SURVEYING INSTRUMENTS

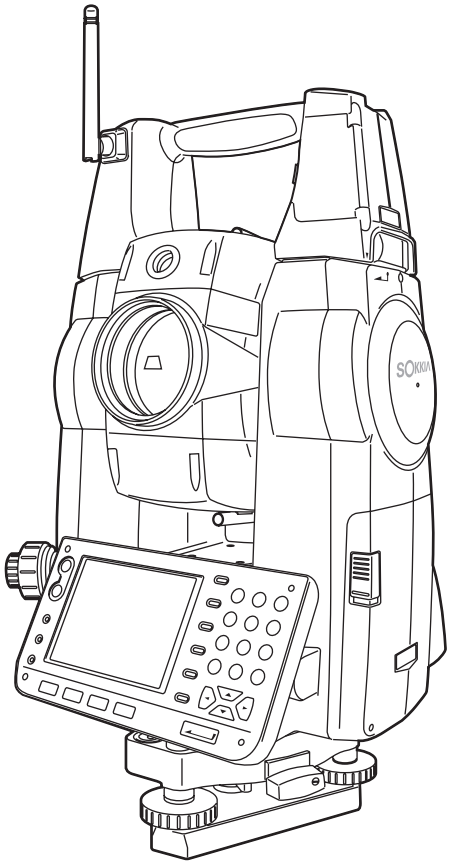
SOKKIA

Series SRX

SRX1
SRX2
SRX3
SRX5

H18.09.21

Total Station



Class 3R Laser Product

Class 1 LED Product

OPERATOR'S MANUAL

JSIMA

This is the mark of the Japan Surveying Instruments Manufacturers Association.

SURVEYING INSTRUMENTS

SOKKIA

Series SRX

SRX1
SRX2
SRX3
SRX5

Total Station

Class 3R Laser Product

Class 1 LED Product

OPERATOR'S MANUAL

- Thank you for selecting the SRX1/2/3/5.
- Before using the instrument, please read this operator's manual carefully.
- Verify that all equipment is included.
  ☞"26. STANDARD EQUIPMENT"
- SRX has a function to output data saved in Program mode (SDR) to a connected host computer. Command operations from a host computer can also be performed. For details, refer to "Interfacing with the SOKKIA SDR Electronic Field Book" and "Command Explanations" manuals and ask your Sokkia agent.
- The specifications and general appearance of the instrument may be altered at any time and may differ from those appearing in brochures and this manual.
- Some of the diagrams shown in this manual may be simplified for easier understanding.

HOW TO READ THIS MANUAL

Regarding other manuals

- Manuals 2, 3, and 4 below are electronic manuals provided on a CD-ROM in PDF format ( ).
- The SRX comes equipped with 4 manuals for operation information:
  1. SRX Operator's Manual (this manual):

     Explains basic operation and functions of the SRX.

  2. Series SRX SDR Software Reference Manual :

     Explains advanced measurement operations using the SRX in Program mode (SDR), and methods for managing measured data.

  3. SFX Dial-Up Program Explanations :

     Explains how to send and receive data using the SFX function

  4. Series SRX Quick Manual :

     Simplified explanations of operations such as Auto-Tracking to allow users to get started straight away.

Symbols

The following conventions are used in this manual.

	:	Indicates precautions and important items which should be read before operations.
☞	:	Indicates the chapter title to refer to for additional information.
Note	:	Indicates supplementary explanation.
	:	Indicates an explanation for a particular term or operation.

[Softkey] etc. : Indicates softkeys on the display and window dialog buttons.

{Key} etc. : Indicates keys on the operation panel.

<Setting out> etc.: Indicates screen titles.

Notes regarding manual style

- Except where stated, "SRX" means "SRX1/SRX2/SRX3/SRX5" in this manual.
- Screens and illustrations appearing in this manual are of SRX3.
- Location of softkeys in screens used in procedures is based on the factory setting. It is possible to change the allocation of softkeys.

☞ Softkey allocation: "21.6 Allocating Key Functions"

- Kodak Gray Card: **KODAK** is a registered trademark of Eastman Kodak Company.

- Bluetooth: **Bluetooth**® is a registered trademark of Bluetooth SIG, Inc.
- **Windows CE**® is a registered trademark of Microsoft Corporation.
- All other company and product names featured in this manual are registered trademarks of each respective organization.

Operation procedure

- Learn basic operations in "4. PRODUCT OUTLINE" and "5. BASIC OPERATION" before you read each measurement procedure. An overview of the available SRX functions is given in "4.1 Functions". For selecting options and inputting figures, see "5.1 Basic Key Operation".
- For Auto Tracking measurement, read this manual in conjunction with the On-demand Remote Control System Manual.
- Measurement procedures are based on continuous measurement. Some information about procedures when other measurement options are selected can be found in “Note” (Note).

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1. PRECAUTIONS FOR SAFE OPERATION

For the safe use of the product and prevention of injury to operators and other persons as well as prevention of property damage, items which should be observed are indicated by an exclamation point within a triangle used with WARNING and CAUTION statements in this operator's manual.
The definitions of the indications are listed below. Be sure you understand them before reading the manual's main text.

Definition of Indication

⚠ WARNING	Ignoring this indication and making an operation error could possibly result in death or serious injury to the operator.
⚠ CAUTION	Ignoring this indication and making an operation error could possibly result in personal injury or property damage.

△ This symbol indicates items for which caution (hazard warnings inclusive) is urged. Specific details are printed in or near the symbol.

⃠ This symbol indicates items which are prohibited. Specific details are printed in or near the symbol.

● This symbol indicates items which must always be performed. Specific details are printed in or near the symbol.

General

⚠ Warning

⃠ Do not use the unit in areas exposed to high amounts of dust or ash, in areas where there is inadequate ventilation, or near combustible materials. An explosion could occur.

⃠ Do not perform disassembly or rebuilding. Fire, electric shock, burns, or hazardous radiation exposure could result.

⃠ Never look at the sun through the telescope. Loss of eyesight could result.

⃠ Do not look at reflected sunlight from a prism or other reflecting object through the telescope. Loss of eyesight could result.

⃠ Direct viewing of the sun during sun observation will cause loss of eyesight. Use a solar filter (option), such as that in "27. OPTIONAL ACCESSORIES", for sun observation.

● When securing the instrument in the carrying case make sure that all catches, including the side catches, are closed. Failure to do so could result in the instrument falling out while being carried, causing injury.

⚠ Caution

⃠ Do not use the carrying case as a footstool. The case is slippery and unstable so a person could slip and fall off it.

1. PRECAUTIONS FOR SAFE OPERATION

Do not place the instrument in a case with a damaged catch, belt or handle. The case or instrument could be dropped and cause injury.

Do not wield or throw the plumb bob. A person could be injured if struck.

Do not touch the instrument or look through the telescope eyepiece while the motor drive is in operation. Hands could be caught in moving parts or an eye could be struck by the telescope and cause injury.

Secure handle to main unit with handle locks. Failure to properly secure the handle could result in the unit falling off while being carried, causing injury.

Tighten the adjustment tribrach clamp securely. Failure to properly secure the clamp could result in the tribrach falling off while being carried, causing injury.

Power Supply

⚠ Warning

Do not disassemble, rebuild, mutilate, incinerate, heat or short circuit the battery and charger. Fire, electric shock, burns or an explosion could result.

Do not use voltage other than the specified power supply voltage. Fire or electrical shock could result.

Do not use damaged power cords, plugs or loose outlets. Fire or electric shock could result.

Do not use power cords other than those designated. Fire could result.

Do not place articles such as clothing on the battery charger while charging batteries. Sparks could be induced, leading to fire.

Use only the specified battery charger to recharge batteries. Other chargers may be of different voltage rating or polarity, causing sparking which could lead to fire or burns.

Do not heat or throw batteries into fire. An explosion could occur, resulting in injury.

To prevent shorting of the battery in storage, apply insulating tape or equivalent to the terminals. Otherwise shorting could occur resulting in fire or burns.

Do not use batteries or the battery charger if wet. Resultant shorting could lead to fire or burns.

Do not connect or disconnect power supply plugs with wet hands. Electric shock could result.

Do not use the battery, charger or AC (power) cable for any other equipment or purpose. Fire or burns caused by ignition could result.

Do not short circuit the battery. Fire or burns caused by heat or ignition could result.

⚠ Caution

Do not touch liquid leaking from batteries. Harmful chemicals could cause burns or blisters.

Tripod

⚠ Caution

When mounting the instrument to the tripod, tighten the centering screw securely. Failure to tighten the screw properly could result in the instrument falling off the tripod, causing injury.

Tighten securely the leg fixing screws of the tripod on which the instrument is mounted. Failure to tighten the screws could result in the tripod collapsing, causing injury.

Do not carry the tripod with the tripod shoes pointed at other persons. A person could be injured if struck by the tripod shoes.

Keep hands and feet away from the tripod shoes when fixing the tripod in the ground. A hand or foot stab wound could result.

Tighten the leg fixing screws securely before carrying the tripod. Failure to tighten the screws could lead to the tripod legs extending, causing injury.

Bluetooth wireless technology

⚠ Warning

Do not use within the vicinity of hospitals. Malfunction of medical equipment could result.

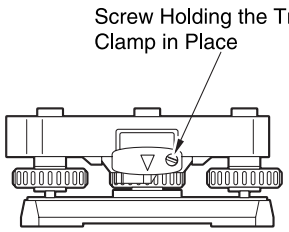
Use the instrument at a distance of at least 22 cm from anyone with a cardiac pacemaker. Otherwise, the pacemaker may be adversely affected by the electromagnetic waves produced and cease to operate as normal.

Do not use onboard aircraft. The aircraft instrumentation may malfunction as a result. Do not use within the vicinity of automatic doors, fire alarms and other devices with automatic controls as they may be adversely affected by the electromagnetic waves produced resulting in malfunction and injury.

2. PRECAUTIONS

Tribrach Clamp

- When the instrument is shipped, the tribrach clamp is held firmly in place with a locking screw to prevent the instrument from shifting on the levelling base. Before using the instrument the first time, loosen this screw with a screwdriver. And before transporting it, tighten the locking screw to fasten the tribrach clamp in place so that it will not shift on the levelling base.
- The SRX handle can be removed. When operating the SRX with the handle attached, always make sure that the handle is securely fixed to the SRX body with the handle lock levers.



Precautions concerning water and dust resistance

SRX conforms to IP64 specifications for waterproofing and dust resistance when the battery cover is closed and connector caps are attached correctly.

- Be sure to correctly attach the connector caps to protect the SRX from moisture and dust particles.
- Make sure that moisture or dust particles do not come in contact with the terminal or connectors. Contact with these parts may cause damage to the instrument.
- Make sure that the inside of the carrying case and the instrument are dry before closing the case. If moisture is trapped inside the case, it may cause the instrument to rust.

Charging the battery

- The battery (BDC58) was not charged at the factory. Charge the battery fully before using the SRX.

The Lithium Battery

The lithium battery is used to maintain the SRX Calendar & Clock function. It can back up data for approximately 5 years of normal use, but its lifetime may be shorter depending on circumstances.

Other precautions

- Never place the instrument directly on the ground. Sand or dust may cause damage to the screw holes or the centering screw on the base plate.
- Do not aim the telescope at the sun. Use the solar filter to avoid causing internal damage to the instrument when observing the sun.
  ☞"27. OPTIONAL ACCESSORIES"
- Do not perform automatic vertical rotation of the telescope when using the lens hood, diagonal eyepiece, or solar filter. Such accessories may strike the SRX causing damage.
- Protect the instrument from heavy shocks or vibration.
- Protect the instrument from rain or drizzle with an umbrella or waterproof cover.
- When the operator leaves the instrument attached to the tripod, the vinyl cover should be placed on the instrument.
- Never carry the instrument on the tripod to another site.
- Turn the power off before removing the battery.
- When placing the SRX in its case, first remove its battery and place it in the case in accordance with the layout plan.

- Make sure that the instrument and the protective lining of the carrying case are dry before closing the case. The case is hermetically sealed and if moisture is trapped inside, the instrument could rust.
- Consult your Sokkia agent before using the instrument under special conditions such as long periods of continuous use or high levels of humidity. In general, special conditions are treated as being outside the scope of the product warranty.

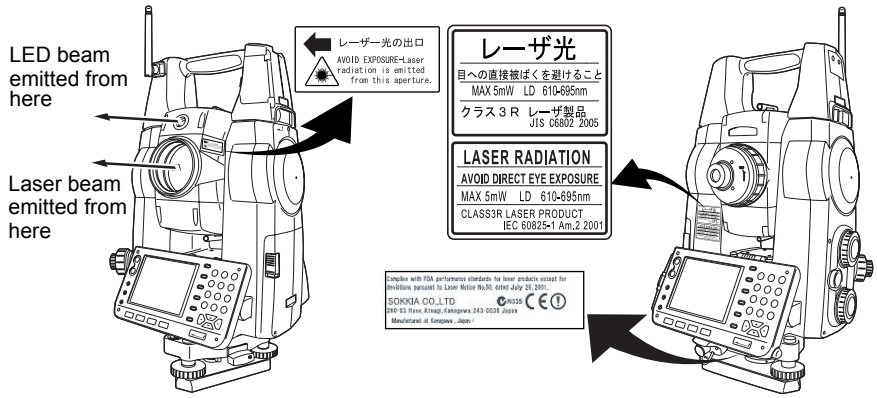
Maintenance

- Wipe off moisture completely if the instrument gets wet during survey work.
- Always clean the instrument before returning it to the case. The lens requires special care. First, dust it off with the lens brush to remove tiny particles. Then, after providing a little condensation by breathing on the lens, wipe it with the wiping cloth.
- If the display is dirty, carefully wipe it with a soft, dry cloth. To clean other parts of the instrument or the carrying case, lightly moisten a soft cloth in a mild detergent solution. Wring out excess water until the cloth is slightly damp, then carefully wipe the surface of the unit. Do not use any organic solvents or alkaline cleaning solutions.
- Store the instrument in a dry room where the temperature remains fairly constant.
- Check the tripod for loose fit and loose screws.
- If any trouble is found on the rotatable portion, screws or optical parts (e.g. lens), contact your Sokkia agent.
- When the instrument is not used for a long time, check it at least once every 3 months.
  ☞"23. CHECKS AND ADJUSTMENTS"
- When removing the instrument from the carrying case, never pull it out by force. The empty carrying case should be closed to protect it from moisture.
- Check the instrument for proper adjustment periodically to maintain the instrument accuracy.

3. LASER SAFETY INFORMATION

SRX is classified as a Class 3R Laser Product and Class 1 LED Product according to IEC Standard Publication 60825-1 Amd. 2: 2001 and United States Government Code of Federal Regulation FDA CDRH 21CFR Part 1040.10 and 1040.11 (Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No.50, dated July 26, 2001.)

- EDM device in objective lens: Class 3R Laser Product
- (When using prism or reflective sheet as target or when in Auto Tracking mode) Class 1 Laser Product
- Auto pointing device in objective lens: Class 1 Laser Product
- Guide light: Class 1 LED product



- EDM device is classified as Class 3R Laser Product when reflectorless measurement is selected. When the prism or reflective sheet is selected as target, the output is equivalent to the safer class 1.
- The cumulative output during distance measurement and tracking in Auto Tracking mode is equivalent to class 1.

⚠Warning

- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Follow the safety instructions on the labels attached to the instrument as well as in this manual to ensure safe use of this laser and LED product.

⚠Caution

- Perform checks at start of work and periodic checks and adjustments with the laser beam emitted under normal conditions.
- When the instrument is not being used, turn off the power and replace the lens cap.
- When disposing of the instrument, destroy the battery connector so that the laser beam cannot be emitted.
- Operate the instrument with due caution to avoid injuries that may be caused by the laser beam unintentionally striking a person in the eye. Avoid setting the instrument at heights at which the path of the laser beam may strike pedestrians or drivers at head height.

- Never point the laser beam at mirrors, windows or surfaces that are highly reflective. The reflected laser beam could cause serious injury.
- When using the laser-pointer function, be sure to turn OFF the output laser after distance measurement is completed. Even if distance measurement is canceled, the laser-pointer function is still operating and the laser beam continues to be emitted. (After turning ON the Laser-pointer, the laser beam is emitted for 5 minutes, and then automatically switches OFF.)
- Only those who have been received training as per the following items shall use this product.
  - Read the Operator's manual for usage procedures for this product.
  - Hazardous protection procedures (read this chapter).
  - Requisite protective gear (read this chapter).
  - Accident reporting procedures (stipulate procedures beforehand for transporting the injured and contacting physicians in case there are laser induced injuries).
- Persons working within the range of the laser beam are advised to wear eye protection which corresponds to the laser wavelength of the instrument being used
- Areas in which the lasers are used should be posted with laser warning notices.
- If Search or Track is selected in the Motor configuration "A.T. Setting", the laser beam will be emitted from the objective lens when tracking a moving prism or searching for the center of the prism.

  ☞ Tracking settings: "12.1 Auto Tracking Settings"
- The LED beam is emitted when the guide light is set to ON and the power is turned ON. Before turning ON the power check that there are no persons in the LED beam path. Alternatively, always set the guide light to OFF when you have finished measurement.

  ☞ Guide light settings for tasks other than setting-out: "14.2 Using the Guide Light"

  ☞ Guide light settings for setting-out: "14.2 Using the Guide Light"

4. PRODUCT OUTLINE

4.1 Functions

SRX has the following features to make operation more efficient.

1. Auto Tracking

   The SRX will automatically follow a moving prism when the target is being moved to the next measurement point, making surveying operations such as setting out faster and smoother. Even when an obstacle causes the SRX to momentarily lose the target, the On-demand Remote Control system allows the operator at the target to move the SRX via remote control and re-acquire the target position.

   ☞"12. MEASUREMENT WITH AUTO TRACKING"

2. Bluetooth wireless technology

   Bluetooth technology removes the need for cumbersome cables and provides wireless communication functionality between the SRX and the On-demand Remote Control system, data collectors and computers for even greater efficiency gains in the field. Bluetooth device address and passkey settings afford greater security when transmitting data wirelessly.

   ☞"8. CONNECTING TO EXTERNAL DEVICES"

   Bluetooth®

3. High accuracy with reflectorless measurement

   Sokkia's own optics, electrical circuits, and processing algorithms combine to provide superior reflectorless accuracy at distances as short as 30cm.

   RED EX -tech
   REvolutionary Digital processing EDM technology

4. Various interface options

   Data link options for the SRX include both a CF card slot and USB ports.

5. Full colour touch panel display

   Not only does the colur screen improve usability, but the Graphic option allows the user to visualise the current survey point during operation. In addition to the operation keys, the touch panel with stylus pen offers another user-friendly method for selecting screens and inputting characters.

   ☞"5.2 Display Functions"

6. Guide light

Setting-out measurement etc. can be carried out effectively using the guide light. The guide light is composed of a light that is divided into a red and a green light. A poleman can ascertain whether to move to the right or left by checking the guide light color.

☞"14.2 Using the Guide Light"

7. Sighting the target and performing distance measurement using Auto Pointing

Use the peep sight to bring the target roughly into the field of view. Then, press **[SRCH]** to automatically sight the center of the target. The instrument and telescope can be rotated manually by hand or, for more precise adjustments, by turning the vertical and horizontal jogging knobs.

The instrument can be set to automatically measures the distance after Auto Pointing has been completed. The search range can be set beforehand.

☞"11.2 Auto-Pointing Function for Target Sighting" and "21.3 EDM Settings"

8. Trigger Key for Easier Operation

Each screen contains a number of softkeys. Softkeys displayed in bold type control the flow of measurement operation. Pressing the trigger key located on the side of the SRX will perform exactly the same operation as the bolded softkey in the current screen. This allows the user to continue operation without having to return to the display to press softkeys, making operations such as resection measurement even simpler.

☞"4.2 Parts of the Instrument Trigger key"

9. Wide range of advanced programs

One touch of the **{PROGRAM}** key allows the user to switch from Basic mode to Program mode (SDR) in order to use advanced measurement programs. The position of menus and softkeys can be user-defined for greater ease-of-use.

☞Switching modes: "4.3 Mode Configuration", rearranging softkeys: "21.6 Allocating Key Functions"

10. SETTINGS Mode

One-touch of the **{SETTINGS}** key allows the user to jump to and from the SETTINGS mode during operation without exiting measurement.

☞"4.3 Mode Configuration"

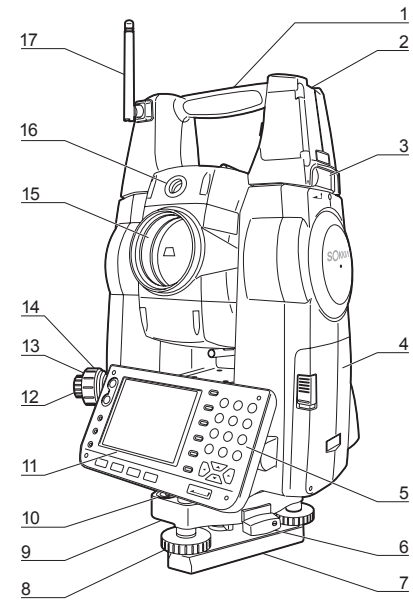
11.Sokkia's original Independent Angle Calibration System (IACS) technology

Unaffected by errors in collimation and instrument setup, this internal calibration technology provides an even higher level of stability and reliability for angle measurement.

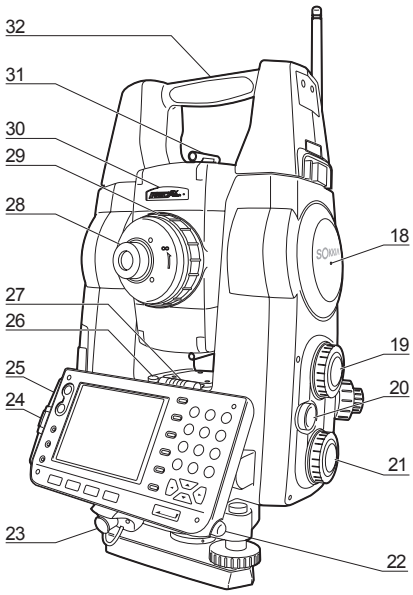
☞Independent angle calibration cannot be performed by the user. Consult your Sokkia agent.

4.2 Parts of the Instrument

Parts and functions of the instrument



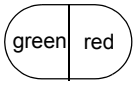
1 Handle
2 Tubular compass slot
3 Handle lock
4 Battery holder
5 Keyboard
6 Tribrach clamp
7 Base plate
8 Levelling foot screw
9 Circular level adjusting screws
10 Circular level
11 Display
12 Optical plummet eyepiece
13 Optical plummet reticle cover
14 Optical plummet focussing ring
15 Objective lens
(Includes "Laser-pointer function")
16 Guide light
17 Bluetooth antenna



18 Instrument height mark
19 Vertical jogging knob
20 Trigger key
21 Horizontal jogging knob
22 Stylus pen holder
23 Combined communications and power supply connector
24 CF card slot
☞"6. USING THE CF CARD SLOT"
25 USB ports
☞"8. CONNECTING TO EXTERNAL DEVICES"
26 Plate level adjusting screw
27 Plate level
28 Telescope eyepiece screw
29 Telescope focussing ring
30 Laser radiation warning indicator
31 Peep sight
32 Instrument center mark

Vertical and Horizontal jogging knobs
The instrument and telescope can be rotated manually by hand or, for more precise adjustments, by turning the vertical and horizontal jogging knobs.
The faster the jogging knobs are turned, the faster the instrument and telescope rotate.

Guide light
Setting-out measurement etc. can be carried out effectively using the guide light. The guide light is composed of a light that is divided into a red and a green light. A poleman can ascertain the present position by checking the guide light color.



Guide light status

Light status	Meaning
Red	(From position of poleman) Move target left
Green	(From position of poleman) Move target right
Red and Green	Target is at correct horizontal position

The guide light indicator is lit or flashes depending on the status of the guide light.

Laser radiation warning indicator
Laser radiation warning indicator is red when laser beam is emitted or laser-pointer is used, allowing the status laser beam of the laser beam to be ascertained from the telescope eyepiece side.

Peep sight
Use peep sight to aim the SRX in the direction of the measurement point.
Turn the instrument until the triangle in the peep sight is aligned with the target.

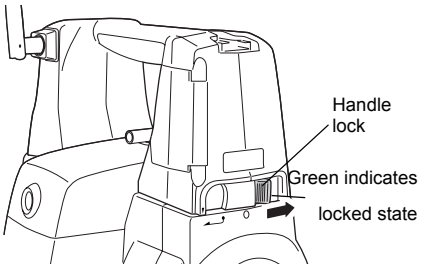
Instrument height mark
The height of the SRX is 236mm (from tribrach dish to this mark). "Instrument height" is input when setting instrument station data and is the height from the measuring point (where SRX is mounted) to this mark.

Trigger key
When the Trigger key is pressed SRX carries out the operation indicated by the softkey in bold type on the screen. This allows the user to continue operation without having to return to the display to press softkeys, making operations such as resection measurement even simpler.

Laser-pointer function
A target can be sighted with a red laser beam in dark locations without the use of the telescope.

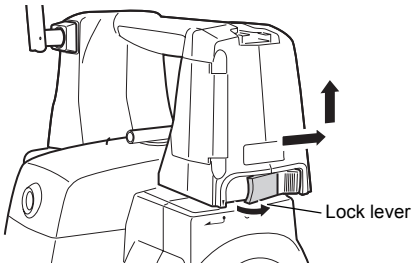
Removing the handle (RC-TS3)

1. Slide the handle locks in the direction as shown at right until a click is heard. The handle are now unlocked.



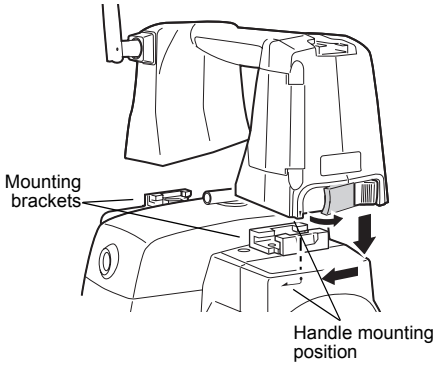
2. Pull the lock levers towards you and slide the handle back and up to remove.
   The handle lock levers, once released, will return to the original position.

   Make sure that the handle does not fall while being removed. Removing the handle requires a certain amount of force. As a result, always hold firmly when removing.

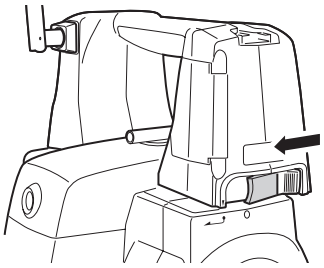


Attaching the handle (RC-TS3)

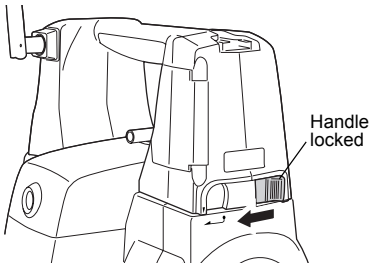
1. Align the handle with the mounting brackets.



2. Slide the handle onto the mounting position until a click is heard. Check that the handle lock levers, once released, return to the closed position.



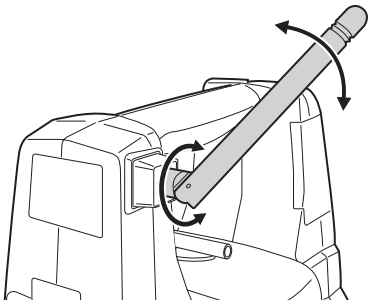
3. Slide the handle locks away from you to lock the handle. Check that the green sections of the handle locks are showing.



- Securely lock the handle in place before starting measurement.

Bluetooth antenna

When performing communication using Bluetooth wireless technology, the antenna must be directed towards the intended companion device.

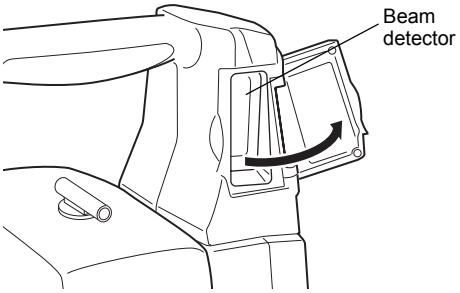


Handle the antenna with care and be aware of the following points when operating.

- An extended antenna may be damaged if struck during operation.
- The antenna may be damaged if forcibly bent in an incorrect direction. The antenna cannot be bent to angles exceeding 90°.

Beam detector for On-demand Remote Control System

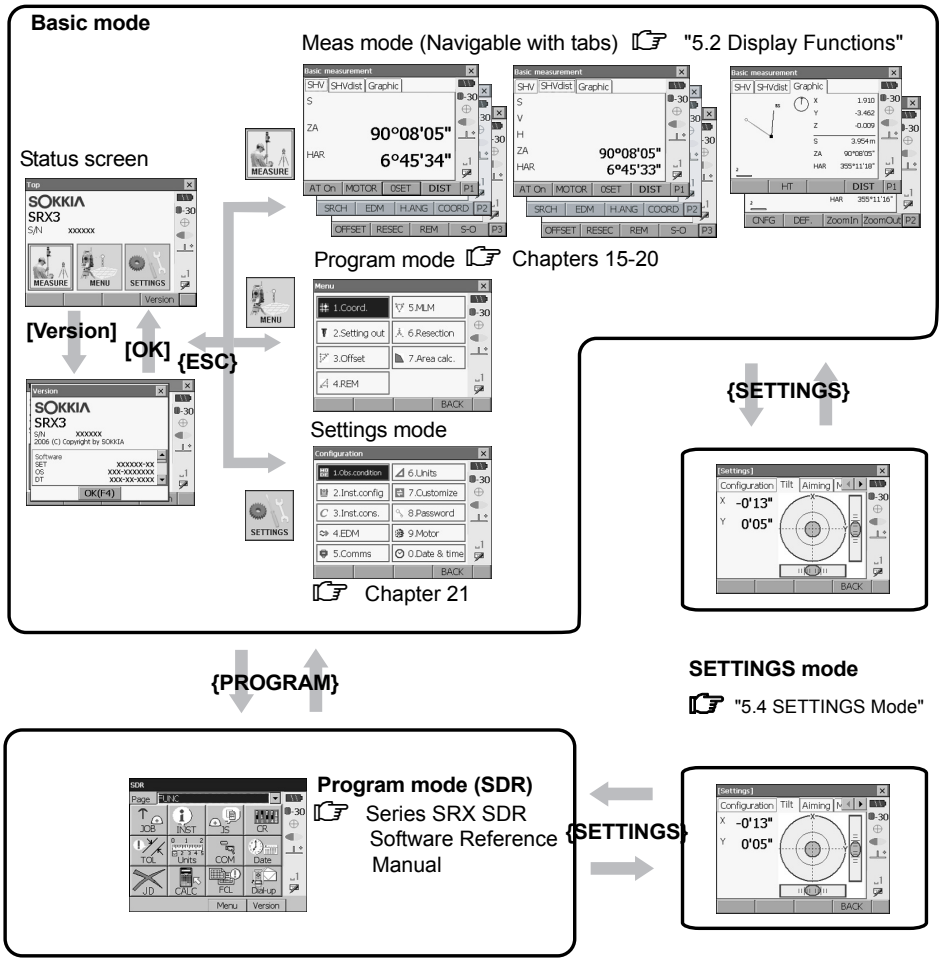
Always open the beam detector cover when using the On-demand Remote Control system.



- The beam detector cover can be damaged if forced open beyond a certain angle. Always close the beam detector cover before moving the instrument.
- Never touch the beam detector. The ability of the system to perform Turning may be adversely affected.

4.3 Mode Configuration

The diagram below describes the different modes of the SRX and key operations for navigating between them. Managing data functions are contained in Program mode (SDR).



- Switching between modes is not possible during distance measurement or while the motor is in operation.

4.4 Bluetooth Wireless Technology

Precautions concerning Bluetooth wireless technology

- Use of this technology must be authorized according to telecommunications regulations of the country where the instrument is being used. Contact your Sokkia agent in advance.
- Sokkia is not liable for the content of any transmission nor any content related thereto. When communicating important data, run tests beforehand to ascertain that communication is operating normally.
- Do not divulge the content of any transmission to any third party.

Radio interference when using Bluetooth technology

Bluetooth communication with the SRX uses the 2.4 GHz frequency band. This is the same band used by industrial, scientific, and medical (ISM) equipment such as microwaves, portable premises radio equipment (license required) and portable specified low-power radio equipment (license-exempt) used in factory production lines, etc.

- Before starting transmission, check that operation will not take place within the vicinity of portable premises radio equipment or specified low-power radio equipment.
- In the case that the instrument causes radio interference with portable premises radio equipment, terminate the connection immediately and take measures to prevent further interference (e.g. connect using an interface cable).
- In the case that the instrument causes radio interference with portable specified low-power radio equipment, contact your Sokkia agent.

Although a radio station license is not required for this instrument, bear in mind the following points when using Bluetooth technology for communication.

● Do not use within the vicinity of the following:
  •Industrial, scientific, and medical (ISM) equipment such as microwaves and pacemakers.
  • portable premises radio equipment (license required) used in factory production lines etc.
  • portable specified low-power radio equipment (license-exempt)
  •IEEE802.11b/IEEE802.11g standard wireless LAN devices

The above devices use the same frequency band as Bluetooth communications. As a result, using the SRX within proximity to the above devices may result in interference causing communication failure or reduction of transmission speed.

- Refrain from using the SRX within proximity to televisions and radios

Televisions and radios use a different frequency band to Bluetooth communications.
However, even if the SRX is used within proximity to the above equipment with no adverse effects with regard to transmission, moving a Bluetooth-compatible device (including the SRX) closer to said equipment may result in electronic noise in sound or images.

Precautions regarding transmission

● For best results

•When using the On-demand Remote Control system, perform communication within a line-of-sight distance of approximately 300m. The usable range becomes shorter when obstacles block the line of sight, or devices other than the On-demand Remote Control system, such as PDAs or computers, are used. Wood, glass and plastic will not impede communication but the usable range becomes shorter. Moreover, wood, glass and plastic containing metal frames, plates, foil and other heat shielding elements as well as coatings containing metallic powders may adversely affect Bluetooth communication and concrete, reinforced concrete, and metal will render it impossible. Use a vinyl or plastic cover to protect the instrument from rain and moisture.

•The direction of the Bluetooth antenna can have adverse effects upon usable range. For best results make sure that the antennas of both the SRX and the companion device are as vertical as possible and visible to one another. When this is not possible, better results can be obtained by pointing the antenna vertically towards the ground.

- Perform communication at a distance of 2m or more from electrical devices such as audio-visual equipment and office automation equipment. In the case of microwave ovens, which are especially susceptible to interference, this distance should be increased to 3m.
  Moreover, operation near televisions and radios may lead to problems with reception.
- Ensure that cellular phones are at least 20cm from the SRX Bluetooth module during operation.
- Change location when proximity to a wireless device or broadcast station results in communication failure.
  When using the SRX near IEEE802.11b or IEEE802.11g standard wireless LAN devices or other devices that operate on the 2.4GHz ISM band, interference may result, causing transmission speed to slow or even disrupting the connection completely. Turn off all devices not being used.

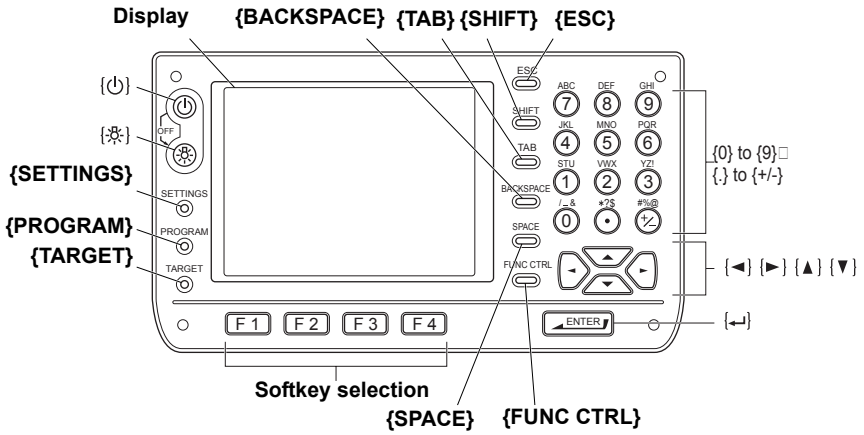
● Reduced range due to atmospheric conditions

The radio waves used by the SRX may be absorbed or scattered by water and airborne moisture. The signal may be weakened by exposure to rain, fog, and moisture from the human body with the limit of usable range becoming much lower as a result. Moreover, as wireless devices lose signal strength when close to the ground, perform communication at as high a position as possible.

5. BASIC OPERATION

Learn basic key operations here before you read each measurement procedure.

5.1 Basic Key Operation



- **Power ON/OFF**

⏻	Power ON
⏻ (while pressing) + {☼}	Power OFF

- **Lighting up the reticle/keys and selecting screen backlight brightness**

{☼}	Switches the reticle illumination/key backlight ON/OFF
	Switches the screen backlight brightness setting

☞ "21.2 Instrument Configuration"

- **Switching to SETTINGS mode**

{SETTINGS}	Switches to screens for tilt correction, returned signal checking, motor operation, fixed velocity rotation,and general configuration
{SETTINGS}/{ESC}	Returns to the previous screen (mode)

☞ "5.4 SETTINGS Mode"

- **Switching to Program mode (SDR)**

{PROGRAM}	Switches between Basic mode and Program mode (SDR)

- **Switching target type**

{TARGET}	Switches between target types

☞ "21.3 EDM Settings"

Note

• Changes can also be made by tapping the status bar icon with the stylus pen.
☞ "5.2 Display Functions"

● **Switching the laser-pointer/guide light ON/OFF**

{☼} (Press and hold until a beep sounds)	Turns the laser-pointer/guide light ON/OFF

☞ Selecting laser-pointer/guide light after pressing **{☼}:** "21.3 EDM Settings"
•After turning ON the laser-pointer/guide light, the laser beam is emitted for 5 minutes, and then automatically switches OFF.
• Changes can also be made by tapping the status bar icon with the stylus pen.
☞ "5.2 Display Functions"

● **Softkey operation**

Softkeys are displayed on the bottom line of the screen.

{F1} to **{F4}**	Select the function matching the softkeys
{FUNC CTRL}	Toggles between softkey pages

● **Inputting letters/figures**

Character input method can be selected from upper case alphabetic, lower case alphabetic and numeric characters.

Note

•A selection can also be made by tapping the status bar icon with the stylus pen.

{0} to {9}	Input numeral or symbol printed above the key (during numeric input mode)
	Input alphabetic character in the order they are listed (in alphabetic input mode)
{.}	Input a decimal point (during numeric input mode)
{+/-}	Input a plus or minus sign (during numeric input mode)
{ESC}	Cancel the input data
{TAB}	Shift to the next item
{BACKSPACE}	Delete the character to the left
{SPACE}	Input a blank space
{◀}/{▶}	Move the cursor left/right during character input
{ ▲ }/{ ▼ }	Move the cursor up/down during character input
{↵}	Select/accept input word/value

● Selecting options

{▲}/{▼}	Move the cursor/selection item up/down
{◀}/{▶}	Move the cursor/selection item left/right or selects other option
{TAB}	Shift to the next item
{SPACE}	Display other options
{↵}	Select/accept the option

● Selecting tabs

{▲}/{▼}	Move tab/cursor in tab up/down
{◀}/{▶}	Display next tab at left/right

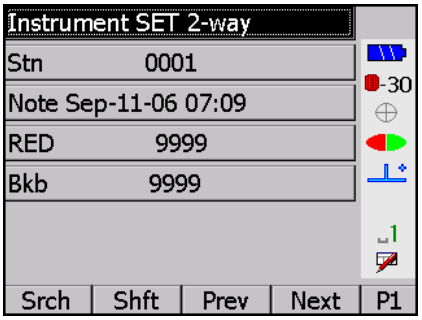
● Other operation

{ESC}	Return to previous screen
{◀}/{▶}	Moves tab left/right

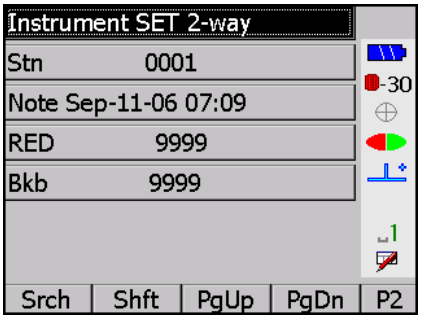
☞ Tabs: "5.2 Display Functions"

Example: Entering "computer" (lower case) as the name of a new device

1. Tap the input mode icon in the status bar (second from bottom) until "_a" is displayed.



2. Press **{7}** three times.
"c" is displayed.



3. Press **{5}** three times.
   "o" is displayed.

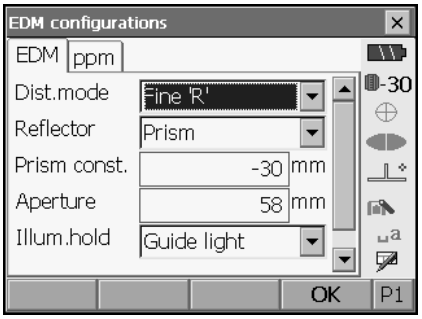
4. Press **{▶}**.
   Press **{5}** twice. "m" is displayed.

5. Continue to input letters. Press **{↵}** to complete inputting.

Example: selecting a reflector type

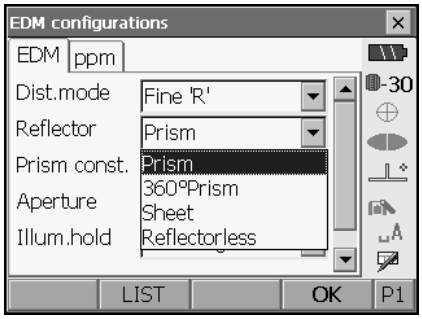
(Method 1)

1. Select **[EDM]** in the second page of Measure mode or "EDM" in SETTINGS mode.



2. Move to "Reflector" using **{▲}**/**{▼}**/**{TAB}**.

3. Press **{SPACE}** to display a list of all options.



4. Select an option using **{▲}/{▼}.**

5. Press {↵} to confirm selection.

(Method 2)

1. Select **[EDM]** in the second page of Measure mode or "EDM" in SETTINGS mode.
2. Move to "Reflector" using **{▲}/{▼}/{TAB}**.
3. Switch between Prism, 360° Prism, Sheet, and Reflectorless using **{◀}/{▶}**.
4. Press **{↵}** to confirm selection.

.

5.2 Display Functions

Screens can be selected/operated using the keys on the keyboard or the touch panel. The touch panel can be operated using either the stylus pen provided or your fingers.

- Do not scratch the display or use any sharp implement other than the stylus pen to operate the touch panel.

Using the stylus

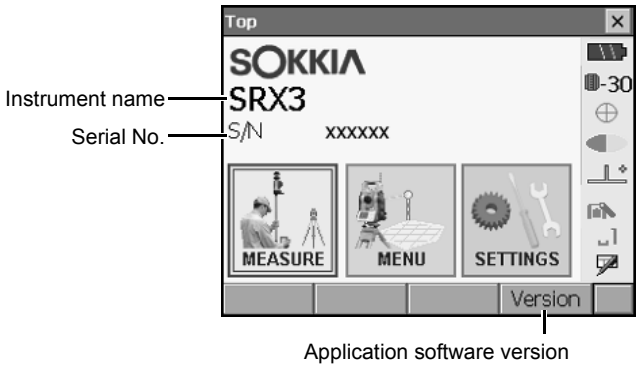
The stylus pen can be used to select menus and buttons on the screen and operate the scroll bar. The touch panel supports "tap", "double tap", and "drag" operations.

Operation	Method
Tap	Lightly tap the display once. This operation is equivalent to that of clicking a mouse button when using a computer.
Double tap	Lightly tap the display twice on the same point.This operation is equivalent to the "double-click" for a computer mouse.
Drag	Lightly apply the point of the stylus pen to the display and move in the desired direction, maintaining contact between the stylus and display all the time.

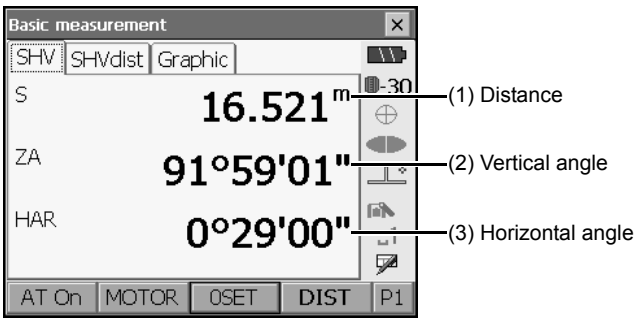
Displaying and operating screens

- To close a screen, tap the cross in the top right corner, or press **{ESC}**.
- Tabs, softkey allocations, displayed tab items, and character sizes can all be changed in accordance with user preferences.
  ☞"21. CHANGING THE SETTINGS"

● **Status screen**



● **Basic measurement screen**



(1) Distance

Press **[/SHV]** to switch between the SHV and SHVdist tabs. An SHVdist tab will be created when one does not exist.

☞ "21.1 Observation Conditions"

☞ "21.6 Allocating Key Functions"

(2) Vertical angle

The Vertical angle display can be switched between Zenith (Z=0°)/Horiz (H=0°)/Horiz (H=±90°) To switch vertical angle/slope in %, press **[ZA/%]** when allocated to the Meas mode screen. The capitalized letter in the softkey indicates the currently selected mode.

☞"21.1 Observation Conditions"

(3) Horizontal angle

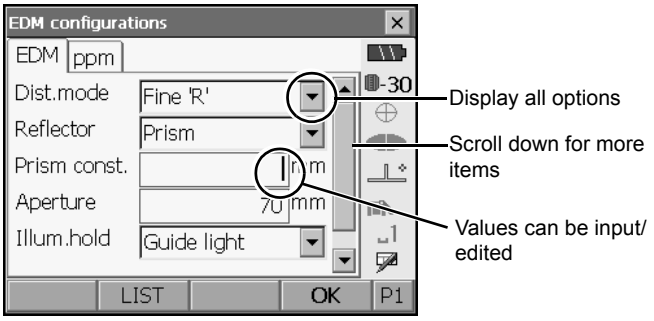
Press **[R/l]** when allocated to the Meas mode screen to switch the display status. The capitalized letter in the softkey indicates the currently selected mode.

HAR : Horizontal angle right

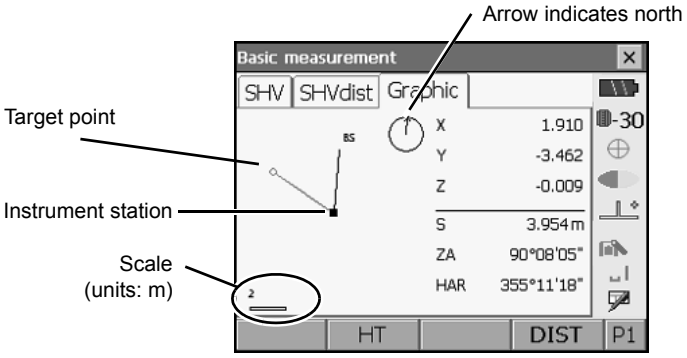
HAL : Horizontal angle left

☞ "21.6 Allocating Key Functions"

● **Input screen/configuration screen**



● **Graphic tab**



The Graphic tab display can be modified using the softkeys in the second page.

[CNFG]: In <Graphic configuration> the user can specify the orientation of the graphic tab display and which point, target or station, to set at the center of the display.

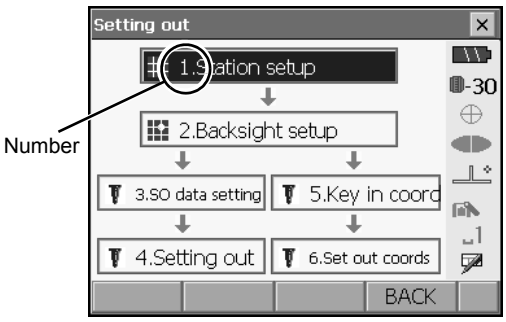
[DEF.]: Returns to the original orientation display.

[ZoomIn]: Zooms in.

[ZoomOut]:Zooms out.

● **Selecting menus**

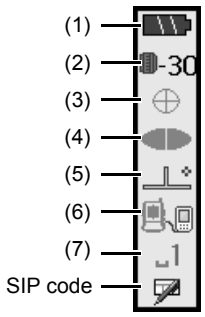
To select a menu, tap the touch panel or press the relevant number key.



● **Status bar**

Indicates the current status of the instrument. Tapping icons (1) to (7) will switch between the relevant options for that item Tapping and holding will display a list of all available options for that item and, in certain cases, a link to the configuration screen for that item.

☞ Settings: "21. CHANGING THE SETTINGS"



(1)Remaining battery power

Remaining battery power indicator and configuration of auto-power function (BDC58/external battery BDC61, Temperature = 25°, EDM on).

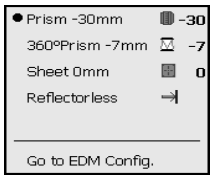
The remaining batter power displayed when distance measurement is in progress may differ to that displayed at other times.

: Level 3	Full power
: Level 2	Plenty of power remains
: Level 1	Half or less power remains
Level 0	Little power remains. (Flashes red and black)
: No power	(Red display in the center of the screen) Stop measurement and charge the battery

☞ "7. USING THE BATTERY"

(2) Target display

Selection of target type and configuration of prism constant.

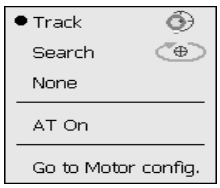


: Prism (-30mm)
: 360° Prism (-7mm)
: Sheet (0mm)
: Reflectorless

Target information can be edited/recorded in <Reflector setting>.

☞ "21.3 EDM Settings"

(3) Motor configuration
Configuration of Auto Pointing/Auto Tracking status.



: Auto Tracking ON
: Auto Pointing ON
: Both Auto Tracking and Auto Pointing OFF
: Start Auto Tracking."AT Off" is displayed when in "Prism wait" status. Press to quit Auto Tracking.

One of the following icons will be displayed while the motor is in operation to indicate the current status of the SRX.

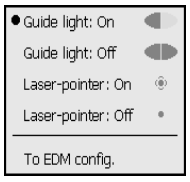
: Rotating
: Rotating at fixed velocity
: Searching
: Auto Tracking in progress (when Auto Tracking set)
: Target lost (when Auto Tracking set)
: (Flashes red) Waiting for prism (when Auto Tracking set)

☞ Motor settings: "11.1 Auto Pointing Settings", "12.1 Auto Tracking Settings"

Note

- Auto Tracking and Auto Pointing cannot be performed when "Reflectorless" has been selected as the target type. Auto Tracking cannot be performed when "Sheet" has been selected as the target type. will be displayed.
- An arrow indicating turn direction will be displayed when the SRX is rotating at a fixed velocity.
  ☞ Fixed velocity rotation: "5.4 SETTINGS Mode ● Fixed velocity rotation"

(4) Laser-pointer/guide light
Configuration of laser-pointer/guide light status.
☞ Switching the laser-pointer/guide light ON/OFF: "5.1 Basic Key Operation"



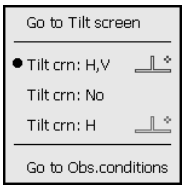
: Guide light ON
: Guide light OFF
: Laser-pointer ON
: Laser-pointer OFF

Note

- The laser-pointer will be automatically switched OFF during distance measurement.

(5) Tilt angle compensation

The vertical and horizontal angles are automatically compensated for small tilt errors usng the SRX's dual-axis tilt sensor. This icon displays the status of this function.



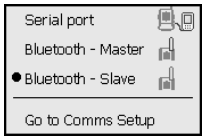
: Horizontal and vertical tilt angles compensated (blue)
: No compensation
: Only horizontal tilt angle compensated (green)

Note

- is displayed when the instrument is out of level.

(6) Communication status

Selection and configuration of communication status with external devices. This icon is not displayed in Program mode (SDR).



: Connection via RS-232C cable
: Connection via Bluetooth (SRX set as "Master" device) (blue antenna)
: Connection via Bluetooth (SRX set as "Slave" device) (green antenna)

Note

- When Bluetooth is selected (SRX set as "Master" device) a connection can be initiated/canceled by tapping / .
- An arrow symbol is displayed while data is being transmitted.
- This icon is not displayed in Program mode (SDR).

Connection status is displayed as follows.

i) Connection via Bluetooth

When SRX is set as the "Master" device the antenna mark is blue. When the SRX is set as the "Slave" device the antenna mark is green.

: Connecting

: Cancelling connection

: Inquiring about other Bluetooth devices (only when SRX is set as "Master" device)

ii) : Connection via RS-232C cable

(7) Input mode

Selection of input mode

_1	Inputting numbers and symbols
_A	Inputting upper case alphabetic characters
_a	Inputting lower case alphabetic characters

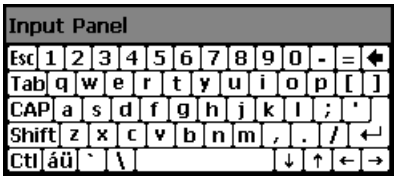
5.3 Inputting Characters using SIP Code (Input Panel)

Tap to display <Input Panel>. This keyboard can be used to input numeric and alphabetic characters as well as symbols. Tap the icon again to close.

Note

- When <Input panel> is covering the icon of the status bar, use the stylus pen to drag the input panel to another part of the screen so that you can access the icon.

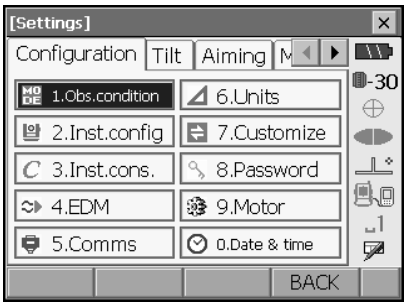
Input panel



Esc	: Deletes all input characters
Tab	: Moves the cursor to the next text box
CAP	:Alternates between upper and lower case alphabetic characters and numbers/ symbols
Shift	:Alternates between upper and lower case alphabetic characters and numbers/ symbols. Is canceled after inputting a single character.
Ctl	:No function
Del/⇦	: Delete the character to the left/right or deletes the entire text in the active section
← →	: Move the cursor left/right
↵	: Accept input characters
Space	: Input a blank space
áü	:Accesses further Latin/Germanic characters/symbols

5.4 SETTINGS Mode

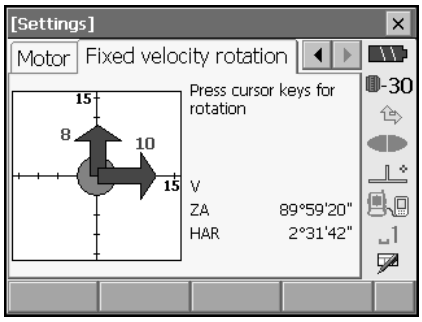
Press **{SETTINGS}** to switch to screens for tilt correction, returned signal checking, motor operation, fixed velocity rotation,and general configuration



☞ Performing settings: "21. CHANGING THE SETTINGS", Tilt settings: "9.2 Levelling", Returned signal checking: "14.1 Returned Signal Checking"

● Motor settings

The instrument can be automatically rotated to a desired vertical and/or horizontal angle by specifying the angle in the "Motor" tab and selecting **[ROTATE]**.

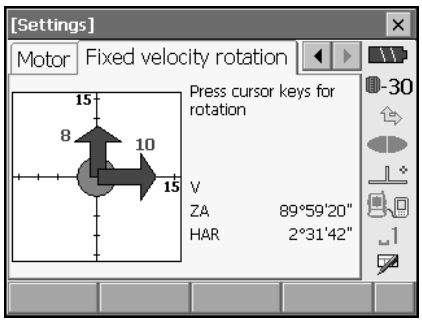


Note

- The following operations can be performed using the softkeys in the second page.
  [READ] : Read in coordinates from Program mode (SDR) and set as the desired angle.
  [COORD] : Specify rotation angle by inputting coordinates in <Key in coord>.
  [TURN] : Rotate the SRX 180°.
  [CNFG] : Perform Motor configuration settings. ☞ "12.1 Auto Tracking Settings"

● **Fixed velocity rotation**

The SRX horizontal angle and telescope can be rotated using the controls in the Fixed velocity rotation tab. Speed settings are from 1 to 16.



Tap the touch panel in the desired rotation direction.
Press **{ESC}** or tap the red center circle to stop rotation.

6. USING THE CF CARD SLOT

CF (Compact Flash) cards, for saving surveying and other data, are supported by the SRX. However, users with SD cards will need to use an CF card slot adapter.
Management of JOB and survey data is done in Program mode (SDR).
☞ Series SRX SDR Software Reference Manual

Note

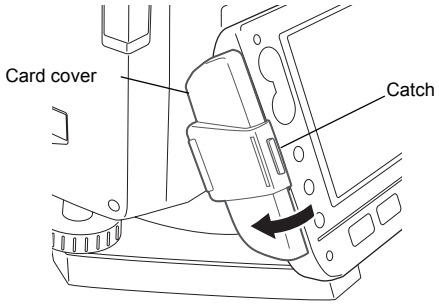
- Contact your Sokkia agent for details regarding communication formats for CF card input/output.
- Data can also be transferred to an external device for storage and/or editing using the SRX's USB ports.
  ☞ "8. CONNECTING TO EXTERNAL DEVICES"

6.1 Inserting/Removing the CF Card

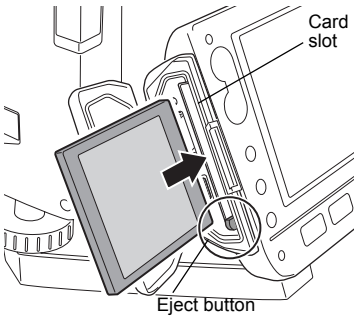
- Do not remove the CF card during data read/write.
- Make sure the eject button is fully depressed when a CF card is inserted. A protruding eject button will be depressed when the card cover is closed causing the card to be ejected.
- Always close the card cover before moving the instrument. The card cover can be damaged if forced open beyond a certain angle.

PROCEDURE Inserting the CF card

1. Push the catch on the card cover to open.

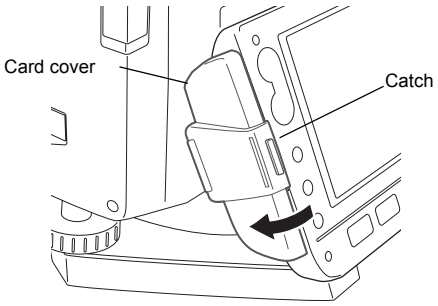


2. Insert the CF card until a click is heard.
3. Close the card cover.

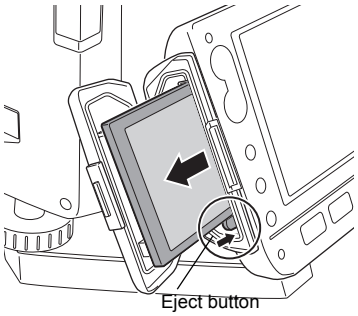


PROCEDURE Removing the CF card

1. Push the catch on the card cover to open.



2. Press the eject button once to release. Once the eject button is fully protruded, press once more to remove the card from the card slot.



3. Close the card cover.

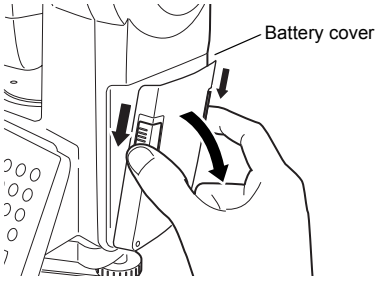
7. USING THE BATTERY

Mount the charged battery (BDC58).
☞ Types of power source: "24. POWER SUPPLY SYSTEM"

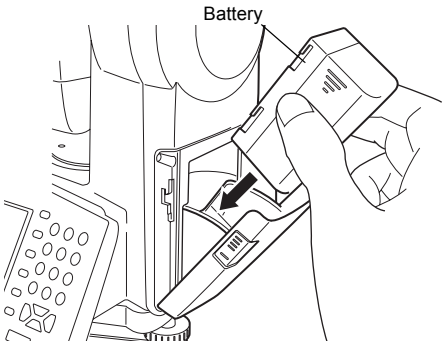
- Remove the battery when the instrument is not being used.
- Before removing the battery, turn off the power to the instrument. If the battery is removed while the power is switched on, a warm boot occurs. File and folder data may be lost as a result.
- When installing/removing the battery, make sure that moisture or dust particles do not come in contact with the inside of the instrument.

PROCEDURE Mounting the battery

1. Slide down the catches on the battery cover to open.



2. Insert the battery in the direction of the arrow printed on the side.
3. Close the battery cover. A click is heard when the cover is secure.

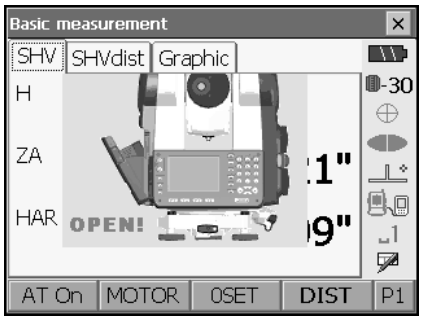


PROCEDURE Removing the battery

1. Slide down the catches on the battery cover to open.
2. Retract the battery.
3. Close the battery cover. A click is heard when the cover is secure.

Note

- Battery cover
  If the battery cover is open during power ON, SRX notifies you by displaying the screen below and beeping.
- When the battery cover is closed, the previous screen is restored.



8. CONNECTING TO EXTERNAL DEVICES

The SRX supports both USB and Bluetooth wireless technology for communication with data collectors, computers, cellular phones, and the On-demand Remote Control system.
Read this manual in conjunction with the operator's manual for the relevant external device.

☞ Bluetooth communication: "4.4 Bluetooth Wireless Technology"
☞ Transferring data using the SFX function: SFX Dial-Up Program Explanations, Output format and command operations: Interfacing with the SOKKIA SDR Electronic Field Book and Command Explanations manuals

8.1 Wireless Communication using Bluetooth Technology

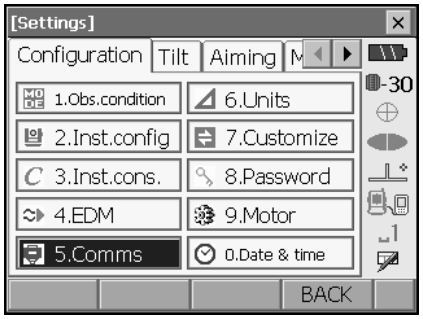
The Bluetooth module incorporated in the SRX can be used for communication with Bluetooth devices other than the SRX.
Security functions such as Bluetooth device address and passkey can be used to provide a level of protection for wireless communication.

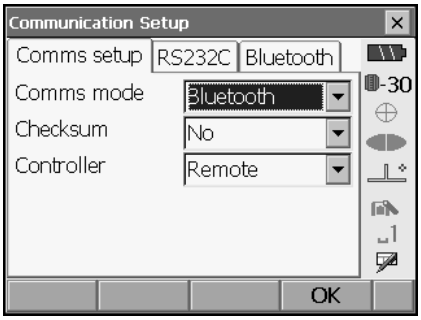
Bluetooth device address
This is a number unique to one particular Bluetooth device used to identify devices during communication. This number consists of 12 characters (numbers 0 to 9 and letters from A to F). Some devices may be referred to by their Bluetooth device address.
☞ SRX Bluetooth antenna: "4.2 Parts of the Instrument Bluetooth antenna"

Bluetooth connections
Communication between a pair of Bluetooth devices requires one device to be set as the "Master" and the other as the "Slave". To initiate connections from the SRX side, set the SRX as the "Master" device. To initiate connections from the paired device side, set the SRX as the "Slave" device. The factory setting is "Slave".

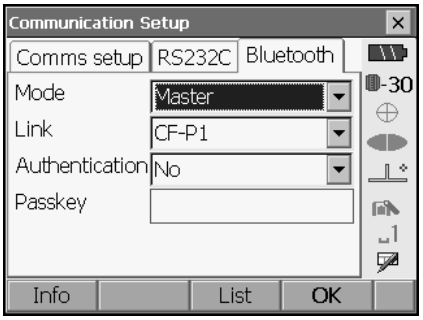
PROCEDURE Necessary settings for Bluetooth communication

1. Select "Comms" in SETTINGS mode. Set Comms mode in the Comms setup tab to "Bluetooth".





2. Select a mode for the SRX in the Bluetooth tab. To initiate connections from the SRX side, set the SRX as the "Master" device. To initiate connections from the paired device side, set the SRX as "Slave".
   The factory setting is "Slave".
   Register companion devices.
   - "Master" cannot be selected when no companion devices have been registered.



3. Select, in "Link", a companion device from among the Bluetooth devices already registered in the SRX.
   ☞ Registering devices: "PROCEDURE Registering Bluetooth companion devices"

   - Companion devices cannot be selected when the SRX is set as "Slave".

4. Set "Authentication" to "Yes" or "No".

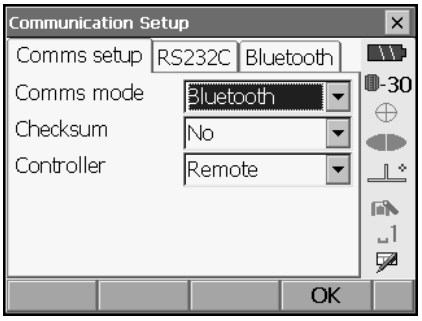
5. When "Authentication" is set to "Yes", input the same passkey as that for the intended companion device. Even if "Authentication" is set to "No", a passkey is requested when authentication is set on the companion device being used.
   • Up to 16 numeral characters can be input. Input characters will be displayed as asterisks (e.g. "*****"). The passkey was set to "0123" at the factory.

6. Press **[OK]** to finish settings.

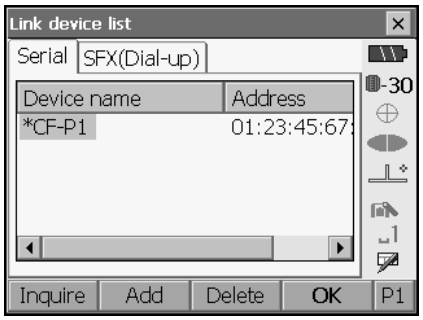
PROCEDURE Registering Bluetooth companion devices

1. Power on the companion device.

2. Select "Comms" in SETTINGS mode.

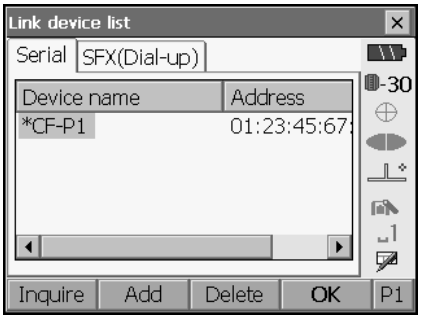


3. Select "Link" in the Bluetooth tab. and press **[LIST]** to display a list of all registered devices. Data collector devices can be set in the Serial tab and devices for use with the SFX Dial-Up Program in the SFX (Dial-Up) tab.



4. Register your Bluetooth device(s).

   Press **[Add]** to display <Add device>. Input the device name and Bluetooth address and press **[OK]**. Up to 12 hexadecimal digits can be input.



Press **[Inquire]** to inquire about Bluetooth devices in the immediate vicinity of the SRX and display their device name and address in a list. Select a device from this list and press **[OK]** to add to the Link device list in step 3.

Press **[Delete]** to delete the selected device name. Deleted device names cannot be retrieved.

- Select a device and press **[Edit]** in the second page to update the device name and/or device address.

5. Press **[OK]** to complete registration and return to the screen in step 2.

PROCEDURE Displaying Bluetooth information for the SRX

1. Select "Comms" in SETTINGS mode.

2. Press **[Info]** in the Bluetooth tab to display the device name and Bluetooth address for the SRX Bluetooth module. Register the Bluetooth address displayed here in the paired device.

8.2 Communication between the SRX and Companion Device

- Bluetooth communication causes SRX battery power to be depleted at a higher than average rate. Under the "Slave" setting, the SRX is constantly being searched for by communicable devices and therefore consumes an ever greater amount of power.
- Check that the companion device (data collector, computer, cellular phone, or On-demand Remote Control system etc.) is turned on and the relevant Bluetooth settings are complete.
- All communication settings will be changed to factory settings when a cold boot is performed. Comms setup will need to be performed again.

☞"8.1 Wireless Communication using Bluetooth Technology"

1. Complete the necessary SRX settings for Bluetooth communication.
   ☞ "8.1 Wireless Communication using Bluetooth Technology"

   • To initiate connections from the SRX side, set SRX as the "Master" device. To initiate connections from the paired device side, set SRX as "Slave".

2. Start communication
   When SRX is set as the "Master" device, the **[Connect]** softkey is allocated to the fourth page of Meas mode. When **[Connect]** is pressed the SRX searches for the device selected in "Link" and a connection starts. When a connection has been successfully established  is displayed in the status bar.

Note

- When SRX is set as the "Slave" device, the establishing of a connection can only be initiated/ canceled by the companion device set as "Master".
- The establishing of a connection can also be initiated by tapping  in the status bar.
  ☞ Status bar, communication status: "5.2 Display Functions"

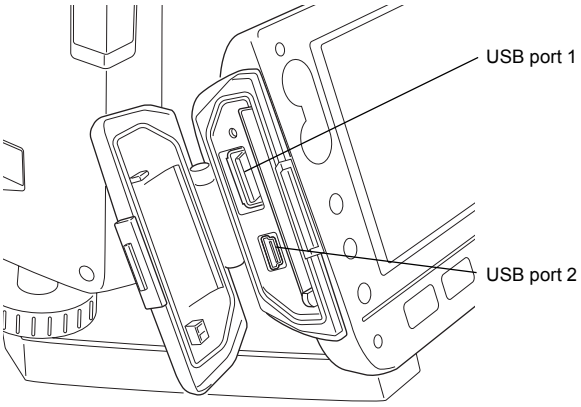
3. Press **[Cancel]** in the fourth page of Meas mode to terminate the connection.

Note

- A connection can also be terminated by tapping  in the status bar.

8.3 Connecting to USB devices

SRX has two different USB ports.Sokkia cannot guarantee that all USB devices are compatible with the SRX USB ports.



Each port is used for connection to different types of devices.

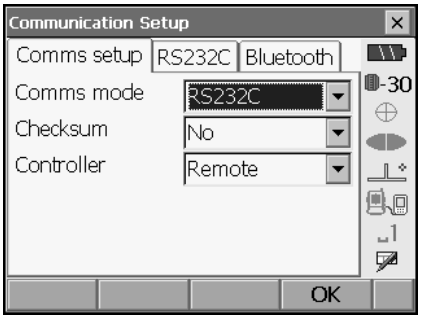
Port name	Device type
USB port 1	USB memory devices etc.
USB port 2	computers etc.

8.4 Connection via RS-232C cable

PROCEDURE Basic cable settings

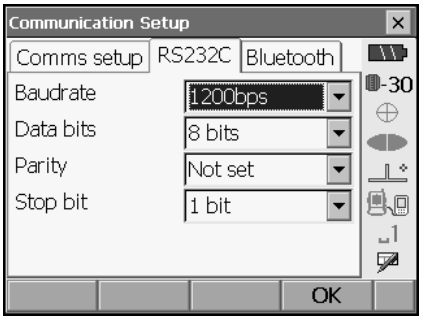
1. Connect the cable.
   ☞ Cables: "27. OPTIONAL ACCESSORIES"

2. Select "Comms" in SETTINGS mode.
   Set communication conditions in the Comms setup tab.Set "Comms mode" to "RS232C".



3. Set options in the RS232C tab according to the selection made in the Comms setup tab.
   *: factory settings

   Baud rate:
   1200*/2400/4800/9600/19200/38400bps
   Data bits: 8*/7 bits
   Parity: Not set*/Odd/Even
   Stop bit: 1*/ 2



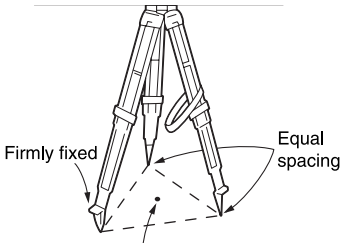
9. SETTING UP THE INSTRUMENT

- Mount the battery in the instrument before performing this operation because the instrument will tilt slightly if the battery is mounted after levelling.

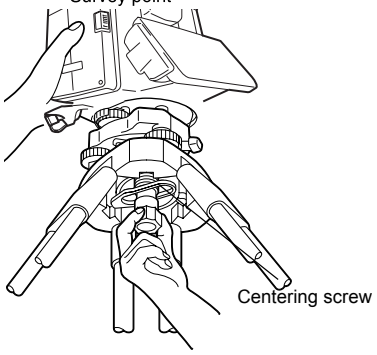
9.1 Centering

PROCEDURE

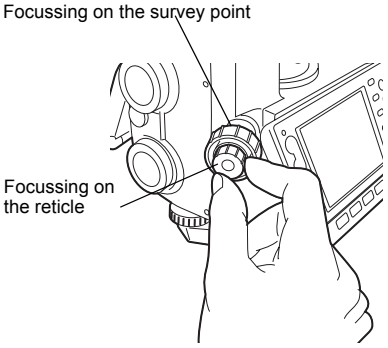
1. Set up the tripod
   Make sure the legs are spaced at equal intervals and the head is approximately level.
   Set the tripod so that the head is positioned over the surveying point.
   Make sure the tripod shoes are firmly fixed in the ground.



2. Place the instrument on the tripod head.
   Supporting it with one hand, tighten the centering screw on the bottom of the unit to make sure it is secured to the tripod.



3. Looking through the optical plummet eyepiece, turn the optical plummet eyepiece to focus on the reticle.
   Turn the optical plummet focusing ring to focus on the surveying point.

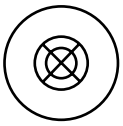


9.2 Levelling

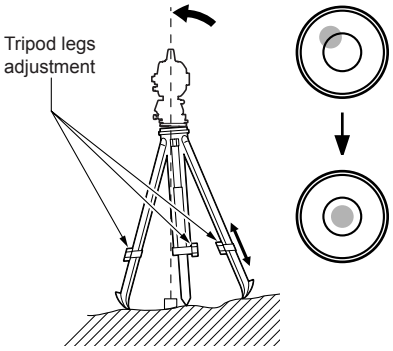
Instrument can be levelled using the screen.
☞ "Note Levelling on the screen"

PROCEDURE

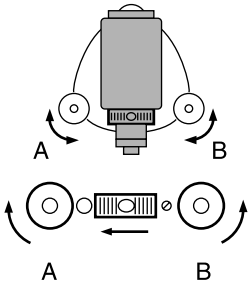
1. Adjust the levelling foot screws to center the surveying point in the optical plummet reticle.



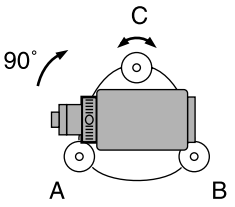
2. Center the bubble in the circular level by either shortening the tripod leg closest to the offcenter direction of the bubble or by lengthening the tripod leg farthest from the offcenter direction of the bubble. Adjust one more tripod leg to center the bubble.



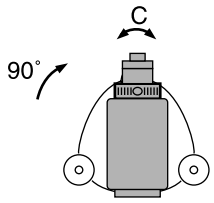
3. Turn the upper part of the instrument until the plate level is parallel to a line between levelling foot screws A and B.
   Center the air bubble using levelling foot screws A and B.
   The bubble moves towards a clockwise rotated levelling foot screw.



4. Turn the upper part of the instrument though 90°.
   The plate level is now perpendicular to a line between levelling foot screws A and B.
   Center the air bubble using levelling foot screw C.



5. Turn another 90° and check bubble position
   Turn the upper part of the instrument a further 90° and check to see if the bubble is still in the center of the plate level. If the bubble is off-center, perform the following:
   a. Turn levelling foot screws A and B equally in opposite directions to remove half of the bubble displacement.
   b. Turn the upper part a further 90°, and use levelling foot screw C to remove half of the displacement in this direction.
   Or adjust the plate level.
   . ☞ "23.1 Plate Level"



6. Turn the instrument and check to see if the air bubble is in the same position in all directions.
   If it is not, repeat the levelling procedure.

7. Loosen the centering screw slightly.
   Looking through the optical plummet eyepiece, slide the instrument over the tripod head until the surveying point is exactly centered in the reticle.
   Retighten the centering screw securely.

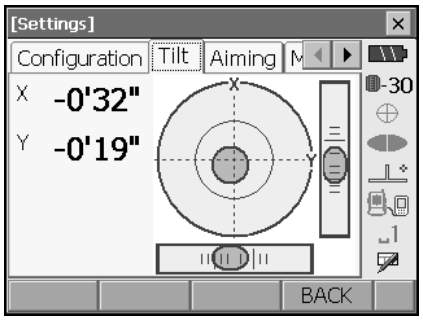
8. Check again to make sure the bubble in the plate level is centered
   If not, repeat the procedure starting from step 3.

PROCEDURE Levelling on the screen

1. Press **{ ⏻ }** to power on.
   ☞ "10. POWER ON/OFF"

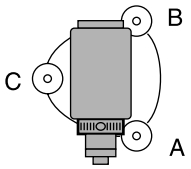
2. Press **{SETTINGS}** to enter SETTINGS mode.

3. Select the Tilt tab to display the circular level on the screen.
   "●" indicates the bubble in circular level. The range of the inside circle is ±3' and the range of the outside circle is ±4.5'.



4. Center "●" in the circular level.
   ☞"9.2 Levelling" steps 1 to 2

5. Turn the instrument until the telescope is parallel to a line between levelling foot screws A and B.



6. Set the tilt angle to 0° using foot screws A and B for the X direction and levelling screw C for the Y direction.

7. Press **{ESC}** to return to Meas mode.

10.POWER ON/OFF

PROCEDURE Power ON

1. Press ⏻ .
   When the power is switched on, a self-check is run.
   The Meas mode screen is displayed.

   If "Out of range" is displayed, the instrument tilt sensor is indicating that the instrument is out of level. Level the instrument once again and the horizontal and vertical angles will be displayed.

Note

- "Tilt crn." in "Obs. condition" should be set to "No" if the display is unsteady due to vibration or strong wind.
  ☞ "21.1 Observation Conditions"

Resume function
The Resume function redisplays the screen appearing before the instrument was powered OFF when the instrument is powered back ON. All parameter settings are also saved. Even if remaining battery power is completely depleted, this function will remain active for 1 minute, after which it is canceled. Replace a depleted battery as soon as possible.

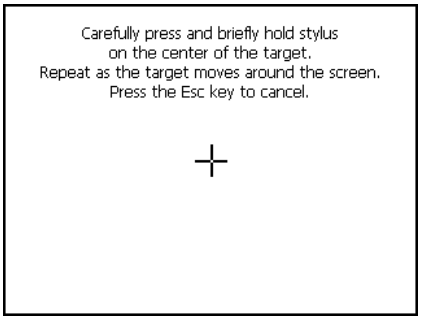
PROCEDURE Power OFF

Press **{** ⏻ **}** while pressing **{**☼**}**.

- When there is almost no battery power remaining, the battery mark in the status bar will start to blink.In this event, stop measurement, switch off the power and charge the battery or replace with a fully charged battery.
- To save power, power to the SRX is automatically cut off if it is not operated for a fixed period of time. This time period can be set in "Power off" in <Inst.config.>.
  ☞ "21.2 Instrument Configuration"

10.1 Configuring the Touch Panel

When using for the first time, or after performing a cold boot, the screen for configuring the touch panel will be displayed.



Follow the instructions on the screen. Tap the cross-hairs at the center of the display with the stylus pen. Tap 5 times. Press **{↵}** to complete touch panel configuration. Press **{ESC}** to retain previous settings.
For units with a display on both the F1 and F2 faces:
After tapping 5 times the display backlight will dim and the display on the reverse face will illuminate. Tap the cross-hairs on the reverse face display a further 5 times.

Note

- Touch panel configuration can be performed at any time by pressing **[PNL CAL]** in <Inst.config.>.
  ☞ Reset: "10.2 Resolving Software Issues"

10.2 Resolving Software Issues

If you are experiencing problems with the SRX and suspect a fault in the program, you should try a warm boot. A warm boot will not erase surveying data in Program mode (SDR) but will cancel the resume function. Whenever possible transmit the data to a personal computer before rebooting.
If the problem is not resolved with a warm boot the next step is to perform a cold boot.

PROCEDURE

1. Power OFF the instrument.

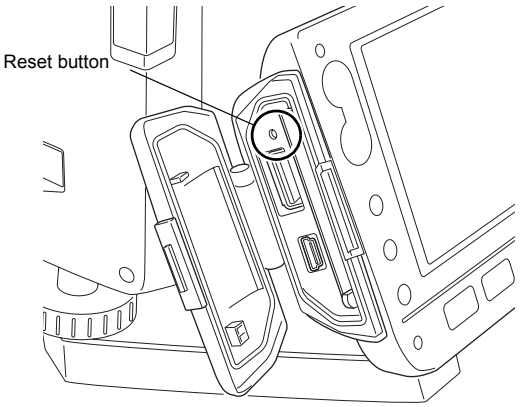
2. **Press { ⏻ }** while pressing **{↵}**.
   The instrument is reset and powers ON as normal.

Cold boot
If the problem is not resolved with a warm boot the next step is to perform a cold boot. A cold boot will not erase surveying data in Program mode (SDR) but all the parameters will be changed to the factory settings. If the data in the memory is necessary, **BE SURE TO TRANSFER IT TO A PERSONAL COMPUTER BEFORE PERFORMING A COLD BOOT.**
To perform a cold boot, while holding **{F3}, {F1},** and **{BACKSPACE}**, press **{ ⏻ }** .
The instrument is reset and powers ON as normal.
☞ "21.10 Restoring Default Settings"

Problems Powering OFF

When the instrument cannot be powered OFF as normal, depress the reset button with the tip of the stylus pen. Then, power ON as normal.

•Do not press the reset button while accessing programs. File and folder data may be lost as a result.



10.3 Powering the SRX ON/OFF from an External Instrument

The SRX can be powered ON/OFF from an external device such as a computer or control terminal. When the SRX is powered OFF from a paired Bluetooth device during Bluetooth communication, the screen shown at right will be displayed.

Powering ON the SRX from the paired device or by pressing ⏻ on the SRX itself redisplays the screen appearing before the instrument was powered OFF. Powering OFF the SRX during Bluetooth communication will cancel the Bluetooth connection. If this screen is displayed continuously for 30 minutes, power to the SRX is automatically cut off.
☞ "12.1 Auto Tracking Settings"

11.TARGET SIGHTING

The target can be automatically sighted using the Auto Pointing function or manually sighted by the operator using the peep sight and telescope. The Auto Pointing function automatically sights the target and does not require you to focus the telescope. The SRX analyses the image of the prism in the field of view and moves the telescope to sight the center of this prism.

•The search method can be set.
☞ "12.1 Auto Tracking Settings"

⚠ Caution

- The instrument emits a laser beam until the center of the prism is sighted.

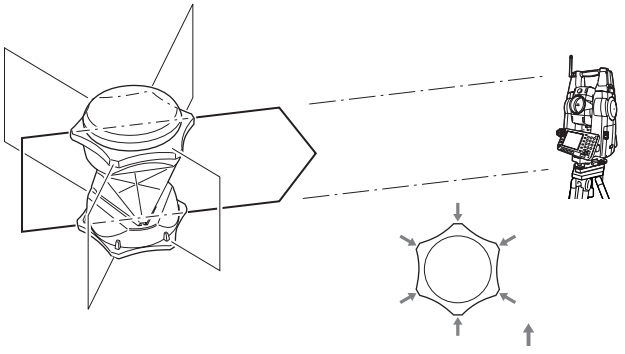
- Auto Pointing can only be performed when a prism or sheet is used as the target. For reflectorless measurement, the target must be sighted manually.
- Use reflective prisms/reflective sheets from Sokkia for higher precision measurement.
- Auto Pointing cannot be performed if the prism is located at the zenith. In this case, manually sight the target.

☞"11.3 Manually Sighting the Target"

- If more than one prism is located in the field of sight during Auto Pointing, an operation error will occur and the SRX will not be able to find the target.
- A prism beyond glass cannot be searched because a measurement error occurs.
- If an obstacle blocks the laser beam path between the SRX and the prism, SRX cannot find the target correctly.
- If strong light shines directly into the objective lens, measurement cannot be performed correctly.
- Position the prism in alignment with the objective lens. In short distance measurement especially, make sure to align the prism with the objective lens (within 10 to 15°) to obtain the correct result. A prism with a prism constant of -40mm can eliminate the error caused by tilted prism.

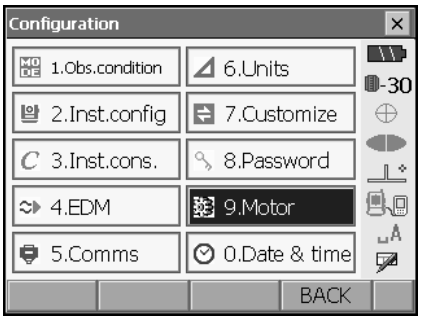
Aspect of the 360° Prism

The 360° Prism should be set up so that a pair of hexagonal points on the rubber flanges of the prism are aligned with the sighting direction of the SRX (see the diagram below).



11.1 Auto Pointing Settings

1. Select "Motor" in <Configuration>.
   Set Auto Pointing functions in the Configuration tab.
   Set "A.T. Setting" to "Search".



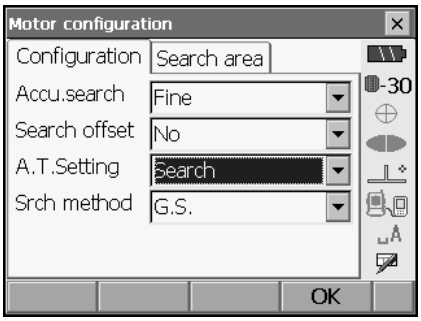
Settings and Options

(*: factory settings)

(1) Accu. search
Fine*/Rapid

(2) A.T. Setting
None/Search*/Track

(3) Srch method
G.S.*/R.C.



Accu. search

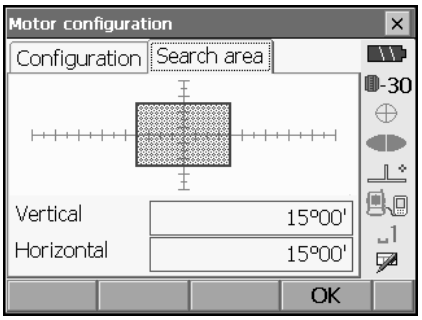
Compared to Digital Imaging Mode ("Rapid" setting), the analysis of the prism image in Optical Imaging Mode ("Fine" setting) is finer and the criteria for completing sighting are more stringent. "Rapid" mode should be used when supporting the pole by hand if "Time out" is displayed before the SRX completes sighting as a result of vibration, or, completing Auto Pointing takes too long.

Srch method

Selects search before distance measurement option.
When set to "G.S." the SRX will search for the target in the area specified in the Search area tab. When set to "R.C.", the SRX will wait for a Turning command to be issued from the RC Controller before starting Auto Pointing. Both methods can be used to sight the target.

2. Set the area in which to perform target sighting in the Search area tab. Drag the box to specify the desired or area or input vertical and horizontal angle values.
   Angle values can only be specified in 1°30' steps (e.g. 15°00', 16°30', 18°00' etc.). Input values not conforming to this format will be automatically rounded up.

3. Press **[OK]**.



11.2 Auto-Pointing Function for Target Sighting

PROCEDURE

1. Use the peep sight to aim the objective lens in the general direction of the target. The vertical and horizontal jogging knobs can be used for precise adjustments of the instrument and telescope.

2. Select **[SRCH]** in any Meas mode screen. The telescope and top half of the instrument rotate and target auto-search begins. When the target is found, the instrument sights the center of the prism and stops.
   ☞ Allocating the **[SRCH]** softkey: "21.6 Allocating Key Functions"

Note

• The following softkeys can also be used for Auto Pointing when "A.T. Setting" in <Motor configuration> is set to "Search".
☞ Motor settings: "12.1 Auto Tracking Settings"

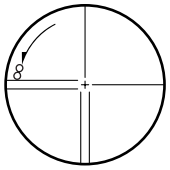
Softkey	Function
[DIST]	Performs Auto Pointing then distance and angle measurement
[SRCH]	Performs Auto Pointing then distance and angle measurement
[H.ANG]	Performs Auto Pointing then sets current angle to the specified angle
[0 SET]	Performs Auto Pointing then sets current angle to 0
[RC]	Rotates in the direction specified by the On-demand Remote Control system then performs Auto Pointing
[<-RC]	Rotates in a counterclockwise direction (from the point of view of the RC Controller) then performs Auto Pointing
[RC->]	Rotates in a clockwise direction (from the point of view of the RC Controller) then performs Auto Pointing
[ROTATE]	Automatically rotates the instrument to the specified vertical and horizontal angles then performs Auto Pointing
[TURN]	Rotates the SRX 180° then performs Auto Pointing

11.3 Manually Sighting the Target

- When sighting the target, strong light shining directly into the objective lens may cause the instrument to malfunction. Protect the objective lens from direct light by attaching the lens hood.

▶PROCEDURE

1. Look through the telescope eyepiece at a bright and featureless background.
   Turn the eyepiece clockwise, then counterclockwise little by little until just before the reticle image becomes focussed.
   Using these procedures, frequent reticle refocussing is not necessary, since your eye is focussed at infinity.



2. Use the peep sight to bring the target into the field of view. Turn the vertical and horizontal jogging knobs for fine sighting adjustments.

3. Turn the telescope focussing ring to focus on the target.
   Turn the vertical and horizontal fine motion screws to align the target with the reticle.
   The last adjustment of each fine motion screw should be in the clockwise direction.

4. Readjust the focus until there is no parallax
   Readjust the focus with the focussing ring until there is no parallax between the target image and the reticle.

Eliminating parallax
This is the relative displacement of the target image with respect to the reticle when the observer's head is moved slightly before the eyepiece.
Parallax will introduce reading errors and must be removed before observations are taken.
Parallax can be removed by refocussing the reticle.

12. MEASUREMENT WITH AUTO TRACKING

With the Auto Tracking function, an SRX, sighted on the target using Auto Pointing, will following that target as it is moved from measurement point to measurmeent point. The On-demand Remote Control System is recommended for high performance Auto Tracking measurement.

⚠ Caution

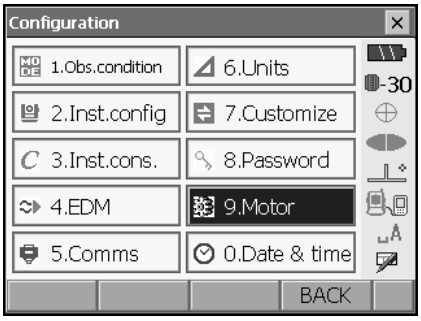
- The instrument emits a laser beam during Auto Pointing and Auto Tracking operation.

- Auto Pointing can only be performed when a prism is used as the target. Auto Tracking is not possible with reflective sheet and reflectorless measurement
- Use reflective prisms from Sokkia for higher precision measurement.
- If more than one prism is located in the field of sight during Auto Tracking, an operation error will occur and the SRX will not be able to find the target.
- The prism beyond the glass can not be searched because measurement error occurs.
- If an obstacle blocks the laser beam path between the SRX and the prism, SRX cannot find the target correctly.
- Position the prism in alignment with the objective lens. In short distance measurement especially, make sure to align the prism with the objective lens (within 10 to 15°) to obtain the correct result. A prism with a prism constant of -40mm can eliminate the error caused by tilted prism.
  ☞ 360 Prism: "11. TARGET SIGHTING Aspect of the 360° Prism"

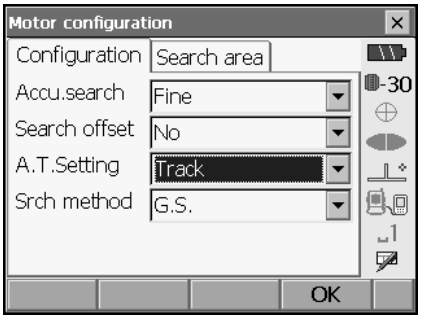
12.1 Auto Tracking Settings

PROCEDURE

1. Select "Motor" in <Configuration>.
   Set Auto Tracking functions in the Configuration tab.
   Set "A.T. Setting" to "Track".

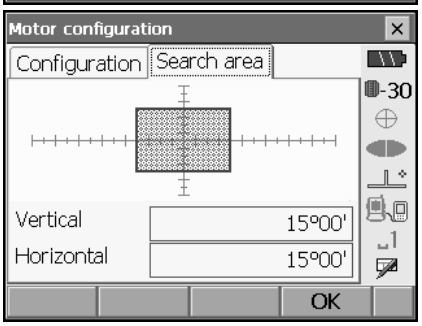


☞ Configuration tab:"11.1 Auto Pointing Settings"



2. Set the area in which to perform target sighting in the Search area tab. Drag the box to specify the desired or area or input vertical and horizontal angle values.
   Angle values can only be specified in 1°30' steps (e.g. 15°00', 16°30', 18°00' etc.). Input values not conforming to this format will be automatically rounded up.

3. Press **[OK]**.



12.2 Measurement with Auto Tracking

PROCEDURE

1. Use the peep sight to aim the objective lens in the general direction of the target. (The vertical and horizontal jogging knobs can be used for precise adjustments of the instrument and telescope.)

2. Select **[DIST]**, **[RC Cont]**, or **[SRCH]** in any Meas mode screen. The telescope and top half of the instrument rotate and target auto-search begins. When the target is found, the instrument sights the center of the prism and Auto Tracking starts.
   ☞ Allocating softkeys: "21.6 Allocating Key Functions"

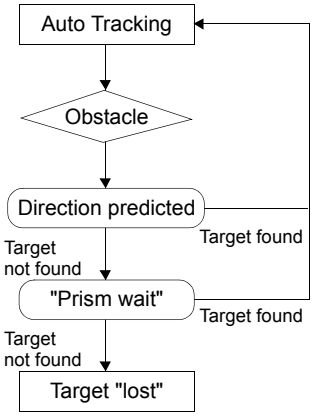
3. Press **[AT Off]** in a Meas mode screen to stop Auto Tracking.

Note

- When **[STOP]** is pressed, distance measurement will stop but Auto Tracking will remain active.

Lost Prism

In the event that an obstacle prevents the SRX sighting the target during Auto Tracking, the instrument will predict the direction in which the target will travel and continue Auto Tracking based on this prediction. If the SRX re-acquires the target in this predicted direction, Auto Tracking continues without change. If the target is not re-acquired however, Auto Tracking will stop and the SRX will enter "prism wait" status for a period of 60 seconds.If the target enters the field of view or a Turning command is received from the RC Controller during "prism wait", the SRX will perform Auto Pointing, then resume Auto Tracking. If the target is not re-acquired during the "prism wait" period, the target is considered "lost" and sighting terminates.
Start Auto Tracking procedure again from step 1.



Note

• The following softkeys can also be used for Auto Pointing when "A.T. Setting" in <Motor configuration> is set to "Track".

Softkey	Function
[DIST]	Performs Auto Pointing then Auto Tracking/distance measurement
[SRCH]	Performs Auto Pointing then Auto Tracking/distance measurement
[H.ANG]	Sets current angle to a specified angle then performs Auto Pointing/ Auto Tracking
[0 SET]	Sets current angle to 0 then performs Auto Pointing/Auto Tracking
[RC]	Rotates in the direction specified by the On-demand Remote Control System then performs Auto Pointing/Auto Tracking
[<-RC]	Rotates in a counterclockwise direction (from the point of view of the RC Controller) then performs Auto Pointing/Auto Tracking
[RC->]	Rotates in a clockwise direction (from the point of view of the RC Controller) then performs Auto Pointing/Auto Tracking

[RC Cont]	Nullifes the current measurement position, continues Turning operation, then performs Auto Pointing/Auto Tracking
[AT On]	Performs Auto Pointing then Auto Tracking
[ROTATE]	Automatically rotates the instrument to the specified vertical and horizontal angles then performs Auto Pointing/Auto Tracking
[TURN]	Rotates the SRX 180° then performs Auto Pointing/Auto Tracking

13.ANGLE MEASUREMENT

This section explains the procedures for basic angle measurement in Basic mode.

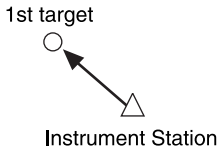
- It is possible to allocate softkeys in measurement menus to suit various applications and the ways that different operators handle the instrument.
  ☞"21.6 Allocating Key Functions"

13.1 Measuring the Horizontal Angle between Two Points (Horizontal Angle 0°)

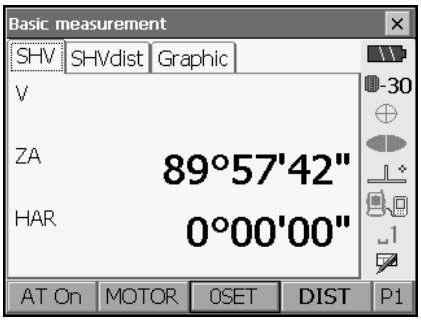
Use the “0SET” function to measure the included angle between two points. The horizontal angle can be set to 0 at any direction.

PROCEDURE

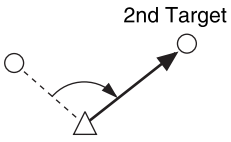
1. Sight the first target as at right.
   ☞"10.3 TARGET SIGHTING"



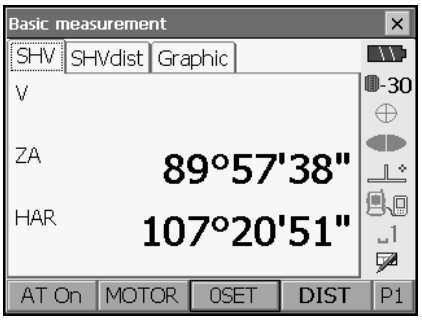
2. In the first page of the Meas mode screen, press **[0SET]**.
   [0SET] will flash, so press **[0SET]** again.
   The horizontal angle at the first target becomes 0°.



3. Sight the second target.



The displayed horizontal angle (HAR) is the included angle between two points.



13.2 Setting the Horizontal Angle to a Required Value (Horizontal Angle Hold)

You can reset the horizontal angle to a required value and use this value to find the horizontal angle of a new target.

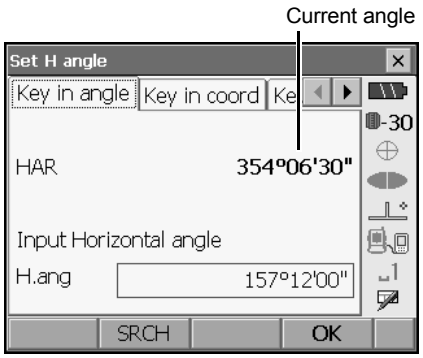
PROCEDURE

1. Sight the first target.

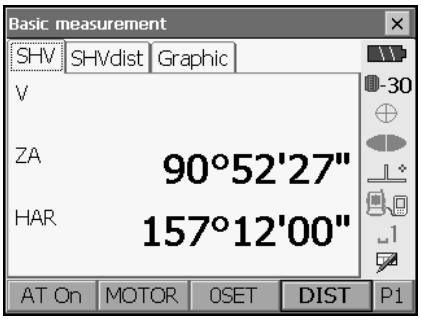
2. In the second page of Basic mode, press **[H.ANG]**. <Set H angle> is displayed.

3. Enter the angle you wish to set, then press **[OK]**. The value that is input as the horizontal angle is displayed.

   - Press **[SRCH]** to rotate the SRX in the direction of the desired angle.
   - The same setting can also be performed with coordinate and azimuth input.
     ☞ "15.2 Azimuth Angle Setting"



4. Press **[OK]** to confirm the input value and display the new horizontal angle.



5. Sight the second target.
   The horizontal angle from the second target to the value set as the horizontal angle is displayed.

Note

- Pressing **[HOLD]** performs the same function as above.
- Press **[HOLD]** to set the displayed horizontal angle. Then, set the angle that is in hold status to the direction you require.

  ☞ Allocating **[HOLD]**: "21.6 Allocating Key Functions"

13.3 Turning the Instrument from the Reference Angle to a Specified Angle

The SRX automatically turns from the reference direction to the specified angle (target).

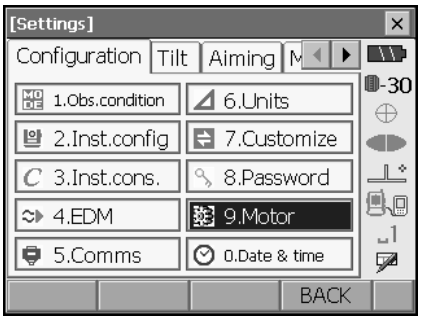
- SRX also turns to the target coordinates when reference angle is omitted.

- Rotation may not be completed correctly when specifiying an angle near the zenith or nadir if "Tilt crn." or "Coll. crn" is set to "Yes" in "Obs.condition".

PROCEDURE

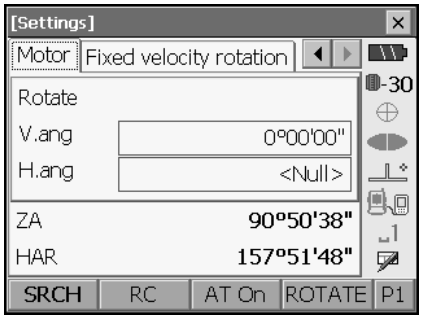
1. Sight the point you will use as the reference angle and set it as the reference angle.
   Sight the reference point and press **[0SET]**, or input the reference point angle.
   ☞"13.1 Measuring the Horizontal Angle between Two Points (Horizontal Angle 0°)"/ "13.2 Setting the Horizontal Angle to a Required Value (Horizontal Angle Hold)"

2. Press **{SETTINGS}** to switch to SETTINGS mode.



3. Enter the vertical and horizontal angles in the Motor tab.

   - Pressing **[READ]** in the second page displays the coordinates data recorded in Program mode (SDR). This data can be recalled and used for settings.
     ☞Series SRX SDR Software Reference Manual
   - The target angle can be obtained from the entered instrument station and target coordinates. Instrument station data is entered on the second page. Press **[OK]** to calculate both the horizontal and vertical angle from the coordinates.



4. After confirming the coordinates, press **[ROTATE]**. The SRX moves to the point (target) entered in step 3.

13.4 Angle measurement and Outputting the Data

The following explains angle measurement and the features used to output measurement results to a computer or other external devices.
☞"6.1 CONNECTING TO EXTERNAL DEVICES", Cables: "27. OPTIONAL ACCESSORIES", Output format and command operations: Interfacing with the SOKKIA SDR Electronic Field Book and Command Explanations manuals

PROCEDURE

1. Connect SRX and external device.
2. Sight the target point.
3. Press **[HV out]** in Meas mode to output target measurement results to the external device.

14.DISTANCE MEASUREMENT

Perform the following settings as preparation for distance measurement in Basic mode.

- Distance measurement mode
- Target type
- Prism constant correction value
- Search area
- Auto Pointing/Auto Tracking
  ☞"11.1 Auto Pointing Settings", "12.1 Auto Tracking Settings", "21.3 EDM Settings"
- It is possible to allocate softkeys in measurement menus to suit various applications and the ways that different operators handle the instrument.
  ☞"21.6 Allocating Key Functions"

⚠ Caution

- When using the laser-pointer function, be sure to turn OFF the output laser after distance measurement is completed. Even if distance measurement is canceled, the laser-pointer function is still operating and the laser beam continues to be emitted. (After turning ON the laser-pointer, the laser beam is emitted for 5 minutes, and then automatically switches OFF.)

- Make sure that the target setting on the instrument matches the type of target used. SRX automatically adjusts the intensity of the laser beam and switches the distance measurement display range to match the type of target used. If the target does not correspond to the target settings, accurate measurement results cannot be obtained.
- Accurate measurement results cannot be obtained if the objective lens is dirty. Dust it off with the lens brush first, to remove minute particles. Then, after providing a little condensation by breathing on the lens, wipe it off with the wiping cloth.
- During reflectorless measurement, if an object with a high reflective factor (metal or white surface) is positioned between the SRX and the target, accurate measurement results may not be received.
- Scintillation may affect the accuracy of distance of measurement results. Should this occur, repeat measurement several times and use the averaged value of the obtained results.

14.1 Returned Signal Checking

Check to make sure that sufficient reflected light is returned by the target sighted by the telescope. Checking the returned signal is particularly useful when performing long distance measurements.

⚠ Caution

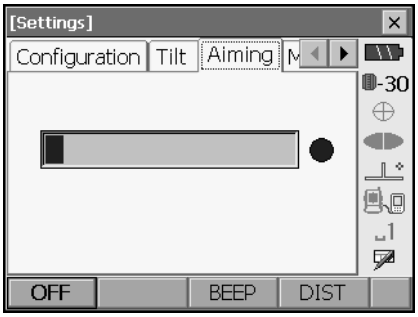
- The laser beam is emitted during returned signal checking.

- Manually sight the target when checking the returned signal.
- When the light intensity is sufficient even though the center of the reflective prism and the reticle are slightly misaligned (short distance etc.), "●" will be displayed in some cases, but in fact, accurate measurement is impossible. Therefore make sure that the target center is sighted correctly.

PROCEDURE

1. Accurately sight the target manually.
   ☞ "11.3 Manually Sighting the Target"

2. Press **{SETTINGS}** to switch to SETTINGS mode and select the Aiming tab or press **[AIM]** in Meas mode.
   ☞ Allocating **[AIM]**: "21.6 Allocating Key Functions"



   When **[AIM]** is pressed, a gauge indicating light intensity is displayed.

   - The more ■■■■■■ displayed, the greater the quantity of reflected light.
   - If "●" is displayed, only enough light for the measurement is returned.
   - When "●" is not displayed, accurately resight the target.

   [BEEP]/[OFF]: Sets a buzzer sound when measurement is possible. Press to switch on and off.
   [DIST]: Returns to Meas mode and starts distance measurement. This softkey is not displayed when the returned signal checking function is accessed from Program mode (SDR).

3. Press **[OFF]** to finish signal checking.
   Press **{ESC}** or tap the cross in the top-right corner to return to the previous screen.

Note

- When ■■■■■■ is displayed persistently, contact your Sokkia agent.
- If no key operations are performed for two minutes, the display automatically returns to the previous screen.

14.2 Using the Guide Light

The color and flashing speed of the guide light indicates the status of the SRX and can be known when the user is located at a distance from the instrument.
☞ Switching the guide light ON/OFF "5.1 Basic Key Operation"

- The pattern of the guide light can be changed.
  ☞ "21.2 Instrument Configuration"

- The guide light will turn off, even when set to ON, during distance measurement and returned signal checking.

Light status	Meaning
Slow flashing (Red and green simultaneously)	Waiting
Fast flashing (Red and green simultaneously)	Searching/returned signal checking in progress
	Measuring (continuous measurement)
Green and red alternate flashing	Search error (error screen only)
	Distance measurement error (no signal, sighting error)

14.3 Distance and Angle Measurement

An angle can be measured at the same time as distance.

- The search range can be set.

☞ "12.1 Auto Tracking Settings"

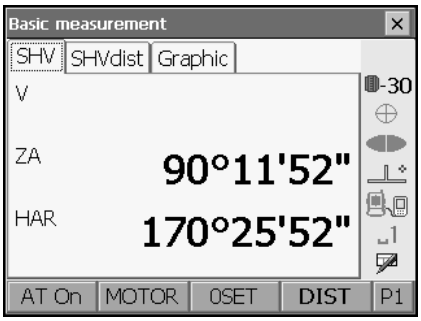
⚠Caution

- The laser beam is emitted during Auto Pointing and Auto Tracking.

PROCEDURE

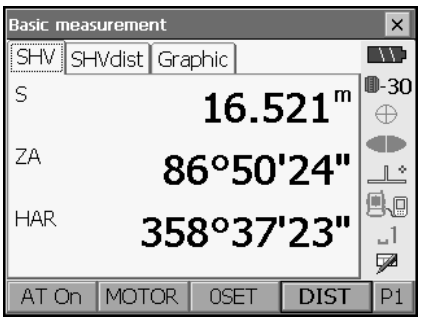
1. Face the SRX in the direction of the target
   Use the peep sight to aim the SRX and telescope toward the target.
   ☞ "11. TARGET SIGHTING"

2. Start measurement.



Press **[DIST]** in the first page of Meas mode to start measurement.

The measured distance data (S), vertical angle (ZA), and horizontal angle (HAR) are displayed.



3. .Press **[STOP]** to quit distance measurement.

Note

- If the single measurement mode is selected, measurement automatically stops after a single measurement.
- During fine average measurement, the distance data is displayed as S1, S2,... to S9. When the designated number of measurements has been completed, the average value of the distance is displayed in the "SA" line.
- The distance and angle that are most recently measured remain stored in the memory until the power is off and can be displayed at any time by pressing **[RCL]**.

☞ Allocating **[RCL]**: "21.6 Allocating Key Functions"

14.4 Distance Measurement and Outputting the Data

The following explains distance measurement and the features used to output measurement data to a computer or external devices.

☞ "8. CONNECTING TO EXTERNAL DEVICES", Communication cables: "27. OPTIONAL ACCESSORIES". Output format and command operations: Interfacing with the SOKKIA SDR Electronic Field Book and Command Explanations manuals

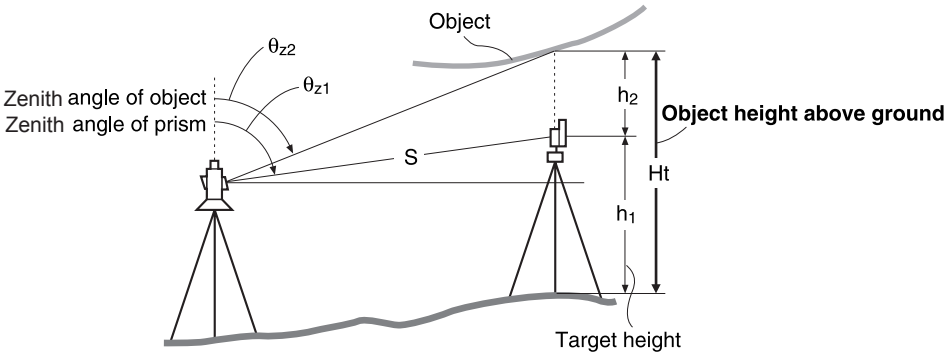
PROCEDURE

1. Connect SRX and external device.
2. Sight the target point.
3. Press **[HVD out]** in Meas mode to start distance measurement. Target measurement results are output to the external device.
   ☞ Output type: "21.6 Allocating Key Functions", "21.1 Observation Conditions"
4. Press **[STOP]** to finish data output and return to the Meas mode.

14.5 REM Measurement

An REM measurement is a function used to measure the height to a point where a target cannot be directly installed such as power lines, overhead cables and bridges, etc.
The height of the target is calculated using the following formula.

$Ht = h_1 + h_2$
$h2 = S \sin\theta_{z1} \times \cot\theta_{z2} - S \cos\theta_{z1}$



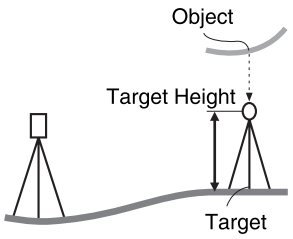
- It is possible to allocate softkeys in the REM measurement menu to suit various applications and the ways that different operators handle the instrument.

☞"21.6 Allocating Key Functions"

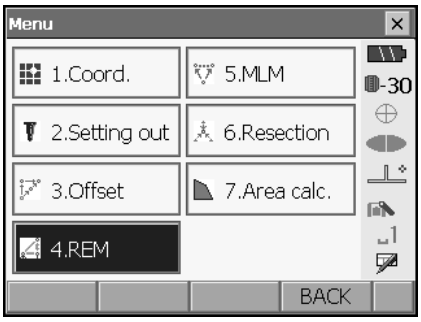
PROCEDURE

1. Set the target directly under or directly over the object and measure the target height with a tape measure etc.

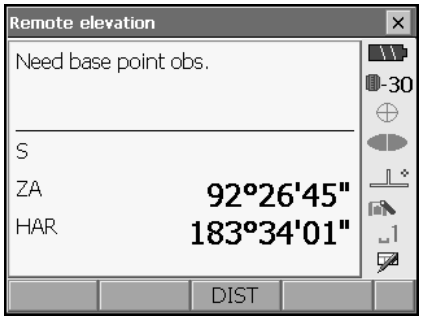
   Press **[HT]** and enter the target height.



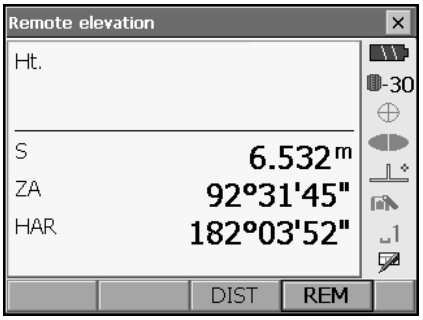
2. Select "REM" in <Menu>.



3. Sight the target and press **[DIST]** to start measurement. Press **[STOP]** to stop the measurement.

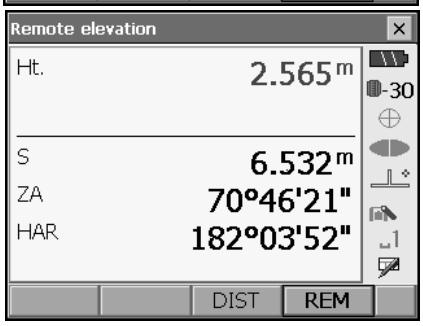


The measured distance data, vertical angle and horizontal angle are displayed.



4. Sight the object, then press **[REM]** to start REM measurement is started. The height from the ground to the object is displayed in "Ht.". Press **[STOP]** to stop the measurement.

   - To re-observe the target, sight the target then press **[DIST]**.
   - To continue REM measurement, press **[REM]**.

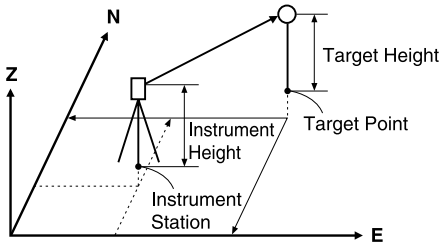


Note

- When measurement data already exists, select **[REM]** in <Menu> as in step 2 to proceed to step 4 and start REM measurement. Press **[STOP]** to stop the measurement.

15.COORDINATE MEASUREMENT

By performing coordinate measurements it is possible to find the 3-dimensional coordinates of the target based on station point coordinates, instrument height, target height, and azimuth angles of the backsight station which are entered in advance.



- It is possible to allocate softkeys in measurement menus to suit various applications and the ways that different operators handle the instrument.
  ☞"21.6 Allocating Key Functions"

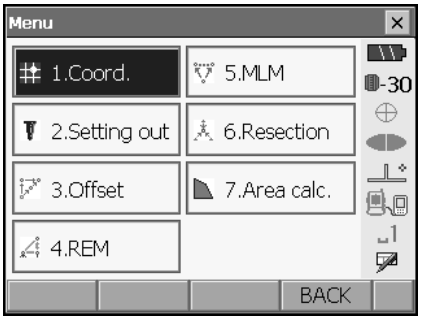
15.1 Entering Instrument Station Data

Before performing coordinate measurement, enter instrument station coordinates, instrument height and target height.

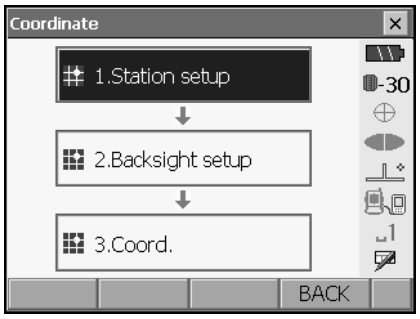
PROCEDURE

1. First measure the target height and instrument height with a tape measure, etc.

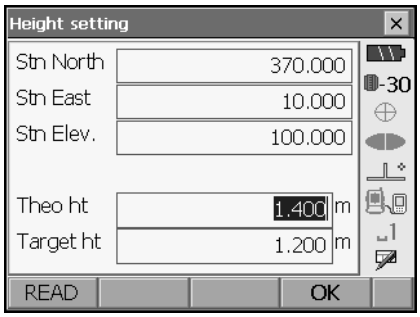
2. Select "Coord." in <Menu>.



3. Select "Station setup" and enter instrument station coordinates, instrument height and target height.



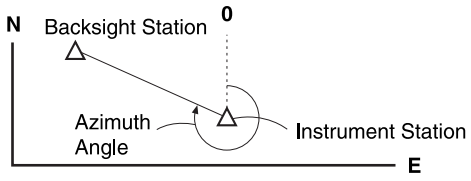
- Press **[READ]** to read in coordinate data registered in Program mode (SDR).
  ☞ Series SRX SDR Software Reference Manual



4. Press **[OK]** to set the input values. <Set H angle> is displayed again.

15.2 Azimuth Angle Setting

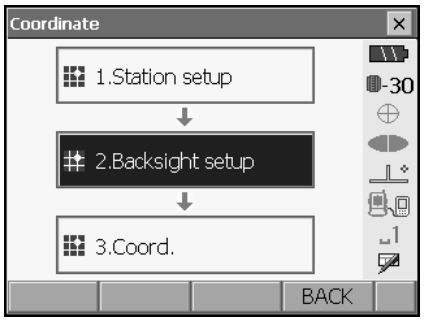
Based on the instrument station coordinates and backsight station coordinates which have already been set, the azimuth angle of the backsight station is calculated.



PROCEDURE Entering coordinates

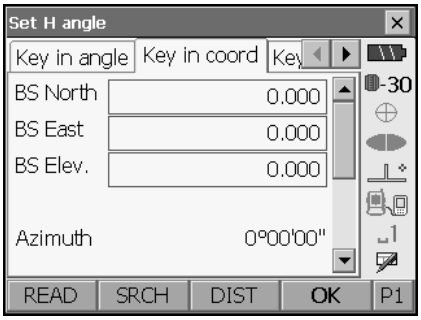
1. Select "Backsight setup" in <Coordinate>. <Set H angle> is displayed.

   • <Set H angle> can also be displayed from the screen in step 4 of "15.1 Entering Instrument Station Data".

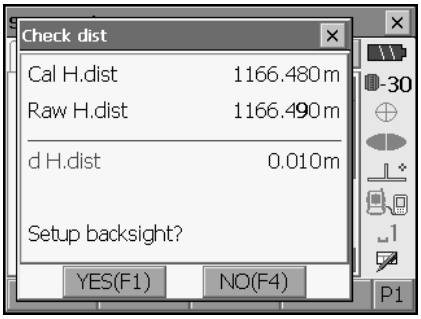


2. Select the Key in coord tab and enter the backsight station coordinates.

   • **[READ]**: Reads in coordinate data registered in Program mode (SDR) .
   ☞Series SRX SDR Software Reference Manual
   • **[SRCH]**: Rotates the SRX in the direction of the desired angle.



   • Sight the backsight station and press **[DIST]**. Press **[STOP]** to display the distance calculated from coordinates, the measured distance, and the difference between the two. Press **[YES]** to set the azimuth angle and display <Coord. measurement>.
   • **[None]**: Switches horizontal angle setting method.
   ☞ Horizontal angle settings



3. Press **[OK]** to set the input values. <Coord. measurement> is displayed.

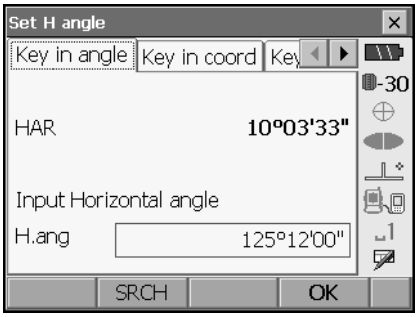
PROCEDURE Entering angle

1. Select "Backsight setup" in <Coordinate>. <Set H angle> is displayed.

. <Set H angle> can also be displayed from the screen in step 4 of "15.1 Entering Instrument Station Data".

2. Select the Key in angle tab and enter the desired angle in "H.ang".

   • **[SRCH]**: Rotates the SRX in the direction of the desired angle.



3. Press **[OK]** to set the input values. <Coord. measurement> is displayed.

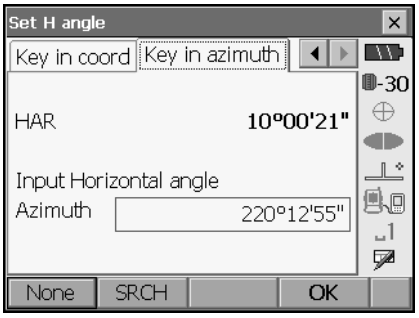
PROCEDURE Entering azimuth

1. Select "Backsight setup" in <Coordinate>. <Set H angle> is displayed.

. <Set H angle> can also be displayed from the screen in step 4 of "15.1 Entering Instrument Station Data".

2. Select the Key in azimuth tab and enter the desired angle in "H.ang".

   • **[SRCH]**: Rotates the SRX in the direction of the desired angle.
   • **[None]**: Switches horizontal angle setting method.
   ☞ "Horizontal angle settings"



3. Press **[OK]** to set the input values. <Coord. measurement> is displayed.

Horizontal angle settings

None (input azimuth angle only)/0 SET (horizontal angle set to 0°)/Azimuth (set both horizontal and azimuth angles to the same value)/H.ANG (input both horizontal and azimuth angles)

15.3 3-D Coordinate Measurement

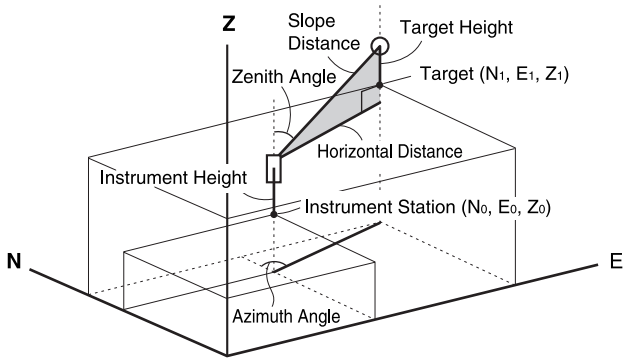
The coordinate values of the target can be found by measuring the target based on the settings of the instrument station and backsight station.

The coordinate values of the target are calculated using the following formulae.

N1 Coordinate = N0 + S x sinZ x cosAz
E1 Coordinate = E0 + S x sinZ x sinAz
Z1 Coordinate = Z0 + S x cosZ + ih - fh

N0: Station point N coordinate	S: Slope distance	ih: Instrument height
E0: Station point E coordinate	Z: Zenith angle	fh: Target height
Z0: Station point Z coordinate	Az: Direction angle	

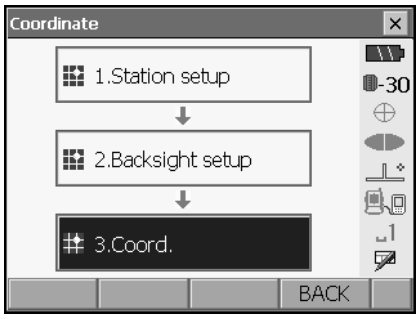
"Null" coordinates will not be included in calculations. "Null" is not the same as zero.



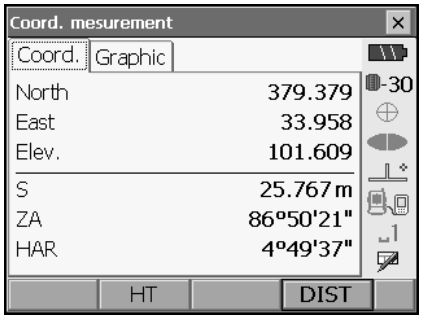
PROCEDURE

1. Sight the target at the target point.
   ☞ "11. TARGET SIGHTING"

2. Select "Coord." in <Coordinate>.



   Press **[DIST]** to start measurement. Press **[STOP]** to stop the measurement. The coordinates of the target point are displayed. Select the Graphic tab to display coordinates on a graph.



   - By pressing **[HT]**, the instrument station data can be reset. When the target height of the next target is different, reenter the target height before beginning the observation.

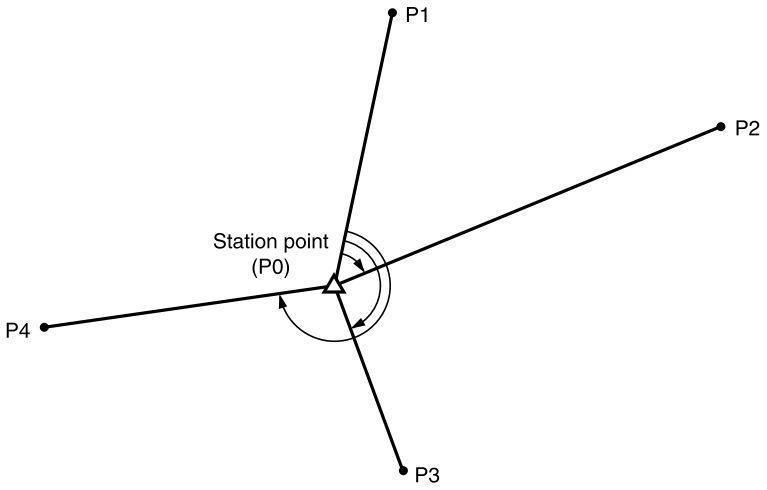
3. Sight the next target and press **[DIST]** to begin measurement. Continue until all targets have been measured.

4. When coordinate measurement is completed, press **{ESC}** or tap the cross in the top-right corner to return to <Coordinate>

16.RESECTION MEASUREMENT

Resection is used to determine the coordinates of an instrument station by performing multiple measurements of points whose coordinate values are known. Registered coordinate data can be recalled and set as known point data. Residual of each point can be checked, if necessary

Entry		Output	
Coordinates of known point	: (Ni, Ei, Zi)	Station point coordinates	: (N0,E0, Z0)
Observed horizontal angle	: Hi		
Observed vertical angle	: Vi		
Observed distance	: Di		



- Between 2 and 10 known points can be measured by distance measurement, and between 3 and 10 known points by angle measurement.
- The more known points there are and the more points there are whose distance can be measured, the higher the precision of the coordinate value calculation.
- It is possible to allocate softkeys in the Coord. measurement menu to suit various applications and the ways that different operators handle the instrument.

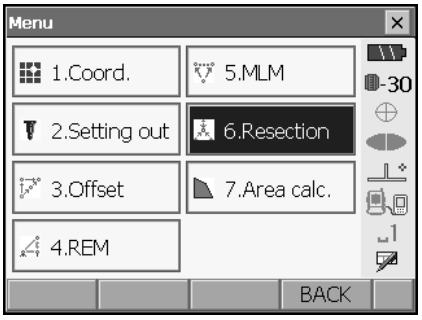
☞"21.6 Allocating Key Functions"

16.1 Coordinate Resection Measurement

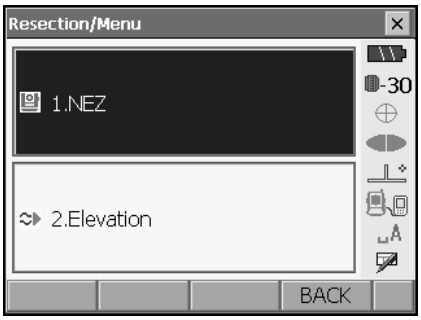
N, E, Z of an instrument station is determined by the measurement.

PROCEDURE

1. Select "Resection" in <Menu>.

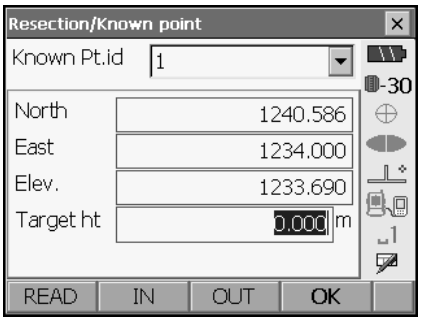


2. Select "NEZ" to display <Resection/Known point>.

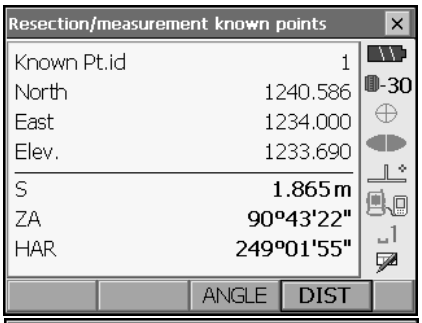


3. Input the known point.
   After setting the coordinates and target height for for the first known point press **[OUT]** to move to the second point.
   - Press **[READ]** to read in coordinate data registered in Program mode (SDR).
   - Press **[IN]** to return to settings for the previous point.

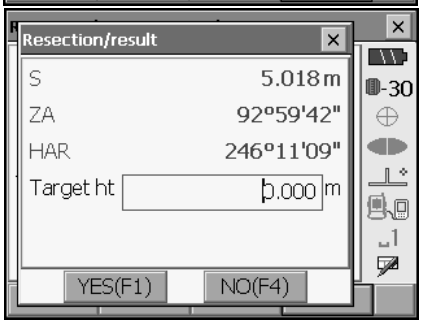
   When all required known points have been set, press **[OK]**.



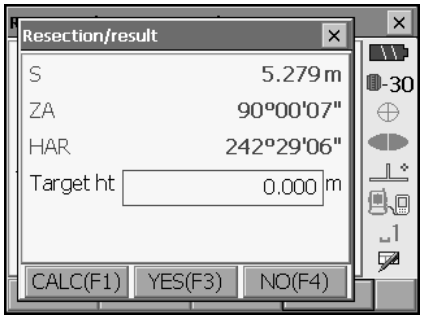
4. Sight the first known point and press **[DIST]** to begin measurement.
   The measurement results are displayed on the screen.
   • When **[ANGLE]** has been selected, the distance cannot be displayed.



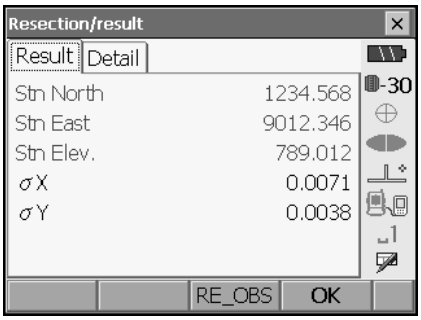
5. Press **[YES]** to use the measurement results of the first known point.
   • You can also input target height here.
   • Press **[NO]** to return to the screen in step 3 and perform measurement again.



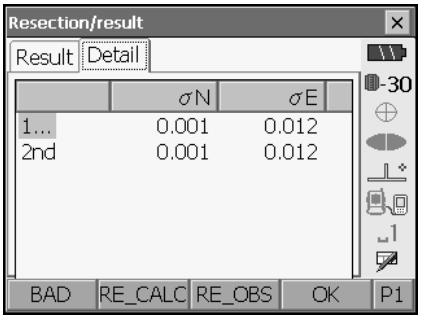
6. Repeat procedures 3 to 4 in the same way from subsequent points.
   When the minimum quantity of observation data required for the calculation is present, **[CALC]** is displayed.



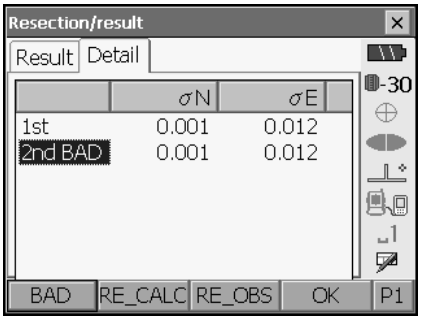
7. Press **[CALC]** or **[YES]** to automatically start calculations after observations of all known points are completed.
   • Instrument station coordinates, station elevation, and standard deviation, which describes the measurement accuracy, are displayed.



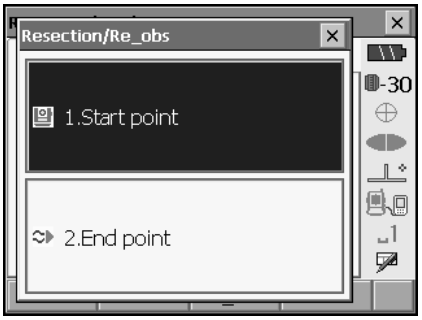
Standard deviation for the northing and easting coordinates of each point are displayed in the Detail tab.



8. If there are problems with the results of a point, align the cursor with that point and press **[BAD]**. "BAD" is displayed to the right of the point. Repeat for all results that include problems.



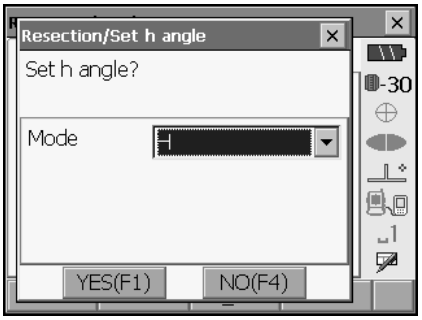
9. Press **[RE CALC]** to perform calculation again without the point designated in step 8. The result is displayed.
   If there are no problems with the result, go to step 10.
   If problems with the result occur again, perform the resection measurement from step 3.
   - Press **[RE OBS]** to measure the point designated in step 8.
     If no points are designated in step 8, all the points or only the final point can be observed again.
   - Press **[ADD]** when there is a known point that has not been measured or when a new known point is added.



10. Press **[OK]** in <Resection/result> to display <Resection/Set h angle>.

11. Select an angle mode and press **[YES]** to set the azimuth angle of the first known point as the backsight point and return to <Resection/Menu>.

12. Press **[NO]** to return to <Resection/Menu> without setting the azimuth angle.



Horizontal angle settings

H (set horizontal angle to measured value)/H=Az (set horizontal angle to the same value as azimuth angle)/Az (set azimuth angle only)

Note

- It is also possible to perform resection measurement by pressing **[RESEC]** when allocated to the Meas mode screen.
  ☞Allocating **[RESEC]**: "21.6 Allocating Key Functions"

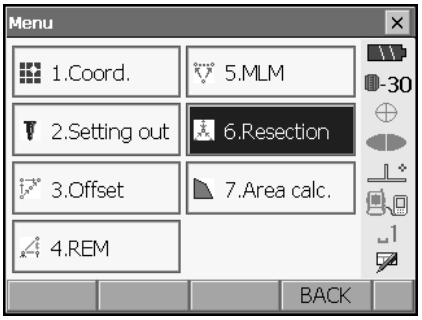
16.2 Height Resection Measurement

Only Z (height) of an instrument station is determined by the measurement.

- Known points must be measured by distance measurement only.
- Between 1 and 10 known points can be measured.

PROCEDURE

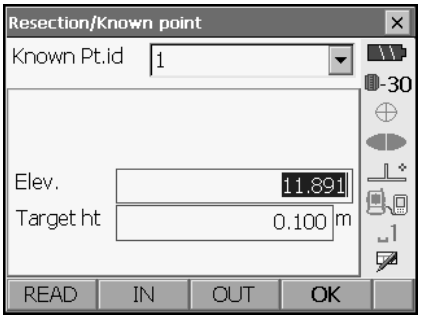
1. Select "Resection" in <Menu>.



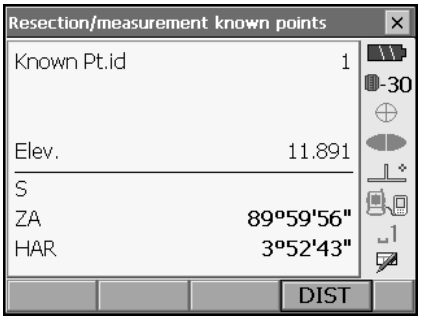
2. Select "Elevation" to display <Resection/Known point>.

3. Input the known point.
   After setting the elevation and target height for for the first known point press **[OUT]** to move to the second point.
   - Press **[READ]** to read in data registered in Program mode (SDR).
   - Press **[IN]** to return to settings for the previous point.

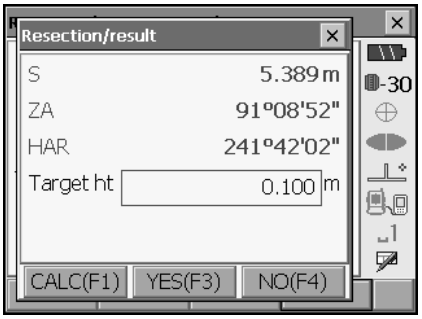
   When all required known points have been set, press **[OK]**.



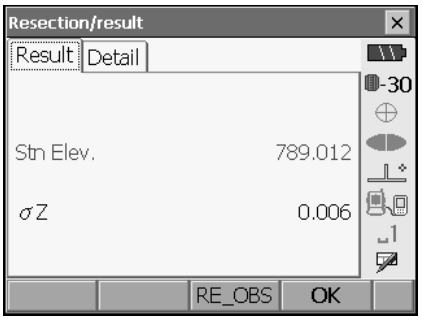
4. Sight the first known point and press **[DIST]** to begin measurement.
   The measurement results are displayed on the screen.
   • When **[ANGLE]** has been selected, the distance cannot be displayed.



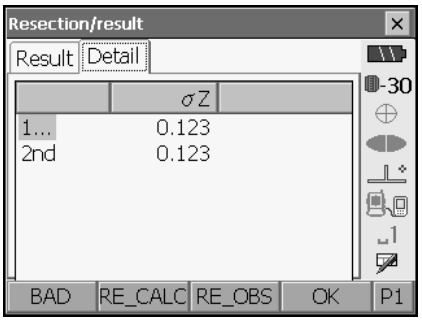
5. If measuring two or more known points, repeat procedures 3 to 4 in the same way from the second point.
   When the minimum quantity of observation data required for the calculation is present, **[CALC]** is displayed



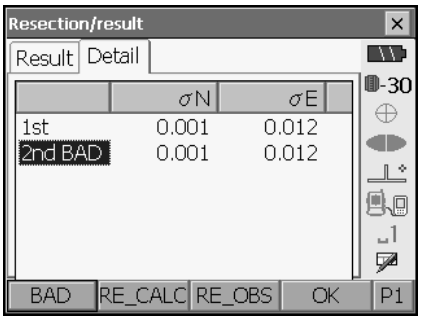
6. Press **[CALC]** or **[YES]** to automatically start calculations after observations of all known points are completed.
   • Instrument station elevation and standard deviation, which describes the measurement accuracy, are displayed in the Result tab.



   Standard deviation values for each point are displayed in the Detail tab.

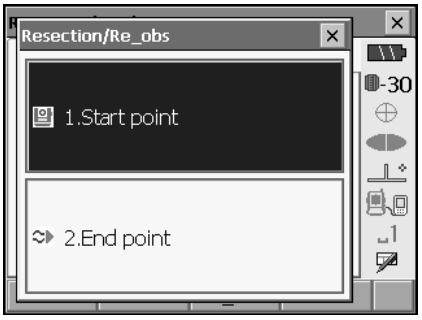


7. If there are problems with the results of a point, align the cursor with that point and press **[BAD]**. “BAD” is displayed to the right of the point. Repeat for all results that include problems.



8. Press **[RE CALC]** to perform calculation again without the point designated in step 8. The result is displayed.
   If there are no problems with the result, go to step 10.
   If problems with the result occur again, perform the resection measurement from step 3.
   • Press **[RE OBS]** to measure the point designated in step 8.

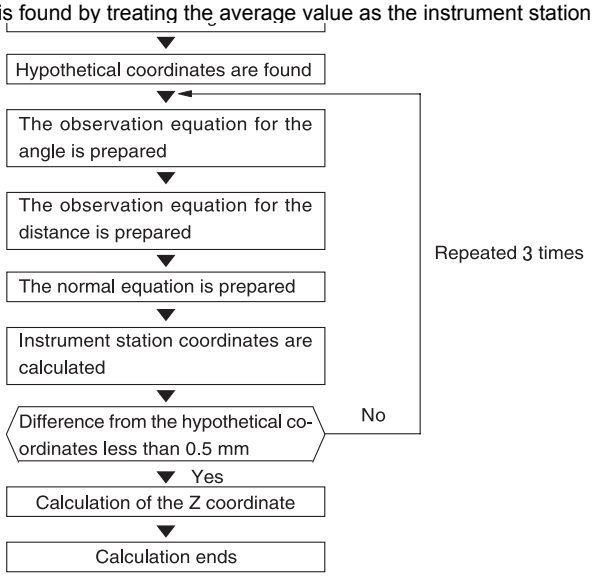
   If no points are designated in step 8, all the points or only the final point can be observed again.
   • Press **[ADD]** when there is a known point that has not been measured or when a new known point is added.



9. Press **[OK]** to finish resection measurement and return to Meas mode. Only Z (elevation) of the instrument station coordinate is set. N and E values are not overwritten.

Resection calculation process

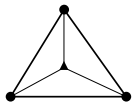
The NE coordinates are found using angle and distance observation equations, and the instrument station coordinates are found using the method of least squares. The Z coordinate is found by treating the average value as the instrument station coordinates.



Precaution when performing resection

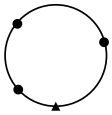
In some cases it is impossible to calculate the coordinates of an unknown point (instrument station) if the unknown point and three or more known points are arranged on the edge of a single circle.

An arrangement such as that shown below is desirable.



△▲ : Unknown point
○● : Known point

It is sometimes impossible to perform a correct calculation in a case such as the one below.

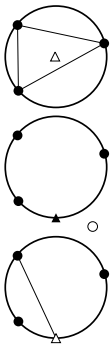


When they are on the edge of a single circle, take one of the following measures.

(1) Move the instrument station as close as possible to the center of the triangle.

(2) Observe one more known point which is not on the circle.

(3) Perform a distance measurement on at least one of the three points.



- In some cases it is impossible to calculate the coordinates of the instrument station if the included angle between the known points is too small. It is difficult to imagine that the longer the distance between the instrument station and the known points, the narrower the included angle between the known points. Be careful because the points can easily be aligned on the edge of a single circle.

17.SETTING-OUT MEASUREMENT

Setting-out measurement is used to set out the required point.
The difference between the previously input data to the instrument (the setting-out data) and the measured value can be displayed by measuring the horizontal angle, distance or coordinates of the sighted point.

The horizontal angle difference distance difference, and coordinate difference are calculated and displayed using the following formulae.
Horizontal difference
Displayed value (angle) = Horizontal angle of setting-out data - measured horizontal angle
Displayed value (distance) = measured horizontal distance x tan (horizontal angle of setting out data - measured horizontal angle)

Slope distance difference
Displayed value (slope distance) * = measured slope distance - slope distance setting-out data
* Horizontal distance or height difference can be input in the above formula.

Coordinate difference
Displayed value (coordinates)* measured N setting-out coordinates - N coordinates of setting-out data
* E or Z coordinates can be input in the above formula

Height difference (REM setting out measurement)
Displayed value (height) = measured REM data - REM data of setting out data

- Setting out data can be input in various modes: slope distance, horizontal distance, height difference, coordinates and REM measurement.
- It is possible to allocate softkeys in the Setting-out measurement menu to suit various applications and the ways that different operators handle the instrument.
  ☞ "21.6 Allocating Key Functions"

17.1 Using the Guide Light

When the guide light is set to ON, the flashing speed of the light indicates the status of the SRX and can be known when the user is located at a distance from the instrument. Also, the flashing colors relative to the target indicate the direction of the instrument and allow the user to reposition the target.
☞ Turning the Guide light ON/OFF: "5.1 Basic Key Operation"

- The pattern of the guide light can be changed.

☞ "21.2 Instrument Configuration"

- The Guide light will turn off, even when set to ON, during distance measurement and returned signal checking.

● **Guide light status and meaning**

Status of SRX

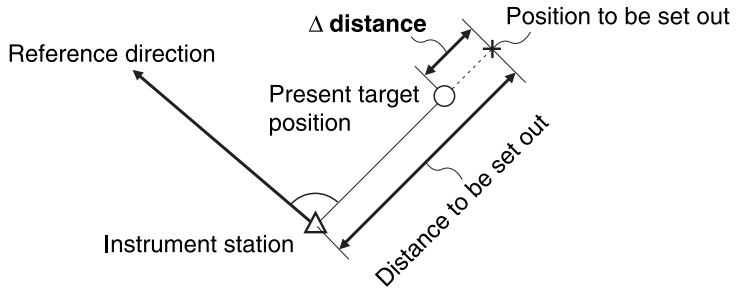
Light status	Meaning
Slow flashing	Waiting
Fast flashing	Searching
	Measuring (repeated measurement)
Green and red alternate flashing	Search error (error screen only)
	Distance measurement error (no signal, sighting error)

Indication for positioning target during setting-out measurement

Light status	Meaning
Increased flashing speed	(From position of poleman) Move target away from SRX
Decreased flashing speed	(From position of poleman) Move target toward SRX
Fast flashing	Target is at correct distance
Red	(From position of poleman) Move target left
Green	(From position of poleman) Move target right
Red and Green	Target is at correct horizontal position

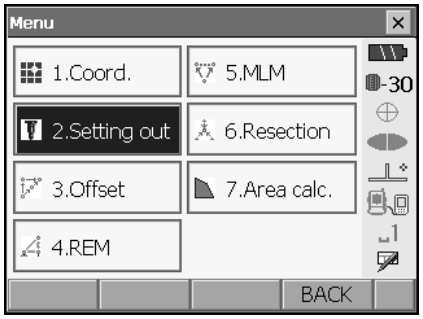
17.2 Distance Setting-out Measurement

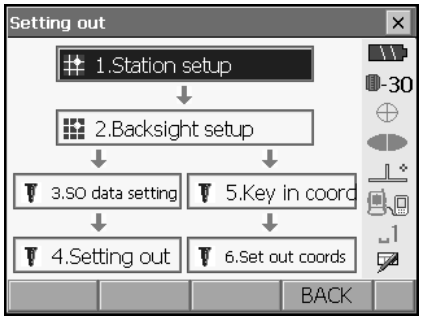
The point is to be found based on the horizontal angle from the reference direction and the distance from the instrument station.



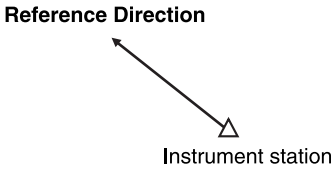
PROCEDURE

1. Select "Setting out" in <Menu> to display <Setting out>.



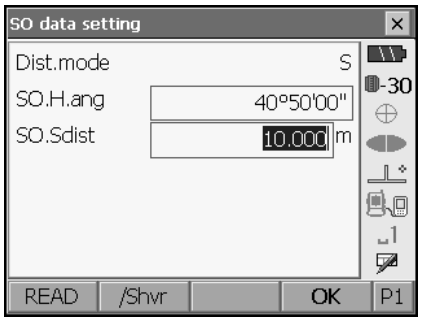


2. Select "Station setup" to display <Height setting>. Enter data for the instrument station and press **[OK]** to move to Backsight setup.
   ☞ "15.1 Entering Instrument Station Data"
   - Press **[READ]** to read in coordinate data registered in Program mode (SDR).
     ☞ Series SRX SDR Software Reference Manual



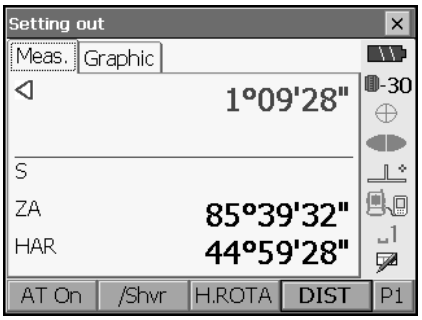
3. Set the azimuth angle for the backsight station. Press **[OK]** to return to <Setting out>.
   ☞ "15.2 Azimuth Angle Setting"

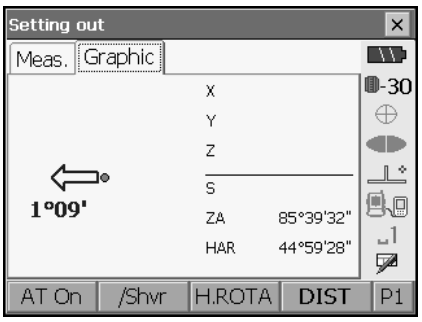
4. Select "SO data setting" In <Setting out> to display <SO data setting>. Enter the included angle between the reference point and the setting-out point in "SO.H.ang", and the distance (slope distance, horizontal distance or height difference) from the instrument station to the position to be set out in "SO.Sdist". Enter the value in the Distance mode that conforms to your measurement requirements.



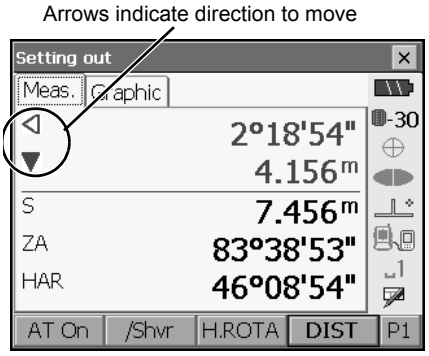
   - Each time **[/Shvr]** is pressed, the distance input mode changes from "S" (slope distance), "H" (horizontal distance), "V" (height difference), and "Ht." (REM).
   - When **[READ]** is pressed, coordinates registered in Program mode (SDR) can be recalled and used. The distance selected according to the selected distance input mode is calculated using these coordinate values.
     ☞ Series SRX SDR Software Reference Manual
   - Press **[COORD]** in the second page and input coordinates in <Key in coord>. The angle and distance from these coordinates to the position to be set out will be calculated.

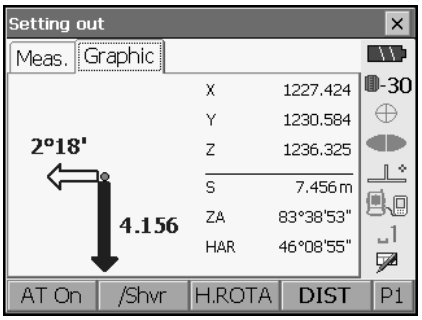
5. Enter values and press **[OK]** to display the screen at right.
   Press **[H.ROTA]** to automatically rotate the SRX toward the horizontal angle set in step 3 and set the angle to the setting out point to 0°.





6. Position the target on the line of sight and press **[DIST]** to begin distance measurement.
The distance and direction to move the target until the setting out point is located is displayed on the SRX. The sighting point measurement results (currently installed position of the target) are displayed.

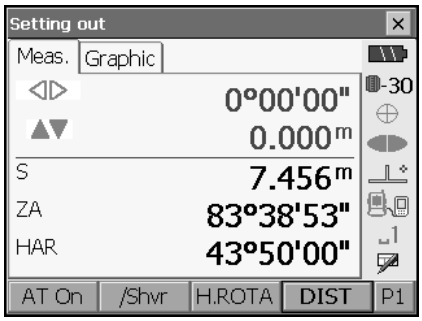


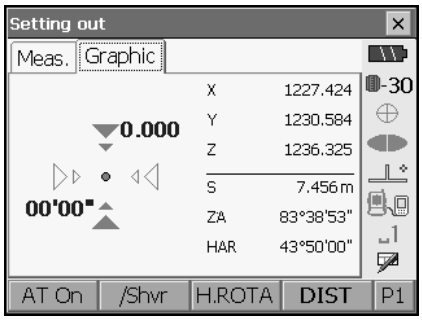


- Movement indicator (Red indicates that target position is correct)
  Arrows indicating horizontal direction will point in the opposite direction when viewing the display in Face 2.
  - ◁ : (Viewed from SRX) Move target to the left
  - ▷ : (Viewed from SRX) Move target to the right
  - ◁▷ : Target position is correct
  - ▼ : (Viewed from SRX) Move target closer
  - ▲ : (Viewed from SRX) Move target away
  - ▲▼ : (Viewed from SRX) Target position is correct
  - ⏫ : Move target upward
  - ⏬ : Move target downward
  - ⏫⏬ : Target position is correct

- Each time **[/Shvr]** is pressed, the distance input mode changes from "H" (horizontal distance), "V" (height difference), "R" (REM), and "S" (slope distance).
- Press **[CNFG]** to set setting out accuracy. When the position of the target is within this range both arrows will be displayed to indicate that the target position is correct.

7. Move the target until the distance to the setting-out point reads 0m. When the target is moved within the allowed range, all distance and position arrows are displayed.

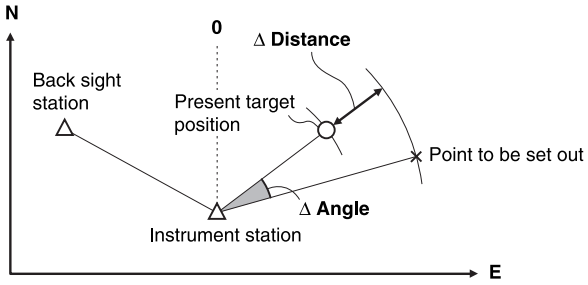




8. Press **[OK]** to return to <Setting out>. Set the next setting out point to continue setting out measurement.

17.3 Coordinates Setting-out Measurement

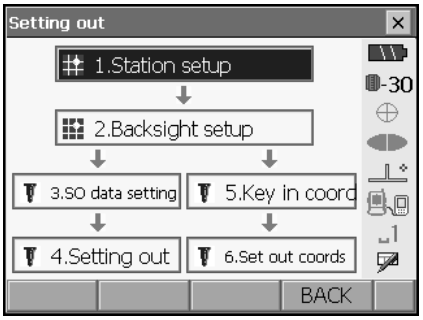
After setting the coordinates for the point to be set out, the SRX calculates the setting-out horizontal angle and horizontal distance. By selecting the horizontal angle and then the horizontal distance setting-out functions, the required coordinate location can be set out.



- Previously recorded setting-out points can be placed in order. Up to 30 points can be recorded.
- To find the Z coordinate, attach the target to a pole etc. with the same target height.

PROCEDURE

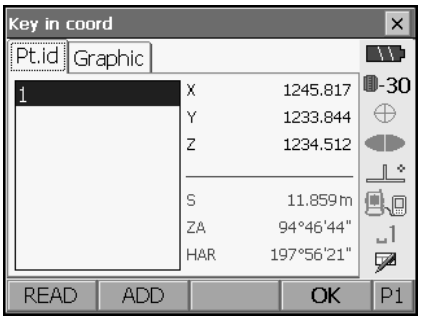
1. Select "Setting out" in <Menu> to display <Setting out>.

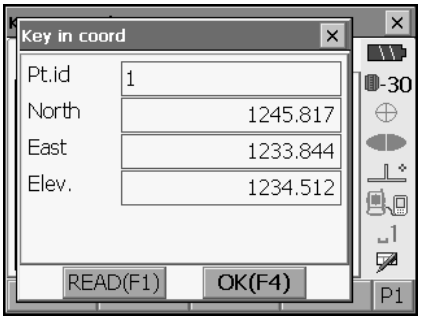


2. Select "Station setup" to display <Height setting>. If necessary, enter data for Backsight setup.
   ☞"17.2 Distance Setting-out Measurement" steps 2 to 3

3. Select "Key in coord" in <Setting out>. Record all the setting-out points (includes setting-out points you will measure from now).
   Press **[READ]** to display recorded angle data or press **[ADD]** to record new data.

   - Press **[DEL]** in the second page to delete the selected setting out point.
   - Press **[DELALL]** in the second page to delete all setting out points.

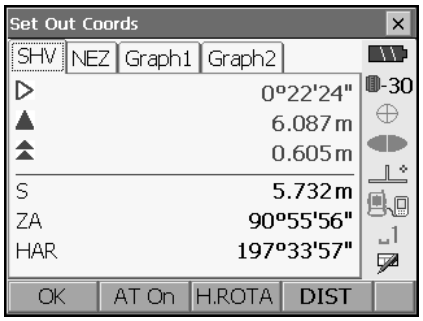


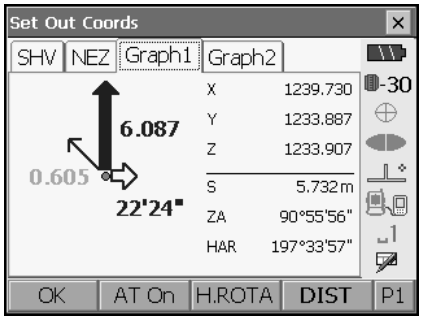


4. Select a setting-out point in the first screen of step 3 and press **[OK]** to display <Set out Coords>**.**
   Press **[H.ROTA]** to automatically rotate the SRX until the angle of the setting out point reads 0°.

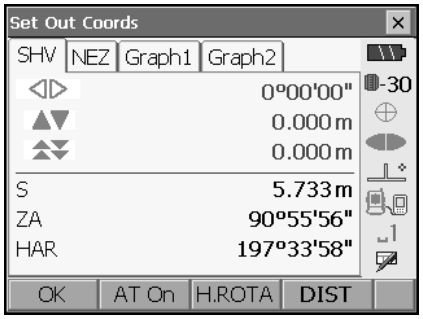
5. Press **[H.ROTA]** to automatically rotate the SRX until the angle of the setting out point reads 0°. Position the target on the line of sight and press **[DIST]** to begin distance measurement.
The distance and direction to move the target until the setting out point is located is displayed on the SRX. The sighting point measurement results (currently installed position of the target) are displayed.

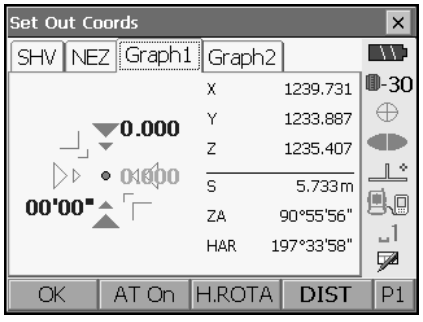
   • <Set out Coords> can also be displayed by selecting "Set out coords" in <Setting out>.
   • Switch between the tabs to display different sets of information.

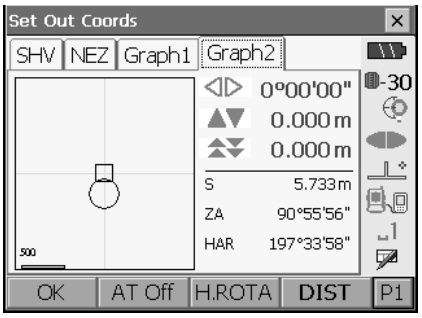




Move the target closer/further away and upward/ downward to find the correct distance (0 is displayed) to the setting out point.
☞ Movement indicators: "17.2 Distance Setting-out Measurement" step 5







6. Press **{ESC}** to return to <Key in coord>. Set the next setting out point to continue setting out measurement.

17.4 REM Setting-out Measurement

To find a point where a target cannot be directly installed, perform REM setting-out measurement.
☞"14.5 REM Measurement"

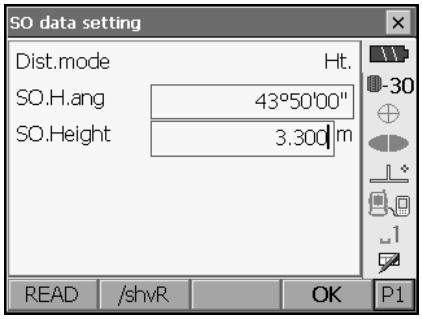
PROCEDURE

1. Install a target directly below or directly above the point to be found. Then use a measuring tape etc. to measure the target height (height from the surveying point to the target).

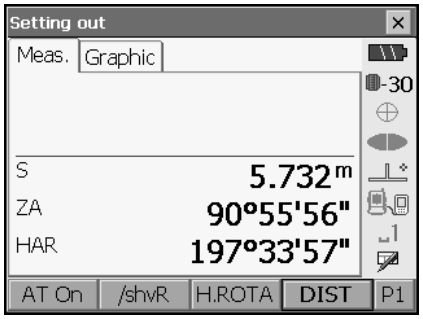
2. Select "Station setup" in <Setting out> to display <Height setting>. If necessary, enter data for Backsight setup.
   ☞"17.2 Distance Setting-out Measurement" steps 2 to 3

3. Select "SO data setting" In <Setting out> to display <SO data setting>. Press **[/Shvr]** until the distance input mode is "Ht.". Input height from the surveying point to the position to be set out in "SO.Height". If necessary, input the angle to the point to be set out.

4. Enter values and press **[OK]** in step 3 to display the screen at right.
   Press **[H.ROTA]** to automatically rotate the SRX toward the horizontal angle set in step 3 and set the angle to the setting out point to 0°.



5. Position the target on the line of sight and press **[DIST]** to begin distance measurement.
   The distance and direction to move the target until the setting out point is located is displayed on the SRX. The sighting point measurement results (currently installed position of the target) are displayed.

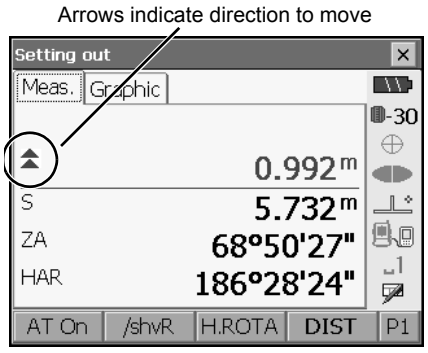


6. Sight the target and press **[DIST]**. Measurement begins and the measurement results are displayed.

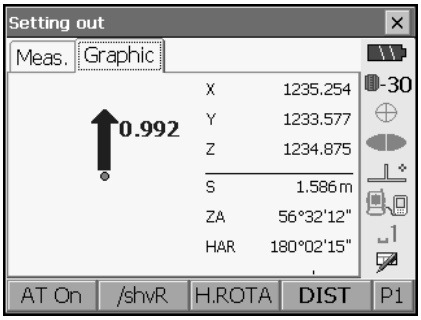
7. Press **[REM]** in the second page to start REM measurement.
   The distance (height difference) and direction to move the target until the sighting point and setting out point are located is displayed on the SRX. The sighting point measurement results are displayed.

   Press **[STOP]** to stop measuring.

   Find the setting-out point by moving the telescope until the distance to the setting-out point reads 0m.



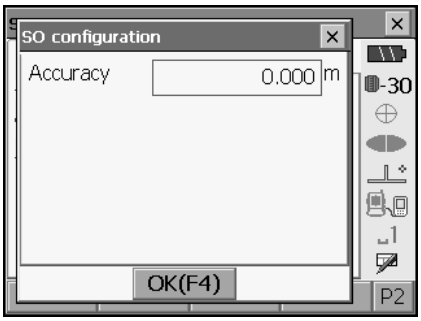
   • Movement indicator (Red indicates that target position is correct)



   : : Move the telescope near the zenith
   : Move the telescope near the nadir
   : Telescope direction is correct

   ☞For details of other movement indicators: "17.2 Distance Setting-out Measurement" step 5

- Press **[CNFG]** to set setting out accuracy. When the position of the target is within this range both arrows will be displayed to indicate that the target position is correct.



8. Press **{ESC}** to return to <SO data setting>.

18.OFFSET MEASUREMENT

Offset measurements are performed in order to find a point where a target cannot be installed directly or to find the distance and angle to a point which cannot be sighted.

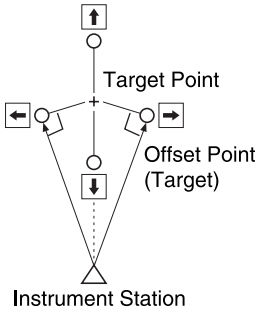
- It is possible to find the distance and angle to a point you wish to measure (target point) by installing the target at a location (offset point) a little distance from the target point and measuring the distance and angle from the surveying point to the offset point.
- The target point can be found in the three ways explained below.
- The instrument station and backsight must be set before the coordinates of an offset point can be found. Station and backsight setup can be performed in the Offset menu.

  ☞ Station setup: "15.1 Entering Instrument Station Data", Backsight setup: "15.2 Azimuth Angle Setting" .
- It is possible to allocate softkeys in the Offset menu to suit various applications and the ways that different operators handle the instrument

  ☞ "21.6 Allocating Key Functions"

18.1 Single-distance Offset Measurement

Finding it by entering the horizontal distance from the target point to the offset point.

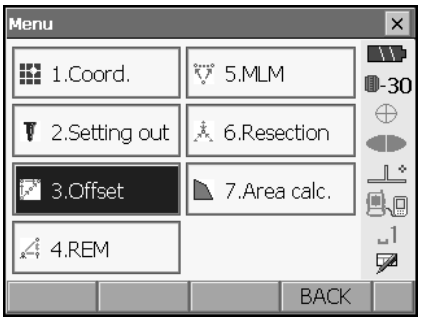


- When the offset point is positioned to the left or right of the target point, make sure the angle formed by lines connecting the offset point to the target point and to the instrument station is almost 90°.
- When the offset point is positioned in front of or behind the target point, install the offset point on a line linking the instrument station with the target point.

PROCEDURE

1. Set the offset point close to the target point and measure the distance between them, then set up a prism on the offset point.

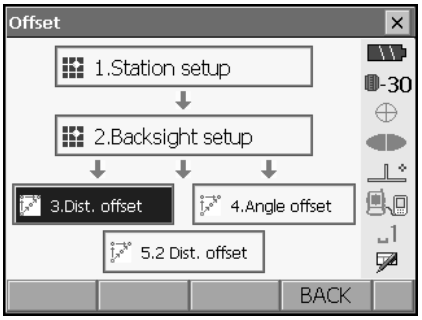
2. Select "Offset" in <Menu> to display <Offset>.



3. Select “Dist. offset”.
   Input the following items.
   (1) Direction of the offset point.
   (2) Horizontal distance from the target point to the offset point.

   • Direction of offset point

   ← : On the left of the target point.
   → : On the right of the target point.
   ↓ : Closer than the target point.
   ↑ : Beyond the target point.



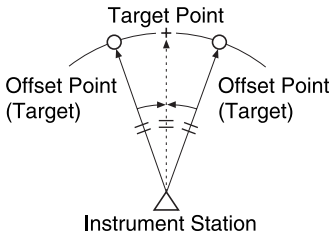
4. Sight the offset point and press **[DIST]** in the screen of step 3 to start measurement.
   Press **[STOP]** to stop the measurement.
   The measurement results are displayed.

   • Press **[HVD/nez]** to switch results for the target point between distance/angle values and coordinate/elevation values.

5. Press **[OK]** in the screen in step 4 to return to <Offset>.

18.2 Angle Offset Measurement

Sighting the direction of the target point to find it from the included angle.
Install offset points for the target point on the right and left sides of and as close as possible to the target point and measure the distance to the offset points and the horizontal angle of the target point.

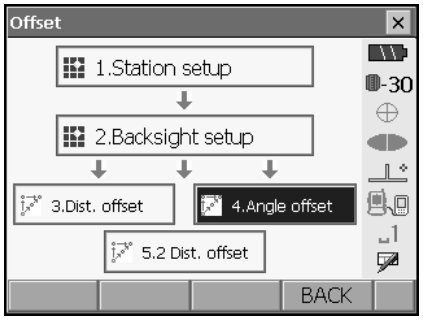


PROCEDURE

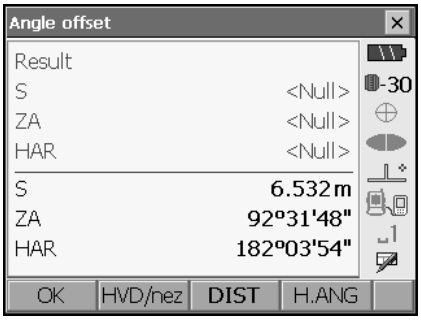
1. Set the offset points close to the target point (making sure the distance from the instrument station to the target point and the height of the offset points and the target point are the same), then use the offset points as the target.

2. Select "Offset" in <Menu> to display <Offset>.

   Select "Angle offset".



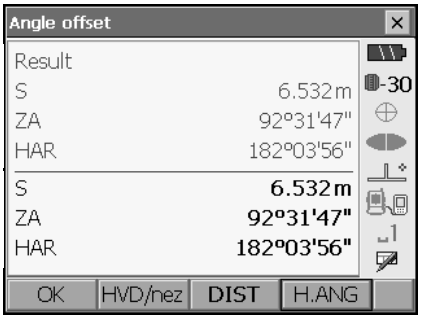
3. Sight the offset point and press **[DIST]** to start measurement.
   Press **[STOP]** to stop the measurement.



4. Sight the target point and press **[H.ANG]**.

   • Press **[HVD/nez]** to switch results for the target point between distance/angle values and coordinate/elevation values.

Results for offset point



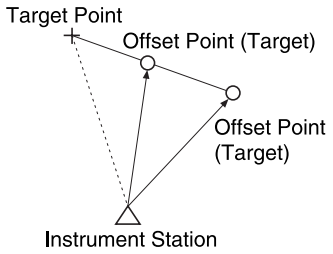
Results for target point

5. Press **[OK]** in the screen in step 4 to return to <Offset>.

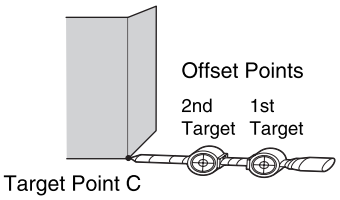
18.3 Two-distance Offset Measurement

By measuring the distances between the target point and the two offset points.
Install two offset points (1st target and 2nd target) on a straight line from the target point, observe the 1st target and 2nd target, then enter the distance between the 2nd target and the target point to find the target point.

- It is possible to make this measurement easily using the optional equipment: the 2-point target (2RT500-K). When using this 2-point target, be sure to set prism constant to 0.
  ☞"25. TARGET SYSTEM"



How to use 2-point target (2RT500-K)



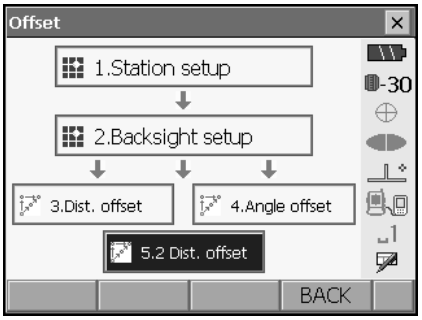
- Install the 2-point target with its tip at the target point.
- Face the targets toward the instrument.
- Measure the distance from the target point to the 2nd target.
- Set the prism constant to 0mm.

PROCEDURE

1. Install two offset points (1st target, 2nd target) on a straight line from the target point and use the offset points as the target.

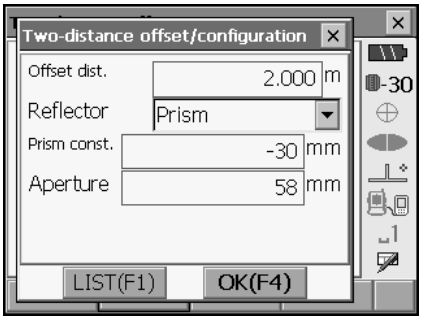
2. Select "Offset" in <Menu> to display <Offset>.

   Select "2 Dist. offset".

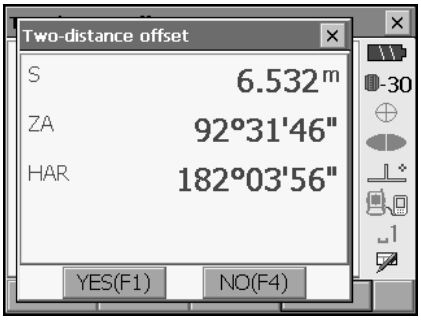


3. Press **[CNFG]** and input the distance from the 2nd target to the target point in "Offset dist.". Select and reflector type and press **[OK]** to finish settings.

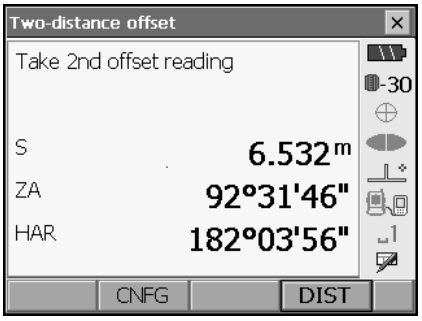
   • Press **[LIST]** to edit the prism constant and aperture in <Reflector setting>.



4. Sight the 1st target and press **[DIST]** to start measurement.
   Press **[STOP]** to stop the measurement. The measurement results are displayed. Press **[YES]** to confirm.

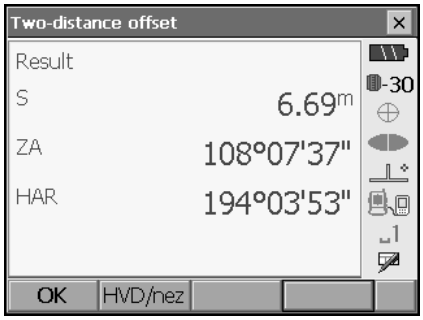


5. Sight the 2nd target and press **[DIST]** to start measurement.
   Press **[STOP]** to stop the measurement. The measurement results are displayed.



6. Press **[YES]** to display results for the target point.

   Press **[HVD/nez]** to switch results for the target point between distance/angle values and coordinate/elevation values.

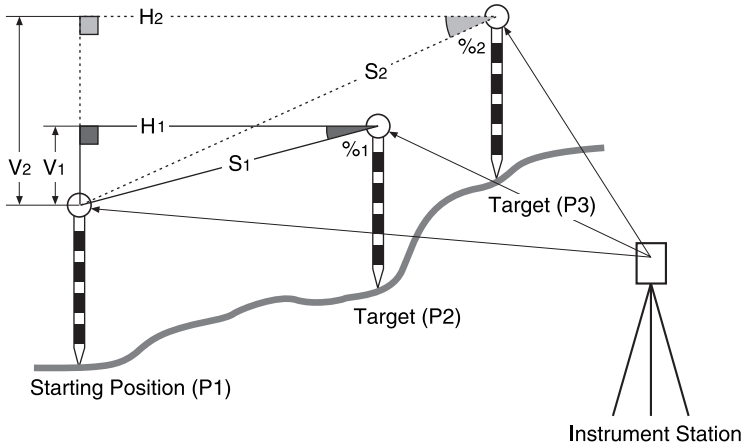


7. Press **[YES]** in the screen in step 4 to return to <Offset>

19.MISSING LINE MEASUREMENT

Missing line measurement is used to measure the slope distance, horizontal distance, and horizontal angle to a target from the target which is the reference (starting point) without moving the instrument.

- It is possible to change the last measured point to the next starting position.
- Measurement results can be displayed as the gradient between two points.



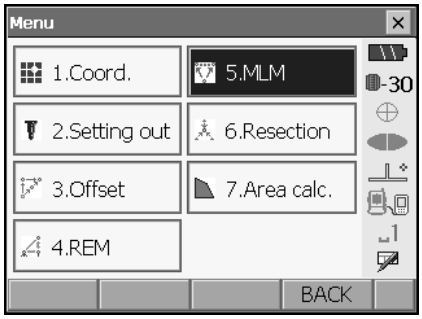
- It is possible to allocate softkeys in the MLM menu to suit various applications and the ways that different operators handle the instrument.

  ☞ "21.6 Allocating Key Functions"

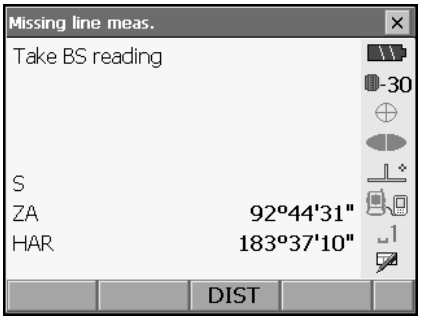
19.1 Measuring the Distance between 2 or more Points

PROCEDURE

1. Select "MLM" in <Menu>.

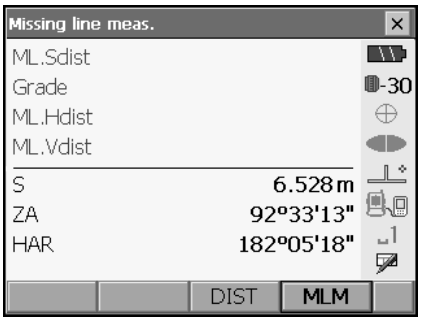


2. Sight the second target, and press **[DIST]** to start measurement.
   Press **[STOP]** to stop measurement.
   The following values are displayed:
   S : Slope distance of the starting position and 2nd target.
   H : Horizontal distance of the starting position and 2nd position.
   V : Height difference of the starting position and 2nd target.



Note

- When measurement data already exists the screen of step 3 is displayed and measurement starts.

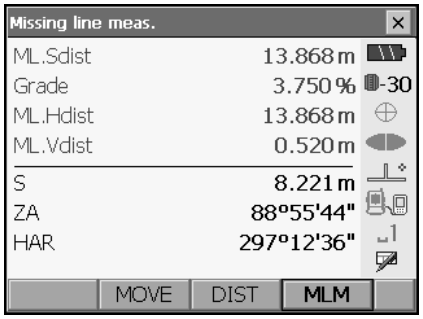


3. Sight the next target and press **[MLM]** to begin observation. Slope distance, horizontal distance and height difference between multiple points and the starting position can be measured this way.

   - Press **[DIST]** to re-observe the starting position. Sight the starting position and press **[DIST]**.
   - When **[MOVE]** is pressed, the last target measured becomes the new starting position to perform missing line measurement of the next target.

4. ☞ "19.2 Changing the Starting Point"

Results for measurement between starting position and second target

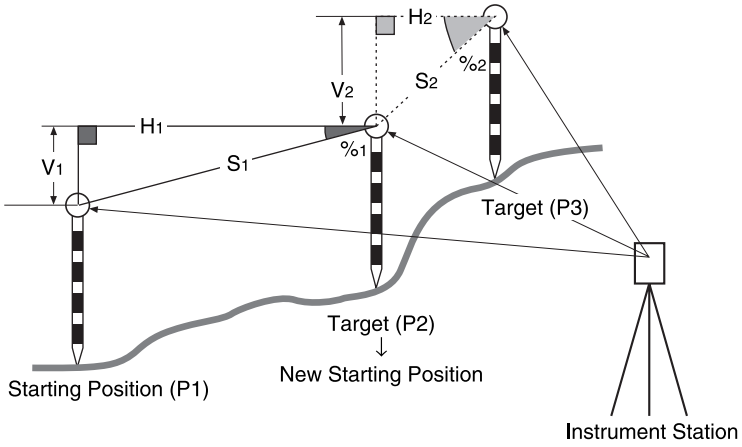


Results for current point

5. Press **{ESC}** or tap the cross in the top-right corner to end missing line measurement.

19.2 Changing the Starting Point

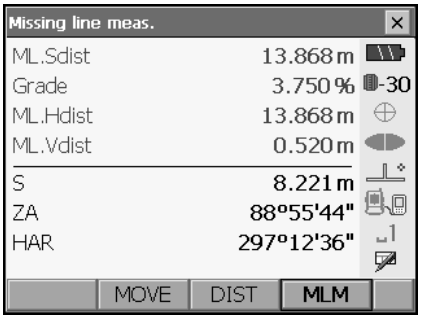
It is possible to change the last measured point to the next starting position.



PROCEDURE

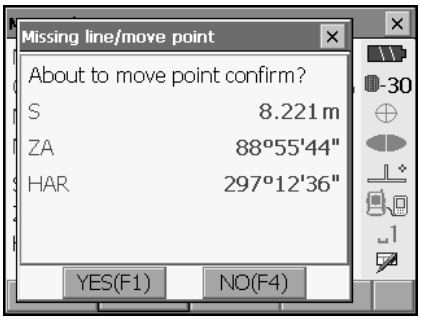
1. Observe the starting position and target following steps 1 to 3 in "19.1 Measuring the Distance between 2 or more Points".

2. After measuring the targets, press **[MOVE]**.



Press **[YES]** in the confirmation message window.

- Press **[NO]** to cancel measurement.

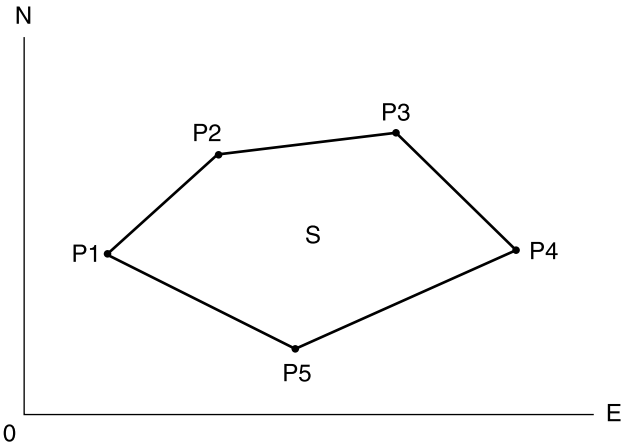


3. The last target measured is changed to the new starting position.
4. Perform missing line measurement following steps 2 to 3 in "19.1 Measuring the Distance between 2 or more Points".

20.SURFACE AREA CALCULATION

You can calculate the area of land (slope area and horizontal area) enclosed by three or more known points on a line by inputting the coordinates of the points

Input		Output	
Coordinates:	P1 (N1, E1, Z1) P2 (N2, E2, Z2) P3 (N3, E3, Z3) :	Surface area:	S (horizontal area and slope area)



- Number of specified coordinate points: 3 or more, 30 or less
- Surface area is calculated by observing in order the points on a line enclosing an area or by reading in the previously registered coordinates and using it as known point data.
- It is possible to allocate softkeys in the MLM menu to suit various applications and the ways that different operators handle the instrument.

☞"21. CHANGING THE SETTINGS"

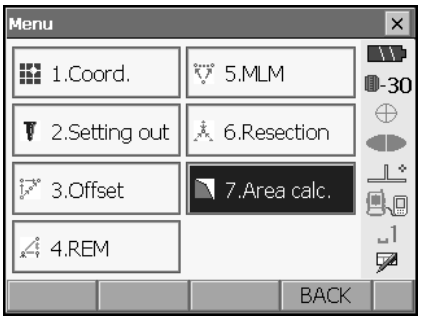
- An error will occur if only two points (or less) are entered (or recalled) when specifying an enclosed area.
- Be sure to observe (or recall) points on an enclosed area in a clockwise or counterclockwise direction. For example, the area specified by entering (or recalling) point numbers 1, 2, 3, 4, 5 or 5, 4, 3, 2, 1 implies the same shape. However, if points are not entered in numerical order, the surface area will not be calculated correctly.

Slope area

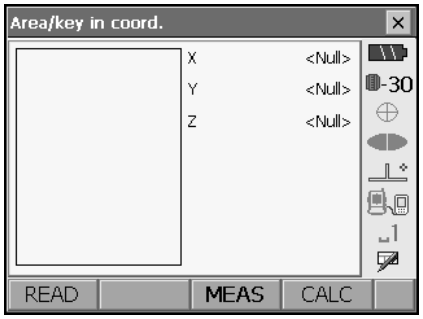
The first three points specified (measured/read-in) are used to create the surface of the slope area. Subsequent points are projected vertically onto this surface and the slope area calculated.

PROCEDURE Surface area calculation by measuring points

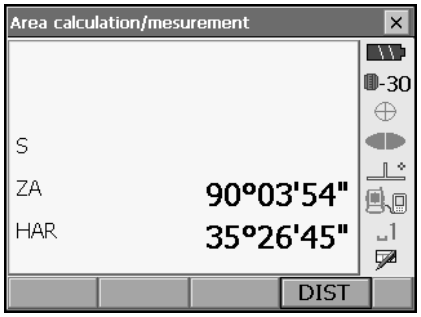
1. Select "Area calc." in <Menu>.



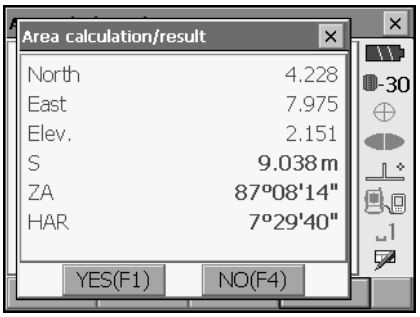
- When **[READ]** is pressed, registered coordinates can be recalled and used in subsequent measurements.
  ☞ "PROCEDURE Surface area calculation using registered coordinate data"

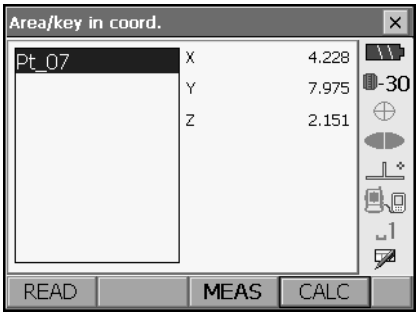


2. Press **[MEAS]** to display <Area calculation/ measurement>. Sight the first point on the line enclosing the area, and press **[DIST]**. Measurement begins and the measured values are displayed. Press **[STOP]** to stop measuring.

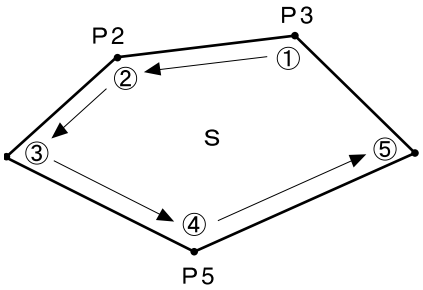


3. The measurement results are displayed. Press **[YES]** to confirm.The value of point 1 is set in "01".

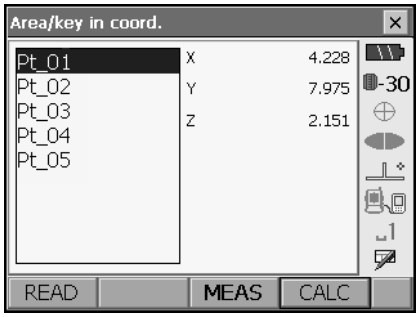


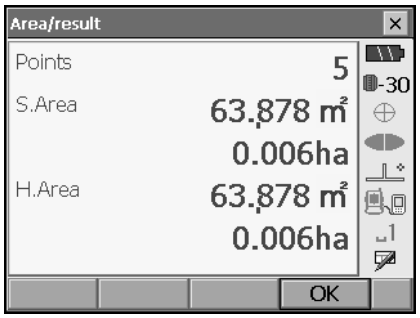


4. Repeat steps 3 to 4 until all points have been measured. Points on an enclosed area are observed in a clockwise or counterclockwise direction.
   For example, the area specified by entering point numbers 1, 2, 3, 4, 5 or 5, 4, 3, 2, 1 implies the same shape.
   After all known points necessary to calculate the surface area have been observed, **[CALC]** is displayed.



5. Press **[CALC]** to display the calculated area.



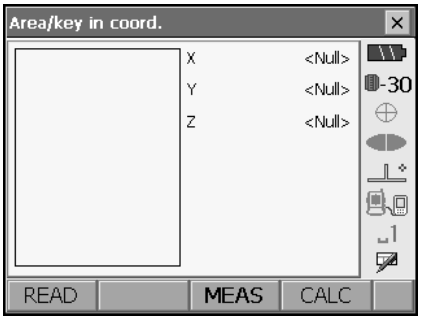


6. Press **[OK]** to return to <Area/key in coord.>.
   Press **{ESC}** or tap the cross in the top-right corner to quit area calculation.

PROCEDURE Surface area calculation using registered coordinate data

Coordinate data registered in Program mode (SDR) can be recalled and used for area calculations.
☞ Series SRX SDR Software Reference Manual

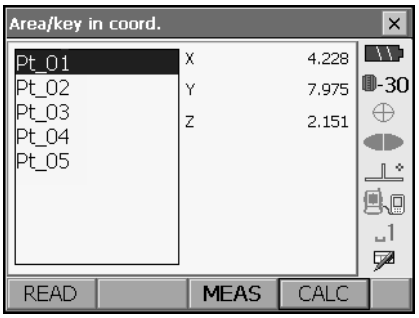
1. Select "Area calc." in <Menu>.
2. Press **[READ]** to display the list of registered coordinate data.



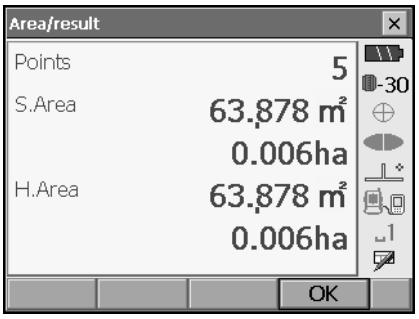
3. Select the first point in the list and press **[OK]**.
   The coordinates of the first point are set as "01".

4. Read in coordinates of point 2 and onward
   Repeat steps 2 to 3 until all points have been read in.
   Points on an enclosed area are read in a clockwise or counterclockwise direction.

   After all known points necessary to calculate the surface area have been observed, **[CALC]** is displayed.



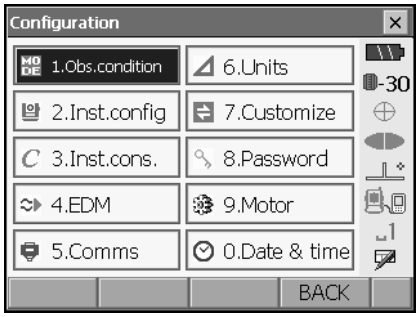
5. Press **[CALC]** to display the calculated area.



6. Press **[OK]** to return to <Area/key in coord.>.
   Press **{ESC}** or tap the cross in the top-right corner to quit area calculation.

21.CHANGING THE SETTINGS

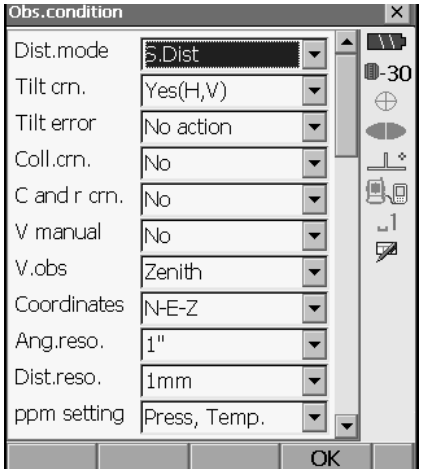
This section explains the contents of parameter settings in Basic mode and how to change these settings.
Each item can be changed to meet your measurement requirements.
SETTINGS mode can be accessed either by pressing **{SETTINGS}** or the "SETTINGS" icon in <Top>.



The following chapters provide details of items in SETTINGS mode.

- Communication settings ☞"8. CONNECTING TO EXTERNAL DEVICES"
- Motor settings ☞"11.1 Auto Pointing Settings", "12.1 Auto Tracking Settings"
- Instrument configurations ☞"23.3 Tilt Sensor", "23.5 Reticle".

21.1 Observation Conditions



Items set and options (*: Factory setting)

Distance mode:	S.Dist (slope distance)*, H.dist (horizontal distance), V.dist (height difference)
Tilt crn (tilt correction):	Yes (H,V)*, Yes (V), No
Tilt error:	No action*/Go to Tilt screen
Coll.crn. (collimation correction):	No*, Yes
C and r crn.:	No*, K=0.142, K=0.20
V manual:	Yes, No*
V.obs (vertical angle display method):	Zenith*, Horiz., Horiz ±90°
Coordinates:	N-E-Z*, E-N-Z
Ang.reso. (Angle resolution):	SRX1/SRX2: 0.5"1"* SRX3/SRX5: 1"*, 5"
Dist.reso. (Distance resolution):	SRX1/SRX2: 0.1mm, 1mm* SRX3/SRX5: 1mm*
ppm setting:	Press, Temp.*, +Humidity

Note

- When "V manual" is set to "No" the horizontal angle will be automatically set to 0.
  ☞Setting V manual to "Yes": "30.1 Manually Indexing the Vertical Circle by Face Left, Face Right Measurement"

Automatic tilt angle compensation mechanism

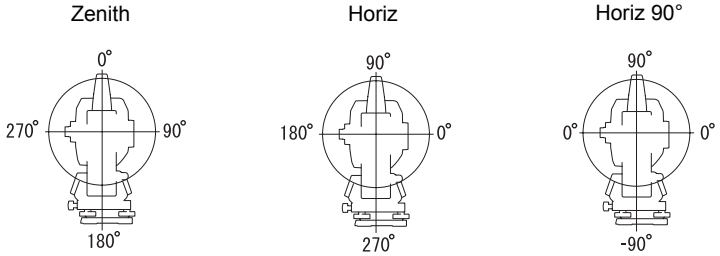
The vertical and horizontal angles are automatically compensated for small tilt errors using the 2-axis tilt sensor.

- Read the automatically compensated angles when the display has stabilized.
- The horizontal angle error (vertical axis error) fluctuates according to the vertical axis, so when the instrument is not completely leveled, changing the vertical angle by rotating the telescope will cause the displayed horizontal angle value to change.
- Compensated horizontal angle = Measured horizontal angle + Tilt in angle / tan (Vertical angle)
- When the telescope is directed close to the zenith or nadir angle, tilt compensation is not applied to the horizontal angle.

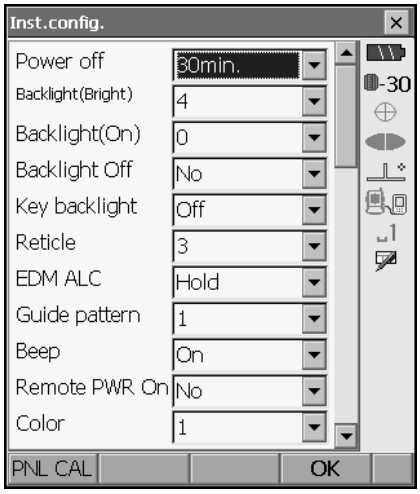
Collimation correction

The SRX has a collimation correction function that automatically corrects horizontal angle errors caused by horizontal axis and leveling axis errors.

V mode (vertical angle display method)



21.2 Instrument Configuration

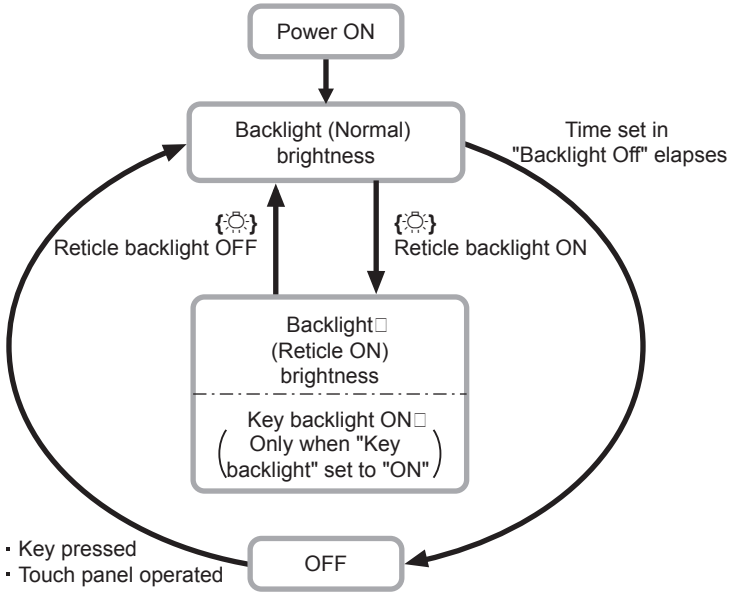


Items set and options (*: Factory setting)

Power off:	5min./10min./15min./30min.*/No
Backlight (Reticle ON):	0 to 8 (6*) (Brightness level on pressing {☼})
Backlight (Normal):	0 to 8 (2*)
Backlight Off:	30sec/1min./5min./10min./No*
Key backlight:	Off*/On
Reticle:	0 to 5 level (3*)
EDM ALC:	Hold*, Free
Guide pattern:	1* (simultaneous), 2 (alternating)
Beep:	Off/On*
Remote PWR-On:	Yes/No*/Yes(Serial)/Yes(Bluetooth)
Color:	1*/2 (monochrome)

Backlight settings

Pressing {☼} switches the brightness level of the backlight between the settings made in "Backlight (Reticle ON)" and "Backlight (Normal)".
When "Backlight (Reticle ON)" is selected the reticle will also be illuminated.
When the SRX is powered ON the brightness level is set to "Backlight (Normal)". "Backlight (Normal)" was set to a higher brightness level than "Backlight (Reticle ON)" when the SRX was shipped but these values can be modified according to user preferences.



Note

- Press **[PNL CAL]** to display the touch panel calibration screen.
  ☞"10.1 Configuring the Touch Panel"

Power-saving automatic cut-off/Backlight Off

To save power, power to the SRX is automatically cut off if it is not operated for the selected time. The backlight will similarly be turned off if the instrument is not operated for the selected time. However, the backlight will not be turned off when "Backlight" is set to "ON".

EDM ALC

Set the light receiving status of the EDM. While carrying out continuous measurement, set this item according to the measurement conditions.

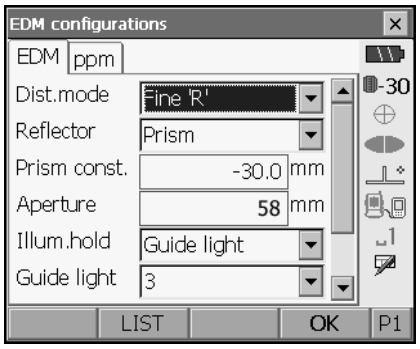
- When EDM ALC is set to "Free," the instrument's ALC will be automatically adjusted if an error occurs as a result of the amount of light received. Set to "Free" when the target is moved during measurement or different targets are used.
- When "Hold" is set, the amount of light received will not be adjusted until continuous measurement is completed.
- If an obstacle intermittently obstructs the light beam during continuous measurement and the "Signal off" error occurs, each time the obstruction occurs it takes some time for the amount of light received to be adjusted and the measurement value displayed. Set to "Hold" when the light beam used for measurement is stable but is frequently obstructed by obstacles such as people, cars, or tree branches etc.

Note

- The EDM ALC setting will automatically be switched to "Free" when the distance measurement mode is set to "Tracking" (target is moved during distance measurement).

21.3 EDM Settings

• EDM tab



Items set, options, and input range (*: Factory setting)

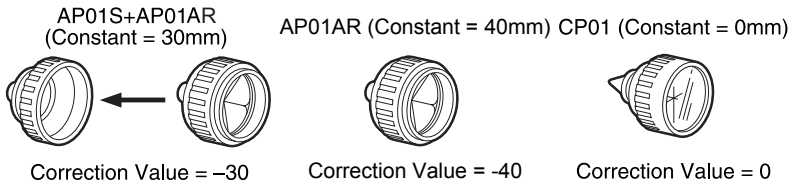
Dist. mode (Distance measurement mode):	Fine “R”*, Fine AVG n= 2 (Setting: 2 to 9 times), Fine “S”, Rapid “S”, Rapid "R", Tracking
Reflector:	Prism*/360° Prism/Sheet/Reflectorless
Prism constant:	-99 to 99 mm ("Prism" is selected: -30*, "360° Prism" is selected: -7, "Sheet" is selected: 0)
Aperture:	1 to 999mm ("Prism" is selected: -58*, "360° Prism" is selected: 34, "Sheet" is selected: 20)
Illum. hold ({☼} function):	Guide light*/Laser-pointer
Guide light (Bright):	1 to 3 (3*)

- The setting for "Fine AVG" distance measurement mode can be increased/decreased using the **[+]**/**[-]** softkeys.
- Target information can be edited and recorded.
  ☞"PROCEDURE Recording and editing target information"
- "Prism constant" and "Aperture" will not be displayed when Reflectorless" is selected in "Reflector".
- The Guide light brightness item ("Guide light (Bright)") will be displayed only when "Illum. hold" is set to "Guide light".

Prism constant correction

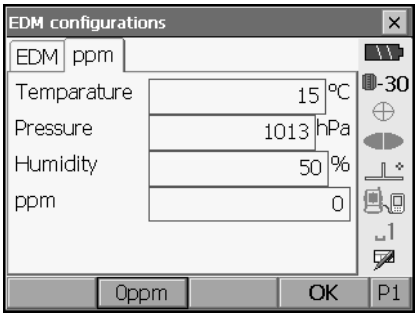
Reflective prisms each have their prism constant.
Set the prism constant correction value of the reflective prism you are using. When selecting "Reflectorless" in "Reflector", prism constant correction value is set to "0" automatically.

・The following are samples of the prism constant correction values of reflective prisms from Sokkia.



Prism constants and aperture settings can be set for each prism. The prism constant and aperture values displayed in the EDM tab will change to reflect the reflector type selected in "Reflector".

● ppm tab



- **[0ppm]**: Atmospheric correction factor returns to 0 and temperature and air pressure are set to the factory settings.
- Atmospheric correction factor is calculated and set using the entered values of the temperature and air pressure. Atmospheric correction factor can also be entered directly.

Items set, options, and input range (*: Factory setting)

Temperature:	-30 to 60°C (15*)
Pressure:	500 to 1400hPa (1013*), 375 to 1050mmHg (760*)
Humidity:	0 to 100% (50*)
ppm (Atmospheric correction factor):	-499 to 499 (0*)

•The "Humidity" item is displayed only when the "ppm setting" in "Obs. condition" is set to "+Humidity".

Atmospheric correction factor

The SRX measures the distance with a beam of light, but the velocity of this light varies according to the index of refraction of light in the atmosphere. This index of refraction varies according to the temperature and air pressure.

- To precisely determine the atmospheric correction factor, the average temperature and air pressure along the measurement beam route must be taken. Take care when calculating the correction factor in mountainous terrain as the difference in height will result in differences in atmospheric conditions between two points.
- The SRX is designed so that the correction factor is 0 ppm at an air pressure of 1013 hPa and a temperature of 15°C.

- By inputting the temperature and air pressure values, the atmospheric correction value is calculated and set into the memory. Calculate the atmospheric correction factor as shown in the following formula.

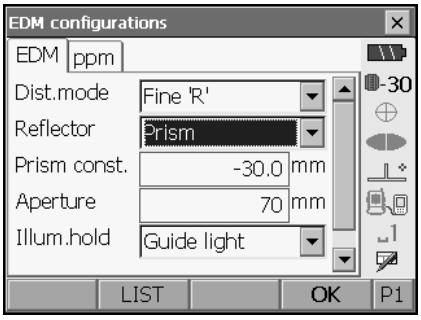
$$ppm = 282.59 - \frac{0.2942 \times \text{air pressure (hPa)}}{1 + 0.003661 \times \text{air temperature (°C)}}$$

☞ "30.2 Atmospheric Correction for High Precision Distance Measurement"

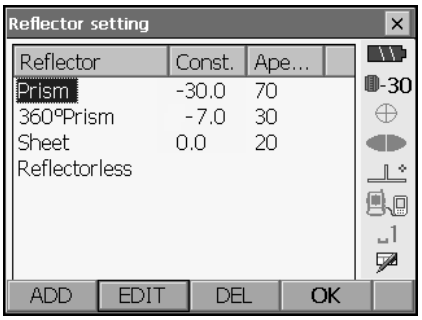
•If the weather correction is not required, set the ppm value to 0.

PROCEDURE Recording and editing target information

The **[LIST]** softkey is be displayed when either "Reflector" or "Prism const." is selected in the EDM tab of <EDM configurations>.



1. Press **[LIST]** to display a list of all recorded targets.

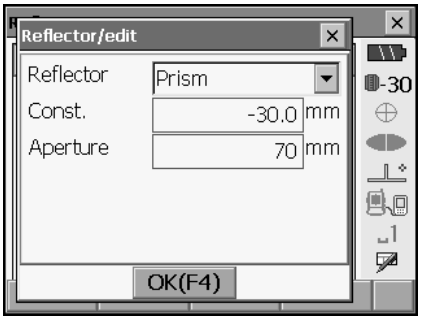


- **[ADD]**: Displays <Reflector list>. Select the desired target from this list and press **[OK]** to add to the list in <Reflector setting>. Up to a maximum of 6 targets can be recorded.
- **[DEL]**: Deletes the selected target.

2. To edit a target, select the desired target and press **[EDIT]**. <Reflector/edit> is displayed. Select/input relevant information for the target.

   Target: Prism/mini-Prism/Sheet/ Reflectorless/360° Prism
   Const.: -99 to 99 mm
   Aperture: 1 to 999 mm

   • When selecting "Reflectorless" in "Reflector", prism constant correction and aperture values are set to "0" automatically.



3. Press **[OK]** in the screen of step 2 to save edited information and return to <Reflector setting>. Press **[OK]** to return to <EDM configurations>.

21.4 Allocating User-defined Tabs

It is possible to allocate tabs in Meas mode to suit the measurement conditions. It is possible to operate the SRX efficiently because unique tab allocations can be preset to suit various applications and the ways that different operators handle the instrument.

- The current tab allocations are retained until they are revised again, even when the power is cut off.
- Press **[CLEAR]** in <Customize/Select screen> to return all customized configurations to their previous settings.
- One screen can contain a maximum of 5 tabs.

- When tab allocations are recorded and registered, the previously recorded tab settings are cleared.

Åú **Tab allocations**

The following are tabs allocated when the SRX was shipped and tabs that can be defined by the user.

• Basic measurement

Factory settings	User-definable tabs
SHV	SHV
SHVdist	SHVdist
Graphic	Graphic
	SHV + Coord.
	Free

• Setting out

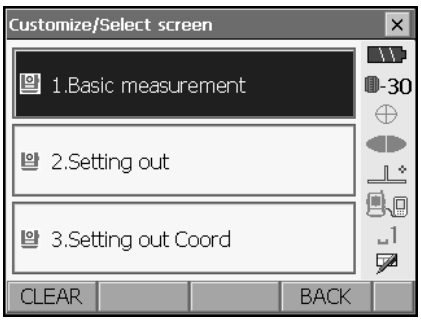
Factory settings	User-definable tabs
Meas.	Meas.
Graphic	Graphic
	Free

• Setting out Coord.

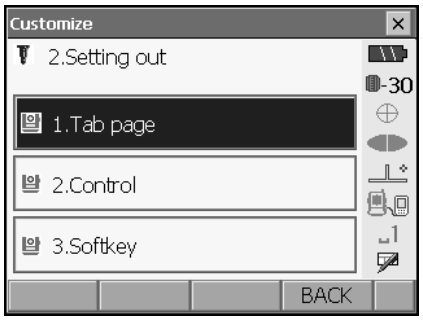
Factory settings	User-definable tabs
SHV	SHV
NEZ	NEZ
Graph1	Graph1
Graph2	Graph2
	Free

PROCEDURE Allocating tabs

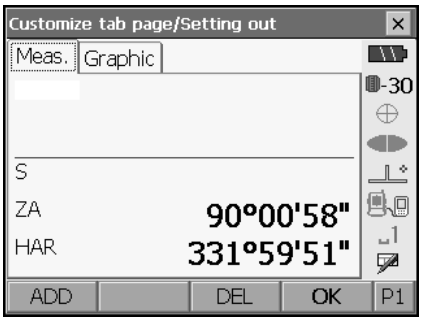
1. Select "Customize" to display <Customize/Select screen>.
   Select the measurement mode in which you want to allocate a tab.



   Select "Tab page".



2. Use the softkeys in <Customize tab page> to allocate the desired tab page layout. Select a tab type from the "Type" drop-down list.



- Press **[ADD]** to add the selected tab at the right-hand side of the screen.
- Press **[INS]** in the second page to insert the selected tab in front of the current tab.
- Press **[CNFG]** in the second page to replace the current tab with the selected tab.
- Press **[DEL]** to delete the current tab.

- Tabs, once deleted, cannot be retrieved.

3. Repeat step 2 to perform further tab allocations.

4. Press **[OK]** to finish allocating tabs. The allocated tabs are stored in memory and <Customize> is displayed. The newly allocated tabs appear in the relevant measurement screen.

21.5 Customizing Screen Controls

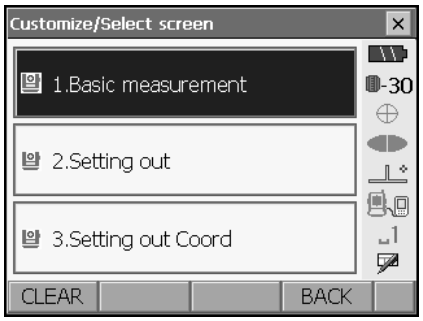
It is possible to customize screen controls in Meas mode to suit the measurement conditions and the different methods employed by different operators.

- The current screen control settings are retained until they are revised again, even when the power is cut off.
- Press **[CLEAR]** in <Customize/Select screen> to return all customized configurations to their previous settings.
- Screen controls cannot be set for the Graphic tab.

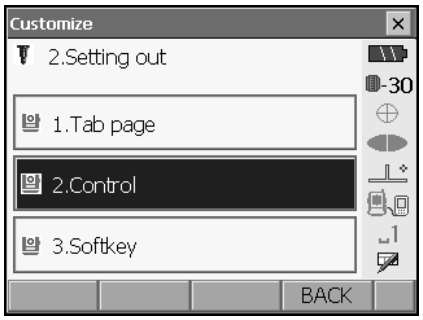
- When screen control settings are recorded and registered, the previously recorded settings are cleared.

PROCEDURE Customizing screen controls

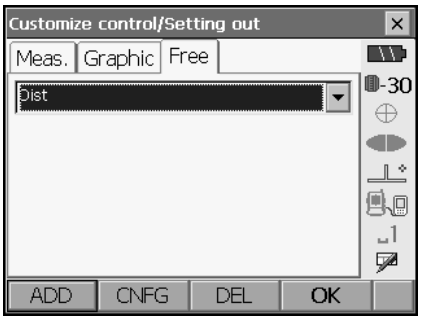
1. Select "Customize" to display <Customize/Select screen>.
   Select the measurement mode in which you want to customize screen controls.



   Select "Control".

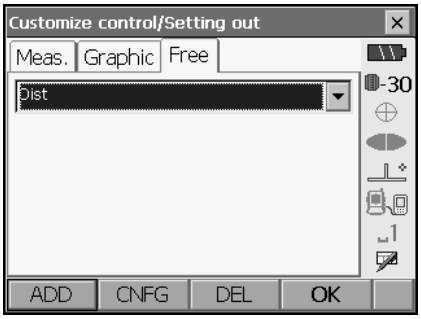


2. Press **[ADD]** to add a control drop-down list.
   • Press **[DEL]** to delete the selected control.

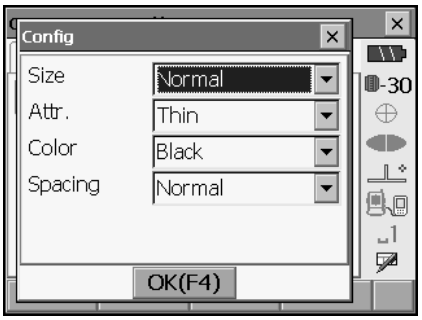


• Controls, once deleted, cannot be retrieved.

3. Select a screen control from the list.



4. Press **[CNFG]** to set the size, thickness, color and spacing of the font.



5. Repeat steps 2 to 4 to customize more screen controls.

6. Press **[OK]** to finish customizing screen controls. The modifications are stored in memory and <Customize> is displayed. The modifications are reflected in the relevant screens.

21.6 Allocating Key Functions

It is possible to allocate the softkeys in Meas mode to suit the measurement conditions. It is possible to operate the SRX efficiently because unique softkey allocations can be preset to suit various applications and the ways that different operators handle the instrument.

- The current softkey allocations are retained until they are revised again, even when the power is cut off.
- Press **[CLEAR]** in <Customize/Select screen> to return all customized configurations to their previous settings.

- When softkey allocations are recorded and registered, the previously recorded key settings are cleared.

● **The following are the softkey allocations when the SRX was shipped.**

(SHV and SHVdist tabs of <Basic measurement>)
Page 1 **[AT On] [MOTOR] [0SET] [DIST]**
Page 2 **[SRCH] [EDM] [H.ANG] [COORD]**
Page 3 **[OFFSET] [RESEC] [REM] [S-O]**

(Meas. tab of <Setting out>)
Page 1 **[AT On] [/shvR] [H.ROTA] [DIST]**
Page 2 **[CNFG] [---] [---] [---]**
Page 3 **[---] [---] [---] [---]**

(SHV and NEZ tabs of <Set out Coords>)
Page 1 **[OK] [AT On] [H.ROTA] [DIST]**
Page 2 **[---] [---] [---] [---]**
Page 3 **[---] [---] [---] [---]**

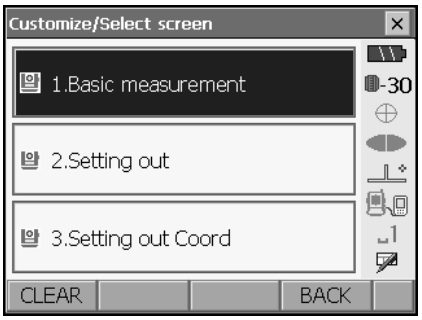
● **The following functions can be allocated to the softkeys.**

[---] : No functions set
[DIST] : Distance and angle measurement
[H.ROTA] : Rotate SRX to the entered horizontal angle
[CNFG] : Set motor drive operation functions (search accuracy, search offset, A.T. setting, search method, search area)
[/SHV] : Switches Distance input mode between slope distance (S)/horizontal distance (H)/ height difference (V). The capitalized letter in the softkey indicates the currently selected mode.)
[/SHVR] : Switches Distance input mode between slope distance (S)/horizontal distance (H)/ height difference (V)/REM (R). The capitalized letter in the softkey indicates the currently selected mode.
[0SET] : Set horizontal angle to 0°
[H.ANG] : Set required horizontal angle
[R/L] : Select horizontal angle right/left. The capitalized letter in the softkey indicates the currently selected mode.

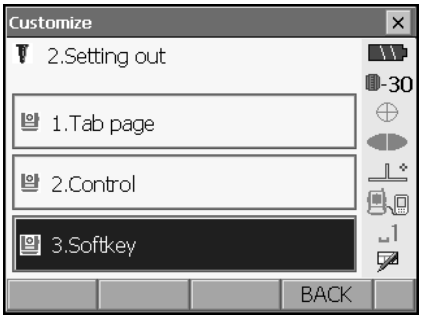
[ZA / %] : Switch between zenith angle/slope in %. The capitalized letter in the softkey indicates the currently selected mode.
[HOLD] : Hold horizontal angle/release horizontal angle
[RCL] : Display final measurement data
[HV out] : Output angle measurement results to an external device
[HVD out] : Output distance and angle measurement results to an external device
[ft/M] : Switch distance units between meters/feet
[HT] : Set the instrument station height and target height
[AIM] : Return signal
[TILT] : Display tilt angle
[MOTOR] : SETTINGS mode Motor tab
[TURN] : Rotates SRX 180°
[SRCH] : Automatically sights the center of the target
[RC] : Rotate in the direction specified by the On-demand Remote Control system
[<-RC] : Rotate in a counterclockwise direction (from the point of view of the RC Controller)
[RC->] : Rotate in a clockwise direction (from the point of view of the RC Controller)
[RC Cont] : Nullify the current measurement position and continue Turning operation
[JOG] : Fine rotation around vertical and horizontal axes
[AT On] : Start Auto Tracking
[EDM] : EDM settings
[MENU] : Display <Menu> (coordinate measurement, setting out measurement, offset measurement, REM measurement, missing line measurement, Resection, area calculation)
[COORD] : Coordinates measurement
[S-O] : Setting-out measurement
[OFFSET] : Offset measurement
[A-OFS] : Angle offset menu
[D-OFS] : Distance offset menu
[2D-OFS] : Offset/2D menu
[MLM] : Missing line measurement
[REM] : REM measurement
[RESEC] : Resection measurement
[AREA] : Surface area measurement

PROCEDURE Allocating a softkey

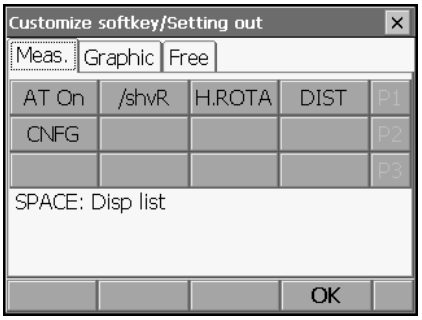
1. Select "Customize" to display <Customize/Select screen>.
   Select the measurement mode in which you want to allocate a softkey.



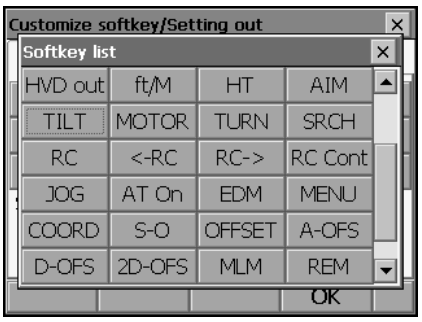
Select "Softkey".



2. Select the desired tab. All softkeys currently allocated to each page of that tab are displayed.



3. Select the softkey whose allocation you want to change. Tapping a softkey, or pressing **{SPACE}** when the cursor is aligned with a softkey, will display <Softkey list>.

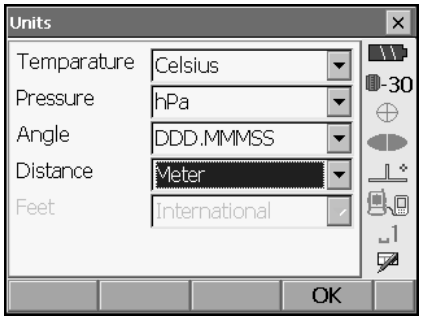


4. Select the desired softkey from <Softkey list> to allocate to the position specified in step 3.

5. Repeat steps 2 to 3 to perform further key allocations.

6. Press **[OK]** to finish allocating keys. The allocated keys are stored in memory and <Customize> is displayed. The newly allocated keys appear in the relevant measurement screen.

21.7 Units

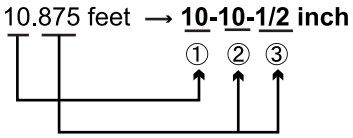


Items set and options (*: Factory setting)

Temperature:	Celsius*/Farenht
Pressure:	hPa/mmHg/InchHg
Angle:	Degree (DDD.MMMSS)*/Gon/Mil
Distance:	Meter*/Feet/Inch
Feet (only displayed when "Feet" or "Inch" selected above):	International*/US

Inch (Fraction of an inch)

"Fraction of an inch" is the unit used in the United States and expressed like the following example.



① **10**.000 feet
② 0.875 feet x 12=**10**.5 inch
③ 0.5 inch=**1/2** inch

- Even if "inch" is selected in this setting, all the data including the result of area calculation are output in "feet" and all the distance values must be input in "feet". In addition, when the "inch" display exceeds the range, it is displayed in "feet".

21.8 Changing Password

Setting a password allows you to protect important information such as measurement data and e-mail addresses.
No password was set when the SRX was shipped. When setting a password for the first time, leave the "Old password" box blank.
When a password has been set, the password screen will appear when the SRX is powered ON. Input the password to continue.

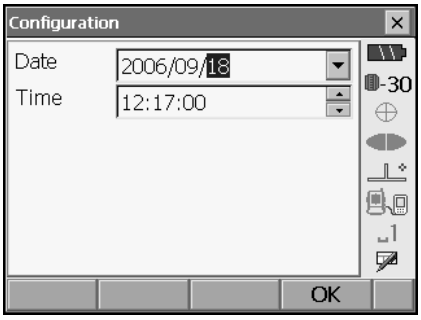
Items set

Old password:	Input current password
New password:	Input the new password
New password again:	Input the new password again

- Password can be up to 16 characters in length. Input characters will be displayed as asterisks.
- To deactivate the password function, perform the new password setting procedure but enter a "space" in the "New password" box.
- The password function will not be canceled when a cold boot is performed.

Note
- An e-mail address is necessary when using the Series SRX SFX Dial-Up Program.t

21.9 Date and Time



Items set

Date:	Manually input date or select from the drop-down calendar. Pressing **{SPACE}** will increment the selected section by 1.
Time:	Manually input time or set using **[▲]/[▼]**.

Date and Time
The SRX includes a clock/calendar function.

21.10 Restoring Default Settings

Perform a cold boot to return all items to factory settings. A cold boot will not erase surveying data in Program mode (SDR). However, if the data in the memory is important, **BE SURE TO TRANSFER IT TO A PERSONAL COMPUTER BEFORE PERFORMING A COLD BOOT.**

To perform a cold boot, while holding **{F3}, {F1},** and **{BACKSPACE}**, press **{ ⏻ }** . The following message appears.

"All Data, Settings will be cleared. Are you sure?"

Press **[YES]** to continue. Press **{ESC}** to cancel.

After **[YES]** is pressed the instrument powers ON as normal.

•The password function will not be canceled.

22.WARNING AND ERROR MESSAGES

The following is a list of the error messages displayed by the SRX and the meaning of each message. If the same error message is repeated or if any message not shown below appears, the instrument has malfunctioned. Contact your Sokkia agent.

Backup battery dead. Clock display may no longer be correct.
The voltage supplied by the lithium battery either declines or is completely discharged. Ask your Sokkia agent to replace the battery for you.

Bad condition
The air is shimmering a lot, etc., measuring conditions are poor.

The center of the target cannot be sighted.
Resight the target.

Unsuitable distance measurement conditions when reflectorless measurement is set. When reflectorless measurement is set, distance cannot be measured because the laser beam is striking at least two surfaces at the same time.
Choose a single surface target for distance measurement.
☞ Precautions for setting prism: ""11. TARGET SIGHTING""

Calculation error
During resection measurement the same point is registered multiple times. Set another known point so that the known point coordinates do not coincide.

During surface area calculation, conditions necessary for calculations are not met. Check conditions and try again.

Cannot changing TS <==> SDR!!
Cannot switch to Program mode (SDR).
Perform a warm boot then power ON as normal. If this error message appears frequently, contact your Sokkia agent.

Device list is full !!
No more Bluetooth devices can currently be registered. Delete unnecessary devices from the list and try again.

Error: Read Build Info.
Error: Read sysflg
Error: Self check
Press **[OK]** to cancel the message. If this error message appears frequently, contact your Sokkia agent.

Incorrect password.
Input password does not match set password. Input correct password.

Input device name !!
Bluetooth device name not input. Input device name and complete device registration.

Input over 3 letters !

The input password consists of less than 3 characters. Input a password at least 3 characters in length.

Job data is not developed. Or job may have broken.

Program mode (SDR) JOB data lost or cannot be read in. Create JOB data again.

Motor error EXXX

A problem has occurred with the motor drive and operation stops.
Power the SRX OFF then ON to correct the problem.
If this error message appears frequently, contact your Sokkia agent.

Need base pt. obs

During REM measurement, the observation of the target was not completed normally.
Reset and sight the prism and perform measurement again.

Need 1st obs

During missing line measurement, the observation of the starting position was not completed normally.
Sight the starting position accurately and press **[OBS]** to perform the measurement again.

New password Diff.

During new password setting, the passwords input twice are different. Input new password twice correctly.

No data

When searching for or reading in coordinate data or searching for code data, the search stopped either because the item in question does not exist or the data volume is large.

No solution

The calculation of the instrument station coordinates during resection does not converge.
Access the results and if necessary, perform the observations again.

Not exist point

When reading in coordinate values during instrument station registration etc., there is no coordinates data registered in the memory and in the selected JOB. Register coordinate data first.

Out of range

During gradient % display, the display range (less than ± 1000%) has been exceeded.
During REM measurement, either the vertical angle has exceeded horizontal ±89° or the measured distance is greater than 9999.999m.
Install the instrument station far from the target.

The instrument station coordinates calculated during resection are too high.
Perform the observation again.

During area calculation, results exceeded the display range.

Reflectorless not supported !!

Automatic sighting cannot be performed with in reflectorless mode.
Use the prism to carry out automatic sighting.

Remote Control communication err !!

Communication between the On-demand Remote Control system RC controller and the SRX failed. Check the status (communications setup, power supply, cable connections etc.) of the RC controller, wireless modem and cables.

Sheet not supported !!

Automatic sighting cannot be performed with the sheet.
Use the prism to carry out automatic sighting.

Signal off

The reflected light is not observed when distance measurement begins. Or, during measurement, the reflected light has weakened or is blocked.
Either sight the target again or, when using a reflective prism, increase the number of reflective prisms.

Target not found !!

The prism cannot be found within the automatic sighting range.
Reset and sight the prism and perform measurement again.

Temp Rnge OUT

SRX is outside useable temperature range and accurate measurement cannot be performed.
Repeat measurement within the appropriate temperature range.

Tilt over range !!

The tilt angle exceeds the tilt angle compensation range of the sensor.
Sight again within ±3'.

Time out !!

Measurement is not carried out in the allotted time.
Reset and sight the prism and perform measurement again.

When designating the angle of rotation or automatically sighting the prism, there is a problem with the positioning of the prism or the operation of the instrument and measurement is not obtained within the fixed time.
Check the positioning of the instrument and prism and perform measurement again.
If observation is still not possible, sight the target manually.

When the telescope turns to zenith/nadir, it is not possible to search !!

The SRX cannot perform a search during Auto Pointing or Auto Tracking when the telescope is directed to the zenith or nadir angle. Check the telescope position and perform the operation again.

23.CHECKS AND ADJUSTMENTS

SRX is a precision instrument that requires fine adjustments. It must be inspected and adjusted before use so that it always performs accurate measurements.

- Always perform checking and adjustment in the proper sequence beginning from "23.1 Plate Level" to "23.8 Additive Distance Constant".
- In addition, the instrument should be inspected with special care after it has been stored a long time, transported, or when it may have been damaged by a strong shock.

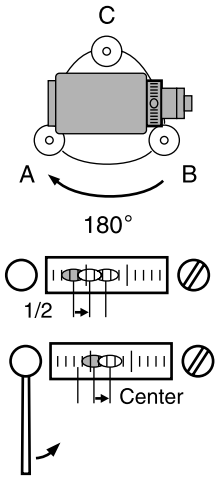
23.1 Plate Level

The bubble tube is made of glass, so it is sensitive to temperature changes or to shock. Check and adjust it as outlined below.

PROCEDURE Checking and adjusting

1. Level the instrument and check the position of the bubble of the plate level.
   ☞"9.2 Levelling", steps 3 to 5

2. Turn the upper part of the SRX through 180° and check the bubble position.
   If the bubble is still centered, no adjustment is necessary.
   If the bubble is off-center, adjust as follows.



3. Correct half of the bubble displacement using levelling foot screw C.

4. Correct the remaining half of the displacement by using the adjustment pin to rotate the plate level adjustment screw.
   When the plate level adjustment screw is turned in the counterclockwise direction, the bubble moves in the same direction.

5. Rotate the top of the instrument and continue adjustments until the bubble remains centered for any position of the upper part.
   If the bubble does not move to the center even when the adjustment has been repeated, ask your Sokkia agent to adjust it.

23.2 Circular Level

Check and adjust it as outlined below.

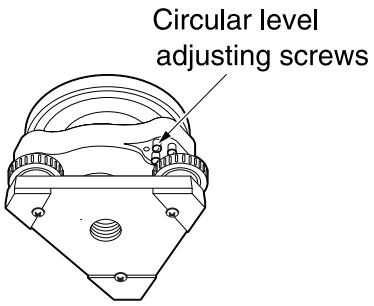
- Be careful that the tightening tension is identical for all the adjusting screws.
- Also, do not over-tighten the adjusting screws as this may damage the circular level.

PROCEDURE Checking and adjusting

1. Perform the plate level inspection and adjustment or carefully use the plate level to level the instrument.
   ☞ "9.2 Levelling", steps 1 to 2

2. Check the position of the bubble of the circular level.
   If the bubble is not off-center, no adjustment is necessary.
   If the bubble is off-center, perform the following adjustment.

3. First confirm the off-center direction.
   Use the adjusting pin to loosen the circular level adjustment screw on the side opposite to the direction the bubble is displaced to move the bubble to the center.



4. Adjust the adjusting screws until the tightening tension of the three screws is the same to align the bubble in the middle of the circle.

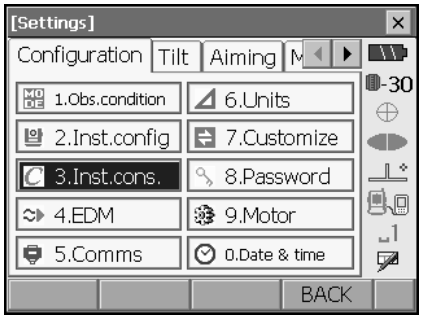
23.3 Tilt Sensor

If the tilt angle shown on the display shifts from tilt angle 0° (zero point), the instrument is not correctly levelled. This will adversely affect angle measurement.
Perform the following procedure to cancel the tilt zero point error.

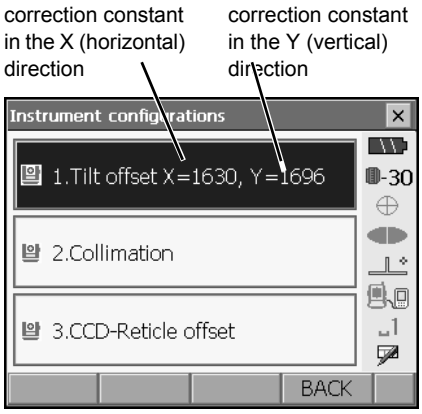
PROCEDURE Checking and adjusting

1. Carefully level the SRX. If necessary, repeat the procedures to check and adjust the bubble levels.

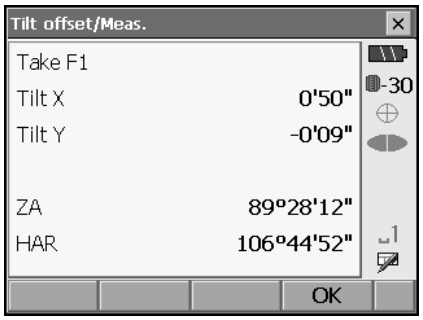
2. Select "Inst. cons." in <Configuration>



3. Select "Tilt offset".



4. Wait a few seconds for the display to stabilize, then read the current tilt angle in the X (sighting) direction and Y (horizontal axis) direction.

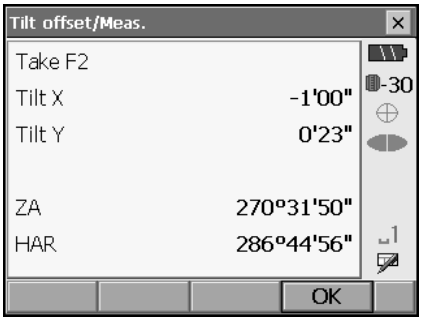


5. Press **[OK]**. The top of the instrument and telescope automatically rotate 180° and the horizontal angle is set to 0°.

6. Wait a few seconds for the screen to stabilize, then read the automatically compensated angles X2 and Y2.

7. In this state, calculate the following offset values (tilt zero point error).
   Xoffset = (X1+X2)/2
   Yoffset = (Y1+Y2)/2

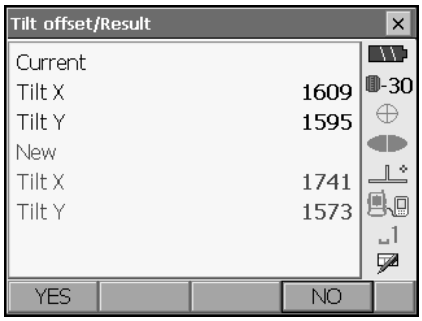
   If one of the offset values (Xoffset, Yoffset) exceeds ±10", adjust the value using the following procedure.
   When the offset value falls within the range ±10", adjustment is not necessary.
   Press **{ESC}** to return to <Instr. const>.



8. Press **[OK]** to automatically rotate the top of the instrument and telescope through 180°.

9. Confirm that the values are in the adjustment range.
   If both correction constants are within the range 1600 ±120, select **[YES]** to renew the correction angle. <Instrument configurations> is restored. Continue to step 11.
   If the values exceed the adjustment range, select **[NO]** to cancel the adjustment and restore <Instrument configurations>. Contact your Sokkia agent to perform the adjustment.

Results for target point



Results for offset point

PROCEDURE Recheck

10. Select "Tilt offset".

11. Wait a few seconds for the display to stabilize, then read the automatically compensated angles X3 and Y3.

12. Press **[OK]** to automatically rotate the top of the instrument and telescope through 180°.

13. Wait a few seconds for the display to stabilize, then read the automatically compensated angles X4 and Y4.

14. In this state, the following offset values (tilt zero point error) are calculated.
    Xoffset = (X3+X4)/2
    Yoffset = (Y3+Y4)/2
    When both offset values fall within the range ±10", adjustment is completed.
    Press **{ESC}** to return to <Instr. const>.

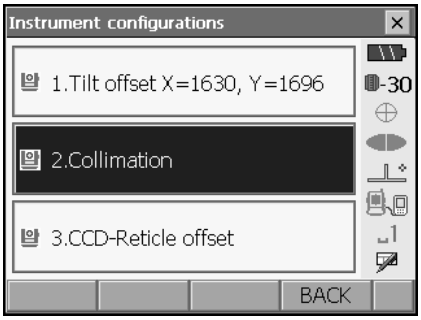
    If one of the offset values (Xoffset, Yoffset) exceeds ±10", repeat the check and adjustment procedures from the beginning. If the difference continues to exceed ±10" after repeating the check 2 or 3 times, have your Sokkia agent perform the adjustment.

23.4 Collimation

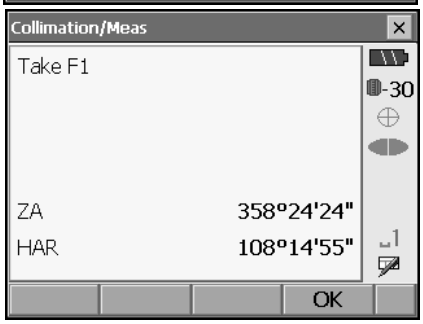
With this option you can measure collimation error in your instrument so that the SRX can correct subsequent single face observations. To measure the error, make angular observations using both faces.

PROCEDURE

1. Select "Inst. cons." in <Configuration>.
2. Select "Collimation".

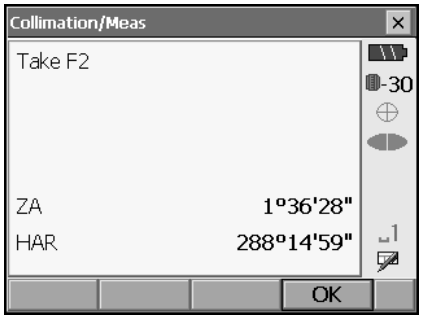


3. Sight the reference point in Face 1 and press **[OK]**. Telescope rotates and vertical circle is indexed.



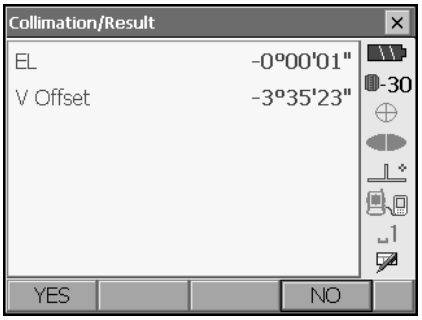
- Do not look through the telescope eyepiece while the motor drive is in operation. An eye could be struck by the telescope and cause injury.

4. Sight the reference point in Face 2 and press **[OK]**.



5. Press **[YES]** to set the constant.

   • Press **[NO]** to discard the data and return to <Instrument configurations>.



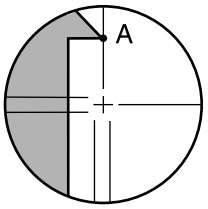
23.5 Reticle

With this option you can check the perpendicularity of the reticle and the horizontal/vertical positions of reticle lines.

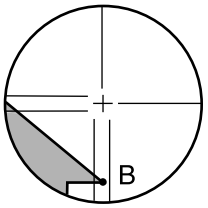
- Check the telescope reticle by manually sighting the target.

PROCEDURE Check 1: Perpendicularity of the reticle to the horizontal axis

1. Carefully level the instrument.
2. Align a clearly visible target (the edge of a roof for example) on point A of the reticle line.



3. Use the jogging knobs to align the target to point B on a vertical line.
   If the target moves parallel to the vertical line, adjustment is unnecessary. If its movement deviates from the vertical line, have your Sokkia service representative adjust it.



PROCEDURE Check 2: Vertical and horizontal reticle line positions

1. Carefully level the instrument.
2. Install a target at a point about 100m in the horizontal direction from the SRX.

3. While the Meas mode screen is displayed and the telescope is in face left, sight the center of the target and read out the horizontal angle A1 and the vertical angle B1.
   Example:
   Horizontal angle A1 = 18° 34' 00"
   Vertical angle B1 = 90° 30' 20"

4. While the telescope is in face right, sight the center of the target and read out the horizontal angle A2 and the vertical angle B2.
   Example:
   Horizontal angle A2 = 198° 34' 20"
   Vertical angle B2 = 269° 30' 00"

5. Do the calculations: A2-A1 and B2+B1
   If A2-A1 is within 180°±20″and B2(B1 is within 360°±20″, adjustment is unnecessary.
   Example:A2-A1 (Horizontal angle)
   =198° 34' 20"- 18° 34' 00"
   =180° 00' 20"
   B2-B1 (Vertical angle)
   =269° 30' 00" + 90° 30' 20"
   =360° 00' 20"
   If the difference is large even after repeating the check 2 or 3 times, have your Sokkia service representative perform the adjustment.

23.6 CCD reticle

The internal CCD sensor is used for automatic sighting. The offset value is set to correct the position of the CCD sensor in relation to the telescope reticle, but if for whatever reason the telescope reticle and CCD camera become misaligned, automatic sighting of the center of the prism cannot be performed correctly. Check and adjust it as outlined below.

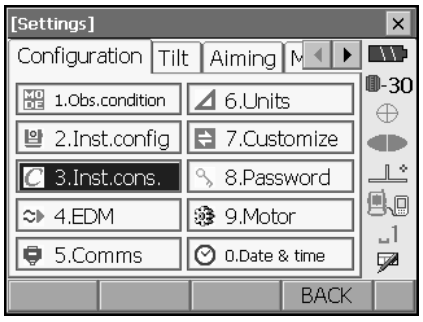
- Perform check and adjustment in weak sunlight and no scintillation.
- It may take up to 20 seconds for an offset value based on the measurement results to appear .

PROCEDURE Checks and adjustments

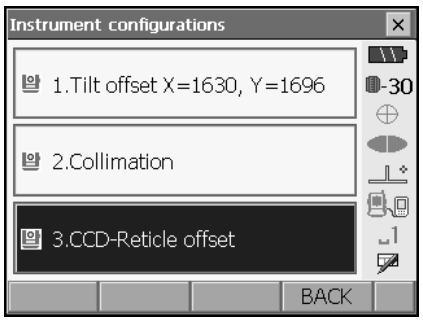
1. Carefully level the instrument.

2. Position the prism in a horizontal direction approximately 50 meters from the SRX.

3. Select "Inst.cons." in <Configuration>.



4. Select "CCD-Reticle offset".

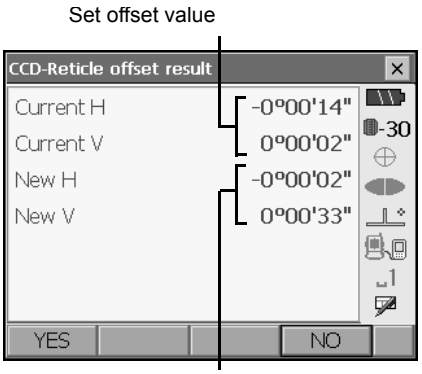


5. Use manual sighting to accurately sight the target.
   ☞"11.3 Manually Sighting the Target"

6. Press **[OK]**.
   Press **[STOP]** to stop the measurement.

7. Offset value (H, V) is obtained from the set offset value (H, V) and the measurement results. The offset value is a constant value that indicates the number of degrees of misalignment between the center of the telescope reticle and the center of the CCD sensor. If the offset value obtained from the measurement result is significantly larger than the set offset value, press **[ESC]** and resight the target.
   If the offset value (H, V) obtained from the measurement results continues to be significantly large after repeated checks, adjustment is necessary. Go to step 8.

   If one of the offset values exceeds the range, an error message appears on the screen. Contact your Sokkia agent to perform the adjustment.



8. Press **[OK]** to renew the offset value.

   • Press **[INIT]** to return to the default settings.

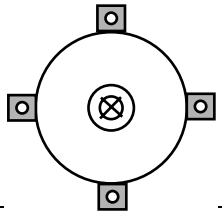
23.7 Optical Plummet

- Be careful that the tightening tension is identical for all the adjusting screws.
- Also, do not over-tighten the adjusting screws as this may damage the circular level.

PROCEDURE Checking

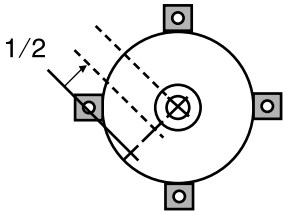
1. Carefully level the SRX and center a surveying point precisely in the reticle of the optical plummet.

2. Turn the upper part through 180° and check the position of the surveying point in the reticle.
   If the surveying point is still centered, no adjustment is necessary.
   If the surveying point is no longer centered in the optical plummet, perform the following adjustment.



PROCEDURE Adjustment

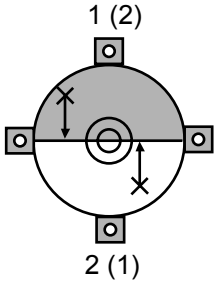
3. Correct half the deviation with the levelling foot screw.

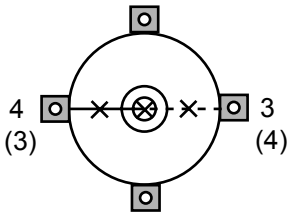


4. Remove the optical plummet reticle cover.

5. Use the 4 adjusting screws of the optical plummet to adjust the remaining half of the deviation as shown below.
   When the surveying point is on the lower (upper) part of the illustration:
   Loosen the upper (lower) adjusting screw slightly, and tighten the upper (lower) adjusting screw the same amount to move the surveying point to a point directly under the center of the optical plummet.
   (It will move to the line in the figure on the right.)

   If the surveying point is on the solid line (dotted line):
   Loosen the right (left) adjusting screw slightly and, tighten the left (right) adjusting screw by the same amount to move the surveying point to a point in the center of the optical plummet.





6. Check to make sure that the surveying point remains centered on the reticle even if the upper part of the instrument is rotated.
   If necessary, perform the adjustment again.

7. Replace the optical plummet reticle cover.

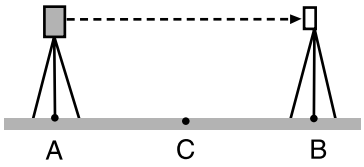
23.8 Additive Distance Constant

The additive distance constant K of the SRX is adjusted to 0 before delivery. Although it almost never deviates, use a baseline with a known distance precision to check that the additive distance constant K is close to 0 several times a year and whenever the values measured by the instrument begin to deviate by a consistent amount. Perform these checks as follows.

- Errors in setting up the instrument and reflective prism or in sighting the target will influence the additive distance constant. Be extremely careful to prevent such errors when performing these procedures.
- Set up so that the instrument height and the target height are identical. If a flat place is not available, use an automatic level to make sure the heights are identical.

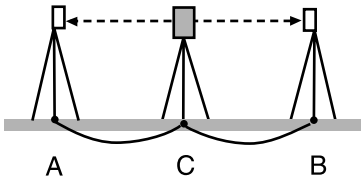
PROCEDURE Check

1. Find an area of flat ground where two points 100m apart can be selected.
   Set up the Instrument at point A and the reflective prism at point B. Establish a point C half way between points A and B.



2. Precisely measure the horizontal distance between point A and point B 10 times and calculate the average value.

3. Place the SRX at point C directly between points A and B and set up the reflective prism at point A.



4. Precisely measure the horizontal distances CA and CB 10 times each and calculate the average value for each distance.

5. Calculate the additive distance constant K as follows.
   K = AB - (CA+CB)

6. Repeat steps 1 to 5 two or three times.
   If the additive distance constant K is within ±3mm even once, adjustment is unnecessary.
   If it always exceeds this range, have your Sokkia service representative perform an adjustment.

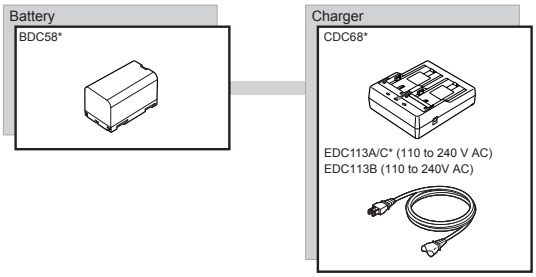
24.POWER SUPPLY SYSTEM

Operate your SRX with the following combinations of power equipment.

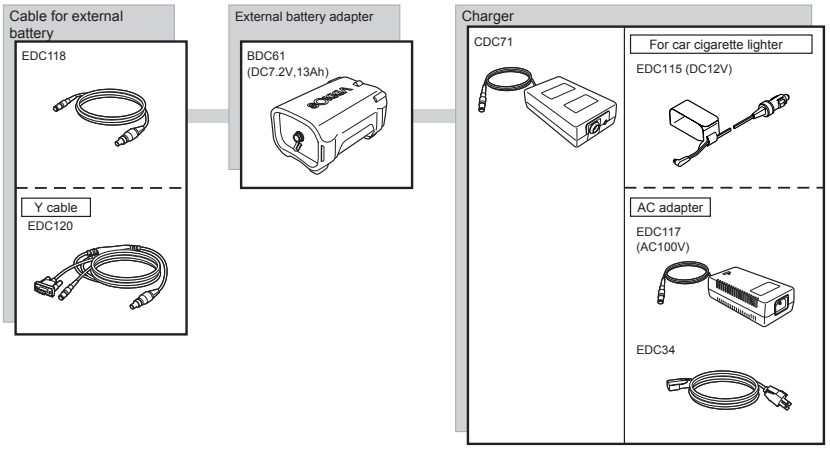
- When using BDC60/61 and EDC117, mount the BDC58 in place to maintain the balance of the instrument.
- Never use any combination other than those indicated below. If you do, the SRX could be damaged.

Those indicated by * are standard accessories. Others are optional accessories (sold separately).

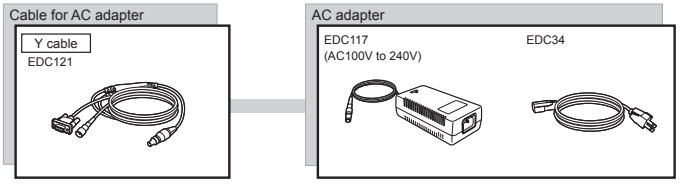
●Battery



●External battery



●AC adapter



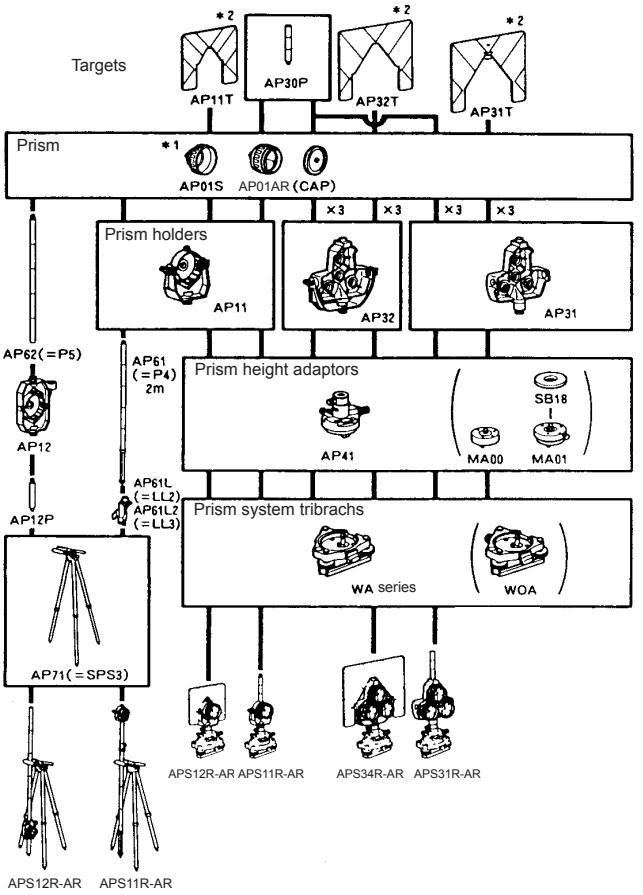
By using the Y cable the SRX can perform RS-232C communication (D-sub 9-pin) at the same time as connecting to an external power source.

25.TARGET SYSTEM

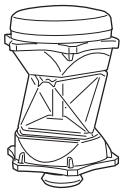
The following are all special accessories (sold separately).

- Because all Sokkia reflecting prisms and accessories have standardized screws, it is possible to combine these prisms, accessories, etc. according to your objectives.
- Because these targets (*2) are coated with fluorescent paint, they reflect when there is little light.

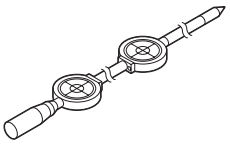
- When using a reflecting prism equipped with a target for distance and angle measurements, be sure to direct the reflective prism correctly and sight the center of the prism target accurately.
- Each reflective prism (*1) has its own prism constant value. When changing prisms, be sure to change the prism constant correction value.
- To use the triple prism assembly AP31 or AP32 as a single prism for short distance measurements, mount the single reflective prism AP01AR in the center mounting hole of the prism holder.



● **360° Prism (ATP1)**
This column-shaped prism reduces the possibility of "losing" the prism during Auto Tracking measurement.



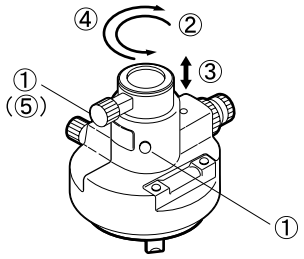
2-point target (2RT500-K)
This target is used for two-distance offset measurement.
Prism constant: 0



● **Instrument height adaptor (AP41)**
This device is used to adjust the height of the target.

- The height of the AP41 instrument height adaptor can be adjusted using two fixing screws. When used with the SRX, make sure that the instrument height "245" (mm) is displayed in the instrument height adjustment window.

- Loosen the screws ① and rotate SRX counterclockwise ②.
  Move the part ③ up or down until the desired instrument height is displayed in the adjustment window ③, then rotate SRX clockwise and tighten the screws ⑤.

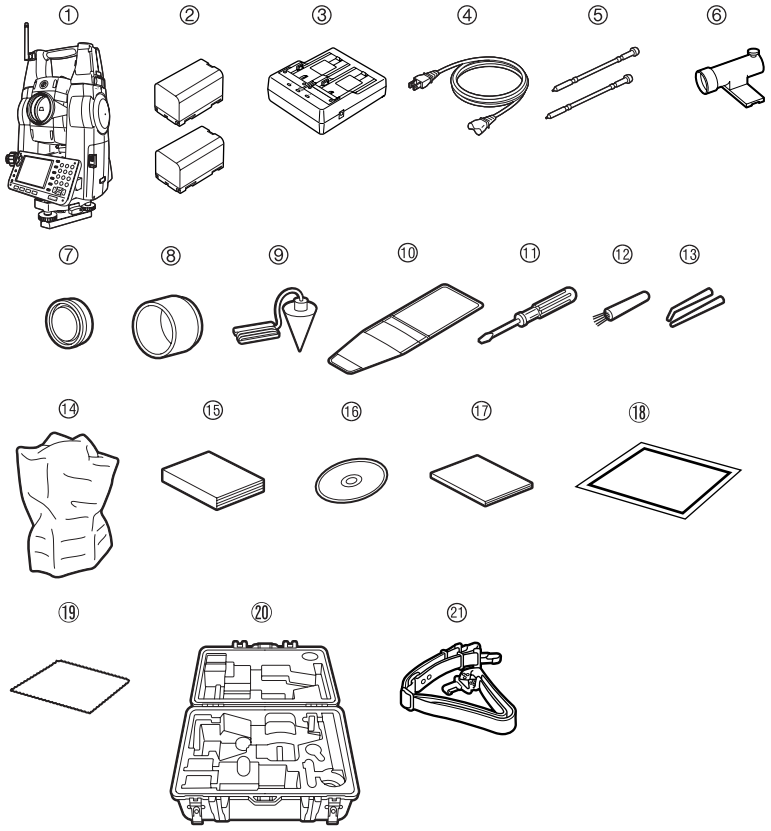


- Adjust the level of the AP41 instrument height adaptor following the checking and adjustment methods of plate level.
☞"23.1 Plate Level"

- Adjust the optical plummet of the AP41 instrument height adaptor following the checking and adjustment methods of optical plummet.
- ☞"23.7 Optical Plummet"

26.STANDARD EQUIPMENT

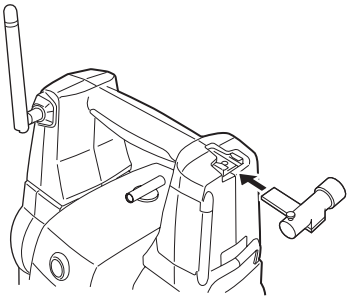
Please verify that all equipment is included.



1	SRX main unit	13	Adjusting pin
2	Battery (BDC58)	14	Cleaning cloth
3	Battery charger (CDC68)	15	Vinyl cover
4	Power cable (EDC113)	16	Operator's manual
5	Stylus pen	17	CD-ROM (Series SRX SDR Software Reference Manual, SFX Dial-Up Program Explanations, Quick Manual)
6	Tubular compass (CP9)	18	Quick Manual
7	Lens cap	19	Laser caution sign-board
8	Lens hood	20	Carrying case (SC219)
9	Plumb bob	21	Carrying strap
10	Tool pouch		
11	Screwdriver		
12	Lens brush		

● **Tubular compass (CP9)**

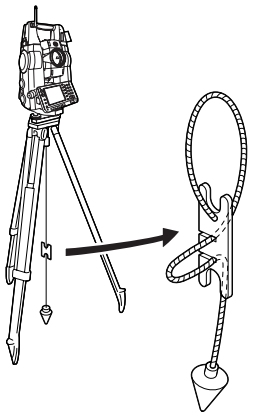
Slide the tubular compass into the tubular compass slot, loosen the clamp screw, then rotate the top part of the instrument until the compass needle bisects the index lines. The telescope's face 1 sighting direction in this position will indicate magnetic north. After use, tighten the clamp and remove the compass from the slot.



- The tubular compass is susceptible to the influence of nearby magnets or metal. Such influence could cause it to fail to accurately indicate magnetic north. Do not use magnetic north as indicated by this compass for base line surveying.

● **Plumb bob**

The plumb bob can be used to set up and center the instrument on days when there is little wind. To use the plumb bob, unwind its cord, pass it through the cord grip piece as shown in the figure to adjust its length, then suspend it from the hook attached to the centering screw.



27.OPTIONAL ACCESSORIES

The following are optional accessories which are sold separately from the SRX.

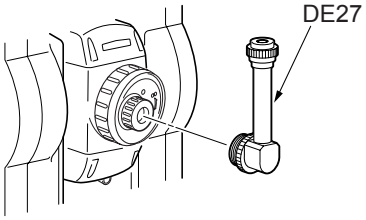
☞ Power supply and target optional accessories: "24. POWER SUPPLY SYSTEM", "25. TARGET SYSTEM".

● **Telescope eyepiece lens (EL7)**

Magnification: 40X
Field of view: 1° 20'

● **Diagonal eyepiece (DE27)**

The diagonal eyepiece is convenient for observations near the nadir and in narrow spaces.
Magnification: 30X



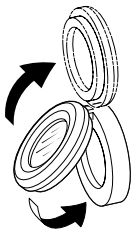
After removing the handle from the SRX loosen the attachment screw to remove the telescope eyepiece. Then screw the diagonal lens into place.

☞ Handle removal method: "4.2 Parts of the Instrument Removing the handle (RC-TS3)"

- Do not perform automatic vertical rotation of the telescope when using the diagonal eyepiece. The diagonal eyepiece may strike the SRX causing damage.

● **Solar filter (OF3A)**

When sighting targets where glare is present, solar observations for example, attach it to the objective lens of the SRX to protect its interior and the eyes of its operator. The filter part can be flipped up without being removed.



- Do not perform automatic vertical rotation of the telescope when using the solar filter. The solar filter may strike the SRX causing damage.

● **Interface cable**

Connect between the SRX and the host computer in combination with EDC120+DOC128.

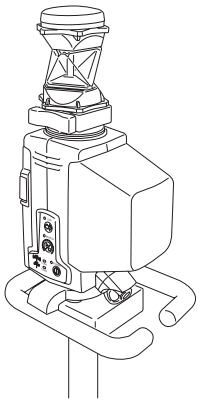
Computer	Cable	Notes
IBM PC/AT or compatible	DOC26	Length : 2m Pin number and signal level : RS-232C compatible

DOS/V	DOC 27	D-Sub connector: DOC 26 DOC 27	: :	 25 pins (female) 9 pins (male)
Other computers	DOC1	No connector for attachment to a computer		

● **On-demand Remote Control System (RC-PR3)**

This system points the SRX in the direction of the prism with speed and precision.

☞ On-demand Remote Control System Explanations



28.SPECIFICATIONS

Except where stated, the following specifications apply to all SRXs.

Telescope

Length:	173mm
Aperture:	45mm (EDM/Auto Tracking:48mm)
Magnification	30X
Image:	Erect
Resolving power	2.5"
Field of view	1°30' (26m/1,000m)
Minimum focus:	1.3m
Focussing screw:	1 speed
Reticle illumination:	5 brightness levels

Angle measurement

Horizontal and Vertical circles type:		
	Photoelectronical absolute encoder scanning	
IACS (Independent Angle Calibration System)		
	SRX1/SRX2 only	
Vertical axis	single	
Angle units:	Degree/Gon/Mil (selectable)	
Minimum display:	SRX1/SRX2:	0.5"/1" (selectable)
	SRX3:	1"/5" (selectable)
	SRX5:	5"/10" (selectable)
Display range	0°00’00" to 359°59’59.5"	
Display interval	Less than 0.3 sec (When "Minimum display" is set to 1"), less than 0.5 sec (When "Minimum display" is set to 0.5")	
Accuracy:		
	SRX1:	1"
	SRX2:	2"
	SRX3:	3"
	SRX5:	5"
	(ISO 17123-3 : 2001)	
Collimation compensation:	On/Off (selectable)	
Measuring mode:		
Horizontal angle:	Right/Left (selectable)	
Vertical angle:	Zenith/Horizontal/Horizontal ±90°/% (selectable)	
Angle measurement settings		
Horizontal angle:	0 SET, H.ANG	
Manual indexing		
Vertical circle	Yes	

Tilt angle compensation

Type:	Liquid 2-axis tilt sensor	
Range of compensation	±3	
Accuracy	SRX1:	within ±3’: 3"
	SRX2:	within ±3’: 6"
	SRX3:	within ±3’: 10"
	SRX5:	within ±3’: 10"
Automatic compensator	ON (V & H/V)/OFF (selectable)	
Compensation constant	Can be changed	

'Distance measurement

Measuring method: Coaxial phase-contrast measuring system

Signal source: Red laser diode 690nm
Class 3R
(IEC60825-1 Amd. 2: 2001/FDA CDRH 21CFR Part1040.10 and 1040.11 (Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No.50, dated July 26, 2001.))
(When the prism or reflective sheet is selected in Config mode as target, the output is equivalent to Class 1).

Measuring range: (Using Sokkia's reflective prism/reflective sheet target during normal atmospheric conditions ***1**/ ***2** is good atmospheric conditions)

Reflective sheet RS90N-K[*3]	1.3 to 500 m
360° Prism ATP1	1.3 to 1,000m
Standard prism AP01AR X 1	1.3 to 5,000 m
Standard prism AP01AR X 3	to 8,000 m (to 10,000 m)
Mini pole prism OR1PA	1.3 to 500 m
Compact prism CP01	1.3 to 2,500 m
Reflectorless (White)[*4]	0.3 to 500m
Reflectorless (Gray)[*5]	0.3 to 250m

Minimum display

Fine measurement: SRX1/SRX2: 0.0001/0.001 m (selectable)
SRX3/SRX5: 0.001 m

Rapid measurement: 0.001 m

Tracking measurement: 0.01 m

Auto Tracking measurement:
0.01 m

Maximum slope distance: 19,200.0000 m

Distance unit: m/ft/US ft/inch (selectable)

Accuracy:

(Using prism)

Fine measurement SRX1: (1.5 + 2 ppm X D) mm (however, distance is more than 4 m when using CPS12)
SRX2/SRX3/SRX5: (2 + 2ppm X D) mm

Rapid measurement (5 + 2 ppm X D) mm

(Using reflective sheet target)[*3]

Fine measurement: (3 + 2 ppm X D) mm

Rapid measurement (single) (6 + 2 ppm X D) mm

(Reflectorless (White))[*4]

Fine measurement
(3 + 2 ppm X D) mm (0.3 to 200m)
(5 + 10 ppm X D) mm (200 to 350m)
(10 + 10 ppm X D) mm (350 to 500m)

Rapid measurement (single):
(6 + 2 ppm X D) mm (0.3 to 200m)
(8 + 10 ppm X D) mm (200 to 350m)
(15 + 10 ppm X D) mm (350 to 500m)

(Reflectorless (Gray))[*5]

Fine measurement:
(3 + 2ppm X D) mm (0.3 to 100m)

(5 + 10ppm X D) mm (100 to 170m)
(10 + 10ppm X D) mm (170 to 250m)

Rapid measurement:

(6 + 2ppm X D) mm (0.3 to 100m)
(8 + 10ppm X D) mm (100 to 170m)
(15 + 10ppm X D) mm (170 to 250m)

(D: measurement distance; Unit: mm)

Measurement mode: Fine measurement (single/repeat)/Rapid measurement (single/repeat)/Tracking (selectable)

Measuring time (fastest time under good atmospheric conditions, no compensation, EDM ALC at appropriate setting, slope distance):

Fine measurement less than 1.6 sec + every 0.9 sec or less
Rapid measurement less than 1.3 sec + every 0.6 sec or less
Tracking measurement less than 1.3 sec + every 0.4 sec or less

Atmospheric correction Temperature, pressure, humidity input/ppm input (selectable):

Temperature input range:- 30 to 60°C (in 0.1°C step)
Pressure input range: 500 to 1,400 hPa (in 1hPa step)
375 to 1,050 mmHg (in 1mmHg step)
14.8 to 41.3 inchHg (in 0.1inchHg step)
Humidity input range: 0 to 100% (in 1% step)
ppm input range: -499 to 499 ppm (in 1 ppm step)

Prism constant correction: -99 to 99 mm (in 1 mm step)
0mm fixed for reflectorless measurement

Earth curvature and refraction correction:
No/Yes K=0.14/Yes K=0.20 (selectable)

Scale factor setting: 0.5 to 2.0
Sea level correction: No/Yes (selectable)

***1**: Slight haze, visibility about 20 km, sunny periods, weak scintillation.
***2**: No haze, visibility about 40 km, overcast, no scintillation.
***3**: Figures when the laser beam strikes within 30° of the reflective sheet target.
***4**: Figures when using Kodak Gray Card White side (reflection factor 90%).
***5**: Figures when using Kodak Gray Card Gray side (reflection factor 18%).

Auto Tracking / Auto Pointing

Measuring method Pulse laser transmitter and CCD detector with co-axial optics
Signal source (emittted beam)infrared laser diode (830nm)
Class 1
(IEC60825-1 Amd. 2: 2001/FDA CDRH 21 CFR Part 1040.10 and 1040.11 (Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No.50, dated July 26, 2001.))
Divergence angle: 2.1°
Viewing angle: ± 45'
Measuring range:
H: 360° (full transit)
V: Elevation angle 70°, Depression angle 40°
Maximum Auto Tracking measurement range:
360° Prism ATP1: 500m
Mini pole prism OR1PA: 400 m
Compact prism CP01: 600 m

	Standard prism AP01	800 m
Auto Tracking speed	14°/sec	
	(Prism moving at 5m/sec. at 20m distance)	
Auto Pointing measurement range:		
	360° Prism ATP1:	600m
	Mini pole prism OR1PA:	500 m
	Compact prism CP01:	700 m
	Standard prism AP01	1,000 m
	Reflective sheet*6*7 RS90N-K	50m
Minimum Auto Pointing measurement range:		
	Mini pole prism OR1PA/Compact prism CP01:	1.3 m
	Standard prism AP01/360° Prism ATP1:	2 m
	Reflective sheet*7 RS90N-K	5 m
Time to completed Auto Pointing (When prism/reflective sheet is in field-of-view)		
	Prism: less than 7 seconds	
	Reflective sheet*6*7: less than 7 seconds	
Sighting accuracy (Standard deviation (1 σ) at 100m):		
	Prism: less than 3"	
	Reflective sheet*7 RT90C-K: less than 3mm	

***6**: When using a reflective sheet for Auto Pointing, the size of sheet (10 to 90 mm) must be selected to correspond to the distance being measured

***7**: Figures when the Auto Pointing beam strikes within 30° of the reflective sheet target.

Motor

Type	DC motor drive with self-locking free rotation system
Motion range	360°(Vertical and horizontal)
Rotation speed	45°/sec (at 25°C) (Rotating time: Less than 10 sec. (when rotating 180°, tilt compensation off, at 25°C))
Fine motion	Variable speed jogging knobs
Accuracy after rotation stopped	± 5" (tilt compensation off, no vibration, wind, or influence of other external factors)
Motor lifetime	1500 hours (at 25°C)
Overcurrent detection function	Yes

Guide Light

(Slight haze, visibility about 20 km, sunny periods, weak scintillation)

Light source:	LED (red 626 nm/green 524 nm) (When SRX in Face 1 and guide light viewed from target side: left = green, right = red, center = both)
Distance:	1.3 to 150m*1
Visible range:	
	Right and Left/Upward and Downward: ± 4° (7m/100m)
Resolving power at center area (width):	
	4' (about 0.12/100m)
Brightness	3 levels (bright/normal/dim)

Memory

Type	Flash ROM
Capacity	64 Mbyte (Internal memory 1 Mbyte (minimum)

External memory

CF card (up to 1 Gbyte)
SD card (up to 1 Gbyte, requires CF adapter)
USB flash memory

Communications

Serial (RS-232C compatible)	Combined communications and power supply connector
Bit rate:	1200*/2400/4800/9600/19200/38400 (selectable)
Data bits:	8 bits
Parity:	No
Stop bit:	1 bit
Check sum	Yes/No (selectable)
Xon/Xoff	Yes/No (selectable)
USB	USB Ver. 1.1, Host (Type A), Client (Type mini B)
Card slot	Compact Flash Type II-compatible
Bluetooth wireless technology	Yes (when RC-TS3 attached)
SFX Dial-Up function	Yes
	Serial port, Bluetooth connection (when RC-TS3 attached)

Handle (RC-TS3)

On-demand Remote Control System Beam Detector

Operable range	(Slope distance when using RC-PR3)
Near mode	2[*8] to 100 m[*9] (normal atmospheric conditions[*11])
	2[*8] to 150 m[*9] (good atmospheric conditions[*12])
Far mode	2[*8] to 250 m[*10] (normal atmospheric conditions[*11])
	2[*8] to 300 m[*9] (good atmospheric conditions[*12])
Maximum detecting area (vertical angle)	
	-40° to +30° (on the basis of horizontal direction)
Optical lens protective cover	Yes

***8**: When there is almost no vertical interval between instrument height and the target height, SRX instrument height is 1.5 m, target height is 0.10 m at a horizontal distance of 1.8 m
***9** When the vertical interval between SRX and the beam emitter of RC-PR3 is no more than 20m
***10**: When the vertical interval between SRX and the beam emitter of RC-PR3 is no more than 40m
***11**: Normal atmospheric conditions: Slight haze, visibility about 20 km, sunny periods, weak scintillation.
***12**: Good atmospheric conditions: No haze, visibility about 40 km, overcast, no scintillation.

On-demand Remote Control System (when RC-TS3 attached)

Turning operation time	Less than 15 sec (until completion of rapid (single)measurement) (When using RC-PR3 and CF-P1, Turning angle 90° to RC-PR3, Auto Pointing mode set to Rapid)

Bluetooth wireless communication unit

BT Qualification ID	B03489
Transmission method:	FHSS (Bluetooth Specification Ver.1.2 compatible, TELEC-compliant)

28. SPECIFICATIONS

Bluetooth profile	SPP, DUN
Frequency band:	2,402 to 2,48GHz
Modulation:	GFSK (Gaussian frequency shift keying) 1 Mbps
Power class	Class 1
Usable range	300m (When using SWT9) (No obstacles, few vehicles or sources of radio emissions/ interference/electronic noise in the vicinity of the instrument, no rain)

Power Supply

Power source:	Rechargeable Li-ion battery BDC58 (7.2V, 4.3Ah)
External power source	Combined communications and power supply connector
Nominal voltage:	7.2 to 12V
Capacity:	25W
Working duration at 25 °C (after continuous Auto Tracking/rapid distance measurement (repeat)):	
	BDC58: about 2 hours
	BDC46A: (optional accessory): about 30 mins
	BDC60: (external battery, optional accessory): about 3.5 hours
	BDC61 (external battery, optional accessory): about 7 hours
Backup battery	Li-ion battery 3.0V (backs up clock and memory)
Lifetime:	5 years
Resume function	Yes (For up to 1 minute following power OFF)
Battery state indicator	4 levels with message function
Auto power-off:	5 levels (5/10/15/30 min/Not set) (selectable)
Remote PWR-On function	Yes (Via serial or Bluetooth connection (when RC-TS3 attached). (Bluetooth: up to 30 min only))

Software

Operating system	Windows CE Ver. 5.0
Application software	SDR Level 5

General

Keys/Display

Display dimensions:	3.5 inch (8.9 cm) with active area of 72.5mm x 49.5mm
Display:	Transflective TFT QVGA color LCD, 76,800 pixels (Horizontal X Vertical: 320 X 240)
Backlight	LED: 8 levels (selectable)
Brightness adjustment	Automatic
Touch panel	Resistance-sensitive analog type (polarizing filter + film + glass)
Keyboard	32 keys (power, edit, direct, cursor, numeric, soft function, operations, power on, light)
Key backlight	Yes
Trigger key	Yes (right side)

Sensitivity of levels

Plate level:	SRX1: 20"/2 mm SRX2/SRX3/SRX5: 30"/2 mm
Electronic level	
Graphic	3’
Digital	± 3’ 30" Brightness: same as tilt angle compensation Minimum display: same as setting for angle measurement

Circular level: 10'/2 mm

Target selection/registration

Target type selection: Prism/pinpole prism/360° Prism/reflective sheet/reflectorless
(Factory setting: prism (prism constant: -30mm, aperture: 70mm)

Target registration: Target type
Prism constant (Reflectorless: set to 0 mm)
Aperture (Not selectable for reflectorless)

Self-correction function Error message/code displayed when an error occurs

Calendar/clock function Yes

Laser-pointer function ON (Automatically switches OFF after 5 minutes)/OFF (selectable)

Laser radiation warning indicatorLCD, lit continuously while laser emitted

Dimensions/Weight

Instrument height: 236 mm from tribrach bottom

Size (with handle): 201 (W) X 220 (D) X 375 (H) mm (display on each face, RC-TS3 attached, excluding protruding sections)
201 (W) X 202 (D) X 375 (H) mm (display on face 1 only, handle attached, excluding protruding sections)

Weight (with BDC58):
Display on both sides: 7.9kg
Display on one side: 7.7kg

Tribrach: WA100A

Operating environment

Operating temperature	-20 to 50°C (no condensation)
Storage temperature range	-30 to 70°C (no condensation)
Dust and water resistance	IP64 (IEC 60529:2001)

29.REGULATIONS

Radio Frequency Interference

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful inter-ference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for uncontrolled equipment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment has very low levels of RF energy that is deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated with at least 20cm and more between the radiator and person’s body (excluding extremeties: hands, wrists, feet and ankles).

Notice for Canada
This Class A digital apparatus meets all requirements of Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la Class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

This class A digital apparatus complies with Canadian ICES-003.
Cet appareil numerique de la classe A est conforme a la norme NMB-003 du Canada.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

This equipment complies with IC radiation exposure limits set forth for uncontrolled equipment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that is deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated with at least 20cm and more between the radiator and person’s body (excluding extremeties: hands, wrists, feet and ankles).

CE Conformity Declaration

30.EXPLANATION

30.1 Manually Indexing the Vertical Circle by Face Left, Face Right Measurement

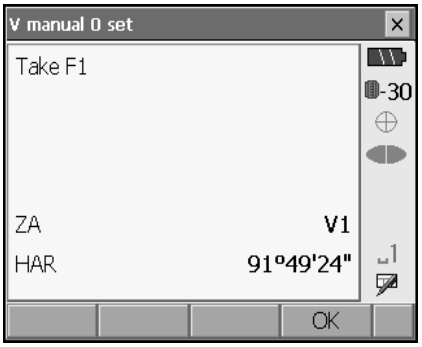
The 0 index of the vertical circle of your SRX is almost 100% accurate, but when it is necessary to perform particularly high precision angle measurements, you can eliminate any inaccuracy of the 0 index as follows.

- If the power is cut off, the vertical circle indexing is ineffective. Do it again every time the power is turned on.
- When indexing the vertical circle, sight the target manually.

PROCEDURE

1. Select “Obs.condition” in <Configuration>. Set “V manual” (vertical circle indexing method) to “Yes”.
   ☞"21.1 Observation Conditions"

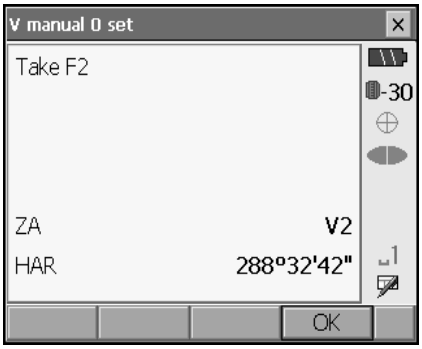
   <V manual 0 set> is displayed.



2. Carefully level the instrument.

3. Accurately sight a clear target with a distance of about 30m in the horizontal direction with the telescope in face left.
   Press **[OK]**. The SRX rotates 180°.

4. Accurately sight the same target and press **[OK]** to rotate the SRX 180°. The vertical angle is displayed.
   This concludes the vertical circle indexing procedure.



30.2 Atmospheric Correction for High Precision Distance Measurement

- Need for atmospheric correction

  The SRX measures the distance with a beam of light, but the velocity of this light varies according to the index of refraction of light in the atmosphere. This index of refraction varies according to the temperature and pressure. Near normal temperature and pressure conditions:

  With constant pressure, a temperature change of 1°: an index change of 1 ppm.

  With constant temperature, a pressure change of 3.6 hPa: an index change of 1 ppm.

  To perform high accuracy measurements, it is necessary to find the atmospheric correction factor from even more accurate temperature and pressure measurements and perform an atmospheric correction.

  Sokkia recommends that extremely precise instruments be used to monitor the air temperature and pressure.

- Finding the average temperature and pressure between two points in different atmospheric conditions

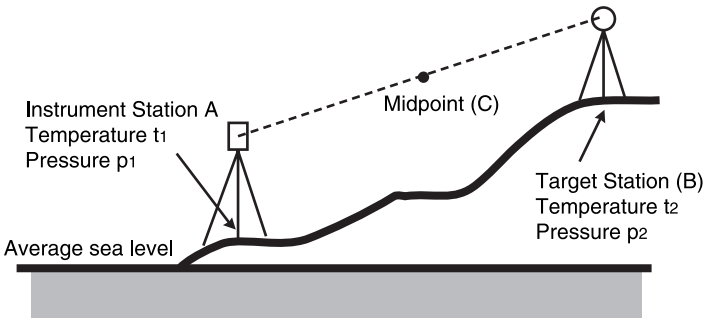
  To precisely determine the atmospheric correction factor, the average temperature and air pressure along the measurement beam route must be taken.

  Determine the temperature and pressure as follows.

Flat terrain	:Use the temperature and pressure at the midpoint of the line.
Mountainous terrain	:Use the temperature and pressure at the intermediate point (C).

  If it is not possible to measure the temperature and pressure at the midpoint, take the temperature and pressure at the instrument station (A) and the target station (B), then calculate the average value.

Average air temperature	:(t1 + t2)/2
Average air pressure	:(p1 + p2)/2



- Calculation of atmospheric correction factor allowing for humidity

The humidity has little influence, particularly on short distance measurements. The effect of humidity should be considered in cases where it is very hot and humid and high precision measurements are to be performed over a particularly long distance.

When taking humidity into consideration, enter the atmospheric correction factor calculated using the following formula.

Atmospheric Correction Factor (ppm) =

$$\left(282.324 - \frac{0.294362 \times p}{1 + 0.003661 \times t} + \frac{0.04127 \times e}{1 + 0.003661 \times t}\right) \times 10^{-6}$$

e (water vapor pressure) can be calculated using the following formula.

$$e = h \times \frac{ew}{100}$$

$$ew = 6.11 \times 10^{\frac{(7.5 \times t)}{(t + 237.3)}}$$

t : Air temperature (°C)
p : Pressure (hPa)
e : Water vapor pressure (hPa)
h : Relative humidity (%)
ew: Saturated water vapor pressure

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MEMO

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