



# MR-2

## GNSS Receiver

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### Operator's Manual



# **MR-2 GNSS Receiver Operator's Manual**

Part Number 1011907-01

Rev A

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# Preface

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## Manual Conventions

This manual uses the following conventions:

Convention	Description	Example
<b>Bold</b>	Menu, or drop-down menu selection	<b>File ▶ 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



The MR-2 receiver from Topcon is a rugged GNSS modular receiver that delivers proven Topcon Vanguard and HD2 technology in a compact and easy to integrate package. The MR-2 receiver incorporates 226 universal tracking channels and is capable of tracking GPS, GLONASS, Galileo, BeiDou, and QZSS signals along with SBAS and L-band augmentation satellites. Dual antenna input support on the receiver extends capabilities to enable precision heading determination (and inclination) in addition to RTK positioning.



**Figure 1: MR-2 – Front View**



Figure 1 for representation purposes only. Final unit will be different.

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## Receiver Features

The MR-2 offers complete IP67 protection against dust and water ingress, in addition to superior resistance to vibration and shock. 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.

The MR-2 features include:

- Vanguard technology for future proof tracking of GPS, GLONASS, Galileo, BeiDou, and QZSS satellite signals
- 226 universal tracking channels
- Proven Topcon GNSS technology delivers precise RTK positioning at up to 100 Hz
- Dual antenna inputs support superior heading and determination simultaneously with RTK using Topcon's HD2 technology
- Simple and robust communication interface supports easy system integration and setup
- High speed Ethernet communication
- High-performance signal acquisition and tracking in the most challenging environments
- 1PPS (pulse-per-second) – a signal providing a very accurate reference source for external devices

## Unpacking the Receiver

When you unpack the MR-2 receiver, verify that your receiver is not damaged from shipment. If it is damaged, contact your Topcon dealer or Topcon technical support (see “Getting Technical Support”). After you unpack your receiver, visit myTopcon (<https://www.topconpositioning.com/support>) and download the following items.

- Warranty card
- Topcon Receiver Utility (TRU) software with online help embedded in the software
- TPStoRinex
- Topcon Link
- Occupation Planning
- MR-2 Operator’s Manual
- GNSS Receiver Interface Language (GRIL) Reference Manual
- B125 Integrator’s Guide

You can purchase the following accessories for the MR-2 receiver from Topcon:

- Cable, Power/Charger (P/Ns):
  - 14-008052-01 (US)
  - 14-008053-01 (AUS)
  - 14-008054-01 (EUR)
- Power supply with 48-in. Safeco connector (p/n: 22-034101-01)
- External antenna, such as the Topcon PG-F1
- External antenna cable
- Serial cable – included with the device (p/n: 14-008207-02)
- Power Adapter – included with the device (p/n: 1000231-01)
- Optional Ethernet cable (p/n: 1008816-01)

## Getting Technical Support

Before contacting a Topcon customer representative, see “Troubleshooting” on page 53 for some solutions that may fix issues you might have with the receiver.

Contact your local Topcon dealer or visit the myTopcon website at <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:

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 and frequency or patterns.
2. Receiver information and configuration settings. For receiver information, click **Information** in TRU, select **Save to File**, enter a file name, and save it to the computer.
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 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 website, visit <http://www.topconpositioning.com>.

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

# Getting Acquainted

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This chapter describes the standard components and accessories included with your receiver.

## Communication and Power Port

Both the serial and Ethernet communication connectors of the MR-2 feature a power input.

### Power Input

The serial and Ethernet connectors on the MR-2 accept an external 9 to 36 VDC power source. Connect the MR-2 to a power source to turn on the receiver. When the LED is lit solid, the MR-2 is receiving power. Disconnect the MR-2 from the power source to begin the shutdown process. The power LED will remain on until the end of the shutdown process (see "Turning the Receiver On/Off" on page 19 for more information).

## Com Features

- Supports serial data using EIA RS-232C-level signals.
- Supports baud rates of 115,200 and higher.
- Supports RS232 RX and TX signals.
- Supports simultaneous output of position and status data along with input of control commands and/or differential corrections for RTK.
- Supports CAN
- Supports GNSS board firmware upgrades.
- Supports input of differential RTK corrections from an external radio source.

### PPS Connector

Modern synchronization and time transfer applications require a highly-reliable timing source. The MR-2 supports a 1PPS (pulse-per-second) signal, which provides a very accurate reference source for external devices. You can program the period, offset, edge, and time reference of the 1PPS signal using GRIL commands.

The 1PPS signal has the following attributes:

- Amplitude (on 50 Ohm load):  $\geq 2$  Volts
- Polarity: Positive
- Normal pulse width: 3.3 ms

### Ethernet Connector

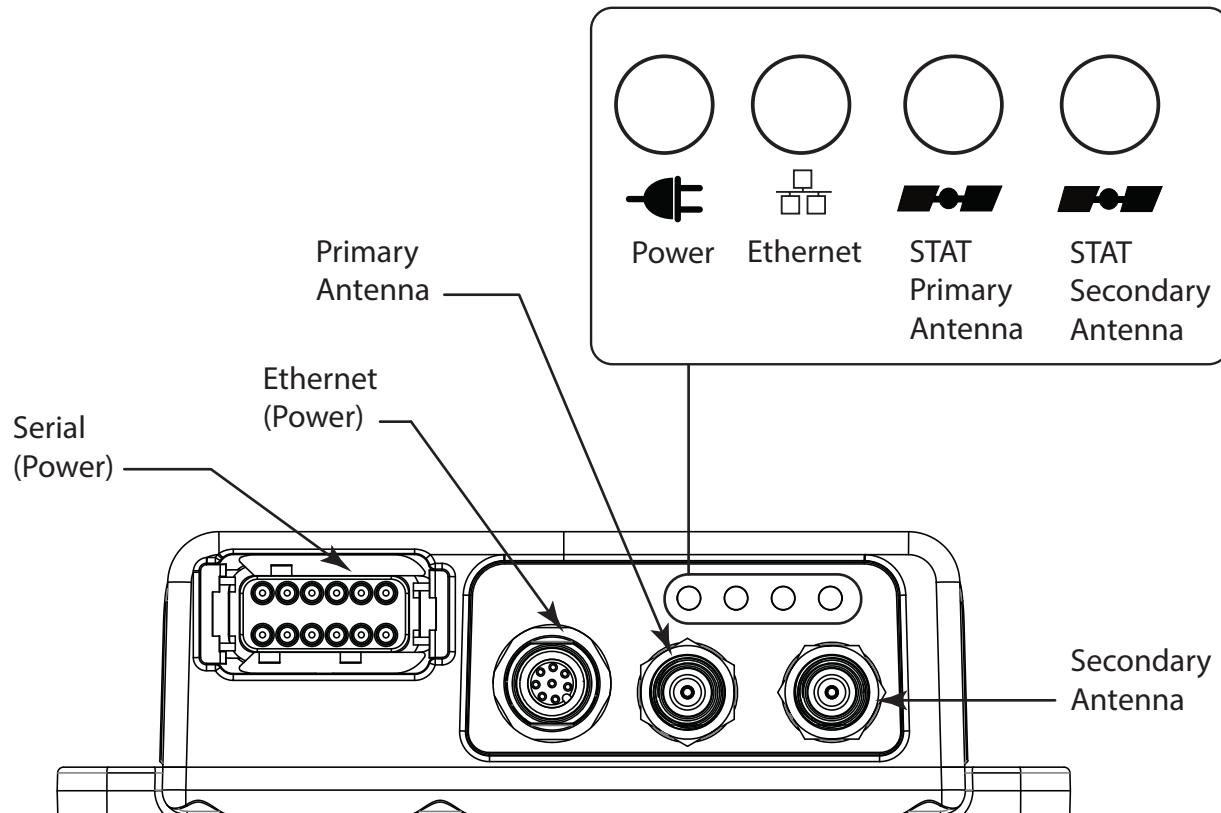
Attach the Ethernet cable to the breakout, which splits the signal to the RJ45 Ethernet port and the SAE power port.

## Antenna Connectors

Figure 2 shows the antenna connectors for the MR-2. The primary antenna connector is used to connect a GNSS antenna for precise RTK positioning. You can connect another GNSS antenna to the secondary connector for heading and inclination determination. For more information, see "Step 4: Connect Dual Antennas (HD2)" on page 14.

For complete MR-2 operation, the external antenna supports at least GPS L1C/A, L2C, L2P (Y), GLONASS L1/L2, and SBAS (WASS/MSAS/EGNOS) signal tracking and accept voltage at +4.75 to +5.10 VDC at 0-70 mA.

Topcon guarantees performance specifications of the MR-2 only when used with Topcon antennas, such as PG-F1 GNSS antennas.



**Figure 2: MR-2 Interface**

## Option Authorization File (OAF)

Topcon Positioning Systems issues an Option Authorization File (OAF) to enable the specific options that customers purchase. An Option Authorization File allows customers to customize and configure the receiver according to particular needs, thus only purchasing those options needed.

Typically, all receivers ship with a temporary OAF that allows it to be used for a predetermined period of time. When the receiver is purchased, a new OAF permanently activates the desired, purchased options. Receiver options remain intact when clearing the NVRAM or resetting the receiver.

The OAF enables the following kinds of functions:

- Signal tracking (standard L1 GPS; optional L2, signal tracking)
- Update rate (standard 1Hz; optional 5, 10, 20, 50, or 100 Hz)
- RTK at 1, 5, 10, 20, 50, and 100 Hz
- RTCM/CMR Input/Output
- 2-D attitude determination
- Advanced multipath reduction
- Satellite Based Augmentation System positioning (WAAS/EGNOS/MSAS)
- RS-232C (2x) connectivity



Visit the TPS website (or consult a TPS dealer) for a complete list of available OAF options, details, and upgrades.

## Twin Antenna System (HD2)

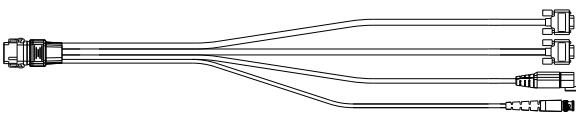
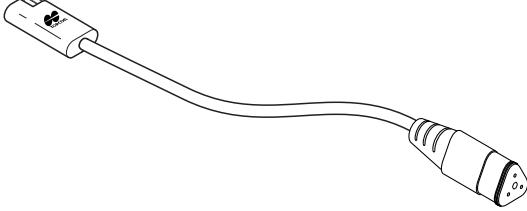
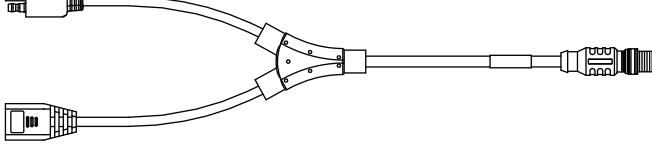
The MR-2 receiver includes a twin antenna system called HD2. It derives 2D attitude parameters, namely the heading and inclination, of the baseline between two antennas mounted on a platform. For more information, see "Twin Antenna System for Heading and Inclination Determination (HD2)" of the *B125 Integrator's Guide*.

# Cables and Accessories

## Standard Cables

The MR-2 package includes a cable harness that breaks out two serial communication ports and a power supply connection to the receiver. Table 1 lists these cables.

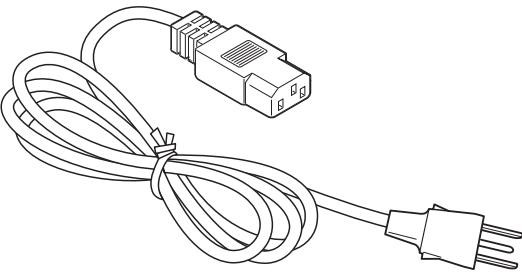
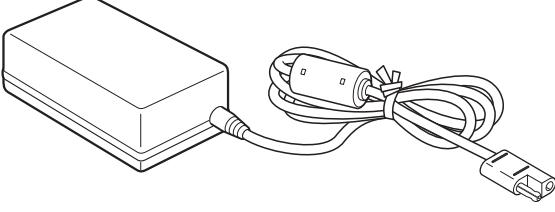
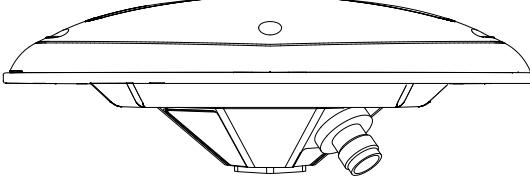
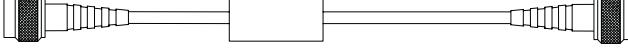
**Table 1. MR-2 Package Cables**

Cable Description	Cable Illustration
<b>Cable Harness</b> <ul style="list-style-type: none"> <li>Deutsch 3-pin connector: Connects the receiver to a 9-36 VDC power supply.</li> <li>DB-9 connectors: Connects the receiver to external devices (controller or computer) for data transfer and receiver configuration.</li> <li>BNC connector: Provides accurate time transfer to external devices.</li> </ul> p/n: 14-008207-02LF	
<b>Power Adapter</b> Converts the Deutsch 3-pin connector to an SAE connector for connection to a 9-36 VDC power supply. p/n 1000231-01	
<b>Ethernet Cable</b> <ul style="list-style-type: none"> <li>SAE connector: Connects the receiver to a 9-36 VDC power supply.</li> <li>Ethernet connector: Connects the receiver to external devices (controller or computer) for data transfer and receiver configuration.</li> <li>M12 connector: Connects to the M12 connector on the receiver.</li> </ul> p/n: 1008816-01	

## Receiver Accessories

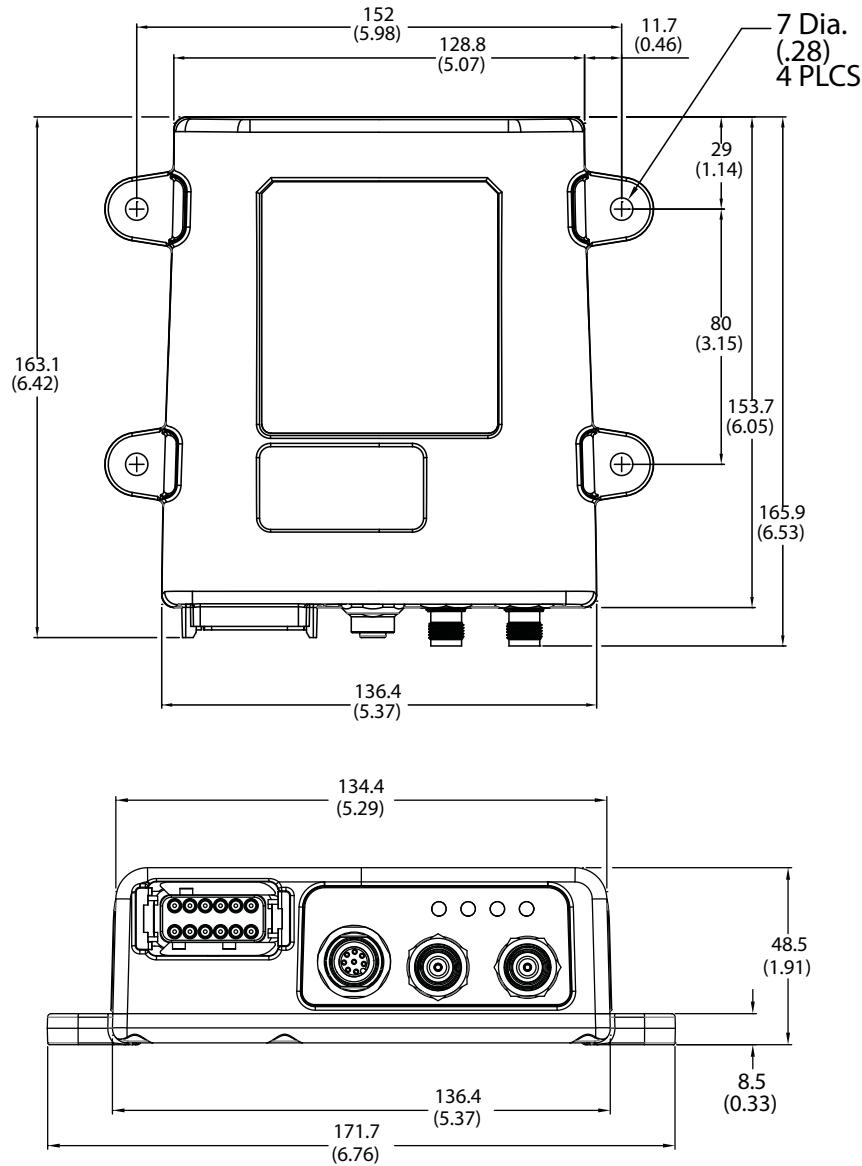
The MR-2 has a variety of accessories to increase its ease of use and facilitate installation. Table 2 lists these accessories. For more details on the optional accessories available for the MR-2, contact a local Topcon dealer.

**Table 2. MR-2 Package Cables**

Cable Description	Cable Illustration
<b>Cable, Power/Charger</b> Connects the power supply unit to a grounded outlet. p/n 14-008052-01 (US) p/n 14-008053-01 (AUS) p/n 14-008054-01 (EUR)	
<b>Power Supply Unit</b> Converts the alternating current (AC) supplied from an electrical outlet to a direct current (DC) for powering the receiver. The unit connects to the receiver via the power adapter cable. p/n 22-034101-01	
<b>Full Wave Antenna</b> For optimal performance, the MR-2 should be paired with a high precision Topcon GNSS antenna. The PG-F1 offers high performance signal tracking for full constellation operation, while the PG-S1 may be used for dual frequency configurations.	
<b>Cable, External Antenna</b> Connects the external antenna to the receiver.	

## Mounting the Receiver

The four mounting flanges on the MR-2 housing enable you to easily secure the receiver in any orientation, onto any hard surface, with the strength to withstand tough environmental conditions (Figure 3).

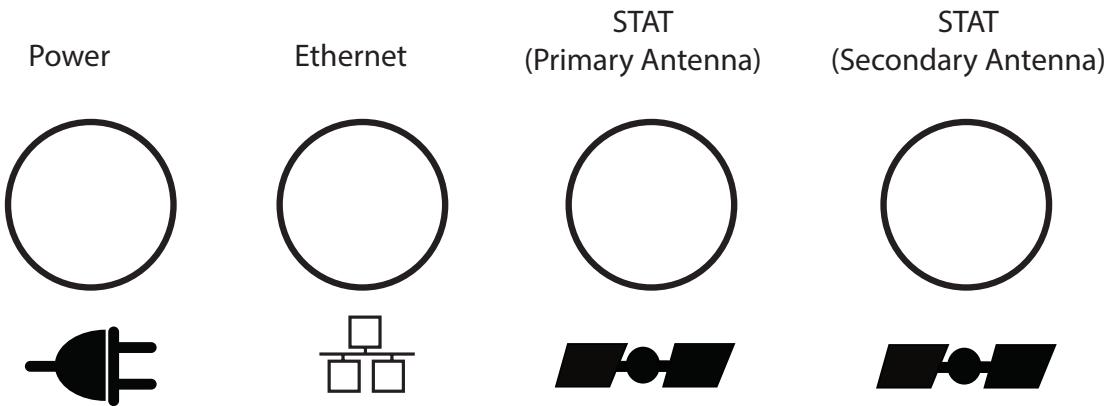


**Figure 3: MR-2 Mounting Dimensions**

# LED Indicators



The LED indicators enable you to control receiver power and data recording. The LEDs display the status of the power, Ethernet connectivity, and satellite tracking. This chapter describes the different LED blink patterns and what they mean.



**Figure 4: LED Indicators**

## Receiver Status LEDs

There are four status LEDs to provide you information about power, Ethernet connectivity, and tracked satellites. This section describes the color and behavior of each LED.

### Power LED

The Power LED indicates whether the receiver is on or off, and to indicate the status and type of OAF loaded.

**Table 3. Power LED Patterns**

LED Color	Description
	When the LED is off, the receiver is off.
	When the LED is blinking or solid, the receiver is on and an OAF is loaded. See below for the types of OAF.
	When the LED continuously blinks between red, green and yellow, a standalone positioning OAF is loaded.
	When the LED is solid green, an RTK-enabled OAF is loaded.

## Ethernet LED

The Ethernet LED indicates the status of the Ethernet connection.

**Table 4. Ethernet LED Patterns**

Display	Description
	Solid Red: No Ethernet connection.
	Solid Green: Ethernet Connection established.

## Satellite Tracking (STAT) LED

There are two LEDs to indicate the status of satellite tracking. If your receiver has only one B125 board, only the STAT LED for the primary antenna will operate (Figure 4 on page 10). If your receiver has a second B125 board both STAT LEDs operate. The number of blinks the LED makes indicates the number of satellites for that constellation. Table 5 describes the blink patterns.

**Table 5. STAT LED**

Blink Order	Definition
1	Green blink per tracked GPS satellite
2	Dark once
3	Yellow blink per tracked GLONASS satellite
4	Dark once
5	Cyan blink per tracked Galileo satellite
6	Dark once
7	Magenta blink per tracked Compass satellite
8	Dark once
9	Blue blink for each QZSS satellite
10	<ul style="list-style-type: none"> <li>One red blink: Receiver is not tracking satellites or does not have a valid position solution</li> <li>Dark: Receiver has a valid position solution</li> </ul>

# System Setup

.....

Before using the MR-2, you will need to connect the necessary cables and antenna(s), and install the Topcon software, which enables you to configure the receiver. This chapter describes how to set up your new receiver.

## Cable and Antenna Connections

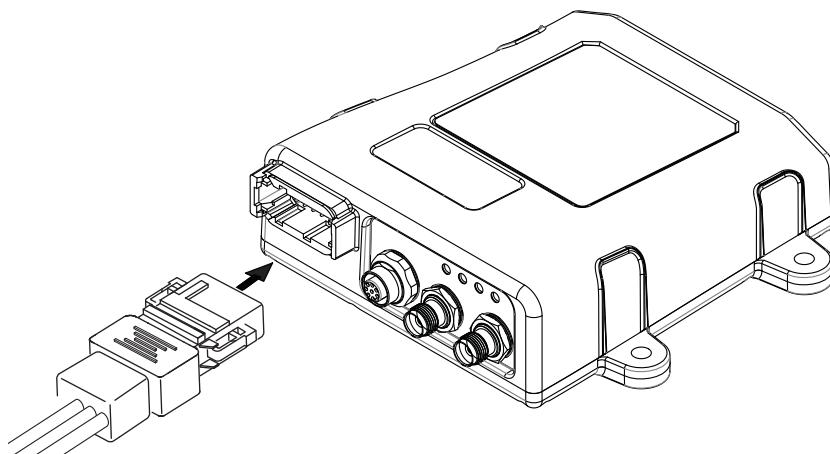
The MR-2 receiver is designed to use either a serial cable or Ethernet cable for full operation. The cable and antenna setup for serial and Ethernet is described below.

### Serial Cable Setup

#### Step 1: Power the Receiver

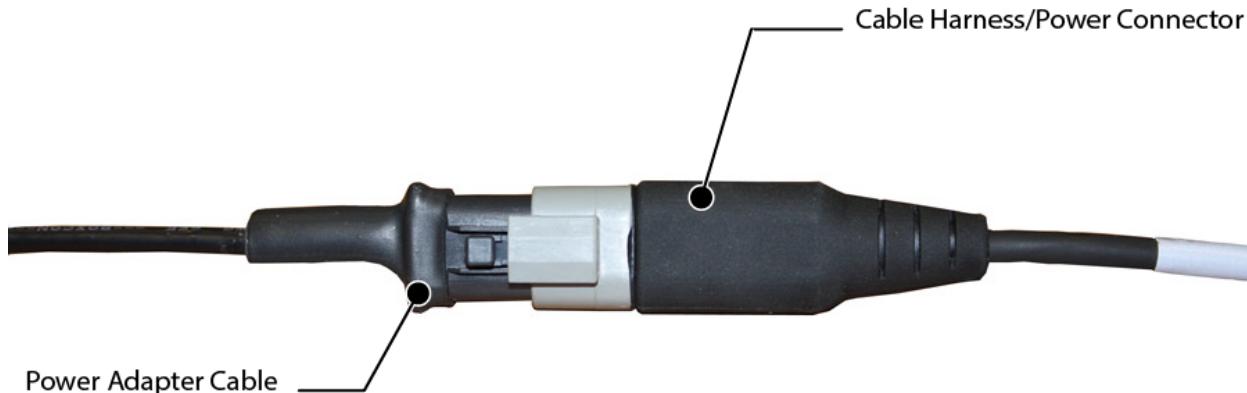
You can apply power to both ports at the same time. The receiver draws power from the port with the higher voltage. If both voltages are the same, power will passively switch between both ports. The switching happens within operating range, and causes no drop in power. The receiver will work without interruption.

1. Mount the receiver to a suitable hard surface where the LED is visible and the ports are accessible. See also "Mounting the Receiver" on page 9.
2. Connect the supplied serial cable harness to the power/communication port (Figure 5).



**Figure 5: Connecting the Serial Cable Harness to the Receiver**

3. Connect the adapter cable to the power connector of the cable harness, as shown in Figure 6.



**Figure 6: Power Adapter Cable to the Power Connector**

4. Connect the other end (SAE connector) of the power adapter cable to a 9-36 VDC power supply unit with an SAE connector, as shown in Figure 7.



**Figure 7: Power Adapter Cable to Power Supply Unit**

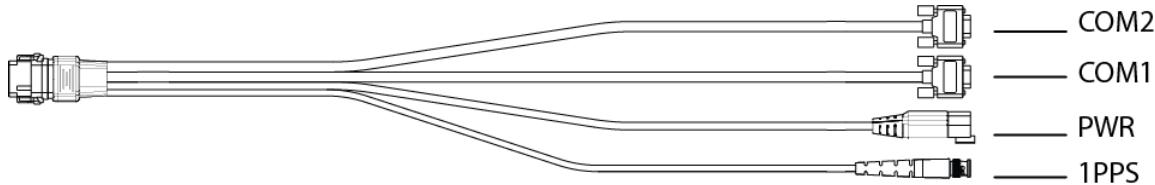


You can also create a custom cable to connect a 9-36 VDC directly to the 3-pin Deutsch connector on the break-out harness.

5. Verify the power supply is on and supplying power.
6. Make sure the MR-2 LED is lit solid, which indicates it is receiving power.

## Step 2: Connect to a Computer or Display Unit and RTK Correction Source

1. Connect the COM1 serial port connector on the cable harness to the serial port on the computer or display.
2. (Optional) If the MR-2 is RTK enabled, connect the COM2 serial port connector to the serial port of the RTK correction source.

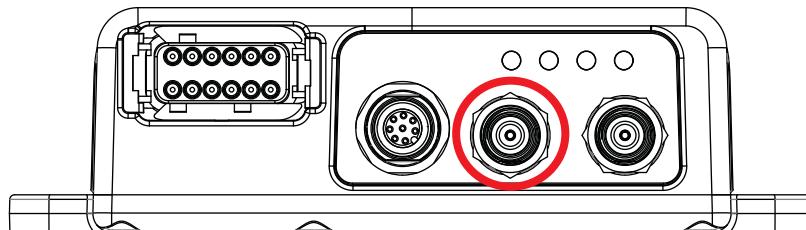


**Figure 8: Cable Harness – COM1 and COM2 Serial Ports**

## Step 3: Connect a Single Antenna

To connect a single external antenna for precise positioning:

1. Mount the GNSS antenna on a rigid surface.
2. Connect the antenna cable to the primary antenna connector circled in red in Figure 9.



**Figure 9: Primary Antenna Connector**

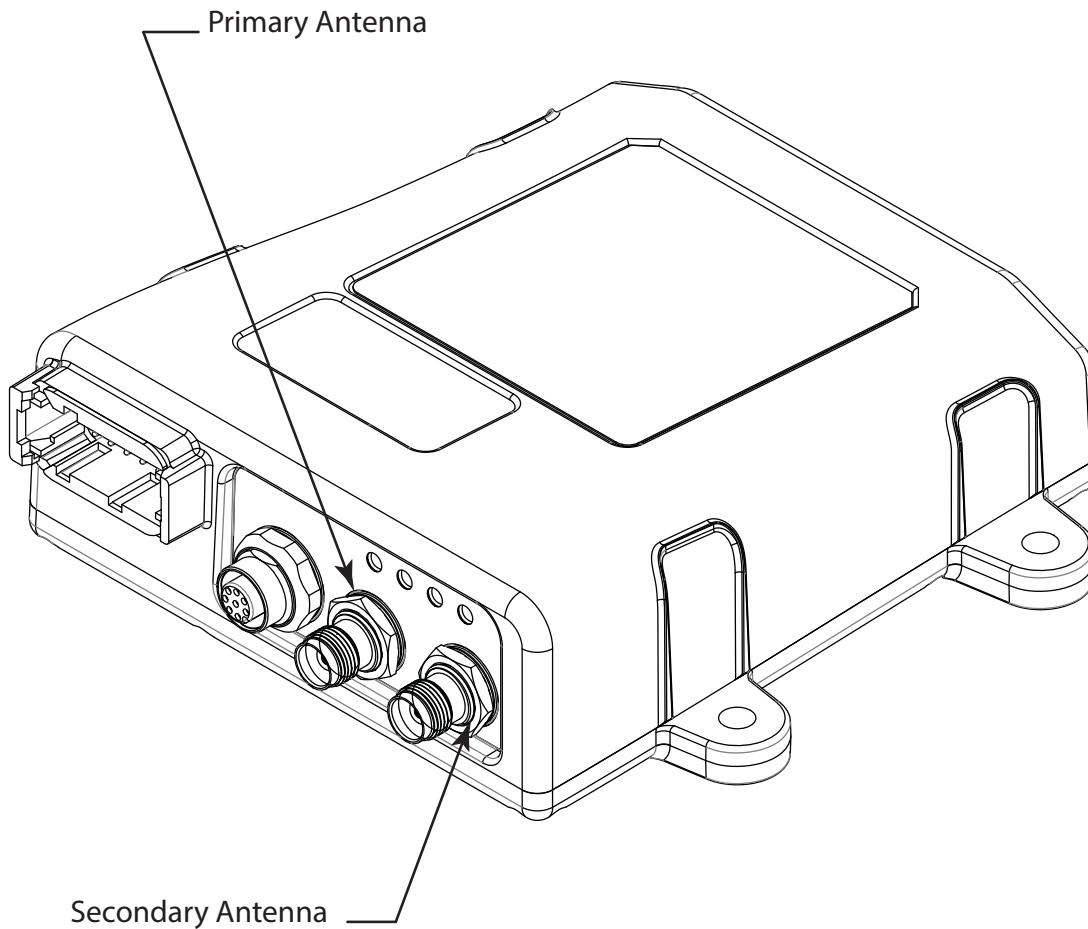
3. Make sure the antenna cable is connected to the antenna.

## Step 4: Connect Dual Antennas (HD2)



HD2 Heading Determination (OCTO) OAF options must be enabled, in addition to a minimum of GPS L1/L2 signal tracking.

1. Mount both antennas on a rigid platform. The recommended antenna orientation is parallel to the direction of travel; however, you can use any azimuth.
2. Connect the primary antenna cable to the rear antenna and to the primary antenna connector (Figure 10) of the MR-2.



**Figure 10: Antenna Connectors**

3. Connect the secondary antenna cable to the front antenna and the secondary antenna connector of the MR-2.
4. Enable HD2 moving base corrections at the primary antenna, and HD2 heading determination at the secondary antenna. See the *B125 Integrator's Guide* for more information.

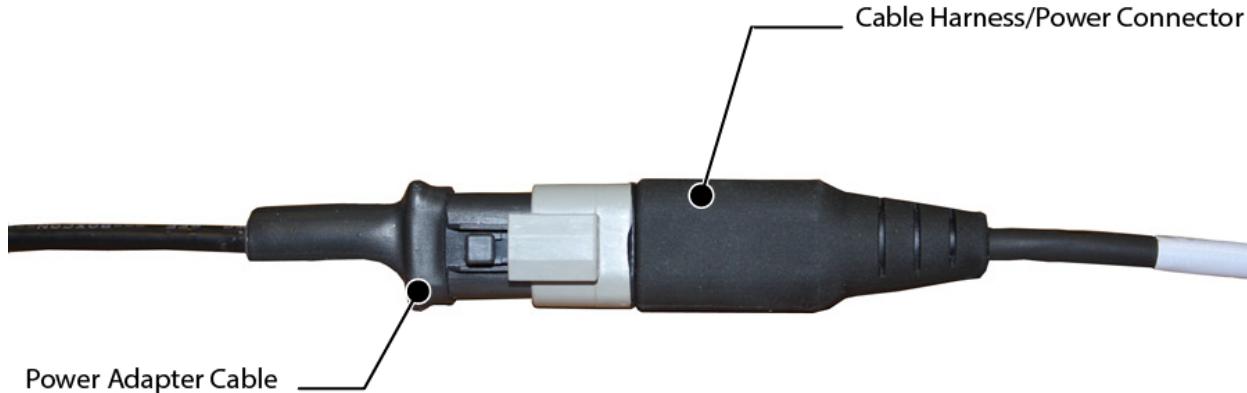
## Step 5: Connect to a PPS Signal

1. Connect the PPS connector on the cable harness to a PPS input port of a suitable instrument.
2. Configure the PPS output with GRIL commands. To do this, see the *B125 Integrator's Guide*.

## Ethernet Cable Setup

### Step 1: Power the Receiver

1. Mount the receiver to a suitable hard surface where the LED is visible and the ports are accessible (see "Mounting the Receiver" on page 9).
2. Connect the adapter cable to the power connector of the cable harness, as shown in Figure 11.



**Figure 11: Power Adapter Cable to the Power Connector**

3. Connect the other end (SAE connector) of the power adapter cable to a 9-36 VDC power supply unit with an SAE connector, as shown in Figure 12.



**Figure 12: Power Adapter Cable to Power Supply Unit**

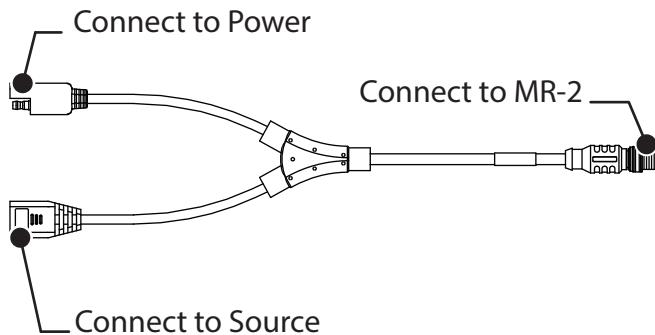


You can also create a custom cable to connect a 9-36 VDC directly to the 3-pin Deutsch connector on the break-out harness.

4. Verify the power supply is on and supplying power.
5. Make sure the MR-2 LED is lit solid, which indicates it is receiving power.

## Step 2: Connect the Ethernet Cable

The MR-2 allows up to five virtual TCP port connections using the same IP address. Virtual TCP ports can be used to connect the device to a PC (for control) and to an RTK source. Figure 13 shows the connections for the Ethernet cable.



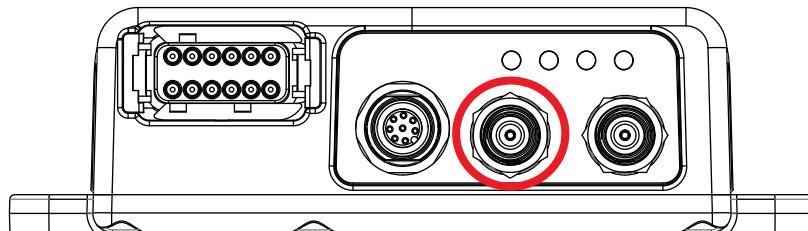
**Figure 13: Ethernet Cable Connections**

1. Connect the Ethernet cable to the MR-2.
2. Connect the RJ45 end of the Ethernet cable to a source.
3. Connect the SAE end of the Ethernet cable to a power source.

## Step 3: Connect a Single Antenna

To connect a single external antenna for precise positioning:

1. Mount the GNSS antenna on a rigid surface.
2. Connect the antenna cable to the primary antenna connector circled in red in Figure 14.



**Figure 14: Primary Antenna Connector**

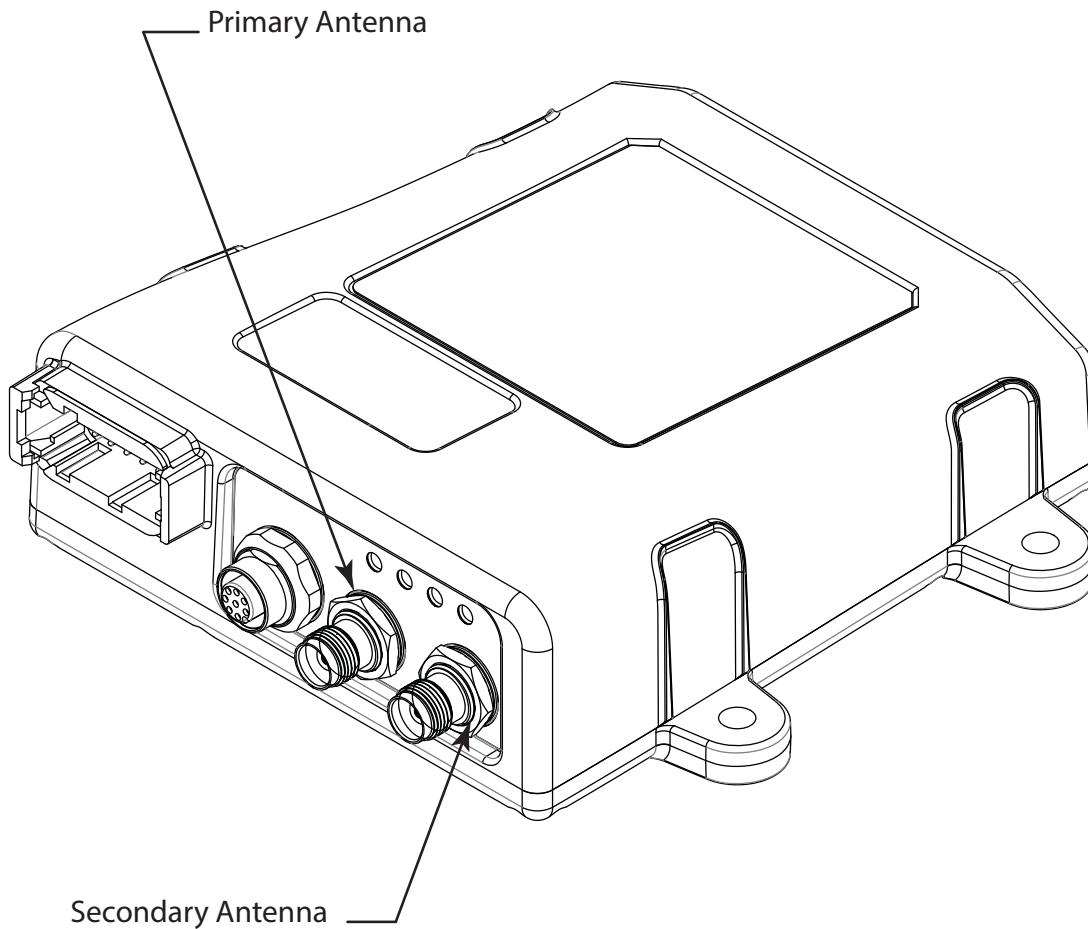
3. Make sure the antenna cable is connected to the antenna.

## Step 4: Connect Dual Antennas (HD2)



HD2 Heading Determination (OCTO) OAF options must be enabled, in addition to a minimum of GPS L1/L2 signal tracking.

1. Mount both antennas on a rigid platform. The recommended antenna orientation is parallel to the direction of travel; however, you can use any azimuth.
2. Connect the primary antenna cable to the rear antenna and to the primary antenna connector (Figure 15) of the MR-2.



**Figure 15: Antenna Connectors**

3. Connect the secondary antenna cable to the front antenna and the secondary antenna connector of the MR-2.
4. Enable HD2 moving base corrections at the primary antenna, and HD2 heading determination at the secondary antenna. See the *B125 Integrator's Guide* for more information.

## Step 5: Connect to a PPS Signal

1. Connect the PPS connector on the cable harness to a PPS input port of a suitable instrument.
2. Configure the PPS output with GRIL commands. To do this, see the *B125 Integrator's Guide*.

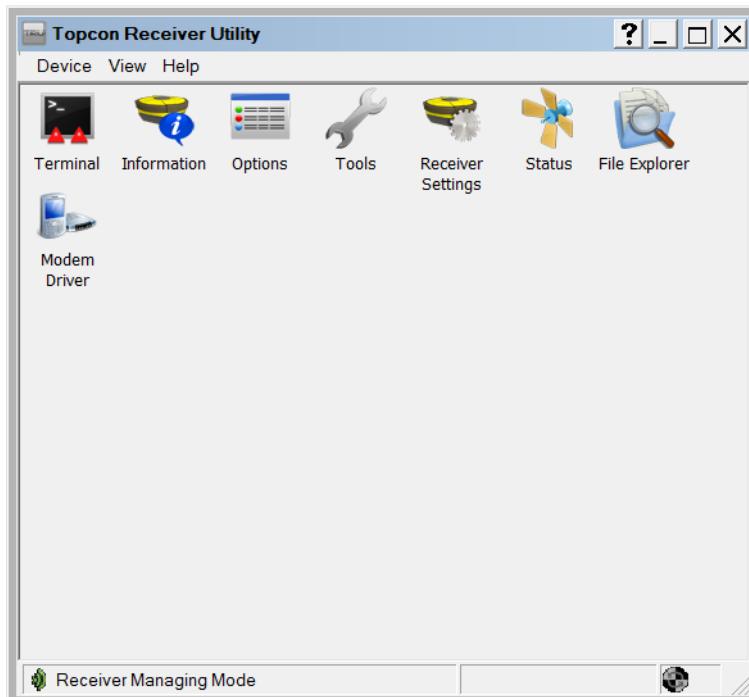
## Install the Topcon Receiver Utility (TRU)

TRU is Topcon's GNSS receiver configuration software. You can download the software from Topcon's myTopcon Website (<https://www.topconpositioning.com/support>). For more information on any of the procedures in this section or on TRU, refer to the *TRU Online Help* embedded in the software.

Computer requirements for TRU are: Microsoft® Windows XP/Vista/7 operating system, an RS-232C port, or an Ethernet port. Mobile editions are also available for Topcon supported devices equipped with serial connections running WinCE 5, WinCE 6, WinMobile 6.1/6.5/6.5.3.

To install and run TRU on a computer:

1. Visit myTopcon (<https://www.topconpositioning.com/support>) and download the file.
2. Locate the TRU.exe file on your computer, and double-click the file to run the installation wizard.
3. Following the on-screen instructions. After installing, a TRU shortcut appears on your desktop.
4. To start TRU, double-click the shortcut, or select it from the Start menu. The TRU main screen appears (Figure 16).



**Figure 16: TRU – Main Screen**

# Managing Power

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

## Turning the Receiver On/Off



Use a 5A fuse if connecting directly to a vehicle DC power source.

1. To turn on the receiver, connect either a serial or Ethernet cable from the unit to a power source.
2. To turn off the receiver, disconnect either the serial or Ethernet cable from the unit.

Once the cable is disconnected, the receiver will begin an internal shutdown process lasting approximately 1 to 1.5 minutes. During this process, the receiver is not receiving power, but the power LED remains on until the end of the shutdown process.

After shutdown, the receiver will begin the startup process lasting approximately 1 to 1.5 minutes. Some receiver functions may be available during this process. All functions of the receiver are available when the startup process completes.

## Powering the Receiver

The receiver is powered by an external power source connected to either the serial connector or Ethernet connector.



Power input greater than 36 VDC could damage the receiver.

## Connect to an External Power Source

To power the receiver with an external power supply, connect the SAE connector to a power supply operating between 9 and 36 volts.

## Power Cycling

If power is removed from the receiver, it will take up to two minutes for a complete shutdown. When the receiver is powered on, it will take approximately one minute for a full reboot.

# Configuration

.....

Configuring the receiver enables you to change GPS settings, verify satellite tracking, etc. To do this, you'll need to use the Topcon Receiver Utility (TRU) software available the myTopcon Website (<https://www.topconpositioning.com/support>). See "Install the Topcon Receiver Utility (TRU)" on page 18 for more information.

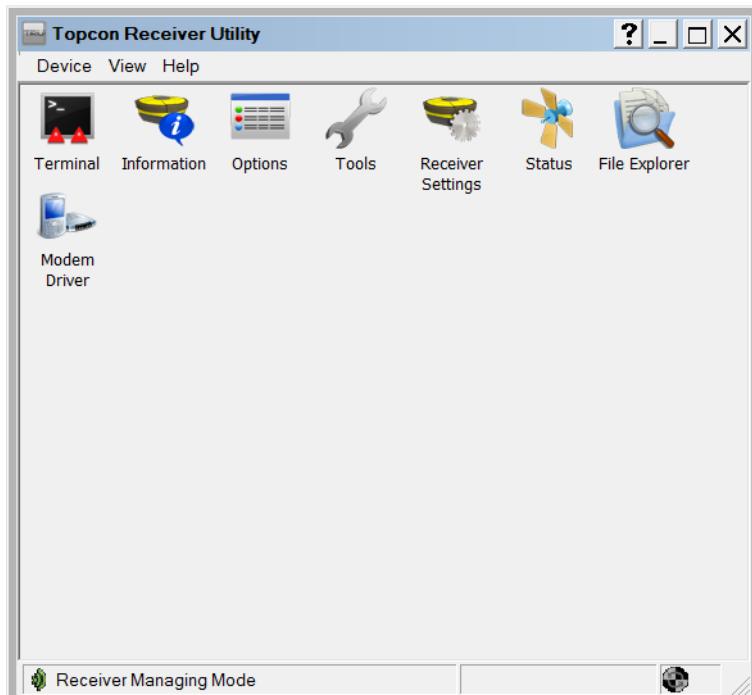
The sections in this chapter describe how to use TRU to configure the receiver. Once this is accomplished, you can:

- Set up GPS parameters and other settings
- Monitor the receiver's GPS status
- Log raw data to a file
- Load a new OAF, firmware, and other configuration files to the receiver

## Connect The Receiver to TRU

The steps in this section work with receivers that have one or two boards.

1. Connect the receiver and computer as described in "Step 2: Connect to a Computer or Display Unit and RTK Correction Source" on page 13.
2. Start TRU on the computer. The TRU main screen displays (Figure 17). Initially the tools are inactive.



**Figure 17: TRU – Main Screen**

3. Click **Device** ▶ **Application Mode** ▶ **Receiver Managing**.
4. Click **Device** ▶ **Connect**. The **Connection Parameters** screen appears.

5. Select **Serial Port** for the **Connect Using** drop-down list (Figure 18).

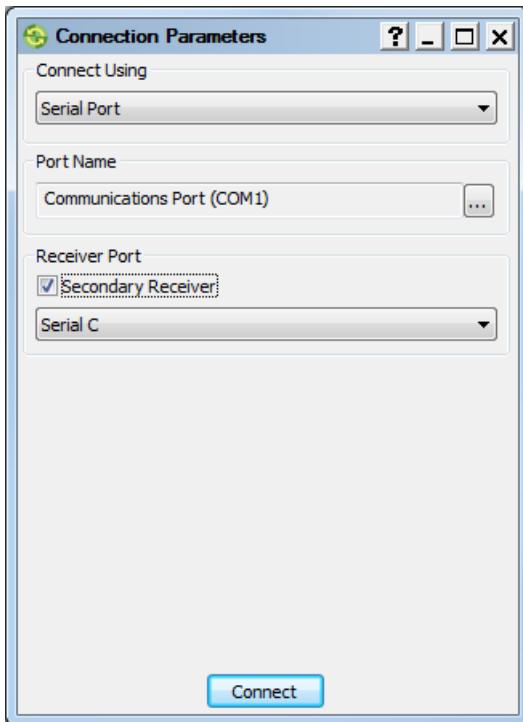


Figure 18: TRU – Connection Parameters

6. Click the Browse button (...) to the right of **Port Name**.
7. Choose a port from the **Select Port** screen, and click **OK** (Figure 19). The **Connection Parameters** screen appears.

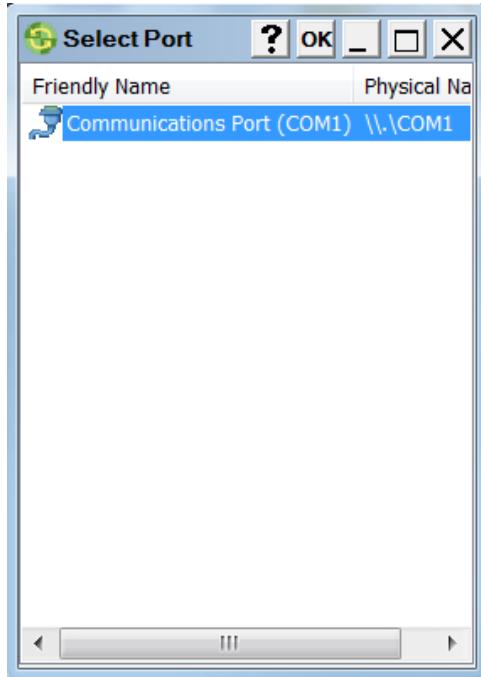


Figure 19: TRU – Select Port Screen

The **Port Name** shows the friendly and physical name of the computer port. The application remembers the last used transport, and the last used successful port/device name for every transport, making it easy to connect to the same device.

8. If using a secondary receiver board, select the **Secondary Receiver** check box, and select **Serial C** from the **Receiver Port** drop-down list (Figure 18 on page 21).
9. Click **Connect** to establish a connection.

Once the receiver connects to TRU, the icons on the main screen become active. Once active, you can configure the receiver.

## Ethernet Connection

This section describes how to customize the Ethernet settings in the receiver, and how to connect to the receiver with TRU using an Ethernet connection.

### Receiver Ethernet Settings

To verify Ethernet connectivity, the receiver must be connected to an external network or laptop. For a laptop connection, set up a static IP address on the computer.

Once connected, the Ethernet LED will be solid 2-5 seconds after the receiver is powered on, indicating that an Ethernet connection is established. If the Ethernet LED does not become green after 10 seconds, check the external network connect, or reboot the receiver.

### View Receiver IP Addresses

The receiver contains a main and auxiliary GNSS board. The IP address for the main board is 192.168.0.9 and the IP address for the auxiliary board is 192.168.0.10.

To view the IP address of each board, do the following.

1. Connect the receiver to TRU using a Serial connection. See "Connect The Receiver to TRU" on page 20.
2. In TRU, click **Receiver Settings > Network**. The **Network** screen appears and the **Ethernet** tab is active (Figure 20).

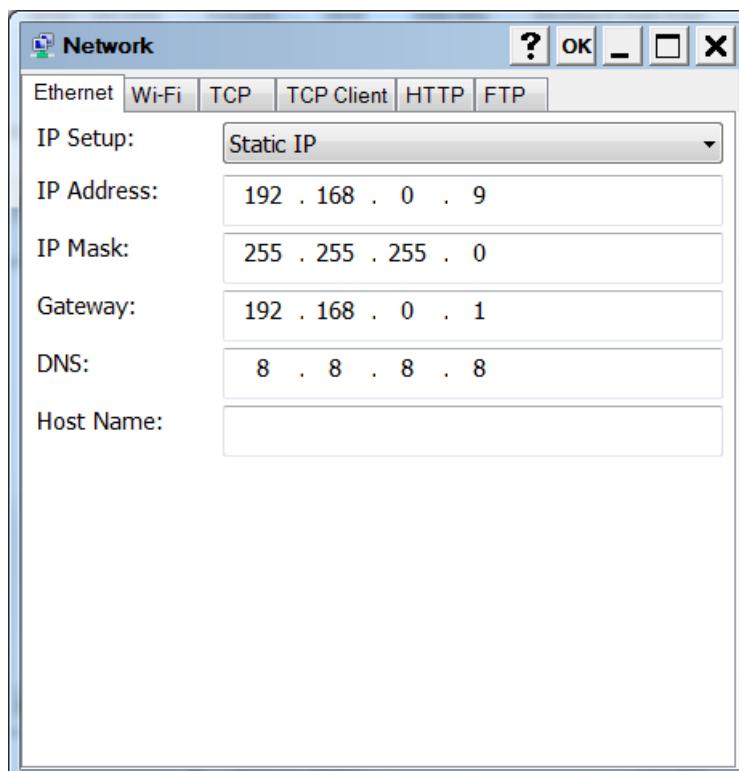


Figure 20: TRU – Network Screen

3. Write down the **IP Address** and **Gateway**.

## Set Up a Static IP Address For the Laptop

When setting up the static IP address of the laptop, the first three numbers of the IP address must match the receiver's IP address. For example, if the receiver's IP address is 10.5.57.200, the computer IP address must be 10.5.57.xxx.

1. Open the **Network and Sharing Center** on your laptop.
2. Change your Local Area Connection TCP/IPv4 settings to match the receiver (Figure 21).

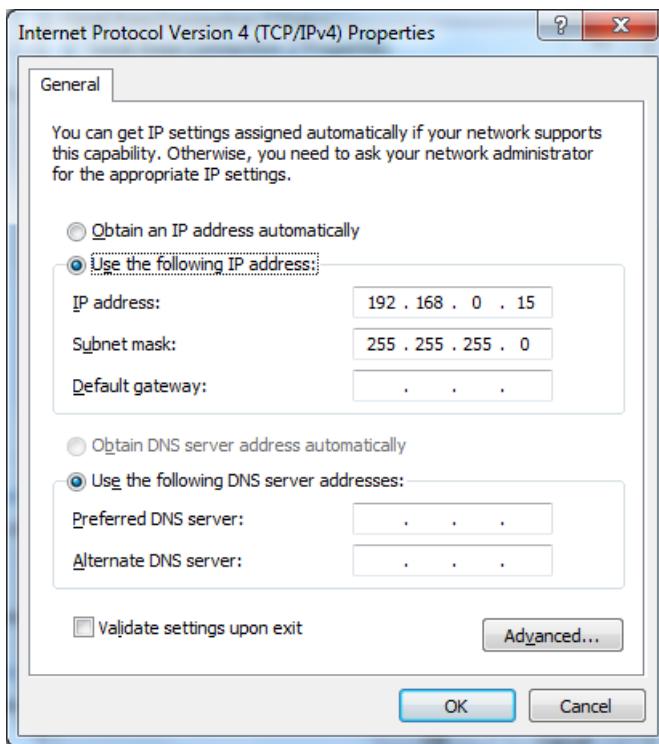
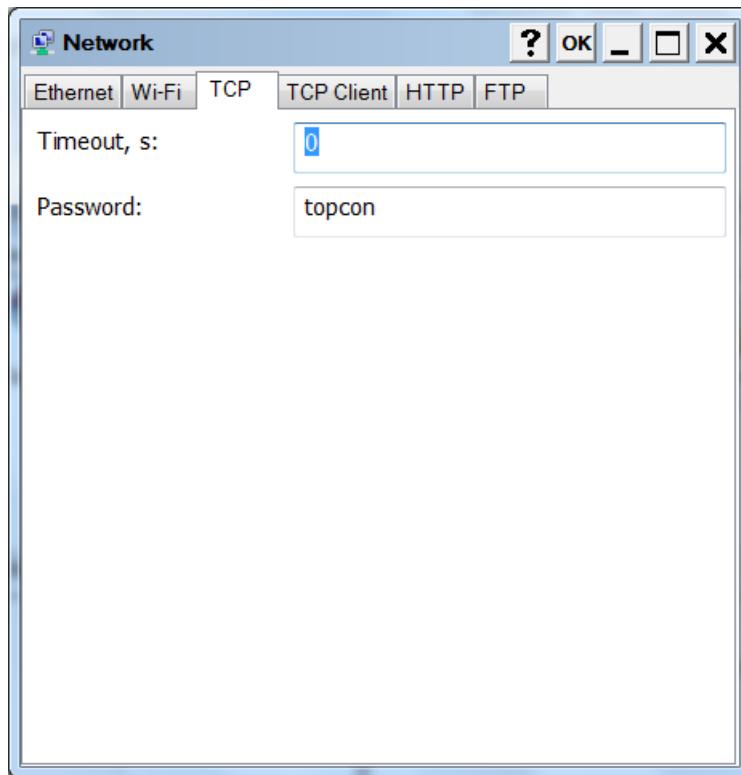


Figure 21: Laptop Internet Protocol Settings

3. Enter the **IP address** for the primary board (see "View Receiver IP Addresses" on page 22).
4. If needed, enter the **Default gateway** address.
5. Click **OK** to apply the changes to your laptop.

## View Receiver Password

1. Connect the receiver to TRU using a Serial connection (see “Connect The Receiver to TRU” on page 20).
2. Click **Receiver Settings > Network**. The **Network** screen appears (Figure 22).



**Figure 22: Network – TCP Tab**

3. Click the **TCP** tab. The password displays in the **Password** field.

## Change Password

1. Connect the receiver to TRU using a Serial connection (see “Connect The Receiver to TRU” on page 20).
2. Click **Receiver Settings > Network**. The **Network** screen appears (Figure 22).
3. Click the **TCP** tab, and enter a new password in the **Password** field.
4. Click **OK**, and reset the receiver to enable the new password.



For all receivers, the default password is *topcon*.

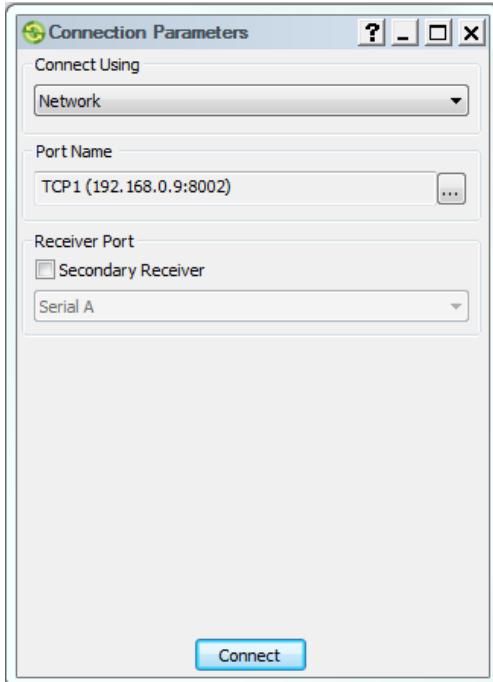
## Reset the Receiver

After changing Ethernet settings, reset the receiver. Open the **Terminal** window, enter *set,reset,yes* and click **Send**. The IP addresses become assigned within 30 seconds after reset. The Receiver will reply with a ping, and become accessible by TCP ports from TRU or PC-CDU. Click **X** to close **Terminal** and go to the TRU main screen.

Shutdown of the receiver takes approximately 1 to 1.5 minutes. After shutdown, the receiver takes approximately 1 to 1.5 minutes to restart. After restart, all functions of the receiver are available.

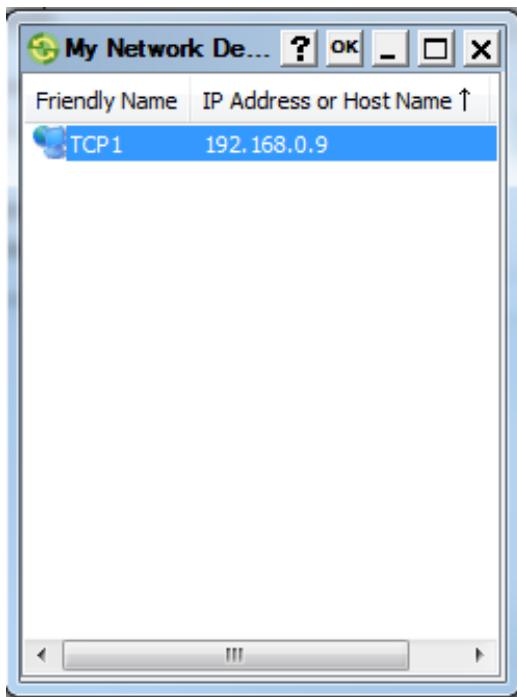
## Connect to TRU Using Ethernet

1. Start TRU on the computer. The TRU main screen displays (Figure 17 on page 20). Initially the tools are inactive.
2. Click **Device** ▶ **Application Mode** ▶ **Receiver Managing**.
3. Click **Device** ▶ **Connect**. The **Connection Parameters** screen appears.
4. Select **Network** from the **Connect Using** drop-down list (Figure 23).



**Figure 23: TRU Connection Parameters – Network**

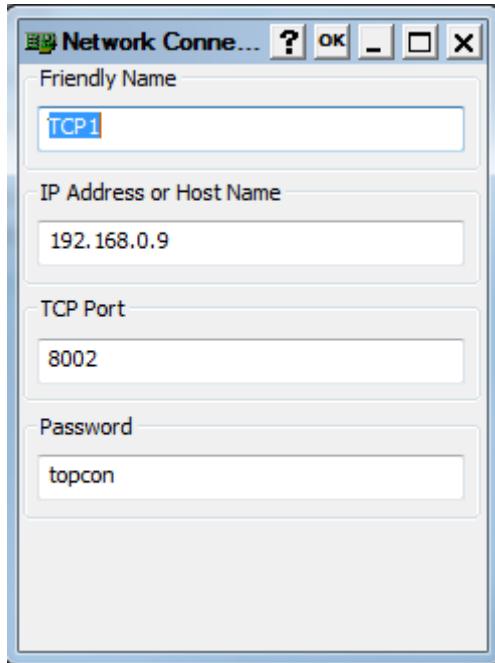
- If needed, click the Browse icon  to the right of **Port Name** to choose a port from the **My Network Devices** screen, and click **OK** (Figure 24). The **Connection Parameters** screen appears.



**Figure 24: My Network Devices – Ethernet Device**

The **Port Name** shows the friendly and physical names of the computer port. The application remembers the last used transport, and the last used successful port/device name for every transport, making it easy to connect to the same device.

- If needed, right-click on the desired port and click **Edit**. The **Network Connection Parameters** screen appears (Figure 25).



**Figure 25: Network Connection Parameters**

- Enter the IP address and password of the GNSS receiver you want to connect to. The main board IP address is *192.168.0.9*, and the auxiliary board IP address is *192.168.0.10*.
- Enter *8002* as the default for **TCP Port**, and click **OK**. The **Connection Parameters** screen appears.
- Click **Connect** to connect to the receiver.

# Configure the Receiver

The following base and rover configurations are recommended for the most common applications; however, you can select configuration parameters as needed.



Do not make other changes without consulting the *TRU Online Help*, embedded in the software.

## Configure the Receiver as a Base

The following describes how to configure the receiver as a base.

### Configure the Antenna

1. In TRU, click **Device** ▶ **Application Mode** ▶ **Receiver Managing** ▶ **Receiver Settings**. The **Receiver Settings** screen appears (Figure 26).

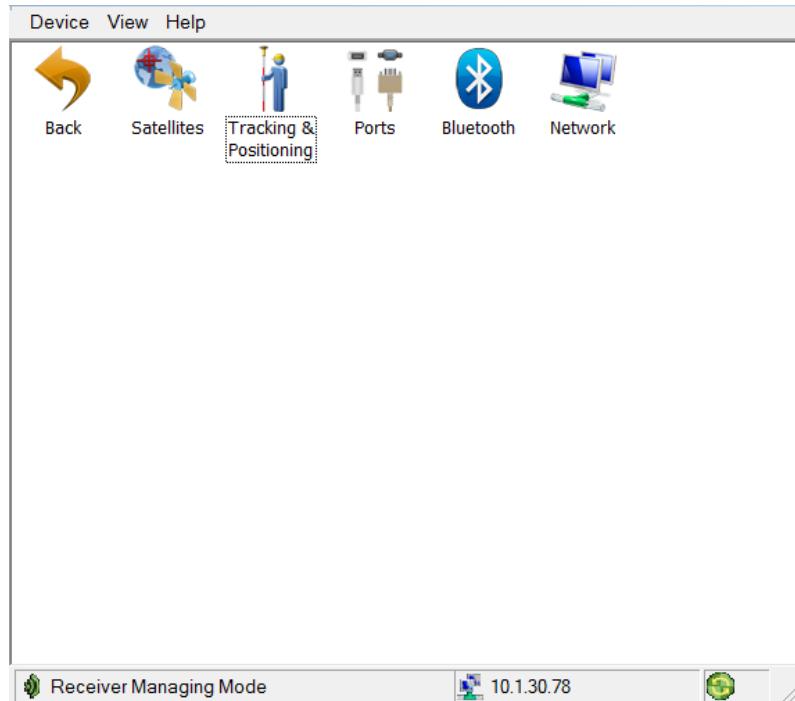


Figure 26: TRU – Receiver Settings

2. Click **Tracking & Positioning**. The **Tracking & Positioning** screen appears (Figure 27 on page 28).
3. Click the **Antenna** tab, and set the **GNSS Antenna** type to **External**.

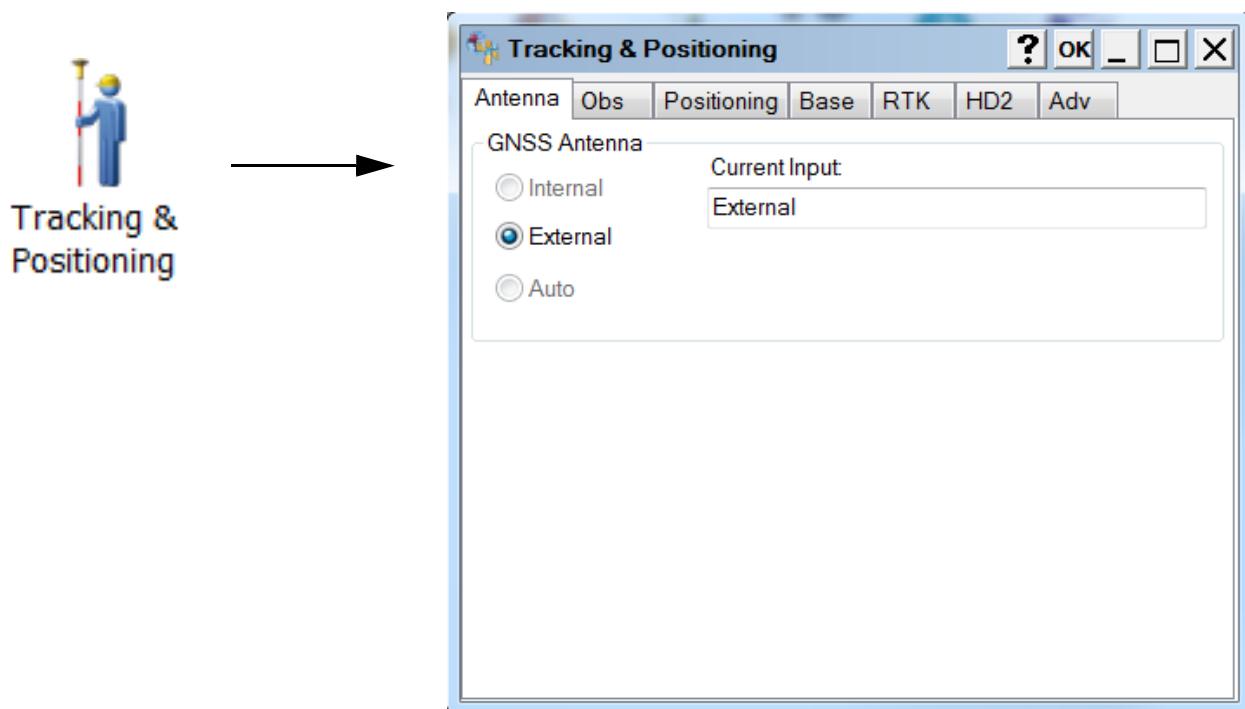


Figure 27: Set Antenna Usage

4. Click the **Obs** tab, and set the following parameters (Figure 28):
  - **Elevation Mask, deg:** Set **Satellites Tracking** to **5** degrees.
  - **Elevation Mask, deg:** Set **Position Computation** to **13** degrees.
  - **PDOP Mask:** Set **Position Computation** to **30** degrees.

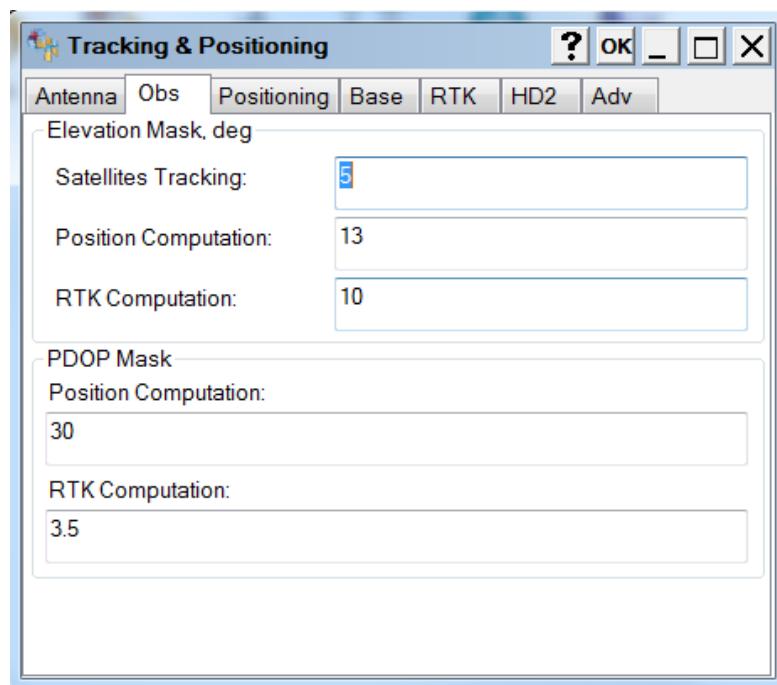
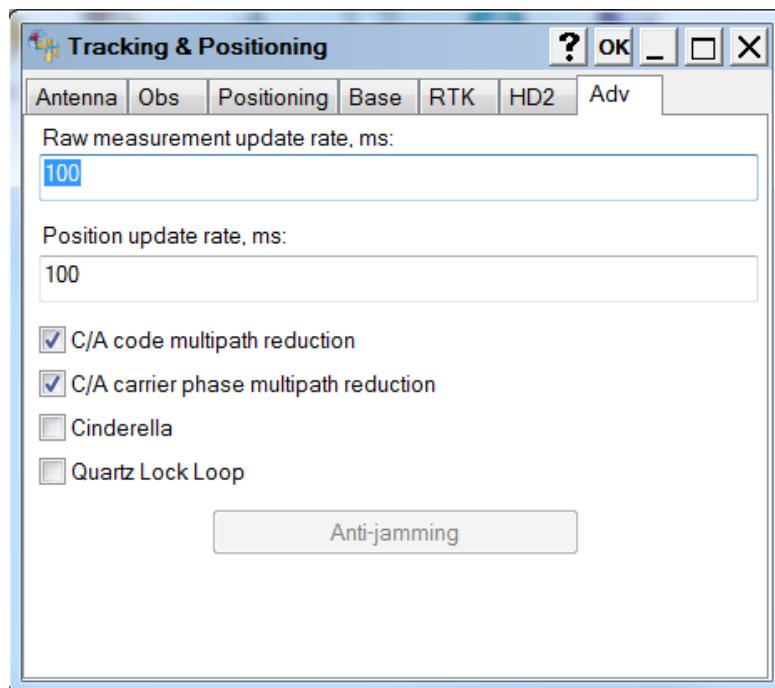


Figure 28: Configure Receiver Positioning – Elevation Mask

5. Click the Adv tab, and set the following parameters (Figure 29):

- Select the C/A code multipath reduction check box. This reduces the C/A code phase multipath.
- Select the C/A carrier phase multipath reduction check box. This reduces the C/A carrier phase multipath.
- Ensure that the Cinderella check box is unselected. Only select this option if you want to set all of the receiver options to their maximum allowable values for 24 hours every other Tuesday at GPS midnight.

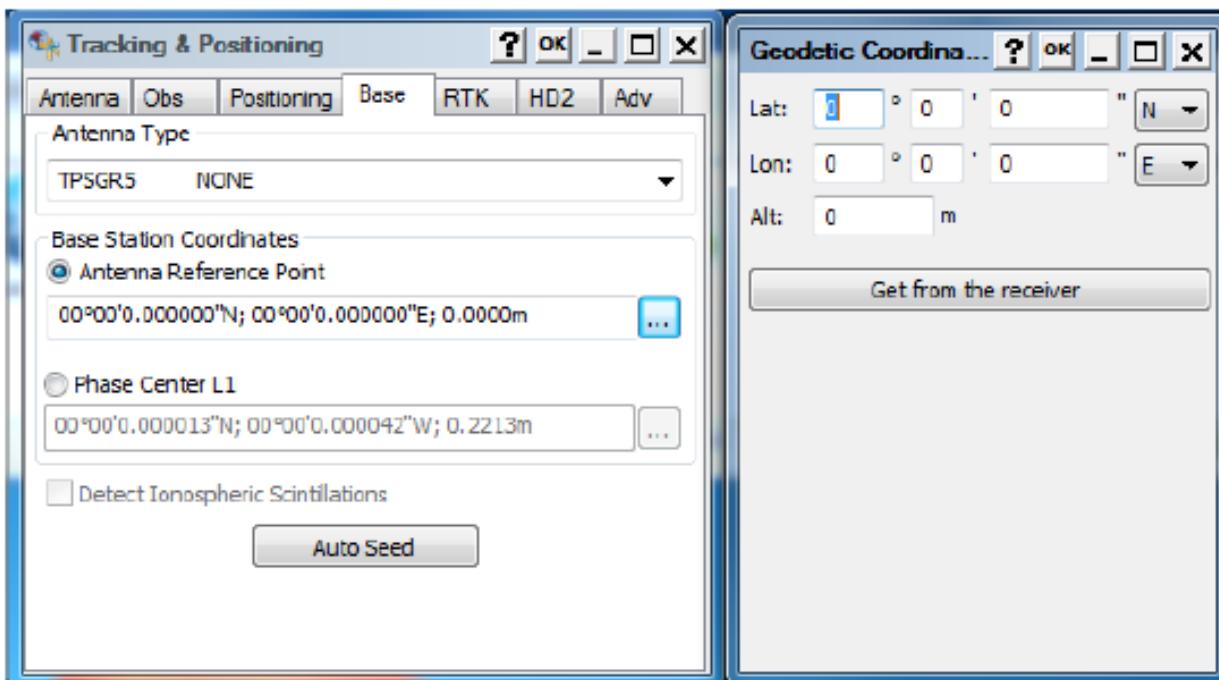


**Figure 29: Configure Advanced Parameters**

6. Click **OK** to return to the **Receiver Settings** screen.

7. Configure the reference coordinates by entering them using GRIL commands (see “Commands” of the *GRIL Reference Guide*).

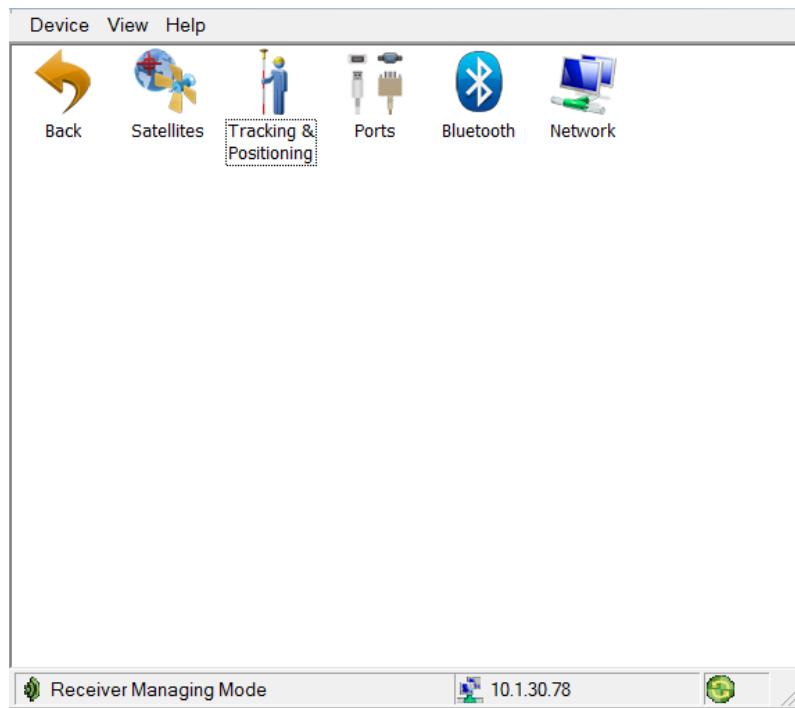
You can also set the reference coordinates using the Base tab in TRU (Figure 30).



**Figure 30: Set Reference Coordinates in the Base Tab**

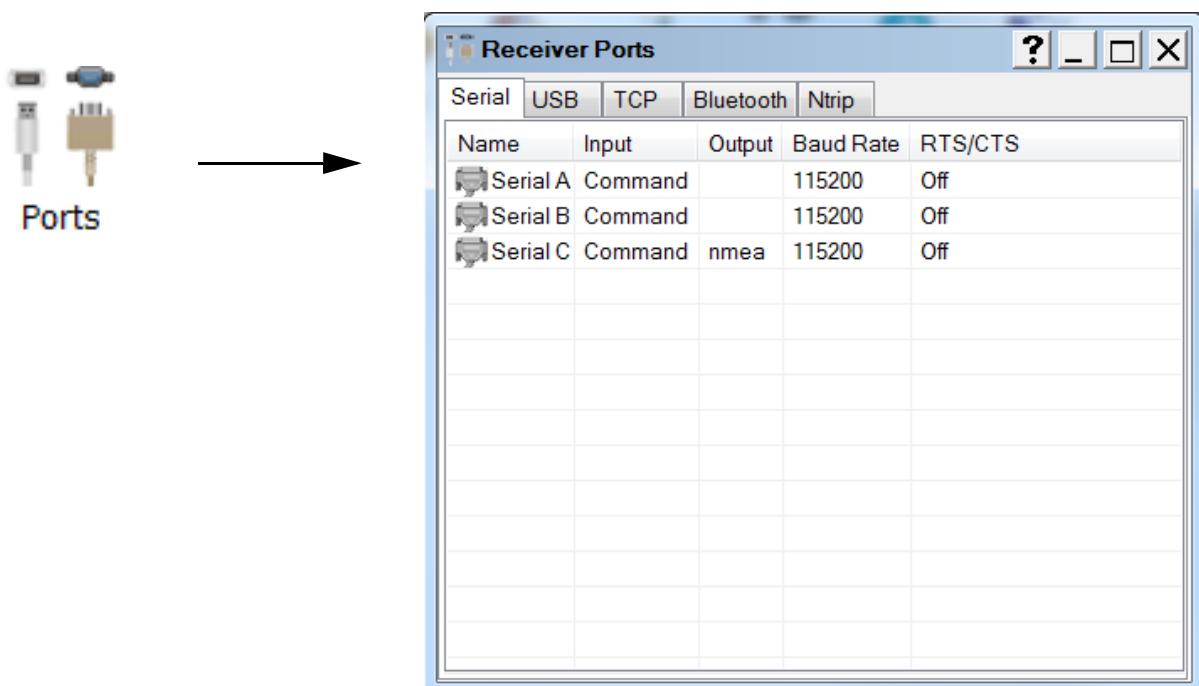
## Set Up the Receiver Serial Ports

1. In TRU, click **Device** ▶ **Application Mode** ▶ **Receiver Managing** ▶ **Receiver Settings**. The **Receiver Settings** screen appears (Figure 31).



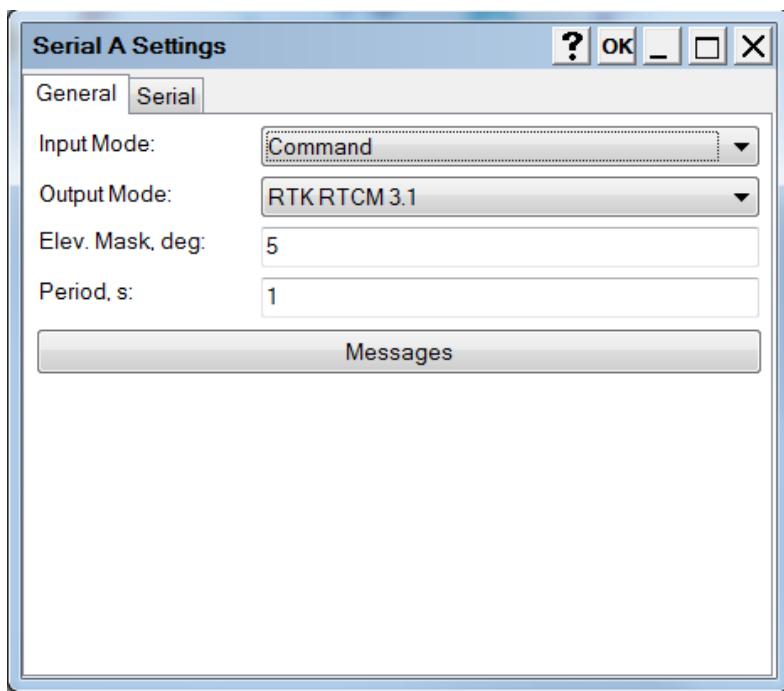
**Figure 31: TRU – Receiver Settings**

2. Click **Ports**. The **Receiver Ports** screen appears (Figure 32 on page 30).
3. Double-click the appropriate Serial Port name (Figure 33 on page 31). The **Settings** screen for that port appears.



**Figure 32: TRU – Receiver Ports**

4. In the **Settings** screen, select the following (Figure 33):
  - **Input Mode** – Select **Command**
  - **Output Mode** – Select **RTK RTCM 3.1**



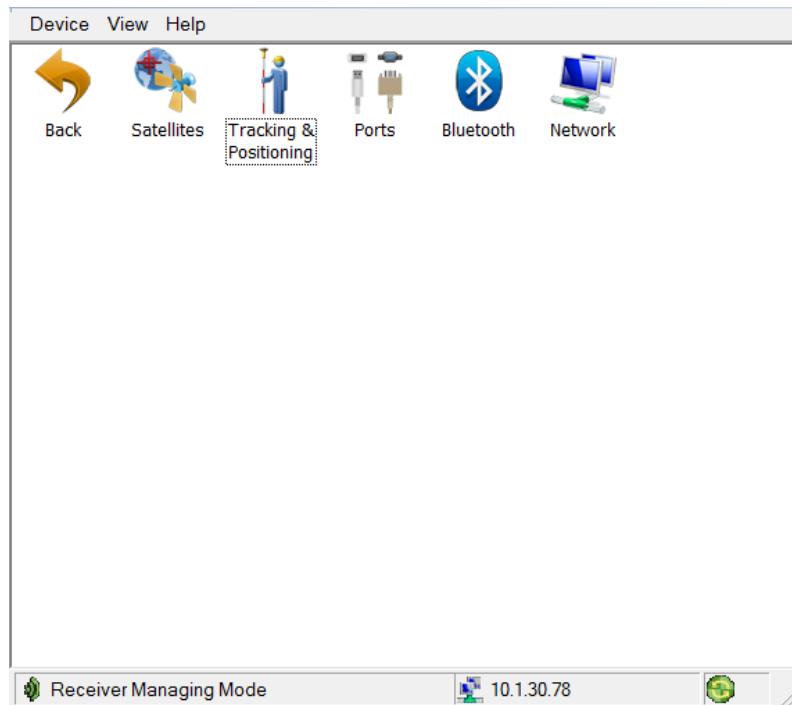
**Figure 33: TRU – Serial Port Settings**

5. Click **OK** to return to the **Receiver Ports** screen.

If you want to set up additional messages, follow the process below. Otherwise click **X** to return to the **Receiver Settings** screen, then click **Back** to return to the TRU main screen.

## Set Up The Receiver TCP Port

1. In TRU, click **Device** ▶ **Application Mode** ▶ **Receiver Managing** ▶ **Receiver Settings**. The **Receiver Settings** screen appears (Figure 34).



**Figure 34: TRU – Receiver Settings**

2. Click **Ports**, then click the **TCP** tab. The **Receiver Ports** screen for the **TCP** tab appears (Figure 35).
3. Double-click the appropriate TCP Port name (Figure 35). The **Settings** screen for that port appears.

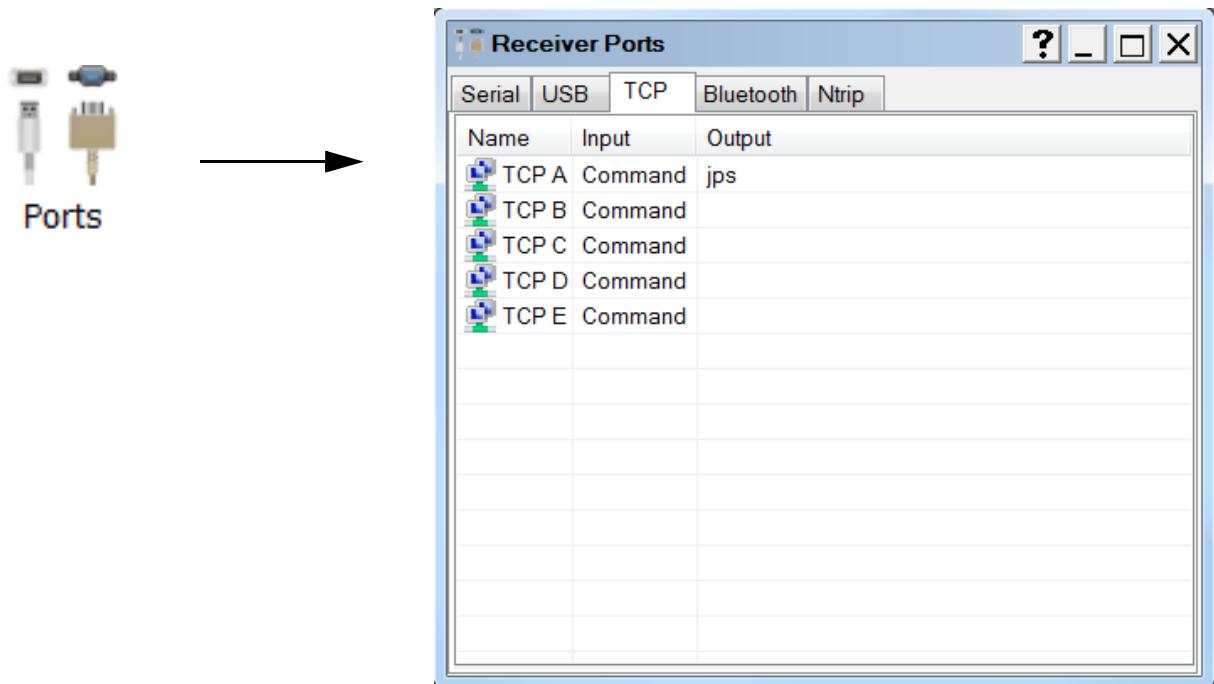


Figure 35: TRU – Receiver TCP Port

4. In the **Settings** screen, select the following (Figure 36):

- **Input Mode** – Select **Command**
- **Output Mode** – Select **RTK RTCM 3.1**

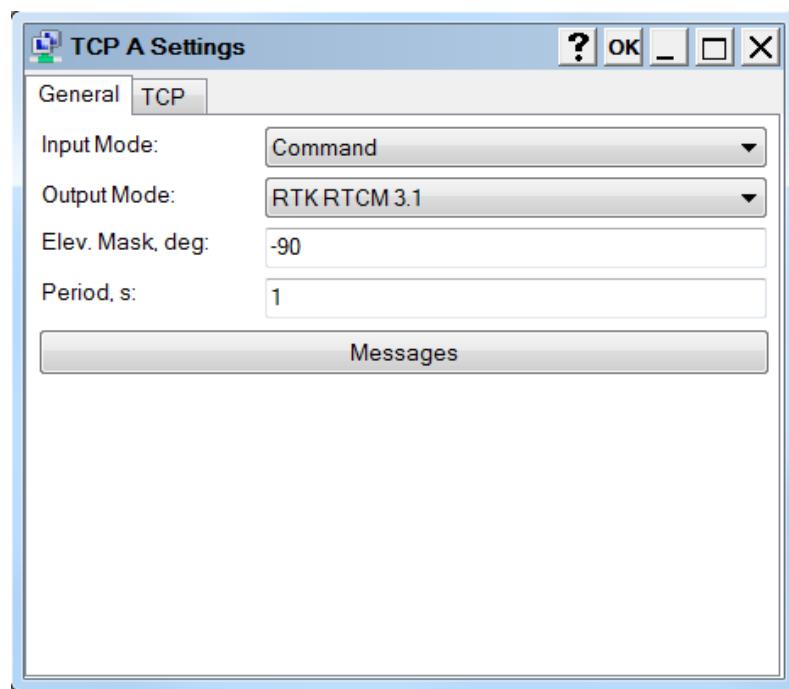


Figure 36: TRU – TCP Port Settings

5. Click **OK** to return to the **Receiver Ports** screen.



Disabling authentication or changing the port number is done in the TCP tab.

6. If you want to set up additional messages, follow the process below. Otherwise click **X** to return to the **Receiver Settings** screen, then click **Back** to return to the TRU main screen.

### Set Up Additional Messages (Optional)

1. In the **Settings** screen for your selected serial port, click **Messages**. The **Messages** screen appears (Figure 37 on page 33).

Message	Per...	P...	C...	F...	Des...
= rtcm3/1004	1.00	0.00	0	0x0	GPSC
= rtcm3/1012	1.00	0.00	0	0x0	GLONASS
= rtcm3/1006	10.00	0.00	0	0x0	Starlink
= rtcm3/1008	10.00	0.00	0	0x0	Antenna
= rtcm3/4091t	10.00	0.00	0	0x0	TPS
= rtcm3/1033	10.00	0.00	0	0x0	Received

Figure 37: TRU – Serial Port Messages

2. Right-click in the screen and click **Add new messages**. The **Receiver Message List** screen appears (Figure 38 on page 34).

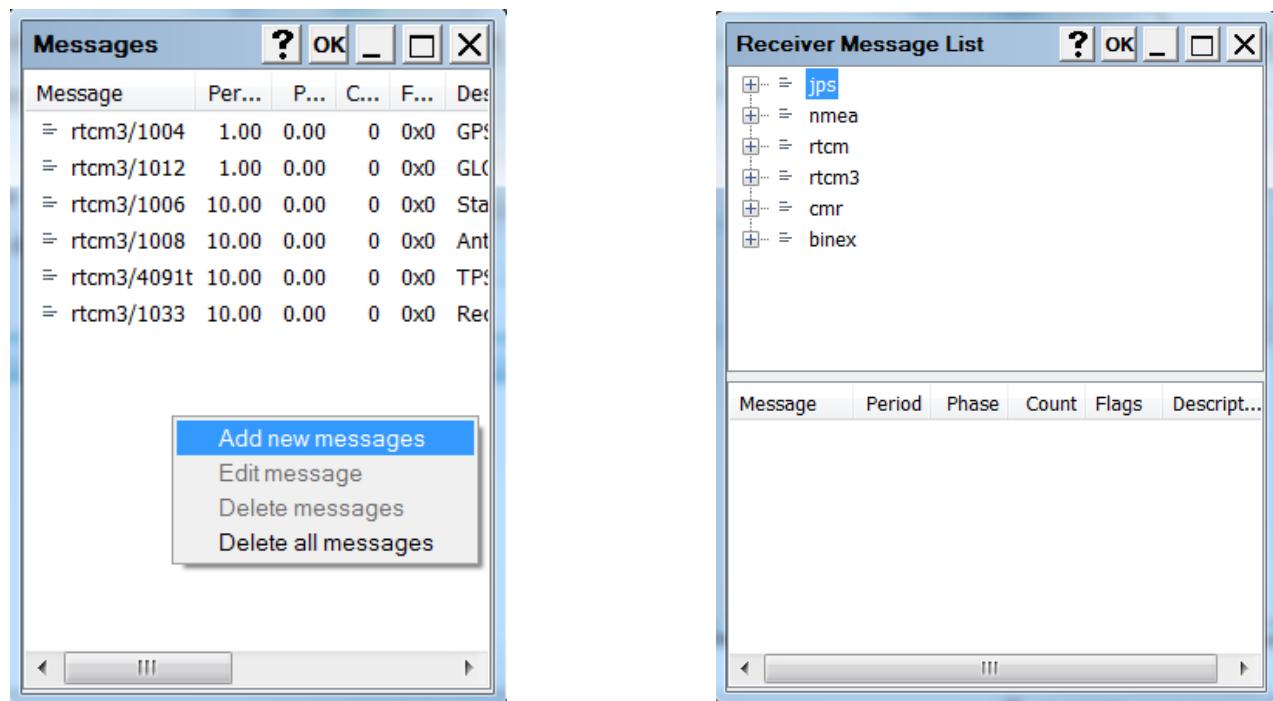


Figure 38: Add New Serial Port Messages

3. Click the (+) icon to expand the **rtcm3** list, and select a message you want to add (Figure 39).
4. Double-click the message to add it. The message appears in the bottom list panel. (Figure 39).

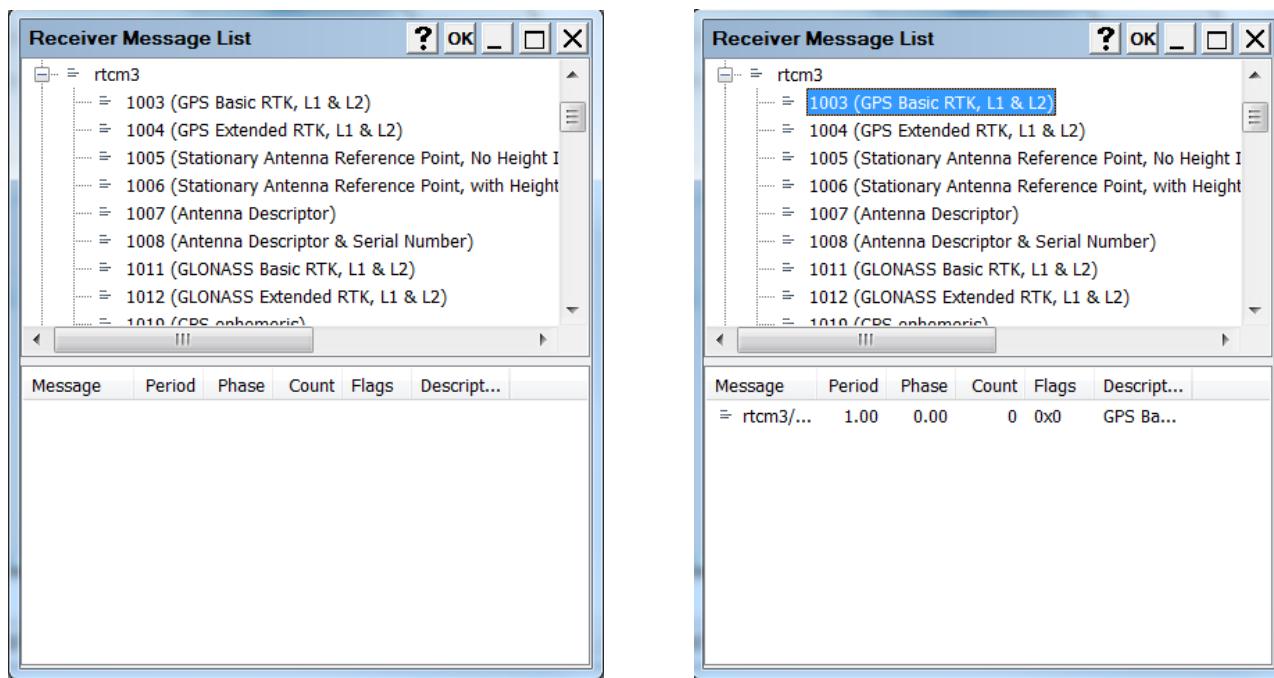
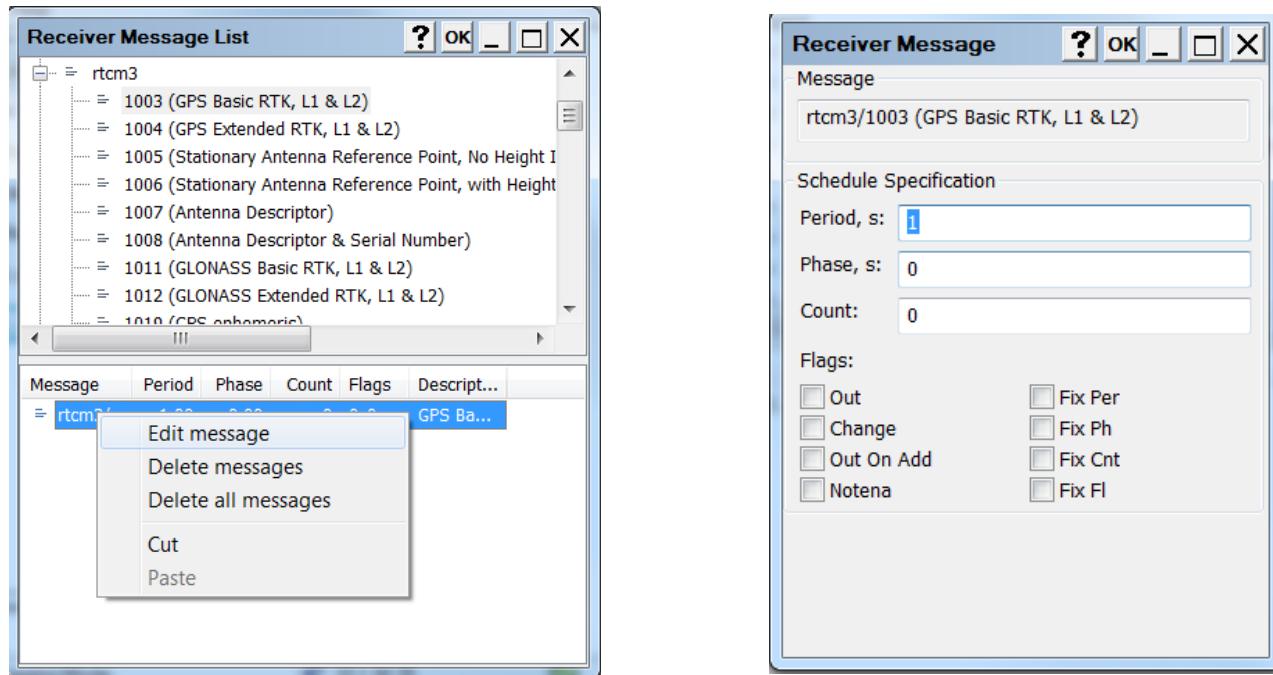


Figure 39: New Serial Port Message Added

If you want to edit the new message, follow the procedure below. Otherwise, Click **OK** to return to the **Settings** screen. Click **OK** again to return to the **Receiver Ports** screen, and Click **X** to return to the **Receiver Settings** screen. Finally, click **Back** to return to the TRU main screen.

## Edit Additional Messages (Optional)

1. Right-click on the new message from the bottom list panel of the Receiver Message List screen.
2. Click Edit message. The Receiver Message screen appears (Figure 40).



**Figure 40: Edit a New Message**

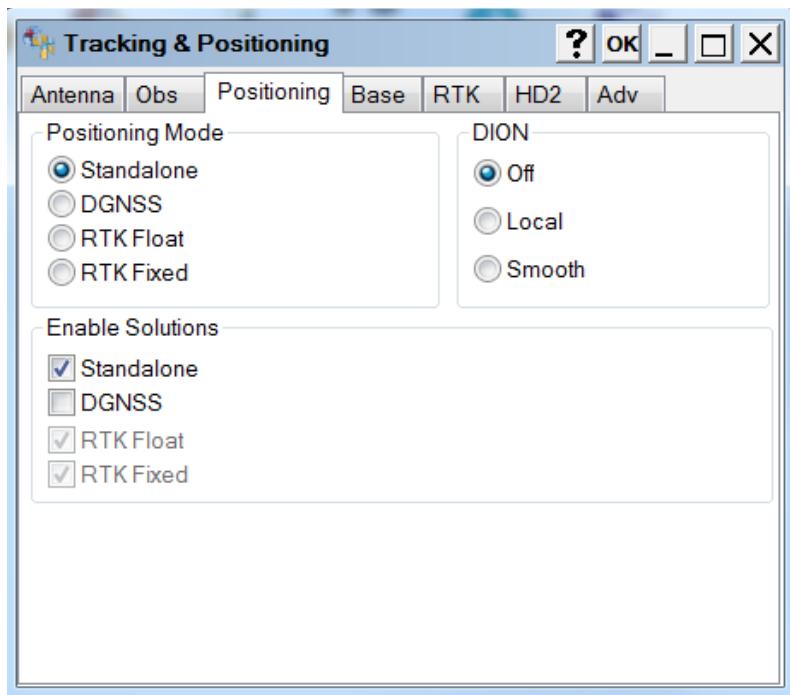
3. Edit the information as needed, and click **OK**. The **Receiver Message List** screen appears.
4. Click **OK** to return to the **Messages** screen, then click **OK** again to return to the **Settings** screen.
5. In the **Settings** screen, click **OK** to return to the **Receiver Ports** screen, then click **X** to return to the **Receiver Settings** screen.
6. Click **Back** to return to the TRU main screen.

## Configure the Receiver as a Rover

The following describes how to configure the receiver as a rover.

### Set the Receiver Positioning

1. Follow steps 1-6 in "Configure the Antenna" on page 27.
2. In the **Receiver Settings** screen, click **Tracking & Positioning**. The **Tracking & Positioning** screen appears.
3. Click the **Positioning** tab (Figure 41 on page 36).



**Figure 41: Receiver Settings – Positioning**

4. Set the following parameters then click **OK** to return to the **Receiver Settings** screen.
  - **Positioning Mode** – Select a positioning mode for the receiver.
  - **Enable Solutions** – Select solutions used in position computation.
    - **Standalone** – Where the receiver computes 3D coordinates in autonomous mode without using differential correction.
    - **Code Differential** – Where the rover receiver computes the current relative coordinate in differential mode using only pseudo ranges.
    - **RTK Float** – Where the Rover receiver computes the current relative coordinates in differential mode using both pseudo ranges and phases; however, with a float solution, the phase ambiguity is not a fixed integer number and the “float” estimate is used instead.
    - **RTK Fixed** – Where the rover receiver computes current relative coordinates, with ambiguity fixing, in differential mode.
  - **DION** – Select the mode in which the DION engine will operate.
    - **Off** – The DION engine is disabled.
    - **Local** – The DION engine provides precise positioning with respect to a starting point.
    - **Smooth** – The DION engine provides smoothed estimates of absolute positions using refined delta positions from carrier phase processing.
5. Click **OK** to return to the **Receiver Settings** screen.

## Set Up the Receiver Serial Ports

1. In the **Receiver Settings** screen, click **Ports** (Figure 42). The **Receiver Ports** screen appears.

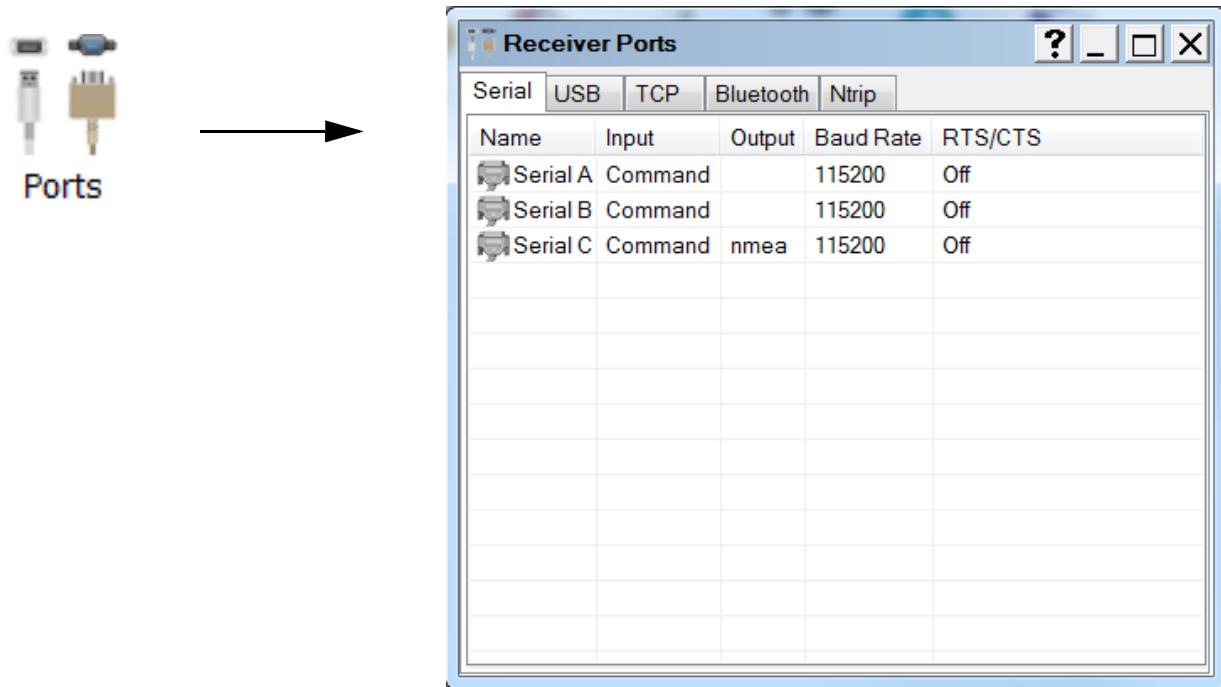


Figure 42: Receiver Settings

2. Double-click the appropriate Serial Port name (Figure 42). The **Settings** screen for that port appears.
3. In the **Settings** screen, select the following (Figure 43):
  - **Input Mode** – Select **RTCM 3.x**
  - **Output Mode** – **None**

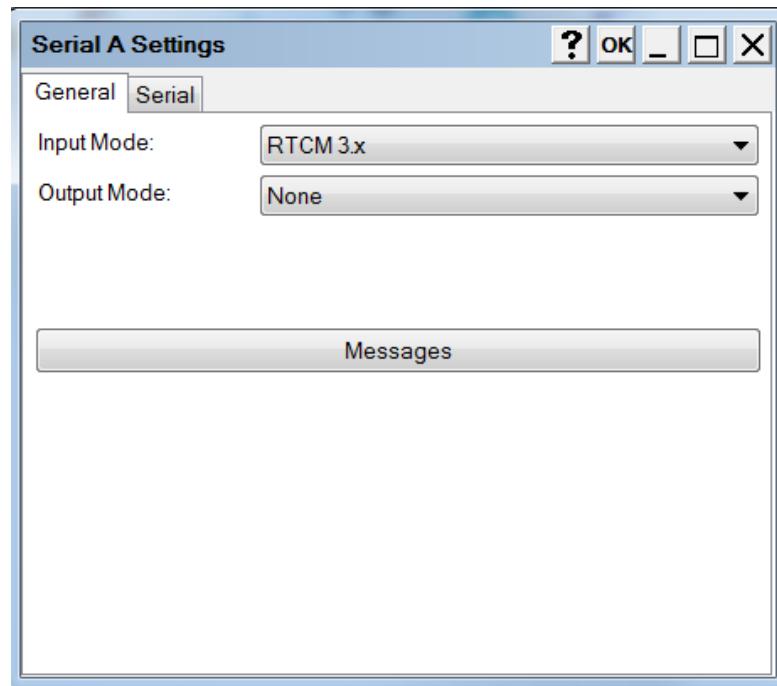


Figure 43: Serial Port Settings

4. Click **OK** to return to the **Receiver Ports** screen, then click **X** to return to the **Receiver Settings** screen.
5. Click **Back** to return to the TRU main screen.

## Set Up The Receiver TCP Port

1. In the **Receiver Settings** screen, click **Ports** then click the **TCP** tab (Figure 44). The **Receiver Ports** screen for the **TCP** tab appears.

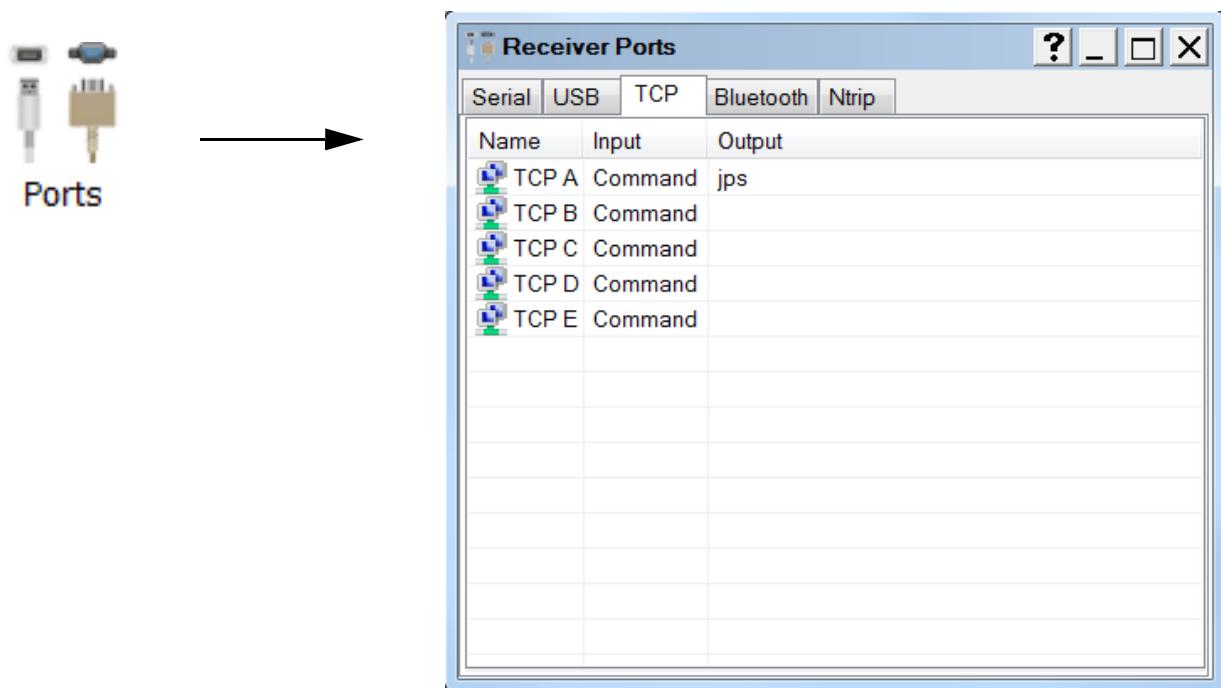


Figure 44: Receiver Settings

2. Double-click the appropriate TCP Port name (Figure 45). The **Settings** screen for that port appears.
3. In the **Settings** screen, select the following (Figure 45):
  - **Input Mode** – Select **RTCM 3.x**
  - **Output Mode** – **None**

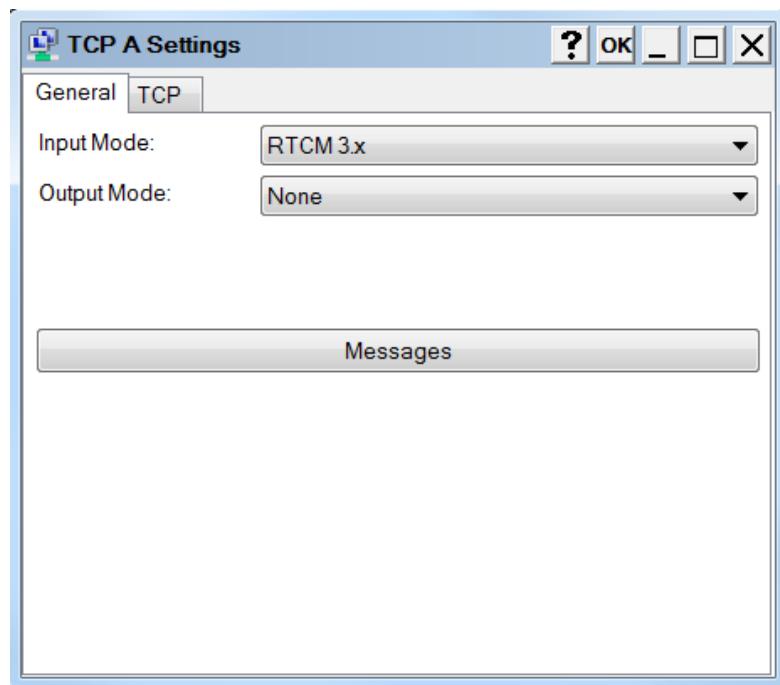


Figure 45: Serial Port Settings

4. Click **OK** to return to the **Receiver Ports** screen, then click **X** to return to the **Receiver Settings** screen.
5. Click **Back** to return to the TRU main screen.

Once the receiver is configured, the configuration remains until changed using TRU or by clearing the NVRAM. For more details on the settings available for configuring receivers, see the *TRU Online Help* embedded in the software.

### Verify Receipt of Differential Corrections (RTK Rover Only)

1. For RTK Rover receivers, click **Status** (Figure 46) to ensure the receiver obtains differential correction. The **Status** screen appears.

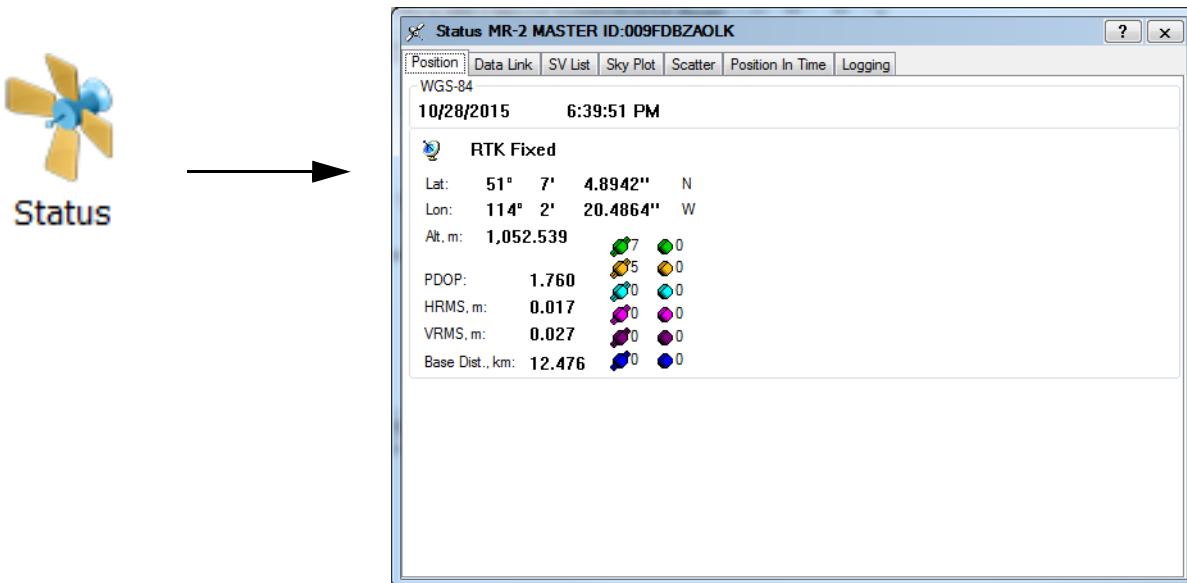
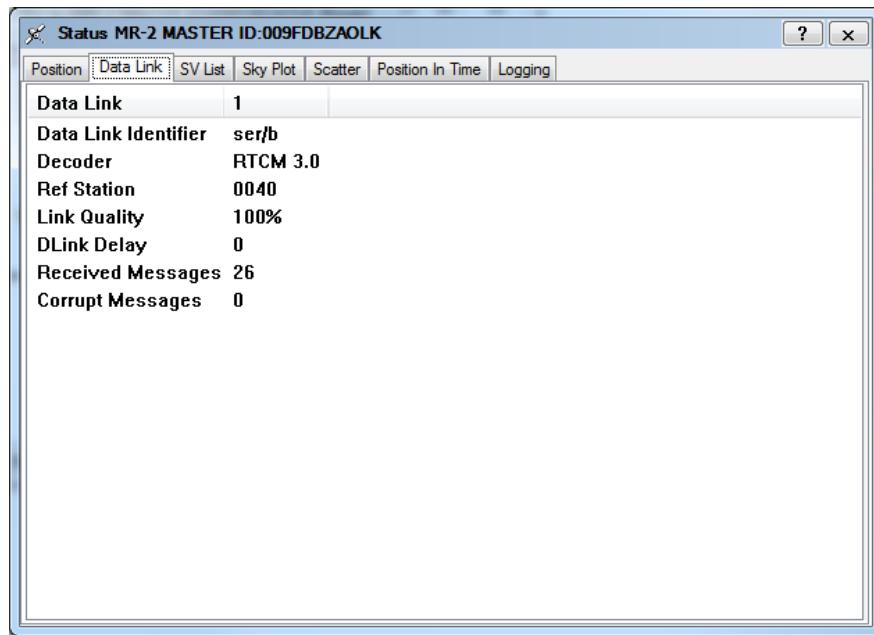


Figure 46: TRU – Main Screen and Status Screen

The **Data Link** tab reflects the status of the received differential messages. If the port is not configured or if the corrections are not being received, the Link Quality field will be empty.



**Figure 47: Status – Data Link**

2. When finished, click **X** to close the **Status** screen and return to the TRU main screen.
3. Click **Device ▶ Disconnect**, then **Device ▶ Exit** to close TRU.



Disconnecting before exiting TRU ensures proper port management.

# Configure Receiver for HD2 Operation

## HD2 Overview



HD2 Heading Determination (OCTO) OAF options must be enabled, in addition to a minimum of GPS L1/L2 signal tracking.

The MR-2 can process accurate and instantaneous attitude parameters. The MR-2 combines a pair of B125 receiver boards, and two external antennas, to create a 2D system for heading and pitch. With this method, one board acts as a moving base, and the other as a rover. The antennas are fixed, and the inter-antenna distance is constant. The moving base sends standalone position and raw data to the rover, which processes the data and sends them using ASCII or binary messages.

You can also configure the moving base to accept RTK measurements from a stationary base station. With this method, the moving base is used as a base and a rover simultaneously. The moving base will process its position, with centimeter level accuracy, using the measurements from the stationary base station. It will then transmit the position to the rover.

HD2 operation requires scripts that will configure the receiver by sending commands to the master board of the MR-2. Several scripts are available on the Topcon Positioning Systems website, which cover the popular work flows of the MR-2, and can be modified for custom applications.

1. Go to <https://www.topconpositioning.com/support/products/mr-2>, and click **Firmware & Software Updates** (Figure 48).

**Figure 48: MR-2 Product Page**

2. Connect the primary receiver board to TRU. For more information about connecting to the receiver using TRU, see "Connect The Receiver to TRU" on page 20.
3. Under **Software**, locate the scripts, click the **Download** icon, and save the scripts to your computer.

- Access the **Terminal** window, and send the script file to the master board by selecting the **Send File** menu item.



Scripts are subject to change as firmware matures.

- To access the heading determination output, connect to the secondary board in TRU, and access the **Status Heading** screen. Alternatively, the VHD log can be output from the secondary board.

## Check the Receiver's OAF

Use TRU to view the status of the receiver's options.

- Connect the receiver to a computer. See "Step 2: Connect to a Computer or Display Unit and RTK Correction Source" on page 13
- Open TRU and connect to the receiver. See "Connect The Receiver to TRU" on page 20.
- Click the **Options** icon in the main screen. The **Receiver Options** screen displays, so you can view the current authorization options and upload new ones (Figure 49).

The screenshot shows the 'Receiver Options' window with three main sections: Tracking, Positioning, and Interfaces.

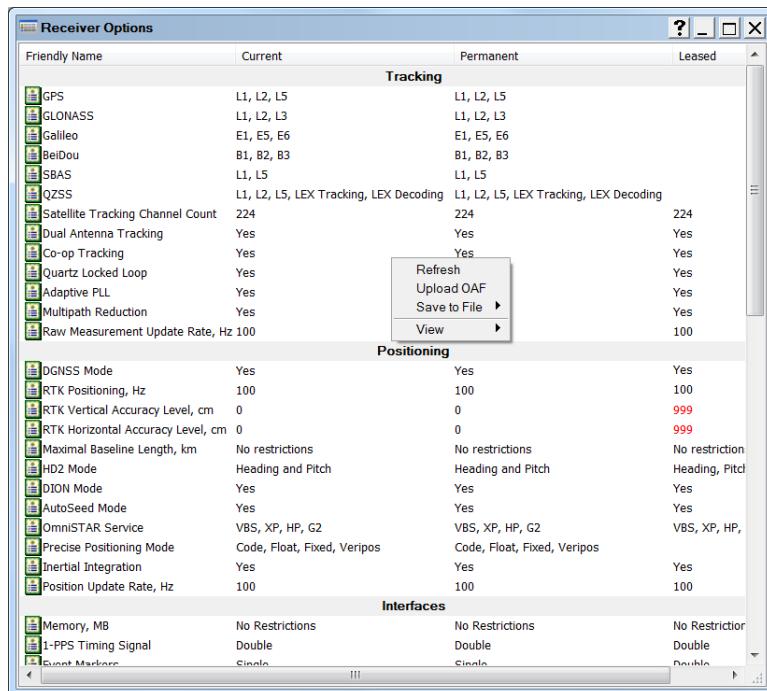
Friendly Name	Current	Permanent	Leased
<b>Tracking</b>			
GPS	L1, L2, L5	L1, L2, L5	
GLONASS	L1, L2, L3	L1, L2, L3	
Galileo	E1, E5, E6	E1, E5, E6	
BeiDou	B1, B2, B3	B1, B2, B3	
SBAS	L1, L5	L1, L5	
QZSS	L1, L2, L5, LEX Tracking, LEX Decoding	L1, L2, L5, LEX Tracking, LEX Decoding	
Satellite Tracking Channel Count	224	224	224
Dual Antenna Tracking	Yes	Yes	Yes
Co-op Tracking	Yes	Yes	Yes
Quartz Locked Loop	Yes	Yes	Yes
Adaptive PLL	Yes	Yes	Yes
Multipath Reduction	Yes	Yes	Yes
Raw Measurement Update Rate, Hz	100	100	100
<b>Positioning</b>			
DGNSS Mode	Yes	Yes	Yes
RTK Positioning, Hz	100	100	100
RTK Vertical Accuracy Level, cm	0	0	999
RTK Horizontal Accuracy Level, cm	0	0	999
Maximal Baseline Length, km	No restrictions	No restrictions	No restriction
HD2 Mode	Heading and Pitch	Heading and Pitch	Heading, Ptd
DION Mode	Yes	Yes	Yes
AutoSeed Mode	Yes	Yes	Yes
OmnISTAR Service	VBS, XP, HP, G2	VBS, XP, HP, G2	VBS, XP, HP,
Precise Positioning Mode	Code, Float, Fixed, Veripos	Code, Float, Fixed, Veripos	
Inertial Integration	Yes	Yes	Yes
Position Update Rate, Hz	100	100	100
<b>Interfaces</b>			
Memory, MB	No Restrictions	No Restrictions	No Restriction
1-PPS Timing Signal	Double	Double	Double
Event Markers	Single	Single	Double

**Figure 49: Receiver Options**

## Load an OAF

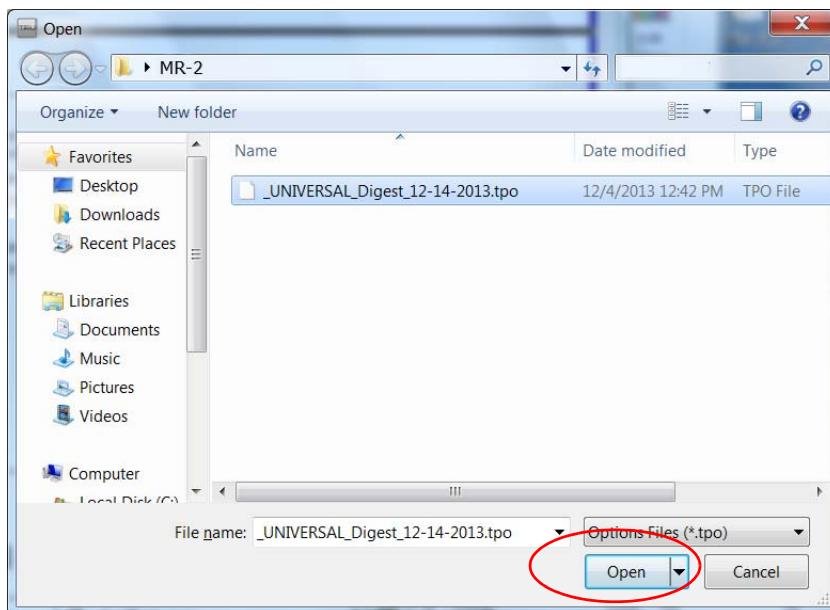
Each B125 board requires an OAF file provided by Topcon dealers. For any OAF related questions, e-mail Topcon at options@topcon.com and include the receiver's ID and serial number. To obtain these numbers, see "Check the Receiver's OAF" on page 42.

1. Follow the steps in "Check the Receiver's OAF" on page 42.
2. Right-click in the **Receiver Options** screen, and select **Upload OAF** (Figure 50).



**Figure 50: 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 51).



**Figure 51: Load OAF**

Topcon's 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 52).

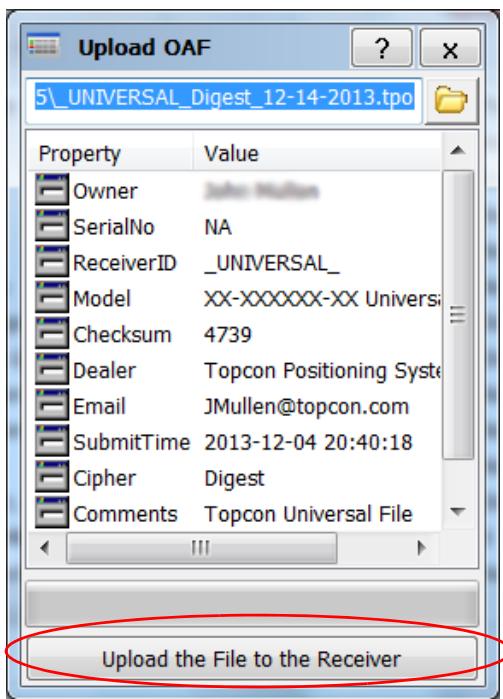


Figure 52: Upload the OAF to the Receiver

6. Click **Yes** at the prompt to reset the receiver (Figure 53).

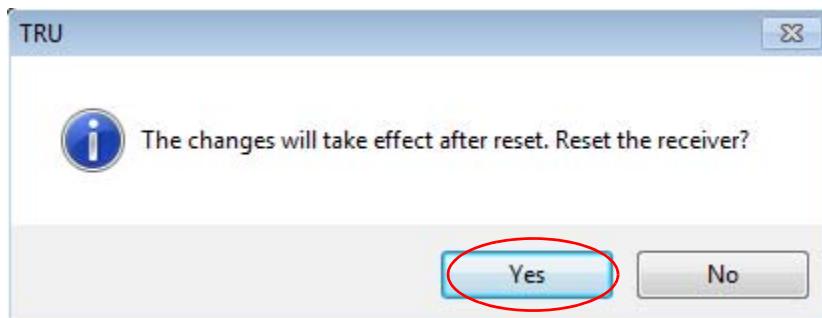
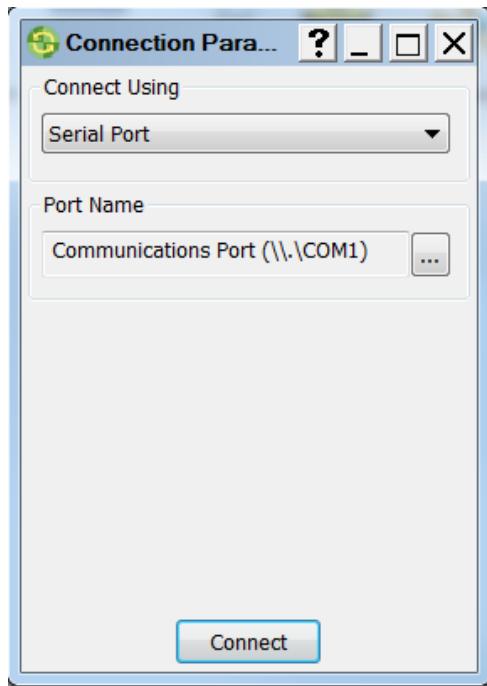


Figure 53: Reset Receiver

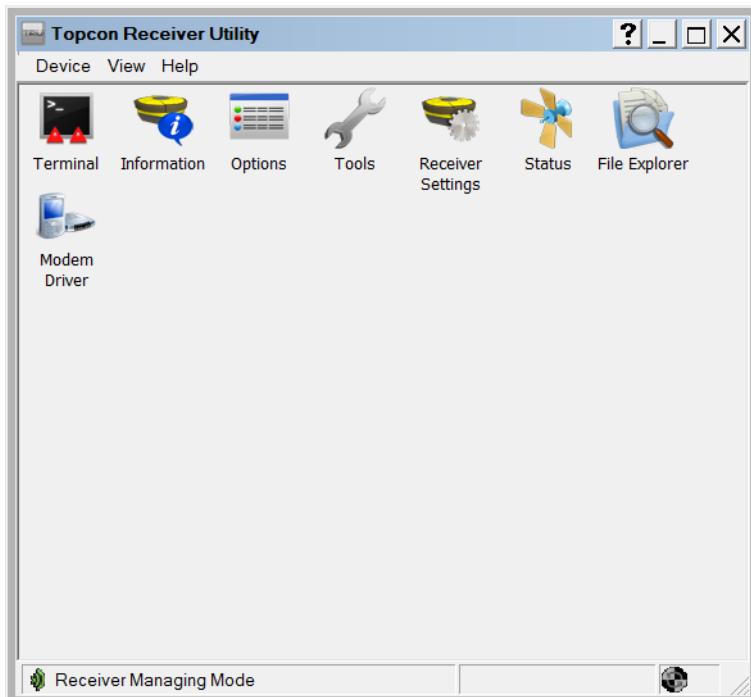
When the receiver resets, the **Connection Parameters** screen opens.

7. Click **Connect** (Figure 54). The TRU main screen appears.



**Figure 54: Connect to the Receiver**

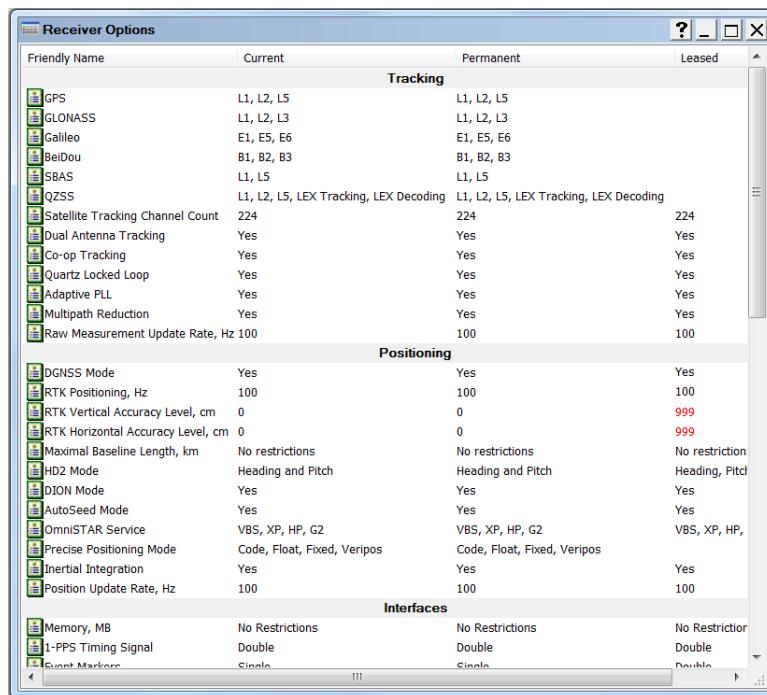
8. Click **Options** (Figure 55). The **Receiver Options** screen displays.



**Figure 55: Click Options**

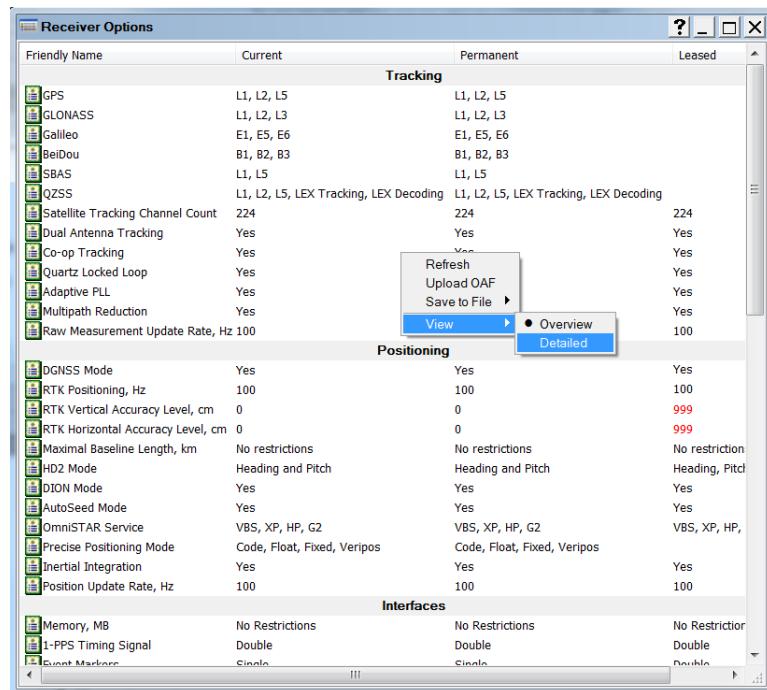
9. In the **Receiver Options** screen (Figure 56), ensure the following are correct:

- If you upload a universal OAF, make sure the expiration date is still valid.
- If you upload a customer OAF, make sure the correct customer file is loaded.



**Figure 56: Receiver Options**

10. To view additional OAF details, right-click in the **Receiver Options** screen and select **View > Detailed** (Figure 57).



**Figure 57: Additional OAF Details**

The **Receiver Options** screen switches to a detailed view with additional information (Figure 58).

Friendly Name	Opti...	Current	Permanent	Leased	Ex
Tracking					
GPS	_GPS	Yes	Yes	Yes	1/30
GPS L1 Signals	GPS1	Yes	Yes	No	
GPS L2 Signals	GPS2	Yes	Yes	No	
GPS L5 Signals	GPS5	Yes	Yes	No	
GLONASS	_GLO	Yes	Yes	Yes	1/30
GLONASS L1 Signals	GLO1	Yes	Yes	No	
GLONASS L2 Signals	GLO2	Yes	Yes	No	
GLONASS L3 Signals	GLO3	Yes	Yes	No	
Galileo	_GAL	Yes	Yes	Yes	1/30
GIOVE	GIOV	Yes	Yes	Yes	1/30
Galileo E1 Signals	GAL1	Yes	Yes	No	
Galileo E5 Signals	GAL5	Yes	Yes	No	
Galileo E6 Signals	GAL6	Yes	Yes	No	
B eiDou	BEID	Yes	Yes	Yes	1/30
B eiDou B1 Signals	BDS1	Yes	Yes	No	
B eiDou B2 Signals	BDS2	Yes	Yes	No	
B eiDou B3 Signals	BDS3	Yes	Yes	No	
SBAS	WAAS	Yes	Yes	Yes	1/30
SBAS Signals	SBAS	Yes	Yes	No	
SBAS L1 Signals	SBA1	Yes	Yes	No	
SBAS L5 Signals	SBAS5	Yes	Yes	No	
QZSS	QZSS	Yes	Yes	Yes	1/30
QZSS L1 Signals	QZS1	Yes	Yes	No	
QZSS L2 Signals	QZS2	Yes	Yes	No	
QZSS L5 Signals	QZS5	Yes	Yes	No	
QZSS LEX Signals Tracking	QZS6	Yes	Yes	No	
QZSS LEX Signals Decoding	QZSL	Yes	Yes	No	
L1 Tracking	_L1_	Yes	Yes	Yes	1/30
L2 Tracking	_L2_	Yes	Yes	Yes	1/30
TC Tracking	L2C	Yes	Yes	Yes	1/30

Figure 58: Receiver Options – Detailed View

11. Click **X** to close the **Receiver Options** screen and return to the TRU main screen.

## Updating Firmware

Updating firmware on the receiver requires an Ethernet connection. If your unit has two B125 boards, each board requires an update, and each board has a different IP address. The IP address for the main board is 192.168.0.9. The IP address for the auxiliary board is 192.168.0.10. Follow the below procedure for both boards.



Do not unplug the power or Ethernet connection during the firmware update process.

1. Download the latest firmware build to your PC.
2. Open TRU and click **Device > Application Mode > Receiver Managing**.
3. Connect to the receiver using an Ethernet connection (Figure 59).

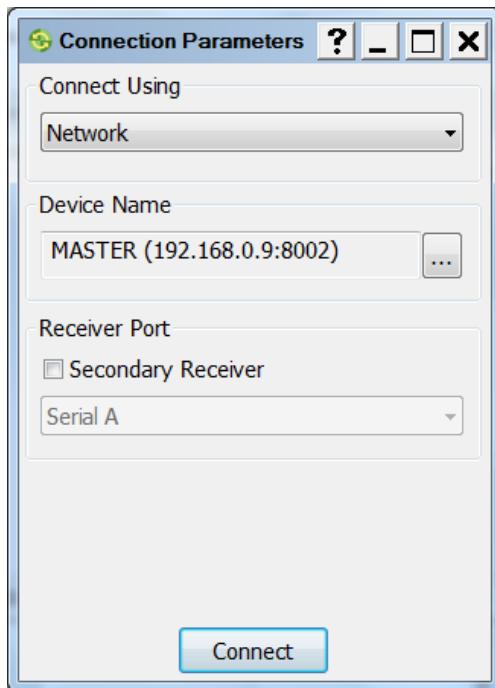


Figure 59: TRU – Ethernet Connection



See "Connect to TRU Using Ethernet" on page 25 for more information.

4. Click **Connect**.
5. Once connected, click **Device > Application Mode > Firmware Loading**.

6. Click the **Firmware Loading** icon. The **Select Device** screen appears (Figure 60).

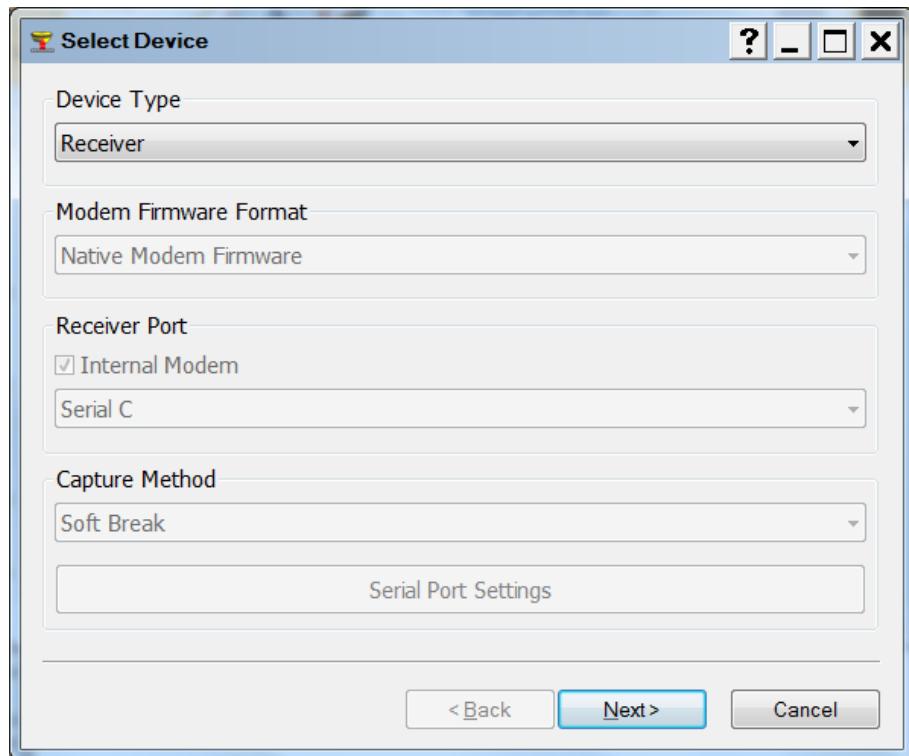


Figure 60: TRU – Firmware Loading

7. Select **Receiver** from the **Device Type** drop-down list.  
8. Click **Next**. The **Information** screen appears (Figure 61).

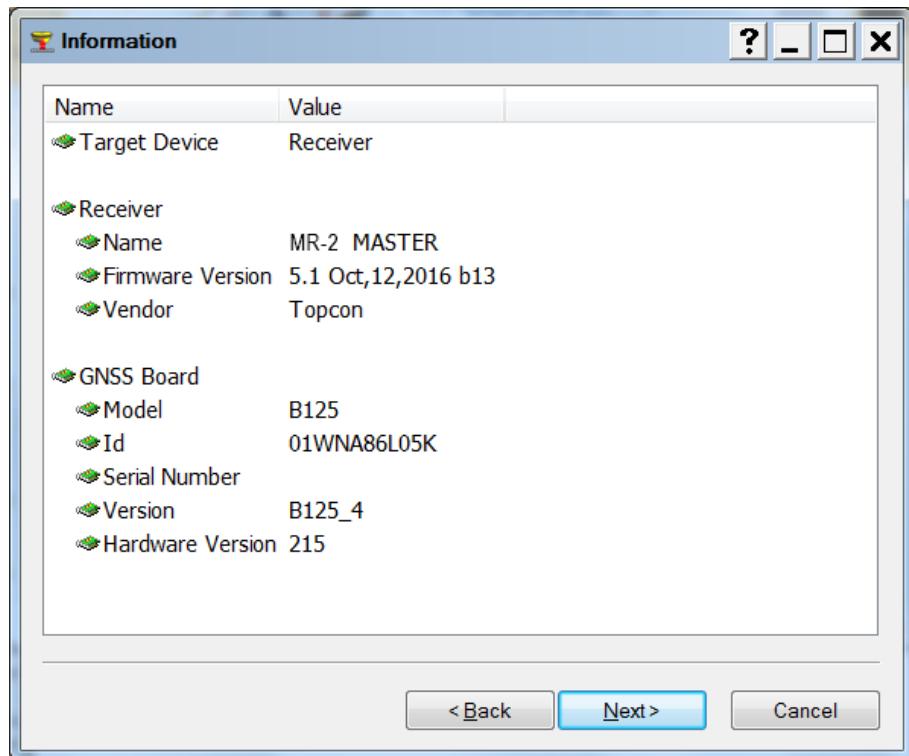
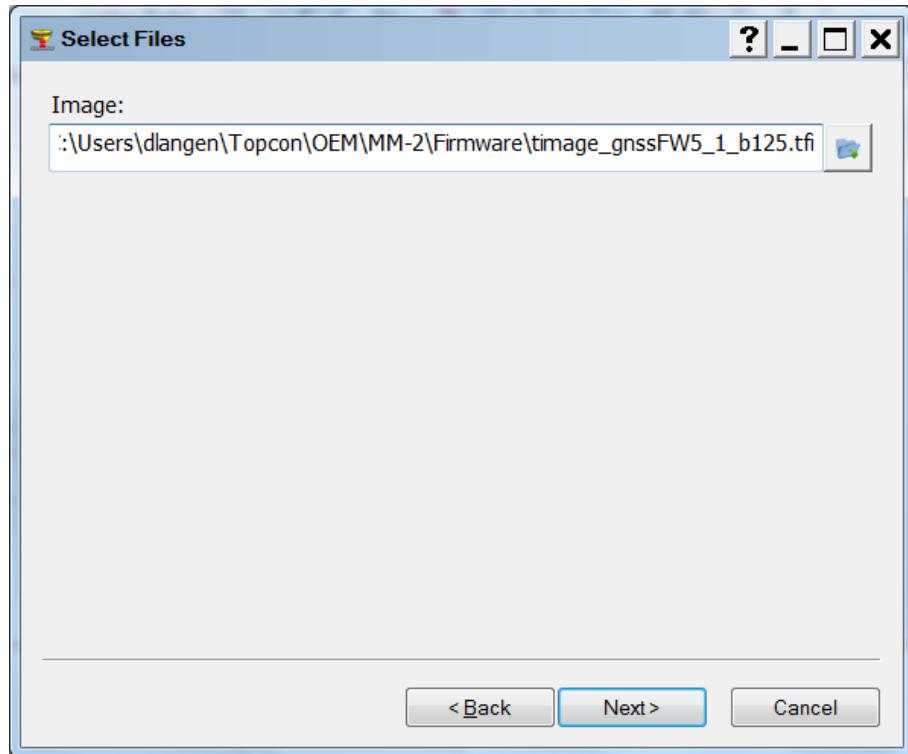


Figure 61: TRU – Receiver Information

9. Verify that the information is correct, and click **Next**. The **Select Files** screen appears (Figure 62 on page 50).

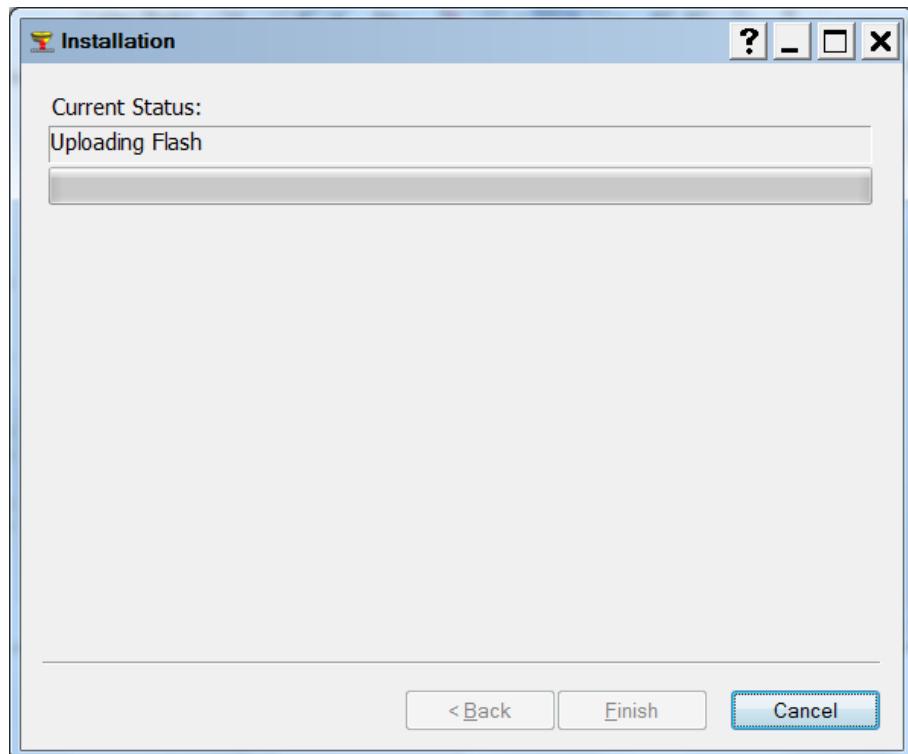
10. Click the folder icon, navigate to, and select the firmware build you downloaded in step 1.



**Figure 62: Locate and Select Firmware**

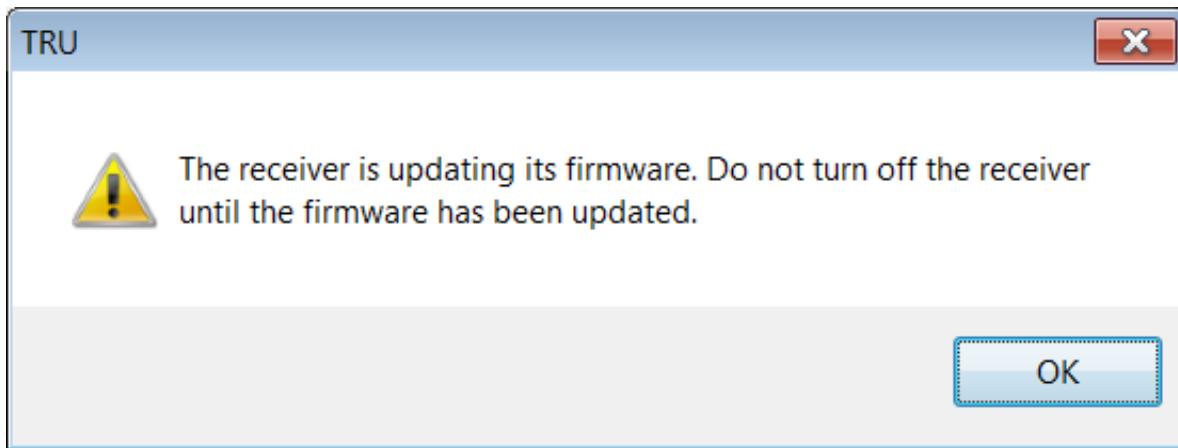
11. Click **Next** to begin the upload.

Once the process begins, a status screen appears (Figure 63). Do not unplug the power or Ethernet connection during this process.



**Figure 63: Firmware Upload In Progress**

12. When the upload ends, click **Finish**. A prompt appears indicating that the receiver is updating firmware (Figure 64).



**Figure 64: Firmware Update In Progress**

13. Wait approximately ten minutes for the process to finish.

14. Click **OK** to return to the **Select Device** screen.

15. Open the **Terminal** window in TRU.

16. Enter *print,dev/core:on* and click **Send**.

During the update process, the receiver will return the following:

```
RE00F/par/dev/core={  
RE01B 0={mode=normal,state=run},  
RE01F 1={mode=update,state=updateX}}
```



For *RE01F 1={mode=update,state=updateX}*, X will increase from 1 to 7.

---

When the update process is finished, the receiver will return the following:

```
RE00F/par/dev/core={  
RE01B 0={mode=normal,state=run},  
RE01B 1={mode=normal,state=run}}
```

17. Repeat steps 2-16 for the auxiliary board.

18. When both boards have been updates, disconnect from the receiver in TRU.

# Use Cases

.....

The MR-2 receiver is suitable for a variety of applications from marine construction to surveying applications. The MR-2 provides precise positioning, and heading and attitude information. This chapter describes different use cases for the MR-2 receiver.

## GNSS Modular Receiver

The MR-2 is a highly efficient GNSS sensor that you can integrate in various surveying and construction operations where there are requirements for high accuracy, rapid deployment, and easy integration.

Serial communication available on this modular receiver provides full flexibility to connect to any external radio. The primary antenna connection enables you to connect an external survey-grade antenna and use the receiver as a rover suited to the job requirements.

## Site Reference Station

You can integrate the MR-2 with an external radio using serial communication, and use it as a base receiver. As a base, the MR-2 configuration can output RTK corrections in industry standard format for a rover receiver to produce reliable and accurate RTK positions.

## GNSS Sensor for Heading and Attitude

The MR-2 allows for the use of a dual antenna system, called HD2, that derives 2D attitude parameters (heading and inclination) from the baseline vector between two antennas connected to the MR-2 receiver. Altogether, the MR-2 can provide the high performance RTK position, heading, and pitch or roll of a vehicle or vessel where it is deployed.

# Troubleshooting

• • • •

This chapter will help you diagnose and solve some common problems encountered 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 Topcon support, check the following:

- Register your product at <https://www.topconpositioning.com/support>.
- Check all external receiver connections carefully to ensure correct and secure connections. Double check for worn or defective cables.
- Check the power source for incorrectly connected cables.
- Check that the most current software is installed onto the computer and that the most current firmware is loaded into the receiver. Check the TPS website for the latest updates.

Then try the following:

- Reset the receiver using TRU (**Tools ▶ Resent Receiver**).
- Restore default settings using TRU (**Tools ▶ Factory Reset**).

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

## Powering Problems

If you are using an external power source, the cable may be disconnected or damaged.

- Make sure the cable is securely connected and undamaged.
- Make sure the power source is not defective.
- Using a volt meter, ensure power is present to the power source output connector.
- Power cycle the receiver. See "Power Cycling" on page 19 for more information.

## 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:
  - Check that the cable connector is attached to the correct receiver port.
  - 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.

Generic problems:

- The receiver port used for connection is not in Command mode:
  - a. Connect the receiver to a computer using a free port (see "Step 2: Connect to a Computer or Display Unit and RTK Correction Source" on page 13) and start TRU.
  - b. Open TRU, and connect to the receiver. See "Connect The Receiver to TRU" on page 20.
  - c. In TRU, click **Receiver Settings ▶ Ports**.
  - d. Double-click on the port, and change the **Input Mode** to **Command**.

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

The corresponding receiver options may be disabled or expired (satellite signals must be enabled with OAFs).

- 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 TPS website for details.
- Refer to the *TRU Online Help* embedded in the software.

## The receiver tracks too few satellites.

The survey is conducted near obstructions (tree canopy, tall buildings, and so forth).

- Check that the multipath reduction check boxes have been selected.
  - a. Connect the receiver to a computer using a free port (see "Step 2: Connect to a Computer or Display Unit and RTK Correction Source" on page 13) and start TRU.
  - b. Open TRU, and connect to the receiver. See "Connect The Receiver to TRU" on page 20.
  - c. In TRU, click **Receiver Settings > Tracking & Positioning > Adv** tab.
  - d. 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.
- The receiver is not configured as a Base or Rover.
  - If the receiver should function as a Base, ensure it has the proper configuration. See "Configure the Receiver as a Base" on page 27 for details.
  - If the receiver should function as a Rover, ensure it has the proper configuration. See "Configure the Receiver as a Rover" on page 35 for details.
- 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. Contact a dealer or visit the TPS website for details
  - Refer to the *TRU Online Help* embedded in the software.
- 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 screen, choose **Receiver Settings > Tracking & Positioning > Obs** tab.
  - 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.
  - a. Connect the receiver to a computer using a free port (see "Step 2: Connect to a Computer or Display Unit and RTK Correction Source" on page 13) and start TRU.
  - b. Open TRU, and connect to the receiver. See "Connect The Receiver to TRU" on page 20.
  - c. In TRU, click **Receiver Settings > Ports**.
  - d. Double-click on the port to configure, and make sure the **Input Mode** of the rover matches the format of the **Output Mode** of the base (i.e. RTCM 3.x) See "Configure the Receiver as a Rover" on page 35 for more information.
- Poor satellite geometry (PDOP/GDOP values are too high). The recommended value is less than 3.5.
  - Conduct a survey when PDOP values are low.
- The elevation mask is above 15 degrees:
  - Lower the elevation mask. To do this, on the TRU main screen, click **Receiver Settings > Tracking & Positioning > Obs** tab.
  - Verify there is a clear view of the sky to allow sufficient satellite tracking.
- The transmitting and/or receiving antenna may be improperly connected:
  - Check that the radio modem's antenna is securely and properly connected to the antenna connector.
  - Check that the radio modem's antenna is undamaged. If damaged, contact a TPS dealer to replace the antenna.

- 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 baud rate to that which the modem supports. Refer to the modem's manual for information.
- The base and rover modems use different radio link parameters.
  - Configure the Base and Rover radio modems according to the procedures listed in the applicable section. See the *Topcon Receiver Utility (TRU) Online Help*, embedded in the software.
- 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).
  - Use a spectrum analyzer to detect the radio characteristics of the interfering signal and change the system's configuration accordingly.
  - Remove the jamming signal source or relocate the radio antennas (if possible).
  - The radio may not be properly connected to the receiver.
  - Double-check all cable connections.

## Clear NVRAM Using TRU

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.

Even though clearing the NVRAM is not a common (nor normally a recommended) operation, there are times when clearing the NVRAM can eliminate communication or tracking problems. Clearing the receiver's NVRAM can be interpreted as a "soft boot" in the computer.

After clearing the NVRAM, the receiver requires time to collect new ephemerides and almanacs (around 15 minutes).

Clearing the receiver's NVRAM will reset the receiver to factory default values.

To clear the NVRAM:

1. Connect the receiver and computer. See "Step 2: Connect to a Computer or Display Unit and RTK Correction Source" on page 13 for this procedure.
2. Open TRU, and connect to the receiver. See "Connect The Receiver to TRU" on page 20.
3. Click the **Tools** icon in the main screen. The **Tools** dialog box appears, enabling you to reset the receiver and clear the NVRAM.
4. Click **Factory Reset**, and then click **Yes** to continue.

## 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.

# Safety Warnings

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## General Warnings



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.

## Receiver Warnings



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



If this product has been dropped, altered, transported or shipped without proper packaging, or otherwise treated without care, erroneous measurements may occur.

The owner should periodically test this product to ensure it provides accurate measurements. Inform TPS immediately if this product does not function properly.

# Specifications

.....

This chapter provides specifications for the MR-2 and its internal components.

## General Details

Table 6 lists the MR-2's general specifications.

**Table 6. General MR-2 Specifications**

Physical	
Enclosure	Aluminum alloy
Color	Topcon Yellow and Black
Dimensions (mm)	172 (w) x 166 (d) x 49 (h)
Weight (g)	Single: 0.88 kg (1.94 lbs) Dual: 0.94 kg (2.07 lbs)
Seals	Silicon
Tracking	
Number of Channels	226 channels with universal tracking channels
Tracked Signals	GPS: L1 C/A, L1C, L1P(Y), L2P(Y), L2C, L5 GLONASS: L1 C/A, L1P, L2 C/A, L2P, L3C Galileo: E1, E5a, E5b, E5AltBoc Compass: B1, B2 SBAS Corrections: WAAS/EGNOS/MSAS QZSS Nav: L1 C/A, L1C, L2C, L5C L-band: Yes (1525 – 1560 MHz)
Antenna Type	External. Supports dual antenna input for heading determination through Topcon HD2 technology.
Multipath Reduction	Yes, code and carrier
PLL/DLL Setting	Adjustable bandwidth and order
Smoothing Interval	Adjustable, code and carrier
Data and Memory	
Internal Memory	Up to 8GB for each B125 board
Data Update / Output Rate	Up to 100 Hz (20 Hz standard) (no interpolation)
Real-time Data Output	Proprietary TPS format, RTCM SC104 ver. 2.x, 3.0, and 3.1; CMR/CMR+; MSM; NMEA 0183 version 2.x, 3.0, and 3.0
Heading Determination	Yes: simultaneous RTK + HD2
Data Logging	On-board data logging (for support purposes only) up to 8GB for each B125 board

**Table 6. General MR-2 Specifications**

<b>Environment</b>	
Operating Temperature	-10° C to +75° C
Storage Temperature	-50° C to +85° C
Humidity	100%, condensing per MSP-PDA-012 class B, ref MRII-143
Waterproof Rating	IPX7 (1 meter submersion)
Dust Rating	IP6X (fully dust proof)
Random Vibration	10-1014 Hz, 7.64g in all three axes
Sinusoidal Vibration	5-200 Hz, 8.9 g, in all three axes
Shock	50 G, 6 -20ms pulse
Drop	3 ft. drop on concrete slab
<b>Power</b>	
Internal Voltage Range	9 to 36 VDC. Reverse Polarity Protected
Power Consumption	Single: 5 watts @ 9-36 VDC (typical) Dual: 8 watts @9-36 VDC (typical) 12 watts max
<b>Power and Communications</b>	
Ports	Deutsch DTM Series 12-pin Receptacle for power and communications Serial (x3), CAN, and PPS on main connector Turck M12 8-Pin Breaks out to RJ45 and SAE power
Antenna Connectors	2x TNC (Antenna power 4.75 – 5.10 VDC)
LEDs	4 LEDs: Power Ethernet Primary Antenna Secondary Antenna
<b>NMEA</b>	
NMEA Version	Ver. 2.1, 2.2, 2.3, 3.0 output
Messages	GGA, GLL, GNS, GRS, GSA, GST, GSV, HDT, RMC, VTG, ZDA, ROT, GMP
Output Interval	1 Hz standard; 5, 10, 20, 50, 100 Hz optional
<b>DGPS</b>	
Correction Format	RTCM SC104 Ver. 2.1, 2.2, and 2.3
RTCM Message Type	1, 3, 9, 31, 32, 34; user selectable
Process Interval	1 Hz standard; 5, 10, 20, 50, 100 Hz optional

**Table 6. General MR-2 Specifications**

Output Interval for RTC Correction Data	1 Hz standard; 5, 10, 20, 50, 100 Hz optional
Elevation Mask	0 to 90 degrees (independent of data logging)
Multi-base DGPS	Differential correction select mode: Nearest, Mix, Best (optional)
<b>RTK</b>	
Correction Format	RTCM SC104 Ver. 2.2, 2.3, 3.1, MSM
RTCM Message Type	3, 18, 19, 20, 21, 22, +RTCM 3; user selectable
Ambiguity Initialize	OTF
Baseline Strength	Up to 50 km in the morning and evening Up to 32 km at noon
<b>Accuracy (rms)<sup>a</sup></b>	
Standalone	Horizontal: 1.2 m Vertical: 1.8 m
RTCM based DGPS	Horizontal: 0.3 m Vertical: 0.5 m
SBAS	Horizontal: 0.8 m Vertical: 1.2 m
OmniSTAR VBS/XP/HP	Horizontal: 0.7/0.15/0.1 m
PPP (TerraStar-D)	Horizontal: 0.05 m Vertical: 0.1 m
Static/Fast Static	Horizontal: 3 mm + 0.5ppm (x baseline length) Vertical: 5 mm + 0.8ppm (x baseline length)
RTK Static	Horizontal: 3 mm + 0.5ppm (x baseline length) Vertical: 5 mm + 0.8ppm (x baseline length)
RTK Kinematic/ Stop&Go/ Network	Horizontal: 5 mm + 0.5ppm (x baseline length) Vertical: 10 mm + 0.8ppm (x baseline length)
Heading	0.3°/D, where D is the inter-antenna distance in meters.
Inclination	0.5°/D, where D is the inter-antenna distance in meters.
Velocity	0.02 m/sec
Time	30 nsec
Time to First Fix (50%)	Hot (almanac, recent ephemeris, and approx. position) <10 sec Warm (almanac, approx. position & time, and no recent ephemeris) <35 sec Cold (no almanac or ephemeris, and no approx. position or time) <60 sec
Reacquisition	<1 sec

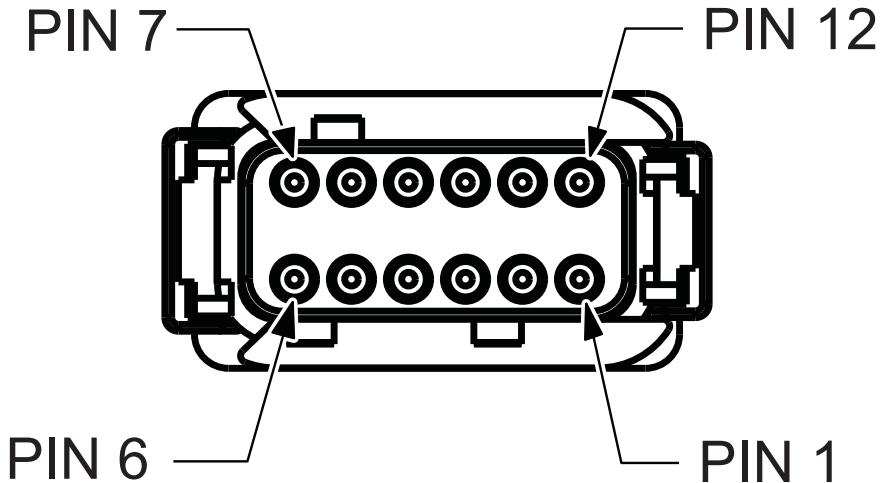
- a. These specifications will vary depending on the number of satellites used, obstructions, satellite geometry (PDOP), occupation time, multipath effects, and atmospheric conditions. Performance may be degraded in conditions with high ionospheric activity, extreme multipath, or under dense foliage. For maximum system accuracy, always follow best practices for GNSS data collections.

## Connector Specifications

The MR-2 has two antenna connectors, and one port connector for power and data upload/download.

### Main Connector

The power connector (Figure 65) is a sealed receptacle, Deutsch DTM Series 12-pin connector located on the front of the receiver.



**Figure 65: Power Connector**

Table 7 provides the power connector specifications.

**Table 7. Main Connector Specifications**

No.	Signal Name	Direction
1	GND_IN	Ground Input
2	PWR_IN	Power Input
3	TXD1	Output
4	RXD1	Input
5	RXD2	Input
6	TXD2	Output
7	GND	Ground
8	IGN	Input
9	CAN_H1/ <sup>a</sup> RXD3	Input/Output
10	CAN_L1/ TXD3	Input/Output
11	PPS	Pulse Per Second Output

**Table 7. Main Connector Specifications**

No.	Signal Name	Direction
12	GND	Ground

a. COM 3 attaches to a secondary B125 board.

## Ethernet Connector

The Ethernet connector is a sealed receptacle located on the front of the receiver.

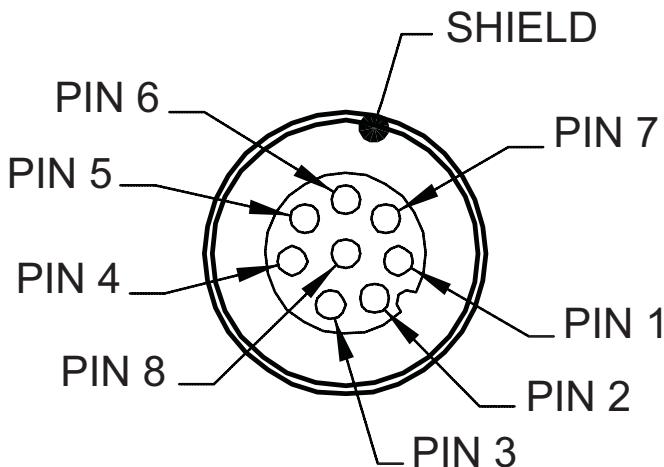
**Figure 66: Ethernet Connector**

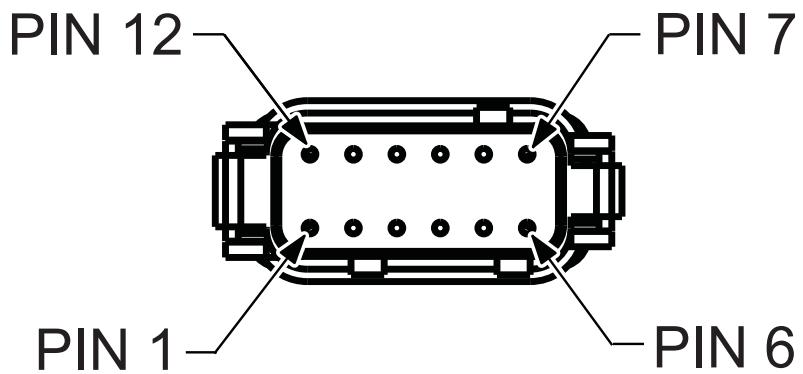
Table 8 provides the Ethernet connector specifications.

**Table 8. Ethernet Connector Specifications**

No.	Signal Name
1	PWR
2	GND
3	GND
4	TX-
5	RX+
6	TX+
7	PWR
8	RX-

# Cable Harness

## Cable Harness Receiver End Connector



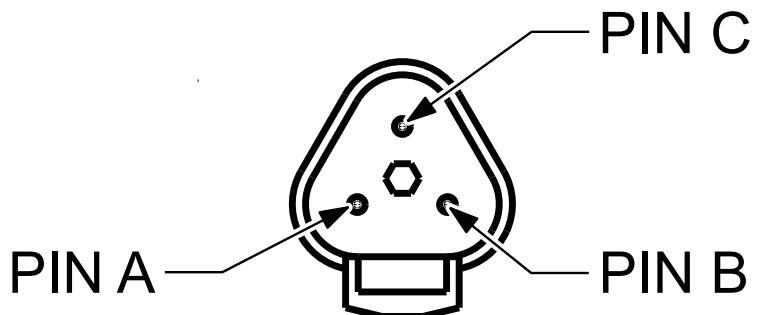
**Figure 67: Cable Harness Receiver Connector**

Table 9 provides pin out specifications for the receiver end of the cable harness.

**Table 9. Cable Harness (Receiver End) Specifications**

No.	Signal Name	Direction
1	GND_IN	Ground Input
2	PWR_IN	Power Input
3	TXD1	Output
4	RXD1	Input
5	RXD2	Input
6	TXD2	Output
7	GND	Ground
8	IGN	Power Input
9	COM3	Input
10	COM3	Output
11	PPS	Pulse Per Second Output
12	GND	Ground

## Cable Harness Power Connector



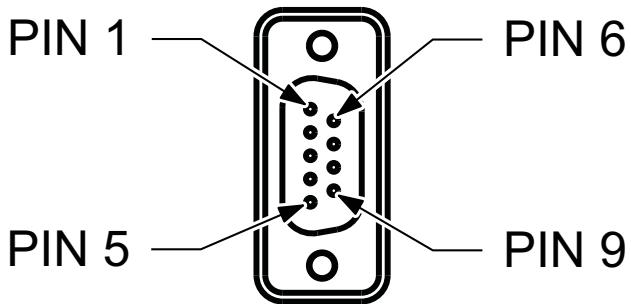
**Figure 68: Cable Harness Power Connector**

Table 10 provides pin out specifications for the power connector of the cable harness.

**Table 10. Cable Harness Power Arm  
(Receiver Side) Specifications**

No.	Signal Name
A	Vin
B	GND
C	IGN

## Cable Harness COM1 Connector



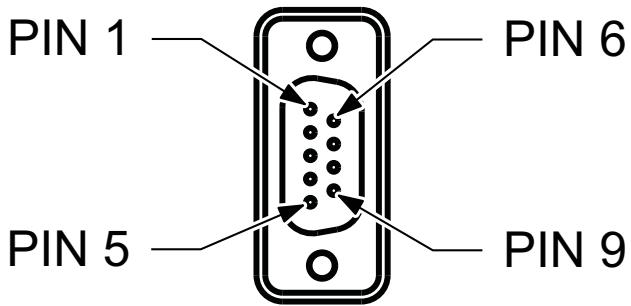
**Figure 69: Cable Harness COM1 Connector**

Table 11 provides pin out specifications for the COM1 connector of the cable harness.

**Table 11. Cable Harness COM1 Connector Specifications**

No.	RS232 Signal	Level	Direction
1	N/C	-	-
2	TXD1	RS232	O/P
3	RXD1	RS232	I/P
4	N/C	-	-
5	GND	GND	GND
6	N/C	-	-
7	CTS	RS232	Connected to Pin 8
8	RTS	RS232	Connected to Pin 7
N/C	-	-	-

## Cable Harness COM2 Connector



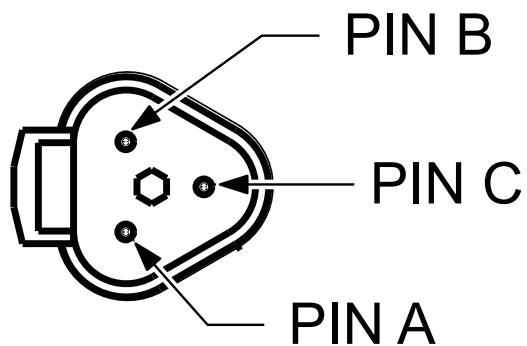
**Figure 70: Cable Harness COM2 Connector**

Table 12 provides pin out specifications for the COM2 connector of the cable harness.

**Table 12. Cable Harness COM2 Connector Specifications**

No.	RS232 Signal	Level	Direction
1	N/C	-	-
2	TXD2	RS232	O/P
3	RXD2	RS232	I/P
4	N/C	-	-
5	GND	GND	GND
6	N/C	-	-
7	N/C	-	-
8	N/C	-	-
9	N/C	-	-

## Power Adapter Connector



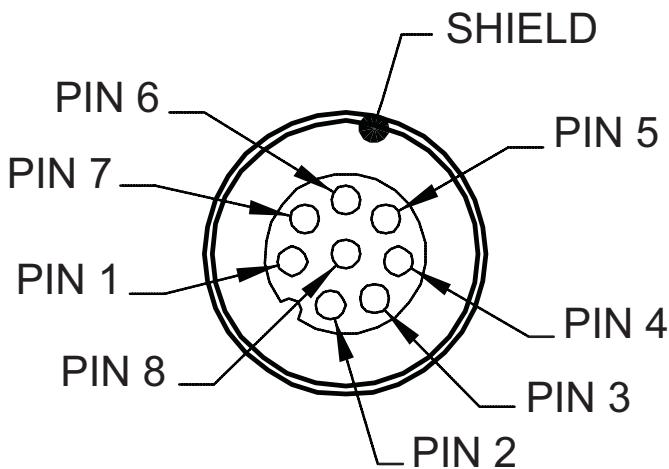
**Figure 71: Power Adapter Cable**

Table 13 provides pin out specifications for the power adapter connector of the optional power adapter cable.

**Table 13. Power Adapter Connector Specifications**

No.	RS232 Signal
A	PWR_IN
B	GND_IN
C	IGN

## Ethernet Cable



**Figure 72: Ethernet Cable - Receiver Side**

Table 14 provides pin out specifications for the receiver side of the optional Ethernet cable.

**Table 14. Receiver Side Ethernet Cable Specifications**

No.	Signal Name	Level	Direction
1	PWR		Power
2	PWR_GND		Power/Ground
3	PWR_GND		Power/Ground
4	TX-		
5	RX+		
6	TX+		
7	PWR		Power
8	RX-		

# Regulatory

.....

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

## FCC Compliance

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.



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

## 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 license-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.

## 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

The following declares that this device conforms to the R&TTE Directive 1999/5/EC and Motor Vehicle EMC Directive 2004/104/ec.

The following standards were applied: (R&TTE Directive 1999/5/EEC and Motor Vehicle EMC Directive 2004/104/ec)

- EN 301 489 V1.9.2 (2011-09)
- EN 60950-1: 2006 + A11:2009/A1:2010/A2:2013
- EN 301 489-3 V1.61 (2013-08)
- EN 300 440-2 V1.4.1
- EMC Directive 204/104/ec

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]	(Topcon) tímto prohlašuje, že tento (MR-2) je ve shod se základními požadavky a dalšími píslušnými ustanoveními smrnice 1999/5/ES.
Dansk [Danish]	Undertegnede (Topcon) erklærer herved, at følgende udstyr (MR-2) overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EU.
Deutsch [German]	Hiermit erklärt (Topcon) dass sich das Gerät (MR-2) in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab (Topcon) seadme (MR-2) vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, (Topcon) declares that this (MR-2) is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente (Topcon) declara que el (MR-2) cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
[Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ (Topcon Positioning Systems, Inc.) ΔΗΛΩΝΕΙ ΟΤΙ (MR-2) ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/EK.

Français [French]	Par la présente ( <i>Topcon</i> ) déclare que l'appareil ( <i>MR-2</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>MR-2</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>MR-2</i> ) atbilst Direktvas 1999/5/EK btiskajm prasbm un citiem ar to saisttajiem noteikumiem.
Lietuvi [Lithuanian]	Šiuo ( <i>Topcon</i> ) deklaruojam, kad šis ( <i>MR-2</i> ) atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart ( <i>Topcon</i> ) dat het toestel ( <i>MR-2</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>MR-2</i> ) jikkonforma mal-tiijiet essenziali u ma provvedimenti orajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, ( <i>Topcon</i> ) nyilatkozom, hogy a ( <i>MR-2</i> ) megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
Polski [Polish]	Niniejszym, ( <i>Topcon</i> ), deklaruję, że ( <i>MR-2</i> ) spełnia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.
Português [Portuguese]	( <i>Topcon</i> ) declara que este ( <i>MR-2</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>MR-2</i> ) v skladu z bistvenimi zahtevami in ostalimi relevantnimi doloili direktive 1999/5/ES.
Slovensky [Slovak]	( <i>Topcon</i> ) týmto vyhlasuje, že ( <i>MR-2</i> ) spa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	( <i>Topcon</i> ) vakuuttaa täten että ( <i>MR-2</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>MR-2</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.



# **Warranty**

• • • •

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

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## 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.

## 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 available for download from myTopcon (<https://www.topconpositioning.com/support>).

**U**



[www.topconpositioning.com](http://www.topconpositioning.com)