

INSTALLATION MANUAL **Mobile Mapping System**

IP-S3 HD1

HOW TO READ THIS MANUAL

Thank you for selecting the IP-S3.

- Please read this Instruction manual carefully, before using this product.
- 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.

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.

Notes regarding manual style

- All other company and product names featured in this manual are trademarks or registered trademarks of each respective organization.

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1. PRECAUTIONS FOR SAFE OPERATION

For the safe use of the product and prevention of injury to operators and other persons as well as prevention of property damage, items which should be observed are indicated by an exclamation point within a triangle used with WARNING and CAUTION statements in this operator's manual.










The definitions of the indications are listed below. Be sure you understand them before reading the manual's main text.



Definition of Indication

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

-  This symbol indicates items for which caution (hazard warnings inclusive) is urged. Specific details are printed in or near the symbol.
-  This symbol indicates items which are prohibited. Specific details are printed in or near the symbol.
-  This symbol indicates items which must always be performed. Specific details are printed in or near the symbol.

General







-  **Warning**
 -  Do not use the unit in areas exposed to high amounts of dust or ash, in areas where there is inadequate ventilation, or near combustible materials. An explosion could occur.
 -  Do not perform disassembly or rebuilding. Fire, electric shock, burns, or hazardous radiation exposure could result.
 -  Carefully attach the IP-S3 cube to the mount kit. Damage to the instrument or serious injury can occur.
 -  To avoid injury, stop the car engine and apply the emergency brake before mounting or removing the device.
 -  Before approaching the extended slide bar, look around carefully. The slide bar may hit your head or face to cause injury.
 -  When securing the instrument in the carrying case make sure to set all the locks. 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 damaged case. The instrument could be dropped and cause injury.
-  Carefully carry this instrument. Dropping it will cause injury of persons or trouble/wrong operation of the instrument.

Power Supply



Warning

-  Do not use voltage other than the specified power supply voltage. Fire or electrical shock could result.
-  Do not use damaged power cords or plugs. Fire or electric shock could result.
-  Do not use power cords other than those designated. Fire could result.
-  Do not connect or disconnect power supply plugs with wet hands. Electric shock could result.
-  To avoid fire and electric shock in the event of an instrument malfunction, immediately turn off the power if you notice heat, smoke or smell coming from the instrument or if you detect other problems.
-  To avoid electric shock, turn off the power of the car before connecting the power cable.

2. PRECAUTIONS

Shock to the instrument

When carrying or transporting this instrument, put it into the special shipping case (Optional). If the instrument is exposed to extreme shock, it may malfunction or be operated wrongly.

Dew condensation

After operating the instrument in a place with much rain/moisture, dry the instrument completely and then store it into the case. If the instrument is stored with water, dew condensation will occur in the instrument to cause malfunction or wrong operation.

Extreme temperature change

If this instrument is subject to extreme temperature change (for example, carrying it from a warm room to the cold outdoors), the survey accuracy is temporarily changed. Accustom the instrument to the use environment before using it.

Mounting to a car

Before mounting/removing this instrument, put the car on a flat and stable place with enough extent and brightness, and turn off the engine. Mount the roof carrier securely according to the roof carrier's instruction manual. Unless you observe this caution, serious injury may occur.

Stain

When the window unit in the laser scanner is dirty, moisten a soft, clean lint-free cloth with water and wipe off the window unit with the cloth. If the instrument with the dirty window unit is used, the accuracy is sometimes affected adversely.

Influence by electric wave

When using this instrument in a place with the strong electric waves mentioned below, it does not operate normally from time to time.

- Near a transceiver or other devices generating strong electric waves
- Near an electric wave source such as television or radio

Driving

Drive the vehicle at legal speed.

Follow all driving laws for your area while driving the vehicle. When starting, steering or braking suddenly, check the mounting status of the device.

When this instrument has been mounted on the car, the car height increases to approximately 2.3m for sedans. Drive the car carefully where the height is limited.

Survey in rainy weather

Do not perform survey in rainy weather. Sometimes the instrument cannot survey the object accurately.

Mounting the wheel encoder

To mount the wheel encoder, install the overfender according to the vehicle laws in your area, and obtain the automobile inspection certificate again.

Privacy

The data collected with this device can include images that violate privacy laws. Delete or alter images that violate privacy rights before making the data publicly available.

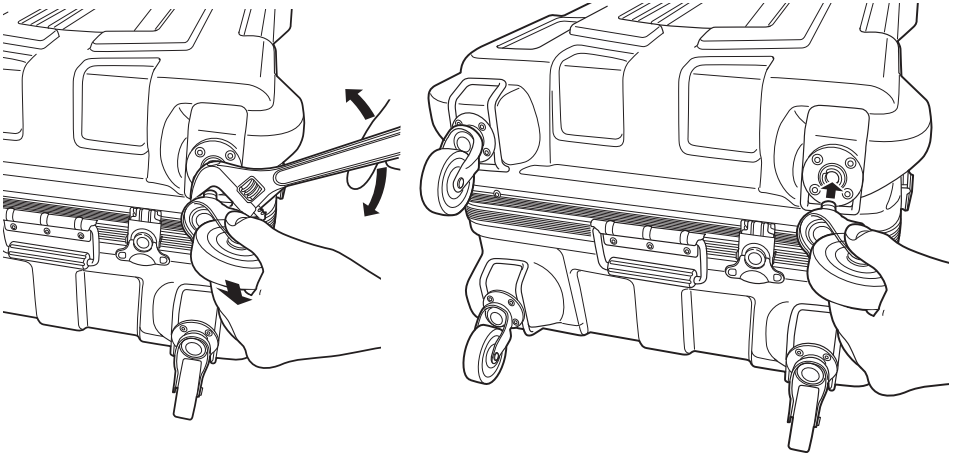
Removing/attaching casters on the carrying case(Optional)

Remove casters from the case as needed.

Removal

If you cannot remove casters by pulling them with your hand, use commercially available tools sold in stores.

Attachment



Maintenance

- Wipe off moisture completely if the instrument gets wet during survey work.
- Always clean the instrument before returning it to the case.
- Store the instrument in a dry room where the temperature remains fairly constant.
- Even when the instrument is not used for a long time, check its operation at least every 3 months.
- 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>

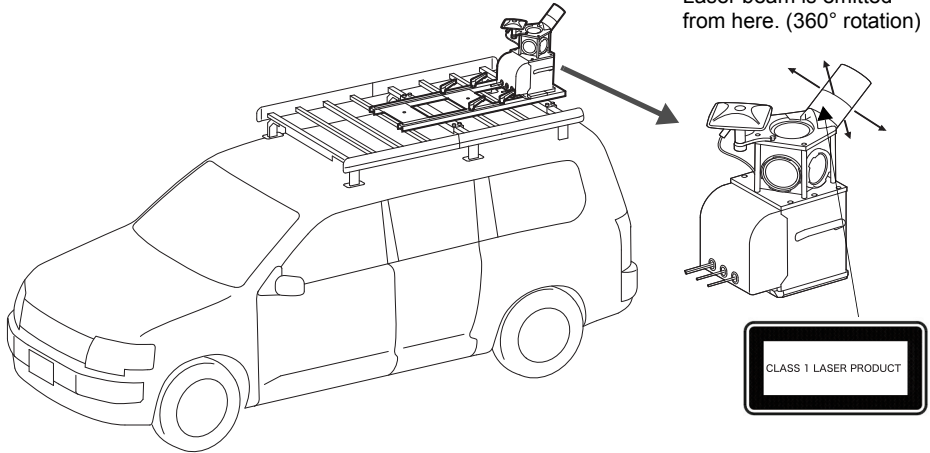
Exceptions from responsibility

- 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.)

Class 1 Laser Product



Please read the following safety instructions carefully before using the IP-S3.

Warning

- 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.

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.

4. SYSTEM CONFIGURATION

4.1 Standard Package Components

■ IP-S3 Cube

Refer to "STANDARD PACKAGE COMPONENTS" (enclosed paper).



IP-S3 cube has already been assembled. Because it has already been adjusted, do not disassemble it.

4.2 Optional Accessories

■ Mount kit

Slide bar (with clamp lever)	: 1 set
Carrier plate	: 2 pcs.
Slide base	: 2 pcs.
Step screw (M6)	: 2 pcs.
Cable tie	:20 pcs.
Carrier base A	: 8 pcs.
Carrier base B	: 8 pcs.
Hexagonal socket head cap screw (M10×55mm)	:16 pcs.
Spare hexagonal socket head cap screw	: 4 pcs.
Washer assembled hexagonal socket head cap screw (M10×20mm)	: 1 pc.
Spare washer assembled hexagonal socket head cap screw	: 1 pc.
Plain washer (M10)	:16 pcs.
Spare plain washer	: 4 pcs.
Spring washer (M10)	:16 pcs.
Spare spring washer	: 4 pcs.

■ Wheel encoder

Wheel encoder	: 1 pc.
Nut	: Size and quantity depend on the car model.



Tire nut quantities and wheel encoder shape are different between vehicles. Contact your local dealer for more information.

■ Gasket

When cables are arranged in the car, a gasket is used to minimize the clearance of the window glass.

4.3 Vehicle Preparation

■ Car



Wheel encoder types are determined by the car model. Contact your local dealer. To prevent the car from being reflected within the scan range of scanner, select a car model where you can mount the instrument at the rear.

■ Roof carrier



Mount the roof carrier onto the car securely.

■ Overfender



When using the wheel encoder, an overfender is required for most of the car models. To mount the overfender, obtain the automobile inspection certificate again. Contact your dealer both when selecting a car model and when mounting the overfender.

■ Personal computer

For the recommended specifications, refer to the Mobile Master Office and Mobile Master Field instruction manuals.

■ AC/DC inverter

This inverter is necessary to activate a personal computer. Prepare an AC/DC inverter according to the power consumption of your personal computer.

■ Tools

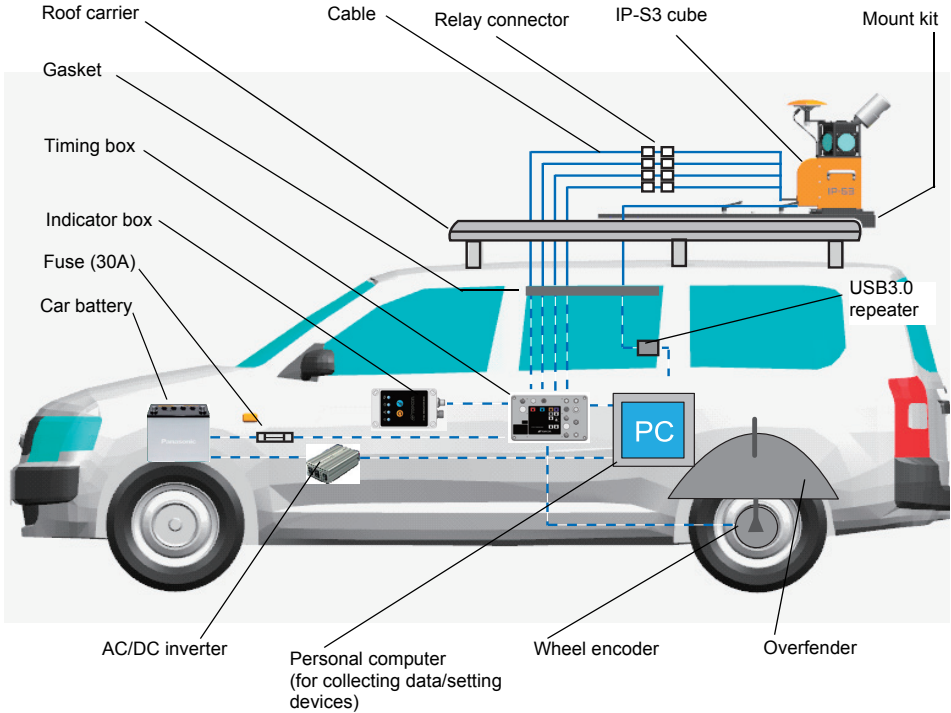
When installing the mount kit, the following tools are necessary.

- Allen wrench 8mm (for hexagonal socket head cap screw)
- Allen wrench 4mm (for step screw)

5. INSTALLING AND ARRANGING CABLES

The outline for installing the devices is shown below.

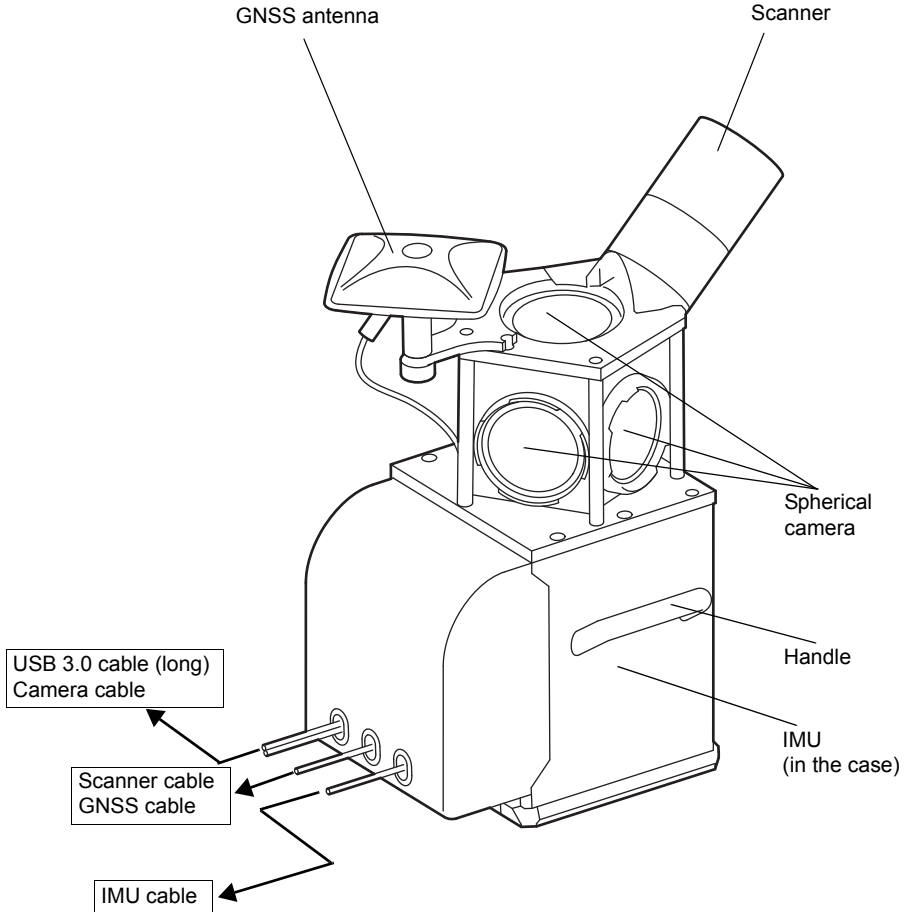
The cables from the IP-S3 cube are connected to the devices from the inside of the vehicle through the windows.



6. IP-S3 CUBE DIAGRAM



The IP-S3 cube has already been assembled. Because it has already been adjusted, do not disassemble it.




7. OPERATION FLOW OF IP-S3 SYSTEM

The operation outline and the relevant instruction manuals are shown below.

Advance preparation (parts that are not removed from the car)

- Installing the roof carrier
- Installing the mount kit
- Installing the wheel encoder
- Installing the gasket

 IP-S3 HD1 Installation Manual (this manual)



Install the IP-S3 cube when surveying (parts that are removed from the car)

- Installing the IP-S3 cube to the mount kit
- Connecting the cables
- Checking the operation
- Preparing the personal computer

 IP-S3 HD1 Installation manual (this manual)



Collect data

- Collecting the base station (known point) data
- Checking the operation of sensors
- Collecting the IP-S3 data

 Mobile Master Field Instruction Manual



Remove the devices



Post-processing

- Post-processing
- Making the point cloud data (Coloring the point cloud)

 Mobile Master Office Instruction Manual



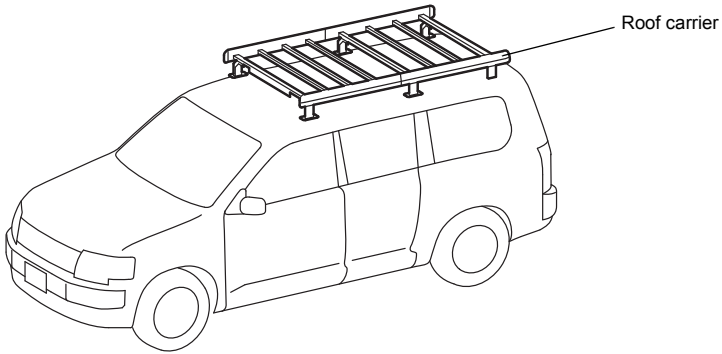
Subsequent work

8. PREPARE THE VEHICLE

When preparing the vehicle, install the following devices.

8.1 Install the Roof Carrier

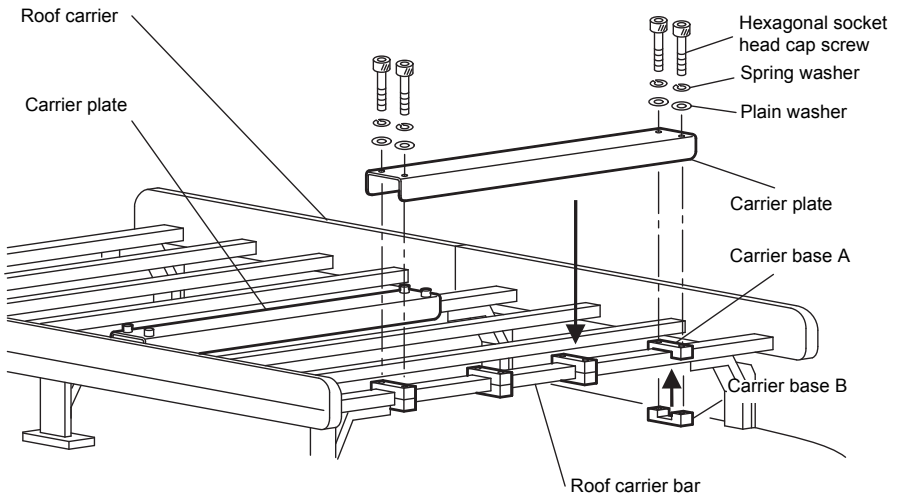
1. Mount the roof carrier onto the car. For details, refer to the roof carrier's instruction manual.



8.2 Install the Mount Kit

Mount the carrier plate onto the roof carrier bar using the following procedure. (The carrier plate has the binding band to clamp the cables.)

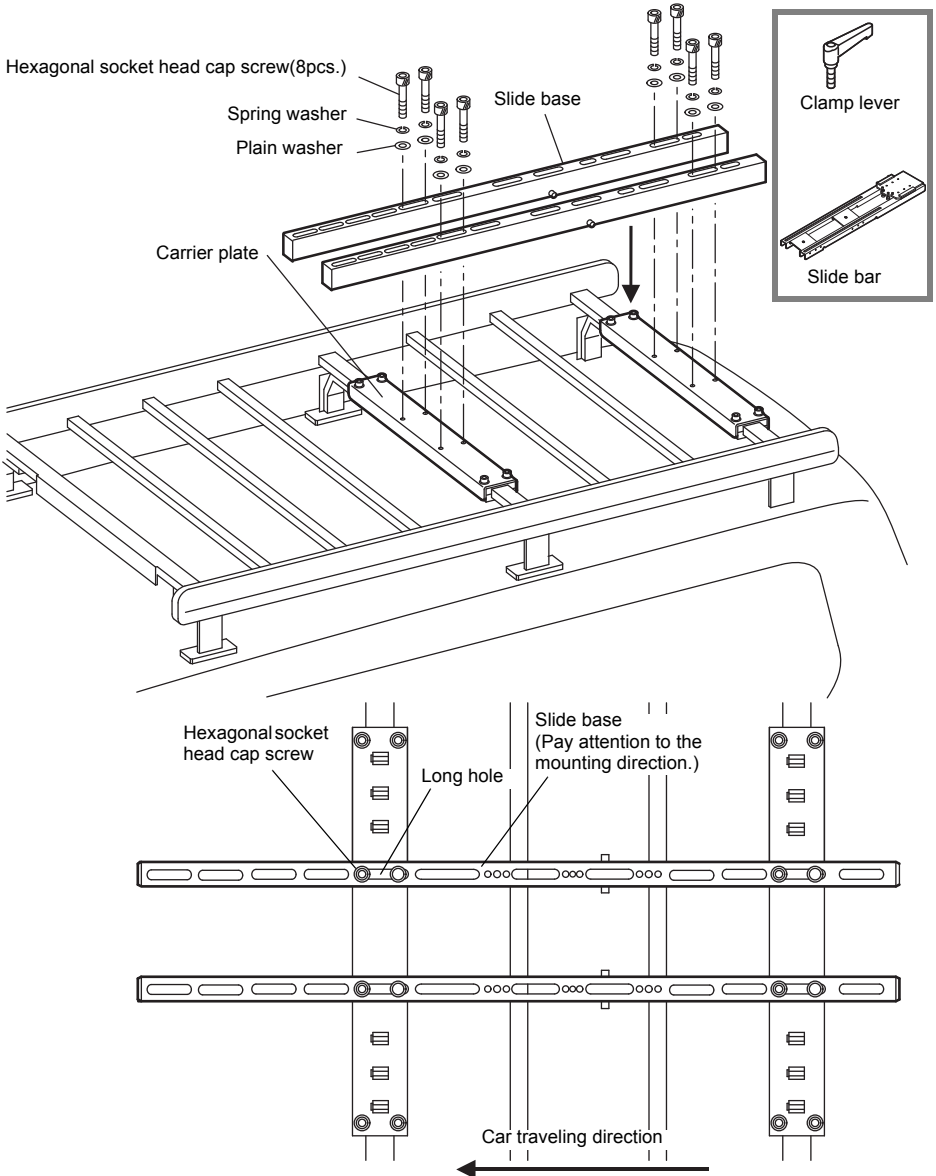
1. Put the carrier base A on the roof carrier bar and align the hole position. (4 places)
2. Put one carrier plate on the carrier base A.
3. Mount the carrier plate to carrier base using the 4 hexagonal socket head cap screws on both ends of the plate.
4. Repeat step 3 for the other carrier plate.



- Mount the side base to the carrier plate using carrier base B and the 8 hexagonal head cap screws. The side base must be pointed in the direction shown below.

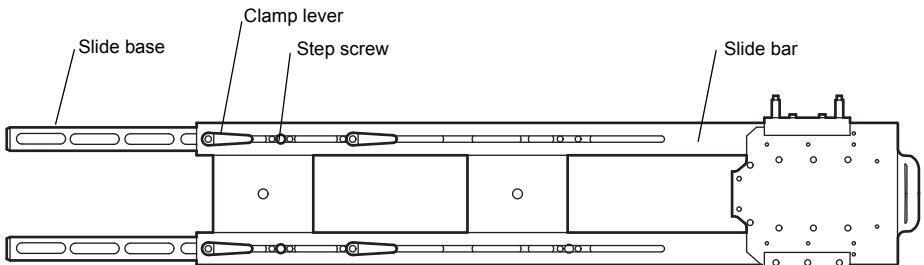
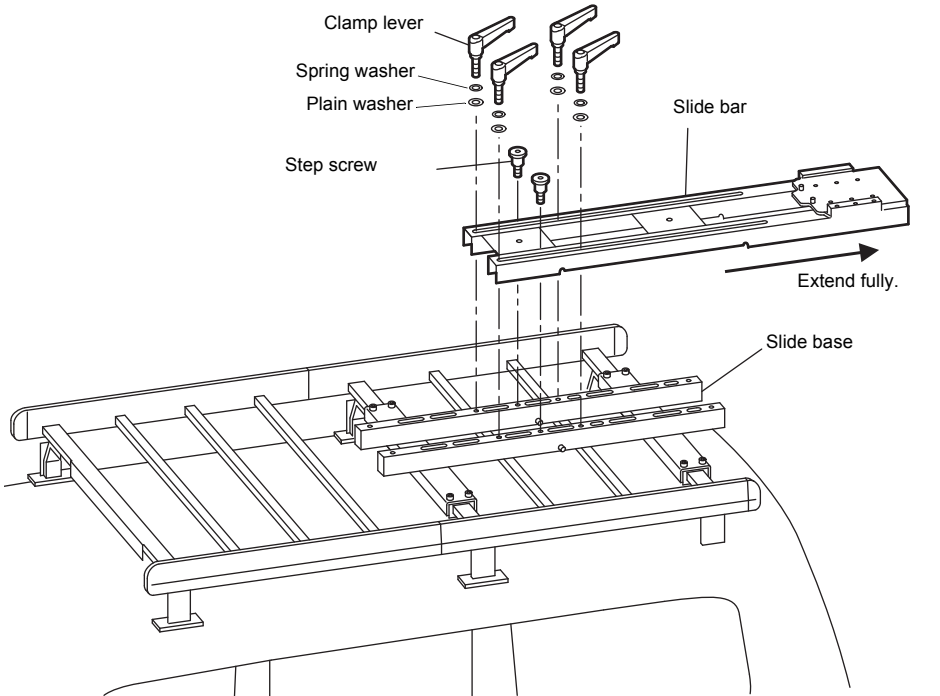
Note

When the instrument is shipped, the slide bases are secured to the slide bar with 4 clamp levers. Detach the clamp levers from the slide bar before using the slide bases.

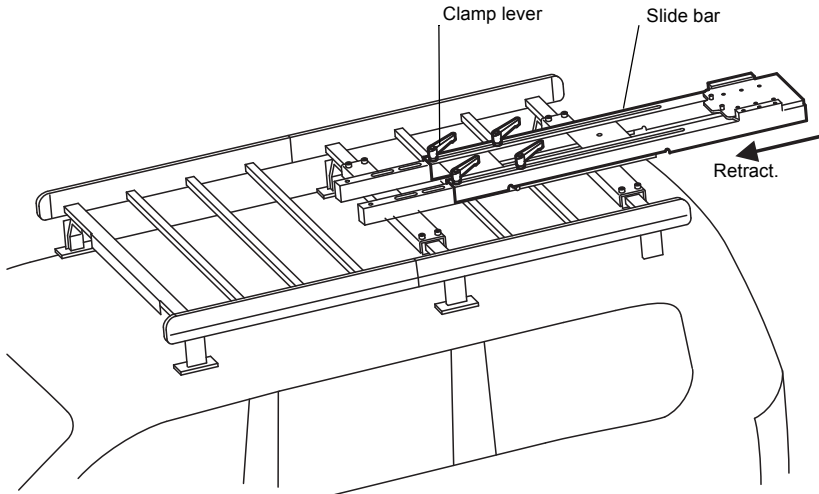


8. PREPARE THE VEHICLE

- Remove the 4 clamp levers, spring washers, and plain washers from the side bar.
- Put the slide bar on the slide base.
- As shown in the illustration below, locate where the sidebar is fully extended and securely tighten the clamp lever and step screw.
Torque the step screw to 5N-m.
- Adjust the slide base to be parallel to the slide bar, making sure clearances are the same.
- Tighten the 8 hexagonal head cap screws, and torque to 24.4N-m.



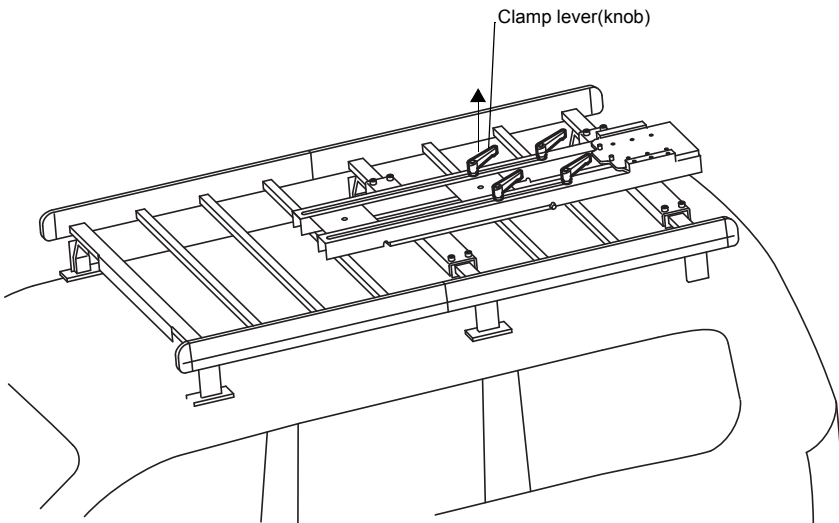
11. Loosen the 4 clamp levers, retract the slide bar, and place it in the center of the roof carrier.



12. Securely tighten the 4 clamp levers by hand.

Note




The knob parts of all clamp levers used for this product can be rotated by pulling them in the direction indicated by the arrow in the diagram below. When tightening the clamp levers, rotate the knobs so that you can easily apply your force.



8.3 Install the Wheel Encoder

■ Required Parts

The number in parentheses is quantity.

<p>Wheel encoder (1)</p> 	<p>Wheel encoder cable (1)</p> 
<p>Wheel encoder nut and bolt (Size and quantity are different between car models.)</p> 	

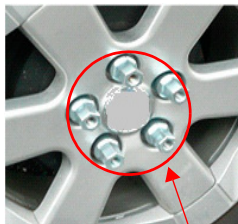
■ Installing the wheel encoder

1. Remove the wheel nuts from one of the right and left tires.



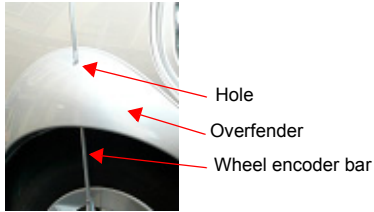
Genuine nut

2. Attach the wheel encoder nuts.

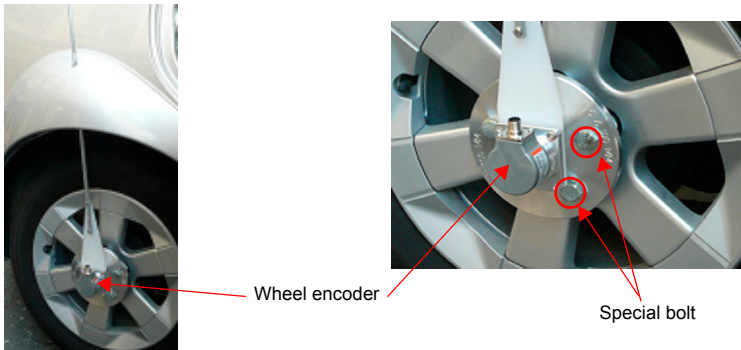


Special nut

3. Make a hole on the overfender of the rear tire to fix the wheel encoder bar.

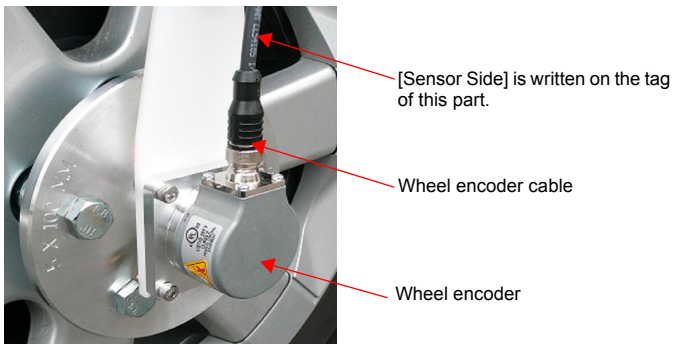


4. Pass the wheel encoder bar through the hole on the overfender of the rear tire.
5. Align the hole of wheel encoder with the nut of the rear tire.
6. Attach the wheel encoder bolt.



■ Installing the wheel encoder cable

1. Connect the cable of rear tire to the wheel encoder. (The connection for the IP-S3 cube will be mentioned later.)



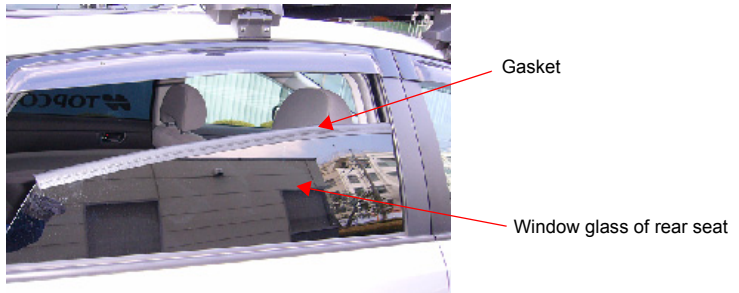


- Arrange the wheel encoder cable so that it stays within the vehicle width.
- The quantity of wheel encoder parts is different from vehicle to vehicle. Contact your local dealer for more information.

8.4 Install the Gasket

After mounting the IP-S3 cube on the roof of the vehicle, connect it to the timing box using the included cables. Keep the rear window slightly open to route the cables to the timing box. Use a gasket to decrease the gap in the open window.

1. Trim the gasket to fit the rear window.
2. Slightly lower the window, and attach the gasket.



9. INSTALLING THE IP-S3 CUBE

9.1 Install the IP-S3 Cube

To prevent theft, only install the IP-S3 cube to the mount kit when surveying.



The IP-S3 cube has already been calibrated. Do not disassemble it.



Warning

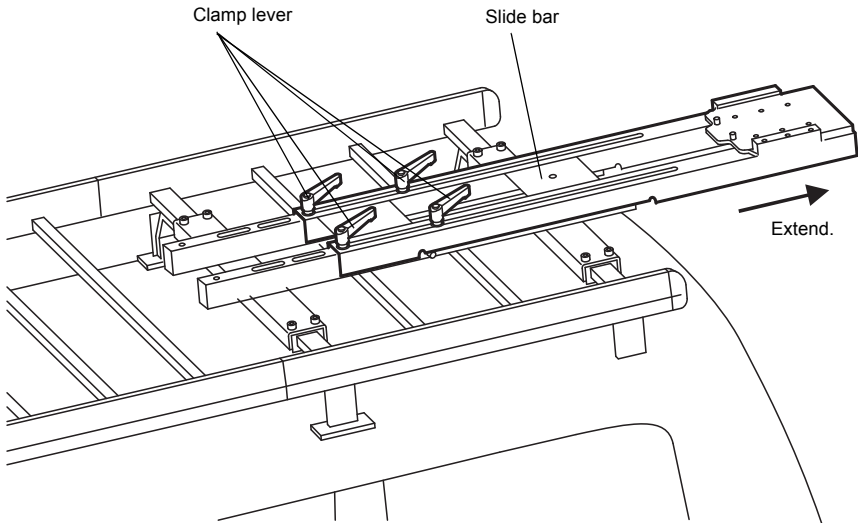


Carefully attach the IP-S3 cube to the mount kit. Damage to the instrument or serious injury can occur.

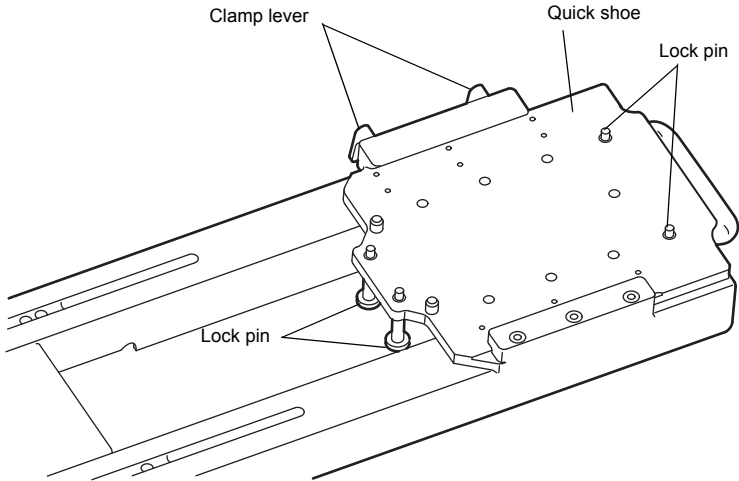


Before approaching the extended slide bar, look around carefully. The slide bar may hit your head or face to cause injury.

1. Loosen the 4 clamp levers of the slide bar.
2. Extend the slide bar in the direction shown in the diagram below.
3. Tighten the 4 clamp levers.



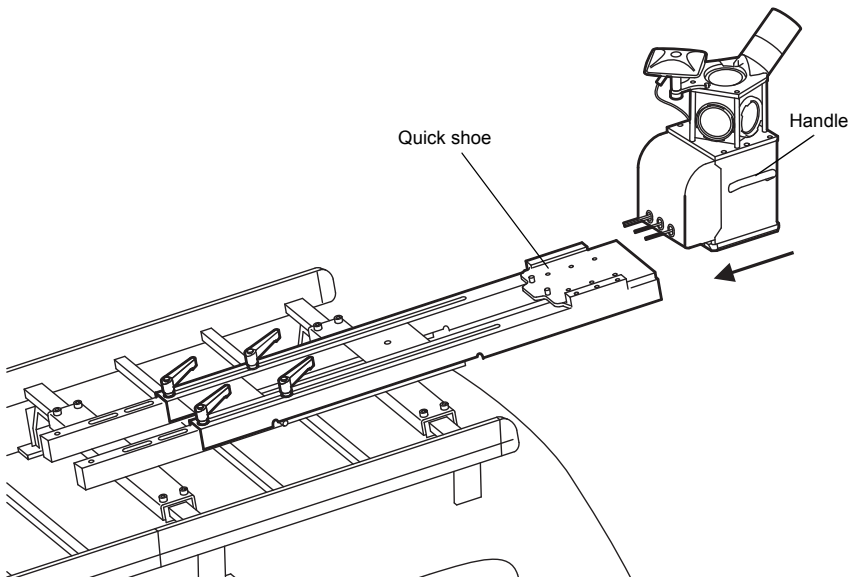
4. Make sure that the four quick shoe lock pins are lowered.
5. Loosen the 2 clamp levers of the quick shoe.



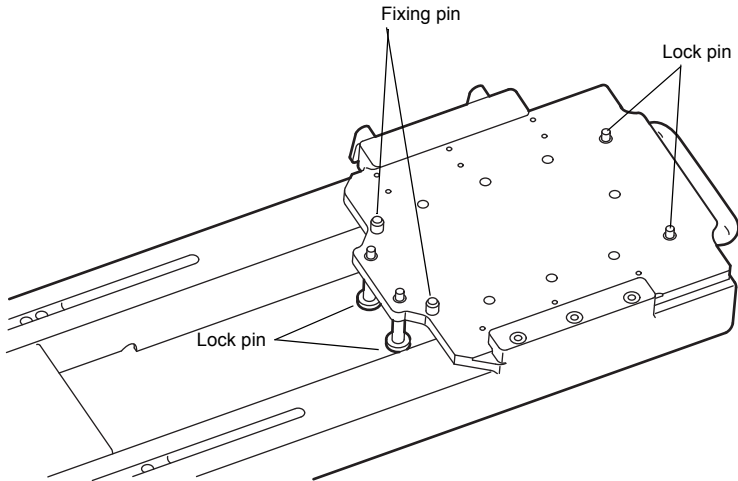
6. Hold both handles of the IP-S3 cube, and place it on the quick shoe as shown in the image below.



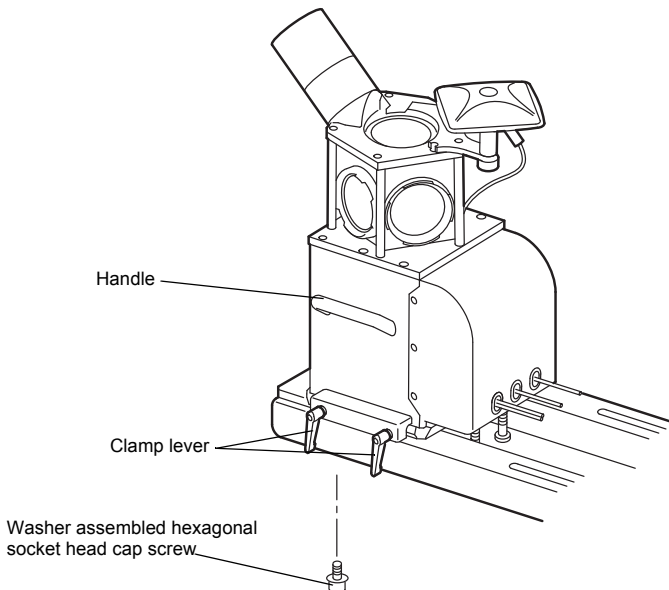
Be careful not to catch the cable.



- Place the IP-S3 cube against the fixing pins of the quick shoe. Then, raise the lock pins to make sure that the IP-S3 cube is secured.



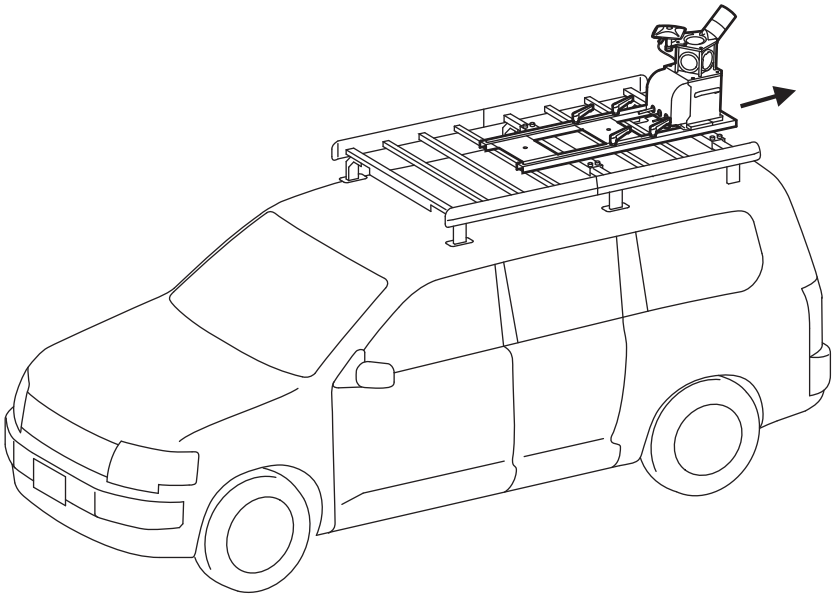
- Tighten the two clamp levers.



- Tighten the hexagonal socket head cap screw with washer (M10 \bar{A} -20mm) from the bottom of the quick shoe.

The IP-S3 cube is now installed.

10. Loosen the clamp lever of the slide bar, and retract the slide bar as shown in the image below.
11. Tighten the clamp lever of slide bar.



- When surveying, extend and use the slide bar.
- If you open the hatchback while the slide bar is extended, the hatchback may be damaged. Before opening the hatchback, retract the slide bar.

9.2 Connect the Cables



Warning

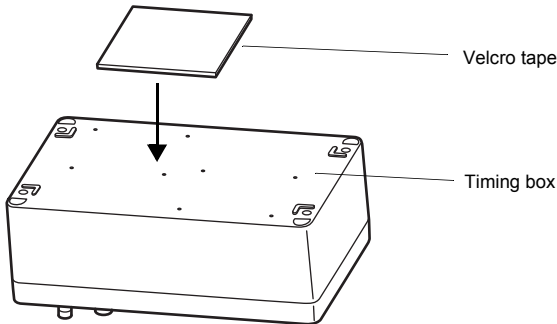


To avoid electric shock, turn off the car engine before connecting the power cables.

After mounting the IP-S3 cube on the roof of the vehicle, connect it to the timing box using the included cables. Keep the rear window slightly open to route the cables to the timing box. Do not allow any slack in the cables.

■ Fixing the timing box

To prevent the timing box from moving while the car is running, adhere Velcro tape to the rear surface of timing box as shown below.

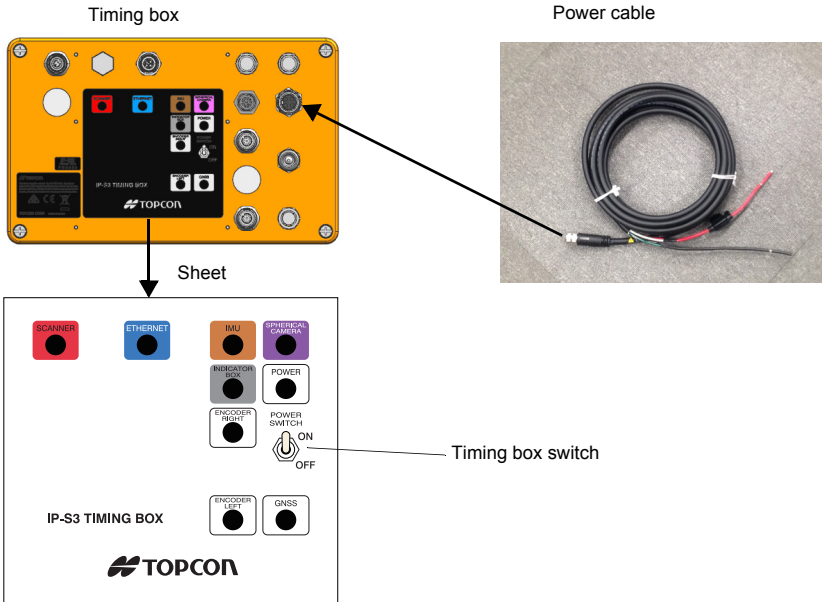


■ Connecting the power cable

1. Connect the IP-S3 side connector ([Timing Box Side] is written on the tag) of the power cable to the power supply port (POWER) of timing box. Do not supply power to the timing box.

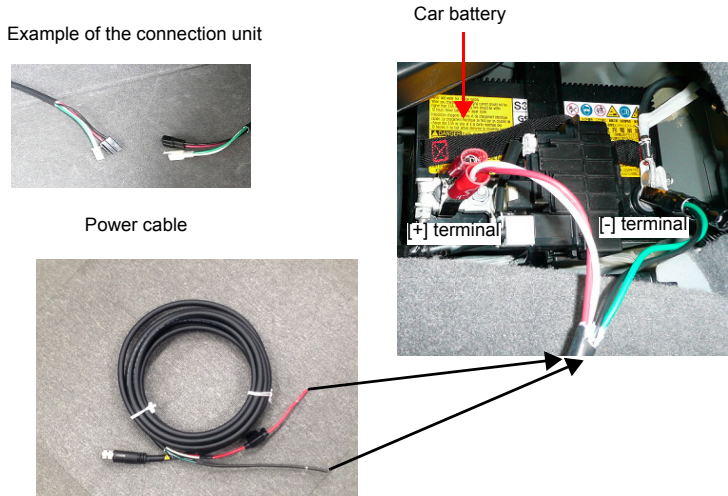


- If power is supplied to the box at this point, it may draw too much power and cause the connector to fail.
- The above illustration shows the position of each connector.
- Do not connect the cables incorrectly.
- The color sheet on the timing box shows the color of each cable tag.



■ Connecting the power cable (battery side)

1. Connect the power cable to the car battery.
The wire on the battery side of the power cable is exposed. Topcon recommends placing the exposed wire inside a connector. For safety and ease of use, connect the red cable to the positive (+) terminal, and the black cable to the negative (-) terminal.





- Power is supplied to IP-S3 from the car battery directly. Even if the car engine is turned off, IP-S3 operates and the car battery discharges power. Whenever the car engine stops, turn off the timing box switch.
- When connecting the power cable, turn off the timing box switch.
- When connecting all cables, turn off the timing box switch.

■ Preparing a personal computer

A computer running Microsoft Windows is required to set up the IP-S3 cube, check the settings, and collect data. An AC power supply is required for the computer.



Set up your computer away from heat and moisture and direct sunlight.

■ Connect the Computer Cable

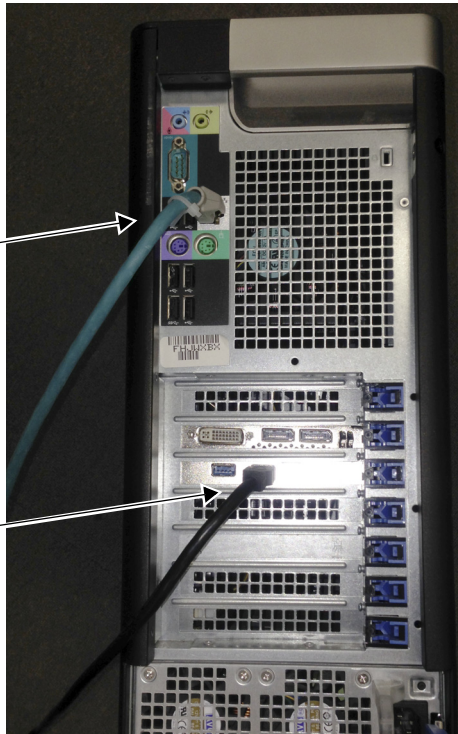
1. Connect the Ethernet cable to the Ethernet port on the computer.
2. Connect the USB 3.0 cable to the USB jack of the computer.



Do not connect the USB 3.0 cable to the computer while Windows is starting. The camera does not operate normally from time to time. In such a case, start Windows correctly, then connect the cable.

Ethernet cable
[PC Side] is written on the tag of this part.

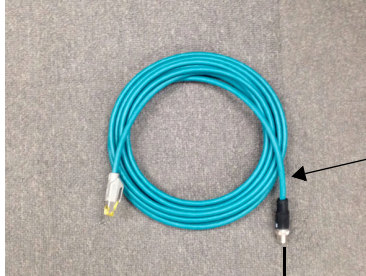
USB3.0 cable
[PC Side] is written on the tag of this part.



■ Connect the Timing Box Ethernet Cable

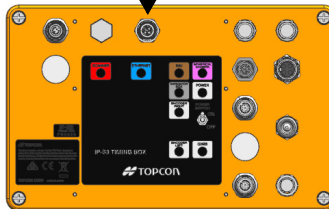
1. Remove the cap from the timing box Ethernet cable.
2. Connect the IP-S3 side of the Ethernet cable to the Ethernet port of the IP-S3 cube.

Ethernet cable



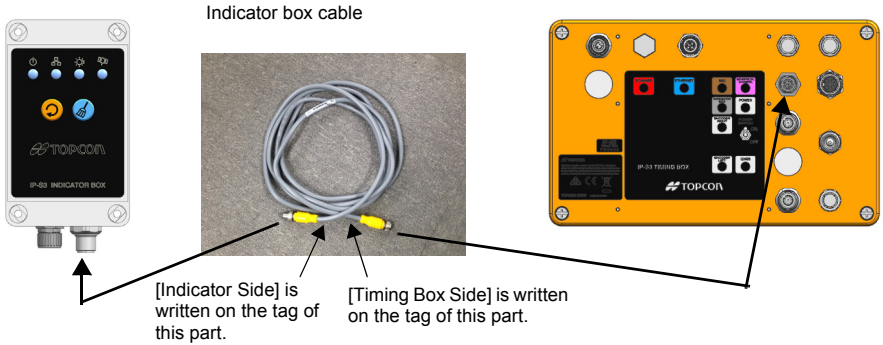
[Timing Box Side] is written on the tag of this part.

Ethernet port(Blue)



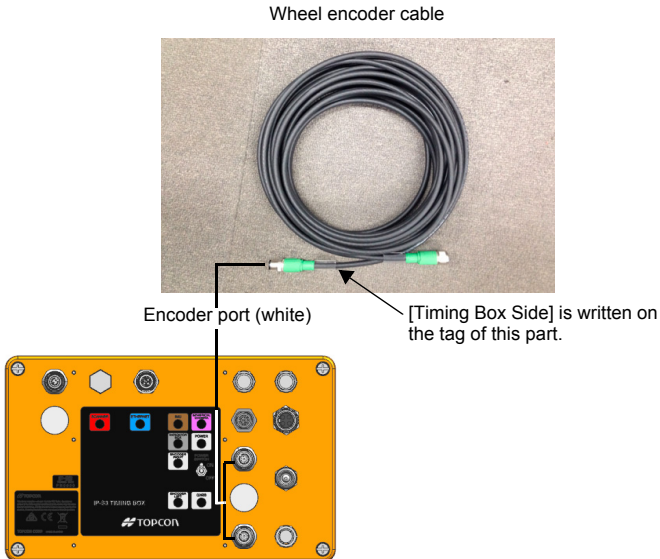
■ Connect the Indicator Box Cable

1. Remove the cap from the indicator box port.
2. Using the indicator box cable, connect the timing box to the indicator box as shown below.



■ Connect the Wheel Encoder Cable to the Box

1. Remove the cap from the timing box Encoder port.
2. Connect the wheel encoder cable to the Encoder port on the timing box. The encoder port is located next to the wheel encoder port. See "8.3 Install the Wheel Encoder" on page 16 for more information.

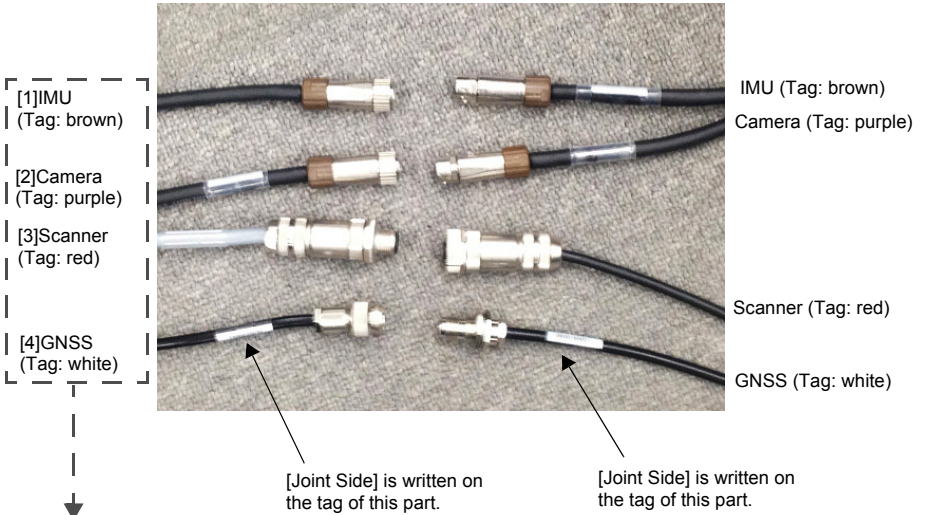


■ Connect the IP-S3 Cube Cables

1. Connect all cables from the timing box to the IP-S3 cube, and ty-wrap them for easy storage.

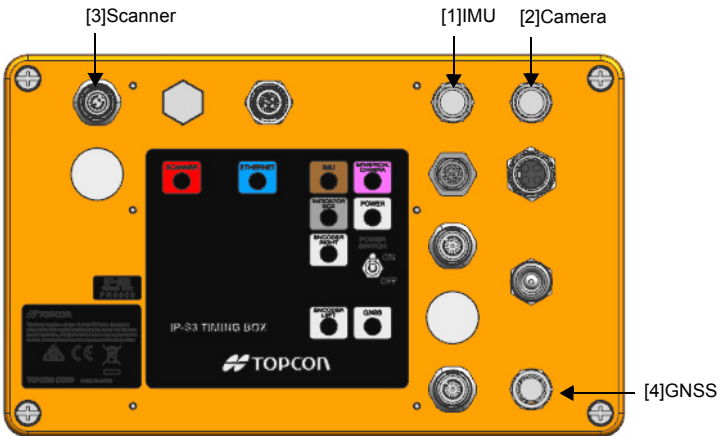
Timing Box side

Cube side



Note

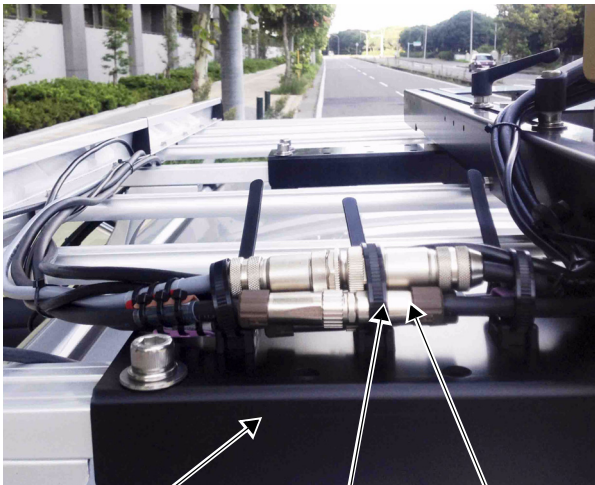
Connect the cables on the timing box side to the ports shown below.



Timing Box

■ Fixing the Cables

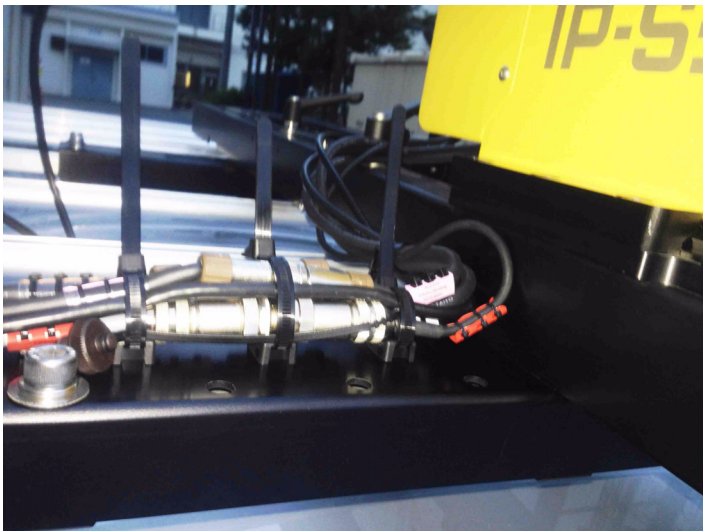
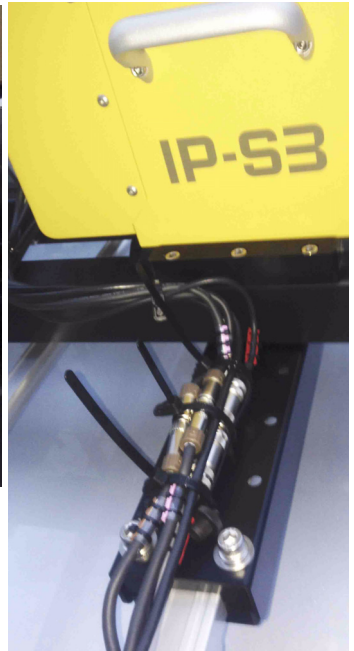
- After connecting all cables, attach them to the binding band of the carrier plate.
- Fix the cables without excessive tension.



Carrier plate

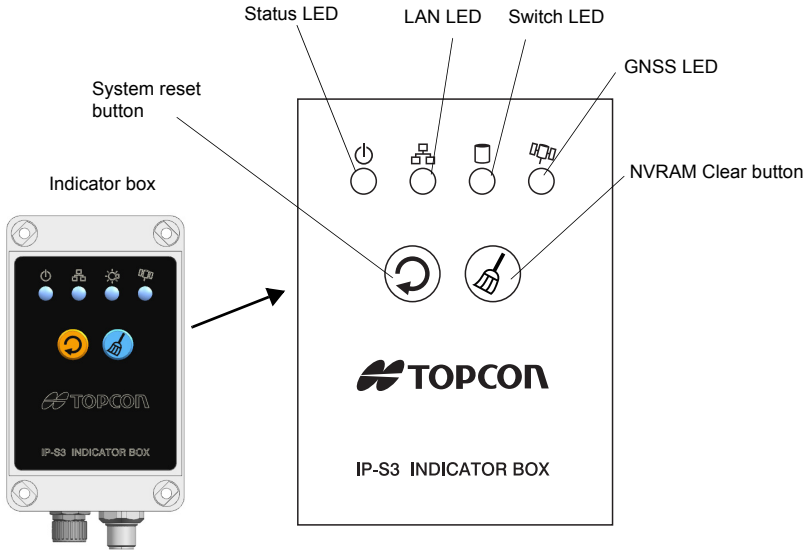
Binding band
(Detachable)

Connector



9.3 Indicator Box

Using the LEDs of the IP-S3 indicator box, check if the IP-S3 system operates properly.



■ Status LED

After turning the power on, if the Status LED blinks red some part of the IP-S3 system is not operating correctly.

If the Status LED blinks green, the IP-S3 system is operating correctly and the system can collect data. It takes approximately 1 minute for the Status LED to register green from turning the power on.

■ GNSS LED

This LED blinks a different color according to the number of satellites currently being tracked in GPS and GLONASS. Green indicates GPS and orange indicates GLONASS. Right after the power is ON, this LED blinks red. A Red blinking LED indicates that the instrument is not surveying. When the single system is surveying, the LED does not blink red.

For more information on device operation, see the Mobile Master Field Instruction Manual.

■ LED display

LED status is described in the table below.

For all errors, except GNSS initialization, follow the steps in "Resetting the Timing Box" below.

For descriptions of errors, see the Mobile Master Field Instruction Manual.

LED	Indication	Contents
Status	Solid red	Startup
	Solid orange	Sensor is being initialized.
	Solid green	Operating properly
	Green blink	Collecting data
	Blinks red two times	System error
	Blinks red three times	GNSS initialization error (Clear NVRAM.)
	Blinks red four times	IMU error
	Blinks red five times	Scanner data error
	Blinks red six times	Scanner synchronization error
LAN	Solid green	During Ethernet connection to timing box from each sensor
Switch	Solid green	Within 4 seconds after the switch is pressed
	Blinks green slowly	Within 4 - 8 seconds after the switch is pressed
	Blinks green rapidly	Instrument reset or NAVRAM is clearing
GNSS	Blinks red	Surveying is not performed
	Blinks green	Tracking GPS satellites: The blinking times indicate the number of satellites being tracked.
	Blinks orange	Tracking GLONASS satellites: The blinking times indicate the number of satellites being tracked.

■ Resetting the timing box

1. Continuously press the System Reset button until the Switch LED blinks slowly.
2. Release the system reset button. The Switch LED blinks rapidly until the timing box is reset. After resetting is finished, the timing box restarts.

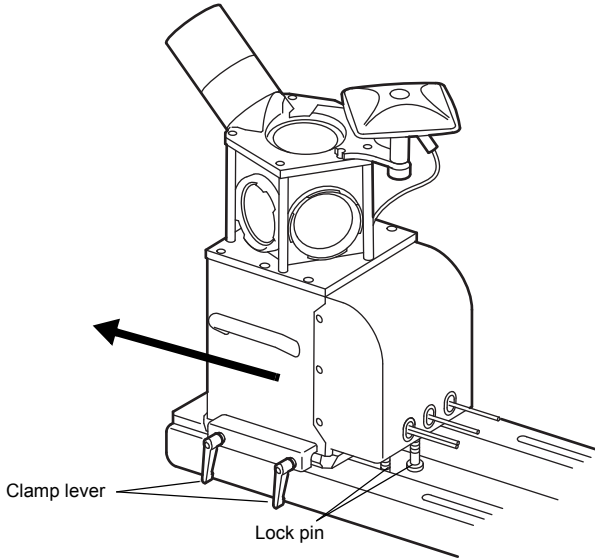
■ Clearing NVRAM (Initializing GNSS)

1. Continuously press the NAVRAM Clear button until the Switch LED blinks slowly.
2. Release the NVRAM Clear button. The Switch LED blinks rapidly until NVRAM is cleared. After NVRAM is cleared, the timing box restarts.

9.4 Removing of IP-S3 Cube

After surveying, follow the steps below to remove the IP-S3 cube.

1. Disconnect the cables.
2. Loosen the clamp lever of slide bar and extend the slide bar.
3. Loosen the clamp lever of the quick shoe.
4. Pull down the 4 lock pins.
5. Holding both handles, remove the IP-S3 cube as shown in the diagram below.



10.SPECIFICATIONS

IP-S3 Timing box

Dimensions	260 (W) × 160 (D) × 121 (H) mm
Weight	3.0kg(6.6lb)
Operating temperature range	-20°C to 50°C (-4° to 122°F)
Storage temperature range	-30°C to 60°C (-22° to 140°F)
Dustproof/Waterproof	IP65 (JIS C0920:2003)
Input/Output port	Power supply, Ethernet, scanner, spherical camera, wheel encoder, IMU, GNSS antenna
Time resolution	10 nsec
Input voltage	9V to 36V
Power consumption	60W (when cube is connected)
GNSS receiver	Built-in

Indicator Box

Dimensions	75 (W) × 125 (D) × 34 (H) mm
Weight	0.2kg(4.4lb)
Operating temperature range	-20°C to 50°C (-4° to 122°F)
Storage temperature range	-30°C to 60°C (-22° to 140°F)
Dustproof/Waterproof	IP65 (JIS C0920:2003)
LED	Status, LAN, Switch, GNSS

Cube

Dimensions	300 (W) × 500 (D) × 600 (H) mm
Weight	18kg(39.6lb)
Sensors installed in Cube	GNSS antenna, IMU, Laser scanner, Spherical camera

Sensors

GNSS receiver	
Number of channel	226 channels GPS L1/L2 carrier, L1CA, L1P, L2P GLONASS L1/L2 carrier, L1CA, L1P, L2P
Data update	10 Hz
Static survey accuracy	H: ±3.0mm + 0.5ppm V: ±5.0mm + 0.5ppm
Kinematic survey accuracy	H: ±10mm + 1ppm V: ±15mm + 1ppm
Operating temperature range	-40°C to 85°C (-40° to 185°F)
Storage temperature range	-40°C to 60°C (-40° to 140°F)
Vibration	4G (sine wave), 7.7G (Random vibration)
Shock	30G
GNSS antenna	
Operating Frequency Range	L1 GPS/GLONASS 1586.5 ± 25MHz L2 GPS/GLONASS 1236 ± 20 MHz L-Band 1535 ± 10 MHz
Operating temperature range	-50°C to 85°C (-58° to 185°F)
Storage temperature range	-55°C to 50°C (-67° to 122°F)
Dustproof/Waterproof	IP67 (JIS C0920:2003)
Vibration	Random Vibration : IEC 60068-2-34, Test Fd Sinusoidal vibration : IEC 60068-2-6, Test Fc
Shock	Shock : IEC 60068-2-29 Test Ea Bump : IEC 60068-2-29 Test Eb Drop : 2m pole drop to concrete



IMU

Gyro bias stability	1°/hr
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Acceleration bias stability	7.5 mg
Operating temperature range	-40°C to 65°C (-40° to 149°F)
Storage temperature range	-50°C to 80°C (-58° to 176°F)
Dustproof/Waterproof	IP67 (JIS C0920:2003)
Vibration	6Grms(20Hz to 2000Hz)
Shock	7G(6 to 10msec 1/2Sine)
Laser scanner	
Point density	700000 points/sec
Valid range	100m
Operating temperature range	-10°C to 60°C (-14° to 140°F)
Storage temperature range	-40°C to 105°C (-40° to 221°F)
Dustproof/Waterproof	IP67 (JIS C0920:2003)
Vibration	3Grms(5Hz to 200Hz)
Shock	500m/s ² (11msec)
Spherical camera	
Camera unit	CCD camera (6 pcs.)
Maximum resolution	8000 × 4000 pixels
Operating temperature range	0°C to 45°C (32° to 113°F)
Storage temperature range	-30°C to 60°C (-22° to 140°F)
Maximum image capturing speed	10fps
Wheel encoder	
Pulse rate	2500 PPR
Operating temperature range	-40°C to 85°C (-40° to 185°F)
Dustproof/Waterproof	IP67 (JIS C0920: 2003)
Vibration	100m/s ² (10Hz to 2000Hz)
Shock	2500m/s ² (6msec)
General	
Absolute coordinates accuracy*1)	50mm@10m distance (1 sigma)
	*1) Comparison to 10 known points in 30 times by 30km/h
Surface accuracy*2)	10mm on road surface (1 sigma)
	*2) Plane fitting results on flat road surface
Continuous surveying time	4 hours

11.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 inter-ference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the operator's 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>
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, U.S.A	Perchlorate Material (CR Lithium Battery)	<div style="border: 1px solid black; padding: 5px;"> <p>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</p> </div>
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 a la norme NMB-003 du Canada.</p>

Region/ Country	Directives/ Regulations	Labels/Declarations
EU	EMC-Class A	<p>EMC NOTICE</p> <p>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> <p>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.</p> <p>Model: Mobile Mapping System IP-S3 HD1</p> <p>Manufacturer</p> <p>Name: TOPCON CORPORATION Address: 75-1, Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 JAPAN</p> <p>Europe Representative</p> <p>Name: Topcon Europe Positioning B.V. Representative Director: Jim Paetz Address: Essebaan 11, 2908 LJ Capelle a/d IJssel, The Netherlands</p> <p style="text-align: center;"></p>
EU	WEEE Directive	<p style="text-align: center;"> WEEE Directive</p> <p style="text-align: center;">■ This symbol is applicable to EU members 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>

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

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