *Grade In / Grade Out* - the grades of the element at the start and end points. For the **Vertical Grade** element, the single *Grade* value is listed.

The ordered list of elements of *Station & Elevation* vertical alignment displays information about each element:

- *Element* - the icon and the name of the element:
  - *Grade Point* -  line at the end of which the vertical grade changes without a vertical curve;
  - *Arc* -  line with different start and end vertical grades, the grade change is calculated as a circular arc;
  - *Parabola* -  line with different start and end vertical grades, the grade change is calculated as a parabola.
- *PVI Station* - the station of the point of vertical intersection for this element. For the **Grade Point** element, the end station is listed;
- *Elevation* - the elevation at the PVI station;
- *Arc Radius* - the radius of circular arc for the **Arc** element (*0* for the **Grade Point** element). For the **Parabola** element, the *VC Length* the vertical curve length is listed;

- *Grade* - the grade of the element at the start station.

To create or edit a chain of geometric elements that form this vertical alignment:

- Click **Add** to select an element type from the drop-down menu and add this element to the end of the list of elements:
  - Vertical Grade, Parabola, or Circular Arc for the vertical alignment of *Length & Grade* type;
  - *Parabola*, *Circular Arc*, or *Grade Point* for the vertical alignment of *Station & Elevation* type (more...).

- Click **Insert** to select an element type from the drop-down menu and insert before the highlighted element in the list:
  - Vertical Grade, Parabola, or Circular Arc for the vertical alignment of *Length & Grade* type;
  - *Parabola*, *Circular Arc*, or *Grade Point* for the vertical alignment of *Station & Elevation* type (more...).

- Click  to change parameters of the highlighted element.
- Click  to remove the highlighted element from the vertical alignment.
- Click **Equations** to open the Add / Edit Station Equation Set dialog to edit an equation set selected in the **Equation Set** field of the **Start Pt** tab or to create a new station equation set for the vertical alignment.

Click  to open the dialog menu with additional options:

- Edit Points - opens the dialog to view and manage points in the project.
- High / Low Positions - opens the dialog to view the stations of the highest and low positions in the vertical alignment.

After entering parameters for a new vertical alignment or modifying an existing vertical alignment, click  to save the vertical alignment to the project and return to the previous dialog. Click  to return to the previous dialog without saving.

Vertical Grade Element

To add / insert a vertical grade element to the vertical alignment of *Length & Grade* type or to modify an existing vertical grade element.

- Enter the **Length** of the vertical grade element.
- Enter the **Grade** of the vertical grade element.

> **Note:** Use caution when setting grades, since road elements are usually tangential to each other.

- The preview panel displays the element in the vertical plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

Circular Arc Element

To add / insert a circular arc element to the vertical alignment of *Length & Grade* type or to modify an existing circular arc element.

- Enter the **Arc Radius** of the circular arc element.
- Enter the **Start Grade** of the circular arc element.
- Enter the **End Grade** of the circular arc element.

> **Note:** Use caution when setting grades, since road elements are usually tangential to each other.

- The preview panel displays the element in the vertical plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

Parabola Element

To add / insert a parabola element to the vertical alignment of *Length & Grade* type or to modify an existing parabola element.

- Enter the **Lenght** of the parabola element.
- Enter the **Start Grade** of the parabola element.
- Enter the **End Grade** of the parabola element.

Note: Use caution when setting grades, since road elements are usually tangential to each other.

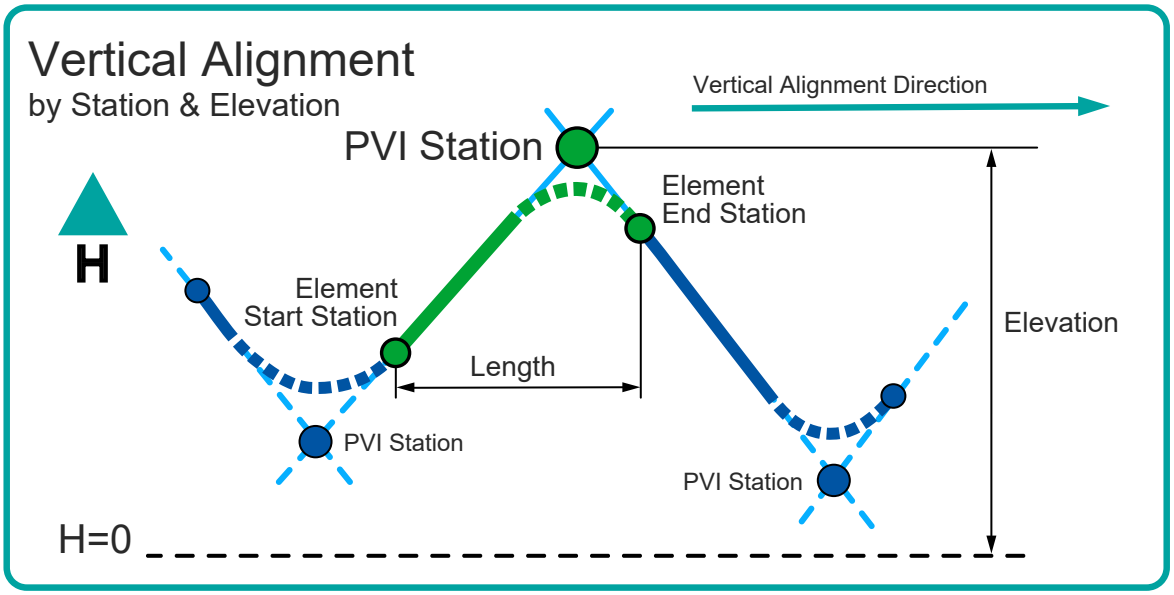
- The preview panel displays the element in the vertical plane. To view the element in a larger screen, double-click the preview panel.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

PVI Element (Parabola / Circular Arc / Grade Point)

To add / insert a PVI based element (*Parabola*, *Circular Arc* or *Grade Point*) of the vertical alignment of the *Station & Elevation* type or to modify an existing PVI based element.



- In the **PVI station** filed, enter the station of the point of vertical intersection for the *Parabola* or *Circular Arc* element or the end station of the *Grade Point* element.
- Enter the **Elevation** at this station.
- When editing an existing element, you can change the current element type, select it in the **Curve Type** drop-down list.
- In the **Arc / Grade Pt** field, enter the radius of *Circular Arc* (enter *0* for *Grade Point*). For the *Parabola* element, enter the **Curve Length**.

- The preview panel displays the element in the vertical plane. To view the element in a larger screen, double-click the preview panel. The vertical curvature of the element is visible when the next element of vertical alignment is already defined.
- The **Grade** and **Length** field group shows the incoming grade and length of the element calculated from the current PVI station. The second **Grade** and **Length** field group is available when the next element of the vertical alignment is already defined. This field group shows the incoming grade and length of the next element calculated from the next PVI station.

After entering parameters of the element, click  to save it and return to the previous dialog.

Click  to return to the previous dialog without saving.

High / Low Positions

To view extremums found along the selected vertical alignment.

To open this dialog, click  in the Add / Edit Vertical Alignment dialog and select **High / Low Positions** in the dialog menu.

The types of extremums found are the high or low positions of circular arcs and parabolas and transition points between ascending and descending lines.

Alignment Name - the name of the vertical alignment.

The **High / Low Positions** list displays information about the found positions:

- *Station* - the station of the high / low position along the vertical alignment;
- *Type* - either *High* or *Low* type of position;
- *Ell ht / Elevation* - the ellipsoidal height or elevation, depending on the coordinate system used;
- *Radius* - the radius of a circular arc, if applicable to this high / low position.

The icon  brings up the pop-up menu. Select the **Save to File** option to save the current list to a file with the default file name: *HighLowPositions.txt*. You can change the file name.



X-Section Templates

To view and manage road cross section templates in the current project.

The cross section template defines the part of the road cross section from the center line to the right or left roadside at the road station. The *X-Sect Templates* dialog contains a list of cross section

templates in the project and a preview panel showing the highlighted template in the vertical plane. To view the highlighted template in a larger screen, double-click the preview panel. Click  /  to hide / show the preview panel.

- Click **Edit** to open the X-Section Template dialog and modify the highlighted cross section template.
- Click **Add** to open the X-Section Template dialog and create a new cross section template.
- Click **Delete** to remove the highlighted cross section template(s) from the project.

Note: When editing or deleting a road or a road element (horizontal / vertical alignment, template / x-section / x-section set), you may get a message that the respective object "is read-only and cannot be edited". This happens if you are working with a project that was originally created in Kantoku 3D software and had road / road elements imported from RSM XML format. (RSM stands for Road Shape Management.)

X-Section Template

To edit the selected cross section template or to create a new cross section template in the current project.

The *X-Sect Template* dialog displays the information about the selected cross section template and the list of segments that form the template. The preview panel displays the entire template in the vertical plane, with segment list and slopes to the terrain, and focuses on the position of the segment highlighted in the list. Click  /  to show the template to the right / left from the road center line. To view the cross section template in a larger screen, double-click the preview panel. Click  /  to hide / show the preview panel.

- **Name** - enter a name of the cross section template.
- **Slope** - enter **Cut** and **Fill** values for the slope to the terrain. These values represent the amount of horizontal increment of the slope per unit of vertical increment.
  - **Cut** - this slope is used when the road surface is below the terrain;
  - **Fill** - this slope is used when the road surface is above the terrain.

The list of segments forming the template displays end points of segments in order from the center line to the roadside:

- *Segment Point* - the name of the segment end point in the cross section template;
- *Hz* - the horizontal offset from the previous point in the list;
- *Vert* - the vertical offset from the previous point in the list.

Populate the list of segments to create or modify the cross section template:

- Click **Add** to open the Segment dialog and add a new segment to the end of the list.
- Click **Insert** to open the Segment dialog and insert a new segment before the highlighted element in the list.

> **Note:** Inserting a segment into the template shifts the existing segments that are closer to the roadside accordingly.

- Click **Edit** to open the Segment dialog and modify the highlighted segment.
- Click **Delete** to remove the highlighted segment from the current cross section template.

After entering parameters for a new cross section template or modifying an existing cross section template, click  to save the cross section template to the project and return to the previous dialog. Click  to return to the previous dialog without saving.

Segment

To add / insert a segment to the cross section template or to modify an existing segment.

- **Segment Point** - enter a name of the segment end point.
- In the **Offset** group:
  - **Horizontal** - enter a horizontal offset from the end point of the adjacent segment that is closer to the center line. For the initial segment, enter an offset from the center line.
  - **Vertical** - choose how to enter a vertical offset by clicking the selection button (**Down** / **Up** / **Grade** / **Ratio**) and enter the value.

After entering parameters of the segment, click  to save it and return to the previous dialog. Click  to return to the previous dialog without saving.



X-Section Set

To manage road cross section sets in the current project.

The cross section set is an ordered set of road stations where the road cross section changes the right and / or left template. The dialog contains a list of cross section sets in the project and a preview panel showing the highlighted cross section set in the horizontal plane. To view the highlighted cross section set in a larger screen, double-click the preview panel.

- Click **Edit** to open the Edit X-Section Set dialog and modify the highlighted cross section set.
- Click **Add** to open the Add X-Section Set dialog and create a new cross section set.
- Click **Delete** to remove the highlighted cross section set(s) from the project.

Note: When editing or deleting a road or a road element (horizontal / vertical alignment, template / x-section / x-section set), you may get a message that the respective object "is read-only and cannot be edited". This happens if you are working with a project that was originally created in Kantoku 3D software and had road / road elements imported from RSM XML format. (RSM stands for Road Shape Management.)

Add / Edit X-Section Set

To edit the selected cross section set or to create a new cross section set in the current project.

The dialog contains a list of cross section stations in the selected cross section set and a preview panel showing the cross section at the highlighted station in the vertical plane. To view the cross section at the highlighted station in a larger screen, double-click the preview panel. Click  /  to hide / show the preview panel.

- **X-Sect Name** - enter a name of the cross section set.

The list of cross section stations in the cross section set displays applied right and left templates and their statuses:

- *Station* - the cross section station;
- *Left X-Section* - the name of template used in cross section from center line to left roadside;
- *Right X-Section* - the name of template used in cross section from center line to right roadside.

Note: The grayed out name means that the cross section template is not applied at the station and the respective template of the previous cross section station is used. The *(End)* status means the break in the road surface on the side of the template, continuing to the next station in this cross section set.

Populate the list of cross section stations to create or modify the cross section set:

- Click **Add** to open the X-Section dialog and add a new cross section station to the list.
- Click **Edit** to open the X-Section dialog and modify the highlighted cross section station.
- Click **Delete** to remove the highlighted cross section station from the current cross section set.

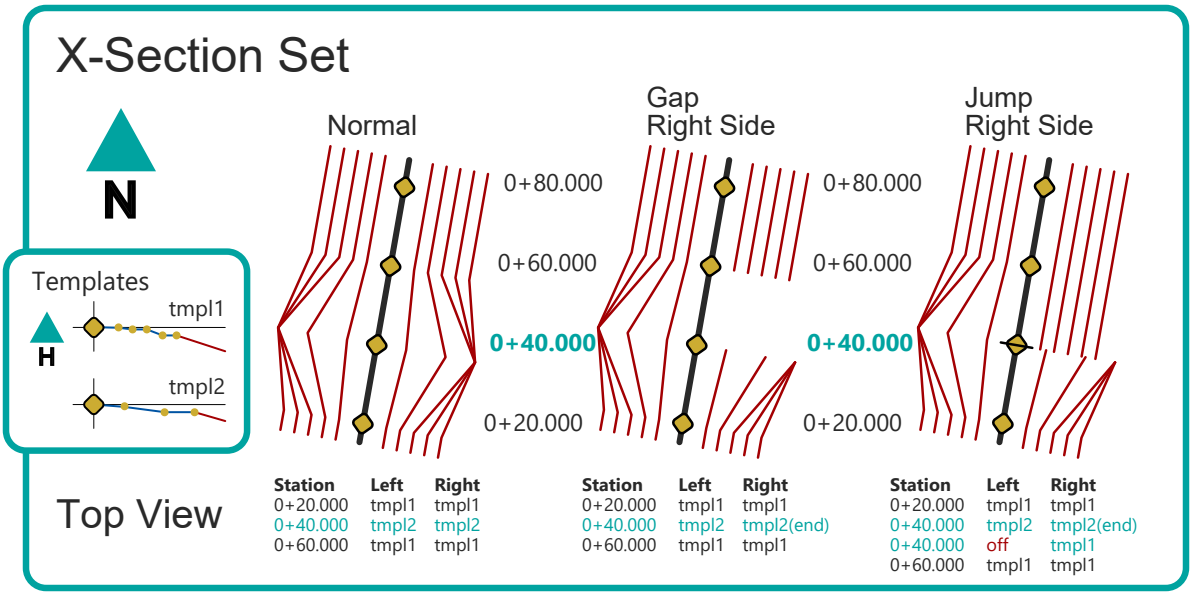
After entering parameters for a new cross section set or modifying an existing cross section set, click  to save the cross section set to the project and return to the previous dialog. Click  to return to the previous dialog without saving.

X-Section

To edit the selected cross section station or to create a new cross section station in the selected cross section set.

The cross section station is a station of the road where the cross section changes the right and / or left template. Specify a station and select the cross section templates that will be applied from that station.

- **Station** - enter a station in the selected cross section set where the desired cross section templates will be applied.
- In the **X-Section** group, define the cross section templates for the entered station:



Options of gap transitions at cross section station

Transition	Station	Side	L Template	End Left	R Template	End Right
Gap left side	0+40.000	Both	tmpl2	☑	tmpl2	☐
Gap right side	0+40.000	Both	tmpl2	☐	tmpl2	☑
Gap both sides	0+40.000	Both	tmpl2	☑	tmpl2	☑

Options of jump transitions at cross section station

Transition	Station	Side	L Template	End Left	R Template	End Right
Jump left side	0+40.000	Both	tmpl2	☑	tmpl2	☐
	0+40.000	Left Only	tmpl1	☐	off	off
Jump right side	0+40.000	Both	tmpl2	☐	tmpl2	☑
	0+40.000	Right Only	off	off	tmpl1	☐
Jump both sides	0+40.000	Both	tmpl2	☑	tmpl2	☑
	0+40.000	Both	tmpl1	☐	tmpl1	☐

Options of gap / jump transitions at cross section station

Transition	Station	Side	L Template	End Left	R Template	End Right
Gap right side / Jump left side	**0+40.000**	Both	tmpl2	☑	tmpl2	☑
	0+40.000	Left Only	tmpl1	☐	off	off
Gap left side / Jump right side	**0+40.000**	Both	tmpl2	☑	tmpl2	☑
	0+40.000	Right Only	off	off	tmpl1	☐

- From the **Side** drop-down list, select which side of the road the template will apply to, either *Left Only*, *Right Only*, or *Both*. Template selection for the excluded side is disabled, this side continues to use the template applied to that side in the previous station of this cross section set.
- From the **Left** drop-down list, select an existing template to be applied to the left side of the road.
  - Check the **End Left** box to set up the jump transition from one cross section template to another or start the gap in the road surface on the left side of the road.

    Note: To start the left gap from this station, just check the **End Left** box. The gap will end at the next cross-section station with specified template for the left side of the road.

    To set up the left jump transition at this station, you will need to add two cross-section stations with the same number to the cross-section set. The first one has the left template ending at this station with the **End Left** box checked. The second one has the left template starting at this station with the **End Left** box cleared.

    Review the illustration and tables above to learn how to set up gap and jump transition combinations on left, right, or both sides of the road.

- From the **Right** drop-down list, select an existing template to be applied to the right side of the road.
  - Check the **End Right** box to set up the jump transition from one cross section template to another or start the gap in the road surface on the right side of the road.

Note: To start the right gap from this station, just check the **End Right** box. The gap will end at the next cross-section station with specified template for the right side of the road.

To set up the right jump transition at this station, you will need to add two cross-section stations with the same number to the cross-section set. The first one has the right template ending at this station with the **End Right** box checked. The second one has the right template starting at this station with the **End Right** box cleared.

Review the illustration and tables above to learn how to set up gap and jump transition combinations on left, right, or both sides of the road.

- The preview panel displays the cross section at the selected station in the vertical plane. To view the cross section in a larger screen, double-click the preview panel.

Click  to open the dialog menu with additional options:

- Edit X-Sect Templates - opens the dialog to view and manage road cross section templates in the current project.

After entering parameters for a new cross section station or modifying an existing cross section station, click  to save the cross section station to the cross section set and return to the previous dialog. Click  to return to the previous dialog without saving.



String Set

To manage road string sets in the current project.

The road string set is a set of strings (horizontal and vertical alignment pairs) along the center line defining the road surface, lengths and slopes of the cross section segments at each station, starting on the left roadside and ending on the right roadside. The dialog contains a list of road string sets in the project and a preview panel showing the highlighted string set in the horizontal plane. To view the highlighted string set in a larger screen, double-click the preview panel.

- Click **Edit** to open the Edit String Set dialog and modify the highlighted road string set.
- Click **Add** to open the Add String Set dialog and create a new road string set.

- Click **Delete** to remove the highlighted road string set(s) from the project.

Add / Edit String Set

To edit the selected road string set or to create a new road string set in the current project.

The dialog contains a list of road strings in the selected road string set and a preview panel showing the highlighted string in the horizontal plane. To view the currently highlighted road string in a larger screen, double-click the preview panel. Click  /  to hide / show the preview panel.

- **String Set** - enter a name of the road string set.

Populate the list of road strings in the selected string set to define the road surface and cross section segments at road stations:

- Click **Edit** to open the Edit Road String dialog and modify the highlighted road string.
- Click **Add** and select **Road String** from the drop-down menu to open the Add Road String dialog and create a new road string. Alternatively select **From Map**, to create new road strings from existing lines by sequentially selecting them on the map.
- Click **Delete** to remove the highlighted road string(s) from the current string set.
- Use  and  to move the highlighted road string(s) up or down in the ordering. This option is helpful when a vertical cross section segment is defined by any two strings in the set. You can swap these strings in the order to correctly integrate the vertical segment into the cross section.

After creating all road strings for a new string set or modifying strings in an existing string set, click  to save the string set to the project and return to the previous dialog. Click  to return to the previous dialog without saving.

Add / Edit Road String

To edit the selected road string or to create a new string in the current road string set.

The dialog contains a list of alignment pairs (horizontal and vertical) forming the road string and two preview panels showing the highlighted alignment pair in the horizontal and vertical planes. To view the currently highlighted alignment pair in a larger screen, double-click the preview panel.

- **String** - enter a name of the road string.

Populate the list of alignment pairs to define the road string:

- Click **Edit** to open the Edit Alignment Pair dialog and modify alignment pair(s) in the road string.
- Click **Add** to open the Add Alignment Pair dialog and create a new alignment pair in the road string.
- Click **Delete** to remove the highlighted alignment pair(s) from the current road string.

After creating all alignment pairs for a new road string or modifying an existing string, click  to save the road string to the current road string set and return to the previous dialog. Click  to return to the previous dialog without saving.

Add / Edit Alignment Pair

To edit the selected alignment pair of the road string or to create a new alignment pair in the current road string.

This dialog allows you to create or edit an alignment pair by using a combination of existing horizontal and vertical alignment or by selecting an existing line and forming a pair of horizontal and vertical alignments from that line.

- From the **Horizontal Alignment** and **Vertical Alignment** drop-down lists, select an existing horizontal and vertical alignment to form a pair.
- Alternatively, form an alignment pair from an existing linework using buttons in the **Select Line** group:
  - Click *From List* to select a linework object from the list. More...
  - Click *From Map* to select a linework object from the map. More...

Click  to open the dialog menu with additional options:

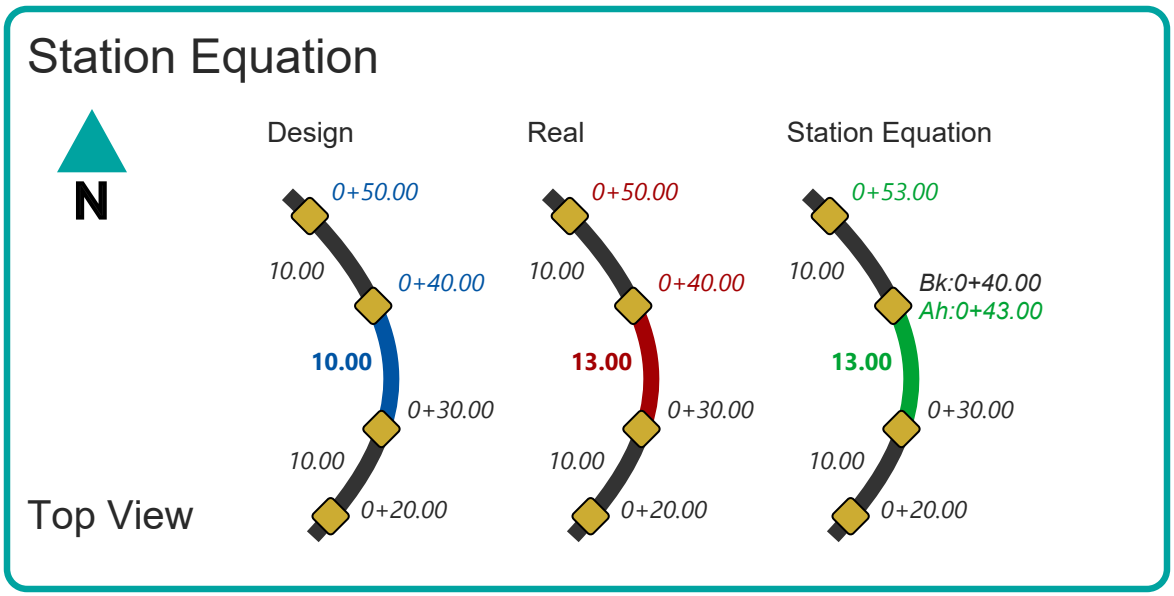
- Hz Align - opens the dialog to view and manage horizontal alignments.
- Vt Align - opens the dialog to view and manage vertical alignments.

After forming a new alignment pair or modifying an existing alignment pair, click  to save the alignment pair in the road string and return to the previous dialog. Click  to return to the previous dialog without saving.

Station Equation Set

To manage station equation sets in the current project.

While contracting road there may be a situation when the original stationing does not fit to the actual alignment, and a new center line stationing may be needed. Station equation is a method to link old and new roadway stationing. Station equations are used to change the stationing from a given spot forward or back, along the alignment:



The dialog displays a list of the station equation sets in the current project:

- Click **Edit** to open the Edit Station Equation Set dialog and modify the highlighted station equation set.
- Click **Add** to open the Edit Station Equation Set dialog and create a new station equation set.
- Click **Delete** to remove the highlighted station equation set(s) from the project.

Add / Edit Station Equation Set

To edit the selected station equation set or to create a new station equation set in the current project.

- **Equation Set** - enter a name of the station equation set.

Populate the list of station equations in the selected station equation set to define spots along the alignment where the stationing changes:

- Click **Edit** to open the Edit Station Equation dialog and modify the highlighted station equation.
- Click **Add** to open the Add Station Equation dialog and create a new station equation at the end of the set.
- Click **Insert** to open the Add Station Equation dialog and create a new station equation and insert it before the highlighted station equation.

> **Note:** The back station number of station equation must be greater than the ahead station number of the previous station equation in the set.

- Click **Delete** to remove the highlighted road station equation(s) from the current station equation set.

After creating all station equations for a new station equation set or modifying station equations in an existing set, click  to save the station equation set to the project and return to the previous dialog. Click  to return to the previous dialog without saving.

Add / Edit Station Equation

To edit the selected station equation or to create a new station equation in the selected station equation set.

- **Equation Name** - enter or change a name of the station equation.
- **Back Station** - enter the last station of the road alignment behind, which is the first station of the road alignment ahead.
- **Ahead Station** - enter the first station of the road alignment ahead, which is the last station of the road alignment behind.

After entering parameters of a new station equation or modifying an existing station equation, click  to save the station equation to the station equation set and return to the previous dialog. Click  to return to the previous dialog without saving.

Select Station Equation

To select a station equation when there are two or more desired station numbers on the road / alignment with station equation set applied.

This dialog opens automatically and allows the user to unambiguously identify the selected station on the road / alignment by choosing the desired station equation from the station equation set applied.

The **Station** field displays the selected station number. The list below shows available station equations and their parameters - *Name*, *Back* and *Ahead* stations.

- Highlight the desired station equation to identify the selected station. Highlight *No equation* to use stationing in front of the first station equation.
- Click the **Select** button to close the dialog and identify the selected station by the highlighted station equation. Click  to return to the previous dialog and revise the station selection.



Regions

To display a list of regions in the current project and to select, add, edit, or delete regions.

Regions are closed polygonal objects used to define areas for tasks and to estimate production volumes.

The dialog contains a list of regions in the current project and a preview panel for the highlighted region in the horizontal plane.

- Click **Info** to open the Region Info dialog to review the details of the highlighted region.
- Click **Edit** to open the Edit Region dialog and modify the highlighted region's name, type, reference alignment and stationing, visibility, layer and graphic style.
- Click **Add** to open the Add Region dialog and create a new region from an existing area.
- Click **Delete** to delete the highlighted region(s) from the project.

Add / Edit Region

To edit the selected region or to create a new region in the current project.

The dialog has two tabs:

- **Properties** - this tab displays the editable parameters of the region.
- **Layer** - this tab defines the layer and graphic style for the region.

In the **Properties** tab, enter the data for the region:

- **For Area** - choose a source area for the new region being created. Select an area from the map  or from the list  of areas in the current project.

  > **Note:** The source area of a region as well as region boundaries cannot be changed after the region has been created. The **For Area** field is not available when editing an existing region.

- **Name** - enter a name of the region.
- **Type** - select a suitable type for the region from the drop-down list. Choose *Unknown* for any non-listed type.
- **Visibility** - configure map visibility of the region using the drop-down list:
  - *By Layer* - the region visibility on maps depends on the visibility setting of the region's layer;
  - *Off* - the region is not displayed on maps.

- **Reference Alignment** - (*optionally*) select an existing road to be the reference alignment for the region. Choose *None* if no reference alignment required.
- **Start Station** - (*optionally*) enter a station of the selected road as the start of the reference alignment.
- **End Station** - (*optionally*) enter a station of the selected road as the end of the reference alignment.

In the **Layer** tab, define a layer and graphic style for the region:

By default, the graphic style is defined by the layer of the region: *<By Layer>*.

- Define the **Layer** where the region resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
- Define the **Line Style** and the **Width** of region boundary lines in points for drawing on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the boundary line drawing. The preview panel displays the current style.
- Define the **Area Style** (pattern) and the **Transparency** of region background fill on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the background fill. The preview panel displays the current style.

Click  to open the dialog menu with additional options:

- Select **Edit Areas** to open the Points in Area tab of the Edit Area dialog to view or edit the area of the current region.

After adding or changing the region on respective tabs, click  to save the region and return to the previous dialog. Click  to return to the previous dialog without saving.

Region Info

To review information on a selected region.

The dialog displays the detailed data about the selected region:

- *Name* - the name of the region in the current project;
- *Perimeter* - the total 2D length of all the segments that outline the region;
- *Area* - the calculated value of the region's area in 2D;
- *Layer* - the layer of the region;
- *Type* - the type of the region;
- *Visibility* - the status of visibility of the region on maps;
- *Ref Alignment* - the name of the road used as a reference alignment for the region.
- *Start Station* - the station of the road used as a start station for the reference alignment.
- *End Station* - the station of the road used as an end station for the reference alignment.

Click  to return to the previous dialog.

 Regions

To display a list of regions in the current project and to select, add, edit, or delete regions.

Regions are closed polygonal objects used to define areas for tasks and to estimate production volumes.

The dialog contains a list of regions in the current project and a preview panel for the highlighted region in the horizontal plane.

- Click **Info** to open the Region Info dialog to review the details of the highlighted region.
- Click **Edit** to open the Edit Region dialog and modify the highlighted region's name, type, reference alignment and stationing, visibility, layer and graphic style.
- Click **Add** to open the Add Region dialog and create a new region from an existing area.
- Click **Delete** to delete the highlighted region(s) from the project.

Add / Edit Region

To edit the selected region or to create a new region in the current project.

The dialog has two tabs:

- **Properties** - this tab displays the editable parameters of the region.
- **Layer** - this tab defines the layer and graphic style for the region.

In the **Properties** tab, enter the data for the region:

- **For Area** - choose a source area for the new region being created. Select an area from the map  or from the list  of areas in the current project.

  > **Note:** The source area of a region as well as region boundaries cannot be changed after the region has been created. The **For Area** field is not available when editing an existing region.

- **Name** - enter a name of the region.
- **Type** - select a suitable type for the region from the drop-down list. Choose *Unknown* for any non-listed type.
- **Visibility** - configure map visibility of the region using the drop-down list:
  - *By Layer* - the region visibility on maps depends on the visibility setting of the region's layer;
  - *Off* - the region is not displayed on maps.

- **Reference Alignment** - (*optionally*) select an existing road to be the reference alignment for the region. Choose *None* if no reference alignment required.
- **Start Station** - (*optionally*) enter a station of the selected road as the start of the reference alignment.
- **End Station** - (*optionally*) enter a station of the selected road as the end of the reference alignment.

In the **Layer** tab, define a layer and graphic style for the region:

By default, the graphic style is defined by the layer of the region: *<By Layer>*.

- Define the **Layer** where the region resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
- Define the **Line Style** and the **Width** of region boundary lines in points for drawing on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog, where you can select a color for the boundary line drawing. The preview panel displays the current style.
- Define the **Area Style** (pattern) and the **Transparency** of region background fill on the map from the respective drop-down lists. Clicking on the **Color** button opens the Select Color dialog,

where you can select a color for the background fill. The preview panel displays the current style.

Click  to open the dialog menu with additional options:

- Select **Edit Areas** to open the Points in Area tab of the Edit Area dialog to view or edit the area of the current region.

After adding or changing the region on respective tabs, click  to save the region and return to the previous dialog. Click  to return to the previous dialog without saving.

Region Info

To review information on a selected region.

The dialog displays the detailed data about the selected region:

- *Name* - the name of the region in the current project;
- *Perimeter* - the total 2D length of all the segments that outline the region;
- *Area* - the calculated value of the region's area in 2D;
- *Layer* - the layer of the region;
- *Type* - the type of the region;
- *Visibility* - the status of visibility of the region on maps;
- *Ref Alignment* - the name of the road used as a reference alignment for the region.
- *Start Station* - the station of the road used as a start station for the reference alignment.
- *End Station* - the station of the road used as an end station for the reference alignment.

Click  to return to the previous dialog.

Reports

To view, manage, customize and export field reports and stake reports.



Field Reports
Opens the list of the existing field reports. You can edit any report or create a new one.



Stake Reports
Opens the list of the existing stakeout reports. You can edit any report or create a new one.



DL Report
Opens the list of the existing level run reports. You can export any report to a PDF file.



Report Header
Creates or edits headers for all types of reports.



Field Reports

The *Field Reports* dialog displays a list of existing field reports in the project and information about each report: its name, date, and time.

The buttons on the dialog serve the following purposes:

- Click **Delete** to remove the highlighted report from the list.
- Click **Edit** to edit the report selected in the list. More...
- Click **Add** to create a new report. More...
- Click **Save as PDF** to display a new report in the PDF file format. You can choose **Portrait** (vertical) or **Landscape** (horizontal) orientation of the report.

Click  to open the dialog menu with additional options:

- **Report Header** - opens the Report Header dialog.

Field Report: Add or Edit

To create a new report or edit an existing report:

1. Enter a **Report Name**.
2. Optionally, in **Created by** field, enter any identifier of the person who created the project.

   > **Note:** If you specified this information in the New Project dialog, this field in the Field Report dialog is automatically filled in.

3. The fields **Project Name**, **Date** (the date of project creation), **Time** (the local time of field report creation), and **Location** (the coordinates of the connected device in the current coordinate system, including elevation) are not editable.
4. If required, enter any additional notes for the report in the **Note** field.
5. The tool bar of the **Image** panel contains the following buttons:



Take Photo
Opens the Capture dialog to take pictures.



Upload from File
Opens the Select Image File dialog, where you can select an image (**.bmp*, **.jpg*, **.png*, **.tif*, **.tiff*) file for uploading to the **Image** panel and adding it to the field report.



Create Picture
Opens the Sketch dialog, where you can create a new picture using the built-in image editor.



Remove Picture
Removes the open image or picture from the **Image** panel. If the **Image** panel is empty, the button is grayed out.



Edit Picture
Opens the Sketch dialog, where you can modify an image open in the **Image** panel using picture using the built-in image editor. If the **Image** panel is empty, the button is grayed out.



Location Stamp
After clicking the button, the **Location** field will display the coordinates in the current coordinate system measured with the connected device at the moment of click. These coordinates will be included into the report. You can also embed them to the picture in the Sketch dialog.



Capture Map
Opens the Select Object From Map dialog, where you can customize the map view and click  to add the displayed map snapshot as an image in your field report.



Image browsing
Browses through all the images attached to this report. The **Image** panel displays the currently selected image. The sequential number of this image and the total number of attached images to this report also display. If the **Image** panel is empty, the buttons are grayed out.



Calculation Results
This button is available when the field report is created from **Map** / **Drawing** / **Profile** tabs of any Calculation dialog (using the context menu command) and has calculation task results attached. Clicking the button displays the calculation results that will be included into the report.

6. Click the  button to save all changes and close the dialog. Click the  button to close the dialog without saving.

Sketch

To create a new picture or edit an existing image / picture using the editing instruments from the toolbar.



Drawing Filled Circle
Creates a filled curve with the defined width and color.



Drawing Circle
Creates a curve with the defined width and color.



Drawing Filled Square
Creates a filled rectangle with the defined width and color.



Drawing Square
Creates a rectangle with the defined width and color.



Drawing Line
Creates a line with the defined width and color.



Pen Drawing
Creates a custom shapes.



Drawing Arrow
Creates an arrow with the defined width and color.



Drawing Text
Creates a plain text on the image / picture. After you enter text and before performing the next action, you can move the text to the desired location by dragging it with the pointer.



Time Stamp
Creates a stamp in the bottom left corner of the drawing area with the current date and time.



Change Color
Opens the *Select Color* dialog where you can set any drawing color as current color.



Location Stamp
Creates a stamp with the coordinates in the current coordinate system measured with the connected device at the moment of click. This bar is located in the bottom left corner of the drawing area.



Change line width
Opens the dialog where you can select the line width and the eraser width. By default, the width value is 1. The current width value will be displayed on the icon.



Compass
Creates an image of compass' arrow in the top left corner of the drawing area. If the connected device supports a compass, the arrow will be rotated according to compass measurements at the moment of click.



Eraser
Erases a part of any shape or shapes before saving changes. You can select the value of the erase width by clicking the **Change line width** icon.



Undo
Undoes your previous actions starting from the last one done.



Redo
Redoes undone actions starting from the last one undone.

Note: You can't perform the reposition, rotation and deleting of any created object.

Click the  icon to save all changes in image / picture and close the *Sketch* dialog.

Click the  icon to close the *Sketch* dialog without saving any changes.



Stake Reports List

The *Stake Reports List* dialog displays a list of existing stake reports in the project and information about each report: its name, type (icon and name), configuration and references.

The  icon to the left of a report name means that a report is set as current for this type. Click the icon to remove current for this type status. Click an empty space to the left of the report name to set a report as current for this type.

The following buttons are available:

- Click **View** to view the full report selected. More...
- Click **Delete** to remove the highlighted report from the list. You will have to confirm deletion before the report is removed.
- Click **Edit** to edit the report selected in the list. More...
- Click **Add** to create a new report. More...

ClickClick  to open the dialog menu with additional options:

- **Report Configs** - opens the Stake Reports Configuration List dialog.
- **Report Header** - opens the Report Header dialog.
- **Export Report** - opens the To File dialog with *Stake Reports* selected as a data type for exporting.

Stake Report: Add or Edit

When adding a new stake report or editing the selected one, fill in the following fields:

- Enter the **Name** of the report.
- Select the **Report Type** from the list: *Point; Line/Arc; Road; Slope; Surface*.

- In the **Configuration** field, choose an available configuration for specified report type. Select *<Edit...>*, to open the Stake Reports Config List dialog and add, edit or delete configurations for this report type.
- Check the **Set Current** box to set this report as the current report for this type.
- Click the ✔ button to save all changes and close the dialog. Click the ✖ button to close the dialog without saving.

Stake Report: View

To display the currently selected stake report.

This dialog display the list of staked objects included into the currently selected report with detailed stakeout data on every listed object.



DL Reports

The *DL Reports* dialog displays a list of existing level run reports in the project.

To save the level run report to a PDF file:

- Highlight the desired report in the list.
- Click the **Save as PDF** button and select a report page layout from the button menu, either *Portrait*, or *Landscape*.
- In the open DL Report dialog, specify a storage location and a name for the generated PDF file, then click ✔ to save.



Report Header

The *Report Header* dialog allows you to customize the headers of reports that can be generated based on the project data.

- Enter text for the header in **Field Report**. The default text is *Sokkia Field Report*.
- Enter text for the header in **Stake Report**. The default text is *Sokkia Stakeout Report*.
- Enter text for the header in **DL Report**. The default text is *Sokkia DL Report*.
- Enter text for the header in **Productivity Report**. The default text is *Daily Stake Summary*.

- Click the  button to add a new picture as a logo for field and stake reports. The Select Image File dialog will open to select a graphic file, **.bmp, *.jpg, *.png, *.tif, *.tiff* formats supported.
- Click the  button to remove current logo from field and stake reports.
- Click the  button to save headers and return to *Reports* dialog. Saved headers will apply to reports in all projects until changed. Click the  button to close the dialog without saving.



Planes

To display a list of planes in the current project and to select, add, edit, or delete planes.

1. To add, edit, or delete a plane.
   - Click **Add** to create a new plane. Clicking the button opens the Add Plane dialog.

     Note: Before creating a plane for using in GNSS survey configurations, select a Grid coordinate system or perform a localization.

   - Click **Edit** to change the properties and parameters of the highlighted plane. Clicking the button opens the Plane Properties dialog.
   - Click **Delete** to remove the highlighted plane(s) from the project.
     - Use the context menu in the list to simplify multiple planes highlighting with the following commands:
       - **Select All** - highlights all planes in the list.
       - **Select All Below** - highlights a currently highlighted plane and all the planes in the list displayed below.
       - **Select Multiple** - highlights multiple planes by sequential clicking on plane names.
       - **Cancel Selection** - removes all highlights in the list.

   - Click  to return to the previous dialog. Click  to open the Home Screen.

2. If this dialog opened to make an existing plane selection from the list of planes to use it in another Sokkia Field dialog, the functionality is limited to plane selection only.
   - Highlight an existing plane in the list of project's planes and click  to confirm the selection of the highlighted plane. Or click  to return to the previous dialog without selection.

- To open the dialog in its full form and manage planes, click  and select Edit planes in the dialog menu.

Add Plane

To select a type for a new plane.

Sokkia Field offers several types of planes to add to the current project to match with the initial available data and the user goals.

> **Note:** Before creating a plane for using in GNSS survey configurations, select a Grid coordinate system or perform a localization.

- From the **Select Plane Type** list, choose a desired type for a new plane:
  - Horizontal
  - Vertical
  - Sloping
  - By 3 points
  - Best Fit Plane
- Click **Next** to create plane of the chosen type. Click  to return to the previous dialog.

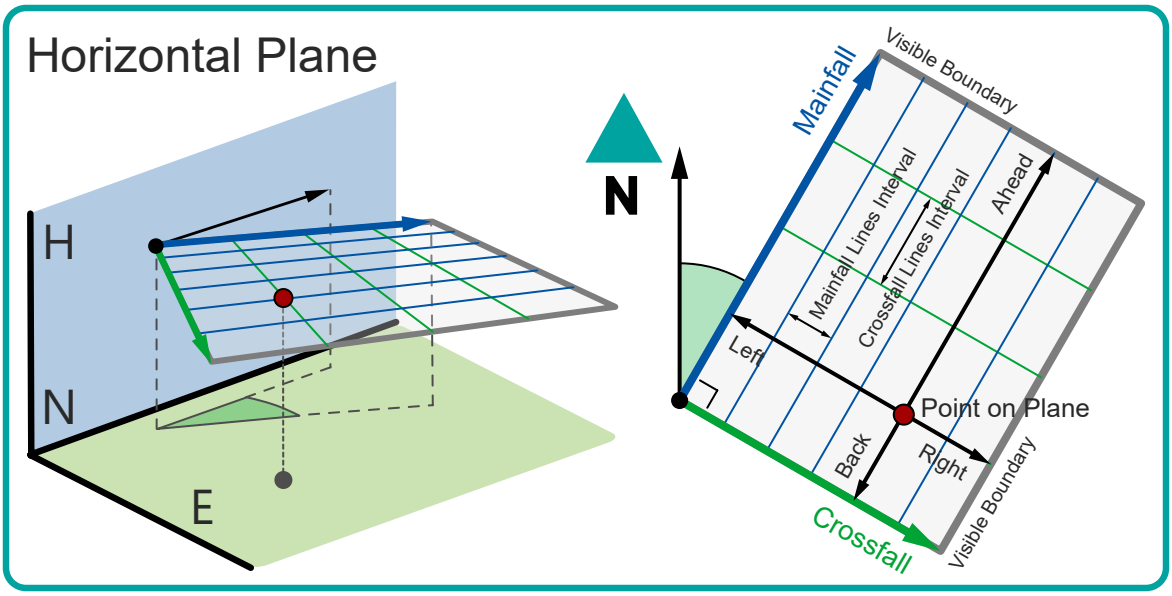
Horizontal Plane

To create a horizontal plane, select one point on this plane, enter the plane plotting boundaries and set the graphic style of the plane.

The dialog contains three tabs:

- General tab
- Boundary tab
- Style tab

The visible boundary of the horizontal plane with the initial point on plane:



1. **General tab** - to create a new horizontal plane and select a point which will define a plane position:

   - In the **Name** field, enter a desired name of the plane. The software-defined name is suggested by default.
   - From the **Layer** drop-down list, select a layer for the plane. Alternatively, click ... to open the Layers dialog and view and manage layers.
   - In the **Point on Plane** group, specify a **Point** on the plane. Enter a point name manually, or select from the map or from the list of points in the project. Clicking the button for GNSS survey opens the *Topo* dialog, or clicking the button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

   Note: Sokkia Field uses coordinates of specified point to calculate the position of the plane and the initial point on the plane, which defines the origin for drawing the visible boundaries of the plane. For the horizontal plane, the initial point on the plane has coordinates of the specified point.

- In the **Mainfall** field, enter the **Azimuth** / **Bearing** value of the plane's mainfall direction in the horizontal plane. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.

2. **Boundary tab** - to specify the size and graphic style of the rectangular border of the plane visible on the map:

   - In the **Boundary Style** group, specify how the visible rectangular border should look on the map:
     - Select a **Style** for the boundary lines and a **Width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for the boundary lines.

   - In the **Boundary Size** group, specify the size of visible rectangular border by entering distances from the initial point of the plane to the sides of the visible rectangle:
     - In the **Back** / **Ahead** fields, set the distances to the boundary from the initial point on the plane back / forward in the mainfall direction of the plane.
     - In the **Left** / **Right** fields, set the distances to the boundary from the initial point on the plane to the left / right perpendicular to the mainfall direction of the plane.

3. **Style tab** - to set the background fill of the plane and the size and style of the mainfall / crossfall grid cells:

   - In the **Fill Style** group:
     - Select a style of the plane background from the drop-down list.
     - Click **Color** to select a color of the plane background.

   - In the **Mainfall Lines** group:
     - Select a **style** of grid lines parallel to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for these lines.
     - In the **Interval** field, enter the distance between grid lines parallel to the plane's mainfall direction.

   - In the **Crossfall Lines** group:
     - Select a **style** of grid lines perpendicular to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for these lines.
     - In the **Interval** field, enter the distance between grid lines perpendicular to the plane's mainfall direction.

Click to create the new plane using entered parameters and close the dialog. Click to cancel a new plane creation and close the dialog.

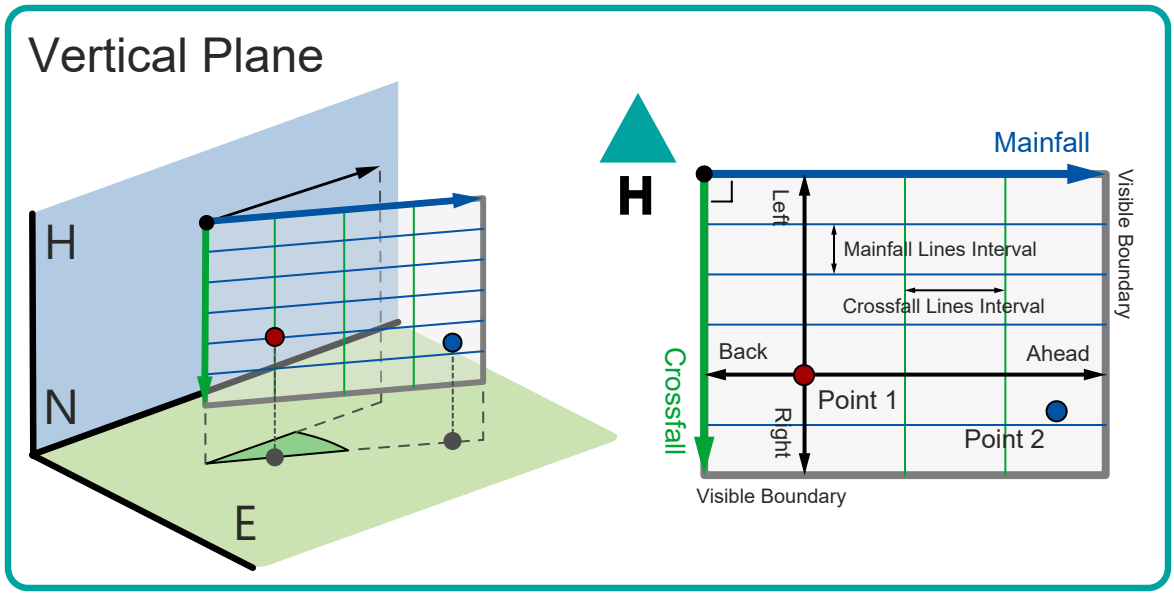
Vertical Plane

To create a vertical plane, select two points on this plane, enter the plane plotting boundaries and set the graphic style of the plane.

The dialog contains three tabs:

- General tab
- Boundary tab
- Style tab

The visible boundary of the vertical plane with the initial point on plane (Point 1) and second point on plane (Point 2):



1. **General tab** - to create a new vertical plane and select two points which will define the plane position:

   - In the **Name** field, enter a desired name of the plane. The software-defined name is suggested by default.
   - From the **Layer** drop-down list, select a layer for the plane. Alternatively, click ... to open the Layers dialog and view and manage layers.

- In the **Points on Plane** group, specify two points defining the vertical plane position: **Point 1** and **Point 2**. Enter point names in the corresponding fields manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

  Note: Sokkia Field uses coordinates of specified points to calculate the position of the plane and the initial point on the plane, which defines the origin for drawing the visible boundaries of the plane. For the vertical plane, the initial point on the plane has coordinates of the point specified in the **Point 1** field.

2. **Boundary tab** - to specify the size and graphic style of the rectangular border of the plane visible on the map:

   - In the **Boundary Style** group, specify how the visible rectangular border should look on the map:
     - Select a **Style** for the boundary lines and a **Width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for the boundary lines.

   - In the **Boundary Size** group, specify the size of visible rectangular border by entering distances from the initial point of the plane to the sides of the visible rectangle:
     - In the **Back** / **Ahead** fields, set the distances to the boundary from the initial point on the plane back / forward in the mainfall direction of the plane.
     - In the **Left** / **Right** fields, set the distances to the boundary from the initial point on the plane to the left / right perpendicular to the mainfall direction of the plane.

3. **Style tab** - to set the background fill of the plane and the size and style of the mainfall / crossfall grid cells:

   - In the **Fill Style** group:
     - Select a style of the plane background from the drop-down list.
     - Click **Color** to select a color of the plane background.

   - In the **Mainfall Lines** group:
     - Select a **style** of grid lines parallel to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for these lines.

    - In the **Interval** field, enter the distance between grid lines parallel to the plane's mainfall direction.

- In the **Crossfall Lines** group:
    - Select a **style** of grid lines perpendicular to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
    - Click **Color** to select a color for these lines.
    - In the **Interval** field, enter the distance between grid lines perpendicular to the plane's mainfall direction.

Note: The first and second specified points define the vertical plane position, but the second point may not lie within visible rectangular boundary (depending on the plane boundary size and the distance between first and second points).

Click  to create the new plane using entered parameters and close the dialog. Click  to cancel a new plane creation and close the dialog.

Sloping Plane

To create a sloping plane, select one point on this plane and specify three angles:

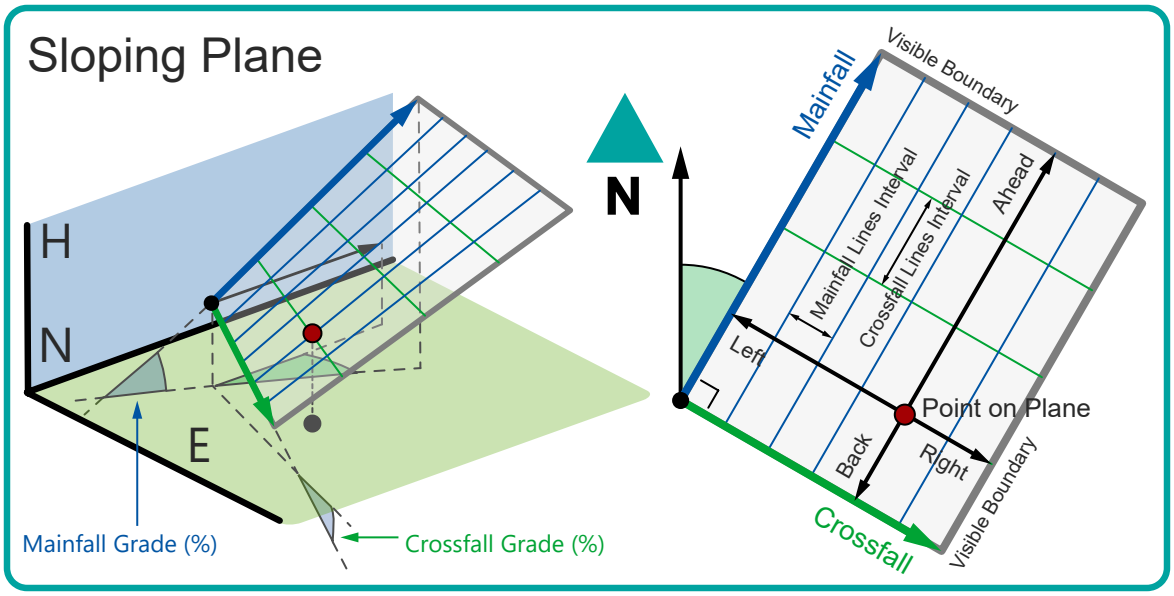
- mainfall azimuth or bearing - the plane's mainfall direction in the horizontal plane,
- mainfall grade - angle between a line on the plane that is parallel to the plane's mainfall direction and the horizontal projection of this line,
- crossfall grade - angle between a line on the plane that is perpendicular to the mainfall direction and the horizontal projection of this line,

and enter the plane plotting boundaries and set the graphic style of the plane.

The dialog contains three tabs:

- General tab
- Boundary tab
- Style tab

The visible boundary of the sloping plane with the initial point on plane, specified mainfall direction, mainfall and crossfall grades:



1. **General tab** - to create a new sloping plane, select a point which will define a plane position, and specify three angles of the plane orientation:

   - In the **Name** field, enter a desired name of the plane. The software-defined name is suggested by default.
   - From the **Layer** drop-down list, select a layer for the plane. Alternatively, click ... to open the Layers dialog and view and manage layers.
   - In the **Point on Plane** group, specify a **Point** on the plane. Enter a point name manually, or select from the map or from the list of points in the project. Clicking the button for GNSS survey opens the *Topo* dialog, or clicking the button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

     Note: Sokkia Field uses coordinates of specified point to calculate the position of the plane and the initial point on the plane, which defines the origin for drawing the visible boundaries of the plane. For the sloping plane, the initial point on the plane has coordinates of the specified point.

   - To orientate the plane's mainfall select one of the following ways in the **Mainfall (A->B)** group:

- Select *Azimuth* / *Bearing* from the drop-down list to use **Azimuth** / **Bearing** and **Grade**:
  - Enter the **Azimuth** / **Bearing** value for the plane's mainfall direction in the horizontal plane. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.
  - Enter the vertical **Grade** value (in percent) of the plane's mainfall lines. The Grade value in the **Mainfall (A->B)** group defines the angle between the plane's mainfall line and its horizontal projection.

- Select *Direction Line* from the drop-down list for using a line between two points. The direction and vertical grade of this line will be used to orient the plane's mainfall:
  - Enter the point **A** and the point **B**. Enter point names in the corresponding fields manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

    Note: You can not select the specified point in the **Point on Plane** field as point **A** or point **B**.

- Select *Direction Point* from the drop-down list for using a line between the specified point of the plane and any selected point. The direction and vertical grade of this line will be used to orient the plane's mainfall:
  - The point **A** for the line is defined in the **Point on Plane** field.
  - Enter the point **B**. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the point **B** field.

- In the **Crossfall** group, enter the vertical **Grade** value (in percent) of the plane's crossfall lines. The Grade value in the in the **Crossfall** group defines the angle between a line on the plane that is perpendicular to the plane's mainfall direction and its horizontal projection.

2. **Boundary tab** - to specify the size and graphic style of the rectangular border of the plane visible on the map:

- In the **Boundary Style** group, specify how the visible rectangular border should look on the map:
  - Select a **Style** for the boundary lines and a **Width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for the boundary lines.

- In the **Boundary Size** group, specify the size of visible rectangular border by entering distances from the initial point of the plane to the sides of the visible rectangle:
  - In the **Back** / **Ahead** fields, set the distances to the boundary from the initial point on the plane back / forward in the mainfall direction of the plane.
  - In the **Left** / **Right** fields, set the distances to the boundary from the initial point on the plane to the left / right perpendicular to the mainfall direction of the plane.

3. **Style tab** - to set the background fill of the plane and the size and style of the mainfall / crossfall grid cells:

- In the **Fill Style** group:
  - Select a style of the plane background from the drop-down list.
  - Click **Color** to select a color of the plane background.

- In the **Mainfall Lines** group:
  - Select a **style** of grid lines parallel to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for these lines.
  - In the **Interval** field, enter the distance between grid lines parallel to the plane's mainfall direction.

- In the **Crossfall Lines** group:
  - Select a **style** of grid lines perpendicular to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for these lines.
  - In the **Interval** field, enter the distance between grid lines perpendicular to the plane's mainfall direction.

Click  to create the new plane using entered parameters and close the dialog. Click  to cancel a new plane creation and close the dialog.

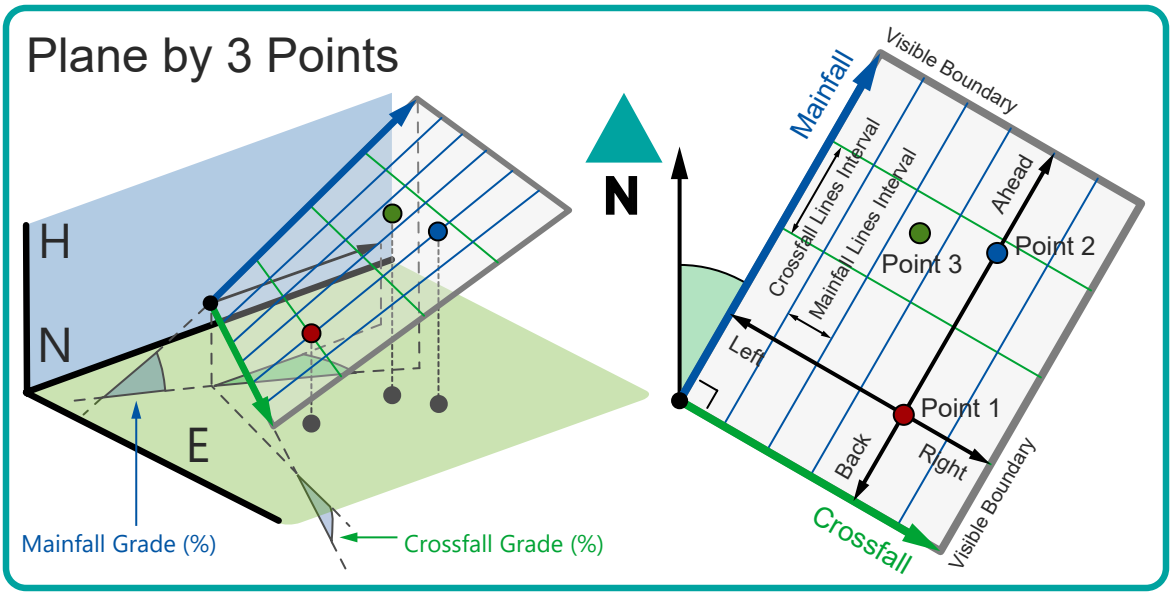
Plane By Three Points

To create a plane defined by three points, select three points on this plane, enter the plane plotting boundaries and set the graphic style of the plane.

The dialog contains three tabs:

- General tab
- Boundary tab
- Style tab

The visible boundary of the plane defined by three specified points - Point 1 (the initial point on plane), Point 2, and Point 3:



1. **General tab** - to create a new plane by selecting three points which will define the plane position:

   - In the **Name** field, enter a desired name of the plane. The software-defined name is suggested by default.
   - From the **Layer** drop-down list, select a layer for the plane. Alternatively, click ... to open the Layers dialog and view and manage layers.
   - In the **Points on Plane** group, specify three points defining the plane position: **Point 1**, **Point 2**, and **Point 3**. Enter point names in the corresponding fields manually, or select from the map or from the list of points in the project. Clicking the button for GNSS survey opens the *Topo* dialog, or clicking the

 button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

- In the **Mainfall** group, orientate the plane's mainfall:
  - Check  the **Calculate Automatically** box to set the plane's mainfall direction (**Azimuth** / **Bearing**) in the horizontal plane in the direction from specified **Point 1** to specified **Point 2**.
  - To manually set the plane's mainfall direction in the horizontal plane, clear  the **Calculate Automatically** box and enter the **Azimuth** / **Bearing** value. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.

> **Note:** Sokkia Field uses coordinates of three specified points to calculate the position of the plane and the initial point on the plane, which defines the origin for drawing the visible boundaries of the plane. If the mainfall direction in the horizontal plane is calculated automatically, the initial point on the plane has coordinates of the point specified in the **Point 1** field. If the mainfall direction in the horizontal plane is set manually, the initial point on the plane is calculated automatically to better fit the geometry of the three specified points.

2. **Boundary tab** - to specify the size and graphic style of the rectangular border of the plane visible on the map:

   - In the **Boundary Style** group, specify how the visible rectangular border should look on the map:
     - Select a **Style** for the boundary lines and a **Width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for the boundary lines.

   - In the **Boundary Size** group, specify the size of visible rectangular border by entering distances from the initial point of the plane to the sides of the visible rectangle:
     - In the **Back** / **Ahead** fields, set the distances to the boundary from the initial point on the plane back / forward in the mainfall direction of the plane.
     - In the **Left** / **Right** fields, set the distances to the boundary from the initial point on the plane to the left / right perpendicular to the mainfall direction of the plane.

3. **Style tab** - to set the background fill of the plane and the size and style of the mainfall / crossfall grid cells:

- In the **Fill Style** group:
  - Select a style of the plane background from the drop-down list.
  - Click **Color** to select a color of the plane background.

- In the **Mainfall Lines** group:
  - Select a **style** of grid lines parallel to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for these lines.
  - In the **Interval** field, enter the distance between grid lines parallel to the plane's mainfall direction.

- In the **Crossfall Lines** group:
  - Select a **style** of grid lines perpendicular to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for these lines.
  - In the **Interval** field, enter the distance between grid lines perpendicular to the plane's mainfall direction.

Note: All three specified points define the plane by three points position, but the second and / or third point may not lie within visible rectangular boundary (depending on the plane boundary size and the distance between the first and second points and / or the first and third points).

Click  to create the new plane using entered parameters and close the dialog. Click  to cancel a new plane creation and close the dialog.

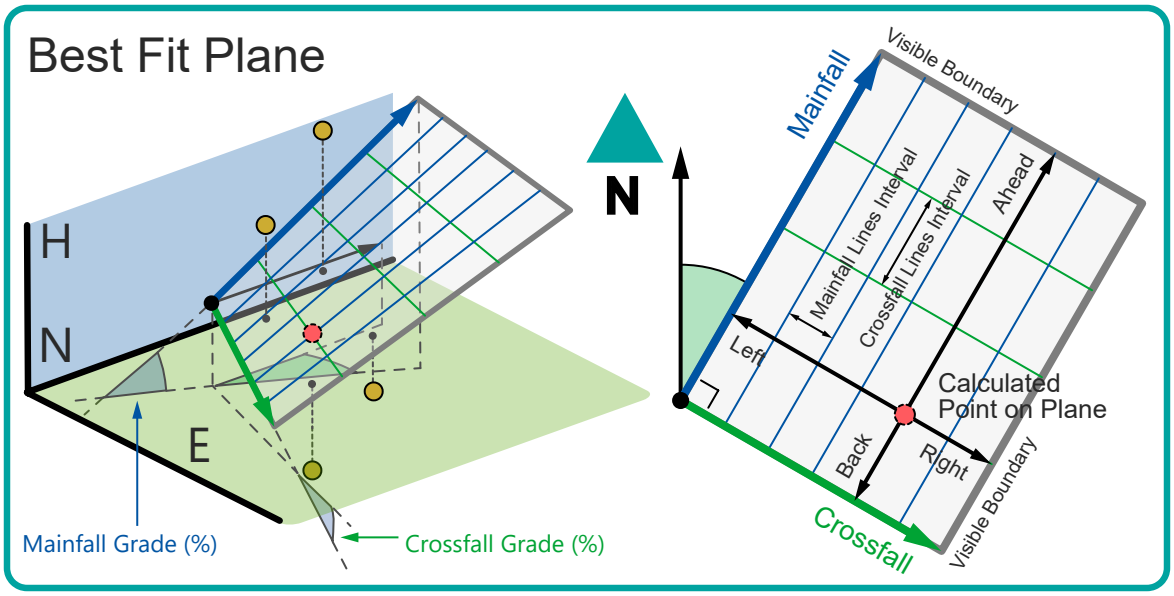
Best Fit Plane

To create a plane in the best fit position, select points and / or other objects used to calculate the best fit position, enter the plane plotting boundaries and set the graphic style of the plane.

The dialog contains three tabs:

- General tab
- Boundary tab
- Style tab

The visible boundary of the best fit plane with the initial point on plane calculated for the selected points:



1. **General tab** - to create a new plane in the best fit position to selected points and /or other objects:

   - In the **Name** field, enter a desired name of the plane. The software-defined name is suggested by default.
   - From the **Layer** drop-down list, select a layer for the plane. Alternatively, click ... to open the Layers dialog and view and manage layers.
   - In the **Input Data** group, fill in the list of points and /or other objects to be used in calculating the best fit position for the plane.

   > **Note:** Sokkia Field uses coordinates of specified points and / or other objects to calculate the best fit position of the plane and the initial point on the plane, which defines the origin for drawing the visible boundaries of the plane.

   - From the drop-down menu, select a type of object(s) to be added to the **Input Data** list:

   > **Note:** You can add objects of different types. Select one type and add desired object(s), then select another type and add desired object(s) of that type, and so on.

- Choose **Points** to add points to the **Input Data** list for calculating the best fit position of the plane:
  - From the **Add Points** drop-down menu, choose an option to add point(s) to the list:
    - *All* - add all the points from the current project.
    - By Range - add points by specifying point name range(s).
    - By Code - add points by point code name(s).
    - By Code String - add points by code string.
    - By Radius - add points which reside in a particular circle.
    - By Name - add points by name or by part of name.
    - By Layer - add points which belong to a particular layer.
  - Alternatively, add points from the map  or from the list  of points in the project.
- Choose **Point List** to add all the points from point list(s) to the **Input Data** list for calculating the best fit position of the plane:
  - Enter a point list name and click  next to the entered name.
  - Alternatively, add point list(s) from the catalog  of the point lists.
- Choose **Linework** to add linework object(s) to the **Input Data** list for calculating the best fit position of the plane:
  - Enter a linework object name and click  next to the entered name.
  - Alternatively, add linework object(s) from the map  or from the list  of linework objects in the project.
- Choose **Area** to add area(s) to the **Input Data** list for calculating the best fit position of the plane:
  - Enter an area name and click  next to the entered name.
  - Alternatively, add area(s) from the map  or from the list  of areas in the project.
- Review the **Input Data** list, remove points and / or other objects from the list:
  - From the  drop-down menu, select a type of object(s) to be displayed in the **Input Data** list.

- Highlight an object name and click  next to the list to remove highlighted object(s) from the list.
- Use the context menu to simplify multiple objects highlighting with the following commands:
  - **Select All** - highlights all objects displayed.
  - **Select All Below** - highlights a currently highlighted object and all the objects displayed below.
  - **Select Multiple** - highlights multiple objects by sequential clicking on object names.
  - **Cancel Selection** - removes all highlights from objects displayed.

- In the **Mainfall** group, orientate the plane's mainfall:
  - Check  the **Calculate Automatically** box to automatically set the plane's mainfall direction (**Azimuth** / **Bearing**).
  - To manually set the plane's mainfall direction in the horizontal plane, clear  the **Calculate Automatically** box and enter the **Azimuth** / **Bearing** value. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.

2. **Boundary tab** - to specify the size and graphic style of the rectangular border of the plane visible on the map:

   - In the **Boundary Style** group, specify how the visible rectangular border should look on the map:
     - Select a **Style** for the boundary lines and a **Width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for the boundary lines.

   - In the **Boundary Size** group, specify the size of visible rectangular border by entering distances from the initial point of the plane to the sides of the visible rectangle:
     - In the **Back** / **Ahead** fields, set the distances to the boundary from the initial point on the plane back / forward in the mainfall direction of the plane.
     - In the **Left** / **Right** fields, set the distances to the boundary from the initial point on the plane to the left / right perpendicular to the mainfall direction of the plane.

3. **Style tab** - to set the background fill of the plane and the size and style of the mainfall / crossfall grid cells:

   - In the **Fill Style** group:
     - Select a style of the plane background from the drop-down list.
     - Click **Color** to select a color of the plane background.

- In the **Mainfall Lines** group:
  - Select a **style** of grid lines parallel to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for these lines.
  - In the **Interval** field, enter the distance between grid lines parallel to the plane's mainfall direction.

- In the **Crossfall Lines** group:
  - Select a **style** of grid lines perpendicular to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
  - Click **Color** to select a color for these lines.
  - In the **Interval** field, enter the distance between grid lines perpendicular to the plane's mainfall direction.

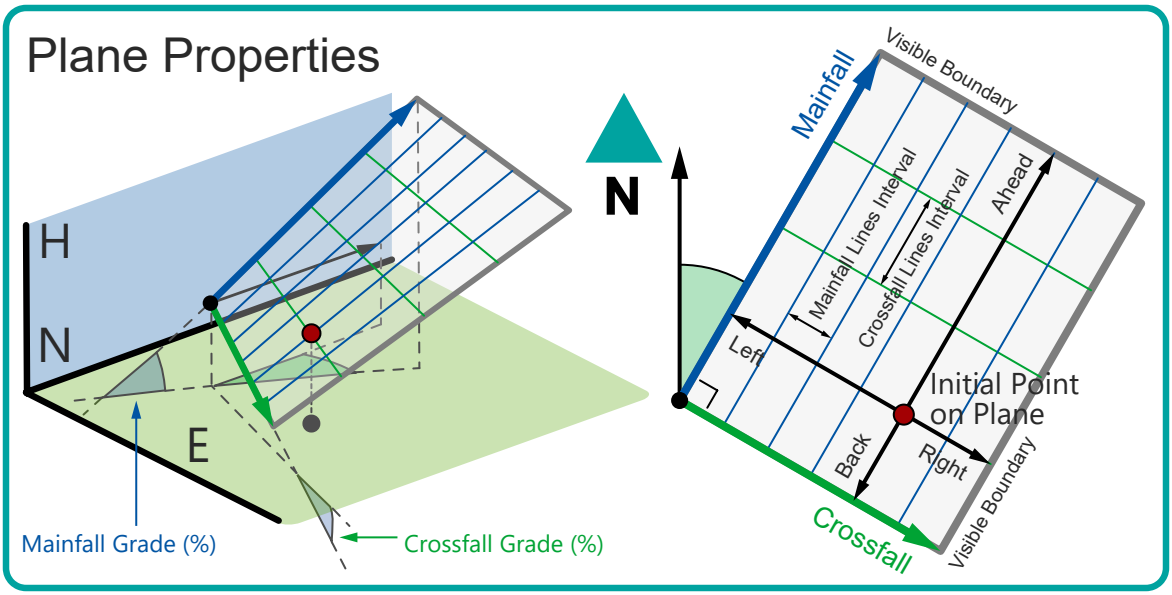
Click  to create the new plane using entered parameters and close the dialog. Click  to cancel a new plane creation and close the dialog.

Plane Properties

To view or edit the name, layer, graphic style and the plane parameters of the plane.

The dialog contains three tabs:

- General tab
- Boundary tab
- Style tab



1. **General tab** - to view and edit the name, layer, and plane parameters of the plane:

   - In the **Name** field, enter a new name for the plane, if required.
   - From the **Layer** drop-down list, select a new layer for the plane, if required. Alternatively, click  to open the Layers dialog and view and manage layers.
   - In the **Plane parameters** group, view or change the parameters defining the position in space of the selected plane:

     Note: Here you can edit the selected plane of any type (horizontal, vertical, by three points, sloping, best fit) as sloping plane by changing the initial point on plane, mainfall direction and grade, and / or crossfall grade Changing of mainfall / crossfall grades is not available for vertical planes. See more details about these parameters in the Sloping Plane dialog.

     - **Point on Plane** - coordinates of the current initial point on the plane, defining the origin for drawing the visible boundaries of the plane.
     - **Change Point on Plane** - allows you to change the current initial point on the plane to a new one. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.
     - **Mainfall Azimuth** / **Mainfall Bearing**) - the direction of the plane's mainfall in horizontal plane.
     - **Mainfall Grade** - the vertical grade of the plane's mainfall in percent (not available for vertical planes).
     - **Crossfall Grade** - the vertical grade of the plane's crossfall in percent (not available for vertical planes).

2. **Boundary tab** - to view and edit the size and graphic style of the rectangular border of the plane visible on the map:

   - In the **Boundary Style** group, specify how the visible rectangular border should look on the map:
     - Select a **Style** for the boundary lines and a **Width** of these lines in points from the corresponding drop-down lists.

- Click **Color** to select a color for the boundary lines.

- In the **Boundary Size** group, specify the size of visible rectangular border by entering distances from the initial point of the plane to the sides of the visible rectangle:
  - In the **Back** / **Ahead** fields, set the distances to the boundary from the initial point on the plane back / forward in the mainfall direction of the plane.
  - In the **Left** / **Right** fields, set the distances to the boundary from the initial point on the plane to the left / right perpendicular to the mainfall direction of the plane.

3. **Style tab** - to view and edit the background fill of the plane and the spacing and style of the mainfall / crossfall lines grid:

   - In the **Fill Style** group:
     - Select a style of the plane background from the drop-down list.
     - Click **Color** to select a color of the plane background.

   - In the **Mainfall Lines** group:
     - Select a **style** of grid lines parallel to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for these lines.
     - In the **Interval** field, enter the distance between grid lines parallel to the plane's mainfall direction.

   - In the **Crossfall Lines** group:
     - Select a **style** of grid lines perpendicular to the mainfall direction and a **width** of these lines in points from the corresponding drop-down lists.
     - Click **Color** to select a color for these lines.
     - In the **Interval** field, enter the distance between grid lines perpendicular to the plane's mainfall direction.

Click  to save changes and close the dialog. Click  to close the dialog without saving changes.

Calculate

Click an icon to calculate the task:



Inverse
To calculate inverse of known points and linework to different objects.



Point in Direction
To calculate the coordinates of a point, using a known point, and angle and distance offsets from the known point.



Calculator
To calculate and convert in scientific, standard and Feet / Inches modes. You type in the entire equation you want to calculate, press equals, and the result is shown.



Session Check
To calculate the residuals for the finished Survey Sessions.



Curves
To calculate the full set of parameters to determine a curve.



Area
To calculate the area of a polygon formed by any points, or the coordinates of point(s) which form a polygon of the desired area, after being added to the point list / linework / area.



Angles
To calculate the angle between two lines, which have a common point.



Offsets
Calculates the coordinates of points along a line, a curve, or a road.



Transform
To transform points in four ways - Rotate, Translate, Scale, 2D Transform and to transform drawings and images, and 3D models.



Traverse
To calculate traverse and sideshot points, perform traverse adjustments and loop misclosure test for the traverse.



Surface
To calculate data for a new surface, surface volumes and surface contour lines.



Enter Plan
Tto draw a plan consisting of elements defined by points, segments and arcs.



Calculate Inverse

Click an icon to calculate the task:



Point To Point
To calculate the inverse (direction and distance) between two known points.



Point to Line
To calculate the known point inverse (direction, distance, station) to a known line.



Point to List
To calculate the inverse (direction and distance) for all the points in a point list with respect to a known point.



Point to Curve
To calculate the known point inverse (direction, distance, station) to a known curve.



Point to Road
To calculate the known point inverse (direction, distance, station) to a known road.



Point to Linework
To calculate the known point inverse (direction, distance, station) to a known linework.



Inverse Linework
To calculate the inverse data for all segments of a known linework.



Point to Plane
To calculate the known point inverse to a known plane.



Line to Plane
To calculate the intersection point of a known line and a known plane.



Two-Point Inverse

To calculate the inverse (direction and distance) between two known points.

1. In the **Input** tab, click the switching button to specify either two known points (switch to **From Point**) or an existing line segment (switch to **Segment**).

   - If switched to **From Point**:
     - Enter known points manually or select them from the map  or from the list  of points in the project.
       - In **From Point**, enter the first known point.
       - In **To Point**, enter the second known point.

     > **Note:** You can only calculate the difference in height (dHeight) for two points if one or two of them do not have horizontal coordinates. Such points can be imported or obtained as a result of a Level Run.

   - If switched to **Segment**:
     - Click  to select an existing line segment from the map.
       - Start point of the segment is the first known point.

    - End point of the segment is the second known point.
    - The field **Segment** displays *Line segment* after segment selection.
- Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
    - *Azimuth:* (or *Bearing:* if bearing is selected to output directions) the direction from the first point to the second point.
    - *HDist* - the horizontal distance from one point to another.
    - *dNorth* - the increment of the North coordinate.
    - *dEast* - the increment of the East coordinate.
    - *dHeight* - the increment of the height.
    - *Grade(Slope)* - the increment of the height in percentage terms.
    - *Slope distance* - the computed distance between the two points.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Point to Line

To calculate the known point inverse (direction, distance, station) to a known line.

1. In the **Input** tab:
    - Select the known **Point** name.

      Note: Every point can be entered manually or selected from the map  or from the list  of points in the project.

    - Switch between the **Start Point** of the line and **Segment** to specify the known line:

- If switched to **Segment**:
  - Click  to select an existing line segment from the map.
    - Start point of the segment is the start point of the line.
    - End point of the segment is the end point of the line.
    - The field **Segment** displays *Line segment* after segment selection.

- If switched to **Start Point**:
  - Enter the Start point of the line.
  - Select between **Azimuth** (or **Bearing** if bearing is selected to output directions) to enter either the direction of the line manually or specify the **End Point** of the line.

- Set the **Start** station of the line.
- The **Calc Pt** field will display the default name of the known point's projection on the line. You can change this name.
- If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
- Check the **PTL Point** box to calculate PTL coordinates of the selected known point relative to the selected line (available if the line is defined by **Start** and **End** points).
- Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab:
   - Review the results of the calculation:
     - *Projected Point* - the name of the known point's projection on the line.
     - *Coordinates* - the coordinates of the projected point presented according to the coordinate system settings and display for the current project.
     - *From Point* - the name of the known point.
     - The *Line* information:
       - *Start Point* - the name of the starting point of the line.
       - *Tangent Azimuth:* (*Tangent Bearing:*) the direction of the known line.
       - *Projected Azimuth:* (*Projected Bearing:*) the direction of the perpendicular from the known point to the line.
       - *Start Station* - the starting station of the line.
       - *Station:* indicates the distance between the starting point and the projection of the known point on the line.
       - *Offset* - the horizontal offset between the known point and the projected point.
       - *dHeight* - the vertical offset between the known point and the projected point. The "-" sign means that the known point is lower than the calculated point.
       - *Slope distance* - the computed distance between the known point and the projected point.

- Click  to save the calculated point to the points list.
- Click  to save the data to a **.txt* file, if required.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Point to Point List

To calculate the inverse (direction and distance) for all the points in a point list with respect to a known point.

1. In the **Input** tab:
   - Select the known **Point**. Enter a point name manually, or select from the map  or from the list  of points in the project.
   - Select the **Point List**. The name can be entered manually, selected from the list  of point lists in the project.

     The points of the selected Point List will be listed along with their codes in the table and shown in the plot. Use the arrow button to hide / show the plot.
   - Click the  **Calc** button to calculate the inverse to every point in the list.
2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
   - *Azimuth:* (*Bearing*) is the direction to the point in the point list from the known point.
   - *HDist:* is the horizontal distance from one point to another.
   - *dNorth:* is the increment of the North coordinate.
   - *dEast:* is the increment of the East coordinate.
   - *dHeight:* is the increment of the height. The "-" sign means that the known point is lower than the point in the list.
   - *Grade(Slope):* is the increment of the height in percent.
   - *Slope distance:* is the computed distance between the two known points.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Point to Curve

To calculate the known point inverse (direction, distance, station) to a known curve.

Open the illustration of curve parameters used in Sokkia Field.

1. In the **Input** tab, select points needed for calculations. Every point can be entered manually or selected from the map  or from the list  of points in the project:
   - Select the known **Point** name.
   - Switch between **PC Point** (point of curvature) and **RP Point** (radius point) to enter the first curve point as required. Depending upon the first curve point chosen, you can define the curve by two different sets of points:
     - If you Select **PC Point**, you need to define this point, **Curve Point** (point on curve) and **PT point** (point of tangent).
     - If you select **RP Point** point, you need to define this point, **PC Point** and **PT point** (point of tangent). In this case, the distance between **RP** point and **PC** point should be equal to the distance between **RP** point and **PT** point, and two curves can be created: a *Small* curve of 180 degrees or less and a *Large* curve of 180 degrees or more.
   - From the **Curve** drop-down list, select which of these two curves should be used for computations.
   - The **Calc Point** field will display the default name of the known point's projection on the curve. You can change this name.

     If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
   - Set the **Start Station** of the reference curve.
   - Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab, review the results of the calculation and click  to save the calculated point in the project or/and click  to save the data to a **.txt* file, if required:

- *Projected Point* - the name of the known point's projection on the curve.
- *Coordinates* - the coordinates of the projected point presented according to the coordinate system settings and display for the current project.
- *Point* - the name of the known point.
- The *Curve* information: *PC Point*, *Curve Point*, *PT Point.*
- *Tangent Azimuth:* (*Tangent Bearing:*) is the direction of the tangent of the curve at the point of the known point's projection.
- *Projected Azimuth:* (*Projected Bearing:*) the direction of the perpendicular from the known point to the tangent of the curve.
- *Start Station* - the starting station of the curve.
- *Station:* indicates the distance between the starting station and the known point's projection on the curve.
- *Offset:* is the horizontal offset between the known point and the projection point.
- *dHeight:* is the vertical offset between the known point and the projection point. The "-" sign means that the known point is lower than the calculated point.
- *Slope distance* - the computed distance between the known point and the projected point.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Point to Road

To calculate the known point inverse (direction, distance, station) to a known road.

1. In the **Input** tab:
   - Select the known **Point** name. The point can be entered manually or selected from the map  or from the list  of points in the project.
   - Select the **Road** from the list  of roads in the project.
   - The **Start** station and the horizontal and vertical plans of the selected road will be shown.
   - The **Point** field will display the default name of the known point's projection on the road. You can change this name.

     If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
   - Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab:
   - Review the results of the calculation:
     - *Projected Point* - the name of the known point's projection on the road.
     - *Coordinates* - the coordinates of the projected point presented according to the coordinate system settings and display for the current project.
     - *Point* - the name of the known point.
     - *Road* - the name of the road.
     - *Tangent Azimuth:* (*Tangent Bearing:*) the direction of the road segment at the projection point.
     - *Projected Azimuth:* (*Projected Bearing:*) the direction of the perpendicular from the known point to the road.
     - *Start* - the starting station of the road.
     - *Station:* indicates the distance between the starting point and the projection of the known point on the road.
     - *Offset* - the horizontal offset between the known point and the projected point.
     - *dHeight* - the vertical offset between the known point and the projected point. The "-" sign means that the known point is lower than the calculated point.
     - *Slope distance* - the computed distance between the known point and the projected point.
   - Click  to save the calculated point to the points list.
   - Click  to save the data to a **.txt* file, if required.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Point to Linework

To calculate the known point inverse (direction, distance, station) to a known linework.

1. In the **Input** tab:
   - Select the known **Point** name. The point can be entered manually or selected from the map  or from the list  of points in the project.
   - Define the linework, either by selecting an existing linework, or by forming a linework object by points with specific code and code string:
     - Set **Linework** to select a linework object from existing linework objects (listed below) or from the map

.

- Set **Code** to form a linework object by points with specific code and code string. Select a code from the drop-down list and a string from the *Strings* list below.
- The plot of the linework is displayed.

- In the **Start** field, specify the start station for the selected linework.
- The **Calc Pt** field will display the default name of the known point's projection on the linework. You can change this name.

  If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
- Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab:
   - Review the results of the calculation:
     - *Projected Point* - the name of the known point's projection on the linework.
     - *Coordinates* - the coordinates of the projected point presented according to the coordinate system settings and display for the current project.
     - *Point* - the name of the known point.
     - *Linework* - the name of the linework.
     - *Tangent Azimuth:* (*Tangent Bearing:*) the direction of the linework segment at the projection point.
     - *Projected Azimuth:* (*Projected Bearing:*) the direction of the perpendicular from the known point to the linework.
     - *Start Station* - the starting station of the linework.
     - *Station:* indicates the distance between the starting point and the projection of the known point on the linework.
     - *Offset* - the horizontal offset between the known point and the projected point.
     - *dHeight* - the vertical offset between the known point and the projected point. The "-" sign means that the known point is lower than the calculated point.
     - *Slope distance* - the computed distance between the known point and the projected point.
   - Click  to save the calculated point to the points list.
   - Click  to save the data to a **.txt* file, if required.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Inverse Linework

To calculate the inverse data for all segments of a known linework.

1. In the **Input** tab:
   - Define the linework, either by selecting an existing linework, or by forming a linework object by points with specific code and code string:
     - Set **Linework** to select a linework object from existing linework objects (listed below) or from the map .
     - Set **Code** to form a linework object by points with specific code and code string. Select a code from the drop-down list and a string from the *Strings* list below.
     - The plot of the linework is displayed.
   - In the **Start** field, specify the start station for the selected linework.
   - Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab:
   - Review the results of the calculation:
     - *Linework* - the name of the linework.
     - *Num Segments* - the number of segments in the linework.
     - *Horz Length* - the total horizontal length of the linework.
     - *Horz Length except gaps* - the horizontal length of the linework, gap segments are excluded from length calculation (displayed if the linework includes gaps).
     - *Start Station* - the starting station of the linework.
     - *End Station* - the ending station of the linework.
     - *Segment:* information about each segment in the linework:
       - *Type* - the type of the segment.
       - *Horz Length* - the horizontal length of the segment.
       - *Azimuth:* (*Bearing:*) the direction of the segment.
       - *Start Station* - the starting station of the segment.
       - *End Station* - the ending station of the segment.
       - *Height* - the increment of the height.
       - *Grade* - the increment of the height in percentage terms.
       - *Slope distance* - the computed distance between the starting station of the segment and the ending station of the segment.
   - Click  to save the data to a **.txt* file, if required.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Point to Plane

To calculate the known point inverse to a known plane.

1. In the **Input** tab:
   - Select the known **Point** name.
   - Select the known **Plane** name.

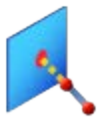
   > **Note:** A point and a plane can be entered manually or selected from the map  or from the list  of points or planes in the project.

   - The **Calc Pt** field will display the default name of the known point's projection on the plane. You can change this name.
   - If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
   - Click the  **Calc** button to calculate the inverse.

2. In the **Results** tab:
   - Review the results of the calculation:
     - *Projected Point* - the name of the known point's projection on the plane.
     - *Coordinates* - the coordinates of the projected point presented according to the coordinate system settings and display for the current project.
     - *From Point* - the name of the known point.
     - *Plane* - the name of the known plane.
     - *Distance to Plane* - the slope distance between the known point and the projection of this point on the plane.
   - Click  to save the calculated point to the points list.
   - Click  to save the data to a **.txt* file, if required.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Inverse Line to Plane

To calculate the intersection point of a known line and a known plane.

1. In the **Input** tab, click the switching button to specify the known line either by start point and end point or direction from the start point (switch to **Start Point**) or an existing line segment (switch to **Segment**).
   - If switched to **Segment**:
     - Click  to select an existing line segment from the map.
       - Start point of the segment is the start point of the line.
       - End point of the segment is the end point of the line.
       - The field **Segment** displays *Line segment* after segment selection.
   - If switched to **Start Point**:
     - Enter the Start point of the line.
     - Click the second switching button to select between **Azimuth** (or **Bearing** if bearing is selected to output directions) or **Az to Point** (**Brg to Point**) to enter the direction of the line manually or specify the second point on the line which will define the direction of the line.
   - Enter the known **Plane** name.

     Note: Point(s) and a plane can be entered manually or selected from the map  or from the list  of points or planes in the project.
   - The **Calc Pt** field will display the default name of a intersection point of the line and the plane. You can change this name.
   - If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
   - Click the  **Calc** button to calculate the inverse.
2. In the **Results** tab:

- Review the results of the calculation:
  - *Projected Point* - the name of a intersection point of the line and the plane.
  - *Coordinates* - the coordinates of the projected point presented according to the coordinate system settings and display for the current project.
  - The *Line* information:
  - *Line Start Point* - the name of the starting point of the line.
  - *Line End Point* - the name of the end point of the line.
  - *Plane* - the name of the known plane.
- Click  to save the calculated point to the points list.
- Click  to save the data to a **.txt* file, if required.

3. The **Map** tab shows the projects's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Point in Direction

To calculate location of a point offset from an existing point by angle and distance.

1. In the **Input** tab:

- In **From Point**, enter a known point manually or select it from the map  or from the list  of points in the project.
- Select between **Azimuth** (or **Bearing** if bearing is selected to output directions) and **Az to Pt** (**Brg to Pt**) to enter the direction at the known point either by value or as a direction to another known point.
- Enter the offsets from the known point:
  - In **Angle Offset** / **Right** / **Left** field, select the **Angle Offset** and set the angle offset from the direction line. To automatically add / subtract 90 or 180 degrees to angle offset, click  and select the desired action. Alternatively, select **Right** or **Left** to set the horizontal distance offset right / left of the offset line.
  - In **Forward** / **Backward** field, set the horizontal distance offset forward / backward of the offset line.

- Specify **Down** / **Up** height offset or the vertical **Grade** offset (in percentage) with respect to the height of the start point. If the grade is falling, the value should be negative.

> **Note:** Optionally, you can select a coordinate system for horizontal distance; horizontal distance in the current grid coordinate system or horizontal distance in the ground coordinate system. To do this, select **Use Grid HD** or **Use Ground HD** option from the dialog menu that displays by clicking ☰ in the top left corner.

- Click the  **Calc** button to calculate the point.

2. In the **Results** tab:

   - Review the results of the calculation:

     - *Calculated Point* - the name of the calculated point.
     - *Coordinates* - the coordinates of the calculated point presented in accordance with the coordinate system settings and display for the current project.
     - *From Point* - the name of the known point.
     - *Forward Azimuth* - the Azimuth from the known point to the calculated point.
     - *Right / Left / Angle Offset* - the horizontal distance offset right /left of the offset line or the angle offset of the offset line.
     - *Forward Azimuth* (*Forward Bearing*) - the direction from the known point to the calculated point.
     - *Vert Offset* / *Vert Distance* - the height offset.

   - Click  to open Calc Points dialog and change the name and set the code and other attributes for the calculated point.
   - To add the calculated point to the project points list, check the box  in a result pane near *Point in Direction* (checked by default) and click . The point is added to the project points list, the box for that point becomes cleared  and  disables.
   - Click  to open Result Export dialog and export the results to a **.txt* file, if required.

3. The **Map** tab shows the project's objects with the new calculated point and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click ☰ to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.



Calculator

The calculator is a powerful tool to do all sorts of calculations and conversions.

The calculator operates in three modes - *Standard*, *Scientific* and *Feet / Inches*; to switch the current mode, use the drop-down list in the dialog title bar.

Type in the entire equation you want to calculate, press equals, and the result is shown:

- *Input Field* (bottom) is where calculations are done. It will accept an entire calculation and then once equals is pressed it will calculate everything at once.
- *Result Field* (middle) is where the result is shown once equals is pressed. This field is also used as the y or theta values for rectangular / polar conversions.
- *Previous Result Field* (top) is where the previous result is moved up to once equals is pressed. This field is also used as the x or r values for rectangular / polar conversions.

The software helps you to enter the values or mathematical expressions without syntax errors:

- the expression will be correctly calculated if one or more right parentheses are not set;
- the multiplication sign automatically sets between the entered value and left parenthesis;
- the multiplication sign automatically sets between the entered value and *Π* or *e*;
- it is impossible to enter a algebraic sign after another algebraic sign;
- the expression will not be calculated and the *ERR: Syntax* message will be displayed if you click "=" after any algebraic sign, left parenthesis, negative sign or fractional inches numerator.

Standard Calculator

The calculator in standard mode allows you to perform standard maths, learn descriptions of the functions:

√x	Calculates the square root of a value.
x^2	Calculates the square of a value.

1/x	Calculates the inverse of a value or 1/x.
x^n	Calculates the nth power of a value in the format x ^ power.
%	Converts the value to a percent or x/100.
MC	Clears the memory.
MR	Recalls the memory value indicated by M in the input field.
MS	Saves the computed result into memory.
M+	Adds the computed result to the value in memory.
DMS+	Adds the left and right values assuming both are in DMS form.
DMS-	Subtracts the right value from the left assuming both are in DMS form.
C	Clears all the fields.
<-	Backspace, removes the last entered symbol, function name with left parenthesis.
copy	If the calculator was started from an edit field, it copies the value back to that field.
+/-	Alternates the last value in the input between positive and negative or appends negative sign to the input.
x	Performs multiplication.
÷	Performs division.
=	Calculates an expression and displays a result.
(	Sets the left parenthesis.
)	Sets the right parenthesis.

Scientific Calculator

The calculator in scientific mode allows you to perform scientific functions, learn descriptions of the functions:

sin	Calculates the sine.
cos	Calculates the cosine.
tan	Calculates the tangent.

arc sin	Calculates the arcsine.
arc cos	Calculates the arccosine.
arc tan	Calculates the arctangent.
log	Calculates the logarithmic value base 10.
ln	Calculates the natural logarithmic value or base e.
√x	Calculates the square root of a value.
x^2	Calculates the square of a value.
1/x	Calculates the inverse of a value or 1/x.
x^n	Calculates the nth power of a value in the format x ^ power.
%	Converts the value to a percent or x/100.
MC	Clears the memory.
MR	Recalls the memory value indicated by M in the input field.
MS	Saves the computed result into memory.
M+	Adds the computed result to the value in memory.
Rad Deg	Converts radians to degrees.
Deg Rad	Converts degrees to radians.
Grad Deg	Converts gradians to degrees.
Deg Grad	Converts degrees to gradians.
Deg DMS	Converts degrees to degrees minutes seconds notation.
DMS Deg	Converts degrees minutes seconds notation to degrees.
Rec Pol	Converts rectangular coordinates (xy) to polar (r theta). This is done by using both result fields, the top one being x, bottom one being y. Enter the values and click Rec Pol and it will convert the top value to r and bottom to theta.

Pol Rec	Converts polar coordinates (r theta) to rectangular (xy). This is done by using both result fields, the top one being r, bottom one being theta. Enter the values and click Pol Rec and it will convert the top value to x and bottom to y.
DMS+	Adds the left and right values assuming both are in DMS form.
DMS-	Subtracts the right value from the left assuming both are in DMS form.
e	The constant e, base of the natural logarithm.
Π	The constant pi, the circumference to diameter ratio for any circle.
C	Clears all the fields.
<-	Backspace, removes the last entered symbol, function name with left parenthesis.
copy	If the calculator was started from an edit field, it copies the value back to that field.
Deg	If this is showing, it means the calculator is working in degrees.
Grad	If this is showing, it means the calculator is working in gradians.
Rad	If this is showing, it means the calculator is working in radians.
+/-	Alternates the last value in the input between positive and negative or appends negative sign to the input.
*****	Performs multiplication.
÷	Performs division.
=	Calculates an expression and displays a result.
(	Sets the left parenthesis.
)	Sets the right parenthesis.

Feet / Inches Calculator

The calculator in feet / inch mode allows you to perform feet and inches calculation, learn descriptions of the functions:

Note: If the entered value does not have any mark (feet or inch), the software will use the value as feet in the calculation.

FT	Sets the Feet mark (') for any entered value. You can use this button once for the value. It is imposable to enter feet sign after inch sign or fractional inch denominator.
IN	Sets the Inch mark (") for any entered value. You can use this button once for the value. It is imposable to enter inch sign after fractional inch denominator.
/	Sets the denominator of fractional inch. Select the required value from the list. The entered by user value is the numerator. You can use this button once for the value.
. and **space bar**	Depending upon the position of the value sets the following: • for the value without any mark (same as clicking the **FT** button): sets the Feet mark (') for any entered value: 7 -> clicking **.** or **space bar** -> 7'; • for the value which entered after Feet (same as clicking the **IN** button) sets the Inch mark (") for any entered value: 7'5-> clicking **.** or **space bar** -> 7'5"; • for the value which entered after Inch (same as clicking the **/** button) sets the denominator of fractional inch. Select the required value from the list. The entered by user value is the numerator: 7'5"4 -> clicking **.** or **space bar** -> select from the list any fractional -> 7'5"4/128; • for the value in Feet sets the Inch mark (''): 7' -> clicking **.** or **space bar** -> 7"; • for the value in Inch sets the denominator of fractional inch. Select the required value from the list. 7" -> clicking **.** or **space bar** -> select from the list any fractional -> 7/128.
√x	Calculates the square root of a value.
x^2	Calculates the square of a value.
1/x	Calculates the inverse of a value or 1/x.
x^n	Calculates the nth power of a value in the format x ^ power.
%	Converts the value to a percent or x/100.
MC	Clears the memory.
MR	Recalls the memory value indicated by M in the input field.
MS	Saves the computed result into memory.
M+	Adds the computed result to the value in memory.
C	Clears all the fields.

<-	Backspace, removes the last entered symbol, function name with left parenthesis or fractional inches denominator.
copy	If the calculator was started from an edit field, it copies the value back to that field.
+/-	Alternates the last value in the input between positive and negative or appends negative sign to the input.
x	Performs multiplication.
÷	Performs division.
=	Calculates an expression and displays a result.
(	Sets the left parenthesis.
)	Sets the right parenthesis.



Session Check

To calculate residuals for repeated measurements of the same physical location in completed survey sessions.

Note: You need to have a number of Survey Sessions in your projects with corresponding data collected.

Sokkia Field calculates residuals for repeated measurements of the same physical point. The measurements should be performed in the same or different sessions. The physical point should be named identically in each session.

Note: You can save two and more points with the same name in the current project, if you select the **Store as check point?** radio button in the Point Check dialog. Sokkia Field performs the comparison with the **last** check measured and saved point of the selected session.

Note: You can see all check points for a point in the Check Points tab of the Edit Point dialog.

To perform the residuals calculation for completed survey sessions:

1. Locate and select completed survey sessions and choose the computation type in the Input Tab 1 - Input Sessions of the dialog.
2. Specify tolerance threshold and reference data in the Input Tab 2 - Input Reference Data of the dialog.
3. Review the results of calculation in the Results tab of the dialog.

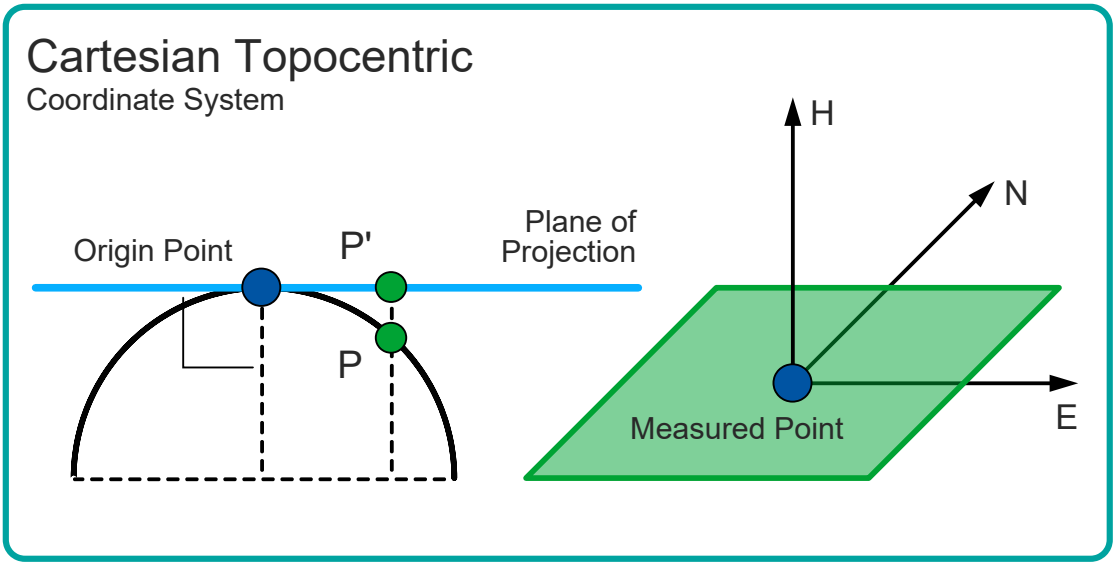
Input Tab 1 - Input Sessions

To select survey sessions and computation type in the Session Check calculation.

- Select the **Computation Type** from the drop-down menu:
  - *Closure* - performs loop closures calculation for the RTK GNSS observations that form a closed loop. More...
  - *Duplicate Vector* - performs comparison of repeated RTK vector components, measured from one base station. More...
  - *Duplicate Coordinates* - performs comparison of RTK points coordinates measured from one base station in the horizontal plane. More...
  - *Check Two Coordinates* - calculates residuals of horizontal distances between control points and RTK measured points. More...
  - *Check Control Points* - calculates residuals of horizontal and vertical distances between control points and RTK measured points. More...
  - *Check Cross Section* - this computation type calculates residuals of two repeated measurements of distances between a central point of the X-section and any other point of the X-section. Sokkia Field calculates the distance measurements residuals in the horizontal and vertical planes. More...
  - *Check Two Sessions* - performs comparison of repeated RTK vector components, measured from one or two base stations and saved in two sessions. More...
  - *Check Topo Meas* - performs comparison of RTK points coordinates measured from one base station command to the receiver. More... This **Computation Type** is shown if you open the *Session Check* dialog from the pop-up menu of the Topo dialog (*Measure* -> *Check Calculation*).

  Sokkia Field calculates residuals of repeated RTK measurements in geocentric coordinate system (X,Y,Z) regardless of the current coordinate system of the project. Depending on the selected computation type, Sokkia Field displays in report and saves residuals of repeated RTK measurements in the following coordinate systems:

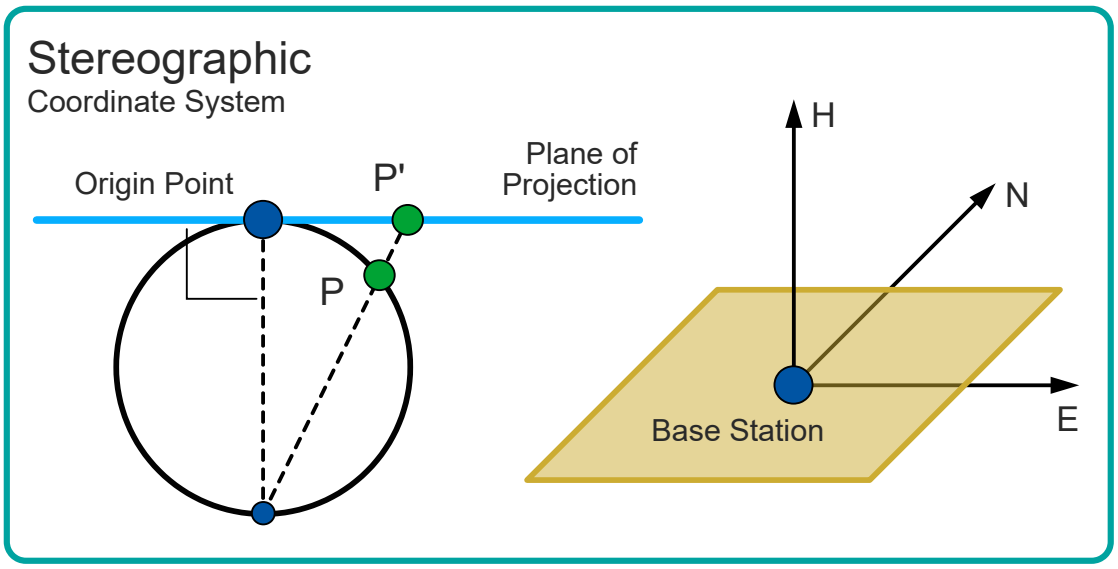
- *Cartesian topocentric coordinate system* - for N,E coordinates such a coordinate system is equivalent to the orthographic projection. A user can select any measured point of the project as the center (origin point) of this projection:



Transformation to such coordinate system is performed for Closure and Duplicate Vector types of computations.

To calculate residuals in the topocentric coordinate system, you should specify central point of the projection in the **Origin Point** field in the Input Tab 2 - Input Reference Data. Select a desired point from the map (click) or from the list of the project points (click).

- *Stereographic coordinate system* is based on the stereographic projection with origin point placed in the location of the base station. If the project contains multiple base stations, the stereographic projection origin is placed in the point, which coordinates are averaged of all base stations coordinates used in the first selected session of the *Input Tab 1 - Input Sessions*:



Transformation to such coordinate system is performed for Duplicate Coordinates, Check Cross Section, Check Two Coordinates, Check Control Points, Check Two Sessions and Check Topo Meas types of computations.

- The tab contains the following columns:
  - *Session* - name of the session with the check box. If the check box is selected, this session is used in the calculation;
  - *Project* - name of the project, where this session is located;
  - *Status* - the calculation status of the session;
  - *Base Pt* - name of the base station which is used in the RTK measurement;
  - *Type* - type of correction data that is used for survey.

- Select the check boxes near the desired sessions to include them into the calculation.
- Click the **From Project** button to open the *Open Project* dialog where you can select a project which contains a corresponding session for residuals calculation. When the project is opened, the desired session is displayed in the tab.
- Click **Next** to specify the reference data for the calculation in the Input Tab 2 - Input Reference Data.

Note: After clicking **Next**, you may need to enter additional data for the selected computation type, see details in the description of the selected computation type.

Computation type: Closure

This computation type performs loop closures calculation for the RTK GNSS observations that form a closed loop. Sokkia Field can perform comparison for:

- two sessions from the current project;
- two sessions from the other project(s);
- one session from the current project and one session from the other project.

There are the following requirements for the RTK measurements:

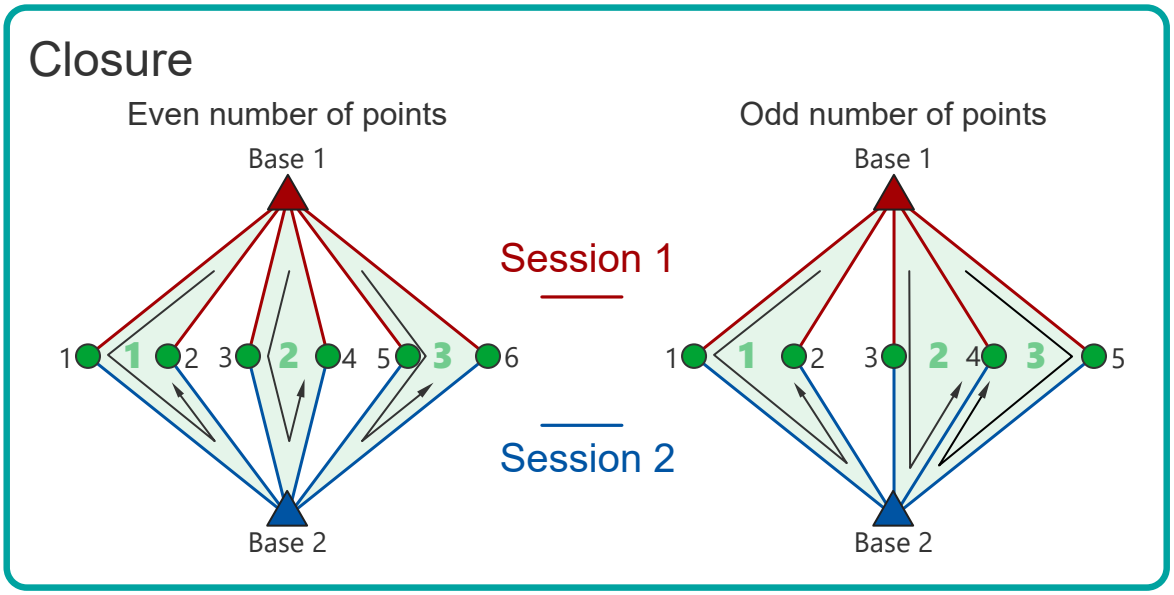
- Two base stations should be to perform measurements;
- Point measured from each base station should be stored in different sessions;
- The same physical point should have the same name in each session;
- Each session should contain at least two measured points.

Sokkia Field calculates residuals for two selected sessions only.

The application calculates loop closures in the geocentric coordinate system (X,Y,Z) and converts these values to a Cartesian topocentric coordinate system (N,E,H). More...

Depending on the number of common points in both sessions, the loop closing order is the following:

Even number of common points in both sessions	Odd number of common points in both sessions
1. Base 1 - pt1 - Base 2 - pt2; 2. Base 1 - pt3 - Base 2 -pt4; 3. Base 1 - pt5 - Base 2 - pt6, etc.	1. Base 1 - pt1 - Base 2 - pt2; 2. Base 1 - pt3 - Base 2 -pt4; 3. Base 1 - final_point - Base 2 - penultimate_ point.



To perform the closure calculation, do the following steps:

1. Select the check boxes of two sessions, which contain the RTK measurements of the same points from different base stations. Click the **Next** button:
2. The application analyzes the closed figure(s) and displays the tab, where:
   - # - number of the closed figures.
   - For each closed figure, the following is shown:
   - # - number of the figure vectors;
   - *Vector* - start and end name of the vector points;
   - *Session* - name of the session, where the point is saved;
   - *Project* - name of the project , where the session is created.
3. Click the **Next** button to set tolerance values for each axis and select the origin point from the map or the list . More...
4. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

If the calculated differences for all axes are less than the threshold values, the test is passed and the  icon is displayed.

If the calculated differences for any axis is more than the threshold values, the test is not passed and the  icon is displayed.

Click the  button to save the calculation results to **.txt* or GNSS-Pro (**.DLF*) file format.

Computation type: Duplicate Vector

This computation type performs comparison of repeated RTK vector components, measured from the same (equal) base station from each selected session. Sokkia Field can perform comparison for:

- two sessions from the current project;
- two sessions from the other project(s);
- one session from the current project and one session from the other project.

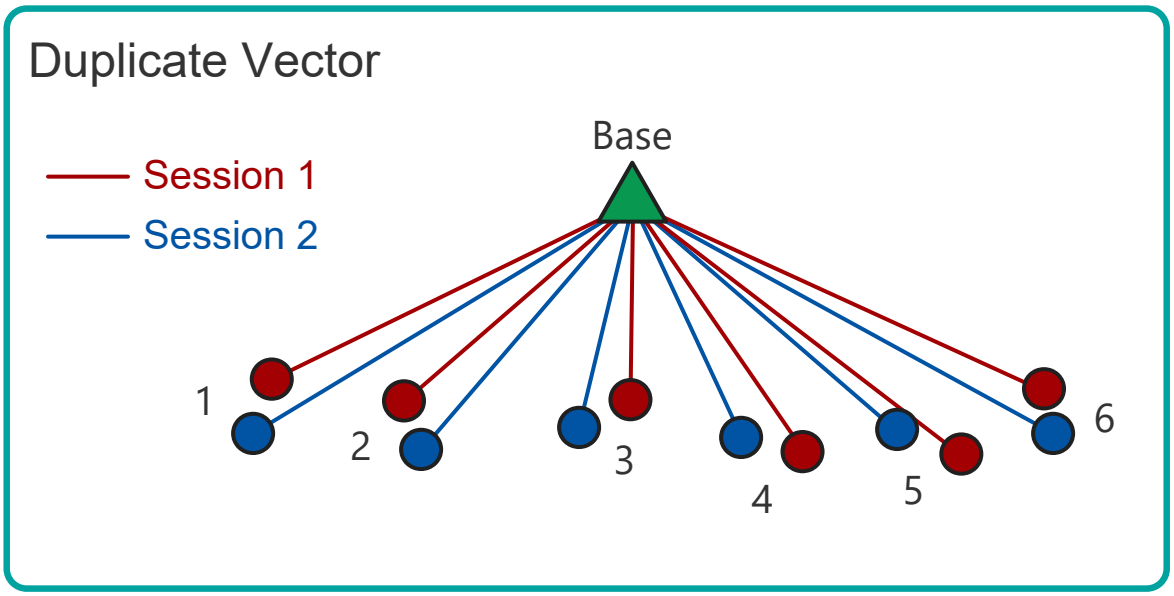
The names of the same base station in different projects or sessions can be different or even completely absent. Sokkia Field compares the sessions using the base stations coordinates.

There are the following requirements for the RTK measurements:

- The same base station should be used to perform measurements;
- The same physical point should have the same name in each session;
- Each session should contain at least one measured point.

Sokkia Field calculates residuals for two selected sessions.

The application calculates the residuals of the vectors components in the geocentric coordinate system (X,Y,Z) and converts these values to a Cartesian topocentric coordinate system (N,E,H). More...



To perform the duplicate vector calculation, do the following steps:

1. Select the check boxes of two sessions, which contain the measurements of the same RTK vectors from one base station.
2. Click the **Next** button to set tolerance values for each axis and select the origin point from the map or the list . More...
3. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated differences for all axes are less than the threshold values, the test is passed and the icon is displayed.

   If the calculated differences for any axis are more than the threshold values, the test is not passed and the icon is displayed.

   Click the button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format.

Computation type: Duplicate Coordinates

This computation type performs comparison of RTK points coordinates, measured from the same (equal) base station from each selected session in the horizontal plane.

Sokkia Field can perform comparison for:

- two sessions from the current project;
- two sessions from the other project(s);
- one session from the current project and one session from the other project.

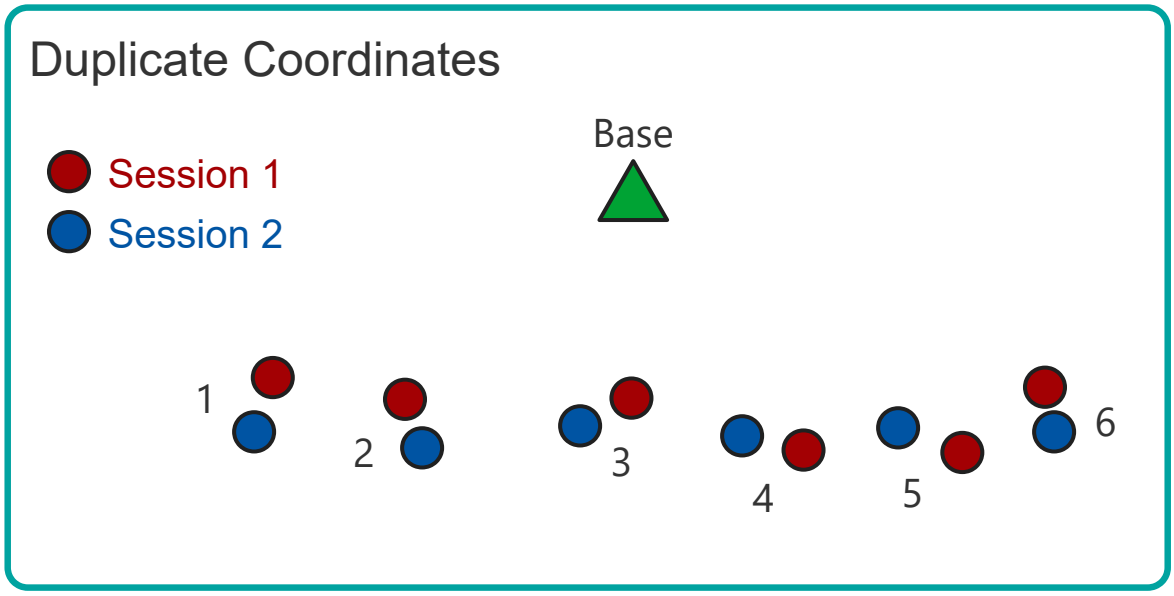
The names of the same base station in different projects or sessions can be different or even completely absent. Sokkia Field compares the sessions using the base stations coordinates.

There are the following requirements for the RTK measurements:

- The same base station should be used to perform measurements;
- The same physical point should have the same name in each session;
- Each session should contain at least one measured point.

Sokkia Field calculates residuals for two selected sessions.

The application calculates residuals of the RTK point coordinates in the geocentric coordinate system (X,Y,Z) and converts these values to a coordinate system that is based on the stereographic projection (N,E) with origin point in the location of the base station. More...



To perform the duplicate coordinates calculation, do the following steps:

1. Select the check boxes of two sessions, which contain the measurements of the same points from one base station.

2. Click the **Next** button to set tolerance values for each axis.
3. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated differences for X and Y axes are less than the threshold values, the test is passed and the  icon is displayed.

   If the calculated differences for X or Y axes are more than the threshold values, the test is not passed and the  icon is displayed.

   Click the  button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format.

Computation type: Check Two Coordinates

This computation type calculates residuals of horizontal distances between two pairs of the following points:

- Control points;
- RTK measured points.

Sokkia Field can perform comparison for:

- one session of the current project;
- one session from another project.

There are the following requirements for calculation of the residuals:

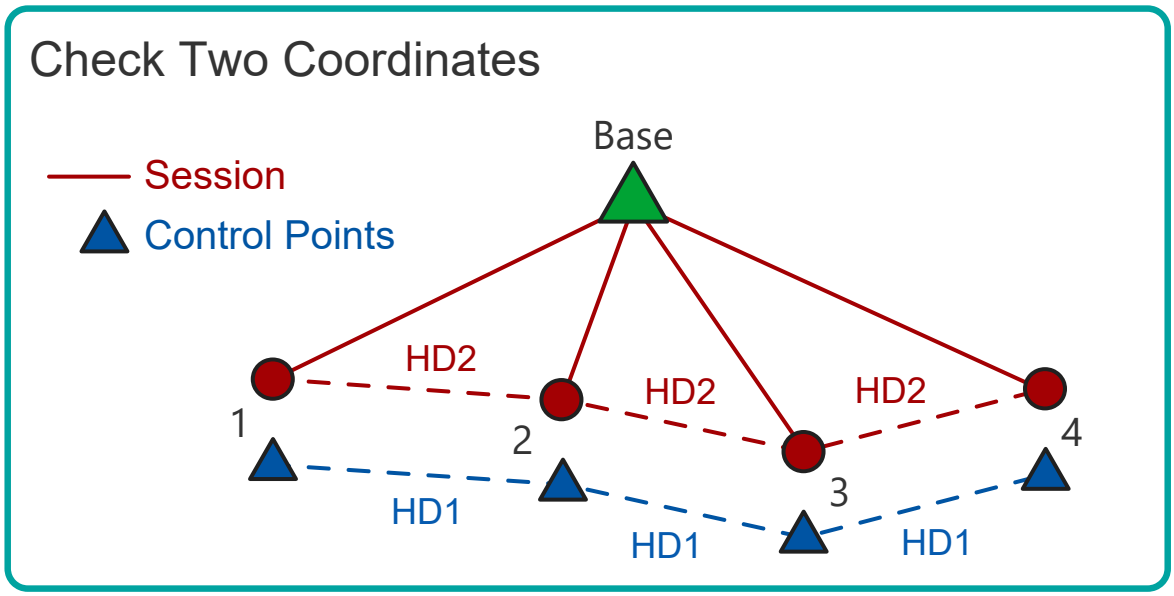
- The same base station should be used to perform measurements;
- Survey session should contain at least two measured points;
- The project should contain at least two control points;
- The same physical and control point should have the same name.

Sokkia Field calculates residuals for one selected session and control points of the current project.

The application calculates residuals of horizontal distance between the control points and measured RTK points in the geocentric coordinate system (X,Y,Z) and converts the values to a coordinate system that is based on the stereographic projection (N,E) with origin point in the location of the base station. More...

The calculation uses the formula ΔHD = HD1 - HD2, where:

- HD1 - horizontal distance between two control points;
- HD2 - horizontal distance between two measured points.



To calculate the horizontal distance residuals, do the following steps:

1. Make sure that your project contains control point(s).
2. Select the check box of the session, which contains the RTK measurements of control points from one base station.
3. Click the **Next** button to set tolerance values in the horizontal plane (ΔHD).
4. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated difference is less than the threshold values, the test is passed and the icon is displayed.

   If the calculated difference is more than the threshold value, the test is not passed and the icon is displayed.

   Click the button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format. Semi-colons in the file name will be automatically replaced with the underscore symbols ("_").

> **Note:** When performing export to a GNSS-Pro (**.DLF*) file, original raw data and session check calculation results will be included to the output files. The observation method will be automatically specified as "Indirect" in the output files (this flag is required by the "GNSS-Pro"application).

Computation type: Check Control Points

This computation type calculates residuals of horizontal and vertical distances between two pairs of the following points:

- Control points;
- RTK measured points.

Sokkia Field can perform comparison for:

- one session of the current project;
- one session from the another project.

There are the following requirements for calculation of the residuals:

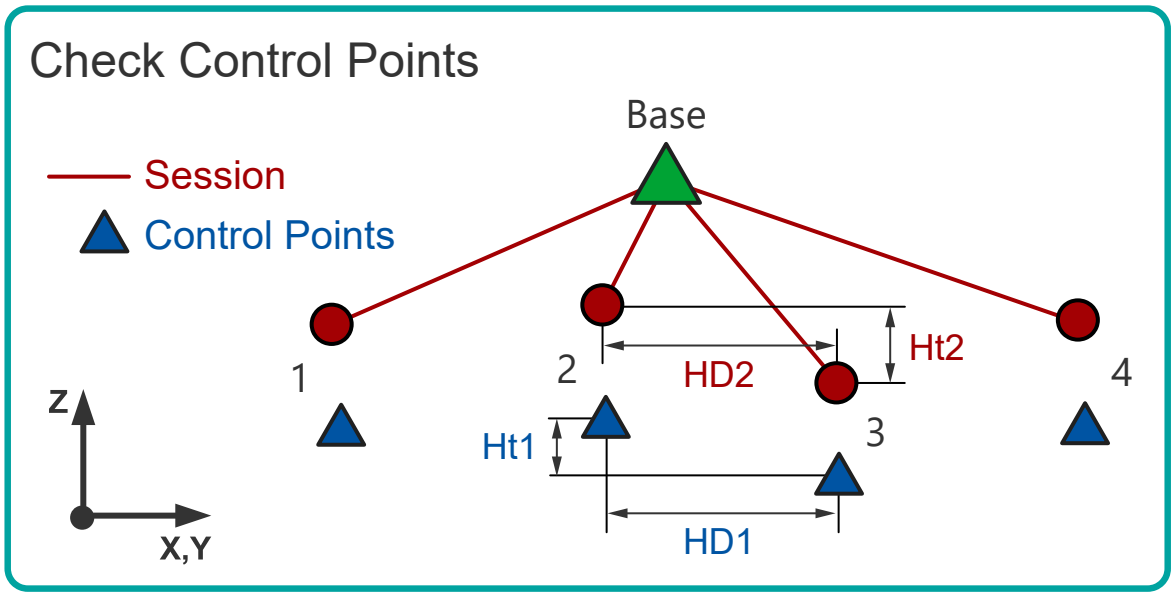
- The same base station should be used to perform measurements;
- Survey session should contain at least two measured points;
- The project should contain at least two control points;
- The same physical and control point should have the same name.

Sokkia Field calculates residuals for one selected session and control points of the current project.

The application calculates the residuals of distance measurements in horizontal and vertical planes between control points and measured RTK points in geocentric coordinate system (X,Y,Z) and converts the values to a coordinate system that is based on stereographic projection (N,E) with origin point in the location of the base station. More...

The calculation uses the formulas ΔHD = HD1 - HD2 and ΔHt = Ht1 - Ht2, where:

- HD1 - horizontal distance between two control points;
- HD2 - horizontal distance between two measured points;
- Ht1 - vertical distance between two control points;
- Ht2 - vertical distance between two measured points.



To calculate the residuals, do the following steps:

1. Make sure that your project contains control point(s).
2. Select the check box of the session, which contains the RTK measurements of control points from one base station.
3. Click the **Next** button to set tolerance values in the horizontal (ΔHD) and vertical planes (ΔHt).
4. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated differences in the horizontal and verticals planes are less than the threshold values, the test is passed and the icon is displayed.

   If the calculated differences for any planes are more than the threshold values, the test is not passed and the icon is displayed.

   Click the button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format.

Computation type: Check Cross Section

This computation type calculates residuals of two repeated measurements of distances between a center point of the X-section and any other point of the X-section. Sokkia Field calculates the distance measurements residuals in the horizontal and vertical planes.

Sokkia Field can perform comparison for:

- two sessions from the current project;
- two sessions from the other project(s);
- one session from the current project and one session from the other project.

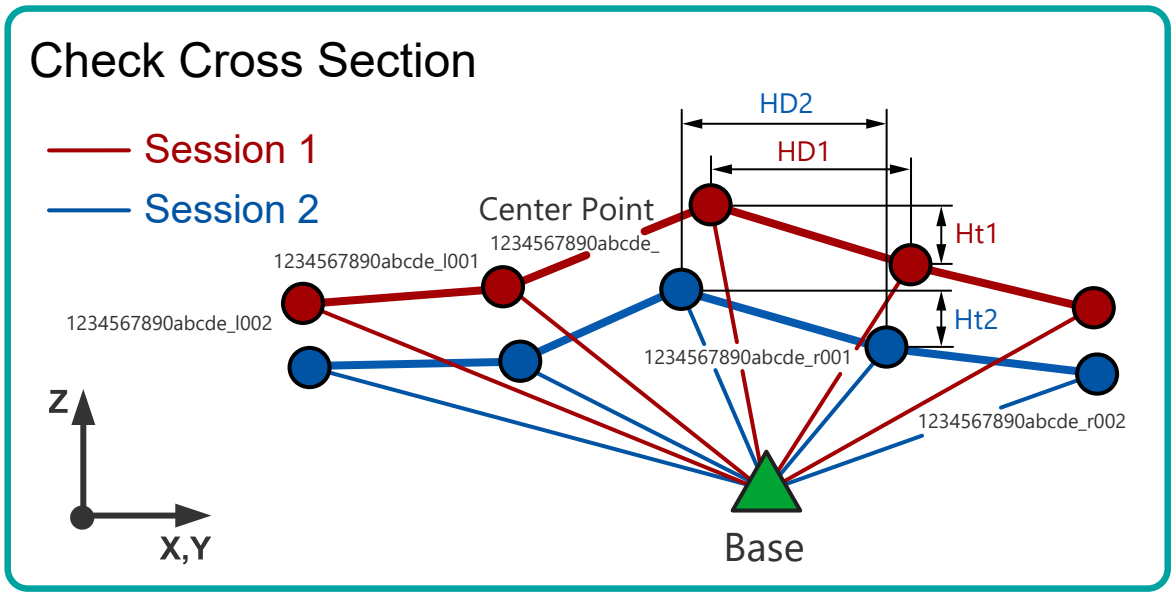
There are the following requirements for the RTK measurements:

- The same base station should be used to perform measurements;
- The repeated road points measured should be stored in different sessions;
- Each session should contain at least two measured points;
- The X-section center point name should contain 16 characters (e.g. 1234567890abcde_);
- The X-section point name (except for the center point) must contain the center point name and 4 extra characters (e.g. 1234567890abcde_R001).

Sokkia Field calculates residuals of distance measurements in horizontal and vertical planes between a central point of the X-section and any other point of the X-section in the geocentric coordinate system (X,Y,Z) and converts these values to a coordinate system that is based on the stereographic projection (N,E) with origin point in the location of the base station. More...

The calculation uses the formulas ΔHD = HD1 - HD2 and ΔHt = Ht1 - Ht2, where:

- HD1 - horizontal distance between Center point and X-section point saved in the first session;
- HD2 - horizontal distance between Center point and X-section point saved in the second session;
- Ht1 - vertical distance between Center point and X-section point saved in the first session;
- Ht2 - vertical distance between Center point and X-section point saved in the second session;



To calculate the residuals, do the following steps:

1. Select the check boxes of two sessions, which contain the RTK measurements of the same x-section from one base station.
2. Click the **Next** button to set tolerance values in the horizontal (ΔHD) and vertical (ΔHt) planes.
3. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated differences in the horizontal and verticals planes are less than the threshold values, the test is passed and the icon is displayed.

   If the calculated differences for any planes are more than the threshold values, the test is not passed and the icon is displayed.

   Click the button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format.

Computation type: Check Two Sessions

This computation type performs comparison of repeated RTK vector components, measured from the same or two different base stations and saved in two sessions.

Sokkia Field can perform comparison for:

- two sessions from the current project;
- two sessions from the other project(s);
- one session from the current project and one session from the other project.

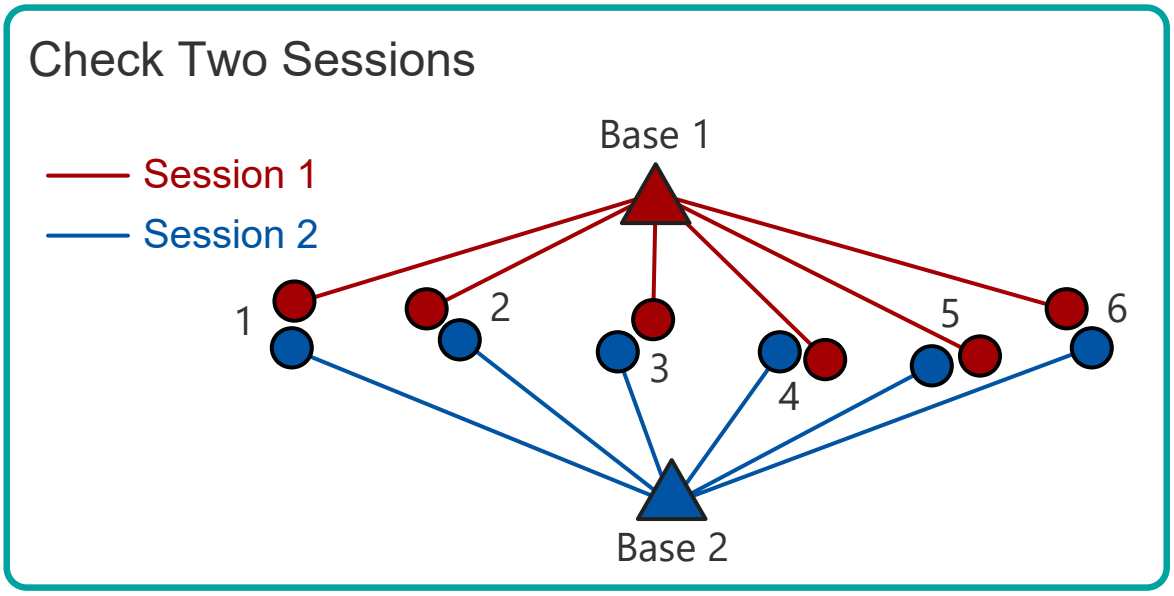
The names of the same base station in different projects or sessions can be different or even completely absent. Sokkia Field compares the sessions using the base stations coordinates.

There are the following requirements for the RTK measurements:

- One or two base stations should be used to perform measurements;
- The same physical point should have the same name in each session;
- Each session should contain at least one measured point.

Sokkia Field calculates residuals for two selected sessions.

The application calculates the residuals of the vectors components in the geocentric coordinate system (X,Y,Z) and converts these values to a coordinate system that is based on the stereographic projection (N,E) with origin point in the location of the base station. More...



To perform the check two sessions calculation, do the following steps:

1. Select the check boxes ☑ of two sessions, which contain the RTK measurements of the same points.

2. Click the **Next** button to set tolerance values for each axis.
3. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated differences for all axes are less than the threshold values, the test is passed and the  icon is displayed.

   If the calculated differences for any axis is more than the threshold values, the test is not passed and the  icon is displayed.

   Click the  button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format. Semi-colons in the file name will be automatically replaced with the underscore symbols ("_").

   Note: When performing export to a GNSS-Pro (**.DLF*) file, original raw data and session check calculation results will be included to the output files. The observation method will be automatically specified as "Indirect" in the output files (this flag is required by the "GNSS-Pro"application).

Computation type: Check Topo Meas

This computation type performs comparison of RTK points coordinates measured from the same base station.

Note: This computation type is shown in the list, if you run the *Session Check* procedure from the pop-up menu of the **Topo** dialog by clicking *Measure* -> *Check Calculation*.

There are the following requirements for the RTK measurements:

- The RTK measurements should be performed in the *Topo* mode.
- The same base station should be used to perform measurements;
- The same physical point should have the same name in one session;
- The Survey session should contain at least one measured point.

Sokkia Field calculates residuals for the current session.

The application calculates the residuals of the points coordinates in the geocentric coordinate system (X,Y,Z) and converts these values to a coordinate system that is based on the stereographic projection (N,E) with origin point in the location of the base station. More...

To perform the calculation, do the following steps:

1. Select the  check box for the session, which contains the RTK measurement(s) of the point(s), measured from the same base station.
2. Click the **Next** button to set tolerance values for each axis. More...
3. Click the **Calc** button to start residuals calculation. The Results tab displays the residuals values.

   If the calculated differences in the horizontal and verticals planes are less than the threshold values, the test is passed and the  icon is displayed.

   If the calculated differences for any planes is more than the threshold values, the test is not passed and the  icon is displayed.

Input Tab 2 - Input Reference Data

To specify the reference data for the Session Check calculation.

This tab opens after clicking **Next** in the Input Tab 1 - Input Sessions.

> **Note:** Prior to enter the reference data, you may need to enter additional data for the selected computation type, see details in the description of the selected computation type.

- Set the **Tolerances** for the data used in the calculation. The content of the fields on this dialog depends on the selected computation type. You can use predefined types for tolerances from the drop-down list available after selecting the **Use Predefined Types** check box.
- Select the **Origin Point** from the map  or the list  for the computation type Closure or Duplicate Vector.
- Click **Calc** to calculate and open the Results tab.

Results Tab

Review the results of the Session Check calculation.

- *Status*
  - the status mark is green , if the coordinate difference in checked points is less than the corresponding tolerance values,

- the status mark is red , if the coordinate difference in checked points is greater than the corresponding tolerance values.

- *Point data* - point name, coordinate or distance differences for displayed points, name of the base point(s) and session number(s).

Click the  button to save the calculation results to **.txt* or GNSS-Pro(**.DLF*) file format.



Calculate Curves

Click an icon to open the calculation task:



Curve
To calculate the full set of curve parameters from length and radius parameters.



3Pt Curve
To calculate the curve parameters from three points - the PC point (start point of the curve), PT point (end point of the curve) and any point on the curve, or from the PC point, PT point and Radius point.



PI & Tangents
To calculate the curve parameters - PC point (start point of the curve), PT point (end point of the curve) and Radius point from two tangents and the point of their intersection (PI).



Radius & Points
To calculate the curve parameters and the coordinates of the Radius point from the start and end points of the curve and a radius parameter.



Spiral
To calculate the full set of spiral parameters from curvature change parameters and spiral length.



Traverse
To calculate the parameters of a traverse curve from the traverse point and traverse direction and curve radius and length parameters.

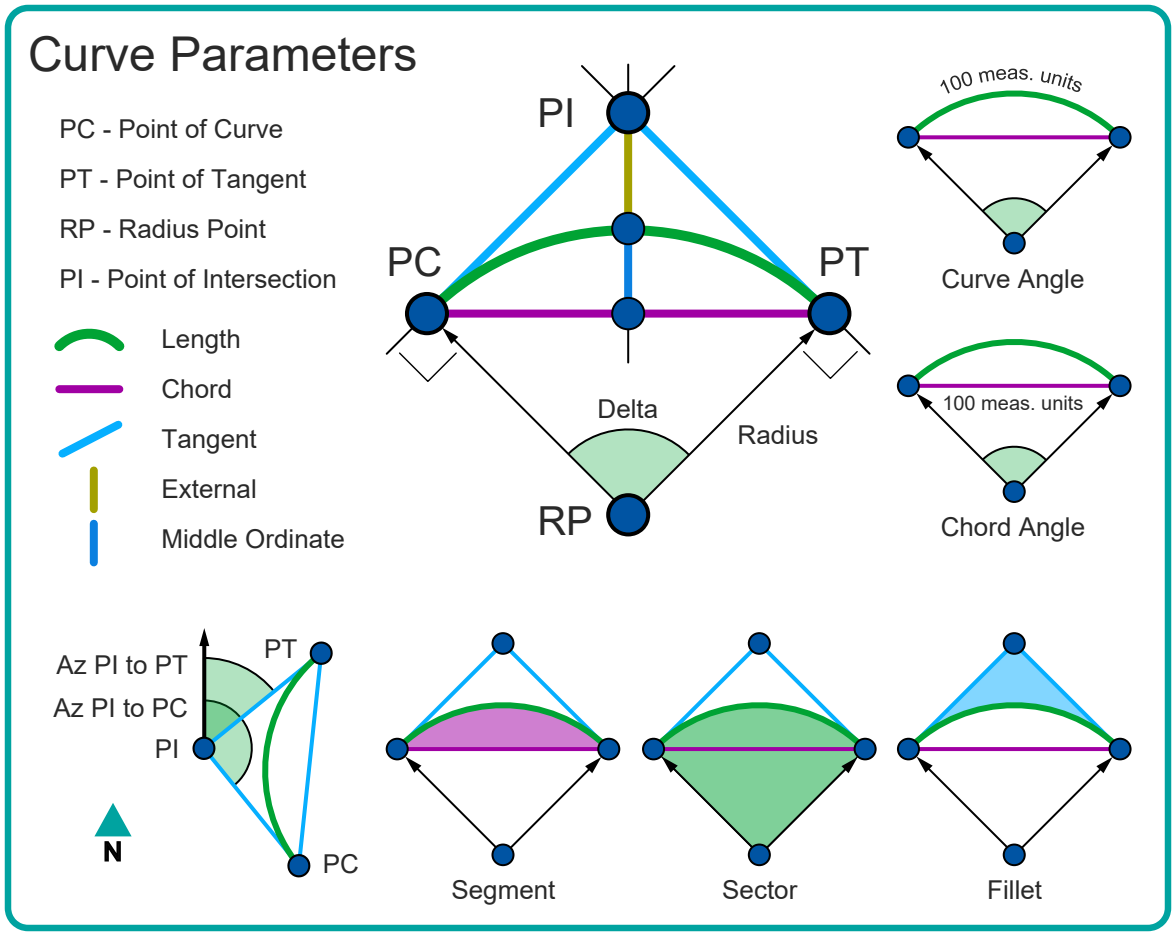


Vertical Curve

To calculate the vertical curve parameters and find stations and elevations for points of vertical curve.

Curve Parameters

To view the curve parameters in Sokkia Field that are used in input by user and in output calculated by the software.



Curve Solution

To calculate the full set of curve parameters when a curvature parameter and a length parameter are given:

Open the illustration of curve parameters used in Sokkia Field.

1. In the **Input** tab, specify one curvature and one length parameter:
   - Select one of the curvature parameters **Radius** / **Chord Angle** / **Curve Angle** and enter the value.
   - Select one of the length parameters of the curve **Delta** / **Length** / **Chord** / **Tangent** / **Mid Ord** / **External** and enter the value.
   - Select the *Left* (counterclockwise) or *Right* (clockwise) direction of curve **Turn**, relative to the PC Point.
   - Check the displayed preview of the curve in the horizontal plane.
   - Click the  **Calc** button to calculate the curve parameters.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
   - *Radius* of the curve.
   - *Length* of the curve.
   - *Chord* is the distance between the start and end points (tangent points) of the curve.
   - *Curve angle* defines the angle in degrees which is used to compute the radius of curve with the length of 100 units.
   - *Chord angle* defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long.
   - *Delta* is the internal angle from center to tangent points.
   - *Tangent* is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.
   - *External* is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).
   - *Mid Ord* is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.
   - *Segment* is the area of a circle bounded by a chord and the circular curve that it cuts off.
   - *Sector* is the area of a circle bounded by two radii and the circular curve they determine.
   - *Fillet* is the area between the circular curve and the two tangents at the start and end points of the curve.

3. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Three Point Curve

To calculate the curve parameters from three points - the PC point (start point of the curve), PT point (end point of the curve) and any point on the curve, or from the PC point, PT point and Radius point.

Open the illustration of curve parameters used in Sokkia Field.

1. In the **Input** tab, specify three points to use in calculation. Every point can be entered manually or selected from the map  or from the list  of points in the project:
   - Select which first point will be used to calculate the curve parameters, **PC Point** (the point of curve) or **RP Point** (radius point). Depending upon the first curve point chosen, you can define the curve by two different sets of points:
     - Specify the **PC Point** (point of curve) , the **Curve Point** (any point on the curve), the **PT point** (point of tangent).
       In this case, the coordinates of the **RP Point** (radius point) will be calculated based on specified curve parameters. You can manually change an automatically suggested point name. Select the code for this calculated point from the existing codes and, if required, click  to set the point's attributes. More...
     - Specify the **RP Point** (radius point), **PC Point** (point of curve), the **PT point** (point of tangent).
       In this case, the distance between RP point and PC point should be equal to the distance between RP point and PT point, and two curves can be created: a *Small* curve of 180 degrees or less and a *Large* curve of 180 degrees or more. From the **Curve** drop-down list, select which of these two curves should be used for computations.
   - Click the  **Calc** button to calculate the curve parameters.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
   - *RP Point* is the name of the calculated radius point. To add the calculated RP point to the project, ensure the check box near the calculated point is checked , then click .
   - *Coordinates* of calculated RP point.
   - *Radius* of the curve.

- *Length* of the curve.
- *Chord* is the distance between the start and end points (tangent points) of the curve.
- *Curve angle* defines the angle in degrees which is used to compute the radius of curve with the length of 100 units.
- *Chord angle* defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long.
- *Delta* is the internal angle from center to tangent points.
- *Tangent* is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.
- *External* is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).
- *Mid Ord* is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.
- *Segment* is the area of a circle bounded by a chord and the circular curve that it cuts off.
- *Sector* is the area of a circle bounded by two radii and the circular curve they determine.
- *Fillet* is the area between the circular curve and the two tangents at the start and end points of the curve.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click ☰ to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.



PI & Tangents

To calculate the curve parameters - PC point (start point of the curve), PT point (end point of the curve) and Radius point from two tangents and the point of their intersection (PI).

Open the illustration of curve parameters used in Sokkia Field.

1. In the **Input** tab, specify two tangents directions and the point of intersection:
   - Specify the **PI Point** (point of intersection of the tangents). Enter a point name manually, or select from the map  or from the list  of points in the project.

- In **Az PI to PC** (**Brg PI to PC** if bearing is selected to output directions), enter the direction from the PI point to the PC point (point of curve, the start point of the curve).
- In **Az PI to PT** (**Brg PI to PT** if bearing is selected to output directions), enter the direction from the PI point to the PT point (point of tangent, the end point of the curve).
- Select one of the curvature parameters **Radius** / **Chord Angle** / **Curve Angle** / **Tangent** and enter the value.
- The coordinates of the **PC Point** (point of curve), **PT Point** (point of tangent), **RP Point** (radius point) will be calculated based on specified curve parameters. You can manually change an automatically suggested point name. Select the code for this calculated point from the existing codes and, if required, click  to set the point's attributes. More....
- Click the  **Calc** button to calculate the curve parameters.

2. In the **Results** tab, review the results of the calculation and click  to save the data to **.txt* file, if required:
   - *PC point*, *PT point* and *RP point* are the names of the respective calculated points. To add calculated points to the project, ensure the check boxes near all desired points are checked , then click .
   - *Coordinates* of calculated points: PC point, PT point and RP point.
   - *Radius* of the curve.
   - *Length* of the curve.
   - *Chord* is the distance between the start and end points (tangent points) of the curve.
   - *Curve angle* defines the angle in degrees which is used to compute the radius of curve with the length of 100 units.
   - *Chord angle* defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long.
   - *Delta* is the internal angle from center to tangent points.
   - *Tangent* is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.
   - *External* is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).
   - *Mid Ord* is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.
   - *Segment* is the area of a circle bounded by a chord and the circular curve that it cuts off.
   - *Sector* is the area of a circle bounded by two radii and the circular curve they determine.
   - *Fillet* is the area between the circular curve and the two tangents at the start and end points of the curve.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click ☰ to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.



Radius & Points

To calculate the curve parameters and the coordinates of the Radius point from the start and end points of the curve and a radius parameter.

Open the illustration of curve parameters used in Sokkia Field.

1. In the **Input** tab, specify the start and end points and radius parameter:
   - Specify the **PC Point** (point of curve, the start point of the curve). Enter a point name manually, or select from the map  or from the list  of points in the project.
   - Specify the **PT Point** (point of tangent, the end point of the curve). Enter a point name manually, or select from the map  or from the list  of points in the project.
   - Select one of the curvature parameters **Radius** / **Chord Angle** / **Curve Angle** and enter the value.
   - Select the *Left* (counterclockwise) or *Right* (clockwise) direction of curve **Turn**, relative to the PC Point.
   - The radius, and the PC and PT points define two curves: a *Small* curve of 180 degrees or less and a *Large* curve of 180 degrees or more. From the **Curve** drop-down list, select which of these two curves should be used for computations.
   - The coordinates of the **RP Point** (radius point) will be calculated based on specified curve parameters. You can manually change an automatically suggested point name. Select the code for this calculated point from the existing codes and, if required, click  to set the point's attributes. More...
   - Click the  **Calc** button to calculate the curve parameters.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
   - *RP Point* is the name of the calculated radius point. To add the calculated RP point to the project, ensure the check box near the calculated point is checked , then click .
   - *Coordinates* of calculated RP point.
   - *Radius* of the curve.
   - *Length* of the curve.
   - *Chord* is the distance between the start and end points (tangent points) of the curve.
   - *Curve angle* defines the angle in degrees which is used to compute the radius of curve with the length of 100 units.
   - *Chord angle* defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long.
   - *Delta* is the internal angle from center to tangent points.
   - *Tangent* is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.
   - *External* is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).
   - *Mid Ord* is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.
   - *Segment* is the area of a circle bounded by a chord and the circular curve that it cuts off.
   - *Sector* is the area of a circle bounded by two radii and the circular curve they determine.
   - *Fillet* is the area between the circular curve and the two tangents at the start and end points of the curve.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click  to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.

Spiral Solution

To calculate the full set of spiral parameters from curvature change parameters and spiral length.

1. In the **Input** tab, specify the spiral type, length and curvature change parameters:
   - In **Spiral Type**, select the type of the spiral to be calculated between two points of curvature change:
     - *TS To SC* from a tangent to a circular curve (start point is the intersection tangent in - spiral, end point is the intersection spiral - circular curve).
     - *CS To ST* from a circular curve to a tangent (start point is the intersection circular curve - spiral, end point is the intersection spiral - tangent out).
     - *CS To SC* between two circular curves (start point is the intersection circular curve in - spiral, end point is the intersection spiral - circular curve out).

     Open the illustration of spiral types used in Sokkia Field.
   - For *CS To SC* and *CS To ST* types of spiral, select one of the curvature parameters of the adjoining circular curve **Radius** / **Chord Angle** / **Curve Angle** at the **Start** point and enter the value.
   - For *CS To SC* and *TS To SC* types of spiral, select one of the curvature parameters of the adjoining circular curve **Radius** / **Chord Angle** / **Curve Angle** at the **End** point and enter the value.
   - Select one of the length parameters of the spiral **Length** / **Spiral Constant** and enter the value.
   - Enter the **Azimuth** (or **Bearing** if bearing is selected to output directions) of the tangent at the start point, or click  to calculate the value from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.
   - Select the *Left* (counterclockwise) or *Right* (clockwise) direction of spiral **Turn**, relative to the start point.
   - Check the displayed preview of the spiral in the horizontal plane.
   - Click the  **Calc** button to calculate the spiral parameters.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
   - *Type* displays the type of the spiral.
   - *Length* is the total length of spiral curve from Start Point to End Point (for all spiral types).
   - *Radius Out* is the end radius of the spiral of TS to SC or CS to SC type.
   - *Radius In* is the start radius of the spiral of CS to ST or CS to SC type.
   - *Turn* is the direction of turn of the spiral. The Right value stands for clockwise direction and the Left value, for counterclockwise direction (for all spiral types).

- *Tangent In Azimuth (Bearing)* is the direction of the tangent to the start point of the spiral (for all spiral types).
- *Tangent Out Azimuth (Bearing)* is the direction of the tangent to the end point of the spiral (for all spiral types).
- *Spiral Constant* is the square root of the length multiplied by the radius of the spiral (for all spiral types).
- *Deg Curve* defines the angle in degrees used to compute the radius of the curve, whose length is 100 units long. Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows:

$$R = \frac{100 \times 180}{\pi} \times \frac{1}{DCV}$$

  Start Deg Curve and *End Deg Curve* values are available for circular curve in and circular curve out respectively, in spirals of the CS to SC type.

- *Deg Chord* defines the angle in degrees used to compute the radius of the curve whose chord length is 100 units long. Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows:

$$R = \frac{50}{\sin\left(\frac{DCH}{2}\right)}$$

  Start Deg Chord and *End Deg Chord* values are available for circular curve in and circular curve out respectively, in spirals of the CS to SC type.

- *End Point X* and *End Point Y* displays the horizontal offsets of the end point from the start point.

3. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

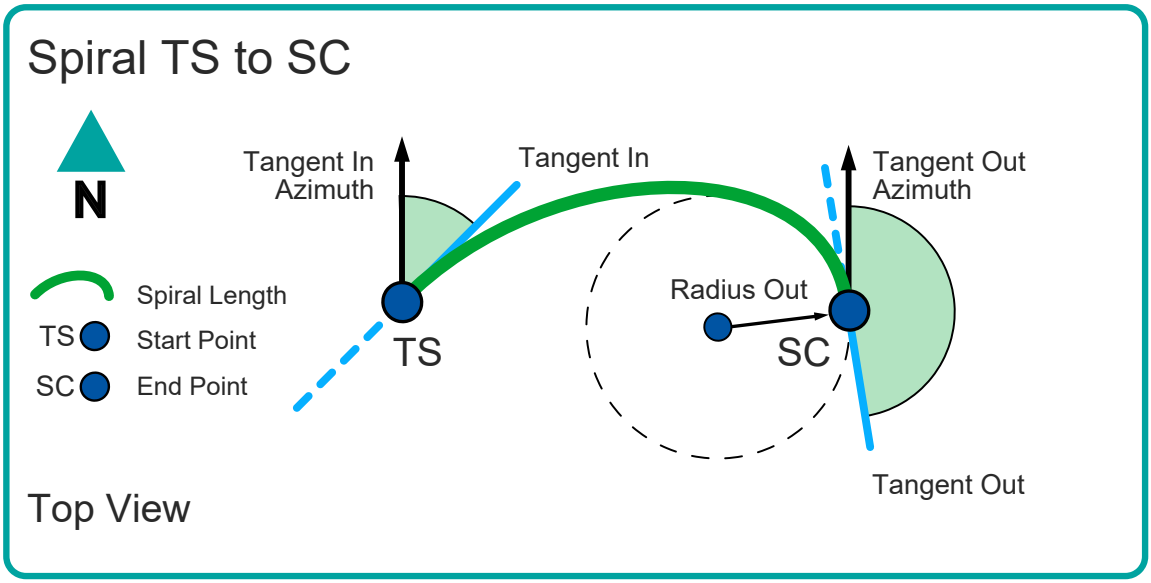
Click ☰ to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.

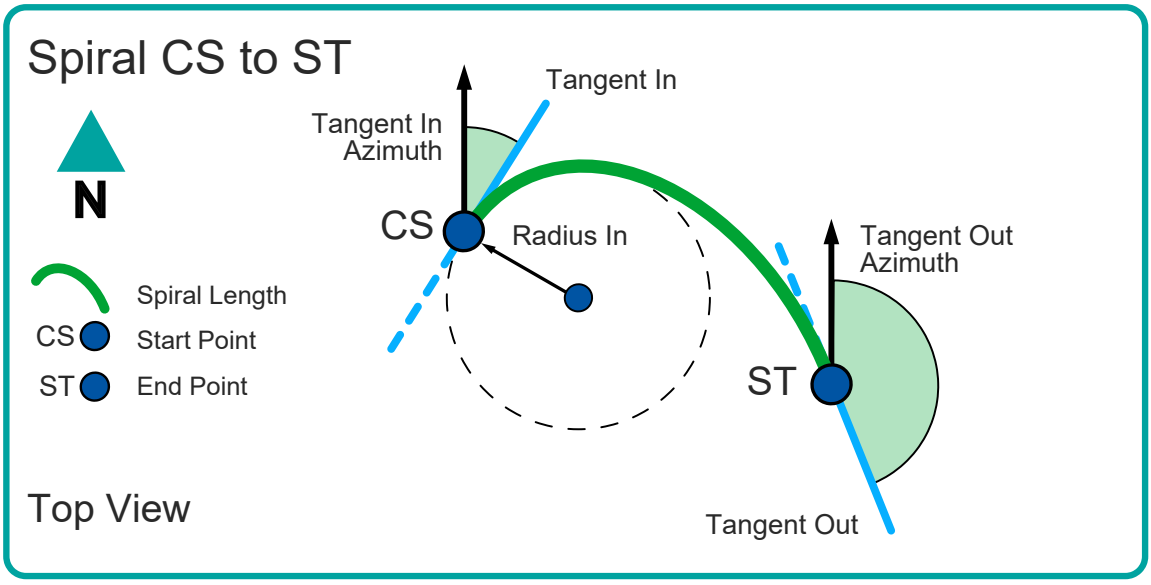
Spiral Types

To view the types of spiral that can be calculated by Sokkia Field.

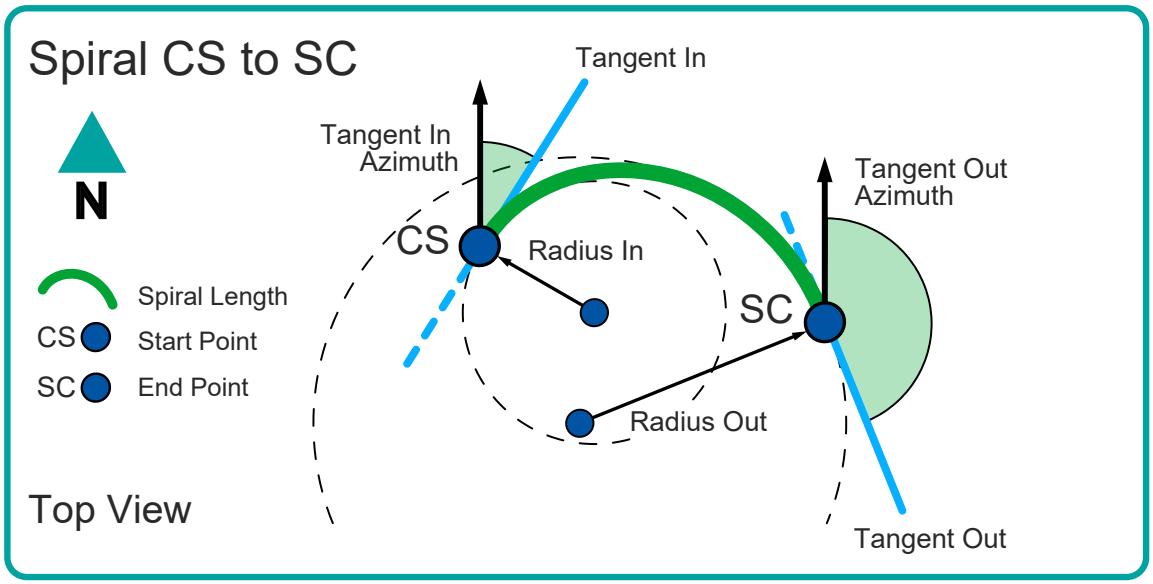
- Spiral **TS to SC** (from *Tangent In - Spiral* point to *Spiral - Circular Curve Out* point):



- Spiral **CS to ST** (from *Circular Curve In - Spiral* point to *Spiral - Tangent Out* point):



- Spiral **CS to SC** (from *Circular Curve In - Spiral* point *to Spiral - Circular Curve Out* point):





Traverse Curve

To calculate the parameters of a traverse curve from the traverse point and traverse direction and curve radius and length parameters.

Open the illustration of curve parameters used in Sokkia Field.

1. In the **Input** tab, specify the traverse point and direction, curve radius and length parameters:
   - Specify the **PC Point** (point of curve, the start point of the curve). Enter a point name manually, or select from the map  or from the list  of points in the project.
   - Select one of the curvature parameters **Radius** / **Chord Angle** / **Curve Angle** and enter the value.
   - Select one of the length parameters of the curve **Delta** / **Length** / **Chord** / **Tangent** / **Mid Ord** / **External** and enter the value.
   - Enter the **Azimuth** (or **Bearing** if bearing is selected to output directions) of the tangent at the PC Point (the start point of the curve), or click  to calculate the value from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.
   - Select the *Left* (counterclockwise) or *Right* (clockwise) direction of curve **Turn**, relative to the PC Point.

- The coordinates of the **PT Point** (point of tangent, end point of the curve) will be calculated based on specified curve parameters. You can manually change an automatically suggested point name. Select the code for this calculated point from the existing codes and, if required, click  to set the point's attributes. More...
- Check the displayed preview of the curve in the horizontal plane.
- Click the  **Calc** button to calculate the curve parameters.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file, if required:
   - *PT Point* is the name of the calculated point of tangent, the end point of the curve. To add the calculated PT point to the project, ensure the check box near the calculated point is checked , then click .
   - *Coordinates* of calculated PT point.
   - *PC Point* is the name of the traverse point, the start point of the traverse curve.
   - *Radius* of the curve.
   - *Length* of the curve.
   - *Chord* is the distance between the start and end points (tangent points) of the curve.
   - *Curve angle* defines the angle in degrees which is used to compute the radius of curve with the length of 100 units.
   - *Chord angle* defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long.
   - *Delta* is the internal angle from center to tangent points.
   - *Tangent* is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.
   - *External* is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).
   - *Mid Ord* is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.
   - *Segment* is the area of a circle bounded by a chord and the circular curve that it cuts off.
   - *Sector* is the area of a circle bounded by two radii and the circular curve they determine.
   - *Fillet* is the area between the circular curve and the two tangents at the start and end points of the curve.
   - *Start Azimuth* (*Start Bearing*) is the direction of the tangent at the start point of the curve.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click ☰ to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.

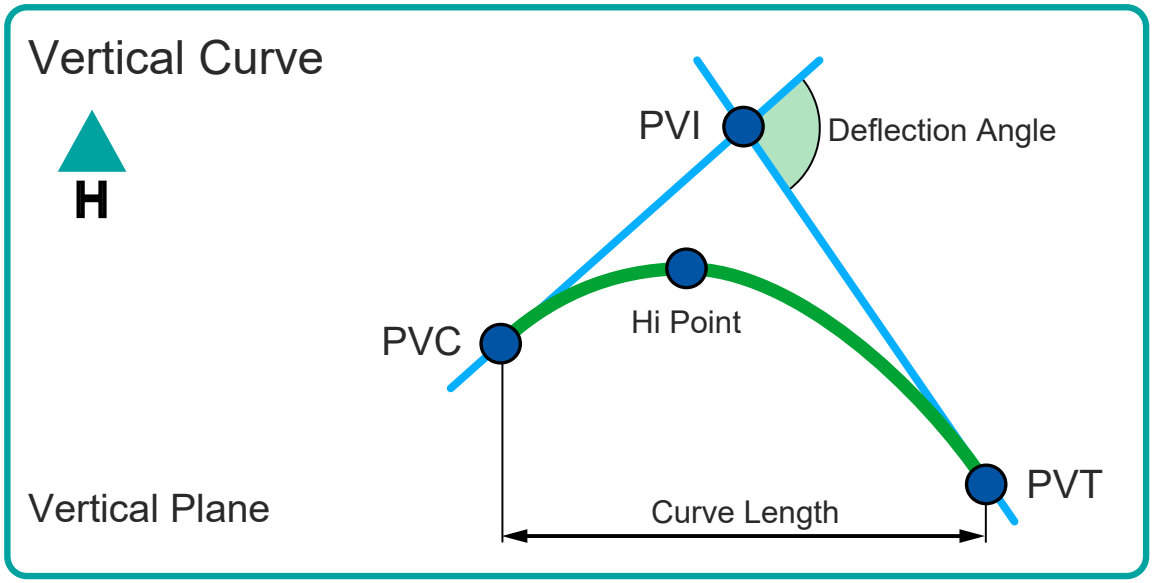


Vertical Curve

To calculate the vertical curve parameters and find stations and elevations for points of vertical curve.

The vertical curve parameters:

- elevation and station of the **PVI Point** (point of the vertical intersection),
- elevation and station of the **PVC point** (start point of the vertical curve),
- elevation and station of the **PVT point** (end point of the vertical curve),
- elevation and station of the **Hi/Low point** (the highest or lowest point of the vertical curve parabola),
- elevation of desired station,
- station(s) of desired elevation,
- **Curve Length** - horizontal distance between PVC and PVT points,
- **Deflection angle** - the intersecting angle between begin grade tangent and end grade tangent.



1. In the **Input** tab, specify the vertical curve parameters for use in calculation:
   - Select one of the vertical curve parameters **Curve Length**, **High/Low Elevation** or **Point on Curve** to use it in calculation.
   - Select either the start point of the vertical curve (**PVC**) or point of vertical intersection (**PVI**) and specify the station and elevation for this point.
   - Specify the **Begin Grade** and **End Grade** of the vertical curve.
   - If you selected the **Curve Length** parameter, specify the **Curve Length** value.
   - If you selected the **Point on Curve** parameter, specify the **Pt. Station** (chainage) and **Pt. Elevation** for this point.
   - If you selected the **High/Low Elevation** parameter, enter the elevation in the **Hi/Lo Elevation** field.
   - Specify the **Find Station** (chainage) value to calculate the elevation of the point at the desired station or specify the **Find Elevation** value to calculate the station(s) of the point(s) with the desired elevation.
   - Check the displayed preview of the vertical curve in the vertical plane.
   - Click the  **Calc** button to calculate the parameters of the vertical curve.

2. In the **Results** tab, review the results of the calculation and click  to save the data to **.txt* file, if required:
   - *Curve Length* of the curve.
   - *Begin Grade* of the curve.
   - *End Grade* of the curve.
   - *Deflection Angle* of the curve.
   - *Station* and *Elevation* for the *PVC Point*.
   - *Station* and *Elevation* for the *PVI Point*.
   - *Station* and *Elevation* for the *PVT Point*.
   - *Station* and *Elevation* for the *HI/Low Point*.
   - *Station* and *Elevation* for the *Point 1* (*Find Station* or *Find Elevation*).
   - *Station* and *Elevation* for the *Point 2* (*Find Elevation*).

3. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click  to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.

Calculate Area

Click an icon to calculate the task:



By Points
To calculate the area of a polygon with known vertices.



Hinge
To calculate the coordinates of a new point on the line of a known polygon edge, and this point is a vertice of the modified polygon of the given area.



Line
To calculate the coordinates of two new points on the lines of two known polygon edges and these points form an edge of the modified polygon of the given area that is parallel to the given edge of the known polygon.



Surface
To calculate the area of an existing surface.



Relative Precision
To calculate the relative positional accuracy of measured points and check compliance with the requirements of relative positional precision.

Compute Area By Points

To calculate the area of a polygon with known vertices:

1. In the **Input** tab:
   - From the  drop-down list, select an object type to specify an area to be computed:
     - **Points** - select points to form an area to compute. Select them from the map  or from the list . Points will be listed along with their codes in the table and the polygon will be shown in the plot.

- Use / to hide / show the plot as required.
- Click to view information about the highlighted point in the Selected Point dialog.
- Click / to change position of highlighted point(s) in the list. The plot will show how the area layout changes.
- Click in the top left corner and select Edit Points to view and manage points in the project.

- **Point List** - enter an existing point list name manually or select it from the list . Points of the selected point list will be listed along with their codes in the table and the polygon will be shown in the plot.
  - Use / to hide / show the plot as required.
  - Click to view information about the highlighted point in the Selected Point dialog.
  - Click / to change position of highlighted point(s) in the list. The plot will show how the area layout changes.
  - Click in the top left corner and select Edit Point Lists to view and manage point lists in the project.
- **Linework** - enter an existing linework name manually or select it from the map or from the list . Points of the selected linework will be listed along with their codes in the table and the linework will be shown in the plot. The start and end point of the non-closed linework form an edge of the closed polygon to compute its area.
  - Use / to hide / show the plot as required.
  - Click to view information about the highlighted point in the Selected Point dialog.
  - Click in the top left corner and select Edit Linework to view and manage linework in the project.
- **Area** - enter an existing area name manually or select it from the map or from the list . Points of the selected area will be listed along with their codes in the table and the polygon will be shown in the plot.

- Use  /  to hide / show the plot as required.
- Click  to view information about the highlighted point in the Selected Point dialog.
- Click  in the top left corner and select Edit Areas to view and manage areas in the project.

- Click the  **Calc** button to calculate the area of the polygon.

  Note: A warning displays if the area layout has self-intersections, and the computation is impossible. Review the plot to avoid such self-intersections.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file if required:
   - The calculated 2D area in sq. ProjectUnits, acres and hectares.
   - 2D perimeter of the polygon.
   - The tolerance interval calculated as area (in meters) minus / plus perimeter multiplied by 1.25.
   - The calculated 3D area in sq. ProjectUnits, acres and hectares.
   - 3D perimeter of the polygon.
   - The list of points constituting the polygon vertices in the correct order.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Known Area - Hinge

The Known Area - Hinge method computes the coordinates of a new point on the line of a known polygon edge, and this point is a vertice of the modified polygon of the given area. Find more on how this method works in Sokkia Field.

1. In the **Input** tab:
   - From the drop-down list, select an object type to specify a known area:
     - **Points** - select points to form the known area. Select them from the map or from the list. Points will be listed along with their codes in the table and the known polygon will be shown in the plot.
       - Use / to hide / show the plot as required.
       - Click to view information about the highlighted point in the Selected Point dialog.
       - Click / to change position of highlighted point(s) in the list. The plot will show how the area layout changes.
     - **Point List** - enter an existing point list name manually or select it from the list. Points of the selected point list will be listed along with their codes in the table and the known polygon will be shown in the plot.
       - Use / to hide / show the plot as required.
       - Click to view information about the highlighted point in the Selected Point dialog.
       - Click / to change position of highlighted point(s) in the list. The plot will show how the area layout changes.
     - **Linework** - enter an existing linework name manually or select it from the map or from the list. Points of the selected linework will be listed along with their codes in the table and the linework will be shown in the plot. The start and end point of the non-closed linework form an edge of the known polygon.
       - Use / to hide / show the plot as required.
       - Click to view information about the highlighted point in the Selected Point dialog.

- **Area** - enter an existing area name manually or select it from the map  or from the list . Points of the selected area will be listed along with their codes in the table and the known polygon will be shown in the plot.
  - Use  /  to hide / show the plot as required.
  - Click  to view information about the highlighted point in the Selected Point dialog.
- Click **Next** to proceed to the **Area** tab.

> **Note:** A warning displays if the area layout has self-intersections, and the computation is impossible. Review the plot to avoid such self-intersections.

2. In the **Area** tab:
   - Specify the hinge calculation parameters:
     - **Total Area** displays the calculated area of the currently selected known polygon. Click  to return to the **Input** tab to modify the known area if necessary.
     - In **Required Area**, enter the required area for your computation. You can express the areas in either sq. ProjectUnits or acres.
     - From the **Rotation Point** drop-down list, select a hinge point for a polygon of required area.
     - Select the **Direction** of hinge rotation from the list: *Counter Clockwise* or *Clockwise*.
     - In **Calc Point**, enter a name of the new calculated point. If required, enter a new code for the point, or select an existing one, or click  to set the point's attributes. More...
   - Click the  **Calc** button to calculate the task.

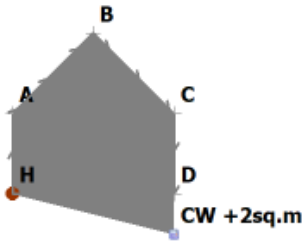
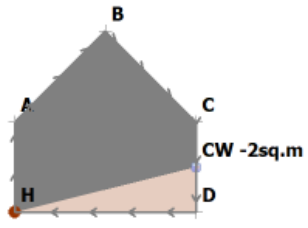
3. In the **Results** tab:
   - Review the results of the calculation:
     - Calc Point's coordinates.
     - Areas in sq. ProjectUnits, acres and hectares for the known polygon (*Total Area*), created polygon (*Plot Area*); and the polygon which was obtained as difference between known and created polygons (*Difference*).
     - The list of points constituting the known polygon vertices in the correct order.
   - Click  to save the data to a **.txt* file if required.
   - To save the calculated point, select the check box  near the calculated point name and click  that will appear.

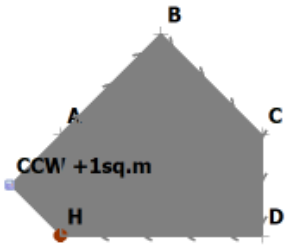
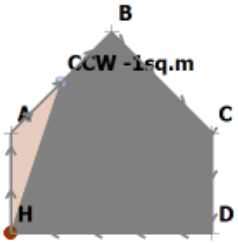
4. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

5. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Compute Area - Hinge method example

Review how the area computation works with Hinge method implementation in Sokkia Field.

Given area:		Given Area: *HABCD* **Total Area:** *12 m^2* **Rotation point:** *H*
Task 1: Add 2 m^2 to the given area using Hinge method with clockwise rotation from given rotation point.		Calculated Area: *HABC[CW]* **Total Area:** *12 m^2* **Plot Area:** *14 m^2* **Rotation point:** *H* **Direction:** *Clockwise* **Calc Point:** *CW*
Task 2: Subtract 2 m^2 from the given area using Hinge method and clockwise rotation from given rotation point.		Calculated Area: *HABC[CW]* **Total Area:** *12 m^2* **Plot Area:** *10 m^2* **Rotation point:** *H* **Direction:** *Clockwise* **Calc Point:** *CW*

Task 3: Add 1 m^2 to the given area using Hinge method with counterclockwise rotation from given rotation point.		Calculated Area: *H[CCW]BCD* **Total Area:***12 m^2* **Plot Area:***13 m^2* **Rotation point:***H* **Direction:***C-clockwise* **Calc Point:***CCW*
Task 4: Subtract 1 m^2 from the given area using Hinge method and counterclockwise rotation from given rotation point.		Calculated Area: *H[CCW]BCD* **Total Area:***12 m^2* **Plot Area:***11 m^2* **Rotation point:***H* **Direction:***C-clockwise* **Calc Point:***CCW*



Known Area - Line

The Known Area - Line method computes the coordinates of two new points on the lines of two known polygon edges and these points form an edge of the modified polygon of the given area that is parallel to the given edge of the known polygon. Find more on how this method works in Sokkia Field.

1. In the **Input** tab:
   - From the  drop-down list, select an object type to specify a known area:
     - **Points** - select points to form the known area. Select them from the map  or from the list . Points will be listed along with their codes in the table and the known polygon will be shown in the plot.
       - Use  /  to hide / show the plot as required.
       - Click  to view information about the highlighted point in the Selected Point dialog.

- Click / to change position of highlighted point(s) in the list. The plot will show how the area layout changes.

- **Point List** - enter an existing point list name manually or select it from the list . Points of the selected point list will be listed along with their codes in the table and the known polygon will be shown in the plot.
  - Use / to hide / show the plot as required.
  - Click to view information about the highlighted point in the Selected Point dialog.
  - Click / to change position of highlighted point(s) in the list. The plot will show how the area layout changes.
- **Linework** - enter an existing linework name manually or select it from the map or from the list . Points of the selected linework will be listed along with their codes in the table and the linework will be shown in the plot. The start and end point of the non-closed linework form an edge of the known polygon.
  - Use / to hide / show the plot as required.
  - Click to view information about the highlighted point in the Selected Point dialog.
- **Area** - enter an existing area name manually or select it from the map or from the list . Points of the selected area will be listed along with their codes in the table and the known polygon will be shown in the plot.
  - Use / to hide / show the plot as required.
  - Click to view information about the highlighted point in the Selected Point dialog.

- Click **Next** to proceed to the **Area** tab.

> **Note:** A warning displays if the area layout has self-intersections, and the computation is impossible. Review the plot to avoid such self-intersections.

2. In the **Area** tab:
   - Specify the line calculation parameters:
     - **Total Area** displays the calculated area of the currently selected known polygon. Click to return to the **Input** tab to modify the known area if necessary.

- In **Required Area**, enter the required area for your computation. You can express the areas in either sq. ProjectUnits or acres.
- From the **Edge Point 1** and **Edge Point 2** drop-down lists, select two points specifying the edge of the known polygon to calculate the parallel edge of a modified polygon of required area.
- In **Calc Point 1** and **Calc Point 2**, enter names of two new calculated points forming an edge of a modified polygon of required area. If required, enter a new code for the point, or select an existing one, or click  to set the point's attributes. More...

- Click the  **Calc** button to calculate the task.

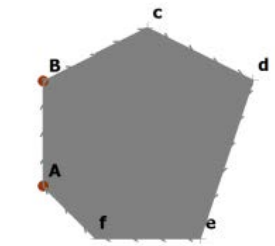
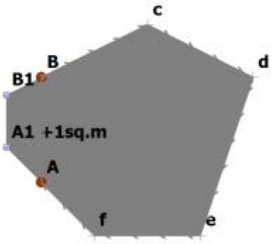
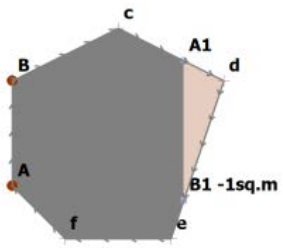
3. In the **Results** tab:
   - Review the results of the calculation:
     - Calc Points' coordinates.
     - Areas in sq. ProjectUnits, acres and hectares for the known polygon (*Total Area*), created polygon (*Plot Area*); and the polygon which was obtained as difference between known and created polygons (*Difference*).
     - The list of points constituting the known polygon vertices in the correct order.
   - Click  to save the data to a **.txt* file if required.
   - To save the calculated points, select the check box  near every calculated point name and click  that will appear. Only points with check mark will be saved.

4. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

5. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Compute Area - Line method example

Review how the area computation works with Line method implementation in Sokkia Field.

Given area:		Given Area: *ABcdef* **Total Area:** *12 m^2* **Edge point 1:** *A* **Edge point 2:** *B*
Task 1: Add 1 m^2 to the given area using Line method applied to the given edge.		Calculated Area: *[A1][B1]cdef* **Total Area:** *12 m^2* **Plot Area:** *13 m^2* **Edge point 1:** *A* **Edge point 2:** *B* **Calc Point 1:** *A1* **Calc Point 2:** *B1*
Task 2: Subtract 1 m^2 from the given area using Line method applied to the given edge.		Calculated Area: *ABc[A1][B1]ef* **Total Area:** *12 m^2* **Plot Area:** *11 m^2* **Edge point 1:** *A* **Edge point 2:** *B* **Calc Point 1:** *A1* **Calc Point 2:** *B1*

Surface Area

To calculate the area occupied by a surface.

This dialog also opens when you select a surface on the map and then select the *Calc Area* command from the Map Pop-up Menu.

1. In the **Input** tab:
   - In the surface field , specify the surface whose area will be calculated. Enter an existing surface name manually, or select from the map  or from the list  of surfaces in the project.
   - Extreme coordinates of the selected surface are displayed.
   - The preview panel displays the selected surface in the horizontal plane.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file if required:
   - *Name* - name of the project surface used in calculation.
   - *Num Points* - number of points in the wireframe;
   - *Num Triangles* - number of triangles in the wireframe;
   - *Area 2D* - calculated 2D area in sq. ProjectUnits, acres and hectares;
   - *Area 3D* - calculated 3D area in sq. ProjectUnits, acres and hectares;
   - *Extreme coordinates* - maximum and minimum boundary coordinates of the selected surface.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Relative Precision

To calculate the relative positional accuracy of measured points and to check the survey's compliance with the requirements of relative positional precision (RPP).

The relative positional accuracy check is based on a least squares adjustment of measured points and a comparison of the resulting deviations with the RPP requirements applicable to the given survey type. These requirements include *maximum allowable relative positional precision* value and relative distance error as the *parts per million (ppm)* value. The surveyor must know the acceptable values in the RPP requirements for the given survey type and enter them before performing the calculation.

Note: Only measured points must be included in the relative positional accuracy calculation.

1. In the **Input** tab, select points:
   - From the  drop-down list, select an object type to specify the points to be included in the calculation:
     - **Points** - select individual points. Select them from the map  or from the list . Points will be listed along with their codes in the table and their schematic position will be shown in the plot.
       - Use  /  to hide / show the plot as required.
       - Click  to view information about the highlighted point in the Selected Point dialog.
       - Click  /  to change position of highlighted point(s) in the list. The plot will show how the least square adjustment will be performed.
       - Click  in the top left corner and select Edit Points to view and manage points in the project.
     - **Point List** - enter an existing point list name manually or select it from the list . Points of the selected point list will be listed along with their codes in the table and their schematic position will be shown in the plot.
       - Use  /  to hide / show the plot as required.
       - Click  to view information about the highlighted point in the Selected Point dialog.

- Click  /  to change position of highlighted point(s) in the list. The plot will show how the least square adjustment will be performed.
- Click  in the top left corner and select Edit Point Lists to view and manage point lists in the project.

- **Linework** - enter an existing linework name manually or select it from the map  or from the list . Points of the selected linework will be listed along with their codes in the table and the linework will be shown in the plot.
  - Use  /  to hide / show the plot as required.
  - Click  to view information about the highlighted point in the Selected Point dialog.
  - Click  in the top left corner and select Edit Linework to view and manage linework in the project.

- **Area** - enter an existing area name manually or select it from the map  or from the list . Points of the selected area will be listed along with their codes in the table and the polygon will be shown in the plot.
  - Use  /  to hide / show the plot as required.
  - Click  to view information about the highlighted point in the Selected Point dialog.
  - Click  in the top left corner and select Edit Areas to view and manage areas in the project.

- Click **Next** to proceed and specify the relative positional precision (RPP) requirements for the survey type from which the points were selected:
  - In the **Constant** field, enter a distance equal to the maximum allowable relative positional precision for the current type of survey.
  - In the **ppm** field, enter a relative distance error as the parts per million (ppm) value for the current type of survey.

- Click the **Calc** button to calculate the relative positional accuracy and check whether the measured points meet the relative positional precision requirements.

2. In the **Results** tab, review the results of the relative positional accuracy calculation and click  to save the data to a **.txt* file if required:

- *<Point name> - <point name>* - the vector in adjustment;
- *Passed* / *Failed* - compliance with the relative positional precision requirements;
- *Precision* - calculated relative positional accuracy;
- *Max* - maximum allowable relative positional precision.



Calculate Angle

Click an icon to open the calculation task:



Corner Angle
To calculate the horizontal angle between two lines, a start and an end, that have a common point, and also calculate the vertical grades (slopes) of these lines.



Triangle
To calculate the area, sides and angles of a triangle by three given parameters.



Corner Angle

To calculate the horizontal angle between two lines, a start and an end, that have a common point, and also calculate the vertical grades (slopes) of these lines.

This dialog opens from the map using the *Calc Corner Angle* command in the map pop-up menu. The **Result** tab instantly shows results based on the objects (either three points, or point and line, or two lines) selected on the map.

1. In the **Input** tab:
   - Specify the **Start Point** that defines the first side of the angle, **Middle Point** that defines the corner of the angle, **End Point** that defines the second side of the angle. Enter point names in the corresponding fields manually, or select from the map  or from the list  of points in the project.
   - Click the  **Calc** button to calculate the angle.
2. In the **Results** tab:

- Review the results of the calculation:
  - *Start Pt ID* - the name of the start point of the angle.
  - *Middle Pt ID* - the name of the middle point of the angle.
  - *End Pt ID* - the name of the end point of the angle.
  - *Angle Right* - the value of the horizontal angle for clockwise direction.
  - *Angle Left* - the value of the horizontal angle for counterclockwise direction.
  - *180 - right* - the value of the angle which is supplementary angle for the angle right.
  - *180 - left* - the value of the angle which is supplementary angle for the angle left.
  - *Slope Dist to Start Pt* - the value of the 3D distance between middle and start points.
  - *Horz Dist to Start Pt* - the value of the horizontal distance between middle and start points.
  - *Azimuth / Bearing to Start Pt* - the direction from the middle point to the start point.
  - *Slope Dist to End Pt* - the value of the 3D distance between middle and end points.
  - *Horz Dist to End Pt* - the value of the horizontal distance between middle and end points.
  - *Azimuth / Bearing to End Pt* - the direction from the middle point to the end point.
  - *Start to Middle:*
    - *Grade (Slope)* - the value of the vertical grade between start and middle points in percents;
    - *Grade (Slope)* - the angle value of the vertical grade between start and middle points.
  - *Middle to End:*
    - *Grade (Slope)* - the value of the vertical grade between middle and end points in percents;
    - *Grade (Slope)* - the angle value of the vertical grade between middle and end points.
  - *Vertical Deflection* - the difference in vertical grades (slopes) between two lines - from the start point to the middle point and from the middle point to the end point.
- Click  to export the data to a **.txt* file, if required.
- Optional: select the *Middle Pt ID* check box and click  to add the calculated middle point of the angle to the project, if required. This point is calculated for an angle between two lines selected on the map when they do not have an intersection point in the project.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results projected in the horizontal plane and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
5. The **Profile** tab shows the illustration for the results projected in the vertical plane and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click  to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.



Triangle Solution

To calculate the area, sides and angles of a triangle by three given parameters.

1. In the **Input** tab:
   - Select a set of three parameters from the drop-down list:
     - *Side-Side-Side*,
     - *Side-Angle-Side*,
     - *Side-Side-Angle*,
     - *Angle-Angle-Side*,
     - *Angle-Side-Angle*.
   - Enter the values of selected parameters in the corresponding fields.
   - Click the  **Calc** button to calculate the area and other parameters of the triangle.
2. In the **Results** tab:
   - Review the results of the calculation:
     - *Side a* / *Side b* / *Side c* - the value of the triangle side length.
     - *Angle A* / *Angle B* / *Angle C* - the value of the triangle angle.
     - *Area*- the value of the triangle area.
   - Click  to export the data to a **.txt* file, if required.
3. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click  to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.



Calculate Offsets

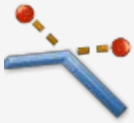
Click an icon to calculate the task:



Intersection
To calculate intersection(s) of two directions or two distances.



Line Offset
To calculate locations of offset points along a line.



Corners Offset
To calculate locations of offset points from nodes of a linework object.



Curve Offset
To calculate locations of offset points along a curve.



Linework Offset
To calculate locations of offset points along a linework object, or create a new linework object offset from an existing linework object.



Points Offset
To select multiple points and calculate locations of offset points from the selected points.



Road Offset
To calculate locations of offset points along a road or alignment.

Intersection

To calculate intersection(s) of two directions or two distances.

1. In the **Input** tab:
   - Select the name of the known **Point 1**. The point can be entered manually or selected from the map  or from the list  of points in the project.
   - Set the direction from Point 1 to the intersection point:
     - Switch to **Azimuth** (or **Bearing** if bearing is selected to output directions) to enter a direction from the Point 1 by value. Specify **Left Offset** or **Right Offset** from the Point 1, if required.
     - Switch to **Az to Pt** (**Brg to Pt**) and select another point to use the direction from the Point 1 to this point as the direction to the intersection point. Specify **Left Offset** or **Right Offset** from Point 1, if required.
     - Switch to **Distance** to enter a distance to the unknown point. In this case, there may be two solutions of calculation and two intersection points will be determined.

   - Select the name of the known **Point 2**. The point can be entered manually or selected from the map  or from the list  of points in the project.
   - Set the direction from Point 2 to the intersection point:
     - Switch to **Azimuth** (or **Bearing** if bearing is selected to output directions) to enter a direction from the Point 2 by value. Specify **Left Offset** or **Right Offset** from the Point 2, if required.
     - Switch to **Az to Pt** (**Brg to Pt**) and select another point to use the direction from the Point 2 to this point as the direction to the intersection point. Specify **Left Offset** or **Right Offset** from Point 2, if required.
     - Switch to **Distance** to enter a distance to the unknown point. In this case, there may be two solutions of calculation and two intersection points will be determined.

   - Click the  **Calc** button to calculate the intersection point.

2. In the **Results** tab:
   - Review the results of the calculation:

     - *Point 1* - the name of the calculated point.
       - *Coordinates* - the coordinates of the calculated point presented according to the coordinate system settings and display for the current project.

- *Point 2* - the name of the second calculated point (displays when the calculation has two solutions).
  - *Coordinates* - the coordinates of the calculated point presented according to the coordinate system settings and display for the current project.

- Click  to open the Calc Points dialog and change the name and set the code and other attributes for the calculated point(s).
- To add the calculated points to the project, ensure the check box near desired points are checked . To skip a point, clear  the corresponding box. Click : the selected point (s) are added to the list of points in the project, the box(es) for that point(s) become cleared  and  disables.
- Click  to open the Result Export dialog and export the results to a **.txt* file, if required.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click  to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.



Line Offset

To calculate locations of offset points along the specified line.

Define the line either by start and end points or by start point and line direction (azimuth / bearing). The preview panel will display the defined line in the horizontal plane.

- Specify the **Start Point** of the line. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, clicking the  button for optical survey opens the *Sideshot* dialog. In the dialogs

you can save the measured point in the current project and use the point for the offset task.

- Select between **End Point** and **Azimuth** (or **Bearing** if bearing is selected to output directions) to define the direction of the line.

> **Note:** If a line is defined by two points, reverse the line direction and instantly swap **Start point** and **End point** by clicking the switchable  /  button.

- In **Ht Comp**, select the type of height computations for the computed points:

> **Note:** This parameter is available if the line is defined by start and end points. If the line is defined by start point and direction, the line is considered horizontal at the height of the start point.

  - *Ht of Start Pt (height of the start point)* - the computed points will have the same height as the start point of the line. In this case you can set the stationing in the horizontal plane only.
  - *Interpolate Ht* - the height of the computed points will be computed through linear interpolation using the height of the start and end points of the line. In this case, the **Start 2D** / **Start 3D** button is available.

- If the *Interpolate Ht* is selected, use the **Start 2D** / **Start 3D** button to set stationing in horizontal plane or 3D. In the field next to **Start 2D** / **Start 3D**, you can set the station to start the calculation.
- The length of the line defined by start and end points is displayed as **2D Length** or **3D Lenth**.
- Select the **Num Subs** check box to enter the number of subdivisions if required to subdivide the line. For instance a value of 3 indicates that you want to compute four points by subdividing the line in three equal segments.
- Select the **Include Transition Point** check box to include start and end points if they do not fall on a designated station.
- Click **Next** to define stationing for offsets and calculate points. More...

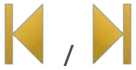
Station & Offsets

To define stationing to calculate the location of offset points along the specified line.

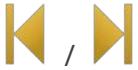
The line can be specified as line, curve, or road / alignment.

The content of the dialog for line, curve depends on the selection of **Num Subs** check box in the previous dialog.

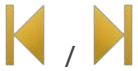
If the **Num Subs** check box is selected and the number of subdivisions is entered, the software creates offset points between **Start Station** and **End Station**:

- In **Start Station** / **3D Start Station**, set the station to start the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button  to reset current stationing to the start station of the selected linework or resume current stationing.
- In **End Station** / **3D End Station**, set the station to finish the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field.
- The **Interval** value is automatically calculated from the line length and the number of subdivisions entered in the previous dialog.
- Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
- Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
- Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click  to set the point's attributes. More...
- Click **Calc** to calculate the offset points.

If the **Num Subs** check box is not selected, or the defined line is the road / alignment, you can select between **Station**, **Start Station** and **Skew Station** to define stationing for the calculation of offset points:

- For **Station** / **3D Station**, the software creates an offset point for the current **Station** and is then ready to create an offset point at the next station.
  - In **Station** / **3D Station**, set the station to calculate an offset point. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button  to reset current stationing to the start station of the selected linework or resume current stationing.
  - Set the **Interval** between stations.
  - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
  - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
  - Enter the name for the calculated point in the **Calc Pt** field. If required, select a code for this point from the existing codes or click  to set the point's attributes. More...

- Click **Calc** to calculate the offset point. The software creates the point for the selected **Station** and focuses on the next station.

- For **Start Station** or **3D Start Station**, when the **Start 3D** button is selected in the previous dialog.
  - In **Start Station** / **3D Start Station**, set the station to start the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button  to reset current stationing to the start station of the selected linework or resume current stationing.
  - In **End Station** / **3D End Station**, set the station to finish the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field.
  - Set the **Interval** between stations.
  - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
  - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
  - Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click  to set the point's attributes. More...
  - Click **Calc** to calculate the offset points.

- For **Skew Station**, the software creates an offset point on a line drawn from the skew station.
  - In **Skew Station**, set the station as the start point of the skewed line.
  - Enter the **Left Skew** or **Right Skew** angle value for the direction of skewed line in the horizontal plane from the selected line.
  - Enter the **Skew Offset** from the start point to set a point on the new line.
  - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the skew station. If the grade is falling, the value should be negative.
  - Enter the name for the calculated point in the **Calc Pt** field. If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
  - Click **Calc** to calculate the offset point.

Corner Offset

To calculate locations of offset points from nodes of the specified linework object.

New points are defined by the offset from the nodes of an existing linework object. Offset may be defined in three ways - either inline, or perpendicular right or perpendicular left. Note, that the new point will be created for each linework segment, connected to the node.

- Choose one of two options to define the linework:
  - **Linework**: Select an existing linework from the linework objects list or select the linework in the map . The plot window will display the defined linework.
  - **Code**: Define a code generated line. When Code is selected, the drop-down list will contain a list of all linework codes used in the project which have associated strings. The list will display all of the available strings associated with the selected code. If the user selects a string the plot window will update to show the selection.

- Click **Next**.

- Select between **Perpendicular / Bisector / Inline** and enter the offset from the linework node.
- For **Perpendicular** or **Bisector**, select either **Left** or **Right** side relative to the linework direction.
- Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click to set the point's attributes. More...
- Click **Create** to calculate and save points with the defined offset.

Curve Offset

To calculate locations of offset points along the specified curve.

Open the illustration of curve parameters used in Sokkia Field.

- In **Point of Curve**, enter the starting point of the curve. Enter a point name manually, or select from the map or from the list of points in the project.
- In **Point of Tangent**, enter the point of tangency, the ending point of the curve. Enter a point name manually, or select from the map or from the list of points in the project.

- Select between **Radius/ Curve Angle/ Chord Angle** and enter the radius parameters of the curve as required.
- In **Ht Comp**, select the type of height computations for the computed points:
  - *Ht of Start Pt (height of the start point)* - the computed points will have the same height as the **Point of Curve**. In this case you can set the stationing in the horizontal plane only.
  - *Interpolate Ht* - the height of the computed points will be computed through linear interpolation using the height of the **Point of Curve** and **Point of Tangent** of the arc. In this case, the **Start 2D** / **Start 3D** button is available.
- If the *Interpolate Ht* is selected, use the **Start 2D** / **Start 3D** button to set stationing in horizontal plane or 3D. In the field next to **Start 2D** / **Start 3D**, you can set the station to start the calculation.
- In the **Turn** drop-down list, select on which side the center point of the curve is located. The preview panel will display the defined curve.
- The length of the curve is displayed as **2D Length** or **3D Lenth**.
- Select the **Include Transition Point** check box to include transition points if they do not fall on a designated station.
- Select the **Num Subs** check box to enter the number of subdivisions if required to subdivide the curve. For instance a value of 3 indicates that you want to compute four points by subdividing the curve in three equal segments.
- Click **Next** to define stationing for offsets and calculate points. More...



Linework Offset

To calculate locations of offset points along the specified linework object, or create a new linework object offset from the specified linework object.

Linework object consists of points that form connected segments of an open or closed figure.

- Choose one of two options to define the linework:
  - **Linework** - select an existing linework from the linework objects list or select the linework in the map . The preview panel will display the defined linework.
  - **Code** - define a code generated line. When code is selected, the drop-down list will contain a list of all linework codes used in the project which have associated strings. The list will display all of the available strings associated with the selected code. After the user selects a string, the preview panel will update to show the selection.
- Click **Create Points** to generate additional interval / segment / curve points along a linework object and save them in a point list. More...
- Select an offset task you want to calculate:
  - **Offset Linework** - to create an offset linework with respect to the selected linework, click **Next**. More...

- **Offset Points From Linework** - to create offset points with respect to the selected linework:
  - Use the **Start 2D** / **Start 3D** button to set stationing in horizontal plane or 3D. In the field next to **Start 2D** / **Start 3D**, you can set the station to start the calculation.
  - From the drop-down menu, select which points to create:
    - *Trans Only* - to create offset points only when the stationing passes a transition point.
    - *Subdivide* - to create offset points at transitions from one subdivision to another. Enter a number of subdivisions by which the linework will be split. Check the **Include Transition Points** box to also create offset points when the stationing passes a linework transition point.
    - *Interval* - to create offset points at the interval that you specify in the next dialog. Check the **Include Transition Points** box to also create offset points when the stationing passes a linework transition point.
  - Click **Next** to define stationing for offsets and calculate points. More...

Offset Linework

To create a new **Offset Linework** at entered offsets from the selected linework.

- In the **Offset Line** field enter the name for the offset linework. The field initially displays a default name *the linework name_[n]* where *[n]* is an integer for the first available unique name that does not already exist in the project. You can change this name.
- Enter the **Right** or **Left** offset perpendicular to the existing line in the horizontal plane.
- Enter the **Up** or **Down** height offset, or the vertical **Grade** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
- Enter the **Forward** or **Backward** offset of the computed line along the existing linework.
- If you need to rotate the computed line from the existing line, enter the angle value to **Rotate Start** or **Rotate End** field. The positive value is rotation in the clockwise direction. The **Rotate Start** selection rotates the *Start Point-End Point* line, the **Rotate End** selection rotates the *End Point-Start Point* line.
- Observe the preliminary view in the  horizontal and  vertical planes. The plot windows show both the selected line as well as the offset line at the current entered offset values. These plot windows update dynamically every time you change the offset values.
- Click **Create** to compute and save the offset linework to the current project.

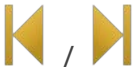
Station & Offsets (Linework)

To define stationing to calculate the locations of points along the specified linework.

The dialog opens if the **Offset Points From Linework** is selected in the Linework Offset dialog.

The content of the dialog depends on the *Subdivide* / *Interval* / *Trans Only* selection in the Linework Offset dialog.

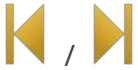
If the **Subdivide** is selected, the software creates offset points between **Start Station** and **End Station**:

- In **Start Station** / **3D Start Station**, set the station to start the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button  to reset current stationing to the start station of the selected linework or resume current stationing.
- In **End Station** / **3D End Station**, set the station to finish the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field.
- The **Interval** value is automatically calculated from the total length of linework and the number of subdivisions entered in the Linework Offset dialog.
- Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
- Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
- In **Angle Pts**, select how the angle points will be computed at segment intersections:
  - **Offset Bk** - the offset point at the intersection will be computed from the end point of the first segment.
  - **Offset Ahd** - the offset point at the intersection will be computed from the start point of the second segment.
  - **Bisector** - the offset point at the intersection will be computed from the intersection of the offsets of the first and second segment.

- In **Curve Pts**, select how points on curve segments will be selected:
  - **Station Only** - the offset points on curve segments will be computed at intervals along the curve.
  - **RP** - only offset from the radius point will be computed.
  - **PI** - only offset from the point of intersection of tangents will be computed.
  - **MOC** - only offset from the point in the middle of the curve will be computed.

- Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click  to set the point's attributes. More...
- Click **Calc** to calculate the offset points.

If the **Interval** is selected, you can select between **Station**, **Start Station** and **Skew Station** to define stationing for the calculation of offset points:

- For **Station** / **3D Station**, the software creates an offset point for the current **Station** and is then ready to create an offset point at the next station.
  - In **Station** / **3D Station**, set the station to calculate an offset point. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button  to reset current stationing to the start station of the selected linework or resume current stationing.
  - Set the **Interval** between stations.
  - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
  - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
  - In **Angle Pts**, select how the angle points will be computed at segment intersections:
    - **Offset Bk** - the offset point at the intersection will be computed from the end point of the first segment.
    - **Offset Ahd** - the offset point at the intersection will be computed from the start point of the second segment.
    - **Bisector** - the offset point at the intersection will be computed from the intersection of the offsets of the first and second segment.

  - In **Curve Pts**, select how points on curve segments will be selected:
    - **Station Only** - the offset points on curve segments will be computed at intervals along the curve.
    - **RP** - only offset from the radius point will be computed.
    - **PI** - only offset from the point of intersection of tangents will be computed.
    - **MOC** - only offset from the point in the middle of the curve will be computed.

  - Enter the name for the calculated point in the **Calc Pt** field. If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
  - Click **Calc** to calculate the offset point. The software creates the point for the selected **Station** and focuses on the next station.

- For **Start Station** or **3D Start Station**, the software creates offset points between these stations.
  - In **Start Station** / **3D Start Station**, set the station to start the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button

 /  to reset current stationing to the start station of the selected linework or resume current stationing.

- In **End Station** / **3D End Station**, set the station to finish the calculation of offset points. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field.
- Set the **Interval** between stations.
- Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
- Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
- In **Angle Pts**, select how the angle points will be computed at segment intersections:
  - **Offset Bk** - the offset point at the intersection will be computed from the end point of the first segment.
  - **Offset Ahd** - the offset point at the intersection will be computed from the start point of the second segment.
  - **Bisector** - the offset point at the intersection will be computed from the intersection of the offsets of the first and second segment.

- In **Curve Pts**, select how points on curve segments will be selected:
  - **Station Only** - the offset points on curve segments will be computed at intervals along the curve.
  - **RP** - only offset from the radius point will be computed.
  - **PI** - only offset from the point of intersection of tangents will be computed.
  - **MOC** - only offset from the point in the middle of the curve will be computed.

- Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click  to set the point's attributes. More...
- Click **Calc** to calculate the offset points.

- For **Skew Station**, the software creates an offset point on a line drawn from the skew station.
  - In **Skew Station**, set the station as the start point of the skewed line.
  - Enter the **Left Skew** or **Right Skew** angle value for the direction of skewed line in the horizontal plane from the selected linework.
  - Enter the **Skew Offset** from the start point to set a point on the new line.
  - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the skew station. If the grade is falling, the value should be negative.

- Enter the name for the calculated point in the **Calc Pt** field. If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
- Click **Calc** to calculate the offset point.

If the **Trans Only** is selected, the software creates offset points between **Start Station** and **End Station**:

- In **Start Station** / **3D Start Station**, set the station to start the calculation of offset points.
- In **End Station** / **3D End Station**, set the station to finish the calculation of offset points.
- Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the station.
- Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
- In **Angle Pts**, select how the angle points will be computed at segment intersections:
  - **Offset Bk** - the offset point at the intersection will be computed from the end point of the first segment.
  - **Offset Ahd** - the offset point at the intersection will be computed from the start point of the second segment.
  - **Bisector** - the offset point at the intersection will be computed from the intersection of the offsets of the first and second segment.

- In **Curve Pts**, select how points on curve segments will be selected:
  - **Station Only** - the offset points on curve segments will be computed at intervals along the curve.
  - **RP** - only offset from the radius point will be computed.
  - **PI** - only offset from the point of intersection of tangents will be computed.
  - **MOC** - only offset from the point in the middle of the curve will be computed.

- Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click  to set the point's attributes. More...
- Click **Calc** to calculate the offset points.

Create Points

To calculate and create additional points along a linework object.

- Select the **Interval** or **Segments** radio button to enter the interval between the calculated points or the number of segments in the linework.

- Select the **Along Tangent** check box to enter the interval between the calculated points or the number of segments in a straight line.
- Select the **Along Curve** check box to enter the interval between the calculated points or the number of segments in a curve.
- Select the corresponding check boxes to create additional linework points as required:
  - **End Points** - the linework's start and end points.
  - **Curve PIs** - the points of intersection of tangents drawn at the start and end points of the curve.
  - **Curve RPs** - the radius points.
  - **Curve MPs** - the points in the middle of the curves.

- Click **Next** to define the calculated points' details. More...

Points Details

To specify details for saving calculated points.

- Enter the name of the **First Point**. If required, select a code for this point from the existing codes or click  to set the point's attributes. More...
- If required, select the **Prefix/Suffix** from the drop-down list and enter the desired value.
- Optionally, select the **Save Points To Point List** check box to create a Point List with the name specified in the field which appears.
- Click  to save the calculated points.



Offset Points Selection

To select multiple points and calculate locations of offset points from the selected points.

- In the **Points / Point List / Linework / Area** field, select points to which the offset will be applied or select groups of points by selecting point lists, linework or area:
  - For **Points**, in the **Add Points** drop-down list, choose an option how to select points in the project:
    - *All* - add all the points from the current project.
    - By Range - add points by specifying point name range(s).
    - By Code - add points by point code name(s).
    - By Code String - add points by code string.
    - By Radius - add points which reside in a particular circle.
    - By Name - add points by name or by part of name.

    - By Layer - add points which belong to a particular layer.
    - From Map - add points manually from the map.
    - From List - add points manually from the list of points in the project.

  - For **Point List**, click  and select an existing point list. The point list name will appear in the edit field. The name can also be manually entered into the edit field and added to the point selection by pressing .
  - For **Linework** and **Area**, click  and select an existing linework / area from the map or click  and select an existing linework / area from the list. The name will appear in the edit field. The name can also be manually entered into the edit field and added to the point selection by pressing .

- The list and the plot will display the points currently selected.
- If required, move points up and down the list to change the order.
- To obtain information about one point highlighted in the list, use the Info icon .
- Click  to remove the highlighted point from the list.
- Click **Next** to set offsets. More...

Offset Points

Enter offsets and details for the calculated points.

- Select a **Method** of the three available to enter the desired offset:
    - **North, East, Ht** - the coordinate offsets from the points. The exact label name depends on the coordinate type setting in the project.
    - **Az (Brg), HD, VD** - the direction, horizontal and vertical distances from the points.
    - **Az (Brg), Slope, Zenith** - the direction, slope distance and zenith angle from the points.

- Enter the name for the next calculated point in the **Calc Pt** field. If required, select a code for the calculated points from the existing codes or click  to set the point's attributes. More...
- Click **Calc** to calculate the offset points.

Road Offset

To calculate locations of offset points along a road or alignment.

The road can be defined either as an existing road, horizontal alignment only, or two alignments - horizontal and vertical.

- In **Road** / **H Alnt** / **HV Alnt**, select how to define the road and specify the road or alignment(s) to calculate offset points. Enter a name manually or select from the list .
- The **Start Station** field shows the starting station of the selected road. Two preview panels display alignment(s) in the horizontal and vertical planes.
- If required, click the **Calculate Points** button to generate points along the defined road. More...
- Click **Next** to define stationing for offsets and calculate points. More...

Calculate Transform

Click an icon to calculate the task:

	Rotate To rotate selected points around a specific point.
	Translate To move selected points in the specified direction and distance.
	Scale To move selected points by applying the specified scale factor to distances from the base point.
	2D Transform To perform a two-dimensional transformation of the coordinates of selected points.
	Drawing Transform To link a background drawing to the coordinate system of the project.



Image Transform
To link pixel coordinates of a background image to the coordinate system of the project.



Rotate

To rotate selected points around a specified point.

- Use the tools in the **Select Points** field to select points to rotate:
  - Click **By Range** to enter a range of points. More...
  - Click  to choose points from the map.
  - Click  to choose points from the list of points in the project.
  - Click  to choose a layer whose points will be rotated.
- Review how many points are included in rotation.
- Select the **Rotation Point** to define the center of rotation. Enter a point name manually, or select from the map  or from the list  of points in the project.
- Select the **Rotation Method**, either *Rotation Angle*, or *Azimuth* (*Bearing*). Enter a *Rotation Angle* manually or define rotation by entering the *Old* and *New Azimuths* (*Bearings*). Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.
- Click the  **Calc** button to calculate new positions of the points.

  Note: If measured points are selected, you will be prompted to confirm or reject the over-writing of such points. Click the  **Calc** button again after confirmation.

- Review how many points are rotated.
- Click the  **Report** button to view the rotation results with an option to save them as **.txt* file.

Translate

To move selected points in the specified direction and distance.

- Use the tools in the **Select Points** field to select points to translate:
  - Click **By Range** to enter a range of points. More...
  - Click  to choose points from the map.
  - Click  to choose points from the list of points in the project.
  - Click  to choose a layer whose points will be translated.
- Review how many points are included in translation.
- From the **Translate By** drop-down list, select the translation method, either *Coords* / *Pts* or *Az* (*Brg*), *Dist*, *Ht*:
  - *Coords* / *Pts* - to specify either the point or coordinates of 'translate from' and 'translate to' points:
    - In **From Pt** / **From Coords**, specify either the point or coordinates of the 'translate from' point. Enter a point name or coordinates manually, or select a point from the map  or from the list  of points in the project.
    - In **To Pt** / **To Coords**, specify either the point or coordinates of the 'translate to' point. Enter a point name or local coordinates manually, or select a point from the map  or from the list  of points in the project.
  - *Az* (*Brg*), *Dist*, *Ht* - to move selected points in the specified direction by a specified distance:
    - In **Azimuth** / **Bearing**, enter the direction of translation. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.
    - In **Hz Dist**, enter the horizontal distance of translation.
    - In **Vert Dist**, enter the vertical distance of translation.
- Click the  **Calc** button to calculate new positions of the points.

> **Note:** If measured points are selected, you will be prompted to confirm or reject the over-writing of such points. Click the **Calc** button again after confirmation.

- Review how many points are translated.
- Click the **Report** button to view the translation results with an option to save them as **.txt* file.

Scale

To move selected points by applying the specified scale factor to distances from the base point.

- Use the tools in the **Select Points** field to select points to scale to the base point:
  - Click **By Range** to enter a range of points. More...
  - Click to choose points from the map.
  - Click to choose points from the list of points in the project.
  - Click to choose a layer whose points will be scaled to the base point.
- Review how many points are included in scaling.
- Select the **Base Point**, the horizontal distances from this point to each of the selected points will be scaled and horizontal coordinates of selected points will be adjusted accordingly. Enter a point name manually, or select from the map or from the list of points in the project.
- Enter the **Scale Factor** that will be applied.
- Select the **Scale Heights** check box to also apply scaling to vertical distances between the base point and each of the selected points, thus also adjusting the height coordinates of selected points.
- Click the **Calc** button to calculate new positions of the points.

> **Note:** If measured points are selected, you will be prompted to confirm or reject the over-writing of such points. Click the **Calc** button again after confirmation.

- Review how many points the scaling is applied to.

- Click the  **Report** button to view the scaling results with an option to save them as **.txt* file.



2D Transformation

To perform a two-dimensional transformation of the coordinates of selected points.

This dialog allows you to create or edit a list of point pairs for use in calculating the transformation parameters between two sets of coordinates.

- Click **Add** to add a new pair of points to the transformation parameters list in the Point Pair Info dialog.
- Click **Edit** to open the Point Pair Info dialog and change points in the highlighted point pair.
- Click **Delete** to remove the highlighted point pair(s) from the list.
- Select the **Keep scale 1.0** check box to apply a scale factor of *1.0* to the transformation calculation. Clear the box to automatically calculate the scale factor.

Click **Next** to open the 2D Transform - Calculation, display an overview of the transformation, select points whose coordinates require transformation, and perform calculation.

Point Pair Info

To select a pair of matching points or coordinates to use in calculation of transformation parameters.

- Select **From Pt** / **From Coords** to specify either the point or coordinates of the 'transform from' point in the pair. Enter a point name or coordinates manually, or select a point from the map  or from the list  of points in the project.
- Select **To Pt** / **To Coords** to specify either the point or coordinates of the 'transform to' point in the pair. Enter a point name or coordinates manually, or select a point from the map  or from the list  of points in the project.
- Click  to save the point pair and return the 2D Transformation dialog. Click  to return to the previous dialog without saving.

2D Transform - Calculation

To display an overview of the current transformation, select points to transform and perform the calculation.

- Review the transformation parameters:
  - *Origin Position* - horizontal coordinates of the calculated center of rotation,
  - *Offset* - horizontal offset between two coordinate sets,
  - *Scale Factor* - scale factor between two coordinate sets,
  - *Rotation* - rotation angle between two coordinate sets,
  - *Residuals* - residuals for each pair of points on the horizontal plane.

- If required, click  to return to the 2D Transformation dialog and revise the transformation point pairs.
- Select points to transform using the tools in the **Select Points** field:

  Note: Point selection is not available if you are performing a 2D transformation on a previously selected object that already has points defined for transformation.

  - Click **By Range** to enter a range of points. More...
  - Click  to choose points from the map.
  - Click  to choose points from the list of points in the project.
  - Click  to choose a layer whose points will be transformed.

- Review how many points are included in transformation.
- Click the  **Calc** button to calculate new positions of the points.

  Note: If measured points are selected, you will be prompted to confirm or reject the overwriting of such points. Click the  **Calc** button again after confirmation.

- Review how many points are transformed.
- Click the  **Report** button to view the transformation results with an option to save them as **.txt* file.

Calculate Traverse

Click an icon to calculate the task:

	Calculate traverse To calculate traverse and sideshot point coordinates by entering distances and directions.
	Adjust To adjust a surveyed traverse by applying corrections to the individual linear and angular measurements.
	Closure To perform the loop misclosure test for a surveyed traverse.

Traverse Calc

To calculate traverse and sideshot points coordinates.

1. In the **Input** tab:
   - In **From Point**, enter the occupation point (the traverse point). Enter the point manually or select it from the map  or from the list  of points in the project.
   - Select between **Azimuth** (or **Bearing**) / **Angle R** / **Angle L** / **Defl R** / **Defl L** to enter the traverse direction:
     - **Azimuth** (or **Bearing** depends on the current direction output settings) from the known point to the calculated point. Clicking the  button opens the Compute Azimuth / Bearing dialog to calculate the value based on existing points and lines.
     - **Angle to the Right** is the angle at the known point from the backsight point to the calculated point in a clockwise direction.
     - **Angle to the Left** is the angle at the known point from the backsight point to the calculated point in an counter clockwise direction.
     - **Deflection to the Right** is the angle at the known point between the prolongation of the line from the backsight point and the line to the calculated point in a clockwise direction.

- **Deflection to the Left** is the angle at the known point between the prolongation of the line from the backsight point and the line to the calculated point in an counter clockwise direction.

- In **HD Gnd** (or **HD Grid**, depends on the current coordinate system), enter the horizontal distance along the line of traverse direction.
- In **Vert Dist**, enter the height offset.
- In **To Point**, enter the name of the calculated point. Select the code for this calculated point from the existing codes and, if required, click  to set the point's attributes. More....
- Click **BS Point** to open the BS Point dialog that allows you to set up the starting backsight or change the current backsight for the traverse direction, which is defined by **Angle R** / **Angle L** / **Defl R** / **Defl L** value. By default, the starting backsight is set to 0 degrees, the current backsight is set to the previous **From Point**.
- Click **Side Shot** to calculate the coordinates of the **To Point**, based on entered direction and distance values. This point is calculated as the side shot point, so the **From Point** name does not change, and **To Point** name is incremented to the next new point in the database.
- Click **Traverse** to calculate the coordinates of the **To Point**, based on entered direction and distance values. This point is calculated as the traverse point, so the **From Point** changes to the **To Point**, and the **To Point** is incremented to the next new name in the database.

2. In the **Results** tab, review and save the results of the calculation:
   - Click  to save the calculated point (side shot or traverse point).
   - Click  to save the data to a **.txt* file if required.
   - Open the **Input** tab to continue calculating the traverse.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).
4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Click  to open the dialog menu with additional options:

- Select Edit Points to view and manage points in the project.

BS Point

To define the starting backsight or current backsight for the traverse calculation, when using relative values (**Angle R** / **Angle L** / **Defl R** / **Defl L**) of traverse direction.

By default, the previous **From Point** is automatically used as the current backsight. Here, you can set up an initial backsight to start calculating the traverse or override anytime the previous **From Point** used as the current backsight manually.

- Switch to **BS Point** to specify an existing point to be used as the backsight. Enter a point name manually, or select from the map  or from the list  of points in the project.
- Switch to **BS Azimuth** (**BS Bearing** depends on the current direction output settings) and manually enter a direction to the backsight.

Click  to save the backsight and return to the Traverse Calc dialog. Click  to close the dialog without saving.



Adjustment

To adjust a surveyed traverse by applying corrections to the individual linear and angular measurements.

Before the result of a traverse can be used to determine its location from the traverse stations, the traverse must be mathematically consistent. The misclosures in the linear and angular measurements must be adjusted out. The process of applying corrections to the corresponding point coordinates is called **traverse adjustment**. The points with adjusted coordinates will be saved in a new Sokkia Field project. The coordinates of the points in the current project remain unchanged.

Follow the three-step wizard to perform an adjustment of a surveyed traverse:

- Specify the **adjustment settings**. More...
- Select the **method** of the traverse adjustment and calculate the task. More...
- Review and save the **results** of the traverse adjustment. More...

Adjustment Settings

To specify the traverse and set adjustment parameters.

This is the starting dialog of the Traverse Adjustment wizard.

Specify the traverse:

- In **Start Point**, set the station on which the traverse originates. Enter a point name manually, or select from the map  or from the list  of points in the project.
- In **End Point**, set the station on which the traverse closes.
- Enable the **Adjust Elevations** check box to include elevations adjustment if it is needed to determine elevations in the traverse.

Set adjustment parameters:

- Enable the **Adjust Sideshots** check box to include sideshots in adjustment.
- If required to consider Earth curvature and atmospheric refraction corrections, set the value of **Curvature refraction** either to 0.14 or 0.20.
- In the **Project to store the results**, click **New** to create a new project to store points with adjusted coordinates. A full path to the project file will be shown, the default name for this project is the name of the current project with the traverse plus suffix *_Adj*.
- Click **Next** to select the method of traverse adjustment.

Adjustment Method

To select method(s) of traverse adjustment and calculate the task.

This is the second dialog of the Traverse Adjustment wizard.

- Enable the **Apply Compass Rule** check box to adjust the traverse by the compass rule.
- Enable the **Apply Angle Balance** check box to adjust angles in the traverse. In this case, the **Closing Angle** will be shown for the traverse adjustment.
- Click **Adjust** to calculate the task, store points with adjusted coordinates to the specified project, and open the results.

Adjustment Results

To view the results and save the traverse adjustment report.

This is the ending dialog of the Traverse Adjustment wizard.

- Complete results of adjustment:
  - Traverse details;
  - Reduced traverse data;
  - Traverse;
  - Misclosure results before angle balance;
  - Angle balance results;

  - Closure results after angle balance;
  - Adjusted point comparison;
  - Adjusted traverse.

- Click  to save the data to a **.txt* file, if required.



Traverse Misclosure

To perform the loop misclosure test for a surveyed traverse.

- Specify the traverse:
  - In **Start Point**, set the station on which the traverse originates. Enter a point name manually, or select from the map  or from the list  of points in the project.
  - In **End Point**, set the station on which the traverse closes.

- Click **Next** to view the results.

Misclosure Results

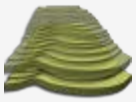
To review and save the results of the traverse loop misclosure test.

- Loop misclosure test results:
  - Traverse details;
  - Reduced traverse data;
  - Traverse;
  - Misclosure results.
- Click  to save the data to a **.txt* file, if required.



Calculate Surface

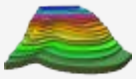
Click an icon to calculate the task:



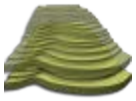
Surface Volumes
To estimate the cut / fill volumes for the surface according to specified parameters.



Create Surface
To calculate and create a new surface from points, point lists, linework objects, areas.



Contour Surface
To generate horizontal contours of an existing surface at a given height or at a given interval.



Surface Volume

To estimate the cut / fill volumes for the surface according to specified parameters.

1. In the **Input** tab:

- Click the first drop-down button to choose a surface used in calculation.
  - Select **Design Surface** to specify the surface whose volume is the target value to which the calculation is made. Enter an existing surface name manually or select from the list  of project surfaces. The preview panel displays the selected surface in the horizontal plane.
  - Select **Original Surface** to specify the surface whose volume is the base value from which the calculation is made. Enter an existing surface name manually or select from the list  of project surfaces. The preview panel displays the selected surface in the horizontal plane.

- Click the second drop-down button to select a parameter or an object for calculation of the cut / fill volumes for selected **Design** or **Original** surface.

- **Min Elevation** - the volume is calculated to the horizontal plane at the minimum elevation of the specified surface.
- **Max Elevation** - the volume is calculated to the horizontal plane at the maximum elevation of the specified surface.
- **Boundary** - the volume is calculated to the virtual surface generated only from the points that form the specified surface area boundary.
- **Fixed Elevation** - the volume is calculated to the horizontal plane at the user defined elevation. Enter the elevation value in the editable field. To set the elevation of a specific point as the fixed elevation, select this point from the map  or from the list  of the project points.
- **Plane** - the volume is calculated to the existing plane. Enter an existing plane name manually or select from the list  of project planes.
- **Original Surface** / **Design Surface** - the volume is calculated to another surface. Enter an existing surface name manually or select from the list  of project surfaces. The preview panel displays the selected surface in the horizontal plane.
- **Road** - the volume is calculated to the surface of a road. Enter an existing road name manually or select from the list  of project roads. The preview panel displays the surface of selected road in the horizontal plane.

- Click the  **Calc** button to calculate cut / fill volumes for the specified surface according to chosen parameters and open the **Results** tab.

2. In the **Results** tab, review the results of the calculation and click  to save the data to a **.txt* file if required:

   - *Design* - the type and name of the object or the parameter and the value to which the calculation is made;
   - *Original* - the type and name of the object or the parameter and the value from which the calculation is made;
   - *Cut* - the estimated volume required to remove;
   - *Fill* - the estimated volume required to add;
   - *2D Area* - the projected area in 2D for calculated volume;
   - *3D Area* - the surface area in 3D for calculated volume.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu). The cut area is displayed in red, the fill area is displayed in blue.

Select Surface

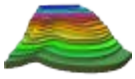
To select an existing surface from the list of surfaces in the current project and use it in another Sokkia Field dialog.

- Highlight an existing surface in the list of project's surfaces.
- Check the displayed preview in horizontal plane. To view the currently highlighted surface in a larger screen or in 3D, double-click the preview.
- Click  to confirm the selection of the highlighted surface. Or click  to return to the previous dialog without selection.

Surface Information

To display the name of the selected surface and the extremes of coordinates.

- Review the information provided and click  to continue.



Contour Surface

To generate horizontal contours of an existing surface at a given height or at a given interval.

In the **Surface Selection** tab, choose an existing surface to be contoured:

- In the **Surface Name** field, enter an existing surface name manually, or select from the map  or from the list  of project surfaces. The preview of selected surface is displayed.
- Click **Next** to open the **Contour Interval** tab and define contours for selected surface.

In the **Contour Interval** tab, set up contouring parameters:

- **Surface Elevation Range** group displays the minimum and maximum elevation values of the selected surface for reference.

- Click the toggle button to enable either **Contour Interval** to set up a height interval to generate contours, or **Contour Elevation** to enter a fixed elevation value to generate a single contour.
  - Set the toggle to **Contour Interval** and enter a height interval between contours.
    - **Start Elevation** - the elevation of the lowest contour.
    - **End Elevation** - the maximal possible elevation to generate the highest contour.
  - Set the toggle to **Contour Elevation** and enter an elevation value to generate the contour.

> **Note:** After generating new contours for the selected surface, the currently existing contours are automatically deleted. To manage or delete generated contours, open the Contours tab of the Surface Properties dialog (click  >  > , highlight the contoured surface in the list and click the **Edit** button).

- Click the  **Save** button to generate contours and go to the **Results** tab or open the **Style** tab to manually set the layer and graphic style of contours before creating them.

In the **Style** tab, review and change the layer and graphic style of the calculated contour(s):

- Define the **Layer** where the calculated contours resides. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
- Click the **Color** button to open the Select Color dialog, where you can select a color for the calculated contours on maps. The preview panel displays the current color.
- Define the **Line Style** and **Width** in points for drawing the calculated contours on maps from the respective drop-down lists.
- Click the  **Save** button to generate contours with specified layer and style and parameters set in the **Contour Interval** tab and go to the **Results** tab.

In the **Results** tab, review the results of surface contouring and click  to save the data to a **.txt* file if required:

- *Surface name* - the name of contoured surface;
- *Interval* - the height interval between generated contours for the **Contour Interval** mode:
  - *Start Elevation* - the elevation of the lowest contour;
  - *End Elevation* - the maximal possible elevation to generate the highest contour;
  - *Num Contours* - the number of generated contours;

- *Elevation* - the fixed elevation value for the **Contour Elevation** mode;

- *Min Elevation* - the minimal elevation of the surface;
- *Max Elevation* - the maximal elevation of the surface;
- *2D Area* - the area occupied by the surface in the horizontal plane;
- *3D Area* - the sum of the areas of all the triangles that form the wireframe of the surface;
- *Num Edges*, *Num Triangles*, *Num Points* - the number of respective elements in the surface wireframe;

The **Map** tab shows the project's objects with the illustration of the surface contour lines and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

The **Drawing** tab shows the illustration of the surface contour lines and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).



Enter Plan

To draw a plan by specifying angle and distance values, usually by moving from one point to another and thus creating individual points or linework consisting of lines, arcs, circles.

All created objects are displayed in the graphical view in the **Enter Plan** dialog and added to the current project after creation.

The essential tools of the **Enter Plan** dialog:

- Enter Plan toolbar - to select and enter the data necessary to draw a plan.
  -  Object Drawing Mode menu button of the Enter Plan toolbar - to specify the type and parameters of currently created element.
  -  Measure menu button of the Enter Plan toolbar - to measure distance, direction or angle values on the plan.

- Map view tools - to navigate the map in many ways and customize map objects output.
- Snap toolbar - to create point(s) with specific position related to an existing object on the current map.

To edit an element of created linework:

- Select the desired element on the plan. The selected element is highlighted in red.
- Use the Enter Plan toolbar to modify values of desired parameters for this element.
- Save changes by clicking .

Note: Changing the parameters of an element affects the parameters of dependent objects, such as coordinates of the points of this element and positions of adjacent segments in the linework.

Click  to open the dialog menu with additional options:

- Edit Points - opens the dialog to view and manage points in the project.
- Edit Lines - opens the dialog to view and manage linework in the project.
- Point Attributes - opens the dialog to view and edit code(s), style and attributes of the next point to be created.
- **Closure Report** - displays the information about the start and end point of the currently created linework and current difference between their horizontal coordinates.

Enter Plan Toolbar

The Enter Plan toolbar is located at the bottom part of the Enter Plan dialog and provides the selection and input tools used to draw a plan.

	Defines the start point of a line / arc or the reference point for another point creation or the center of a circle.
	Defines the end point of a line / arc. This field available in the Point or Arc 2 pt / Arc 3 pt modes.
	Defines the radius point or third point of an arc. This field available only in the Arc 3 pt mode.
	Opens the list of the points in the project. You may select any point from this list.



Defines the direction. This field is displayed in all modes, but it is available for the parameters input only in the *Length* and Arc modes.



Defines the line length. This field available in the *Length* and Circle mode.



Defines the arc radius. This field is available only in the Arc and Arc 2pt modes. This field contains the list of the following arc parameters, which may define the arc radius:

- Radius (default);
- Chord angle;
- Curve angle.

Click the button to select the desired parameter from the drop-down list.



Defines the arc length. This field available only in the Arc mode. This field contains the list of the following arc parameters, which may define the arc length:

- Delta angle (default);
- Length of the arc;
- Length of the chord;
- Length of the tangent;
- Middle ordinate (the distance from the midpoint of the chord to the mid-point of the arc);
- External (the distance from the midpoint of the arc to the intersection point of tangents).

Click the button to select the desired parameter from the drop-down list.



Allows quickly add or subtract standard angles to the current direction. The **Extend** function instantly sets the angle to the direction of the tangent to the previous element in the linework.



Measures distance, direction or angle values depending on the selected drawing mode and instantly enters the result in the respective field in the Enter Plan toolbar.

> **Note:** Distance and direction values are measured from two selected points (start and end point), angle values are measured from three selected points (start, mid and end point). The measured parameter in the fields  and  is defined by the selection made in the respective field. See detailed information about what parameters are available for different drawing modes in the Distance, Direction and Angle Measurements section.



Opens the drop-down menu for selecting drawing modes.



Discards the last performed action. This feature is limited to an object that is being created but is not completed.



Adds a new element to the current linework. The last point created is automatically set as the new start point for next element.



Saves changes to the currently edited element. The button is displayed instead of  when you are editing an element.

When you finished to specify new element parameters but have not clicked , the dotted red line will be shown from the start point to the end point. This preview helps you to see an element before it is created.

Object Drawing Modes

Use the Enter Plan toolbar located at the bottom of the dialog to specify parameters of currently created element. Available parameters depend on the selected drawing mode. Click  and select the desired drawing mode from the drop-down list.

- If the *Draw Line* is selected , lines, circle or arcs are created after configuring the desired mode:
  - *Length* - to create a line by specifying its start point, length and direction. Enter the name of the start point manually, or select it from the list, or by clicking a point on the plan.
  - Point - to create a line from one existing point to another existing point. Enter the names of start and end points manually or select them from the list or by clicking on the plan.
  - Circle - to create a circle using any existing point as center of the circle. Also you need to specify the circle radius.
  - Arc - to create an arc with the right or left turning from a start point. Also you need to specify more arc parameters.
  - Arc 2 pt - to create an arc, defined by two existing points. Also you need to specify the arc radius.
  - Arc 3 pt - to create an arc, defined by three existing points.
  - Rectangle - to create a rectangle or parallelogram from a linework object consisting of two line segments.
  - Close - to create a closed figure from a linework object consisting of two or more segments.
  - *Restart* - to complete the creation of a linework object and continue drawing a plan from another point.

- If the *Draw Line* is deselected, only points are created after configuring the desired mode:
  - *Length* - to create a point in the horizontal distance and direction from an existing point. Enter the name of the existing point manually, or select it from the list, or by clicking a point on the plan.
  - Arc - to create a point calculated as the end point of an arc whose start point is an existing point. Enter the name of the existing point manually, or select it from the list, or by clicking a point on the plan. Also you need to specify more arc parameters.
  - *Restart* - to continue drawing a plan from another point.

Creating Points

- Click  and deselect *Draw Line* mode. In this mode you can create a point as an end point of a line or an end point of an arc.

- To create an end point of a line, click  and select  *Length*. To create an end point of an arc, click  and select  *Arc* (*Arc Right* or *Arc Left*).
- Enter the start point name in the field  or select from the list .
- If the created point is the end point of a line:
  - enter the desired direction *(azimuth* / *bearing*) in the field  and *length* in the field .
- If the created point is the end point of an arc:
  - click , select and enter either the arc *radius* or one of the two parameters unambiguously defining the radius: *chord angle*, or *curve angle*.
  - click , select and enter either the *delta* (the angle between the radii to the start and end points of the arc), or one of five parameters unambiguously defining the arc length: *length* of the arc, length of the *chord*, length of the *tangent*, *middle ordinate* (the distance from the mid-point of the chord to the midpoint of the arc), *external* (the distance from the midpoint of the arc to the intersection point of tangents).
  - enter the direction (azimuth / bearing) of the tangent to the start point of the arc in the field .
- Check the preview and click  to create the point, add it as design point  to the current project and to continue creating new points from this point. To start creation of points from another point, click  and select *Restart*.

Creating Line between Two Existing Points

- Click  and select  *Draw Line* mode.
- Click  and select  *Point*.
- Enter the start point name in the field  or select from the list (click ).
- Enter the end point name in the field  or select from the list (click ).

- Check the preview and click  to draw the line and to continue creating a linework object from the end point of the line. To complete the linework and start drawing from another point, click  and select *Restart*.

Creating Circle

- Click  and select  *Draw Line* mode.
- Click  and select  *Circle*.
- Enter the center point name in the field  or select from the list (click ).
- Enter the radius of the circle in the field .
- Check the preview and click  to draw the circle.

Creating Arc

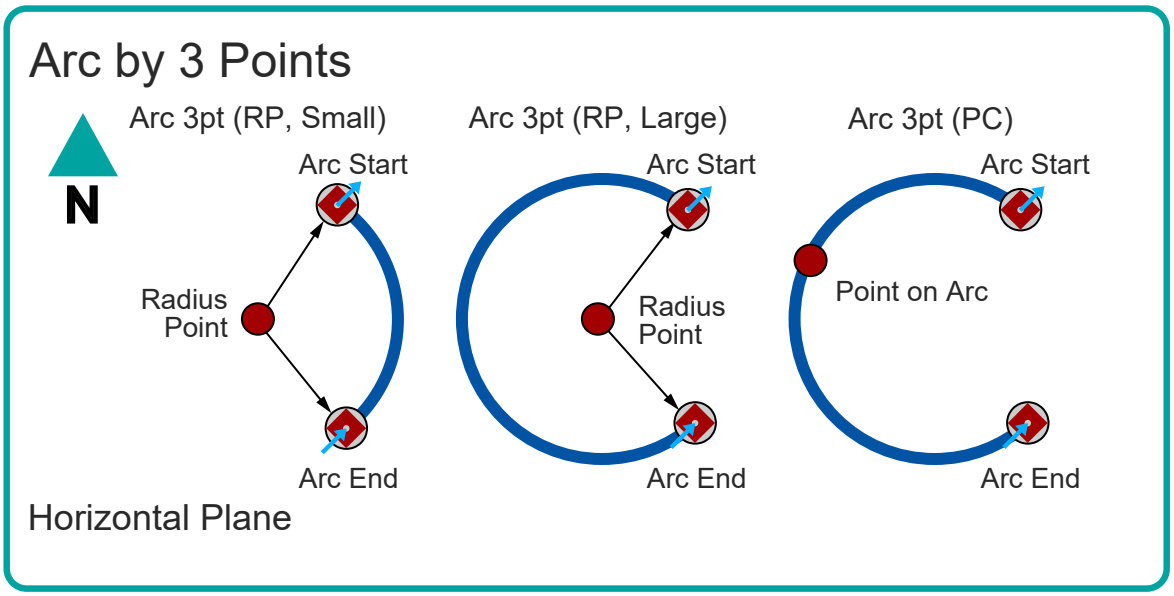
- Click  and select  *Draw Line* mode.
- Click  and select  *Arc* (*Arc Right* or *Arc Left*).
- Enter the start point name in the field  or select from the list (click ).
- Enter either the *radius* of the arc, or one of the two parameters unambiguously defining the radius: *chord angle* or *curve angle* in the field .
- Enter either the *delta* (the angle between the radii to the start and end points of the arc), or one of five parameters unambiguously defining the arc length: *length* of the arc, length of the *chord*, length of the *tangent*, *middle ordinate* (the distance from the midpoint of the chord to the mid-point of the arc), *external* (the distance from the midpoint of the curve to the intersection point of tangents) in the field .
- Enter the direction (azimuth / bearing) of the tangent to the start point of the arc in the field .

- Check the preview and click  to draw the arc and to continue creating the linework from the end point of the arc. To complete the linework and start drawing from another point, click  and select *Restart*.

Creating Arc by Two Points

- Click  and select  *Draw Line* mode.
- Click  and select  *Arc 2pt*:
  - Arc 2pt (Right, Small);
  - Arc 2pt (Right, Large);
  - Arc 2pt (Left, Small);
  - Arc 2pt (Left, Large).
- Enter the start point name in the field  or select from the list (click ).
- Enter the end point name in the field  or select from the list (click ).
- Enter either the *radius* of the arc, or one of the two parameters unambiguously defining the radius: *chord angle* or *curve angle* in the field .
- Check the preview and click  to draw the arc and to continue creating the linework from the end point of the arc. To complete the linework and start drawing from another point, click  and select *Restart*.

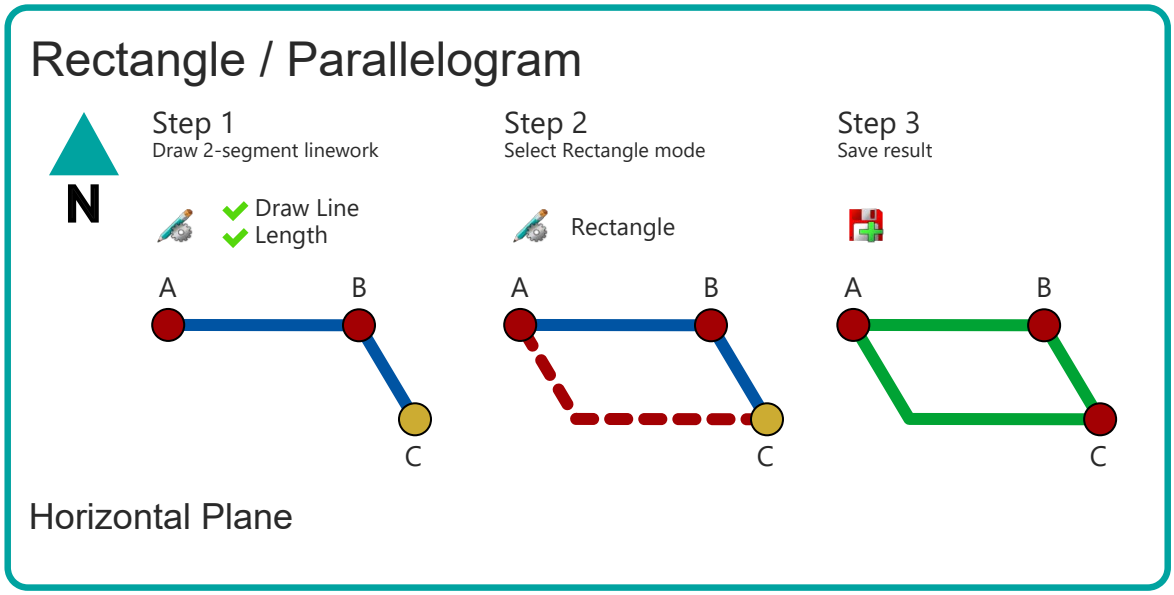
Creating Arc by Three Points



- Click and select *Draw Line* mode.
- Click and select *Arc 3pt*:
  - *Arc 3pt (RP, Small)* / *Arc 3pt (RP, Large)* modes - two points as start and end points of the arc and one point as radius point of the arc.
  - *Arc 3pt (PC)* - two points as start and end points of the arc and one point as any other point lying on the arc.
- Enter the start point name in the field or select from the list (click).
- Enter the end point name in the field or select from the list (click).
- Enter the name of the arc radius point for *Arc 3pt (RP, Small)* / *Arc 3pt (RP, Large)* modes, or the name of the third point on the arc for *Arc 3pt (PC)* mode in the field or select from the list (click).
- Check the preview and click to draw the arc and to continue creating the linework from the end point of the arc. To complete the linework and start drawing from another point, click and select *Restart*.

Creating Rectangle

To use the *Rectangle* feature, you need to create a two-segment linework.



- Create a linework object with two line segments:
  - Click and select *Draw Line* mode.
  - Click and select *Length*.
  - Enter the name of the start point in the field or select from the list (click).
  - Enter the desired direction in the field and length in the field for the first segment.
  - Click to draw the line.
  - Enter the desired direction in the field and length in the field for the second segment.

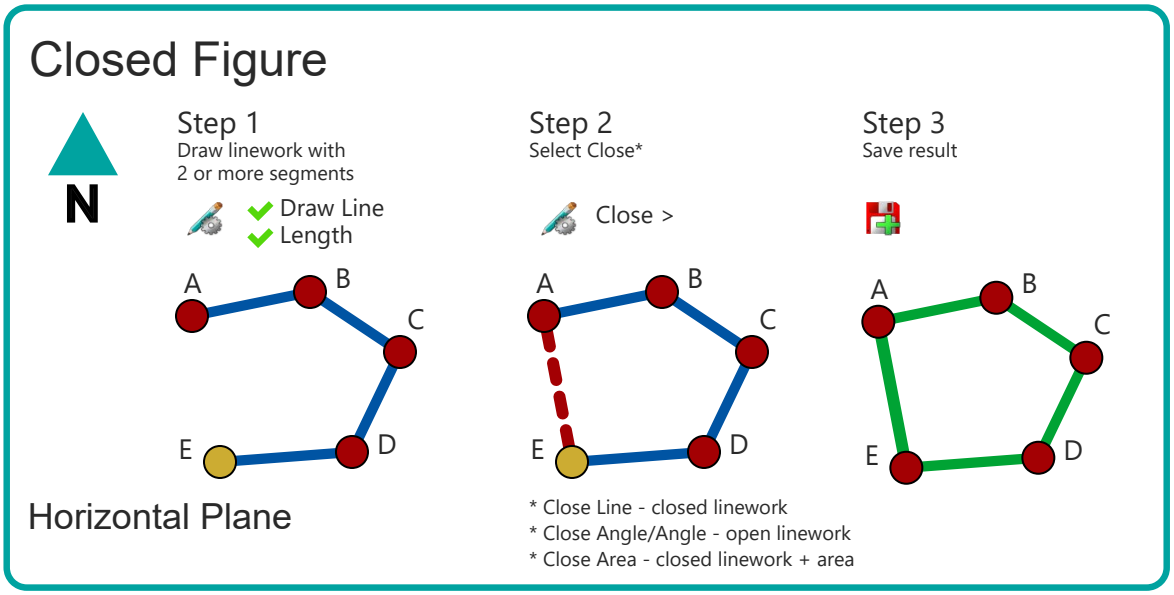
    Note: Any angle between two segments of created linework is supported. Parallelograms can be created this way.

  - Click to draw the line.
- Click and select *Rectangle*.

- Check the preview and click to create a rectangle or parallelogram.

Creating Closed Figure

To use the *Close* feature, you need to create a linework object consisting of two or more segments.



- Create a linework object with two or more line segments:
  - Click and select *Draw Line* mode.
  - Click and select *Length*.
  - Enter the name of the start point in the field or select from the list (click).
  - Enter the desired direction in the field and length in the field for the first segment.
  - Click to draw the line.
  - Enter the desired direction in the field and length in the field for the second segment.
  - Click to draw the line.
  - Add more segments when required. Arc segments are also supported.

- Click  and select *Close*:
  - *Close Line* - to create a closed linework;
  - *Close Angle/Angle* - to create an open linework (the linework end point will be created at the location of the start point);
  - *Close Area* - to create a closed linework and an area from this closed linework.

- Check the preview and click  to create a closed figure.

Distance, Direction and Angle Measurement

To measure distance or / and direction values and to enter them automatically into the corresponding parameter fields in the Enter Plan toolbar you will need to click two points in order on the plan, the start and end point. To measure an angle value and to enter it automatically into the corresponding parameter field in the Enter Plan toolbar you will need to click three points in order on the plan, the start, mid, and end point.

- Click  and select  *Draw Line* mode.
- Click  and select  *Length*.
- Click  and select the desired parameter from the drop-down list of available parameters for the currently selected drawing mode:
  - If the Circle mode is selected, length can be measured from existing points and entered in the field .
  - If the *Length* mode is selected, length, direction (azimuth / bearing), or both length and direction values can be measured and entered in the fields  and .
  - If the Arc Left / Arc Right mode is selected, direction (azimuth / bearing) can be measured and entered in the field , radius / chord angle / curve angle can be measured and entered in the field , or length / delta / chord / tangent / middle ordinate / external values can be measured and entered in the field .
  - If the Arc 2 pt mode is selected, radius / chord angle / curve angle can be measured and entered in the field .

- Click the desired points in order on the plan.

- After clicking the last required point, the corresponding field(s) in the Enter Plan toolbar display the value of the selected parameter(s) calculated from just clicked points.
- You can measure value for another available parameter or continue drawing in the current mode and use measured and automatically entered value(s) for the element being created.

Calc Points

To change a name and set code and other attributes for the calculated point(s).

- Enter a name for the calculated point in the **Calc Point** field. (A software-defined name for that type of points is suggested by default).
- Select a code attribute for the calculated point from the drop-down list. Depending on your selection additional drop-down lists may appear to set code string and control code.
- Alternatively, click the **Code** button to open the Point Attributes dialog and select point codes, code attributes as well as point properties (such as style, photo, note).
- Repeat the routine for every calculated point.

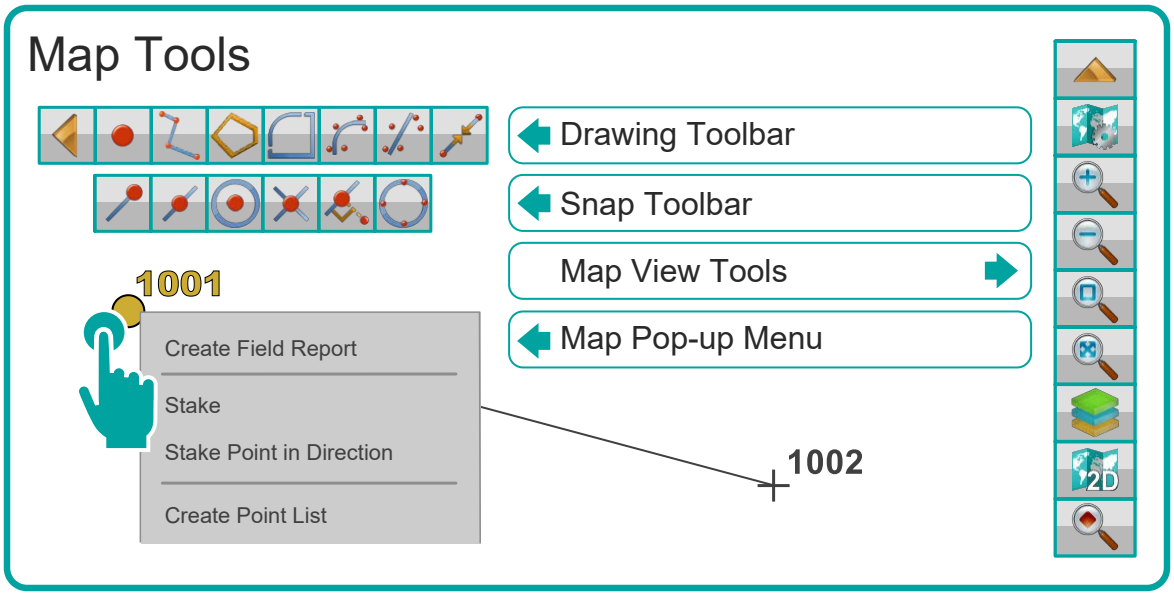
Click the **OK** button to set attributes to the calculated point(s) and close the dialog. Click to close the dialog without saving attributes.

CAD

The CAD icon on the Home screen opens the map of the current project where you find the objects charted by the software after completing surveys as well as objects created manually or imported by the user. The map operates in two switchable modes: 3D and 2D. The map always displays on-screen scale bar and compass (direction indicator) in both 2D and 3D modes. The map retains current project view including charted objects and settings, so user may quit map screen any time and return later.

Note: To avoid cluttering of the elements displayed on the map at the current zoom level, they are combined. Closely positioned points are displayed as a single point with a bracketed number of hidden points next to its name: for example, P001{5}, where 5 is the number of hidden (not displayed) points. If there are more than 99 cluttered points, they will be displayed as {99+}. Hidden elements become visible with the further zoom in.

Operate the map with four sets of interface instruments:



- Map View Tools - to navigate the map in many ways and customize map objects output.
- Drawing Toolbar - to create new objects on the map.
- Snap Toolbar - to calculate and create points at specific positions relative to existing objects and quickly add them to an object being created using the Drawing Toolbar.
- Map Pop-up Menu - to quickly run the most useful commands depending on the objects selected.

Customize the map look to meet your needs in the Map Properties dialog, open it by clicking  in the Map View Tools.

Click  to open the dialog menu with additional options. More...

Map View Tools

The **Map View Tools** toolbar offers tools to navigate the map in many ways and customize objects output on the map.

To open / close the **Map View Tools** toolbar click the  /  button in the top right corner of the plan.

Click a tool button to execute the corresponding command:



Map Properties
Open the Map Properties dialog.



Zoom In
Zoom the map inwards.



Zoom Out
Zoom the map outwards.



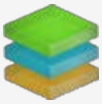
Zoom Window
Click this button and drag the pointer to define a rectangular area to scale and center on.



Zoom All
Scale and focus automatically to display all map objects in single view.



Center to Point
Select a point through Select Points From List dialog for centering the map.



Edit Layers
Open the Layers dialog for quick access to layers manipulations.



Switch to 2D/3D



Switch the view of the map between 3D and 2D mode.

When the 3D View is selected, an additional sidebar with more command buttons is displayed:



Top View

The observer is located above the objects, looking perpendicular to the horizontal plane.



Perspective View

The observer is located in front of the objects and above them, the gaze direction is free.

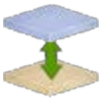


Switch between Rotate / Horizontal Pan / Vertical Pan modes

- **Rotate**
  Rotate the map around center:
  - If **Top View** is selected, objects will be rotated in the horizontal plane;
  - If **Perspective View** is selected, objects will be rotated in the vertical and horizontal planes. The value of the rotation angle in the vertical plane is in the range from 0 to 90 degrees.

- **Horizontal Pan**
  Move the map relative to the observer horizontally by dragging the pointer in any direction while maintaining scale and orientation of the map.
- **Vertical Pan** (available when **Perspective View** is enabled)
  Move the view point vertically by dragging the pointer up and down.

Perspective correction is applied when working in **3D View** with **Perspective View** enabled.



Vertical scaling

Change the vertical scale of all shown objects in the 3D view. Click the icon to activate and drag the pointer vertically up to increase or down to decrease the vertical scale.



Clipping
Set the clipping of space on the map in 3D mode. Click the icon to activate clipping and drag the pointer vertically up or down to visually set the height of the clipping (single clipping plane or first and second clipping planes).



Check the **Enable clipping planes** box in the 3D tab of the Map Properties dialog to show clipping button(s) and click  to initially set up the clipping planes in the Clipping Planes dialog. When using two clipping planes, the top clipping button in the toolbar corresponds to the first plane, and the bottom clipping button corresponds to the second plane.

Drawing Toolbar

The **Drawing Toolbar** toolbar offers tools to create new objects such as lines, polylines, areas, arcs, fillets. When used in combination with the Snap Toolbar, the **Drawing Toolbar** also allows you to create new points at specific positions relative to existing objects.

To open / close the **Drawing Toolbar**, click the  /  button in the top left corner of the map.

The **Drawing Toolbar** contains the following drawing tool buttons:



Point Drawing Tool
To calculate and generate a point at specific position relative to existing object(s). Use this tool in combination with the desired tool from the Snap Toolbar.



Polyline Drawing Tool
To create a polyline through ordered point selection. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.



Area Drawing Tool
To create an enclosed area through ordered point selection. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.



Fillet Drawing Tool
To calculate and generate a fillet between two lines with user-defined radius.

	Best Fit Arc Drawing Tool To calculate and generate a horizontal circular arc as the best fit to the selected points. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.
	Best Fit Line Drawing Tool To calculate and generate a line as the best fit to the selected points. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.
	Join Lines Drawing Tool To create a new polyline by joining multiple lines.



Point Drawing Tool

To create a new point relative to the existing objects using tools from the Snap Toolbar.

- Click  to activate the tool.
- Select the desired snap tool by clicking the respective button in the Snap Toolbar.
- Click the desired object(s) on the map to which the selected snap tool applies.
- The point is calculated and created according to the applied snap tool.



Polyline Drawing Tool

To create a new polyline, by selecting the node points of the polyline in order on the map. You can also add new node points on the fly by using tools from the Snap Toolbar.

To create a polyline:

- Click  to activate the tool.
- Start clicking in order on the desired points on the map to form a polyline from start to end.
- If required, use tools from the Snap Toolbar to calculate new points on the fly and add them as polyline nodes.
- The currently formed polyline is previewed on the map.

- After the end point of the polyline is added, click  again to finish.
- The polyline is created.

 Area Drawing Tool

To create a new enclosed area, by selecting the boundary points of the area in order on the map. You can also add new points on the fly by using tools from the Snap Toolbar.

To create an enclosed area:

- Click  to activate the tool.
- Start clicking in order on the desired points on the map to form an area boundary.
- If required, use tools from the Snap Toolbar to calculate new points on the fly and add them to the area boundary.
- The currently formed area is previewed on the map
- After the last point of the area boundary is added, click  again to finish.
- The enclosed area is created.

 Fillet Drawing Tool

To create a fillet between two existing straight lines or straight segments of a polyline. A fillet starts at the starting point of the first selected line and contains a circular arc with a user-specified radius.

- Click  to activate the tool.
- In the open edit box, enter a radius of the circular arc in the fillet.
- Click the first straight line or segment on the map.
- Click the second straight line or segment on the map.
- The fillet between two lines is created starting from the start point of the first selected line.



Best Fit Arc Drawing Tool

To create a new circular arc as the best fit to the selected points.

Note: At least three points are required to create an arc with the Best Fit Arc tool. If three points were selected, an arc by three points is created. In this case, the first selected point defines horizontal coordinates of the Point of Curve (start point), the second point defines horizontal coordinates of the point on the curve, the third point defines horizontal coordinates of the Point of Tangent (end point).

- Click  to activate the tool.
- Click the desired points on the map that will be used to calculate the best fit position and fixed best fit height.
- After selecting points, click  to finish.
- The horizontal circular arc in the best fit position to the selected points is created.



Best Fit Line Drawing Tool

To create a new horizontal straight line as the best fit to the selected points.

Note: At least two points are required to create a line with the Best Fit Line tool. If two points were selected, the first selected point defines horizontal coordinates of the start point of the line, the second selected point defines horizontal coordinates of the end point of the line.

- Click  to activate the tool.
- Click the desired points on the map that will be used to calculate the best fit position.
- After selecting points, click  to finish.
- The horizontal straight line in the best fit position to the selected points is created.



Join Lines Drawing Tool

To create a new polyline from a selection of multiple lines where all adjacent lines share one common point.

- Click  to activate the tool.
- In the open edit field, enter a tolerance distance so that points of two adjacent lines are considered common.
- Start clicking in order on the desired lines on the map to form a new polyline from start to end.
- The currently formed joined polyline is previewed on the map.
- After selecting the desired lines, click  to finish.
- The new polyline is created.

Snap Toolbar

The **Snap Toolbar** acts as an addition to the Drawing Toolbar and offers tools to quickly calculate and create points at specific positions relative to existing map objects. Such points can be calculated and added directly when creating a new object with instruments on the Drawing Toolbar.

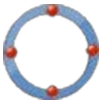
To open the **Snap Toolbar**, select either point , polyline , area , best fit arc , or best fit line  in the Drawing Toolbar. In the moment, when you need to add a new point to an object being created, click the desired instrument on the **Snap Toolbar**. Then click appropriate existing object(s) on the map and a new point will be calculated and added to the selection of points for an object being created:

- When used with the Point  drawing tool, a new point will be created.
- When used with the Polyline  drawing tool, a new point will be created and instantly added as a node point to the currently created polyline.
- When used with the Area  drawing tool, a new point will be created and instantly added as a boundary point of the currently created polyline.
- When used with the Best fit arc  drawing tool, a new point will be created and instantly added as a point used in calculation of the best fit position of currently created arc.

- When used with the Best fit line drawing tool, a new point will be created and instantly added as a point used in calculation of the best fit position of currently created line.

Note: After a new point is created, the used snap tool is released. To use the same snap tool again, click the respective button again. Alternatively you can check the **Persistent Snap Toolbar Buttons** box in the General tab of the Map Properties dialog, click to open. This option keeps the current snap tool active until it is switched to another tool or released manually by click.

The **Snap Toolbar** contains the following snap tool buttons:

	End Point Snap Tool To create a point at the nearest end of the clicked line or segment of a polyline.
	Middle Point Snap Tool To create a point it the middle of the clicked line or segment of a polyline.
	Circle Center Snap Tool To create a point in the center of the clicked circular arc or circle.
	Line Intersection Snap Tool To create a point at the intersection of two selected lines.
	Perpendicular Snap Tool To create a point projected from the selected point onto the clicked line or segment of a polyline.
	Quadrant Snap Tool To create a point in the nearest quadrant of the clicked circular arc or circle.



End Point Snap Tool

To create a point at the nearest end of the clicked line or segment of a polyline.

- Click to start the desired drawing tool or just continue to use the current tool from the Drawing Toolbar: Point , Polyline , Area , Best fit arc , or Best fit line .
- Click in the **Snap Toolbar** to activate the tool.
- Click a line, arc, or segment of a polyline on the map to create an end point on the side of the clicked object closest to where you clicked.



Middle Point Snap Tool

To create a point it the middle of the clicked line or segment of a polyline.

- Click to start the desired drawing tool or just continue to use the current tool from the Drawing Toolbar: Point , Polyline , Area , Best fit arc , or Best fit line .
- Click in the **Snap Toolbar** to activate the tool.
- Click a line, arc, or segment of a polyline on the map to create a point in the middle of the clicked object.



Circle Center Snap Tool

To create a point in the center of the clicked circular arc or circle.

- Click to start the desired drawing tool or just continue to use the current tool from the Drawing Toolbar: Point , Polyline , Area , Best fit arc , or Best fit line .
- Click in the **Snap Toolbar** to activate the tool.
- Click a circular arc, or circle on the map to create a point in the center of the clicked object.

Line Intersection Snap Tool

To create a point at the intersection of two selected lines.

Note: An intersection point can be created for straight or arc segments. Automatic calculation of the extension of one straight segment can be used to find the intersection. In case of arc segment(s) or circle(s), there may be two intersections, the intersection closest to where you clicked the second object is used to create a point.

- Click to start the desired drawing tool or just continue to use the current tool from the Drawing Toolbar: Point , Polyline , Area , Best fit arc , or Best fit line .
- Click in the **Snap Toolbar** to activate the tool.
- Click a segment on the map to highlight it and use it as the first intersecting object.
- Click another segment on the map to highlight it, use it as the second intersecting object and create a point at the intersection.

Perpendicular Snap Tool

To create a point projected from the selected point onto the clicked line or segment of a polyline.

Note: A projected point can be created on a straight or arc segment. Automatic calculation of the extension of a straight segment can be used to find the projection.

- Click to start the desired drawing tool or just continue to use the current tool from the Drawing Toolbar: Point , Polyline , Area , Best fit arc , or Best fit line .
- Click in the **Snap Toolbar** to activate the tool.
- Click a point on the map to highlight it as the point to calculate the projection or just use an already highlighted point.
- Click a segment on the map to highlight it and create a point projected onto this segment.

Quadrant Snap Tool

To create a point in the nearest quadrant of the clicked circle or arc.

- Click to start the desired drawing tool or just continue to use the current tool from the Drawing Toolbar: Point , Polyline , Area , Best fit arc , or Best fit line .
- Click in the **Snap Toolbar** to activate the tool.
- Click a circle or arc on the map to create a quadrant point of the clicked object closest to where you clicked.

Map Pop-Up Menu

Map Pop-Up menu is a handful instrument to quickly access the most useful map objects related commands and options. To open a pop-up menu, right click or hold down the pointer on any place in the map. If any object or a group of objects is selected on the map, a pop-up menu for this object or group of objects opens.

Note: If you hold down the pointer on cluttered multiple objects, you open the Objects near selected point dialog which allows you to select individual object(s) from the pointed group.

The menu options and commands vary depending on what is selected:

Note: When selected on the map, *points*, *lines*, *planes* that are elements of an imported composite object such as drawing, as well as *external control points* from the Shared Data file restrict some commands and options in Map Pop-up Menu since they are not standard objects in the project and cannot be individually deleted, edited, and so on.

To create a copy of such individual element in the project, select it on the map and use the **Layer** - **Add To** command from the Map Pop-up Menu to choose an existing layer in the project for that copy. The standard object management policy applies to such copy.

When a *point* that is part of an imported composite object such as drawing, as well as an *external control point* from the Shared Data file is selected on the map and involved in the creation of another object in the project, such as linework, area, surface, point list, etc., this point is copied to the project as a design point. The standard point management policy applies to such copy.

No objects

If there are **no objects** selected, the pop-up menu contains the following commands:

- *Create Point Here* - opens the Add Point dialog, where you can view / edit name, coordinates and layer for a new point. After clicking , the new point is created.
- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Set Simulator Here* - places the current position to the point on the map where the menu was called. Only displayed if the simulation mode was selected in the configuration.
- *Set Simulator Direction* - starts to slowly move the current position from the current point in the direction where the menu was called. To stop movement use the *Set Simulator Here* menu command. Only displayed if the simulation mode was selected in the GNSS survey configuration.

1 point

If a **point** is selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake* - displays sub-menu items related to stakeout of objects:
  - *Stake Point* - opens the Stake dialog for the point. In this dialog you can stake the selected point. The point is automatically set as *Design Point*.
  - *Stake Point in Direction* - opens the Stake Point in Direction dialog for the point. In this dialog you can stake a point, using the selected point, the azimuth, and the offsets from the azimuth line. The point is automatically set as *From Point*.
- *Create* - displays sub-menu items related to creation of objects in the current project:
  - *Create Point List* - instantly creates a new point list containing selected point. Review the created point list in the Point Lists dialog.
  - *Create Point in Direction* - opens the Point in Direction dialog for the point. The point is automatically set as *From Point*. In this dialog you can create a point in a specific direction from the selected point.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.

  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Edit* - opens the Edit Point dialog, where you can view / edit name, coordinates and layer for this point.
- *Delete* - deletes this point from the project.
- *Information* - opens the Selected Point dialog with aggregated information about the selected point.

2 points

If **two points** are selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake* - displays sub-menu items related to stakeout of objects:
  - *Stake Point List* - opens the Stake Point List dialog. The software automatically creates a *Point List* for the selected points and offers to perform stakeout.
  - *Stake Line* - opens the Stake Line dialog. The software automatically creates a line using the selected points and offers to perform stakeout of the line.
  - *Stake Line and Offset* - opens the Stake Line Offset dialog. The software automatically creates a line using the selected points and offers to perform stakeout an offset point from the line.
  - *Stake Curve* - opens the Stake Curve dialog with selected points entered as point of curve and point of tangent.
  - *Stake Curve and Offset* - opens the Stake Curve Offset dialog to stake a curve (section of an arc) at specified horizontal and vertical offsets from the curve.
  - *Stake Point in Direction* - opens the Stake Point in Direction dialog for the point. In this dialog you can stake a point, using the selected points and the offsets from the azimuth line. These points are automatically set as *From Point* and *Azimuth to Point*.
- *Create* - displays sub-menu items related to creation of objects in the current project:
  - *Create Linework* - instantly creates a new linework from selected points.
  - *Create Point List* - instantly creates a new point list containing selected points in the order of selection. Review the created point list in the Point Lists dialog.
  - *Create Point in Direction* - opens the Point in Direction dialog for the point. These points are automatically set as *From Point* and *Azimuth to Point*. In this dialog you can create a point in direction, which is defined by two selected points.
- *Calc Inverse* - opens the **Results** tab of the Two-Point Inverse dialog with the calculated azimuth and distance between the two selected points.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object(s) to reside.
  - *Lock* - locks the layer(s) with selected object(s) preventing any changes. To unlock the layer(s), click  icon in Map View Tools and open the Layers dialog.

  - *Hide* - makes the layer(s) with selected object(s) invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
- *Edit* - opens the Editing Multiple Points dialog. This dialog allows you to set Layer and style, Codes or Note attribute for all selected points at once.
- *Delete* - deletes the selected points from the project.

3 points

If **three points** are selected, the pop-up menu contains the following commands:

- *Create* - displays sub-menu items related to creation of objects in the current project:
  - *Field Report* - opens the Field Report dialog, where you can create a new report.
  - *Plane* - opens the Plane By Three Points dialog to specify a plane defined by three points.
  - *Arc Center* - instantly creates a point at the center of a circular curve or circle formed by three points selected on the 3D model.
  - *Linework* - instantly creates a new linework from selected points. Points are added to form a linework object in the order of their selection.
  - *Area* - instantly creates a new area from selected points. Points are added to form an area in the order of their selection.
  - *Surface* - instantly creates a new surface from selected points. Points are added to form a surface in the order of their selection.
  - *Point List* - instantly creates a new point list containing selected points in the order of selection. Review the created point list in the Point Lists dialog.
- *Stake Point List* - opens the Stake Point List dialog. The software automatically creates a *Point List* for the selected points and offers to perform stakeout.
- *Calc* - displays sub-menu items related to calculations:
  - *Calc Corner Angle* - opens the **Results** tab of the Corner Angle dialog with calculated angle between two lines. The lines were automatically defined by selected points - the first and second selected points form one line, the second and third points form another line.
  - *Calc Area* - opens the **Results** tab of the Compute Area dialog with calculated area and perimeter of a polygon formed from selected points.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object(s) to reside.
  - *Lock* - locks the layer(s) with selected object(s) preventing any changes. To unlock the layer(s), click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer(s) with selected object(s) invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
- *Edit* - opens the Editing Multiple Points dialog to add or edit Layer and style, Codes, or Note attribute for all selected points at once.
- *Delete* - deletes the selected points from the project.

4 or more points

If **four or more points** are selected, the pop-up menu contains the following commands:

- *Create* - displays sub-menu items related to creation of objects in the current project:
  - *Field Report* - opens the Field Report dialog, where you can create a new report.
  - *Best Fit Plane* - opens the Best Fit Plane dialog to create a plane in the optimal position to the objects selected on the map.
  - *Linework* - instantly creates a new linework from selected points. Points are added to form a linework object in the order of their selection.
  - *Area* - instantly creates a new area from selected points. Points are added to form an area in the order of their selection.
  - *Surface* - instantly creates a new surface from selected points. Points are added to form a surface in the order of their selection.
  - *Point List* - instantly creates a new point list containing selected points in the order of selection. Review the created point list in the Point Lists dialog.
- *Stake Point List* - opens the Stake Point List dialog. The software automatically creates a *Point List* for the selected points and offers to perform stakeout.
- *Calc* - displays sub-menu items related to calculations:
  - *Calc Intersection* (available when four points selected) - opens the **Results** tab of the Intersection dialog. The software automatically calculates the intersection point for the line formed by the first and second selected points and the line formed by the third and fourth selected points.
  - *Calc Area* - opens the **Results** tab of the Compute Area dialog with calculated area and perimeter of a polygon formed from selected points.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object(s) to reside.
  - *Lock* - locks the layer(s) with selected object(s) preventing any changes. To unlock the layer(s), click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer(s) with selected object(s) invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
- *Edit* - opens the Editing Multiple Points dialog to add or edit Layer and style, Codes, or Note attribute for all selected points at once.
- *Delete* - deletes the selected points from the project.

1 point and linework

If a **point** and a **linework** are selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake Perpendicular* - opens the Stake dialog. In this dialog you can stake a point which is intersection point of the perpendicular from the selected point to selected line and this line.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object(s) to reside.
  - *Lock* - locks the layer(s) with selected object(s) preventing any changes. To unlock the layer(s), click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer(s) with selected object(s) invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
- *Delete* - deletes the selected point and line from the project.
- *Calc Multiple Intersections* - instantly calculates and creates points at segment intersections of the selected linework. Intersections are 2D intersections, the height of created intersection points is the averaged height of the intersecting segments at the created point.

2 points and linework

If **two points** and a **linework** are selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake Intersection* - opens the Stake dialog. In this dialog you can stake a point which is intersection point of the two lines: a line between two selected points and first line segment.
- *Calc Corner Angle* - opens the **Results** tab of the 3D Corner Angle dialog with calculated angle between two lines. The lines were automatically created using two selected points and first point of the linework.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object(s) to reside.
  - *Lock* - locks the layer(s) with selected object(s) preventing any changes. To unlock the layer(s), click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer(s) with selected object(s) invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
- *Delete* - deletes the selected points and line from the project.
- *Calc Multiple Intersections* - instantly calculates and creates points at segment intersections of the selected linework. Intersections are 2D intersections, the height of created intersection points is the averaged height of the intersecting segments at the created point.

1 linework

If a **linework** is selected, the pop-up menu contains the following commands:

- *Stake* - displays sub-menu items related to stakeout of objects:
  - *Line* - opens the Stake Line dialog, where you can stake the **selected segment**.
  - *Line and Offset* - opens the Stake Line Offset dialog, where you can stake offsets from the **selected segment**.
  - *Linework* - opens the Stake Linework dialog. The software offers to stake out the **selected linework**.
  - *Slope* - opens the Stake Slope dialog. The software automatically sets **Linework** as the current object and offers to perform stake a slope for the selected linework.
  - *Point in Direction* - opens the Stake Point in Direction dialog for the **selected segment**. In this dialog you can stake a point, using the start and end of the **selected segment**. These points are automatically set as *From Point* and *Azimuth to Point*.
- *Reverse Direction* - inverts order of the linework points.
- *Inverse Line* - opens the **Results** tab of the Two Point Inverse dialog, where you can calculate inverse data for the **selected segment**.
- *Linework Report* - opens the **Results** tab of the Linework Report dialog, where you can view calculated data for all segments of the linework.
- *Create*:
  - *Road* - opens the Add Road dialog, where you can create a central line of a new road using the linework data.
  - *Points* - opens the Create Points dialog, where you can create points along the entire linework.
  - *Offset Line* - opens the Line dialog, where you can create a point at specified offset from the **selected segment**.
  - *Offset Linework* - opens the Linework Offset dialog, where you can create a new linework at specified offsets from the selected linework.
  - *Corner Offset* - opens the Corner Offset dialog, where you can create new point at specified offsets from the selected corner.
  - *Point in Direction* - opens the Point in Direction dialog, where you can create a point in direction, which is defined by **selected segment**.
  - *Field Report* - opens the Field Report dialog, where you can create a new report.
- *Information* - opens the Selected Line dialog with aggregated information about the selected line.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.

  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Edit* - opens the Point in Line tab of the Edit Line dialog, where you can view / edit the selected linework and layer of the line.
- *Delete* - deletes the selected line(s) from the project.
- *Calc Multiple Intersections* - instantly calculates and creates points at segment intersections of the selected linework. Intersections are 2D intersections, the height of created intersection points is the averaged height of the intersecting segments at the created point.

2 linework objects

If **two linework objects** are selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake Intersection* - opens the Stake dialog. In this dialog you can stake a point which is intersection point of the two lines (first segments of two linework objects).
- *Calc Corner Angle* - opens the **Results** tab of the 3D Corner Angle dialog with calculated angle between two lines.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object(s) to reside.
  - *Lock* - locks the layer(s) with selected object(s) preventing any changes. To unlock the layer(s), click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer(s) with selected object(s) invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
- *Delete* - deletes the selected linework objects from the project.
- *Calc Multiple Intersections* (available for two or more selected linework objects or areas) - instantly calculates and creates points at segment intersections of all selected linework objects or areas. Intersections are 2D intersections, the height of created intersection points is the averaged height of the intersecting segments at the created point.

Area

If an **area** is selected, the pop-up menu contains the following commands:

- *Stake* - displays sub-menu items related to stakeout of objects:
  - *Line* - opens the Stake Line dialog, where you can stake the **selected segment**.
  - *Line and Offset* - opens the Stake Line Offset dialog, where you can stake offsets from the **selected segment**.
  - *Linework* - opens the Stake Linework dialog. The software offers to stake out the selected line.

  - *Slope* - opens the Stake Slope dialog. The software automatically sets **Linework** as the current object and offers to perform stake a slope for the selected linework.
  - *Point in Direction* - opens the Stake Point in Direction dialog for the **selected segment**. In this dialog you can stake a point, using the start and end of the **selected segment**. These points are automatically set as *From Point* and *Azimuth to Point*.
- *Calc Area* - opens the **Results** tab of the Compute Area dialog with calculated area and perimeter of selected area.
- *Reverse Direction* - inverts order of the linework points.
- *Linework Report* - opens the **Results** tab of the Linework Report dialog, where you can view calculated data for all segments of the linework.
- *Create*:
  - *Road* - opens the Add Road dialog, where you can create a central line of a new road using the linework data.
  - *Points* - opens the Create Points dialog, where you can create points along the entire linework.
  - *Offset Line* - opens the Line dialog, where you can create a point at specified offset from the **selected segment**.
  - *Offset Linework* - opens the Linework Offset dialog, where you can create a new linework at specified offsets from the selected linework.
  - *Corner Offset* - opens the Corner Offset dialog, where you can create new point at specified offsets from the selected corner.
  - *Point in Direction* - opens the Point in Direction dialog, where you can create a point in direction, which is defined by **selected segment**.
  - *Field Report* - opens the Field Report dialog, where you can create a new report.
- *Information* - opens the Selected Area dialog with aggregated information about the selected area.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.
  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Edit* - opens the Points in Area tab of the Edit Area dialog, where you can view / edit the selected area and layer of the area.
- *Delete* - deletes the selected area(s) from the project.

- *Calc Multiple Intersections* - instantly calculates and creates points at boundary segments intersections of the selected area. Intersections are 2D intersections, the height of created intersection points is the averaged height of the intersecting boundary segments at the created point.

Road

If a **road** is selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake Road* - opens the Stake Road dialog. The software offers to perform stakeout of the point along the road.
- *Stake Slope* - opens the Stake Slope dialog. The software automatically sets **Road** as the current object and offers to perform stake a slope for the selected road.
- *Create Points* - opens the Calculate Points dialog, where you create points along, to the right and to the left of the center line of the selected road, along its entire length.
- *Create Surface* - opens the Input New Surface Name dialog to enter a name for the road surface being created.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.
  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Edit* - opens the Edit Road dialog, where you can view / edit the selected road and layers of the road.
- *Information* - opens the Selected Road dialog with aggregated information about the selected area.
- *Delete* - deletes the selected road(s) from the project.

Surface

If a **surface** is selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake* - opens the Stake Surface, where you can stake the selected surface.
- *Calc Area* - opens the Surface Area dialog with calculated area of selected surface.

- *Contour* - opens the Contour surface dialog, where you can generate horizontal contours of the selected surface at a given height or at a given interval.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.
  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Hide* - hides the selected surface from the Map. To show the surface again, click  in the tool-bar and click the surface in the Surfaces tab.
- *Edit* - opens the Surface Properties dialog, where you can view the selected surface details and change the surface plotting style.
- *Delete* - deletes the selected surface(s) from the project.

Surface contour line

If a **contour line** is selected on a surface, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.
  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Stake Linework* - opens the Stake Linework dialog. The software offers to stake out the selected contour.
- *Information* - opens the Selected Contour dialog with aggregated information about the selected contour.

- *Edit* - opens the Contour Style dialog, where you can view and change the layer and plotting style of the selected contour.
- *Delete* - removes the selected contour from the surface and deletes the selected contour line from the project.

Plane

If a **plane** is selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Stake* - opens the Stake Surface (Plane), where you can stake the current plane.
- *Layer(s)* - displays sub-menu items related to layer manipulation:
  - *Add To* - opens the Select Layer dialog, where you can choose a layer for selected object to reside.
  - *Lock* - locks the layer with selected object preventing any changes. To unlock the layer, click  icon in Map View Tools and open the Layers dialog.
  - *Hide* - makes the layer with selected object invisible on the map. To show the layer again, click  icon in Map View Tools and open the Layers dialog.
  - *Set default* - sets the layer with selected object as current (default). All new objects that have no particular reference to a specific layer are placed to that layer by default.
  - *Isolate* - makes all layers except the selected object's layer invisible on the map.
  - *Clear Isolation* - restores visibility to all invisible layers if isolation was applied to any layer.
- *Edit* - opens the Plane Properties dialog, where you can view the selected plane details and change the element's name, layer, boundary, and plotting style.
- *Delete* - deletes the selected plane(s) from the project.

Plane and point

If a **plane** and a **point** are selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Calc Inverse Point to Plane* - opens the Results tab of the Inverse Point to Plane dialog to calculate inverse of the selected point to the selected plane.
- *Delete* - deletes the selected plane and point from the project.

Plane and line

If a **plane** and a **line** are selected, the pop-up menu contains the following commands:

- *Create Field Report* - opens the Field Report dialog, where you can create a new report.
- *Calc Inverse Line to Plane* - opens the Results tab of the Inverse Line to Plane dialog to calculate

inverse of the selected line to the selected plane.
- *Delete* - deletes the selected plane and line from the project.

Map Properties

To configure how the map elements and project objects look on the screen and which parameters display.

This dialog contains the following tabs:

- General tab
- Points tab
- Entities tab
- 3D tab
- Surfaces tab
- Regions tab
- Backgrounds tab

Click  to open the dialog menu with additional options:

- **Edit Drawings** - opens the Background Drawings dialog.
- **Edit Images** - opens the Background Images dialog.
- **Edit WMS** - opens the WMS Records dialog.
- **Edit Regions** - opens the Regions dialog.
- **Help** - opens this page.

General tab 

This tab of the Map Properties dialog contains settings for tuning of the **Map** look and enabling and using of in-build map features.

Map Font

In this group you can change font size and font style of text on the Map. You can select either *Small Font*, or *Medium Font*, or *Large Font*. Additionally, you can set *Bold Font* style for the selected font size.

Data Label Font

In this group you can change the font style for the displayed values (configurable in the Select

Value to Display and Select Stakeout Value dialogs). This group is not displayed in the properties of main map.

Map View
For Stake map view, this group allows to toggle the display of **Cut/Fill** bar and enter the desired Cut/fill bar gradation spacing in the **Interval** field.

For Stake map view, this group also allows to toggle the display of **Compass** that shows the distance and direction to the point being staked. The **High Precision** option for compass zooms into the point when the user navigates close to the point being staked, and then switches the navigation compass to a precise mode for more convenience. Note that the **Compass** option is unavailable in specific stakeout routines (e.g. real-time road).

For map views in Topo GNSS, Topo Optical, Autotopo GNSS, Autotopo Robotic TS surveys, and when the reference surface is enabled, this group allows to toggle the display of **Cut/Fill** bar on the map and enter the desired Cut/fill bar gradation spacing in the **Interval** field.

For Survey X-Section map view, this group allows to toggle the **Section View** on the map. The Section View is a semitransparent overlay panel on the map that displays measured points in the vertical plane on a cross section scheme. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel.

For Stake map view when staking a road, a surface of a design road, or a slope, this group allows to toggle the **Section View** on the map. The Section View is a semitransparent overlay panel on the map that display the cross section scheme on the current stakeout station and the current position in the vertical plane. Displayed cross section is referred by the blue dotted line on the map. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel.

For Stake map view when staking a design surface, this group allows to toggle the **Section View** on the map. The Section View is a semitransparent overlay panel on the map that displays the section of the design surface in the vertical plane on the current position. The orientation of the displayed surface section can be set with the **Direction** button: select either *North* to orient the section view, or *Moving Direction* to orient the section view to the direction of moving during the stakeout session. Displayed section is referred by the blue dotted line on the map. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel.

In the bottom part of the dialog more controls are available:

- **Dark background**
  If the check box is selected, the background of displayed map changes to black.

- **Persistence Snap Toolbar Buttons**
  If the check box is selected, the currently used snap tool remains active until it is switched to

another tool or released manually by click. If cleared, the current snap tool is released each time, after a point is created.

- **Data Label Background**
  If the check box is selected, the background of customizable data fields is solid. Cleared check box makes the background of customizable data fields transparent. The check box is not available in main map properties.

- **Current Position**

  If the check box is selected, the current position  is displayed on the map. Sokkia Field also automatically snaps back to the current position if it moves off the edge of the map. The check box is not available in stake map properties.

- **Center Current Position**
  If the check box is selected, Sokkia Field always centers the map on your current position while maintaining the map's current orientation. With this check box cleared, the user pans and centers the map manually. The check box is automatically selected if the **Map rotation** check box is selected. The check box is not available in main map properties.

- **Map rotation**
  If the check box is selected, Sokkia Field always centers the map on your current position and automatically rotates the map around the current position. With this check box cleared, the user rotates the map around map center manually. The check box is not available in main map properties.

- **Show Stake Point List**
  If the check box is selected, design points from the point list being staked are displayed in the interactive panel during stakeout. This feature is available for the Stake point list task. The panel shows only the remaining points to stake and hides already staked points. Tap and hold (or right-click) the desired point and select the **Stake Point** command from the context menu to instantly switch current stakeout to that point.

Points tab

This tab of the Map Properties dialog configures types of points and specific point data to show or hide on the **Map**.

- Check the **Points** box to display points and points attributes on the map, then select point types and attributes to be displayed. If the **Points** check box is cleared, points of all types and their attributes are hidden on the map.

- In the **Attributes** group, select which point attributes will be displayed on the map.
  - Check the boxes near desired attributes: **Names**, **Codes**, **Notes**, **Heights**, and **Custom Symbols**.

- In the **Type** group, select what types of points will be displayed on the map.
  - Check the boxes near desired point types: **Auto Topo**, **Scanned** and **Staked** (including / excluding **Staked Design** - design points after they are staked). Also, you can enable / disable displaying of **External Control Points** - points from the Shared Data file that can be used as control points across all the Sokkia Field projects without the need of importing them into the specific project. External control points are marked on maps with the ▼ symbol located in front of the point name.
- Check the **TS Icons** box to mark the current total station setup (occupation  and backsight ) on the map with respective icons.

Entities tab 

This tab of the Map Properties dialog configures types of objects and specific data for these objects to show or hide on the **Map**.

Lines

If the **Lines** check box is selected, **Map** shows all the linework objects in the current project.

- **Transitions** - select this check box to show all start / end points of the linework segment. Note that transitions will be displayed for a selected linework only.
- **Distances** - select this check box to display distances between start / end points for each segment of a selected linework.
- **Directions** - select this check box to display directions for a selected linework.

Roads

If the **Roads** check box is selected, **Map** shows all the roads in the current project.

- **Stations** - select this check box to show the road start stations;
- **Transitions** - select this check box to show start /end points of horizontal alignment segments (will be displayed for all roads of the current project);
- **Templates** - select this check box to show the road X-sections.

Planes

If the **Planes** check box is selected, **Map** shows all the planes in the current project.

3D tab

This tab of the Map Properties dialog contains settings for tuning of the **Map** look in 3D view and enabling and using of in-build specific 3D view features.

- In the **Surface Fill mode** group, select how to plot a surface on the **Map** in 3D view:
  - **Solid** - solid color fill is used to visually isolate a surface from other objects on the 3D Map.
  - **Wireframe** - triangulated surface wire-frame without color fill is plotted to visually isolate a surface from other objects on the 3D Map.
  - **Solid + Wireframe** - combination of solid color fill and triangulated surface wire-frame visually isolates a surface from other objects on the 3D Map.
  - Check the **Relief Map** box to apply the elevation depended gradient to the color fill of surface on the 3D Map.
- If the **Show Objects Border** check box is selected, a contoured rectangular cuboid covering all the objects is displayed on the **Map** in 3D view.
- If the **Show Grid Lines** check box is selected, grid lines are shown on the **Map** in 3D view.
- Check the **Enable clipping planes** box to use one or two planes as the clipping boundary of the shown space on the **Map** in 3D view.
  - Click ... to open the Clipping Planes dialog to define a plane or two planes for the clipping boundary.

Clipping Planes

To define a plane or two planes to be the clipping boundaries for displaying objects on the map in 3D view.

You can use clipping planes on the map after checking the **Enable clipping planes** box in the 3D tab of the Map Properties dialog.

Note: For quick change of clipping height right on the map after setting up clipping plane(s) in this dialog, use the clipping button(s)  ( / ) of the Map View Tools. This feature allows the user to visually add a height offset to the current clipping plane(s) by dragging the pointer across the map.

The clipped part can be defined either as the zone above or below a plane. A combination of two clipping planes can be used to display the space that is limited from above and from below, for example a floor of building. Other forms of space clipping are also supported by overlaying zones above / below each of the two planes. Objects that are completely outside the visible space cannot be viewed or selected when clipping is applied. Partially cut elements can be selected on the map.

Note: Vertical planes cannot be used as clipping planes.

- From the drop-down list, select the plane type to be used in clipping, choose either plane *By height* to define horizontal plane(s) by entering elevation value(s), or *By project plane(s)* to select existing plane(s).
- From the drop-down list, select the quantity of clipping planes, choose either *One plane* or *Two planes*.
- Specify the clipping plane(s) position(s):
  - For plane(s) defined *By height*, specify the height. Use the toggle button to enter the **Height** manually or to set **Height by Point**, the point can be entered manually or selected from the map  or from the list  of points in the current project.
  - For plane(s) defined *By project planes*, enter plane name(s). Enter an existing plane name manually or click  to select a plane from the list of project planes. Optionally, enter **Offset** values for planes defined *By project plane(s)*: positive to place the plane higher, negative to place the plane lower.

- Use the **Flip** button to select the clipped zone either *above*  or *below*  the respective plane. If two clipping planes are used, combine the selected clipped zones to create boundaries of visible space.
- Click  to save displayed data and return to the previous dialog. Click  to return without saving.

Surfaces tab 

This tab of the Map Properties dialog contains the list of available surfaces and their contours that can be visible on the **Map**.

- The left panel of the tab contains the list of surfaces available in the current project as well as separate controls for each surface and contours visibility on the map.
  - Check the box ☑ in the **On** column to make the respective surface visible on the map and available to work with. Clear the box ☐ to remove the surface from the map.
  - Check the box ☑ in the **Contour** column to make contours of the respective surface visible on maps and available to work with. Clear the box ☐ to remove the contours of this surface from the map.

  - Use the **Select All** / **Unselect All** buttons with built-in drop-down menu to quickly select / deselect check boxes of:
    - *All surfaces and contours*;
    - *All surfaces*;
    - *All contours*.

- The right panel displays the highlighted surface preview in the horizontal plane.
- For Stake map view when staking a surface / staking a grid additional options are available:
  - **Color bar** - check the box to show the colored scale instead of cut / fill bar. Set the **Interval** for the scale. The current design surface triangle on the Stake map will be colored respectively depending on the difference between staked and design elevations.
  - **Show Cut/Fill Contours** - check the box to show contoured sectors of the staked surface. Sectors between contours in a color of the cut/fill **color bar** show up after minimum three points on a surface are staked.

Regions tab 

This tab of the Map Properties dialog contains the list of available regions that can be visible on the **Map**.

- The left panel of the tab contains the list of regions available in the current project.
  - Check the box ☑ near the region name to make this region visible on maps and available to work with. Clear the box ☐ to remove the region from maps.

- Alternatively, use the context menu with **Check** / **Uncheck** commands applicable to all the highlighted regions at once. The context menu also simplifies multiple data items highlighting with the following commands:
  - **Select All** - highlights all data items in the list.
  - **Select All Below** - highlights a currently highlighted data item and all the data items in the list displayed below.
  - **Select Multiple** - highlights multiple data items by sequential clicking on data item names.
  - **Cancel Selection** - removes all highlights in the list.
- Click the **Select All** button to make all the regions visible on maps and available to work with. Click the **Unselect All** button to remove all regions from maps.

- The right panel displays the highlighted region preview in the horizontal plane.

Backgrounds tab 

This tab of the Map Properties dialog contains the list of available backgrounds of different types that can be visible on the **Map**.

The left panel of the tab contains the list of backgrounds of supported types:

-  is used for vector background;
-  is used for raster background.

The right panel previews the background highlighted in the right panel.

To manage and select backgrounds to view and work with them on the **Map**.

- To preview a background, highlight it. The right panel will display the background.
- To have a background displayed / hidden on the **Map**, select / deselect the check box in the **On** column near the respective background.
- For the vector drawing background, you can lock / unlock all the layers in this drawing. The icon  /  in the Lock column near the respective drawing background indicates that its layers are unlocked / locked. Click on the icon to switch the lock status for layers in this drawing.
- You can display *Predefined* geographic web map from supported global map providers such as Bing or OSM. You can also use *Custom WMS / WFS* geo-referenced data downloaded from the user specified provider to show it on the **Map**. This option is available for selection if both of the following conditions are satisfied:
  - raster background () is not selected in the left panel;
  - either a GNSS type of instrument is selected for work, or an optical type of instrument is selected to work and there is a projection (other than *<none>*) selected.

Click ... in the **Web Map** panel to open the Web Map Layers dialog, where you can setup the desired web map.

Note: Displaying a web map is not supported in tape measurements (the Tape Dimension dialog).

Web Map Layers

To manage Sokkia Field-predefined and custom web maps downloaded from Web Map Services and Web Feature Services.

This dialog opens from the Backgrounds tab of the Map Properties dialog by clicking ... in the **Web Map** field.

The dialog contains two tabs:

- WMS - this tab contains tools to select predefined web map services (Bing and OSM) and manage raster web maps from user-defined WMS (Web Map Service) providers.
- WFS - this tab contains tools to manage vector web maps from user-defined WFS (Web Feature Service) providers.

1. **WMS tab** allows you to choose and download the raster web maps to use.
   - Check the **Predefined** box to download and display predefined web maps delivered by global web map providers. Currently there are three predefined web maps:
     - *Bing ™ Hybrid*;
     - *Bing ™ Terrain*;
     - *OpenStreetMap* (© OSM).

     Note: To show a **predefined** web map on the map, the project must either have the **Coordinate Type**: *WGS84*, or *Grid and a projection selected*, or *Ground with Grid / Ground transformation enabled and a projection selected*. Setup the desired **Coordinate Type** in the Display dialog, select a projection and enable Grid / Ground transformation in the Coordinate System dialog.

   - Check the **Custom WMS** box to display raster web maps downloaded from the Web Map Services (WMS) and displayed in the list below.
     - WMS web map layers are presented as a logical tree of providers and their raster web map content. Expand the tree nodes to see the names of the content layers. You can

select entire nodes or specific layers in the list for loading to the application and displaying them on the map.
  - Clicking the **Edit** button opens the WMS Records dialog, from where you can add a new record of your WMS provider, edit or delete existing records of WMS providers or change the displaying order of the images obtained from existing WMS records.
  - The fields  display upper left corner and lower right corner boundaries coordinates for the highlighted WMS web map.

> **Note:** To correctly show a **custom** raster web map on the map, the project must use the specific projection supported by the custom WMS. You can view the currently used projection in the project and the list of projections supported by each of the added Web Map Services in the in the Web Maps Projections dialog.

- Clear both check boxes to not display raster web maps.

2. **WFS tab** allows you to choose the geometrical geo-referenced objects that can be used as standard vector backgrounds on the map which you can use for surveying or staking.
   - Check the **Use WFS** box to display vector backgrounds downloaded from the Web Feature Services (WFS) and displayed in the list below. With the check box cleared, WFS vector backgrounds are not used.
     - WFS vector backgrounds are presented as a logical tree of providers and their vector background content. Expand the tree nodes to see the names of available vector objects. You can select entire nodes or specific objects in the list for loading to the application and using them on the map.
     - Clicking the **Edit** button opens the WFS Records dialog, from where you can add a new record of your WFS provider, edit or delete existing records of WFS providers or change the displaying order of the vector backgrounds obtained from existing WFS records.

> **Note:** To correctly show a vector web map on the map, the project must use the specific projection supported by the corresponding WFS. You can view the currently used projection in the project and the list of projections supported by each of the added Web Feature Services in the in the Web Maps Projections dialog.

Click  to open the dialog menu with additional options:

- **Web Map Info** - opens the Web Maps Projections dialog to view the list of projections supported in each added WMS and WFS.
- **Web Map Activity** - opens the Web Map Activity dialog to view an activity log of connected WMS and WFS that provide web maps.

- **Clear Cache** - select this command to delete all downloaded WMS and WFS data. Click **Yes** to confirm deletion or click **No** to cancel. If a WMS / WFS record remains in the dialog but all web maps are deleted from the application's cache, the application will start downloading data from the corresponding WMS / WFS provider again.

Click  to save changes to web map settings and return to the Backgrounds tab of the Map Properties dialog. Click  to discard changes and return to the Backgrounds tab of the Map Properties dialog.

Web Map Activity

To view an activity log of connected WMS (Web Map Services) and WFS (Web Feature Services) that provide web maps.

Open this dialog from the Web Map Layers dialog by clicking  and selecting **Web Map Activity**.

The dialog displays the activity history of connected WMS / WFS providers that deliver web maps to maps displayed in Sokkia Field.

- From the drop-down list, you may select a specific WMS / WFS to display the activity or select *ALL* to show activities of all connected WMS and WFS providers.
- The overall status of WMS / WFS activity is displayed next to the drop-down-list.
- The detailed log of web map data download and validation is displayed below the drop down list.

To exit the dialog click .

Web Maps Projections

To view the list of projections supported by each user-specified Web Map Service and Web Feature Service .

You can see the names of WMS / WFS records and supported projection names with their numbers in EPSG database of coordinate system information.

The dialog title displays the EPSG number of projection that Sokkia Field uses to request the Web map data from the WMS / WFS provider. This projection is also used on the map in 2D view to show WMS image tiles. The projection set in the project is always used to display WMS image tiles in 3D view.

Note: WebSphereMercator projection is recommended to set as the projection for the current project in the Coordinate System dialog for global web maps provided by *Bing* ™.

To exit the dialog click .

Linework Report

To generate, display and export a report on a linework object.

1. In the **Input** tab:
   - Choose either **Linework** or **Code** for selecting the linework.
     - Set **Linework** to select a linework object from existing linework objects (listed below) or from the map .
     - Set **Code** to form a linework object by points with specific code and code string. Select a code from the drop-down list and a string from the *Strings* list below.
     - The preview panel displays the highlighted linework in the horizontal plane. To view the currently highlighted linework in a larger screen, double-click the preview panel.
   - In the **Start** field, specify the start station for the selected linework that will be considered in the report.
   - Click the **Calc** button to generate a report.

2. In the **Results** tab:
   - Review the report:
     - *Linework* - the name of the linework.
     - *Num Segments* - the number of segments in the linework.
     - *Horz Length* - the total horizontal length of the linework.
     - *Horz Length except gaps* - the horizontal length of the linework, gap segments are excluded from length calculation (displayed if the linework includes gaps).
     - *Start Station* - the starting station of the linework.
     - *End Station* - the ending station of the linework.
     - *Area* - the square of the area when the linework is a closed polygon.
     - *Segment* - the order number and information about each segment of the linework.
       - *Type* - the type of the segment.
       - *Horz Length* - the horizontal length of the segment.
       - *Azimuth:* (or *Bearing:* if bearing is selected to output directions) the direction of the line segment; *Start Azimuth* and *End Azimuth* for arc segment.
       - *Start Station* - the starting station of the segment.
       - *End Station* - the ending station of the segment.

- *dHeight* - the increment of the height.
- *Grade* - the increment of the height in percentage terms.
- *Slope Distance* - the 3D distance between the start station and the end station.

- Click  to export the data to a **.txt* file, if required.

3. The **Map** tab shows the project's objects with the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

4. The **Drawing** tab shows the illustration for the results and supports generation of a field report with the results of calculation (use the **Create Field Report** command from the context menu).

Select Object From Map

To select object(s) on the map for further use.

- Click an object (a point, line, surface, etc. - depending on the dialog where you clicked ) on the map to select it.
- If objects on the map are cluttered, the Objects near selected point dialog will open to specify the selection.
- If a single object is required to select, you will be instantly returned to the previous dialog.
- If multiple objects are required to select, click on them sequentially. When finished with selection of multiple objects, click  to return to the previous dialog.
- Click  to return to the previous dialog without selection.

Objects Near Selected Point

To specify the selection of an object from a cluster of nearby objects on the map.

Typically, you can directly tap objects on the map to highlight them. Alternatively, this dialog may appear to select a desired object from a cluster of nearby objects.

- Highlight an object in the list.
- Review an illustration of the object in the illustration pane.
- If required, click the **Info** button to review information on the highlighted object.

- Click  to return to the previous dialog with the marked object. Click  to return to the previous dialog without selection.

Select Layer

To choose a layer for object(s) selected on the map.

This dialog opens after applying the *Layer(s) - Add To* command from the Map Pop-Up Menu to objects selected on the map.

- Choose an existing layer from the **Layer** drop-down list to move all selected objects to this layer.
- Click  to open the Layers dialog to quickly manipulate the layers in the current project. This is useful to add, modify, or delete layer(s) before moving selected objects to the required layer. All the layer modifications apply to the **Layer** drop-down list after returning to this dialog.
- Click  to accept chosen layer for selected object(s) and close the dialog. Click  to close the dialog and keep the layer attribute unchanged for selected object(s).

Select Color

This dialog allows you to choose the color for selected objects.

- Click the box of the desired color to highlight it.
  - Highlight the **Layer** color box to use the color specified for the layer of the selected object.
  - Highlight the **Code** color box to use the color specified for the code of the selected object. If a point is not assigned a code and its color is set to *by code*, the point has the color specified for its layer.

- Click  to store the highlighted color and return to the previous dialog.
- Click  to return to the previous dialog without storing.

Selected Line

To review information on a selected line.

The dialog displays the detailed data about the selected line:

- *Line* - the line name;
- *Code* - the line's code (if assigned);
- *String* - the line's string (if assigned);
- *Length* - the 2D length of the line;
- *Length except gaps* - the 2D length of the line, gap segments are excluded from length calculation (displayed if the line includes gaps);
- *Height* - the elevation of the line (displayed if the line's start and end points have the same elevation);
- *Surface* - the status of the 'Use in Surface' property of code;
- *Layer* - the layer of the line.
- *Type* - the type of segment (displayed for segments on vector background).
- *Start / End point coordinates* - the coordinates of start and end point (displayed for segments on vector background).

Click  to return to the previous dialog.

Selected Area

To review information on a selected area.

The dialog displays the detailed data about the selected area:

- *Line* - the name of the area;
- *Code* - the area's code (if assigned);
- *String* - the area's string (if assigned);
- *Perimeter* - the total 2D length of all the segments that outline the area;
- *Area* - the calculated value of the area in 2D;
- *Height* - the elevation of the area (displayed if all the area's points have the same elevation);
- *Surface* - the status of the 'Use in Surface' property of code;
- *Layer* - the layer of the area.

Click  to return to the previous dialog.

Selected Road

To review information on a selected road.

The dialog displays the detailed data about the selected road:

- *Road* - the road name;
- *Length* - the total length of the road;
- *HAL Name* - the horizontal alignment name used for this road;
- *VAL Name* - the vertical alignment name used for this road;
- *North* - the Northing coordinate of the start station;
- *East* - the Easting coordinate of the start station;
- *Start* - the road's start station position;
- *Surface* - the name of the road surface;
- *Layer* - the layer of the road.

Click  to return to the previous dialog.

Connections

To connect with GNSS and /or Optical survey device(s) and to establish communications with network survey service provider and cloud servers.

- The **General** tab:
  - Select your survey configuration and connect to GNSS and / or optical device(s) to work at the site. More...
  - Set up automatic or prompted connection to your equipment each time you open the project. More...

- The **Network** tab:
  - Connect to a mount point or server in a network based survey to receive corrections. More...

- The **Long-Range BT** tab:
  - Find, configure, connect, disconnect, or switch the base transmitting corrections using Long-Range Bluetooth communication. More... (The **Long-Range BT** tab displays after Sokkia Field is connected to a GNSS rover receiver with Long-Range Bluetooth selected as an internal radio.)

- Click the  icon to open a menu of options for the **Connections** dialog:
  - Select **Show All Mountpoints** to display all the available mount points from the drop-down list in the **Network tab** of this dialog. (This option becomes available after a GNSS receiver is connected to a network and NTRIP caster / server.)
  - Click **Turn off cell modem** to instantly turn off the cell modem of a connected receiver. (This option becomes available when connected to a device supporting this functionality.) This is useful to save the receiver's power when the receiver's cell modem is not required.
  - Click **Turn off receiver** to instantly turn off a connected receiver. (This option becomes available when connected to a device supporting this functionality.)
  - Click **Setup NMEA on current port** to set up the current port used for connection to a GNSS receiver for NMEA output. After a prompt displayed, the Configure NMEA output dialog opens. After NMEA configuration is saved, the current connection to a GNSS receiver closes. Reconnect to a GNSS receiver.
  - Click **Connect Base via Proxy** to use a connected GNSS receiver as Bluetooth proxy unit to select an available (for receiver's Bluetooth module) Bluetooth enabled base and establish connection to that base.
  - Click **Connect Last Base via Proxy** to use a connected GNSS receiver as Bluetooth proxy unit to immediately establish connection with the last successfully connected base bypassing base discovery and selection.
  - Click **Update Signal Quality & Operator Name** to retrieve information about the cellular connection quality and service provider and display it in the Network tab of the Connections

dialog. (This option becomes available if the **Get signal quality and operator name** check box is enabled in Miscellaneous settings of survey configuration.)

General tab of the Connections dialog

To connect and disconnect a surveying device, to change a type of the device to work with, and to select another survey configuration.

1. Select the device type for connection:

   - Select the **Fusion Positioning ™** check box to activate the Fusion Positioning ™ mode, allowing user to directly toggle between GNSS and Robotic configurations having both GNSS receiver and optical robot connected to the Sokkia Field.
   - Select the **Optical** type of instrument and the configuration to work in the current project.
   - Select the **GNSS** type of instrument and the configuration to work in the current project. Select the **Base** or **Rover** radio button when working with the base receiver or the rover receiver in RTK surveys, respectively.

     Note: The icon next to device type displays the connection type with a device:

      - Serial connection;

      - Bluetooth connection;

      - Wi-Fi connection.

   - Click  next to a device type to open the Configuration Library dialog and choose another survey configuration from the list of existing configurations of that type.

2. For serial based connection:

   - From the drop-down list of available serial communication ports, select a COM port used in the controller to connect to a device.

> **Note:** USB interface and USB cable can be used to establish serial connection between controller and specific GNSS receiver (applicable to Sokkia **GCX2**, **GCX3**, **GRX3**, **GRX5**, **GNR5** receivers). After connecting the controller and the GNSS receiver with USB cable, a new virtual COM port (USB Serial device COM or Sokkia Receiver COM) is automatically added to the controller and to the drop-down list of available serial communication ports in Sokkia Field. (Exit and open again the Connection dialog to refresh the list of available serial communication ports.) Select this new COM port in the drop-down list to connect Sokkia Field to the GNSS receiver via USB interface and USB cable.
> **Important:** For Windows versions older than Windows 10, ensure the **GNSS Receivers Drivers** box was checked in Sokkia Field installer. Reinstall Sokkia Field if necessary.

3. For Wi-Fi-based configuration:

   - Click the **Configure Wi-Fi** button to set up a connection with the device via Wi-Fi. The button is displayed if a Wi-Fi-based configuration is selected.
   - For more information on Wi-Fi connection configuration steps, refer to Configure Wi-Fi (GNSS).

4. Configure the settings related to connection with last used device and connection prompt:

> **Note:** When launched, Sokkia Field is ready to establish the last successful connection to the surveying device. When disconnected from the surveying device, Sokkia Field automatically tries to establish the last successful connection to the device, upon opening Topo and Stake surveys related dialogs.

   - Check the **Prompt for connection at startup** box to display this dialog after launching Sokkia Field preventing it from automatic establishing the last successful connection. The user can change connection parameters, device type, survey configuration, and initiate a connection manually by clicking the **Connect** button. Leave this check box cleared and Sokkia Field will automatically try to establish the last connection bypassing this dialog.
   - Check the **Connect to last used BT device** box to bypass the Select Device (Bluetooth connection) dialog and let Sokkia Field instantly initiate the connection to the last connected device. If you clear this check box, the Select Device (Bluetooth connection) opens by pressing the **Connect** button.
   - Check the **Connect to last used Wi-Fi device** box to bypass the Select Total Station (Wi-Fi connection) dialog and let Sokkia Field instantly initiate the connection to the last connected device. If you clear this check box, the Select Total Station (Wi-Fi connection) dialog opens by pressing the **Connect** button.

> **Note:** The **Connect to last used Wi-Fi device** option is not applicable to connections to GNSS equipment and is actual for specific configurations with total stations using Wi-Fi connection.

5. Click the **Connect** button to initiate the connection to the device associated with the currently selected configuration. The connection status indicator on the dialog title bar displays the connection progress and result. Learn more about Title Bar Associated Icons and Buttons.

   Note the following:

   - If options of the GNSS receiver expired, you will be prompted to check OAF.
   - If Sokkia Field detects that connected GNSS receiver does not match the receiver model selected in the project configuration settings, you will receive the respective warning.
   - In specific RTK and DGPS configurations, when starting the base, you can receive the following warning:

     "Your rover firmware does not recognize the base antenna. Make sure that height of measured points is correct".

     Refer to this section to solve the issue.

6. When Sokkia Field has an active connection to the surveying device the **Connect** button transforms to the **Disconnect** button. Click the **Disconnect** button to close an active connection and disconnect from the device.

   - By default, disconnection with the rover receiver closes connection of the receiver to the server. Therefore, the rover receiver will not obtain the correction data from the server. In order to hold rover-to-server connection after termination of PC (or controller)-to-rover connection, you should clear the **Auto-disconnect from caster** (the option can be displayed **Auto-disconnect from server** for specific configuration) check box in the Miscellaneous dialog.
   - Optionally, you can turn the receiver off. To do this, select the **Turn off receiver** option from the dialog menu that displays by clicking ☰ in the top left corner. After activating the **Turn off receiver** option, the receiver will be turned off. When you use serial connection with the receiver, you can turn the receiver on by clicking the **Connect** button.

Configure Wi-Fi (GNSS Device)

The name of the dialog contains the device type or its model.

To configure the Wi-Fi connection settings between Sokkia Field and a GNSS receiver supporting Wi-Fi connectivity.

Note: Prior to establish a Wi-Fi connection between the Sokkia Field application and the GNSS receiver, ensure the controller where Sokkia Field is installed and the GNSS receiver are connected to the same Wi-Fi network. Learn more about the GNSS Receiver Wi-Fi module settings, **Client** and **Access Point** modes and refer to the controller's documentation for its Wi-Fi settings, if required.

1. To configure the Wi-Fi connection between Sokkia Field and the GNSS receiver, when the GNSS receiver is set up as a Wi-Fi Access Point:
   - Enter the **IP address** of the GNSS receiver's Access Point.

     Note: This IP address is defined in the **IP** field of the Receiver Wi-Fi dialog during the initial configuration of the GNSS receiver Wi-Fi module in the **Access Point** mode. The default value is 192.168.4.10, don't change this address without clear purpose. Connect to the GNSS receiver using alternative method (Bluetooth or cable USB / Serial), open the Receiver Wi-Fi dialog and retrieve the **IP** address in case it has been changed and lost or forgot.

   - The **Port number** field displays the port number used to connect Sokkia Field to the GNSS receiver over TCP protocol. The default port number is 8002. Don't change the port number without clear purpose.
   - The **Password** field specifies the password required by the receiver for the Sokkia Field application to connect over TCP protocol via Wi-Fi. Enter the required password.

     Note: This password should be defined in the **TCP password** field of the Receiver Wi-Fi dialog during the initial configuration of the GNSS receiver Wi-Fi module in the **Access Point** mode. Connect to the GNSS receiver using alternative method (Bluetooth or cable USB / Serial), open the Receiver Wi-Fi dialog and retrieve password in case it has been lost or forgot.

   - Click ✔ to save the Wi-Fi connection settings between Sokkia Field and the GNSS receiver and return to the General tab of the Connections dialog to initiate connection.

2. To configure the Wi-Fi connection between Sokkia Field and the GNSS receiver, when the GNSS receiver is set up as a client of an existing Wi-Fi network:

   - Enter the **IP address** of the GNSS receiver assigned to it in the Wi-Fi network. For example, if this is the controller's hotspot Wi-Fi, check the controller Wi-Fi hotspot settings and find an IP address of the connected GNSS receiver. Enter it here.

     Note: If you constantly use the same Wi-Fi network to connect the GNSS receiver as a Wi-Fi client, it's strongly recommended to arrange static IP addressing for the connected devices in that network. Thus, Sokkia Field will automatically use the last successful Wi-Fi connection configuration and you won't need to enter IP addresses and other credentials each time.

   - The **Port number** field displays the port number used to connect Sokkia Field to the GNSS receiver over TCP protocol. The default port number is 8002. Don't change the port number without clear purpose.
   - The **Password** field specifies the password required by the receiver for the Sokkia Field application to connect over TCP protocol via Wi-Fi. Enter the required password.

     Note: This password should be defined in the **TCP password** field of the Receiver Wi-Fi dialog during the initial configuration of the GNSS receiver Wi-Fi module in the **Client** mode. Connect to the GNSS receiver using alternative method (Bluetooth or cable USB / Serial), open the Receiver Wi-Fi dialog and retrieve password in case it has been lost or forgot.

   - Click  to save the Wi-Fi connection settings between Sokkia Field and the GNSS receiver and return to the General tab of the Connections dialog to initiate connection.

Click  to return to the General tab of the Connections dialog without applying any changes to the Wi-Fi connection configuration.

Select Device (Bluetooth connection)

To discover and to select the Bluetooth device for connection.

The name of the dialog contains the device type or its model.

The procedure of Bluetooth connection includes three stages:
1. Select Device - discover and select the device to connect (**this dialog**).
2. Authentication - enter PIN if necessary.
3. Connection to Bluetooth device - perform actual connection to the selected device.

To discover nearby Bluetooth devices:

- Upon opening this dialog, Sokkia Field instantly starts to discover all nearby available Bluetooth devices.
- Wait until the discovering phase is over and the list of available devices becomes populated with detected Bluetooth devices.
  - Click the **Start Over** button to stop and restart discovering, if required.
- The list of detected Bluetooth devices shows each discovered device's *Bluetooth Name*. If the name cannot be resolved, *Bluetooth Unique Address* displays instead. *Type of device* and its services display if a device provides this information.
- If a device is not present in the list or some devices did not report their names in a timely manner, click the **Refresh** button to start the detection again. If the device is still not listed, then the distance to it can be too large or the device can be connected to a different controller.
- Connection to the device is possible even if its name was not resolved and only Bluetooth Unique Address is listed.

> **Note:** We suggest to keep on hand Bluetooth Name and Bluetooth Unique Address of your equipment, especially while working on crowded sites. Open the Receiver Info dialog (click ) to view and save a connected GNSS receiver's Bluetooth Name and Bluetooth Unique Address.

To select the discovered Bluetooth device and to initiate connection:

- Highlight a discovered device in the list you're connecting to.
- Click the **Select** button to open the Bluetooth PIN dialog and initiate authentication with a device.
- If Bluetooth hardware is disabled (powered off) or the controller has an unsupported Bluetooth stack, a warning will be displayed. Currently, only the Microsoft Bluetooth stack is supported.

Click  to cancel connection and return to the Connections dialog.

Bluetooth PIN

To authenticate with the Bluetooth device Sokkia Field is connecting to and to enter Bluetooth PIN.

The procedure of Bluetooth connection includes three stages:
1. Select Device - discover and select the device to connect.
2. Authentication - enter PIN if necessary (**this dialog**).
3. Connection to Bluetooth device - perform actual connection to the selected device.

The **Bluetooth PIN** dialog displays information (Bluetooth name, device type and Bluetooth address) about the selected device in the **Device info** field.

- The application maintains authentication information independently of Bluetooth UI in the Operating System. There is no need to pair devices beforehand, the application performs the pairing.
- The application supports connections with devices that do not require a PIN code. To use this feature, clear the **Require PIN** check box.
- If the PIN code is required, select the **Require PIN** check box and enter the PIN code in the **BT PIN** field.
- Click the **Connect** button to open Accessing Device (Bluetooth connection) and initiate a connection.
- If the correct PIN code is provided and a connection is successful, the application stores the PIN code in a protected area and uses it in automatic connections to this device or fills the **BT PIN** field in this dialog when a user connects manually to this device.

Note: open the Receiver Settings dialog (click  >  >  > ) to view, change, or remove a connected GNSS receiver's Bluetooth PIN.

Click  to stop connection and return to the Select Device (Bluetooth connection) dialog.

Accessing Device (Bluetooth connection)

To connect to the selected Bluetooth device and to start the work with this device.

The name of the dialog contains the device type or its model.

The procedure of Bluetooth connection includes three stages:
1. Select Device - discover and select the device to connect.
2. Authentication - enter PIN if necessary.
3. Connection to Bluetooth device - perform actual connection to the selected device (**this dialog**).

Sokkia Field tries to establish a connection to the selected Bluetooth device.

- If a connection cannot be established in a timely manner, the dialog will automatically stop the connection. A connection can be canceled manually by clicking the **Cancel** button.
- It is possible to restart device discovering and open the Select Device (Bluetooth connection) dialog by clicking the **Change device** button.
- When a connection to the selected Bluetooth device is established the dialog closes. The connection status indicator in the title bar displays the connection progress and result. Learn more about Title Bar Associated Icons and Buttons.

Click  to stop connection and return to the Bluetooth PIN dialog.

Select Total Station (Wi-Fi connection)

To discover and to select a total station for connection over Wi-Fi.

This dialog lists all visible Wi-Fi devices and allows user to select a device for connection.

- In the list of devices available to connect via Wi-Fi, find the necessary device and click **Select** to connect to it.
- If you do not see your device in the list, click **Refresh** to search for it again. Alternatively, check if you have any Windows Firewall alert: you need to allow the connection (the alert can be displayed in the background, so you might need to switch to it). If you do not have any firewall alerts shown, allow the connection in the Windows firewall settings dialog.

Receiver Setup Problem

This dialog opens if any problem occurs while connecting to the GNSS receiver and initializing its work.

To review details of an occurred problem while connecting and starting work of Sokkia Field with the GNSS receiver.

- Review the description of an occurred problem.
- In the **Details** information pane, review the problem's details.

- In the **OAF expire on:** field, check the expiration date of OAF installed into the GNSS receiver and ensure the GNSS receiver has valid OAF installed. More about OAF installation.
- The **Firmware Version** field displays the version of firmware currently installed int the GNSS receiver. Ensure the GNSS receiver has the latest firmware installed. More about firmware updating.
- Depending of an error occurred, the option of reconnecting and / or reinitializing the same command to the GNSS receiver may appear. Click **Yes** to let Sokkia Field try reconnecting and / or reinitializing the same command to the GNSS receiver. Click **No** to close the dialog and verify an actual survey configuration and GNSS receiver's settings.
- Click  to close the dialog and return to the Connections dialog.

Long-Range BT tab of the Connections dialog

To discover available bases supporting Long-Range Bluetooth communication with the connected rover; to connect, disconnect, or switch the base that transmits corrections; to remotely configure a base receiver using rover's Long-Range Bluetooth.

This tab is available when **Long-Range Bluetooth** is selected as a base and rover receivers' internal radio for kinematic surveys in the Base radio / Rover radio dialog and Sokkia Field is connected to a rover receiver.

> **Note:** Long-Range Bluetooth technology provides the interference free base-rover communication on 1,000+ ft (300+ m) from the base station and doesn't require an FCC license to operate. Long-Range Bluetooth communication is supported by the following Sokkia GNSS receivers: **GSX2**, **GCX2**, **GCX3**, or **GRX3**.

The Long-Range Bluetooth connection automatically establishes by the rover receiver if there is an available base with enabled Long-Range Bluetooth.

1. To review the details of a connected Long-Range Bluetooth base transmitting corrections and other available Long-Range Bluetooth bases:
   - The connected base transmitting corrections is marked with .
   - All other available Long-Range Bluetooth bases are marked with .
   - The list of Long-Range Bluetooth bases displays:

- *Name* - the Bluetooth name of a base;
- *Site ID* - the name of a base occupation point;
- *Signal* - the signal strength in percents;
- *Distance* - the current distance to a base;
- *Avail.* - the sequential number among detected available bases;
- *3 coordinates* - the current coordinates of a base occupation presented in the current project's type of coordinates;
- *BT Address* - the Bluetooth Unique Address of a base.

- Click the **Start Over** button while discovering available bases to start the search again, when required.
- Click the **Refresh** button to start a new search for available bases and update the list.

2. To connect, disconnect, or switch to another Long-Range Bluetooth base transmitting corrections to the connected rover:
   - To stop receiving corrections from the connected base, highlight the connected  base and click the **Disconnect** button. The connected rover stops receiving corrections from that base.
   - To start receiving corrections from a base, highlight an available  base and click the **Connect** button. Sokkia Field initiates Long-Range Bluetooth communication with that base and after the connection is established the rover starts to receive corrections.

3. To remotely access and configure an available base using Long-Range Bluetooth:
   - Highlight a base in the list and click the **Configure** button to remotely connect Sokkia Field to this base, when required. The current connection to the rover stopped, and the rover receiver is used as a Long-Range Bluetooth proxy unit to connect to a base receiver right from the current location.
   - Reconnect to the rover receiver in a usual way after completing remote connection to the base receiver via Long-Range Bluetooth proxy.

Note: The Long-Range Bluetooth connectivity is also useful to remotely connect Sokkia Field to a robotic total station (*iX* series is supported) through a Long-Range Bluetooth enabled GNSS receiver. Learn more...

How to connect to TS via GNSS receiver using Long-Range Bluetooth

To remotely connect to a robotic total station (*iX* series) at an extended range (comparing to a BT connection), you can use a GNSS receiver that supports Long-Range Bluetooth communication (**GSX2**, **GCX2**, **GCX3GRX3**).

This connection type can be used to replace Remote Control unit to control a robotic TS.

For setting up this type of connection, the following actions are required:

1. Create an optical configuration for a robotic TS (*iX* series). In the Connection Mode dialog of configuration wizard, select *Bluetooth TS via GNSS*. Save the configuration.
2. Create a suitable GNSS configuration with rover receiver:
   - In the most basic case it can be *Autonomous/SBAS/PPP*. If you intend to work in the Fusion Positioning ™ mode, create the desired GNSS configuration (*RTK/Skybridge*, *Network RTK/Skybridge*, or any other).
   - In the Rover Receiver of configuration wizard, specify the rover receiver model you intend to use and the connection type.Note that the receiver must support Long-Range Bluetooth connectivity.
   - Save the configuration.
3. Turn the GNSS receiver and the TS on. Do not run *External Link* mode on the TS.
4. In the Connections dialog, select the created optical configuration in the **Device Type** group. Click **Connect**.
5. First, Sokkia Field starts connection to the GNSS receiver the way specified in the GNSS configuration.
6. After successful connection to GNSS receiver, the Select Robotic Device dialog opens. Find your TS in the list of discovered devices and connect to it.

On successful connection, a green antenna will be displayed on the respective icon on the TS status screen. You can verify the communication with the instrument by manipulating it with the joystick (or virtual joystick) in the Remote Control dialog (click  >  > ).

Network tab of the Connections dialog

To review details on a connection of the GNSS receiver to a mount point in a network based survey; to connect, disconnect, or switch a network mount point.

This tab is available for network based survey configurations when Sokkia Field is connected to a GNSS receiver. The GNSS receiver automatically starts connection to a network according to the

network connection settings of used survey configuration.

1. To review the connection status to a network mount point:

   - The information panel visualizes the actions Sokkia Field performs while connecting to the network transmitting correction data.
   - The main list displays a log of necessary connection actions. Listed items are marked with check boxes if the respective actions are completed. The latest performed action is the last item in the list.
   - The  field displays a label of connection and an IP address of a currently connected caster (or server, if TCP/IP protocol was chosen in the Configuration dialog) as it has been defined in the Internet Address dialog during survey configuration.
   - The drop-down list below displays a currently connected mount point. Click  to open the Mount Point Info dialog to display detailed information about the selected mount point. If TCP/IP protocol was chosen in the Configuration dialog, the mount point isn't used.
   - The information pane display connection progress statuses and the last connection status.
   - The signal  /  /  indicator shows the signal strength along with mobile operator name. More bars at indicator means better radio signal. This indicator is enabled only if the **Get signal quality and operator name** check box is enabled in Miscellaneous settings.

2. To connect, disconnect, or switch to another mount point:

   - Click the **Disconnect** button to disconnect from the caster (server). The GNSS receiver stops receiving correction data from the network. While disconnected you can change the caster (server) and / or the mount point and then reconnect according to changed parameters. The **Disconnect** button doesn't close the current connection to the Internet.
     - Click the  button to change the caster (server), select an available caster (server) label from the button's context menu. The connection starts instantly.
     - While disconnected, select an available mount point from the drop-down list. (Not applicable if TCP/IP protocol was chosen in the Configuration dialog).
       - Click  to open the Mount Point Info dialog to display detailed information about the selected mount point.
       - Click  to refresh the list of available mount points, if required.

         Note: Sokkia Field stores mount points per server (i.e. not per configuration or a project). The list of mount points keeps the history of up to 10 items.

- Click the **Connect** button to connect to the selected caster (server). Upon connection, the GNSS receiver starts receiving correction data from the network.
  - During the connection phase, click the **Stop** button to stop the connection, if required.

Mount Point Info

To display the detailed information about the selected Mount point.

The data fields displayed include:

Mount point name, identifier, solution, coordinates, navigation system, country, carrier, format, format-details, NMEA, generator, network, compr-encrypt, authentication, fee, bitrate, comment, type.

The actual displayed data depends on mount point settings on provider's site.

Click  to return to the Network tab of the Connections dialog.



Setup

Before conducting the survey you may need to perform some preliminary work that depends upon the current project configuration:

- Setup GNSS
- Setup Optical (Total Station)

Setup (GNSS)

Click an icon to perform the task:



Status
Displays information about the current position of the GNSS receiver, RTK status, and the satellite constellations.



Manage Receiver
Displays information about the receiver's firmware, ID board, serial number and OAF. *Not available for onboard.*



Mission Planning
Calculates the observation conditions, such as satellite visibility and PDOP values for survey anywhere in the world.



Start Base
Sets the Base Receiver in RTK survey. Available after establishing a connection with the base receiver.



Localization
Calculates localization parameters of the mathematical coordinate transformation between an original coordinate system, in which the project points are measured or given, and a local coordinate system, in which control points are known.



Simulator
Sets initial WGS84 position for GNSS simulation configured.

	Static Occupation Starts logging data at the point occupied for static observations in the PP Static survey.
	PP Sessions Installs sessions plans for GNSS receiver to automatically start and finish of a raw data file. This icon is displayed if the **Post Processing** check box is selected in the Receiver Make dialog.
	Survey Session Creates a survey session, where the measured points will be recorded.
	Correct Base Specifies a topo point and the known point to perform the correction of a base receiver. The item is not displayed for PP Static, PP Kinematic, or PP DGPS configurations. *Not available for onboard.*
	Mock Location Supplies the position coming from the connected GNSS receiver to external applications.



Status

To check the status of a GNSS survey and connected GNSS equipment.

The **Status** dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position.
- System tab - shows the current state of GNSS measurements and GNSS equipment.
- Log History tab - displays on a time line the number of satellites which raw data is logging.
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases.
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter.
- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR).

Click the  button to open the Status dialog menu. Displayed menu items vary depending on the configuration type and equipment used:

- Rover Antenna Setup opens the dialog to configure a GNSS antenna for the rover receiver.
- **Config Radio** is available for connected base or rover receiver, when an internal or external radio modem is used in GNSS survey configuration. More...
- **Config Cell** is available for connected base or rover receiver, when an internal or external cellular modem is used in GNSS survey configuration. More...
- **Reset Tracking and Positioning** - the command that re-initializes the receiver.
- PPP Known Pt Init (available in *Autonomous / SBAS / PPP* survey configuration with enabled PPP) - opens dialog to prepare and use a PPP seeding point for instant PPP convergence.
- **Full PPP Reset** (available when Skybridge ™ / Starpoint ™ mode is on) - the command that restarts PPP positioning from the beginning.
- Tracking Options opens the dialog to choose satellite constellations for GNSS measurements.

Click the  button in the title bar to open the Settings dialog to set Elevation Mask and Base Make At Rover parameters.

> **Note:** In specific RTK and DGPS configurations, when starting the base receiver, you can get the following warning:
>
> "Your rover firmware does not recognize the base antenna. Make sure that height of measured points is correct".
>
> Refer to this section to solve the issue.

Click  to return to the previous dialog. Click  to open the Home Screen.

Position tab of the Status dialog

 Status dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position (**this tab**).
- System tab - shows the current state of GNSS measurements and GNSS equipment
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases.
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter.

- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR).
- Log History tab - displays on a time line the number of satellites which raw data is logging.

To display current coordinates measured with a connected GNSS receiver, local time, solution type, number of tracked satellites, PDOP factor and distance to the base.

Review the data related to a currently occupied position:

- The numbers of the available satellites:
  - The  icon displays the number of the satellites tracked.
  - The  icon displays the number of satellites used in position determination.
- Current *Local* time.
- Current *Solution type*. Learn more about solution types.
- Current *Coordinates* of the position in the selected coordinate system and units.
-  *PDOP* value is a parameter used to describe the strength of the current satellite configuration, or geometry, and its impact on the accuracy of the data collected by a GNSS receiver at the time of use.
  - *HRMS* and *VRMS*are RMS (root mean square) values of the horizontal and vertical coordinates, respectively.
- *Base Dist*: slope distance to base antenna. The field is unavailable if no differential corrections are received.

System tab of the Status dialog

 Status dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position.
- System tab - shows the current state of GNSS measurements and GNSS equipment (**this tab**).
- Log History tab - displays on a time line the number of satellites which raw data is logging.
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases.
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter.
- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR).

To display the information about the current state of GNSS measurements and GNSS equipment.

- *Position Type* - Indicates the solution type of the position;
- *Skybridge ™ Status* - indicates the current status of Skybridge ™ mode for RTK or Network RTK survey if PPP is enabled.
  - *Unknown* - no information available;
  - *Rover Not Ready* - the rover receiver is not ready to work in the Skybridge ™ mode: please check the receiver options, Starpoint ™ subscription and satellite tracking;
  - *No PPP or RTK corrections* - the rover receiver does not obtain PPP correction data from network mount point / Lband satellite and / or RTK correction data from network mount point / RTK base station; the rover is not ready to work in the Skybridge ™ mode;
  - *Base Estimation* - the rover receiver performs estimation of Network or RTK base station precise position in ITRF 2020 coordinate system; percentage complete is displayed, the rover is not ready to work in the Skybridge ™ mode until base estimation is completed;
  - *Ready* - the rover receiver is ready to work in the Skybridge ™ mode;
  - *Ready. Transmitted coords* - the rover receiver is ready to work in the Skybridge ™ mode. The PPP engine uses the precise coordinates of current RTK base station, which are transmitted in RTK corrections by Topnet Live correction service.
- Seven lines with number of satellites for *GPS*, *GLONASS*, *SBAS*, *QZSS*, *Galileo*, *BDS*, and *NavIC* constellations. Each line contains three numbers: "used satellites", "available satellites" and "locked satellites":
  - "used satellites" - Number of satellites used in positioning for the current solution type. If the current solution type is *Autonomous*, this number shows the satellites number, which are used in the positioning for this receiver only. If the current solution type is *DGPS*, or *Fixed*, or *Float* this number shows the number of common satellites between base and rover, which are used in the positioning.
  - "available satellites" - Number of satellites available for positioning. In this case, the number refers to this receiver only.
  - "locked satellites" - Number of observed satellites.
- *Radio Link* - Quality of the radio link;
- *RTK-Age(sec)* - Age of the last correction message in seconds;
- *Base Power Source* - Status of RTK base receiver power source (*type*, *remaining charge if battery*, *voltage*), available on rover side if base and rover receivers are running firmware 5.6 or later.
- *Lband Link* - Quality of the Lband link;
- *Galileo HAS Link* - Quality of the Galileo HAS link;
- *Beidou B2b Link* - Quality of the Beidou B2b link;
- *Receiver Storage* - Available memory in the receiver for storing TPS files;
- *Internal Battery* - Remaining battery charge of the internal battery (in percentages);
- *Battery A* - Remaining battery charge of the first internal battery (in percentages);
- *Battery B* - Remaining battery charge of the second internal battery (in percentages);
- *Removable Battery* - Remaining battery charge of the removable battery (in percentages);
- *Ext. Battery Pack* - Remaining battery charge of the external battery pack (in percentages);
- *External Power* - Current power voltage of the external power supply (only if connected);
- *Controller Storage* - Available memory in the controller;
- *Controller Power* - Remaining battery charge of the controller;

- *NetRTK (MAC) Status* - Applies to Network RTK survey type with MAC corrections selected. The status will display '*Yes*' if MAC is used for position computation;
- *Network Datum* - Name of the datum, which parameters are obtained by the rover receiver from the correction data;
- *Network Grid* - Name of the grid projection, which parameters are obtained by the rover receiver from the correction data;
- *Survey Session* - Name of the current Survey session;
- *Base Make at Rover* - Manufacturer of the base station. The field is shown, if *Automatic Detection* is selected in the **Base Station Make** drop-down list of the Advanced dialog (see Configuration Wizard) or Settings dialog. You can open this dialog by clicking  in the upper right corner of the *Status* dialog. This information is obtained by the rover receiver from the correction data transmitted by the base receiver. If the base receiver does not support IGS Class extensions in correction formats or if the required RTCM messages aren't enabled on the base, this field reports ("") and the rover applies default GLONASS corrections to calculate the position. If you selected the manufacturer manually in the **Base Station Make** drop-down list, this field is not displayed.
- *Starpoint ™ Subscription* - the field can display the following values:
  - *N/A* - the subscription is absent or the date of the subscription is expired;
  - *Not Ready* - the current subscription is not ready. The subscription expiration date also displays.
  - *Ready* - the current subscription properly works. The subscription expiration date also displays.
- *Lband Satellite* - name of the current satellite;
- *Lband Signal Quality* - received power level, in dB;
- *Lband SNR* - current signal to noise ration, in dBHz.

Log History tab of the Status dialog

 Status dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position.
- System tab - shows the current state of GNSS measurements and GNSS equipment.
- Log History tab - displays on a time line the number of satellites which raw data is logging (**this tab**).
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases.
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter.
- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR).

The **Log History** tab is available, while the connected receiver is logging a raw data file (**.tps*). The tab graphically displays satellite numbers, which raw data is recording to the **.tps* file.

> **Note:** The **Log History** tab is unavailable for **GRX5** receiver.

For convenience, the field of the tab is divided into 5-minute strips along dotted lines. The starting time line and next half hour line is marked with time labels (shown as orange triangles ▼).

Multi Base tab of the Status dialog

 Status dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position.
- System tab - shows the current state of GNSS measurements and GNSS equipment.
- Log History tab - displays on a time line the number of satellites which raw data is logging.
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases (**this tab**).
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter.
- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR).

1. To view the information about the base station ID and other parameters of the current base station and other bases available for multi base mode.
   - **Use** - a check mark indicates this base station is currently used by the rover;
   - **ID** - the unique numerical ID of this base station;
   - **Base** - the name of this base station (only available if this base is currently in use);
   - **Age** - the age of the last correction message received from this base station;
   - **Link** - the quality of the radio link of this base station;
   - **Type** - the solution type of the position (only available for a base that is currently in use);
   - **Dist** - the distance between this base station and the rover (only available for a base that is currently in use).

2. To manually switch a base that is currently in use to another available base.

   This option is available if multiple base stations have been set up in multi base mode meaning they have their own unique base station IDs, share the same radio channel and transmit corrections in either CMR+ or RTCM 3.x format. Each base station must be configured to use its own transmission delay.

By default, Sokkia Field automatically switches bases to the one that is mostly suited for the rover at the specific location. When required, a user has an option to manually select a desired base station from the list of available bases and instruct the rover to obtain corrections from that base.

- Check the box  manually in the **Use** column in a desired base row to turn off the automatic base switching and select the base station. The RTK engine starts to use correction data from that base.
- Click the **Select Base Automatically** button to return to automatic mode and let Sokkia Field choose the mostly suited base station. (This button is disabled when automatic mode is on.)

Scatter Plots tab of the Status dialog

 Status dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position.
- System tab - shows the current state of GNSS measurements and GNSS equipment.
- Log History tab - displays on a time line the number of satellites which raw data is logging.
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases.
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter (**this tab**).
- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR).

To graphically display the current receiver position changing in time and showing measurements scatter.

The dialog has two plots available: the vertical position and the horizontal position relative to the position in a local (northing, easting) coordinate system.

- Click  /  to switch to the horizontal / vertical position plotting.
- Click  /  to scale in / out the horizontal position plot.
- Click  to open the *Properties* dialog for horizontal position plot and vertical position plot depending on the plot displayed.

Properties of Horizontal Plot

To set up grid and auto zoom features for the horizontal plotting in the Scatter Plots tab of the Status dialog.

- Check the **Show Grid** box to display the local coordinate axes on the horizontal plot in the Scatter Plots tab of the Status dialog.
- Check the **Auto Zoom** box to automatically scale the horizontal plot to fit into the Scatter Plots tab of the Status dialog.
- Click  to save the settings and return to the Scatter Plots tab of the Status dialog. Click  to return to the Scatter Plots tab of the Status dialog without saving changes to the settings.

Properties of Vertical Plot

To specify a duration in seconds for the time axis for the vertical plotting in the Scatter Plots tab of the Status dialog.

- In the **Time Window** field, enter a duration value in seconds for the time axis.
- Click  to save the setting and return to the Scatter Plots tab of the Status dialog. Click  to return to the Scatter Plots tab of the Status dialog without saving changes tothe setting.

SVs tab of the Status dialog

 Status dialog contains information about current survey, connected receiver position and satellite constellations. The status information is presented in the following tabs:

- Position tab - displays the data related to a currently occupied position.
- System tab - shows the current state of GNSS measurements and GNSS equipment.
- Multi Base Status tab - displays the information about current base station and allows you to switch between available bases.
- Scatter Plots tab - displays graphically the current receiver position changing in time and showing measurements scatter.
- SVs tab - represents graphically the satellites on the sky and their signal-to-noise ratio (SNR) (**this tab**).
- Log History tab - displays on a time line the number of satellites which raw data is logging.

To represent graphically the position of the satellites on the sky or their signal - to - noise ratio (SNR).

- In the right side of the dialog the satellite constellation icons are located. By pressing the corresponding button, you can display or hide each satellite constellation on the sky plot or in the List representation:
  -  /  - GPS satellites constellation hide / display;
  -  /  - GLONASS satellites constellation hide / display;
  -  /  - Galileo satellites constellation hide / display;
  -  /  - BeiDou satellites constellation hide / display;
  -  /  - SBAS satellites constellation hide / display;
  -  /  - QZSS satellites constellation hide / display;
  -  /  - NavIC satellites constellation hide / display;
  -  /  - Lband geostationary satellites hide / display.

  Note: The satellites constellation icons availability depends on the corresponding settings in the Tracking dialog (see Configuration Wizard) and the connected GNSS receiver model. The GPS satellites constellation icon is always available. The Lband satellites icon availability also depends on the type of survey and settings in the Rover Receiver dialog (see Configuration Wizard) and the connected GNSS receiver model.

- Toggle between **SNR** and **Plot** to observe the satellites sky plot or the signal-to-noise ratio for the signals from satellites.

1. **Plot** mode:
   - Displayed diagram represents the geographically oriented sky plot with its center defined by the current coordinates measured with the connected GNSS receiver in real time.
   - Outer circle line is the horizon line.
   - Bold circle line is the elevation mask line. Navigation satellites outside this line aren't observed, don't display, and will not be used in measurements. To customize the elevation mask, click  in the title bar, open the Settings dialog and enter required value.

- Observed satellites are shown according to their position on the sky plot in real time. Color of a satellite is the color of the constellation this satellite belongs to. The satellite number also displays next to its respective icon. Use constellation icons on the right to display / hide its satellites.

2. **SNR** (signal to noise ratio) mode:
   - Displayed diagram represents every observed navigation satellite on the sky plot by its signal to noise ratio parameter measured in real time.
   - Horizontal axis shows each observed satellite number. Vertical axis is a SNR value in dBHz.
   - Every observed satellite is shown by two constellation colored columns. The left column is a SNR value for L1 frequency signal, the right one is a SNR value for L2 frequency signal.
   - Use constellation icons on the right to display / hide its satellites.
   - Use horizontal scroll bar below diagram to view measured SNR values for all satellites.

- Click **List** to obtain the table displaying the observed satellites parameters.
  - The list of displayed parameters:
    - *#*: - shows the number of the satellite;
    -  - the check box defines whether the satellite is used in position computation. Check / clear the box manually to use / exclude the respective satellite from position computation. Note that clearing the box does not stop tracking that satellite.
    - *CA*- shows the signal to noise ratio in the C/A channel on the L1 frequency [dBHz];
    - *EL*- shows the elevation angle of the satellite:
      - *EL+* - elevation angle is increasing;
      - *EL-* - elevation angle is decreasing;
      - *EL^* - elevation angle is maximum and will decrease;
    - *AZ*- shows the azimuth of the satellite;
    - *H/U*- shows whether the satellite is healthy or unhealthy;
    - *L2*- shows the signal to noise ratio in the P channel on the L2 frequency [dBHz];
    - *L2C*- show the signal to noise ratio in the C/A channel on the L2 frequency [dBHz];
    - *L5*- show the signal to noise ratio on L5 frequency [dBHz].
  - Click a column header to sort the list of satellites in either ascending or descending order based on that header. Orange arrows  /  in the column's header indicate the order.
  - Use constellation icons on the bottom to display / hide its satellites.
  - Click **Back** to return to the diagram mode.

Settings

The dialog content depends on the project configuration.

In this dialog you can select the signal processing parameters and RTK setting:

- **Elevation Mask**: Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.
- From the **Base Station Make** drop-down list, select the manufacturer of the base station to designate Base Make (IGS Class) used by the rover receiver to account for GLONASS biases. (This setting is not available for **GRX5** receiver. The **GRX5** rover always uses *Automatic Detection* and applies default GLONASS corrections if automatic detection failed.)
  - The default setting *Automatic Detection* allows the rover receiver to use the information transmitted by the base. The message 1033 of the RTCM 3.x format contains this information.
  - If the base station does not transmit the manufacturer name, manually select the base manufacturer name from the drop-down list.

> **Note:** Incorrect name of the Base receiver manufacturer can result in a Float solution.



Manage Receiver

Click an icon to perform the task:



Info
The dialog displays information about the receiver's model, firmware, ID, serial number, and OAF expiration date. In this dialog you can send *Clear NVRAM* command to the GNSS receiver.



File Manager
The dialog displays a list of files stored in internal memory of the GNSS receiver and allows a user to download, upload and remove files in GNSS receiver.



OAF License
The dialog displays information about loaded licensed options and allows a user uploading the new OAF.



Update
Allows a user to upload a firmware to the connected receiver.



Recovery
Allows a user to recovery a receiver via a its serial port. Available for **GSX2**, **GRX1**, **GRX2**, **Atlas** receivers.



Settings
Allows a user to configure receiver's miscellaneous settings.



Wi-Fi
Allows a user to configure and manage the Wi-Fi connectivity. Available for **GRX5**, **GNR5** receivers.



Receiver Info

The dialog shows the information about the connected receiver. The following information is shown:

- **Options** - the number of expired option(s) out of total number of uploaded options.
- **Receiver model** - Sokkia receiver model name.
- **Firmware version** - GNSS receiver firmware version and release date.
- **ID** - OEM board identification number.
- **Serial Number** - GNSS receiver serial number.
- **BT Name** - GNSS receiver Bluetooth identification name.
- **BT Address** - GNSS receiver Bluetooth address.
- **Pin** - GNSS receiver Bluetooth PIN (if used).
- **IMEI** - International Mobile Equipment Identity number of cell modem module installed in the GNSS receiver (if installed).
- **PAC ID** - GNSS receiver identification number required to order a Starpoint ™ subscription.
- **Firmware hash** - hash value of the loaded GNSS receiver firmware.
- **Bootloader hash** (**Bootloader1 hash** / **Bootloader2 hash**) - hash value of the GNSS receiver bootloader (if available).
- **Starpoint ™ subscription** - current subscription level to Topnet Global services.
- **Starpoint ™ satellites** - set of GNSS constellations associated with current Starpoint ™ subscription (if used).
- **Starpoint ™ solution** - PPP solution level associated with current Starpoint ™ subscription (if used).

To export displayed information to **.txt* file click **Save to file** button. Enter a file name and choose a destination in the Save file dialog, then click ✔ to save a file and return to Receiver Info dialog.

Click ☰ in the top left corner to reset the GNSS Receiver. Two reset options are available:

- **Reset Parameters** - sets all the receiver parameters to their default values and reboots the receiver. This operation will not delete any raw data files stored in the receiver's memory.
- **Factory Reset** - performs factory reset (clears the NVRAM and reboots the receiver). All receiver parameters will be set to their default values. Almanacs, ephemerides, etc., will be erased. This operation will not delete any raw data files stored in the receiver's memory. The receiver will require some time (around 15 minutes) to collect new ephemerides and almanacs.



File Manager

The dialog displays a list of files (for example (*.*tps*) raw data files) stored in the GNSS receiver memory and allows a user to upload, download, and remove files.

- The file list pane displays the general information about files stored in the GNSS receiver memory:
  - **Name** - the name of a file.
  - **Date** - the date and the time of a file record.
  - **Size** - the size of a file in bytes.

- The file list pane context menu simplifies files selection with the following commands:
  - **Select All** - highlights all files in the list.
  - **Select All Below** - highlights a currently highlighted file and all the files in the list displayed below.
  - **Select Multiple** - highlights multiple files by sequential clicking on file names.
  - **Cancel Selection** - removes highlight from all highlighted files in the list.

- To ensure that the list of displayed files is up-to-date, click **Refresh** button.

- To download file(s) from the internal memory of the GNSS receiver:
  - Highlight file(s) in the file list and click **Download** button.
  - Choose a destination for file(s) in the Select download path dialog and click ✔ to proceed.
  - The **Downloading** pop-up dialog will display downloading file name, destination folder, and current downloading progress with an option to cancel the action.

- To upload file(s) into the internal memory of the GNSS receiver:
  - Click **Upload** button.
  - Choose file(s) for upload in the Select a file to upload dialog and click ✔ to proceed.

  - The **Uploading** pop-up dialog will display uploading file name with full path and current uploading progress with an option to cancel the action.

- To delete file(s) from the internal memory of the GNSS receiver, highlight file(s) in the file list and click **Remove** button. The confirmation prompt will open to prevent an accidental deletion.

This dialog also allows a user to instruct the GNSS receiver (such as GRX3, GNR5) to mount the receiver memory as a Windows disk in the controller when the receiver is connected to the controller via a USB cable. Click ☰ and choose the **Show files as a Windows disk when USB is used** command from the dialog menu to turn on /off this feature. Activated feature is marked with ✓. Mounting of GNSS receiver memory as a USB disk in the controller occurs at the moment when USB cable links USB interfaces of the controller and the GNSS receiver. When mounted in the controller, the GNSS receiver memory is unavailable for file operations within Sokkia Field (including RAW data file (**.tps*) logging into the receiver memory). The application will prompt to deactivate this feature and restart the receiver when required.



Receiver License (OAF)

The dialog shows information about loaded options. An Option Authorization File (OAF) contains receiver license with authorized options. To upload the OAF to a GNSS receiver click the **Load OAF** button. There are two types of the Option Authorization File:

- Option Authorization File contains options which are always enabled, i.e. these options are permanent. This OAF is created for the individual Sokkia GNSS receiver and it can be uploaded to this GNSS receiver only. User can purchase a permanent options file and cannot lease it.
- Option Authorization File contains options which are enabled until some date (an expiration date), i.e. these options are temporary. This OAF is created for all Sokkia GNNS receivers and it can be uploaded to any Sokkia GNSS receiver. This OAF is called Universal Option Authorization File (UOAF). User can lease a temporary options file and cannot purchase it.

The dialog displays the following information for each loaded option:

- **Name** - displays a name for the receiver option in a user-friendly manner.
- **Exp. Date** - indicates the expiration date of the option. The date is displayed for temporary option only.
- **Cur** - indicates the current status or value of the option:
  - *Yes* - the option is enabled.
  - *No* - the option is disabled.
  - *Positive integer* or *Text*- the option is enabled with a specified value.
  - *Not supported* - the firmware version does not support this option.

- **Purch** - indicates the purchased status of the option:
  - *Yes* - the option is purchased.
  - *No* - the option is not purchased.
- **Leased** - indicates the leased status of the option:
  - *Yes* - the option is leased.
  - *No* - the option is not leased.

Optionally, you can delete all receiver options in the connected GNSS receiver. To do this, select the **Reset OAF** option from ☰ menu in the top left corner.

> **Note: Reset OAF** deletes all options from the receiver. After the options are deleted, the receiver will not track any satellites. Before resetting OAF, make sure that:
> • the options file you are going to load matches your receiver, and
> • the options in the file are not expired.



Receiver Update

The dialog allows the user to upload a firmware to the GNSS receiver. The dialog displays the following information about the GNSS receiver: **Board model**, **Board version**, receiver **ID** and receiver **Hardware version**.

You can update the firmware using any connection (cable USB / Serial, Bluetooth, or Wi-Fi) available to your GNSS receiver.

> **Note:** To update the receiver's firmware, be sure that the receiver is connected to the application. To establish the connection, click the **Connect** button in the Connections dialog.

- Click the **FW Upload** button, to start firmware updating.
- Choose the corresponding format of the firmware file in the **Type** field and select the desired file with firmware in the Select Path dialog:
  - *ldp Files (*.ldp)* format for all Sokkia GNSS receivers, except **GNR5**, **GRX3**, **GRX5**;
  - *tfi Files (*.tfi)* format for **GNR5**, **GRX3**;
  - *itb Files (*.itb)* format for **GRX5**.
- Click ✔ to upload selected file to the receiver. The *Receiver Update* dialog displays the uploading progress bar.

- When the firmware file is uploaded to the receiver successfully, Sokkia Field displays the following message: *"Receiver will reset and start update*". Click the **Close** button. The process of updating of the firmware was started.
- You can monitor completing of firmware update using LED display of the GNSS receiver. Wait for the firmware update to complete and reconnect Sokkia Field to the receiver.



Receiver Recovery

To recover a receiver by uploading firmware file using the external loader image. The recovery is available for the following GNSS receivers: **GSX2**, **GRX1**, **GRX2**, **Atlas**.

- Connect the GNSS receiver to the controller's COM port via serial cable, turn on the receiver.
- Choose between two ways to start firmware loading to the GNSS receiver.
  - **Auto** - the application sends the special command to start the firmware loading. After clicking the **Start Recovery** button, manual receiver turning OFF/ON is not required.
  - **Manual Restart** - this method requires manual receiver turning OFF/ON after clicking the **Start Recovery** button.

- Click  in the **Loader Image** panel to open Select Path dialog and choose a loader image **.ldr* file, which will be loaded to RAM of the receiver.
- Click  in the **Flash Image** panel to open Select Path dialog and choose a flash image **.ldp* file, which will be loaded to Flash memory of the receiver.

- Select a serial port for connection to the receiver from the drop-down list.
- Click the **Start Recovery** button.
  - If you selected **Manual Restart**, turn OFF/ON the receiver after clicking the **Start Recovery** button.

- The *Receiver Recovery* dialog displays the uploading progress bar. When the firmware is loaded to the receiver, the receiver performs a reset to start updating the firmware.
- You can monitor completing of firmware update using LED display of the GNSS receiver. Wait for the firmware update to complete and reconnect Sokkia Field to the receiver.



Receiver Settings

To view and set up the **Bluetooth PIN** for the connected GNSS receiver.

- The **Bluetooth PIN** field displays the actual PIN required for connection to the GNSS receiver over Bluetooth. The field is blank if the PIN has not been set up. The field is inactive if this feature is unavailable for the connected GNSS receiver or there is no connection to a GNSS receiver.
- Enter a PIN in the **Bluetooth PIN** field and click to return to the Manage Receiver menu or click to open the Home Screen. The entered PIN is required to establish the connection with this GNSS receiver over Bluetooth.
- Clear the **Bluetooth PIN** field and click to return to the Manage Receiver menu or click to open the Home Screen. The PIN is not required to establish the connection with this GNSS receiver over Bluetooth.



Receiver Wi-Fi

To switch on and off the Wi-Fi module of a connected GNSS receiver and to review and to configure GNSS receiver's Wi-Fi settings.

This dialog is available for GNSS receivers supporting Wi-Fi connections: **GNR5** and **GRX5**. For initial Wi-Fi settings configuration, connect the GNSS receiver using alternative method such as Bluetooth or cable USB / Serial.

To switch off and on the Wi-Fi module of the connected GNSS Receiver:

- Select *Off* from the **Mode** drop-down list to switch off the Wi-Fi module of the receiver.
- Select *On* from the **Mode** drop-down list to switch on the Wi-Fi module of the receiver. (The receiver should be connected via Bluetooth or cable USB / Serial).
- Click to send the selected command to the Wi-Fi module of the connected GNSS receiver and open the Manage Receiver menu.

To establish Wi-Fi connection between the GNSS receiver and a controller, a user can set up the GNSS receiver to work in one of two connection modes:

- **Client** connected to an existing Wi-Fi network, for example, a controller's access point;
- Independent Wi-Fi **Access Point** hosted on the GNSS receiver, a controller connects to.

Sokkia Field supports configuring and storing settings for both modes separately.

1. To set up the GNSS receiver as a **Client** for an existing Wi-Fi Network:

   - Select *Client* from the **Mode** drop-down list.

     Note: To set up your GNSS receiver to connect to an existing Wi-Fi network, prepare and keep on hand the credentials of this network: **SSID** (Service Set Identifier), the name of a wireless network, also known as Network ID, and **SSID password**, the secret word or string of symbols you enter to authorize connection of your device to that wireless network. If your controller will act as an Access Point for your GNSS receiver, check these credentials in your controller's Wi-Fi settings.

   - **TCP password** - this password is required to authorize communication between the Sokkia Field application and the GNSS receiver over TCP protocol within Wi-Fi network. It is not related to Wi-Fi network access. This password is obligatory and will be stored in the receiver's memory. Enter the desired password and keep it on hand. You will provide this password in the Configure Wi-Fi (GNSS device) dialog, while connecting Sokkia Field application to the GNSS receiver over Wi-Fi.
   - **MAC** - displays MAC address (Media Access Control address), a unique identifier assigned to the GNSS receiver Wi-Fi hardware module.
   - **SSID** - enter a Wi-Fi network name (Network ID) the receiver will connect to.
   - **SSID password** - enter a password to authorize connection to the Wi-Fi network.
   - **SSID username** - enter a user name if required to authorize the connection to the Wi-Fi network.
   - **IP** - displays IP address assigned to the GNSS receiver in the Wi-Fi network. This field is blank while setting up the **Client** mode.
   - Click  to save the Wi-Fi **Client** mode settings to the GNSS receiver. If entered Wi-Fi network credentials are correct and the GNSS receiver is in that Wi-Fi network range, the receiver connects to the Wi-Fi network automatically and becomes available for Sokkia Field to connect to it over Wi-Fi.

2. To set up the GNSS receiver as a Wi-Fi **Access Point** and have controllers and / or other devices connect to it over Wi-Fi:

   - Select *Access Point* from the **Mode** drop-down list.
   - **TCP password** - this password is required to authorize communication between the Sokkia Field application and the GNSS receiver over TCP protocol within Wi-Fi network. It is not related to Wi-Fi network access. This password is obligatory and will be stored in the

receiver's memory. Enter the desired password and keep it on hand. You will provide this password in the Configure Wi-Fi (GNSS device) dialog, while connecting Sokkia Field application to the GNSS receiver over Wi-Fi.

- **MAC** - displays MAC address (Media Access Control address), a unique identifier assigned to the GNSS receiver Wi-Fi hardware module.
- **SSID** -displays a Wi-Fi network name (Network ID) the receiver will provide for other devices to connect to.
- **SSID password** - displays a password required to authorize connection to the receiver's Wi-Fi network.

> **Note:** The receiver's Wi-Fi network **SSID** and **SSID password** are obligatory parameters to set up the GNSS receiver's Wi-Fi module to work in the **Access Point** mode and can be customized by the user. Just enter the desired values. The minimum length of the SSID password is 8 symbols. Keep on hand these values to provide them while configuring a controller or another device for connection to the receiver's Wi-Fi network.

- **IP** - displays the current IP address of the receiver's Access Point. The default value is 192.168.4.10, don't change this address without clear purpose. Keep on hand this IP address, you will provide it in the Configure Wi-Fi (GNSS device) dialog, while connecting Sokkia Field application to the GNSS receiver over Wi-Fi.
- **Subnet** - displays the current subnet mask of the receiver's Access Point. The default value is 255.255.255.0, don't change this value without clear purpose.
- Check the **Do not Broadcast SSID** box to stop broadcasting the receiver's Wi-Fi network SSID, so wireless clients can't discover this Wi-Fi network and have to know and specify its SSID manually in order to connect to. Clear the box to let wireless clients scan for and discover the receiver's Wi-Fi network.
- Click  to save the Wi-Fi **Access Point** mode settings to the GNSS receiver. The GNSS receiver starts its built-in Wi-Fi **Access Point** with entered settings and is ready to accept connections to its Wi-Fi network.

Click  to close the dialog without saving changes to the GNSS receiver's Wi-Fi settings and open the Manage Receiver menu.

Mission Planning

To calculate the observation conditions, such as satellites visibility and PDOP values for survey anywhere in the world.

This feature is useful to find out the best timing for observations at the specified point (mission planning point). Sokkia Field performs such calculations using Almanac data. If Sokkia Field is connected to a GNSS receiver, the application downloads Almanac Data from the receiver and uses the latest navigation data to calculate the corresponding values. If Sokkia Field is not connected to a receiver, the application uses Almanac Data saved during the last receiver connection.

Sokkia Field presents the calculated satellite observation conditions as four diagrams. Select a diagram to display from the drop-down list in the dialog's top right corner.

- Sky Plot - displays the satellites positions on the sky plot during the planned mission time.
- Sat List - displays the specific satellite visibility on the planned mission time line.
- Sat Num - displays the quantity of visible satellites for every constellation on the planned mission time line.
- PDOP - displays the PDOP values on the planned mission time line.

Click  in the dialog's title bar to open the Mission Planning Setting dialog and specify coordinates, date, duration and other parameters of the planned mission.

Click  to close the dialog and open the Setup menu.

Mission Planning Setting

To specify coordinates of the mission planning point and to set up date, time, duration and elevation mask of the mission.

1. To specify the coordinates of the mission planning point:
   - Click  to instantly enter the current coordinates values received from the connected GNSS receiver.
   - Enter required coordinates or edit displayed values manually in the corresponding fields. Use the project's coordinate type and coordinate units to enter values.

2. To set up date, time, duration and elevation mask of the mission:
   - In the **Date** field, select the date of planned mission. Choose it from the drop-down calendar or enter manually.

> **Note:** The information about satellites availability depends on the validity of received Almanacs for a selected mission date.

- In the **Start Time** field, enter the starting time of planned mission. Use arrows to scroll hours and minutes or enter them manually.
- In the **Time Span** field, enter the duration of planned mission in hours.
- In the **Elev Mask** field, enter the elevation mask value in degrees. Satellites below this elevation aren't considered in mission planning data.

Click  to save the settings and open the Mission Planning dialog with calculated diagrams. Click  to close the dialog without saving changes to the settings.

Sky Plot diagram of the Mission Planning dialog

 Mission Planning dialog calculates the observation conditions, such as satellites visibility and PDOP values for survey anywhere in the world.

Sokkia Field presents the calculated satellite observation conditions as four diagrams. Select a diagram to display from the drop-down list in the dialog's top right corner.

- Sky Plot - displays the satellites positions on the sky plot during the planned mission time (**this diagram**).
- Sat List - displays the specific satellite visibility on the planned mission time line.
- Sat Num - displays the quantity of visible satellites for every constellation on the planned mission time line.
- PDOP - displays the PDOP values on the planned mission time line.

To represent graphically the position of the satellites during the planned mission time.

- Displayed diagram represents the geographically oriented sky plot with its center defined by the mission planning point coordinates. To change the mission planning point coordinates, click  in the title bar, open the Mission Planning Setting dialog and measure or enter coordinates.
- Outer circle line is the horizon line.
- Bold circle line is the elevation mask line. Navigation satellites outside this line aren't observed, don't display, and will not be used in measurements. To customize the elevation mask, click  in the title bar, open the Mission Planning Setting dialog and enter required value.

- Observed satellites are shown according to their position on the sky plot during the planned mission. Color of a satellite is the color of the constellation this satellite belongs to. The satellite number also displays next to its respective icon.
- Use constellation icons above to hide / display its satellites. Each icon displays the number of visible satellites for the constellation. Click the icon to hide / display the constellation on the sky plot:
  - 

/ 

- GPS satellites constellation hide / display;
  - 

/ 

- GLONASS satellites constellation hide / display;
  - 

/ 

- Galileo satellites constellation hide / display;
  - 

/ 

- BeiDou satellites constellation hide / display;
  - 

/ 

- SBAS satellites constellation hide / display;
  - 

/ 

- QZSS satellites constellation hide / display;
  - 

/ 

- NavIC satellites constellation hide / display.

- Use the following buttons to manage the planned mission time line and to update the satellites positions for every ten-minute interval of the planned mission:
  - 

- return to the start time of the planned mission;
  - 

- move the time line backward with ten-minute intervals;
  - 

- move the time line forward with ten-minute intervals;
  - 

- pause the time line at any ten-minute interval.

- The diagram also displays:
  - **PDOP** - the PDOP value for selected calculation moment.
  - **Local** - the date and local time of selected calculation moment.
  - **Coordinates** - the mission planning point coordinates in the project's coordinate system.

Sat List diagram of the Mission Planning dialog

 Mission Planning dialog calculates the observation conditions, such as satellites visibility and PDOP values for survey anywhere in the world.

Sokkia Field presents the calculated satellite observation conditions as four diagrams. Select a diagram to display from the drop-down list in the dialog's top right corner.

- Sky Plot - displays the satellites positions on the sky plot during the planned mission time.
- Sat List - displays the specific satellite visibility on the planned mission time line (**this diagram**).
- Sat Num - displays the quantity of visible satellites for every constellation on the planned mission time line.
- PDOP - displays the PDOP values on the planned mission time line.

To review the satellites availability for observation on the planned mission time line.

- Select a satellite constellation to display by highlighting its respective icon above the diagram:
  -  /  - GPS satellites constellation hide / display;
  -  /  - GLONASS satellites constellation hide / display;
  -  /  - Galileo satellites constellation hide / display;
  -  /  - BeiDou satellites constellation hide / display;
  -  /  - SBAS satellites constellation hide / display;
  -  /  - QZSS satellites constellation hide / display;
  -  /  - NavIC satellites constellation hide / display.

- Displayed diagram shows satellites of selected constellation available for observation on the planned mission time line.
- Horizontal axis is the planned mission time line. Vertical axis is the satellite number in selected constellation.
- The presence of the colored stripe confirms the availability of a satellite for observation at specific time segments of the planned mission.

Sat Num diagram of the Mission Planning dialog

 Mission Planning dialog calculates the observation conditions, such as satellites visibility and PDOP values for survey anywhere in the world.

Sokkia Field presents the calculated satellite observation conditions as four diagrams. Select a diagram to display from the drop-down list in the dialog's top right corner.

- Sky Plot - displays the satellites positions on the sky plot during the planned mission time.
- Sat List - displays the specific satellite visibility on the planned mission time line.
- Sat Num - displays the quantity of visible satellites for every constellation on the planned mission time line (**this diagram**).
- PDOP - displays the PDOP values on the planned mission time line.

To review the quantity of visible satellites for every constellation on the planned mission time line.

- Select a satellite constellation to display by highlighting its respective icon above the diagram:
  -  - GPS satellites constellation hide / display;
  -  - GLONASS satellites constellation hide / display;
  -  - Galileo satellites constellation hide / display;
  -  - BeiDou satellites constellation hide / display;
  -  - SBAS satellites constellation hide / display;

-  /  - QZSS satellites constellation hide / display;
-  /  - NavIC satellites constellation hide / display.

- Displayed diagram shows the number of satellites available for observation for selected constellation on the planned mission time line.
- Horizontal axis is the planned mission time line. Vertical axis is the quantity of visible satellites.
- Blue column confirms the quantity of visible satellites of selected constellation is more than five. Red column warns the quantity of visible satellites of selected constellation is no more than five.

PDOP diagram of the Mission Planning dialog

 Mission Planning dialog calculates the observation conditions, such as satellites visibility and PDOP values for survey anywhere in the world.

Sokkia Field presents the calculated satellite observation conditions as four diagrams. Select a diagram to display from the drop-down list in the dialog's top right corner.

- Sky Plot - displays the satellites positions on the sky plot during the planned mission time.
- Sat List - displays the specific satellite visibility on the planned mission time line.
- Sat Num - displays the quantity of visible satellites for every constellation on the planned mission time line.
- PDOP - displays the PDOP values on the planned mission time line (**this diagram**).

To review the calculated PDOP value on the planned mission time line.

PDOP value is a parameter used to describe the strength of the current satellite configuration, or geometry, and its impact on the accuracy of the data collected by a GNSS receiver at the time of use.

- Displayed diagram shows the PDOP values on the planned mission time line.
- Horizontal axis is the planned mission time line. Vertical axis is the PDOP value.



Start Base

To set up the connected receiver for a base occupation in RTK / RT DGPS surveys.

This dialog has the special layout for setting up the base for PP Kinematic and PP DGPS surveys.

To set up and start the base occupation.

- Enter the name of the **Point** where the Base receiver is located. It can be chosen from the map  or the list  of points in the current project, or can be entered manually.
- Select the **Code** for the point from the drop-down list. If required, set a string. Click  to set the point's attributes. More...
- The coordinates of the base point in the selected coordinate system will be shown.
- You can enter the measured coordinates of the current point. To measure the current position:
  - Enter the antenna height and set the type of height measurement( vertical or  slant). You can edit the antenna type, the value of the antenna height, and the type of height in the Antenna Setup dialog.
  - Click the button  . Once pressed, the button turns into .
  - Click this button to stop logging the position. The average measured coordinates will be displayed. The Pos field appears to show the number of the measurements used for averaging.
- Click the  **Start Base** button to start the receiver as the Base that transmits the correction data. This button also starts the raw GNSS data file logging for the Post-Processed RTK. To stop the correction data transmission, click  and select the **Stop Base** command from the pop-up menu.
- If you start the base with a UHF radio and only for the first time in the project, clicking the **Start Base** button opens the **Quick Radio drop-down list** on the bottom of the dialog so you can quickly select the UHF radio channel and start corrections transmission.
  - If you change a radio parameter value using any other application, Sokkia Field will not consider the new value, and Quick Radio will not work correctly.
  - If you connect the same base receiver as the RTK rover, and then back as the base, Quick Radio will be reset and will open again when you start the base.
  - If you change the transmission power using the *Config Radio* option in the dialog menu, Quick Radio will be reset and will open again when you start the base.
  - If you change the channel using either the *Config Radio* dialog or the Quick Radio configuration during the last Start Base, Quick Radio will not be reset and will not open when you start the base.
- For configuration with post processing, the **Duration** field displays the time the receiver logs data to the raw GNSS data file. To start / stop logging the raw file, click  / . Clicking the  **Start Base** button also starts file logging.

Click  to open the Post-Processing dialog and review raw data logging settings in surveys with post-processing.

Important note:
In specific RTK / RT DGPS configurations, when starting the base, you can receive the following warning:

"Base station data was updated from corrections. Your rover firmware does not recognize the base antenna. Make sure that height of measured points is correct."

If you encountered this situation:

- First try reaching out for support to get the updated firmware for your rover receiver. After you have the updated firmware on you rover receiver, the problem will no longer occur.
- If the latest firmware for your rover receiver is not available yet, take the following steps:
  - In configuration wizard, open the Antenna Setup step for the base receiver (*RTK / RT DGPS* > ... > *Base Receiver* > *Antenna Height* > *Edit*).
  - Select the **Transmit as if zero offset antenna** option located under the  menu. Save changes to the configuration.
  - Restart the base receiver.
  - This option can be used only in case the updated firmware is not available for your rover receiver.

Click  to open the Post-Processing dialog and review raw data logging settings.

Click  to open the dialog menu with additional options:

- Status - to review the current position and GNSS parameters.
- *Stop Base* - to stop the correction data transmission.
- **Config Radio** is available for connected base receiver, when an internal or external radio modem is used in GNSS survey configuration. More...
- **Config Cell** is available for connected base receiver, when an internal or external cellular modem is used in GNSS survey configuration. More...
- Multi Base - to view or edit the Base Station ID of the connected receiver and setup the base receiver for Multi Base mode.
- Grid to Ground - to setup grid / ground parameters (available if starting the base in a grid coordinate system).

Multi Base Mode and Base Station ID

To set up the base station ID, that can be viewed at the rover side and to enable the base station to work in multi base mode.

The base station ID set on the base receiver is visible on the rover side and allows the user to understand which base station the rover is receiving corrections from.

Multi base mode means multiple local base stations share the same radio channel and transmit either CMR+ or RTCM 3.x corrections. Each of these bases must have its own transmission delay time.

In multi base mode, the rover receives corresponding CMR+ or RTCM 3.x corrections and switches to the most suitable available base station automatically, or the user can switch between available base stations manually (see the Multi Base tab of the Status dialog for more details).

> **Note: GRX5**, **GNR5** receivers cannot work as base receivers in multi base mode. **GRX5** receiver cannot work as rover receiver in multi base mode.

- Specify the base station ID:
  - **Base Station ID** - enter the identifying number of the base. Each base in a network must have a unique ID. This ID is viewable on the rover side in the Multi Base tab of the Status dialog.

- Enable the multi base mode:
  - **Transmit Delay** - check the box to enable the multi base mode for the base station and select the signal transmission delay for this base. This value must be set to ensure that the radio signals from multiple bases do not overlap. Each base must be set at least 250 milliseconds apart from any other. (At least 500 milliseconds for data transfer rates less than 9600 bps.)
- Click  to save the settings and return to the Start Base dialog.



Start Base (PP Kinematic / PP DGPS)

To set up and start the base occupation in Post-Processed Kinematic or Post-Processed DGPS survey.

- Enter the name of the **Point** where the Base receiver is located. It can be chosen from the map  or the list  of points in the current project, or can be entered manually.

- Select the **Code** you want assigned to the point. It will be included in the raw GNSS data file.
  Click  to set the point's attributes if required. More...
- Enter the antenna height and set the type of height measurement( vertical or  slant). You can edit the antenna type, the value of the antenna height, and the type of height in the Antenna Setup dialog.
- Click the **Start Base** button to start the logging of data into the raw GNSS data file. Once clicked, the button changes to the **Stop Base** button.
- The **Duration** field displays the time the receiver logs data.

Click  to open the Post-Processing dialog and review raw data logging settings.

Click  to open the dialog menu with additional options:

- Status - to review the current position and GNSS parameters.



Simulator

In the **Simulation Setup** dialog you can setup the initial WGS84 position for GNSS simulation. You can enter the position manually or select a point from the map  or from the list .

If simulation moving speed is not zero, the current position starts to drift immediately. The current position is remembered between Sokkia Field runs.

The speed and direction of movement can be changed in the map views of **Topo** or **Stake** dialogs using the following arrow keys:

- **Up** - to increase the speed,
- **Down** - to decrease the speed,
- **Right** - to increase the azimuth of the direction,
- **Left** - to decrease the azimuth of the direction.

The current elevation can be changed in the map views of **Topo** or **Stake** dialogs using the following keys:

- **+ (Plus)** - to increase the elevation,
- **- (Minus)** - to decrease the elevation.

If the depth finder simulation mode is activated in the Depth Finder dialog, you can also enter the initial **Depth** value. Change this value in the map views of **Topo** or **Stake** dialogs using the following key combinations:

- **Ctrl**+**Up** - to increase the depth,
- **Ctrl**+**Down** - to decrease the depth.

> **Note:** Prior to use simulator control keys, click ☰ in **Topo** or **Stake** dialogs, select **Setup**, and activate the **Simulator** feature in the dialog menu. Activated feature is marked with ✓.

Click ☰ to open the dialog menu with additional options:

- Select **Simulate solution loss and other events** to activate / deactivate the mode simulating unstable GNSS signal. Activated mode is marked with ✓.

Click ✓ to save the simulation settings and open the Home Screen. Click ✗ to close the dialog without saving changes and return to the Setup menu.



PP Sessions

To select session(s) for automatic raw data file logging and load up to the GNSS receiver.

This dialog is available, if the **Post Processing** check box is selected in the Receiver Make dialog. You can create new or manage existing session plans in the Sessions dialog. If necessary, open it from the dialog menu by clicking ☰ and selecting *Edit Session*.

- Click **Refresh** to renew the list of active sessions already loaded into the receiver.
- The **Active Sessions** list displays the parameters of sessions:
  - *ID* - session ordinal number;
  - *Site* - the name of the site where the receiver will be placed for the survey;
  - *Type* of survey - either *Static* or *Kinematic*;
  - *Start Day* and *Start Time* - the day of week and the local time that the receiver will start the survey;

- *End Day* and *End Time* - the day of week and the local time that the receiver will end the survey.

- In the **Receivers** panel, expand the tree of configured receivers with their session plans.
- Highlight a receiver node to select all receiver's sessions or highlight an individual session and click the arrow button  to copy selected session(s) to the **Active Sessions** list.

> **Note:** A receiver with firmware 5.6 or later can load up to three sessions. A receiver with older firmware can load up to two sessions.

- Click  to delete a highlighted session from the **Active Sessions** list, if you need.
- Select the **Sleep mode after export** check box to put the receiver into sleep mode after uploading the **Active Sessions** list to the receiver.

> **Note:** Enabling sleep mode terminates the current connection with the receiver. You will need to press the power button on the receiver to re-establish the wireless connection.

- Click **Apply** to upload the displayed **Active Sessions** list to the connected receiver. After successful upload, the dialog closes and the receiver will execute the uploaded sessions according to their schedule.



Survey Session

The wizard allows you to create a survey session, where the measured points will be recorded. Using one or several sessions you can calculate residuals for the corresponding points measured. Any type of the solution type (*Fixed*, *Float*, *DGPS*, etc) can be used in the computation.

There are two ways for opening the *Survey Session* dialog:

- Click **Setup** -> **Survey Session**;
- Click *Setup* -> *Survey Session* in the pop-up menu of the **Topo** dialog.

  Note: This command is displayed in the pop-up menu, if the **Prompt for Survey Session** check box is selected in the Miscellaneous dialog of the *Configuration Wizard*.

You can do all calculations for the created session(s) in the *Session Check* dialog.

To open the Session Check dialog use one of the following ways:

- Click **Calculate** ->**Session Check**;
- Click *Measure* -> *Check Calculation* in the pop-up menu of the **Topo** dialog.

If the current project does not have a session with required data set, you cannot perform any computations in the *Session Check* dialog.

The used session is displayed in the following dialogs:

- in the *Raw Data* dialog (**Edit** ->**Raw Data**). The **Session name** column displays the names of the sessions for measured points.
- in a text field to display value on the Map view for the **Topo** and **Auto Topo** survey.

There are two ways for creating a new session:

- manually - you can create a new session in the **Session Name** field on the first page of the wizard;
- automatically - a new session is created automatically when the user changes one of the following parameters:
  - surveyor name (could be changed in the **Surveyor** field on the first page of the wizard);
  - temperature, pressure, humidity, weather or wind types (could be changed on the second page of the wizard);
  - configuration type of the current project (could be changed in the Configuration dialog);
  - format of the differential corrections data (could be changed in the **RTK Format** field of the Base Receiver or Rover receiver dialogs);
  - opening a file for data logging in surveys with post processing (click  in the Topo or Auto Topo dialogs) or closing a file for data logging in surveys with post processing (click  in the Topo or Auto Topo dialogs);
  - minimum number of the tracked satellites to start the logging of the **.tps* file (could be changed in the Base PP Setup or Rover PP Setup dialogs).
  - elevation mask value (could be changed in the Settings dialogs, which can be opened by clicking  in the Status dialog);
  - PDOP mask value (could be changed in the Configuration -> RTK Settings dialog);
  - any parameter in the Tracking dialog;
  - replacement of Field Controller or GNSS receiver;
  - replacement of radio modem.

Note: If you would like to record measured points to the same session, you should not change any of the above listed parameters while surveying. Otherwise, if you have changed some parameter during your survey, the next measured point will be recorded to a new session.

The Survey session wizard consists of three pages:

1. RTK parameters. More...
2. Meteorological parameters. More...
3. The rover and base receivers parameters. More...

Survey Session: Survey parameters

The parameters for a Survey Session include:

- **Session Name** - select between **Custom** or **Full Day** or **Day of Year**.
  - If you have selected **Custom**, enter any session name in the field.
  - If you have selected **Full Date**, the application automatically sets a name of session in *YEAR-MOUNTH -DAY HOUR:MINUTE:SECONDS* format.
  - If you have selected **Day of Year**, the application automatically sets a name of session as the *NUMBER of CURRENT DAY* with alphanumeric suffix.
- **Surveyor** - enter the name of the person, who has performed the survey task.
- **Satellite System** - this field displays the satellite systems which are used in surveying. You can edit this value in the Tracking dialog;
- **Elevation Mask** - this field displays the elevation angle below which the satellites are not taken into account. You can edit this value in the Base Receiver or Rover Receiver dialogs;
- **Minimum SVs** - this field displays minimum number of the tracked satellites to start the logging of the **.tps* file (you can edit this parameter in the Base PP Setup or Rover PP Setup dialogs).
- **PDOP Mask** - This field displays the threshold value of the PDOP. If the current value of the PDOP exceeds the threshold value, the rover receiver will not compute the RTK position. You can change configuration in the Configuration -> RTK Settings dialog.

Click **Next** to configure the Meteorological settings.

Survey Session: Meteorological parameters

The meteo settings in the current units for an Survey Session include:

- The air **Temperature**.
- The **Pressure** of air.
- The relative **Humidity**.
- The type of the **Weather** (*Sunny*; *Cloudy*; *Rainy*; *Snowy*).
- The type of the **Wind** (*Calm*; *Gentle breeze*; *Moderate breeze*; *Fresh breeze*; *Moderate gale*).

Click **Next** to configure the receivers' settings.

Survey Session: Receivers

The **Rover** receiver settings for a Survey Session include:

- The type of the **Receiver** used and it's serial number (**s/n**).
- The type of the **Antenna** used and it's serial number (**s/n**).

The **Base** receiver settings for a Survey Session include (if the Base receiver is used in the configuration):

- The **Vendor** of the base receiver.
- The type of the **Receiver** used and its serial number (**s/n**).
- The **Antenna Serial Number**.

Note that data in the fields is read-only and provides the information about the instruments selected for the survey.

Click  to return to the Setup menu.



Mock Location

To supply the position coming from the connected GNSS receiver to external applications.

> **Note:** The installation of the Sokkia location device driver is required to use this functionality in Windows. Usually, the driver installs automatically with Sokkia Field. Make sure the driver is installed and note that it only supports Sokkia GNSS receivers.

- Check the **Supply position** box to start supplying the current position coming from the connected GNSS receiver to external applications that require precise location data.
  - You can manually set any desired coordinates to be supplied, just configure the simulation of the GNSS receiver: check the **Simulation mode** box in the Receiver Make dialog. Then open the Simulator dialog and enter the coordinates for simulated position.

- The **Current position in WGS84** panel displays the WGS84 coordinate values (**Lon**, **Lat**, **Alt**), as well as the current **HRMS** and **VRMS** values being supplied to external applications at the moment.

- If the **Supply position** check box is cleared or there is no active connection to a GNSS receiver, *n/a* values are displayed and position data is not sent to external applications.

Note: Keep Sokkia Field running and have an active connection to the GNSS receiver to use the Mock Location functionality.

- Click  to return to the Setup (GNSS) Menu dialog. Click  to open the Home Screen.



Correct Base

This dialog allows to perform correction of the existing Base coordinates, or to assign new coordinates for the Base if it was installed at an imprecise position.

Warning: We advise you to experiment with the correction procedure before using it for work. This will allow you to understand whether the exported results and generated reports meet your requirements.

The Correct Base procedure can be performed without a connection to the Rover: for example, after the survey.

Note: Base correction cannot be performed if the **Known Point** with the existing Base coordinates has local coordinates (offsets have 'N/A' values).

The Base correction can be applied in two ways: 1 - to horizontal and vertical coordinates of the existing Base or 2 - to vertical coordinate only.

1. To perform the correction of horizontal and vertical coordinates of the existing Base:

   - In the **Known Point** field, leave the **Correct Height Only** check box cleared.
   - In the **Known Point** field, select the point with known coordinates. Enter this point name in the corresponding field manually, or select from the map  or from the list  of points in the project.
   - In the **Measured Point** field, select the point with measured coordinates of the known point. Enter this point name in the corresponding field manually, or select from the map  or from the list  of points in the project. Clicking the  button opens the *Topo* dialog to measure and save the point to the current project and instantly enter this point in the corresponding field.

2. To perform the correction of vertical coordinate of the existing Base:

   - In the **Known Point** field, check the **Correct Height Only** box to apply correction only to the vertical coordinate of existing Base. Horizontal coordinates remain non-corrected.
   - In the **Known Point** field, use the switching button to choose how to enter the known vertical coordinate:
     - Switch the button to **Point** to select the point with known vertical coordinate. Enter point name in the corresponding field manually, or select from the map  or from the list  of points in the project.
     - Switch the button to **Height** to enter the corrected vertical coordinate manually. If you also check the **Create Design Point** box, the Add Point dialog will open later to add a new point with entered vertical coordinate to the current project.
   - In the **Measured Point** field, select the point with measured vertical coordinate of the known point or location of the known height. Enter point name in the corresponding field manually, or select from the map  or from the list  of points in the project. Clicking the  button opens the *Topo* dialog to measure and save the point to the current project and instantly enter this point in the corresponding field.

Click  to to view the difference between known and measured coordinates that will be used to recompute the coordinates for all points already measured using this Base in the current project. After confirming, you will have the option to save the corrected Base coordinates as a new point in the current project. The coordinates of all points already measured using this base in the current project will be recalculated taking into account the correction performed.

After base correction, the Edit Raw Data dialog displays the base station coordinates as **Ph. Center / *Mark Coords (Corrected)*.

> **Note:** The Correct Base procedure can be repeated. Old corrections will be replaced with new corrections, and all dependent coordinates will be updated in the project.



Static Occupation

To set up the GNSS receiver and start the static occupation to obtain precise coordinates after post-processing of collected GNSS raw data.

- In the **Point** field, specify the point where the static receiver is located. Enter a new or existing point name manually or select an existing point from the map

 or from the list  of points in the project.

- The **Code** field displays the code for the selected existing point. You can set a code and attribute information for the new point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- In the **Note** field, enter a description for the point of static occupation.
- Enter the **Antenna Height**. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

> **Note:** If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

- Click  to view or change GNSS raw data logging parameters for use in post-processing. More...
- Click the **Start Occ** button to start logging GNSS raw data to the file. After starting, the button changes to **Stop Occ** and can be used to stop logging.
- The raw data logging icon  in the status bar indicates the recording status. If raw data is being logged to a file, the icon shows an animated pencil  .
- The **Duration** field displays the time passed since the start of logging data to the GNSS raw data file.
- The **Remaining time** field displays the time left to log data to the GNSS raw data file based on the settings in the Occupation Times dialog of PP Static survey configuration wizard. (This feature is unavailable for use with **GRX5** receiver)

Click ☰ to open the dialog menu with additional options:

- Status - allows you to check the status of a GNSS survey. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.

Setup Optical (Total Station)

Click an icon to perform the task:

	Backsight Sets up a Total Station survey with a reference direction.
	Resection Computes the coordinates of an occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates.
	Benchmark Computes the elevation of an occupation point, where the instrument is set up, using measurements to points with known elevations.
	Reference Line Computes the coordinates of an occupation point, where the instrument is set up, using measurements to two design points on a reference line (or offsets from them).
	Reference Direction Computes the coordinates of an occupation point, where the instrument is set up, using measurements to one known point and direction of the reference line, where the points lies.
	Setup by Grid Lines Computes the coordinates of an occupation point, where the instrument is set up, using measurements to any two points on each of two known lines and calculated distances from the intersection point of these known lines to each measured point.
	Backsight Adjustment Transforms Occupation and Backsight points.



Localization
Calculates localization parameters of the mathematical coordinate transformation between an original coordinate system, in which the project points are measured or given, and a local coordinate system, in which control points are known.



Simulator
Performs the TS simulation setup.



Remote Control
Transmits commands from the controller to the connected total station.



Backsight

To set a reference direction from an occupation point in a Total Station survey.

The backsight wizard helps you to perform the procedure:

1. To specify the occupation point and reference direction:
   - In the **Occupation Point** group, define the occupation:
     - Enter the name of the **Point**, where the total station is located. You can set the occupation point in one of the following ways:
       - Type in a name of the point.

         Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

       - Choose a point from the map .
       - Choose a point from the list of the project points. Click  and select From List in the button menu.
       - Determine a point by the station, offset and elevation in relation to a road / alignment. Click  and select Station and Offset in the button menu.
       - Determine a point location by resection. Click  and select Resection in the button menu.

- Compute the elevation of an occupied point by vertical resection. Click  and select Remote BM in the button menu.

- In the **HI** field, enter the height of the instrument.
- In the **Scale** field, specify the scale factor for the occupation point. Click  and select the scale factor for the occupation point. Available choices depend on the Coordinate System, Coordinate Type, and Localization that are used in the project. The asterisk (*) will be added to the scale value, if you have updated the initial value of the **Scale** field.

  Note: The **Scale** setting is unavailable if WGS84 coordinate type is set in the Display dialog. The **Scale** setting is locked to *Grid to Ground* if the transformation to ground coordinates is enabled in the Coordinate System dialog.

  - *Scale=1* - to set the scale to one.
  - *Grid Scale* - to set the scale of the currently used projection.
  - *Grid to Ground* - to set the scale of the currently used grid / ground parameters.
  - *Localization* - to use the scale of performed localization.
  - *User Scale* - to manually enter the user defined scale.

- In the **Backsight Point** group, define the backsight:
  - Set the toggle button to **Azimuth** (or **Bearing** depending on direction settings in the Display dialog) to enter a known direction.
    - Enter the direction value manually or click  to calculate the value of backsight direction from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.
  - Set the toggle button to **Point** to define the backsight by direction to a known point. Specify a known point in one of the following ways:
    - Type in a name of the point.

      Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

    - Choose a point from the map .
    - Choose a point from the list of the project points. Click  and select From List in the button menu.

- Determine a point by the station, offset and elevation in relation to a road / alignment. Click  and select Station and Offset in the button menu.
- Perform control measurements to multiple known points and then select the backsight point. Click  and select Multiple BS from the pop-up menu.

- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

Note: If the occupation point has no elevation (i.e. is a 2D point), the backsight point measured using azimuth (bearing) will have no elevation. As the result, all topo points measured with this setup will also have no elevation.

- Check the **Setup instrument for 3DMC** box - if checked, the occupation point coordinates, horizontal circle value and instrument height will be sent to the total station automatically. The horizontal circle value is equal to the BS direction value. The instrument height value is used for calculating the elevation of the instrument center mark. The dialog of the instrument will show this elevation. The field *HI* of the dialog will show "zero".
- Check the **Observation info** box to open the Observation info dialog, where you can enter meteo data for the session.
- Click the **Next** button to continue.

2. To perform the backsight measurement and to set up the reference direction for the optical survey:
   - Check the setup settings:
     - **Occ** - the occupation point name and the height of the instrument.
     - **BS** - the backsight point name (or "---" if the **Azimuth** (**Bearing**) was selected in the **Backsight Point** group) and the height of the target.
     - **Azimuth** or **Bearing** - the calculated direction from the occupation point.
   - The **Set Circle to** field displays the horizontal circle reading corresponding to the backsight point. Click

 to open the button menu that enables you to set the circle reading to zero or to entered direction (azimuth or bearing), to input a value or to get from the instrument, or to change the value by +/- 90 or 180 degrees. The software retains the previous setting for this parameter.

- To turn a Robotic total station to the Backsight Point, click the **To BS** button .
- Check the **Measure Distance** box to measure the distance to the backsight point, if required.
- Use the dialog view switch in the dialog title bar to change the dialog views between *Normal* and *Map* at any time. More...
- If required, click the **Check** button  to make a control measurement to the current backsight (BS check). Click  to save the result of control measurement to a **.txt* file. The control measurement doesn't affect the current backsight setup and is used for verification purposes only.
- Click the **Set** button  to take the backsight measurement and then review the results of backsight setup. If required, click  to save the backsight setup results into a **.txt* file.
- Click  to accept the results of backsight setup and return to the Home Screen. Click  to return to the backsight setup.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
- Edit Points - opens the dialog to view and manage points in the project.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:

- **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
- **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with  :
  - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
  - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
- **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
- **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.

- Inverse - opens the dialog to calculate the direction and distance between two known points.
- Intersection - opens the dialog to calculate the intersection point(s) of two given directions or two distances.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- **Help** - opens the help topic.

User Scale

To specify a scale factor for the occupation point.

This dialog opens when *user defined scale* is selected for an occupation point when starting the Backsight measurement or Resection. User defined type of scale can be chosen directly in the Backsight dialog or can be enabled for resection in the Resection Options dialog.

- In the **User Scale** field, enter the required scale value for the occupation point.
- Click  to save the entered scale, click  to return to the previous dialog without saving.

Station and Offset

To determine the backsight or occupation point by the station, offset and elevation in relation to an existing alignment or road.

To determine the point:

- Click the toggle button and select either **Road**, or **Horizontal Alignment** to be a reference for the point.
- Enter an existing road / alignment name manually, or select from the list  of project roads / alignments.
- Enter a **Station** along the selected road / alignment to determine the point. Enter a station location manually or click  to select any road point in the Road Points dialog.
- Enter an **Offset** distance from the selected station. Negative value means left offset, positive value means right offset.
- Enter the **Elevation** of the point.
- Click  to open the Add Point dialog and add the point with calculated coordinates to the list of points in the project. This point will be automatically selected as the backsight or occupation point.

Multi-Point Backsight

To measure a number of known points and to select the backsight point based on the quality of measurements results.

Several dialog views are available to perform multiple BS measurements. The *Multi-Point BS: Normal* view is used to specify a known point to measure and the *Multi-Point BS: Map* view provides visual control over available points locations. The Multi-Point BS: Results view is used to review performed measurements results and to select the backsight point. Use the view selector in the dialog title bar to switch between views at any time.

Take measurements to a number of BS points:

- In the *Multi-Point BS: Normal* view, specify the known **Point**. Enter a point name manually, or select from the map  or from the list  of points in the project.
- The **Code** field displays the selected point's code.
- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
- Take measurement in *Multi-Point BS: Normal* or *Multi-Point BS: Map* dialog view. More...

- After the measurement is saved, review the results in the open Multi-Point BS: Results dialog view. If you will need to measure more points click there the **Add** button to open the *Multi-Point BS: Normal* view and specify a new known **Point** to measure.

To review, manage and accept the results of performed multi-point backsight measurements on a number of known points, use the controls provided in the Multi-Point BS: Results dialog view.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- **Setup** - click the item to expand the sub-menu:
  - Grid Lines - set up the grid to be displayed on the Plan.
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.

  - **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **View Last Point** - opens the Last Point Data dialog with the information about the last point.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Quick Codes** - click the item to expand the sub-menu:
  - <*Menu items with the names of quick codes groups*> - select the name of an existing quick codes group to display its code buttons on the map for quick measurement, adding assigned codes, and saving a point with one click. Currently used code group is marked with . These items are visible in menu if quick codes groups are created. To create desired quick codes groups, select **Edit Quick Codes**.
  - **Hide Quick Codes** - select to hide all quick code buttons on the map.
  - **Edit Quick Codes** - opens the Quick Codes tab of the Code Options dialog to configure quick codes and create groups.
- **Help** - opens the help topic.

Multi-Point Backsight Results

To review, manage and accept the results of performed multi-point backsight measurements on a number of known points.

Each measurement on a known point is a row in the present table with columns showing obtained values:

- **BS** - backsight point selection: check the box  near a desired point in the table to select it as the backsight point;
- **Point** - name of the point;
- **Res HA** - difference of horizontal angle (HA) value from the average of all the HA values;
- **HR** - height of reflector;
- **Target Type** - method of distance measurement with EDM (*Prism*, *Sheet* or *Non-Prism*);
- **PC** - prism constant, the parameter of the prism characterizing the difference between the reflection plane and the center of the prism / target offset for non-prism target types;
- **HA** - horizontal angle measurement value;
- **VA** - vertical angle measurement value;
- **SD** - slope distance measurement value;
- **Set** - measurement set number and the type of performed measurement.

Sd HA - standard deviation of horizontal angle values is displayed below the table.

Use the context menu to manage the list of performed measurements:

- **Copy All To Clipboard** - copies to clipboard the data of all the measurements in the list.
- **Copy Selection To Clipboard** - copies to clipboard the data of highlighted measurements.
- **Edit** - opens the Enter Rod Height dialog to edit the height of the reflector for a highlighted measurement.
- **Select All** - highlights all measurements in the list.
- **Select All Below** - highlights a currently highlighted measurement and all the measurements in the list displayed below.
- **Select Multiple** - highlights multiple measurements by sequential clicking on data item names.
- **Cancel Selection** - removes all highlights in the list.

Use available buttons to manage measurements and to select and accept the backsight point:

- **Add** - to measure another known point in the open the Multi-Point BS: Normal dialog and add it to the table.
- **Re-Meas** - to delete the highlighted measurement and measure a known point in the open the Multi-Point BS: Normal dialog.
- **Remove** - to delete the highlighted measurement.
- **Accept** - to select a point with checked box  as the backsight point and proceed to the Backsight dialog to set the reference direction from an occupation point to this point.

Observation Info

To verify current weather conditions around the instrument for calculating the atmospheric correction of measured distances.

By default, weather conditions have the values according to the Instrument Settings dialog. These values can be changed manually by surveyor:

- Enter the value of the **Temperature** in the current units.
- Enter the value of the air **Pressure** in the current units.
- Enter the value of the relative **Humidity** in the current units.
- **PPM** - the parts per million value is automatically calculated and shows the relative distance error for provided weather conditions.

Enter additional data to be useful in reports:

- From the **Weather** drop-down list, select the most suitable status of current clouds and precipitation.
- From the **Wind** drop-down list, select the current wind force.
- Optionally, enter the **Surveyor** name.
- Optionally, enter the **Instrument No.** used in survey.

When finished, click **Next** to proceed.

Resection

To determine the location of the total station occupation point by measuring control points.

To calculate the three dimensional resection, minimum two points with distance measurements are required. With angle-only measurements, three points are required. If additional points are measured, a least-squared solution is used.

To select the resection method (*2D*, *2D+H* or *3D Combined*) and to configure resection settings, click and select Options from the dialog menu. Selected method and configured settings retain between sessions. Currently selected resection method is shown in the dialog title.

The resection wizard helps you to perform the procedure:

1. Specify the occupation point in the **Define Instrument setup** group.
   - In the **Occupy** field, enter a name of the occupation point. If you determine the coordinates of an unknown occupation point, type in a new point name. If you want to recalculate the coordinates of the known occupation point choose the point either from the map or from the list .
   - Set **Code** and attributes for the point:
     - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
     - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
     - Click the **Code** button to access more code and attribute parameters in the Point Attributes dialog.
   - In the **HI** field, enter the height of the instrument.
   - In the **Scale** field, specify the scale factor for the occupation point. (This setting is available when *User Defined* is selected in the **Scale Factor** field in the Resection Options dialog.) Click ... and select the scale factor for the occupation point. Available choices depend on the Coordinate System, Coordinate Type, and Localization that are used in the project. The asterisk (*) will be added to the scale value, if you have updated the initial value of the **Scale** field.

> **Note:** The **Scale** setting is unavailable if WGS84 coordinate type is set in the Display dialog. The **Scale** setting is locked to *Grid to Ground* if the transformation to ground coordinates is enabled in the Coordinate System dialog.

  - *Scale=1* - to set the scale to one.
  - *Grid Scale* - to set the scale of the currently used projection.
  - *Grid to Ground* - to set the scale of the currently used grid / ground parameters.
  - *Localization* - to use the scale of performed localization.
  - *User Scale* - to manually enter the user defined scale.

- Check the **Setup instrument for 3DMC** box - if checked, the occupation point coordinates, horizontal circle value and instrument height will be sent to the total station automatically. The horizontal circle value is equal to the BS direction value. The instrument height value is used for calculating the elevation of the instrument center mark. The dialog of the instrument will show this elevation. The field *HI* of the dialog will show "zero".
- Check the **Observation info** box to open the Observation info dialog, where you can enter meteo data for the session.
- Click the **Next** button to continue.

2. Specify and measure control points.

   Several dialog views are available to perform multiple control points measurements: The *Resection: Normal* view is used to specify a control point to measure and the *Resection: Map* view provides visual control over available points locations. The Resection: Results view is used to review performed measurements results and to calculate the resection. Use the view selector in the dialog title bar to switch between views at any time.

   > **Note:** External control points  in the Shared Data file can be used in the resection calculation. After accepting the resection results, the external control points that were used in the resection calculation are copied to the project as design points  with control point  status.

   - In the *Resection: Normal* view, specify the current control point to measure in one of two ways: by manually entering the name of the current control point and then measuring it, or by using the auto-recognition feature, which involves measuring the desired control points one by one, and before calculating resection, the application recognizes their names and coordinates among existing points based on the received geometry.
     - Click the toggle button to select **Known Point** and enter a point name manually, or select from the map

 or from the list  of points in the project.

> **Note:** If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

  - Click the toggle button to select **Unknown Point** and start measuring any desired control point without indicating its name. If you use this method for at least one control point, after measuring the third point, you will be prompted to open the Match Control Points wizard to recognize measured unknown points. This short wizard allows the user to select which of the existing points should be used in the recognition, displays possible results of automatic recognition of unknown points, and provides the ability to select and confirm a specific result before calculating the resection.

- With the help of the **Use H** and **Use V** check boxes, specify whether the control point should be used for horizontal and / or for vertical resection calculation:
  - If only **Use H** is selected, the control point will be used for horizontal calculation only. Note that this option is disabled when selected point has no horizontal coordinates.
  - If only **Use V** is selected, the control point will be used for vertical calculation only. Note that this option is disabled when selected point has no elevation (i.e., is a 2D point).
  - If both **Use H** and **Use V** are selected, the control point will be used for both horizontal and vertical calculation.

> **Note:** By combining **Use H** and **Use V** filters, a user can group the control points to calculate horizontal coordinates only (☑ **Use H** / ☐ **Use V**) and separately group the control points to calculate height only (☐ **Use H** / ☑ **Use V**). In this way, the 3D coordinates of an occupation point are calculated right in the Resection dialog, without sequential calculating in the Resection and then in the Benchmark dialogs.

- The **Code** field displays the selected point's code.
- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
- Take measurement in *Resection: Normal* or *Resection: Map* dialog view. More...
- When you have measured sufficient resection points, the Resection: Results view opens. To continue measuring more control points, click there the **Add** button to return to *Resection: Normal* view and repeat the procedure for the remaining control points.
- When you have measured sufficient resection points, the **Find** button becomes available next to the **Point** field. After a control point name is specified, click **Find** to open the **Find Resection Point** dialog. In this dialog:

- The **Turn To** angle values are displayed, giving you the direction to the selected point.
- The **Right/Left: Rod to TS** check box sets the vector to indicate right / left directions: *Rod to TS* if checked ☑, *TS to Rod* when cleared ☐.
- For robotic total stations, there is also the **To point** button to force the instrument to automatically turn to the selected point.

3. To review, manage and accept the results of performed measurements on a number of control points, use the controls provided in the Resection: Results dialog view.

Note: Read more information on performing Resection in Fusion Positioning ™ Mode where TS and GNSS measurements are used simultaneously.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- **Measure** - click the item to expand the sub-menu:
  - Sideshot - measures individual points.
  - Horizontal Angle Offset - determines a point using the horizontal angle from one point and the distance to another.
  - Horizontal / Vertical Angle Offset - determines a point using the horizontal and vertical angles.
  - Distance Offset - determines a point by adding or subtracting distances, horizontally and vertically.
- **Setup** - this menu is available in Fusion Positioning ™ mode , click the item to expand the sub-menu:
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two points.

- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with  :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Options** - opens the Resection Options dialog to select the resection method and to configure resection settings.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **View Last Point** - opens the Last Point Data dialog with the information about the last point.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Help** - opens the help topic.

Match Control Points

To check and confirm that measured points that do not have a name are automatically recognized as existing points for resection calculation.

This wizard can be opened after measuring three points for the Resection and when at least one of them has been measured as *Unknown Point*, i.e. without specifying a point name. If all measurements were carried out on points with entered names, this wizard is skipped.

1. Specify which points should be included in automatic recognition and view statistics of the procedure.
   - Check the **Only match control points** box to recognize only the points in the project that have the control point  status. If cleared, any points will be used in automatic recognition.
   - View the upcoming point recognition statistics:

- *Measurements* - the number of performed measurements;
- *Points to search* - the number of points included in automatic recognition;
- *Search combinations* - the number of possible geometric combinations of points included in automatic recognition;
- *Approximate time* - estimated time required to perform automatic recognition of the current configuration.

- Click **Next** to view the matches found.

2. If the geometry of measured points produces two or more matched sets of recognized points, the wizard informs that multiple solutions have been found and displays a list of them.
   - Recognized points that were measured as *Unknown* points are marked with an asterisk *.
   - Check the box near the desired set of recognized points and click to confirm the selection and review the result for the selected set or click to reject the results and return to measuring.

3. View the result of matching the measurements taken with the recognized point geometry.
   - Check the list of matched points that will be used in the resection calculation. The name and coordinates of each control point are displayed. Recognized points that were measured as *Unknown* points are marked with an asterisk *.
   - Review the geometry of matched points in the preview panel. To view the geometry of control points in a larger screen, double-click the preview.
   - Click to confirm the current matching of measurements to existing points and open the Resection Results or click to reject the results and return to measuring.

Resection Results

To review and manage performed measurements on a number of known points and to accept the results of TS occupation calculation.

Each measurement on a known point is a row in the present table with columns showing obtained values:

- **BS** - backsight point selection: check the box near a desired point in the table to select it as the backsight point;
- **Point** - name of the point;
- **Res HA** - difference of horizontal angle (HA) value from the average of all the HA values;
- **Res VA** - difference of vertical angle (VA) value from the average of all the VA values;

- **Res SD** - difference of slope distance (SD) value from the average of all the SD values;
- **Res N** - difference of northing coordinate (N) value from the average of all the N values;
- **Res E** - difference of northing coordinate (E) value from the average of all the E values;
- **Res H** - difference of height (H) value from the average of all the H values;
- Statuses of obtained values in TS occupation calculation. Check the box ☑ to use the respective value in calculation, clear the box ☐ to skip this value. TS occupation can be calculated only when sufficient data are selected for use in calculation.
  - **H** - status of obtained horizontal coordinates in resection calculation;
  - **V** - status of obtained vertical coordinate in resection calculation;
  - **HA** - status of horizontal angle value in resection calculation;
  - **VA** - status of vertical angle value in resection calculation;
  - **SD** - status of slope distance value in resection calculation.
- **HR** - height of reflector;
- **Target Type** - method of distance measurement with EDM (*Prism*, *Sheet* or *Non-Prism*);
- **PC** - prism constant, the parameter of the prism characterizing the difference between the reflection plane and the center of the prism / target offset for non-prism target types;
- **HA** - horizontal angle measurement value;
- **VA** - vertical angle measurement value;
- **SD** - slope distance measurement value;
- **Set** - measurement set number and the type of performed measurement.

Use the context menu to manage the list of performed measurements:

- **Copy All To Clipboard** - copies to clipboard the data of all the measurements in the list.
- **Copy Selection To Clipboard** - copies to clipboard the data of highlighted measurements.
- **Edit** - opens the Enter Rod Height dialog to edit the height of the reflector for a highlighted measurement.
- **Select All** - highlights all measurements in the list.
- **Select All Below** - highlights a currently highlighted measurement and all the measurements in the list displayed below.
- **Select Multiple** - highlights multiple measurements by sequential clicking on data item names.
- **Cancel Selection** - removes all highlights in the list.

If there are sufficient data to calculate a TS occupation, standard deviations for coordinates (**Sd N**, **Sd E**, **Sd H**) are displayed below the table. Depending on the scale factor settings in the Resection Options dialog, the calculated or user-defined **Scale Factor** value is also displayed.

> **Note:** Grayed Scale Factor indicates that the displayed value is not used in calculation of a TS occupation.

Click  to save the resection results to a **.txt* file.

Use available buttons to manage measurements and to accept the results of TS occupation calculation:

- **Add** - to measure another known point in the open the Resection: Normal dialog and add it to the table.
- **Re-Meas** - to delete the highlighted measurement and measure a known point in the open the Resection: Normal dialog.
- **Remove** - to delete the highlighted measurement.
- **Accept** - to calculate the occupation point coordinates based on performed and approved measurements and to finish the Resection procedure by storing calculated occupation point to the current project.

Resection Options

To select a method of resection and to configure resection parameters.

- From the **Resection Method** drop-down list, select a method of the resection:
  - **2D** - to calculate resection adjustments in the horizontal plane. This method is useful if known points have no elevation (2D points) assuming the occupation point obtains no elevation adjustment.

    > **Note:** When at least one point in **2D** resection has height, the result point is a 3D point with a 0.0 height. When measuring all points with no height, the result is a 2D point.

  - **2D+H** - to separately calculate horizontal resection and vertical resection;
  - **3D Combined** - to calculate combined resection in both horizontal and vertical planes.

    The currently selected resection method is shown in the corresponding Resection or Setup by Grid Lines dialog title.

- From the **Scale Factor** drop-down list, select how to use the scale factor in resection calculations:
  - Select *None* to disable the scale factor in calculation of a TS occupation.
  - Select *Estimate Scale Factor* to determine a scale factor. In this case, the scale is shown but not applied (shown scale factor value is grayed in resection results).
  - Select *Use Calculated Scale Factor* to determine a scale factor and use it in the calculation of a TS occupation (shown scale factor value has normal color in resection results).
  - Select the *User Defined* value to enter the scale directly in the Resection dialog and use it in the calculation of a TS occupation (shown scale factor value has normal color in resection results).

- From the **Residuals Info** drop-down list, select the residuals to display in resection results:

- Select *Angular* to display angular residuals (Res HA, Res VA, and Res SD) in resection results.
- Select *Coords* to display coordinate residuals (Res N, Res E, and Res H) in resection results.
- Select *All* to display both angular and coordinate residuals in resection results.

- If required, clear the **Use Default Measurement Accuracy** check box to change the system default values for measurement accuracy:
  - **Distance** - error in the distance measurement.
  - **PPM** - part per million error in the distance measurement.
  - **Horz Angle** - error in the horizontal angle measurement.
  - **Vert Angle** - error in the vertical angle measurement.

Click  to save the entered resection parameters, click  to return to the previous dialog without saving.

Resection in Fusion Positioning ™ Mode

The Fusion Positioning ™ mode allows you to simultaneously record the point coordinates from GNSS rover receiver and Total Station to the opened project. This option can be activated only for Robotic Total Station with reflector. The GNSS receiver and Robotic Total Station are connected to the project simultaneously. Using Fusion Positioning ™ mode you can obtain an occupation point coordinates in Grid or WGS-84 coordinate systems.

Before performing resection you need to activate **Fusion Positioning ™**, select a desired prism with enabled and specified **Fusion Positioning ™ antenna offset** and open the Resection dialog.

> **Note:** Review the detailed information on how to set the antenna height in a single equipment setup ready for both, Fusion Positioning ™ and standard GNSS surveys.

There are several scenarios to perform the resection procedure:

Scenario A:

The desired Grid projection is defined in the project. Grid to Ground transformation is not selected. The GNSS and TS measurements are performed for each unknown point. The coordinates of the Occupation Point are calculated in the current Grid coordinate system.

1. Select the desired Grid projection in the Coordinate System dialog.
2. In the **Define instrument setup** group (**Resection** dialog) you can:
   - In the **Occupy** field, enter a name of the occupation point. If you determine the coordinates of an unknown occupation point, type in a new point name. If you want to recalculate the coordinates of the known occupation point choose the point either from the map  or

from the list .

- In the **HI** field, enter the height of the instrument.
- Select from the list (**Code**) a desire code for the occupation point.
- Click the **Next** button to continue.

3. In the **Specify control point** group you can:
   - Enter the name (**Point**); you can select the point either from the map  or from the list .

     Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

   - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
   - The **Measure FS** displays the values of horizontal angle (HA), vertical angle (VA) and slope distance (SD).
   - Take the TS measurements. More...
4. In the **Measure GNSS Point For** you see the point coordinates in the current Grid are measured by the GNSS receiver. In this group you can:
   - Change the point name or select the point either from the map  or from the list .
   - Click  to perform the measurement with the precise settings and store the point either automatically, or manually or click  to perform the measurement with the quick settings and to automatically store the point.
5. After measuring second control point (and subsequent points), the Results screen displays measured values of angles and slope distances with estimate of accuracy. In this screen you can:
   - Click **Add** to measure another control point.
   - Click **Remove** to delete any selected measurement.
   - Click **Re-Meas** to repeat the measurement to the previous point.
   - Click **Accept** to calculate (or recalculate, when you add a measurement to next control points) the occupation point coordinates in the current Grid coordinate system and finish the resection procedure. Clicking on the button opens the Point Check dialog, where the occupation point coordinates are saved.

Scenario B:

The desired Grid projection is defined in the project. Grid to Ground transformation is selected. The relationship between Grid and Ground coordinate systems is known. Coordinates for both coordinate sets are displayed in the current coordinate system. The coordinates of the Occupation Point are calculated in the Grid or Ground coordinate systems.

The routine of the resection procedure is similar to the Scenario A.

1. Select the desired Grid projection in the Coordinate System dialog.
2. Check the **Use Grid / Ground** box, click  and select the desired parameter (**Parameters**) in the Grid / Ground Parameters dialog. Click  to save the selected grid to ground parameters.
3. Perform the steps 2-5 of the Scenario A.

Scenario C:

The Grid projection is not defined in the project. The user has coordinates of the control points (two points at least) in the Ground coordinate system. For each control point TS and GNSS measurements are provided. The software performs the localization between WGS-84 and Ground. The coordinates of the Occupation Point are calculated in the Ground and WGS-84 coordinate systems.

1. Select <none> in the **Projection** of the Coordinate System dialog.
2. In the **Define instrument setup** group (**Resection** dialog) you can:
   - Set a name of the occupation point **(Occupy**). If you determine the coordinates of an unknown occupation point, type in the point name. If you want to recalculate the coordinate of the known occupation point choose the point either from the map  or from the list .
   - In the **HI** field, enter the height of the instrument.
   - Select from the list (**Code**) a desire code for the occupation point.
   - Click the **Next** button to continue.
3. In the **Specify control point** group you can:
   - Either enter the name of the new point (**Point**) or select the known point from the map  or from the list .

     Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

   - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.

- The **Measure FS** displays the values of horizontal angle (HA), vertical angle (VA) and slope distance (SD).
- Take the TS measurements. More...

4. In the **Measure GNSS Point For** you see the point coordinates in WGS-84 are measured by the GNSS receiver for localization. In this group you can:
   - Change the point name or select the point either from the map  or from the list .
   - Click  to perform the measurement with the precise settings and store the point either automatically, or manually or click  to perform the measurement with the quick settings and to automatically store the point.
5. After measuring second control point (and subsequent points), the Results screen displays measured values of angles and slope distances with estimate of accuracy. In this screen you can:
   - Click **Add** to measure another control point.
   - Click **Remove** to delete any selected measurement.
   - Click **Re-Meas** to repeat the measurement to the previous point.
   - Click **Accept** to calculate (or recalculate, when you add a measurement to next control points) the occupation point coordinates in the current Ground coordinate system and finish the resection procedure. Clicking on the button opens the Point Check dialog, where the occupation point coordinates are saved. Click  to perform the localization between Ground and WGS-84 coordinate system. If the factual residuals for the known point are less than internal threshold values, the localization will be created. After that:
     - In the Projection field of the Coordinate System dialog, Localization is set automatically.
     - Next measured pair of points in the resection procedure is not automatically added to localization. The localization parameters are not updated.
     - Next measured pair of points in the resection procedure is used in recalculation of the occupation point coordinates.

     Note: When the Localization is selected as the current projection of the project, you can use unknown point(s) for resection task in the Fusion Positioning ™ mode.

     You can review the point pairs that are used for localization in the Localization dialog and you can manually add or delete any pair there.

Scenario D:

The coordinates of the control points (two points at least) in the Ground coordinate system imported in the project. The desired Grid projection is defined in the project. For each control point TS and GNSS measurements are provided. The software automatically performs the localization

between Grid and Ground. The coordinates of the Occupation Point are calculated in the Grid and Ground coordinate systems.

1. Import the set of points with coordinates in Ground coordinate system to the project. Then select the desired Grid projection.
2. Perform the steps 2-5 in the Scenario C.

   Next measured pair of points in the resection procedure is used in recalculation of the occupation point coordinates.



Benchmark

To determine the elevation of the total station occupation point by measuring point(s) with known elevation(s).

The benchmark wizard helps you to perform the procedure:

1. Specify the occupation point in the **Define Instrument setup** group.
   - In the **Occupy** field, specify the occupation point. Enter a point name manually, or select from the map  or from the list  of points in the project.

     Note: If you have entered a new point name, the software will prompt you to manually enter this point's known horizontal coordinates and any elevation value in the Add Point dialog.

   - Set **Code** and attributes for the point:
     - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
     - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
     - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

   - In the **HI** field, enter the height of the instrument.

- In the **Update method** drop-down list, select how to update the total station elevation with calculated benchmark result:
  - *Update Elevation* - elevation of the current occupation point will be calculated and updated according to the benchmark result.
  - *Rename* - benchmark result will be saved as a new point in the project and current occupation point will move to that point.
  - *Update HI* - new height of the instrument for the current occupation will be calculated and updated according to the benchmark result.

- Check the **Setup instrument for 3DMC** box - if checked, the occupation point coordinates, horizontal circle value and instrument height will be sent to the total station automatically. The horizontal circle value is equal to the BS direction value. The instrument height value is used for calculating the elevation of the instrument center mark. The dialog of the instrument will show this elevation. The field *HI* of the dialog will show "zero".
- Click the **Next** button to continue.

2. Specify and measure point(s) with known elevation(s).

   Several dialog views are available to perform multiple known elevations measurements: The *Benchmark: Normal* view is used to specify a known elevation to measure and the *Benchmark: Map* view provides visual control over location of available points with known elevations. The Benchmark: Results view is used to review performed measurements results and to calculate the TS occupation elevation. Use the view selector in the dialog title bar to switch between views at any time.

   - In the *Benchmark: Normal* view, specify the known elevation:
     - Set the toggle button to **Point** to specify a control point with known elevation. Enter a point name manually, or select from the map  or from the list  of points in the project.

       > **Note:** If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

     - Set the toggle button to **Elevation** to specify a control elevation by manually entering its value. If you also check the **Create Design Point** box, the Add Point dialog will open after measurement to add a new design point with entered elevation to the current project.

   - The **Code** field displays the selected point's code.
   - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
   - Take measurement in *Benchmark: Normal* or *Benchmark: Map* dialog view. More...

- When you have measured a known elevation, the Benchmark: Results view opens. To continue measuring more control points with known elevations, click there the **Add** button to return to *Benchmark: Normal* view and repeat the procedure for the remaining points with known elevations.

3. To review, manage and accept the results of performed measurements on a number of known elevations, use the controls provided in the Benchmark: Results dialog view.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- **Setup** - this menu is available in Fusion Positioning ™ mode , click the item to expand the sub-menu:
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with  :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.

  - **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **View Last Point** - opens the Last Point Data dialog with the information about the last point.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Help** - opens the help topic.

Benchmark Results

To review and manage performed measurements on a number of known elevations and to accept the results of TS elevation calculation.

Each measurement on a known elevation is a row in the present table with columns showing obtained values:

- **Point / Elev** - name of the point or the known elevation value;
- **Res VA** - difference of vertical angle (VA) value from the average of all the VA values;
- **Res VD** - difference of vertical distance (VD) value from the average of all the SD values;
- **HR** - height of reflector;
- **Target Type** - method of distance measurement with EDM (*Prism*, *Sheet* or *Non-Prism*);
- **PC** - prism constant, the parameter of the prism characterizing the difference between the reflection plane and the center of the prism / target offset for non-prism target types;
- **HA** - horizontal angle measurement value;
- **VA** - vertical angle measurement value;
- **SD** - slope distance measurement value;
- **Ht Diff** - difference between TS elevation calculated from the average of all the measurements and the elevation in this measurement;
- **Set** - measurement set number and the type of performed measurement.

Use the context menu to manage the list of performed measurements:

- **Copy All To Clipboard** - copies to clipboard the data of all the measurements in the list.
- **Copy Selection To Clipboard** - copies to clipboard the data of highlighted measurements.
- **Edit** - opens the Enter Rod Height dialog to edit the height of the reflector for a highlighted measurement.
- **Select All** - highlights all measurements in the list.
- **Select All Below** - highlights a currently highlighted measurement and all the measurements in the list displayed below.
- **Select Multiple** - highlights multiple measurements by sequential clicking on data item names.
- **Cancel Selection** - removes all highlights in the list.

The standard deviation value for height measurement **Sd H** is displayed under the table:

- For a single measurement: standard deviation of height measurement (error in height) is calculated considering an instrument error only (residual for a vertical angle and distance measurement).
- For repeated measurements: standard deviation of height measurement (error in height) is calculated considering an instrument error of each measurement and residuals of repeated measurements to the given point.

Click  to save the Benchmark results to a **.txt* file.

Use available buttons to manage measurements and to accept the results of TS elevation calculation:

- **Add** - to measure another known point / elevation in the open the Benchmark: Normal dialog and add it to the table.
- **Re-Meas** - to delete the highlighted measurement and measure a known point in the open the Benchmark: Normal dialog.
- **Remove** - to delete the highlighted measurement.
- **Accept** - to calculate or recalculate the TS elevation based on listed measurements and save the result in accordance with the chosen **Update Method** (*update elevation*, *rename*, or *update height of the instrument*).



Setup by Reference Line

To determine the location of the total station occupation point by measuring two design points on a reference line.

The reference line setup wizard helps you to perform the procedure:

1. Specify the occupation point in the **Define Instrument setup** group.
   - In the **Occupy** field, enter a name of the occupation point. If you determine the coordinates of an unknown occupation point, type in a new point name. If you want to recalculate the coordinates of the known occupation point choose the point either from the map  or from the list .
   - In the **HI** field, enter the height of the instrument.
   - Click the **Next** button to continue.

2. Specify and measure two design points on a reference line, start from a left design point relative to the occupation, then proceed to a right design point. Refer to the setup graphics in the bottom that schematically shows current measurement.
   - Specify the left design **Point** on a reference line. Enter a point name manually, or select from the map  or from the list  of points in the project.

     > **Note:** If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

   - Enter values for along line offset and / or vertical offset from the specified design point, if required:
     - Set **Right** - to enter an offset along the line to the right relative to the TS occupation.
     - Set **Left** - to enter an offset along the line to the left relative to the TS occupation.
     - Set **Up** - to enter a vertical offset from the reference line to increase the height.
     - Set **Down** - to enter a vertical offset from the reference line to decrease the height.
     - Set **Elevation** - to set up a fixed elevation for this design point measurement.
     - Set **2D** - to calculate occupation point's horizontal coordinates only; in this case:
       - If at least one design point has an elevation, the result point is a 3D point with 0.0 elevation.
       - If both design points have no elevation (i.e., are 2D points), the result point has no elevation as well.
   - Click **Next** to proceed with measurement of the specified point.
   - Follow the displayed instruction.
     - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
   - When ready, click  /  to take measurements. More...
   - Repeat the routine for the right design point.
   - After both, left and right design points are measured, the Reference Line Setup Results dialog opens.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- **Setup** - click the item to expand the sub-menu:
  - PTL Mode - to set up the point to line method of interpretation of point coordinates. Enabled PTL mode is marked with . The PTL horizontal coordinates are calculated as offsets from the specified reference line (along line and left / right offset).
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **View Last Point** - opens the Last Point Data dialog with the information about the last point.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Help** - opens the help topic.

Setup by Reference Line Results

To review and manage performed measurements on two design points on a reference line and to accept the results of TS occupation calculation.

Review the map that displays the setup and performed measurements graphically in horizontal plane. The map shows calculated TS occupation, reference line, both design points, left and right, and two measured design locations.

The table displays two performed measurements with reference errors: *Design Point*, *Delta North*, *Delta East*, and *Delta Height*. The first row is a measurement of the left point, the second row is a measurement of the right point.

From the drop-down list below the table, select a method to distribute reference error among performed measurements:

- **Hold Left** - to assume the measurement to the left design point has zero reference error.
- **Hold Right** - to assume the measurement to the right design point has zero reference error.
- **Hold Center** - to equally distribute the reference error between both, left and right design point measurements.

TS occupation is calculated based on two measurements, the direction between the two points, and selected reference error distribution method.

Click  to save the Reference Line Setup results to a **.txt* file.

Click  to go back in the Reference Line Setup wizard and re-measure left and right design points.

Click **Accept** to calculate the occupation point coordinates based on performed measurements and selected method of error distribution and to finish the Reference Line Setup procedure by storing calculated occupation point to the current project.



Setup by Reference Direction

To determine the location of the total station occupation point by measuring two points: the first point is a known point, the second point is an unknown point in the known direction from the first point.

The reference direction setup wizard helps you to perform the procedure:

1. Specify the occupation point in the **Define Instrument setup** group.
   - In the **Occupy** field, enter a name of the occupation point. If you determine the coordinates of an unknown occupation point, type in a new point name. If you want to recalculate the coordinates of the known occupation point choose the point either from the map  or from the list .
   - In the **HI** field, enter the height of the instrument.
   - Click the **Next** button to continue.

2. Specify and measure the known point that is a start point of the line with the known direction. Refer to the setup graphics in the bottom that schematically shows current measurement.
   - Specify the known **Point**. Enter a point name manually, or select from the map  or from the list  of points in the project.

     Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

   - Click **Next** to proceed with measurement of the specified point.
   - Follow the displayed instruction.
     - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
   - When ready, click  /  to take measurements. More...

3. Specify and measure the unknown point that lies in the known direction from the known point. Refer to the setup graphics in the bottom that schematically shows current measurement.
   - In the **Point** field, type in a name for the unknown point.
   - In the **Line Azimuth (Bearing)** field, enter a known direction, either *Azimuth*, or *Bearing* (depending on the direction setting in the Display dialog).
   - Click **Next** to proceed with measurement of the specified point.
   - Follow the displayed instruction.
     - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
   - When ready, click  /  to take measurements. More...
   - After the unknown point is measured, the Reference Direction Setup Results dialog opens.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- **Setup** - click the item to expand the sub-menu:
  - PTL Mode - to set up the point to line method of interpretation of point coordinates. Enabled PTL mode is marked with . The PTL horizontal coordinates are calculated as offsets from the specified reference line (along line and left / right offset).
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **View Last Point** - opens the Last Point Data dialog with the information about the last point.

- **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Help** - opens the help topic.

Setup by Reference Direction Results

To review performed measurements on the known point and to the unknown point lying in the known direction from the known point and to accept the results of TS occupation calculation.

- Review the map that displays the setup and performed measurements graphically in horizontal plane. The map shows calculated TS occupation, the known point location and measurement, the line with known direction and the unknown point measurement and calculated location.
- Click  to go back in the Reference Direction Setup wizard and re-measure two points.
- Click **Accept** to calculate the occupation point coordinates based on performed measurements and to finish the Reference Direction Setup procedure by storing measured unknown point and calculated occupation point to the current project.



Setup by Grid Lines

To determine the position of an occupation point using measurements to any two points on each of two known lines and calculated distances from the intersection point of these known lines to each measured point.

To use this type of resection, Sokkia Field requires data on two known lines intersecting each other and two measured points on each of these lines. Based on this data, Sokkia Field calculates four distances from the known lines intersection point to each of the measured points and performs resection to these points.

To configure resection settings, click  and select Options from the dialog menu. Configured settings retain between sessions.

The resection wizard helps you to perform the procedure:

1. Specify the occupation point in the **Define Instrument setup** group.
   - In the **Occupy** field, enter a name of the occupation point. If you determine the coordinates of an unknown occupation point, type in a new point name. If you want to recalculate the coordinates of the known occupation point choose the point either from the map  or from the list .

- In the **HI** field, enter the height of the instrument.
- Set **Code** and attributes for the point.
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.
- In the **Scale** field, specify the scale factor for the occupation point. (This setting is available when *User Defined* is selected in the **Scale Factor** field in the Resection Options dialog.) Click  and select the scale factor for the occupation point. Available choices depend on the Coordinate System, Coordinate Type, and Localization that are used in the project. The asterisk (*) will be added to the scale value, if you have updated the initial value of the **Scale** field.

  Note: The **Scale** setting is unavailable if WGS84 coordinate type is set in the Display dialog. The **Scale** setting is locked to *Grid to Ground* if the transformation to ground coordinates is enabled in the Coordinate System dialog.

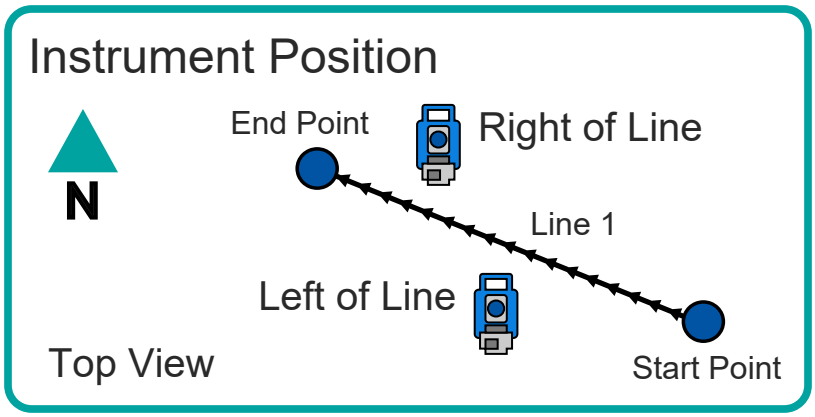
  - *Scale=1* - to set the scale to one.
  - *Grid Scale* - to set the scale of the currently used projection.
  - *Grid to Ground* - to set the scale of the currently used grid / ground parameters.
  - *Localization* - to use the scale of performed localization.
  - *User Scale* - to manually enter the user defined scale.
- Click **Next** to proceed and specify known lines.

2. Specify the first line (*Line 1*) of two known intersecting lines and measure any two points on this line.
   - Switch button to **Line** and select a line from the map , choose either an existing line or line's start and end points. The field next to the button will show *Line selected* upon selection.
   - Switch buttons to **Start Point** and **End Point**. Select each point by typing its name, selecting it from the map  or from the list .
   - Switch buttons to **Start Point** and **Azimuth** (or **Bearing** depending on direction settings in the Display dialog). Select start point by typing its name, selecting it from the map  or

from the list . Specify the line's direction by entering **Azimuth** (**Bearing**) and vertical **Grade**.

- If *Grid* or *Ground* coordinate type is set in the Display dialog, a known line can be specified as parallel to one of the coordinate axes:
  - Switch button to **Northing** to specify a parallel line and enter Northing coordinate and elevation for this line.
  - Switch button to **Easting** to specify a meridian line and enter Easting coordinate and elevation for this line.

- From the **Instrument is** drop-down list, select the instrument position relative to the *Line 1* direction. Choose either *Right of line* or *Left of line*.



- Measure any two points on *Line 1* along line's direction by following the displayed instruction.

  Note: Maintain the correct direction of the grid lines. The first point should be closer to the start of the line than the second one.

  - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
  - Place the target at the first desired location on the *Line 1*. When ready, click  /  to take measurements. More...
  - Place the target at the second desired location on the *Line 1*. When ready, click  /  to take measurements. More...

3. Specify the second line (*Line 2*) of two known intersecting lines and measure any two points on this line.

- Switch button to **Line** and select a line from the map , choose either an existing line or line's start and end points. The field next to the button will show *Line selected* upon selection.
- Switch buttons to **Start Point** and **End Point**. Select each point by typing its name, selecting it from the map  or from the list .
- Switch buttons to **Start Point** and **Azimuth** (or **Bearing** depending on direction settings in the Display dialog). Select start point by typing its name, selecting it from the map  or from the list . Specify the line's direction by entering **Azimuth** (**Bearing**) and vertical **Grade**.
- If *Grid* or *Ground* coordinate type is set in the Display dialog, a known line can be specified as parallel to one of the coordinate axes:
  - Switch button to **Northing** to specify a parallel line and enter Northing coordinate and elevation for this line.
  - Switch button to **Easting** to specify a meridian line and enter Easting coordinate and elevation for this line.

- Measure any two points on *Line 2* along line's direction by following the displayed instruction.

  Note: Maintain the correct direction of the grid lines. The first point should be closer to the start of the line than the second one.

  - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
  - Place the target at the first desired location on the *Line 2*. When ready, click  /  to take measurements. More...
  - Place the target at the second desired location on the *Line 2*. When ready, click  /  to take measurements. More...

- After the second point on *Line 2* is measured, the Setup by Grid Lines Results dialog opens.

Click the **EDM** button in the dialog's title bar to open the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work.

Click  in the dialog's title bar to review and modify the survey settings. More...

Click  to open the dialog menu with additional options:

- **Setup** - click the item to expand the sub-menu:
  - PTL Mode - to set up the point to line method of interpretation of point coordinates. Enabled PTL mode is marked with . The PTL horizontal coordinates are calculated as offsets from the specified reference line (along line and left / right offset).
  - Grid Lines - set up the grid to be displayed on the Plan.
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** - if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Options** - opens the Resection Options dialog to select the resection method and to configure resection settings used in calculation of Setup by Grid Lines.
- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .

  - **View Last Point** - opens the Last Point Data dialog with the information about the last point.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.
- **Help** - opens the help topic.

Setup by Grid Lines Results

To review and manage performed measurements on a points along known intersecting lines and to accept the results of TS occupation calculation.

Each measurement on a point is a row in the present table with columns showing obtained values:

- **BS** - backsight point selection: check the box  near a desired point in the table to select it as the backsight point;
- **Point** - name of the point;
- **Res HA** - difference of horizontal angle (HA) value from the average of all the HA values;
- **Res VA** - difference of vertical angle (VA) value from the average of all the VA values;
- **Res SD** - difference of slope distance (SD) value from the average of all the SD values;
- **Res N** - difference of northing coordinate (N) value from the average of all the N values;
- **Res E** - difference of northing coordinate (E) value from the average of all the E values;
- **Res H** - difference of height (H) value from the average of all the H values;
- Statuses of obtained values in TS occupation calculation. Check the box  to use the respective value in calculation, clear the box  to skip this value. TS occupation can be calculated only when sufficient data are selected for use in calculation.
  - **H** - status of obtained horizontal coordinates in resection calculation;
  - **V** - status of obtained vertical coordinate in resection calculation;
  - **HA** - status of horizontal angle value in resection calculation;
  - **VA** - status of vertical angle value in resection calculation;
  - **SD** - status of slope distance value in resection calculation.
- **HR** - height of reflector;
- **Target Type** - method of distance measurement with EDM (*Prism*, *Sheet* or *Non-Prism*);
- **PC** - prism constant, the parameter of the prism characterizing the difference between the reflection plane and the center of the prism / target offset for non-prism target types;
- **HA** - horizontal angle measurement value;
- **VA** - vertical angle measurement value;
- **SD** - slope distance measurement value;
- **Set** - measurement set number and the type of performed measurement.

Use the context menu to manage the list of performed measurements:

- **Copy All To Clipboard** - copies to clipboard the data of all the measurements in the list.
- **Copy Selection To Clipboard** - copies to clipboard the data of highlighted measurements.
- **Edit** - opens the Enter Rod Height dialog to edit the height of the reflector for a highlighted measurement.

- **Select All** - highlights all measurements in the list.
- **Select All Below** - highlights a currently highlighted measurement and all the measurements in the list displayed below.
- **Select Multiple** - highlights multiple measurements by sequential clicking on data item names.
- **Cancel Selection** - removes all highlights in the list.

If there are sufficient data to calculate a TS occupation, standard deviations for coordinates (**Sd N**, **Sd E**, **Sd H**) are displayed below the table. Depending on the scale factor settings in the Resection Options dialog, the calculated or user-defined **Scale Factor** value is also displayed.

> **Note:** Grayed Scale Factor indicates that the displayed value is not used in calculation of a TS occupation.

Click  to save the Setup by Grid Lines results to a **.txt* file.

Click  to go back in the Setup by Grid Lines wizard and re-measure four required points.

Click **Accept** to calculate the occupation point coordinates based on performed and approved measurements and to finish the Setup by Grid Lines procedure by storing calculated occupation point and four measured points to the current project.



Backsight Adjustment

To move, rotate or transform the current total station setup along with measured points.

After updating the coordinates of station and backsight, Sokkia Field automatically recalculates the coordinates of the measured point(s) from the station.

Select the **Occupation Point** of the network which will be adjusted. Enter a point name manually, or select from the map  or from the list  of points in the project.

To move the point network of the selected station, activate **Translate**  and click **Next** to open the Translate dialog with already selected points that will be translated.

To rotate the point network of the selected station, activate **Rotate**  and click **Next** to open the Rotate dialog with already selected points that will be rotated.

To transform plane coordinates of the point network of the selected station, activate **Transform 2D** and click **Next** to open the 2D Transform dialog with already selected points that will be transformed.



Simulation Setup

To set up the total station simulation parameters.

The total station simulation has two methods to set up - measuring by angles and measuring a point.

1. To simulate measuring of horizontal and vertical angles, and slope distance.
   - Ensure the **Enter Coords** check box is unavailable (when the backsight is not specified) or cleared.
   - Enter values for **HA** (Horizontal Angle), **VA** (Vertical angle), and **SD** (Slope Distance) in current project's units. (You can use '/' symbol to enter values such as 47°26'58", just type 47/26/58).
2. To enter coordinates and simulate measuring of a point.
   - Ensure the backsight has been set up in the Backsight dialog.
   - Check the **Enter Coords** box to switch to measuring of a point simulation setup.
   - Enter three coordinate values of a point to simulate measuring using current project's coordinate type. Alternatively, you can select the point from the map or from the list .
3. To enter depth value and simulate measuring of depth by depth finder.
   - During survey configuration, check the **Depth Finder** box in the Peripheral dialog, click **Parameters** and check the **Simulation Mode** box in the Depth Finder dialog.
   - Enter the initial depth value in the **Depth** field. Change this value in the map views of **Topo** or **Stake** dialogs using the following key combinations:
     - **Ctrl**+**Up** - to increase the depth,
     - **Ctrl**+**Down** - to decrease the depth.

> **Note:** Prior to use simulated depth control keys, click in **Topo** or **Stake** dialogs, select **Setup**, and activate the **Simulator** feature in the dialog menu. Activated feature is marked with .

Click to save the simulation settings and open the Home Screen. Click to close the dialog without saving changes and return to the Setup menu.

Remote Control

To control the connected robotic total station from the controller and verify the connection and measurements.

- Switch between Normal mode and Map mode by clicking on the dialog's title.
  - **Remote Control: Normal** - this mode provides status and control tools to communicate with TS and displays the measurements values, received from TS.
  - **Remote Control: Map** - this mode provides status and control tools to communicate with TS and displays the location and directions graphically on the map.
- Click the icon to toggle between the status panel and the tool panel. Learn more about status indicators and remote control tools accessible from these panels.
- Control the TS using command buttons on the tool panel.
- Check the measurement data received from the controlled TS in the **Remote Control: Normal** dialog mode:
  - **HA** - current horizontal angle value received from the robotic TS.
  - **VA** - current vertical angle value received from the robotic TS.
  - **SD** - measured slope distance. Shown if the **Angle-only** mode is not selected in the Electronic Distance Measurement settings (click the **EDM** button in the title bar to adjust).
- Click to return to the Setup menu or click to open the Home Screen.

Click to open the dialog menu with additional options:

- **Setup** - click the item to expand the sub-menu:
  - PTL Mode - to set up the point to line method of interpretation of point coordinates. Enabled PTL mode is marked with . The PTL horizontal coordinates are calculated as offsets from the specified reference line (along line and left / right offset).
  - **Display Coords** - to display coordinates of the current target (instead of HA, VA and SD) in the **Remote Control: Normal** dialog mode. Activated mode is marked with .
  - Grid Lines - set up the grid to be displayed on the Plan.
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**HiPer XR**, **HiPer HR**, **HiPer VR** or Sokkia **GRX3**, **GRX5**).

  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **HiPer XR** or Sokkia **GRX5** GNSS receiver.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points of the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with ✔:
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** - if this option is selected, clicking ✔ opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
- **Help** - opens the help topic.

Rotate

To rotate the connected total station by angles or to a point.

1. To rotate by **Rotation Angles**:
   - The **Horizontal** and **Vertical** fields display the current angles. Enter the values of the horizontal and vertical angles to turn.
     - To quickly add or subtract 90 or 180 degrees to / from the entered values, click  and select desired amount from the context menu.
   - Click **Turn** to send the data to the total station. The TS status icon in the dialog's low left corner shows the rotation process.

2. To **Rotate to Point**:

- Select a **Point** by typing its name, selecting it from the map  or from the list .
- Enter the height of the target. Type the value manually or click the button with current reflector icon to select one of the previously used values from the context menu.
- Click **Turn** to send the data to the total station. The TS status icon in the dialog's low left corner shows the rotation process.

Click **Plunge TS** to perform a "plunge" or "flip" (rotate the telescope and the body by 180 degrees).

Click  /  to activate / deactivate arrow joystick on a controller or open the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.

Click  to stop the total station rotation.

Click  to return to the previous dialog.

Remote Control (Virtual Joystick)

To rotate the connected robotic total station using virtual joystick buttons.

This dialog is helpful in operating the connected robotic total station with a controller that has no joystick buttons. This dialog opens after clicking , if Virtual Joystick function is activated: click  and select *Robotic* - *Virtual Joystick* in survey or stake dialogs from where you operate the robotic total station.

- Click and hold an arrow (left, right, up, down) button to turn the total station in that direction. Release an arrow button to stop rotation. Left and right are directions to the left and to the right from the operator looking at the total station's front.
  - Use the **Turn Speed** drop-down list to adjust the TS rotation speed, when required.

- Use available buttons to transmit additional commands:
  -  - turns on / off the laser pointer;
  -  - turns on / off the guide light;
  -  - forces the TS to search for a prism without measurements;
  -  - forces the TS to track the prism without measurements;
  -  - forces the TS to stop searching and tracking the prism.

- Clear the **Virtual Joystick** box in the top part of the dialog to deactivate the Virtual Joystick function in Sokkia Field. To activate it back while surveying open the dialog menu by clicking and select *Robotic* - *Virtual Joystick*.
- Click to return to the previous dialog.

Remote Control Tilt

To review the connected total station tilt correction status.

To access this dialog, click and select *Robotic* - *Tilt* in survey or stake dialogs from where you operate the robotic total station.

The dialog displays the virtual bubble level of a connected total station:

- Two bars show the level bubbles in two directions.
- **X** and **Y** fields display numerical values of the instrument tilt.
- The circle represents the tolerance of location of the level bubble for the vertical and horizontal angle tilt correction.
- If required, adjust the instrument tilt to visually set the bubble into the tolerated area. Adjustment manipulations are reflected on the plot in real time.
- Click the **Auto-Level** button to force the total station to perform automatic tilt correction. The button is available for instruments supporting this function.

When the total station tilt correction is done, click to return to the previous dialog.

Enter Rod Height

Enter the new height of the reflector for selected measurement set.

Enter the height of the target:

- type the value manually or;
- click the button with current reflector icon to select one of the previously used values from the context menu.

Click to save the entered height of the reflector to the selected measurement set and return to the previous dialog. Click to return to the previous dialog without saving.



Localization

To select the localization type and points and calculate the transformation parameters.

Localization is a calculation of transformation parameters between WGS84 / Datum / Grid and a ground coordinate system. For more information on how localization is calculated, see Localization in Sokkia Field.

- Select the **Type** of Localization:
  - **WGS84 ->Local** - the stereographic projection is used on WGS-84 for the horizontal localization. This type transforms WGS-84 coordinates into Ground coordinates for a network where the maximum distance between the local points is less than 5 kilometers. Before localization, set the **Projection** to *<none>* and set the **Datum** to *WGS84* in the Coordinate System dialog.
  - **Datum -> Local** - the stereographic projection is used on specified datum for the horizontal localization. You need to know which datum is used for the local coordinate system. Before localization, set the **Projection** to *<none>* and specify the desired **Datum** in the Coordinate System dialog.
  - **Grid->Local** - if you know which projection is used for the local coordinate system, you can use this localization type. In this case, the specified projection and corresponding datum will be used in calculation of localization parameters. Such approach to the calculation of the localization parameters between two coordinate systems is more rigorous method, than using the stereographic projection for a unknown local projection. This way the distance between localization points can be significantly increased (up to some hundred of kilometers depending on the type of the projection) without loss in transformation precision. Before localization, specify desired **Projection** and **Datum** for specified projection in the Coordinate System dialog.

- Click **Add** to open the Add Localization Point dialog for adding control point(s). The quantity of points required for localization depends on how these points are used in localization parameters calculation (see table...).

  Note: The localization is recomputed every time a new point is added to the list of localization points. The new coordinate system will be saved under the name *Localization* and is automatically selected in the Coordinate System dialog.

- Check the **Keep scale** box to use the default value of *1.0* to preserve the localization from a scale transformation or enter the desired scale factor to reduce the grid localization to the ground. With cleared check box (default state), the scale factor will be calculated based on the number of localization points.

- If required, click **Edit** to open the Edit H/V Controls dialog to change how the highlighted point pair is used in localization parameters calculation.
- Click **Remove** to remove the highlighted points pair(s).
- Click **Details** to display the current Localization Detals.
- Click  to apply changes to localization and open the Home Screen.

> **Note:** If after clicking , you see the message "Please check pair *X*", do the following:
> 1. Highlight the mentioned point pair in the list of point pairs.
> 2. Click **Edit**.
> 3. Click . You will get a message that contains problem description and recommended solution.

Click  to open the dialog menu with additional options:

- Edit Points - opens the dialog to view and manage points in the project.
- **Export to File** - opens the To File dialog, where you can select the desired file format to export the transformation parameters. The **Export to File** menu item is enabled, when the localization type is **WGS84 -> Local**.
- **Import from Shared Data** - opens the From File dialog with selected localization in the Shared Data file ready for import. (This menu item is available if the Shared Data file is used in the project and contains a localization data set).
- **Localization Origin** - click the item to select how to set the center of map projection. Activated feature is marked with .
  - **Center of Localization Points** (default setting) - the geometric center of pairs of points that are used in localization is the center of the map projection.
  - **First Localization Point** - the first pair of points used in localization is the center of the map projection.
- **Legacy Mode** - enables / disables the legacy mode for the horizontal localization. Activated feature is marked with .
  - We recommend you to enable this mode when you import the Topcon 3D localization file (**.gc3*), which was created by all versions TopSURV, Pocket 3D, 3D-Office and versions 1.* of MAGNET Tools and MAGNET Field. If this mode is disabled (default setting), the normal mode is applied.
  - We recommend you to use normal mode when you import the Topcon 3D localization file (**.gc3*), which was created in MAGNET Tools and MAGNET Field starting from version 2.0.

- When you import localization file into the open project and you check the **Use Legacy Localization** box in the From File dialog, the legacy mode is automatically set.

Localization in Sokkia Field

When performing a task of transformation of GNSS points coordinates measured in WGS-84 / Datum / Grid coordinate system into a Ground coordinate system, we cannot use the algorithms of transformation which are applied to predefined or created by the user grids and datums. In this case, Sokkia Field does not have predefined relation between two coordinate systems. We use Localization to perform coordinate transformation from WGS-84 / Datum / Grid to Ground (and vice versa).

Localization in Sokkia Field is a calculation of transformation parameters between WGS84 / Datum / Grid and a ground coordinate system. To perform localization, you need to have two independent sets of coordinates for the same point or few points in the Sokkia Field. Two sets are independent if the coordinate system of one set is not related to the coordinate system of the other set. To perform localization in Sokkia Field, you need to manually select coordinates in the Ground coordinate system ("Known Point") and in the Grid coordinate system or WGS84 / Datum coordinate system ("Measured Point") for the same point in the current project. Such a point is called Localization Point.

In Sokkia Field, horizontal localization and vertical localization are performed separately.

- Horizontal localizations use two-dimensional conformal transformations. This kind of transformation is also known as a four-parameter similarity transformation (**Rotation**, **Scale**, and two translation parameters (**DX**, **DY**)). To relate the points' geodesic coordinates (measured with GNSS receivers) to local plane coordinates (obtained with total stations, etc.), a map projection is used as an intermediate step.
- Vertical localizations use a three-parameter transformation - one shift (**H0**) and two slopes (**Hx**, **Hy**) - to convert between the points' ellipsoidal or orthometric heights and the elevations in the local height system. These three parameters are necessary in order to specify the plane that would adequately model the difference between the local geoid and the WGS84 ellipsoid in the given local area.

You determine how the localization points will use in localization parameters calculation by selecting the corresponding check boxes:

- **Use Horizontal** - the point will use only in horizontal plane localization.
- **Use Vertical** - the point will use only in vertical plane localization.
- **Use Horizontal** and **Use Vertical** - the point will use in both localizations.

Also you can select the point which will use only in the determination of rotation between two coordinate systems by selecting the corresponding check box **Rotation Only**.

When you check **Use Horizontal** and / or **Use Vertical** you can use one, two, three and more localization points. For this case Sokkia Field will calculate a different set of transformation parameters and residuals. The table displays which parameters are calculated in the process of localization, some parameters can be set to zero depending on the used number of the localization points:

Localization	Parameters	ONE Point	TWO Points	THREE Points	FOUR Points
Horizontal Plane	**Note:** To perform localization in horizontal plane, check the **Use Horizontal** box for minimum ONE point.				
	DX, **DY** - horizontal offset between two coordinate systems	CALC	CALC	CALC	CALC
	Scale - combined Scale factor	CALC	CALC	CALC	CALC
	Rotation - rotation between two coordinate systems	0	CALC	CALC	CALC
	N Residual, **E Residual** - residuals on the horizontal plane	0	0	CALC	CALC
Vertical Plane	**Note:** To perform localization in vertical plane, check the **Use Vertical** box for minimum ONE point.				
	H0 - vertical offset between two coordinate systems	CALC	CALC	CALC	CALC
	Deflection North, **Deflection East** - deflection components	0	0	CALC	CALC
	Ht Residual - residuals on the vertical plane	0	CALC	0	CALC
Note: Using only point(s) with the *Rotate Only* box checked is not enough to perform localization. Add one or more points with *Use Horizontal* or *Use Horizontal* / *Use Vertical* status.					

If a geoid model is set in the project, Sokkia Field will use this geoid model for calculating orthometric height (elevation).

Sokkia Field enables you to perform the horizontal localization in three ways:

1. Using default (the stereographic) projection on WGS84;
2. Using default (the stereographic) projection on any datum;
3. Using any predefined or created projection.

Select the desired localization type and specify localization points in the Localization dialog.

Add Localization Point / Edit H/V Controls

To add a localization point (a pair of known and measured points) to the localization or to edit localization controls of existing localization points.

- Select the localization control where the localization point will be used:
  - **Rotate Only** - check the box to use the point only in the determination of rotation angle between two coordinate systems.

    Note: Using only point(s) with the *Rotate Only* box checked is not enough to perform localization. Add one or more points with *Use Horizontal* or *Use Horizontal* / *Use Vertical* status (see table...).

  - **Use Horizontal** - check the box to use the point in the horizontal localization. You can select one, two, three and more localization points. For each case, the application will calculate a different set of horizontal transformation parameters and residuals.
  - **Use Vertical** - check the box to use the point in the vertical localization. You can select one, two, three and more localization points. For each case, the application will calculate a different set of vertical transformation parameters and residuals.

    Note: To obtain horizontal and vertical (3D) coordinates for points after localization, there must be minimum one localization point with **Use Horizontal** and one localization point with **Use Vertical** check box enabled, or one localization point with both **Use Horizontal** and **Use Vertical** check boxes enabled.

- In the **Known Point** field, enter the *Point* in the local (ground) coordinate system. You can enter the point manually or select it from the map  or from the list  of points in the project.
- In the **Measured Point** field, enter the *Point* in the coordinate system that is set for the current project. You can enter the point manually, select it from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog. There you

can save the measured point to the current project and instantly enter this point in the corresponding field.

- Click  to save the point pair and return to the Localization dialog. Click  to return to the previous dialog without saving.

Click  to open the dialog menu with additional options:

- Edit Points - opens the dialog to view and manage points in the project.

Localization Details

To display an overview of the current localization data.

1. The **Result** tab displays the input data and calculated parameters of the localization:

   - *Localize To* - the name of the projection (datum) of the current project to which the localization was applied.
   - *Rotation* - the rotation angle between the projection (datum) and local coordinate systems.
   - *Scale* - the scale factor between the projection (datum) and local coordinate systems.
   - *Offsets* - the offset vector between the origins of coordinate systems.
     - *North* - the horizontal component of the offset vector on the X axis.
     - *East* - the horizontal component of the offset vector on the Y axis.
     - *HO* - the vertical component of the offset vector.

   - *Deflections* - the vertical deflection.
     - *North* - the North component.
     - *East* - the East component.

   - *Geodetic Origin* - the center of map projection in the projection (datum) set.
     - *Lat* - the latitude of the origin.
     - *Lon* - the longitude of the origin.
     - *Ht* - the ellipsoidal height of the origin.

   - *Local Origin* - the center of map projection in the local set.
     - *North* - the northing coordinate of the origin.
     - *East* - the easting coordinate of the origin.
     - *Ht* - the orthometric height of the origin.

   - *Quality estimation* - the coordinate transformation error.

- *Hz error* - the coordinate transformation error in the horizontal plane.
- *Angle error* - the angular error of the coordinate transformation.

2. The **Map** tab displays the project map. Localization points are marked by blue triangles showing how this point is used in current localization:

-  - localization point is used in horizontal and vertical localization;
-  - localization point is used in horizontal localization;
-  - localization point is used in vertical localization;
-  - localization point is used for the determination of rotation between two coordinate systems;
-  - localization point is not used in current localization.

Measure

Measuring types availability depends on the current project configuration.

Follow a link to learn more:

- Measure GNSS
- Measure Optical (Total Station)

Measure (GNSS)

Click an icon to start the measuring of that type.



Topo
To collect points with the GNSS rover receiver by determining coordinates of locations on the survey site and storing points at the user's command. See details on how to collect inaccessible points by logging coordinates of accessible locations in Offsets section.



Auto Topo
To automatically collect points with GNSS rover receiver by auto-saving a point each time a specified criterion is met.



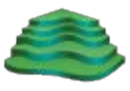
X-Section
To obtain the coordinates of points that lie on a plane perpendicular to a road center line. This type of survey is typically performed by moving from one side of a road to the other in the cross sectional plane, and then crossing back in the opposite direction at a different location along the road



Find Station
To identify the station of the road for the projection of the given point to the road and to calculate the offset for this point from the center line.



Tape Dimension
To record points based on tape measured lengths of lines perpendicular to each other starting from a reference line made of two known points.



Surface
To conduct a surface survey along with real time calculation of ground volumes.

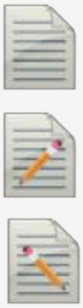
Panels, Buttons and Indicators (GNSS)

Status Panel is displayed at the top of the dialog. The status panel contains indicators showing the current status of the connected GNSS receiver and other equipment. The tool panel is available when a robotic total station is used and contains command buttons and indicators to control the robotic TS from Sokkia Field.

Click  to show the status panel at the top of the dialog, click  to hide the status panel.

Topo Panel is always displayed in the bottom of the dialog. The topo panel contains buttons to perform measurements and save the results to the current project. When the map view is used, the topo panel also displays information about the current point and measurement and has several input fields for quickly adjusting this data without exiting the map view.

Status panel (GNSS)



Logging a **.tps* file to a receiver or a controller. This icon will be displayed, if the **Post-Processing** check box is selected in the Receiver Make dialog. There are two statuses:

- "without a pencil" - the file logging is not started by a user;
- "moving pencil" - the file logging is started by a user.



The icon is displayed when **Depth Finder** is selected in the Peripherals dialog for the rover receiver:



- Gray ship - a depth finder is not connected to the controller;
- Color ship with question mark - a depth finder is connected to the controller but it is not transmitting any data;
- Color ship with green curves - a depth finder is connected to the controller and it is transmitting data.



The robotic total station is tracking and performing the observations. The icon is displayed in GNSS mode when the Fusion Positioning ™ mode is activated.



PPP engine supplies the current solution, the receiver obtains PPP corrections data from Lband satellite. (Available for GNSS survey configurations with activated Skybridge ™ or Starpoint ™ in the Receiver Settings dialog). More about Precise Point Positioning (PPP).



Quality of the radio link for correction data transmission (the age in seconds of the last correction message received by the rover is displayed):

- Crossed out link indicator - link quality is not detected;
- Red indicator and no colored bars - link quality is 0 or age is more than 5 sec;
- Orange indicator and 1 colored bar - link quality is 1 to 49 percents;
- Yellow indicator and 2 colored bars - link quality is 50 to 79 percents;
- Green indicator and 3 colored bars - link quality is 80 to 97 percents;
- Green indicator and 4 colored bars - link quality is 98 to 100 percents.



GNSS solution:

- The red bar indicates an *Autonomous* solution in standalone mode, *DION* extrapolated solution or *Convergence PPP* stage in PPP mode.
- The yellow bar indicates a *Float* solution in RTK mode, *DGPS* solution or *PPP Low* solution in PPP mode.
- The light green bar indicates a *PPP Normal* or *PPP Full* solution in PPP mode.
- The green bar indicates a *Fixed* solution in RTK mode.



Skybridge ™ status indicator.
Displayed in RTK and Network RTK configuration with enabled PPP mode and Skybridge ™ service:

- The red circle indicates that the Skybridge ™ status is unknown, point saving with current PPP solution is disabled.
- The circle with timer indicates that the rover receiver is not ready to work in the Skybridge ™ mode, point saving with current PPP solution is disabled.
- The green circle indicates that the rover receiver is ready to work in the Skybridge ™ mode, point saving with current PPP solution is enabled.



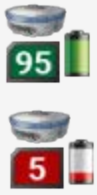
By default, **H** stands for RMS error of the horizontal coordinates in the current units for the current epoch. When storing a point is initiated, this field outputs RMS error for averaged horizontal coordinates. (To view RMS error value for the current epoch while averaging coordinates is in progress, use customizable data fields in the map view and select the *Epoch HRMS* parameter to display).



By default, **V** stands for RMS error of the vertical coordinates in the current units for the current epoch. When storing a point is initiated, this field outputs RMS error for averaged vertical coordinates. (To view RMS error value for the current epoch while averaging coordinates is in progress, use customizable data fields in the map view and select the *Epoch VRMS* parameter to display).



The icon displays the number of the GNSS satellites tracked (N) and the number of GNSS satellites used in position determination (M).



Receiver memory free space in the percentages and battery charge level statuses. The icons with a question mark mean the corresponding information is unavailable. An exclamation mark on the battery means critically low charge level (from 0 to 10%).



Controller memory free space in the percentages and battery charge level statuses. The icons with a question mark mean the corresponding information is unavailable. An exclamation mark on the battery means critically low charge level (from 0 to 10%).

Topo panel (GNSS)

The *Topo Panel* along the bottom of the dialog displays a number of buttons used to provide information and facilitate surveying.

-  **Code Button**: Sets code and attributes for the point.
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking

the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.

- Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

-  /  **GNSS Antenna Height** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

> **Note:** If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

-  /  **Start / Stop Raw Data Logging Button** - to manually start / stop raw data logging in survey configurations with enabled post processing.

- Buttons in Topo Survey:
  -  **Measuring Button** - to determine coordinates of the current position in GNSS *Precise* mode and to automatically save the point to the project if the **Auto Store** feature is enabled for GNSS *Precise* mode in the Topo Survey Settings dialog.
  -  **Store Button** - to determine coordinates of the current position in GNSS *Quick* mode and instantly save the point to the project, or to accept determined coordinates of the current position in GNSS *Precise* mode and save the point to the project.

-  **Stop Measurements Button** - to discard the current determination of coordinates, the point is not saved.

- Buttons in Auto Topo Survey:
  -  **Measuring Button** - to start auto topo measurements and immediately save the current position as an auto topo point.
  -  **Store Button** - to immediately save the current position as an auto topo point.
  -  **Stop Measurements Button** - to finish auto topo measurements.
  -  **Pause button** - to pause the logging of auto topo points.
  -  **Continue button** - to continue the logging of auto topo points.

-  **Configurable Data fields** - to display values of desired parameters during survey. The *Map view* has six customizable data fields in the bottom part of the screen. Clicking the field will open the Select Value to Display dialog, where you can select any desired parameter from the list to display in the map view of topo dialogs.



Topo Survey (GNSS)

To collect points with the GNSS rover receiver by determining coordinates of locations on the survey site and storing points at the user's command.

Sokkia Field allows the user to save a point to the project if the current GNSS solution matches the solution type that is set for the current GNSS survey configuration in the Topo Survey Settings dialog. Always check the current GNSS solution in the Status panel at the top of the Topo survey dialogs. To see more details about current GNSS parameters open the Status dialog by clicking  in the top left corner and selecting **Status** in the dialog menu. The GNSS solution requirements for saving points can be changed at any time by clicking  in the dialog title bar and opening the Topo Survey Settings dialog.

The Topo dialog offers various **Offset** modes to support collection of some inaccessible points by determination of coordinates of accessible locations. See details on offset modes available in the Topo Survey (GNSS). Choose a specific **Offset** mode in the dialog menu - click  and choose the desired mode from the **Measure** sub-menu.

Use the view selector in the dialog title bar to switch between Normal view and Map view at any time:

- **Normal view** - displays real-time coordinates for the current position, provides an editable overview of the point being stored, contains point and GNSS raw data saving tools, and shows feedback on GNSS receiver activity.
- **Map view** - shows the surveying process in real time on the map and contains point and GNSS raw data saving tools including buttons with quick codes.

Collecting points is possible in both dialog views, *Normal view* and *Map view*. Use buttons at the bottom of the dialog to log coordinates and save a point to the project. Brief on-screen text information and tips assist the saving process.

- Click  to determine coordinates of the current position in GNSS *Precise* mode. Then click  to accept determined coordinates and save the point to the project (if the **Auto Store** feature is enabled for GNSS *Precise* mode in the Topo Survey Settings dialog, the point with determined coordinates is saved automatically).
- Click  to determine coordinates of the current position in GNSS *Quick* mode and instantly save the point to the project, or to accept determined coordinates of the current position in GNSS *Precise* mode and save the point to the project.
- Click  to discard the current determination of coordinates, the point is not saved.

Switch to the *Normal view* to set up, review and modify collected points data before or during the topo survey.

- The **Point** field displays the name of the next collected point. Enter a point name manually or keep an automatically incremented name suggested according to point naming settings.

- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking

the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.

- Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

> **Note:** Next point collected in this survey session will have the code of the previous point if the **Codes** box was checked in the Persistence tab of the Code Options dialog. The user can manually enter a new code or remove currently used code for the next point at any time.

- In the **Note** field, enter a description for the next collected point.
- Enter the **Antenna Height**. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

> **Note:** If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- The electronic bubble level  is available for **GRX3** and **GRX5** receivers and is shown if the **Show eLevel** box is checked in the TILT ™ Settings dialog. The electronic bubble level displays the current leveling in real time and warns of possible leveling problems. Adjust the position of connected GNSS equipment to match correct leveling. When necessary, use the context menu by tap and hold (right-click)  to enable / disable Electronic Tilt Correction, adjust TILT ™ Settings or Calibrate connected GNSS receiver.
- Real-time coordinates of the current position are displayed at the bottom. Coordinate values are shown in the coordinate system specified in the Display dialog.
- If GNSS raw data is being logged, the **Remaining time** of current occupation is displayed according to the time specified in the Occupation Times dialog for current survey configuration. (This feature is unavailable for use with **GRX5** receiver).

Switch to the *Map view* at any time to visually overview the current position and the positions of possible reference objects. Tools available in the Map view:

- Status panel at the top;
- Topo panel at the bottom;
- Map View Tools at the right side.
- **Context menu** displayed on a long tap (right-click) in empty space of the map:
  - *Move eLevel Here* - places the bubble level on the screen where the menu was called. Available for **GRX5** and **GRX3** receivers and displayed if **Show eLevel** was selected in the TILT ™ Settings dialog.
  - *Set Simulator Here* - "moves" you to the point on the map where the menu was called. Only displayed if the simulation mode was selected in the configuration.
  - *Move Profile View Here* - centers the Profile View semitransparent overlay panel on the screen where the menu was called. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel. Only displayed if **Profile View** was selected in Map Properties dialog.
  - *Create Field Report* - opens the Field Report dialog.
  - *Reverse Direction* - reverses the direction (swaps start and end points) of the currently selected linework.

- **Configurable Data fields** - to display values of desired parameters during topo survey. The *Map view* has six customizable data fields  in the bottom part of the screen. To set up or change the data displayed in such field, tap or click on the field to open the Select Value to display dialog and select the required item from a list of all available parameters for the current survey mode.

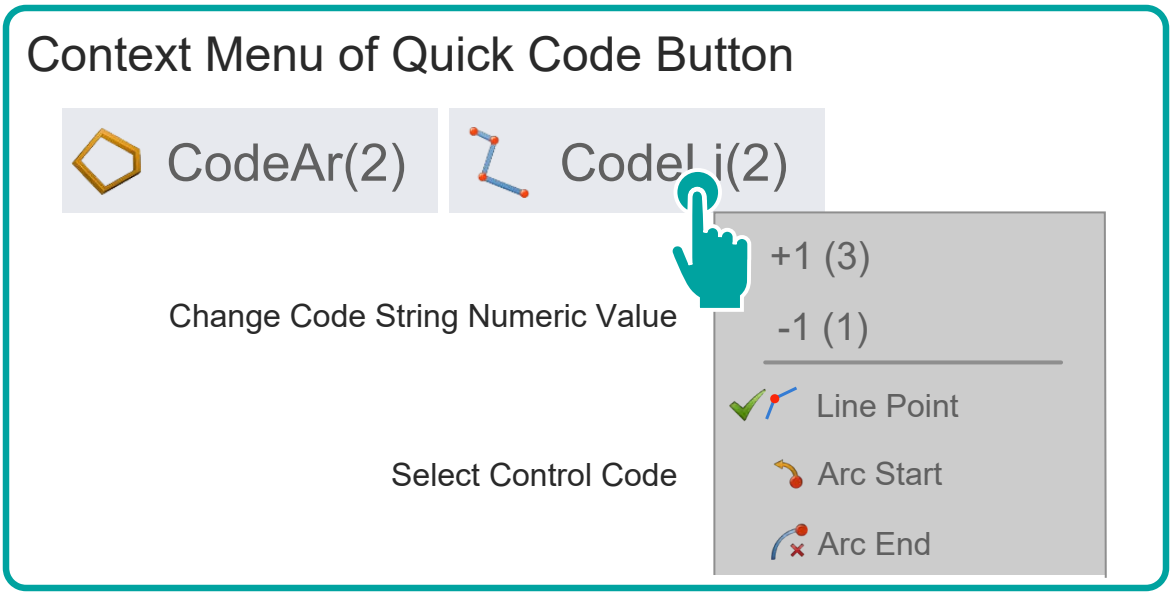
To avoid cluttering of the elements displayed on the map at the current zoom level, they are combined. Closely positioned points are displayed as a single point with a bracketed number of hidden points next to its name: for example, *P001{5}*, where *5* is the number of hidden (not displayed) points. If there are more than 99 cluttered points, they will be displayed as *{99+}*. Hidden elements become visible with the further zoom in.

Note: When measuring lines or areas with points having code of Line or Area type, you may need to extend an existing line or area. As a rule, you have a common code and an individual numeric code string assigned to each of them. To extend a line or area, simply click it - this will instruct Sokkia Field that the selected line or area should be extended with the point you are going to measure next. You can identify your selection: the code and code string in the topo panel at the bottom will be adjusted to the selected object automatically.

The selected line will be extended depending on the side the line is clicked.

The *Map view* is required to use overlay buttons with quick codes to collect field data and save a point with assigned code or codes by single tap or click.

Quick code buttons with assigned code of Line or Area type feature their own context menu available on right click (long tap). This menu allows the user to quickly add the desired control code to the point. If a numeric code string is assigned to the code on the quick code button, this menu is also useful to quickly increase or decrease the code string number and switch to another line / area in a simple way rather than having to type in the number.



For GNSS survey configurations with enabled post processing (the **Post Processing** box is checked in the Receiver Make dialog), the GNSS raw data file logging controls are available in both *Normal view* and *Map view* of the Topo dialog:

- Click  to start GNSS raw data logging into a file according to the settings in the Rover PP Setup dialog. For the user-defined file name, enter the file name at the logging start. More...
- Click  to stop raw data logging into a file.

For more information on the available controls and GNSS receiver statuses, see the Status Panel (GNSS survey) and Topo panel (GNSS survey).

Click  to change the Topo Survey settings.

Click  to open the dialog menu with additional options. More...

Topo Dialog Pop-up Menu (GNSS)

The pop-up menu includes additional options which can be useful during the survey. The menu content depends on the project configuration and survey task. The items with small arrows have sub-menus. Clicking on such a menu item opens a subset of items.

- **Measure** - click the item to expand the sub-menu:
  - List of offset measurement modes. More...
  - **Connect to the last laser** - to bypass the Select Device (Bluetooth connection) dialog and let Sokkia Field instantly initiate the connection to the last connected laser rangefinder. Activated feature is marked with ✔. (Available if the **External Laser** box was checked in the Peripherals for the Rover Receiver dialog and Bluetooth is used to connect to the laser rangefinder).
  - **Check Calculation** - opens Session Check dialog, where you can calculate the residuals for the measured RTK points.

- **Setup** - click the item to expand the sub-menu:
  - Reference CL - to specify a reference centerline for a topo task. The offset values from the line and distance from the first point of the line can help you to perform the topo survey. Activated feature is marked with ✔.
  - Reference Surface - to specify a reference surface for a topo task. The cut / fill value from the reference surface can help you to perform the topo survey. Activated feature is marked with ✔.
  - **Simulator** - to enable or disable the simulator control keys to change the simulated position on the map. More... Activated feature is marked with ✔. (Available if the **Simulation Mode** box was checked in the Receiver Make dialog during survey configuration).
  - **Select Corr. Input** - displays sub-menu with ports available for corrections input. Select a required port to start obtaining corrections using that port. The selected port is marked with ✔. This functionality is available for RTK and RT DGPS configurations. The **Multiple Ports** box should be checked in the Peripherals for the Rover Receiver dialog and these rover receiver's ports should be configured for use with generic (*Do not setup Radio*) internal or external radio modems during GNSS survey configuration.
  - Config Radio / Config Cell / Config CDPD - configures the settings for the modem. This functionality is available for RTK and RT DGPS configurations. The name of the command depends on the type of modem used. When the **Multiple Ports** box is checked in the Peripherals for the Rover Receiver dialog during GNSS survey configuration, the sub-menu with available modems or ports appears. Select a required item to configure and start obtaining corrections from that modem / port. The currently used device is marked with ✔.

- PTL Mode - to set up the point to line method of interpretation of point coordinates. Enabled PTL mode is marked with ✔. The PTL horizontal coordinates are calculated as offsets from the specified reference line (along line and left / right offset).
- Grid Lines - set up the grid to be displayed on the Map.
- **Use Depth** - to receive data from the connected depth finder. Activated mode is marked with ✔. To display the current water depth, click on a customizable data field and select the *Depth* parameter in the Select Value to Display dialog.
- TILT ™ Settings - opens the dialog to set up automatic tilt correction and compensation for **GRX3** and **GRX5** GNSS receivers.
- **Reset Tracking and Positioning** - the command that re-initializes the receiver.
- **Reset TILT ™** - the command that re-initializes the Dynamic TILT ™ for connected **GRX5** GNSS receiver.
- PPP Known Pt Init - to prepare and use a PPP seeding point for instant PPP convergence (available in *Autonomous / SBAS / PPP* survey configuration with enabled PPP).
- **Full PPP Reset** (available when Skybridge ™ / Starpoint ™ mode is on) - the command that restarts PPP positioning from the beginning.
- Survey Session - opens a wizard for creating a survey session, where the measured points will be recorded. This command is displayed if the **Prompt for Survey Session** is selected in the Miscellaneous dialog.
- **Disconnect from MP** / **Connect to MP** - instantly disconnects / connects the NTRIP caster and mount point or the TCP/IP server specified in the Network tab of the Connections dialog. Available for Network RTK and Autonomous or RTK with PPP survey configurations. The **Disconnect from MP** command doesn't close the current connection to the Internet.

- **Ordered X-section Segment** - click to enable or disable adding of *ordered segment* flag in the raw data record for a point being measured. (Available in the X-section survey).
- Status - allows you to check the status of a GNSS survey. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- **Topo** - opens the Topo dialog. This item is displayed only if you are currently in the Auto-Topo or X-Sect dialog.
- Edit Points - opens the dialog to view and manage points in the project.
- Edit Roads - opens the dialog to view and manage roads in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Quick Codes** - click the item to expand the sub-menu:
  - <*Menu items with the names of quick codes groups*> - select the name of an existing quick codes group to display its code buttons on the map for quick measurement, adding assigned codes, and saving a point with one click. Currently used code group is marked with ✔. These items are visible in menu if quick codes groups are created. To create desired quick codes groups, select **Edit Quick Codes**.
  - **Hide Quick Codes** - select to hide all quick code buttons on the map.

  - **Edit Quick Codes** - opens the Quick Codes tab of the Code Options dialog to configure quick codes and create groups.

- **Raw Data** - click to expand the menu:
  - Add Raw Note - allows you enter a *Raw Note Text* to give a description during the survey if required.
  - View Last Point - contains the information about the last point that has been logged since this dialog was opened.
  - Edit - displays the collected raw data.

- **Volume Report** - opens the Surface Topo Volume Report dialog to display the current stockpile / pit volume report. (Available in the Surface survey).

Offsets in Topo Survey (GNSS)

Offsets in topographic survey (GNSS) provide extended possibilities for determining the coordinates of points that are not available for direct measurement, hidden, or even physically non-existent. This is done by determining the coordinates of accessible locations and adding known or measured offset values. Sokkia Field offers multiple offset modes that combine advanced interface tools for easy and fast collection of ancillary data and calculation routines for offset measurements.

To enable the desired offset mode, click  in the top left corner of the Topo Survey (GNSS) dialog and click **Measure** to expand the menu with available offsets:

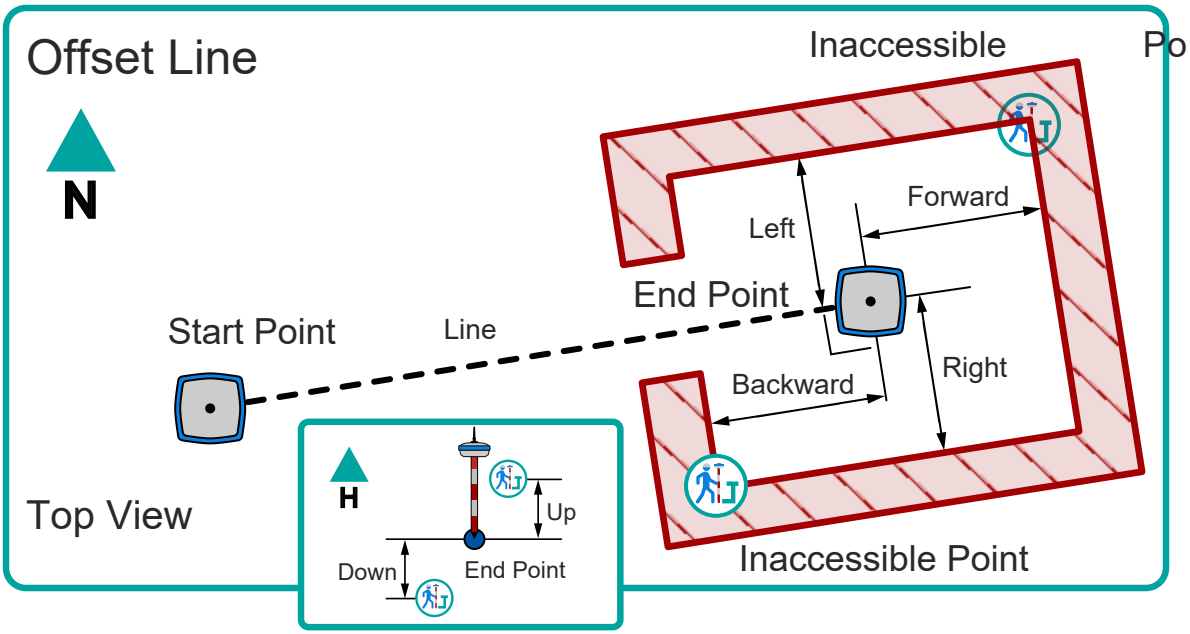
- Offset Line - to determine a point in a distance from the line defined by two measured points.
- Azimuth (Bearing) and Offsets - to determine a point by the direction, horizontal distance and vertical offset from the measured point.
- 2 Distance Offset - to determine the horizontal coordinates of a point by horizontal distances to this point from two measured points.
- Offset Laser - to determine a point with the offset measured by a laser rangefinder (available if the **External Laser** box was checked in the Peripherals for the Rover Receiver dialog).

Offset Line

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using coordinates of two measured points defining the direction for offsets and additional distance offsets measurements, for example performed with the tape.

To enter this offset mode, click  in the top left corner of the Topo Survey (GNSS) dialog, click **Measure** to expand the sub-menu and select **Offset Line**.

Offset Line mode requires coordinates of two points defining the line direction for offsets. The end point of this line is the origin point for calculating offsets.



- In the **Reference Line** group, specify the **Start Point** and **End Point** of the line. Click the button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use existing points to specify the line, select the desired point from the map or from the list points in the project.
- In the **Offsets From End Point** group, specify offsets directions and distances from the end point of the line to the inaccessible point:
  - Select the direction *Forward* / *Backward* by clicking the toggle button and enter the desired horizontal distance along the line from the end point.
  - Select the direction *Left* / *Right* by clicking the toggle button and enter the desired distance from the inaccessible point in perpendicular to the specified line.
  - Select the direction *Up* / *Down* by clicking the toggle button and enter the desired height offset from the end point of the specified line.

Note: You can define the direction of any offset in two ways: either click on the corresponding button of the current selection, or use the minus sign "-" for the current value. For instance, *Forward 12.000* and *Backward -12.000* directions are the same.

- In the **Offset** group, specify the inaccessible **Point** name and **Code** to be stored in the project, just as described in the Topo survey (GNSS).

> **Note:** The vertical coordinate of the inaccessible point is calculated as the vertical coordinate of the end point of the line plus entered vertical offset value.

After specifying the reference line and offset data, click  to calculate horizontal and vertical coordinates and store the inaccessible point to the project. The stored point has the  icon in point listings of the current project.

Click  to return to the Topo Survey (GNSS) dialog.

Azimuth (Bearing) and Offsets

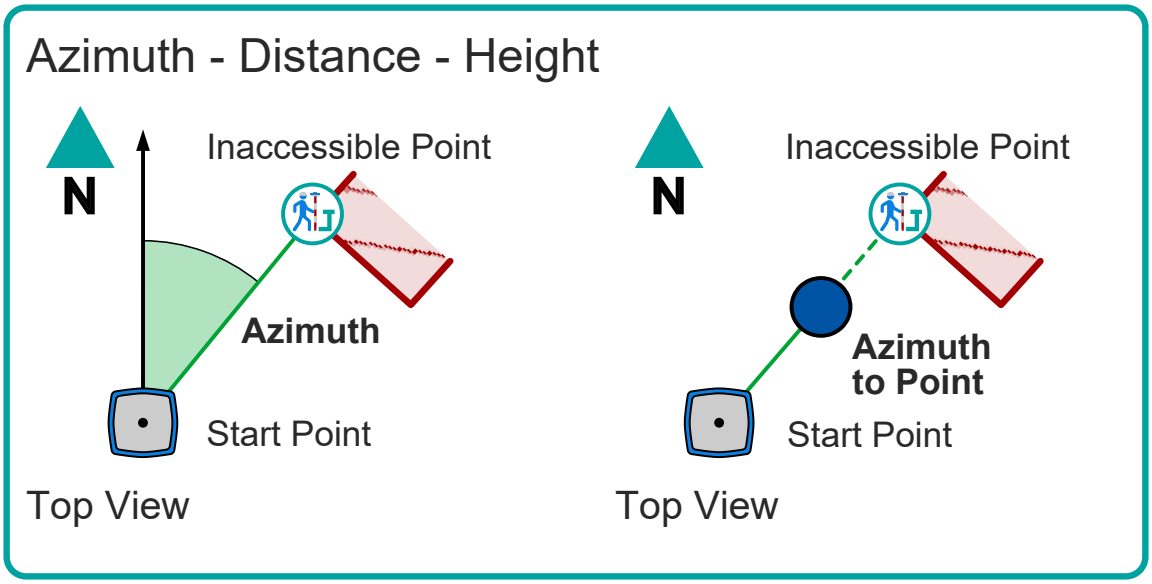
To determine the horizontal and vertical (3D) coordinates of an inaccessible point using the direction, horizontal distance and vertical offset from the measured point.

To enter this offset mode, click  in the top left corner of the Topo Survey (GNSS) dialog, click **Measure** to expand the sub-menu and select **Azimuth and Offsets** (**Bearing and Offsets**, if bearing is set as direction in the Display dialog). The **Azimuth (Bearing) - Distance - Height** dialog opens.

Azimuth and Offsets (Bearing and Offsets) mode requires coordinates of single point defining the origin point for calculating offsets.

- In the **Start Point** field specify the point for calculating offsets from. Click the  button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use an existing point from the current project, select the desired point from the map  or from the list  points in the project.
- Specify the inaccessible **Point** name, **Code** and **Note** to be stored in the project, just as described in the Topo survey (GNSS).

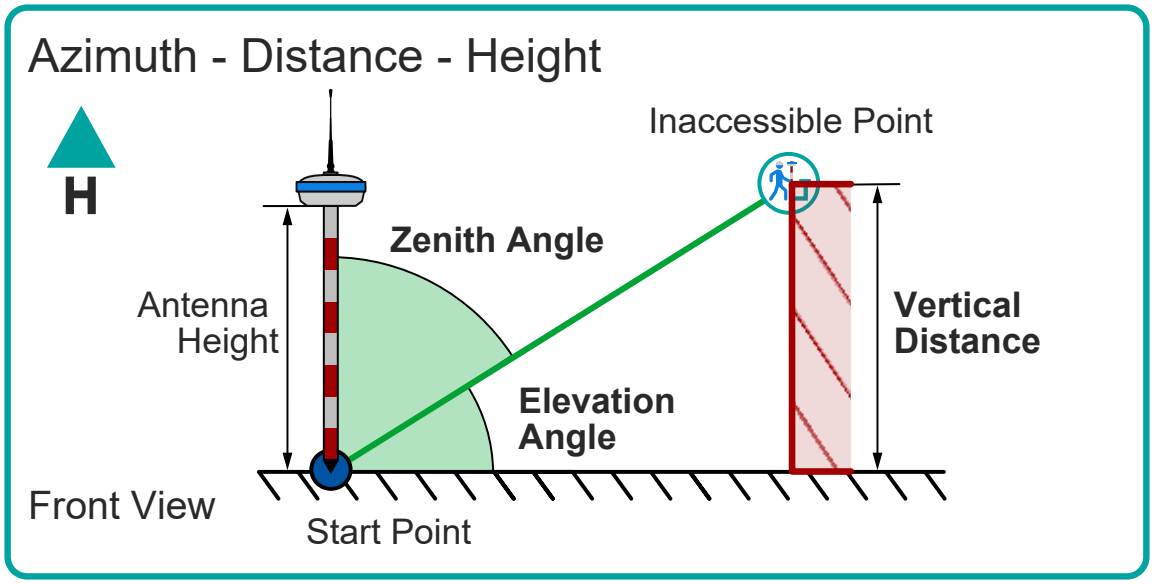
- Choose how to set the horizontal offset direction from the start point to the inaccessible point by clicking the toggle button **Azimuth (Bearing)** / **Az to Pt (Brg to Pt)**:



  - Set the toggle button to **Azimuth** (or **Bearing** depending on direction settings in the Display dialog) to enter a known direction. Enter the direction value manually or click  to calculate the value of offset direction from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog. The horizontal offset direction from the start point to the inaccessible point is determined by the azimuth (bearing).
  - Set the toggle button to **Az to Pt** (or **Brg to Pt** depending on direction settings in the Display dialog) to use the direction to another point. Enter this point name manually, or select from the map  or from the list  points in the project. The horizontal offset direction from the start point to the inaccessible point is determined by the line start point - selected point.

- In the **Horizontal Distance** field, enter the distance value from the **Start Point** to the inaccessible point.

- Choose how to set the vertical offset from the start point to the inaccessible point by clicking the toggle button **Zenith Angle** / **Elevation Angle** / **Vertical Distance**:



  - Set the toggle button to **Zenith Angle** and enter additionally measured vertical angle from the start point to the inaccessible point (value 0 is the zenith direction).
  - Set the toggle button to **Elev Angle** and enter additionally measured vertical angle from the start point to the inaccessible point (value 0 is the horizontal).
  - Set the toggle button to **Vert Distance** and enter measured vertical distance from the start point to the inaccessible point.

After specifying the start point and offset data, click ✔ to calculate horizontal and vertical coordinates and store the inaccessible point to the project. The stored point has the icon in point listings of the current project.

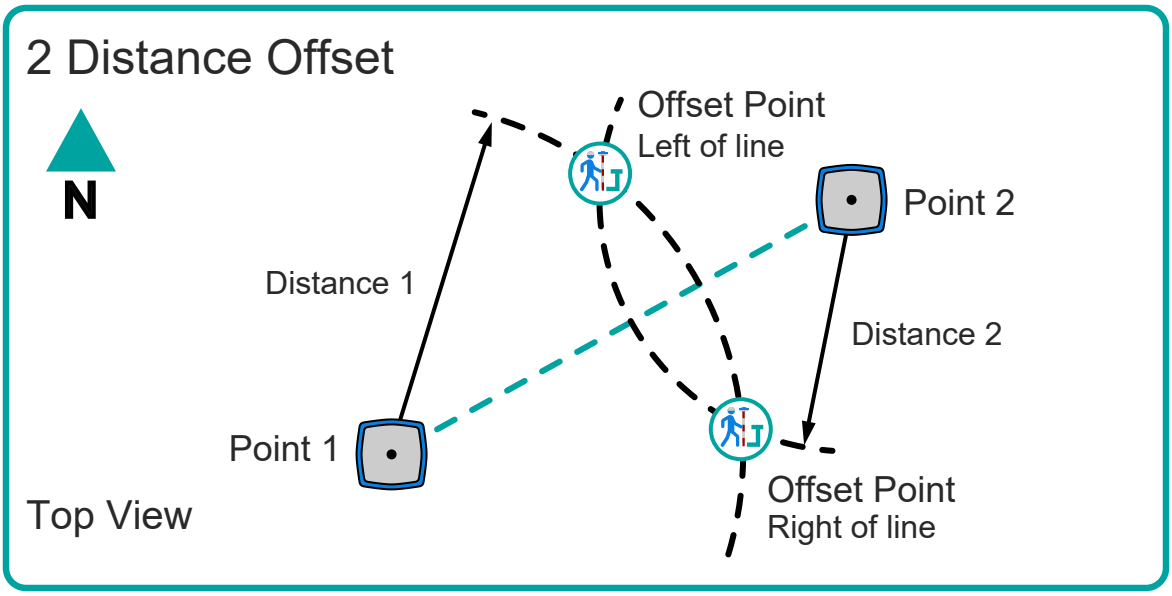
Click to return to the Topo Survey (GNSS) dialog.

2 Distance Offset

To determine the horizontal coordinates of an offset point using coordinates of two measured points and horizontal distances to the offset point from each of these two points.

To enter this offset mode, click ☰ in the top left corner of the Topo Survey (GNSS) dialog, click **Measure** to expand the sub-menu and select **2 Distance Offset**.

2 Distance Offset mode requires coordinates of two points and known horizontal distances from these points to the offset point.



- In the **Point 1** field, specify the first point. Click the button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use an existing point from the current project, select the desired point from the map or from the list points in the project.
  - In the **Distance** field, enter the horizontal distance value form the first point to the offset point. If the **External Laser** check box is selected in the Rover Peripherals dialog and a laser rangefinder is configured, click to measure the distance and instantly enter the value.
- In the **Point 2** field, specify the second point. Click the button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use an existing point from the current project, select the desired point from the map or from the list points in the project.
  - In the **Distance** field, enter the horizontal distance value form the first point to the offset point. If the **External Laser** check box is selected in the Rover Peripherals dialog and a laser rangefinder is configured, click to measure the distance and instantly enter the value.
- Specify the offset **Offset Pt** name and **Code** to be stored in the project, just as described in the Topo survey (GNSS).

- From the drop-down list, select the direction to calculate the horizontal coordinates of offset point, relative to the line point 1 - point 2, either *Left of line*, or *Right of line*.

> **Note:** The vertical coordinate of the offset point is equal to the vertical coordinate of the first point (**Point 1**).

After specifying two points and distances, click  to calculate horizontal coordinates and store the offset point to the project. The stored point has the  icon in point listings of the current project.

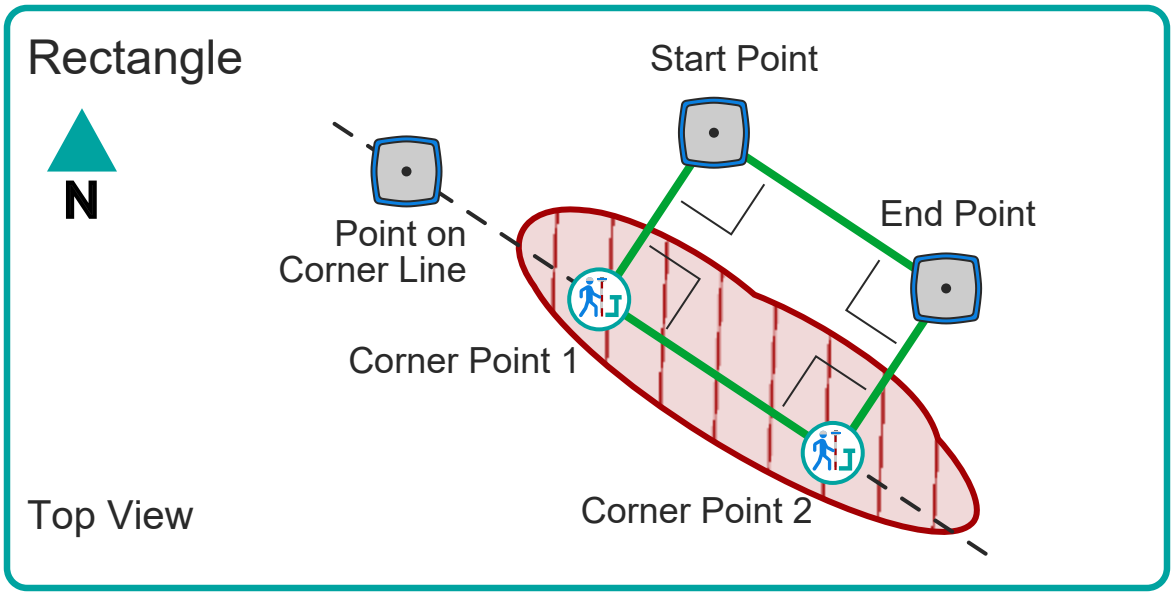
Click  to return to the Topo Survey (GNSS) dialog.

Rectangle

To determine the coordinates of two points forming the opposite side of the rectangle, based on the measured coordinates of two points defining the known side of the rectangle, and the measured coordinates of an arbitrary point on the line to which the opposite side of the rectangle belongs.

To enter this offset mode, click  in the top left corner of the Topo Survey (GNSS) dialog, click **Measure** to expand the sub-menu and select **Rectangle**.

Rectangle mode requires the coordinates of three points - two adjacent vertices of the rectangle and any point lying on the line on which the opposite side of the rectangle is located.



- Define the known side of the rectangle in the **Reference Line** group:
  - In the **Start Pt** field, specify the first known vertice. Click the  button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use an existing point from the current project, select the desired point from the map  or from the list  of points in the project.
  - In the **End Pt** field , specify the second known vertice. Click the  button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use an existing point from the current project, select the desired point from the map  or from the list  of points in the project.
- Define any point on the line to which the opposite side of the rectangle belongs in the **Corner Line** group:
  - In the **Point** field, specify the point on the line. Click the  button to measure a point and instantly enter this point coordinates to the corresponding field. The field will display *Measured*. Alternatively, use an existing point from the current project, select the desired point from the map  or from the list  of points in the project.
- After specifying three points, click  to calculate horizontal coordinates of two unknown vertices of the rectangle. Sokkia Field displays two corresponding points ready to save them to the project:
  - **Corner Point 1** - the vertice on the opposite side of the rectangle that is adjacent to the **Start Pt**. The elevation of this point is equal to the elevation of the **Start Pt**.
  - **Corner Point 2** - the vertice on the opposite side of the rectangle that is adjacent to the **End Pt**. The elevation of this point is equal to the elevation of the **End Pt**.
- The coordinates of the **Corner Point 1** and **Corner Point 2** are calculated based on coordinates of three specified points. You can manually change automatically suggested point names. Select code(s) for these points from the existing codes and, if required, click  to set the point's attributes. More...
- Click  to save two found vertices of the rectangle as offset points to the project. The stored points have the  icon in point listings of the current project.

Click  to return to the Topo Survey (GNSS) dialog.

Offset Laser

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using measurement by a laser rangefinder from the point with measured coordinates.

This mode is only available for GNSS survey configurations if the **External Laser** check box is selected in the Peripherals for the Rover Receiver dialog of the GNSS survey configuration and supported laser rangefinder model is configured.

To enter this offset mode, click  in the top left corner of the Topo Survey (GNSS) dialog, click **Measure** to expand the sub-menu and select **Offset Laser**. Detect and select configured laser rangefinder in the open Select Device (Bluetooth connection) dialog.

Note: To bypass the Bluetooth device discovery in the Select Device (Bluetooth connection) dialog next time and let Sokkia Field instantly initiate the connection to the last connected laser rangefinder, click  in the top left corner of the Topo Survey (GNSS) dialog, click **Measure** to expand the sub-menu and select **Connect to the last laser**. Activated feature is marked with .

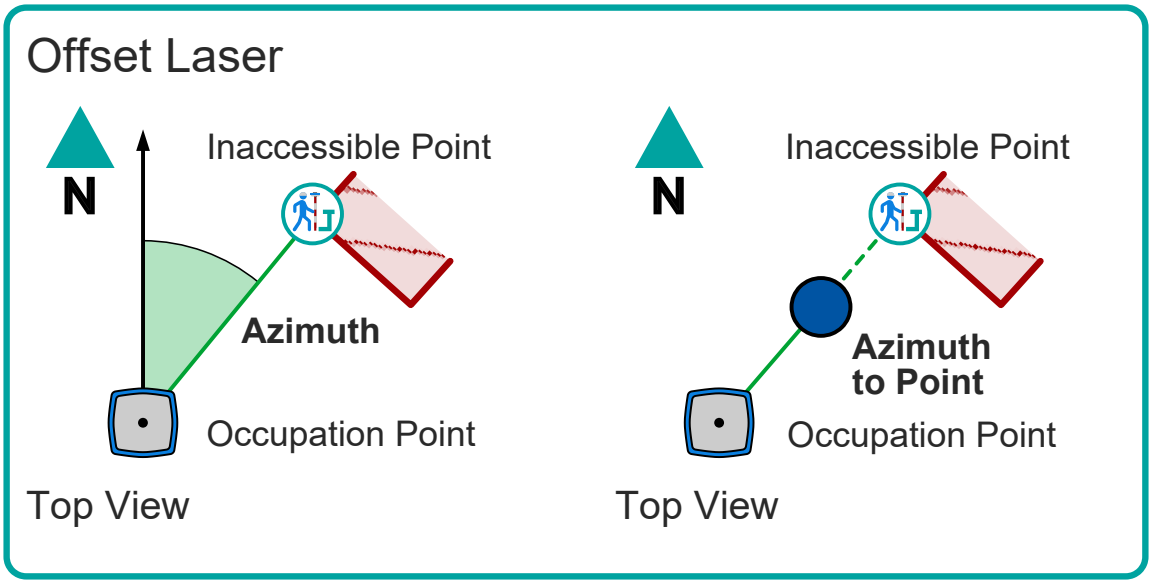
After the connection to the laser rangefinder is established, the **Laser Measure** dialog opens.

Offset Laser mode requires coordinates of single point defining the occupation point for the laser rangefinder.

Note: If *TruPulse 360* model and *TruPulse with Compass* type is configured as an external laser, the Laser BS Measure dialog opens automatically on entering the **Offset Laser** mode. Set up the occupation point and backsight direction in that dialog and skip the occupation point and offset direction setup in the current dialog. In this case, the horizontal offset direction will be calculated from the horizontal angle measurement by the laser rangefinder. Click the **BS Setup** button to manually open the Laser BS Measure dialog and change the initial backsight settings.

- In the **Occupation Point** field, select the point for the laser rangefinder occupation. Enter a point name manually, or select from the map  or from the list  points in the project. By default, the last saved GNSS point is suggested.

- Choose how to set the horizontal offset direction from the laser rangefinder occupation point to the inaccessible point by clicking the toggle button **Azimuth (Bearing)** / **Az to Pt (Brg to Pt)**:

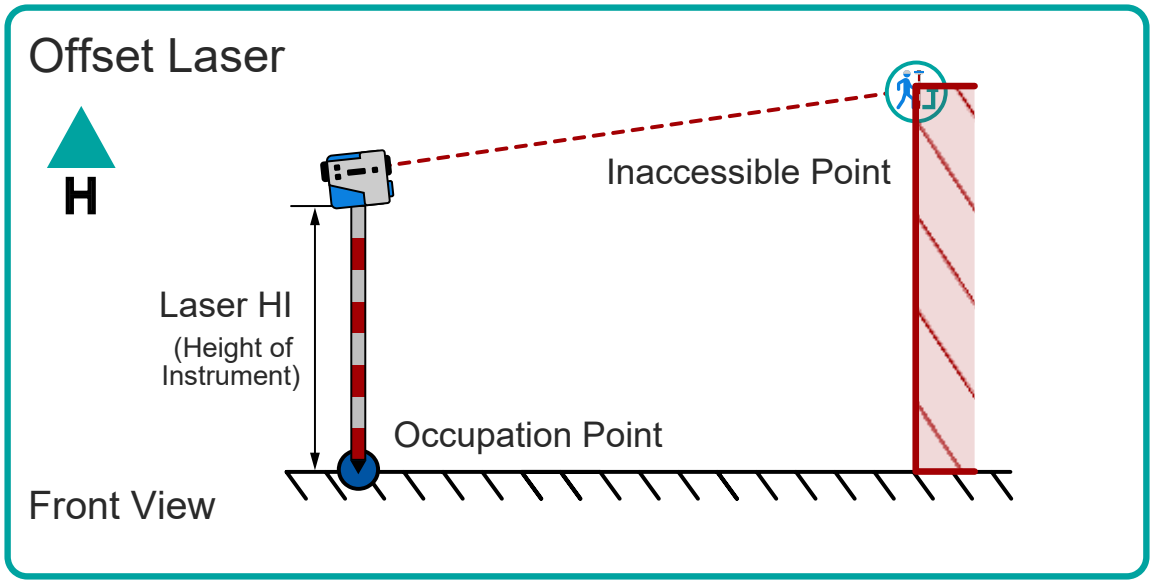


  - Set the toggle button to **Azimuth** (or **Bearing** depending on direction settings in the Display dialog) to enter a known direction. Enter the direction value manually or click  to calculate the value of offset direction from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog. The horizontal offset direction from the occupation point to the inaccessible point is determined by the azimuth (bearing).
  - Set the toggle button to **Az to Pt** (or **Brg to Pt** depending on direction settings in the Display dialog) to use the direction to another point. Enter this point name manually, or select from the map  or from the list  points in the project. The horizontal offset direction from the occupation point to the inaccessible point is determined by the line occupation point - selected point.
- In the **Laser HI** field, enter the height of the instrument (laser rangefinder) above the occupation point.

> **Note:** Ensure, the laser rangefinder is set up to measure horizontal distance and vertical angle (plus horizontal angle for the device with built-in compass and specified backsight).

- Specify the inaccessible **Point** name and **Code** to be stored in the project, just as described in the Topo survey (GNSS).

- Place the laser rangefinder on the occupation point, aim to the inaccessible point, and press the **Fire** button on the laser rangefinder.



- Sokkia Field captures measured values of Vertical Angle (VA) and Horizontal Distance (HD) from the laser rangefinder (plus Horizontal Angle (HA) from the rangefinder with built-in compass), calculates offsets from the occupation point in the specified direction, and opens the Add Point (Store Point As) dialog to store the point with determined coordinates in the current project. The stored point has the icon in point listings of the current project.

After saving the point, you can measure another laser offset or click to return to the Topo Survey (GNSS) dialog.

Laser BS Measure

To set the reference direction for the horizontal angle readings in a laser rangefinder equipped with built-in compass.

This dialog opens automatically or by clicking the **BS Setup** button in the Laser Measure dialog, if *TruPulse 360* model and *TruPulse with Compass* type is configured as an external laser in the Peripherals for the Rover Receiver dialog of the GNSS survey configuration.

- In the **Occupation Point** field, select the point for the laser rangefinder occupation. Enter a point name manually, or select from the map or from the list points in the project. By default, the last saved GNSS point is suggested.
- Use the toggle button to set the reference direction either by point or by known direction:

- Set the toggle button to **BS Point** to perform laser measurement to a point and select the backsight point. Enter a point name manually, or select from the map  or from the list  points in the project.
- Set the toggle button to **BS Azimuth** (or **BS Bearing** depending on direction settings in the Display dialog) to enter a known direction. Enter the direction value manually or click  to calculate the value of backsight direction from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.

- Place the laser rangefinder on the occupation point, aim to the backsight point or in the known backsight direction, and press the **Fire** button on the laser rangefinder. Measured values of Horizontal Angle (HA), Vertical Angle (VA) and Horizontal Distance (HD) are captured by Sokkia Field and displayed in the dialog.
- Click  to accept the backsight measurement data and open the Laser Measure dialog.



Auto Topo (GNSS)

To automatically collect points with GNSS rover receiver by auto-saving a point each time a specified criterion is met.

Auto Topo survey is supported in GNSS survey configurations with a GNSS rover receiver and allows you to collect points automatically. While the GNSS rover receiver obtains the required GNSS solution, Sokkia Field checks the status of the criterion in real time and saves the obtained coordinates as another auto topo point in the project at the moment the criterion condition is met.

The required GNSS solution and the criterion that triggers the saving of a point are defined in the Auto Topo Survey dialog. This dialog is a part of the Configuration wizard for GNSS survey. It's possible to review and change the criterion at any time in the auto topo survey by clicking  in the Auto Topo dialog's title bar.

Use the view selector in the dialog title bar to switch between *Normal* view and *Map* view at any time:

- **Normal view** - contains tools to supervise collected point names and codes, displays the current status of auto topo mode and features the auto topo mode start / stop, auto topo points logging pause / continue and instant manual save controls.

- **Map view** - shows the current position of GNSS rover receiver in real time on the map along with collected points and features the auto topo mode start / stop, auto topo points logging pause / continue and instant manual save controls.

Switch to the *Normal view* to review and modify collected points data before going to the auto topo mode.

- The **Point** field displays the name of the first collected point. Enter a point name manually or keep an automatically suggested name.

  Note: Further points collected in auto topo mode in this survey session will be named automatically according to point naming settings.

- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

  Note: Further points collected in auto topo mode in this survey session will have the code of the starting point if the **Codes** box was checked in the Persistence tab of the Code Options dialog.

- In the **Note** field, enter a description for the first collected point.
- Enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

Switch to the *Map view* to start the auto topo survey and automatically collect points.

- Click to start collecting points in auto topo mode. Sokkia Field immediately saves the coordinates obtained from the GNSS rover receiver as an auto topo point, if the specified GNSS solution exists. The next point is automatically saved when the auto topo criterion is met.
- During an auto topo session, click to pause the logging of auto topo points. To continue paused session click , Sokkia Field immediately saves another auto topo point and continues to automatically save points according to the criterion.
- Click to save the currently obtained coordinates as a point immediately, regardless of the criterion status. Such a point is saved as an auto topo point in the project but doesn't affect the current status of the criterion.
- Click to finish current auto topo session. Sokkia Field stops auto saving points. Between sessions, it is possible to modify point naming, codes, etc., switch to the *Normal mode* and review and modify data for further points. Click to start a new auto topo session.

Note: To make auto topo points and their coordinates viewable in the project, open the Points dialog (click > > to open), click / in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click > > to open).

For GNSS survey configurations with enabled post processing (the **Post Processing** box is checked in the Receiver Make dialog), the GNSS raw data file logging controls are available in both, *Normal view* and *Map view* of the Auto Topo dialog:

- Click to start GNSS raw data logging into a file according to the settings in the Rover PP Setup dialog. For the user-defined file name, enter the file name at the logging start. More...

- Click  to stop raw data logging into a file.

For more information on the available controls and GNSS receiver statuses, see the Status Panel (GNSS survey) and Topo panel (GNSS survey).

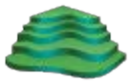
Click  to change the Auto Topo Survey settings.

Click  to open the dialog menu with additional options. More...

Measure (Optical)

Click an icon to start the measuring of that type.

	Topo To collect points with the total station by measuring locations on the survey site and storing points at the user's command. See details on how to collect inaccessible points by measuring accessible locations in the Offsets section.
	Auto Topo To automatically collect points by auto-saving a point each time a specified criterion is met. *Available for robotic total stations.*
	X-Section To obtain the coordinates of points that lie on a plane perpendicular to a road center line. This type of survey is typically performed by moving from one side of a road to the other in the cross sectional plane, and then crossing back in the opposite direction at a different location along the road.
	Find Station To identify the station of the road for the projection of the given point to the road and to calculate the offset for this point from the center line.
	Tape Dimension To record points based on tape measured lengths of lines perpendicular to each other starting from a reference line made of two known points.



Surface
To conduct a surface survey along with real time calculation of ground volumes.



Missing Line
To emulate the total station measurement from one point to another and store the result in the Raw Data database.



Monitor
To repeatably measure targets located on points from a predefined point list, with an option to output performed measurements to an external file or communication port. *Available for robotic total stations.*



Set Collection
To collect points using the Angle/Distance Sets - Dir/Rev method eliminating centering errors in the horizontal and vertical circles.



Image Scan
To define a scan area (with or without scan images), to select a scanning interval, and to collect points within that area.

Panels, Buttons and Indicators (Optical)

Status Panel and Tool Panel are displayed at the top of the dialog. The status panel contains indicators showing the current status of the connected total station and other equipment. The tool panel is available when a robotic total station is used and contains command buttons and indicators to control the robotic TS from Sokkia Field.

Click  to show panels at the top of the dialog and toggle between the status panel and the tool panel. Click  to hide panels at the top of the dialog.

Topo Panel is always displayed in the bottom of the dialog. The topo panel contains buttons to perform measurements and save the results to the current project. When the map view is used, the topo panel also displays information about the current point and measurement and has several input fields for quickly adjusting this data without exiting the map view.

Tools Panel for Robotic TS



Quick lock with RC-3 or RC-4: The RC-3 or RC-4 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.



Quick lock with RC-PR3: The RC-PR3 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.



Quick lock with RC-PR4: The RC-PR4 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.



Quick lock with RC-5: The RC-5 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.



The GNSS solution is available. The icon is displayed in TS mode when the Fusion Positioning ™ mode is activated.

- The red bar indicates an *Autonomous* solution in standalone mode, *DION* extrapolated solution or *Convergence PPP* stage in PPP mode.
- The yellow bar indicates a *Float* solution in RTK mode, *DGPS* solution or *PPP Low* solution in PPP mode.
- The light green bar indicates a *PPP Normal* or *PPP Full* solution in PPP mode.
- The green bar indicates a *Fixed* solution in RTK mode.



Fusion Lock: Clicking on the icon automatically turns the Robotic Total Station to the reflector. To search the reflector, the software has to have the coordinates of the occupation point (where the Robotic Total Station is set) and current coordinates of a point where the rod (with GNSS antenna and reflector) is set in WGS -84 coordinate system.

The icon is displayed when the Fusion Positioning ™ mode is activated.

The icon is available when the localization are performed or Grid to Ground transformation is selected or a Grid coordinate system was selected for Total Station measuring.



Laser Pointer: Turns the laser pointer on or off. Available for certain total stations only.



Turn: Opens the Rotate dialog to turn the Total station to various angles or points.



Arrow joystick: Allows to rotate the total station from a controller.
If a controller has the arrow joystick and the *Virtual Joystick* option is not active, clicking the icon activates the controller's arrow joystick for total station rotation. The icon's arrows become green.

If the *Virtual Joystick* option is active, clicking the icon opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.



Search: Forces the total station to aim to the prism without starting of measurements.



Search & Measure: Forces the total station to aim to the prism and make the measurement.



Search & Lock:

- Starts the instrument to search,
- locks onto the prism, tracks it and makes the measurements.



Stop: Forces the total station to stop tracking the prism and go into a "*Standby*" mode.

Status Panel for TS



The total station is performing the observations.



The icon is displayed when **Depth Finder** is selected in the Peripherals dialog:



- Gray ship - a depth finder is not connected to the controller;
- Color ship with question mark - a depth finder is connected to the controller but it is not transmitting any data;
- Color ship with green curves - a depth finder is connected to the controller and it is transmitting data.



Instrument battery charge level:

- Four green horizontal bars is full (from 80 to 100%);
- Three green horizontal bars is medium (from 60 to 80%);
- Two yellow horizontal bars is low (from 40 to 60%);
- One yellow horizontal bar is over low (from 20 to 40%);
- One red horizontal bar is none (from 0 to 20%).



Shows the status of connection with the instrument:

- the connection with the robotic and conventional total station is established;
- the transmission data with the robotic total station is broken;
- the connection with the robotic and conventional total station is broken.



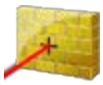
Controller memory free space in the percentages and battery charge level statuses. The icons with a question mark mean the corresponding information is unavailable. An exclamation mark on the battery means critically low charge level (from 0 to 10%).

Topo Panel for TS

-  **Code Button** - to set code and attributes for the point.
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

-  **Reading Button** - to make an observation (in precise mode for robotic TS).
-  **Reading and Store Button**- to make an observation (in quick mode for robotic TS) and automatically save it.
-  **Store Button** - to save the current observation immediately.
-  **Stop Measurements Button** - to discard the current observation.

- **Target Height** - to enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;

-  when a sheet is selected, target offset also displays below;
-  when a non-prism is selected, target offset also displays below.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

-  **Configurable Data fields** - to display values of desired parameters during survey. The *Map view* has six customizable data fields in the bottom part of the screen. Clicking the field will open the Select Value to Display dialog, where you can select any desired parameter from the list to display in the map view of topo dialogs.



Topo Survey (Optical)

To collect points with the total station by measuring locations on the survey site and storing points at the user's command.

Topo Survey offers different options and methods of point collection. The optical topo survey can be conducted in **Sideshot** mode, **Traverse** mode, and various **Offset** modes.

- **Sideshot** mode supports measurements to single points from a fixed TS occupation position. This mode is set by default when starting a topo survey.
- **Traverse** mode assumes that the TS occupation position will automatically change to the previous foresight point and the backsight point will automatically change to the previous occupation point. The Backsight dialog will automatically open to update for the next occupation point.
- Various **Offset** modes support collection of some inaccessible points by measuring accessible locations or using special techniques. See details on offset modes available in the Topo Survey (Optical).

Set **Sideshot**, **Traverse**, or choose a specific **Offset** mode in the dialog menu - click  and choose the desired mode from the **Measure** sub-menu.

> **Note: Offset** modes are unavailable if the *Direct/Reverse* measurement method is selected.

Both **Sideshot** and **Traverse** modes support measurements using a total station in direct position only and measurement sets when total station is used in both direct and reverse position.

- **Direct** - the measurement to a single point is taken using the direct position of the total station.
- **Direct/Reverse** - the measurement to a single point is taken using one direct and one reverse measurement (i.e., plunge - flip and rotate the total station by 180 degrees to get the reverse measurement). These two measurements constitute a measurement set. This measurement method is used to eliminate the vertical circle centering errors.

Set up the measurement method in the Survey Settings dialog. This dialog is a part of the Optical configuration wizard. It's possible to change the measurement method in the topo survey by clicking  in the dialog's title bar. The dialog title will change according to the selection:

- *Sideshot-Direct*;
- *Sideshot-Direct/Reverse*;
- *Traverse-Direct*;
- *Traverse-Direct/Reverse*.

Use the view selector in the dialog title bar to switch between *Normal* view and *Map* view at any time:

- **Normal view** - provides supervising of measured locations, offers on-screen guidance for operating the total station, and contains measurement saving tools.
- **Map view** - shows the measurement process in real time on the map and contains measurement saving tools including buttons with quick codes.
- When surveying in the *Direct/Reverse* mode, an additional view is available:
  Meas Set view - shows the detailed data of performed measurement set, and offers options to accept or redo this measurement set. This view is accessible at any time but also opens automatically after completion of each direct / reverse measurement set. More...

Taking measurements is possible in both dialog views, *Normal view* and *Map view*. More...

Switch to the *Normal view* to set up, review and modify collected points data before or during the topo survey.

- The **Point** field displays the name of the next collected point. Enter a point name manually or keep an automatically incremented name suggested according to point naming settings.

- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking

the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.

- Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

> **Note:** Next point collected in this survey session will have the code of the previous point if the **Codes** box was checked in the Persistence tab of the Code Options dialog. The user can manually enter a new code or remove currently used code for the next point at any time.

- In the **Note** field, enter a description for the next collected point.
- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- Depending on the TS type and model, the information about current measurement is displayed along with short description of currently performed action:
  - **HA** - current value of the horizontal angle;
  - **VA** - current value of the vertical angle;
  - **SD** - current value of the slope distance.

> **Note:** Displayed **HA** / **VA** /**SD** values can be changed to calculated coordinate values of the currently measured point. Click  and select **Setup** - **Display Coords**. Activated mode is marked with .

Switch to the *Map view* at any time to visually overview the occupation position, the positions of possible reference objects, and the current target location. Tools available in the Map view:

- Status and Tools panels at the top;
- Topo panel at the bottom;
- Map View Tools at the right side.
- **Context menu** displayed on a long tap (right-click) in empty space of the map:
  - *Find me here* - forces the connected robotic total station to turn and search for a prism in the direction from where this command was called.
  - *Set Simulator Here* - "moves" you to the point on the map where the menu was called. Only displayed if the simulation mode was selected in the configuration.
  - *Move Profile View Here* - centers the Profile View semitransparent overlay panel on the screen where the menu was called. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel. Only displayed if **Profile View** was selected in Map Properties dialog.
  - *Create Field Report* - opens the Field Report dialog.
  - *Reverse Direction* - reverses the direction (swaps start and end points) of the currently selected linework.

- **Configurable Data fields** - to display values of desired parameters during topo survey. The *Map view* has six customizable data fields  in the bottom part of the screen. To set up or change the data displayed in such field, tap or click on the field to open the Select Value to display dialog and select the required item from a list of all available parameters for the current survey mode.

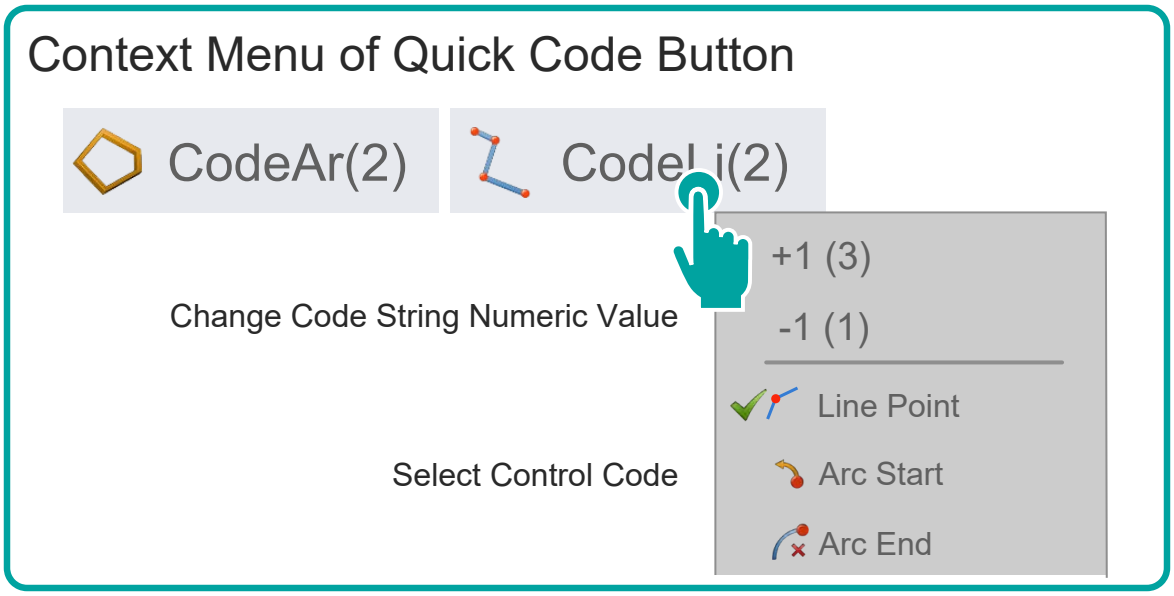
To avoid cluttering of the elements displayed on the map at the current zoom level, they are combined. Closely positioned points are displayed as a single point with a bracketed number of hidden points next to its name: for example, *P001{5}*, where *5* is the number of hidden (not displayed) points. If there are more than 99 cluttered points, they will be displayed as *{99+}*. Hidden elements become visible with the further zoom in.

Note: When measuring lines or areas with points having code of Line or Area type, you may need to extend an existing line or area. As a rule, you have a common code and an individual numeric code string assigned to each of them. To extend a line or area, simply click it - this will instruct Sokkia Field that the selected line or area should be extended with the point you are going to measure next. You can identify your selection: the code and code string in the topo panel at the bottom will be adjusted to the selected object automatically.

The selected line will be extended depending on the side the line is clicked.

The *Map view* is required to use overlay buttons with quick codes to collect field data and save a point with assigned code or codes by single tap or click.

Quick code buttons with assigned code of Line or Area type feature their own context menu available on right click (long tap). This menu allows the user to quickly add the desired control code to the point. If a numeric code string is assigned to the code on the quick code button, this menu is also useful to quickly increase or decrease the code string number and switch to another line / area in a simple way rather than having to type in the number.



For more information on the available controls and TS statuses, see the Status and Tools Panels (Optical survey) and Topo Panel (Optical survey).

Click to open the Survey settings dialog.

Click the **EDM** button to quickly access TS functions and parameters that are frequently used and changed during survey. More...

Click to open the dialog menu with additional options. More...

Topo Dialog Pop-up Menu (Optical Survey)

To access additional commands and options available in the Optical Topo survey dialogs.

The dialog pop-up menu is available by clicking in the top left corner and includes additional command options which can be useful in the field during survey.

Note: Actually available menu items depend on the current project, survey configuration and the current survey task.

- **Measure** - click the item to expand the sub-menu:
  - Sideshot - to measure individual points.
  - Traverse - to measure traverse points.
  - List of offset measurement modes. More...

- **Setup** - click the item to expand the sub-menu:
  - Reference CL - to specify a reference centerline for a topo task. The offset values from the line and distance from the first point of the line can help you to perform the topo survey.
  - Reference Surface - to specify a reference surface for a topo task. The cut / fill value from the reference surface can help you to perform the topo survey.
  - Backsight - to setup the backsight location.
  - Topo Output Config - to configure settings for data output in the *Topo* and *Auto Topo* survey.
  - PTL Mode - to set up the point to line method of interpretation of point coordinates. Enabled PTL mode is marked with ✔. The PTL horizontal coordinates are calculated as offsets from the specified reference line (along line and left / right offset).
  - **Monitor Config** - to review and configure the Monitor Options during the Monitor session.
  - **Display Coords** - to display coordinates of the current target (instead of HA, VA and SD) in the Normal View. Activated mode is marked with ✔.
  - **Simulator** - to enable or disable the control keys to change the simulated depth value. More... Activated feature is marked with ✔. (Available if the **Simulation Mode** box was checked in the Depth Finder dialog during survey configuration).
  - **Use Depth** - to receive data from the connected depth finder. Activated mode is marked with ✔. To display the current water depth, click on a customizable data field and select the *Depth* parameter in the Select Value to Display dialog.
  - Grid Lines - to set up a grid to be displayed on the Map for assistance while collecting points.
  - **Move instrument** - to move the instrument to the next position during the Traverse survey and to change occupation point to the previous foresight point and the backsight point to the previous occupation point.
  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.

- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- Edit Points - opens the dialog to view and manage points in the project.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- **Robotic** - click the item to expand the sub-menu:
  - **Remote Settings** - to open the Search/Track Parameters dialog and set up how the robotic TS searches for and tracks a target (reflector).
  - **Search:** - to select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with ✓:
    - **Search: Nearest** - to activate this mode and ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - to activate this mode and give the search reflector priority to the RC signal.
  - **Tilt** - to open the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** - if this mode is enabled, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation. Activated mode is marked with ✓.
- **Volume Report** - to open the Surface Topo Volume Report dialog to display the current stockpile / pit volume report. (Available in the Surface survey).
- **Raw Data** - click the item to expand the sub-menu:
  - **Add Raw Note** - to open the Add Raw Note dialog where you can enter any description during the survey if required.
  - **View Last Point** - to open the Last Point Data dialog with the information about the last point.
  - **Edit** - to open the Raw data dialog with raw data collected in the project.
- **Quick Codes** - click the item to expand the sub-menu:
  - <*Menu items with the names of quick codes groups*> - to select the name of an existing quick codes group and display its code buttons on the map for quick measurement, adding assigned codes, and saving a point with one click. Currently used code group is marked with ✓. These items are visible in menu if quick codes groups are created. To create desired quick codes groups, select **Edit Quick Codes**.
  - **Hide Quick Codes** - to hide all quick code buttons on the map.

- **Edit Quick Codes** - to open the Quick Codes tab of the Code Options dialog and configure quick codes and create groups.

EDM Button

The **EDM** button is located in the title bar of Sokkia Field dialogs where measurements with total station are performed. This button opens the drop-down menu with a set of TS functions and parameters that are frequently used and changed during survey. Actually displayed menu items depend on the TS model and the type of currently performed measurements.

- **EDM Mode settings** - clicking this menu items opens the Measurement Modes dialog to modify the current EDM mode.
  - *Precise EDM*: <*currently used setting*> of Precise mode for current TS and survey configuration;
  - *Quick EDM*: <*currently used setting*> of Quick mode for current TS and survey configuration.

  > **Note:** For instruments supporting only one EDM mode, the menu displays all the available EDM settings for that instrument. Click the desired EDM setting to instantly turn it on. Currently used EDM setting is marked with ✔.

- **Target Type settings** - currently used target type is marked with ✔. Click the desired item to switch to that target type.
  - *Prism* - target type is the currently selected prism;
  - *Non-Prism* - target type is non-prism;
  - *Long Non-Prism* - target type is long range non-prism;
  - *Sheet* - target type is sheet.

- **Auto Target** - automatic searching, locking, and saving the measurement on clicking  /  button during the survey with robotic TS. Click the item to turn the feature on / off. ✔ indicates that the feature is active.

- **Guides On / Off** - currently used setting is marked with ✔. Click the desired item to switch to that setting.
  - *Point Guide On* - turn on the point guide on the TS;
  - *Laser Guide* On - turn on the laser guide on the TS;
  - *Off* - turn off guide lights on the TS.

- **Angle-Only** - when measuring a point, Sokkia Field saves only HA and VA values instead of point coordinates. Click the item to turn the feature on / off. ✔ indicates that the feature is active.

Taking Measurements

To perform measurement with a total station.

Depending on the total station type, Sokkia Field offers the following ways to take measurements.

For **Conventional** total station survey type:

When using the Conventional Total Station you may quickly save a single measurement, or you may perform a single measurement to the point; verify the result and then confirm or reject the saving:

- Click  to take the single measurement to the point and automatically save it.
- Click  to obtain the single measurement. Then click  to save it or click  to discard the measurement.

Note: Survey settings (click  in the dialog title bar) and EDM selections (click **EDM** in the dialog title bar) are applicable to both buttons ( and ) in the Conventional total station survey type.

For **Robitic** total station survey type:

The Robotic Total Station automatically takes the measurement to the target in either *Quick mode* or *Precise mode*. There are two buttons in the dialog:

- When you click , the Robotic starts measurement in the *Quick mode*. You can set the desired parameters for the mode in the Survey Settings dialog by clicking  in the dialog title bar. Depending on your settings for the Quick mode you can save either a single or an averaged measurement in the Fine / Rapid (Coarse) / Tracking mode to the project.
- When you click  the Robotic starts measurement in the *Precise mode*. You can set the desired parameters for the mode in the Survey Settings dialog by clicking  in the dialog title bar. Depending on your settings for the Precise mode you can obtain either continuous measurements, or a single or an averaged measurement in the Fine / Rapid (Coarse) / Tracking mode. Also you can select the Auto Store option, when either the single or the averaged measurement

will be automatically stored in the project. If you did not set this option, click  to save the measurement, or click  to discard the measurement.

Offsets in Topo Survey (Optical)

Offsets in topographic survey (optical) provide extended possibilities for determining the coordinates of points that are not available for direct measurement, hidden, or even physically non-existent. This is realized through measurements to accessible locations, special surveying techniques and background calculations. Sokkia Field offers multiple offset modes that combine advanced interface tools for easy and fast collection of ancillary data and calculation routines for offset measurements.

To enable the desired offset mode, click  in the top left corner of the Topo Survey (Optical) dialog and click **Measure** to expand the menu with available offsets:

> **Note:** Offset modes are available only for the **Direct** measurement method. Prior to enable one of the offset modes, ensure this method is currently used. If necessary, select it in the Survey Setting dialog (by clicking  in the title bar of any optical topo survey dialog).

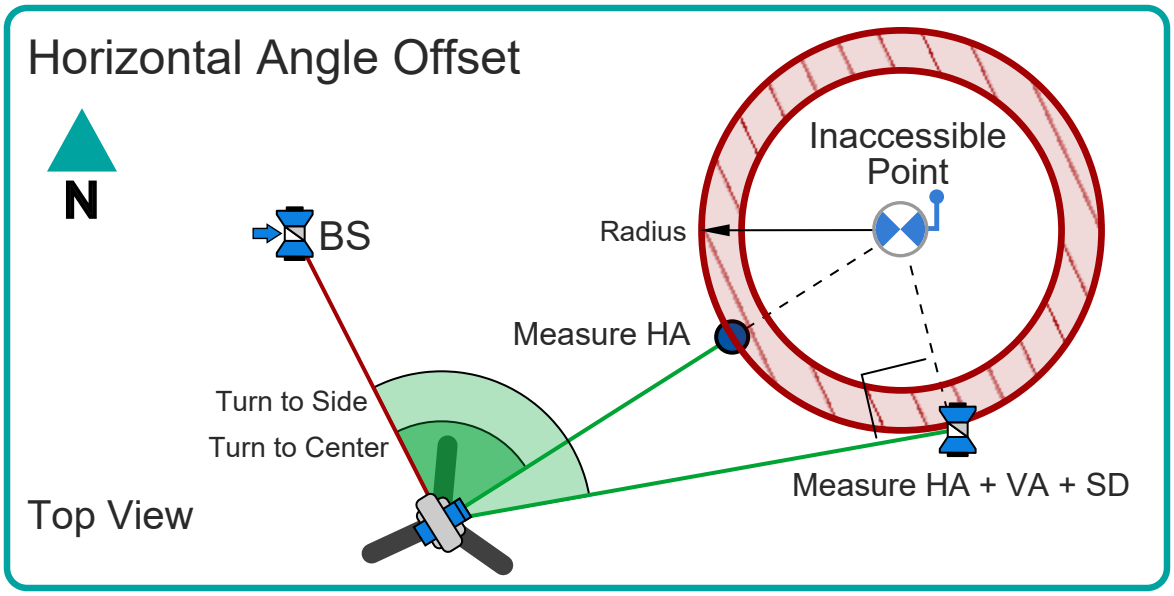
- Horizontal Angle Offset - to determine a point using the horizontal angle from one point and the distance to another.
- Horz / Vert Angle Offset - to determine a point using the horizontal and vertical angles.
- Distance Offset - to determine a point by adding or subtracting distances, horizontally and vertically.
- Hidden Point - to determine a point with a slanted rod touching this point.
- Two Line Intersection - to determine a point by the intersection of two lines, which are specified by measuring two points on each of the two lines.
- Line and Corner - to determine a point on the corner by the line defined by two points and a horizontal angle measurement.
- Line and Offset to determine a point in a distance from the line defined by two points.
- Plane and Corner - to determine a point on the plane, measured from the three available points, and horizontal and vertical angle measurement to an inaccessible point.
- Column Offset - to determine a center point (inaccessible point) inside the column or tree using the distance and angle measurements.
- Vertical Search Offset - to determine a point using the horizontal angle of the ferrule of the pinpole and the vertical angle and slope distance of the prism (*available for Robotic TS*).

Horizontal Angle Offset

To determine the horizontal (2D) coordinates of an inaccessible inner center of pipe / tree / pillar using distance and angle measurements.

To enter this offset mode, click ☰ in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Horizontal Angle Offset**.

Horizontal Angle Offset mode requires measurement of two locations: HA measurement to the visible center of the pipe / tree / pillar and HA + SD measurement to the side of the pipe / tree / pillar so that the line station - prism is tangent. VA measurements are not taken into account in this mode.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Take two required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance and horizontal angle to the side of the pipe / tree / pillar (position the prism on the side of the pipe / tree / pillar so that the station-prism line is tangent).
  - Aim the total station to the visible center of the pipe / tree / pillar and click the 2 button to measure the horizontal angle.

Note: The inaccessible point lies on the perpendicular to the station-prism line at the prism point.

After taking two measurements, Sokkia Field calculates horizontal coordinates and stores the inaccessible point to the project. The vertical coordinate of the inaccessible point is not considered. The stored point has the  icon in point listings of the current project.

Horizontal / Vertical Angle Offset

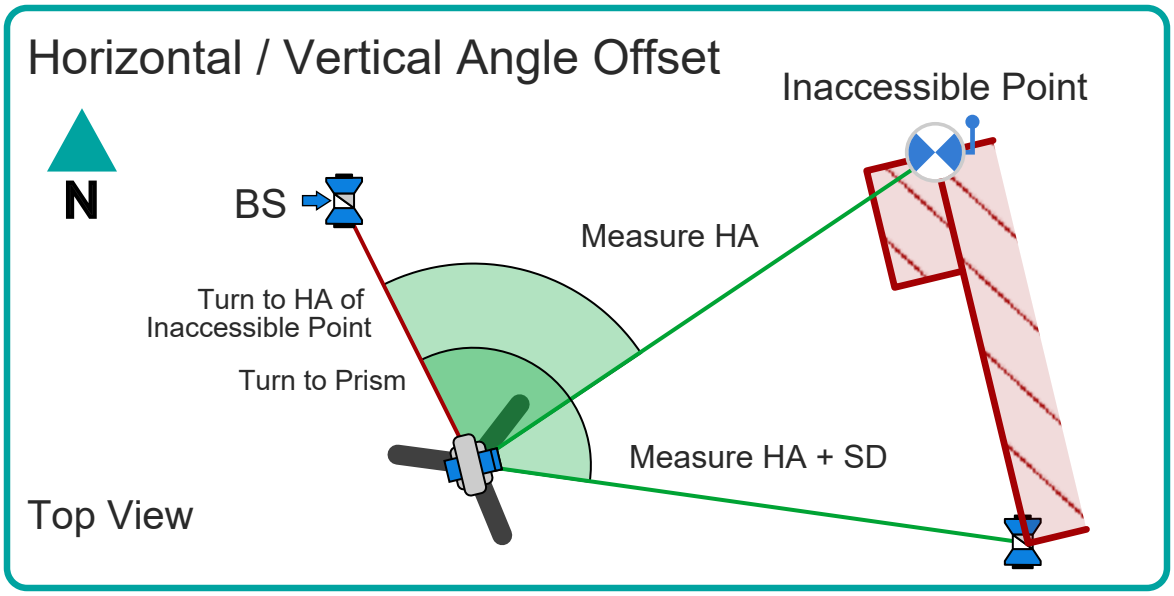
To determine the horizontal and vertical (3D) coordinates of an inaccessible point using angle measurement to this point and angle and distance measurement to an accessible point.

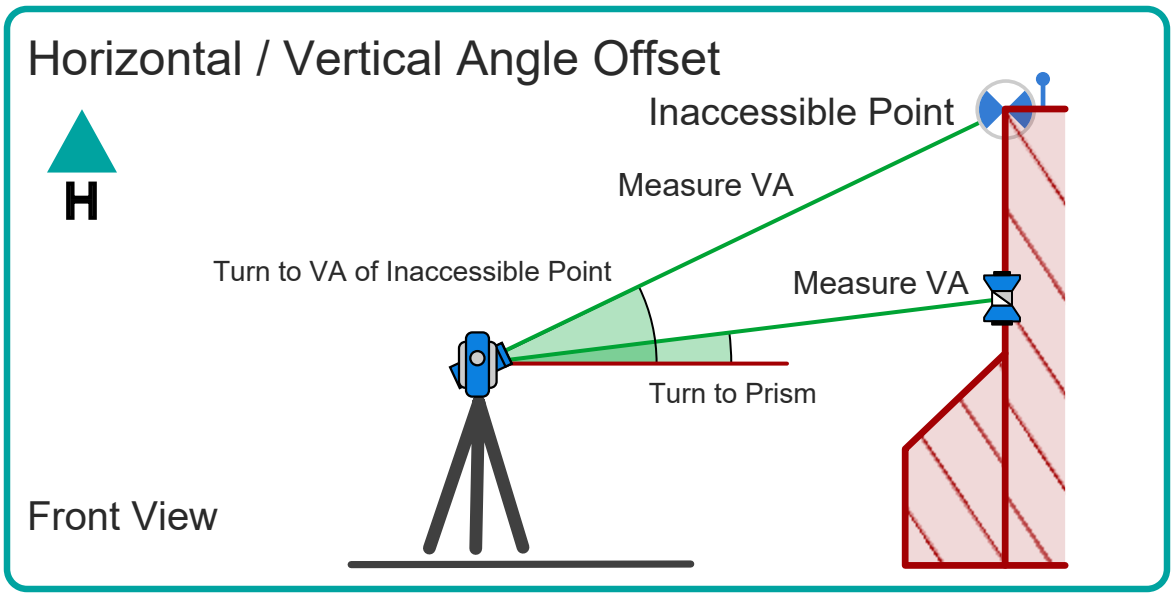
To enter this offset mode, click  in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Horz / Vert Angle Offset**.

Horizontal / Vertical Angle Offset mode requires measurement of two locations: HA+VA measurement to the inaccessible point and HA+VA+SD measurement to the prism located at the same horizontal distance from the station as the inaccessible point.

Horizontal coordinates are calculated based on measured values of horizontal angles to the accessible point and inaccessible point and the assumption that the horizontal distance from the total station to the accessible point is equal to the horizontal distance from the total station to the inaccessible point.

Vertical coordinate is calculated based on measured values of vertical angles to the accessible point and inaccessible point.





- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Take two required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, horizontal and vertical angles to the prism located at the same horizontal distance from the station as the inaccessible point.
  - Aim the total station to the inaccessible point and click the 2 button to measure the horizontal and vertical angle.

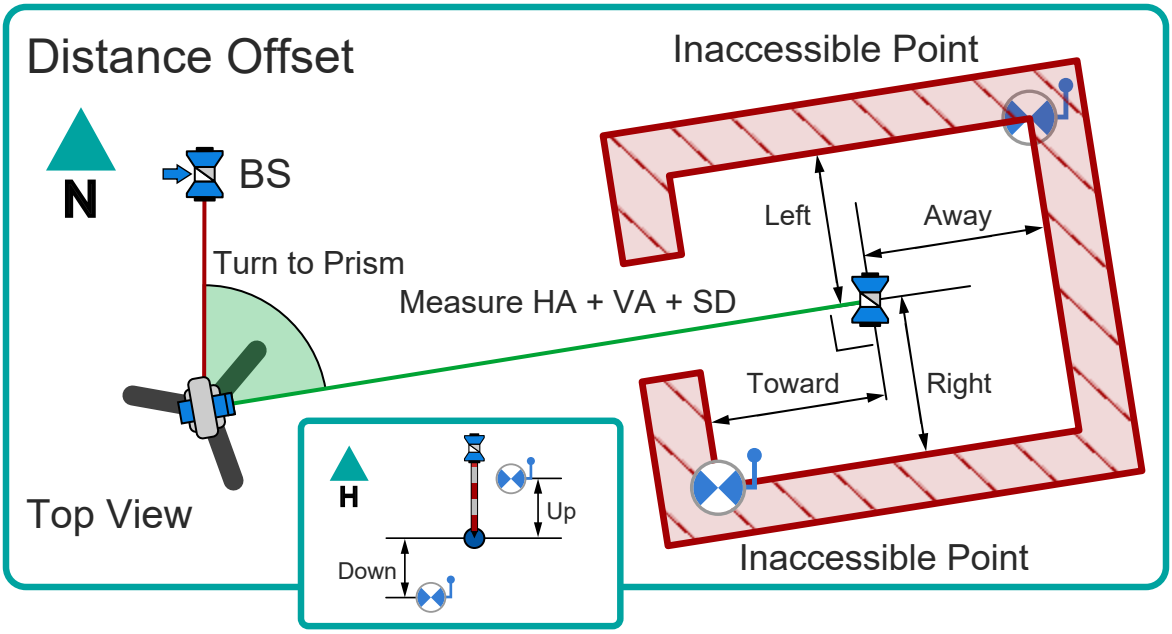
After taking two measurements, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the icon in point listings of the current project.

Distance Offset

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using angle and distance measurement, and additional distance offsets measurements, for example performed with the tape.

To enter this offset mode, click in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Distance Offset**.

Distance Offset mode requires measurement of one location: HA+VA+SD measurement to an accessible point, and manually enter the offset directions and distances from that point to the inaccessible point.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Place the target at an accessible point from which you can enter offsets to the inaccessible point. Click / (precise / quick measurement mode) to take measurement.
- Enter offset directions and distances from the measured point to the inaccessible point in the Enter Distance Offsets dialog that opens automatically.

After taking the measurement and entering offset directions and distances, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the  icon in point listings of the current project.

Enter Distance Offsets (Distance Offset)

To enter the offset values from the measured prism point to the inaccessible point:

- *Away* / *Toward* - the horizontal distance from the prism point along the line station - prism;
- *Right* / *Left* - the horizontal distance from the inaccessible point in perpendicular to the line station - prism;
- *Up* / *Down* - the height offset from the prism point.

> **Note:** You can define the direction of any offset in two ways: either click on the corresponding button of the current selection, or use the minus sign "-" for the current value. For instance, *Away 2.560* and *Toward -2.560* directions are the same.

Check the **Right/Left Offset: Rod to TS** box to calculate and display the offset relative to the direction *from TS to Rod*. Clear the box to calculate and display the offset relative to the direction *from Rod to TS*.

> **Note:** Changing the status of the **Right/Left Offset: Rod to TS** check box in this dialog also changes the **Right/Left Rod to TS** setting in the Miscellaneous dialog for the optical survey configuration.

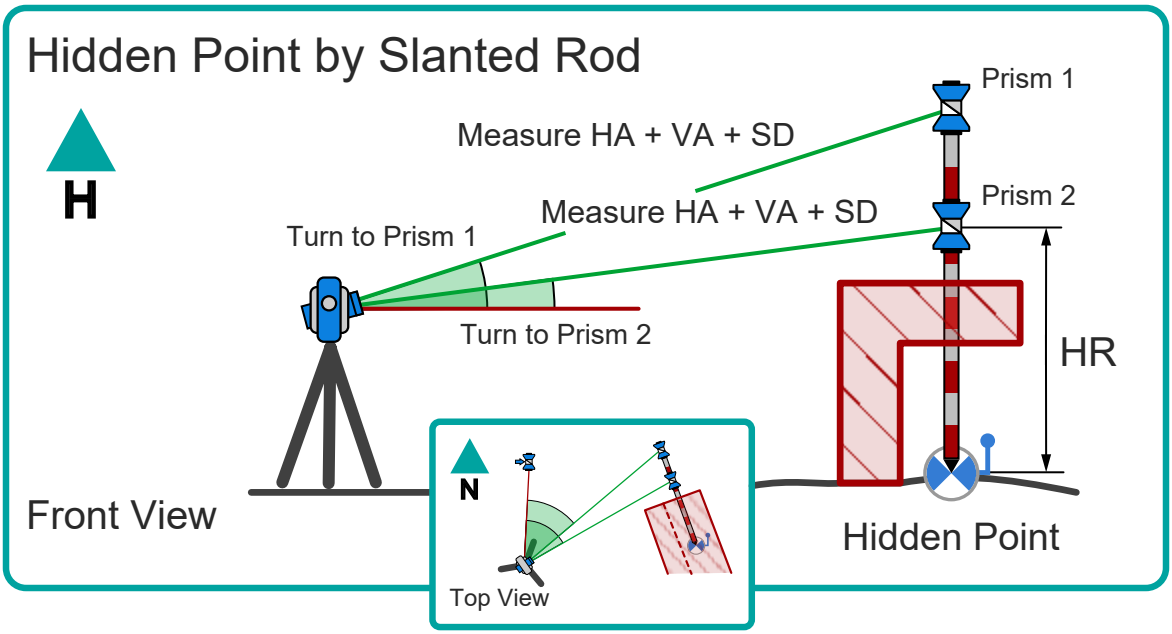
Click  to accept entered values, calculate the inaccessible point coordinates and close the dialog. Click  to discard entered values and return to the Distance Offset dialog without calculations.

Hidden Point

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using distance and angle measurements to two prisms located on the slanted rod touching this point.

To enter this offset mode, click  in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Hidden Point**.

Hidden Point mode requires measurements to two prisms on the rod: HA+VA+SD measurement to the top prism and HA+VA+SD measurement to the bottom prism.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).

  Note: Enter the distance between the pole tip and the bottom prism in the **HR** (height of the target) field.

- Click the button in the bottom of the dialog to open the Hidden Point Options dialog and set up a distance tolerance check for upcoming measurements of two prisms.
- Take two required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, horizontal and vertical angles to the top prism on the rod.
  - Click the 2 button to measure the slope distance, horizontal and vertical angles to the bottom prism on the rod.

After taking two measurements, Sokkia Field checks the tolerance (if enabled), then calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the icon in point listings of the current project.

Hidden Point Options

To configure the tolerance check for measured distance between two prisms on the slanted rod.

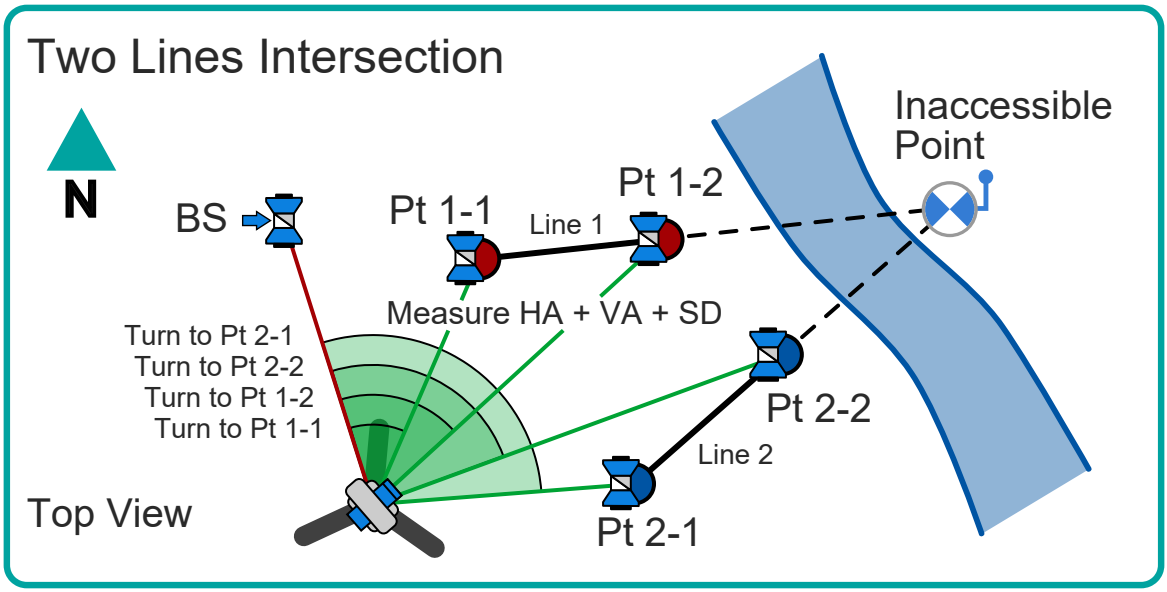
- **Check tolerance before storing** - check the box to enable the tolerance check before storing the results of a hidden point measurement. With cleared box, the measured results are stored always.
- If the **Check tolerance before storing** box is selected , specify the **Distance between prisms** and **Tolerance** values. The point will only be saved if the difference between the entered distance and the distance between the prisms calculated from the two measurements is within the specified tolerance. The measurement rejection message will be displayed if the difference is out of tolerated range.

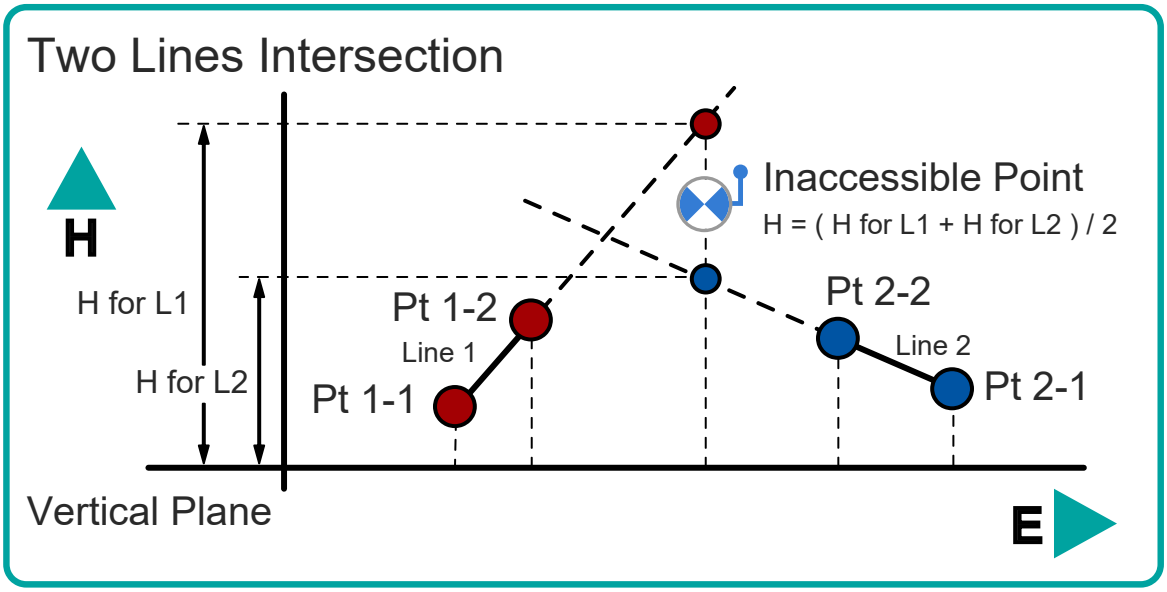
Two Lines Intersection

To determine the horizontal and vertical (3D) coordinates of an inaccessible point as the intersection of two lines, which are defined by measuring two accessible points on each of the two lines.

To enter this offset mode, click  in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Two Lines Intersection**.

Two Lines Intersection offset mode requires four measurements to define two lines which intersection is an inaccessible point. Measure HA+VA+SD to two accessible points on each line.





- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Take four required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, horizontal and vertical angles to the first point of the first line.
  - Click the 2 button and measure the slope distance, horizontal and vertical angles to the second point of the first line.

- Click the  button and measure the slope distance, horizontal and vertical angles to the first point of the second line.
- Click the  button and measure the slope distance, horizontal and vertical angles to the second point of the second line.

Note: The height of the inaccessible point is calculated as the mean of heights of each line at the intersection point.

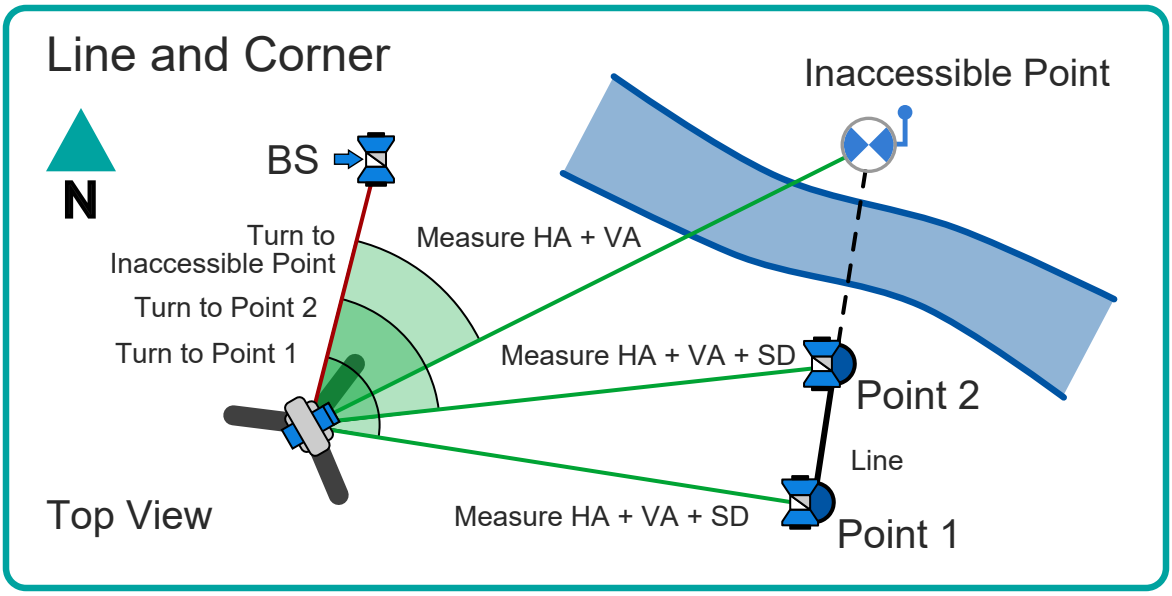
After taking four measurements, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the  icon in point listings of the current project.

Line and Corner

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using angle measurement to this point and angle and distance measurements to two accessible points lying on the line with the inaccessible point.

To enter this offset mode, click  in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Line and Corner**.

Line and Corner offset mode requires measurement of three locations: HA+VA measurement to the inaccessible point and HA+VA+SD measurements to two accessible points on the same line with the inaccessible point.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Take three required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, vertical and horizontal angle to the first point of the line.
  - Click the 2 button to measure the slope distance, vertical and horizontal angle to the second point of the line.
  - Click the 3 button to measure the vertical and horizontal angle to the inaccessible point.

> **Note:** The vertical coordinate of inaccessible point is calculated as the height of the line at that point (calculated by extrapolation along the Point 1 - Point 2 line).

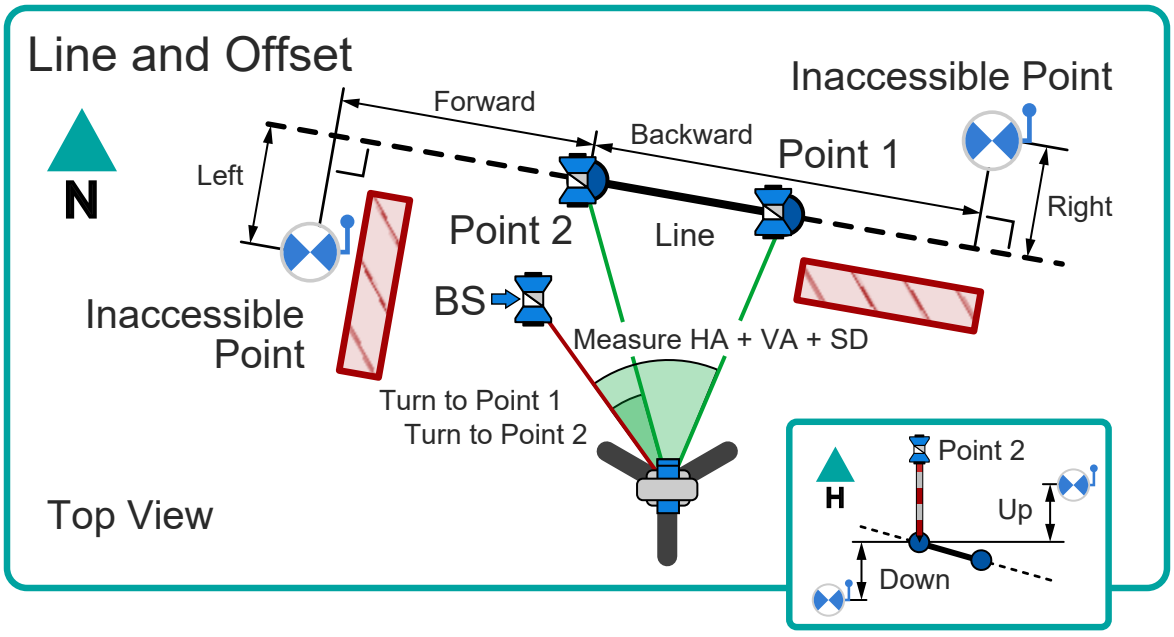
After taking three measurements, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the icon in point listings of the current project.

Line and Offset

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using angle and distance measurements to two accessible points defining the direction for offsets and additional distance offsets measurements, for example performed with the tape.

To enter this offset mode, click ☰ in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Line and Offset**.

Line and Offset mode requires measurement of two locations: HA+VA+SD measurements to two accessible points defining the line direction for offsets. The second measured point of this line is the origin point for calculating offsets.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Take two required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, vertical and horizontal angle to the first point (Point 1) of the line.
  - Click the 2 button to measure the slope distance, vertical and horizontal angle to the second point (Point 2) of the line.

- Enter offset directions and distances from the measured second point (Point 2) of the line to the inaccessible point in the Enter Distance Offsets dialog that opens automatically.

> **Note:** The vertical coordinate of inaccessible point is calculated as the vertical coordinate of the second measured point (Point 2) plus entered vertical offset value.

After taking the measurements to two accessible points and entering offset directions and distances, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the  icon in point listings of the current project.

Enter Distance Offsets (Line and Offset)

To enter the offset values from the measured line to the inaccessible point:

- *Forward* / *Backward* - the horizontal distance from the second point along the line Point 1 - Point 2;
- *Right* / *Left* - the horizontal distance from the inaccessible point in perpendicular to the line Point 1 - Point 2;
- *Up* / *Down* - the height offset from the second point (Point 2).

> **Note:** You can define the direction of any offset in two ways: either click on the corresponding button of the current selection, or use the minus sign "-" for the current value. For instance, *Forward 12.000* and *Backward -12.000* directions are the same.

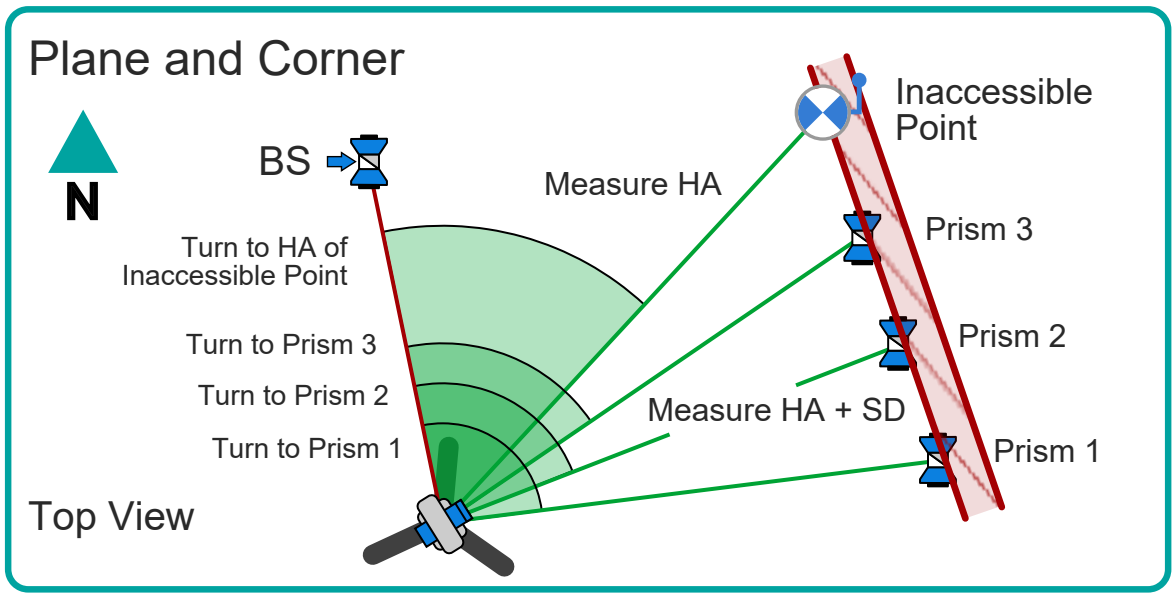
Click  to accept entered values, calculate the inaccessible point coordinates and close the dialog. Click  to discard entered values and return to the Line and Offset dialog without calculations.

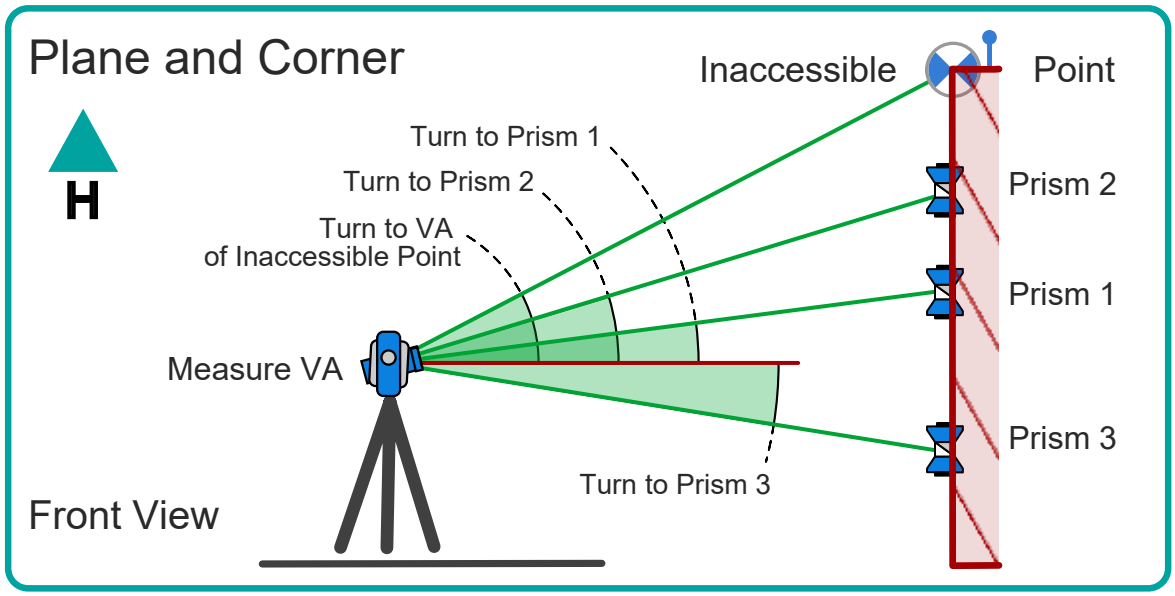
Plane and Corner

To determine the horizontal and vertical (3D) coordinates of an inaccessible point using angle measurement to this point and angle and distance measurements to three accessible points lying in the same plane as the inaccessible point. Note, that all four points must not be on the same line.

To enter this offset mode, click  in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Plane and Corner**.

Plane and Corner offset mode requires measurement of four locations: HA+VA measurement to the inaccessible point and HA+VA+SD measurements to three accessible points forming one plane with the inaccessible point.





- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Take four required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, vertical and horizontal angle to the first point (Prism 1) on the plane.
  - Click the 2 button to measure the slope distance, vertical and horizontal angle to the second point (Prism 2) on the plane.

- Click the 3 button to measure the slope distance, vertical and horizontal angle to the third point (Prism 3) on the plane.
- Click the 4 button to measure the vertical and horizontal angle to the inaccessible point.

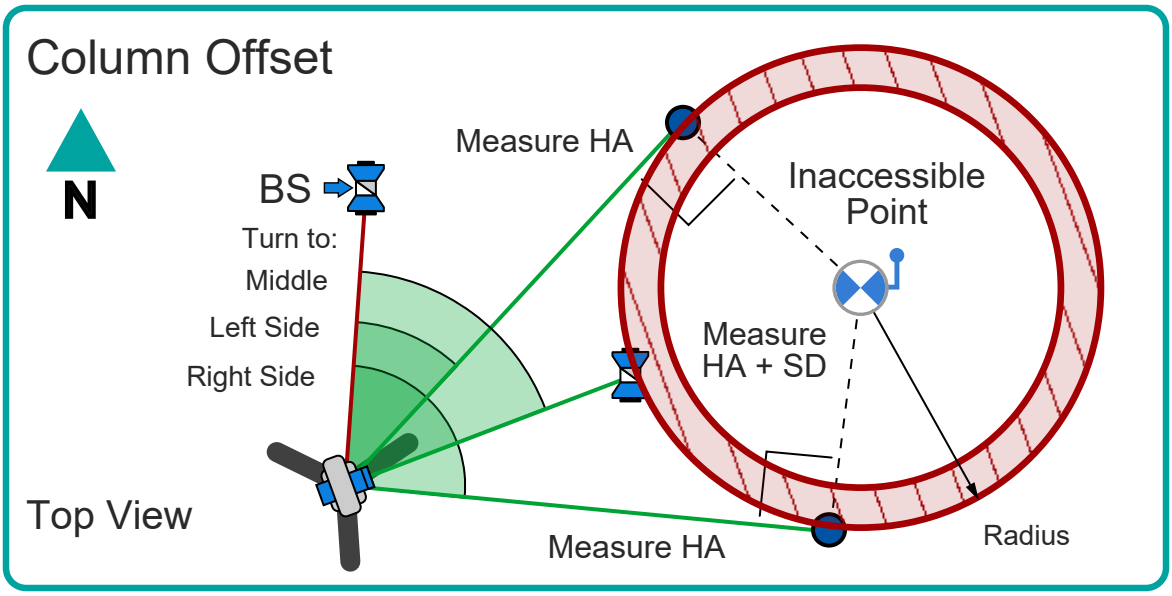
After taking four measurements, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the icon in point listings of the current project.

Column Offset

To determine the horizontal coordinates of an inaccessible inner center of pipe / tree / pillar using distance and angle measurement to the visible center and horizontal angle measurements to left and right sides of pipe / tree / pillar.

To enter this offset mode, click in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Column Offset**.

Column Offset mode requires measurement of three locations: HA measurements to the left and right sides of the pipe / tree / pillar so that the lines of sight are tangent and HA + SD measurement to the middle of the pipe / tree / pillar. VA measurements are not taken into account in this mode.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).

- Take three required measurements in any order using the respective buttons:
  - Click the  button to measure the slope distance and horizontal angle to the middle of the pipe / tree / pillar (position the prism in the middle of the pipe / tree / pillar).
  - Aim the total station to the left side of the pipe / tree / pillar so that the line of sight is tangent, and click the  button to measure the horizontal angle.
  - Aim the total station to the right side of the pipe / tree / pillar so that the line of sight is tangent, and click the  button to measure the horizontal angle.

After taking three measurements, Sokkia Field calculates horizontal coordinates and stores the inaccessible point to the project. The vertical coordinate of the inaccessible point is not considered.

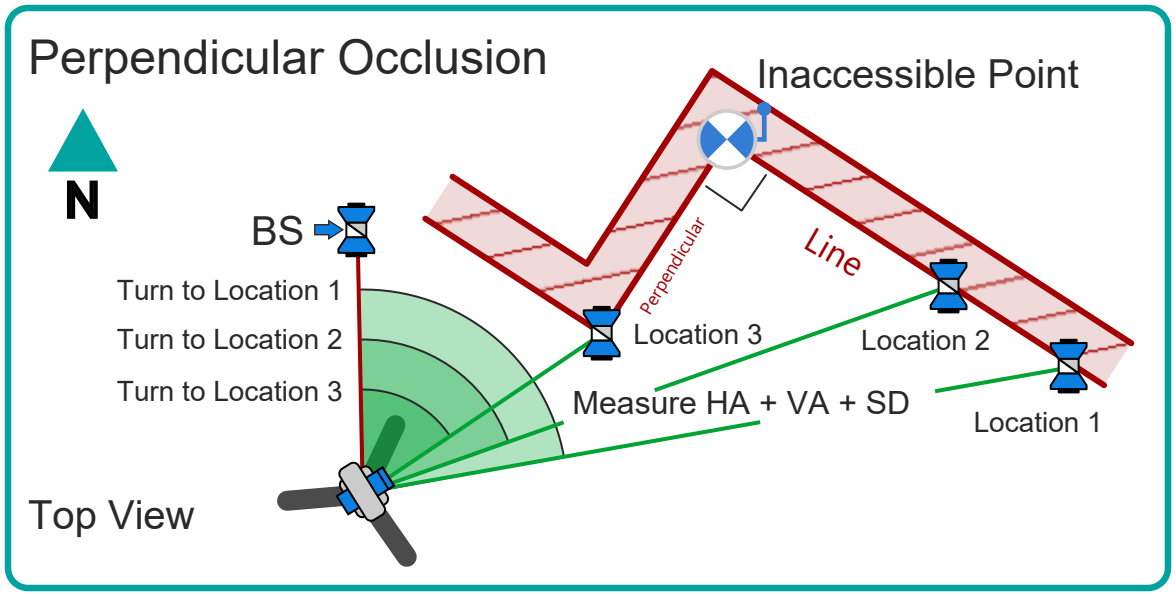
The stored point has the  icon in point listings of the current project.

Perpendicular Occlusion

To determine the horizontal and vertical (3D) coordinates of an inaccessible point on a visible line that is the intersection point of a perpendicular from an accessible point to that line.

To enter this offset mode, click  in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Perpendicular Occlusion**.

Perpendicular Occlusion mode requires measurement of three locations: HA+VA+SD measurement to any two locations on the known line and HA+VA+SD measurement to a known point which defines the perpendicular to the line.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).

  Note: In most situations, when using the Perpendicular Occlusion mode, you'll just aim at walls, so you can set up a reflectorless target.

- Take three required measurements in any order using the respective buttons:
  - Click the 1 button to measure the slope distance, horizontal and vertical angles to the first visible location on the known line.
  - Click the 2 button to measure the slope distance, horizontal and vertical angles to the second visible location on the known line.
  - Click the 3 button to measure the slope distance, horizontal and vertical angles to the point which defines the perpendicular to the line.

After taking three measurements, Sokkia Field calculates horizontal and vertical coordinates and stores the inaccessible point to the project. The stored point has the icon in point listings of the current project.

Vertical Search Offset

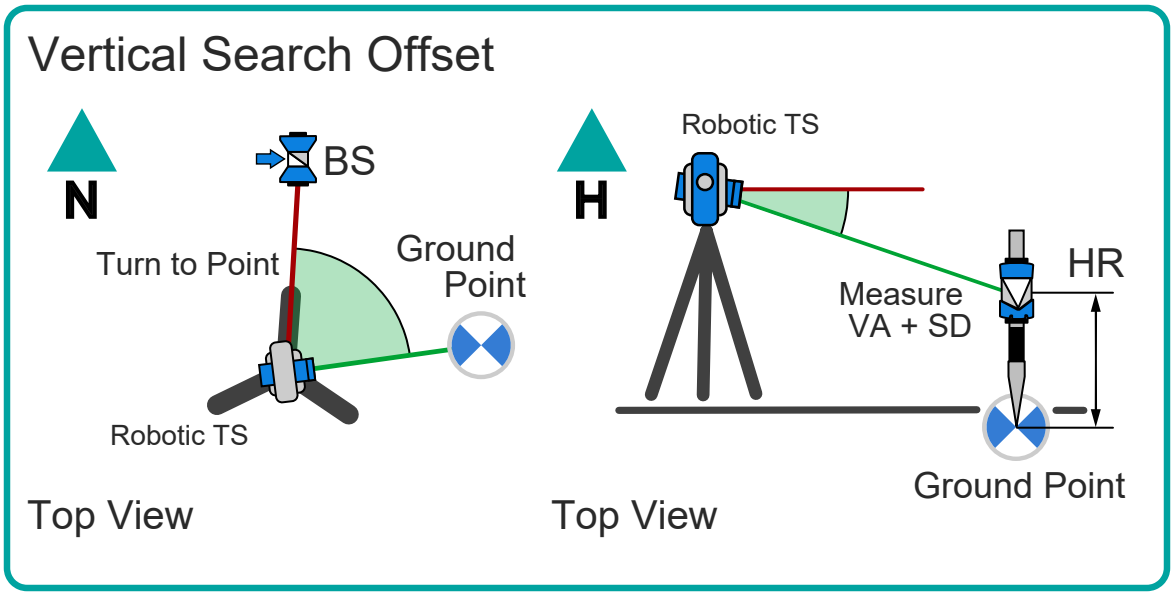
To determine the horizontal and vertical (3D) coordinates of a ground point by manual aiming to the ferrule of the pin-pole to measure HA and then instruct the robot to search for a prism on the rod to measure vertical angle and slope distance.

This method increases the measurement accuracy by reducing the influence of a possible inclination of the rod from the vertical. A pin-pole prism is also recommended.

> **Note:** Vertical Search Offset mode is only available for survey configurations with a robotic total station.

To enter this offset mode, click ☰ in the top left corner of the Topo Survey (Optical) dialog, click **Measure** to expand the sub-menu and select **Vertical Search Offset**.

Vertical Search Offset mode requires measurement of one location: manual aiming to the point to fix HA and measuring VA+SD.



- Enter the inaccessible point data (name, code and so on) to be stored in the project and set up the total station and target, just as described in the Topo survey (Optical).
- Aim the robotic total station to the ferrule of the pin-pole to fix the HA value for the upcoming measurement.
- Click  /  (precise / quick measurement mode) to measure VA and SD of the prism. The robotic total station will find the target automatically.

After taking the measurement, Sokkia Field calculates horizontal and vertical coordinates and stores the point to the project. The stored point has the  icon in point listings of the current project. The "*V*" symbol (Vertical Search) is automatically added to the end of text note for this point.



Auto Topo (Robotic TS)

To automatically collect points with robotic total station by auto-saving a point each time a specified criterion is met.

Auto Topo survey is supported by robotic total stations and allows you to collect points automatically. While the robotic total station is tracking the target, Sokkia Field checks the status of the criterion in real time and saves the obtained measurement result as another auto topo point in the project at the moment the criterion condition is met.

The criterion that triggers the saving of a point is defined in the Auto Topo settings dialog. This dialog is a part of the Optical configuration wizard for Robotic survey. It's possible to review and change the criterion at any time in the auto topo survey by clicking  in the Auto Topo dialog's title bar.

Use the view selector in the dialog title bar to switch between *Normal* view and *Map* view at any time:

- **Normal view** - contains tools to supervise collected point names and codes, displays currently performed measurement data and features the auto topo mode start / stop and instant manual save controls.
- **Map view** - shows the tracked target in real time on the map along with collected points and features the auto topo mode start / stop and instant manual save controls.

Switch to the *Normal view* to review and modify collected points data before going to the auto topo mode.

- The **Point** field displays the name of the first collected point. Enter a point name manually or keep an automatically suggested name.

  Note: Further points collected in auto topo mode in this survey session will be named automatically according to point naming settings.

- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

> **Note:** Further points collected in auto topo mode in this survey session will have the code of the starting point if the **Codes** box was checked in the Persistence tab of the Code Options dialog.

- In the **Note** field, enter a description for the first collected point.
- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

Switch to the *Map view* to start the auto topo survey and automatically collect points.

- Click  to start collecting points in auto topo mode. Sokkia Field immediately saves the measurement to the target as an auto topo point. The next point is automatically saved when the

auto topo criterion is met. The saved points counter for current auto topo session is displayed in the upper right corner of the map.

- Click  to finish current auto topo session. Sokkia Field stops auto saving points, the counter of saved auto points is reset at the beginning of the next session. Between sessions, it is possible to modify point naming, codes, etc., switch to the *Normal mode* and review and modify data for further points. Click  to start a new auto topo session.
- Click  to save the current measurement as a point immediately, regardless of the criterion status. Such a point is saved as an auto topo point in the project but isn't included in the auto topo counter and doesn't affect the current status of the criterion.

Note: To make auto topo points and their coordinates viewable in the project, open the Points dialog (click  >  >  to open), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Auto Topo Points** box in the list of point types. To display auto topo points on the Map, check the **Auto Topo** box in the Points tab of the Map Properties dialog (click  >  >  to open).

For more information on the available controls and TS statuses, see the Status and Tools Panels (Optical survey) and Topo Panel (Optical survey).

Click  to change the Survey settings and Auto Topo settings.

Click the **EDM** button to quickly access TS functions and parameters that are frequently used and changed during survey. More...

Click  to open the dialog menu with additional options. More...

Missing Line

To find or to verify the distance (horizontal, vertical, and slope distances) between two points (which usually have no direct visibility between them) by measuring them from the third point which has two given points in the direct visibility.

The *Missing Line* emulates the total station measurement from one point to another actually measuring these two points from the third point. The result is stored in the Raw Data database as the *MLM* type of measurement and marked with  icon in the list.

Sokkia Field offers two ways to use Missing Line feature: to measure the distance between two points that have an obstruction between them (clear the **Check Measurement** box) and to find the difference from the calculated distance between two known points and measured distance between these two points (select the **Check Measurement** box).

In the **Ref Line** tab, enter the data for missing line measurement and perform measurement.

- In the **Method** field, select either radial mode (*A-B, A-C*), or continuous mode *(A-B, B-C*) mode for missing line measurement.

- If the **Check Measurement** box is cleared, use missing line measurement to calculate the distance between two points:
  - In the **Start Point** field, specify a starting point for missing line measurement. Enter an existing point name manually, or select from the map  or from the list  of points in the project. Alternatively, you can measure a new point, click  to open the Sideshot dialog. After saving the measured point to the current project, this point is instantly entered to the corresponding field.
  - In the **End Point** field, specify an ending point for missing line measurement. Enter an existing point name manually, or select from the map  or from the list  of points in the project. Alternatively, you can measure a new point, click  to open the Sideshot dialog. After saving the measured point to the current project, this point is instantly entered to the corresponding field.
  - Click the **Calc** button to find the distance between two entered points. If these points were known project points the distance is calculated based on points data. If they were new points measured by a total station, the distance is calculated based on missing line measurement data. The **Data** tab opens and displays the result of missing line measurement.

- If the **Check Measurement** box is selected, use missing line measurement to find the difference between the calculated distance and measured distance between two points:
  - In the **Start Point** field, specify a starting point for missing line measurement. Enter an existing point name manually, or select from the map  or from the list  of points in the project. Then click  to open the Sideshot dialog and measure the specified point. After saving the measured point, the measured data is added as the check point for the specified point and used to find the difference between calculated and measured distances.
  - In the **End Point** field, specify an ending point for missing line measurement. Enter an existing point name manually, or select from the map  or from the list  of points in the project. Then click  to open the Sideshot dialog and measure the specified point. After saving the measured point, the measured data is added as the check point for the specified point and used to find the difference between calculated and measured distances.
  - Click the **Calc** button to find the distance between two measured points and find the difference between calculated and measured distances. The **Data** tab opens and displays the result of missing line measurement.

Use the **Data** and **Map** tabs to review the results of the Missing Line calculation:

- Review the Missing Line calculation results:
  - *Start Point* - the name of the first point for missing line measurement.
  - *End Point* - the name of the second point for missing line measurement.
  - *dHD* - the horizontal distance between the start and end point.
  - *dVD* - the vertical distance between the start and end point.
  - *dSD* - the slope distance between the start and end point.
  - *Diff_HDist* - the difference between the horizontal distances resulted from point coordinates and from performed measurements (available if the **Check Measurement** box was selected).
  - *Diff_VDist* - the difference between the vertical distances resulted from point coordinates and from performed measurements (available if the **Check Measurement** box was selected).
  - *Diff_SDist* - the difference between the slope distances resulted from point coordinates and from performed measurements (available if the **Check Measurement** box was selected).
  - The occupation setup is also included in the results.
- Click  to export the results to a **.txt* file.
- Open the **Map** tab to view the results graphically in the horizontal plane showing the start point, end point and the line between them.



Monitor Point List

To select a point list for repeatable measurements of targets located on points from this point list.

The Monitor function allows you to monitor targets located on points from a predefined point list. Repeatable measurements are recorded into the raw data file. Optionally, performed measurements or computed points coordinates can be outputted to a file or communication port in either the FC-6 or GTS-7 format. The output format and destination as well as other monitoring parameters can be configured in the Monitor Options dialog when configuring the total station or by clicking ☰ and selecting **Monitor Config** from the dialog menu.

- Select a point list to use in the monitor session:
  - In the **Point List** field, enter an existing point list name manually, or select it from the list  of point lists in the project.
  - The dialog displays the list and the plan view of points in the selected Point List. The point highlighted in the list is marked with a yellow circle on the plan view. The  /  button can be used to toggle the plan view of the point list.
  - Use  and  to move the highlighted point(s) up or down in the ordering. Use context menu to highlight multiple points:
    - **Select All** - highlights all points in the list.
    - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
    - **Select Multiple** - highlights multiple points by sequential clicking on point names.
    - **Cancel Selection** - removes all highlights in the list.
- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations.
- Click **Next** to start the monitoring. More...

Click ☰ to open the dialog menu with additional options:

- **Backsight** - to set a reference direction from an occupation point in the Backsight dialog.
- **Monitor Config** - to configure monitoring parameters in the Monitor Options dialog.
- **Edit Point Lists** - to view and manage project point lists in the Points Lists dialog.

Monitor

To perform repeatable measurements of one or more targets in the point list monitoring session.

During the monitoring session, the robotic total station will automatically find, lock and repeatably measure targets that are located on points of the monitored point list selected in the Monitor Point List dialog.

The dialog provides control over the monitoring process and offer tools to manually save measurements or to set up the automatic mode.

Use the view selector in the dialog title bar to switch between *Normal* view and *Map* view at any time:

- **Normal view** - contains tools to select and set up measurements saving mode, displays currently performed measurement data and features start / stop monitoring control.
- **Map view** - shows the monitoring process in real time on the map and features start / stop monitoring control.

Switch to the *Normal view* to select the measurement saving mode.

- The **Point** field displays the name of measured point. If the **Store As Check Point** box was checked in the Monitor Options dialog, measurements are saved as Check Points to the original points in the monitored point list; otherwise, they are saved as normal points. In case of normal points, the user can manually enter name for saved points.

  > **Note:** Click ☰ and select **Monitor Config** from the **Setup** sub-menu to review or change monitoring parameters in the Monitor Options dialog.

- Select a measurement saving mode from the **Auto** drop-down list:
  - Select *ON* to instruct the robotic total station to automatically rotate to the next point in the sequence and record a measurement.
    - Set the **Cycle Time** period. It is the total time for a complete sequence or cycle. If there is time left after a sequence is completed, the instrument will wait the appropriate amount of time before restarting the sequence. The monitor function will always complete the entire sequence, even if the measurements take longer than the cycle time.
    - In the **Retries** field, specify the number of repeated measurements of a point, if the first measurement failed.

  - Select *OFF* to instruct the robotic total station to automatically rotate to the next point in the sequence. The user should click ✔ to record a measurement. This permits to verify or correct the centering to the target prior to saving.

Click  in the bottom of either **Normal view**, or **Map View** to start the monitoring according to configured parameters. Click  to stop the monitoring.



Set Collection

To perform measurements using the Angle/Distance Sets - Dir/Rev method to eliminate centering errors in the horizontal and vertical circles in precision data collection.

When measuring a point using the **Angle/Distance Sets - Dir/Rev** method, the instrument will use the specified angle sequence to perform repeated measurements. The sequence of four measurements constitutes one set. The sequence consists of two measurements to the backsight in direct and reverse position of the total station and two measurements to the foresight point in direct and reverse position of the total station. The order of measurements in the sequence is customizable. Multiple foresight points can be included into the set of Angle/Distance Sets - Dir/Rev measurements.

Go through the Set Collection wizard to setup and perform measurements using this method.

1. Set up the occupation and backsight. More...
2. Optionally, enter weather conditions and observation information. More...
3. Configure Angle/Distance Sets - Dir/Rev measurement parameters. More...
4. Verify and correct survey settings for the instrument. More...
5. Optionally, define foresight point names, codes and target parameters for each of the points prior to measure them. More...
6. Perform Angle/Distance Sets - Dir/Rev measurements. More...
7. Review and manage performed measurements, grouped by sets. More...
8. Review aggregated Set Collection results and their compliance with the tolerances in the used measurement accuracy class. More...

Set Collection Setup

To specify the occupation point and the backsight for Angle/Distance Sets - Dir/Rev measurements.

This is the starting dialog of the Set Collection wizard.

By default, Sokkia Field offers current occupation point and current backsight. If they are not defined, specify them right from this dialog:

- In the **Occupy** group, define the occupation:
  - Enter the name of the **Point**, where the total station is located. You can set the occupation point in one of the following ways:
    - Type in a name of the point.

      Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

    - Choose a point from the map .
    - Choose a point from the list of the project points. Click  and select From List in the button menu.
    - Determine a point by the station, offset and elevation in relation to a road / alignment. Click  and select Station and Offset in the button menu.
    - Determine a point location by resection. Click  and select Resection in the button menu.
    - Compute the elevation of an occupied point by vertical resection. Click  and select Remote BM in the button menu.
  - In the **HI** field, enter the height of the instrument.
- In the **Backsight** group, define the backsight:
  - Set the toggle button to **Azimuth** (or **Bearing** depending on direction settings in the Display dialog) to enter a known direction.
    - Enter the direction value manually or click  to calculate the value of backsight direction from two project points or a segment of an existing linework in the Compute Azimuth / Bearing dialog.
  - Set the toggle button to **Point** to define the backsight by direction to a known point. Specify a known point in one of the following ways:
    - Type in a name of the point.

      Note: If you have entered a new point name, the software will prompt you to manually enter this point coordinates in the Add Point dialog.

    - Choose a point from the map .

  - Choose a point from the list of the project points. Click  and select From List in the button menu.
  - Determine a point by the station, offset and elevation in relation to a road / alignment. Click  and select Station and Offset in the button menu.
  - Perform control measurements to multiple known points and then select the backsight point. Click  and select Multiple BS from the pop-up menu.

- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

- Check the **Measure Distance** box to measure the distance to the backsight point, if required.

- Check the **Setup instrument for 3DMC** box - if checked, the occupation point coordinates, horizontal circle value and instrument height will be sent to the total station automatically. The horizontal circle value is equal to the BS direction value. The instrument height value is used for calculating the elevation of the instrument center mark. The dialog of the instrument will show this elevation. The field *HI* of the dialog will show "zero".
- Check the **Observation info** box to open the Observation info dialog, where you can enter meteo data for the session.

Click **Next** to proceed to configuration of Angle/Distance Sets - Dir/Rev measurement parameters.

Set Collection Config

To configure Angle/Distance Sets - Dir/Rev measurement parameters.

This dialog is a part of the Set Collection wizard.

- From the **Angle Sequence** drop-down list, select a desired measurement sequence for Angle/Distance Sets - Dir/Rev measurement set. *BS* is a backsight point, *FS* is a foresight point,

and ^ is the *Plunge* term that stands for flipping and rotating the total station telescope by 180 degrees.

- From the **Class** drop-down list, select a desired class. Each class contains the appropriate number and combination of angle and distance sets and tolerances. Click  to view details or edit classes. More...
- The **Set Circle to** field is available when the first measurement in the chosen **Angle Sequence** is the *BS* (backsight). This field displays the initial horizontal circle reading corresponding to the backsight direction. Click  to open the button menu that enables you to set the initial circle reading to zero or to entered direction (azimuth or bearing), to input a value or to get from the instrument, or to change the value by +/- 90 or 180 degrees.
- The **Set circle at start of each new set** check box is available for **Classes** with more than one measurement set and when the first measurement in the chosen **Angle Sequence** is the *BS* (backsight). Check the box to use the current horizontal circle reading corresponding to the backsight point at start of each set of angle measurements. Clear the box to reset the horizontal circle reading to the displayed initial value before starting a new set of measurements.
- Check the **Auto turn** box to instruct the robotic total station to automatically rotate to the next target in the measurement sequence.
  - From the **Search After Turn** drop-down list, select *Search and Aim* to instruct the robotic total station to automatically search and lock the target after performing an **Auto turn**. Select *None* to have the robotic total station go into standby mode after performing an **Auto turn**.
  - Check the **Auto accept measurement** box to automatically perform and store the measurement after an **Auto turn** and to automatically proceed to the next target in the sequence. Clear the box to proceed to the next target in the sequence after manually accepting the measurement.

- Check the **Predefined points** box to specify point names, codes and target parameters for each of the presumed *FS* points prior to start measurements. The Predefined Points dialog opens later as a part of the Set Collection wizard. Clear the box to skip the Predefined Points dialog and specify names, codes and targets for *FS* points on the go, when measuring.

> **Note:** Enabling **Predefined points** simplifies, speeds up and automates transitions between predefined targets in the set especially if measurements to multiple *FS* points are included into the single set.

Click **Next** to proceed and verify the instrument settings for an optical survey.

Predefined Points

To enter point names, codes and target parameters for foresight points prior to start Angle/Distance Sets - Dir/Rev measurements.

This dialog provides tools to populate the list of points that should be included into the Set Collection Angle/Distance Sets - Dir/Rev measurements.

Note: The backsight point or direction that is defined in the Set collection Setup dialog is already included and cannot be removed. Only the target type and height for the backsight can be changed.

The list of points displays the backsight and foresight point(s) that should be included into the sequence of Angle/Distance Sets - Dir/Rev measurements set.

- **Point** - the point name;
- **Code** - the point code;
- **HR** - the height of target;
- **Target Type** - the method of distance measurement with EDM (*Prism*, *Sheet*, *Non-Prism* or *Long Non-Prism*);
- **PC** - prism constant, the parameter of the prism characterizing the difference between the reflection plane and the center of the prism / target offset for non-prism target types;

Populate the list of predefined points with point names along with codes and target parameters:

- Click **Add** to add a predefined foresight point data to the list:
  - In the **Point** field, enter a point name manually.
  - Set a code and attribute information for the point:
    - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
    - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
    - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.
  - Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the

context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon has the view:

-  when a normal prism is selected, prism constant also displays below;
-  when a 360 prism is selected, prism constant also displays below;
-  when a sheet is selected, target offset also displays below;
-  when a non-prism is selected, target offset also displays below.

- Click **Edit** to modify the entered predefined point data that is highlighted in the list.
- Click **Remove** to remove the predefined point data that is highlighted in the list.

Click **Next** to start the Angle/Distance Sets - Dir/Rev measurements set, after the list of predefined points is populated with desired data.

Sideshot - Set Collection

To perform sequence of measurements in the previously defined Angle/Distance Sets - Dir/Rev measurement sets.

This dialog is a part of the Set Collection wizard. The dialog provides guided control over the measurement sequences and offer instant access to the data collected during the measurements.

Note: The *Traverse* survey is also supported, click ☰ to open the dialog menu and select **Traverse** from the **Measure** sub-menu to switch the dialog to *Traverse Set Collection* from the *Sideshot Set Collection* mode. After completion of defined Angle/Distance Sets - Dir/Rev measurement sets, current occupation point will change to the measured foresight point (the Advance dialog opens and offers new occupation point selection if there are multiple foresight points). Current backsight will change to the previous occupation point. The Backsight dialog will automatically open to update backsight data.

Use the view selector in the dialog title bar to switch between different views of the dialog at any time:

- **Normal view** - provides supervising of measured locations, offers on-screen guidance for operating the total station, and contains measurement saving tools.
- **Map view** - shows the measurement process in real time on the map and contains measurement saving tools.
- **Meas Set view** - shows all the data of performed measurements, grouped by sets, informs about the current tolerance state according to the used measurement accuracy class, and offers

options to accept or redo measurement sets. This view is accessible at any time but also opens automatically after completion of all measurements. More...

- **Results view** - shows the aggregated Set Collection results and their compliance with the tolerances in the used measurement accuracy class. The data is available after completion of measurement set. More...

Switch to the *Normal view* to supervise measured locations and receive on-screen guidance for total station manipulation.

> **Note:** If the **Predefined points** box was checked in the Set Collection Config dialog, Sokkia Field automatically follows the list, created in the Predefined Points dialog, and accordingly populates **Point** name, **Code** and **Target** for currently measured point.

- The **Point** field displays the name of measured point. Enter a point name manually or keep an automatically suggested name.

> **Note:** All displayed point data is read-only when it is time to measure to the backsight in the measurement sequence.

- Set a code and attribute information for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- In the **Note** field, enter a description for the point.
- Enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;

-  when a sheet is selected, target offset also displays below;
-  when a non-prism is selected, target offset also displays below.

- An on-screen message displays the current observation in the measurements sequence and the total station position that should be used in this measurement:
  - *BSD* - measurement to the backsight in direct position;
  - *BSR* - measurement to the backsight in reverse position;
  - *FSD* - measurement to the foresight in direct position;
  - *FSR* - measurement to the foresight in reverse position;

  > **Note:** An increment is added to the next foresight *FSR#* when multiple foresight points are included into the measurement set. If necessary, check the name of the current foresight point in the **Point** field above.

  - The current *Set* number in the set queue is shown also.

- Switch to the *Map view* at any time to visually review occupation position and current target location.
- Take measurement in either *Normal view*, or *Map view*. More...
  - *Optionally*, it is possible to add more foresight points to the current set. The button  /  displayed in a row with  and  means the choice: either to add another foresight point to the set, or to continue the current sequence. Click  and  to take the measurement to another foresight point. Measurements to this point are now included into the sequence. Click  /  /  to not add measurements to another foresight point and finish the set or continue the sequence with already measured foresight points.
  - *Optionally*, it is possible to interrupt the started sequence before all FS points included in the sequence have been measured and take some sideshots that will not be included into the Angle/Distance Sets - Dir/Rev measurement set. Click  to open the dialog menu and select **Sideshot Interrupt** from the **Measure** sub-menu to switch the dialog to *Sideshot Interrupt* from the *Sideshot Set Collection* mode. Choose a sideshot measurement and accuracy **Class** and proceed to sideshot measurements out of the current Angle/Distance Sets - Dir/Rev measurement set. Measure any desired point or points and return to the interrupted Angle/Distance Sets - Dir/Rev measurements by clicking  that becomes available to the left from  and . The points measured during an interruption will only be saved after

the defined Angle/Distance Sets - Dir/Rev measurement sets have been completed and the results saved.

- After saving a measurement, Sokkia Field focuses on the next target in the sequence.

> **Note:** When a robotic total station is used, Sokkia Field can automatically rotate and plunge the instrument during the measurements sequence, force the robot to automatically find and lock the target, and automatically save measurement. These settings can be configured in the Set Collection Config dialog.

- After all the measurements are completed, the Meas Set view opens automatically and displays obtained results with options to accept or redo measurements.

Sideshot - Set Collection: Meas Set

To review and manage the results of performed measurements grouped by sets.

The *Meas Set* view of the Sideshot - Set Collection dialog shows all the data of performed measurements grouped by sets, informs about the current tolerance state according to the used measurement accuracy class, and offers options to accept or redo measurement sets. This view is accessible at any time using the view selector in the dialog title bar but also opens automatically after completion of all measurements.

Review the results of performed Angle/Distance Sets - Dir/Rev measurements, grouped by sets. Each measurement in the set sequence is a row in the present table with columns showing obtained values:

- **Point** - name of the point;
- **Res HA** - difference of horizontal angle (HA) measurement from the average of all the HA's in this set;
- **Res VA** - difference of vertical angle (VA) measurement from the average of all the VA's in this set;
- **Res SD** - difference of slope distance (SD) measurement from the average of all the SD's in this set;
- **StdDev HA** - standard deviation of the horizontal angle (HA) measurements;
- **StdDev VA** - standard deviation of the vertical angle (VA) measurements;
- **StdDev SD** - standard deviation of the slope distance (SD) measurements;
- **HR** - height of target (reflector);
- **Target Type** - method of distance measurement with EDM (*Prism*, *Sheet*, *Non-Prism* or *Long Non-Prism*);
- **PC** - prism constant, the parameter of the prism characterizing the difference between the reflection plane and the center of the prism / target offset for non-prism target types;

- **HA** - horizontal angle measurement value;
- **VA** - vertical angle measurement value;
- **SD** / **SD#** - slope distance measurement value (numbered SD columns are added when the used measurement accuracy class assumes more than one SD measurement within an observation);
- **Set** - measurement set number and the type of observation in performed measurement.

Use the context menu to copy data from the measurements list to clipboard:

- **Copy All To Clipboard** - copies to clipboard the data of all the measurements in the list.
- **Copy Selection To Clipboard** - copies to clipboard the data of highlighted measurements.
- **Select All** - highlights all measurements in the list.
- **Select All Below** - highlights a currently highlighted measurement and all the measurements in the list displayed below.
- **Select Multiple** - highlights multiple measurements by sequential clicking on data item names.
- **Cancel Selection** - removes all highlights in the list.

Check the tolerance state according to the used measurement accuracy class:

-  *In tolerance* - performed measurement set meets the used class tolerances and can be accepted.
-  *Tolerance exceeded* - performed measurement set fails to meet the used class tolerances and cannot be accepted.

Use the buttons to manage the results of performed sets of Angle/Distance Sets - Dir/Rev measurements:

- **Re-Meas** - to select the specific set or all sets and to repeat the measurement sequence.
- **Report** - to review the *Angle Set Report* on performed measurement sets, with an option to export to **.txt* file.
- **Accept** - to accept the results of performed Angle/Distance Sets - Dir/Rev measurements, save measured points with obtained coordinates and finish the set collection task.

Sideshot - Set Collection: Results

To review the compliance of obtained results with the tolerances in the used measurement accuracy class.

The *Results* view of the Sideshot - Set Collection dialog shows obtained angle and distance values relative to the respective tolerances in the used measurement accuracy class, and offers options to accept or redo measurement sets. This view is accessible at any time using the view selector in the dialog title bar but displays data only after completion of measurement set.

Review the compliance of obtained angle and distance values with the tolerance in the used measurement accuracy class. Each row in this table represents a measured point, with columns showing the values that determine compliance with class tolerances.

Use the context menu to copy data from the table to clipboard:

- **Copy All To Clipboard** - copies to clipboard the data of all the rows.
- **Copy Selection To Clipboard** - copies to clipboard the data of highlighted rows.
- **Select All** - highlights all rows in the table.
- **Select All Below** - highlights a currently highlighted row and all the rows in the table displayed below.
- **Select Multiple** - highlights multiple rows by sequential clicking on them.
- **Cancel Selection** - removes all highlights from rows in the table.

Check the tolerance state according to the used measurement accuracy class:

-  *In tolerance* - performed measurement set meets the used class tolerances and can be accepted.
-  *Tolerance exceeded* - performed measurement set fails to meet the used class tolerances and cannot be accepted.

Use the buttons to manage the results of performed sets of Angle/Distance Sets - Dir/Rev measurements:

- **Re-Meas** - to select the specific set or all sets and to repeat the measurement sequence.
- **Report** - to review the *Set Collection Report* with details on angle and distance computations for each point and an option to export to **.txt* file.
- **Accept** - to accept the results of performed Angle/Distance Sets - Dir/Rev measurements, save measured points with obtained coordinates and finish the set collection task.

Advance

To select the next occupation point when advancing in the traverse survey.

This dialog automatically opens when a choice from multiple points is available to select the next occupation point in the traverse survey.

- After moving the instrument to the next occupation, highlight the respective point in the list and click  to transfer the current occupation to this point and proceed to the Backsight measurement.
  - Click the **Add** button to open the Select Points From List dialog and manually add another project point in the list.

- Click the **Remove** button to remove the highlighted point from the list of available occupation points.

Taking Measurements

To perform measurement with a total station.

Depending on the total station type, Sokkia Field offers the following ways to take measurements.

For **Conventional** total station survey type:

When using the Conventional Total Station you may quickly save a single measurement, or you may perform a single measurement to the point; verify the result and then confirm or reject the saving:

- Click  to take the single measurement to the point and automatically save it.
- Click  to obtain the single measurement. Then click  to save it or click  to discard the measurement.

> **Note:** Survey settings (click  in the dialog title bar) and EDM selections (click **EDM** in the dialog title bar) are applicable to both buttons ( and ) in the Conventional total station survey type.

For **Robitic** total station survey type:

The Robotic Total Station automatically takes the measurement to the target in either *Quick mode* or *Precise mode*. There are two buttons in the dialog:

- When you click , the Robotic starts measurement in the *Quick mode*. You can set the desired parameters for the mode in the Survey Settings dialog by clicking  in the dialog title bar. Depending on your settings for the Quick mode you can save either a single or an averaged measurement in the Fine / Rapid (Coarse) / Tracking mode to the project.
- When you click  the Robotic starts measurement in the *Precise mode*. You can set the desired parameters for the mode in the Survey Settings dialog by clicking  in the dialog title bar. Depending on your settings for the Precise mode you can obtain either continuous

measurements, or a single or an averaged measurement in the Fine / Rapid (Coarse) / Tracking mode. Also you can select the Auto Store option, when either the single or the averaged measurement will be automatically stored in the project. If you did not set this option, click  to save the measurement, or click  to discard the measurement.



Image Scan

Image Scan is useful to transform the coordinate system in existing scan image to the project coordinate system through control points on a scan image and measured points on a location and to scan an area from that image on a location. Scanning of an area without scan image and coordinate transformation is also available. Scanning is accomplished with the help of a Wizard.

The scanning begins in the Scanning: Scan Type Selection dialog.

Scanning: Scan Type Selection

The dialog is a part of the Image Scan wizard.

To select whether to use an existing scan image for scanning or to scan an area on a location without a scan image.

- Select a desired **Scan Type**:
  - *Scan with Image* - to establish relationship between pixels coordinates of an existing scan image and grid / ground coordinates in a location and to scan an area from a scan image on a location.
  - *Scan w/o Image* - to define and scan an area in a location.
- Click **Next**. If you selected the scan with image, the Scanning: Select Scan Image dialog will be opened, if you selected the scan without image, the Area dialog will be opened.

Scanning: Scan Image Selection

The dialog is a part of the Image Scan wizard.

To select an existing scan image for scanning on a location:

- Enter a **Session** name or select it from the drop-down list.
- Select an **Image** existing in the current project from the drop-down list, or browse  for a new one.
- Select a **Camera** information. If the image exists in the current project, the camera information is set automatically; otherwise, select a camera existing in the current project from the drop-down list or browse  for a new one (camera information is stored in a file with the **.cmr* extension).
- The **View** button is available for a completed scan session and shows the image with the scanned points. More...
- Click **Next** to select orientation points required to establish relationship between pixels coordinates of the image and real grid / ground coordinates.

View Scan

To display the scan image along with orientation and scanned points in completed scan sessions.

Image Orientation

The dialog is a part of the Image Scan wizard.

To select the orientation points required to calculate the relationship between pixels coordinates of the scan image and the real grid / ground coordinates on a location.

- Click  /  to zoom in or out the plot, click  to display the whole image, click  /  to enable or disable *Pan* image mode).
- When the *Pan* button is disabled (), the following instruction is appeared: **Tap on Orientation Pt**. You can start to search the orientation point:
  - Tap on the image in an area, where the orientation point is located.
  - The following instruction is appeared: **Select or meas Orient Pt**. The image will zoom to this point and show a cross-hair. Click  to adjust the position of the cross-hair using the keyboard arrow keys. Also you can select *Tele* (the default zoomed-in view of the cross-hair) or *Wide* (a zoomed-out area of the image including all orientation points).
  - Click **Meas** and select the desired way to get the coordinate of the given orientation point:
    - *Meas* - opens the Sideshot dialog, where you can measure and save the orientation point coordinates to the current project.
    - *From Map* - opens the Map, where you can select the corresponding point on the map.

  - *From List* - opens the Points dialog, where you can select the corresponding point from the list.
- The name "ori0N" will be assigned to the measured / selected point, where N is the number of each orientation point.

- When a minimum of four orientation points are established, click **Next** to compute the image orientation and display the results.

Orientation Results

The dialog is a part of the Image Scan wizard.

To display the results of the scan image orientation.

- Review the results for each orientation point displayed as dX and dY in image pixels.
- The maximal deviation (**MAX)** and root-mean-square (**RMS**) for the orientation points are also displayed.
- If required, click **Remove** to remove the selected point to adjust the orientation calculation. If four points still remain, the new results are displayed. If there are less than four orientation points, then this dialog will close automatically to return to the orientation procedure.
- Click **Next** to select area(s) for scanning.

Scan Area

The dialog is a part of the Image Scan wizard.

To select one or more areas on a scan image for further scanning with total station:

- Use one of the following two ways:
  - Draw a rectangle by pressing the stylus in the dialog for the start point and dragging to the end point. When the stylus is lifted, the area is set.
  - Draw a polygon by pressing the stylus down at each vertex. Lines will be drawn connecting each vertex to the previous one. Press the stylus near the first vertex to close the area.
- Click **Clear** to erase all drawn areas.
- Click  to open the Survey Settings dialog.
- When required areas are set, click **Next** to define scanning parameters and intervals.

Area

The dialog is a part of the Image Scan wizard.

To define a scan area. This dialog is available when *Scan w/o Image* type was selected in the Scanning: Scan Type Selection dialog.

You can specify three vertices of a rectangular area and the fourth vertice will be computed automatically or four vertices to make an arbitrary four-sided area. The vertices are labeled: *Upper Left*, *Lower Left*, *Upper Right* and *Lower Right*.

Specify each of 3 or 4 vertices of a scan area:

- Manually enter a name of an existing point.
- Click **Meas** to open the Sideshot dialog and measure and save the vertice coordinates to the current project.
- Click  to open the Map, where you can select the corresponding point on the map.
- Click  to open the Points dialog, where you can select the corresponding point from the list.

Click **Next** to open the Interval dialog.

Interval

The dialog is a part of the Image Scan wizard.

To set intervals for scanning points by a total station:

- In **Start Pt**, enter the starting name for scanned points.
- In the **Scan Mode** you can control how the instrument turns to the scan points:
  - *Fine* mode requires the instrument to turn to each point and measure it. For DS-i robotic device the *Fine* mode is always selected.
  - *Grid* mode allows the instrument to continuously turn and measure at the same time.
- For scanning procedure the *"Reflectorless"* is always selected in the **Meas Mode**.
- Select the type of **Interval** for scanning. You can specify scanning interval using:
  - *Angle* - enter angles interval in the **HA** and **VA** fields.
  - *Distance* - enter the distance between neighbor points on the horizontal (**H Dist**) and vertical (**V Dist**) axes.
  - *Num Points* - enter the number of scanning points on the horizontal axe (field **Num H**) and vertical axe (field **Num V**).
- Click **Next** to save the settings and open the Estimate Time dialog.

Estimate Time

The dialog is a part of the Image Scan wizard.

To review the information about scanning including the total number of points to be scanned and an estimate of the time it will take to complete the scan.

- **Start Pt** - the name of the first scanned point.
- **Scan Mode** - the mode defining how the instrument turns to the scan points.
- **Meas Mode** - the measurement mode (usually *non-prism* for scanning).
- **H Interval** - the horizontal interval between scanned points.
- **V Interval** - the vertical interval between scanned points.
- **Areas** - the number of defined area to be scanned.
- **Points** - the calculated total number of points to be scanned.
- **Time** - the estimate of time required to perform scanning with these parameters.

If the estimated time is too long, click **Back** and enter larger intervals.

Click **Start Scan** to begin scanning.

Scan Progress

To display points scanning progress.

As the total station measures points within the predefined area, scanned points appear on the plot in real time and current scan progress is viewable in the bottom part of the dialog.

- Click the **Pause** button to pause scanning.
- Click the **Resume** button to continue scanning after pausing.
- Click the **Stop** button to cancel the scan session. You have to confirm this action in open prompt.
- Click the **Finish** button to save all measurements and close the current scan session.

Note: To make scanned points and their coordinates viewable in the project, open the Points dialog (click  >  > ), click  /  in the title bar, select filter **by Type** from the drop-down menu and check the **Scanned Points** box in the list of point types. To display scanned points on the Map (click  >  > , check the **Scanned** box in the Points tab of the Map Properties dialog.

Survey Cross Section

To perform the survey of the cross section:

- Select between **Road**, **H Align** and **None** as required.
- Enter the name of the Road / Horizontal alignment manually or select it from the list .
- When no alignment is selected (None), enter the **Centerline Code** from the drop-down list. Click the **Code** button to set attributes. More...

  The centerline code must be a valid line code to apply to the surveyed points for creating the alignment.

  If the road has not been set, define the plane. On the first station, the survey is performed so that every next point has a different code, for example A, B, C, cl, D, E, F. Press to automatically change the station number. The application suggests that the survey on the next station uses the same codes in the opposite order: F, E, D, cl, C, B, A. The line is created along the points with the cl code.
- Set the **X-Sect Sta** where the cross section will be surveyed. You can select any road point as the current point. To do it, click in this field and select any road point in the Road Points dialog.
- Enter the **Interval** of distance towards the next station.
- Select the **Use automatic X-Section Station** check box to automatically set a next nearest cross section station to survey.
- Select the **Use Horizontal Transition Points** check box to include transition points, in spite of the station distance.
- If required, click the **Range Limits** button to open Survey Cross Section Limits dialog and set up monitoring of acceptable limit of distance offset between cross section measurements and right and left ranges for the current cross section measurement. This functionality is available for cross section survey of existing road or horizontal alignment.
- Click to start measurements.

Click to open the dialog menu with additional options:

- Selecct Edit Roads to view and manage roads in the project.

Survey Cross Section Limits

To set up monitoring of acceptable limit for distance offset between cross section measurements and right and left ranges for the current cross section measurement.

- Check the **Check distance** box in the **Distance Limit** group to enable monitoring of the limit for distance offset between cross section measurements. In the **Offset** field, enter the acceptable offset. Clear the check box to disable monitoring of the distance limit between cross section measurements.
- Check the **Check measurement range** box in the **Measurement Range** group to enable monitoring of acceptable left and right ranges when measuring current cross section. Enter the acceptable ranges in the **Left** and **Right** fields. These ranges are shown as red dotted lines in the Section View overlay panel in the X-Section Map View. Clear the check box to disable monitoring of acceptable right and left ranges when measuring current cross section.

Click  to save entered settings for monitoring the cross section limits and return to the Survey Cross Section dialog. Click  to return to the Survey Cross Section dialog without saving.

Pole Measurement

To create a point calculated as an offset from the point that was measured with a GNSS receiver or TS during cross section survey.

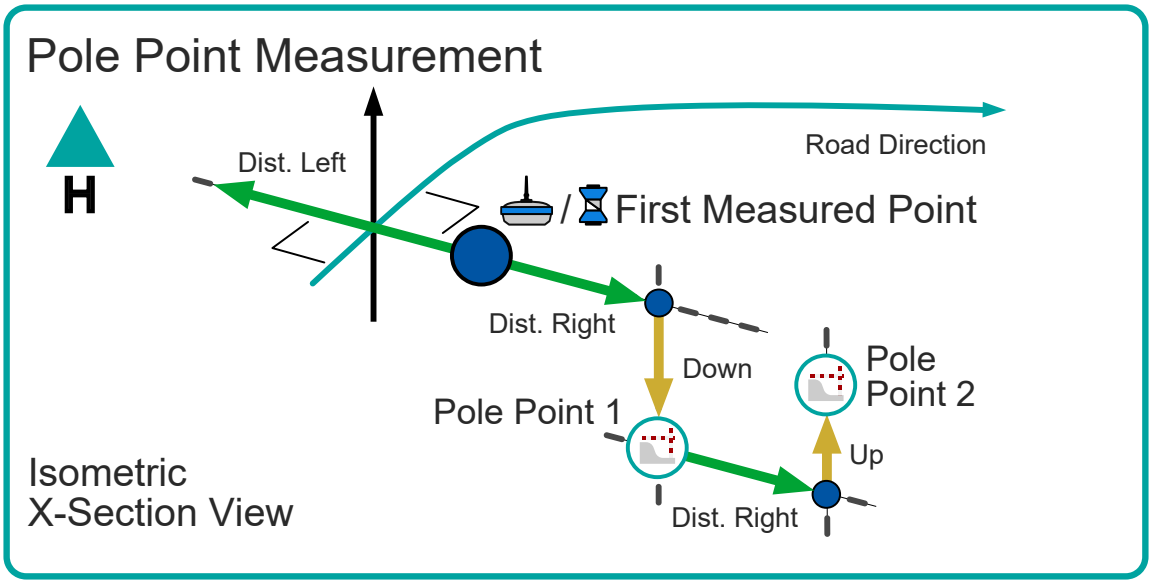
Taking pole-measured points is useful when you are unable to measure them directly.

To open this dialog and record the pole point, click  after measuring a point in cross section survey.

Mind the following:

- The first point on the cross section must be a point measured by the instrument (GNSS receiver or total station). From this measured point, a pole point can be measured.
- The pole point coordinates are calculated on the assumption that it is in the same x-section as the previous point, so the left / right direction of the pole is the direction from the previous point (measured point or pole point) perpendicular to the direction of the road.

- Elevation of the pole point is the vertical offset from the previous point (which has already had a height coordinate).



To create a pole point:

- Enter the data of the offset from the previous point:
  - **Dist Left** / **Dist Right** - horizontal distance from the previous point;
  - **Up** / **Down** - vertical offset from the previous point.
- Click to confirm creating the pole point. The stored point has the icon in point listings of the current project. You can create the next pole point in this cross section from just saved pole point.

X-Sect: Normal View

To conduct the cross section survey with a GNSS receiver.

- Enter the name of the **Point** to be logged.
- Set **Code** and attributes for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection

menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.

- Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- Enter the **Antenna Height** and set the type of height measurement (*Vertical* or *Slant*).
- Start the measurement operation according to your preference:
  - Click  to perform the measurement with the precise settings and store the point either automatically or manually. The point is automatically saved, if it meets the criteria for storing the point as specified in Topo Survey Settings. In manual mode, after pressing the button, two new buttons appear along with the count of the epochs achieved. Click  to save or  to cancel the measurement.
  - Click  to perform the measurement with the quick settings and to store the point automatically.
  - Click  to open a file for data logging in surveys with post processing. This button is shown if you have selected the **Post Processing** check box in the Receiver Make dialog. For the user-defined file name, enter the file name at the logging start. Click  to stop data logging into a file.
  - Click  to view or change the settings for the Topo survey. More...

- This dialog displays in the real time:
  - *X-Sect Sta* - the position of the station, where the cross section must be surveyed;
  - *Along* - the distance along the central line from the current position of the GNSS antenna to the X-Section Station;
  - *Station* - the position of the station for the current position of the GNSS antenna;
  - *Left* / *Right* - the distance of perpendicular to the central line from the current position of the GNSS antenna.

Specific cross section survey features accessible from this dialog are also available:

-  - opens the Pole measurement dialog to create a point calculated as an offset from the point that was logged using a GNSS receiver. Taking pole-measured points is useful when you are unable to log them directly. The button is active after logging a point using a GNSS receiver.
- **Ordered X-Section Segment** - adds *ordered segment* flag in the raw data record for a point being logged. This special flag controls the order of cross section segments in post-processing of

some data export formats. Click  and select this command from the dialog menu to activate. When active, the green mark  is displayed near the command.

Read more information about the Status panel located at the top.

Switch between the current *X-Sect: Normal* view and the X-Sect: Map view any time by taping (clicking) the dialog title bar.

X-Sect: Map View

The dialog shows the surveyed points graphically. All the survey process can be done through this view. It contains the information similar to the X-Sect: Normal View.

The Map View contains:

- Status panel along the top;
- Topo panel along the bottom;
- Map View tools along the right side.

To control more survey parameters, click on any of six customizable  data fields in the lower part of the map to open the Select Value to Display dialog. Select the desired parameter from the list and click  to display it's value in the data field during the survey.

Specific cross section survey features are also available:

-  - opens the Pole measurement dialog to create a point calculated as an offset from the point that was logged using a GNSS receiver. Taking pole-measured points is useful when you are unable to log them directly. The button is active after logging a point using a GNSS receiver.
- **Section view** overlay panel - starts displaying logged points visually in section layout for better control over the survey. To display this overlay panel on the map click  in the XSect: Map view and check the **Section View** box in the General tab of the Map Properties dialog.
- **Ordered X-Section Segment** - adds *ordered segment* flag in the raw data record for a point being logged. This special flag controls the order of cross section segments in post-processing of some data export formats. Click  and select this command from the dialog menu to activate. When active, the green mark  is displayed near the command.

Switch between the current *X-Sect: Map* view and the X-Sect: Normal view any time by taping (clicking) the dialog title bar.

Context menu

The dialog's context menu is displayed on a right-click in empty space of the map. The menu contains the following items:

- *Move eLevel Here* - places the bubble level on the screen where the menu was called. Available for **GRX3** and **GRX5** receivers and displayed if **Show eLevel** was selected in the TILT ™ Settings dialog.
- *Set Simulator Here* - "moves" you to the point on the map where the menu was called. Only displayed if the simulation mode was selected in the configuration.
- *Move Profile View Here* - centers the Profile View semitransparent overlay panel on the screen where the menu was called. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel. Only displayed if **Profile View** was selected in Map Properties dialog.
- *Move Section View Here* - centers the Section View semitransparent overlay panel on the screen where the menu was called. Long tap (right click) on the top of the overlay panel and use the local context menu to increase / decrease the visible size of the panel. Only displayed if **Section View** was selected in Map Properties dialog.

  > **Note:** Only one overlay panel must present on the X-section survey Map View, choose either **Profile View** or **Section View** to display.

- *Create Field Report* - opens the Field Report dialog.

XSect-Direct

To conduct the cross section survey with a total station using direct measurement method.

The points are surveyed similar to the observations from the Sideshot-Direct dialog.

Specific cross section survey features are also available:

-  - opens the Pole measurement dialog to create a point calculated as an offset from the point that was measured with a TS. Taking pole-measured points is useful when you are unable to measure them directly. The button is active after measuring a point with a TS.
- **Section view** semitransparent overlay panel - starts displaying measured points visually in section layout for better control over the survey. To display this overlay panel on the map click 

in the XSect-Direct: Map view and check the **Section View** box in the General tab of the Map Properties dialog.

- **Ordered X-Section Segment** - adds *ordered segment* flag in the raw data record for a point being measured. This special flag controls the order of cross section segments in post-processing of some data export formats. Click  and select this command from the dialog menu to activate. When active, the green mark  is displayed near the command.

XSect-Direct/Reverse

To conduct the cross section survey with a total station using direct / reverse measurement method.

The points are surveyed similar to the observations from the Sideshot-Direct/Reverse dialog.

Specific cross section survey features are also available:

-  - opens the Pole measurement dialog to create a point calculated as an offset from the point that was measured with a TS. Taking pole-measured points is useful when you are unable to measure them directly. The button is active after measuring a point with a TS.
- **Section view** overlay panel - starts displaying measured points visually in section layout for better control over the survey. To display this overlay panel on the map click  in the XSect-Direct/Reverse: Map view and check the **Section View** box in the General tab of the Map Properties dialog.
- **Ordered X-Section Segment** - adds *ordered segment* flag in the raw data record for a point being measured. This special flag controls the order of cross section segments in post-processing of some data export formats. Click  and select this command from the dialog menu to activate. When active, the green mark  is displayed near the command.



Find Station

To identify the station by computing the distance from the beginning of the road to the projection of the point to the road and to calculate the offset of the point from the center line of the road.

The dialog offers tools to specify a road / alignment, select or measure a point, calculate the station and offset and review and save the calculation results. Use the view selector in the dialog title bar

to switch between *Input* view, *Map* view and *Results* view:

- **Input view** - contains tools to enter data for calculation and to initiate calculation.
- **Map view** - displays the calculation results graphically showing the selected road / alignment, the given point, the calculated station (point projection to the road center line / alignment) and the offset line.
- **Results view** - displays the calculation results and offers to save them, click  to export the results to a **.txt* file.

Use the **Input view** to select a road / alignment and a point to perform the calculation:

- Click the toggle button to define either **Road**, **Horizontal Alignment**, or **Horizontal and Vertical Alignments** should be used in calculation.
- Enter an existing road / alignment name manually in the respective field(s) or select from the list (s)  of project roads / alignments.
- Specify a point and calculate the station and offset for this point:
  - If the point is an existing project point:
    - In the **Point** field, enter a point name manually, or select from the map  or from the list  of points in the project.
    - Click  to calculate the station for the point projection and the offset form the road / alignment and open the **Results view**.
  - If the point is a new point that should be measured:
    - In the **Point** field, enter a new point name manually or keep an automatically suggested new name.
    - Set **Code** and attributes for the point:
      - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
      - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.

  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- Measure the point. Click  /  for GNSS survey configuration (more on GNSS measurements) or  /  for optical survey configuration (more on measurements with total station).
- After measured point is saved, the Find Station results are calculated automatically and the **Results view** opens.

Use the **Results view** and **Map view** to review the results of the Find Station calculation:

- Review the Find Station calculation results:
  - *Point* - the name of the point, the Find Station calculation was performed for.
  - *Station* - the calculated station for the point projection to the road center line / alignment.
  - *Offset* - the horizontal distance between the point and the point projection to the road center line / alignment, positive for the right offset relative to the road / alignment direction, negative for the left offset.
  - *Cut / Fill* - the vertical distance from the point to the road surface, negative for *Cut* values, positive for *Fill* values (available if a road is used in calculation).
  - *Grade* - the road x-section grade value for the point position (available if a road is used in calculation and the point position is within the working corridor of the road surface).
  - For the optical survey configuration, additional data is also included in the results: occupation setup, angle and slope distance measurement values and calculated point coordinates for the point measured by total station.

- Click  to export the results to a **.txt* file.



Tape Dimension

To record points based on tape measured lengths of lines perpendicular to each other starting from a reference line made of two known points.

The *Tape Dimension* is useful for calculation of the periphery of structures, such as buildings, that have features perpendicular to each other. This is done using tape measurements, relative to two known points that belong to one side of the structure (wall of the building), forming the reference line.

The dialog offers tools to specify start and end points of the reference line, input tape measured perpendicular segments (length and direction) one after another, calculate and record segment points coordinates and calculate the delta difference between horizontal coordinates of end point of the last measured segment and start point of the reference line. Four tabs are available in the dialog:

- Ref Line tab - to specify the reference line to start measurements from.
- Tape Dim tab - to enter tape measurements of perpendicular segments.
- Results tab - to review details on entered tape measurements and calculated results.
- Map tab - to view entered tape measurements graphically on the map.

Click  to open the dialog menu with additional options:

- **Raw Data** - click the item to expand the sub-menu:
  - Add Raw Note - opens the dialog where you can enter any text comment during the survey that is saved as a raw data note .
  - **Edit** - opens the Raw data dialog with raw data collected in the project.

In the **Ref Line** tab, specify the reference line to start tape measurements from:

- Define the **Start Point** of the line. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.
- Define the **End Point** of the line. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

  Note: The end point of the reference line is the start point for measuring the first perpendicular segment by tape.

- After both points of the reference line are defined, proceed to entering tape measurements by clicking the **Next** button or the **Tape Dim** tab title.

In the **Tape Dim** tab, enter the performed tape measurements one after another and monitor overall progress:

- The preview panel displays the reference line and measured perpendicular segments. Initially, only the reference line is visible. The end point of the reference line is the start point of the first perpendicular segment that is measured by tape.
- In the **Point** field, enter a name for the calculated end point of currently measured segment. This point will be also the start point of the next perpendicular segment.
- Set **Code** and attributes for the point:
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- Enter obtained tape measurement data for the current segment:
  - Enter the length of the measured segment in current distance measurement units.
  - Click the toggle button to select the current perpendicular direction relative to the previous segment direction, either  **Dist Left** or  **Dist Right**.
  - Click the **Accept** button to save the end point of the measured segment to the project, this point is marked with  icon in listings. The point's horizontal coordinates are calculated based on the tape measurement, the vertical coordinate is equal to the vertical coordinate of end point of the reference line. The measurement result is also stored in the Raw Data database as the *Tape* type of measurement and marked with either , or  icon in the list.

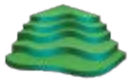
- Repeat the routine for every perpendicular segment sequentially measured by tape.
- **Finish** the tape measurements, either by choosing *Close polygon* (the line will connect the calculated end point of last measured segment and the start point of the reference line), or *Calc Closure* if assumed that the end point of the last measured segment is the start point of the reference line (the delta difference between horizontal coordinates of these points is calculated).

In the **Results** tab, review detailed data on entered tape measurements, check and save calculated results:

- Review the Tape Dimension calculation results:
  - *Start Point* - the name of the start point of the reference line.
  - *End Point* - the name of the end point of the reference line.
  - *Point* - the name of the end point of the last measured segment.
  - *Coordinates* - the calculated coordinates of the end point of the last measured segment.
  - *dNorth* and *dEast* - the calculated delta difference between horizontal coordinates of end point of the last measured segment and start point of the reference line.
  - *Taped distance* - perpendicular direction and tape measured distance for all perpendicular segments in their respective order.
  - For the optical survey configuration, the occupation setup is also included in the results.

- Click  to export the results to a **.txt* file.

In the **Map** tab, entered tape measurements are shown graphically on the map along with other project objects. The reference line and measured perpendicular segments are red lines, their points are blue circles.



Surface

To set up and perform the survey of a surface along with real time calculation of ground volume.

Sokkia Field offer tools to measure a new surface or extend an existing surface, and calculate its stockpile / pit ground volumes relatively to existing objects or given parameters. During survey, Sokkia Field provides visual triangulation of the measured surface wireframe on the map and access to real-time reporting on current ground volumes calculated relative to given parameter or object.

Start the surface topo volume survey by entering survey parameters in the Volume Input dialog.

Volume Input

To define a surface and set up parameters for surface survey.

- Click the first drop-down button to choose either a new surface should be measured or an existing surface should be extended:
  - Select **New** for the new surface and enter a name for this new surface.
  - Select **Append To** to extend an existing surface. Enter an existing surface name manually or select from the list

 of project surfaces. The preview panel displays the selected surface in the horizontal plane.

- Click the second drop-down button to select a parameter or an object for calculation of the stockpile / pit ground volumes of measured surface.
  - **Boundary** - the volume is calculated to the virtual surface generated only from the points that form the measured surface area boundary.
  - **Min Elevation** - the volume is calculated to the horizontal plane at the minimum elevation of the measured surface.
  - **Max Elevation** - the volume is calculated to the horizontal plane at the maximum elevation of the measured surface.
  - **Fixed Elevation** - the volume is calculated to the horizontal plane at the user defined elevation. Enter the elevation value in the editable field. To set the elevation of a specific point as the fixed elevation, select this point from the map  or from the list  of points in the project.
  - **Plane** - the volume is calculated to the virtual plane defined by three points. Enter existing points names manually, or select from the map  or from the list  of points in the project.
  - **Design Surface** - the volume is calculated to another surface. Enter an existing surface name manually or select from the list  of project surfaces. The preview panel displays the selected surface in the horizontal plane.
  - **No Volume Calc** - the calculation of the stockpile / pit ground volumes of measured surface is disabled, the Surface Topo Volume Report is unavailable.

- Check the **Auto Topo** box to automatically store points of a measured surface when meeting conditions for auto-storing positions. This feature is available for GNSS or Robotic configurations. Auto-storing parameters are set in the Auto Topo Survey dialog during GNSS survey configuration or the Auto Topo dialog during Robotic survey configuration.

Click  to open the dialog menu with additional options:

- Reference CL - you can specify a reference line for the task. The offset values from the line and distance from the first point of the line can help you to perform measurements. Activated feature is marked with .

Click **Next** to start the Surface Topo Volume Survey.

Surface Topo Volume Survey

To measure and record surface points, monitor the surface survey progress and calculate current and final ground volumes.

- Click  /  for GNSS survey configuration (more on GNSS measurements) or  /  for optical survey configuration (more on measurements with total station) to measure another point of the surface.
- Visual triangulation of the measured surface wireframe on the map view becomes available after the first three points of the surface are stored.
- If the Reference CL function is activated , the selected reference line is highlighted on the map view during survey.
- Click  and select **Volume Report** from the dialog menu to view the current Surface Topo Volume Report. This dialog also opens automatically and show the final report on finishing measurements and exiting the surface volume survey.

Surface Topo Volume Report

To review the detailed data of measured surface including calculated stockpile / pit volumes relatively to defined objects or parameters.

- *Volume Surface* - the name of measured surface;
- *Computed to* - the object or the parameter defined in the Volume Input dialog and used to calculate volumes;

> **Note:** If Design Surface is the object to calculate volumes, the *Stockpile*, *Pit*, *Area* values are calculated only to intersecting areas of both surfaces.

- *Stockpile* - the calculated volume of the surface which sits above the defined object or parameter;
- *Pit* - the calculated volume of the surface which sits below the defined object or parameter;
- *Area* - the area occupied by the measured surface in the horizontal plane;
- *Num Edges*, *Num Triangles*, *Num Points* - the number of respective elements in the measured surface wireframe;
- *Omitted Points* - measured points that are not used in the measured surface wireframe;
- *Max / Min Coordinates* - extreme coordinate values of the measured surface.

Click  to export the results to a **.txt* file.

Grid Setup

To set up a customized grid and display it on the map to help you collect points.

- Select the **Display Grid** box to display a grid in the Map tab with the settings that follow.
- Specify the **Origin Point** for the grid. Select this point on the map  or from the list .
- Select either **Azimuth (Bearing)** or **Azimuth (Bearing) to Point** by clicking on the button to indicate the direction of the lines and enter the corresponding value.
- In the **Spacing** field, specify the intervals for drawing **Along Azimuth (Bearing)** and **Perpendicular** grid lines.

After setting up the grid, click  to save changes and return to the previous dialog. Click  to return to the previous dialog without saving.

PTL Mode

The Point-To-Line mode (PTL) is a method of interpretation of the point coordinates. The horizontal coordinates are defined as offsets from the specified reference line (along line and left / right offset).

- Check the **PTL Mode On** box to enable the PTL mode. *(PTL)* will be added to the ending of dialog titles where the PTL mode is applied.
- Specify the reference line to calculate PTL coordinates. In **Start reference point** and **End reference point**, enter respective point names manually, or select from the map  or from the list  of points in the project. The specified **Start reference point** is an origin point for calculation of PTL data.

After setting up the PTL mode, click  to save the changes and return to the previous dialog.

Click  to return to the previous dialog without saving.

Add Raw Note

Enter a **Raw Note Text** to give a description during the survey if required.

This note is shown in Raw Data.

When creating a file from the project data, the note will be also saved in this file.

Last Point Data

The dialog contains the information about the last point that has been logged since this dialog was opened. Click  to save the data to a **.txt* file if required.

Select Value to Display

Highlight the desired parameter from the list and click  to display its value in the selected data field during surveys of the current type.

Click  and choose **Label Name** to open the sub-menu for customizing the selected data label name output:

- **Hide** - the name of the data label is not displayed. The selected data field displays only its value.
- **Small Font** - smaller font is used to display the data label name. This setting doesn't affect the value output font size.
- **Match Label Value Font** - the label name font size is equal to the value output font size.



Two-Peg Test

To determine any error in the line of sight through the level in a series of measurements of the two peg test.

- Center a Digital Level (DL) between the two points to measure and take a measurement (by clicking the Measuring button) to point 1 and point 2.
- Move the DL for the point 2 (approximately 3 meters from the point) and take the shots to the point 1 (by clicking the Measuring button). After that Sokkia Field automatically calculates and displays the true value for the point 2.
- To compare the true and the measured value, reverse the staff located at point 2. Collimate the staff on the point and read the value manually. If necessary, remove the eyepiece cover to expose the cross-hair adjusting screw and shift the horizontal cross-hair line up or down (as required) until the line is coincided with the reticle reading value. After adjustment the DL, perform the step 1 and step 2.
- To get the relative error of the DL, again reverse the staff located at point 2 and take a measurement to the point.
- Check the results of the two peg test in the open Two Peg Test Results dialog.

Two Peg Test Results

To review the results of two peg test after all measurements are taken.

The dialog displays all the shots taken in the Two Peg Test and the computed error.

Click  to save the displayed Two Peg test results in a text *(*.txt)* file.



Level Run

To create a new level run or to continue an existing level run.

- In the **Name** field, enter a new name to create and start a new level run or select a name from the drop-down list to continue a level run that exists in the current project.
- In the **Note** field, enter a description for the selected level run.
- Click **Next** to open the Level Run dialog and proceed to leveling in the selected level run.

Note: Sokkia Field project supports multiple separate level runs that can be created, selected, started and continued from this dialog at any time.

Level Run

To perform leveling and to evaluate the progress of the current level run.

This dialog provides the interface for leveling and shows details of performed measurements. The dialog title displays a name of the current level run.

DL tab

To perform level measurements and record them into a field-book table.

- Customize columns and their order in the table by clicking  and choosing Display Setting in the dialog's menu. Review the description of available columns here.
- Start the level run with the backsight measurement. In the point field marked with , specify a point with known elevation. Enter a point name manually or select it from the map  or from the list  of points in the project. Click the **BS** button to take the backsight measurement to the current level location. If you typed a new name for the backsight point, the Add Point dialog opens. Enter the known coordinates of the point in the dialog and click  to take the measurement to the point. The **BS** measurement is marked with  symbol in the table.
- Optionally, click the **SS** button to take a sideshot measurement to the level location. A new point with calculated elevation is created in the current project with a name specified in the point  field. The **SS** measurement is marked with  symbol in the table.
- Move the rod to the foresight point and click the **FS** button take the foresight measurement to the level location. A new point with calculated elevation is created in the current project with a name specified in the point  field. The **FS** measurement is marked with  symbol in the table.
- To proceed with the level run, place the level to a new location and click the **BS** button to take the BS measurement from the last FS point to move the current backsight point along the level run. Move the rod to a new foresight point and take a new FS measurement. Repeat these steps until all required locations are covered.
- Use the measurement table context menu during the level run by long tapping (right clicking) on a highlighted measurement performed to the current level location:
  - **Remeasure BS / FS / SS** - to perform the same measurement of the respective type.
  - **Change FS to SS** - to change a highlighted foresight measurement to the sideshot measurement.
  - **Change SS to FS** - to change a highlighted sideshot measurement to the foresight measurement. This option is available if there is no foresight measurement performed to the current level location. (To swap FS and SS measurements, change FS to the desired SS measurement, then change the desired SS measurement to FS.)
- To perform the level run closure:

- Move the rod to the initial backsight point with known elevation.
- In the point field marked with , specify the initial backsight point. Enter a point name manually or select it from the map or from the list of points in the project.
- Click the **FS** button to take the foresight measurement to the current level location from the initial backsight point.
- In the open Point Check dialog select the **Store as check point** option and click to close the current level run. The measurement is saved as a check point of the initial backsight point and the current level run is closed. The **Closure** record displays in the lowest row of the **Point** column.

  Note: Closed level run cannot be modified or continued.

- The **SumBS-SumFS** field below the table shows the current difference between summarized BS and summarized FS horizontal distances.

Data tab

To review and export all the data related to the last measurement in the current level run.

Available data for a performed level measurement:

- *Point* - point name of the current level measurement;
- *BS* - backsight measurement value (middle wire);
- *HI* - height of the instrument (sum of current backsight point's elevation and performed backsight measurement (*BS*) value);
- *FS* - foresight measurement value (middle wire);
- *Elev* - calculated elevation (difference between current height of the instrument (*HI*) and performed measurement (either *BS*, *FS*, or *SS*) value;
- *BS Dist* - calculated horizontal distance for current backsight measurement;
- *FS Dist* - calculated horizontal distance for current foresight measurement;
- *Sum BS Dist* - sum of calculated horizontal distances of already performed backsight measurements;
- *Sum FS Dist* - sum of calculated horizontal distances of already performed foresight measurements;
- *SumBS-SumFS* - difference between current *Sum BS Dist* and current *Sum FS Dist* values;
- *Accumulated Ht* - difference between current foresight measurement's elevation (*Elev*) and known elevation of the initial backsight point;
- *Notes* - text notes added in the Sokkia Field project to the point.

If required, click to save the displayed information to a text (**.txt*) file.

Level Run dialog pop-up menu

Click  to open the dialog menu with additional options.

- Point Setting - to choose how to save level measurements during the level run.
- Display Setting - to customize the columns of the field-book table in the DL tab.
- Vertical Offset - to apply the vertical offset for level measurements.
- Stake Point - to stake a design point elevation with the digital level.
- Stake Point List - to stake point elevations of a design point list with the digital level.
- Stake Elevation - to stake a design elevation on a surface with the digital level.
- Inverse - to calculate the inverse (direction and distance) between two known points.

Settings - Points (DL)

To choose how to save DL measurements during the level run.

Sokkia Field stores performed DL measurements as project points of DL type with calculated elevation. Simplify and / or speed up storing routine according to your needs.

In the **Point Check** drop-down list:

- Select **Prompt** to open the Point Check dialog and choose from *Overwrite*, *Rename*, and *Store as check point* saving options everytime a new measurement of an existing point in level run is performed.
- Select **Store As Check Point** to always save level run measurement as a check point for an existing project point.

Click  to save the selected setting, click  to return to the Level Run dialog without saving selection.

Settings - Columns (DL)

To customize the columns of the field-book table in the DL tab of the Level Run dialog.

The dialog displays a list of available DL measurement parameters which columns can be included in the table. By default, all the columns present in the table.

Review the description of available columns here.

- Check the box  near the parameter to include this parameter's column into the table and display the respective parameter value. Clear the box  to exclude the parameter's column from

the table.

- Use  and  to move the highlighted column(s) in the ordering. Use context menu to highlight multiple columns:
  - **Select All** - highlights all items in the list.
  - **Select All Below** - highlights a currently highlighted item and all the items in the list displayed below.
  - **Select Multiple** - highlights multiple items by sequential clicking on item names.
  - **Cancel Selection** - removes all highlights in the list.
- Click  to save columns settings and return to the Level Run dialog. Click  to discard changes and return to the Level Run dialog.

Vertical Offset (DL)

To apply the vertical offset for level measurements.

- Enter a value of vertical offset for level measurements.

  Note: The entered vertical offset is applicable to upcoming measurements in the current level run / stakeout.

- Click  to apply the entered offset and return to the previous dialog.

Manual Entry (DL)

To enter level measurement data manually.

This dialog displays to manually enter level measurement values when *Manual Mode* is selected in the **Manufacturer** drop-down list in the Instrument dialog during the Level survey configuration.

Enter values of a performed level measurement manually:

- The height of the **Top Wire** (if using a 3 Wire instrument).
- The height of the **Middle Wire**.
- The height of the **Bottom Wire** (if using a 3 Wire instrument).
- The horizontal **Distance** measurement between the level and the rod (if using a 1 Wire instrument).

Click  to store the level measurement with entered values in the current project and return to the previous dialog. Click  to discard the level measurement.

Stakeout

To perform stakeout of different objects using GNSS or Total Station equipment connected to Sokkia Field.

Find the information about the **Stake** dialog here.

Click an icon to start the respective stakeout task:



Points
To stake design points.



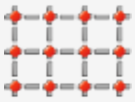
Lines
To stake points along the line formed by design points.



Offsets
To stake design objects with offsets in the horizontal and vertical directions. Objects included: line, lines intersection point, curve, curve by 3 points, spiral.



Surface
To stake a surface by design elevation, road, surface, or plane.



Grid
To stake points in grid nodes inside the defined boundaries.



Point in Direction
To stake a point using the direction from a known point, and the offsets from the direction line.



Point List
To stake points of a point list.



Curve
To stake points along the curve formed by design points.



Road
To stake points on a road.



Slope
To stake points on a slope of a road, alignment, or linework.



Linework
To stake an object of linework type with optional offsets in the horizontal and vertical directions.

To perform elevation stakeout using a digital level .

Find the information about the DL Stakeout dialog here.

Click an icon to start the respective stakeout task:



Points
To stake elevations of design points.



Point List
To stake point elevations of a design point list.



Elevation
To stake elevations on a surface.

Stake Point

To stake design points. Sokkia Field supports points staking in several modes - standard mode, PTL (point to line), and Drape.

Note:
- If the dialog name contains "(PTL)", it means that the PTL mode is activated for the survey or the stakeout. To activate or deactivate, click ☰ and select **Setup** - **PTL mode**.
- If the dialog name contains "(Drape)", it means that the Drape mode is activated for the stakeout. To activate or deactivate, click ☰ and select **Setup** - **Drape mode** (available for optical survey configuration with selected robotic total stations).

To stake a point:

- Select either the **Design Point** or the **Nearest Point**.
  - If the **Design Point** is selected, enter a point name manually, or select from the map or from the list of points in the project. The **Code** field displays the code for the design point.
  - If the **Nearest Point** is selected, Sokkia Field will automatically look for a nearest point among existing points in the current project. This point will be used as the point to be staked.
- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height (*Vertical* or *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...
- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu.

Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:

-  when a normal prism is selected, prism constant also displays below;
-  when a 360 prism is selected, prism constant also displays below;
-  when a sheet is selected, target offset also displays below;
-  when a non-prism is selected, target offset also displays below.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- If *Point / Azimuth (Bearing)* compass orientation is selected in the *Stake Settings* dialog (click  to open), the **Orient Pt** / **Orient Az (Orient Brg)** toggle button is displayed. Here you can define a point or a direction to orient the screen top.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Click  to open the dialog menu with additional options. More...



Stake Line

To stake points along the line formed by design points. Sokkia Field supports lines staking in two modes - standard mode and Drape.

> **Note:** If the dialog name contains "(Drape)", it means that the Drape mode is activated for the stakeout. To activate or deactivate, click  and select **Setup** - **Drape mode** (available for robotic total station optical configuration).

- Define the line:
  - Define the **Start Point** of the line. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.
  - Select between **End Point** and **Azimuth** (or **Bearing** if bearing is selected to output directions) to define the direction of the line.

    Note: If a line is defined by two points, reverse the line direction and instantly swap **Start point** and **End point** by clicking the switchable  /  button.

- In **Ht Comp**, select the type of height computations for the computed points:
  - *Ht of Start Pt (height of the start point)* - the computed points will have the same height as the start point of the line. In this case you can set the station for the start point in the horizontal plane only (**Start 2D** mode).
  - *Interpolate Ht* - the height of the computed points will be computed through linear interpolation using the height of the start and end points of the line. In this case, the switchable **Start 2D** / **Start 3D** button is available.

    Note: The *Interpolate Ht* option is available when the line is defined by start and end points.

    Note: If reference surface is enabled, the computed points will have the same height as the reference surface height *(Ref Surface Ht)*.

- In the field next to the **Start 2D** / **Start 3D** button, you can set stakeout start station from the start point along the line in the horizontal plane or 3D.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- To stake the selected line, click the **Line** button and click **Stake** to start the stakeout process. More...
  To stake the prolongation of the given line, click the **End slope** button and click **Next** to open the Stake Slope dialog.

Click  to open the dialog menu with additional options. More...

Stake Slope (Line)

To specify the slope of the prolongation for the line to stakeout.

You can define the slope of the prolongation using one of the following radio buttons:

- **Project slope** - the slope of the prolongation will be equal to the slope of the line defined in the Stake Line dialog. If *Ht of Start Pt* or *Ref Surface Ht* is selected in the **Height Computation** drop-down list, zero values are always applied. If the *Interpolate Ht* is selected in the **Height Computation** drop-down list, the slope value of the defined line is applied.

  or

- **Enter slopes** - manually set **Cut** and / or **Fill** values of the prolongation.

Click **Stake** to start the stakeout process. More...



Stake Offsets

Click an icon to perform the specific offset stakeout task:

	Line To stake a line with offsets in the horizontal and vertical directions.
	Intersection To stake the intersection point of two lines parallel to two other lines at specified offsets.
	3Pt Curve To stake a curve created by three design points with offsets in the horizontal and vertical directions.
	Curve To stake a curve with offsets in the horizontal and vertical directions.
	Spiral To stake a spiral curve with offsets in the horizontal and vertical directions.

Stake Line Offsets

To stake a line with offsets in the horizontal and vertical directions.

- Define the line:
  - Define the **Start Point** of the line. Enter a point name manually, or select from the map or from the list of points in the project. Clicking the button for GNSS survey opens the *Topo* dialog, or clicking the button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.
  - Select between **End Point** and **Azimuth** (or **Bearing** if bearing is selected to output directions) to define the direction of the line.

    Note: If a line is defined by two points, reverse the line direction and instantly swap **Start point** and **End point** by clicking the switchable / button.

- In **Ht Comp**, select the type of height computations for the computed points:
  - *Ht of Start Pt (height of the start point)* - the computed points will have the same height as the start point of the line. In this case you can set the station for the start point in the horizontal plane only (**Start 2D** mode).
  - *Interpolate Ht* - the height of the computed points will be computed through linear interpolation using the height of the start and end points of the line. In this case, the switchable **Start 2D** / **Start 3D** button is available.

    Note: The *Interpolate Ht* option is available when the line is defined by start and end points.

    Note: If reference surface is enabled, the computed points will have the same height as the reference surface height *(Ref Surface Ht*).

- In the field next to the **Start 2D** / **Start 3D** button, you can set stakeout start station from the start point along the line in the horizontal plane or 3D. Also the line length is displayed for the selected mode.
- Select the **Include Transition Point** check box to include start and end points if they do not fall on a designated station.

- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to proceed in the Station & Offsets dialog.

Note: If the dialog name contains "(Drape)", it means that the Drape mode is turned on for the stakeout. To turn on / off, click ☰ and select **Setup** - **Drape mode** (available for robotic total station optical configuration).

Click ☰ to open the dialog menu with additional options. More...

Station & Offsets

To define parameters for staking offset locations. The **Station** / **Real-Time** / **Skew Station** button allows you to toggle between staking known and unknown staking locations:

1. For **Station**:
   - Select **Station** (**3D Station** if the *Start 3D* mode is chosen for the stakeout) to set the current or start station. The two arrow buttons ◀ ▶ allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button ⏮ / ⏭ to reset current stationing to the start station of the selected line or resume current stationing.
   - Set the station **Interval**.
   - If the defined line / curve is finite, the **Num Segments** field is displayed. This field shows the number of segments of the line determined with the given station **Interval**. Entering the number of segments recalculates the station **Interval** to match this number.
   - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the stations.
   - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.

   - For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- Click **Stake** to start the stakeout process for the designated offset locations. More...

2. For **Real Time**:
   - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the stations.
   - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.

   - For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- Click **Stake** to start the stakeout process for the designated offset locations. More...

3. For **Skew Station**:
   - Select **Skew Station** to set the current station as start station of the new line. Enter the corresponding station.
   - Enter the **Left Skew** or **Right Skew** value as the start angle in the horizontal plane (relative to the existing line) of the new line.
   - Enter the **Skew Offset** to set a point on the new line.
   - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the skew station. If the grade is falling, the value should be negative.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value

manually or click the button to select one of the previously used values from the context menu.

Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- Click **Stake** to start the stakeout process for the designated offset locations. More...



Stake Intersection Offset

To stake the intersection point of two lines parallel to two known lines at specified offsets or to stake intersection at the known distance.

To define **Line 1** and the offset for the first parallel line:

- Define the point of the line in the **From Point** field. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS

survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.

- Select between **Azimuth** (or **Bearing** if bearing is selected to output directions) / **Az to Pt** (**Brg to Pt**) to set the direction of the line through either the direction of the line or the direction from the start point to the selected point. Alternatively, you can define the **Distance** from the point. In this case, the offset setting is not available and there may be two solutions of calculation and two design points will be determined and added to stakeout. You can stake any of them or both, use arrows in the Stake panel to select the desired design point.
- Select either the **Right Offset** or the **Left Offset** as required and enter the offset distance value.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to define Line 2 and the offset for the second parallel line.

Note: If the dialog name contains "(Drape)", it means that the Drape mode is turned on for the stakeout. To turn on / off, click  and select **Setup** - **Drape mode** (available for robotic total station optical configuration).

Click  to open the dialog menu with additional options. More...

Stake Intersection Offset / Line 2

To stake the intersection point of two lines parallel to two known lines at specified offsets or to stake intersection at the known distance.

To define **Line 2** and the offset for the second parallel line:

- Define the point of the line in the **From Point** field. Enter a point name manually, or select from the map  or from the list  of points in the project. Clicking the  button for GNSS survey opens the *Topo* dialog, or clicking the  button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.
- Select between **Azimuth** (or **Bearing** if bearing is selected to output directions) / **Az to Pt** (**Brg to Pt**) to set the direction of the line through either the direction of the line or the direction from the start point to the selected point. Alternatively, you can define the **Distance** from the point. In this case, the offset setting is not available and there may be two solutions of

calculation and two design points will be determined and added to stakeout. You can stake any of them or both, use arrows in the Stake panel to select the desired design point.

- Select either the **Right Offset** or the **Left Offset** as required and enter the offset distance value.
- In the **Intersect Ht** field, you can manually enter the height value for the intersection. By default, this is the height of the point entered as **From Point** for *Line 1*.
- In the **Store Point** field, enter the name of the intersection point to be stored.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height (*Vertical* or *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  - when a normal prism is selected, prism constant also displays below;
  - when a 360 prism is selected, prism constant also displays below;
  - when a sheet is selected, target offset also displays below;
  - when a non-prism is selected, target offset also displays below.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- Click **Stake** to start the stakeout process. More...

Stake 3 Pt Curve Offsets

To stake a curve created by three design points with offsets in the horizontal and vertical directions.

Open the illustration of curve parameters used in Sokkia Field.

- Define the curve by three points. Enter these point names manually, or select from the map  or from the list  of points in the project:
  - In **Point of Curve**, define the starting point of the curve.
  - In **Point of Tangent**, define the ending point of the curve.
  - Select either the **Curve Pt** or the **Radius Point** . The dialog changes its appearance depending upon the selection. In the second case the distance between **Radius Point** and **Point of Curve** should be equal to the distance between **Radius Point** and **Point of Tangent**. The Radius Point, the Point of Curve, and Point of Tangent define two curves - one with delta less than or equal to 180 degrees (*Small* curve) and the other with delta greater than or equal to 180 degrees (*Large* curve). Select either *Small* or *Large* from the **Curve** drop-down list to indicate which of these two curves should be used.
- You can perform the stakeout process in the horizontal plane. To do this, set **Start 2D**. To stakeout a curve in the horizontal and vertical planes, set **Start 3D**.
- In the field next to the **Start 2D** / **Start 3D** button, you can set stakeout start station from the start point along the curve in the horizontal plane or 3D. Also the curve length is displayed for the selected mode.
- Select the **Include Transition Point** check box to include start and end points if they do not fall on a designated station.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to proceed in the Station & Offsets dialog.

Click  to open the dialog menu with additional options. More...

Stake Curve Offsets

To stake a curve with offsets in the horizontal and vertical directions.

Open the illustration of curve parameters used in Sokkia Field.

- Define the curve. Enter point names manually, or select from the map or from the list of points in the project:
  - In **Point of Curve**, define the starting point of the curve.
  - In **Point of Tangent**, define the ending point of the curve.
  - Select between **Radius** / **Chord Angle** / **Curve Angle** / **Radius Point** / **Curve Point** and define the radius of the curve as required.
- In **Ht Comp**, select the type of height computations for the computed points:
  - *Ht of Start Pt (height of the start point)* - the computed points will have the same height as the start point of the curve. In this case you can set the station for the start point in the horizontal plane only.
  - *Interpolate Ht* - the height of the computed points will be computed through linear interpolation using the height of the start and end points of the curve. In this case, the **Start 2D** / **Start 3D** button is available.

    Note: If reference surface is enabled, the computed points will have the same height as the reference surface height *(Ref Surface Ht*).
- In the field next to the **Start 2D** / **Start 3D** button, you can set stakeout start station from the start point along the curve in the horizontal plane or 3D. Also the curve length is displayed for the selected mode.
- In the **Turn** drop-down list, select the direction of turn, relative to the Point of Curve. (This parameter is available if **Radius** / **Chord Angle** / **Curve Angle** was used to define the curve radius.)
  - If the **Radius Point** was used to define the curve radius, the **Curve** drop-down list is available instead of **Turn**. In this case, the distance between **Radius Point** and **Point of Curve** should be equal to the distance between **Radius Point** and **Point of Tangent**. The Radius Point, the Point of Curve, and Point of Tangent define two curves - one with delta less than or equal to 180 degrees (*Small* curve) and the other with delta greater than or equal to 180 degrees (*Large* curve). Select either *Small* or *Large* from the **Curve** drop-down list to indicate which of these two curves should be used.
- Select the **Include Transition Point** check box to include start and end points if they do not fall on a designated station.
- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open

the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to proceed in the Station & Offsets dialog.

Click ☰ to open the dialog menu with additional options. More...

Stake Spiral Offsets

To stake a spiral curve with offsets in the horizontal and vertical directions.

- Define the spiral:
  - Define the **TS Point**, the starting point of the spiral (tangent to the spiral point). Enter a point name manually, or select from the map or from the list of points in the project. Clicking the button for GNSS survey opens the *Topo* dialog, or clicking the button for optical survey opens the *Sideshot* dialog. There you can save the measured point to the current project and instantly enter this point in the corresponding field.
  - In the **Tangent Azimuth** (or **Tangent Bearing** if bearing is selected to output directions) field, enter the direction of the tangent to the spiral at the TS point.
  - Select between **Radius** / **Chord Angle** / **Curve Angle** to enter the radius parameter of the spiral as required.
  - Select between **Length** / **Spiral Constant** to enter the length of the spiral at the ending point, or the constant of the spiral.
  - In the **Turn** drop-down list, select the direction of spiral turn, either *Left* of *Right*.
  - In the **Dir** drop-down list, select the direction of spiral moving:
    - Select **TS To SC**, Tangent Spiral to Spiral Circle, this is the incoming spiral to the internal circle.
    - Select **SC To TS**, Spiral Circle to Tangent Spiral, this is the outgoing spiral from the circle to the Tangent.

- In the **Start** field, enter the starting station to begin stakeout.
- Select the **Include Transition Point** check box to include start and end points if they do not fall on a designated station.
- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to proceed in the Station & Offsets dialog.

Click ☰ to open the dialog menu with additional options. More...

Stake Surface

To stake points on a design surface and to create the new surface from staked points.

Sokkia Field supports four types of design surfaces:

- Elevation - to stake the surface of a fixed elevation;
- Road - to stake the surface of an existing road;
- Surface - to stake the surface of an existing surface;
- Plane - to stake the surface of an existing plane.

Set the required type by clicking the selection button.

Stake Surface of a Fixed Elevation

To stake the surface of a fixed elevation.

- Set **Elevation** by clicking the selection button.
- Enter the elevation value in the editable field. To set the elevation of a specific point as the fixed elevation, select this point from the map  or from the list  of points in the project.
- If required, check the **Define Boundary** box to specify a boundary (polygon) for the stakeout. The Surface Boundary dialog will open after clicking the **Next** button.
- Check the **Auto stake** box to automatically stake points of a surface when meeting conditions for auto-storing positions. This feature is available for GNSS or Robotic configurations. Auto-storing parameters are set in the Auto Topo Survey dialog during GNSS survey configuration or the Auto Topo dialog during Robotic survey configuration.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- If required, check the **Create Surface** box to create a surface from 3 or more staked points. The prompt for the new surface name will open before stakeout, after clicking the **Next** button. From the drop-down list below, select a surface model to use in the stakeout:
  - If the *Elevation* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated from real staked measurements.
  - If the *Cut / Fill* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated as the difference between the design surface and the staked surface.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Click  to open the dialog menu with additional options. More...

Surface Boundary / Grid Boundary

To define boundaries for the stakeout:

- In the **Points / PointList / Linework / Area / Extents** field, choose the method of adding the data to create the boundary.
  - The dialog displays the list of points and the plan view of point positions defining the boundary. The point highlighted in the list is marked with a yellow circle on the plan view.
    - Use  and  to move the highlighted point(s) up or down in the ordering. Use context menu to highlight multiple points:

- **Select All** - highlights all points in the list.
- **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
- **Select Multiple** - highlights multiple points by sequential clicking on point names.
- **Cancel Selection** - removes all highlights in the list.

- The joystick arrows symbol  /  switches on / off the controller's keys to move points inside the list.
- To remove the highlighted point(s) from the point list, highlight the point(s) and click .
- To obtain information about one point, highlight the point and click .

- For **Points**, in the **Add Points** drop-down list, choose an option to select multiple points in the project for creating the boundary:
  - *All* - add all the points from the current project.
  - By Range - add points by specifying point name range(s).
  - By Code - add points by point code name(s).
  - By Code String - add points by code string.
  - By Radius - add points which reside in a particular circle.
  - By Name - add points by name or by part of name.
  - By Layer - add points which belong to a particular layer.
  - From Map - add points manually from the map.
  - From List - add points manually from the list of points in the project.
- For **Point List**, enter an existing point list name manually, or select it from the list  of project point lists.
- For **Linework**, enter an existing linework name manually, or select it from the map  or from the list  of existing linework objects.
- For **Area**, enter an existing area name manually, or select it from the map  or from the list  of project areas.
- For **Extents** (available for creating a boundary for the Stake Grid process), enter the extents (start and end distances from the origin point) along the defined direction and in perpendicular to it. The grid will be staked within the formed rectangle according to entered extents.

- Click  to create the surface boundary for the Stake Surface process or click **Stake** to start stakeout for the Stake Grid process.

Input New Surface Name

To specify the name of the new surface that should be created in the current task and saved to the current project.

This dialog is displayed before a surface stakeout if the **Create Surface** check box has been selected in the Stake Surface dialog.

- Enter a desired name for the surface or keep an automatically suggested name.
- Click  to accept the name and continue.

Surface Volume

To review the information about staked surface.

This dialog is displayed at the end of a surface stakeout if the **Create Surface** check box has been selected in the Stake Surface dialog and three or more points were staked out.

- *Design object* - the type and name of the design object (surface, road, or plane) or the parameter and value (elevation) that was staked;
- *Staked surface* - the name of the surface that is created in the current project based on staked points;
- *Cut* - the estimated volume required to remove;
- *Fill* - the estimated volume required to add;
- *Area* - the area of staked surface in 2D.

Review the displayed information and click  to save the data to a **.txt* file if required.

Stake Surface of a Road

To stake the surface of an existing road.

- Set **Road** by clicking the selection button.
- Enter an existing road name manually, or select from the map  or from the list  of project roads. Two panels display the plot of the selected road in horizontal and vertical planes.
- Check the **Auto stake** box to automatically stake points of a surface when meeting conditions for auto-storing positions. This feature is available for GNSS or Robotic configurations. Auto-storing parameters are set in the Auto Topo Survey dialog during GNSS survey configuration or the Auto Topo dialog during Robotic survey configuration.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- If required, check the **Create Surface** box to create a surface from 3 or more staked points. The prompt for the new surface name will open before stakeout, after clicking the **Next** button. From the drop-down list below, select a surface model to use in the stakeout:
  - If the *Elevation* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated from real staked measurements.
  - If the *Cut / Fill* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated as the difference between the design surface and the staked surface.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Click ☰ to open the dialog menu with additional options. More...

Stake Surface of a Plane

To stake the surface of an existing plane.

- Set **Plane** by clicking the selection button.
- Enter an existing plane name manually, or select from the map  or from the list  of project planes. The horizontal plot of the plane will be displayed.
- Check the **Auto stake** box to automatically stake points of a surface when meeting conditions for auto-storing positions. This feature is available for GNSS or Robotic configurations. Auto-storing parameters are set in the Auto Topo Survey dialog during GNSS survey configuration or the Auto Topo dialog during Robotic survey configuration.
- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- If required, check the **Create Surface** box to create a surface from 3 or more staked points. The prompt for the new surface name will open before stakeout, after clicking the **Next** button. From the drop-down list below, select a surface model to use in the stakeout:
  - If the *Elevation* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated from real staked measurements.
  - If the *Cut / Fill* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated as the difference between the design surface and the staked surface.

Note: The **Create Surface** feature is unavailable if the vertical plane is used for stakeout.

- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Click  to open the dialog menu with additional options. More...

Stake Surface of a Surface

To stake the surface of an existing surface.

- Set **Surface** by clicking the selection button.
- Enter an existing surface name manually, or select from the map  or from the list  of project surfaces. The preview of selected surface is displayed.
- Check the **Auto stake** box to automatically stake points of a surface when meeting conditions for auto-storing positions. This feature is available for GNSS or Robotic configurations. Auto-storing parameters are set in the Auto Topo Survey dialog during GNSS survey configuration or the Auto Topo dialog during Robotic survey configuration.
- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- If required, check the **Create Surface** box to create a surface from 3 or more staked points. The prompt for the new surface name will open before stakeout, after clicking the **Next** button. From the drop-down list below, select a surface model to use in the stakeout:
  - If the *Elevation* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated from real staked measurements.
  - If the *Cut / Fill* model is selected for the new surface, the *Min Elevation* / *Max Elevation* values are calculated as the difference between the design surface and the staked surface.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Click  to open the dialog menu with additional options. More...

Stake Grid

To create a grid with the specified interval between grid node points in the horizontal plane and to stake the node points of this grid.

- Specify the **Origin Point** for the grid. Enter a point name manually, or select from the map or from the list of points in the project.
- Select between **Azimuth** (or **Bearing** if bearing is selected to output directions) and **Az to Pt** (**Brg to Pt**) to enter the direction of grid lines either by value or as a direction to another known point.
- In the **Spacing** field, specify the intervals for nodes on **Along Azimuth (Bearing)** and **Perpendicular** grid lines.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height (*Vertical* or *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  - when a normal prism is selected, prism constant also displays below;
  - when a 360 prism is selected, prism constant also displays below;
  - when a sheet is selected, target offset also displays below;
  - when a non-prism is selected, target offset also displays below.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- If required, check the **Create Surface** box to create a surface from 3 or more staked points. The prompt for the new surface name will open before stakeout, after clicking the **Next** button. From the drop-down list below, select a surface model to use in the stakeout:
  - If the *Elevation* model is selected for the new surface, the *Min Elevation* / *Max Elevation* are calculated from real staked measurements.
  - If the *Cut / Fill* model is selected for the new surface, the *Min Elevation* / *Max Elevation* are calculated as the difference between the design surface and the staked surface.

  Note: Click ☰ and select **Setup** - **Reference Surface** to open the Reference Surface dialog and define a design surface for the new *Cut / Fill* surface.

- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to open the Grid Boundary dialog and define the boundaries of the grid to stakeout.

Click ☰ to open the dialog menu with additional options. More...



Stake Point in Direction

To stake a point, using the direction from a known point, and the offsets from the direction line.

- In the **From Point** field, enter the known point manually, or select from the map  or from the list  of points in the project.
- Select between **Azimuth** (or **Bearing** if bearing is selected to output directions) and **Az to Pt** (**Brg to Pt**) to enter the direction to the known point either by value or as a direction to another known point.
- Enter the offsets from the known point:
  - Set the **Angle Offset** from the direction line. To add / subtract 90 or 180 degrees to the displayed value, click  and select the desired action.

  - In the **Horz. Distance** field, set the horizontal distance offset along the angle offset line.
  - In the switchable field **Grade / Up / Down**, set the height offset.
- The **Store Point** field will display the default name of the staked point. You can change this name.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height (*Vertical* or *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  - when a normal prism is selected, prism constant also displays below;
  - when a 360 prism is selected, prism constant also displays below;
  - when a sheet is selected, target offset also displays below;
  - when a non-prism is selected, target offset also displays below.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process for the designated offset locations. More...

Note: If the dialog name contains "(Drape)", it means that the Drape mode is turned on for the stakeout. To turn on / off, click ☰ and select **Setup** - **Drape mode** (available for robotic total station optical configuration).

Click ☰ to open the dialog menu with additional options. More...

Stake Point List

To stake points of an existing point list.

- In the **Name** field, enter an existing point list name manually, or select it from the list of project point lists.
  - The dialog displays the list of points in the selected Point List and the plan view. The point highlighted in the list is marked with a yellow circle on the plan view. The / button can be used to toggle the graphical view of the point list.
- Use and to move the highlighted point(s) up or down in the ordering. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- Check the **Reverse Order** box to perform the stakeout starting in reverse order from the end of the Point List.
- Check the **Nearest Point** box to perform the stakeout by the nearest point relative to the current location.

Note: When staking a point list, check the **Show Stake Point List** box in the General tab of the Map Properties dialog to display the interactive panel with points from the list that are not yet staked. This panel delivers better control over point list stakeout and offers the instant and arbitrary selection of a next point to stake.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Note: If the dialog name contains "(Drape)", it means that the Drape mode is turned on for the stakeout. To turn on / off, click  and select **Setup** - **Drape mode** (available for robotic total station optical configuration).

Click  to open the dialog menu with additional options. More...

Stake Curve

To stake points along the curve formed by design points.

Open the illustration of curve parameters used in Sokkia Field.

- Define the curve. Enter these point names manually, or select from the map or from the list of points in the project:
  - In **PC Point**, define the Point of Curve (starting point of the curve).
  - In **PT Point**, define Point of Tangent to the curve (ending point of the curve).
  - Select between **Radius** / **Chord Angle** / **Curve Angle** / **Radius Point** / **Curve Point** and define the radius of the curve as required.
- You can perform the stakeout process in the horizontal plane only. To do this, set **Start 2D**. To stakeout a curve in the horizontal and vertical planes, set **Start 3D**.
- In the field next to the **Start 2D** / **Start 3D** button, you can set stakeout start station from the start point along the curve in the horizontal plane or 3D.
- In the **Turn** drop-down list, select the direction of turn, relative to the Point of Curve. (This parameter is available if **Radius** / **Chord Angle** / **Curve Angle** was used to define the curve radius.)
- In the **Curve** drop-down list, select either a curve with delta less than or equal to 180 degrees (*Small* curve), or a curve with delta greater than or equal to 180 degrees (*Large* is used. (This parameter is available if **Radius** / **Chord Angle** / **Curve Angle** / **Radius Point** was used to define the curve radius.)
- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height (*Vertical* or *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

> **Note:** If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

> **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu.

Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:

-  when a normal prism is selected, prism constant also displays below;
-  when a 360 prism is selected, prism constant also displays below;
-  when a sheet is selected, target offset also displays below;
-  when a non-prism is selected, target offset also displays below.



Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Stake** to start the stakeout process. More...

Click  to open the dialog menu with additional options. More...



Stake Road

To stake points along the road.

- Select either **Road**, **Horizontal Alignment**, or **Horizontal and Vertical Alignment** to be staked. Enter an existing road / alignment name(s) manually in the respective text field, or select from the list  of project roads / alignments. Two panels display the plot of the selected road in horizontal and vertical planes.
- The **Start Station** field displays the distance from the beginning of the road to start the stakeout.
- Click the **Transition Points** button to select transition point types to include in the stakeout. The checked box  indicates that some type(s) of transition points are already included. The clear box  indicates that no transition point types are selected. More...
- Click the **Surface Thickness** button to select a surface and calculate elevation of staked road / alignment from this surface. This option can be useful in monitoring material thickness during road construction. The checked box

 indicates that the feature is enabled and a surface is already selected. The clear box  indicates that the feature is disabled. More...

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to open the Stake Alignment (Road) dialog if **Road** is selected or the Stake Alignment (CL Offset) dialog if **Horizontal Alignment** / **Horizontal and Vertical Alignment** is selected.

Click  to open the dialog menu with additional options. More...

Surface Thickness

To select a surface and report elevation of staked road / alignment from this surface.

The Surface Thickness option can be useful in monitoring material thickness during road construction. Select a surface of a layer under the staked road surface and get details of material thickness above this layer.

- Check the **Report thickness** box to enable the Surface Thickness feature and choose a surface to calculate elevation from. Clearing the box disables the Surface Thickness feature.
  - In the **To surface** field, define the surface. Enter an existing surface name manually, or select from the map  or from the list  of surfaces in the project.
  - The horizontal plot of the selected surface will be displayed.
- Click  to confirm the selection and return to the previous dialog.

The *Road Surface 2*, *Cut / Fill to Road Surface 2* parameters, and the *Road Surface Thickness* for each measured point will be available.

> **Note:** To have these values displayed in customizable data fields during stakeout, select them in the Select Stakeout Value dialog.

Stake Alignment (CL Offset)

To define a temporary cross section for stakeout of a road / slope without having predefined road templates.

Enter the cross section parameters:

- In the **CL Offsets** fields enter the horizontal and vertical offsets to the right (**Right**) and to the left (**Left**) from the centerline.

  The vertical offsets can be entered as *Up*, *Down*, or *Grade*. Grade can be specified as gradient, percentage or degree (the format is set in the Display dialog).

- If you select the **Stake Curb/Ditch** check box, you can enter the horizontal and vertical offsets for the curb / ditch. The geometry of the curb / ditch can be *Diagonal*, *Hz/Vert*, or *Vert/Hz*.
- The plan shows all the entries graphically, displaying segment point codes: CL (centerline), EP (edge of pavement), CURB, etc. Double-tap (double-click) the plan to view in full screen.
- Click **Next** to proceed with stakeout setup.

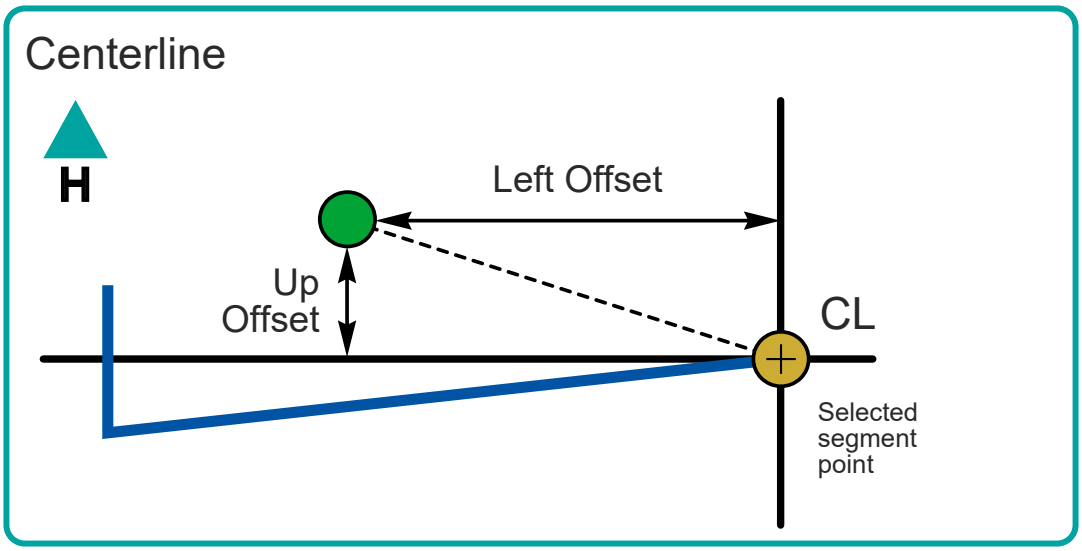
Stake Alignment (Road)

The **Stake Alignment** dialog displays the properties of the cross section on the stakeout station and helps you stakeout all of the desired points.

Select the **Station**, **Road Points**, or **Skew Station** to specify the type of design location for stakeout.

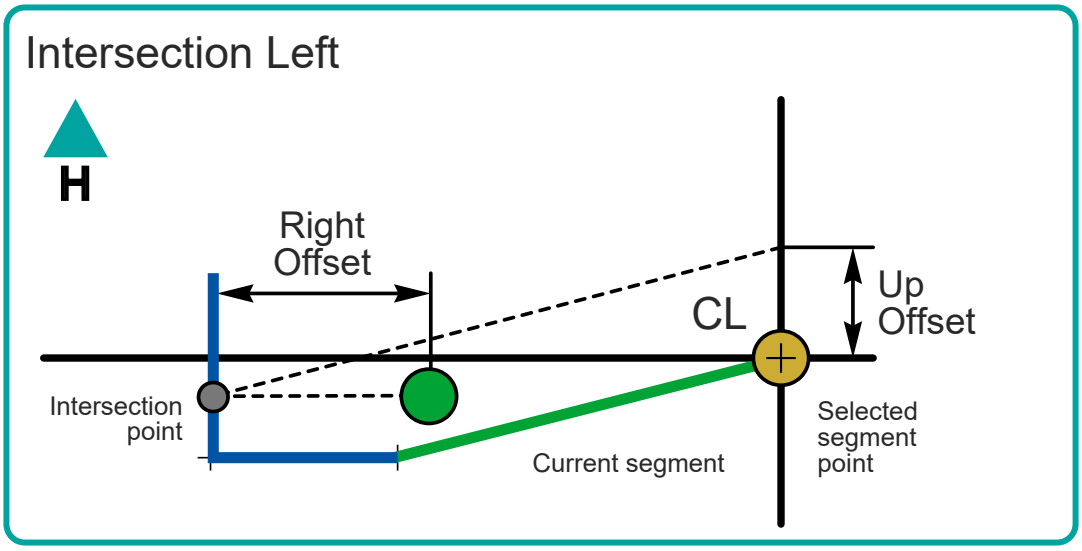
- If the **Station** is selected, you can change the station number by the value of *Interval* using the  buttons.
  If the **Road Points** is selected you can select any road point as the current point. To do it, click  and select a road point in the Road Points dialog.
  - Enter the **Interval** for the station increment.
  - The **Segment Pt** field shows the selected segment point code.
    - The  /  buttons move the current segment point along the cross section.
    - The panel below displays the plan. Currently selected segment point is a yellow dot marked with a cross. The design point is displayed as a green dot. Double-tap (double-click) the plan to view in full screen.
  - Select between **Right Offset / Left Offset** to enter the horizontal offset from the current segment point as required.
  - Select between **Up Offset / Down Offset** to enter the vertical offset from the current segment point as required.
  - From the bottom drop-down list, select one of the following modes to specify offsets location:

- *Centerline*: both the horizontal and vertical offset start at the centerline. Note that this mode is not available for roads that have a cross section template specified.



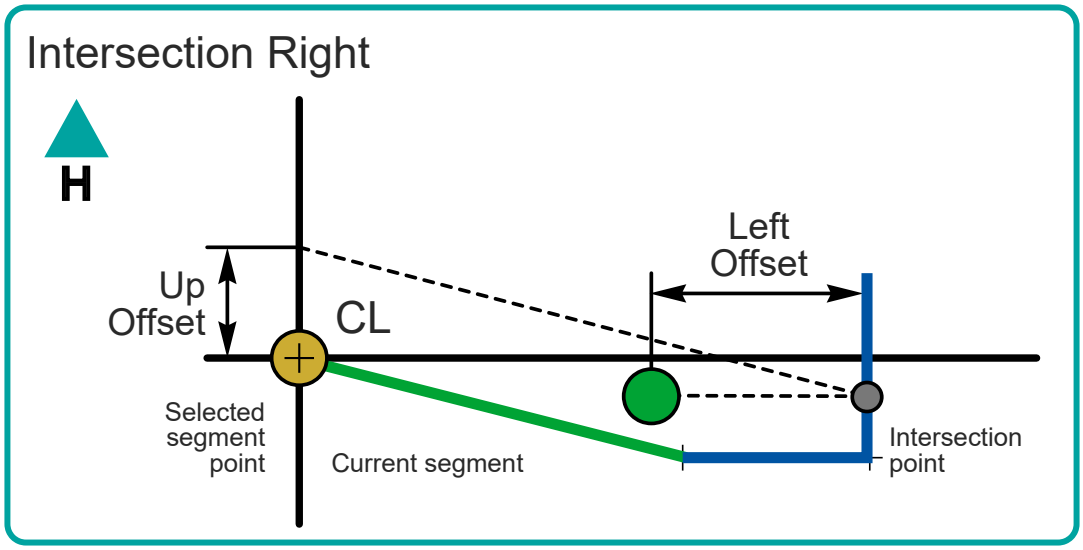
- *Intersect Left*: the vertical offset starts at the selected segment point; the horizontal offset starts at the point of intersection of the line that is parallel to the current segment with a segment that is on the left of it. The / button allows you to specify the offset direction: vertical or perpendicular to the selected segment.

> **Note:** This mode implies that you have one or more segments on the left of the selected segment.

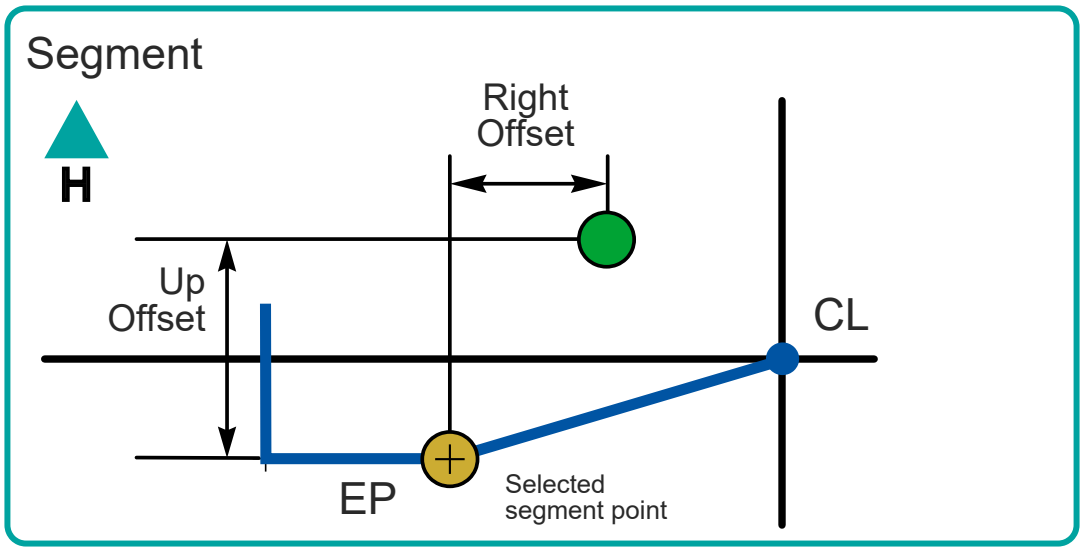


- *Intersect Right*: the vertical offset starts at the selected segment point; the horizontal offset starts at the point of intersection of the line that is parallel to the current segment with a segment that is on the right of it. The  /  button allows you to specify the offset direction: vertical or perpendicular to the selected segment.

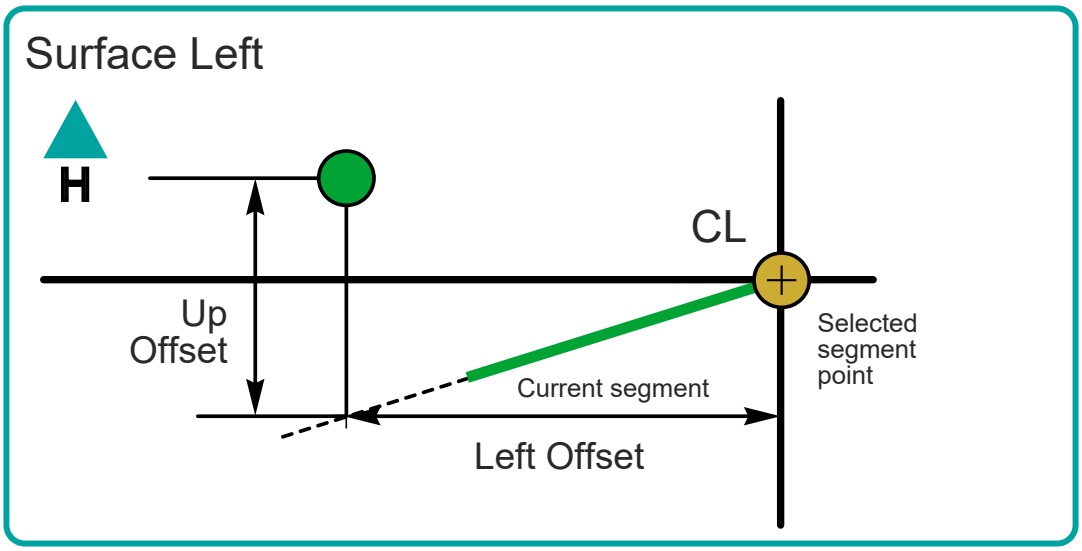
> **Note:** This mode implies that you have one or more segments on the right of the selected segment.



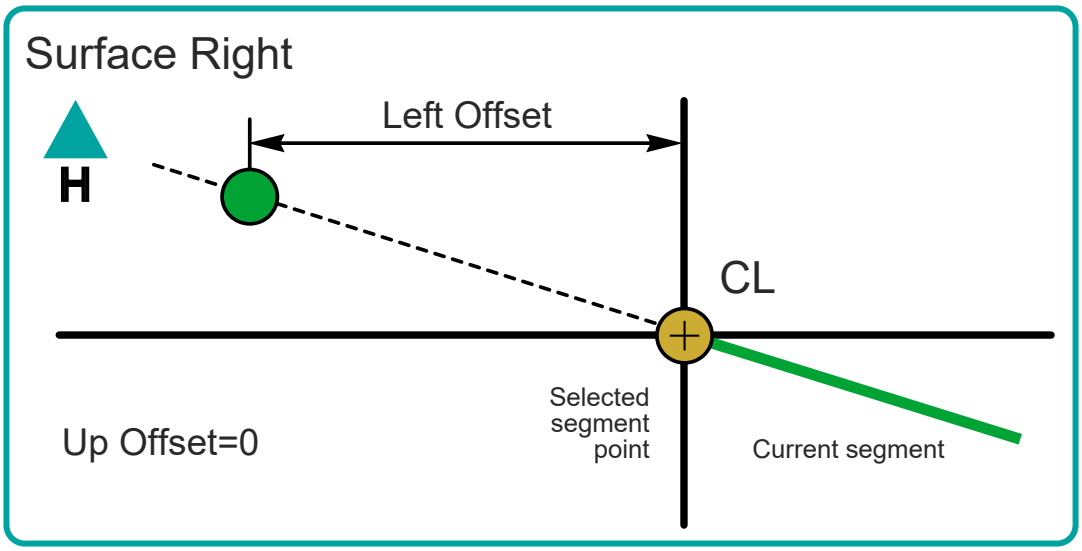
- *Segment*: both the horizontal and vertical offset start at the selected segment point.



- *Surface Left*: the horizontal offset starts at the selected segment point; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

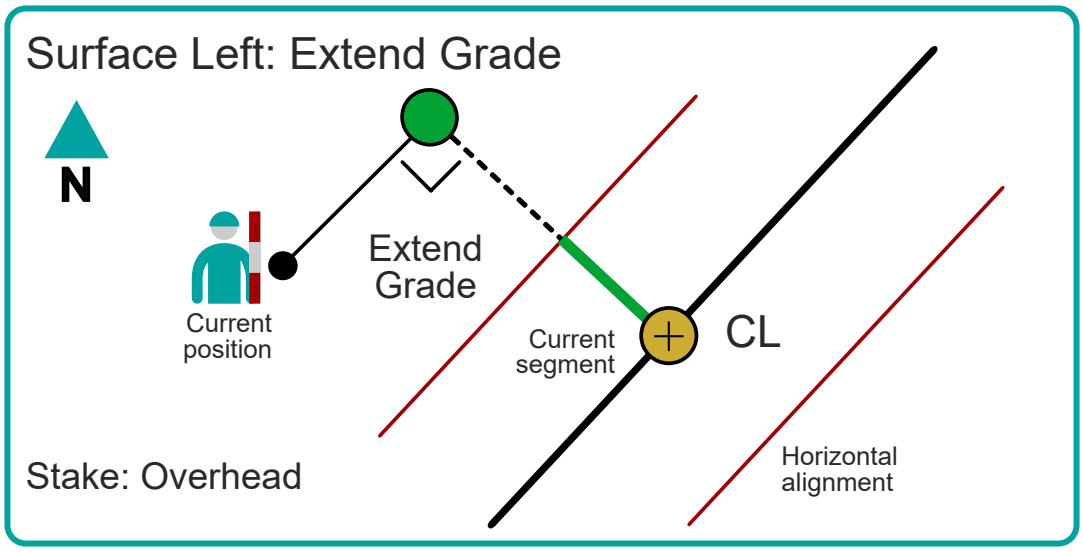


- *Surface Right*: the horizontal offset starts at the selected segment point; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.



For *Surface Right* and *Surface Left* modes you can use **Extend Grade**. For that, select the **Left Offset**/**Right Offset** button until **Extend Grade** is displayed.

- If the **Extend Grade** offset is used then when staking the road in the Overhead View screen, the design position (green dot) will move along the design surface at the current position.



See also How to use Extend Surface in Stakeout.

- If the **Skew Station** is selected:
  - Set the current station as start station. Enter the corresponding station.
  - Enter the **Left Skew** or **Right Skew** value as the start angle in the horizontal plane (relative to the existing line) of the new line.
  - Enter the **Skew Offset** to set a point on the new line.
  - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the skew station. If the grade is falling, the value should be negative.

Click **Stake** to start the stakeout process. More...

Stake Slope

To stake points on a slope of a road, alignment, or linework.

- Switch to a desired object type and specify an object of that type used to stake a slope:
  - **Road** - to select a road which slope should be staked out.
    - Enter an existing road name manually, or select from the list of project roads. Two panels display the plot of the selected road in horizontal and vertical planes.
  - **H Align** - to select a horizontal alignment which slope should be staked out.

  - Enter an existing horizontal alignment name manually, or select from the list  of project horizontal alignments. The left panel displays the plot of the horizontal alignment.
- **HV Align** - to select horizontal and vertical alignments which slope should be staked out.
  - Enter an existing horizontal and vertical alignments names manually in the respective text field, or select from the list  of project alignments. Two panels display the plot of the selected alignments in horizontal and vertical planes.
- **Linework** - to select a linework object which slope should be staked out.
  - Select a linework object from existing linework objects (listed in the left panel below) or from the map . The right panel displays the plot of the linework.
- **Code** - to select a linework object by code and code string which slope should be staked out.
  - Select a code from the drop-down list and a string from the *Strings* list in the left panel below. The right panel displays the plot of the linework.
- **Start Point** - to select a line by start and end point which slope should be staked out.
  - Define the **Start Point** of the line. Enter a point name manually, or select from the map  or from the list  of points in the project.
  - Define the **End Point** of the line. Enter a point name manually, or select from the map  or from the list  of points in the project.
- The **Start Station** field displays the distance from the start point of the object to begin the stakeout. You can manually enter the desired stakeout start station for linework object type.
- Click the **Transition Points** button to select transition point types to include in the stakeout. The checked box  indicates that some type(s) of transition points are already included. The clear box  indicates that no transition point types are selected. More...

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

> **Note:** If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

>  **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

  Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click **Next** to open the Stake Alignment (Slope) dialog if **Road** is selected or the Stake Alignment (CL Offset) dialog if **Horizontal Alignment** / **Horizontal and Vertical Alignment** / **Linework** is selected.

Click  to open the dialog menu with additional options. More...

Stake Alignment (Slope)

The **Stake Alignment** dialog displays the properties of the cross section on the stakeout station and helps you stakeout all of the desired points.

Select either **Station**, or **Road Points** to specify the type of design location for stakeout.

- If the **Station** is selected, you can change the station number by the value of *Interval* using the  buttons.
  If the **Road Points** is selected you can select any road point as the current point. To do it, click  and select a road point in the Road Points dialog.
- Enter the **Interval** for the station increment.
- The **Hinge Pt** field shows the selected hinge point code. The hinge point is a point of rotation of the cut / fill slopes.

- The  /  buttons move the current hinge point along the cross section.
- Click  /  to choose the direction of slope rotation, either clockwise or counterclockwise.
- The panel below displays the plan. Currently selected hinge point is a yellow dot marked with a cross. The design point is displayed as a green dot. Double-tap (double-click) the plan to view in full screen.

- Select between **Right Offset / Left Offset** to enter the horizontal offset from the current hinge point as required.
- Select between **Up Offset / Down Offset** to enter the vertical offset from the current hinge point as required.
- From the drop-down list, select the mode of template offsets:
  - *Auto*: automatically set the last template point (without offsets).
  - *Intersect Left*: the vertical offset starts at the hinge point; the horizontal offset starts at the point of intersection of the line parallel to the left segment with the cross section. The  /  button allows you to specify the offset direction: vertical or perpendicular to the selected segment.
  - *Intersect Right*: the vertical offset starts at the hinge point; the horizontal offset starts at the point of intersection of the line parallel to the right segment with the cross section. The  /  button allows you to specify the offset direction: vertical or perpendicular to the selected segment.
  - *Segment*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the centerline.
  - *Segment Slope*: it is very similar to the normal *Segment*, but it uses the next point in the direction of the slope to calculate the slope ratio. This mode also skips the Stake Slope dialog, since it has no effect. Click **Stake** to start the stakeout process. More...
  - *Surface Left*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

    Note: This mode implies that you have one or more segments on the left of the selected segment.

  - *Surface Right*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

    Note: This mode implies that you have one or more segments on the right of the selected segment.

Click **Next** to proceed in the Stake Road (Slope) dialog.

Stake Road (Slope)

To specify the slope of the prolongation for staked object.

You can define the slope of the prolongation using one of the following radio buttons:

- **Template Slopes** - the slopes of the prolongation will be equal to the template cut / fill slope values (when road template is available).

  or

- **Enter slopes** - manually set **Cut** and / or **Fill** slope values of the prolongation.

Click **Stake** to start the stakeout process. More...



Stake Linework

To stake an object of linework type with optional offsets in the horizontal and vertical directions.

This dialog sets up the stakeout of an object of linework type, such as linework, area, region, or contour of a surface.

- Use the drop-down menu to define the object to be staked either by selecting an existing linework, region, area, surface contour, or by forming a linework object by manually selecting points, or by using a specific code and string:
  - Set **Linework** to select a linework object or area from existing linework objects and areas (listed below) or from the map .
  - Set **Code** to select a linework object formed by points with specific code and code string. Select a code from the drop-down list and a string from the *Strings* list below.

  - Set **Points** to form a linework object from existing points:
    - From the **Select Points** drop-down menu, choose an option to add point(s) from the project to form the linework:
      - *All* - add all the points from the current project.
      - By Range - add points by specifying point name range(s).
      - By Code - add points by point code name(s).
      - By Code String - add points by code string.
      - By Radius - add points which reside in a particular circle.
      - By Name - add points by name or by part of name.

  - By Layer - add points which belong to a particular layer.
  - From Map - add points manually from the map.
  - From List - add points manually from the list of points in the project.

- Highlight desired point(s) in the list. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- Use  and  to move the highlighted point(s) up or down in the ordering.
- To remove the highlighted point(s) from the linework, highlight the point(s) and click .
- To obtain information about one point, highlight the point and click .

- Set **Region** to select a region from the existing regions (listed below) or from the map . By default, all existing regions are listed. To narrow the list to the regions associated with a particular reference alignment (road), click  and use *Filter by Road* to select the desired road. When the displayed list of regions is already filtered, the button shows the green icon . Use *Reser All* command to remove filtering.
- Set **Contour** to select a surface contour line by the elevation (listed below) or from the map . By default, elevations of all existing contours in the project are listed. To narrow the list to the contour elevations on a particular surface, click  and use *Filter by Surface* to select the desired surface. When the displayed list of contour elevations is already filtered, the button shows the green icon . Use *Reset All* command to remove filtering.

- Use the preview panel to the right to view the selected or formed linework object in the horizontal plane.

- You can perform the stakeout process in the horizontal plane. To do this, set **Start 2D**. To stakeout a linework object in the horizontal and vertical planes, set **Start 3D**.
- In the field next to the **Start 2D** / **Start 3D** button, you can set stakeout start station from the start point along the linework in the horizontal plane or 3D.
- Select the **Include Transition Points** check box to include linework segment points if they do not fall on a designated station.

- For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

  Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

   **Note:** In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.

- Click **Next** to proceed in the Linework Station & Offsets dialog.

Click  to open the dialog menu with additional options. More...

Linework Station & Offsets

To define parameters for staking offset locations.

The **Station** / **Real-Time** / **Skew Station** button allows you to toggle between staking known and unknown staking locations:

1. For **Station**:
   - Select **Station** (**3D Station** if the *Start 3D* mode is chosen for the stakeout) to set the current or start station. The two arrow buttons  allow you to decrease or increase the station by the interval specified in the **Interval** field. Use the toggle button  to reset current stationing to the start station of the selected linework or resume current stationing.
   - Set the station **Interval**.
   - The **Num Segments** field shows the number of segments of the line determined with the given station **Interval**. Entering the number of segments recalculates the station **Interval** to match this number.
   - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the stations.
   - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value should be negative.
   - In **Angle Pts**, select how the angle points will be computed at segment intersections:
     - **Offset Bk**: The offset point at the intersection will be computed from the end point of the first segment.
     - **Offset Ahd**: The offset point at the intersection will be computed from the start point of the second segment.
     - **Bisector**: The offset point at the intersection will be computed from the intersection of the offset of the first and second segment.
   - In **Curve Pts**, select how points on curve segments will be selected:
     - **Station Only**: The offset points on curve segments will be computed at intervals along the curve.
     - **RP**: Only the curve radius point will be computed.
     - **PI**: Only the curve point of intersection of tangents will be computed.
     - **MOC**: Only the point in the middle of the curve will be computed.
   - Click **Stake** to start the stakeout process for the designated offset locations. More...

2. For **Real Time**:
   - Enter the **Right Offset** or **Left Offset** of the computed point with respect to the line at the stations.
   - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the line at the station. If the grade is falling, the value

should be negative.
- Click **Stake** to start the stakeout process for the designated offset locations. More...

3. For **Skew Station**:
   - Select **Skew Station** to set the current station as start station of the new line. Enter the corresponding station.
   - Enter the **Left Skew** or **Right Skew** value as the start angle in the horizontal plane (relative to the existing line) of the new line.
   - Enter the **Skew Offset** to set a point on the new line.
   - Enter the **Up Offset** or **Down Offset** height offset, or the vertical **Grade Offset** (in percentage) with respect to the height of the skew station. If the grade is falling, the value should be negative.
   - Click **Stake** to start the stakeout process for the designated offset locations. More...

Stake Dialog

To perform the stakeout routine in the field using connected equipment: either a GNSS receiver, or a total station.

This dialog provides the interface for staking points or other objects in the field offering specific options assisting in specific stakeout tasks.

The dialog offers the set of tools and options to perform stakeout tasks:

- There is a number of Stake Dialog Views facilitating the specific stakeout. View selector is accessible from the dialog title bar and provides instant switching between available views;
- Status and tool panels along the top provide information about connected equipment status and some command tools to operate this equipment;
- Stake panel along the bottom provides controls to select design objects along with information about them and command buttons to perform measurements and save measured points;
- Configurable **Data fields** to display specific stakeout information during stakeout. All Stake Dialog Views except the Data view have six customizable data fields  in the bottom part of the screen. They are used to display the value of a chosen stakeout parameter. To change the data displayed in such field, tap or click on the field to open the Select Stakeout Value dialog and select the required item from a list of all available parameters for the current stakeout mode.
- The  button opens the Stake dialog pop-up menu that provides numerous additional options related to stakeout and equipment settings and operation. More...

Stake Dialog Views

To choose a convenient view of the Stake dialog for specific stakeout from the list of available dialog views.

Each of the stakeout modes has a set of available dialog views assisting in different aspects. To switch between views, use the drop-down list in the dialog's title bar.

- **Data view** - this view is available in all stakeout modes and provides a complete list of stakeout parameters and their values available in the current staking mode. There is no visual assistance. Status and control of the connected equipment as well as saving staked points are available.

- **Normal view** - this view is available whenever you are staking known design coordinates and provides a directional way of locating the design locations:
  - If the distance to the design is more than 3 m, the compass arrow will point to the target direction with the current location in the center of the dialog.
  - If the distance to the target is less than 3 m, the plot zooms in to showing the target point in the center and the current location nearby: directions to the target and distances are also displayed.
  - As soon as the target becomes closer than the *Horizontal Distance Tolerance* value, the plot shows a bull's-eye target point. This means the point is ready to be staked and stored in the project.

- **Map view** - this view is available in all stakeout modes and provides a visual way of navigating to the design locations over the project's 2D map:
  - If the distance to the design is more than 3 m, the compass arrow will point to the target direction. **Compass** should be enabled in the General tab of the Map Properties dialog.
  - If the distance to the target is less than 3 m, the compass shows two directional arrows (from N, W, S, E directions) with respective horizontal distances to the target.
  - As soon as the target becomes closer than the *Horizontal Distance Tolerance* value, the plot shows a bull's-eye target point or a high precision compass with current offsets of actually measured location from the design location if the **High Precision** compass mode is enabled in the General tab of the Map Properties dialog. This means the point is ready to be staked and stored in the project.
  - The Map View Tools toolbar is available in the right part of the dialog for navigating the map in many ways and customizing map objects output.
  - *Cut / Fill bar* is available in the left part of the dialog to visually display the elevation delta between design location and current location. **Cut / Fill bar** should be enabled in the General tab of the Map Properties dialog.
  - When staking out a point, line or linework, you can select another point, line or linework on the map and use the respective *Stake* command in the context menu to switch the stake focus to the next object of the same type without exiting the Stake dialog.

- **Overhead view** - this view is available whenever you are staking known design coordinates and provides a visual directional way of navigating to the design locations:
  - The view automatically focuses on the current stakeout task isolating it from the other map objects.
  - The view automatically zooms to current and design locations at maximum possible map scale.

- **Slope view** - this view is available whenever you are staking the prolongation of the design line with specified end slope and shows the slope scheme with hinge point (**HP**) catch point (**CP**), and current position in the vertical plane:
  - The limited Map View Tools toolbar with zooming buttons is available in the right part of the dialog.
  - The current catch point (**CP**) is displayed in green, the hinge point (**HP**) is displayed in yellow.

- **Cross Section view** - this view is available in road, and slope stakeout modes and shows the cross section scheme of the current stake location and current position in the vertical plane:
  - The limited Map View Tools toolbar with zooming buttons is available in the right part of the dialog.
  - Depending on the stakeout setup, the segment points as defined in the cross section template, hinge (**HP**), catch (**CP**), centerline (**CL**) points of the cross section are displayed.
  - The current design point is displayed in green.

Stake Status and Tool Panels

Status and tool panels along the top of the Stake dialog provide visual information about connected equipment status and some command tools to operate the equipment.

Stake Status panel for GNSS receivers

To review status indicators in the Stake Status panel for GNSS receivers:

To display the status panel click , and to hide it click  on the top left of the Stake dialog.



Logging a **.tps* file to a receiver or a controller. This icon will be displayed, if the **Post-Processing** check box is selected in the Receiver Make dialog. There are two statuses:

- "without a pencil" - the file logging is not started by a user;
- "moving pencil" - the file logging is started by a user.



The icon is displayed when **Depth Finder** is selected in the Peripherals dialog for the rover receiver:

- Gray ship - a depth finder is not connected to the controller;
- Color ship with question mark - a depth finder is connected to the controller but it is not transmitting any data;
- Color ship with green curves - a depth finder is connected to the controller and it is transmitting data.



PPP engine supplies the current solution, the receiver obtains PPP corrections data from Lband satellite. (Available for GNSS survey configurations with activated Skybridge ™ or Starpoint ™ in the Receiver Settings dialog). More about Precise Point Positioning (PPP).



Quality of the radio link for correction data transmission (the age in seconds of the last correction message received by the rover is displayed):

- Crossed out link indicator - link quality is not detected;
- Red indicator and no colored bars - link quality is 0 or age is more than 5 sec;
- Orange indicator and 1 colored bar - link quality is 1 to 49 percents;
- Brown indicator and 2 colored bars - link quality is 50 to 79 percents;
- Green indicator and 3 colored bars - link quality is 80 to 97 percents;
- Green indicator and 4 colored bars - link quality is 98 to 100 percents.



GNSS solution:

- The red bar indicates an *Autonomous* solution in standalone mode, *DION* extrapolated solution or *Convergence PPP* stage in PPP mode.
- The yellow bar indicates a *Float* solution in RTK mode, *DGPS* solution or *PPP Low* solution in PPP mode.
- The light green bar indicates a *PPP Normal* or *PPP Full* solution in PPP mode.
- The green bar indicates a *Fixed* solution in RTK mode.



Skybridge ™ status indicator.
Displayed in RTK and Network RTK configuration with enabled PPP mode and Skybridge ™ service:

- The red circle indicates that the Skybridge ™ status is unknown, point saving with current PPP solution is disabled.
- The circle with timer indicates that the rover receiver is not ready to work in the Skybridge ™ mode, point saving with current PPP solution is disabled.
- The green circle indicates that the rover receiver is ready to work in the Skybridge ™ mode, point saving with current PPP solution is enabled.



By default, **H** stands for RMS error of the horizontal coordinates in the current units for the current epoch. When storing a point is initiated, this field outputs RMS error for averaged horizontal coordinates.



By default, **V** stands for RMS error of the vertical coordinates in the current units for the current epoch. When storing a point is initiated, this field outputs RMS error for averaged vertical coordinates.



The icon displays the number of the GNSS satellites tracked (N) and the number of GNSS satellites used in position determination (M).



Receiver memory free space in the percentages and battery charge level statuses. The icons with a question mark mean the corresponding information is unavailable. An exclamation mark on the battery means critically low charge level (from 0 to 10%).

	Controller memory free space in the percentages and battery charge level statuses. The icons with a question mark mean the corresponding information is unavailable. An exclamation mark on the battery means critically low charge level (from 0 to 10%).
	Opens the stake settings to view and edit. (This button is displayed in the dialog title bar.)

Stake Tool panel for robotic total stations

To review indicators and tools in the Stake Tools panel for robotic total stations:

To toggle between the status panel and the tool panel, click  on the top left of the Stake dialog. Click  to hide panels.

	**Quick lock with RC-3 or RC-4**: The RC-3 or RC-4 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.
	**Quick lock with RC-PR3**: The RC-PR3 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.
	**Quick lock with RC-PR4**: The RC-PR4 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.
	**Quick lock with RC-5**: The RC-5 Remote Control system is used for wireless communication with robotic total station. Click the button to force the total station to make quick search and lock on a prism with attached remote control device.



The GNSS solution is available. The icon is displayed in TS mode when the Fusion Positioning ™ mode is activated.

- The red bar indicates an *Autonomous* solution in standalone mode, *DION* extrapolated solution or *Convergence PPP* stage in PPP mode.
- The yellow bar indicates a *Float* solution in RTK mode, *DGPS* solution or *PPP Low* solution in PPP mode.
- The light green bar indicates a *PPP Normal* or *PPP Full* solution in PPP mode.
- The green bar indicates a *Fixed* solution in RTK mode.



Fusion Lock: Clicking on the icon automatically turns the Robotic Total Station to the reflector. To search the reflector, the software has to have the coordinates of the occupation point (where the Robotic Total Station is set) and current coordinates of a point where the rod (with GNSS antenna and reflector) is set in WGS -84 coordinate system.

The icon is displayed when the Fusion Positioning ™ mode is activated.

The icon is available when the localization are performed or Grid to Ground transformation is selected or a Grid coordinate system was selected for Total Station measuring.



Laser Pointer: Turns the laser pointer on or off. Available for certain total stations only.



Turn: Opens the Rotate dialog to turn the Total station to various angles or points.



Arrow joystick: Allows to rotate the total station from a controller.
If a controller has the arrow joystick and the *Virtual Joystick* option is not active, clicking the icon activates the controller's arrow joystick for total station rotation. The icon's arrows become green.

If the *Virtual Joystick* option is active, clicking the icon opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.



Search: Forces the total station to aim to the prism without starting of measurements.



Search & Measure: Forces the total station to aim to the prism and make the measurement.



Search & Lock:

- Starts the instrument to search,
- locks onto the prism, tracks it and makes the measurements.



Stop: Forces the total station to stop tracking the prism and go into a "*Standby*" mode.

Stake Status panel for total stations

To review status indicators in the Stake Status panel for total stations:

To toggle between the tool panel and the status panel, click  on the top left of the Stake dialog. Click  to hide panels.

	The total station is performing the observations.
	The icon is displayed when **Depth Finder** is selected in the Peripherals dialog: • Gray ship - a depth finder is not connected to the controller; • Color ship with question mark - a depth finder is connected to the controller but it is not transmitting any data; • Color ship with green curves - a depth finder is connected to the controller and it is transmitting data.
	
	



Instrument battery charge level:

- Four green horizontal bars is full (from 80 to 100%);
- Three green horizontal bars is medium (from 60 to 80%);
- Two yellow horizontal bars is low (from 40 to 60%);
- One yellow horizontal bar is over low (from 20 to 40%);
- One red horizontal bar is none (from 0 to 20%).



Shows the status of connection with the instrument:

- the connection with the robotic and conventional total station is established;
- the transmission data with the robotic total station is broken;
- the connection with the robotic and conventional total station is broken.



Controller memory free space in the percentages and battery charge level statuses. The icons with a question mark mean the corresponding information is unavailable. An exclamation mark on the battery means critically low charge level (from 0 to 10%).

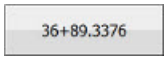
EDM

Opens the associated drop-down menu with a set of total station functions and parameters that are frequently used and changed during field work. (This button is displayed in the dialog title bar.)

Stake Panel

Stake panel along the bottom of the Stake dialog provides controls to navigate through design locations along with information about them and command buttons to perform measurements and save measured points.

- 

or 

Design Button: The design button provides the information on the current design point / station. Pressing the button will display a pop-up list detailing the design

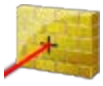
location information.

-  and  **Arrow Buttons**: The arrow buttons are displayed if the staking task has multiple design locations. Pressing the buttons will advance backward and forward through the different design locations.
-  **Reading Button** for TS configuration: Makes an observation in *Precise* EDM mode.
-  **Reading and Store Button** for TS configuration: Makes an observation in *Quick* EDM mode and initiates storing a point.
-  **Measuring Button** for GNSS configuration: Takes a GNSS measurement in *Precise* mode.
-  **Store Button:** Initiates storing of the current observation immediately (confirms storing in GNSS and TS *Precise* mode; measures and initiates storing automatically in GNSS *Quick* mode).
-  **Stop Measurements Button**: Cancels the stake measurement.
-  **Waiting indicator** for GNSS configuration: The **Store Button** was clicked, but the storing of the point is still not occurred, because storing conditions were not completely met. In this case, the indicator will be displayed. After obtaining the corresponding solution type, the measured point coordinates will be saved and the indicator will be hidden.

- **Antenna or target height** field:
  - For **GNSS configuration** - enter the antenna height. Click the button to select a method used to measure the antenna height ( *Vertical* or  *Slant*). Type the antenna height value manually or click the button to select one of the previously used values from the context menu.

    Note: If the *Unknown* antenna model is selected during configuration, only the *Vertical* antenna height measurement method is available.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the antenna height is calculated automatically, based on the height of reflector (HR) and prism model (**Fusion Positioning ™ antenna offset** parameter). More...

- For **TS configuration** - enter the height of the target. Type the value manually or click the button with current target icon to select one of the previously used values from the context menu. Select **Edit** from the context menu to open the Targets dialog to add or modify target configurations. Depending on the selected target type, the target icon looks like:
  -  when a normal prism is selected, prism constant also displays below;
  -  when a 360 prism is selected, prism constant also displays below;
  -  when a sheet is selected, target offset also displays below;
  -  when a non-prism is selected, target offset also displays below.

Note: In the *Fusion Positioning* ™ survey and stakeout routines, the height of the reflector (HR) should be measured in the normal manner, from the optical center of the prism to the ground point. More...

Stake Dialog Pop-up Menus

To access additional commands and options available in the Stake dialog and Stake Setup dialogs pop-up menus.

The dialog pop-up menus are available by clicking ☰ in the top left corner and include additional command options which can be useful when setting up an object to stake and when performing stakeout in the field.

Note: Actually available menu items depend on the current project and survey configuration and the type of staked object.

Stake Setup Pop-up Menu for GNSS

- **Setup** - click to expand the menu:
  - Reference CL - you can specify a reference centerline for any stakeout task. The offset values from the line and distance from the first point of the line can help you to perform stakeout any object. Activated feature is marked with ✔.
  - Reference Surface - you can specify a reference surface for a stakeout task. Activated feature is marked with ✔.
  - Reference Alignment - you can specify a reference alignment for a surface stakeout task. Activated feature is marked with ✔.
  - Reference Plane - you can specify a reference plane for a stakeout task. Activated feature is marked with ✔.
  - Status - opens the dialog which contains information about the current position of the receiver, RTK status, and the satellite constellation.
  - Config Radio - opens the dialog which contains the settings for the radio modem.
  - **PTL Mode** - enables / disables the PTL mode for stakeout. When enabled ✔, design points for stakeout should have PTL (point to line) data.
  - **Reset Tracking and Positioning** - the command that re-initializes the receiver.
  - **Full PPP Reset** (available when Skybridge ™ / Starpoint ™ mode is on) - the command that restarts PPP positioning from the beginning.
  - **Use Depth** - to receive data from the connected depth finder. Activated mode is marked with ✔. To display the current water depth, click on a customizable data field and select the *Depth* parameter in the Select Stakeout Value dialog.

- Edit Points - opens the dialog to view and manage points in the project. This menu item is available when setting up a point to be staked.
- Edit Roads - opens the dialog to view and manage roads in the project. This menu item is available when setting up either a road, or an alignment, or a slope to be staked.
- Edit Point Lists - opens the dialog to view and manage point lists in the project. This menu item is available when setting up a point list to be staked..
- Edit Linework - opens the dialog to view and manage linework objects in the project. This menu item is available when setting up a linework object to be staked.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- View Report - displays the currently selected stake report and data included in it.
- **Raw Data** - click to expand the menu:
  - **Add Raw Note** - opens the Add Raw Note dialog where you can enter any description during the survey if required.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.

Stake Setup Pop-up Menu for Total Station

- **Setup** - click to expand the menu:
  - Reference CL - you can specify a reference centerline for any stakeout task. The offset values from the line and distance from the first point of the line can help you to perform stakeout any object. Activated feature is marked with ✔.
  - Reference Surface - you can specify a reference surface for a stakeout task. Activated feature is marked with ✔.
  - Reference Alignment - you can specify a reference alignment for a surface stakeout task. Activated feature is marked with ✔.
  - Reference Plane - you can specify a reference plane for a stakeout task. Activated feature is marked with ✔.
  - Backsight - you can set the BS direction angle.
  - **PTL Mode** - enables / disables the PTL mode for stakeout. When enabled ✔, design points for stakeout should have PTL (point to line) data.
  - Drape mode - to activate the Drape mode for stakeout of an inaccessible point or line which is located inside a wall, tunnel, or road. This mode is available for stakeout with robotic reflectorless total station (**Target Type** - *Non Prism*).
  - **Use Depth** - to receive data from the connected depth finder. Activated mode is marked with ✔. To display the current water depth, click on a customizable data field and select the *Depth* parameter in the Select Stakeout Value dialog.

- **Robotic** - this menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the reflector search and track parameters for the connected Robotic TS.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with ✔:
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.

- Edit Points - opens the dialog to view and manage points in the project. This menu item is available when setting up a point to be staked.
- Edit Roads - opens the dialog to view and manage roads in the project. This menu item is available when setting up either a road, or an alignment, or a slope to be staked.
- Edit Point Lists - opens the dialog to view and manage point lists in the project. This menu item is available when setting up a point list to be staked..
- Edit Linework - opens the dialog to view and manage existing linework objects. This menu item is available when setting up a linework object to be staked.
- Inverse - opens dialog to calculate the direction and distance between two known points.
- View Report - displays the currently selected stake report and data included in it.
- **Raw Data**- click to expand the menu:
  - **Add Raw Note** - opens the Add Raw Note dialog where you can enter any description during the survey if required.
  - **Edit** - opens the Raw data dialog with raw data collected in the project.

Stake Pop-up Menu for GNSS

- **Setup** - click to expand the menu:
  - **Simulator** - to enable or disable the simulator control keys to change a simulated position on the map. More... Activated feature is marked with ✓. (Available if the **Simulation Mode** box was checked in the Receiver Make dialog during survey configuration).
  - Status - opens the dialog which contains information about the current position of the receiver, RTK status, and the satellite constellation.
  - **Select Corr. Input** - displays sub-menu with ports available for corrections input. Select a required port to start obtaining corrections using that port. The selected port is marked with ✓. This functionality is available for RTK and RT DGPS configurations. The **Multiple Ports** box should be checked in the Peripherals for the Rover Receiver dialog and these rover receiver's ports should be configured for use with generic (*Do not setup Radio*) internal or external radio modems during GNSS survey configuration.
  - Config Radio / Config Cell / Config CDPD - configures the settings for the modem. This functionality is available for RTK and RT DGPS configurations. The name of the command depends on the type of modem used. When the **Multiple Ports** box is checked in the Peripherals for the Rover Receiver dialog during GNSS survey configuration, the sub-menu with available modems or ports appears. Select a required item to configure and start obtaining corrections from that modem / port. The currently used device is marked with ✓.
  - **Reset Tracking and Positioning** - the command that re-initializes the receiver.
  - **Full PPP Reset** (available when Skybridge ™ / Starpoint ™ mode is on) - the command that restarts PPP positioning from the beginning.

- **Start / Stop PP Log** - starts / stops post processing data file logging. Available when the **Post Processing** option is selected in the Receiver Make dialog in survey configuration.
- **Use Depth** - to receive data from the connected depth finder. Activated mode is marked with ✔. To display the current water depth, click on a customizable data field and select the *Depth* parameter in the Select Stakeout Value dialog.
- TILT ™ Settings - opens the dialog to set up automatic tilt correction and compensation for **GRX3** and **GRX5** GNSS receivers.
- **Reset TILT ™** - the command that re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- **Disconnect from MP** / **Connect to MP** - instantly disconnects / connects the NTRIP caster and mount point or the TCP/IP server specified in the Network tab of the Connections dialog. Available for Network RTK survey configuration. The **Disconnect from MP** command doesn't close the current connection to the Internet.

- **Topo** - opens the Topo dialog to conduct a stationary survey.
- **Real-Time Stakeout** - enables / disables stakeout in real time. The green mark ✔ means the feature is active.
- **Design Offsets** - opens the Design Elev dialog to change the height of design points during stakeout.
- Set References - sets cross section points and cross section segments as reference objects for the staked points.
- Hold Slope - open the dialog to select a slope when the hinge point lies on or very close to a vertex or edge of the TIN triangle.
- **Store Design Pt / Layer** - opens the Design Pt / Layer dialog to choose whether to display the staked point info before storing it and to select a layer for staked points.
- Initial Point Name - opens the dialog to specify the starting name, code and attributes for staked points.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- View Report - displays the currently selected stake report and data included in it.

Stake Pop-up Menu for Total Station

- **Setup** - click to expand the menu:
  - **Use Depth** - to receive data from the connected depth finder. Activated mode is marked with ✔. To display the current water depth, click on a customizable data field and select the *Depth* parameter in the Select Stakeout Value dialog.

  - TILT ™ Settings - when in Fusion Positioning ™ mode, opens the dialog to set up automatic tilt correction and compensation for the rod with an attached prism and GNSS receiver (**GRX3** or **GRX5**).
  - **Reset TILT ™** - when in Fusion Positioning ™ mode, re-initializes the Dynamic TILT ™ for the connected **GRX5** GNSS receiver.
- **Robotic** - This menu is available for Robotic survey configuration, click the item to expand the sub-menu:
  - **Remote Settings** - opens the Search/Track Parameters dialog to configure the settings for searching and tracking the prism by the robotic total station.
  - **Search:** - select the search reflector mode (available for specific Robotic TS when Remote Control unit is used). Currently activated mode is marked with ✔ :
    - **Search: Nearest** - activate this mode to ignore the RC signal and search the reflector near the location TS is aiming to. (Useful when several reflectors are used and the RC is attached to one of them.)
    - **Search: Continuous Turning** - activate this mode to give the search reflector priority to the RC signal.
  - **Tilt** - opens the Remote Control Tilt dialog displaying the virtual bubble level of the connected total station.
  - **Virtual Joystick** if this option is selected, clicking  opens the Remote Control (Virtual Joystick) dialog, containing virtual joystick for total station rotation.
  - **Right / Left Rod to TS** / **Right / Left TS to Rod** - choose from two vectors to set up right / left offset directions. Currently used vector is marked with ✔ .
- **Topo** - opens the Topo dialog to conduct a stationary survey.
- GNSS Status - allows you to check the status of a GNSS survey when in Fusion Positioning ™ mode. The *Status* dialog contains information about current survey, connected receiver position and satellite constellations.
- **Real-Time Stakeout** - enables / disables stakeout in real time (available for Robotic survey configuration). The green mark ✔ means the feature is active.
- **Design Offsets** - opens the Design Elev dialog to change the height of design points during stakeout.
- Set References - sets cross section points and cross section segments as reference objects for the staked points.
- Hold Slope - open the dialog to select a slope when the hinge point lies on or very close to a vertex or edge of the TIN triangle.
- **Store Design Pt / Layer** - opens the Design Pt / Layer dialog to choose whether to display the staked point info before storing it and to select a layer for staked points.

- Initial Point Name - opens the dialog to specify the starting name, code and attributes for staked points.
- Inverse - opens the dialog to calculate the direction and distance between two known points.
- View Report - displays the currently selected stake report and data included in it.

Reference Centerline

To enable or disable the use of reference centerline for current topo survey or current stakeout task and to specify a line as the reference.

- Check the **Use Reference Centerline** box to enable. After that, the **Linework** / **Road** / **H Align** / **Code** switching button becomes available. Cleared check box disables the reference centerline use in current topo survey or current stakeout task.

- Define the line, either by selecting an existing **Linework**, **Road**, **H Align**, or by forming a linework object by points with specific **Code** and code string:
  - Set **Linework** to select a linework object from existing linework objects (listed below) or from the map .
  - Set **Road** to select a road from the project roads (listed below) or from the map .
  - Set **H Align** to select a horizontal alignment of the roadway from the project alignments (listed below) or from the map .
  - Set **Code** to form a linework object by points with specific code and code string. Select a code from the drop-down list and a string from the *Strings* list below.

- The preview panel shows the highlighted line in the horizontal plane. To view the currently highlighted line in a larger screen, double-click the preview panel.
- If a linework is selected as the reference, you can define the reference line in the horizontal plane. To do this, set **Start 2D**. To define the reference line in the horizontal and vertical planes, set **Start 3D**.
- If a linework is selected as the reference, you can define the reference line in the horizontal plane. To do this, set **Start 2D**. To define the reference line in the horizontal and vertical planes, set **Start 3D**.
  - In the field next to the **Start 2D** / **Start 3D** button, you can set the start station for the reference line in the horizontal plane or 3D. Also, the reference line length is displayed for the selected mode.

> **Note:** For topo survey, defining the reference line is limited to 2D, set the **Start Station** and review the **Horizontal Length** if required.

- Click  to save the reference line.

For each measured point, the following parameters will be available for reference:

- *Reference Centerline Station* - the distance from start point of the centerline to perpendicular to the measured point;
- *Reference Centerline Offset* - the perpendicular distance from the measured point to the reference centerline.

> **Note:** To have these values displayed in customizable data fields during stakeout or survey, select them in the Select Stakeout Value or Select Value to Display dialog, respectively.

Reference Surface

To enable or disable the use of reference surface for current topo survey or current stakeout task and to specify a surface as the reference.

- Check the **Use reference surface** box to enable. After that, the reference surface can be defined. Cleared check box disables the reference surface use in current topo survey or current stakeout task.

- Define the surface, either by selecting an existing **Surface**, **Road**, or entering a fixed **Elevation**:

  > **Note:** For stakeout tasks, the **Road** and **Elevation** options are unavailable to define the reference surface.

  - Set **Surface** to use a surface as the reference surface. Enter an existing surface name manually, or select from the map  or from the list  of project surfaces. The preview panel shows the selected surface in the horizontal plane. To view the surface in a larger screen, double-click the preview panel.
    - If the reference centerline has been enabled for stakeout, check the **Extend perpendicular to reference CL** box to use this feature in stakeout tasks in situation when the reference surface should be extended. See details on How to extend a surface in stakeout.

  - For road, alignment, or slope stakeouts, check the **Extend perpendicular to alignment** box to use this feature in situation when the reference surface should be extended. See details on How to extend a surface in stakeout.
  - Choose a slope for the reference surface. Select **Surface Slope** to use an actual slope of the surface or select **Enter slope** and manually enter a fixed slope value in the respective field.

- Set **Road** to use a road as the reference surface. Enter an existing road name manually, or select from the map  or from the list  of project roads. Two preview panels show the selected road in the horizontal and vertical plane. To view the road in a larger screen, double-click the preview panel.
- Set **Elevation** to use a surface of a fixed elevation as the reference surface. Enter the elevation value in the editable field. To set the elevation of a specific point as the fixed elevation, select this point from the map  or from the list  of points in the project.

- Click  to save the reference surface.

When the reference surface is enabled for stakeout, the software automatically changes the elevation of the design point. The new elevation value is the elevation of the intersection point of the reference surface and perpendicular from the design point to the reference surface.

During stakeout, *Design Elevation* and available *Cut/Fill* values will be calculated using the specified reference surface.

During topo survey, available *Cut/Fill* values will be calculated using the specified reference surface. The **Cut/Fill** bar for reference surface can be enabled on the map views for topo survey in the General tab of the Map properties dialog.

Note: To have these values displayed in customizable data fields during stakeout or survey, select them in the Select Stakeout Value or Select Value to Display dialog, respectively.

How to extend surface in stakeout

Needed: a Reference Surface to extend perpendicular to a reference centerline. For that, take the following steps:

1. Select **Stake** > **Point**.
2. Choose a point that is outside of the surface that can be extended.

3. From the ☰ menu, Select **Setup** > **Reference CL**.
4. Enable and select the centerline to extend the surface with.
5. Click ✓ to save the settings.
6. From the ☰ menu, select **Setup** > **Reference Surface**.
7. Enable the **Use reference surface** option.
8. Select the surface to extend.
9. Select the **Extend perpendicular to reference CL** option.
10. Click ✓ to save the settings.
11. Click **Stake** to begin stakeout using the extended surface.

Notes:

- When staking a slope, a road, or a real-time road using the extended surface, the perpendicular to the selected alignment will be used to extend the surface with.
- When staking a surface, the menu items **Setup** > **Reference Surface** are changed to **Setup** > **Reference Alignment** to select either a road, or a horizontal alignment to use the extended surface.
- Other object types, such as lines, curves, spirals, points in direction, and point lists, can use the extended surface feature.

Reference Alignment

To enable or disable the use of reference alignment for a surface stakeout task and to specify an alignment as the reference.

- Check the **Use Reference Alignment** box to enable. After that, the **Road** / **H Align** button will be available. Cleared check box disables the reference alignment use in surface stakeout task.
- Set either **Road**, or **Horizontal Alignment** to choose how to define the reference alignment.
- Select an existing road or horizontal alignment from the project objects (listed below) or from the map . The preview panel shows the highlighted object in the horizontal plane. To view the highlighted object in a larger screen, double-click the preview panel.
- Click ✓ to save the reference alignment for a surface stakeout.

During surface stakeout, the *Current station* and *Current Offset from centerline* distance values will be calculated.

Note: To have these values displayed in customizable data fields during stakeout, select them in the Select Stakeout Value dialog.

Reference Plane

To enable or disable the use of reference plane for a stakeout task and to specify a plane as the reference.

- Check the **Use Reference Plane** box to enable. After that, the **Plane** field becomes available. Cleared check box disables the reference plane use in current stakeout task.
- Define the plane in either of the following ways:
  - Enter an existing plane name manually in the respective text field.
  - Select an existing plane from the list  of project planes.
  - Select an existing plane from the map .
  - Create a new plane and select it as the reference plane by clicking  and opening the Add Plane dialog.
- Click  to save the reference plane.

For each measured point, the *Distance to Reference Plane* parameter will be available.

Note: To have this value displayed in a customizable data field during stakeout, select it in the Select Stakeout Value dialog.

Design Elevation

To change the height of design points during stakeout by applying a fixed value or an offset from the design road or surface.

This dialog is accessible any time during stakeout from the  menu by selecting **Design Offsets** to open. The actually available method(s) of changing the height of design points depend on the current stakeout task:

- Check the **Design Ell Ht / Elev** box to apply the fixed Ellipsoidal Height / Elevation for the design point to be staked and manually enter the value to be used.
- Check the **Road Offset** box to apply to apply the offset from the design road to the height for the design point to be staked and manually enter the value to be used.
- Check the **Surface Offset** box to apply the offset from the design surface to the height for the design point to be staked and manually enter the value to be used.

Click ✔ to save the settings. The height of the design points in current stakeout will be set accordingly.

Set References

To set cross section points and cross section segments as reference objects for the staked points.

Selected references will be included in the data of the stored staked points.

This dialog is accessible any time during stakeout from the ☰ menu when the type of stakeout implies cross sections (for example roads). Alternatively, open it by clicking the **Set Ref** button when storing staked point in the Data tab of the Store Point dialog.

The dialog displays the cross section scheme of the current stakeout station. Cross section points are shown with check marks and corresponding labels. Cross section segments are shown as lines connecting points.

- Tap (or click) on desired points and / or segments to select them.
- Selected objects are shown in green.
- To clear the current selection, click ☰ and select **Remove selected**.
- Click ✔ to set the selected references for the current stakeout. Their reference values will be calculated and included in the data of the stored staked points.

Design Pt / Layer

To enable or disable the confirmation dialog with detailed staked point data when storing staked points to the current project, and to set a layer for calculated design points and staked points.

- Check the **Display Store Point Info** box to display the confirmation Store Point dialog with detailed staked point data before storing this point to the current project.

- Define the **Layer** where the current and future calculated design points and staked points will reside by default. Select an existing layer quickly from the drop-down list or click  to open the Layers dialog and manage layers in the current project.
- Click  to save the settings and return to the stakeout. Click  to return to the stakeout without saving.

Initial Point Name

To specify the starting name, code and attributes for the design points calculated during the stakeout task.

- In the **First Point** field, enter a name of the first calculated design point. Sokkia Field continues to name calculated design points starting from this name and using the naming rules defined in the Point Naming dialog during survey configuration.
- Specify a **Code** and attribute information for the calculated design points.
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.
- Click  to save the settings and return to the stakeout. Click  to return to the stakeout without saving.

Hold Slope

To select a slope when the hinge point lies on or very close to a vertex or edge of the TIN triangle.

The dialog displays the list of available slopes and the plot showing the hinge point location and TIN triangles. Selecting a slope in the list highlights the corresponding triangle in the plot.

- Highlight the desired slope in the list and choose a way of using the selected slope in stakeout.
  - Enable **Auto** to let Sokkia Field choose the slope automatically.
  - Enable **Select** to use the highlighted slope in the current design stationing only. (Not available for real-time stakeout).
  - Enable **Hold** to use the highlighted slope in the current stakeout session.
- In the **Tolerance** field, specify the distance value used to determine when the hinge point is near a vertex or edge. The default tolerance is equal to the stake horizontal distance tolerance.

  The new value activates only after clicking ✔.

Select Stakeout Value

Highlight the desired parameter from the list and click ✔ to display its value in the selected data field during stakeouts of the current type.

Click ☰ and choose **Label Name** to open the sub-menu for customizing the selected data label name output:

- **Hide** - the name of the data label is not displayed. The selected data field displays only its value.
- **Small Font** - smaller font is used to display the data label name. This setting doesn't affect the value output font size.
- **Match Label Value Font** - the label name font size is equal to the value output font size.

Reference Info

To define the controller screen top orientation during the stakeout by specific point or specific direction.

This dialog is displayed before the stakeout if *Point / Azimuth (Bearing)* is selected as the **Compass Orientation** in the Stake Settings for GNSS dialog or in the Stake Settings for TS dialog.

- Click the toggle button and select **Orient Pt** to define the point to orient the controller screen top during the stakeout.
  - Enter a point name manually, or select from the map  or from the list  of points in the project.
- Click the toggle button and select **Orient Az (Orient Brg)** to define the direction to orient the controller screen top during the stakeout.
  - Enter a direction angle manually.

Click  to accept entered data and proceed to stakeout. Click  to return to the previous dialog.

Store Point

To review the detailed information about the staked point and to confirm storing of this point to the current project.

This dialog opens when saving staked point to the current project if the **Display Store Point Info** box has been checked in the Design Pt / Layer dialog.

After reviewing and editing the provided information about the staked point, click  to store point in the current project and return to the stakeout. Click  to discard the staked point and return to the stakeout.

Available information about the staked point being stored is present in a set of tabs. Actually available tabs depend on the current stakeout type. Some present data can be added or edited manually.

Stake tab

To review and edit staked point name, layer, and height of the antenna (for GNSS) / target (for TS):

- **Name** - review the name of the staked point being stored. Edit the name manually if required.
- **Antenna / Target Height** - review the antenna height (for GNSS stakeout) of the target height (for TS stakeout). Edit the value manually if required.
- **Layer** - review the layer for the staked point being stored. Select another layer from the drop-down list of existing layers if required.
  - Check the **Use layer from code** box to define the layer the point is on as the layer of point code. If you later change the code for this point, the layer will change accordingly. If the point is not assigned a code or the check box is cleared, the setting from the **Layer** field is applied.

> **Note:** If a point is assigned multiple codes, that point is simultaneously on the layers of all assigned codes. You can view these layers in the Extra Info tab of the Edit Point dialog.

Design tab

To review and edit calculated design point name, code, layer:

The Design tab is available only for stakeout tasks where Sokkia Field calculates design points for staking.

- **Name** - review the name of the calculated design point for the staked point being stored. Edit the name manually if required.
- **Code** - review the code and attribute information for the calculated design point.
  - Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a new code with entered name.
  - If the code type is Line or Area, the respective icon indicates that the point belongs to a line or area. Set a Code String and, if required, select a Control Code (single or dual) by clicking the button and selecting it from the button menu. At the top of the control code selection menu, you can select where to add the next segment to the current linework: *Add to End*, *Add to Start*, or *Insert*.The latter means that the closest existing segment of the linework will be split into two segments by the saved point.
  - Click the **Code**  button to access more code and attribute parameters in the Point Attributes dialog.

- **Layer** - review the layer for the calculated design point. Select another layer from the drop-down list of existing layers if required.
  - Check the **Use layer from code** box to define the layer the point is on as the layer of point code. If you later change the code for this point, the layer will change accordingly. If the point is not assigned a code or the check box is cleared, the setting from the **Layer** field is applied.

    Note: If a point is assigned multiple codes, that point is simultaneously on the layers of all assigned codes. You can view these layers in the Extra Info tab of the Edit Point dialog.

- **Pt Inc/Dec Size** - review the value for increment / decrement of names in automatic design point naming. Edit the value manually if required.

Codes tab

To review and edit staked point code and code attributes:

- Select an existing **Code** from the drop-down list. You can manually type a code name. If there is no code with such name, the Code dialog will open when saving. There you can quickly create a

new code with entered name.
- Select a Code String for the code of the line or area type.
- If required, select up to two Control Codes from the **Ctrl Code** drop-down lists. The control code is a special type of code that can be used together with the code of Line or Area type and the same code-string by some graphic tools for the interpretation of the survey results.
- The attribute table lists all available attributes for the code and allows you to enter / select its value. The table is empty if the code selected from the **Code** drop-down list has no attributes.
  - Click the **Props** button to open the Attribute Ranges dialog, which displays the valid ranges for the attributes for the selected code.
  - Click the **Repeat** button to set the previous saved value.
  - Click the **Default** button to set the default value.

- Click the **Multiple Codes** button to open the Multi-Code tab and add several codes to the selected point.

Photo tab

To add photos or image files for the staked point.

1. To add or remove a photo or image file to / from the point:
   - Click  to open the Image Capture dialog and make a photo (the field controller should be equipped with a camera). The Compass Calibration dialog may open and prompt you to calibrate the compass before taking a photo (if not already calibrated). The captured image will be displayed in the **Photo** panel and attached to the point.

     Note: Click  button in the title bar of the Image Capture dialog to open the Camera Setting dialog and set up embedding time stamp, coordinates, and direction right into photos.

   - Click  to open the Select Image File dialog, where you can select an image (**.bmp*, **.jpg*, **.png*, **.tif*, **.tiff*) file. The selected image file will be displayed in the **Photo** panel and attached to the point.
   - Click  to remove the photo / image displayed in the **Photo** panel from being attached to the point. This action doesn't delete the file from the storage.

2. To review and manipulate photos / images attached to the point:

- The **Photo** panel displays a currently attached image (if any). The name of the field also contains the sequential number of this image and the total number of attached images to this point.
- Click  and  to browse through all attached images.
- Click on an image to display the image in full screen. Click on an image again to return to the dialog mode.
- Click  to open the Sketch dialog where you can modify an image open in the **Photo** panel using the built-in image editor.
- Click  to quickly save the open image as a **.JPG* file to a local storage. The generated file name will be as: *100_000.jpg*, where *100* is a point's name and *000* is a sequential number of this image among all attached images to this point.

3. To review or edit a text note for the staked point:
   - By default, the name of design point is added as a text note to the staked point.
   - Review the text note in the **Note** field in the bottom part of the tab.
   - Enter your own note or delete an automatically suggested note if required.

Data tab

To review the detailed information of performed stakeout before storing the staked point, and to change the next point to stake if required.

The Data tab displays complete information about performed stakeout. Review the information before storing the staked point to the current project. After evaluating the provided data, you can change the next stakeout focus from the drop-down list:

- **Advance to Next** to automatically open the Stake dialog for the next design point after storing the staked point.
- **Advance to Previous** to automatically open the Stake dialog for the previous design point after storing the staked point.
- **Don't advance** to open the Stake dialog for the current design point after storing the staked point.

For slope stakeout tasks, an option to immediately stake an offset point from the catch point is available. Check the **Stake Offset Pt** box and enter an offset value. Sokkia Field calculates the design point for the entered offset and opens the Stake dialog for this design point after storing the staked point.

For tasks implying stakeout stations with cross sections, an option to add, change, or remove cross section references for the staked point is available. Click the **Set Ref** button to open the Set Refer-

ences dialog and choose the reference points and / or segments on the current cross section scheme. The **Set Ref** button in green color means that some references have been already set.

Mark tab

To review the delta between design point and staked point positions along with the calculated data for grade stake marking.

Review the information about the design point name, the staked point name and code, design and ground elevations, calculated cut / fill value, horizontal coordinates delta and horizontal distance between design point and staked point.

The value you should measure off from the ground to make a mark of even number on the grade stake is also provided. This value is calculated according to the settings made in the Grade Stake Marking dialog during survey configuration.

Drape tab

To review information about the drape plane used for the point staked in drape mode.

Drape tab is available only for stake tasks with activated Drape mode.

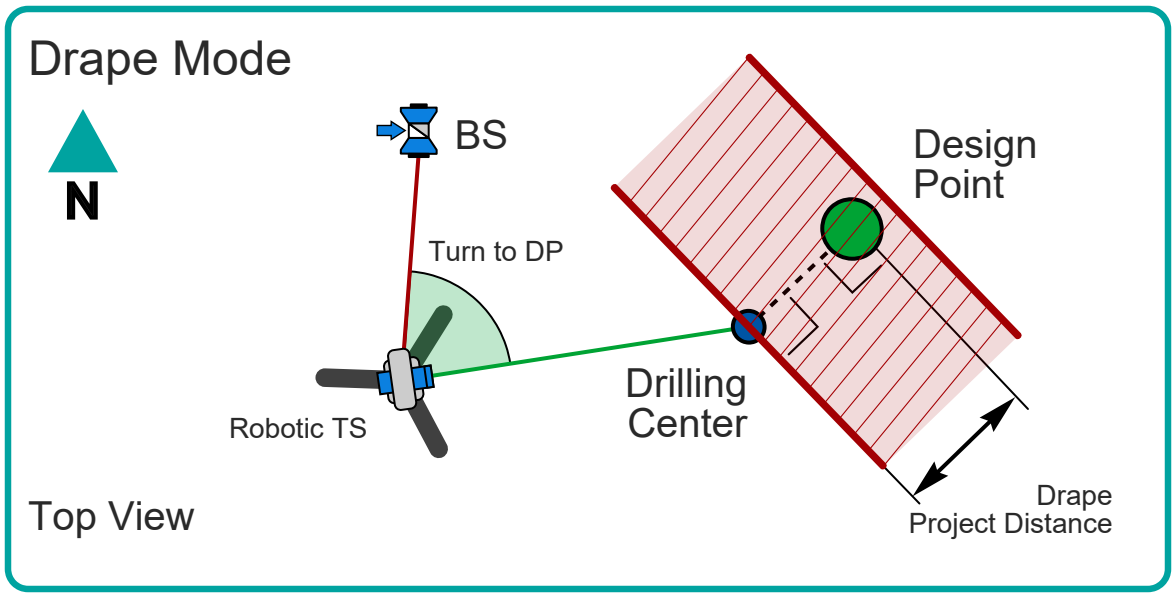
Review the drape plane used for the staked point.

- **Plane Name** - the name of the drape plane used for staked point.
- **Layer** - the layer for the drape plane.

If a drape plane for the staked point was scanned by the robotic total station during stakeout you have an option to save this plane in the current project. Check the **Save drape plane** box, enter a plane name and select a layer for the drape plane being saved. If a drape plane for the staked point is an existing plane from the current project, this option is unavailable.

Drape Mode

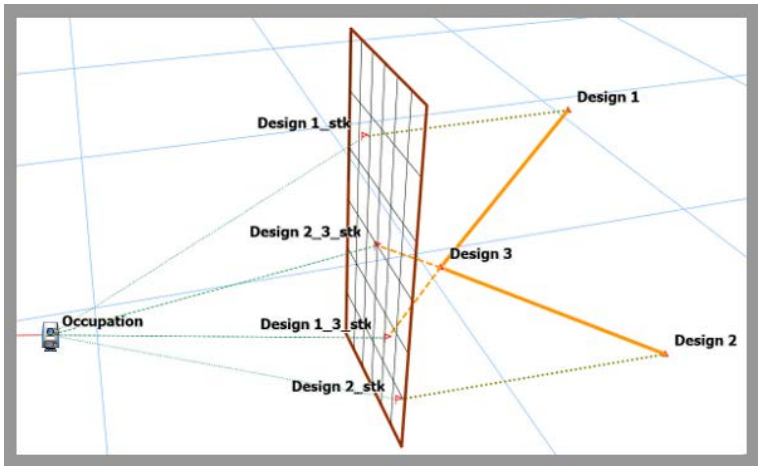
Sokkia Field offers a special routine with simultaneous robotic total station measurements and software calculations providing the stakeout of known points or lines that are inaccessible for direct measuring and marking, for example hidden inside a wall.



Point stakeout in Drape mode assumes using of an accessible plane to calculate and then stake out the projection of inaccessible point to this plane and calculating "drilling" distance form projected point to inaccessible point.

Line stakeout in Drape mode assumes using of an accessible plane to calculate and then stake out the intersection point of the inaccessible line with this plane and calculate the distance from the start point of the inaccessible line to the intersection point.

The scheme below displays two points and two lines staked out in Drape mode. Design 1, Design 2, Design 3 are inaccessible design points inside a wall. The robotic total station scanned and automatically defined a single accessible plane (a wall) for all inaccessible design points and made stakeouts in Drape mode for two points: Design 1 (resulted in Design 1_stk) and Design 2 (Design 2_stk); and two lines: Design 1 - Design 3 (resulted in Design 1_3_stk) and Design 2 - Design 3 (Design 2_3_stk).



Drape mode is available for specific stakeouts:

-  Stake point
-  Stake line
-  Stake line offsets
-  Stake intersection
-  Stake point in direction
-  Stake point list

Click  and select **Setup** - **Drape mode** in the menu of any dialog listed above to activate. With Drape mode activated, the title of stake dialog includes *(Drape)* at its end, the target type switches

to  *non-prism*, and the Drape Options dialog will open for configuring Drape mode after clicking **Next**. Configurable drape options depend on the type of staked object.

> **Note:** To change the  *non-prism* target type, click  in the title bar. Selection of another target type quits Drape mode.

Additional options become available during stakeout routine in the Stake dialogs when using Drape mode.

- **Drape** sub-menu with two commands is added to the supported stake dialog menus accessible by clicking .
  - **Find new plane** - Forces the total station to define a new plane for staked object.
  - **Select existing plane** - Forces the total station to use an existing plane for locating the drape point. Choose this plane manually from the list of project's planes in the Planes dialog that opens.

- Drape mode related data is added to the pop-up menu of the **Design Button** on the Stake panel.
  - **Drape Plane** - Displays the name of a plane existing in the project and used as a drape plane for the current design point.
  - **Find New Drape Plane**  - Forces the total station to scan for a new plane for the current design point.

- **Drape Project Distance** is added to the values list in the Select Stakeout Value dialog. Select this parameter to display the "drilling" distance from the drape point to the design point in Stake dialogs when stacking out inaccessible points in Drape mode.

- **Drape** tab is added to the Store Point dialog. On this tab, when storing a staked point you will have a choice to review and store this point's drape plane scanned by the total station for further use in the current project.

More information: Quick guide for point stakeout in Drape mode; Quick guide for line stakeout in Drape mode.

Drape Options

To specify the plane for point or line stakeout in Drape mode. This plane can be scanned with the robotic total station or selected manually from the list of current project's planes.

1. For **Point** stakeout:

   - Choose **Find one plane for all points** to force the total station to scan and define a single plane for staking all points in Drape mode.
     - In the **Drape** field, choose the mostly suitable type of plane for your current stakeout in Drape mode:
       - **Wall**;
       - **Ceiling**;
       - **Floor**.

       This choice affects the algorithm a robotic total station uses to scan and define the plane and the time spent for scanning.

   - Choose **Find a new plane for each point** to force the total station to scan and define a new plane for every point staked in Drape mode.
     - In the **Drape** field, choose the mostly suitable type of plane for your current stakeout in Drape mode:
       - **Wall**;
       - **Ceiling**;
       - **Floor**.

       This choice affects the algorithm a robotic total station uses to scan and define the plane and the time spent for scanning.

   - Choose **Use existing plane for all points** to select a plane in the current project. Enter a plane name manually, or select from the map , from the list  of project planes, or click  to open the Add Plane dialog and create a new plane. Total station is forced to use this plane as the drape plane.

2. For **Line** stakeout:

   - Choose **Find drape plane** to force the total station to scan and define a plane for staking a line in Drape mode.
     - In the **Drape** field, choose the mostly suitable type of plane for your current stakeout in Drape mode:
       - **Wall**;
       - **Ceiling**;
       - **Floor**.

       This choice affects the algorithm a robotic total station uses to scan and define the plane

and the time spent for scanning.

- Choose **Use existing plane** to select a plane in the current project. Enter a plane name manually, or select from the map , from the list  of project planes, or click  to open the Add Plane dialog and create a new plane. Total station is forced to use this plane as the drape plane.

Note: You can change the drape plane any time during stakeout:

1) click **Design Button** and select **Find New Drape Plane**  to scan for a new plane for the current design point;

2) click  and select either **Drape** - **Find New Plane** to scan for a new drape plane or **Drape** - **Select Existing Plane** to choose this plane manually from the list of project's planes in the Planes dialog that opens.

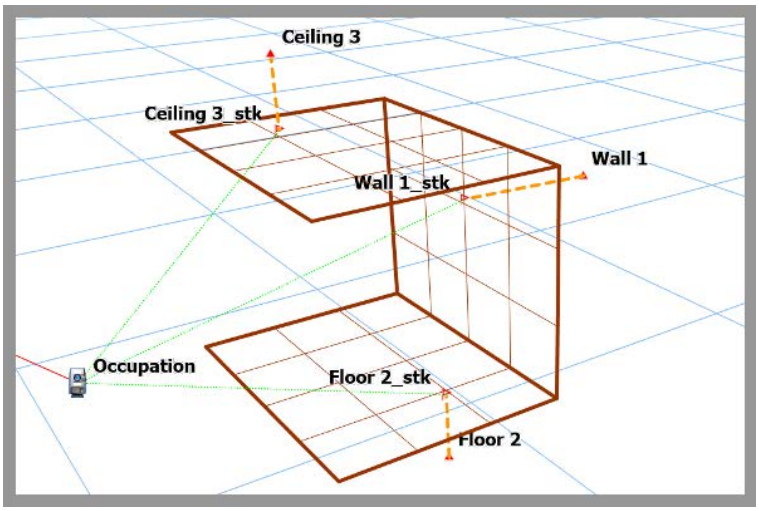
Once the drape plane options are specified click the **Stake** button.

- Depending on the options choice, the dialog may open with a prompt to turn the instrument to the *Wall* / *Ceiling* / *Floor* near the drape point.
- Turn the total station correctly and click **Yes** to open the Stake dialog and start stakeout in Drape mode. The total station will scan the drape plane according to the settings. After that it is ready to perform measurements.
- Alternatively, click **No** to return to this dialog and review the drape plane setup.

Quick guide for point stakeout in Drape mode

To stakeout in Drape mode the given design points hidden in the wall (*Wall 1* point), in the floor (*Floor 2* point), in the ceiling (*Ceiling 3* point) (see the scheme below).

The result of this stakeout in Drape mode will be the projections of each inaccessible point to the corresponding drape plane (*Wall 1_stk*, *Floor 2_stk*, *Ceiling 3_stk*), which are accessible and ready to marking out. The distance between the design point and its respective projection is the "drilling" distance and the projection point is the center of "drilling" in perpendicular to the drape plane.



1. Configure a survey with robotic total station. Click - - .
2. Connect to the configured total station. Click - .
3. Setup Occupation point and Backsight. Click - - .
4. Open the Stake Point dialog. Click - - .
5. Click , select **Setup** - **Drape mode** from the dialog menu to enable Drape mode: *(Drape)* is added to the dialog's title, target type is forced to *non-prism*.
6. Select the desired design point (*Wall 1* in our example) from the map or from the list and click **Next**.
7. In the open Drape Option dialog, select **Find a new plane for each point** - in our example we have only one inaccessible design point hidden in the wall.
8. Then select an appropriate plane (**Wall** in our example) for the chosen point: next to **Wall** confirms the selection.
9. Click **Stake**.

10. The dialog may open with a prompt to turn the instrument to the *Wall* hiding the inaccessible design point. Turn the total station as the application requests and click **Yes**.
11. The robotic total station starts scanning for a drape plane according to the settings made and after the plane is scanned the instrument's laser pointer specifies the drape point on that plane for the inaccessible design point *Wall 1*.
12. The Stake dialog opens and its Map View shows a location along with the design point *Wall 1* and the calculated drape point  on the scanned plane.
13. **Design Button** at the bottom of the Stake dialog displays the design point name 

and opens a pop-up list detailing the design point information with an option to scan for a new drape plane.
14. Click any **Text field** in the bottom part of the map to open the Select Stakeout Value dialog and select *Drape Projected Distance* from the list of available parameters. The "drilling" distance between the design point *Wall 1* and the found drape point  now displays in that Text Field.
15. Click  /  (Precise / Quick EDM mode) to measure the found drape point and open the Store Point dialog to review the staked drape point attributes and store this point in the current project.
16. In the open Store Point dialog you also have an option to store the scanned drape plane in the current project for further use. Open the **Drape** tab of this dialog, check the box **Save drape plane**, enter the plane name and layer and click  to save the drape point and drape plane and return to Map View of the Stake dialog.
17. Staked drape point *Wall 1_stk* and scanned drape plane now appear as objects in the current project's map. Ensure **Staked points** and **Planes** are selected in the Map Properties (click  on the map).

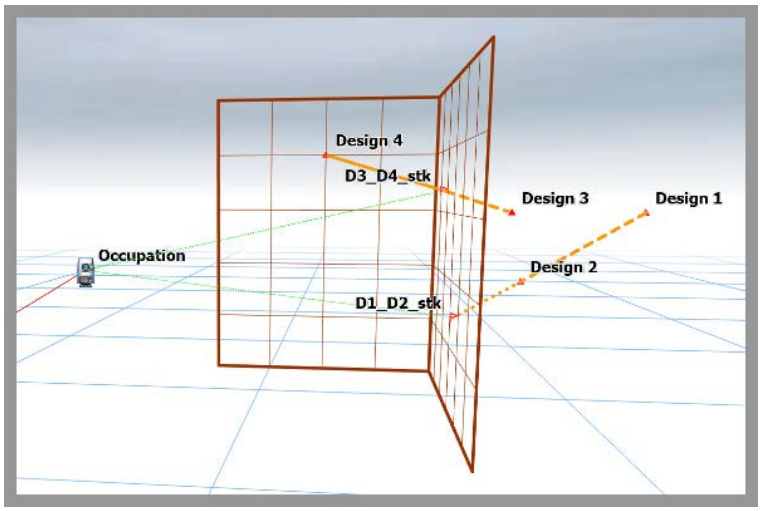
For *Floor 2* and *Ceiling 3* inaccessible design points, repeat the routine using *Floor* and *Ceiling* on step 8 and 10.

More information: Quick guide for line stakeout in Drape mode.

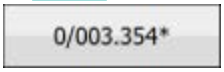
Quick guide for line stakeout in Drape mode

To stakeout in Drape mode the given lines hidden or partially hidden in the wall: Line *(Design 1 - Design 2)* has its start point (*Design 1*) and end point (*Design 2*), both inaccessible and hidden in the wall. Line (*Design 3 - Design 4*) has its start point (*Design 3*) hidden in the wall and its end point (*Design 4*) is accessible and located on an adjacent wall (see the scheme below).

The result of this line stakeout in Drape mode will be the intersections of each line with the drape plane. These intersection points are accessible and ready to marking out: Point *D1_D2_stk* for Line *(Design 1 - Design 2)* and Point D3_D4_stk for Line (*Design 3 - Design 4*). For better viewing, accessible (visible) segment of staked line is plotted solid, inaccessible segments are dashed, extrapolated segment is dotted.



1. Configure a survey with robotic total station. Click  -  - .
2. Connect to the configured total station. Click  - .
3. Setup Occupation point and Backsight. Click  -  - .
4. Open the Stake Line dialog. Click  -  - .
5. Click , select **Setup** - **Drape mode** from the dialog menu to enable Drape mode: *(Drape)* is added to the dialog's title, target type is forced to  *non-prism*.
6. Specify the desired line by entering its start and end points (in our example Line *Design 1 - Design 2*, with start point *Design 1* and end point *Design 2*).
7. In **Start Point** field, select the design point (*Design 1*) from the map  or from the list . This point will be the start point of the staked line.

8. In **End Point** field, select the design point (*Design 2*) from the map  or from the list . This point will be the end point of the staked line.
9. In **Ht Comp** field, the *Interpolate Ht* is always used in Drape mode, meaning the height of the drape point is computed through linear interpolation, using the height of the start and end points of the line.
10. Select **Start 3D** to stakeout the line in horizontal and vertical planes and enter *0* value to keep the start point of the staked line as a start station in our example.
11. Click **Next**.
12. In the open Drape Option dialog, select **Find drape plane** - in our example we instruct the robotic total station to scan the location for a new accessible drape plane for the staked line.
13. Then select an appropriate plane (**Wall** in our example) for the chosen line:  next to **Wall** confirms the selection.
14. Click **Stake**.
15. The dialog may open with a prompt to turn the instrument to the *Wall* hiding the inaccessible point(s) of the staked line. Turn the total station as the application requests and click **Yes**.
16. The robotic total station starts scanning for a drape plane according to the settings made and after the plane is scanned the instrument's laser pointer specifies the drape (intersection) point on that plane for the line *Design 1* - *Design 2*.
17. The Stake dialog opens and its Map View shows a location along with start *Design 1* and end *Design 2* points of the line as well as the calculated drape point  on the scanned plane.
18. **Design Button** at the bottom of the Stake dialog displays the calculated drape point station along the extrapolated design line 

and opens a pop-up list detailing the line *Design 1* - *Design 2* information with an option to scan for a new drape plane.
19. Click  /  (Precise / Quick EDM mode) to measure the found drape point and open the Store Point dialog to review the staked drape point attributes and store this point in the current project.
20. In the open Store Point dialog you also have an option to store the scanned drape plane in the current project for further use. Open the **Drape** tab of this dialog, check the box **Save drape plane**, enter the plane name and layer and click  to save the drape point and the drape plane and return to Map View of the Stake dialog.
21. Staked drape point *D1_D2_stk* and scanned drape plane now appear as objects in the current project's map. Ensure **Staked points** and **Planes** are selected in the Map Properties (click  on the map).

For *Design 3* - *Design 4* line with inaccessible start point (*Design 3*), repeat the same routine and obtain the drape point *D3_D4_stk* as the result of stakeout.

More information: Quick guide for point stakeout in Drape mode.

Stakeout (Digital Level)

To perform elevation stakeout using a digital level .

	Points To stake elevations of design points.
	Point List To stake elevations of points in the design point list.
	Elevation To stake design elevations on any surface.

Find the information about the **DL Stakeout** dialog here.

Stake Point (DL)

To stake the elevation of design point with the digital level.

- In the **BS Point** field, specify a point with known elevation to be used for the backsight measurement. Enter a point name manually, or select from the map or from the list of points in the project.
- In the **Design Point** field specify a design point which elevation should be staked. Enter a point name manually, or select from the map or from the list of points in the project.
- The **Stake Report** field shows the name of the current stake report if it is set. Click ... to open the Stake Reports List dialog to select the desired report or add a new one.
- Click the **BS** button to take the DL measurement to the selected BS point.
- Click the **Stakeout** button to start the stakeout process. More...

Stake Point List (DL)

To stake elevations of points in the design point list with the digital level.

- In the **BS Point** field, specify a point with known elevation to be used for the backsight measurement. Enter a point name manually, or select from the map  or from the list  of points in the project.
- In the **Point List** field, enter an existing point list name manually, or select it from the list  of project point lists.
- The dialog displays the list and the plan view of points in the selected Point List. The point highlighted in the list is marked with a yellow circle on the plan view.
- Check the **Stk in Reverse Order** box to perform the stakeout starting in reverse order from the end of the Point List.
- Use  and  to move the highlighted point(s) up or down in the ordering. Use context menu to highlight multiple points:
  - **Select All** - highlights all points in the list.
  - **Select All Below** - highlights a currently highlighted point and all the points in the list displayed below.
  - **Select Multiple** - highlights multiple points by sequential clicking on point names.
  - **Cancel Selection** - removes all highlights in the list.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click the **BS** button to take the DL measurement to the selected BS point.
- Click the **Stakeout** button to start the stakeout process. More...

Stakeout Elevation (DL)

To stake design elevation on any surface with the digital level.

- In the **BS Point** field, specify a point with known elevation to be used for the backsight measurement. Enter a point name manually, or select from the map  or from the list  of points in the project.
- In the **Elevation** field, enter the design elevation value to stake.
- The **Stake Report** field shows the name of the current stake report if it is set. Click  to open the Stake Reports List dialog to select the desired report or add a new one.
- Click the **BS** button to take the DL measurement to the selected BS point.
- Click the **Stakeout** button to start the stakeout process. More...

Stakeout (DL)

To perform the elevation stakeout in the field using digital level.

The dialog displays the following data:

- The current design point name or elevation is displayed next to the  icon.
- The BS point name is displayed next to the  icon.
- **HI** - the height of the instrument (sum of current BS point's elevation and performed backsight measurement value).

Perform the elevation stakeout and store the result to the current project.

- Click the **Meas** button to take a measurement to the rod and review the measurement results:
  - **Elev** - the staked point elevation.
  - **Cut** / **Fill** - the calculated cut / fill value of the staked point from the BS point's known elevation.

- The **Vertical Offset** can be applied to the measurement. Click  to open the dialog menu and select the respective command. Enter the value in the open Vertical Offset dialog. The entered value will be reflected in upcoming measurements of the current DL stakeout session.

- When staking a point list:
  - Check the **Auto Advance Pt** box  to turn on the automatic focusing to the next point in the point list after storing the current staked point.
  - Use  /  to browse through the point list and manually select the current design point.

- Click the **Store** button to store the measured elevation as a new staked point in the current project.

Apps

Click an icon to use an application built in your device:



Take Photo
Starts camera application or opens the Capture dialog to take a photo.
This icon is available when an external or internal camera is connected.



Photo Viewer
Starts pictures and videos browser to view pictures attached to the current project. *Not available for onboard.*



Files
Starts file explorer to manage files.

Capture

To take a photo or scan a QR code and decode the information.

Depending on your controller and camera, the following photo capture controls can be available.

- For a controller equipped with several cameras (for example, main and front cameras), choose a camera device to use from the **Camera** drop-down list.
- Use the buttons to zoom the picture -  zoom in ,  zoom out, or  reset zooming.
- Select the output photo resolution (the set of available resolutions depends on the camera used) from the **Size** drop-down list.
- Click the  button in the title bar to open the Camera Setting dialog and set up embedding time stamp, coordinates, and direction right into photos for the current project.
- To capture the photo, click the  button. The Preview dialog opens after capturing to confirm saving to the current project.

Click  to close the dialog.

Camera Settings

To set up to geotagging for every image when you capture it for the current project.

- Select **Add Timestamp** to display the current date and time over the photos.
- Select **Add Coordinates** to display the coordinate system and the coordinates of this point over the photos.
- Select **Add Direction** to display compass readings taken at the time you capture the image. This option is enabled if the device supports the camera and the compass.

  Note: The direction is displayed over the photos provided the compass has been calibrated.

- Click  to apply the geotag settings and return to the Capture dialog. Click  to close the dialog without saving any changes and return to the Capture dialog.

Compass Calibration

The Compass Calibration dialog allows you to process the compass calibration. The application provides a graphic image describing calibration movement.

- If you do not want to process the calibration, click the **Skip** button to ignore the compass calibration, and no direction will be provided even if the *Add Direction* is selected in the Camera Settings dialog.

  Note: If you skip the calibration, you will not be prompted again as long as you edit the point. You can calibrate the compass any time by clicking the *Calibrate Compass* option enabled in the pop up menu.

- Click the **Start** button to start calibration. The calibration time depends on the device used.

Preview

To preview and confirm / discard the captured image before saving and /or attaching it to an object in the current project.

- Review the captured photo.
- Click  and select **View Image Attribs** to open the Attribute Values dialog, if required.

- Click  to accept the photo and return with this photo to the dialog from where the Capture dialog was called.
- Click  to discard the photo, close the preview, and return to the Capture dialog.

Attribute Values

To review the attributes of a selected image.

The attribute list displays:

- *Attribute name* - the name of an attribute;
- *Value* - the value of an attribute.

Click  to return to the previous dialog.

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