

## INSTRUCTION MANUAL ROTATING LASER

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# RL-H1Sa



## Foreword

Thank you for purchasing the Topcon RL-H1Sa Rotating Laser.

It is one the world's most advanced lasers.

To quickly and effectively use the RL-H1Sa, please read these brief instructions carefully, and keep them in a convenient location for future reference.

## Handling Precautions

Before starting work or operation, be sure to check that the instrument is functioning correctly with normal performance.

### 1 Vibration and Impact Protection

When transporting the instrument, provide protection to minimize risk of severe vibration or impact. Severe vibration or impacts may affect beam accuracy.

### 2 Storing the instrument for long period

Remove the batteries from the instrument when you will not be using it for long period.



### Caution:

Use of adjustment controls or performance procedures other than those specified herein may results in hazardous radiation exposure.

## Safety Information

In order to ensure the safe use of this product, prevent any danger to the operator or others, or damage to property, important warnings are placed on the product and inserted in the instruction manual.

We recommend that you become familiar with the meaning of these Warnings and Cautions before continuing.

<b>Display</b>	<b>Meaning</b>
 <b>WARNING</b>	Ignoring or disregarding of this display may lead to death or serious injury.
 <b>CAUTION</b>	Ignoring or disregarding of this display may lead to personal injury or physical damage to the instrument.

Injury refers to hurt, burn, electric shock, etc.

Physical damage refers to damage to equipment, structure or furnishings.

## Safety Precautions

 **WARNING**

- **There is a risk of fire, electric shock or physical harm if you attempt to disassemble or repair the instrument yourself.**

Repairs are to be carried out by TOPCON or an authorized dealer ONLY!

- **Laser beams can be dangerous and can cause eye injury if used incorrectly.**

Never attempt to repair the instrument yourself.

- **Risk of fire or electric shock.**

Do not use a wet battery.

- **May ignite explosively.**

Never use an instrument near flammable gas or liquid matter, and do not use in a coal mine.

- **Battery can cause explosion or injury.**

Do not dispose in fire or heat.

- **Short circuits can cause a fire.**

Do not allow a battery to contact other objects when storing it.

 **CAUTION**

Use of controls, adjustment to the laser, or the performing of any procedures other than those specified herein may result in hazardous radiation exposure.

Do not allow skin or clothing to come into contact with acid from the batteries. If this occurs, wash off with copious amounts of water and seek medical attention.

Damaged or broken carrying cases may fall open causing injury, or damage to the laser. Do not use a carrying case with damaged belts, grips or latches.

It could be dangerous if the instrument falls off of its mount. Please check that you have mounted the instrument to the wall mount or tripod securely and correctly.

An unstable tripod can pose a potential risk of injury or damage to the laser. Always check that screws or leg locks are tight and tripod is sitting firmly.

Please note that the tips of tripod can be hazardous and be aware of this when setting up or carrying the tripod.

## **User Precautions**

- 1 Always wear protective clothing (safety shoes, helmet, etc.) when operating.

## **Exceptions from Responsibility**

- 1 The user of this product is expected to follow all operating instructions and make periodic checks of the product's performance.
- 2 The manufacturer, or its representatives, assumes no responsibility for results of a faulty or intentional usage or misuse including any direct, indirect, consequential damage, and loss of profits.
- 3 The manufacturer, or its representatives, assumes no responsibility for consequential damage, and loss of profits by any disaster, (an earthquake, storms, floods etc.), fire, accident, or an act of a third party and/or a usage in other than usual conditions.
- 4 The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits due to a change of data, loss of data, an interruption of business etc., caused by using the product or an unusable product.
- 5 The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits caused by usage other than explained in the user manual.
- 6 The manufacturer, or its representatives, assumes no responsibility for damage caused by wrong movement, or action due to connecting with other products.

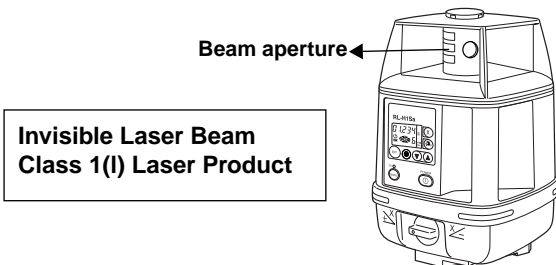
## Laser Safety

This product uses a invisible laser beam, and is manufactured and sold in accordance with “Performance Standards for Light-Emitting Products” (FDA/BRH 21 CFR 1040) or “Radiation Safety of Laser Products, Equipment Classification, Requirements and User’s Guide” (IEC Publication 825) provided on the safety standards for laser products.

As per the said standard, this product is classified as a “Class 1 (I) Laser Product”.

This is a simple product to operate and does not require training from a laser safety officer.

In case of any failure, do not disassemble the instrument. Contact TOPCON or your TOP-CON dealer.





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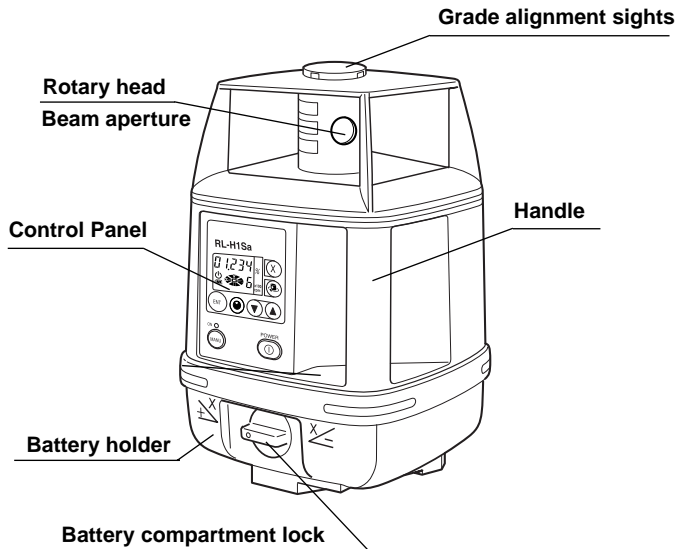
## Standard System Components

1	RL-H1Sa .....	1pc.
2	DB-51 battery holder .....	1set
3	D-cell battery .....	4pcs.
4	LS-70B Laser Sensor .....	1pc.
5	Laser Sensor holder, model 3 .....	1pc.
6	Carrying case .....	1pc.
7	Instruction manual.....	1vol.

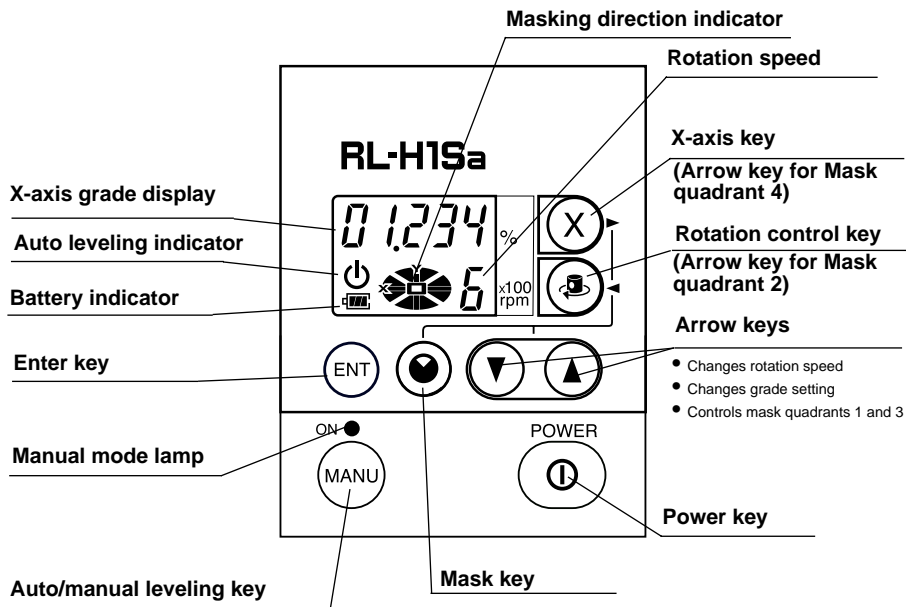
Please make sure that all of the above items are in the box when you unpack.

# Nomenclature and Functions

## RL-H1Sa

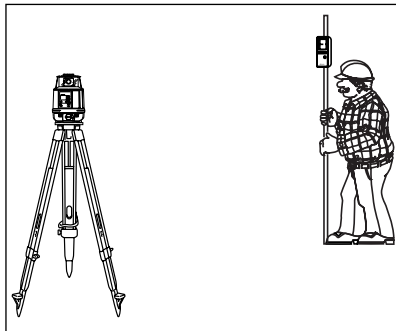


## Control Panel



## Basic Operation

- 1** Set the RL-H1Sa on a tripod or flat surface.  
(See "Instrument Set-up Procedure " on page 12.)
- 2** Turn the instrument ON and enter a grade if desired. (See "Entering Grade " on page 18.)
- 3** Set beam rotation to the desired speed.  
(See "Changing rotation speed " on page 16.)
- 4** Set the electronic beam shutter (mask) for specific quadrants if desired. (See "Masking (Laser beam shutter) " on page 20.)
- 5** Turn on LS-70 laser sensor. If high-precision detection is desired, select that setting on the LS70.( See "Standard / Optional Accessories " on page 34 for more information.)
- 6** Use the LS-70 to intercept the rotating laser beam to check a specific elevation.



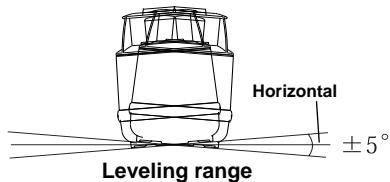
# Preparation and Functions

## Battery Installation

For battery installation instructions, see "Maintaining Power Sources " on page 21.

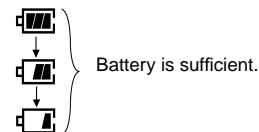
## Instrument Set-up Procedure

- 1 Set the instrument on any smooth surface that is within  $\pm 5^\circ$  of true level. The RL-H1Sa auto-level system will not function if the unit is placed more than  $5^\circ$  out of level. For best operation, it is recommended that it be mounted to a tripod. Beam slope can be set in the X-axis (See "Entering Grade " on page 18.)



## Battery Warning Indicator

The Battery warning indicator indicates the battery power remaining.



The power is low, but laser is still usable.  
In this state, the laser will transmit the battery warning signal to laser sensor.  
AC/DC converter AD-9B or AD-7C is available for continuing the operation.



Dead batteries. The rotary head stops and no beam is emitted from the laser.  
Recharge the battery (BT-51Q Optional accessory) or replace the dry batteries with new ones. (The laser will shut down a few minutes after the blinking indicator comes on.)  
AC/DC converter AD-9B or AD-7C is available but it is necessary to turn OFF the instrument once, and turn ON the instrument again.

### Note

- When BT-51Q (Optional accessory) is used, the blinking period will be shorter because of the characteristic of the battery.
- The LS-70A and LS-70B laser sensors can detect and signal low power state of laser.

## Auto-leveling lamp

 Flashing :

Auto-leveling is in process. When automatic leveling is almost complete, the flashing rate will be slow. The head will not rotate and the laser beam will not emit during the auto-leveling process.

 ON Solid:

Auto-leveling is complete.  
The rotary head is active and emits the laser beam.

### To turn automatic leveling off

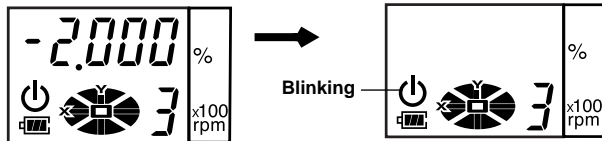
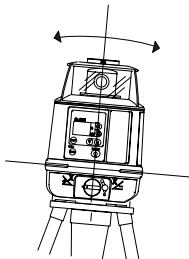
To turn OFF the auto-leveling function (manual mode), press the Auto/Manual leveling control pad twice in quick succession. The manual mode indicator light will illuminate. The instrument can be positioned in any direction and the laser beam remains on and the head will rotate.

**IMPORTANT:** In manual mode, the laser beam will not shut off if disturbed! To return to Auto-leveling mode, press Auto/Manual control pad once.



## Inclination Warning

If the instrument is positioned outside of the auto-leveling range ( $\pm 5^\circ$ ), the Auto-leveling lamp will blink and the grade display will disappear.



## Height Alert function

When auto-leveling and height alert function re active, this function prevents the instrument from operating if it is disturbed. This insures accurate control. If the unit is disturbed, all displays and Auto-leveling lamp will flash. The elevation (height of instrument) should be verified and re-established if necessary.

### Note

- The LS-70A and LS-70B laser sensors can detect and signal the height alert warning.

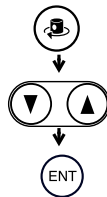
### To activate the height alert function

To activate the height alert function, depress and hold the Manual key [MANU] while turning on the instrument by pressing the Power key. The display will show “HiON” for two seconds before starting auto-leveling. Height alert function will be turned ON automatically after 10 minutes since the auto-leveling is completed.

Turn the power key OFF and ON again, the height alert function will be de-active again.

## Changing rotation speed

Press Rotation Control key to activate rotation speed mode. Select the rotation speed 300 r.p.m or 600 r.p.m by pressing the arrow keys. Press the Enter key to accept the setting.

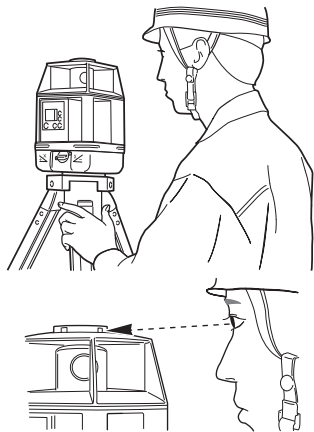


## Aligning Direction of Grade

When using the laser with a percent of grade entered, the laser must be properly aligned so the slope of the laser beam is parallel to the desired direction of grade.

The sighting collimator on top of the instrument is calibrated to the grade axis of the laser beam. Follow the steps below to align the laser to the desired direction of grade:

- 1** Establish a target line parallel to desired direction of grade.
- 2** Set up the laser over this line (drop a plumb bob from the tripod mounting screw).
- 3** Rough align the instrument to the direction of grade. Make sure it is properly oriented for the grade to be entered, positive or negative. (See page 18)
- 4** Place a rod or other target down range on the target line.
- 5** While sighting through the collimator, adjust the instrument until the sight is aligned with the target. (see right)



Target

Plus direction



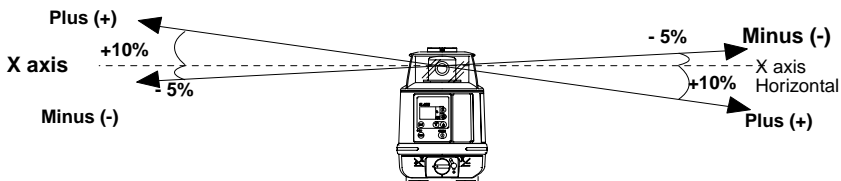
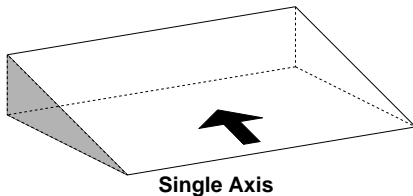
Target

Minus direction

## Entering Grade

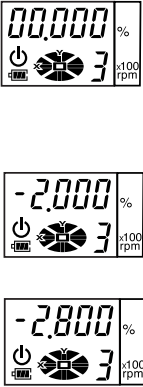
The laser beam can be sloped in the X axis (single slope).

**X-axis grade range: -5.000% to +10.000%**



## How to enter grade

Setting example: Grade toward X-axis -2.8%

Operating procedure	Operation	Display
<ol style="list-style-type: none"> <li><b>1</b> Turn the instrument on by pressing the power control pad. Auto-leveling will start.</li> <li><b>2</b> Press the [X] key to activate grade entry. The position of the second figure to the left of the decimal point will blink.</li> <li><b>3</b> Press the [▲] or [▼] key to set "-" (negative grade).</li> <li><b>4</b> Press the [X] key to activate the first figure to the left of the decimal point.</li> <li><b>5</b> Press the [▲] key twice to set '2'.</li> <li><b>6</b> Press the [X] key to activate the first figure to the right of the decimal point.</li> <li><b>7</b> Press the [▼] key twice to set '8'.</li> <li><b>8</b> Press the [ENT] key to accept the X-axis grade.</li> </ol>	<p><b>Power ON</b></p> <p>[X]</p> <p>[▲]or[▼]</p> <p>[X]</p> <p>[▲]twice</p> <p>[X]</p> <p>[▼]twice</p> <p>[ENT]</p>	 <p>The display shows the grade being entered in three stages: 1. Initial state: '00.000' with a power icon and a fan icon. 2. After pressing [X]: '-2.000' with a power icon and a fan icon. 3. After pressing [▲] twice: '-2.800' with a power icon and a fan icon. The fan icon is labeled 'x100 rpm'.</p>
<ul style="list-style-type: none"> <li>• Grade range: Single axis, -5.000% to 10.000% grade.</li> <li>• After grade entry is completed, it will take about two minutes for the beam to reset and rotation to begin. DO NOT touch or tilt the instrument during automatic leveling as it will disturb the precision of the leveling.</li> </ul>		

## Masking (Laser beam shutter)

The RL-H1Sa features electronic beam “masking” to prevent the beam from transmitting on one or multiple sides of the instrument. This can be useful to eliminate duplicate laser beams on job sites where more than one laser may be in use.

The beam plane is divided into four masking quadrants as indicated on the masking display. The direction of the four masking quadrants can be set as shown below.



Mask display

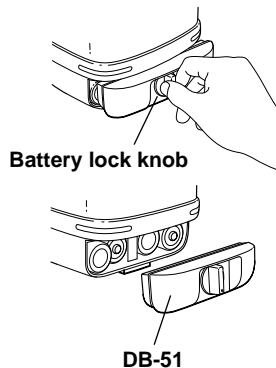
- 1 Press the Mask key.
- 2 To change the masking direction mode, press the Mask key again.  
Each press toggles between the two masking direction modes.
- 3 To mask a specific quadrant, press the arrow key that corresponds to that quadrant.  
Each press toggles between activating and releasing the mask for that quadrant.
- 4 To mask additional quadrants, repeat step 3 with the arrow key for that quadrant.
- 5 Press the Enter key to accept the masking settings.

Mask display and Direction	Operation keys

# Maintaining Power Sources

## How to replace dry batteries

- 1 Remove the battery holder DB-51 by turning the battery compartment lock to “OPEN”.
- 2 Remove the old batteries and replace with four (4) new “D” cell alkaline batteries making sure each is placed in the proper direction as indicated.
- 3 Replace the battery holder (DB-51) and turn the knob to “Lock”.



### Note

- Replace all 4 batteries with new ones.
- Do not mix used and new batteries, and do not mix different types of batteries together.
- Insert batteries with the positive (+) and negative (-) terminals oriented correctly.

# Checking and Adjusting Calibration

There are three areas of performance the user should check periodically.

Horizontal Calibration

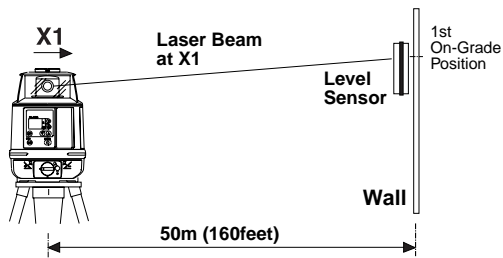
Horizontal Rotation Cone

Grade Setting Error

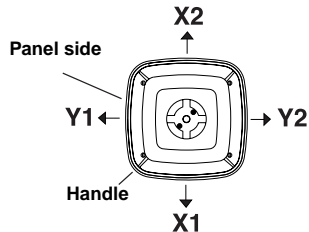
The Horizontal Calibration can be easily checked and, in most cases, adjustments can be made by the user. Horizontal Rotation Cone and Grade Setting Error can be checked by the user. However, if an error is found, adjustments must be made by a Topcon service facility.

## Horizontal Calibration

### (1) Checking Calibration



### Instrument as seen from above



- 1 Set up a tripod 50m (160ft) from a wall. Mount the instrument on the tripod, facing the X1 side toward the wall.



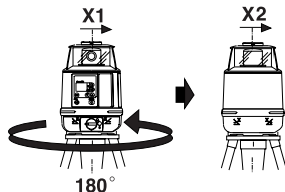
**2** Turn the unit on and allow auto-leveling to complete. Confirm that the grade is set to 00.000%.

**3** Put the laser sensor in fine detection mode by pressing the mode switch. (See page 35.)

**4** Position the sensor so that it “finds” the rotating laser beam and signals “on-grade” by displaying a horizontal bar and emitting a continuous beep.

**5** Mark the “on-grade” position and turn off the instrument.

**6** Loosen the tripod screw, rotate the instrument 180 degrees and re-secure it on the tripod.



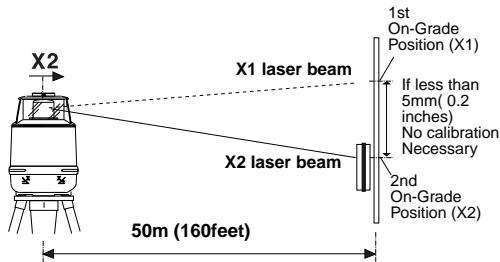
<b>Note</b>	• When rotating the instrument, avoid knocking it off level or changing height.
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**7** Turn the unit on again and allow auto-leveling to complete. Confirm the grade is set to 00.000%.

**8** Position the sensor so that it “finds” the rotating laser beam and signals “on-grade”.

**9** Mark the on-grade position (X2).

**10** Measure the distance between the first mark (X1) and your second



mark (X2). No calibration is necessary if distance is within 5mm (0.2 inches). If the distance is greater than 5mm (0.2 inches), adjust as follows.

**11** Repeat procedure for the Y axis.

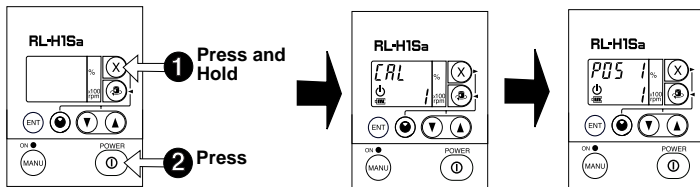
<b>Note</b>	• Please contact your Topcon dealer if the distance between the first and second mark exceeds $\pm 40\text{mm}$ (1.6 inches).
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## (2) Adjusting Calibration

To calibrate the X axis:

**1** Press the Power button once to turn off the laser.

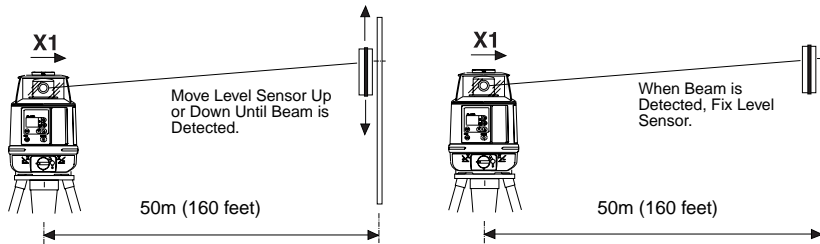
Turn the laser back on by pressing the Power button down while pressing the X AXIS button. This activates the X axis calibration mode. Confirm that rotation speed is set to 1.



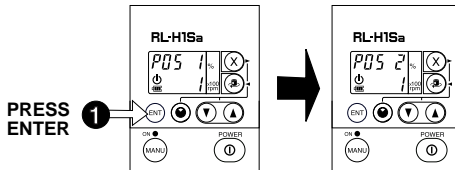
**2** After the “CAL” display changes to “POS 1”, move the laser sensor up or down until it “finds” the rotating laser beam and signals “on-grade”.

**Note** • When the instrument has auto-leveled, the “POS 1” will stop flashing.

**3** When the sensor signals “on-grade”, secure its position.



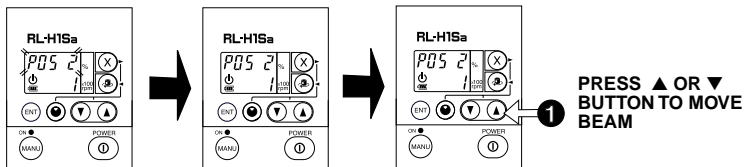
**4** Press the ENT key. The display will change to “POS 2”.



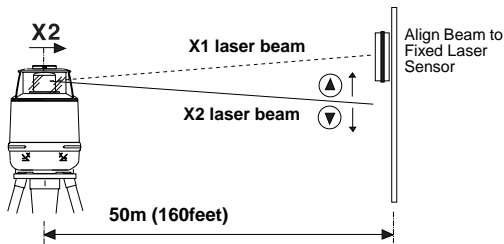
- 5 When “POS 2” is displayed, rotate the instrument 180 degrees; the instrument will self-level. When the instrument has auto-leveled, the “POS 2” will stop flashing.

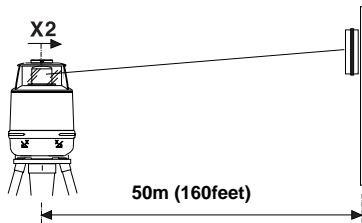
**Note**

- When rotating the instrument, avoid knocking it off level or changing height.



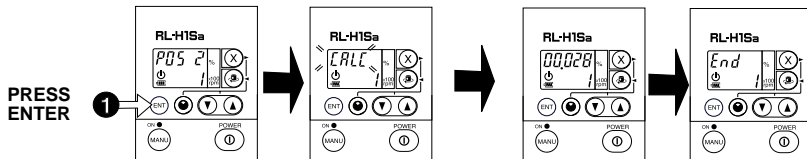
- 6 Adjust the laser beam to the sensor so that an “on-grade” signals is displayed. To adjust the position of the laser beam, press the up or down arrows on the panel.





"On-grade" signal means X2 beam has been adjusted to same elevation as X1 beam.

- 7 When a continuous "on-grade" signal is achieved, press the ENT key. "CALC" will appear in the display. Keep the instrument as it is until an error correction value appears. (If the instrument was disturbed during the calculation, you will need to re-start the adjustment process.) After a short time, "END" will appear.

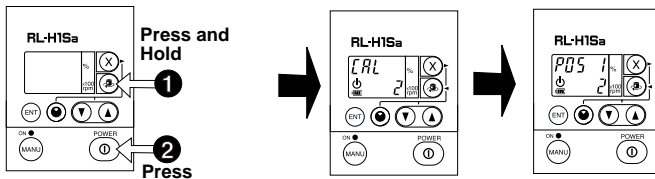


**Note**

- If the error is greater than the self-correction range, "E72" error code will display and LEDs will blink alternately. Contact your Topcon dealer.

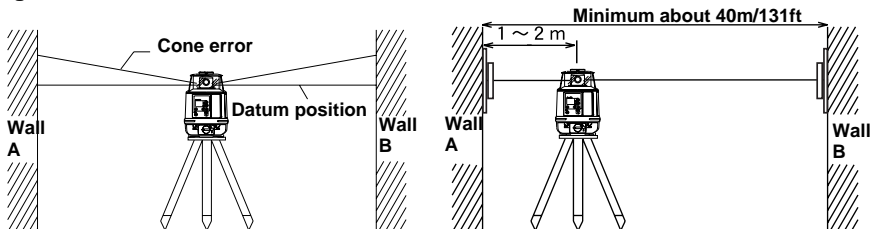
- 8 Turn Off the instrument by pressing the Power key.
- 9 Turn the power ON again and follow the checking procedure again to confirm that proper calibration has been completed.
- 10 Repeat the checking and, if necessary, the adjusting procedure for the Y-axis.
- 11 If the Y-axis requires adjustment, begin at Step 1 on page 24. However, when turning on the instrument in calibration mode, press and hold the Rotation key while pressing the Power key. This activates the Y-axis calibration mode and is confirmed by displaying a 2 on the rotation indicator.

For Y-axis  
calibration



## Horizontal Rotation Cone Error

Perform the following check after completing "Horizontal Calibration" on the previous pages.



- 1 Set up the laser centered between two walls approximately 40m (131ft) apart. Orient the instrument so one axis, either X or Y, is facing the walls. Confirm grade is set to 00.000%.
- 2 Locate and mark the position of the rotating laser beam on both walls using the laser sensor.
- 3 Turn off the instrument and move the instrument closer to wall A (1m to 2m / 3 ft to 6 ft). Do not change the axis orientation of the instrument. Turn the instrument on.
- 4 Again locate and mark the position of the rotating laser beam on both walls using the laser sensor.
- 5 Measure the distance between the first and second marks on each wall.
- 6 If the difference between each set of marks is less than 4mm (5/32 of an inch), no error exists.

<b>Note</b>	<ul style="list-style-type: none"><li>• If the error is greater than 4mm ( 5/32 of an inch), contact your Topcon dealer.</li></ul>
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## Grade Setting Error

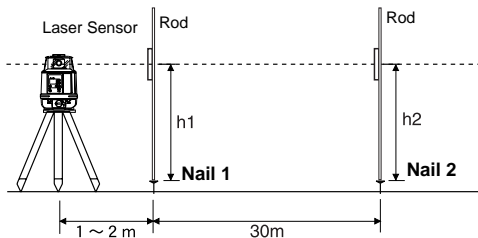
Perform the following check only after completing "Horizontal Calibration" and "Horizontal Rotation Cone Error" procedures.

### (1) Checking

Note	
	<ul style="list-style-type: none"><li>• Due to the accuracy required to perform this check, the rod used in this procedure must be graduated in millimeters.</li></ul>



- 1 Securely position two nails or stakes exactly 30m (93 ft) apart. These positions will be called Nail 1 and Nail 2.

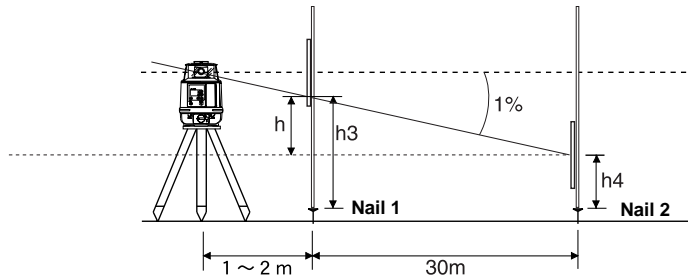


- 2 Set up the instrument on a tripod approximately 1m to 2m (3 ft to 6 ft) in front of Nail 1 on the line created by Nail 1 and Nail 2. Position the instrument so the X-axis is exactly aligned to the line created by Nail 1 and Nail 2.
- 3 Turn on the instrument and verify the grade setting is 00.000%. Turn on the LS-70 laser sensor and set it to high precision detection. Using the rod, read the elevation of the laser



beam in millimeters at Nail 1 and Nail 2. Designate the elevation at Nail 1 as “h1”, at Nail 2 as “h2”.

- 4** Set X-axis grade to 1.000%. Again, read the elevation of the laser beam in millimeters at Nail 1 and Nail 2. Designate these elevations as “h3” at Nail 1, and “h4” at Nail 2.



- 5** Using the millimeter elevation readings for h1, h2, h3 and h4, and converting the 30mm distance between Nail 1 and Nail 2 to 30000mm, complete the equation below.

$$x(\%) = \frac{(h2-h4) - (h1-h3)}{30000 \text{ (mm)}} \times 100$$

If the calculated result is the range of 0.990% - 1.010%, the instrument is within specifications.

**Note**

- If the calculated result is out of the range, contact your dealer or Topcon.

**Example;** h1 = 1370; h2 = 1390; h3 = 1362; h4 = 1080

$$x(\%) = \frac{(1390-1080)-(1370-1362)}{30000} \times 100$$

$$x(\%) = \frac{310 - 8}{30000} \times 100 =$$

$$x(\%) = 0.010066 \times 100 =$$

$$x(\%) = 1.006\%$$

The X axis of instrument is normal because 1.006 is within the range 0.990 to 1.010.

## **Storage Precautions**

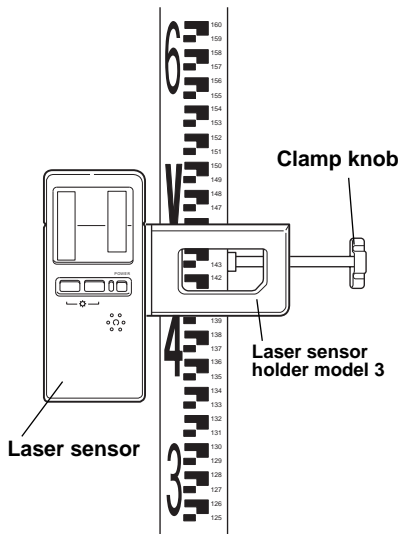
Always clean the instrument after use.

Use a clean cloth, moistened with a neutral detergent or water. Never use an abrasive cleaner, ether, thinner benzene, or other solvents.

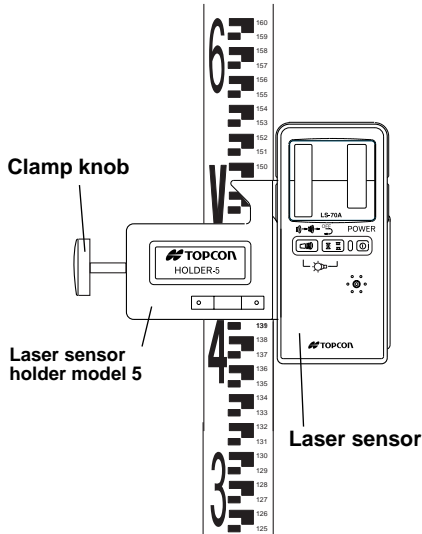
Always make sure instrument is completely dry before storing. Dry any moisture with a soft, clean cloth.

# Standard / Optional Accessories

## Laser sensor holder model 3



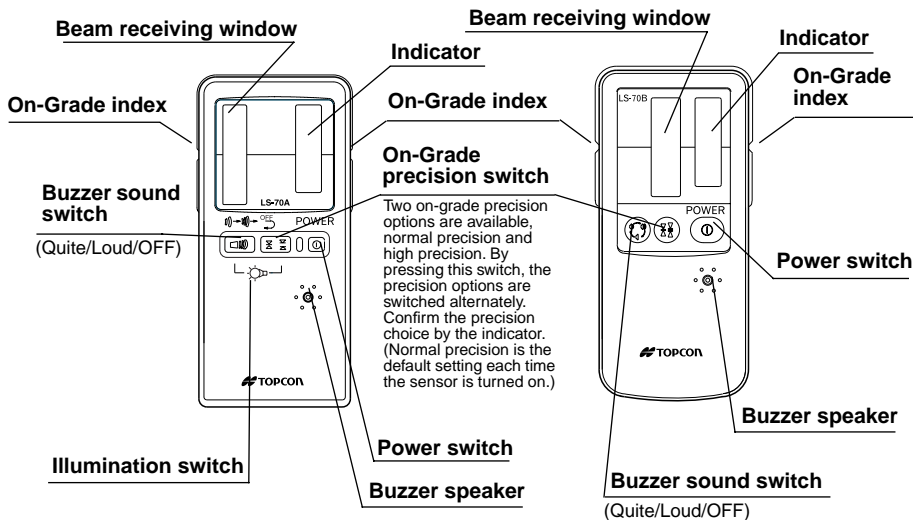
## Laser sensor holder model 5



Holder Model 5 allows the laser sensor to be moved up or down on the rod by squeezing the spring-loaded clamp on its back side without removing the sensor from the rod.

## LS-70A Laser Sensor

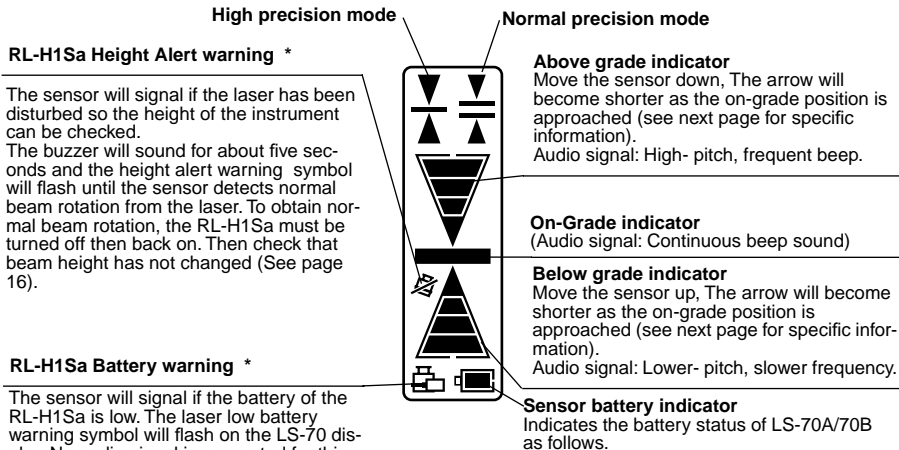
## LS-70B Laser Sensor



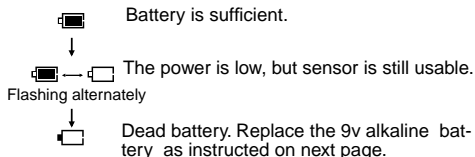
### Auto-cut off function (LS-70A and LS-70B)

The power will be turned off automatically if no laser beam is detected within approximately 30 minutes. (To turn the sensor on again, press the power switch.)









## Display (LS-70A/70B)



\*Warning detection at the LS-70 can be canceled by turning off the LS-70, then turning it back on while pressing the buzzer sound switch.

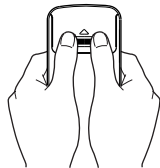


## Detective range (LS-70A/70B)

	 HIGH	 NORMAL
	LS-70A ±1mm/±.0032ft (2mm/.0064ft width)	±2mm/±.0064mm (4mm/.013 ft width)
	±5mm/±.016ft (10mm/.032ft width)	
	±10mm/±.033ft (20mm/.066ft width)	
	±15mm/±.05ft (30mm/.10ft width)	
	More than ±15mm/±.05ft	
	Laser sensor has been moved above or below the laser beam. Move sensor in direction of arrow to receive laser.	

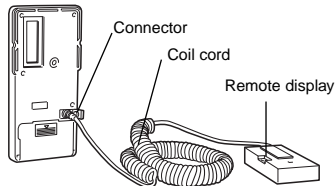
## Replacing Battery (LS-70A/70B)

- 1 Press the lid in the direction of the arrow to lift.
- 2 Remove the battery and replace with a new 9v alkaline battery.
- 3 Press the lid down and click to close.



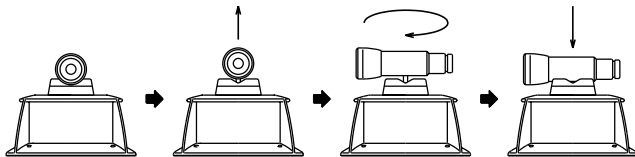
## Remote display with coil cord (LS-70A option only)

Optional remote display connects to the back of the LS-70A. The remote LCD display can be positioned up to 5m (16 ft) from the laser sensor.



### Scope Model 3

The optional scope replaces the sighting collimator (See page 17) on top of the instrument and provides greater accuracy in aligning the laser to the direction of grade. The scope can be swiveled and locked in place so its aimed toward any of the four beam axes. Using the scope, follow the steps on page 17 to align the instrument.



### Rechargeable battery BT-51Q, Rechargeable battery holder DB-51C AC/DC Converter AD-9B/7C

#### Installing

- 1 Insert the BT-51Q rechargeable battery into the instrument.
- 2 Place the DB-51C rechargeable battery holder firmly into the instrument and turn the battery cover knob to “LOCK”.

#### Charging

- 1 Plug the AC/DC converter (AD-9B or AD-7C) into the charger jack on the DB-51C rechargeable battery holder.

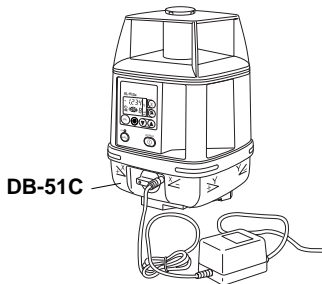


- 2 Plug the converter cord into a proper power outlet (AD-9B is for AC120V, AD-7C is for AC230V)
- 3 Complete charging by unplugging the converter connector from the DB-51C rechargeable battery holder after approximately 9 hours.
- 4 Unplug the converter from the outlet.

**The DB-51C LED will indicate charging status as follows:**

- Red ON : Charging
- Green ON : Charging completed
- Green flashing : DB-51C is not connected to BT-51Q rechargeable battery.
- Red flashing : BT-51Q protection feature is working automatically.  
RL-H1Sa can be used in this state.

Automatic protection feature; In case of overcharge or high or low temperature state exceeding charging range, charging will be stopped or changed to protect battery.



**AC/DC converter AD-9B/7C**

**Note**

- 1) The RL-H1Sa can be charged while using the laser.
- 2) Alkaline batteries can be used with the DB-51C rechargeable battery holder.

<b>Note</b>	<p>3) Recharging should take place in a room with an ambient temperature range of 10°C to 40°C (50°F to 104°F).</p> <p>4) The battery source will discharge when stored and should be checked before using with instrument .</p> <p>5) Be sure to charge stored battery source every 3 or 4 months and store in a place at 30°C (60°F) or below. If you allow the battery to be completely discharged, it will have an effect on future charging.</p> <p>6) Recharging of the BT-51Q may sometimes take less than 9 hours because of its remaining capacity at time of charging.</p>
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## Error Code

Error code	Description	Countermeasures
<b>E30, 31</b>	Abnormal operation of tilting system detected.	Turn the instrument OFF and ON again.
<b>E62</b>	Abnormal operation of internal vertical angle detecting system has occurred.	Turn the instrument OFF and ON again.
<b>E72</b>	Calibration error is greater than self-correction range.	Turn the instrument OFF and ON again and perform the calibration again.
<b>E99</b>	Abnormal operation of internal memory system detected.	Turn the instrument OFF and ON again.

If errors still persist after attempting to clear them, contact your dealer or Topcon.

# Specifications

## RL-H1Sa

<b>Auto-leveling range</b>	:	$\pm 5^\circ$
<b>Beam detecting range</b> (When using with LS-70A/70B)	:	2m–700m diameter (6ft–2,300ft)
<b>Laser source</b>	:	Laser diode (invisible)
<b>Laser class</b>	:	Class 1 laser product
<b>Rotation speeds</b>	:	Changeable : 300, 600 r.p.m.
<b>Grade setting range</b>	:	-5% to +10%
<b>Power supply</b>	:	4 D-cell batteries (DC6 V), Rechargeable battery BT-51Q

### Continuous operating time (+20°C)

#### Alkaline (dry) batteries

: Approx. 45 hours

#### Rechargeable battery BT-51Q (Optional accessory)

: Approx. 30 hours

<b>Tripod screw</b>	:	Flat and dome head type, 5"/8 × 11threads
<b>Operating temperature</b>	:	-20°C to +50°C (-4°F to +122°F)
<b>Dimensions</b>	:	169 (L) × 169(W) × 250(H) mm [ 6.7(L) × 6.7 (W) × 9.8(H) in]
<b>Weight</b>	:	2.7 kg [6 lbs] (with four dry batteries)

## Laser Sensor LS-70A/B

<b>Beam detection window</b>	:	50mm (2.0 in)
<b>Beam detection precision</b>	:	High precision:±1mm(±0.04 in) Normal precision:±2mm(±0.08 in)
<b>Beam detection indication</b>	:	Liquid crystal and buzzer
<b>Power source</b>	:	DC 9V alkaline (dry) battery
<b>Auto shut-off delay</b>	:	Approx. 30 minutes without beam detection.
<b>Operating temperature</b>	:	-20°C to +50°C (-4°F to +122°F)
<b>Continuous operating time at +20°C (68°F)</b>		

### Alkaline manganese dry batteries

: Approx. 80 hours

### Dimensions

<b>LS-70A</b>	:	167(l) × 78(w) × 27(h) mm [ 6.6(L) × 3.1 (W) × 1.1(H) in]
<b>LS-70B</b>	:	165(l) × 78(w) × 26(h) mm [ 6.5(L) × 3.1 (W) × 1.0(H) in]
<b>Weight</b>	:	0.25 kg [0.55 lbs] (with dry batteries)
<b>Remote display</b>	:	Optional for LS-70A only

**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.

**TOPCON AMERICA CORPORATION****CORPORATE OFFICE**

37 West Century Road, Paramus, New Jersey 07652, U.S.A.  
Phone: 201-261-9450 Fax: 201-387-2710 www.Topcon.com

**TOPCON CALIFORNIA**

3380 Industrial BLVD, Suite 105, West Sacramento, CA 95691, U.S.A.

Phone: 916-374-8575 Fax: 916-374-8329

**TOPCON MIDWEST**

891 Busse Road, Elk Grove Village, IL 60007, U.S.A.

Phone: 847-734-1700 Fax: 847-734-1712

**TOPCON LASER SYSTEMS, INC.**

5758 West Las Positas Blvd., Pleasanton, CA 94588, U.S.A.

Phone: 925-460-1300 Fax: 925-460-1315 www.topconlaser.com

**TOPCON EUROPE B.V.**

Esse Baan 11, 2908 LJ Capelle a/d IJssel, The Netherlands.

Phone: 010-4585077 Fax: 010-4585045 www.topconeurope.com

**TOPCON BELGIUM**

Preenakker 8, 1785 Merchtem, Belgium

Phone: 052-37.45.48 Fax: 052-37.45.79

**TOPCON DEUTSCHLAND G.m.b.H.**

Halskestr. 7, 47877 Willich, Germany.

Phone: 02154-9290 Fax: 02154-929-111 Telex: 8531981 TOPC D

**TOPCON S.A.R.L.**

89, rue de Paris 92585 Clichy, Cedex France.

Phone: 01-4106 9494 (MEDICAL) 1-4106 9490 (TOPOGRAPHIE)

Fax: 01-47390251

**TOPCON ESPAÑA S.A.****HEAD OFFICE**

Frederic Mompou 5, ED. EUR03 08960, Sant Just Desvern Barcelona, Spain.

Phone: 93-473-4057 Fax: 93-473-3932

**MADRID OFFICE**

Avenida Burgos,16E, 1° 28036, Madrid, Spain.

Phone: 91-302-4129 Fax: 91-383-3890

**TOPCON SCANDINAVIA A. B.**

Industrivägen 4 P. O. Box 2140 43302 Sävedalen Sweden.

Phone: 031-261250 Fax: 031-268607 Telex: 21414

**TOPCON (GREAT BRITAIN) LTD.****HEAD OFFICE**

Topcon House Kennet Side, Bone Lane Newbury Berkshire RG14 5PX U.K. Phone: 001-44-1635-551120 Fax: 001-44-1635-551170

**TOPCON SINGAPORE PTE. LTD.**

Alexandra Distripark Block 4, #05-15, Pasir Panjang Road, Singapore 118491

Phone: 2780222 Fax: 2733540 E-mail: topcon@singnet.com.sg

**TOPCON AUSTRALIA PTY. LTD.**

408 Victoria Road, Gladestville, NSW 2111, Australia

Phone: 02-9817-4666 Fax: 02-9817-4654

**TOPCON INSTRUMENTS (THAILAND) CO., LTD.**

77/162 Sinn Sathorn Tower, 37th Fl., Krungthongburi Rd., Klonglonsai, Klongsarn, Bangkok 10600 Thailand.

Phone: 662-440-1152~7 Fax: 662-440-1158

**TOPCON INSTRUMENTS (MALAYSIA) SDN. BHD.**

Lot 226 Jalan Negara 2, Pusat Bandar Taman Melawati, Taman Melawati, 53100, Kuala Lumpur, Malaysia.

Phone: 03-4079801 Fax: 03-4079796

**TOPCON KOREA CORPORATION**

Hyobong Bldg., 1-1306, Seocho-Dong, Seocho-Gu, Seoul, Korea.

Phone: 02-3482-9231 Fax: 02-3481-1928

**TOPCON OPTICAL (H.K.) LIMITED**

2/F., Meeco Industrial Bldg., No. 53-55 Au Pui Wan Street, Fo Tan Road, Shatin, N.T., Hong Kong

Phone: 2690-1328 Fax: 2690-2221 E-mail: sales@topcon.com.hk

**TOPCON CORPORATION BEIJING OFFICE**

Room No. 962 Poly Plaza Building, 14 Dongzhimen Nandajie, Dongcheng District, Beijing, 100027, China

Phone: 10-6501-4191~2 Fax: 10-6501-4190

**TOPCON CORPORATION BEIRUT OFFICE**

P. O. BOX 70-1002 Antelias, BEIRUT-LEBANON.

Phone: 961-4-523525/961-4-523526 Fax: 961-4-521119

**TOPCON CORPORATION DUBAI OFFICE**

Office No. 102, Khalaf Rashid Al Nayli Bldg., 245 Abu Hail Road, Deira, Dubai, UAE

Phone: 971-4-696511 Fax: 971-4-695272

**TOPCON CORPORATION**

75-1 Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 Japan

Phone: 3-3558-2520 Fax: 3-3960-4214 [http:// www.topcon.co.jp](http://www.topcon.co.jp)

31326 90080 RL-H1Sa 0101(2b)