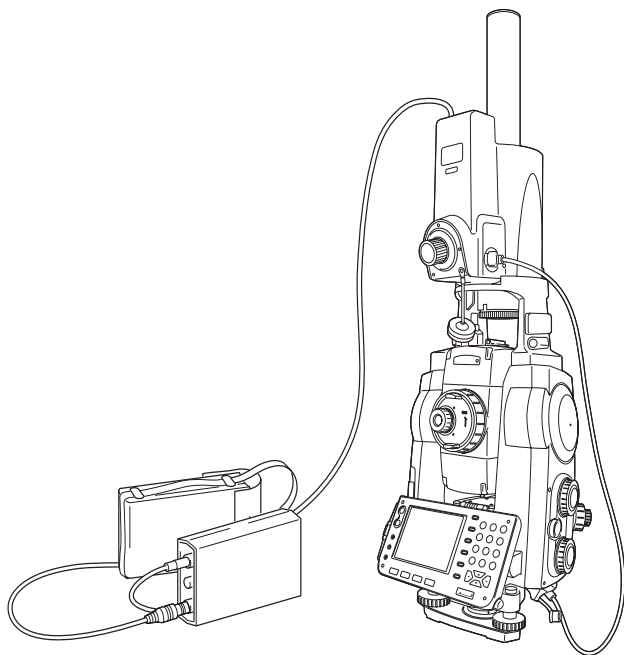


SOKKIA

GYROX
GYRO1X
GYRO2X
GYRO3X
Auto Gyro Station



CLASS 3R Laser Product

CLASS 1 LED Product

OPERATOR'S MANUAL

Gyroscope unit



Ni-MH

| | |
|--------------|---|
| [English] | CONTAIN Ni-MH BATTERY. CADMIUM-FREE. MUST BE RECYCLED OR DISPOSED OF PROPERLY. |
| [Deutsch] | MIT NiMH AKKU. ENTHALT KEIN KADMIUM. EFORDERT RECYCLING ODER FACHGERECHTE ENTSORGUNG. |
| [Français] | CONTIENT UNE BATTERIE AU Ni-MH. SANS CADMIUM. DOIT ÊTRE RECYCLÉE OU DONNÉE A UN ORGANISME DE RETRAITEMENT. |
| [Italiano] | CONTIENE NiMH BATTERIA. NON CONTIENE CADMIO. DEVE QUINDI ESSERE RICICLATA O ELIMINATA IN MODO APPROPRIATO. |
| [Nederlands] | BEVAT EEN NiMH BATTERIJ. BEVAT GEEN CADMIUM. DIENT GERECYCLEERD OF OP EEN CORRECTE MANIER VERNIETIGD TE WORDEN. |
| [Español] | CONTIENE UNA NiMH BATERÍA. NO CONTIENE CADMIO. DEBE RECICLARSE O ELIMINARSE ADECUADAMENTE. |
| [Portugulês] | CONTEM BATERIA DE NiMH. SEM CÁDMIO. DEVERÁ SER RECICLADA OU DEPARTADA CONVENIENTEMENTE. |
| [Svensk] | INNEHÅLLER NiMH BATTERI. KÄDMIUMFRITT. BÖR ÅTERVINNAS ELLER FÖRSTÖRAS PÅ ETT SAKERT SÄTT. |
| [Suomi] | SISÄLTÄÄ NiMH AKUN. HÄVITETTÄESSÄ KÄSITELTÄVÄ ONGELMAJÄTTEENÄ. |
| [Norsk] | NiMH BATTERIER. INNEHOLDER IKKE KADMIUM. MÅ RESIRKULERES ELLER KASTES PÅ EN FORSVARLIG MÅTE. |
| [Dansk] | INDEHOLDER NiMH BATTERI. KADMIUMFRIT. SKAL GENVINDES ELLER KASSERES PÅ FORSVARLIG MÅDE. |
| [Ελληνικά] | ΠΕΡΙΕΧΕΙ ΜΠΑΤΑΡΙΑ ΝΙΚΕΛΙΟΥ-ΜΕΤΑΛΛΟΥ ΥΔΡΙΔΙΟΥ. ΔΕΝ ΠΕΡΙΕΧΕΙ ΚΑΔΜΙΟ. ΠΡΕΠΕΙ ΝΑ ΑΝΑΚΥΚΛΩΝΕΤΑΙ Η ΝΑ ΚΑΤΑΣΤΡΕΦΕΤΑΙ ΜΕ ΤΟΝ ΚΑΤΑΛΛΗΛΟ ΤΡΟΠΟ. |

For U.S.A. ATTENTION:

The product that you have purchased contains a rechargeable battery. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details in your area for recycling options or proper disposal. Use the standard battery charger.

Die Schweiz: Nach Gebrauch der Verkaufsstelle zurückgeben.

La Suisse: Après usage à rapporter au point de vente.

Swizzera: Ritornare la pila usate al negozio.

SOKKIA

GYROX
GYRO1X
GYRO2X
GYRO3X
Auto Gyro Station

CLASS 3R Laser Product





CLASS 1 LED Product

OPERATOR'S MANUAL

- Thank you for selecting the GYRO1X/2X/3X.
- Please read this operator's manual carefully before using this product.
- Verify that all equipment is included.
☞ "13. STANDARD EQUIPMENT"
- The specifications and general appearance of the instrument are subject to change without prior notice and without obligation by Sokkia Topcon Co., Ltd. and may differ from those appearing in this manual.
- The content of this manual is subject to change without notice.
- Some of the diagrams shown in this manual may be simplified for easier understanding.

HOW TO READ THIS MANUAL

Regarding other manuals

- Manuals 3, 4, and 5 below are electronic manuals provided on a CD-ROM in PDF format (). Adobe Reader is necessary in order to view these documents. The latest version of Acrobat Reader can be downloaded from the Adobe homepage.
- The GYRO1X/2X/3X comes equipped with 4 manuals for operation information:
 1. GYRO1X/2X/3X Operator's Manual (this manual):
Explains Gyro Station use only.
 2. Series SRX Operator's Manual:
Explains basic operation and functions of the SRX.
 3. Spectrum Survey Field Program Explanations (SRX)  :
Explains advanced measurement operations using the Spectrum Survey Field.
 4. SFX Dial-Up Program Explanations (SRX)  :
Explains how to send and receive data using the SFX function
 5. Mesh-Scan Survey Program Explanations (SRX)  :
Explains how to measure using the Mesh-Scan Survey function
 6. Quick Start Guide (SRX):
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.



: 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.

Notes regarding manual style

- Except where stated, “SRX” means “SRX1X/2X/3X” in this manual.
- Except where stated, “GYRO X” means “GYRO1X/2X/3X” in this manual.

CONTENTS

| | |
|---|----|
| 1. PRECAUTIONS FOR SAFE OPERATION | 1 |
| 2. PRECAUTIONS | 5 |
| 3. LASER SAFETY INFORMATION | 7 |
| 4. PARTS OF THE INSTRUMENT | 9 |
| 4.1 Gyro Station Features | 9 |
| 4.2 Parts of the Instrument | 10 |
| 4.3 Mode Structure | 12 |
| 5. BASIC OPERATION | 13 |
| 5.1 Basic Key Functions | 13 |
| 6. BATTERY CHARGING | 15 |
| 7. PREPARATION AND FINISHING MEASUREMENT . 17 | |
| 7.1 Connecting the Instruments | 17 |
| 7.2 Preparing for Measurement with Gyro Station | 19 |
| 7.3 Booting up and Quitting the Gyro Station Program . . 21 | |
| 7.4 Finishing the Gyro Station Measurement | 23 |
| 8. TRUE NORTH MEASUREMENT | 24 |
| 8.1 Azimuth Display | 25 |
| 8.2 TRUE NORTH MEASUREMENT | 26 |
| 9. INSTRUMENT CONSTANT MEASUREMENT . 33 | |
| 10.ERROR MESSAGES | 38 |
| 11.TROUBLE SHOOTING | 39 |
| 11.1 Replacing the Fuse | 40 |
| 12.CHECKS | 41 |
| 12.1 Check Mode | 42 |
| 12.2 Checking the Suspension Tape | 42 |
| 13.STANDARD EQUIPMENT | 45 |
| 14.SPECIFICATIONS | 47 |
| 15.REGULATIONS | 49 |
| 16.APPENDIX : PRINCIPLE OF THE GYRO X . . . 50 | |

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.

1. PRECAUTIONS FOR SAFE OPERATION

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 using the telescope during sun observation will cause loss of eyesight. Use solar filter (option) 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.



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.















Secure handle to main unit with locking screws. 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 short circuit. Heat or ignition could result.
-  Do not place articles such as clothing on the battery charger while charging batteries. Sparks could be induced, leading to fire.
-  Do not use batteries other than those designated. An explosion could occur, or abnormal heat generated, leading to fire.
-  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.
-  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 use the battery or charger for any other equipment or purpose. Fire or burns caused by ignition could result.
-  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.






Caution

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

1. PRECAUTIONS FOR SAFE OPERATION

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.

2. PRECAUTIONS

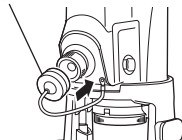


- Please ensure that you are fully familiar with the Series SRX instrument and operator's manual before using this manual.

Using the gyroscope unit

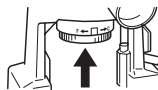
- Never place the gyroscope unit directly on the ground. Sand or dust may cause damage to the screw holes or the centering screw on the base plate.
- Protect the gyroscope unit from heavy shocks or vibration.
- Perform measurement where there is no vibration. Sometimes vibration affects the measurement accuracy or hinders the gyro station from measuring an object.
- The eyepiece lens must not be exposed to a strong light during measurement. When you are compelled to use the gyro station in such an environment, attach a cap to the eyepiece lens and perform measurement.
- As the battery capacity is limited to about 5 hours for continuous measurement, it is advised that all the measurements at the same survey station are performed without switching the power off. (The running-up of the gyro uses a large amount of battery power.)
- Charge the battery after measurements, using the charger CDC75.
- Ensure that the gyromotor is fully clamped before switching on or off the gyroscope unit. (The suspension tape seldom breaks when the correct clamping procedure is followed.)

Eyepiece cap




"7.4 Finishing the Gyro Station Measurement"

- When removing the battery from the gyroscope unit, make sure that the gyromotor is fully clamped, and the power switched off.
- When storing the gyroscope unit, make sure that the gyromotor is fully clamped and put the clamp lock over the clamping ring.




Clamp lock

Precautions concerning water and dust resistance

 For SRX waterproofing and dust resistance, see Series SRX operator's manual

2. PRECAUTIONS

Maintenance

- The gyromotor should be overhauled three years after the purchase date, or after 3000 hours of use, whichever occurs sooner.
 - 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.
 - Store the GYROX in a dry room where the temperature remains fairly constant.
 - If any trouble is found on the rotatable portion, screws or optical parts (e.g. lens), contact your local dealer.
 - When the instrument is not used for a long time, check it at least once every 3 months.
-  "12. CHECKS"
- 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.

Exceptions from responsibility

- The user of this product is expected to follow all operating instructions and make periodic checks (hardware only) of the product's performance.
- The manufacturer, or its representatives, assumes no responsibility for results of faulty or intentional usage or misuse including any direct, indirect, consequential damage, or loss of profits.
- The manufacturer, or its representatives, assumes no responsibility for consequential damage, or loss of profits due to any natural disaster, (earthquake, storms, floods etc.), fire, accident, or an act of a third party and/or usage under unusual conditions.
- The manufacturer, or its representatives, assumes no responsibility for any damage (change of data, loss of data, loss of profits, an interruption of business etc.) caused by use of the product or an unusable product.
- The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits caused by usage different to that explained in the operator's manual.
- The manufacturer, or its representatives, assumes no responsibility for damage caused by incorrect operation, or action resulting from connecting to other products.

3. LASER SAFETY INFORMATION

GYRO X is classified as the following class of Laser Product and LED Product according to IEC Standard Publication 60825-1 Ed. 2.0:2007 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 June 24, 2007.)

- | | |
|--|------------------------|
| • EDM device in objective lens: | Class 3R Laser Product |
| (When using prism or reflective sheet as target) | Class 1 Laser Product) |
| • Auto pointing device in objective lens: | Class 1 Laser Product |
| • Guide light: | Class 1 LED product |
| • Index detecting device in gyroscope unit: | Class 1 LED product |



- EDM device is classified as Class 3R Laser Product, however the equivalent of class 2 output is emitted only when reflectorless measurement is selected. When the prism and reflective sheet is selected in Config mode as target, the output is equivalent to the safer 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. The position of these labels are described in the Series SRX operator's manual.
- Never point the laser beam at another person. If the laser beam strikes skin or an eye, it could cause serious injury.
- Do not look directly into the laser beam source. Doing so could cause permanent eye damage.
- Do not stare at the laser beam. Doing so could cause permanent eye damage.
- If an eye injury is caused by exposure to the laser beam, seek immediate medical attention from a licensed ophthalmologist.
- Never look at the laser beam through a telescope, binoculars or other optical instruments. Doing so could cause permanent eye damage.
- Sight the targets so that laser beam does not stray from them.

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.
- When disposing of the instrument, destroy the battery connector so that the laser beam cannot be emitted.

3. LASER SAFETY INFORMATION

- 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.
- Only those who have 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).
- Areas in which the lasers are used should be posted with laser warning notices.
- 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.
- 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.
- 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.

4. PARTS OF THE INSTRUMENT

4.1 Gyro Station Features

Gyro station GYRO X is a system for measuring true north using a combination of the gyroscope unit and SRX total station.

- The gyroscope unit uses a suspended gyromotor which oscillates around the earth's meridian (true north) due to the principle of precession caused by the rotation of the earth.

☞ "16. APPENDIX : PRINCIPLE OF THE GYRO X".

- The combination of the gyroscope unit and the SRX total station with special application software programs and motor drive allows the true north position to be automatically calculated by the SRX instrument.
- Two different measurement methods (follow-up and time measurements) are combined to determine the true north position. The true north measurement can be performed regardless of the magnetic conditions to a mean accuracy of $\pm 15''$ (0.005 gon/0.074 mil).

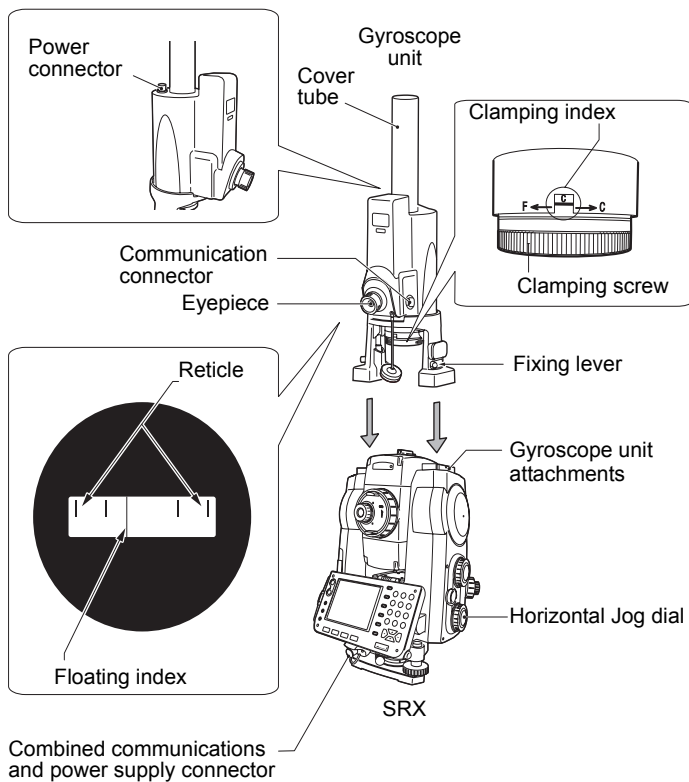
☞ "8. TRUE NORTH MEASUREMENT".

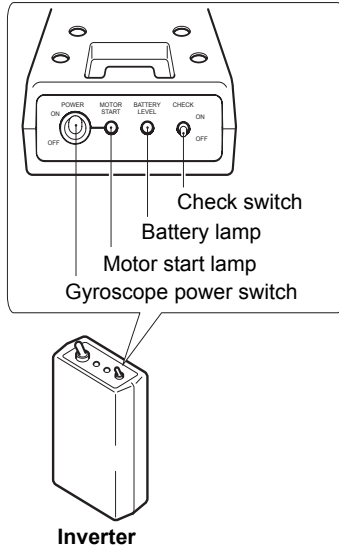
- The calculated true north position can be easily transferred to the SRX horizontal circle.

4. PARTS OF THE INSTRUMENT

4.2 Parts of the Instrument

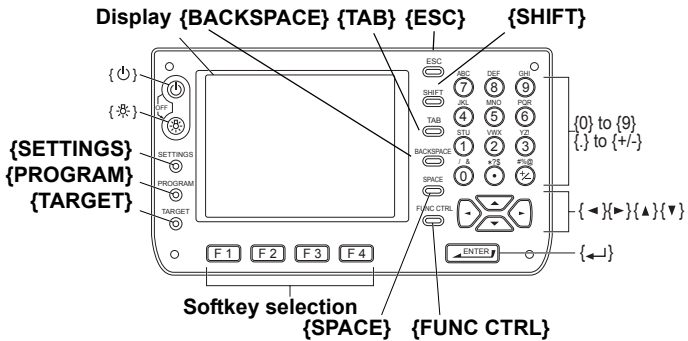
For parts of the SRX, see Series SRX operator's manual





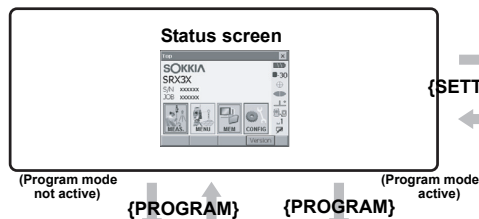
► SRX operation panel

☞ "5.1 Basic Key Functions"

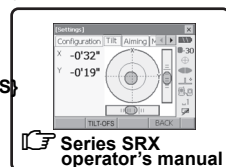


4.3 Mode Structure

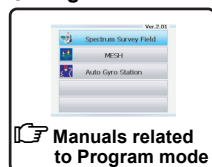
● Basic mode



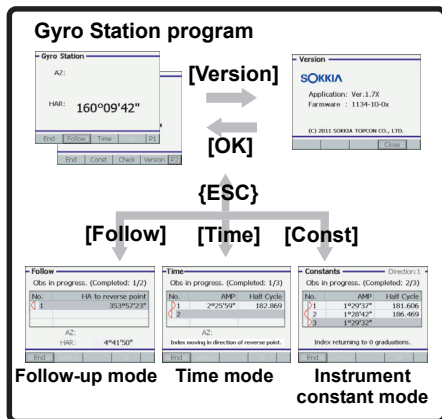
● SETTINGS mode



● Program selection screen ● Program mode




Boot up
Quit






5. BASIC OPERATION

5.1 Basic Key Functions

 For the SRX operation panel layout, see "4.2 Parts of the Instrument", for other key operations for the SRX, see the Series SRX operator's manual

● Power ON/OFF

| | |
|--|-----------|
| {  } | Power ON |
| {  } (while pressing) + {  } | Power OFF |

● Switching to Program mode

| | |
|-----------|--|
| {PROGRAM} | Switches from Basic mode to Program mode |
|-----------|--|

● Gyro Station program key functions

● Azimuth display mode

| | |
|-------------|--|
| [N] | Transfer the measured azimuth angle (the angle from calculated true north) to the original horizontal angle value. |
| [End] {ESC} | Return to the Status screen. |
| [Follow] | Enter the Follow-up measurement mode. |
| [Time] | Enter the Time measurement mode. |
| [Const] | Enter the Instrument constants measurement mode. |
| [Check] | Enter the Check mode. |
| [Version] | Display the version information. |

● Follow-up measurement mode

| | |
|-------------|---|
| [Setting] | Change the times of measurement. |
| [OK] | Shift to the next screen. |
| [End] {ESC} | Cancel or end the Follow-up measurement. (When measurement has already been performed twice or more, the azimuth angle is displayed.) |

● Time measurement mode

| | |
|-------------|--|
| [Setting] | Change the times of measurement. |
| [OK] | Shift to the next screen. |
| [End] {ESC} | Cancel or end the Time measurement. (When measurement has already been performed twice or more, the azimuth angle is displayed.) |

5. BASIC OPERATION

- Instrument constants measurement mode

| | |
|--------------------|---|
| [Setting] | Change the times of measurement. |
| [OK] | Shift to the next screen. |
| [End] {ESC} | Cancel or end the Instrument constants measurement. |
| [REC] | After calculating the constant, overwrite the existing value. |

- Check mode

| | |
|--------------------|-------------------------------|
| [OK] | Shift to the next screen. |
| [End] {ESC} | Cancel or end the Check mode. |

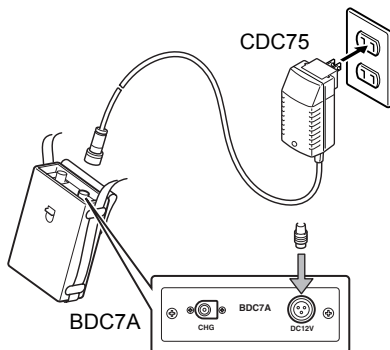
6. BATTERY CHARGING



- Charge the battery at a temperature between 0 and 40°C. The higher the temperature, the longer the charging time will be.
- When charging, do not connect the gyroscope unit to the battery.
- Cables should not be connected to both the CHG and DC12V receptacles simultaneously.
- The battery charger normally becomes warm while charging.
- Do not charge the same battery more than once in quick succession.
- Do not wet the battery charger.
- Disconnect from the wall outlet when not in use.
- Charge the battery once a month when not in use for long periods.
- Prevent short circuit by closing case flap when not charging.

► PROCEDURE

1. Plug the charger power plug into the wall outlet.
2. Open the BDC7A case flap and insert the cable attached to CDC75 into the DC12V receptacle on BDC7A. The yellow LED blinks slowly. Then after a short period, the green LED blinks and charging starts.
3. The green LED stops blinking and lights steadily when charging is complete. Charging time is about 9 hours.
4. When charging is complete, disconnect the charger cable from the battery and unplug the charger power plug from the wall outlet.



6. BATTERY CHARGING

- The following table describes the status of the yellow/green LEDs under various conditions.

| Display on Main Unit | Status | Yellow LED | Green LED |
|----------------------|---|-------------|-------------|
| Standby | Stand-by | ON | OFF |
| Pre Charge | Pre-charge check | Slow blink | OFF |
| Rapid Charge | Rapid Charge | OFF | Rapid blink |
| Maintain | Trickle Charge | OFF | Slow blink |
| Error | Battery may be faulty. Please contact your local dealer. | Rapid blink | OFF |
| Ready | Charging complete | OFF | ON |
| Wait | N/A | | |

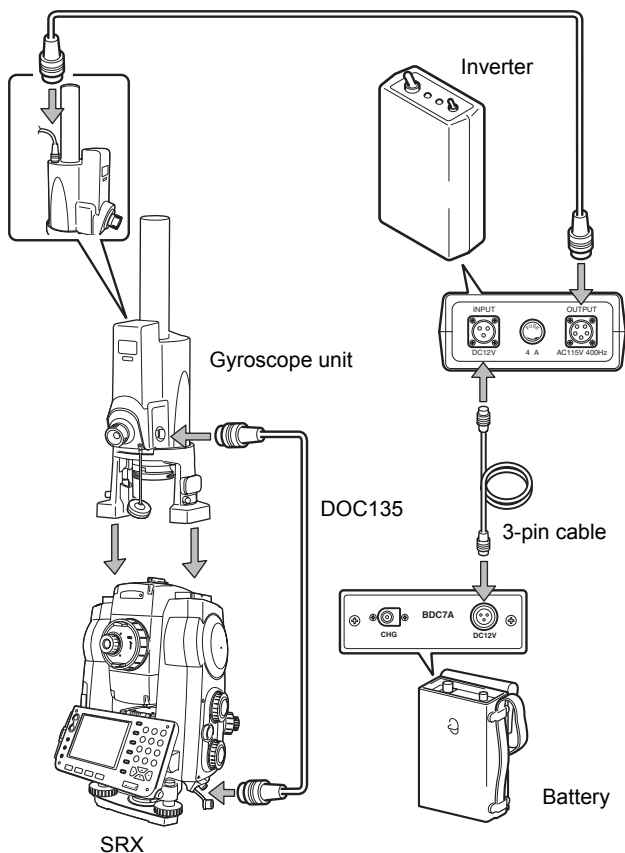
7. PREPARATION AND FINISHING MEASUREMENT

This chapter will describe the preparations necessary for measurement as well as explaining how to finish measurement.

7.1 Connecting the Instruments

Connect the SRX, Gyroscope unit, inverter and battery as shown below.

5-pin cable




- Before removing the battery, clamp the pendulum and turn off the power.

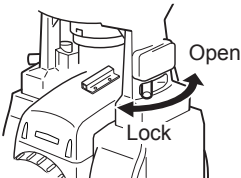

7. PREPARATION AND FINISHING MEASUREMENT

►PROCEDURE

1. Set up the tripod over the measurement point and mount the SRX on the tripod.

 Series SRX operator's manual

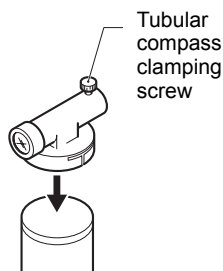


- Perform measurement where there is no vibration. Sometimes vibration affects the measurement accuracy or hinders the gyro station from measuring an object.
2. Set the gyroscope fixing lever to the open position. Mount the gyroscope unit on SRX and set the fixing lever to the close position.
- 
3. Connect the power connector of the gyroscope unit to the inverter OUTPUT connector with the 5-pin cable.
 4. Connect the Inverter INPUT connector to the battery DC 12V connector with the 3-pin cable.
 5. Connect the gyroscope unit to SRX. Connect the communication connector of the gyroscope unit to the data input/output connector of SRX through the communication cable (DOC135).
 6. Perform leveling as described in  Series SRX operator's manual

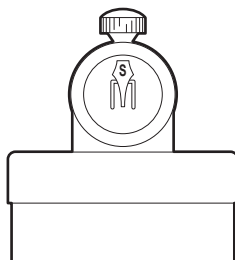
7.2 Preparing for Measurement with Gyro Station

► PROCEDURE

1. Mount the tubular compass on the top of the gyroscope unit and align the compass body with the SRX telescope. Loosen the tubular compass clamping screw.



2. Using the horizontal jog dial of SRX, align the tubular compass needle with "S". The SRX is now pointing towards approximate magnetic north. Where the compass is not usable, use any other available means to point the SRX telescope in the north direction; e.g. map, sun, time etc.



3. Check the pendulum.
Using the check mode, check that the right-and-left movement of the floating index is symmetrical.

 "12.2 Check Mode"

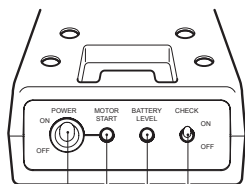
7. PREPARATION AND FINISHING MEASUREMENT

- Set the gyroscope power switch on the inverter to ON.
Make sure that the pendulum is in the **FULL CLAMP position**.
Then, set the gyroscope power switch on the inverter to OFF.



- When the battery power becomes low the battery lamp is lit red. Recharge the battery.

☞ "6. BATTERY CHARGING"



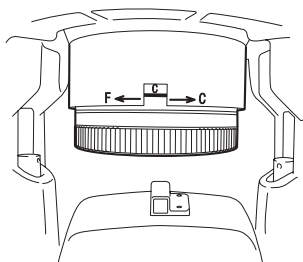
Check switch
Battery lamp
Motor start lamp
Gyroscope power switch

Note

- The fixed status of pendulum is classified into the following three types.

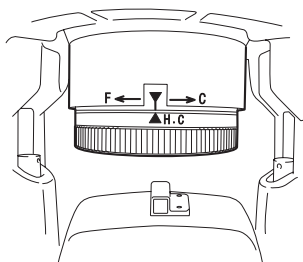
FULL CLAMP position

Turn the clamp screw fully in the C direction until the "C" mark can be seen in the clamping index. The pendulum is now fully clamped - FULL CLAMP position.



HALF-CLAMP position

Turn the clamp screw in the F direction until the "▼" mark can be seen in the clamping index. Continue turning in the F direction until the "▲HC" mark on the clamp screw is aligned with the "▼" mark in the clamping index. The pendulum is now only lightly clamped. This is the HALF-CLAMP position.



FREE position


Now turn the clamp screw fully in the F direction. When the clamp can be turned no further in the F direction the FREE position has been reached. The pendulum is now freely suspended.

5. Approximately 60 seconds after turning on the power, the motor start lamp is lit green. This indicates that the gyromotor is rotating correctly.

Preparation for measurement with the Gyro Station is complete.

7.3 Booting up and Quitting the Gyro Station Program

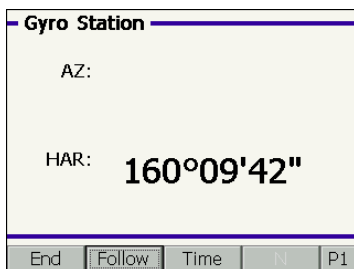
►PROCEDURE Booting Up

1. Mount the battery.
 Series SRX operator's manual
2. Press {⏻}. When the power is switched on, a self-check is run. The Status screen is displayed.
3. Press {PROGRAM} in Basic mode to display the program selection screen. The program selection screen provides access to all programs in Program mode.



7. PREPARATION AND FINISHING MEASUREMENT

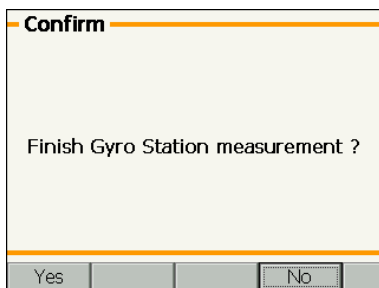
4. Select "Gyro Station" in the screen of step 3. The screen shown at right is displayed.



- Quit Gyro Station program, then press **{PROGRAM}** to return to Basic mode.

►PROCEDURE Quitting

1. Press **{ESC}** to display the confirmation screen shown in step 2.
2. Press **[YES]** to quit Gyro Station program.



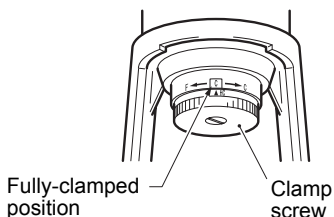
- Pressing **{PROGRAM}** after performing a warm boot will automatically restore the program active before the warm boot was performed.

7.4 Finishing the Gyro Station Measurement

Always follow the procedure below to finish measurement. This procedure should also be performed when moving to a different point.

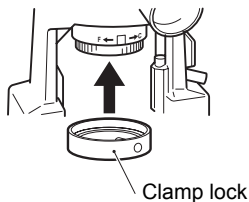
► PROCEDURE

1. Turn the clamp screw in the C direction until the pendulum is in the FULL CLAMP position.



2. Set the gyroscope power switch on the inverter to OFF.
Check that the pendulum is in the **FULL CLAMP position** then turn off the power to the gyroscope unit using the switch on the inverter.

3. Wait for approx. 10 minutes for the motor to come to a complete standstill. Check that no sound is coming from the motor and put the clamp lock over the clamping screw, then store in the carrying case or move to the next point.



8. TRUE NORTH MEASUREMENT

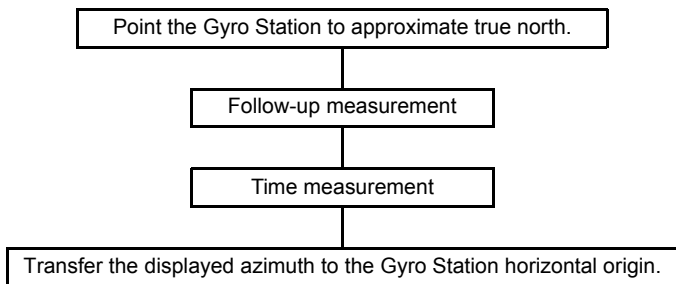
When using GYRO X, you can get the true north position by performing "FOLLOW-UP MEASUREMENT" and "TIME MEASUREMENT" as a measurement sequence.

Follow-up measurement

Follow-up measurement involves carefully rotating the Gyro Station to follow the movement of the floating index. When the floating index reaches its turning point, the horizontal angle is automatically recorded. When continuous two or more successive turning points have been measured, the true north direction can be determined.

Time measurement

Time measurement is performed without moving the Gyro Station. By detecting the amplitude of the right and left turning points (position of the turning points on the graduated scale) and the passing of the floating index through the center between the right and left reticles, it is possible to calculate a true north direction with high accuracy.



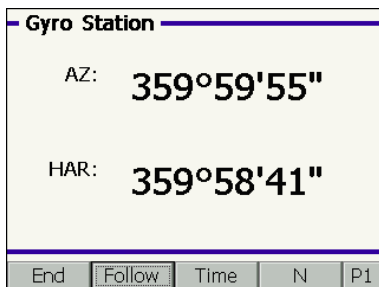
Turning point

The turning point is the point at which the movement of the floating index switches $R \rightarrow L$ or $L \rightarrow R$. As the index approaches the turning point it appears to slow down and stop, before changing direction.

The following is a method for following the floating index.

8.1 Azimuth Display

Start the Gyro Station program on SRX, and the azimuth angle screen appears.



- The azimuth (angle from the calculated true north position) is displayed in AZ and the horizontal angle is displayed in HAR. The horizontal angle can be displayed as a clockwise/counterclockwise value whereas the azimuth can only be displayed as a clockwise value.
- Press **[N]** to transfer the azimuth angle to the horizontal angle. The azimuth angle is now displayed as a horizontal angle, even in Basic mode.
- When you have performed true north measurement, rotate the SRX horizontally until the displayed AZ value (azimuth angle) is 0° 00' 00".
- When the horizontal angle is set to 0 in the Instrument constants measurement mode the current azimuth angle settings cease to be in effect and the azimuth angle is no longer displayed. To display the azimuth angle, perform either Follow-up measurement or Time measurement.

 "9. INSTRUMENT CONSTANT MEASUREMENT"

8.2 TRUE NORTH MEASUREMENT



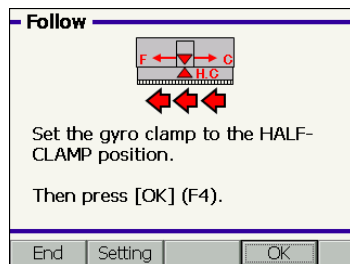
- Before beginning measurement, point the Gyro Station to approximate true north direction.
 ☞ “7.2 Preparing for Measurement with Gyro Station”
- In the environment where the eyepiece lens is exposed to a strong light, attach a cap to the eyepiece lens and perform measurement.

►PROCEDURE Follow-up measurement

1. Press **[Follow]** in the screen shown at right.



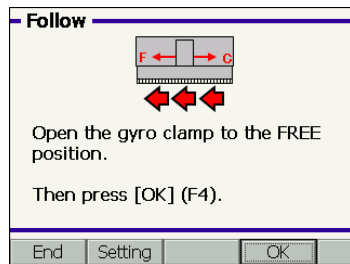
2. To prepare for measurement, set the gyroscope unit to the HALF-CLAMP position and wait for approx. 10 seconds to allow the movement of the floating index to settle. Then, press **[OK]**.



After the screen is changed, slowly open to the FREE position.



- If the floating index appears to make fine oscillations after turning the clamping screw to the FREE position, turn the clamp back halfway in the C direction. When these irregular movements have ceased release the clamp back to the FREE position.



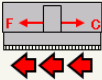
8. TRUE NORTH MEASUREMENT

3. Start follow-up measurement.
When the gyroscope unit is in the FREE position, press **[OK]**.

The Gyro Station begins rotating automatically according to the move of the floating index.

After measurement is finished, the Gyro Station stops rotating. The true north direction is calculated and the azimuth angle is displayed.

Follow



Open the gyro clamp to the FREE position.

Then press **[OK]** (F4).

End Setting OK

Follow

Obs in progress. (Completed: 0/2)

| No. | HA to reverse point |
|-----|---------------------|
| | |
| | |
| | |

AZ:

HAR: 358°21'35"

End Setting Ok

Follow

Obs in progress. (Completed: 1/2)

| No. | HA to reverse point |
|-----|---------------------|
| 1 | 353°57'23" |
| | |
| | |

AZ:

HAR: 4°41'50"

End Setting Ok

Follow

Obs in progress. (Completed: 2/2)

| No. | HA to reverse point |
|-----|---------------------|
| 1 | 353°57'23" |
| 2 | 6°00'09" |
| | |

AZ: 4°22'45"


HAR: 4°21'31"

End Setting Ok

8. TRUE NORTH MEASUREMENT

4. End follow-up measurement.
Turn the clamping screw in the C direction to set the gyroscope unit in the CLAMP position.


To finish measurement, set the gyroscope unit in the CLAMP position and then turn off the gyroscope unit.


 "7.4 Finishing the Gyro Station Measurement"

After measurement is finished, press **[End]**.

The Gyro Station rotates to the true north direction automatically according to the calculated azimuth angle.

- The calculated azimuth angle can be set as the horizontal angle.

 "8.1 Azimuth Display"

- To finish the Gyro Station program
 Finish the procedure of "7.3 Booting up and Quitting the Gyro Station Program"

Note

- Press **[Setting]**, and you can set the measurement times of floating index. If the Gyro Station is unstable due to a strong wind, etc., set a higher value. The settable value for the measurement times is "2" to "10".

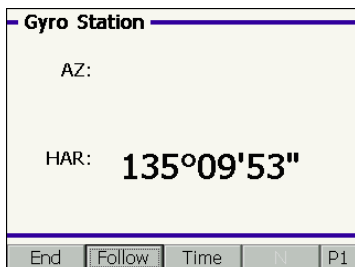
| Follow | | | |
|-----------------------------------|---------------------|----|--|
| Obs in progress. (Completed: 2/2) | | | |
| No. | HA to reverse point | | |
| 1 | 353°57'23" | | |
| 2 | 6°00'09" | | |
| AZ: 4°22'45" | | | |
| Set gyro to FULL CLAMP position. | | | |
| End | Setting | Ok | |

| Gyro Station | | | | |
|--------------|------------|------|---|----|
| AZ: | 359°59'55" | | | |
| HAR: | 359°58'41" | | | |
| End | Follow | Time | N | P1 |

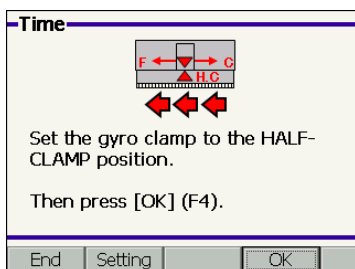
| Setting | |
|----------------|--------------------------------|
| Turning points | <input type="text" value="2"/> |
| OK | Cancel |

►PROCEDURE Time measurement

1. Select the time measurement mode. Press **[Time]** on the Gyro Station screen.



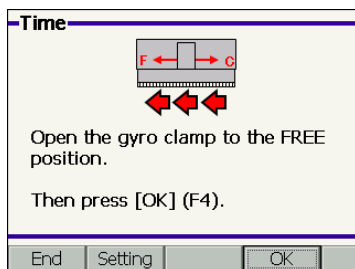
2. To prepare for measurement, set the gyroscope unit to the HALF-CLAMP position and wait for approx. 10 seconds to allow the movement of the floating index to settle. Then, press **[OK]**.



After the screen is changed, slowly open to the FREE position.



- If the floating index appears to make fine oscillations after turning the clamping screw to the FREE position, turn the clamp back halfway in the C direction. When these irregular movements have ceased release the clamp back to the FREE position.



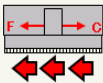
3. Observe the movement of the floating index. Make sure that the floating index moves within the range of the right and left reticles.



8. TRUE NORTH MEASUREMENT

- Start time measurement. When the gyroscope unit is in the FREE position, press **[OK]**.

Time



Open the gyro clamp to the FREE position.

Then press **[OK]** (F4).

End Setting **OK**

The Gyro Station starts to measure the floating index.

Time

Obs in progress. (Completed: 0/3)

| No. | AMP | Half Cycle |
|-----|-----|------------|
| | | |
| | | |

AZ:

Index returning to 0 graduations.

End Setting **OK**

Time

Obs in progress. (Completed: 1/3)

| No. | AMP | Half Cycle |
|-----|----------|------------|
| 1 | 2°25'59" | 182.869 |
| 2 | | |

AZ:

Index moving in direction of reverse point.

End Setting **OK**

Time

Obs in progress. (Completed: 2/3)

| No. | AMP | Half Cycle |
|-----|----------|------------|
| 1 | 2°25'59" | 182.869 |
| 2 | 2°25'54" | 185.292 |
| 3 | | |

AZ: 0°00'05"

Index moving in direction of reverse point.

End Setting **OK**


8. TRUE NORTH MEASUREMENT

After measurement is finished, the true north direction is calculated and the azimuth angle is displayed.

| Time | | |
|-----------------------------------|----------|------------|
| Obs in progress. (Completed: 3/3) | | |
| No. | AMP | Half Cycle |
| 1 | 2°25'59" | 182.869 |
| 2 | 2°25'54" | 185.292 |
| 3 | 2°25'53" | 183.133 |
| AZ: | | 0°00'08" |
| Set gyro to FULL CLAMP position. | | |
| End | Setting | OK |

5. End time measurement.
Turn the clamping screw in the C direction to set the gyroscope unit in the CLAMP position.

To finish measurement, set the gyroscope unit in the CLAMP position and then turn off the gyroscope unit.

 "7.4 Finishing the Gyro Station Measurement"

After measurement is finished, press **[End]**.


| Confirm | | | |
|-------------------|--|----|--|
| Exit observation? | | | |
| Yes | | No | |

8. TRUE NORTH MEASUREMENT

The Gyro Station rotates to the true north direction automatically according to the calculated azimuth angle.

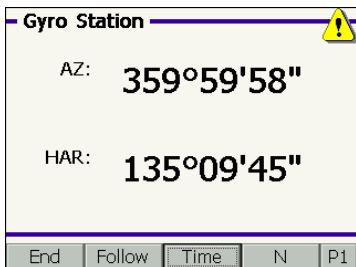
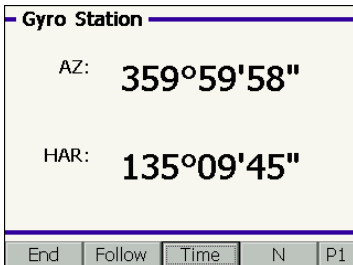
- The calculated azimuth angle can be set as the horizontal angle.

 "8.1 Azimuth Display"

- To finish the Gyro Station program
 Finish the procedure of "7.3 Booting up and Quitting the Gyro Station Program".

Note

- When the gyro station finishes measurement as it is influenced by vibration or strong light, "⚠" is displayed at the upper right corner on the screen.
In this case, the measurement result does not meet the measurement accuracy of the specification from time to time.



9. INSTRUMENT CONSTANT MEASUREMENT

Instrument constant measurement should be performed after the suspension tape has been replaced or if the measuring location is greatly different in latitude from the previous location.

The instrument constants R and G can be obtained using "Instrument constant measurement" when an accurate true north position is known.


Three measurements are taken: $0^{\circ} 00' 00''$ (true north: first direction), $359^{\circ} 50' 00''$ (second direction) and $0^{\circ} 10' 00''$ (third direction).



- When the constant measurement has started, the horizontal angle is set to "0". If the azimuth angle is displayed, it will not be displayed.

►PROCEDURE

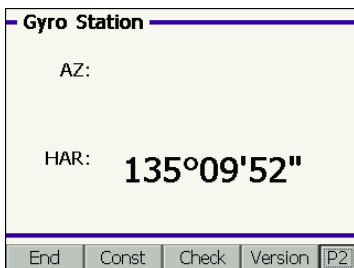
1. Check that the Gyroscope unit is in the FULL CLAMP position.

 "7.2 Preparing for Measurement with Gyro Station"

2. Point the Gyro Station to the true north.

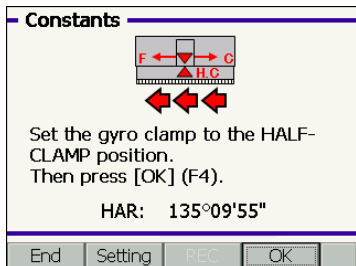
Point the Gyro Station to the accurate true north direction.

3. Select the constant measurement mode. Press **[Const]** on Page 2 of the soft key on the <Gyro Station> screen.



9. INSTRUMENT CONSTANT MEASUREMENT

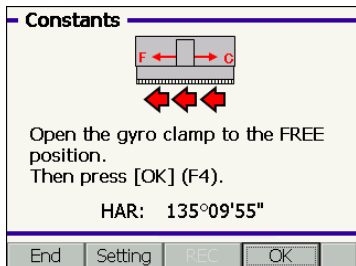
- To prepare for measurement, set the gyroscope unit to the HALF-CLAMP position and wait for approx. 10 seconds to allow the movement of the floating index to settle. Then, press **[OK]**.



After the screen is changed, slowly open to the FREE position.



- If the floating index appears to make fine oscillations after turning the clamping screw to the FREE position, turn the clamping screw halfway in the C direction. When these irregular movements have ceased, release the clamping screw back to the FREE position.



- Observe the movement of the floating index. Make sure that the floating index moves within the range of the right and left reticles.
- Start constant measurement. When the gyroscope unit is in the FREE position, press **[OK]**.
 - The horizontal angle is set to "0".



9. INSTRUMENT CONSTANT MEASUREMENT

- The Gyro Station automatically starts the first direction (true north) measurement.

Constants

1st direction

HAR: 0°00'00"

End Setting REC OK

Constants Direction:1

Obs in progress. (Completed: 0/3)

| No. | AMP | Half Cycle |
|-----|-----|------------|
| | | |
| | | |
| | | |

Index returning to 0 graduations.

End Setting REC OK

⋮

Constants Direction:1

Obs in progress. (Completed: 2/3)

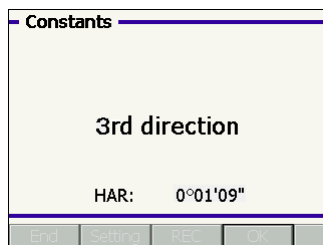
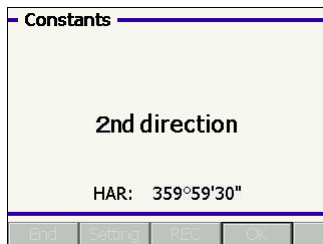
| No. | AMP | Half Cycle |
|-----|----------|------------|
| 1 | 1°29'37" | 181.606 |
| 2 | 1°28'42" | 186.469 |
| 3 | 1°29'32" | |

Index returning to 0 graduations.

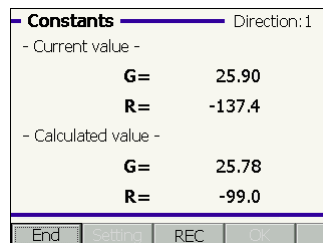
End Setting REC OK

9. INSTRUMENT CONSTANT MEASUREMENT

- When the first direction measurement has been finished, the second and third direction measurements are performed.

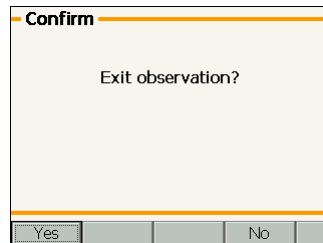


7. Record the constants.
After the third direction measurement is finished, the current constants (existing values) and the calculated constants (calculated values) are displayed.




To record these calculated constants, press **[REC]**.

- Press **[Yes]** on the <Confirm> screen, and the existing values are overwritten by the calculated values.
- Press **{ESC}** to display the quit mode confirmation screen. Press **[Yes]** to discard results.




8. Turn the clamp to the FULL CLAMP position, then turn off the power to the gyroscope unit.

 "7.4 Finishing the Gyro Station Measurement"

10. ERROR MESSAGES

The following is a list of the error messages displayed by the SRX and the meaning of each message.

 For error messages not explained here, refer to the Series SRX operator's manual.

The floating index is not stable.

Measurement has started under the condition that the floating index makes fine oscillations or is not stable.

Turn the clamping screw back halfway in the C direction. When these irregular movements have ceased, release the clamping screw gently to the FREE position. Then, perform measurement again.

Another remedial measure is to move GYRO X to a place without vibration and perform measurement again.

Gyroscope unit: Light intensity error.

A strong light enters through the eyepiece lens of the gyroscope unit.

Attach the eyepiece cap and perform measurement again.

Timeout

During measurement, the gyroscope unit cannot communicate with SRX.

After the error message is displayed, the azimuth angle is displayed on the screen.

Floating index range check

Measurement has started while the floating index is moving out of the reticles range.









After the error message is displayed, the azimuth angle is displayed on the screen.



- The error message also appears for other troubles in addition to the above. If the floating index does not move properly for obtaining data during measurement, the error message is displayed and then the azimuth angle is displayed on the screen.

11. TROUBLE SHOOTING

Perform the relevant "countermeasures" when the following problems occur. Contact your local dealer if the problem persists.

| PROBLEM | COUNTERMEASURE |
|--|---|
| Battery lamp is lit | <ul style="list-style-type: none">• Battery power is low. Ensure that the gyromotor is fully clamped then switch off the gyroscope unit. Remove and charge the battery.  "6. BATTERY CHARGING" |
| Gyromotor does not run (The rotation sound cannot be heard.) | <ul style="list-style-type: none">• Check if the battery lamp is lit red.  "Battery lamp is lit"• Check if the cables are firmly connected.• Check if the fuse of the Inverter is blown.  "11.1 Replacing the Fuse"• Check if any cables are broken. |
| Index mark does not move | <ul style="list-style-type: none">• Check if the SRX is levelled correctly.  Series SRX operator's manual• Check to see if the suspension tape is broken.  "12.1 Checking the Suspension Tape" |
| Index movement speed increases during observation: | <ul style="list-style-type: none">• Check if the battery lamp is lit red.  "Battery lamp is lit" |
| Floating index/reticles cannot be seen. | <ul style="list-style-type: none">• Check if the cables are firmly connected.• Check if the battery lamp is lit red.  "Battery lamp is lit" |
| Motor start lamp does not light | <ul style="list-style-type: none">• Check if the battery lamp is lit.  "Battery lamp is lit" |

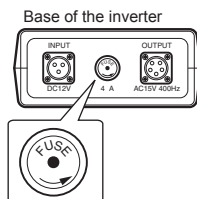
11. TROUBLE SHOOTING

11.1 Replacing the Fuse

If the motor does not run even when the power has been turned on, it is possible that the cause is a blown fuse. To replace a blown fuse, follow the procedure below.

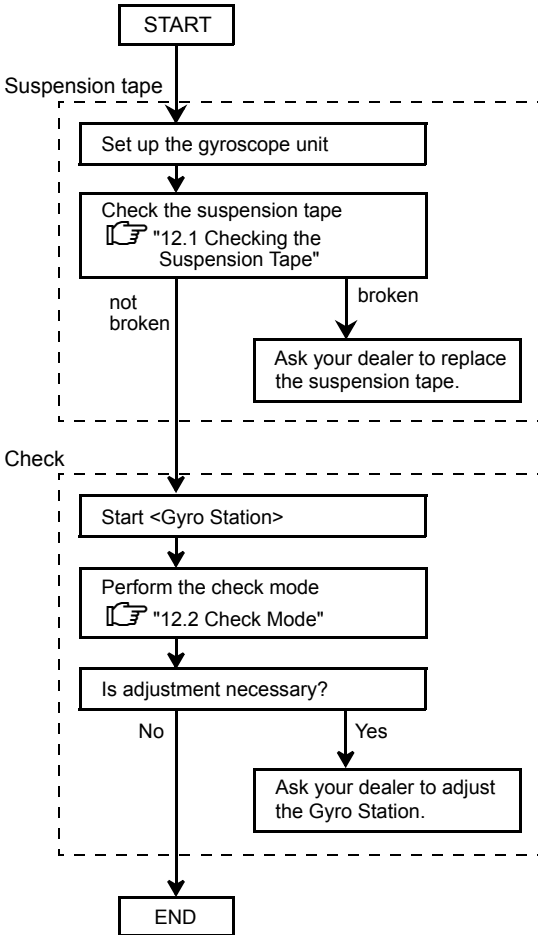
►PROCEDURE

1. Turn the fuse screw (located on the base of the inverter) in a counterclockwise direction and pull out. The fuse is located on the inner portion of the fuse screw.
2. Remove the blown fuse and insert a fresh one. The fuse can be inserted in either direction.
3. Check that fuse is fitted properly. Insert the fuse screw back into the slot and turn in a clockwise direction to re-fasten.




12. CHECKS

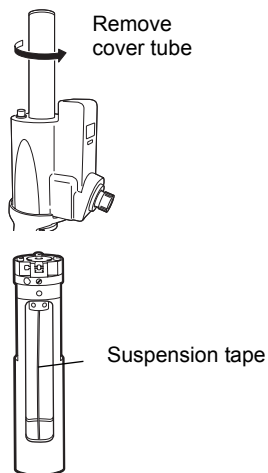
Before performing true north measurement, perform the periodical check. If, by checking, the system displays "It is necessary to adjust it", ask your local dealer to adjust the Gyro Station.



12. CHECKS

12.1 Checking the Suspension Tape

1. Set up the gyroscope unit on the SRX.
 "7.1 Connecting the Instruments"
2. Unscrew and remove the gyroscope unit cover tube.
3. Check if the tape is broken. If it is broken, contact your local dealer. Replacement of the suspension tape is carried out by our service representative.



12.2 Check Mode

Access the check mode in the Gyro Station, and the gyroscope unit is automatically checked.



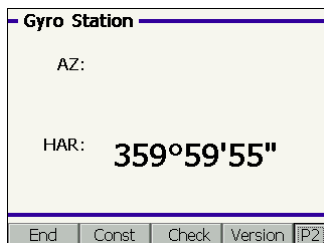
- Before checking, turn off the power switch of the gyroscope unit. It is not possible to perform checking correctly while the power is ON or the gromotor is rotating.



- You can adjust the gyroscope unit even if the Gyro Station is not set in the true north direction.
- Before checking, make sure that the gyroscope unit is in the CLAMP position.

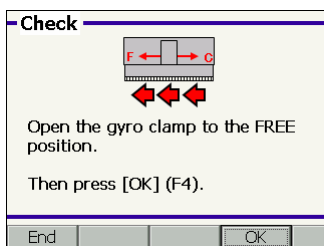
►PROCEDURE

1. Set the inverter's check switch to ON.
You can check the floating index without driving the gyromotor.
2. Select the check mode.
Press **[Check]** on Page 2 of the soft key on the <Gyro Station> screen.

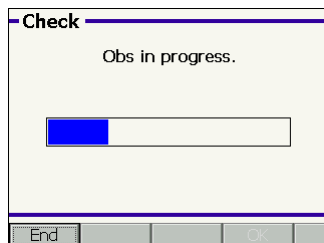


3. Set the pendulum in the FREE position.
Set the gyroscope unit in the FREE position.
Make sure that the floating index moves within the range of the right and left reticles.

After the screen is changed, slowly open to the FREE position.

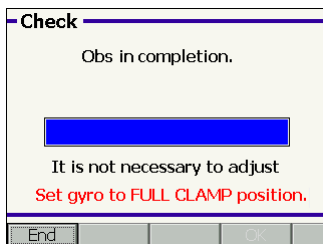


4. Start the check mode.
After the gyroscope unit is in the FREE position, press **[OK]**.

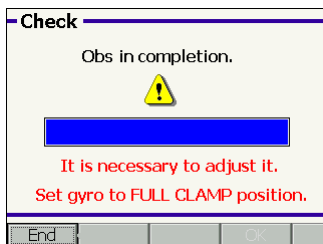


12. CHECKS

5. Check the result.
The following two messages show the check result.
- It is not necessary to adjust.
 - It is necessary to adjust it.



- When "It is necessary to adjust it" is displayed, contact your local dealer.

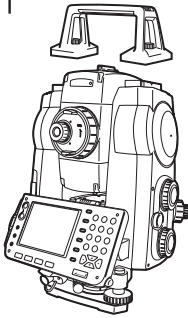


6. End the check mode.
Press **[End]** to finish the check mode.
7. Set the inverter's check switch to OFF.

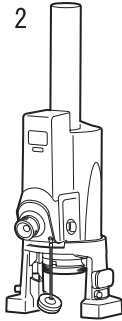
13. STANDARD EQUIPMENT

Please verify that all equipment is included.

1



2



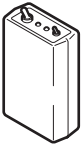
3



4, 5



6



7



8



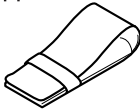
9



10



11



12



13



14



15



16



17



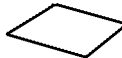
18



19



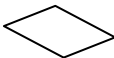
20



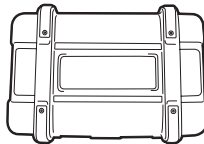
21



22



23



13. STANDARD EQUIPMENT

| | | | | | |
|----|---|---|----|---|---|
| 1 | SRX main unit | 1 | 12 | Watch-maker's screwdrivers. . . | 2 |
| 2 | Gyroscope unit with bridge . . | 1 | 13 | Screwdriver. | 1 |
| 3 | Battery (BDC7A) | 1 | 14 | Lens brush | 1 |
| 4 | Charger (CDC75). | 1 | 15 | Adjusting pin. | 3 |
| 5 | AC plug (EDC80) (Already installed to CDC75) . | 1 | 16 | Lens hood. | 1 |
| 6 | Inverter. | 1 | 17 | Tubular compass (Exclusively for gyroscope unit) | 1 |
| 7 | 5-pin cable | 1 | 18 | Clamp lock | 1 |
| 8 | 3-pin cable | 1 | 19 | Vinyl cover | 1 |
| 9 | Communication cable (DOC135). | 1 | 20 | Cleaning cloth. | 1 |
| 10 | Fuse. | 3 | 21 | Operator's manual | 1 |
| 11 | Tool pouch | 1 | 22 | Clamp caution card. | 1 |
| | | | 23 | Carrying case | 1 |

For SRX accessories,  Series SRX operator's manual

► OPTIONAL ACCESSORIES

● Y Cable (EDC140)

14. SPECIFICATIONS

Gyroscope unit with bridge (GYRO X)

| | |
|--------------------|--|
| Measurement method | Time measurement |
| Accuracy: | 15" (0.005 gon/0.074 mil) (standard deviation) (when telescope pointed to within $\pm 20'$ of true north) |
| Running-up time: | Approx. 60 sec |
| Usable area: | Up to latitude 75° |

Half period (at middle latitudes):

Approx. 3 min
gyroscope unit mounting accuracy:
 $\pm 5''$ (0.002 gon/0.025 mil)

Operating temperature:

-20 to 50°C

Size:

145(W) x 186(D) x 416(H) mm
(5.71(W) x 7.32(D) x 16.38(H) inch)

Weight:

Approx. 4.0 kg (8.8 lb)

Inverter

| | |
|---------|--|
| Input: | 12V DC |
| Output: | 115V AC, 400 Hz 12 V DC |
| Size: | 130(W) x 55(D) x 240(H) mm (5.12(W) x 2.17(D) x 9.45(H) inch) |
| Weight: | Approx. 1.6 kg (3.5 lb) |

Power supply

| | |
|---------------------------|----------------------------------|
| Power source: | BDC7A Ni-MH rechargeable battery |
| Working duration at 20°C: | Approx. 5 hours |

Battery (BDC7A)

| | |
|-----------|--|
| Voltage: | 12V DC |
| Capacity: | 9Ah |
| Size: | 140(W) x 50(D) x 250(H) mm (5.51(W) x 1.97(D) x 9.84(H) inch) |
| Weight: | Approx. 2.2 kg (4.7 lb) |

Charger (CDC75)

| | |
|--|--|
| Input voltage: | 100~240 VAC |
| Charging time: | Approx 9 hours |
| Size (excluding plug, protruding sections, and cable): | 51.5(W) x 87.5(D) x 33(H)mm (2.03(W) x 3.44(D) x 1.3(H) inch) |
| Weight: | Approx. 180g (0.4 lb) |

14. SPECIFICATIONS

Cables

| | |
|----------------------------------|-------|
| 5 pin: | 1.5 m |
| 3 pin: | 1.0 m |
| Communication cable: (DOC135) | 1.5 m |

SRX1X/2X/3X

Instrument size (with handle): 201 (W) X 220 (D) X 379 (H) mm (with optional Face 2 display, excluding protruding sections)

Instrument weight (with BDC58 and handle):

Display on both sides: 7.6kg (16.8 lb)

Others: Carrying case and handle exclusively for GYRO X are provided as accessories. (H-BC1, H-BT1 and RC-TS3 cannot be installed.)



For other SRX specifications, see Series SRX operator's manual

15. REGULATIONS

Users must ensure that their instrument is compliant with the relevant regulations and legal restrictions in place in the country of use.

For users in the US

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 interference 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.

For users in California

WARNING: Handling the cord on this product or cords associated with accessories sold with this product will expose you to lead, a chemical known to the State of California to cause birth defects or other reproductive harm. ***Wash hands after handling.***

This product contains a CR Lithium Battery which contains Perchlorate Material - special handling may apply.

See <http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

Note: This is applicable to California, U.S.A only.

For users in 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.

16. APPENDIX : PRINCIPLE OF THE GYRO X

The GYRO X pendulum-type gyroscope consists of a gyroscopic motor suspended by a tape and housed in a cylindrical body, which is mounted on the SRX total station.

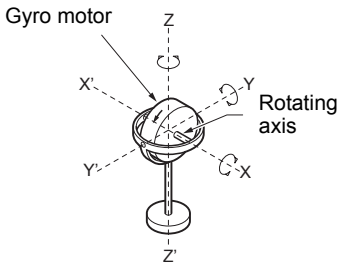
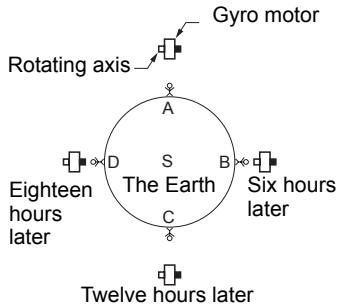
The pendulum oscillates around the earth's meridian. This oscillation (called precession) is observed by the use of a mirror attached to the pendulum and can be followed without applying any torque to the suspension tape by slowly turning the theodolite (follow-up mode). Both turning points of the precessional oscillation can be read on the horizontal circle of the total station and the SRX can calculate the centre of the precession (true north). When the optical axis of the theodolite is coincidental with the direction of the centre of precession, the instrument telescope is sighting true north.

[Theory of the gyroscope]

The gyroscope is really a motor having a large moment of inertia, and spinning rapidly. When the angular momentum of the rotor is high, and the rotor is freely suspended, the direction of the rotating axis is kept unchanged in space.

The Earth is seen from the south.

Suppose a gyroscope started to oscillate over the arbitrary point A on the equator. It is assumed that the gyroscope has freedom in three axes as shown below.



[Degree of freedom in three axes]

The three axes are defined as shown. If the rotating axis of the gyroscope can freely change direction around the XX' , YY' , and ZZ' axes, the gyroscope is said to have freedom in three axes.

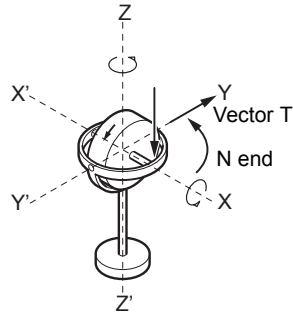
Six hours later, the rotation of the earth will cause point A to reach point B. At that moment, the N end of the rotating axis faces the same direction as it did at point A. Similarly, 12 hours later, at point C and 18 hours later at point D, the direction of the axis will remain unchanged. Although an observer on the axis will perceive the direction of the axis to be changing, it must be remembered that, as described above, a gyroscope maintains its original rotating direction.

Besides the ability to maintain axis direction, the gyroscope has another important characteristic. When torque (twisting moment to change the axis direction) is applied to the rotating axis, the rotating axis starts moving in the direction of the torque vector due to precession.

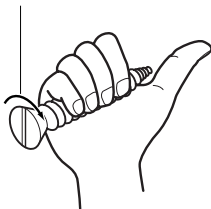
If torque is applied to the rotating axis, lowering the N end of the rotating axis, while the gyro, which has freedom in three axes, is rotating clockwise as viewed from X' , the gyroscope will start rotating counterclockwise on the ZZ' axis as viewed from Z .

The original rotation of the rotor and the torque applied to the rotor which moves the N end downward are expressed as vectors H and T , respectively, based on the right-hand screw law.

The rotating vector H rotates in the direction of torque vector T , and this rotating motion is called precession.



Direction of screw rotation

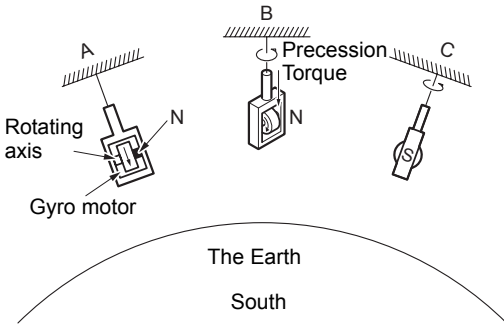


[Right-hand screw law]

The four fingers represent the direction of screw rotation, while the thumb indicates the advancing direction of the screw. Torque vector is defined as the direction of the thumb. The direction and amount of rotation are thus represented by a vector shown by the right-hand screw law.

[Pendulum gyroscope]

If the motor of a pendulum gyroscope is rotated clockwise viewed from end S of the rotating axis with another end N of the rotating axis facing east at an arbitrary point Q, the gyroscope changes its position from A to B, then B to C (see below) and finally the N end faces true north, i.e., the rotating axis aligns itself with the meridian by precession. Here it is assumed that the torque around the suspension tape is nil. Let us consider what causes the northward rotation of the N end.



Even though the axis has a property which allows it to maintain its direction unchanged, end N of the axis must go down because of the rotation of the earth. In other words, when the Earth's gravity applies torque to the pendulum, its vector faces north. Therefore, end N of the axis (vector of rotor) starts a precession toward the north. Until end N precesses to the north, the torque caused by gravity is applied and the precession continues. The speed of precession is greatest in the north direction. After end N passes north, gravity applies torque to lower the new end N (old end S) downward. Therefore, the speed of precession decreases. When the new S end precesses to the same bearing at this end, a movement back to the north starts. Because the rotation of the Earth never stops, the back and forth motion around north will continue as long as the motor continues to rotate. This is the precession of a pendulum gyroscope.

SOKKIA TOPCON CO., LTD.

<http://www.sokkia.co.jp/english/>

1-5-2, AZUSAWA, ITABASHI-KU, TOKYO, 174-0051 JAPAN

1st ed. 01-1105

©2011 SOKKIA TOPCON CO., LTD.