

SOKKIA

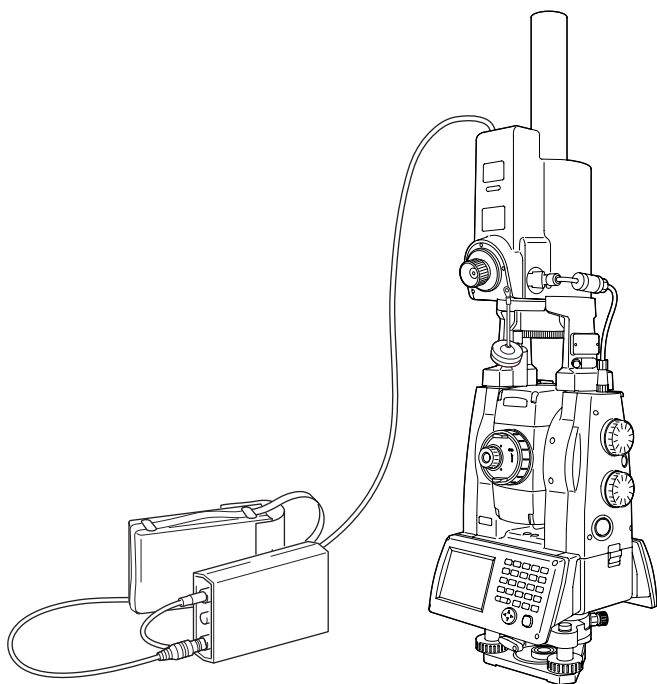
GYRO X II

GYRO1X II

GYRO2X II

GYRO3X II

Automated Gyro Stations



CLASS 3R Laser Product

OPERATOR'S MANUAL

21904 90020

HOW TO READ THIS MANUAL

Thank you for selecting the GYRO1X II/2X II/3X II.

- Please read this Operator's manual carefully, before using this product.
- GYRO X II has a function to output data to a connected host computer. Command operations from a host computer can also be performed. For details, refer to "Communication manual" and ask your local dealer.
- The specifications and general appearance of the instrument are subject to change without prior notice and without obligation by TOPCON CORPORATION 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.
- This manual is protected by copyright and all rights are reserved by TOPCON CORPORATION.
- Except as permitted by Copyright law, this manual may not be copied, and no part of this manual may be reproduced in any form or by any means.
- This manual may not be modified, adapted or otherwise used for the production of derivative works.
- Some models may not been sold in certain countries or regions.

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, "SX" means "SX-101P/102P/103P" in this manual.
- Except where stated, "GYRO X II" means "GYRO1X II/2X II/3X II" in this 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 VERNIEUW 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 DECARTEADA 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 ΜΠΑΤΕΡΙΑ 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.

 SX battery: SX series operator's manual



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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.

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.


1. PRECAUTIONS FOR SAFE OPERATION

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.

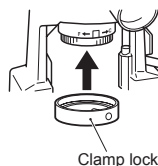
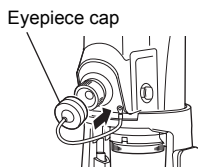
2. PRECAUTIONS



- Please ensure that you are fully familiar with the SX series 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 little vibration. Sometimes vibration affects the measurement accuracy. If large vibration occurs, it hinders the gyro station from measuring an object from time to time.
- 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.
- Charge the battery after measurements, using the charger CDC75.
- Ensure that the gyromotor is fully clamped before turning on or off the Gyroscope power switch. (The suspension tape seldom breaks when the correct clamping procedure is followed.)
 "7.4 Finishing the Gyro Station Measurement"
- Before removing the battery from the gyroscope unit, set the gyromotor in the fully clamped status and then turn off the power.
 "7.4 Finishing the Gyro Station Measurement"
- When storing the gyroscope unit, make sure that the gyromotor is fully clamped and put the clamp lock over the clamping ring.



Precautions concerning water and dust resistance



For SX waterproofing and dust resistance, see SX series 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 GYRO X II 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

The instrument is classified as the following class of Laser 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 |



- 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.

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 product. The position of these labels are described in the SX series 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.
- 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

3. LASER SAFETY INFORMATION

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.
- 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.

4. PARTS OF THE INSTRUMENT

4.1 Gyro Station Features

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

- By the rotation of the internal motor, the Gyro pendulum built in the gyroscope unit oscillates around the earth's meridian (true north) due to the principle of precession caused by the rotation of the earth.


 "15. APPENDIX : PRINCIPLE OF THE GYRO X II".

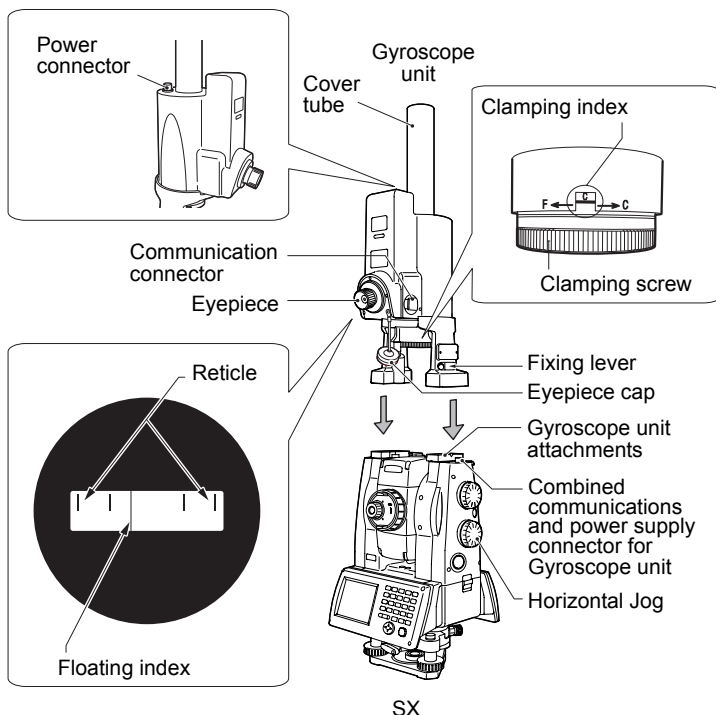
- The combination of the gyroscope unit and the SX total station with exclusive application software programs and motor drive allows the true north position to be automatically calculated by the SX instrument.
- Two different measurement methods (follow-up and time measurements) are usable to determine the true north position.

 "8. EXPLANATION OF MEASUREMENT MODES".

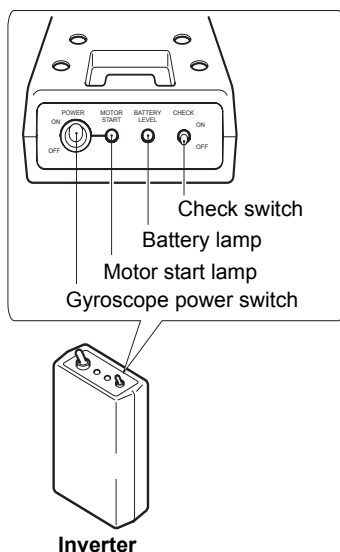
- The calculated true north position can be easily transferred to the SX horizontal circle.

4.2 Parts of the Instrument

 For parts of the SX, see SX series operator's manual

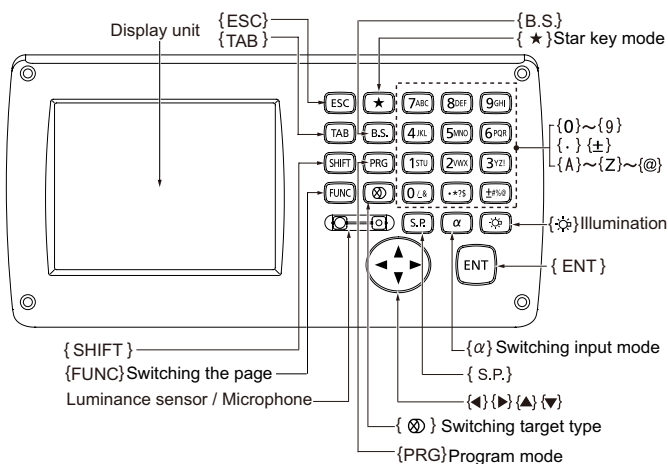


4. PARTS OF THE INSTRUMENT



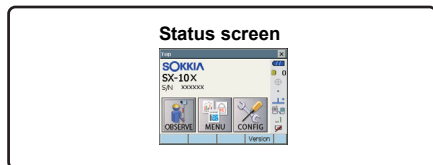
► SX operation panel

☞ "5.1 Basic Key Functions"



4.3 Mode Structure

● Basic mode

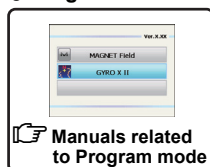


● Star key mode



{PRG}

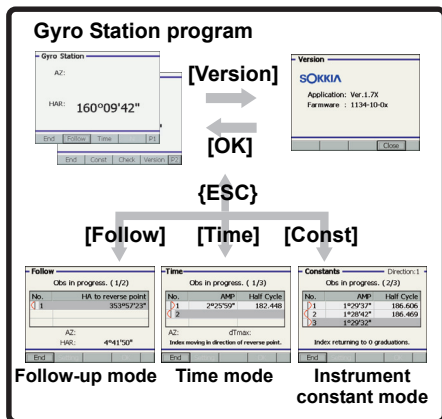
● Program selection screen



Hand icon: Manuals related to Program mode

● Program mode


Boot up
Quit



- Do not power OFF while using Gyro Station program. Doing so will cancel the resume function for Basic mode.
Reboot Gyro Station program and press [END] to regain the canceled resume function for Basic mode.

5. BASIC OPERATION

5.1 Basic Key Functions

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

● Power ON/OFF

{ ① }	Power ON
{ ① } (Press and hold: About 1 second)	Power OFF

● Switching to Program mode

{PRG}	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.

- Initialization mode

[Yes]	Return the constant to the initial value.
[End] {ESC}	Cancel the initialization mode.

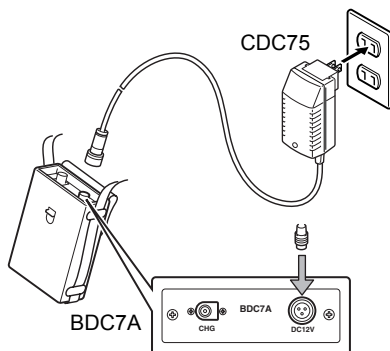
6. BATTERY CHARGING



- 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.

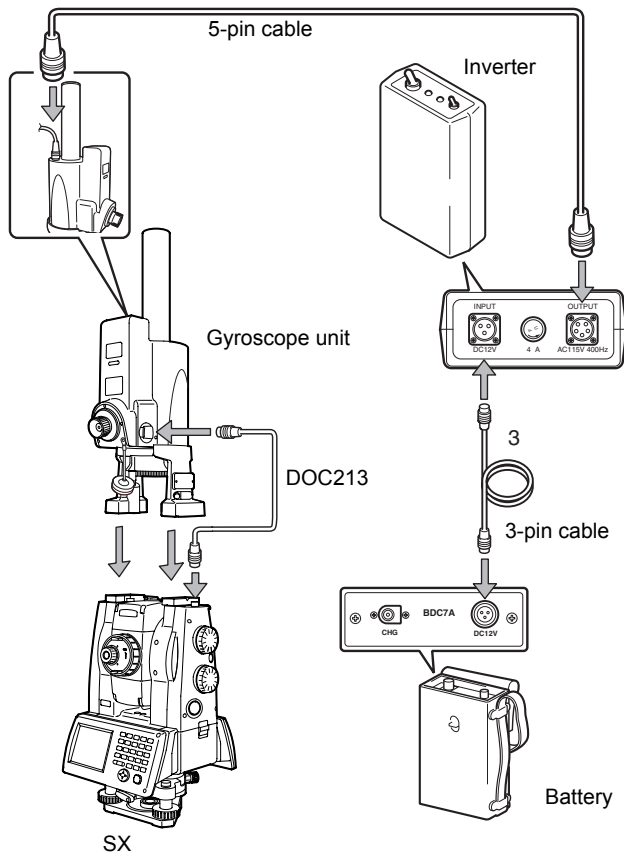
Display on Main Unit	Status	Yellow LED	Green LED
Standby	Stand-by	ON	OFF
Pre Charge	Pre-charge check	Slow blink	OFF
Rapid Charge	Rapid Charge	OFF	Rapid blink
Maintain	Trickle Charge	OFF	Slow blink
Error	Battery may be faulty. Please contact your local dealer.	Rapid blink	OFF
Ready	Charging complete	OFF	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 SX, Gyroscope unit, inverter and battery as shown below.



- Before removing the battery from the gyroscope unit, clamp the pendulum and then turn off the power.

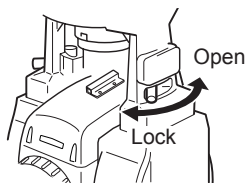
►PROCEDURE

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

☞ SX series operator's manual



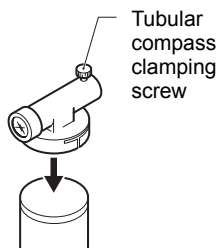
- Perform measurement where there is little vibration. Sometimes vibration affects the measurement accuracy or hinders the gyro station from measuring an object.
2. Set the gyroscope fixing lever to the open position. Mount the gyroscope unit on SX and set the fixing lever to the close position.
 3. 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 SX. Connect the communication connector of the gyroscope unit to the data input/output connector of SX through the communication cable (DOC213).
 6. Perform leveling as described in
☞ SX series operator's manual



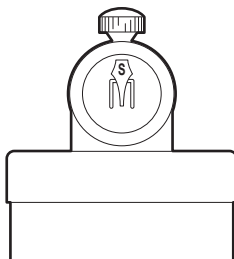
7.2 Preparing for Measurement with Gyro Station

►PROCEDURE

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



2. Use the horizontal jog to turn the SX until the tubular compass needle is centered between the S index lines. The SX is now pointing towards approximate magnetic north. Eliminate the deviation of magnetic north and true north at the measuring position, and point SX towards approximate true north.



- Compass can be affected by building structures or mineral ore and sometimes does not point towards magnetic north correctly. Where the compass is not usable, use any other available means to point the SX telescope in the north direction; e.g. map, the sun, time etc.



"10. ERROR MESSAGES" :

The maximum value is exceeded. (needle offset)

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"

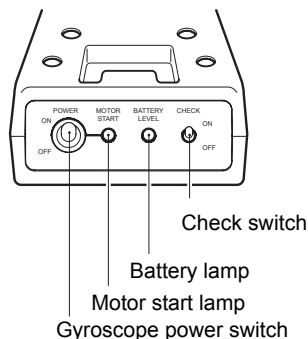
7. PREPARATION AND FINISHING MEASUREMENT

4. 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 ON.



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

➡ "6. BATTERY CHARGING"

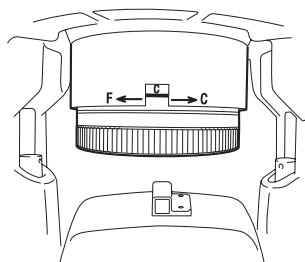


Note

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

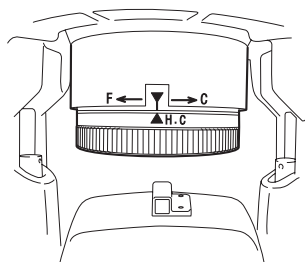
FULL CLAMP position

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.
 SX series operator's manual
2. Press {①}. When the power is switched on, a self-check is run. The tilt screen is displayed.
3. Level the SX.
 SX series operator's manual
4. Press {PRG} 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

Select "GYRO X II" in the screen of step 4. The screen shown at right is displayed and it is possible to start measurement.

 "8. EXPLANATION OF MEASUREMENT MODES"



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

►PROCEDURE Quitting

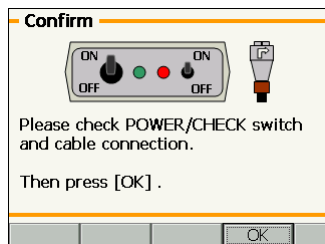
1. Press **{ESC}** to display the confirmation screen shown in step 2.
2. Press **[YES]** to quit Gyro Station program.



- When the Gyro Station Program starts, it checks if SX and the gyroscope unit can communicate with each other.
Make sure that SX is connected to the gyroscope unit with the communication cable (DOC213) and the gyroscope unit is ON.

7. PREPARATION AND FINISHING MEASUREMENT

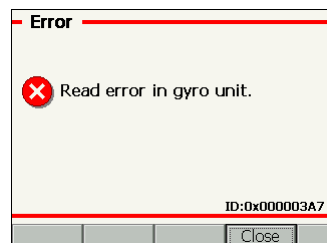
If the gyroscope unit is OFF or if SX is not connected with the communication cable, the screen shown at the right appears.



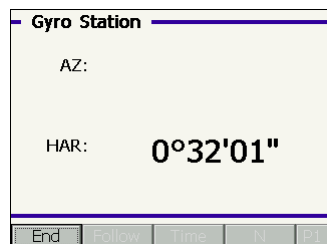
Press **[OK]**, and the program checks again if the communication can be done.

If checking has failed again, the error screen appears.

When the error message appears, contact your local dealer.



Press **[Close]**, and the azimuth angle screen appears. Press **[End]** to finish the Gyro Station Program.

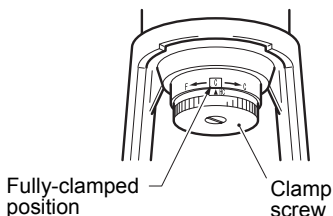


7.4 Finishing the Gyro Station Measurement

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

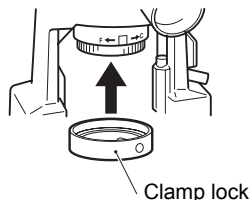
►PROCEDURE

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. EXPLANATION OF MEASUREMENT MODES

This section will explain the selection of measurement mode and the Azimuth display which is displayed before and after the execution of true north measurement.

8.1 Selection of Measurement Mode

When using GYRO X II, you can measure the true north by two methods, "Follow-up measurement" and "Time measurement".

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 successive turning points have been measured, the true north direction can be determined with the accuracy of standard deviation 20'.

When continuous three or more successive turning points have been measured, the true north direction can be determined with the accuracy of standard deviation 15".

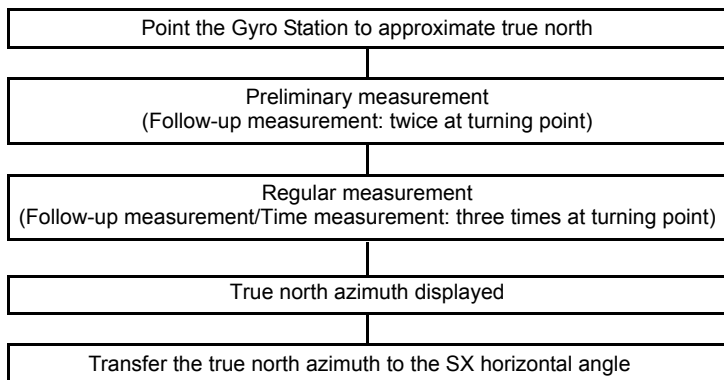
Time measurement

Time measurement is performed without moving the Gyro Station. By calculating the amplitude of the right and left turning points (position of the turning points on the graduated scale) and the passing time 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. When continuous three or more successive points have been measured, the true north direction can be determined with the accuracy of standard deviation 15".



- The accuracy of follow-up measurement is the value when measurement starts from $\pm 2^\circ$ in the true north direction.
The accuracy of time measurement is the value when measurement starts from $\pm 20'$ in the true north direction.

8. EXPLANATION OF MEASUREMENT MODES



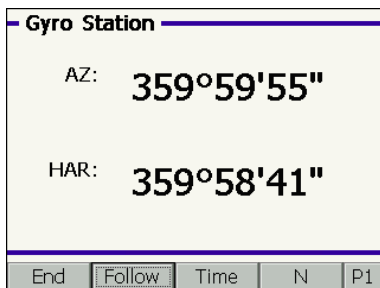
Turning point

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.

8.2 Azimuth Display

Start the Gyro Station program on SX, 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 SX 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.

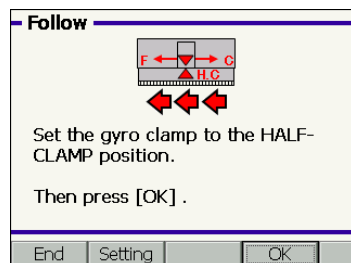
"9. INSTRUMENT CONSTANT MEASUREMENT"

8.3 FOLLOW-UP MEASUREMENT

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



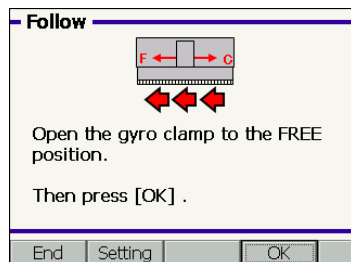
2. To prepare for measurement, set the pendulum to the HALF-CLAMP position and wait for approx. 10 seconds to allow the movement of the floating index to settle. Then, press **[OK]**.




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.



- You can set the half cycle measurement times.
 **[Note]** Setting for half cycle measurement times"

8. EXPLANATION OF MEASUREMENT MODES

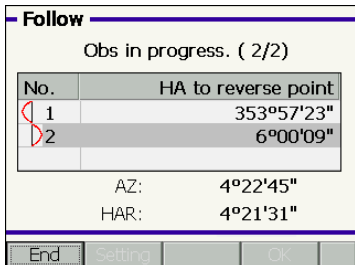
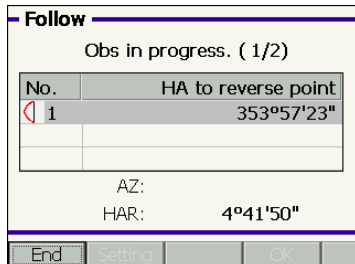
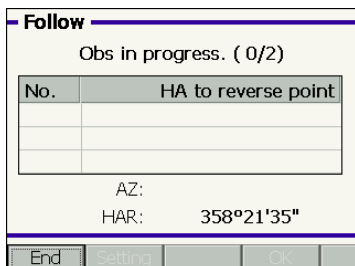
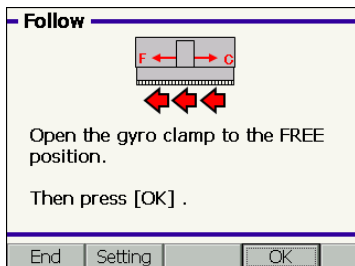
3. Start follow-up measurement.

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.

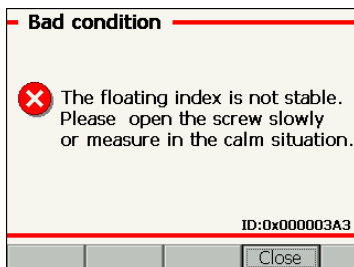
- Press [End] to cancel the measurement. Measurement result calculated by the completed measurements is displayed.
When the number of measurements is less than 2, the result is not displayed.
If the measurement result does not meet the requirement of the accuracy (standard deviation), only an error screen is displayed.

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



8. EXPLANATION OF MEASUREMENT MODES

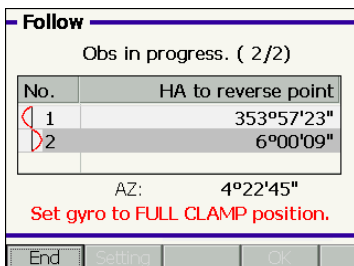
- The screen on the right is displayed when the result does not meet the requirement of the accuracy (standard deviation) due to a vibration or a swing etc. Press **[Close]** and cancel the measurement, then retry the measurement in a stable location.



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"



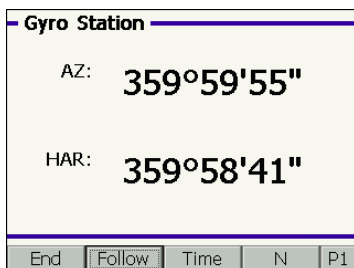
After measurement is finished, press **[End]**.

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.

☞ "8.2 Azimuth Display"

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





Setting for half cycle measurement times

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

When "Auto" is checked, measurement will be performed 3 times. If the measurement result does not meet the requirement of the accuracy (standard deviation), measurement will continue up to 10 times automatically.

The screen on the right is displayed during the measurement.

- Press **[End]** to cancel the measurement. Measurement result will not be displayed.

Setting

Turning points : ☐ Auto

OK Cancel

Setting

Turning points : ☒ Auto

OK Cancel

Follow

Obs in progress. (2/-)

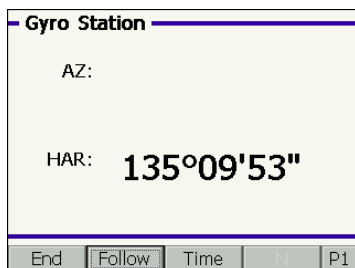
No.	HA to reverse point
1	353°57'23"
2	6°00'09"

AZ: 4°22'45"
HAR: 4°21'31"

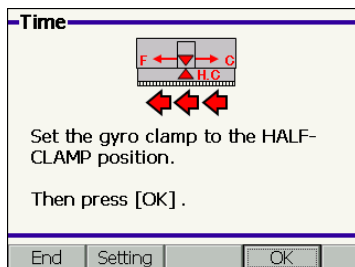
End Setting OK

8.4 TIME MEASUREMENT

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




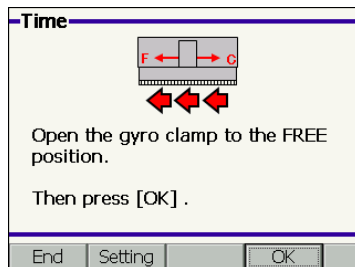
2. To prepare for measurement, set the pendulum to the HALF-CLAMP position and wait for approx. 10 seconds to allow the movement of the floating index to settle. Then, press **[OK]**.



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.
- You can set the half cycle measurement times.
 **[Note]** Setting for half cycle measurement times"



8. EXPLANATION OF MEASUREMENT MODES

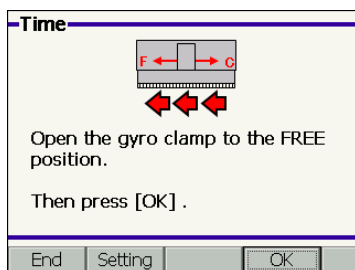
3. Observe the movement of the floating index.
Make sure that the floating index moves within the range of the right and left reticles.



- If measurement is performed under the condition that the floating index is out of the range of the right and left reticles, the error message is displayed.

☞ "10. ERROR MESSAGES"

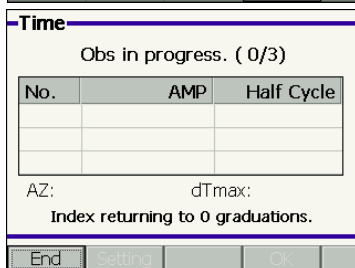
4. Start time measurement. When the gyroscope unit is in the FREE position, press **[OK]**.



The Gyro Station starts to measure the floating index.

dT max:

The largest value of time difference measured every turning point is displayed. The value is renewed when the latest value is larger than the previous value.



8. EXPLANATION OF MEASUREMENT MODES

- Press **[End]** to cancel the measurement. Measurement result calculated by the completed measurements is displayed.
When the number of measurements is less than 2, the result is not displayed.
If the measurement result does not meet the requirement of the accuracy (standard deviation), only an error screen is displayed.

Time

Obs in progress. (1/3)

No.	AMP	Half Cycle
1	2°25'59"	182.448
2		

AZ: dTmax:
Index moving in direction of reverse point.

End Setting Ok

Time

Obs in progress. (2/3)

No.	AMP	Half Cycle
1	2°25'59"	182.448
2	2°25'54"	182.292
3		

AZ: 0°00'05" dTmax: 0.156
Index moving in direction of reverse point.

End Setting Ok

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

Time

Obs in progress. (3/3)


No.	AMP	Half Cycle
1	2°25'59"	182.448
2	2°25'54"	182.292
3	2°25'53"	182.133

AZ: 0°00'08" dTmax: 0.159
Set gyro to FULL CLAMP position.

End Setting Ok

- The screen on the right is displayed when the result does not meet the requirement of the accuracy (standard deviation) due to a vibration or a swing etc. Press **[Close]** and cancel the measurement, then retry the measurement in a stable location.

Bad condition

 The floating index is not stable.
Please open the screw slowly
or measure in the calm situation.

ID:0x000003A3

Close

8. EXPLANATION OF MEASUREMENT MODES

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]**.

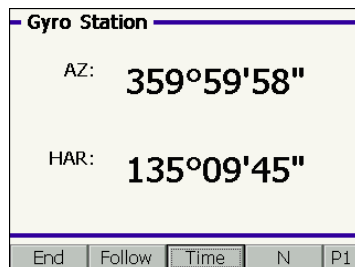
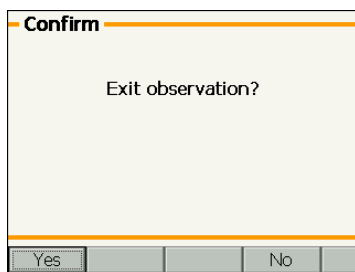
The Gyro Station rotates to the true north direction automatically according to the calculated azimuth angle.

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

☞ "8.2 Azimuth Display"

- To finish the Gyro Station program

☞ Finish the procedure of "7.3 Booting up and Quitting the Gyro Station Program".





Setting for half cycle measurement times

- 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".

When "Auto" is checked, measurement will be performed 3 times. If the measurement result does not meet the requirement of the accuracy (standard deviation), measurement will continue up to 10 times automatically.

The screen on the right is displayed during the measurement.

- Press **[End]** to cancel the measurement. Measurement result will not be displayed.

Setting

Turning points :
☐ Auto

OK Cancel

Time

Obs in progress. (2/-)

No.	AMP	Half Cycle
1	2°25'59"	182.448
2	2°25'54"	182.292
3		

AZ: 0°00'05" dTmax: 0.156


Index moving in direction of reverse point.

End Setting Ok

8.5 OUTPUTTING MEASUREMENT DATA

Measurement data is output in the following folder.

Start up the SX in USB mode, and transfer the measurement data to a computer.

 Connecting to USB devices: SX series operator's manual

\\PROGRAM\\AutoGyro\\data



- The maximum number of files that can be stored in the data folder is 30 including all the measurement data.
Exceeded data is overwritten from oldest data.

(Output sample: Follow method)

Instrument serial No.: [100002]

Const G:, (26.260"/pixel)

Const R:, (10.47")

Last check:, 2012/03/30 08:03:28

Last check result:, Normal end.

Measurement sequence:, Follow method

Measurement start:, 2012/03/30 12:47:00

Start HA:, (155-51'47")

HA to reverse point 1:, (155-07'55")

HA to reverse point 2:, (155-49'56")

HA for north 1:,,(155-28'56")

HA to reverse point 3:, (155-07'17")

HA for north 2:,,(155-28'46")

Calculated HA for north:, (155-28'46")

Measurement stop:, 2012/03/30 12:55:38

8. EXPLANATION OF MEASUREMENT MODES

(Output sample: Time method)

Instrument serial No.: [100002]

Const G: (25.408"/pixel)

Const R: (-176.19")

Last check: 2012/03/30 08:03:28

Last check result: Normal end.

Measurement sequence: Time method

Measurement start: 2012/03/30 13:38:34

Start HA: (155-05'16")

Amplitude 1: (1-55'37")

Half cycle 1: (174.127s)

Amplitude 2: (- 2-18'26")

Half cycle 2: (195.873s)

HA for north 1: (359-48'17")

Amplitude 3: (1-55'37")

Half cycle 3: (174.127s)

HA for north 2: (359-48'17")

Calculated HA for north: (359-48'24")

Measurement stop: 2012/03/30 13:43:35

9. INSTRUMENT CONSTANT MEASUREMENT

If the latitude of the measuring location is greatly changed and you want to perform time measurement, instrument constant should be set again.

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° 00' 00" (true north: first direction), 359° 50' 00" (second direction) and 0° 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.

Gyro Station	
AZ:	
HAR:	135°09'52"
End Const Check Version P2	

9. INSTRUMENT CONSTANT MEASUREMENT

4. To prepare for measurement, set the pendulum 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.

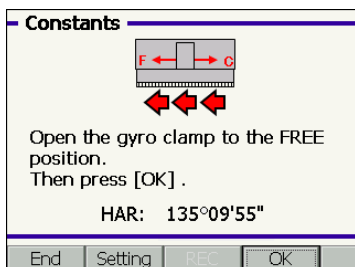
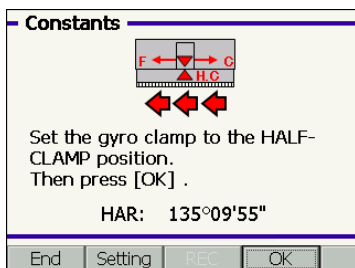
5. Observe the movement of the floating index. Make sure that the floating index moves within the range of the right and left reticles.

- If measurement is performed under the condition that the floating index is out of the range of the right and left reticles, the error message is displayed.

 "10. ERROR MESSAGES"

6. 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"

EndSettingRECOK

Constants Direction: 1

Obs in progress. (0/3)

No.	AMP	Half Cycle

Index returning to 0 graduations.

EndSettingOK

⋮

Constants Direction: 1

Obs in progress. (2/3)

No.	AMP	Half Cycle
1	1°29'37"	186.606
2	1°28'42"	186.469
3	1°29'32"	

Index returning to 0 graduations.

EndSettingOK

9. INSTRUMENT CONSTANT MEASUREMENT

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

Constants			
2nd direction			
HAR: 359°59'30"			
End	Setting	REC	OK

Constants			
3rd direction			
HAR: 0°01'09"			
End	Setting	REC	OK

7. Record the constants.

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

Constants		Direction: 1
- Current value -		
G=	25.90	
R=	-137.4	
- Calculated value -		
G=	25.78	
R=	-99.0	
End	Setting	REC OK

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.

Confirm			
Exit observation?			
Yes		No	

9. INSTRUMENT CONSTANT MEASUREMENT


- If the calculated constant value is not proper, "No solution" is displayed for "Calculated value". Press **[End]** to finish the instrument constant measurement.

Constants				
- Current value -				
G=	26.26			
R=	-5.3			
- Calculated value -				
G=	No solution			
R=	No solution			
Set gyro to FULL CLAMP position.				
End	Setting	REC	OK	

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"



- If the last instrument constant measurement was not finished normally, the screen shown at the right is displayed at the program start. In this case, GYRO X II uses the constant at shipment (initial value).
- When the measurement is being done by using the initial constant value, the items ("AZ" and "HAR") of azimuth and horizontal angle are displayed in red. Moreover, the caution icon is displayed at the upper right corner on the screen.

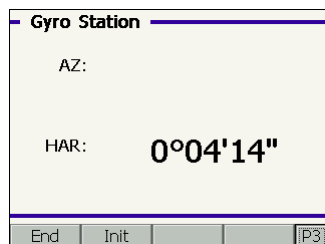
Warning		
	Const measurement was failed.	
Please measure the constants again.		
Initial value is used.		
		Close

Gyro Station				
AZ:				
HAR:	0°32'00"			
End	Follow	Time	N	P1

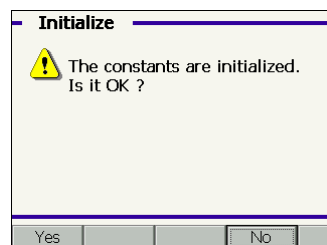
►PROCEDURE Initialization of constant

To return the constant to the initial value (at 35.7° North Latitude), perform the initialization of constant.

1. Initialize the constant.
Press **[Init]**, and the check message is displayed.




- Press **[Yes]**, and the constant is returned to the initial value. When the initialization mode is finished, the azimuth angle screen appears again.



10. ERROR MESSAGES

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

 For error messages not explained here, refer to the SX series operator's manual.

Gyroscope unit: Light intensity error. Please cap the eyepiece of gyro unit.

A strong light enters through the eyepiece lens of the gyroscope unit. Attach the eyepiece cap and perform measurement again.

Read error in gyro unit.

Checking the start of the gyroscope unit has failed.

Read constants error.

The instrument constant, which is recorded in the gyroscope unit, cannot be obtained in the start procedure. Press **[End]** to finish the Gyro Station Program and then restart it.

Setting constants was failed.

The result of the instrument constant measurement cannot be recorded in the gyroscope unit.

Press **[Close]** to finish the instrument constant measurement. After restarting the Gyro Station Program, execute the instrument constant measurement again.

The minimum value is under. (needle offset)

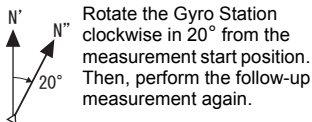
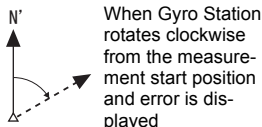
The maximum value is exceeded. (needle offset)

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.



- When "The maximum value is exceeded. (needle offset)" is displayed during the follow-up measurement, it is probable that the direction of the Gyro Station is deviated from the true north in a great degree at the measurement start. As shown in the figure at the right, rotate the Gyro Station in 20° from the start position of follow-up measurement and perform the follow-up measurement again.



N': Direction of Gyro Station when follow-up measurement starts

N'': Direction of Gyro Station when follow-up measurement is done again

Timeout

During measurement, the gyroscope unit cannot communicate with SX.

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









Initialization of constants was failed.

Initialization of the constant has failed.

Press **[End]** to finish the Gyro Station Program and then restart it.

11. TROUBLE SHOOTING

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

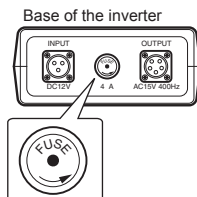
PROBLEM	COUNTERMEASURE
Battery lamp is lit	<ul style="list-style-type: none">Battery power is low. Ensure that the gyromotor is fully clamped then switch off the gyroscope unit. Remove and charge the battery.  "6. BATTERY CHARGING"
Gyromotor does not run (The rotation sound cannot be heard.)	<ul style="list-style-type: 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 SX is levelled correctly.  SX series operator's manualCheck 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"

11.1 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.

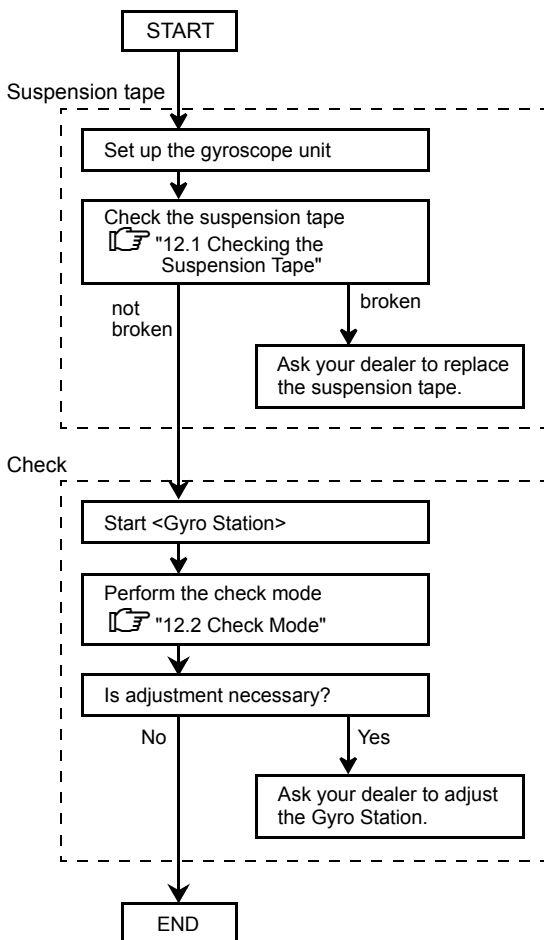
►PROCEDURE

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.




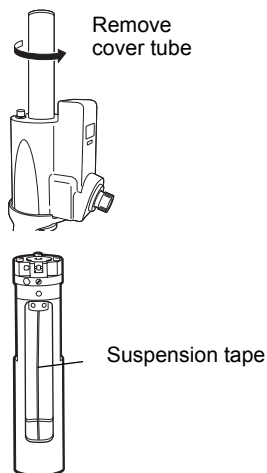
12. CHECKS

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.



12.1 Checking the Suspension Tape

1. Set up the gyroscope unit on the SX.
 "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.



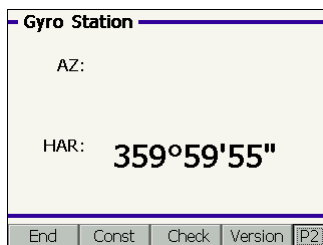
- Before checking, turn off the power switch of the gyroscope unit. It is not possible to perform checking correctly while the power is ON or the gyromotor is rotating.



- 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.

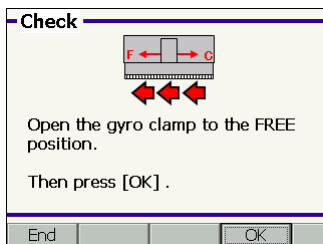
►PROCEDURE

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.



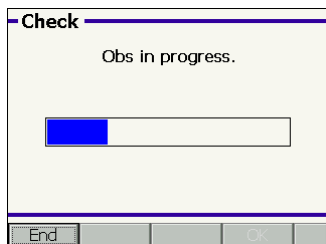
- If measurement is performed under the condition that the floating index is out of the range of the right and left reticles, the error message is displayed.

"10. ERROR MESSAGES"

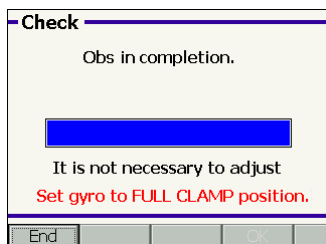


12. CHECKS

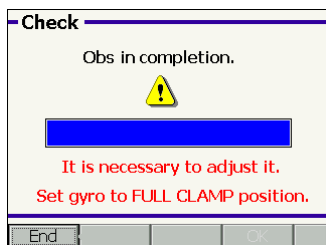
4. Start the check mode.
After the gyroscope unit is in the FREE position, press **[OK]**.



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. SPECIFICATIONS

Gyroscope unit with bridge

Measurement method	Follow-up measurement Time measurement
Accuracy:	15" (0.005 gon/0.074 mil) (standard deviation)
Follow-up measurement:	When measurement starts from $\pm 2^\circ$ in the true north direction.
Time measurement:	When measurement starts from $\pm 20'$ in the true north direction. When telescope pointed to within $\pm 20'$ of true north (When the tilt of the total station unit is within $\pm 3'$ (both in follow-up measurement and time measurement))
Running-up time:	Approx. 60 sec
Usable area:	Up to latitude 75°
Half period (at latitude 35°):	Approx. 3 min
Gyroscope unit mounting accuracy:	$\pm 5''$ (0.002 gon/0.025 mil)
Operating temperature:	-20 to 50°C (no condensation)
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)

13. SPECIFICATIONS

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)

Cables

5 pin:	1.5 m
3 pin:	1.0 m
Communication cable: (DOC213)	150 mm

SX-101P/102P/103P

Instrument size (with handle):	230 (W) X 207 (D) X 401 (H) mm (with optional Face 2 display, excluding protruding sections)
Instrument weight (with BDC70 and handle):	
Display on both sides:	7.1kg (15.7 lb)
Others:	Carrying case and handle exclusively for GYRO X II are provided as accessories. (Standard handle for SX can not be attached)



For other SX specifications, see SX series operator's manual



14. REGULATIONS

Region/ Country	Directives/ Regulations	Labels/Declarations
U.S.A.	FCC-Class A	<p>FCC Compliance</p> <p>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.</p> <p>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.</p> <p>This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.</p> <p>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 extremities: hands, wrists, feet and ankles).</p> <p>Declaration of Conformity Model Number: GYRO X II Trade Name: TOPCON CORPORATION</p> <p>Manufacture Name: TOPCON CORPORATION Address: 75-1, Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 JAPAN 243-0036 Country: JAPAN</p> <p>U.S.A. Representative Responsible party: SOKKIA CORPORATION Address: 16900 West 118th Terrace, Olathe, KS 66061, U.S.A</p>



14. REGULATIONS

Region/ Country	Directives/ Regulations	Labels/Declarations
U.S.A.	FCC-Class A	<p>Means of conformity</p> <p>This device complies with part 15 of the FCC Rules, Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.</p>
California, U.S.A.	Proposition 65	<div style="border: 1px solid black; padding: 5px;"> <p>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. <i>Wash hands after handling.</i></p> </div>
California and NY, U.S.A.	Recycling Batteries	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;"><u>DON'T THROW AWAY RECHARGEABLE BATTERIES, RECYCLE THEM.</u></p> <p style="text-align: center;"><u>Sokkia Corporation United States Return Process for Used Rechargeable Nickel Metal Hydride, Nickel Cadmium, Small Sealed Lead Acid, and Lithium Ion, Batteries</u></p> <p>In the United States Sokkia Corporation has established a process by which SOKKIA customers may return used rechargeable Nickel Metal Hydride (Ni-MH), Nickel Cadmium (Ni-Cd), Small Sealed Lead Acid (Pb), and Lithium Ion (Li-ion) batteries to Sokkia Corporation for proper recycling and disposal. Only SOKKIA batteries will be accepted in this process.</p> <p>Proper shipping requires that batteries or battery packs must be intact and show no signs of leaking. The metal terminals on individual batteries must be covered with tape to prevent short circuiting and heat buildup or batteries can be placed in individual plastic bags. Battery packs should not be disassembled prior to return.</p> <p>SOKKIA customers are responsible for complying with all federal, state, and local regulations pertaining to packing, labeling, and shipping of batteries. Packages must include a completed return address, be prepaid by the shipper, and travel by surface mode. <u>Under no circumstance should used/recyclable batteries be shipped by air.</u></p> <p>Failure to comply with the above requirements will result in the rejection of the package at the shipper's expense.</p> <p>Please remit packages to: Sokkia Corporation 16900 W. 118th Terrace Olathe, KS 66061</p> <p style="text-align: center;"><u>DON'T THROW AWAY RECHARGEABLE BATTERIES, RECYCLE THEM.</u></p> </div>

14. REGULATIONS

Region/ Country	Directives/ Regulations	Labels/Declarations
Canada	ICES-Class A	<p>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.</p> <p>This class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.</p> <p>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.</p> <p>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 should be installed and operated with at least 20cm and more between the radiator and person's body (excluding extremities: hands, wrists, feet and ankles).</p>
Europe	EMC-Class B	<div style="border: 1px solid black; padding: 10px; text-align: center;">  <p>EMC NOTICE In industrial locations or in proximity to industrial power installations, this instrument might be affected by electromagnetic noise. Under such conditions, please test the instrument performance before use.</p> </div>
EU	WEEE Directive	<div style="border: 1px solid black; padding: 10px;">  <p>WEEE Directive This symbol is applicable to EU member states only.</p> <p>Following information is only for EU-member states: The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product or consult.</p> <p style="text-align: right;">TOPCON CORPORATION</p> </div>

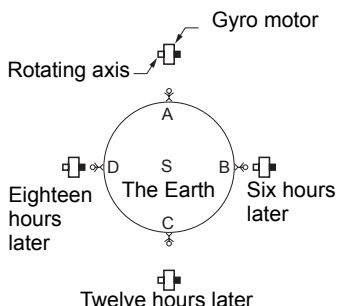
14. REGULATIONS

Region/ Country	Directives/ Regulations	Labels/Declarations
EU	EU Battery Directive	<div>  EU Battery Directive This symbol is applicable to EU members states only. Battery users must not dispose of batteries as unsorted general waste, but treat properly. </div>
Australia	C-Tick	

15. APPENDIX : PRINCIPLE OF THE GYRO X II

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

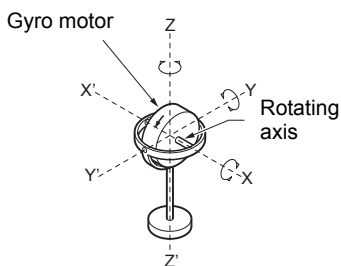


[Theory of the gyroscope]

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.

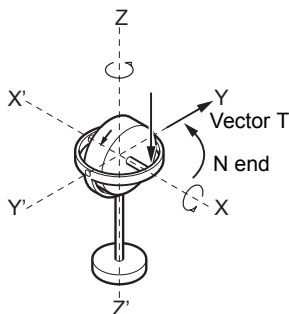
Six hours later, the rotation of the earth will cause point A to reach point B. At that moment, the N end of the rotating axis faces the same direction as it did at point A. Similarly, 12 hours later, at point C and 18 hours later at point D, the direction of the axis will remain unchanged. Although 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.

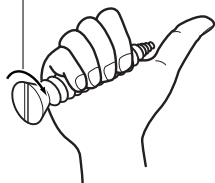
If torque is applied to the rotating axis, lowering the N end of the rotating axis, while the gyro, which has freedom in three axes, is rotating clockwise as viewed from X' , the gyroscope will start rotating counterclockwise on the ZZ' axis as viewed from Z .

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

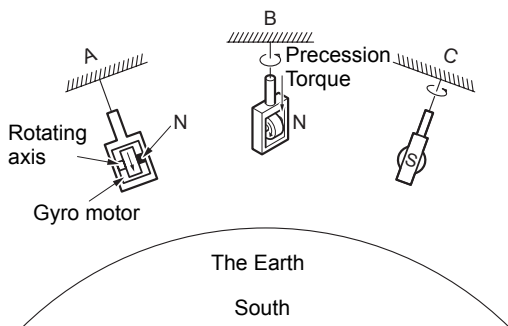


[Right-hand screw law]

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 point 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.

TOPCON CORPORATION

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Please see the attached address list or the following website for contact addresses.

GLOBAL GATEWAY <http://global.topcon.com/>
