



INSTRUCTION MANUAL LAYOUT NAVIGATOR

21313 91070

HOW TO READ THIS MANUAL

Thank you for selecting the LN-100 series.

- · Please read this Instruction manual carefully, before using this product.
- LN-100 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.
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- · This manual may not be modified, adapted or otherwise used for the production of derivative works.

Symbols

The following conventions are used in this manual.

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

{Power switch} etc. : Indicates keys on the operation panel.

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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

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



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



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



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

General



Warning

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



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



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.



This instrument automatically operates when the power is turned ON or OFF. Do not touch the instrument during operation. Doing so may cause injury.

Power Supply



Warning

Do not use batteries other than those designated. An explosion could occur, or abnormal heat generated, leading to fire.

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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 place articles such as clothing on the battery charger while charging batteries. Sparks could be induced, leading to fire.



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.

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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 connect or disconnect power supply plugs with wet hands. Electric shock could result.



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Do not short circuit. Heat or ignition could result.



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

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 or chargers into fire. An explosion could occur, resulting in injury.



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



Caution



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

Tripod



Caution



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



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



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



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



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

Wireless technology (Wireless LAN)



Warning

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



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



Do not use onboard aircraft. The aircraft instrumentation may malfunction as a result.



Do not use within the vicinity of automatic doors, fire alarms and other devices with automatic controls as the electromagnetic waves produced may adversely affect operation resulting in an accident.

2. PRECAUTIONS

Charging Battery

• Be sure to charge the battery within the charging temperature range. Charging temperature range : 0 to 40°C

Warranty policy for Battery

 Battery is an expendable item. The decline in retained capacity depending on the repeated charging/ discharging cycle is out of warranty.

About operation when the power is turned ON/OFF

This instrument operates as shown below and performs auto leveling/auto rotation when the power of the instrument is turned ON or OFF. Do not touch the instrument during operation. Doing so may cause injury.



Precautions concerning water and dust resistance

Dustproof and waterproof performance of the instrument comply with IP65. Please read the following carefully before using.

- · Close the battery cover tightly.
- Make sure that moisture or dust particles do not come in contact with the terminal or connectors. Operating the instrument with moisture or dust on the terminal or connectors may cause damage to the instrument.
- Make sure that the inside of the carrying case and the instrument are dry before closing the case. If
 moisture is trapped inside the case, it may cause the instrument to rust.
- If there is a crack or deformation in the rubber packing for the battery cover or external interface hatch, stop using and replace the packing.
- To retain the waterproof property, it is recommended that you replace the rubber packing once every two years. To replace the packing, contact your local sales representative.

Other precautions

- Do not insert a foreign object into the instrument during the auto leveling. Doing so will cause a failure.
- Never place the instrument directly on the ground. Sand or dust may cause damage to the screw holes or the centering screw on the base plate.
- · Protect the instrument from heavy shocks or vibration.
- · Protect the instrument from rain or drizzle with an umbrella or waterproof cover.
- Never carry the instrument on the tripod to another site.
- · Turn the power off before removing the battery.
- Remove the battery before placing the instrument in its case.
- Make sure that the instrument and the protective lining of the carrying case are dry before closing the case. The case is hermetically sealed and if moisture is trapped inside, the instrument could rust.
- Consult your local dealer before using the instrument under special conditions such as long periods
 of continuous use or high levels of humidity. In general, special conditions are treated as being
 outside the scope of the product warranty.

Maintenance

- Wipe off moisture completely if the instrument gets wet during survey work.
- Always clean the instrument before returning it to the case. The lens requires special care. First, dust it off with the lens brush to remove tiny particles. Then, after providing a little condensation by breathing on the lens, wipe it with the wiping cloth.
- · Store the instrument in a dry room where the temperature remains fairly constant.
- · Check the tripod for loose fit and loose screws.
- If any trouble is found on the rotatable portion, screws or optical parts (e.g. lens), contact your local dealer.
- When the instrument is not used for a long time, check it at least once every 3 months.
- Every 4,000 to 5,000 hours operation in total, change grease of driving parts. Contact your local dealer for the maintenance.
- When removing the instrument from the carrying case, never pull it out by force. The empty carrying case should be closed to protect it from moisture.
- · Check the instrument for proper adjustment periodically to maintain the instrument accuracy.

Exporting this product (Relating EAR)

- This product is equipped with the parts/units, and contains software/technology, which are subject to the EAR (Export Administration Regulations). Depending on countries you wish to export or bring the product to, a US export license may be required. In such a case, it is your responsibility to obtain the license. The countries requiring the license as of May 2013 are shown below. Please consult the Export Administration Regulations as they are subject to change.
 - North Korea
 - Iran
 - Syria
 - Sudan Cuba

URL for the EAR of the US: http://www.bis.doc.gov/policiesandregulations/ear/index.htm

Exporting this product (Relating telecommunications regulations)

 Wireless communication module is incorporated in the instrument. Use of this technology must be compliant with telecommunications regulations of the country where the instrument is being used. Even exporting the wireless communication module may require conformity with the regulations.

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 : Class 3R Laser Product
- Laser pointer : Class 3R Laser Product
- Laser plummet : Class 2 Laser Product



Please read the following safety instructions carefully before using the LN-100.

- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Never intentionally point the laser beam at another person. The laser beam is injurious to the eyes and skin. If an eye injury is caused by exposure to the laser beam, seek immediate medical attention from a licensed ophthalmologist.
- Do not look directly into the laser beam. Doing so could cause permanent eye damage.
- · Do not stare at the laser beam. Doing so could cause permanent eye damage.
- Never look at the laser beam through a telescope, binoculars or other optical instruments. Doing so could cause permanent eye damage.
- · Sight targets so that the 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.

- Avoid setting the instrument at heights at which the path of the laser may strike pedestrians or drivers at head height. Operate the instrument with due caution to avoid injuries that may be caused by the laser beam unintentionally striking a person in the eye.
- 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 this manual for usage procedures for this product.
 - Hazardous protection procedures (read "LASER SAFETY INFORMATION")
 - Requisite protective gear (read "LASER SAFETY INFORMATION")
 - Accident reporting procedures (stipulate procedures beforehand for transporting the injured and contacting physicians in case there are laser-induced injuries).
- Persons working within the range of the laser beam are advised to wear eye protection which corresponds to the laser wavelength of the instrument being used.
- Areas in which the laser is used should be posted with a standard laser warning sign.
- 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. NOMENCLATURE AND FUNCTIONS

4.1 Parts of the Instrument



Instrument height mark

The height of the instrument is as follows:

176 mm (from the position where a tripod is mounted to the instrument height mark)

 \square "About the instrument height when setting the instrument point" on page 20

Sighting collimator

Use this function to align the direction (horizontal only) of the instrument with the survey point. Look through the sighting collimator and align the window with the direction of the prism.

Reset switch

This function resets the W-LAN setting to the default factory setting. $\square \mathcal{F}$ "8.2 What to Do When" on page 25 Do not use this switch under normal circumstances.

Wireless antenna

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This antenna may be damaged depending on how it is handled. Be careful not to hit the antenna while working, as it sticks out from the instrument.

4.2 Control Panel



Explanation of the operation panel

Name	Function details
Power switch	Power ON: Press it for a short time Power OFF: Hold down the switch for more than 1 second
Power LED	Off: Power OFF Lighting up in green: Power is ON Blinking in green: During Power-OFF-process Blinking in red: Battery voltage dropped
W-LAN mode selector switch (inside the battery cover)	Mode A: Flip the switch to the right Mode B: Flip the switch to the left

When it is Mode A	
Connection waiting st	ate: Blinking in green every 1 second (repeating a cycle in which the LED is on for 1 second and then off for 1 second)
Connecting.	Lighting up in green
When it is Mode B Connection waiting st	ate: Blinking in green quickly (repeating a cycle of quick on twice, followed by 2 seconds off)
Connecting: When an error is dete	Lighting up in green cted in the W-LAN setting item: Lighting up in red
Laser plummet ON: Pre Laser plummet OFF: Pre Laser plummet ON page 11	ss it ess and hold (More than 1 second). I/OFF and brightness adjustment" on
Off: Laser plummet or la Blinking in green: Laser	iser pointer is OFF plummet or laser pointer ON
Starts auto leveling: Press it while auto leveling is stopped. Stops auto leveling: Press it again while auto leveling is being performed. Extends the leveling screw: Hold it down. CF "Auto leveling" on page 18	
Blinking in green: In a Lighting up in green: Wit cor Lighting up in red: Ou Blinking in red: Ou	auto leveling thin the range of inclination npensation (±6 minutes) tside the range of inclination npensation (±6 minutes or over) tside the range of auto leveling
	When it is Mode A Connection waiting st Connecting: When it is Mode B Connection waiting st Connection waiting st Connecting: When an error is dete Laser plummet ON: Pre Laser plummet OFF: Pr ICF "Laser plummet OFF: Pr CF "Laser plummet OFF: Pr Starts auto leveling: Pres Starts auto leveling: Pres

Displaying battery life

The battery life is low when the power LED is blinking in red and a beep sound (repeating beeps) is heard. Exchange the battery. The battery life of the instrument is displayed on the controller. $\Box \overline{r}$ Refer to the instruction manual of the controller.

■ Laser plummet ON/OFF and brightness adjustment

The operation method of the laser plummet is as follows:

Function	Description	
Turn ON the laser plummet	Press the {laser plummet switch} for a short time. The laser plummet lights up with the stored brightness.	
Turn OFF the laser plummet	Hold down the {laser plummet switch} for at least 1 second or it turns OFF automatically about five minutes after the laser plummet is turned ON. The brightness used when the laser plummet turned OFF is stored.	
Turn up the brightness	Pressing the {laser plummet switch} for a short time while the laser plummet is turned ON turns up the brightness by one level, up to level 5. After reaching level 5, it goes back to level 1.	

5. PREPARATION

5.1 Using the Battery

Battery charging

The battery was not charged at the factory. Charge the battery fully before using the instrument.

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- The charger will become rather hot during use. This is normal.
- · Do not use to charge batteries other than those specified.
- The charger is for indoor use only. Do not use outdoors.
- Batteries cannot be charged, even when the charging lamp is flashing, when the temperature is outside the charging temperature range.
- Remove batteries from the charger before putting into storage.
- · When not in use, disconnect the power cable plug from the wall outlet.
- Store the battery in a dry room where the temperature is within the following ranges. For long-term storage, the battery should be charged at least once every six months.

Storage period	Temperature range
1 week or less	-20 to 50°C
1 week to 1 month	-20 to 45°C
1 month to 6 months	-20 to 40°C
6 months to 1 year	-20 to 35°C

Batteries generate power using a chemical reaction and as a result have a limited lifetime. Even
when in storage and not used for long periods, battery capacity deteriorates with the passage of
time. This may result in the operating time of the battery shortening despite having been charged
correctly. In this event, a new battery is required.

PROCEDURE

- 1. Connect the power cable to the charger and plug the charger into the wall outlet.
- 2. Mount the battery in the charger by matching the grooves on the battery with the guides on the charger.



- 3. When charging starts, the lamp starts blinking.
- 4. The lamp lights when charging is finished.
- 5. Remove the battery and unplug the charger.



Note

· Slots 1 and 2:

The charger starts charging the battery mounted first. If you place two batteries in the charger, the battery in slot 1 is charged first, and then the battery in slot 2. ($\Box \vec{r}$ step 2)

· Charging lamp:

The charging lamp is off when the charger is outside the charging temperature range or when the battery is mounted incorrectly. If the lamp is still off after the charger falls within its charging temperature range and the battery is mounted again, contact your local dealer. (IFF steps 2 and 3)

• Charging time per battery (at 25°C): BDC70:about 5.5 hours

Installing the battery

Mount the charged battery.

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- Use the attached battery (BDC70).
- When installing/removing the battery, make sure that moisture or dust particles do not come in contact with the inside of the instrument.
- Be careful not to shut the battery cover on your fingers.
- Before removing the battery, turn off the power to the instrument. If the battery is removed while the power is switched on, a warm boot may occur. File and folder data may be lost as a result.
- Do not open the battery cover while the power is on.
- Remove batteries from the surveying instrument or charger before putting into storage.

PROCEDURE

1. Push the catch on the battery cover upwards to open the cover.



- Do not insert the battery diagonally, as this may damage the main unit or the battery terminal.
- 3. Close the battery cover. Make sure it clicks.





5.2 W-LAN Connection with the Controller

There are two methods to set up a W-LAN connection between the instrument and the controller:

Mode A connection

This is a one-to-one connection using the instrument as a master machine and the controller as a slave machine for W-LAN connection. When using the Mode A connection, the instrument performs as a DHCP server.

For details of the connection method, refer to the instruction manual of W-LAN Config for LN-100.



Mode B connection

Connect via other access point (as the master machine) using the instrument and the controller as slave machines for W-LAN connection.

EF For details of the connection method, refer to the instruction manual of W-LAN Config for LN-100.

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• The network settings of Mode A and Mode B are saved one each.



■ Connection setting items

Item		Selection item	Default factory setting
	SSID	Fixed	Model name _ serial number (e.g. LN-100_AB1234)
	Security	None/WEP/WPA/WPA2	WPA2
Mode A	Password (Security key)	WEP64: String of 5 characters (e.g. RIVER) or 10 hexadecimal characters (e.g. 12345678AF) WEP128: String of 13 characters or 26 hexadecimal characters WPA/WPA2: String of 8 to 63 characters or 64 hexadecimal characters	00serial number (e.g. 00AB1234)
	Channel	1 to 11	11
	IP address	Fixed	192.168.0.1
	Subnet mask	Fixed	255.255.255.0
	DHCP function	Fixed	DHCP server enabled
	DHCP lease address	Fixed	192.168.0.10 to 192.168.0.25
	SSID	Up to 32 bytes	No setting
	Security	None/WEP/WPA/WPA2	None
Mode B	Password (Security key)	WEP64: String of 5 characters or 10 hexadecimal characters WEP128: String of 13 characters or 26 hexadecimal characters WPA/WPA2: String of 8 to 63 characters or 64 hexadecimal characters	No setting
	IP address	xxx.xxx.xxx.xxx format	No setting
	Subnet mask	xxx.xxx.xxx.xxx format	No setting
	DHCP function	DHCP client / static IP	DHCP client

• After purchasing the instrument, change the password for Mode A to other than the serial number.

• If you forget the password, refer to "8.2 What to Do When" on page 25.

5.3 Setting Up the Instrument

Power ON/OFF

Caution

This instrument automatically operates when the power is turned ON or OFF. Do not touch the instrument during operation. Doing so may cause injury.

PROCEDURE: Power ON

1. Turn the power ON.

Press the {Power switch} on the operation panel to turn the power ON. When the power is turned ON, the power LED turns on. After the leveling automatically has started, the instrument rotates automatically.

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- · Avoid a W-LAN connection during auto leveling when setting up the instrument.
- After the rotation starts, do not touch the instrument until it stops at the original position. IP Refer to "Auto leveling" on page 18 for information on auto leveling.
- Auto Power OFF function: If no key operation or no data communication has been performed for about 30 minutes, the power turns OFF automatically.
- If the power cannot be turned ON even when the battery is mounted or if the power turns OFF as soon as the power turns ON, it is thought that the battery life is gone. Change it for a fully charged battery.

CF "Displaying battery life" on page 11

Procedure: Power OFF

1. Hold down the {Power switch} for about 1 second.

Auto leveling



Do not touch the instrument during auto leveling. Doing so may cause injury.

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 By performing auto leveling, the center of the instrument is automatically leveled within the range of ±30". After that, if the inclination of the main unit exceeds the range of inclination compensation (±6'), the red LED will light up. In this case, auto leveling will not automatically start. Perform auto leveling again.

PROCEDURE

 Press {Auto leveling switch} while auto leveling is stopped. The auto leveling LED starts blinking in green and auto leveling starts. After completing auto leveling, the LED lights up in green.

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If a foreign object gets caught in the auto leveling section, hold down {Auto leveling switch}.
 If the leveling screw is extended, remove the foreign object, and restart auto leveling.
 The following describes how to press {Auto leveling switch} and its relationship with the operation of the instrument:

Auto leveling switch	Beep sound *1)	While auto leveling is stopped	While auto leveling is being performed
Short press	One beep	After the beep sound is heard, auto leveling starts when you release the switch.	After the beep sound is heard, auto
Long press (1 second)	Two beeps	After the beep sound is heard, auto leveling starts when you release the switch. At this time, the instrument rotates 180°.*2)	leveling stops when you release the switch.
Hold down	Two beeps	After the beep sound is heard, the leveling screw starts extending. It stops when you release the switch.	

*1)

If a sound other than these beep sound patterns is heard, refer to the instruction manual of TS-Shield.

*2)

When auto leveling is performed by pressing {Auto leveling switch} for a long time (1 second), the same auto leveling operation as that performed when {Power switch} is turned ON is performed. Measurement by rotating the instrument 180° calibrates the inclination sensor.

Centering

PROCEDURE

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

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

 Aim a laser beam at the survey point. Turn the {Laser Plummet Switch} ON and loosen the centering screw.
 Fix the centering screw after aiming the laser beam at the survey point.



Note

• The laser light blinks when the instrument is performing auto leveling.

■ About the instrument height when setting the instrument point

The instrument height entered for setting the instrument point is the height from the survey point to the instrument height mark.

 \square Refer to the instruction manual of the controller for the settings.



6. OUTLINE OF SURVEY

The instrument can perform a stakeout survey and a side shot method. Use the controller for measurement.

6.1 Usable Range

The following shows the usable range of the instrument.

Do not operate the instrument out of the usable range shown below.



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Distance Measurement

The distance measurement limit of the instrument is a radial shape with a radius of 104 m from the center of the instrument.

Moving the target at the limit of the distance measurement range may result in the target being located outside the range within which measurement is possible.

6.2 Functions of Guide Light

By setting the guide light to "ON," you can tell from a distance about the state of the instrument and the direction to move the pole, by reference to the color of the light and the blinking pattern. The left of the guide light is green and the right is red.



7. CHECK

LN-100 is a precision instrument. It must be inspected before use so that it always performs accurate measurements.

In addition, the instrument should be inspected with special care after it has been stored a long time, transported, or when it may have been damaged by a strong shock.

Setting Up the Instrument

Perform a setup operation under an environment where the sunlight is weak and not fluctuating as well as LN-100 and the targets can be set as illustrated below.

• To perform checking efficiently, mark the four points described below using setting-out function in advance.



- 4
- Place the instrument and targets in a straight line when looking from directly above.
- Acceptable range of each point position is ±5cm in all directions.
- Set LN-100 and the targets on a substantially horizontal place (such as a floor, level ground, tripods of the same height). (The guideline for difference in height at 30 m is about 30 cm)
- Use ATP2 (360° prism) or ATP2S (360° slide prism) for the target.
- To set ATP2S, lower the height of the prism to reduce the setting error.

Measurement

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- Sighting can be more accurately performed by facing the ATP2/ATP2S toward the instrument.
- ATP2 : The 360° Prism should be set up so that a pair of diametrically-opposed hexagonal points on its rubber flanges are aligned with the sighting direction of the instrument (see the diagram below).



ATP2S : The 360° Prism should be set up so that a pair of diametrically-opposed marks on top of the prism are aligned with the sighting direction of the instrument.





t: Prism sighting direction

- 1. Set the instrument at instrument point 1.
- Measure the target set at measurement point a to record the coordinates. Because the target is re-measured at measurement point a after shifting to measurement point b, the position should be marked (positioning accuracy is approximately ±1mm).



- 3. Set the target at measurement point b.
- 4. Measure the target set at measurement point b to record the coordinates.



- 5. Set up the instrument at instrument point 2.
- 6. Measure the target set at measurement point b to record the coordinates.



- 7. Set the target at measurement point a. Return to the measurement position shown in 2. above.
- 8. Measure the target set at measurement point a to record the coordinates.



Measurement results recording table:

Instrument point	Target	X [m]	Y [m]	Z [m]
1	а	X _{1,a:}	Y _{1,a :}	Z _{1,a :}
I	b	X _{1,b:}	Y _{1,b :}	Z _{1,b:}
2	а	X _{2,a:}	Y _{2,a :}	Z _{2,a:}
2	b	X _{2,b :}	Y _{2,b :}	Z _{2,b:}

Calculation

Obtain the distance error (ED) and the vertical error (EZ) from the following formulas:

$$D_{1} = \sqrt{(X_{1,a} - X_{1,b})^{2} + (Y_{1,a} - Y_{1,b})^{2}}$$
$$D_{2} = \sqrt{(X_{2,a} - X_{2,b})^{2} + (Y_{2,a} - Y_{2,b})^{2}}$$
$$Z_{1} = Z_{1,a} - Z_{1,b}$$
$$Z_{2} = Z_{2,a} - Z_{2,b}$$
$$ED[mm] = \frac{(D_{1} - D_{2})}{2} \times 1000$$

$$EZ[mm] = (Z_2 - Z_1) \times 1000$$

Assessment

Confirm that the distance error (ED) and the vertical error (EZ) fall within the following ranges:

- Distance error -6 (mm) < ED < +6 (mm)
- Vertical error
 - -11.6 (mm) < EZ < +11.6 (mm)

Note

• If the error falls out of the range, contact your local dealer.

8. TROUBLESHOOTING

If there is a problem, check the table below and follow the suggestions.

8.1 LED Display

LED display	What is happening	How to resolve
Auto leveling LED is blinking in red.	Because the instrument is inclined excessively, auto leveling cannot be performed.	Perform auto leveling again after leveling the surface, such as the flat top surface of the tripod, where the instrument is installed.
W-LAN LED is blinking in red	An error occurred in the hardware.	A repair is necessary. Contact your local dealer.

8.2 What to Do When

Conditions	Causes	How to resolve	
Forgot the password.		Press the reset switch*) to reset to the factory default settings. Configure the communication settings again.	
	Signal is weak.	Use the instrument in a good signal environment.	
	Incorrect security settings	Configure the security setting to the same as that of LN-100.	
Wireless connection to the	Incorrect password	Enter the correct password.	
controller is disabled.	Another controller is already communicating.	Check whether it is communicating with another controller.	
	It takes too long for WPA2 authentication.	Wait until the authentication completes.	
When the W-LAN mode is set to Mode B			
Wireless connection to the	Access point cannot be found.	The channel of the access point may be set to 12 or greater (out of the search range of LN-100). Change the channel.	
controller is disabled.	Attempting to connect with an access point that cannot be connected unless the MAC address is registered in advance.	MAC address for LN-100 needs to be registered in advance.	

*) How to press the reset switch

Set the W-LAN mode to Mode A, and then turn the power ON.

Before being connected to the wireless (while the W-LAN LED is blinking), hold down the reset switch until it beeps twice.

At this time, the W-LAN is configured as follows: Security: WPA2 Password: 00 serial number

9. SPECIFICATIONS

Usable range

Altitude angle	±25° (0.9 to 22 m)
Difference of altitude	±10 m (22 to 100 m)
Horizontal angle	360°
Distance	0.9 to 100 m
(I 🕼 "6.1 Usable Range" on page 21)	

General accuracy (While measuring coordinates at 50 m)

Reproducibility	-
Horizontal positioning	$3 \text{ mm} (2\sigma)$
Altitude positioning	6 mm (2σ)
Absolute positioning	
Horizontal positioning	±5 mm
Altitude positioning	±10 mm

Angle measurement section

Method	Absolute rotary encoder method
Resolving power	1"

Inclination compensation section

Method	Hydraulic dual-axis inclination sensors
Compensation range	±6' 00"

Distance measuring section

Method	•	Retardation survey method (Prism distance measurement only)
Measura	ible range	0.9 to 100 m *1
Update r	ate of distance data	20 Hz
Light sou	urce	Laser diode
Wavelen	igth	690 nm
Laser cla	ass	Class 1 equivalent when measuring the distance
Atmosph	neric correction	Entry of the temperature and atmospheric pressure
		(Depending on the application)
		(Default factory setting : 15°C, 1013hPa)
		Atmospheric correction factor (ppm)*2
Prism co	onstant correction	Yes

Prism constant correction

- *1: When using ATP2/ATP2S Weather conditions for measurement: Other than bad weather, such as rain, dense fog, and strong heat haze
- *2: Atmospheric correction factor (ppm) The atmospheric correction value is calculated using the following formula and set into the memory.

Atmospheric Correction Factor (ppm) =

$$282.324 - \frac{0.294362 \times p}{1 + 0.003661 \times t} + \frac{0.04127 \times e}{1 + 0.003661 \times t}$$

- t : Air temperature (°C)
- p : Pressure (hPa)
- e : Water vapor pressure (hPa)
- h : Relative humidity (%)
- E : Saturated water vapor pressure

• e (water vapor pressure) can be calculated using the following formula.

$$e = h \times \frac{E}{100}$$

E = 6.11 × 10^(t+237.3)

Laser pointer section (Availability of the function depends on the application to be used.)

emission and reception

Light source	Laser diode
Wavelength	690 nm
Laser class	Class 3R
Spot size	Width: 7 mm / Length: 8 mm (at a distance of 20 m)
	Width 16.9 mm / Length: 19.3 mm (at a distance of 50 m)
A - A	,

Auto tracking section

Method

Auto trackable range	
	0.9 to 100 m* ¹
Light source	Laser diode
Wavelength	793 nm
Laser class	Class 1

*1: When using ATP2/ATP2S

Weather conditions for measurement: Other than bad weather, such as rain, dense fog, and strong heat haze

Image sensor method using a coaxial optical system for beam

Ranging tracking optical system

Structure	Coaxial optical system for tracking a measurement of distance
Objective aperture	Ø16.5 mm
Focus distance	50 mm

Motor actuator

Motion range	360° (Horizontal)	
Maximum rotation speed	60°/second (10 rpm)	
	(The time required for 180° rotation: 3.0 seconds)	
Minimum feed angle (operated from the external application)		
	15" (±3.75 mm equivalent at a distance of 50 m)	

Auto leveling section

Method	Main unit integral type
Auto leveling mechanism	Dual-axis
Leveling range	±3°

Guide light

Light source	Light-emitting diode (LED) (Red 626 nm / Green 524 nm)
Visible range	Greater than 8° at horizontal (full length: 7 m at a distance of 50
	m)

Laser plummet section	
Light source	Laser diode
Wavelength	635 nm
Laser class	Class 2
Beam accuracy	1.0 mm or less (At the height of the head of a tripod of 1.3 m)
Spot diameter	Ø3 mm or less (At the height of the head of a tripod of 1.3 m)
Communication section	
W-LAN	Supports 802.11 n/b/g
Antenna for W-LAN	External
Security (Selection item)	None/WEP/WPA/WPA2 (Default factory setting : WPA2)
Communication distance	100 m (Depending on the controller to be used)
Power source section	
Standard battery	BDC70 lithium-ion battery
Continuous service hour (at 20°	°C)
	About 5 hours
Battery (BDC70)	
Nominal voltage	7.2 V
Capacity	5,240 mAh
Dimensions	40 (W) X 70 (D) X 40 (H) mm
Weight	About 197 g
Charger (CDC68A)	
Input voltage	100 to 240 V AC
Charging time (at 25°C per	battery)
BDC70	About 5.5 hours (Charging may take longer than this at low or high temperature.)
Range of charging temperature	
	0 to 40°C
Range of storage temperature	
	-20 to 65°C
Dimensions	94 (W) X 102 (D) X 36 (H) mm
Weight	About 170 g
Backup power supply (for the c	lock)
	Lithium battery (More than 8 years)
Power off function	Yes (30 minutes)
General	
Panel section	
Number of keys (types)	
	3 types (Power source, laser plummet, auto leveling)
Number of LEDs (types)	
	4 types (Power source, laser plummet, auto leveling, W-LAN)
W-LAN mode switching	Mode A/B switching (Inside the battery box)
Self-diagnosis function	Yes
Buzzer	Beep only
Sighting collimator	Yes
Dimensions	185 (W) X 196 (D) X 295 (H) mm

 Instrument height
 176 mm

 Weight
 About 4 kg (Including the battery)

 Environmental resistance
 -20 to 50°C (No condensation)

 Storage temperature
 -30 to 60°C (No condensation)

 Dustproof / Waterproof
 IP65

10.REGULATIONS

Region/ Country	Directives/ Regulations	Labels/Declarations	
U.S.A.	FCC-Class A	FCC Compliance WARNING: Changes or modificatior party responsible for co operate the equipment.	ns to this unit not expressly approved by the mpliance could void the user's authority to
		NOTE: This equipment has been for a Class A digital dev These limits are designed harmful inter-ference wh environment. This equip frequency energy and, it operator's manual, may communications. Opera likely to cause harmful i required to correct the in	en tested and found to comply with the limits ice pursuant to Part 15 of the FCC Rules. ed to provide reasonable protection against nen the equipment is operated in a commercial ment generates, uses, and can radiate radio f not installed and used in accordance with the cause harmful interference to radio tion of this equipment in a residential area is interference in which case the user will be hterference at his own expense.
		Means of conformity This device complies wi subject to the following harmful interference, an received, including inter This transmitter must no with any other antenna	th part 15 of the FCC Rules, Operation is two conditions: (1) This device may not cause d (2) this device must accept any interference ference that may cause undesired operation. of be co-located or operated in conjunction or transmitter.
		This equipment complie for uncontrolled equipm Exposure Guidelines in very low levels of RF en maximum permissive ex that it should be installe between the radiator an hands, wrists, feet and a Declaration of Conform	s with FCC radiation exposure limits set forth ent and meets the FCC radio frequency (RF) Supplement C to OET65. This equipment has lergy that is deemed to comply without coosure evaluation (MPE). But it is desirable d and operated with at least 20cm and more d person's body (excluding extremities: ankles). nity
		Model Number:	LN-100
		Manufacturer	TOPCON CORPORATION
		Name:	TOPCON CORPORATION
		Address:	75-1, Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 JAPAN Country:JAPAN
		U.S.A. Representative	
		Responsible party:	TOPCON POSITIONING SYSTEMS, INC.
		Address	7400 National Drive Livermore, CA94551, U.S.A
		Telephone number:	925-245-8300

10. REGULATIONS

Region/ Country	Directives/ Regulations	Labels/Declarations	
California, U.S.A	Proposition 65	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>	
California, U.S.A	Perchlorate Material (CR Lithium Battery)	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	
California and NY, U.S.A.	Recycling Batteries	DON'T THROW AWAY RECHARGEABLE BATTERIES, RECYCLE THEM. Topcon Positioning Systems Inc., United States Return Process for UsedRechargeable Nickel Metal Hydride, Nickel Cadmium, Small Sealed Lead Acid, and Lithium Ion, Batteries In the United States Topcon Positioning Systems Inc., has established a process by which Topcon customers may return used rechargeable Nickel Metal Hydride(Ni-MH), Nickel Cadmium(Ni-Col), Small Sealed Lead Acid(Pb), and Lithium Ion(Lion) batteries to Topcon for proper recycling and disposal. Only Topcon batteries will be accepted in this process. Proper shipping requires that batteries or battery packs must be intact and show no signs of Heaking. The metal terminals on the individual batteries must be covered with tape to prevent short circuiting and heat buildup or batteries can be placed in individual plastic bag. Battery packs should not be dissembled prior to return. Topcon 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 by shipped by air.</u> Failure to comply with the above requirements will result in the rejection of the package at the shipper's expense. Please remit packages to: Topcon Positioning Systems, Inc. C/O Battery Return Dept. 150 7400 National Dr. Livermore, CA 94551 DON'T THROW AWAY RECHARGEABLE BATTERIES, RECYCLE THEM.	

Region/ Country	Directives/ Regulations	Labels/Declarations	
Canada	ICES-Class A	This Class A digital apparatus meets all requirements of Canadian Interference-Causing Equipment Regulations. Cet appareil numérique de la Class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.	
		This class A digital apparatus complies with Canadian ICES-003. Cet appareil numerique de la classe A est conforme a la norme NMB-003 du Canada.	
		Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.	
		This equipment complies with IC radiation exposure limits set forth for uncontrolled equipment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment 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).	
EU	EMC-Class A	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. This is a CLASS A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.	
EU	R&TTE- Class 1	R&TTE Directive LN-100 Hereby, TOPCON CORP., declares that the above-mentioned equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. Please inquire below if you wish to receive a copy of Topcon's Declaration of Conformity. Topcon Europe Positioning B.V. Essebaan 11, 2908 LJ Capelle a/d IJssel, The Netherlands Tel:+31-10-4585077 Fax:+31-10-2844949 http://www.topcon-positioning.eu/	

Region/ Country	Directives/ Regulations	Labels/Declarations	
EU	WEEE Directive	WEEE Directive This symbol is applicable to EU members states only. 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.	
		TOPCON CORPORATION	
EU	EU Battery Directive	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 property.	



For more information contact Synergy Positioning Systems or visit the Synergy Positioning Systems website at www.synergypositioning.co.nz All branches: Phone 0800 867 266 Email: info@synergypositioning.co.nz

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