



# HiPer HR

## **Multi-Purpose GNSS Receiver**

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Operator's Manual



# HiPer HR Operator's Manual

Part Number 1010117-01

Rev D



For more information contact Synergy Positioning Systems or visit the Synergy Positioning Systems website at [www.synergypositioning.co.nz](http://www.synergypositioning.co.nz)  
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# Preface

Thank you for purchasing this Topcon product. The materials available in this Manual (the "Manual") have been prepared by Topcon Positioning Systems, Inc. ("TPS") for owners of Topcon products, and are designed to assist owners with the use of the receiver and its use is subject to these terms and conditions (the "Terms and Conditions").



Please read the terms and conditions carefully.

## Terms and Conditions

### Use

This product is designed to be used by a professional. The user should have a good knowledge of the safe use of the product and implement the types of safety procedures recommended by the local government protection agency for both private use and commercial job sites.

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## Safety

Improper use of the receiver can lead to injury to persons or property and/or malfunction of the product. The receiver should only be repaired by authorized TPS warranty service centers.

## Miscellaneous

### Miscellaneous

The above Terms and Conditions may be amended, modified, superseded, or canceled, at any time by TPS. The above Terms and Conditions will be governed by, and construed in accordance with, the laws of the State of California, without reference to conflict of laws.



## Manual Conventions

This manual uses the following conventions:

Convention	Description	Example
<b>Bold</b>	Menu, or drop-down menu selection	<b>File</b> ▶ <b>Exit</b> (Click the <b>File</b> menu and click <b>Exit</b> )
	Name of a dialog box or screen	From the <b>Connection</b> screen...
	Button or key commands	Click <b>Finish</b> .
Mono	User supplied text or variable	Type <code>guest</code> , and click <b>Enter</b> .
<i>Italic</i>	Reference to another manual or help document	Refer to the <i>Topcon Reference Manual</i> .



Further information to note about system configuration, maintenance, or setup.



Supplementary information that can have an adverse affect on system operation, system performance, data integrity, measurements, or personal safety.



Notification that an action has the potential to result in system damage, loss of data, loss of warranty, or personal injury.

# Introduction

Topcon's HiPer HR receiver is a compact and high-performing integrated GNSS receiver for static and kinematic land surveying applications. The receiver design includes 452 GNSS channel Vanguard Technology™ with Universal Tracking Channels, and advanced integrated Fence Antenna™ technology. These technologies deliver world class positioning and navigation capability to your application by tracking signals with multiple frequencies and multi-constellation satellite systems such as GPS, GLONASS, BeiDou, QZSS, SBAS and Galileo.

To create a future proof, efficient positioning system appropriate for any survey needs, the receiver combines GNSS tracking capabilities, multiple-frequency RTK, and DGPS solutions, extensive communication capabilities, built-in 8 GB memory, integrated batteries, and hot swappable batteries.

Several unique features, including advanced multipath mitigation, adjustable Phase Locked Loop (PLL) and Delay Locked Loop (DLL), offer a reliable and versatile reception of weak signals even in degraded signal environments. The receiver also supports Quartz Locked Loop™ (QLL) for superior GNSS tracking in high-vibration environments.

The HiPer HR offers complete IP67 protection against dust and water ingress, in addition to superior vibration and shock resistance. The Topcon communication interface allows you to quickly integrate Topcon's premium GNSS performance within new systems, and quickly deliver world class positioning and navigation support to your applications.



**Figure 1: HiPer HR Receiver**

## HiPer HR Features

The HiPer HR receiver's advanced design allows a simplified setup and premium performance. The HiPer HR receiver features the following:

- 452 GNSS channel Vanguard Technology™ with Universal Tracking Channels for multi-frequency tracking of multiple satellite constellations such as GPS, GLONASS, BeiDou, QZSS, SBAS and Galileo.
- Industry leading full-wave Fence Antenna™ technology
- An internal battery and a removable external battery
- An internal UHF or FH915 radio modem
- Integrated Bluetooth®, multi-channel LongLink™, and Wi-Fi wireless and radio technology<sup>1</sup>
- Wi-Fi as an access point and as a client
- Web interface for receiver monitoring and configuration
- Interface for controlling and viewing data logging through the LED display
- Topcon Integrated Leveling Technology (TILT™)
- External power, USB, and serial-data ports
- External GNSS antenna connector
- Internal 8 GB SDHC memory card
- Virtual serial port via USB
- Mass storage data access via USB

The HiPer HR comes in one of the following configurations:

- R2 Lite UHF radio module
- R2 Lite FH915 radio module
- No UHF/FH915 radio

## Unpacking Your Receiver Kit

This section describes the documentation, standard kit components<sup>2</sup>, and accessories (depending on your purchase) that accompany your receiver. When you unpack your receiver kit, verify that you received the items listed in this section. If any items are missing or damaged, contact your local Topcon dealer. See "Getting Technical Support" on page 4.

## Standard Kit Components

Table 1 lists the standard kit components for the HiPer HR. For more information about the included cables, see "Cables" on page 7.

**Table 1. HiPer HR Standard Kit Components**

HiPer HR Receiver	Power Cable
Power Adapter	Wall Charger Cable
Micro USB Cable	Serial Cable
Additional Removable Battery Pack	Battery Charger with Cradle
Battery Charger Cable	Warranty Card
LED Card – Describes the LED behavior and technical content.	

1. Bluetooth, LongLink, Cellular, and Wi-Fi wireless radio technologies are available in all configurations of the receiver. Local radio restrictions apply for operation of these radio technologies.

2. Components in the standard kits may differ based on your region. Contact your local Topcon dealer to inquire about items included in your regional standard kit, and accessories that are available with the receiver.

## Accessories

Topcon offers a wide variety of accessories specially designed to improve system flexibility and job site efficiency. For more details on the optional accessories available for HiPer HR, contact your Topcon dealer.

Table 2 lists the accessories available for the HiPer HR. For more information about accessories, see "Accessories" on page 8.

**Table 2. HiPer HR Accessories**

Radio Antenna	Rover Pole
External Antenna Cable	Fixed Height Heavy Duty Tripod
Rover Pole Offset Adapters	Economy Tripod
Tribrach with Plug Adapter	Tape Measure
Horizontal Measuring Bar	Prism
Hand-Held Controller and Brackets	
Prism Adapter	

## Technical Documents

The following documents will help you set up and use your new receiver.

- *HiPer HR Operator's Manual* (this document) – Contains detailed information on how to use your new receiver. You can download the document from Topcon's TotalCare website (<https://www.topconpositioning.com/support>).
- *HiPer HR LED Card* – Contains basic hardware and LED descriptions, along with safety and regulatory statements. This guide is available in your standard kit package.
- *Topcon Receiver Utility (TRU) Help* – An on-screen help document embedded in the software that contains detailed information on how to use the TRU software. For more information about the TRU software, see "Using Topcon Software With Your Receiver".

## Using Topcon Software With Your Receiver

Use the HiPer HR receiver in conjunction with the Topcon Receiver Utility (TRU) and MAGNET Field™ or Pocket-3D applications for a precision positioning solution. Topcon software enables you to configure the receiver and other external devices, manage files, collect data, and perform survey and construction work flows.

The Topcon Receiver Utility (TRU) is a hardware configuration software for receivers and peripheral devices. You can install it on desktop computers, and data controllers. You can download this program from the myTopcon website (<https://www.topconpositioning.com/support>). The help document for TRU is embedded in the software.

Topcon's MAGNET Field™ software for data controllers provides real-time communication, cloud storage, data collection and exchange, and field solutions, such as topo, staking, roads, calculations, and more.

Pocket-3D is a field application for survey and construction markets. The software runs on data controllers with Windows CE® and mobile platforms. Pocket-3D simplifies data collection, allowing you to check cuts and fills, layout points and survey all or part of the job site quickly and efficiently.

Contact your Topcon dealer for more information about Topcon field data collection software for the surveying and construction markets.

## Getting Technical Support

Before contacting a Topcon customer representative about any problems with the receiver, see “Troubleshooting” on page 61 for some solutions that may fix the issue.

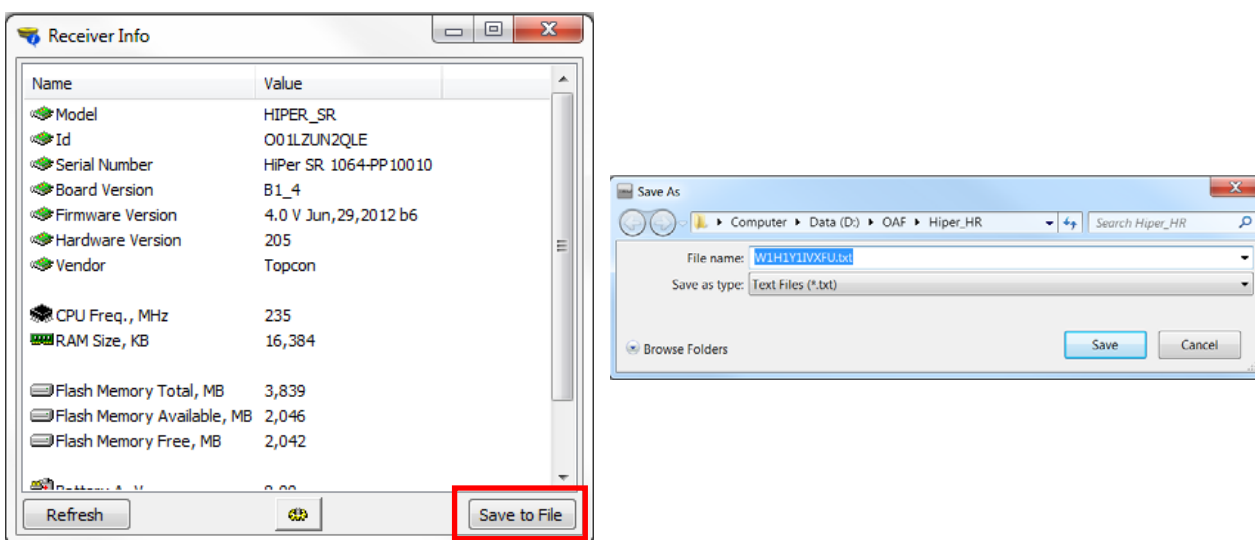
Contact your local Topcon dealer or visit the myTopcon website (<https://www.topconpositioning.com/support>) for technical support.



For quick and effective support, provide a detailed description of the problem.

When contacting Topcon for technical assistance, provide the following information for better and faster service:

1. A description of the following:
  - Field operation that was being performed when the problem occurred.
  - Details of the unexpected behavior, symptoms, and any error messages that precede or follow the problem.
  - Problem occurrence frequency or patterns.
2. Receiver information and configuration settings. For receiver information, do the following:
  - a. Run TRU on a PC or a field controller, switch on the receiver.
  - b. Use serial or USB cable for connection.
  - c. Select **Device** ▶ **Application Mode** ▶ **Receiver Managing**.
  - d. Select **Device** ▶ **Connect**.
  - e. Click **Connect** on the **Connection Parameters** screen to establish a communication to the receiver.
  - f. In the TRU main screen, click **Information**. The **Receiver Info** screen appears, and displays basic information such as hardware and firmware versions, RAM size, receiver ID, and serial number.
  - g. Click **Save to File**, enter a file name, and save it to the computer (Figure 2).



**Figure 2: HiPer HR Receiver Info**

3. Specifications of mobile devices and computers used in the field or office exhibiting the problem. These specifications should include model information, version number, operating system information, memory and storage capacity, etc.
4. Information about the system software, including the version number and steps to reproduce the problem.
5. A description of the field environment and/or observation conditions when the problem occurred.

## Website

The Topcon Positioning System's corporate website provides current information about Topcon's line of products. The support area of the website provides access to Topcon field and office software, manuals, frequently asked questions, and so forth. To access the Topcon corporate website, visit [www.topconpositioning.com](http://www.topconpositioning.com).

The myTopcon website provides complete support, such as news, updates, reminders, training, live webinars, and customer service to help you get the information you need. Visit <https://www.topconpositioning.com/support>.

The HiPer HR receiver enclosure is fully sealed and incorporates the GNSS receiver board, antenna, batteries, memory storage, and a wireless communication modules in rugged housing.

## Receiver Overview

The upper part of the receiver includes GNSS, Bluetooth and Cellular antennas. It is covered by the radome, and securely surrounded by a shock-absorbing rubber bumper. The radio modem antenna connector is mounted on the top point of the radome.

The magnesium alloy lower enclosure features an easy-to-operate display panel, one internal battery, one removable battery, data ports, an external GNSS antenna connector, power connector and SIM card slot.

The receiver has a highly-visible display panel with single-button operation. The display panel enables you to view the receiver's operational status. For more information, see "Display Panel" on page 13.

You can locate regulatory and product identification information on the two receiver labels, which are located on the bottom of the product and inside the battery compartment. The product identification label contains the serial number and part number.

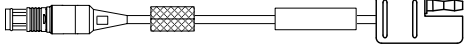
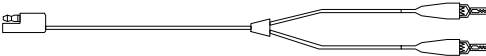
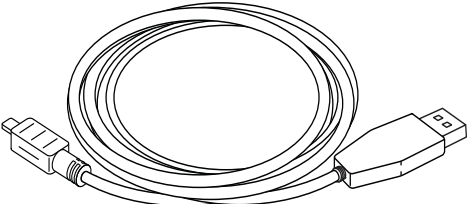
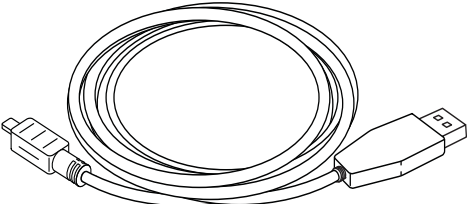
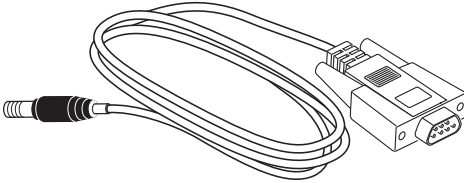

## Cables

The HiPer HR<sup>1</sup> package includes a power supply cable, a USB cable, and a power adapter. Table 3 describes the cables included with your receiver, depending on your regional standard kit configuration. Make sure to contact your local Topcon dealer to inquire about standard items included in your receiver kit.



Align the keyways when connecting the power/serial cable to the receiver port. To disconnect the cable, push the cable in, and then gently remove the cable.

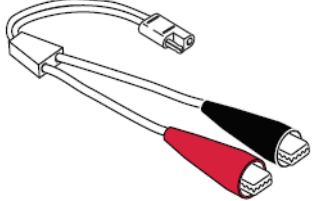
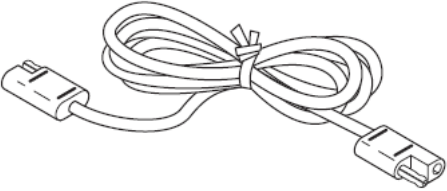
**Table 3. Receiver Cables**

Cable Description	Cable Illustration
<p><b>Receiver Power/Charging Cable</b> Connects the receiver and the power supply unit via SAE connectors for battery charging. p/n 14-008016-04LF</p>	
<p><b>Alligator Clips-to-SAE Cable</b> Connect the receiver power cable to an external 12V battery.</p>	
<p><b>Power Charger Cable(s)</b> Connects the power adapter to a grounded outlet. Different options are available for the power charger cable based on your country. To purchase this cable, contact your Topcon dealer. Refer to this part number p/n 1005793-01 - Cable, Power Charger (US) p/n 1005794-01 - Cable, Power Charger (EUR)</p>	
<p><b>Micro USB Cable</b> Connects the receiver to an external device (controller or computer) for data transfer and receiver configuration. p/n 1013602-01</p>	
<p><b>Serial Cable</b> Connects the receiver to an external device (controller or computer) for data transfer and receiver configuration. p/n 14-008005-03</p>	
<p><b>External Antenna Cable (Optional)</b> Connects the receiver to an external Topcon GNSS antenna. p/n 1006447-01</p>	

1. Components in the standard kit may differ based on your region. Contact your local Topcon dealer to inquire about items included in your regional standard kit, and accessories that are available with the receiver.



Table 3. Receiver Cables

Cable Description	Cable Illustration
<p><b>Alligator Clips Cable (Optional)</b> Connects any 12 - volt DC power source to the receiver via the SAE cable. p/n 14-008025-01</p>	
<p><b>SAE-to- SAE extension cable (Optional)</b> Connects SAE connectors over longer distances. p/n 14-008022-01</p>	

## Accessories

Topcon offers a wide variety of accessories specially designed to improve system flexibility and job site efficiency. For more details about the available accessories, contact your Topcon dealer.<sup>1</sup>

- **Power Supply Unit** (p/n 1005555-01): This item charges the external (removable) and internal batteries when connected to a grounded outlet. This unit converts the Alternating Current (AC), normally supplied from an electrical outlet, to Direct Current (DC) for charging the batteries, and/or powering the receiver.
- **Battery Pack** (p/n 1006555-01): External battery for the receiver.
- **Modem Antenna:** The Spread Spectrum (FH915+) antenna is a reverse polarity TNC RF connection (p/n 30-030012-01) and the UHF antenna is a BNC connection (p/n 30050501-01 UHF 435-470 or p/n 30050502-01 UHF 400-435).
- **Universal Tribraich and Tribraich Adapter**<sup>2</sup> (p/n 22-006008-01 and p/n 22-006009-011): These items level the tripod, and secure the receiver or antenna to the tripod.
- **Precision Tribraich Adapter:** This item precisely centers, aligns, and levels the tripod over a point. The horizontal spacer (p/n 51842) inserts into the precision tribraich, and allows the receiver to sit securely on the precision tribraich.
- **Wooden Tripod** (p/n 59010)
- **Heavy Duty Tripod** (p/n 22-05050101)
- **2 Meter Fixed Height Rover Pole** (p/n 22-050908-01)
- **Hand-held Controller:** This items allows the HiPer HR Base and Rover systems to be configured and monitored directly in the field. Use the Topcon Receiver Utility (TRU) to configure the receiver, and any Topcon field data collection software.
- **MAGNET and Pocket-3D Software:** These items can be used to operate the receiver. See the *TRU Help* (embedded in the software) or the help files in the field collection software for more information.
- **HiPer HR External GNSS Antenna Cable** (p/n 1006447-01): This item allows to connect to an external GNSS antenna.
- **Battery Charger w/ Adapter** (p/n 1010975-02): Dual charger for the external (removable) batteries.
- **Hybrid Positioning Adapter** (p/n 1003241-01)
- **100 mm Prism Spacer** (p/n 51949)
- **Tape Measure** (p/n 22-050902-01) HV1034DM 3/4 x 12 ft. / 3.7 m PWR Tape 10ths.
- **1pps Cable** (p/n 14-008066-01)

1. Some accessories may be included in the standard kit for your region. Contact your dealer for details.

2. The universal tribraich and tribraich adapter are not needed when using the heavy duty tripod.

## Batteries

The receiver has an internal battery and removable batteries, both rechargeable, for powering the receiver. For more information about using the batteries, see “Managing Power” on page 26.

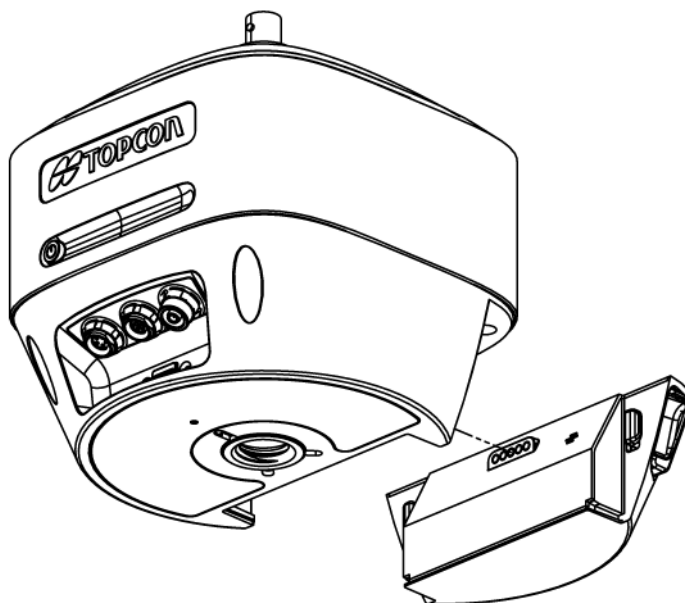


Figure 3: HiPer HR Removable Battery

## Data and Power Ports

The HiPer HR has the following four ports (shown in Figure 4):

- **Power** – rimmed in red; used to connect the receiver to an external power source. This port can also be used to charge the batteries. The body of the connector on the corresponding cable is red.
- **Serial Port** – rimmed in green; used for communication between the receiver and an external device.
- **External GNSS Antenna** – SMB connector rimmed in blue; used for connecting the receiver to an external GNSS antenna for use in base station and rover station setups.
- **USB** – Micro USB connector; used for high-speed data transfer and communication between the receiver and an external device.

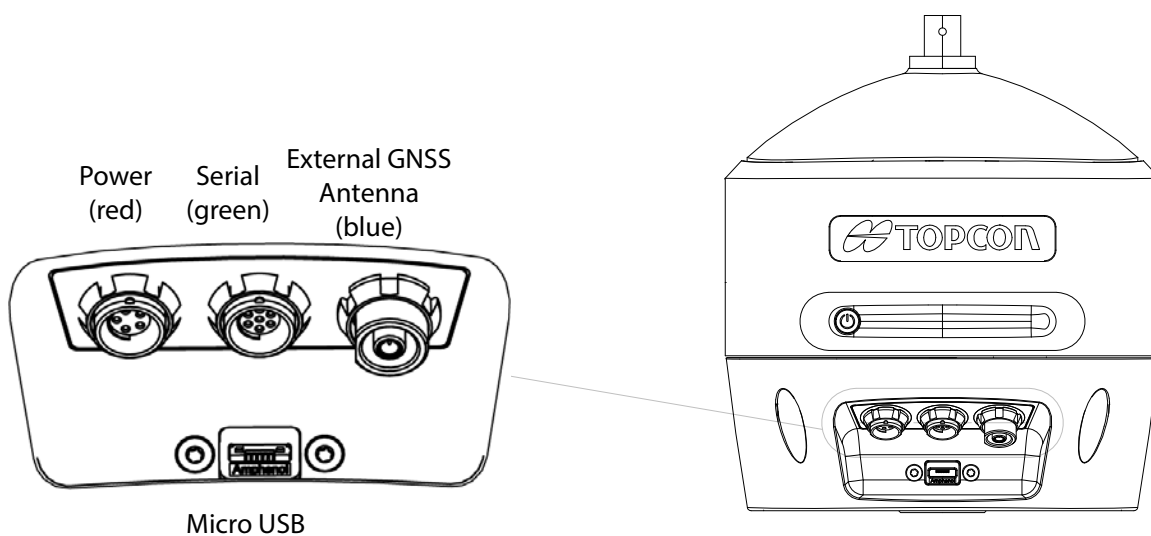
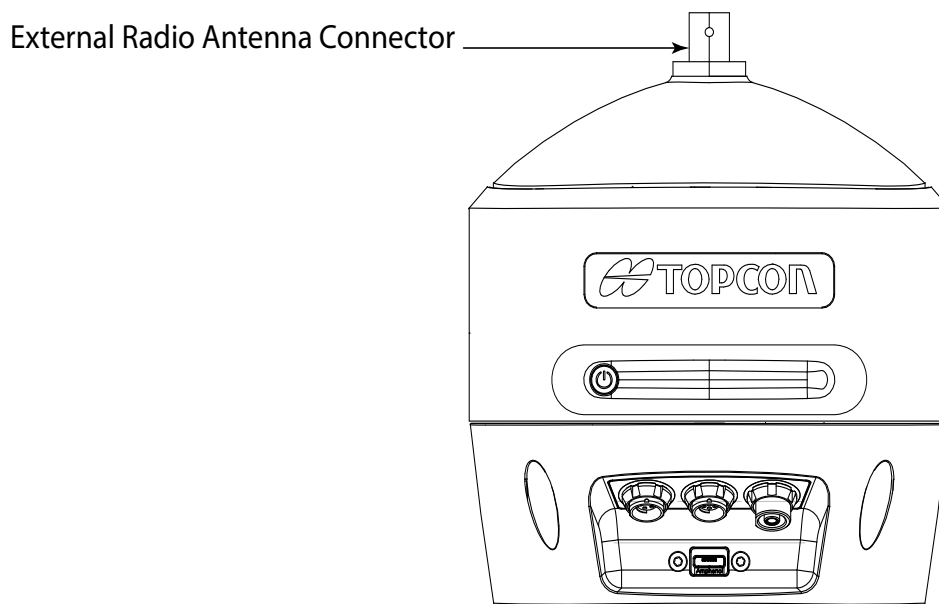


Figure 4: HiPer HR Ports

## External Radio Antenna Connector

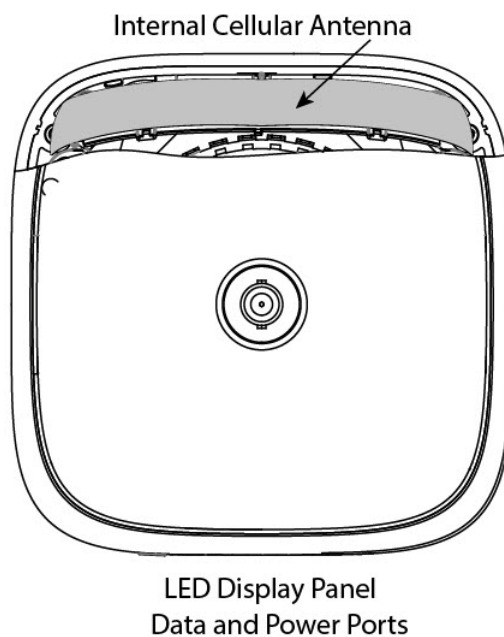
The antenna of the FH915 or UHF radio modems plug into the external antenna connector on the radome (Figure 5). The radio antenna uses a reverse polarity TNC or BNC connection depending on the installed radio modem. The reverse polarity TNC connector is used for FH915, and the BNC connector is used for UHF.



**Figure 5: HiPer HR Radome and External Antenna Connector**

## Internal Cellular Antenna

If using only the internal cell modem for your survey, do not insert the antenna into the external antenna connector. In this case, the receiver will use only the internal cell modem antenna, mounted under the radome, as shown in Figure 6.



**Figure 6: Internal Cell Modem Antenna**

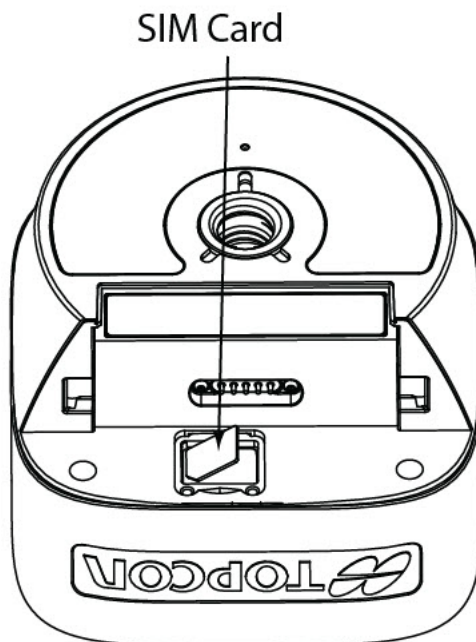
## SIM Card Location

The HiPer HR can use a Micro-SIM card. The SIM card is located under the door on the upper surface of the removable battery slot (Figure 7). To install a SIM card, do the following:

1. Remove the external battery.
2. Remove the SIM card door using a TORX T6 screwdriver.
3. Insert the SIM card, and attach the external battery.

Once installed, the SIM card provides a unique identification for the receiver's GSM/CDMA module and enables functionality based on the subscribed services. The receiver board accesses the GSM/CDMA module, which accesses the SIM card. The SIM card can remain inside the receiver.

To configure the module, use MAGNET Field or TRU.



**Figure 7: SIM Card Location**

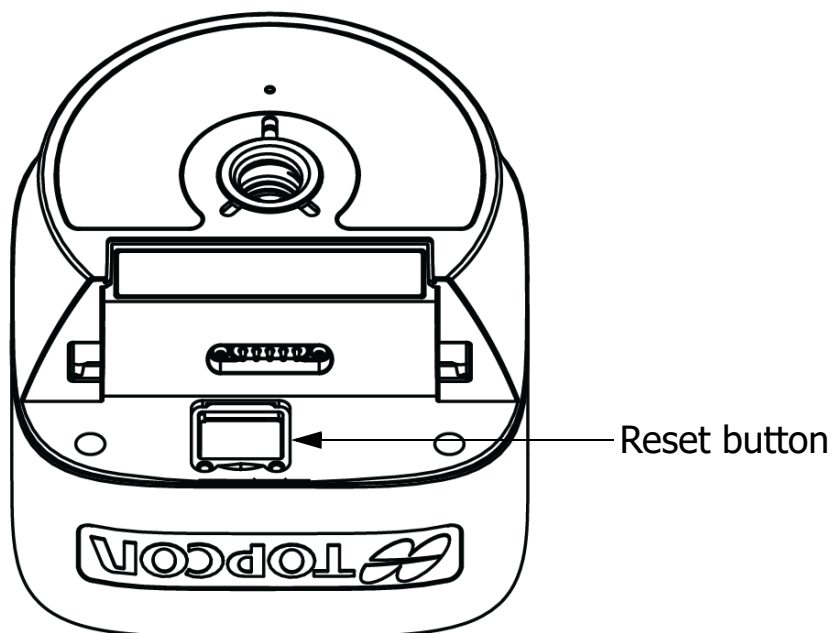
## Hardware Reset Button



Use the Hardware Reset button only when the unit will not power on from the Power button. Follow the guidelines in “Troubleshooting” on page 61 before using the Hardware Reset button.

To perform a hardware reset, press the Reset button located under the removable battery compartment.

1. Remove the external battery.
2. Remove the SIM card door using the TORX T6 screwdriver.
3. Press the Reset button using the screwdriver.
4. Close the SIM card door using the TORX T6 screwdriver.
5. Attach the external battery.



**Figure 8: Reset Button Location**

# Display Panel

The receiver has a highly-visible display panel with single-button operation. The LED display panel (Figure 9) allows for control of receiver power and data recording. The LEDs display the status of the satellite tracking, recording/memory capacity, Wi-Fi and Bluetooth connections, cell modem status, and batteries. This chapter describes the different LED blink patterns and what they mean.

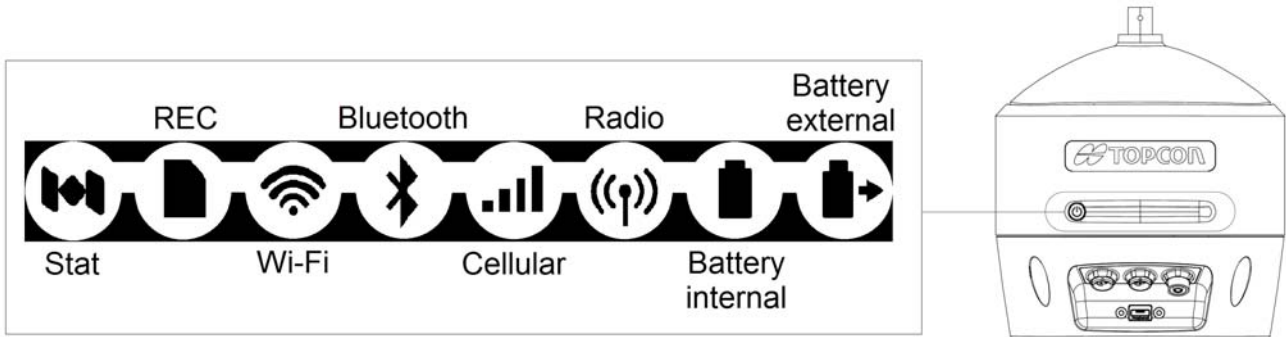


Figure 9: LED Display Panel

## Power Button

The power button performs multiple functions. The duration in which the button is pressed and held determines how the receiver will perform. While pressing the button, the LED panel indicates the selected operation using particular LEDs. Table 4 describes how to use the power button.

Table 4. Power Button Functions and Descriptions

Function	Press Button	LED Description
Power On	1+ seconds	Power LED blinks green until startup completes, then LED is solid green.
Power Off	3-10 seconds	Release the Power button when the STAT LED turns yellow.
Start/Stop Data Logging	Three times in a row within 2 seconds	Refer to the REC (Recording) LED description.
Toggling between Static and Kinematic post-processing modes	Two times in a row within 1 second	Refer to the REC (Recording) LED description. This function is available for "Occupation mode switch" only. See "Power Button Mode Switching" below.
Performing Factory Reset	10-15 seconds	Release the Power button when STAT LED blinks magenta. When the unit starts up, the REC LED blinks yellow, and then operates normally.



A delay of several seconds occurs between the last clicking of the Power button and first blinking/last blinking of the REC LED.



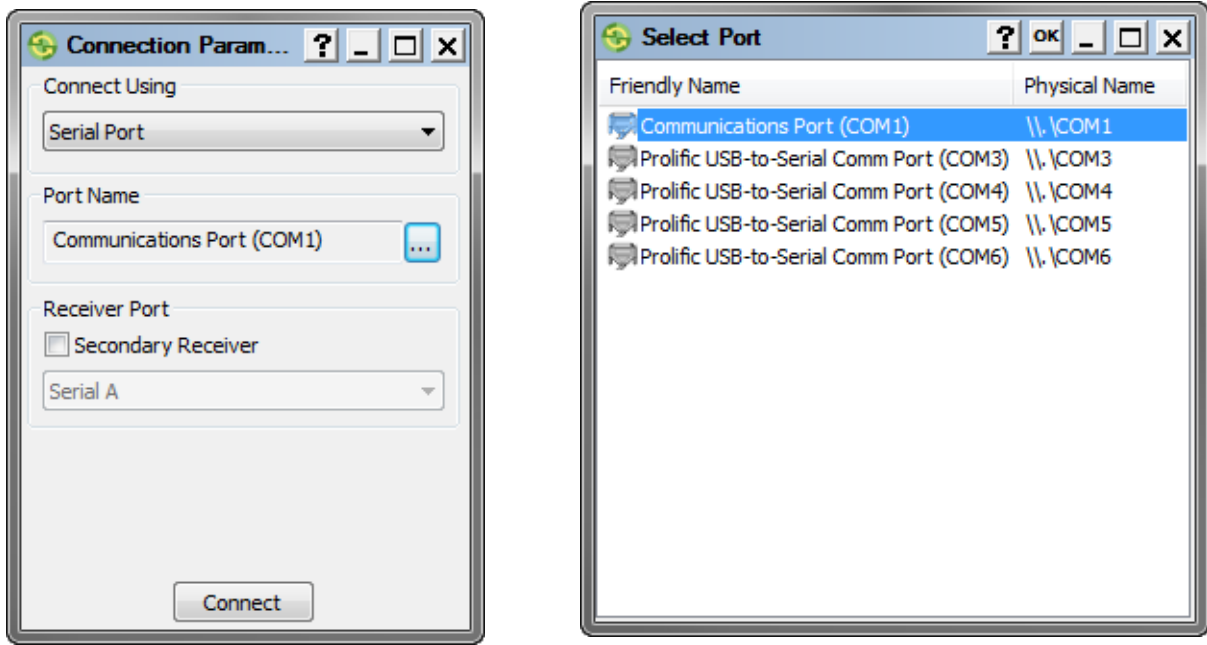
When using external power, the Power LED is solid green except for startup and shutdown procedures.

## Power Button Mode Switching

The Power button operates in two modes: LED blink mode switch and Occupation mode switch. In Occupation mode switch, you can switch the receiver between Static and Kinematic survey modes while recording a file.

You may select these modes in the Topcon Receiver Utility (TRU). To do so:

1. Connect the receiver to a computer and open TRU.
2. Click **Device ▶ Application Mode ▶ Receiver Managing**.
3. Click **Device ▶ Connect**. The **Connection Parameters** window appears (Figure 10).



**Figure 10: TRU — Connection Parameters**

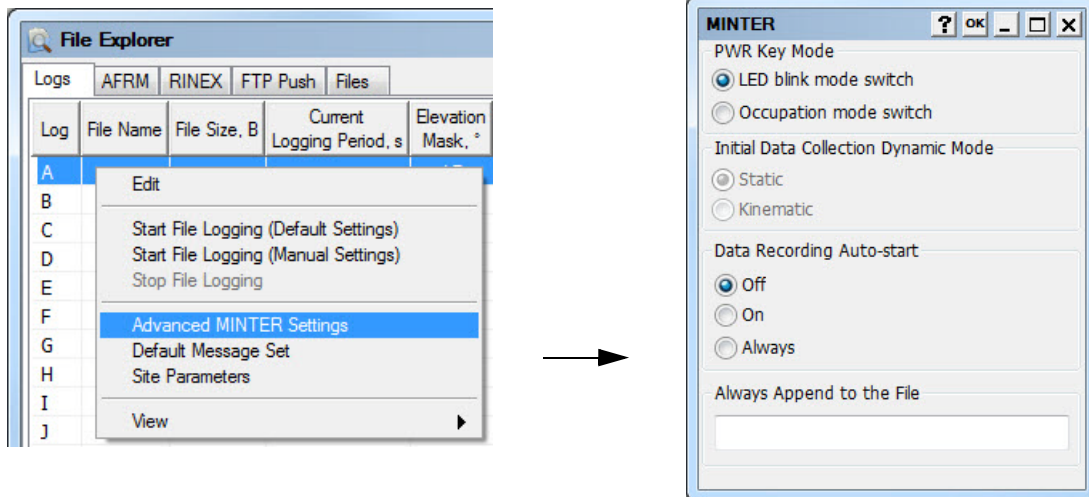
4. Select the required connection method from the **Connect Using** drop down list. You can connect to the HiPer HR using Serial Port, USB, Network, or Bluetooth.
5. If needed, select a port in the **Port Name** field. Click the button. The **Select Port** window appears (Figure 10).
6. Select the required port and click **OK**. The **Connection Parameters** window appears.
7. Click **Connect** to establish a connection with the receiver. The TRU main screen appears.
8. In the TRU main screen, click the **File Explorer** icon. The **Logs** tab appears (Figure 11).



File Explorer									
Logs									
Log	File Name	File Size, B	Current Logging Period, s	Elevation Mask, °	Prefix	MINTER & AFRM Logging Period, s	AFRM Rotation Period, s	Use for MINTER & AFRM	RINEX Version
A				15	lda	1	3,600	No	3.00
B				12	lgb	9	3,600	Yes	2.10
C				5	lgc	1	3,600	No	None
D				7	lrd	7	3,600	Yes	None

**Figure 11: TRU — File Explorer Logs Tab**

- In the **Logs** tab, right click any place to open the context menu and select **Advanced MINTER Settings**. The **MINTER** screen appears (Figure 12).



**Figure 12: Context Menu of Logs — MINTER**

- Select the required Power button mode in the **FN Key Mode** group box.
- For the Occupation mode switch, select the default data collection method in the **Initial Data Collection Dynamic Mode** group box.
- Click **OK**. The **File Explorer** window appears.
- Click **OK**.



You must click **OK** in both **MINTER** and **File Explorer** widows; otherwise, settings will not be applied.

- Click **Device ▶ Disconnect**.



## Receiver Status LEDs

There are eight status LEDs to provide information about satellite tracking, memory capacity, Wi-Fi, Bluetooth, radio, and internal and external battery life. This section describes the color and behavior of each LED.

### Status LED



The tracking status LED displays the status of tracked satellites when the receiver is on.

**Table 5. Status LED Descriptions**






Display	LED Color	Description
	Green Blink	One blink per tracked GPS satellite.
	Yellow Blink	One blink per tracked GLONASS satellite.
	Cyan Blink	One blink per tracked Galileo satellite.
	Magenta Blink	One blink per tracked BeiDou satellite.
	Blue Blink	One blink per tracked QZSS satellite.
	White Blink	One blink per tracked L-band Satellite.
	Red Blink	One blink per second when there are no tracked satellites or solutions. Two blinks per second when the receiver is in exception mode. Otherwise, LED is dark.
	Red-Green-Yellow	OAF is expired.

## Recording LED



The recording LED indicates if data is being written to memory, and displays the current survey mode (static or kinematic) when the Occupation mode switch is selected.

**Table 6. Recording LED Descriptions**

Display	LED Color	Description
<b>LED blink mode switch is selected</b>		
	Green Blink	File logging is in progress. Each blink indicates data is being written to memory.
	Red Solid	File logging problem. No free memory, or hardware problem with data recording. LED is off when file is not logging data.
<b>Occupation mode switch is selected</b>		
	Green Blink	File logging is in progress. The Static mode is the current post-processing mode.
	Yellow Blink	File logging is in progress. The Kinematic mode is the current post-processing mode.
	Red Solid	File logging problem. No free memory, or hardware problem with data recording. LED is off when file is not logging data.

## Communication LEDs




The communication LEDs display the status of the wireless activity. The following tables describe the communication activity for four use cases: Bluetooth, Wi-Fi and radio (UHF).

### Bluetooth LED



The Bluetooth LED displays the status of the Bluetooth activity. Table 7 describes the activity.

**Table 7. Bluetooth LED Descriptions**




Display	LED Color	Description
	Blue Blink	Bluetooth is on and waiting for a connection.
	Blue Solid	A single Bluetooth connection has been established.
	Blue Solid + Blue Blink * N every 10 seconds	Multiple (N) valid Bluetooth connections have been established.

## Cellular LED



The Cellular LED displays the status of the internal cellular modem. Table 8 describes the activity.

**Table 8. Cellular LED Descriptions**



Display	LED Color	Description
	No Light	The internal cell modem is switched off.
	Green Solid	Cell modem is on and waiting for a connection.
	Green Blink	The connection has been established.

## Wi-Fi LED



The Wi-Fi LED displays the status of Wi-Fi activity. Table 9 describes the activity.

**Table 9. Wi-Fi LED Descriptions**

Display	LED Color	Description
	Green Solid	The internal Wi-Fi modem is starting up.
	Green Blink	The internal Wi-Fi modem is transmitting or receiving data.

## Radio LED



The Radio LED displays the status of the UHF or FH915+ modem. Table 10 describes the LED colors and patterns for the UHF modem.

**Table 10. UHF Modem LED Descriptions**















Display	LED Color	Description
<b>Command mode (Rover and Base)</b>		
  	Red Blink - Green Blink - No Light	MAGNET Field or TRU sends commands to configure the modem.
<b>Receiver mode (Rover)</b>		
	Green Solid	Modem is not receiving correction data.
	Yellow Solid	Modem is receiving correction data from a base.
<b>Transmitter mode (Base)</b>		
	Green Solid	Modem is not transmitting correction data.
	Red Solid	Modem is transmitting correction data.
<b>Retranslator mode (Base)</b>		
 	Yellow Blink - Red Blink	Modem is receiving and transmitting correction data.

Table 11 describes the LED colors and patterns for the FH915+ modem.

**Table 11. FH915+ Modem LED Descriptions**

Display	LED Color	Description
<b>Command mode (Rover and Base)</b>		
	Red Blink - Green Blink - No Light	MAGNET Field or TRU sends commands to configure the modem.
<b>Receiver mode and Retranslator mode (Rover)</b>		
	Green Blink	Modem is not synchronized with a base.
	Green Solid	Modem is synchronized with a base and ready to receive correction data.
	Yellow Solid	Modem receives correction data from a base.
<b>Transmitter mode (Base)</b>		
	Red Solid	Modem transmits correction data.








## Battery LEDs

### Internal Battery LED







The internal battery LED indicates the remaining charge of the internal battery. When using an external power source, the LED turns solid green and begins to blink if the batteries are charging. See Table 12 for more information.

**Table 12. Internal Battery LED Descriptions**

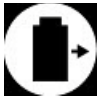
Display	LED Color	Description
<b>The receiver is on; the internal battery is in use</b>		
	Green Solid	The charge is greater than 50%.
	Yellow Solid	The charge is between 10% and 50%.
	Red Solid	The charge is less than 10%.
<b>The receiver is on; external power source in use</b>		
	Green Solid	The internal battery is fully charged.
	Green Blink	The internal battery is at greater than 50% capacity; the battery is charging.
	Yellow Blink	The internal battery is at greater than 10% capacity; the battery is charging.
	Red Blink	The internal battery is at less than 10% capacity; the battery is charging.

**Table 12. Internal Battery LED Descriptions**

Display	LED Color	Description
<b>The receiver is off</b>		
	Green Solid	The receiver is connected to an external power source, and the battery is fully charged.
	Green Blink	The receiver is connected to an external power source, and the battery is at greater than 50% capacity; the battery is charging.
	Yellow Blink	The receiver is connected to an external power source, and the battery is at less than 50% capacity; the battery is charging.
	No Light	The receiver is not connected to an external power source.



## External Battery LED






The external detachable battery LED indicates the remaining charge of the external battery. When using an external power source, detach the battery from the receiver and connect it to the external battery charger. Once connected to a charger, the LED turns green and begins to blink when the batteries are charging. See Table 13 for more information.

**Table 13. External Battery LED Descriptions**

Display	LED Color	Description
<b>The receiver is on; the external battery is in use</b>		
	Green Solid	The charge is greater than 50%.
	Yellow Solid	The charge is between 10% and 50%.
	Red Solid	The charge is less than 10%.
<b>The receiver is on; the external battery is in use; external power in use</b>		
	Green Solid	An external power source is in use, and the external battery charge is greater than 50%.
	Yellow Solid	An external power source is in use, and the external battery charge is between 10% and 50%.
	Red Solid	An external power source is in use, and the external battery charge is less than 10%.
<b>The receiver is on; the external battery is disconnected from receiver</b>		
	No Light	The receiver is using the internal battery only.

Table 13. External Battery LED Descriptions

Display	LED Color	Description
<b>The receiver is off; the external battery is in use</b>		
	Green Solid	The receiver is connected to an external power source, and the battery is fully charged.
	Green Blink	The receiver is connected to an external power source, and the battery is at greater than 50% capacity; the battery is charging.
	Yellow Blink	The receiver is connected to an external power source, and the battery is at less than 50% capacity; the battery is charging.

This chapter describes how to power the receiver, charge the batteries, and use an external power source.

## Turning the Receiver On/Off

To turn on the receiver, press and hold the power button until the LEDs briefly flash. The receiver is turning on when: the Power LED blinks green, the receiver channels initialize and start tracking all visible satellites at any time and location, and the serial port is available. When the startup is complete, the Power LED is solid green only when external power is used; otherwise the Power LED is off. After startup, the integrated wireless devices in the receiver are ready to use, and the receiver is available to start recording data to the internal memory.

To turn off the receiver, press and hold the power button for more than 3 (but less than 10) seconds. Release the power button when the Power LED blinks yellow. This delay prevents the receiver from being turned off by mistake. Allow the receiver to complete the power off cycle, which is approximately 30 seconds.



The receiver will draw a small amount of power from the external battery when it is turned off. If the receiver is placed in storage for a long period, 3-6 months, the battery may become fully discharged. Use an external power supply or recharge the battery before use.

## Powering the Receiver

The receiver is powered by an internal battery, a removable external battery, or an external valid power source connected to the power port. If an external power source is connected, the receiver draws power from it instead of the batteries. You can connect the receiver to an external power source, such as a vehicle battery, with 9 to 28 VDC to operate the receiver. See "Specifications" on page 66 for more information.

When the receiver is in use, the external battery will be discharged first, and then the internal battery. When a valid external power supply is available, the receiver draws power from the external power supply.

See "Charging the Batteries" on page 28 for more information.



Power input greater than 28 VDC could damage the receiver.

## Removable External Battery

The receiver first draws power from a connected external power source. When there is no valid external power source connected, or if the source has discharged lower than 6.5V, the receiver will draw its power from the high-capacity external removable battery.



The external battery is shipped from the factory with a partial discharge. For maximum operating time, fully charge the battery before using the receiver.

## Internal Battery

The receiver draws power from the internal (non-removable) battery once the external battery is discharged. If there is no valid external power source connected, or if the source has discharged lower than 6.5V, or the external battery is discharged, the receiver will draw power from the internal battery.

You can replace a discharged external battery with a charged one without interrupting receiver's operation.



The internal battery is shipped from the factory with a partial discharge. For maximum operating time, fully charge the battery before using the receiver.

## Operating Hours

Table 14 describes the use conditions and the operating hours of the receiver. The first values in the **Approx. Hour of Operation** column are obtained while using both batteries (internal and removable external). The second values are obtained while using the external removable battery only (internal battery is discharged).

**Table 14. Operating Hours**

Use Condition	Description	Approx. Hours of Operation <sup>a</sup>
Static Survey	Static setup logging raw GNSS data at 1 Hz.	5 hours / 2 hours 30 min
LongLink RTK Base	Base transmitting RTCM3 differential corrections to one or multiple rovers at XX output power.	5 hours / 2 hours 30 min
LongLink RTK Rover	Rover receiving RTCM3 differential corrections over LongLink connected through Bluetooth to a data collector.	5 hours / 2 hours 30 min
Network RTK Rover	Rover receiving RTCM3 differential corrections from a Network correction service, and connected through Bluetooth to a data collector.	4 hours 30 min / 2 hours 15 min
UHF Receive Only Mode	Rover receiving RTCM3 differential corrections over UHF radio connected through Bluetooth to a data collector.	4 hours 15 min / 2 hours
UHF Transmitting at 0.5 W	Base transmitting RTCM3 differential corrections at 0.5 W.	3 hours 45 min / 2 hours
UHF Transmitting at 1 W	Base transmitting RTCM3 differential corrections at 1 W.	3 hours 30 min / 1 hours 45 min
UHF Repeater at 1 W	Receiving RTCM3 corrections, and transmitting RTCM3 differential corrections at 1 W.	3 hours 30 min / 1 hours 45 min
FH915+ Receive Only Mode	Rover receiving RTCM3 differential corrections over FH915+ radio connected through Bluetooth to a data collector.	4 hours 30 min / 2 hours 15 min
FH915+ Transmitting at 0.25 W	Base transmitting RTCM3 differential corrections at 0.5 W.	3 hours 15 min / 1 hours 30 min
FH915+ Transmitting at 1 W	Base transmitting RTCM3 differential corrections at 1 W.	2 hours 30 min / 1 hours 15 min
FH915+ Repeater	Receiving RTCM3 corrections, and transmit RTCM3 differential corrections at 1 W.	2 hours 30 min / 1 hours 15 min

**Table 14. Operating Hours**

UHF Receiver + LongLink Base	Receiving RTCM3 corrections over UHF radio, and transmitting RTCM3 differential corrections over LongLink.	4 hours 15 min / 2 hours
FH915+ Receiver + LongLink Base	Receiving RTCM3 corrections over FH915+ radio, and transmitting RTCM3 differential corrections over LongLink.	4 hours 30 min / 2 hours 15 min

a. Average with Bluetooth on and 20 SVs tracked. Using new, fully-charged batteries, operating at room temperature and transmitting at 1 Hz rate.

## Charging the Batteries

While the battery loses charge, the BAT LED changes from solid green, to yellow and then red, depending on the remaining charge (see "Battery LEDs" on page 22).

When the receiver is connected to an external power source, the internal battery is charging, regardless of the receiver state. The external battery is charging only when the receiver is off. You can detach the external battery and charge it with a separate battery charger.

To charge the internal battery:

1. Connect the supplied power cable to the receiver's power port.
2. Connect the SAE connector of the power cable to the SAE connector of the power adapter.
3. Plug the power adapter into an available outlet for approximately five hours to fully charge the battery. Overcharging the battery will not happen; the battery stops charging when it reaches full charge. During charging, the BAT LED will blink (see Table 12 on page 22).

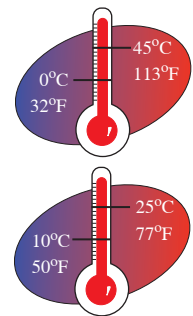


Use a grounded wall outlet, or grounded surge protector while charging. The socket should be located near the equipment, and easily accessible.

## Battery Charging Temperatures

Charge the batteries only in temperatures between 32°F (0°C) and 113°F (45°C).

An optimal charging temperature is between 50°F (10°C) and 77°F (25°C). If possible, charge the batteries within this temperature range.

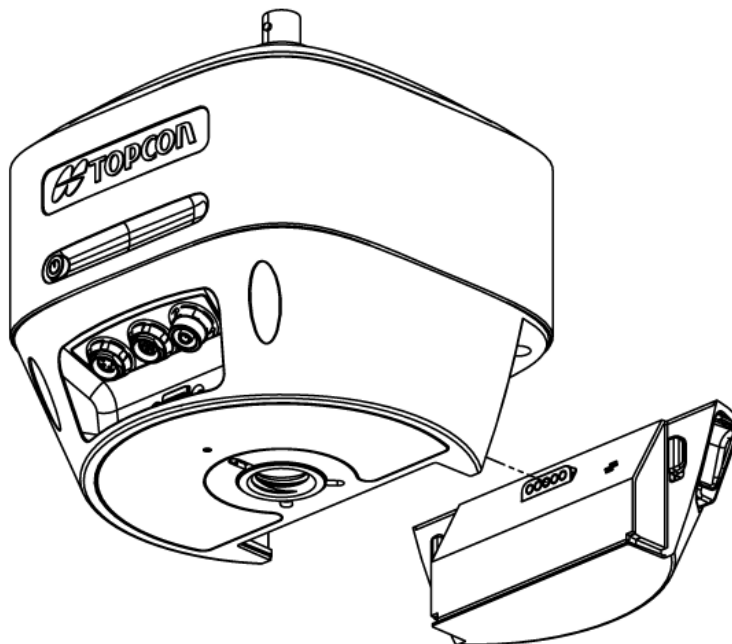


The charge terminates automatically if battery temperature rises above 113°F (45°C) or falls below 32°F (0°C).

## Attaching the External Battery

To attach the external battery:

1. With the battery slightly tipped, place the bottom of the battery into the bottom of the battery compartment (Figure 13).

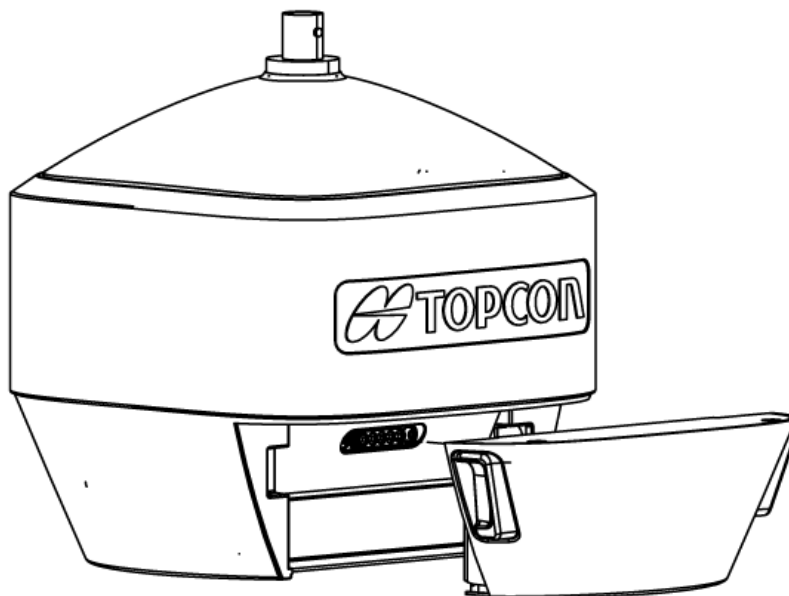


**Figure 13: Attach HiPer HR Battery**

2. Gently push the top of the battery into the battery compartment until it snaps into place, ensuring that the clip at the top of the battery completely snaps into place.

## Detaching the External Battery

To detach the external battery, use the clip at the top of the battery to gently pull down and out. The battery will detach from the receiver (Figure 14).



**Figure 14: Detach HiPer HR Battery**

## Surveying While Charging

The receiver can perform any kind of surveying while charging the internal battery without degrading performance.



While charging, make sure the air temperature is between +32 °F (0 °C) and +113 °F (+45 °C). This is important to prevent serious damage to the batteries and the receiver, or injury to persons.

## Changing the Batteries While Surveying

It is safe to change a depleted removable external battery with a fully charged one while surveying (i.e., on the fly) without turning off the receiver. Before doing this, make sure the internal battery has enough charge to power the receiver while changing the depleted battery; surveying will not be disrupted.

## Using an External Power Source

In addition to the removable battery, you can connect the receiver to an external power source (such as a vehicle battery with 9 to 28 VDC) to operate the receiver, and for continuous use of the receiver if the removable batteries become discharged.



Power input greater than 28 VDC could damage the receiver.

To connect the receiver to an external battery:

1. Combine the ODU-to-SAE cable (P/N 14-008016-04LF) and SAE-to-alligator clips cable (P/N 14-008025-01) provided in your kit. This composite cable allows for charging the receiver Base station from an external battery.
2. Connect the alligator clips to the external 12-V battery.
3. Insert the 5-pin ODU connector into the power port of the receiver.
4. Turn on the receiver.

## Insufficient Power

If the batteries become fully discharged and an external power supply is not connected, the receiver will shut down and automatically save recorded files. To avoid disruptions, check the BAT LED on the display panel for the battery charge status. See "Battery LEDs" on page 22 for more information. If the receiver shuts down due to insufficient power, the receiver and all communication ports become deactivated.

To restore power to the receiver do one or all of the following:

- Recharge the batteries, or connect to an external power source.
- Make sure the power cable is correctly connected to the power port of the receiver.
  - a. Align the keyways when connecting the power cable to the power port of the receiver.
  - b. The cable will click when it is secured in the port.
  - c. To remove the cable, push the cable in, then gently remove it from the power port.
  - d. Connect the receiver to a different power source.



Recharge the batteries or connect to an external power source using the charging cables and power adapter shipped with the receiver.

The receiver is primarily used for surveying land and construction job sites, and to support static and RTK applications. You can also log data internally to a non-removable SD card. These logs can be downloaded from the receiver for static or kinematic surveying, mapping, monitoring, and positioning applications. The receiver uses different built-in communication technologies to transmit or receive RTK corrections, and to achieve RTK solutions using field applications like MAGNET Field or Pocket-3D.

The receiver can be configured in a variety of ways, depending on your project requirements. Typically, the receiver supports the following operation modes:

- static and kinematic post-processing
- NTRIP server and NTRIP caster functionality
- network RTK rover as NTRIP client or TCP/IP client
- UHF base and rover in RTK or DGPS configuration
- LongLink base and rover in RTK or DGPS configuration
- DGPS or RTK repeater
- PPP (Point Precise Positioning) rover
- SBAS rover

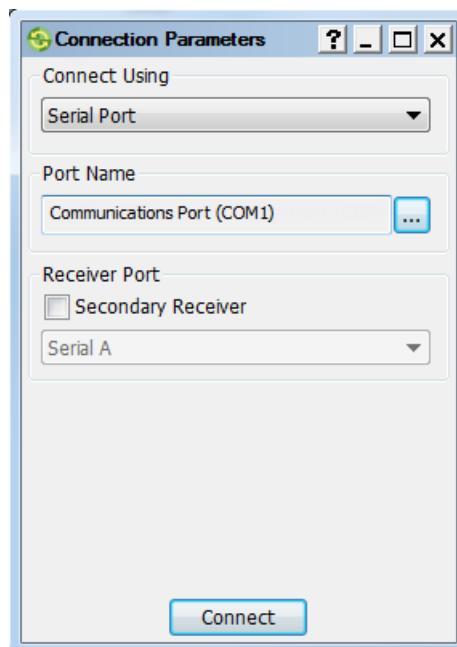
The sections in this chapter describe receiver configuration, receiver options, loading a new Option Authorization File (OAF), updating firmware, and performing a factory reset. To do this, download the Topcon Receiver Utility (TRU) software from the myTopcon website at <https://www.topconpositioning.com/support>. For information about installing the software, see the Topcon Receiver Utility (TRU) Online Help, available in the software.

## Viewing Receiver Information

In the Topcon Receiver Utility (TRU), the **Receiver Info** screen displays basic receiver information, such as hardware and firmware versions, RAM size, receiver ID, serial number, etc.

To open the receiver window, do the following:

1. Connect the receiver to a computer and open TRU.
2. Click **Device** ▶ **Application Mode** ▶ **Receiver Managing**.
3. Click **Device** ▶ **Connect**. The **Connection Parameters** screen appears (Figure 15).



**Figure 15: Connection Parameters**

4. Click **Connect** to establish a connection with the receiver. The TRU main screen appears.



5. In TRU, click the **Information** icon. The **Receiver Info** window appears (Figure 16).

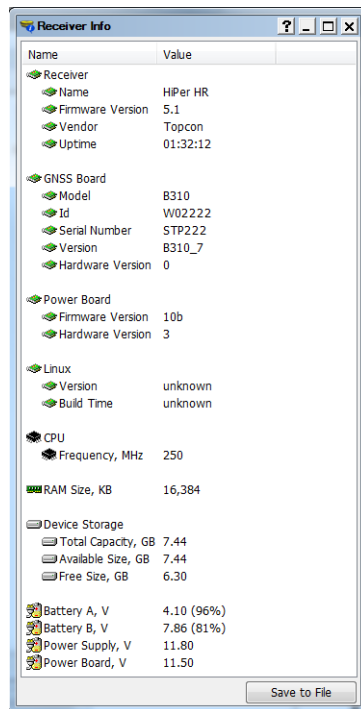


Figure 16: TRU – Receiver Info

## Loading New Firmware

This section describes how to update firmware on the HiPer HR with a USB connection. To connect the receiver to your computer, use a micro USB cable (p/n 1013602-01) and USB drivers installed on the computer. USB drivers and firmware are available at <https://www.topconpositioning.com/support>.

After plugging the receiver into the computer, the operating system will report a new external device has been found. It will be assigned to a virtual COM port. You may check its number in the Windows **Device Manager** (Figure 17).

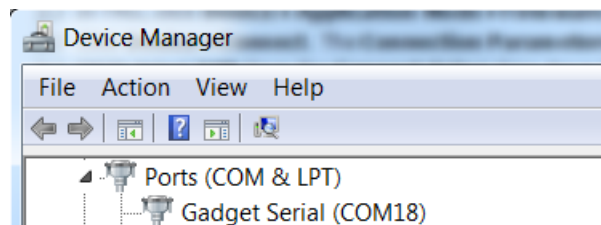


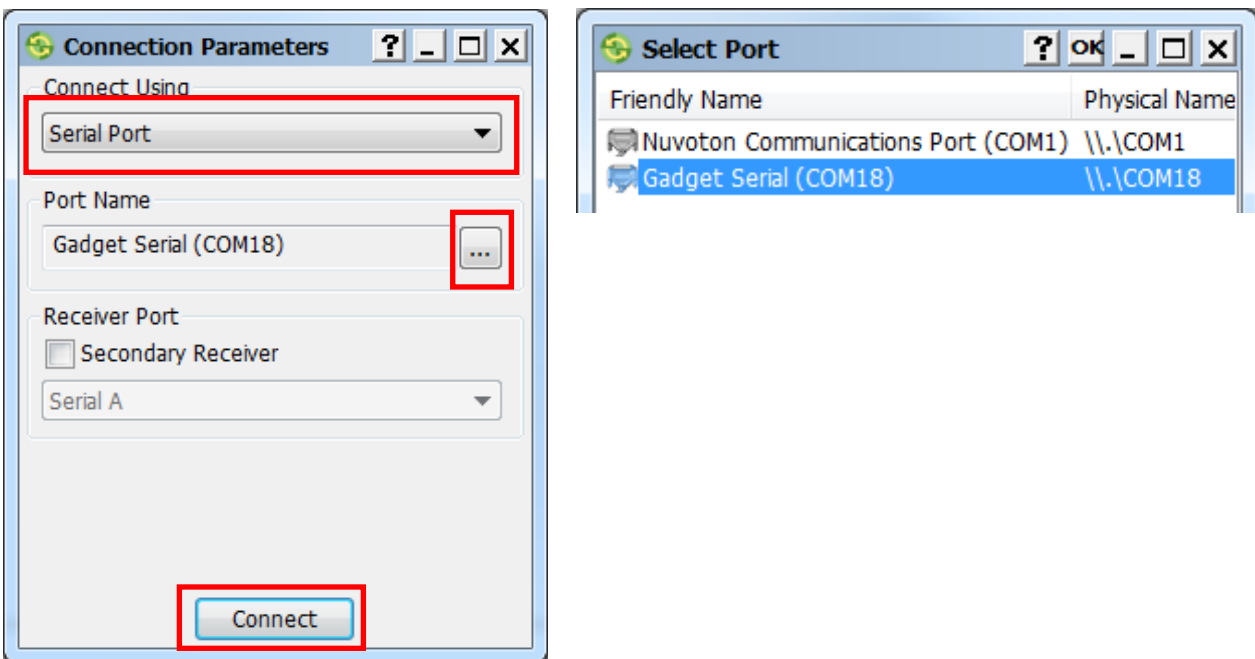
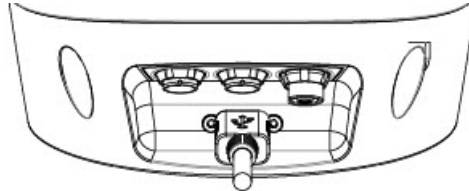
Figure 17: Device manager

This virtual port is used for loading new firmware. You can also update the firmware using a physical COM port or high speed wireless connection via Wi-Fi or Bluetooth. Loading firmware using a physical COM port takes longer than using TRU. Therefore, Topcon does not recommend using physical a COM port.

Receiver board firmware is released as a file with `*.tfl` extension. Topcon Receiver Utility ver 3.2 and higher supports loading of files with `*.ldr`, `*.ldp`, `*.tar`, `*.tfl` extensions.

To upload firmware files to the receiver, do the following:

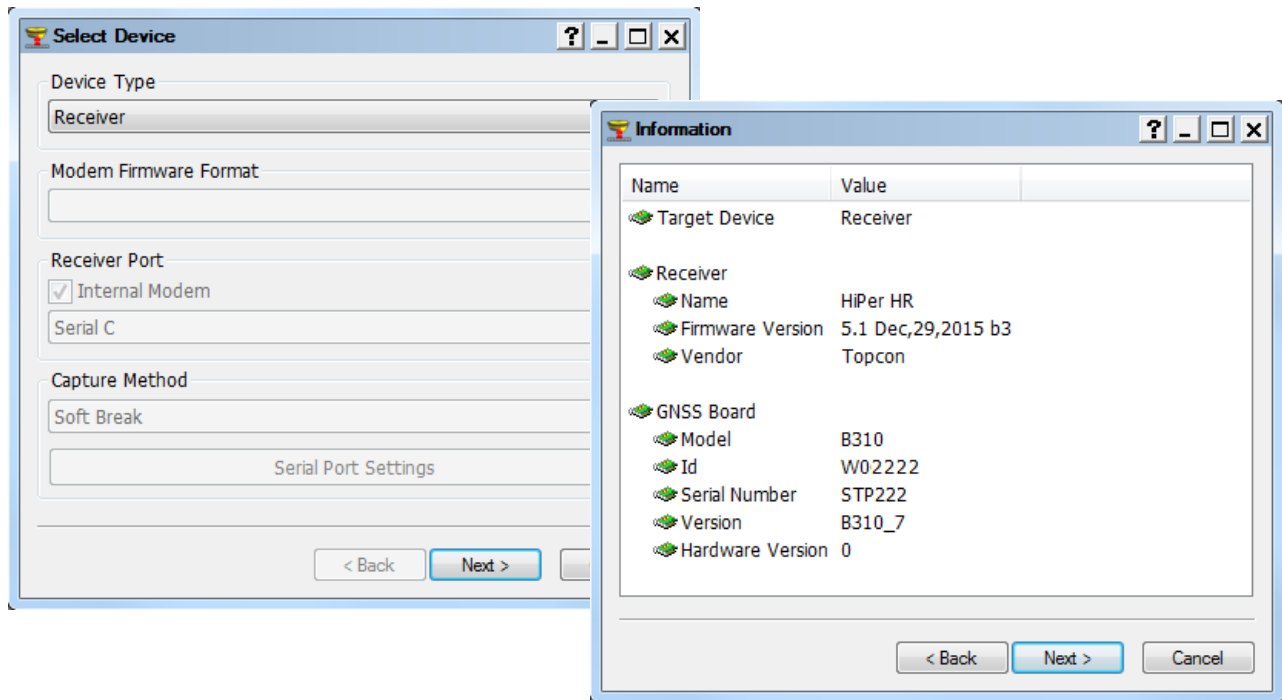
1. Connect the receiver to a computer using a Micro USB cable.
2. In the Windows **Device Manager**, check the number of the virtual COM port.
3. Start TRU on your computer.
4. Click **Device** ▶ **Application Mode** ▶ **Firmware Loading**, to set TRU to the firmware loading mode.
5. Click **Device** ▶ **Connect**. The **Connection Parameters** screen appears (Figure 18).
6. Select **Serial Port** from the **Connect Using** drop down list (Figure 18).
7. Click the **...** button. The **Select Port** screen appears (Figure 18).
8. Select the **Gadget Serial** port for USB communication, and click **OK**. The **Connection Parameters** screen appears.



**Figure 18: Connection Parameters/Select Port**

9. Click **Connect** to establish a connection with the receiver. The **Firmware Loading** screen appears.

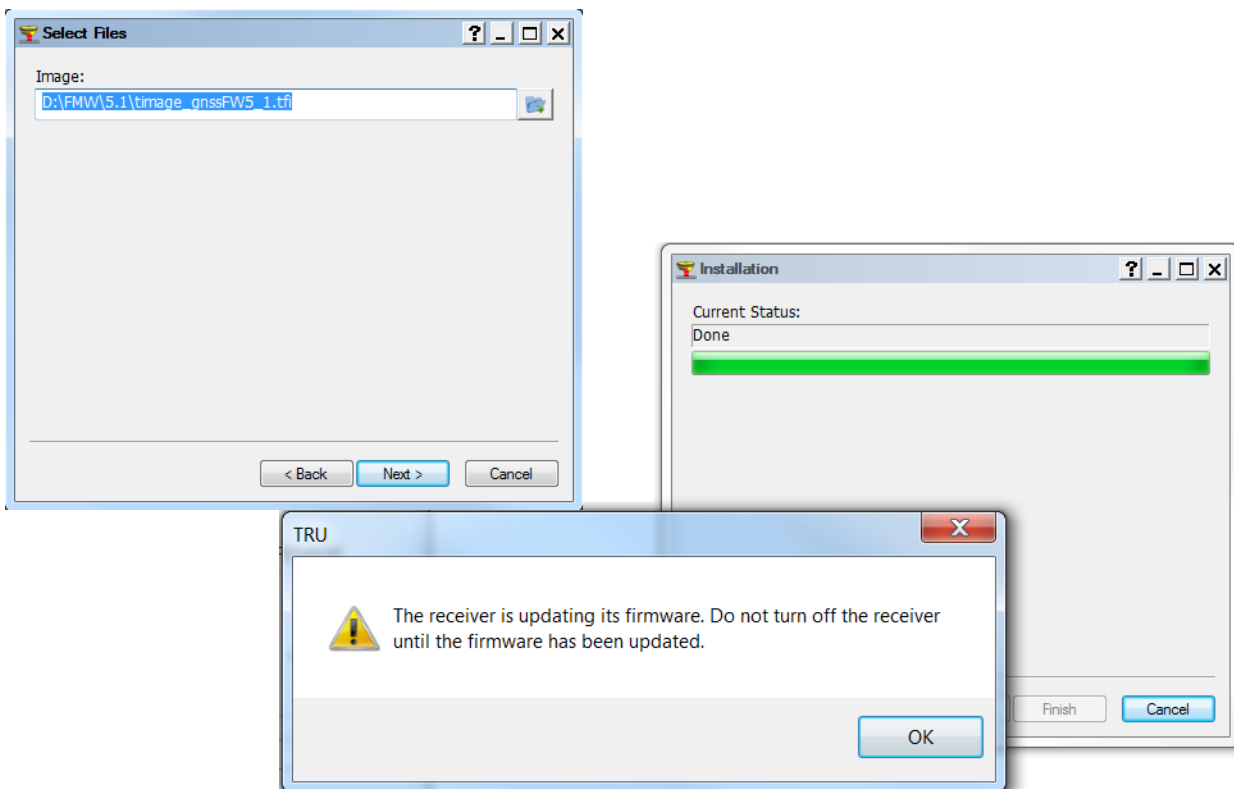
10. Click the **Firmware Loading** icon. The **Select Device** screen appears (Figure 19).




**Figure 19: Select Device/Device Information**

11. Click **Next**. The **Information** screen appears (Figure 19).

12. Click **Next**. The **Select Files** screen appears (Figure 20).



**Figure 20: Select Files/Install**

13. Click the  button and browse for the receiver's \*.tfi file.

14. Click **Next**. The **Installation** screen appears and the firmware begins uploading (Figure 20).

15. When the progress bar is filled with green, click **OK** in the dialog box. TRU automatically disconnects from the receiver.

## Option Authorization Files


Topcon issues an Option Authorization File (OAF) to enable the specific options that you purchased. Topcon's OAF system allows you to customize and configure the receiver according to your particular requirements, therefore purchasing only the options you need.

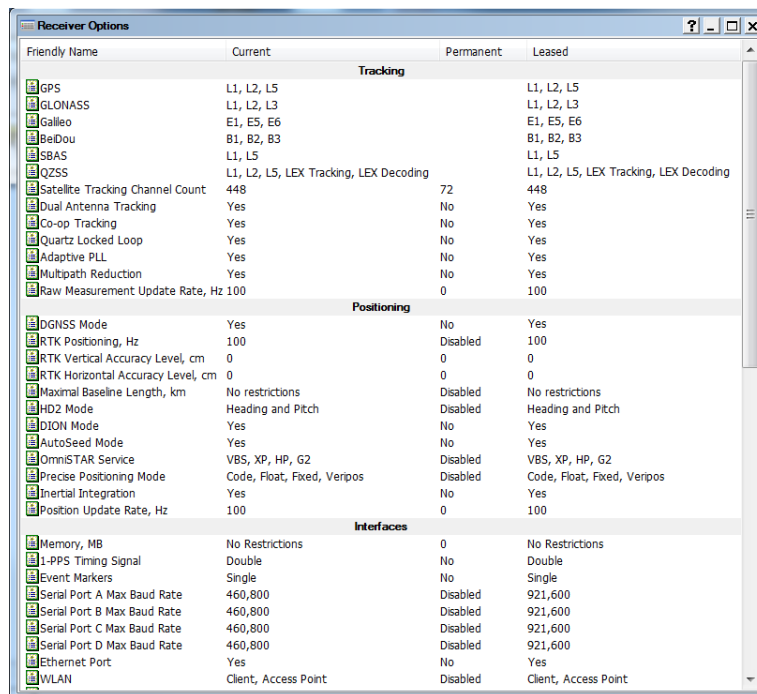
The HiPer HR receiver is typically shipped with an OAF as per initial purchase of the receiver kit configuration. There are several upgrade options available with the receiver that can extend the receiver's functionality to better suit your job requirement. Examples of upgrade options are listed below:

- GPS L1, L2, L5 signal tracking
- GLONASS L1, L2, L3 signal tracking
- BeiDou B1, B2, B3 signal tracking
- QZSS L1, L2, L5 signal tracking
- SBAS L1, L5 signal tracking
- QZSS L1, L2, L5, Lex signal tracking
- Galileo E1, E5 signal tracking
- RTK and update rate 20 Hz (10 Hz standard)
- Precise Position Mode (Code, Float, Fixed, Terrastar)

Contact your Topcon dealer or a customer representative for a complete listing of available options and pricing information.

## Checking the Receiver's OAF

1. Connect the receiver to a computer and open TRU. See the *Topcon Receiver Utility (TRU) Online Help* for more information about connecting the receiver to a computer.
2. In TRU, connect to the receiver.
3. Click the **Options**  icon in the main screen. The **Receiver Options** window (Figure 21) displays, so you can view the current authorization options and upload new ones.



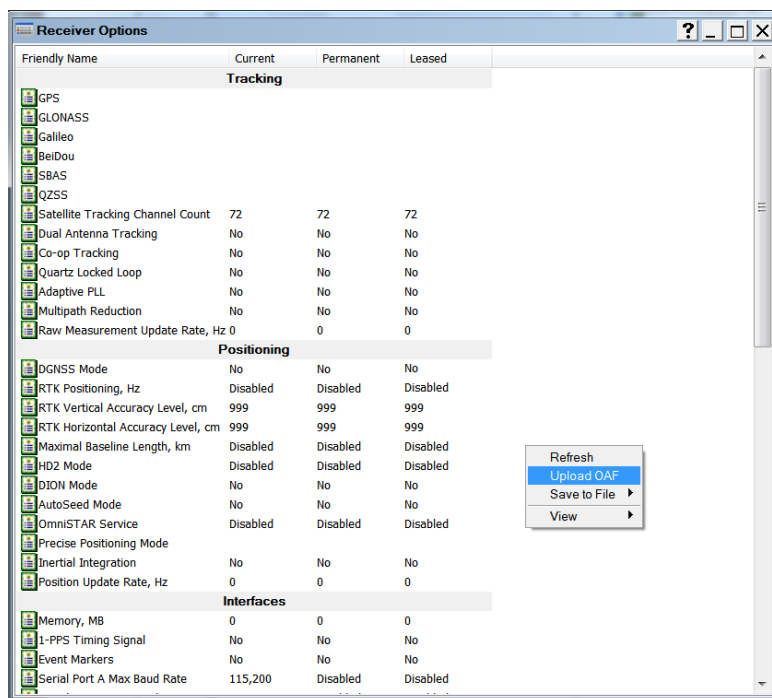
Friendly Name	Current	Permanent	Leased
<b>Tracking</b>			
<input checked="" type="checkbox"/> GPS	L1, L2, L5		L1, L2, L5
<input checked="" type="checkbox"/> GLONASS	L1, L2, L3		L1, L2, L3
<input checked="" type="checkbox"/> Galileo	E1, E5, E6		E1, E5, E6
<input checked="" type="checkbox"/> BeiDou	B1, B2, B3		B1, B2, B3
<input checked="" type="checkbox"/> SBAS	L1, L5		L1, L5
<input checked="" type="checkbox"/> QZSS	L1, L2, L5, LEX Tracking, LEX Decoding		L1, L2, L5, LEX Tracking, LEX Decoding
<input checked="" type="checkbox"/> Satellite Tracking Channel Count	448	72	448
<input checked="" type="checkbox"/> Dual Antenna Tracking	Yes	No	Yes
<input checked="" type="checkbox"/> Co-op Tracking	Yes	No	Yes
<input checked="" type="checkbox"/> Quartz Locked Loop	Yes	No	Yes
<input checked="" type="checkbox"/> Adaptive PLL	Yes	No	Yes
<input checked="" type="checkbox"/> Multipath Reduction	Yes	No	Yes
<input checked="" type="checkbox"/> Raw Measurement Update Rate, Hz	100	0	100
<b>Positioning</b>			
<input checked="" type="checkbox"/> DGNSS Mode	Yes	No	Yes
<input checked="" type="checkbox"/> RTK Positioning, Hz	100	Disabled	100
<input checked="" type="checkbox"/> RTK Vertical Accuracy Level, cm	0	0	0
<input checked="" type="checkbox"/> RTK Horizontal Accuracy Level, cm	0	0	0
<input checked="" type="checkbox"/> Maximal Baseline Length, km	No restrictions	Disabled	No restrictions
<input checked="" type="checkbox"/> HD2 Mode	Heading and Pitch	Disabled	Heading and Pitch
<input checked="" type="checkbox"/> DION Mode	Yes	No	Yes
<input checked="" type="checkbox"/> AutoSeed Mode	Yes	No	Yes
<input checked="" type="checkbox"/> OmniSTAR Service	VBS, XP, HP, G2	Disabled	VBS, XP, HP, G2
<input checked="" type="checkbox"/> Precise Positioning Mode	Code, Float, Fixed, Verpos	Disabled	Code, Float, Fixed, Verpos
<input checked="" type="checkbox"/> Inertial Integration	Yes	No	Yes
<input checked="" type="checkbox"/> Position Update Rate, Hz	100	0	100
<b>Interfaces</b>			
<input checked="" type="checkbox"/> Memory, MB	No Restrictions	0	No Restrictions
<input checked="" type="checkbox"/> 1-PPS Timing Signal	Double	No	Double
<input checked="" type="checkbox"/> Event Markers	Single	No	Single
<input checked="" type="checkbox"/> Serial Port A Max Baud Rate	460,800	Disabled	921,600
<input checked="" type="checkbox"/> Serial Port B Max Baud Rate	460,800	Disabled	921,600
<input checked="" type="checkbox"/> Serial Port C Max Baud Rate	460,800	Disabled	921,600
<input checked="" type="checkbox"/> Serial Port D Max Baud Rate	460,800	Disabled	921,600
<input checked="" type="checkbox"/> Ethernet Port	Yes	No	Yes
<input checked="" type="checkbox"/> WLAN	Client, Access Point	Disabled	Client, Access Point

Figure 21: Receiver Options

## Loading an OAF

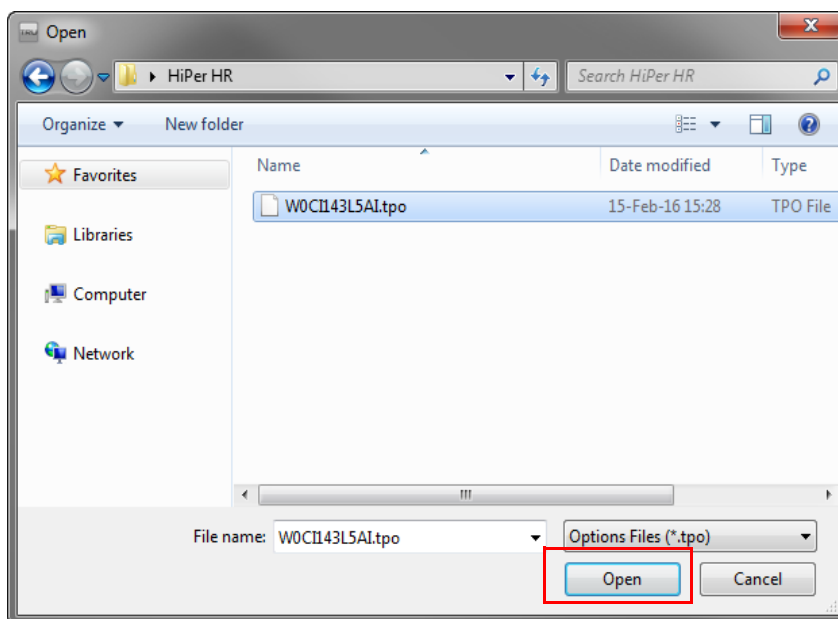
Topcon dealers provide customers with OAF files. For any OAF related questions, e-mail Topcon at [options@topcon.com](mailto:options@topcon.com) and include the receiver’s ID and serial number. To obtain these numbers, see “Viewing Receiver Information” on page 31.

1. Follow the steps in “Checking the Receiver’s OAF” above.
2. Right-click on the **Receiver Options** window, and select **Upload OAF** (Figure 22).



**Figure 22: Right-click and Select Upload OAF**

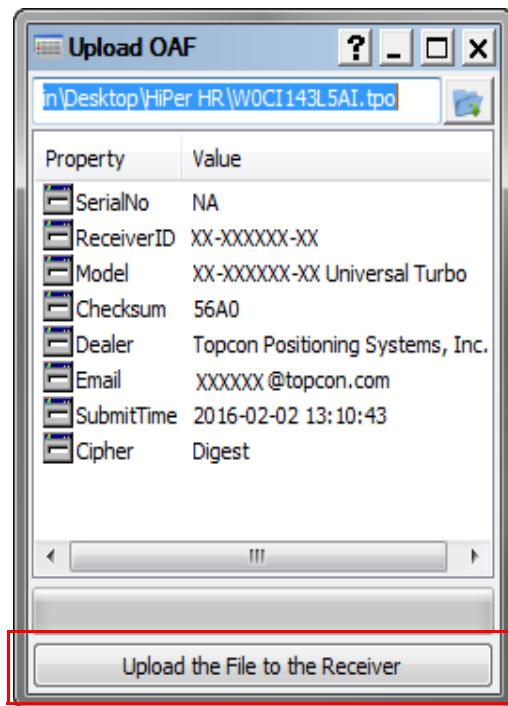
3. Navigate to the location of the new Option Authorization File.
4. Select the appropriate file, and click **Open** (Figure 23).



**Figure 23: Load OAF**

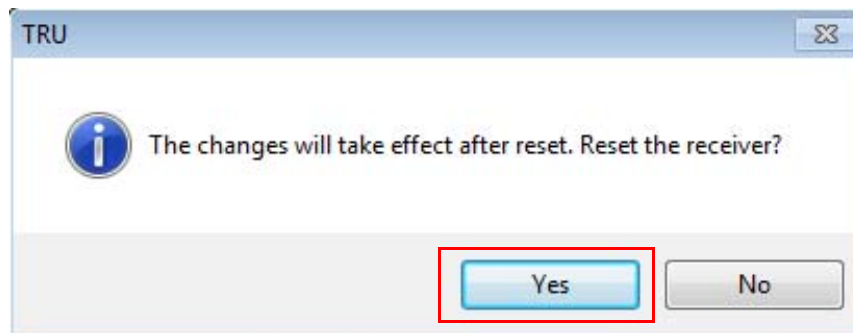
TRU initially checks to see if the selected file is compatible with the currently connected receiver. If you chose a file not intended for this receiver, the **Upload OAF** window displays an error icon next to the **Receiver ID**, and disables the **Upload the File to the Receiver** button.

5. Click **Upload the File to the Receiver** to start loading the file (Figure 24).



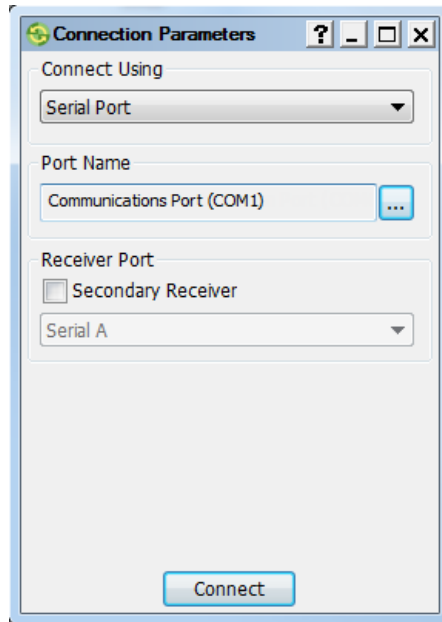
**Figure 24: Upload OAF to the Receiver**

6. Click **Yes** at the prompt to reset the receiver (Figure 25). The **Connection Parameters** screen appears.



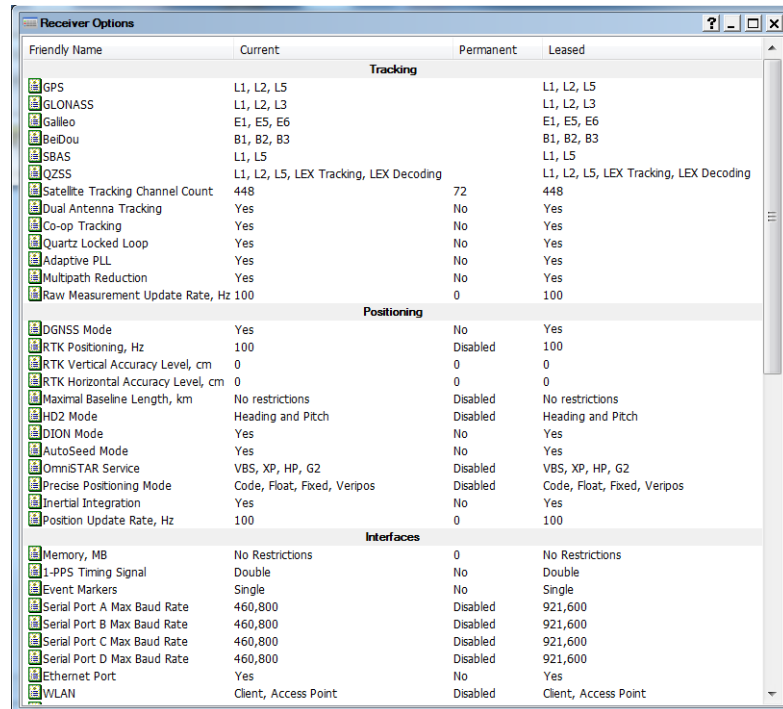
**Figure 25: Reset Receiver**

Click **Connect** (Figure 26). The TRU main screen appears.



**Figure 26: Connect to the Receiver**

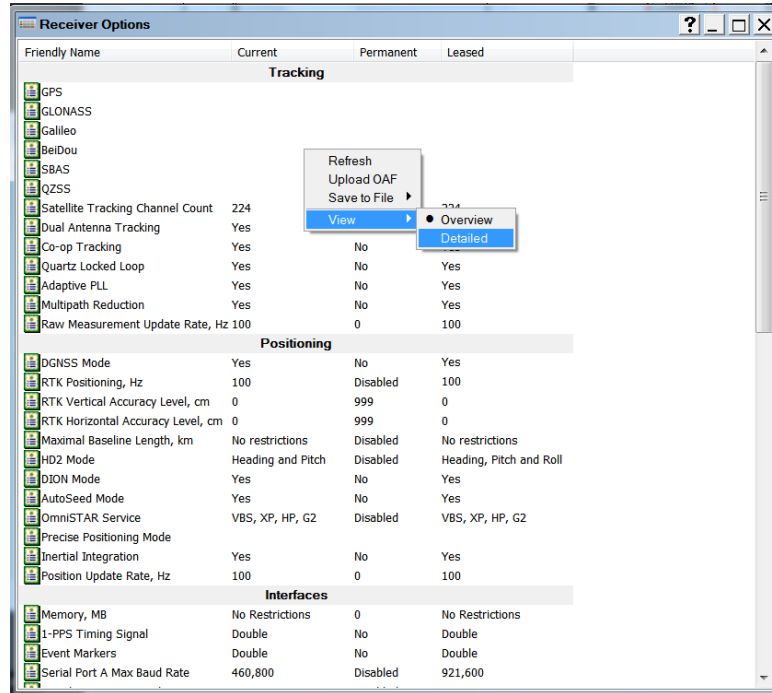
7. Click the **Options** icon. The **Receiver Options** screen appears (Figure 27).
8. Check the following conditions:
  - If you uploaded a universal OAF, make sure the expiration date is still valid.
  - If you uploaded a customer OAF, make sure the correct customer file is loaded.



**Figure 27: Receiver Options Screen**



- To view additional OAF details, right-click in the **Receiver Options** window and select **View ▶ Detailed** (Figure 28).



**Figure 28: Additional OAF Details**

## Performing a Factory Reset

The receiver's Non-Volatile Random Access Memory (NVRAM) holds data required for satellite tracking, such as ephemeris data and receiver position. The NVRAM also keeps the current receiver's settings, such as active antenna input, elevation masks and recording interval, and information about the receiver's internal file system. A factory reset clears the receiver's NVRAM and restores the receiver's factory default settings. Factory reset takes about 1-2 minutes to perform.

Although a factory reset or clearing the NVRAM is not recommended as a common practice, there are times when it can eliminate communication or tracking problems.

After a factory reset, the receiver requires time to collect new ephemerids and almanacs (around 15 minutes).

A factory reset will not delete any files already recorded in the receiver's memory, and the NVRAM keeps information about the receiver file system. The process takes approximately two minutes.

There are two ways you can perform a factory reset: using TRU and using the LED display panel.

### Perform a Factory Reset Using TRU

1. Connect the receiver to a computer, and open TRU. See the *Topcon Receiver Utility (TRU) Online Help* for more information about connecting the receiver to a computer.
2. In TRU, connect to the receiver.
3. Click the **Tools** icon in the main screen. The **Tools** window appears, enabling you to reset the receiver and clear the NVRAM (Figure 29).

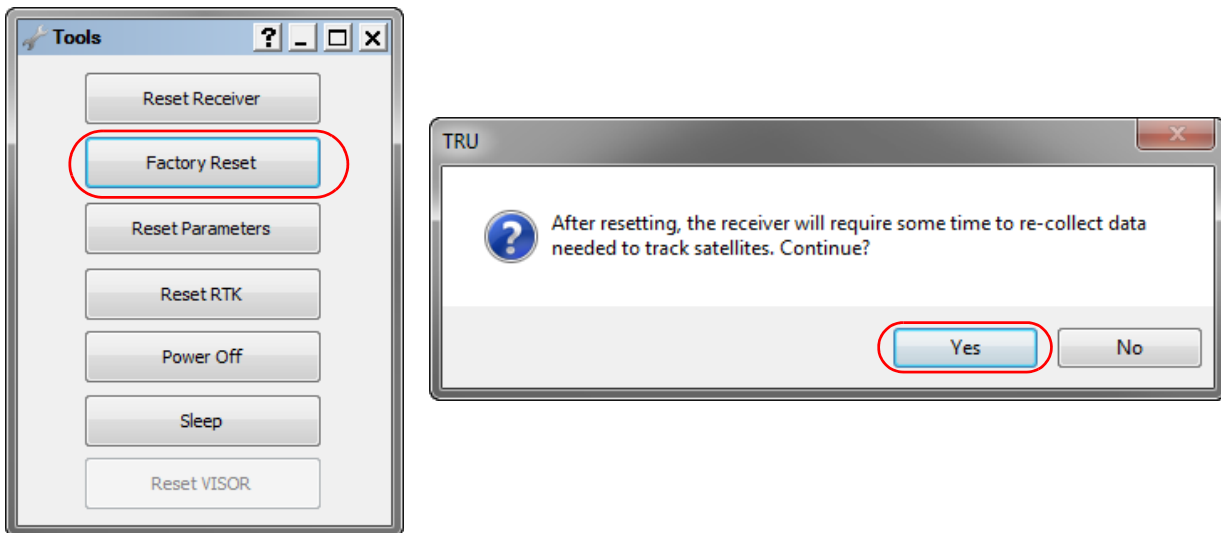


Figure 29: Tools Window

4. Click **Factory Reset**, then click **Yes** at the prompt.

### Perform a Factory Reset Using the LED Display

1. Press and hold the Power button for 10-15 seconds.
2. Release the Power button when STAT LED turns magenta.
3. Wait until the STAT and REC LEDs blink orange.
4. Wait until the STAT and REC LEDs turn green.

## Using the Web interface

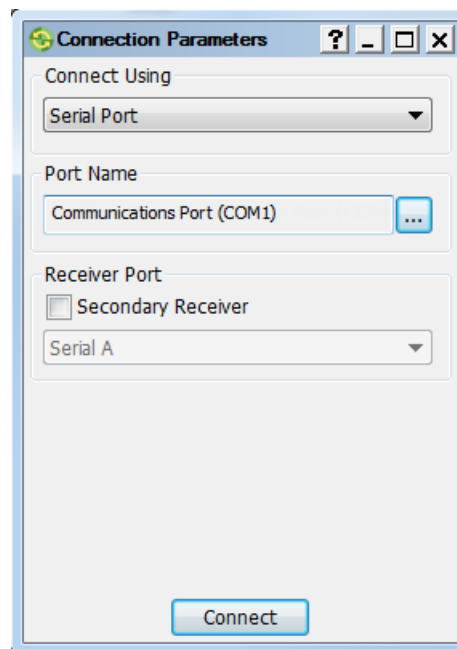
The HiPer HR receiver includes a built-in Web server that allows you to configure and monitor the receiver with a Web browser. Topcon recommends the following Web browsers:

- Internet Explorer 6.0 or later
- Opera 9.0 or later
- Google Chrome
- Mozilla Firefox 2.0 or later

## Configuring Network Parameters

To access HiPer HR Web interface, configure the receiver as a Wi-Fi access point and connect to it, or connect the receiver and your computer to the same Wi-Fi network. This section describes how to configure the network parameters of the receiver.

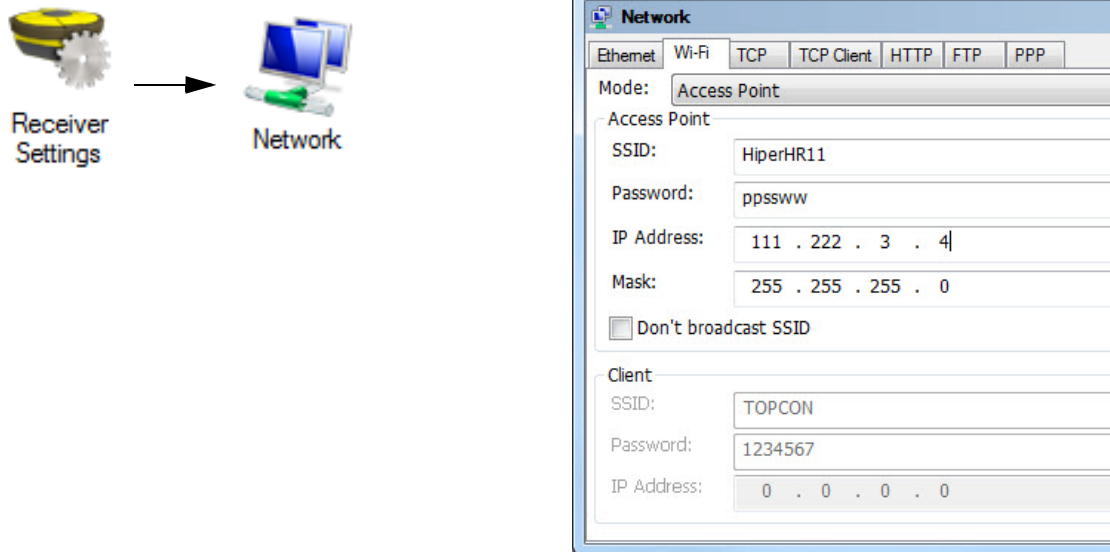
1. Connect the receiver to a computer and open TRU.
2. Click **Device ▶ Application Mode ▶ Receiver Managing**.
3. Click **Device ▶ Connect**. The **Connection Parameters** screen appears (Figure 30).



**Figure 30: Connection Parameters**

4. Click **Connect** to establish a connection with the receiver. The TRU main screen appears.
5. In the TRU main screen, click the **Receiver Settings** icon. The TRU receiver settings screen appears.

- In the TRU receiver settings screen, click the **Network** icon. The **Network** window appears. (Figure 31).



**Figure 31: TRU – Receiver Network Parameters, Wi-Fi Tab**

- In the **Network** window, open the **Wi-Fi** tab.
- Make the required configurations for the mode you need. See the sections below for details.

### Configuring Receiver as an Access Point

This section describes how to configure the receiver as a Wi-Fi access point. Before you begin, complete all steps described in “Configuring Network Parameters” on page 42.

- Select **Access Point** from the **Mode** drop down list. Fields in the **Access Points** group box are active.
- Specify the network name in the **SSID** edit box. Enter a meaningful name.
- Specify the password for the network in the **Password** edit box.
- Specify the IP address of the receiver’s access point in the **IP address** edit box. This IP address is used to access receiver’s Web interface.
- If needed, specify the network mask of the access point in the **Mask** edit box.
- If needed, select the **Don’t broadcast SSID** check box. In that case, specify the network name manually to connect to it.
- Click **OK**.

### Configuring Receiver as a Client

This section describes how to configure HiPer HR receiver as a client. Before you begin, complete all steps, described in “Configuring Network Parameters” on page 42.

- Select **Client** from the **Mode** drop down list. Fields in the **Client** group box are active.
- Specify the name of the required network in the **SSID** edit box.
- Specify the password of the network in the **Password** edit box.
- Click **OK**.
- In the TRU receiver settings screen, click the **Network** icon. The **Network** screen appears. (Figure 31).
- Open the **Wi-Fi** tab.
- Write down the IP address of the receiver from the **IP Address** field of the **Client** group box. This IP address is used to access receiver’s Web interface.

## Accessing the Receiver Through the Web Browser

Before accessing the receiver using the Web browser, make sure the network parameters (SSID, IP address, and so on) are specified in the receiver, as described in "Configuring Network Parameters" on page 42.

To open the Web interface:

1. Connect to the receiver, working in the access point mode; or connect to the same Wi-Fi network as the receiver.
2. Open your Web browser.
3. In the address or location bar of the Web browser, type the following address: *http://ipaddress*, where *ipaddress* is the IP address of the receiver for the connection type in use. Then click *Enter*. The login page displays (Figure 32).

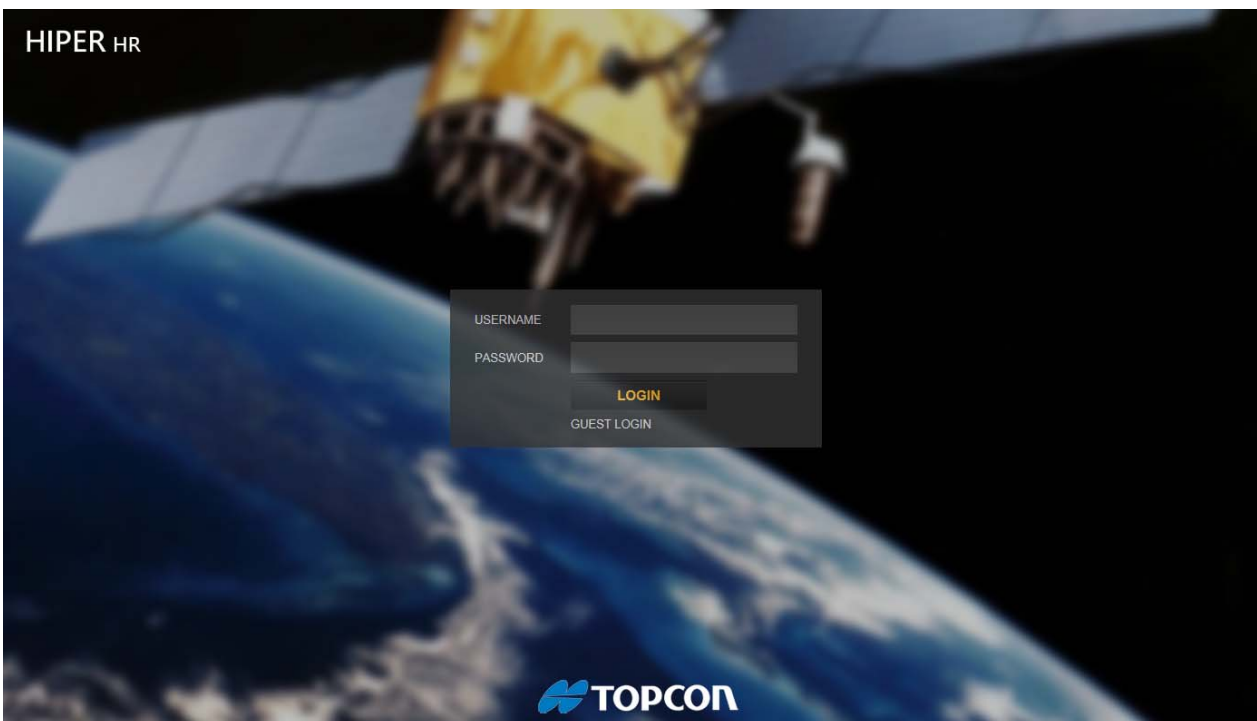


Figure 32: Main Page of the HiPer HR Web Interface

4. Enter the login and password to access the Web interface. The default user name and password are *admin*. User name and password are case sensitive.
5. Click **LOGIN**.

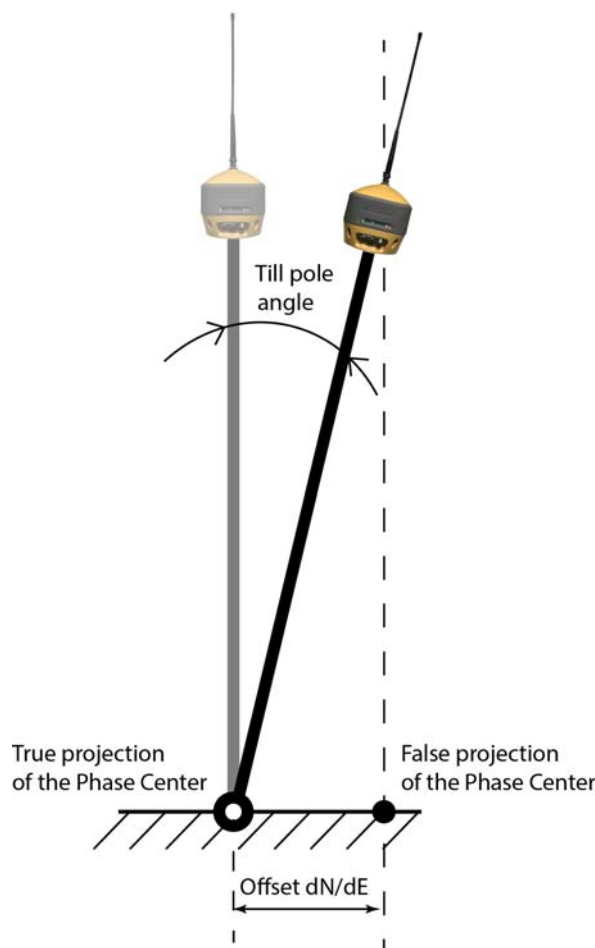


You can access the receiver without entering the user name and password by clicking **GUEST LOGIN**; however, you are restricted to view-only access.

## Using TILT Correction Technology

The receiver contains the internal Electronic Level and Compass (ELC) module, which allows you to perform the following tasks.

- Determine the tilt angle of the pole and transmit the value to the field software. The software will calculate the true coordinate of the measured ground point. You can activate this mode using MAGNET Field (version 4.0 and higher). For *Topo*, *Autotopo* and *Stake survey*, MAGNET Field uses the till angle of the pole from the ELC to calculate the offset of the phase center GPS antenna in the horizontal plane, for each GPS epoch. These offset values are used for obtaining the true coordinate of the measured ground point. This mode will work if the current tilt does angle not exceed the value in the **Tilt Correction Limit** field. To activate this mode (**Tilt Correction mode**) select the check box in the **Tilt Correction Limit** field, and specify the corresponding angle.



**Figure 33: Tilt Correction Mode**

- Automatically start the measuring of a point if the pole tilt value was less than one degree during the time interval longer than the **Auto Store After** value (by default it is two seconds). To activate this mode (**Auto Store mode**) select the check box in the **Auto Store After** field, and specify the corresponding time interval. In this mode, **Tilt Correction mode** can be can work with activated or deactivated.

When the mode is deactivated, if the till pole is at an angle which exceeds the value in the **Tilt Filter Limit** field, the epoch counter will stop. To continue the measurement, set the pole vertically.

When the mode is activated, MAGNET Field calculates the offset of the phase center GPS antenna in the horizontal plane, for each GPS epoch; however, the current till pole must not exceed the value in the **Tilt Correction Limit** field.

- Show/hide graphic view of the bubble level. After selecting the **Show eLevel** check box, the bubble level will be shown on the *Topo*, *Autotopo* and *Stake* dialogs for GPS configuration only.



The graphic view of the bubble level depends on whether tilt correction mode is on or off.

- Show/hide the value of the external magnetic field in the graphical and text view in the *Topo*, *Autotopo* and *Stake* mode (when **Map View** is selected).

Using MAGNET Field or TRU, you can perform the electronic level calibration procedure and the compass calibration procedure.

## Calibrating the ELC

The ELC inside the receiver provides 3-axis monitoring of the earth's magnetic field to deliver azimuth data. Due to characteristics of the e-compass used in this technology, field calibration is required.

The calibration procedure consists of the following steps:

1. Calibrate the electronic level of the receiver.
2. Calibrate the magnetic compass of the receiver in 3D.
3. Calibrate the magnetic compass of the receiver in the horizontal plane.

Calibration is performed independently and sequentially. After all three calibrations are finished, the ELC is ready to use.

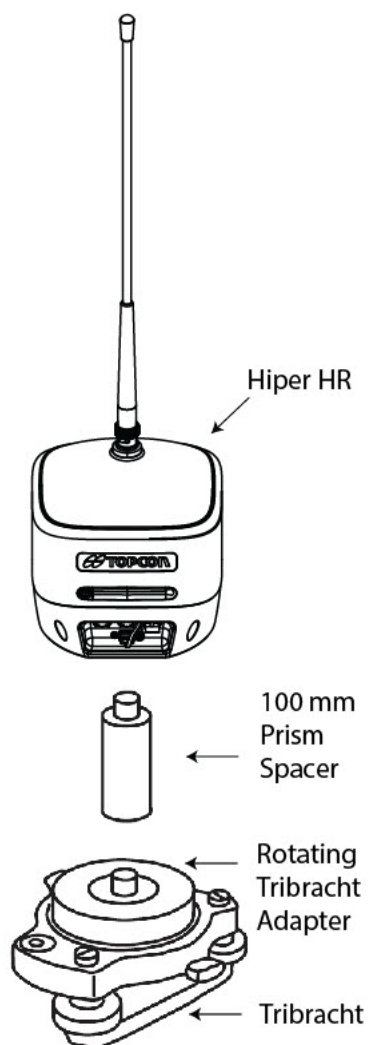
Topcon recommends the following to calibrate the ELC:

- a. Calibrate the ELC in the field, after the receiver has tracked satellites and determines a position.
- b. Connect the receiver to a controller via Bluetooth or Wi-Fi.
- c. Before calibrating, turn on and/or attach all equipment which will be used for the survey. For RTK survey, receive the corrections data using the desired modem and obtain the Fixed solution.
  - if you use UHF or FH modems, connect the radio antenna and turn on the radio modem;
  - if you use both batteries for the survey, attach the removable battery;
  - do not use an external power source.

You can use MAGNET Field or TRU to calibrate the ELC module.

## Calibrating the Level

For accurate level and compass readings, perform the electronic level calibration procedure. You will need a universal tribrach, tribrach adapter, and 100 mm aluminum prism spacer (Figure 34).



**Figure 34: Electronic Level Calibration**

1. Set up a tripod with the universal tribrach and tribrach adapter.
2. Level the tribrach, and place the receiver on the tribrach adapter with the prism spacer to eliminate vibrations during calibration. The receiver will track satellites and determine its position.
3. Click the **Calibrate** button in the **Level** field to start the procedure.
4. Wait for 30 seconds.

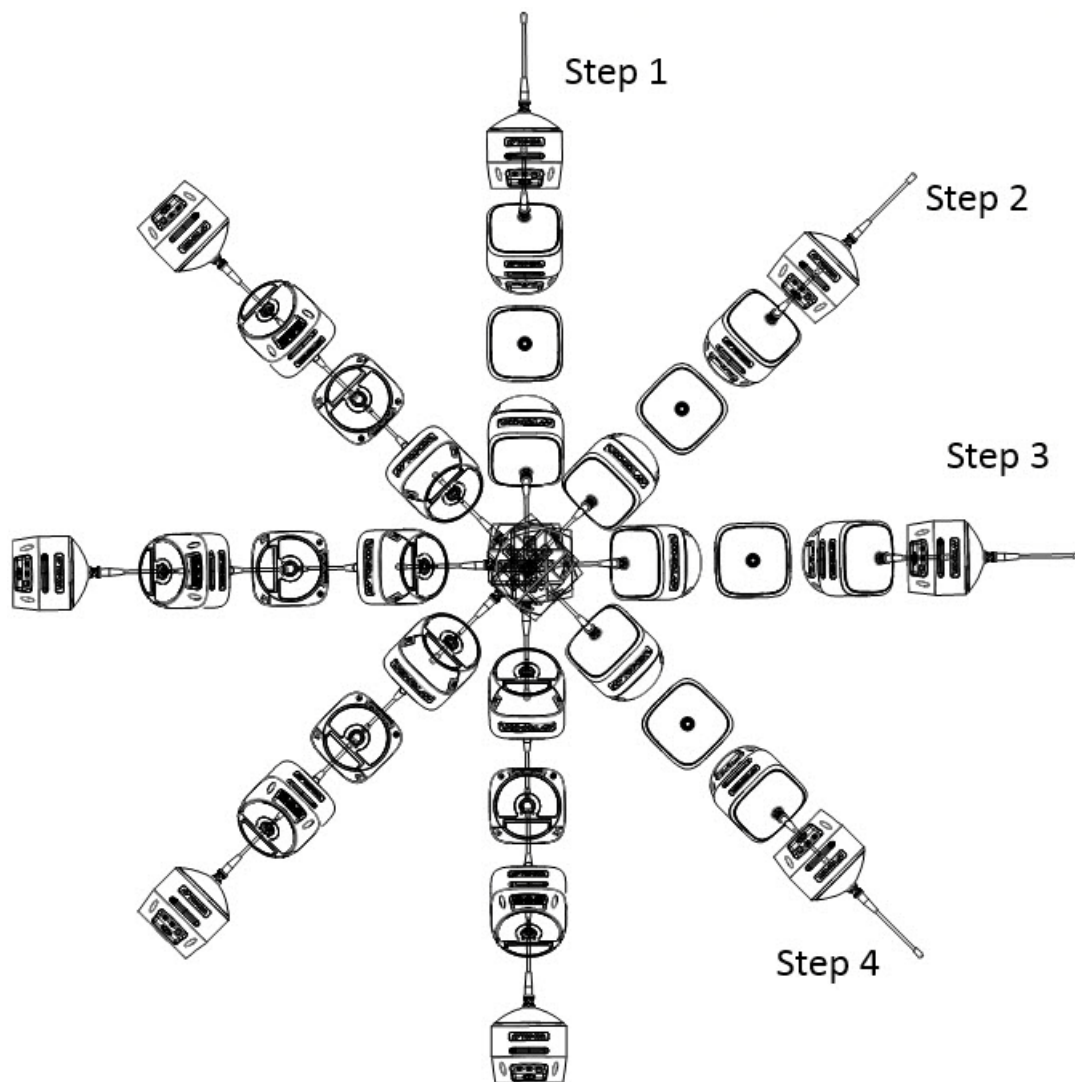
If calibration succeeds, the application will show the date and time of calibration. If calibration fails, the field will show the date and time of the previous successful calibration and the ⚠ icon.



## Calibrating the Compass in 3D

To take an accurate compass reading, perform the compass calibration procedure for each location before starting the survey. Make sure to calibrate the level before calibrating the compass.

1. Hold the receiver flat with the GNSS antenna radome pointed up, and the LED display panel pointed to you.
2. Click the **Calibrate** button in the **Compass** field to start the procedure.
3. Rotate the receiver 360 degrees in the vertical plane along the X axis (Step 1 of Figure 35).



**Figure 35: Calibrate Compass in 3D**


4. Rotate the receiver approximately 45 degrees to the left in the vertical plane along the Y axis, then rotate the receiver 360 degrees in the vertical plane along the X axis (Step 2 of Figure 35).
5. Repeat step 4 until the receiver completes a full 360 degree circle around the X axis (Step 3 and Step 4 of Figure 35).

If calibration succeeds, the application will show the date and time of calibration. If calibration fails, the field will show the date and time of the previous successful calibration and the ⚠ icon.

## Calibrating the Compass in the Horizontal Plane

For accurate compass readings, perform the compass calibration procedure in the horizontal plane for each location before starting the survey. Make sure to calibrate the level, then calibrate the compass in 3D before you begin. You will need a universal tribrach, tribrach adapter, and 100 mm aluminum prism spacer (Figure 34 on page 47).

1. Set up a tripod with the universal tribrach and tribrach adapter.
2. Level the tribrach, and place the receiver on a tribrach with the aluminum prism spacer. Maximum calibration accuracy is possible when the receiver is orthogonal to the horizontal plane and vibrations are eliminated.
3. Make sure the receiver displays a **no-none** solution type.
4. If using MAGNET Field, click the **Calibrate** button in the **Compass Alignment** field. If using TRU, click the **Align** button in the **Compass** field.
5. Turn the receiver clockwise in the horizontal plane. The indicator shows the time left until the calibration process completes.

If calibration succeeds, the application will show the date and time of calibration. If calibration fails, the field will show the date and time of the previous successful calibration and the  icon.

During operation, the receiver evaluates the local magnetic environment and alerts a user if a recalibration is required. These alerts appear in the field software. Recalibrate the receiver when the field software indicates, and under following conditions:

- if the receiver has been off for a long time;
- if the receiver is used for the first time;
- if the survey location changes frequently;
- if the receiver took a shock, such as being dropped;
- if temperature changes are 10° C or more;
- if the receiver was transported by a car or airplane;
- if the receiver was near a strong magnetic object or material, such as a permanent magnet, electromagnet, electric transformer, AC power supply, etc;
- after loading new firmware;
- after clearing the NVRAM.

The receiver transmits RTK corrections from the base to the rover receiver using either LongLink™ wireless technology, or UHF or FM modem. The internal cell module receives correction data from reference GNSS networks.

This chapter describes the field setup for base or RTK rover usage.

## Setting Up the Base Receiver

1. Install a heavy-duty tripod (p/n 22-050501-01) over a known point. You do not need a universal tribrach and tribrach adapter when working with this tripod.
2. Position the base receiver over a point with a known coordinate in the current coordinate system.
3. Attach the antenna to the UHF or FH modem antenna connector.
4. Level the tripod and tighten the screws.
5. If needed, attach any other accessories, such as a back-up power supply.
6. Measure the height of the receiver from the ground using the tape measure. See “Measuring Antenna Height” on page 54.
7. Press the Power button to turn on the receiver. The integrated wireless device in the receiver turns on when the receiver is powered.
8. Run Topcon field software on the field controller, and connect the Base receiver to the controller using a serial Port or Bluetooth.
9. Select the following parameters:
  - Select an elevation mask.
  - Select the RTK output format.
  - Select the radio modem parameters (for UHF modem: **Power, Protocol, Modulation, Spacing, Scrambling, FEC**; for FH modem: **Power, Channel, Protocol, Location**).
  - Select **raw data logging** if required.
10. Set the receiver as a Base in the field software:
  - a. Enter the name of the point where the Base receiver is located.
  - b. Enter the coordinates of the point.
  - c. Click **Start Base** to set the receiver as the Base, and transmit the correction data.
11. View the LED display panel for the receiver’s current status. See “Display Panel” on page 13 for more information about LEDs.



Select the **RTCM MSM3** format in the RTK output protocol to create the correction data with measurements for GPS, GLONASS, BeiDou, Galileo and QZSS satellite systems.

## Setting Up the Rover Receiver

1. Attach the receiver to the pole. Make sure the receiver locks into place.
2. If you are not using a fixed height rover pole, measure the height of the receiver from the ground. See "Measuring Antenna Height" on page 54.
3. If using a radio modem, attach the antenna to the UHF or FH modem antenna connector.
4. If using a SIM card, install the SIM card into the receiver (see "SIM Card Location" on page 11).
5. Press the Power button to turn on the receiver. The integrated wireless device in the receiver turns on when the receiver is powered.
6. Run Topcon field software on the field controller, and connect the Rover receiver to the controller using a serial Port or Bluetooth.
7. Configure the UHF/FH or cell modems.
  - a. If using UHF/FH, do the following:
    - Select an elevation mask.
    - Select the RTK input format.
    - Select the radio modem parameters (for UHF modem: **Modulation, Protocol, Scrambling, FEC**; for FH modem: **Channel, Protocol, Location**).
    - Select **raw data logging** if required.
  - b. If using a cell modem, do the following:
    - Select the type of correction data used for survey (**VRS, Single Base, or MAGNET Relay**).
    - Select the input correction data protocol: **TCP/IP, NTRIP 2.0/1.0, or NTRIP 1.0**.
    - Select an elevation mask.
    - Select the RTK input format.
    - Select the Internet address and TCP port number of the remote server.
    - Enter a User ID and to log in, and configure parameters for a dialup Internet connection.
    - Select **raw data logging** if required.
8. Establish an Internet connection to the remote server, and obtain the correction data.
9. View the LED display panel for the receiver's current status. See "Display Panel" on page 13 for more information about LEDs.



## Using the Receiver with an External Antenna

The Hiper HR can be used with an external antenna. Topcon recommends using a Topcon active (with LNA) external antenna.



Topcon cannot guarantee the correct performance with other brands of GNSS antenna. Do not use passive GNSS antenna with the receiver.

When an external antenna is used, the receiver supplies a voltage from +4.5 V to +5.5 V to the central pin of the SMB antenna connector. Maximum antenna current is equal to 120 mA.

To use an external antenna, use MAGNET Field or TRU to set up the external antenna.

### Setting Up The External Antenna in MAGNET Field

1. Open MAGNET Field, and click **Configure** ▶ **Application Mode**.
2. Open the **Config: Base Receiver** or **Config: Rover Receiver** dialog box (Figure 36). The default antenna is set to **HiPer HR**.

The screenshot shows the 'Config: Base Receiver' dialog box. It has a title bar with a 'M' icon, a green checkmark, and a red 'X'. The dialog contains several fields:


- External Receiver
- Receiver Model: HiPer HR
- Serial Number: (empty text box)
- Elevation Mask: 13 deg
- RTK Format: RTCM 3.x MSM3
- Antenna: HiPer HR (highlighted in blue)

**Figure 36: MAGNET Field – Default Antenna**

3. Select the desired external antenna from the **Antenna** drop-down list (Figure 37).

The screenshot shows the 'Config: Base Receiver' dialog box, identical to Figure 36, but with the 'Antenna' dropdown menu set to 'PG-A1' (highlighted in blue).

**Figure 37: MAGNET Field – External Antenna Selected**

4. Click  to save the settings.

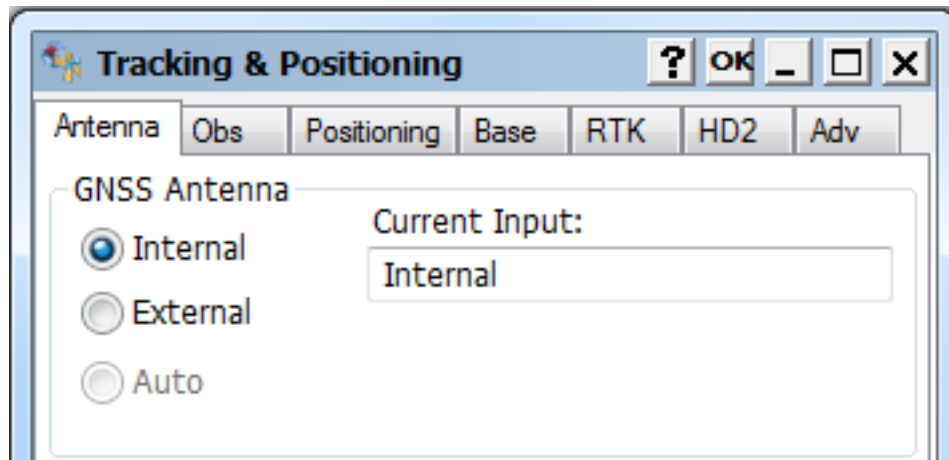
5. Connect the external antenna to the receiver using the external antenna cable (p/n 1006447-01).



Once the external antenna is connected, the receiver will only track GNSS signals.

## Setting Up the External Antenna in TRU

1. Connect to the receiver using a serial or bluetooth connection.
2. Click **Receiver Settings** ▶ **Tracking & Positioning**. The Tracking & Positioning screen appears with the Antenna tab active and the default antenna set to **Internal** (Figure 38).



**Figure 38: TRU – Default Antenna**

3. Select **External** to activate an external antenna.
4. Click **OK** to save the settings.
5. Connect the external antenna to the receiver using the external antenna cable (p/n 1006447-01)..



Once the external antenna is connected, the receiver will only track GNSS signals.

## Measuring Antenna Height

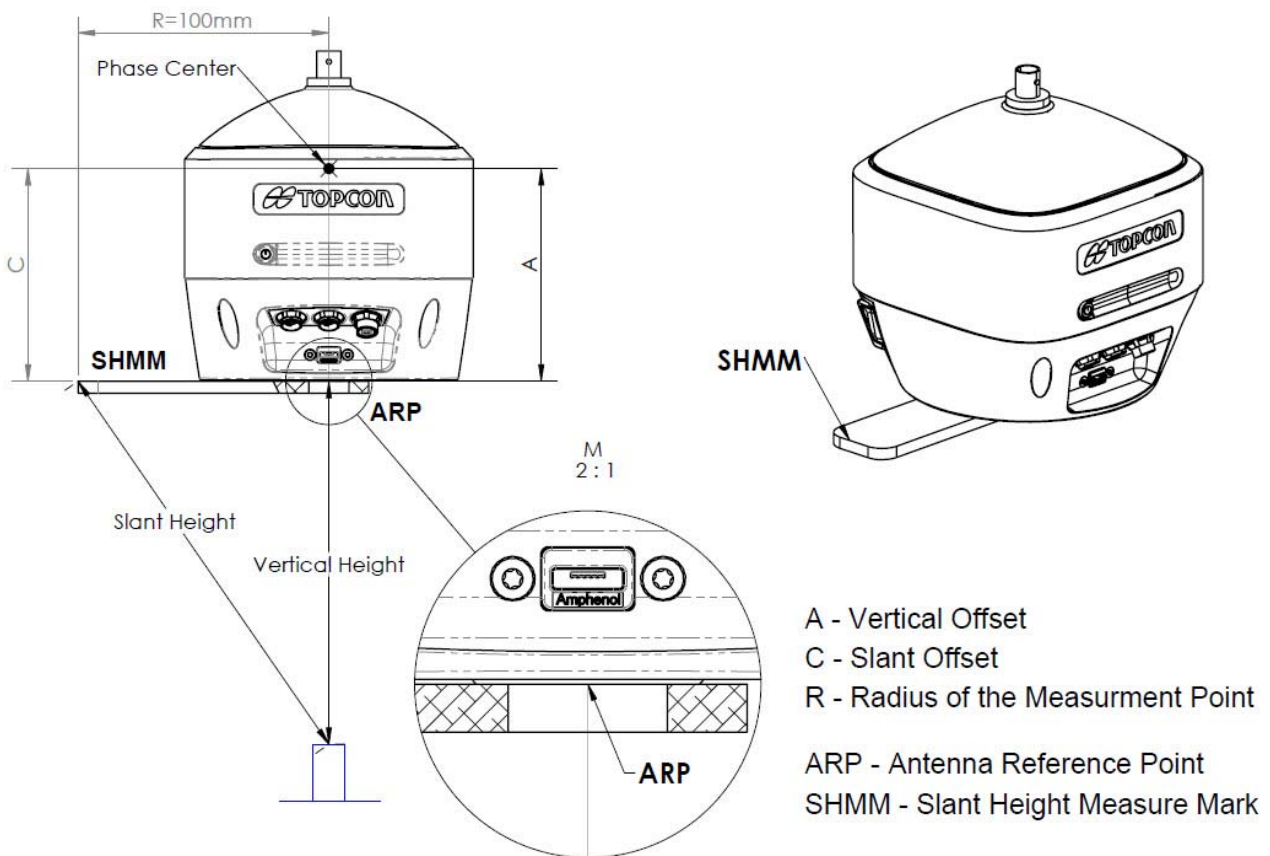
The receiver calculates the coordinates of the antenna's phase center. To determine the coordinates of the station marker, specify the following:

- measured height of the antenna above the station marker
- method of measuring the antenna height
- model of the antenna/receiver used

Any necessary antenna phase center adjustments, based on the antenna model, are automatically applied. These adjustments, when combined with accurately measured height and measurement methods, allow for correctly computed reference marker coordinates.

To accurately measure the antenna height, do the following:

1. Measure the antenna height above the control point or marker, either the slant height or the vertical height.  
You may either measure the vertical height to the Antenna Reference Point (ARP) located at the bottom of the receiver at the base of the mounting threads, or measure the slant height to the Slant Height Measurement Mark (SHMM) on the side of the receiver. For ARP and SHMM marks on the receiver, see Figure 39.
2. Record the antenna height, points name, and start time in the field notes.



**Figure 39: Antenna Height Measurement Points**

This chapter provides general information about memory, recording data, downloading data, and removing files to free up memory space.

## Memory

The HiPer HR is equipped with an internal SD/SDHC memory card. The 8 GB card is formatted as FAT32. As data is logged to the card, the REC LED displays the memory capacity status. To access the raw data files on the memory card, see "Managing Files" on page 59.

## Setting Recording Parameters

You can use one of the following ways to set logging parameters, such as logging rate, types of messages, etc.

- Receiver's Web interface
- Topcon Receiver Utility (TRU) software
- MAGNET Field software

## Logging Rates

Memory usage for data logging depends on the logging rate. For more information about setting logging rate parameters, see the *TRU Online Help*.

## Recording Data

You can log GNSS Raw data to the receiver's SD/SDHC card, and use the Topcon Receiver Utility (TRU) or MAGNET Office™ software to download the files to a computer.

### Recording Data via the LED Display Panel

To start recording data, using the LED display panel:

1. Press the Power button to turn on the receiver.
2. Wait for the Power LED to become solid green. The receiver is now available to log the raw data.



The receiver is not available to log the raw data until the startup procedure is completed.

3. Press the Power button three times in a row within 2 seconds to start recording.
4. Make sure the REC light blinks green, which indicates a "\*.tps" file has opened and data collection has started. The REC LED blinks each time data is saved to the SD/SDHC memory card. If the REC light blinks red, the receiver has either a hardware problem, or an improper OAF. See "Option Authorization Files" on page 35 for more information.

To stop recording press the Power button three times in a row within 2 seconds, and make sure that the REC LED is dark.



With the Power button, you can record up to 16 raw data files.



## Recording Data via the Receiver Web Interface

To start recording data using the receiver Web interface:

1. Press the Power button to turn on the receiver.
2. Wait for the Power LED to become solid green.
3. Login to the receiver's Web interface. See "Using the Web interface" on page 42 for details.
4. Open the **Receivers Settings** ▶ **Data Logging** page. You can simultaneously start up to 16 raw data files with the different recording parameters and the Automatic File Rotation Mode (AFRM) option.
5. To configure recording parameters, click **CONFIGURE** in the required file slot (**FILE A - FILE P**). The **Configuration** page appears.
6. To disable file logging when AFRM is on or started via the Minter, disable the **Controlled by AFRM /Minter** check box.
7. Enter the file name in the **Filename** field, specify the **Logging Rate** and the **Elevation Mask** in the corresponding fields.
8. Click the **Start Logging** button to start recording data to this file. The **Data Logging** page reloads, and the **LOG FILES** panel displays the status of the log files (Figure 40).

LOG FILES						
SLOT	NAME	DATA PERIOD	ROTATION PERIOD	REMOVE OLD FILES	DATA LOGGED	
FILE A	/LOG/TEST-1	1.00		OFF	0.1493 MB	<b>STOP</b>
FILE B	/LOG/TEST-3	0.20		OFF	0.0603 MB	<b>STOP</b>
FILE C		1.00		OFF	0.0000 MB	<b>CONFIGURE</b>

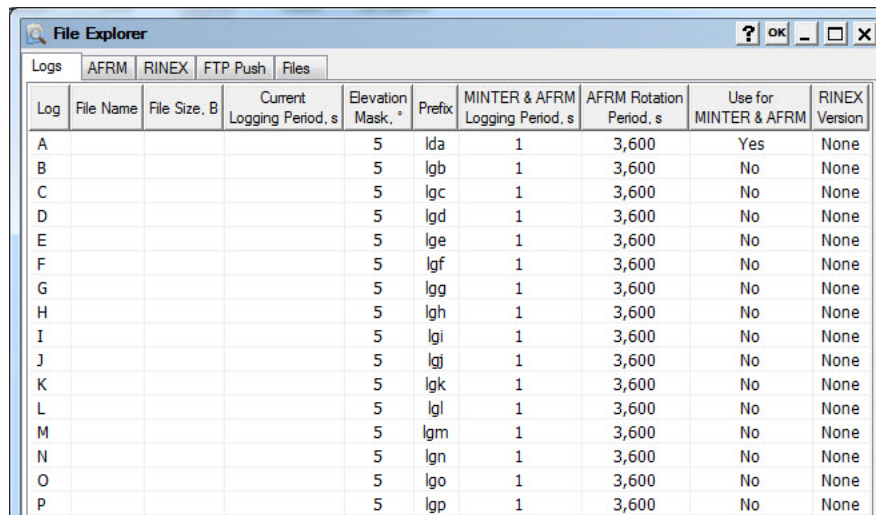
**Figure 40: Web Interface – Log Files**

9. Make sure the REC LED blinks green.
10. To stop recording, press the **Stop** button in the required file slot.

## Recording Data Using Topcon Receiver Utility

To start recording data using TRU:

1. Press the Power button to turn on the receiver.
2. Wait for the Power LED to become solid green.
3. Launch TRU, and establish the connection with the receiver in the **Receiver Managing** mode. See the TRU Help for more information.
4. Click the **File Explorer** icon. The **File Explorer** screen appears (Figure 41).
5. Open the **Logs** tab. You can record up to 16 raw data files simultaneously, from *A* to *P*. For each file you can use its own default settings for logging.



Log	File Name	File Size, B	Current Logging Period, s	Elevation Mask, °	Prefix	MINTER & AFRM Logging Period, s	AFRM Rotation Period, s	Use for MINTER & AFRM	RINEX Version
A				5	lda	1	3,600	Yes	None
B				5	lgb	1	3,600	No	None
C				5	lgc	1	3,600	No	None
D				5	lgd	1	3,600	No	None
E				5	lge	1	3,600	No	None
F				5	lge	1	3,600	No	None
G				5	lge	1	3,600	No	None
H				5	lgh	1	3,600	No	None
I				5	lgi	1	3,600	No	None
J				5	lgj	1	3,600	No	None
K				5	lgk	1	3,600	No	None
L				5	lgl	1	3,600	No	None
M				5	lgm	1	3,600	No	None
N				5	lgn	1	3,600	No	None
O				5	lgo	1	3,600	No	None
P				5	lgp	1	3,600	No	None

Figure 41: Logs Tab of the File Explorer Screen

6. Right click on the desired file to open the context menu.
7. Click **Edit** to open the **Log** screen, and specify individual settings such as **Elevation Mask**, **Prefix** and **Rotation Period**.  
You can also select the RINEX version of the current file from the **RINEX Version** drop-down list. If you select **None**, the RINEX conversion will not be enabled.
8. To use these log parameters after pressing the MINTER, select **Use for MINTER & AFRM** (Figure 42).

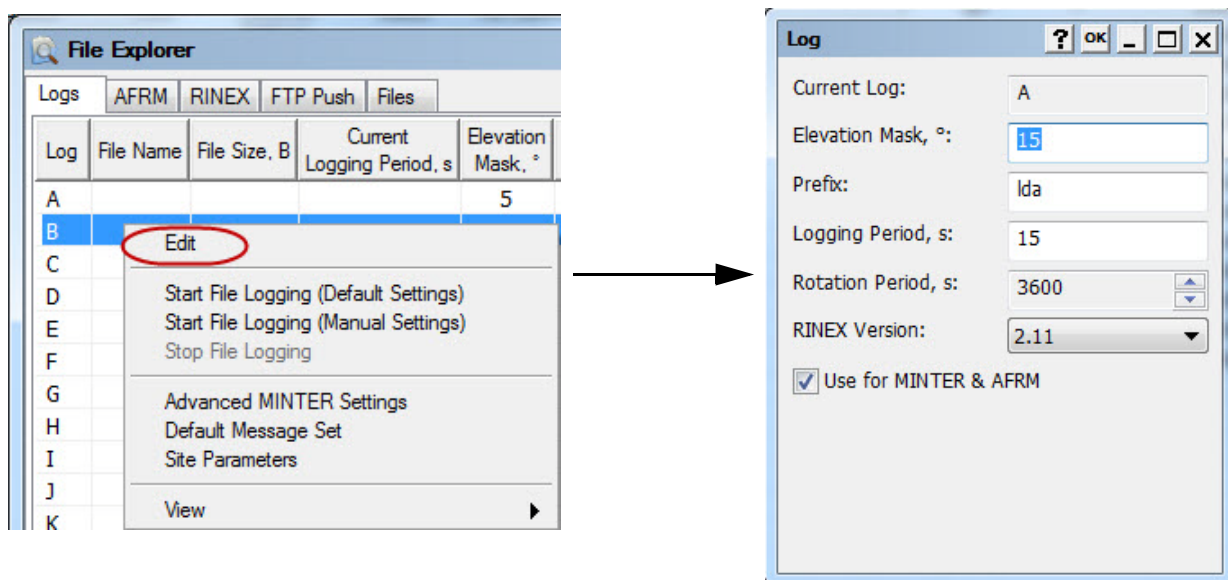
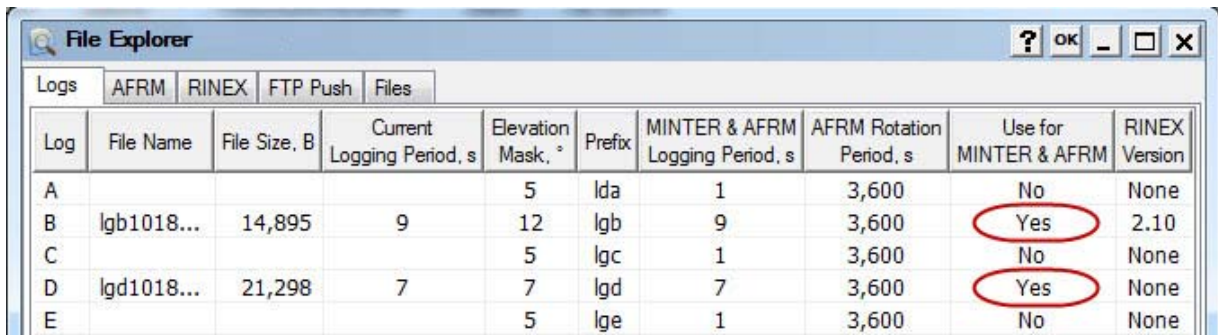


Figure 42: Context Menu of Logs Tab

9. Click **OK** to save all changes.

Using the MINTER, you can start logging one or more files. By default, clicking the Power button three times in a row within two seconds will log a file. This file is called File A (Figure 44). By default, the **Use for MINTER & AFRM** check box is enabled only for File A. You can select this check box for any number of files. In this case, clicking the Power button will simultaneously start those files for which the **Use for MINTER & AFRM** check box is enabled. The current logging files are displayed in the **Logs** tab (Figure 43).

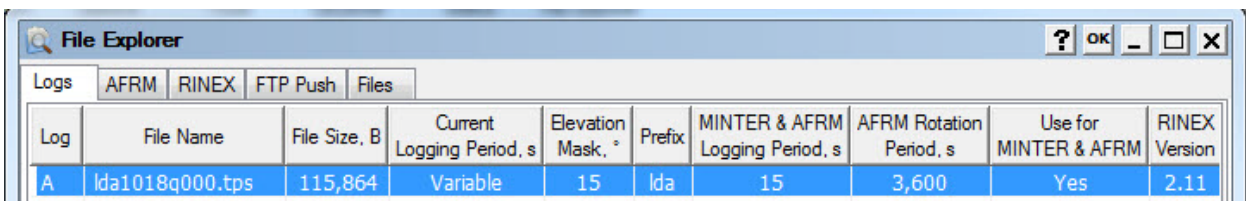


Log	File Name	File Size, B	Current Logging Period, s	Elevation Mask, °	Prefix	MINTER & AFRM Logging Period, s	AFRM Rotation Period, s	Use for MINTER & AFRM	RINEX Version
A				5	lda	1	3,600	No	None
B	lgb1018...	14,895	9	12	lgb	9	3,600	Yes	2.10
C				5	lgc	1	3,600	No	None
D	lgd1018...	21,298	7	7	lgd	7	3,600	Yes	None
E				5	lge	1	3,600	No	None

Figure 43: Logs Tab

To start recording data to the selected file with default settings do the following.

1. Right click on the desired file to open the context menu.
2. Click **Start File Logging (Default Settings)**. The current logging file is displaying in the **Logs** tab (Figure 44).

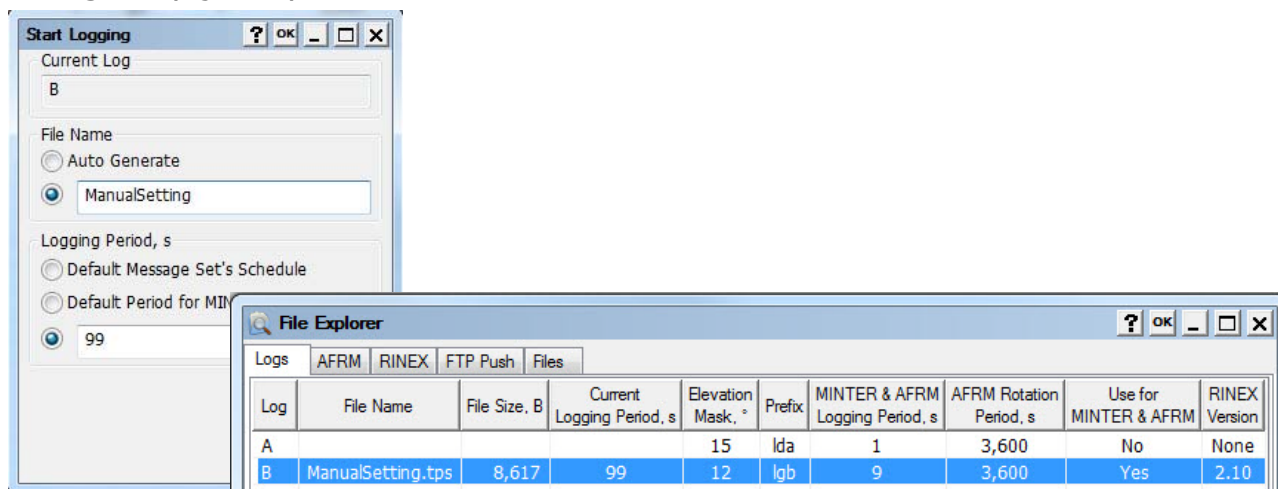


Log	File Name	File Size, B	Current Logging Period, s	Elevation Mask, °	Prefix	MINTER & AFRM Logging Period, s	AFRM Rotation Period, s	Use for MINTER & AFRM	RINEX Version
A	lda1018q000.tps	115,864	Variable	15	lda	15	3,600	Yes	2.11

Figure 44: Start File Logging With Default Settings

You can specify the logging parameters manually. To start recording data to the selected file with arbitrary settings, do the following.

1. Right click on the desired file to open the context menu.
2. Click **Start File Logging (Manual Settings)**. The **Start Logging** dialog is opened.
3. Specify the file name and logging period.
4. Click **OK** to start logging the file using the entered parameters. The current logging file is displaying in the **Logs** tab (Figure 45).



The **Start Logging** dialog box is shown with the following settings:

- Current Log: B
- File Name:  Auto Generate,  ManualSetting
- Logging Period, s:  Default Message Set's Schedule,  Default Period for MINTER,  99

The **File Explorer** Logs tab shows the following table:

Log	File Name	File Size, B	Current Logging Period, s	Elevation Mask, °	Prefix	MINTER & AFRM Logging Period, s	AFRM Rotation Period, s	Use for MINTER & AFRM	RINEX Version
A				15	lda	1	3,600	No	None
B	ManualSetting.tps	8,617	99	12	lgb	9	3,600	Yes	2.10

Figure 45: Start File Logging With Manual Settings

To stop recording data, highlight the desired file, do the following.

1. Right click it on the desired file to open the context menu.
2. Click **Stop File Logging**. The **Files** tab of **File Explorer** screen displays the list of raw data files stored in the receiver memory.



You can also log data using MAGNET Field software. With MAGNET Field, you can record only one raw data file at time.

## Managing Files

The receiver records TPS data to a storage medium with a FAT32 file system. The files and folders are organized in a hierarchical structure. A total of 3000 files can be recorded and stored on the storage medium.

You can program the receiver to:

- Record TPS data to up to a maximum of 16 simultaneous files. Each file can be logged with its own parameters.
- Close the current log file and open a new one according to a user-defined schedule. This option is called Automatic File Rotation Mode (AFRM).
- Automatically remove the oldest files to make room for the new files, when AFRM is activated.
- Automatically convert the current log file to a RINEX file.
- Automatically upload files to an FTP server.

## Downloading and Deleting Files

When a survey is completed, you can download data files to a computer for storage, post-processing, or backup. To download raw data file(s) from the receiver to a computer, do the following.

1. Select the **Files** tab in the **File Explorer** screen (Figure 46). The **Files** tab displays the list of raw data files stored in the receiver memory.
2. Right-click on the desired file(s) to open the context menu and select **Download** (Figure 46).
3. Select the folder where the \*.tps file(s) will be saved (Figure 46).
4. Click **OK**. TRU downloads the selected file(s) to the folder (Figure 46).

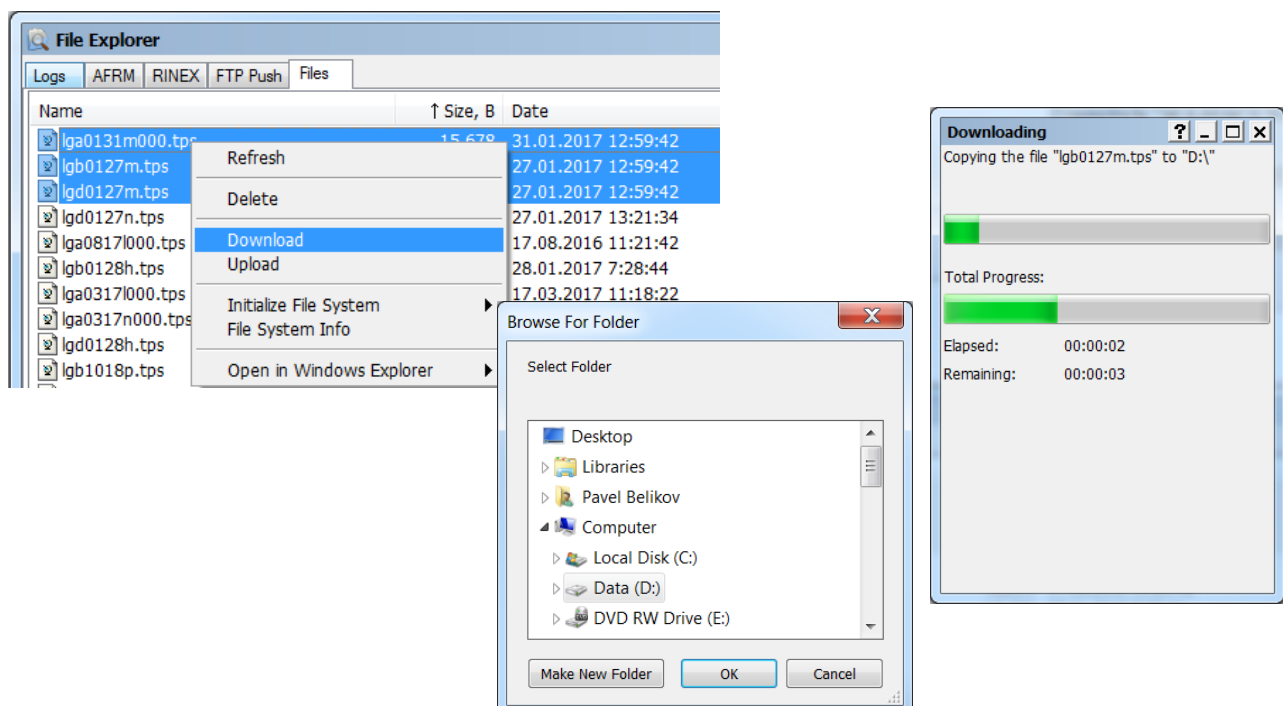


Figure 46: Upload \*.tps Files to a Computer

When the internal memory is full, the receiver stops logging data, and the REC LED turns off, indicating an error condition. Existing data are not overwritten.

To delete raw data files, do the following.

1. Right-click on the desired file(s) to open the context menu and select **Delete**.
2. Click **Yes** to confirm, then click **OK**. TRU deletes the file(s) from the receiver memory.

This chapter will help you diagnose and solve some common problems that may occur with the receiver.



Do not attempt to repair equipment yourself. Doing so will void the warranty and may damage the hardware.

## Check This First

Before contacting your local dealer or Topcon Technical Support, check the following:

- Check all external receiver connections carefully to ensure correct and secure connections. Double check for worn or defective cables.
- Check the receiver's internal batteries for a full charge.
- Check the power source for incorrectly connected cables, and ensure the power source is valid. See "Specifications" on page 66 for external power requirements.
- Check the software. Make sure the most current software version is downloaded onto the computer and the most current firmware is loaded into the receiver. Check the Topcon website for the latest updates.
- Check Topcon Technical Support ([www.topconsupport.com](http://www.topconsupport.com)) or Topcon Support (<https://www.topconpositioning.com/support>) for the latest updates.

Then, try the following:

- Power on and off the receiver by pressing the Power button or by using TRU (**Tools ▶ Reset receiver**).
- Restore default settings by clearing the NVRAM. See "Performing a Factory Reset" on page 41. This restores the receiver's parameters to the factory default settings and erases the almanac and ephemeris files. This action does not delete data files from the receiver memory.

If the problem persists, see the following sections for other solutions.

## Powering Problems

The following are some of the most commonly encountered power problems.

### The Receiver Does Not Power Up

The battery may be discharged.

- Charge the battery overnight. See "Charging the Batteries" on page 28.
- If you are using an external power source, the cable may be disconnected or damaged.
  - Make sure the cable is securely connected and undamaged.
- The receiver may have a defective charger or defective battery.
  - If, after changing the battery or connecting an external power source, the receiver still does not power up, contact your local dealer or Topcon Technical Support for advice.

If the batteries are charged, reset the hardware using the Hardware Reset button. See "Hardware Reset Button" on page 12.

## Receiver Problems

The following are some of the most commonly encountered receiver problems.

### The Receiver Cannot Establish a Connection to a Computer or External Controller

Cable specific problems:

- The cable is not properly plugged in.
  - Unplug the cable, then securely and properly reconnect it to the receiver.
- The cable is damaged.
  - Use an undamaged cable. Contact a dealer to replace the cable.
- The USB driver is not installed.
  - If you are using a USB cable connection, make sure the USB driver, included on the GPS+ Software CD, is installed on the computer. You can also download the driver from the Topcon support Website at [www.topcontotalcare.com](http://www.topcontotalcare.com).

Generic problems:

- The receiver port used for connection is not in Command mode.
  - a. Connect the receiver to a computer and open TRU (see "Connection" in the *Topcon Receiver Utility (TRU) Help* embedded in the software).
  - b. Click **Receiver Settings ▶ Ports**.
  - c. Change the **Input Mode** for the port used for connection to **cmd**.

### The receiver does not lock on to satellites for a long period of time

- The corresponding receiver options may be disabled or expired (L1/L2, GPS/GLONASS must be on to track satellites).
  - Order a new OAF with the desired options activated to enable or extend validity of the corresponding receiver options. Contact a dealer or visit the Topcon website for details.
  - Refer to the "Receiver Managing" chapter of the *Topcon Receiver Utility (TRU) Help* for a detailed description of options.

### The receiver tracks too few satellites

- If the survey is conducted near obstructions (tree canopy, tall buildings, and so forth).
  - Make sure the Multipath Reduction boxes have been enabled in the field data collection software.
    - a. Connect the receiver to a computer and open TRU (see "Connection" in the *Topcon Receiver Utility (TRU) Help* embedded in the software).
    - b. In TRU, connect to the receiver.
    - c. On the TRU main screen, choose **Receiver Settings ▶ Tracking ▶ Adv** tab. Make sure the **C/A code multipath reduction** check box is selected.
- Move to an area free of obstructions, if possible.

### The receiver cannot obtain Code Differential and/or RTK solutions

- Incorrect Base coordinates entered.
  - Specify the correct coordinates for the Base station using TRU or another suitable field data collection software.
  - There could be some obstruction to the connection.
  - Clear all possible obstructions or relocate the Base so there is a "line-of-sight" path to the Rover.
- The corresponding receiver options may be disabled or expired.
  - Order a new OAF with the required options activated to enable or extend validity of the corresponding receiver options.
  - Refer to the *Topcon Receiver Utility (TRU) Help* for a detailed description of options.
- There are not enough common satellites. In order to obtain a fixed solution, the Base and Rover should track at least five common satellites.
  - Check the elevation masks of the Rover and Base receivers; they should be the same. To do this, on the TRU main window, choose **Receiver Settings ▶ Tracking ▶ Obs**.
  - Verify there is a clear view of the sky to allow sufficient satellite tracking.

- A discrepancy exists between the differential standards used at the Base and Rover receivers.
  - Ensure the Base and Rover receivers use the same corrections input/output format:
    - a. Connect the receiver to a computer and open TRU (see “Connection” in the *Topcon Receiver Utility (TRU) Help* embedded in the software).
    - b. In TRU, connect to the receiver.
    - c. On the TRU main window, choose **Receiver Settings ▶ Ports**.
    - d. Double-click on the port to be configured and make sure the input mode of the Rover matches the format of the Base output mode (i.e. RTCM3).
- Poor satellite geometry (PDOP/GDOP values are too high).
  - Conduct the survey where satellite visibility is better (low PDOP value).
  - Ensure the elevation mask is less than 10 degrees.
  - Increase the PDOP threshold. To do this, on the TRU main window, choose **Receiver Settings ▶ Tracking ▶ Obs**.
- The elevation mask is above 10 degrees.
  - Lower the elevation mask. To do this, on the TRU main window, choose **Receiver Settings ▶ Tracking ▶ Obs**.
  - Verify there is a clear view of the sky to allow sufficient satellite tracking.
- The modem battery is low.
- The specified baud rate is incompatible with the baud rates the modem supports. The baud rate is the rate at which the receiver transmits differential messages to the modem and vice versa.
  - Change the modem’s baud rate.
- The Base and Rover modems use different radio link parameters.
  - Configure the Base and Rover radio modems according to the procedures listed in the *TRU Help*.
- The distance between the Base and Rover is too far.
  - Close the distance between the Base and Rover.
  - Use repeaters to increase radio coverage.
- There may be a source of radio interference that disrupts radio communications.
  - Change the RF channel (if possible).
  - Removing the source of the jamming signal or relocate the radio antennas (if possible).

**The receiver does not start logging data**

- The receiver’s memory is disabled or expired.
  - Make sure the memory option is enabled. For details, see the *Topcon Receiver Utility (TRU) Help*.
- The memory card does not have free space.
  - Download and/or delete data files to free up space for new files. See “Downloading and Deleting Files” on page 59.
  - The file system is not initialized. Initialize the File System on the SD card using TRU. To do this, on the TRU main screen, choose **File Explorer ▶ Initialize File System**.



## Bluetooth Problems

The following are some of the most commonly encountered error messages and other problems.

### TRU error message: Can't find receiver

- The receiver is turned off.
  - Ensure the receiver has power and is turned on.
- Bluetooth is not turned on; the BT LED is off.
  - Reset the receiver to the factory default settings by pressing the Power button for 10 to 15 seconds.
  - You can also turn on power to Bluetooth using TRU. To do this, on the TRU main window, choose **Receiver Settings ▶ Bluetooth**.
- There is interference.
  - Move the receiver, controller, or computer to an unobstructed location.
- The receiver is too far away.
  - Move the devices closer together.
- The receiver is already connected via Bluetooth to another device.
  - Disconnect the receiver from the other controller or computer.
- The receiver port used for connection is not in Command mode.
  - a. Connect the receiver to a computer and open TRU (see "Connection" in the *Topcon Receiver Utility (TRU) Help* embedded in the software).
  - b. Click **Configuration ▶ Receiver ▶ Ports**.
  - c. Change the **Input Mode** for the Bluetooth serial port used for connection to **cmd**.



This is the most common cause for this error message. Use TRU to double check the settings for the connection port.

### TRU error message: Open COM# port failed: Access is denied

- Another application uses the computer port dedicated for connection.
  - Close the application, and then re-connect.
  - Connect the receiver via another, unused computer port.

### After searching for available devices, none are discovered

- The receiver is not receiving power.
  - Check that the receiver is getting power and is turned on.
  - Check that the power cable is correctly attached to the port if one is being used.
  - Unplug the cable, then securely and properly reconnect it to the receiver.
  - If the power cable is damaged, contact a Dealer to purchase a new cable.

### Can see the icon for the receiver's Bluetooth module on the computer screen, but cannot connect to it

- Device security settings probably differ.
  - Make sure the Bluetooth enabled devices use the same security settings.
- Bluetooth module settings may have changed.
  - a. If the settings are changed for the Bluetooth module, remove it from the list of discovered Bluetooth devices using the Bluetooth manager program (supplied with the device used to manage the receiver).
  - b. Repeat the search.

## TRU Problems

The following is the most commonly encountered TRU problem.

### TRU cannot connect to the receiver

- The receiver is turned off.
  - Ensure the receiver has power and is turned on.
- If using a cable, the cable's connectors are improperly attached.
  - Check that the cable connector is attached to the correct serial port.
  - Unplug the cable, then securely and properly reconnect it to the receiver.
- If using a cable, the cable is damaged.
  - Use an undamaged cable.
  - Contact a dealer to purchase a new cable.
- If using Bluetooth wireless technology, the incorrect port is selected.
  - Use a computer or receiver that has Bluetooth wireless technology enabled/installed.
  - Make sure the computer and receiver use the correct ports for communication. For the HiPer HR receiver, this is Bluetooth serial port A (btsp\a).

## Cleaning and Storing the Receiver

- Use a clean cloth moistened with neutral detergent or water.
- Never use an abrasive cleaner, ether, thinner benzene, or other solvents.
- Always make sure the receiver is completely dry before storing it. Dry any moisture with a soft, clean cloth.

## Getting Customer Support

If the troubleshooting hints and tips in this operator's manual fail to remedy the problem, contact your local Topcon dealer or visit the Topcon Support Website (<https://www.topconpositioning.com/support>) for technical support. For contact information, see "Getting Technical Support" on page 4.

# Specifications

This chapter provides specifications for the HiPer HR and its internal components.

## General Details

Table 15 lists the receiver's general specifications.

**Table 15. General Receiver Specifications**

<b>Physical</b>	
Enclosure	Magnesium Alloy housing
Color	Topcon Yellow / Gray bumper
Dimensions (mm)	115 (w) x 132 (h) x 115 (d)
Weight	1,172 g with batteries, 1,032 g without batteries
GNSS Antenna	Internal/External integrated full wave Fence Antenna™ Technology with internal ground plane
Battery	Internal and removable external (with support of run charge and hot swappable features)
Seals	Silicon (molding in color)
Key	1 Power Key – On/Off and Start/Stop Data Logging
LEDs	Nine status LEDs: <ul style="list-style-type: none"> <li>• Power</li> <li>• STAT</li> <li>• REC</li> <li>• Wi-Fi</li> <li>• Radio</li> <li>• BT</li> <li>• Cellular</li> <li>• BATT Internal</li> <li>• BATT External</li> </ul>
Ports	5 Ports: <ul style="list-style-type: none"> <li>• Power</li> <li>• Serial</li> <li>• USB</li> <li>• External GNSS antenna</li> <li>• External Radio antenna</li> </ul>
SIM Card	Secured and User accessible (inside external battery compartment)
<b>Environment</b>	
Operating Temperature	<b>Data logging and logging with external power</b> <ul style="list-style-type: none"> <li>• -20° C to +50° C (Battery power/Non-charging)</li> <li>• 0° C to +45° C (External power supply/Battery charging)</li> <li>• -40° C to +65° C per MIL-STD 810G</li> </ul>
Storage Temperature	-20° C to +85° C

**Table 15. General Receiver Specifications**

Humidity	100%
Ingress Protection	Dust and water ingress protected (IPX7 and IP6X)
Vibration	Random: Compliance with MIL-STD 810G - 514.6 - Cat.24 Mechanical: Compliance with MIL-STD 810G - 516.6
Drop	Survive 2m pole drop onto concrete surface Survive 1m handle drop
<b>Power</b>	
Batteries	Internal: Li-ion, 5200 mAh, 3.7 V; External: Li-ion 2900 mAh, 7.2 V
Battery Size	110 x 40 x 40 (mm)
Battery Weight	150 g (1 battery)
Operating Time  Average with modem "on" and 20 SVs tracked.  Using new, fully-charged batteries, operating at room temperature and transmitting at 1 Hz rate.	<p><b>For the HiPer HR with R2 Lite FH915 Modem:</b></p> <ul style="list-style-type: none"> <li>• Receive-only mode – 4 hours 30 min</li> <li>• Transmitting at 250 mW – 3 hours 15 min</li> <li>• Transmitting at 1 W – 2 hours 30 min</li> <li>• GSM/GPRS in urban areas – 4hours 30 min</li> </ul> <p><b>For the HiPer HR with R2 Lite UHF Modem:</b></p> <ul style="list-style-type: none"> <li>• Receive-only mode – 4 hours 15 min</li> <li>• Transmitting at 0.5 W – 3 hours 45 min</li> <li>• Transmitting at 1 W – 3 hours 30 min</li> <li>• GSM/HSPA in urban areas – 4 hours 15 min</li> </ul> <p><b>For the HiPer HR with Any Modem:</b> Modem off – 5 hours</p>
External Power	ODU-5
Input Voltage	9 to 28 VDC Internal Battery (3.7 V, 5200 mAh) External Battery (7.2 V, 2900 mAh)
Battery Operating Time	<ul style="list-style-type: none"> <li>• GGD Standalone: 5 hours</li> <li>• GGD UHF Rover: 4 hours 15 min</li> <li>• GGD UHF Base: 3 hours 30 min</li> <li>• G5 Standalone: 5 hours</li> <li>• G5 UHF Rover: 4 hours 15 min</li> <li>• G5 UHF Base: 3 hours 30 min</li> </ul>
Battery Charge	Connect the AC adapter to charge the internal battery. External battery must be removed, and charged with a recommended charger.
Charging Time	Approx. 4 hours for full charge using manufacturer-supplied battery charging cradle (p/n 1010975-02) and adapter (p/n 1005556-01).
On-board	Backup battery for timekeeping and almanac data storage; minimum 10 years of operation

**Table 15. General Receiver Specifications**

<b>GNSS Receiver Board Details</b>	
Number of Channels	448 GNSS channels Vanguard Technology™ with Universal Tracking Channels <sup>a</sup>
Tracked Signals	GPS: L1 C/A, L1C, L1P(Y), L2P(Y), L2C, L5 GLONASS: L1 C/A, L1P, L2C/A, L2P, L3C Galileo: E1, E5a, E5b, E5AltBOC, E6 BeiDou: B1, B2, B3 with ICD availability IRNSS: SPS-L5 SBAS: WAAS/EGNOS/MSAS QZSS: L1 C/A, L1C, L2C, L5, LEX L-band: 1525-1560 MHz
<b>Tracking</b>	
Multipath Reduction	Yes, code and carrier
PLL/DLL Settings	Bandwidth, order, adjustable
SBAS	WAAS/EGNOS/MSAS
Quartz Lock Loop (QLL)	Protection against vibrations
<b>Data</b>	
USB	USB Micro-A/B Host Mode – USB flash drive Device Mode – Mass storage, virtual serial
Formats	TPS proprietary, RTCM SC104 ver. 2.X, RTCM 3.X, CMR/CMR+, BINEX
Features	Up to 20 Hz update rate for real time position and raw data
ASCII Output	ASCII output NMEA 0183 version 2.x, 3.x, and 4.x
Data Logging	Support for sixteen simultaneous sessions Advanced file/folder system
RINEX	Onboard RINEX conversion
I/O Signals	1pps (combined with Serial A)
<b>Communication</b>	
Optional Radio Type	Integrated UHF (410-470 MHz), 12.5 kHz spacing (Satel, PDL, TrimTalk protocols) UHF Radio Range: 5-7 km typical; 15 km in optimal conditions <sup>b</sup> Integrated Spread Spectrum (915 MHz), FH915 & FH915+ protocols
<b>Memory</b>	
Type of Memory	SD (Secure Digital) non-removable card
Capacity	8 GB pre-installed
Number of Files	up to 3000
Logging Size	6.0 MB per hour (32 SVs, 1 sec, L1/L2, default message set)
Logging Interval	0.01 to 86400 seconds, depending on purchased options

**Table 15. General Receiver Specifications**

<b>Output</b>	
Communication Ports	<ul style="list-style-type: none"> <li>High-speed RS232 serial port (rimmed in green)</li> <li>USB 2.0 up to 480 Mbps               <ul style="list-style-type: none"> <li>USB device with mass storage and virtual serial port functionality</li> <li>USB host supporting mass storage devices under Micro USB A/B connector</li> </ul> </li> <li>Internal Cell Modem</li> </ul>
Bluetooth	<ul style="list-style-type: none"> <li>Internal Bluetooth:               <ul style="list-style-type: none"> <li>LongLink™</li> <li>Class 2</li> <li>BLE</li> </ul> </li> </ul>
Serial Port Specifications	RS232 Serial Port: <ul style="list-style-type: none"> <li>Baud rate: 460800, 230400, 115200 (default), 57600, 38400, 19200, 9600, 4800, 2400, 1200, 600, 300</li> <li>Flow control: RTS/CTS</li> <li>Length: 7 or 8 (default)</li> <li>Stop bit: 1 (default), 2</li> <li>Parity: None (default), Odd, Even</li> </ul>
Connectors	<ul style="list-style-type: none"> <li>UHF or FH915 Modem Antenna (BNC or reverse polarity TNC depending on modem type)</li> <li>PWR</li> <li>RS232 Serial</li> <li>USB 2.0 Micro-A/B</li> <li>External GNSS Antenna</li> </ul>
MINTER (LED Display)	<ul style="list-style-type: none"> <li>9 external LEDs</li> <li>ON/OFF control input (power button)</li> </ul>
<b>NMEA</b>	
NMEA 0183 Output	Ver. 2.x, 3.x, and 4.x
Messages	GGA, GLL, GMP, GNS, GRS, GSA, GST, GSV, HDT, RMS, ROT, VTG, UID, and ZDA
Output Interval	1Hz standard; 5, 10, 20, Hz optional
<b>DGPS</b>	
Correction Format	RTCM SC104 Ver 2.x and 3.x
RTCM Message Type	1, 3, 9, 31, 32, 34; user selectable
Process Interval	1Hz standard; 10, 20, 50, 100 Hz optional
Output Interval for RTCM Correction Data	1Hz standard; 10, 20, Hz optional
Elevation Mask	0 to 90 degrees (independent of data logging)
<b>Real-Time Kinematic Mode</b>	
Correction Format <sup>c</sup>	RTCM SC104 Version 2.x, RTCM 3.x, RTCM 3.X MSM3, CMR/CMR+ (Trimble compatible), TPS proprietary
Supported RTK Network Solutions	VRS, MAC, FKP

**Table 15. General Receiver Specifications**

Ambiguity Initialization	On-The-Fly (OTF): L1, L1/L2, L1/L2/L5
Baseline Length	Up to 50km, depending on atmospheric and multipath conditions
Initialize Time	from 1 second depending on the baseline length (D) and multipath conditions
Output Interval for CMR/RTCM	1Hz standard; 10Hz and 20 Hz optional
Elevation	0 to 90 degrees (independent of data logging)
Solution Mode	Delay (synchronization) mode Extrapolation (not synchronized) mode
Process Interval	1Hz standard; 10, 20, Hz optional
<b>Survey Modes</b>	
Base or Rover	Autonomous (standalone) DGPS (w/ user base) DGPS (w/ SBAS) Static Kinematic (continuous, stop and go) RTK (delay, extrapolation)
<b>Positional Accuracy<sup>d</sup></b>	
Static/Fast Static	L1 only: H: 3mm + 0.8ppm (x baseline length) V: 5mm + 1.0ppm (x baseline length) L1+L2: <sup>e</sup> H: 3mm + 0.3ppm (x baseline length) V: 5mm + 0.5ppm (x baseline length)
Kinematic, RTK, Network RTK	L1+L2: H: 5mm + 0.5ppm (x baseline length) V: 10mm + 0.8ppm (x baseline length)
RTK, TILT Compensated <sup>f</sup>	RTK accuracy, and additionally: H: 1.3mm/°Tilt; Tilt ≤ 10° H: 1.8mm/° Tilt, Tilt > 10°
Code Differential GNSS	H: <0.4m V: <0.6m
DGPS	H: <1.0m V: <1.5m
Autonomous Accuracy	H: <1.5m V: <2.0m
Cold Start Warm Start Reacquisition	<40 sec. <20 sec. <1 sec.
RTK Time-to-First-Fix (TTFF)	<20 sec.

a. Vanguard ASIC includes four additional dedicated channels for L-Band signal tracking.

b. Varies with terrain and operating conditions.

- c. CMR/CMR+ is a third-party proprietary format. Use of this format is not recommended and performance cannot be guaranteed. Use of industry standard RTCM 3.x is always recommended for optimal performance.
- d. Subject to multipath anomalies, interference, atmospheric conditions, and atypical satellite geometry. GNSS survey best practices must always be applied.
- e. The stated accuracy and reliability requires nominal observing conditions and strict processing methods. This includes use of dual frequency GPS measurements, precise (final) ephemerides during post-processing, calm ionospheric conditions, unobstructed visibility above 10 degrees, approved antenna calibration parameters, and an observation duration of 3 hours or more (dependent on baseline length). Accuracy and reliability may be subject to multipath anomalies and atypical satellite geometry. GNSS survey best practices must always be applied.
- f. Subject to successful TILT calibration, and an operating environment free of magnetic disturbances.

## R2 Lite UHF Internal Modem Board Details (Optional)

Table 16 lists the HiPer HR's optional R2 Lite UHF modem specifications.

**Table 16. R2 Lite UHF Internal Modem Board Specifications**

Operating Frequency Range	406MHz – 470MHz for Rover and Base
Channel Spacing	6.25 KHz / 12.5 KHz / 20KHz / 25KHz user-selectable
Signal Modulation	<ul style="list-style-type: none"> <li>• 4FSK</li> <li>• GMSK</li> </ul>
Communication Mode	Time division duplex
Supported Protocol(s)	TPS, PDL, Trimble, Satel 3AS
Transmitter Carrier Power	10, 20, 50, 100, 200, 500 and 1000 mW, user selectable
Receiver Sensitivity	GMSK: -115 dBm at $10^{-5}$ BER and 12.5 KHz spacing 4FSK: -106 dBm at $10^{-5}$ BER and 12.5 KHz spacing
Receiver Dynamic Range	-110 to -10 dBm
Serial Data Rate	115200 bps
Radio Data Rate	25KHz: 9600 bps for GFSK and 19200 pbs for 4FSK 12.5KHz: 4800 bps for GMSK and 9600 pbs for 4FSK
Antenna Type	Whip antenna
Antenna Connector	BNC
Error Correction	FEC on/off



## R2 Lite FH915 Internal Modem Board Details

Table 17 lists the HiPer HR's optional R2 Lite FH915 modem specifications.

**Table 17. R2 Lite FH915 Internal Modem Board Specifications**

Frequency Range Country/Region/Purpose Dependent	<ul style="list-style-type: none"> <li>• 902.2 MHz – 927.8 MHz (128 channels), USA</li> <li>• 915.2 MHz – 927.8 MHz (63 channels), AUS</li> <li>• 920.8 MHz – 927.8 MHz (36 channels), NZL</li> </ul>
Signal Structuring	Frequency-hopping spread spectrum
Hopping Pattern	5 per band, user-selectable
Hopping Channels	128 Channels
Occupied Bandwidth	± 100KHz
Frequency Modulation Technique	FSK, 64 Kbps
Network Topology	Point-to-point, Point-to-multipoint
System Gain	135dB
Operation Mode	Transmitter, receiver, repeater
Protocol	FH915, FH915+
Transmitter Carrier Power	250mW (24 dBm)/1 W (30 dBm), user selectable
Receiver Sensitivity	-105 dBm at $10^{-4}$ BER
Receiver Dynamic Range	105 dB
Serial Interface	RS232
Serial Data Rate	115200 bps
Effective Radio Link Rate	9600, 10200, 17000, 51000 bps, user selectable for FH915 3600, 4800, 6600, 19200 for FH915+
Error Correction	FEC (15.7), majority decoding
Antenna Type	1/2 wave articulating whip
Antenna Connector	Reverse polarity TNC
Antenna Gain	2.5 dBi

## Wi-Fi Module Details

Table 18 list the HiPer HR's Wi-Fi module specifications.

**Table 18. Wi-Fi Module Specifications**

Type	IEEE 802.11b,g,n compliant
Mode	Access point, Client
Power	20.0 dBm, 11 Mbps, CCK(b) 14.5 dBm, 54 Mbps, OFDM(g) 12.5 dBm, 65 Mbps, OFDM (n)

## Bluetooth Module Details

Table 19 list the HiPer HR's Bluetooth module specifications.

**Table 19. Bluetooth Module Specifications**

Range	up to 50 m (indoor); up to 1000 m (outdoor)
Type	Class 1
Service Classes	Miscellaneous
Supported Profiles	SPP, LongLink™
Frequency Country Code	North America and Europe

## Connector Specifications

The HiPer HR has one antenna connector for radio transmission/reception, and four port connectors for power, data communication, and the external GNSS antenna. Cellular, LongLink, Bluetooth, and Wi-Fi antennas are internal.

### Radio (Modem) RF Connector

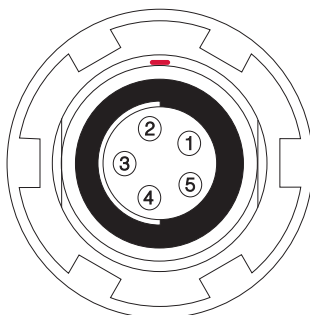
The modem connector (Table 20) is a reverse TNC connector for 915+ radio, and a BNC connector for UHF radio.

**Table 20. Modem Connector Specifications**

Modem	Type	Signal Type	Dir	Details
915+	Reverse TNC	Modem I/O	I/O	RF output from modem antenna
UHF	BNC	Modem I/O	I/O	RF output from modem antenna

## Power Connector

The power connector (Figure 47) is a sealed receptacle, 5 pin, ODU part number G80F1C-T05QF00-0000.



**Figure 47: Power Connector**

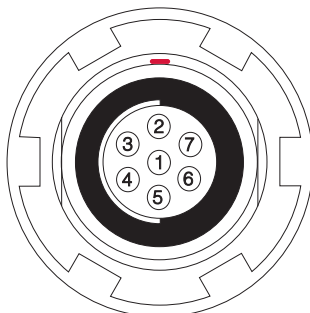
Table 21 describes power connector specifications.

**Table 21. Power Connector Specifications**

Number	Signal Name	Dir	Details
1	Power_INP	P	9 to 28 volts DC input
2	Power_INP	P	9 to 28 volts DC input
3	Power_GND	P	Ground, power return
4	Power_GND	P	Ground, power return
5	Aux_Power	P	9 to 28 volts DC input

## Serial C-RS232 Connector

The serial RS232 connector (Figure 48) is a sealed receptacle, 7 pin, ODU part number G80F1C-T07QC00-0000.



**Figure 48: Serial RS232 Connector**

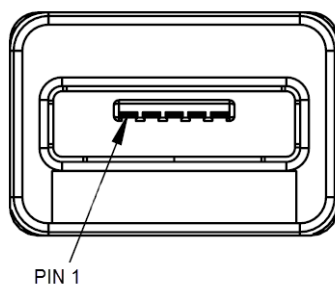
Table 22 gives the RS232 cable connector specifications.

**Table 22. RS232 Connector Specifications**

Number	Signal Name	Dir	Details
1			Not used
2	GND	-	Signal ground
3	CTS	I	Clear to send
4	RTS	O	Request to send
5	RXD	I	Receive data
6	TXD	O	Transmit data
7	PPS	O	1PPS

## Micro USB Connector

The Micro USB connector is a standard 5-pin micro USB A/B connector (Figure 49).



**Figure 49: USB Connector for GGD Options**

Table 23 gives the Micro USB connector specifications.

**Table 23. USB Specifications**

Number	Signal Name	Dir	Details
1	USB_PWR	P	Bus power input
2	USB D-	I/O	Data minus
3	USB D+	I/O	Data plus
4	ID	I	USB ID
5	GND	P	Ground

# Product Identification

The HiPer HR receiver, featuring Vanguard™ Technology, supports 452 channels, which are listed in Table 24 by serial number range.

**Table 24. Product Serial Numbers**

<b>Part Number</b>	<b>Description</b>	<b>Serial Number</b>
1006276-03	HiPer HR (No UHF/FH915)	1405
1006276-01	HiPer HR R2 Lite UHF	1407
1006276-02	HiPer HR R2 Lite FH915	1406

## General Warnings



To comply with RF exposure requirements, maintain at least 32cm between the user and the radio modem.



TPS receivers are designed for survey and survey related uses (that is, surveying coordinates, distances, angles and depths, and recording such measurements). This product should never be used:

- Without the user thoroughly understanding this manual.
- After disabling safety systems or altering the product.  
With unauthorized accessories.
- Without proper safeguards at the survey site.
- Contrary to applicable laws, rules, and regulations.



TPS receivers should never be used in dangerous environments. Use in rain or snow for a limited period is permitted.

## Battery Pack Warnings



Never attempt to open the casing of the removable batteries! Lithium-Ion batteries can be dangerous if mishandled!



Do not incinerate or heat battery pack above 185 degrees Fahrenheit (85 degrees Celsius). Excessive heat can cause serious damage and possible explosion.



Tampering with the batteries by end users or non-factory authorized technicians will void the battery's warranty.

- Do not attempt to open the battery pack or replace it.
- Do not disassemble the battery pack.
- Do not charge in conditions different than specified.
- Do not use other than the specified battery charger.
- Do not short circuit.
- Do not crush or modify.



Dispose of batteries in accordance with your local regulations.

## Receiver Warnings

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Tampering with the receiver by the end users or non-factory authorized technicians will void the receiver's warranty:

- Do not attempt to open the receiver and modify any of its internal components.
  - Do not charge in conditions different than specified.
  - Do not short circuit.
- 

## Usage Warnings

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If this product has been dropped, altered, transported or shipped without proper packaging, or otherwise treated without care, erroneous measurements may occur. The surface of the unit may overheat under maximum operating temperature conditions. Use caution when operating under this condition. No impact on functionality will occur if operating within the temperature limit. See "Specifications" on page 66 for operating temperatures. The owner should periodically test this product to ensure it provides accurate measurements. Inform TPS immediately if this product does not function properly.

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The following sections provide information on this product's compliance with government regulations for use.

## FCC Compliance

This equipment complies with FCC radiation exposure limits set forth for uncontrolled equipment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated with at least 32cm and more between the radiator and person's body (excluding extremities: hands, wrists, feet and ankles).

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Move the equipment away from the receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.
- Consult the dealer or an experienced radio/television technician for additional suggestions



To maintain modular approval of R2Lite FH915 modem in United States, only the antenna types that have been tested shall be used. It is permissible to use different antenna manufacturer provided the same antenna type and antenna gain (equal to or less than) is used.

Antenna Type: 1/4 wave antenna

Gain: 4.0 dBi max

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Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.

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## Industry Canada Compliance

This class A digital apparatus complies with Canadian ICES-003.

*Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.*

This device complies with Industry Canada licence-exempt RSS standard(s). 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 the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3(A)/NMB-3(A)



This radio Transmitter (IC:6050B-R2LITEFH915) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna Type: 1/4 wave antenna

Gain: 4.0 dBi max



Cet émetteur radio (IC : 6050B - R2LITEFH915) a été approuvé par Industrie Canada coopérer avec les types d'antenne énumérés ci-dessous avec le gain maximal autorisé est indiqué types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

Type d'antenne : antenne d'onde 1/4

Gain: 4.0 dBi max

## Community of Europe Compliance

The product described in this manual is in compliance with the R&TTE and EMC directives from the European Community.

### European Community Declaration of Conformity

#### European Community Declaration of Conformity with Radio Equipment Directive 2014/53/EU

The following standards were applied:

- ETSI EN 301 489-1 v1.9.2
- ETSI EN 301 489-3 v1.6.1
- ETSI EN 301 489-5 v1.3.1
- ETSI EN 301 489-7 v1.3.1
- ETSI EN 300 328 v1.8.1
- EN 55022:2010/AC:2011
- EN 55024:2010
- ETSI EN 301 511 v9.0.2
- EN 62311:2008
- ETSI EN 301 489-17 v2.2.1
- ETSI EN 301 489-24 v1.5.1
- ETSI EN 301 908-2 v6.2.1
- ETSI EN 301 908-1 v6.2.1
- ETSI EN 300 400-2 v1.4.1
- EN 60950-1:2006;+A11:2009+A1:2010+A12:2011+A2:2013

The following CE mark is affixed to the device:



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.

### Declaration of Conformity (R&TTE Directive 1999/5/EC)

esky [Czech]	( <i>Topcon</i> ) tímto prohlašuje, že tento ( <i>HiPer HR</i> ) je ve shod se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk [Danish]	Undertegnede ( <i>Topcon</i> ) erklærer herved, at følgende udstyr ( <i>HiPer HR</i> ) overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt ( <i>Topcon</i> ) dass sich das Gerät ( <i>HiPer HR</i> ) in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab ( <i>Topcon</i> ) seadme ( <i>HiPer HR</i> ) vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, ( <i>Topcon</i> ) declares that this ( <i>HiPer HR</i> ) is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Español [Spanish]	Por medio de la presente ( <i>Topcon</i> ) declara que el ( <i>HiPer HR</i> ) cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
[Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ ( <i>Topcon Positioning Systems, Inc.</i> ) ΔΗΛΩΝΕΙ ΟΤΙ ( <i>HiPer HR</i> ) ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français [French]	Par la présente ( <i>Topcon</i> ) déclare que l'appareil ( <i>HiPer HR</i> ) est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente ( <i>Topcon</i> ) dichiara che questo ( <i>HiPer HR</i> ) è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo ( <i>Topcon</i> ) deklar, ka ( <i>HiPer HR</i> ) atbilst Direktvas 1999/5/EK btiskajm prasbm un citiem ar to saisttajiem noteikumiem.
Lietuvi [Lithuanian]	Šiuo ( <i>Topcon</i> ) deklaruoja, kad šis ( <i>HiPer HR</i> ) atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart ( <i>Topcon</i> ) dat het toestel ( <i>HiPer HR</i> ) in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, ( <i>Topcon</i> ) , jiddikjara li dan ( <i>HiPer HR</i> ) jikkonforma mal-tijiet essenzjali u ma provvedimenti orajn rilevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, ( <i>Topcon</i> ) nyilatkozom, hogy a ( <i>HiPer HR</i> ) megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
Polski [Polish]	Niniejszym, ( <i>Topcon</i> ) , deklaruje, e ( <i>HiPer HR</i> ) spenia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.
Português [Portugues]	( <i>Topcon</i> ) declara que este ( <i>HiPer HR</i> ) está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	( <i>Topcon</i> ) izjavlja, da je ta ( <i>HiPer HR</i> ) v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensy [Slovak]	( <i>Topcon</i> ) týmto vyhlasuje, že ( <i>HiPer HR</i> ) spa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	( <i>Topcon</i> ) vakuuttaa täten että ( <i>HiPer HR</i> ) tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska [Swedish]	Härmed intygar ( <i>Topcon</i> ) att denna ( <i>HiPer HR</i> ) står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

## WEEE Directive

Following information is for EU-member states only:

The use of the symbol below indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, to 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 a supplier where you purchased the product or consult.



## Bluetooth Transmission Statements/Compliance

This Bluetooth device is compliant to the following profiles of the core spec version 2.1/2.1+EDR:

- Baseband
- HCI
- Link Manager
- Radio

The radio has been tested using the maximum antenna gain of 2.3 dBi and the Bluetooth qualification is valid for any antenna with the same or less gain.

## Korean KC-RF Compliance

인증정보 (Product Id Code): MSIP-RMM-T8S-6276

Applicant: Topcon Positioning Systems, Inc.

Type of equipment: GPS surveying device with Bluetooth, Wi-Fi, UHF radio, and Cellular modem.

Model Name: HiPer HR

Year of manufacture: 2016

Manufacturer and country of origin: Topcon Positioning Systems, Inc. U.S.A.

Applicant Code: T8S

## Korean KC-EMC Class A Statement

이 기기는 업무용 (A 급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다

This optional integrated cellular modem (PXS8) reference application complies with the requirements of the Korean Communications Commission (KCC). The certificate granted in accordance with KCC has the identifier: MSIP-CRM-T8S-PXS8.

## Japan Radio/Telecommunications Law Compliance

It is verified that Bluetooth Longlink, BLE, Wi-Fi, and UHF modules have been certified under clause 2, Article 58-2 of the radio Waves Act.

- Bluetooth LongLink – KCC-CRM-BGT-WT41-E
- BLE – MSIP-CRM-T8S-PAN1711
- Wi-Fi – MSIP-CRM-T8S-TiWi5
- R2Lite UHF – MSIP-CRM-T8S-R2LITEUHF

## Japan Bluetooth and Wi-Fi Module Compliance

The integrated Bluetooth LongLink, BLE, and Wi-Fi module reference application described on page 73 complies in accordance with the provisions of Article 38-24 paragraph 1 of Japan Radio Law. The certificate granted in accordance with Japan Radio Law has the identifier R 209-J00047 (Bluetooth LongLink), R 211-160821 (BLE), and R 211-160820 (Wi-Fi).

## Cellular Module Compliance

The optional integrated cellular modem (PXS8) reference application complies with the requirements of the Japanese Telecommunications Business Law and Ordinance Concerning Conformity Certification of Specified Radio as well as with the requirements of the Japanese "Radio Law" and "Ordinance Concerning Technical Conditions Compliance Approval and Certification Type for terminal Equipment."

The certificate granted in accordance with the Telecommunications Business Law has the identifier R 211-160813.

The certificate granted in accordance with the "Radio Law" has the identifier T AD160012211.

# Warranty

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Topcon laser and electronic positioning equipment are guaranteed against defective material and workmanship under normal use and application consistent with this Manual. The equipment is guaranteed for the period indicated, on the warranty card accompanying the product, starting from the date that the product is sold to the original purchaser by Topcon's Authorized Dealers.<sup>1</sup>

During the warranty period, Topcon will, at its option, repair or replace this product at no additional charge. Repair parts and replacement products will be furnished on an exchange basis and will be either reconditioned or new. This limited warranty does not include service to repair damage to the product resulting from an accident, disaster, misuses, abuse or modification of the product.

Warranty service may be obtained from an authorized Topcon warranty service dealer. If this product is delivered by mail, purchaser agrees to insure the product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location and to use the original shipping container or equivalent. A letter should accompany the package furnishing a description of the problem and/or defect.

The purchaser's sole remedy shall be replacement as provided above. In no event shall Topcon be liable for any damages or other claim including any claim for lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, the product.

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1. The warranty against defects in a Topcon battery, charger, or cable is 90 days.

# Glossary

## B

**BDS** – BeiDou Navigation Satellite System maintained and operated by China. See also, BeiDou.

**Base Station** – A GNSS receiver set up over a known point, which is used to derive correction information for nearby Rover (mobile) GNSS receivers.

**BeiDou** – Navigation Satellite System maintained and operated by China. See also, BDS.

**Bluetooth®** – Often used in place of cables, Bluetooth is open wireless technology for exchanging data over short distances from fixed and mobile devices.

## C

## G

**GALILEO** – The satellite system currently being maintained and operated by the European Union (EU) and European Space Agency (ESA).

**GGD** – GPS + GLONASS Dual Frequency signal tracking.

**GLONASS** – The GLObal NAVigation Satellite System maintained and operated by the Russian Federation.

**GNSS** – Global Navigation Satellite Systems, such as GPS and GLONASS.

**GPS** – The Global Positioning System maintained and operated by the United States Department of Defense.

## L

**L1** – The primary L-band carrier used by GPS and GLONASS satellites to transmit satellite data.

**L2** – The secondary L-band carrier used by GPS and GLONASS satellites to transmit satellite data.

**Light-Emitting Diode (LED)** – Used as indicator lights on the receiver to display the status of the receiver's components and control receiver operations.

## M

**MAGNET Field™** – Data controller software that is part of the MAGNET software system.

**MAGNET Office™** – Post-processing and CAD solution software for surveying and grade application. It is part of the MAGNET software system.

**MINTER** – The receiver's Minimum INTERface used to display and control data input and output.

## N

**Network RTK** – Collects satellite observations from the reference stations within the network and sends RTK corrections to the Rover.

## O

**Option Authorization File (OAF)** – This enables the specific features that a customer purchases.

## P

**Phase Center of Antenna** – The point from which the electromagnetic radiation spreads spherically outward, with the phase of the signal being equal at any point on the sphere.

**Pocket-3D** – Field controller software by Topcon that supports both GNSS and TS.



**R**

**Real-Time Kinematic (RTK)** – A precise method of real-time surveying. RTK enables you to check the measurement quality without having to process the data.

**Root Mean Square (RMS)** – Statistical measure of the magnitude of a varying quantity.

**Rover** – A mobile GNSS receiver and data collector used for determining location in the field.

**S**

**Satellite-Based Augmentation Systems (SBAS)** – Complements existing global navigation systems. SBAS transmits differential corrections and messages for navigation satellites that are within sight of a network or reference stations in a wide area, such as a continent.

**Static Survey** – Typically uses a network or multiple baseline approach for positioning. This method provides the highest accuracy and requires the longest observation times.

**T**

**Topcon Receiver Utility (TRU)** – Hardware configuration software for receivers and peripheral devices. TRU is included on the GPS+ Software CD that accompanied your receiver.

**U**

**Universal Serial Bus (USB)** – A connection standard used by devices, such as a receiver, controller, computer, etc.



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