

TRU Topcon Receiver Utility





TRU

Reference Manual

Part Number 7010-0908

Rev G

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Preface



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



Please read the terms and conditions carefully.

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Improper use of the receiver can lead to injury to persons or property and/or malfunction of the product. The receiver should only be repaired by authorized TPS warranty service centers. Users should review and heed the safety warnings in an Appendix.

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The above Terms and Conditions may be amended, modified, superseded, or canceled, at any time by TPS.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

Manual Conventions

This manual uses the following conventions:

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



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



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



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

Introduction



Topcon Receiver Utility™ (TRU) is a software product designed for users who need to configure the receiver hardware or peripheral devices (internal, and external modems, Bluetooth® boards, etc.). It is available for installation on any personal computer and hand-held controllers (Mobile devices). This manual describes version 2.8 of TRU with the Base license type of register intended for general users.

Installing TRU

You can install TRU on any personal computer with Microsoft Windows XP Service Pack 2 or later, or into controllers with Windows Mobile 5.0 or later. Two types of installers are available: one for personal computers and one for Mobile devices.

To install TRU onto the controller, run the Mobile Installer on the PC. The Installer automatically detects the mobile platform connected to the PC (CPU, OS, specific hardware) and installs an appropriate edition of TRU onto the controller. After installation, shortcuts on the desktop and in the Program menu are created.

To start TRU, double-click the shortcut  or launch the software from the Start menu.

Main Window

The **Main Window** consists of a **Menu Bar**, **Tools Area**, and **Status Bar** (Figure 1).

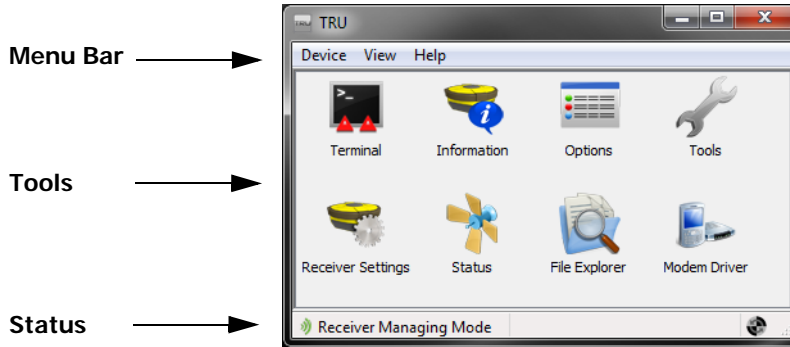


Figure 1: Main Window

The **Menu Bar** has the following components:

- **Device** – contains options that allow connecting to a device, changing general-purpose parameters, and selecting the application mode.
- **View** – shows or hides the status bar.
- **Help** – allows you to register the version of TRU, and view Help and TRU version.

The **Tools Area** contains icons for the tools included in the current software mode. Each tool is designated by an icon. An icon can also open the next menu level.



The tools area is inactive until a connection to a device is established. (The connection icon in the status bar is green)

The **Status Bar** shows the current mode and the connection status icon. (The green icon indicates that the device is connected with TRU; the gray indicates that there is no connection.) You can hide the status bar by unchecking the **Status Bar** option under the **View** menu in the menu bar.

Device

The device submenu items are **Connect** ("Connection" on page 8), **Disconnect**, **Setup**, and **Application Modes** (Figure 2).

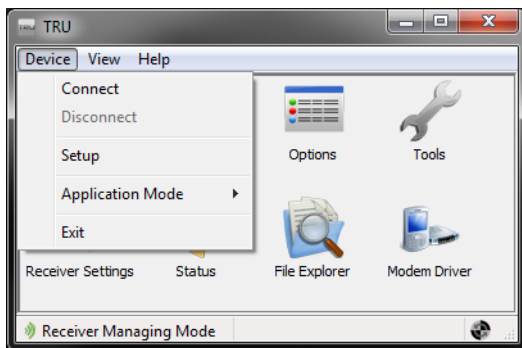


Figure 2: Device Submenu

Application Modes

Topcon Receiver Utility has four application modes:

- Simple Terminal – In this mode, TRU is used only as a terminal. This mode is also used to update the firmware of inoperative receivers.
- Receiver Managing (default) – used for configuring GNSS receivers and OEM boards.
- Modem Managing – used for configuring internal and external modems.
- Firmware Loader – used for updating firmware in GNSS receivers and modem/Bluetooth/power boards.

You can choose the application mode from the **Device** menu.

Setup

To change general-purpose parameters, select **Device** ► **Setup** from the **Main Window**. The Setup dialog box contains three tabs, **General**, **Status**, and **Modems**.

General

The **General** tab configures a way to display the receiver position in the Status dialogs. You can select either Geodetic (Latitude, Longitude, Altitude) or Cartesian (X,Y,Z) coordinate system.

Status

In the **Status** tab, you can view and modify colors used for representing a solution type in the Status dialogs.

Modems

The **Modems** tab shows that automatic mode is set for detection of the modem.



Manual Selection is not allowed for the Base license type.

Help

The Help submenu items are **Register**, **Help**, and **About...**

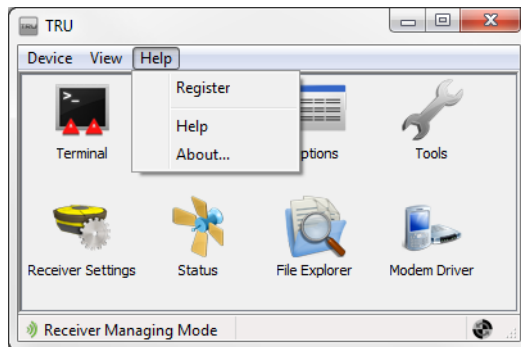


Figure 3: Help Submenu

Register

1. To view or update your license for using TRU, click **Help ▶ Register**. The Register dialog box displays.
 - **License Type** – The Base version is intended for general users.



This manual describes the Base version of TRU.

-
- **Update the license** – If you know the Serial Number for your Computer UID, you are able to change the Base license type for other license.



Only the license base version is available for users. Topcon will notify distribution if there is any need for you to obtain an advanced TRU license.

-
2. Click **Update the license**, to view the UID number for your computer.
 3. Enter an appropriate serial number to view the license type to which this number corresponds.
 4. Click **OK** to save the update.

Help


To display Help:

- On a hand-held controller with Windows Mobile, click the question mark in the upper-right corner of each screen.
- On a hand-held controller with Windows CE, click the question mark in the **Menu Bar**.
- On a personal computer, click the F1 key or click **Help ▶ Help** in the **Menu Bar**.


About

Click **Help** ▶ **About** from the **Menu Bar** in the **Main Window** to display information about the software, such as the version number, date created, application edition, and the name of publishing company.

Exiting TRU

1. To exit TRU:
 - From the **Menu Bar** in the **Main Window**, select **Device** ▶ **Exit**, or
 - from the **Menu Bar** in the **Main Window**, click the close button  in the upper right corner.
2. After one of the methods above is used to begin closing the program, TRU verifies exiting. Click **Yes** to exit TRU, or click **No** to continue using TRU.



The close button  only closes TRU from the **Main Window**. From within any submenu, this button returns to the upper level window.

Connecting to the Device

You can establish a connection to your device in any of the four application modes:

- **Simple Terminal** mode allows advance users to connect with receivers, including devices not supported by TRU, through manual commands. (See “Simple Terminal” on page 25 for more information on Simple Terminal mode.)
- **Receiver Managing** mode allows you to configure Topcon GNSS receivers. When in this mode, TRU automatically tries to detect a receiver at the time of connection. If there is no receiver, or if it does not respond, a connection cannot be established. (See “Receiver Managing” on page 29 for more information on Receiver Managing mode.)
- **Modem Managing** mode allows you to configure Topcon and third-party modems.(See “Modem Managing” on page 89 for more information on Modem Managing mode.)
- **Firmware Loader** mode allows you to load firmware onto various devices within a Topcon GNSS receiver. (See “Firmware Loader” on page 115 for more information on Firmware Loader mode.)

In any of these application modes, you can connect to a receiver via **Serial Port**, **Bluetooth**, **Network**, or **USB** (PC version of TRU only).

The following sections describe how to connect to your device.



Bluetooth transport may not be available in the following situations: a device-specific Bluetooth stack is not supported by TRU, or the Bluetooth power is turned off. If the Bluetooth power is off, turn on the Bluetooth power before using a Bluetooth manager. Server operating systems also do not support Bluetooth.



If your version of TRU, for the specified platform, does not support installed Bluetooth stack, use virtual serial ports provided by a Bluetooth manager for your Bluetooth radio.



To use a USB connection, install a Topcon USB driver designed for your specific operating system version and system type (32- or 64-bit). Visit www.topcontotalcare.com to get information on latest USB driver available for Topcon GNSS receivers.

Serial Port Connection

1. To establish a serial port connection to the device, select **Device** ► **Connect** from the **Menu Bar** on the **Main Window**. The **Connection Parameters** dialog box displays.

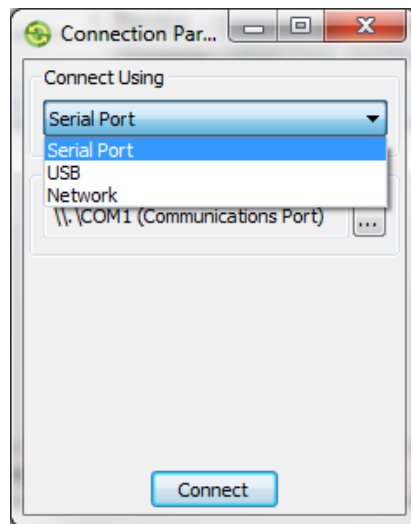



Figure 4: Connection Parameters Dialog Box

2. Select **Serial Port** from the **Connect Using** drop-down menu.
3. Select the **Port Name** by clicking the **List** button  .

4. On the **Select Port** dialog box (Figure 8), highlight the port, click and hold, or right-click, and click **Select the port**.

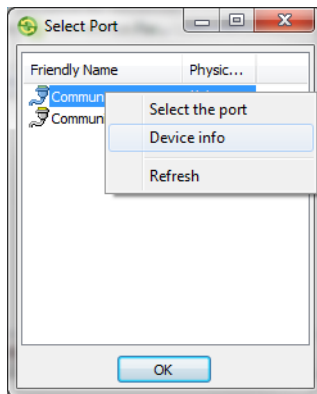



Figure 5: Select Port Dialog Box and Pop-up Menu

You can also select **Device Info** from the **Port Name** pop-up menu (Figure 8) to view information about the selected port.

The **Device Info** dialog box displays both the physical and friendly **Device Names** of the serial port. Click the close button  to exit.

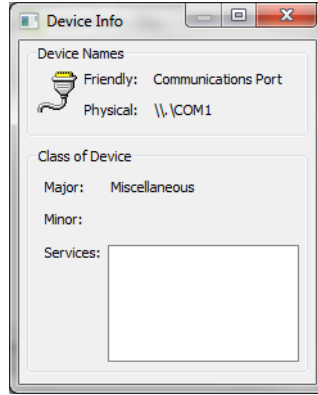


Figure 6: Device Info Dialog Box

5. Click **Ok** on the **Select Port** dialog box (Figure 5).
6. If available, check the **Internal Modem** box and select the GNSS receiver port to which an internal modem is connected from the **Receiver Port** drop-down menu.



Receiver Port is only available in Modem Managing mode.

7. Click **Connect** to establish a connection to your device (Figure 4).



TRU always remembers the last successful port settings. When you try to establish a new connection, TRU first tries to use the last selected settings. The connection is established right away if you are connecting to the same device.

- When TRU is in Simple Terminal mode, it just opens the port. TRU does not try to detect the hardware connected to the port, nor change the port settings.
- When TRU is in Receiver Managing mode, it attempts to detect the device connected to the port.
 - When detecting a receiver, the **Detecting Receiver** dialog box displays. An ActiveSync animated icon and the **Cancel** button displays. Additional parameters display when using serial transport, i.e., baud rate and flow control.
- When TRU is in Modem Managing mode and auto detection is setup, it tries to detect a modem at the time of connection. If there is no modem, or if it does not respond, a connection cannot be established.
 - When detecting a modem, the **Detecting Modem** dialog displays identical to the **Detecting Receiver** dialog box.

Click **Cancel** to terminate the process.

Bluetooth Connection

1. To establish a Bluetooth connection to the device, click **Device** ► **Connect** from the **Menu Bar** on the **Main Window**. The **Connection Parameters** dialog box displays.

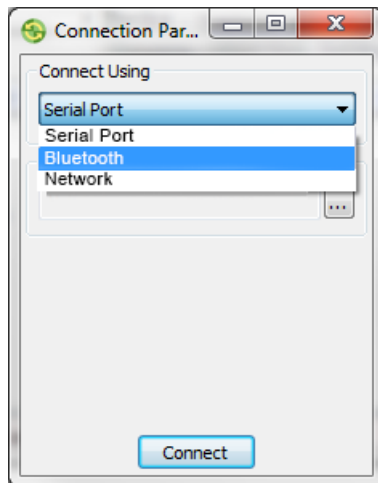



Figure 7: Connection Parameters Dialog Box

2. Select **Bluetooth** from the **Connect Using** drop-down menu.
3. Select the **Device Name** by clicking the **List** button  .

4. On the **Select Device** dialog box (Figure 8), highlight the Bluetooth device, click and hold it, or right-click and select **Select the port** or get the device information on that port from the pop-up menu.

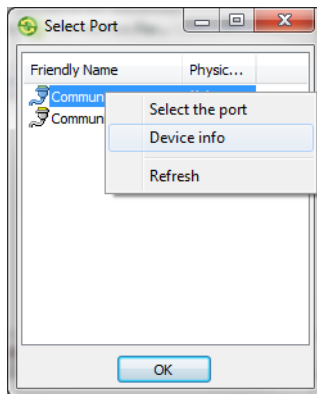



Figure 8: Select Port Dialog Box and Pop-up Menu

You can also, select **Device Info** from the **Port Name** pop-up menu (Figure 8) to view information about the selected port.

The **Device Info** dialog box displays both the physical and friendly **Device Names** of the serial port. Click the close button  to exit.

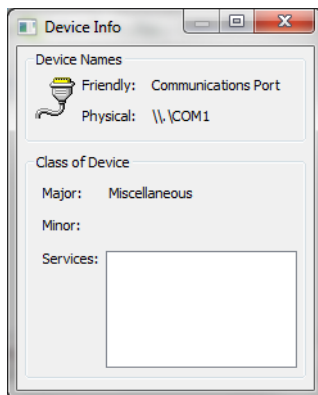


Figure 9: Device Info Dialog Box

5. If available, check the **Internal Modem** box and select the GNSS receiver port to which an internal modem is connected from the **Receiver Port** drop-down menu.



Receiver Port is only available in Modem Managing mode.

6. Click **Ok** on the **Select Port** dialog box.

7. Click **Connect** to establish a connection to your device. .



TRU always remembers the last successful port settings. When you try to establish a new connection, TRU first tries to use the last selected settings. The connection is established right away if you are connecting to the same device.

- When TRU is in Simple Terminal mode, it just opens the port. TRU does not try to detect the hardware connected to the port, nor change the port settings.
- When TRU is in Receiver Managing mode, it attempts to detect the device connected to the port.
 - When detecting a receiver, the **Detecting Receiver** dialog box displays. An ActiveSync animated icon and the **Cancel** button displays. Additional parameters display when using serial transport, i.e., baud rate and flow control.
- When TRU is in Modem Managing mode and auto detection is setup, it tries to detect a modem at the time of connection. If there is no modem, or if it does not respond, a connection cannot be established.
 - When detecting a modem, the **Detecting Modem** dialog displays identical to the **Detecting Receiver** dialog box.

Click **Cancel** to terminate the process.

USB Connection

1. To establish a USB connection to the device, select **Device** ► **Connect** from the **Menu Bar** on the **Main Window**. The **Connection Parameters** dialog box displays.

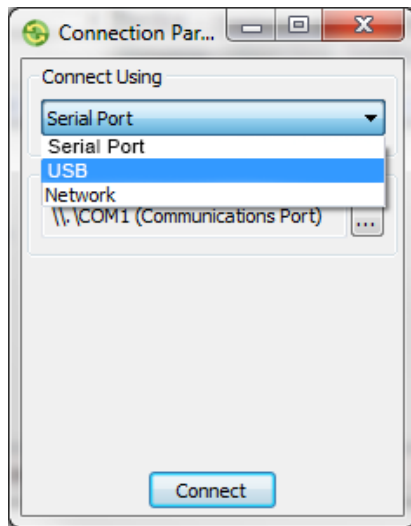


Figure 10: Connection Parameters Dialog Box

2. Select **USB** from the **Connect Using** drop-down menu.

3. Select the **Device Name** by clicking the **List** button , and choose the receiver from the list.



Device Name is only available in Receiver Managing and Modem Managing modes.

4. If available, check the **Internal Modem** box and select the GNSS receiver port to which an internal modem is connected from the **Receiver Port** drop-down menu.



Receiver Port is only available in Modem Managing mode.

5. Click **Ok**.
6. Click **Connect** to establish a connection to your device.



TRU always remembers the last successful port settings. When you try to establish a new connection, TRU first tries to use the last selected settings. The connection is established right away if you are connecting to the same device.

- When TRU is in Simple Terminal mode, it just opens the port. TRU does not try to detect the hardware connected to the port, nor change the port settings.
- When TRU is in Receiver Managing mode, it attempts to detect the device connected to the port.

- When detecting a receiver, the **Detecting Receiver** dialog box displays. An ActiveSync animated icon and the **Cancel** button displays. Additional parameters display when using serial transport, i.e., baud rate and flow control.
- When TRU is in Modem Managing mode and auto detection is setup, it tries to detect a modem at the time of connection. If there is no modem, or if it does not respond, a connection cannot be established.
 - When detecting a modem, the **Detecting Modem** dialog displays identical to the **Detecting Receiver** dialog box.

Click **Cancel** to terminate the process.

Network Connection

1. To establish a serial port connection to the device, select **Device** ► **Connect** from the **Menu Bar** on the **Main Window**. The **Connection Parameters** dialog box displays.

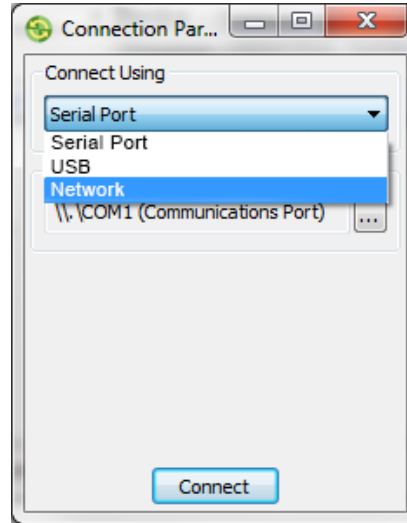


Figure 11: Connection Parameters Dialog Box

2. Select the **New** from the **Connect Using** drop-down menu.
3. Click the **List** button under **Device Name**.
4. Specify the network settings for your receiver from the **Network Connection** dialog box (Figure 12):

- IP address or host name
- TCP port number
- Password

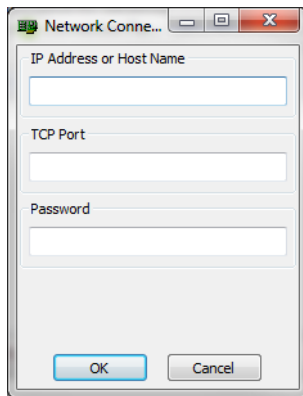


Figure 12: Network Connection Dialog Box

5. Click **Ok**.
6. Click **Connect** to establish a connection to your device.



TRU always remembers the last successful port settings. When you try to establish a new connection, TRU first tries to use the last selected settings. The connection is established right away if you are connecting to the same device.

- When TRU is in Simple Terminal mode, it just opens the port. TRU does not try to detect the hardware connected to the port, nor change the port settings.
- When TRU is in Receiver Managing mode, it attempts to detect the device connected to the port.
 - When detecting a receiver, the **Detecting Receiver** dialog box displays. An ActiveSync animated icon and the **Cancel** button displays. Additional parameters display when using serial transport, i.e., baud rate and flow control.
- When TRU is in Modem Managing mode and auto detection is setup, it tries to detect a modem at the time of connection. If there is no modem, or if it does not respond, a connection cannot be established.
 - When detecting a modem, the **Detecting Modem** dialog displays identical to the **Detecting Receiver** dialog box.

Click **Cancel** to terminate the process.

Disconnection Auto Detection

When in Receiver Managing or Modem Managing modes, TRU periodically checks if the device is still connected by obtaining the receiver ID. If connection to the device is lost, an error message displays ¹

TRU then closes the established connection and makes the tool area inactive. TRU does not try to reconnect to the device.

1. A connection to the receiver was lost.

You must choose an appropriate application mode and transport, then initialize a new connection by selecting **Device** ▶ **Connect** from the **Main Window**.



Disconnection auto detection does not work when in:

- Simple Terminal mode while using any tool
 - Receiver Managing mode while using the Terminal or Firmware Upload tool
 - Modem Managing mode while using any tool
-



When using a Bluetooth or USB connection the operating system notifies TRU that the connection has physically been broken (e.g., the remote device was switched off). In that case, TRU also closes the established connection irrespective of the current application mode or active tool.

Simple Terminal

Simple Terminal mode provides flexibility to connect with receivers through manual commands. Use of this mode is intended for advanced users and can be really useful if you want to connect to a device that is not supported by TRU.

Note that Simple Terminal mode does not enable the following functionalities:

- Device detection
- Port setting changes
- Data transmission to the port



To make the tool area active, first establish a port connection on the controller using the **Connect** option from the **Device** menu. See "Connection" on page 8.

In the **Main Window** the following icon is available.



The **Terminal** icon allows you to communicate with any device in manual mode. You can record data to a file from a connected device.

Terminal Parameters

Click the **Terminal** icon  to open the **Terminal** dialog box.

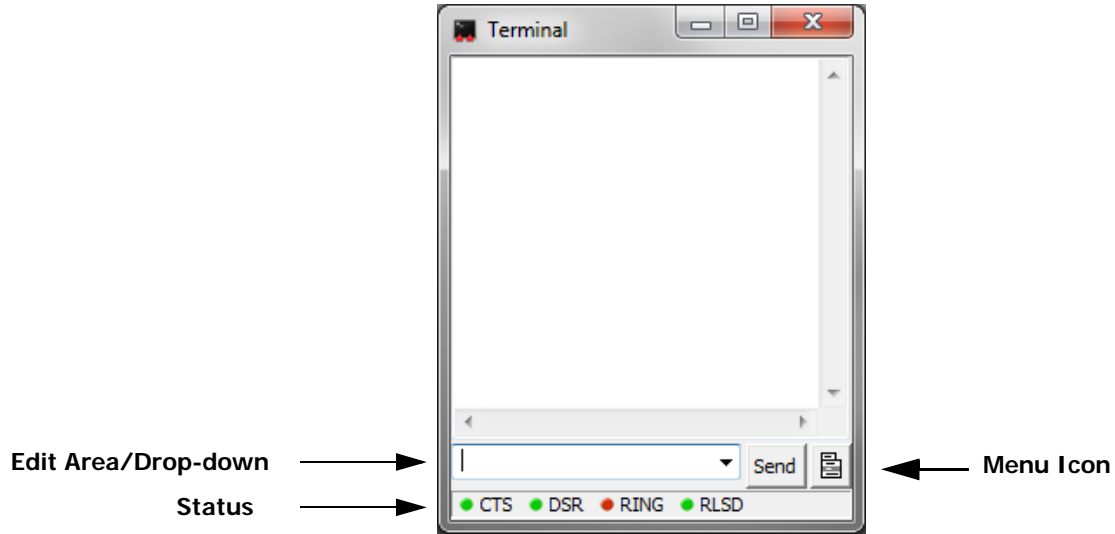


Figure 13: Terminal Dialog Box

The **Terminal** screen allows you to send commands through the selected port using the **Edit Area** at the bottom of the dialog box, and the **Send** button. The **Edit Area** remembers previous commands, which you can select from the drop-down list at the bottom of the dialog box.

The **Status Bar** in the lower part of the dialog shows the current state of transport for specific signals.

The **Menu** icon  in the lower right corner of the **Terminal** dialog box opens the pop-up menu with the following options:

- **Clear View** – clears the main view.
- **Send File** – sends a file that contains either commands or binary data. This option sends files as is. TRU does not change encoding or charset, add carriage returns or line feed characters.
- **Send File (XMODEM Protocol)** – sends a file using the XMODEM protocol.
- **Escape Functions** – opens the **Escape** dialog box to send transport specific commands.
- **Port Settings** – opens the **Port Settings** dialog box to adjust port settings. When TRU is in Simple Terminal mode, it does not change port settings.



Port settings depend on the operating system:

- Usually the operating system for the PC remembers the previous port state, so if the port baud rate is changed, the assigned value is kept.

CE.NET and Windows Mobile usually reset port settings to their default values; therefore, if you open a serial port next time, you have to adjust port settings again.

- **Simple Mode** –
 - If the **Simple Mode** item is selected, the terminal works in a similar way as a traditional terminal application, such as HyperTerminal. Every time you press a key, the key code is immediately sent to the connected device.

- When the **Simple Mode** item is not selected, and you compose a command in the edit box, you must click either the **Send** button or **Enter** to send the text (followed by a carriage return and line feed) to the connected device.
- **ASCII/HEX** – toggles text/HEX mode.
- **Text Size** – sets the size of the text (Largest, Larger, Normal, Smaller, Smallest).
- **Bytes in a Row (HEX Mode)** – selects the number of bytes in a row, and optionally displays the left hand (data) pane and the right hand (character) pane. This option only applies to HEX mode.
- **Start Logging** – initiates writing all the data received from the device to a file.
- **Stop Logging** – stops writing data received from the device to a file.





Receiver Managing







Use Receiver Managing mode to configure Topcon GNSS receivers.

When in Receiver Managing mode, TRU tries to detect a receiver at the time of connection. If there is no receiver or if it does not respond, a connection cannot be established. For more information on connecting to your device, see “Connection” on page 8.

In Receiver Managing mode, the following icons display in the tools area of the **Main Window**:

	Allows you to communicate with a receiver in manual mode. You can record data to a file from a connected device.
	Displays essential information about the receiver.
	Displays information about receiver options and allows you to upload OAF files.
	Resets the receiver, its settings, and RTK engine.

	Opens a submenu with tools to configure the receiver.
	Displays the receiver status (coordinates, list of satellites, sky plot, etc). You can also use this control to record data to a file from a connected receiver.
	Manages log files (deleting, downloading, uploading, and restoring deleted files), initializes file system, and displays information about file system and the memory card.
	Displays internal modems, detects new modems, and manages cell modem drivers.

Terminal

Click the **Terminal** icon  to open the **Terminal** dialog box.

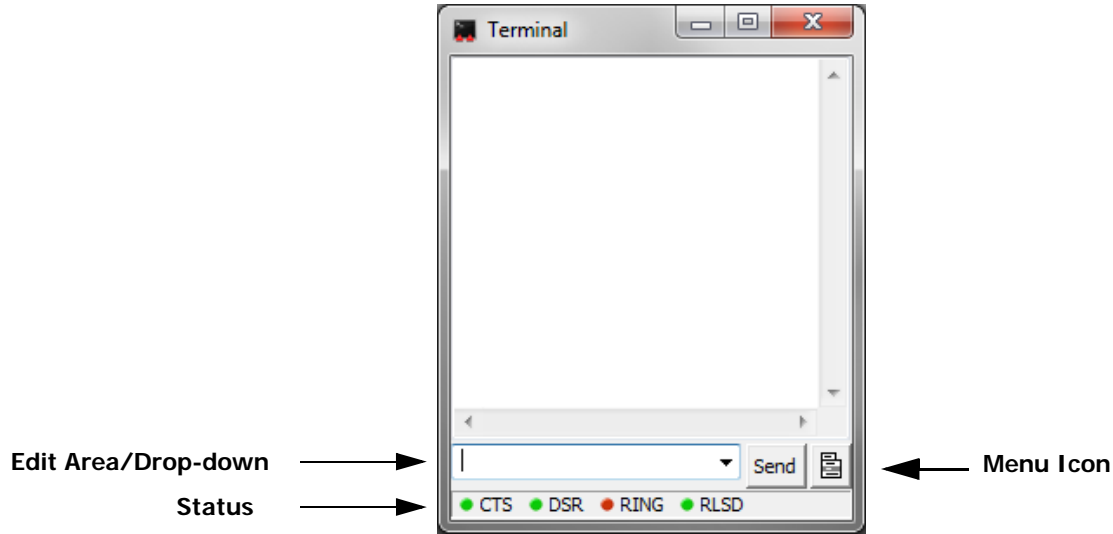


Figure 14: Terminal Dialog Box

The **Terminal** screen allows you to send commands through the selected port using the **Edit Area** at the bottom of the dialog box and the **Send** button. The **Edit Area** remembers previous commands, which you can select from the drop-down list at the bottom of the dialog box.

The **Status Bar** in the lower part of the dialog box shows the current state of transport for specific signals.

The **Menu** icon  in the lower right corner of the **Terminal** dialog box opens the pop-up menu with the following options:

- **Clear View** – clears the main view.
- **Send File** – sends a file that contains either commands or binary data. This option sends files as is. TRU does not change encoding or charset, add carriage returns or line feed characters.
- **Send File (XMODEM Protocol)** – sends a file using the XMODEM protocol.
- **Escape Functions** – opens the **Escape** dialog box to send transport specific commands.
- **Port Settings** – opens the **Port Settings** dialog box to adjust port settings. When TRU is in Simple Terminal mode, it does not change port settings



Port settings depend on the operating system. Usually the computer's operating system remembers the previous port state, so if the port baud rate is changed, the assigned value is kept. CE.NET and Windows Mobile usually reset port settings to their default values, so the next time you open a serial port, you must adjust the port settings again.

- **Simple Mode** – if the **Simple Mode** item is checked, the terminal works in a similar way as a traditional terminal application, such as HyperTerminal. Every time you press a key the key code is immediately sent to the connected device.
When the Simple Mode item is not selected, you compose a command in the edit box, and then click either **Send** or press **Enter**. The entered text (followed by carriage return and line feed) is sent to the connected device.
- **ASCII/HEX** – toggles text/HEX mode.
- **Text Size** – sets the size of the text (Largest, Larger, Normal, Smaller, Smallest).
- **Bytes in a Row (HEX Mode)** – selects the number of bytes in a row and optionally displays the left hand (data) pane and the right hand (character) pane. This option only applies to HEX mode.
- **Start Logging** – initiates writing all the data received from the device to a file.

- **Stop Logging** – stops writing data received from the device to a file.



There is only one difference between Terminal in Simple Terminal mode and Terminal in Receiver Managing mode. While in Simple Terminal mode you have to manually adjust port settings (for a serial cable connection). In Receiver Managing mode, TRU automatically adjusts the port settings.

Information

Click on the **Information** icon  to view receiver information.


The Receiver Info dialog box displays basic receiver information (hardware, firmware versions, RAM size etc.) about the currently connected receiver.



Parameters not supported by the connected receiver are not shown.

- **Refresh** – refreshes the parameter list.
- **Save to File** – saves the receiver parameters and options to a text file. By default the TRU sets the <receiver ID>.txt file name.

Options

Click on the **Options** icon  to manage receiver options.

The **Receiver Options** dialog box shows you the current/purchased/leased authorization options and uploads OAF files.

- **Option Name** – displays a name for the receiver option.




The options list depends on the firmware version loaded into the receiver.

- **Internal Name** – displays a name for the receiver option in a GRIL convention.
- **Current** – indicates the current value of the option.
- **Purchased** – indicates the purchased value of the option.
- **Leased** – indicates the leased value of the option.
- **Exp. Date** – indicates the date the leased option is expired.
- **Refresh** – refreshes the options list.
- **Upload OAF** – uploads a new OAF file. By default, TRU offers to use the <receiver ID>.tpo file name.
- **Save to File** – saves the options list to a text file. By default, TRU sets the <receiver ID>.opt.txt file name.

Upload OAF

1. After clicking the **Upload OAF** button from the **Receiver Options** dialog box, navigate to the location of a file that contains new authorization options for the receiver and select the desired file.
Then the **Upload OAF** dialog displays the full path name and information about the selected OAF file.
2. Click the **Open Folder** icon to select another OAF if needed.
3. TRU initially checks if the file you selected is compatible with the connected receiver:
 - If you chose a file not intended for this receiver, TRU displays an error icon in front of Receiver ID and disables the **Upload the File to the Receiver** button.
 - If the **Upload the File to the Receiver** button is available, click it to start loading the file. The content of the dialog box changes. It shows the options that have been installed with the new OAF and the progress bar.
 - It is possible that on some receivers, option name or loading results may not display during the update process; however, SRU displays a message box informing you about the result when the OAF loading process is finished.
 - If an OAF file is uploaded to the receiver, TRU offers to reset the receiver to apply new authorization options.


Tools

The **Tools** icon  opens the **Send Command** dialog box that allows you to perform different resets and other power related operations, listed below, on the receiver.





- **Reset Receiver** – performs a hardware reset that is functionally equivalent to power cycling the receiver. Resetting the receiver leaves all receiver parameters and files intact. Typical use of this tool is to apply certain settings that require a hardware reset. After completing this operation, the receiver requires from a few seconds to a few minutes to begin tracking satellites and logging data.





- **Factory Reset** – resets all the receiver parameters to their default values and clears the receiver’s Non-Volatile Random Access Memory (NVRAM). NVRAM holds data required for satellite tracking, such as ephemeris data and position, and also keeps the current receiver’s settings, such as active antenna input, elevation masks, etc. Factory Reset does not delete any files from the receiver and does not reset modem parameters. This is typically used after loading a new firmware file and sometimes to eliminate communication or tracking problems. After performing this procedure, the receiver requires some time to collect new ephemerides and almanacs (up to 15 minutes).
- **Reset Parameters** – resets all the receiver parameters to their default values. This operation does not delete files, almanac, and ephemerides from the receiver and does not reset modem parameters.
- **Reset RTK** – resets the RTK engine.
- **Power Off** – turns the receiver off. You cannot turn on the receiver via TRU.
- **Sleep** – puts the receiver into sleep mode. The receiver enters into sleep mode immediately after you click **Yes** on the confirmation prompt and stays in this mode until you turn on the receiver manually or the receiver detects any activity on one of the serial ports.
- **Reset VISOR** – resets the VISOR engine.

Receiver Settings


The **Receiver Settings** icon  opens a submenu, which contains a set of tools for receiver configuration.

The **Back** icon returns you to the **Main Window**.

	Manages receiver tracking parameters such as antenna type, tracking signals, etc. This tool consists of the following tabs: Signals, Antenna, Obs, Adv, Msint, GPS, GLONASS, Galileo, BeiDou, SBAS, QZSS, and OmniSTAR.
	Manages positioning mode and desired solution type.
	Displays and configures receiver ports.
	Manages power output to internal slots.

	Runs RTK operations without using an external interface to localize the base receiver.
	Manages volume parameters of HiPer II and HiPer V receivers.
 	<p>Displays and configures Bluetooth parameters.</p> <p>Manages SIM cards for the HiPer SR+ Receiver.</p>

Tracking

Click the **Tracking** icon  to manage receiver tracking parameters, such as antenna type, tracking signals, etc.

Signals

Specify which satellite signals that you want the receiver to track. The following signals are available:

- GPS P – satellite signals in the GPS P1 and P2 channels.
- GPS L2C – satellite signals in the GPS L2C channel.
- GPS L5 – satellite signals in the GPS L5 channel.
- GLONASS P – satellite signals in the GLONASS P1 and P2 channels.
- GLONASS L2C – satellite signals in the GLONASS L2C channel.
- QZSS L2C – satellite signals in the QZSS L2C channel.
- BeiDou B2 – satellite signals in the BeiDou B2 channel.

Antenna

The **Antenna** tab changes the tracking antenna type used with the connected receiver (either Internal, External, or Auto) if the connected receiver is capable of tracking satellites with internal and external antennas.

The **Current Input** control shows the antenna type currently used with the connected receiver: Internal or External.

Observations

The **Obs** tab changes parameters for satellites observation. The appearance of this dialog box depends on the RTK Engine version.

- **Elevation Mask** – configures various elevation masks in degrees, specifically:
 - Satellites Tracking – Defines the minimum angle at which the receiver tracks satellites. The default value is 5 degrees.
 - Position Computation – Defines the minimum angle at which the receiver uses satellites for position computation. The default value is 5 degrees.

- RTK Computation – Defines the minimum angle at which the receiver uses satellites for the RTK position computation. The default value is 10 degrees.
- **PDOP mask** – configures various PDOP values for satellites used in computation:
 - Position Computation – the receiver does not compute positions over the corresponding epochs while PDOP exceeds the entered threshold value. The default is 30.
 - RTK Computation – specifies the PDOP mask used in RTK position computation. The default value is 3.5.

Advanced

The **Adv** tab allows changing advanced signal processing parameters.

- Anti-jamming – if available for the connected receiver, enables suppression of narrow-band interference for GPS, GLONASS, L1, L2 signals, for auto-detected or manually selected bands affected by interference.
- The **Anti-jamming manual settings** button opens the **Anti-Jamming Manual Settings** dialog. Use it to manually configure which RF bands to monitor for the interfering signals.
- C/A code multipath reduction – when selected, enables the use of a special signal processing technique for reduction of C/A code phase multipath.
- C/A carrier phase multipath reduction – when selected, enables the use of a special signal processing technique for reduction of C/A carrier phase multipath.
- Cinderella – when selected, enables the Cinderella option which sets all receiver options to their maximum allowable values for 24 hours every other Tuesday at GPS midnight.



If the Cinderella option has been changed, reset the receiver to apply changes.

- Quartz Lock Loop – enables or disables the Quartz Locked Loop (QLL). For more information on QLL and how it can benefit your system operation, visit OEM technology section at <http://oem.topconpositioning.com>

Raw Measurements and Position Update Rates

The **Msint** tab contains settings for specifying the rate at which the receiver updates raw measurements and positions. The range of allowed values depends on the firmware version, hardware, and the current receiver options.

- Raw measurements update rate – determines the rate at which the receiver generates pseudoranges, carrier phases, and some other GNSS observables.
- Position update rate – determines the rate at which the receiver updates the position.

GPS

The **GPS** tab enables or disables the receiver to track and use specific GPS satellites. You can choose GPS satellites used for tracking and position computation by selecting specific satellite check boxes or by using the pop-up menu.

GLONASS

The **GLONASS** tab enables or disables the receiver to track and use specific GLONASS satellites. You can choose GLONASS satellites for tracking and position computation by selecting specific satellite check boxes or by using the pop-up menu. The pop-up menu also enables you to change the presentation of GLONASS satellites. You may choose either USI or FCN numbers.

Galileo

The **Galileo**¹ tab enables or disables the receiver to track Galileo satellites. Tracked Galileo satellites can be selected using the checkboxes or the pop-up menu.

BeiDou

The **BeiDou**¹ tab enables or disables the receiver to track BeiDou (COMPASS) satellites. Tracked BeiDou satellites can be selected using the checkboxes or the pop-up menu.

SBAS

The **SBAS** tab allows configuring WAAS/EGNOS/MSAS.

To make the receiver track a SBAS satellite, select the corresponding SBAS USI (Universal Satellite Identifier). The following USI's are allocated to SBAS satellites.

System	Name	USI	NMEA Satellite ID
WAAS	AOR-W	122	35 (Phased out July 30th, 2007)
	Anik	138	51 (New WAAS satellite)
	POR	134	47 (Phased out July 30th, 2007)
	PanAm	135	48 (New WAAS satellite)
EGNOS	AOR-E	120	33

1. Refer to the receivers' brochure or manual for more information on supported constellations and signals. Some Sokkia receivers are Galileo and BeiDou ready systems; full support of these new constellation(s) and associated signals will be made available on these receivers via an FW/OAF upgrade.

	Artemis	124	37
	IOR-W	126	39
	IOR-E	131	44
MSAS	MTSAT-1	129	42
	MTSAT-2	137	50

- Tracked Satellites – lists USI’s of all SBAS satellites. Select the corresponding check boxes to allow the receiver to track selected SBAS satellites. Use the pop-up menu options to enable or disable all satellites.
- Interpret message #0 as – enables and disables the receiver to use any data from SBAS satellites if message type 0 is being broadcast.
 - 0: the receiver does not substitute message type 0 and therefore does not use any data from the SBAS satellite.
 - [1...99]: the receiver substitutes the selected message type for message type 0 and therefore interprets message type 0 as a message with the selected type.
- Use Iono Corrections – enables and disables the receiver to apply ionospheric delay corrections broadcast by a SBAS satellite to the GPS satellites.

For none Vanguard, G3 and TG-3 based receivers, the **SBAS** screen provides the setting True SBAS USI number. With this setting enabled, the receiver outputs true USIs in SI messages rather than associated with a GPS USI.

QZSS

The **QZSS** tab enables you to configure the Quasi-Zenith Satellite System (QZSS).

Tracked Satellites – lists USI's of all QZSS satellites. Select the corresponding check boxes to allow the receiver to track selected QZSS satellites. Use the pop-up menu options to enable or disable all satellites.

OmniSTAR


The **OmniSTAR** tab configures the OmniSTAR engine in the receiver. OmniSTAR is a wide-area differential GNSS service provider.



OmniSTAR correction signals are proprietary, and you need to purchase a subscription from the OmniSTAR corporation to receive a subscription authorization.

- VBS Engine:
Enable: Enables VBS engine.
- HP Engine:
Enable: Enables HP Engine.
Wait VBS: If this option is enabled, the HP Engine does not start until a VBS solution is received.
- Nominal Frequency and Symbol Rate:
Nominal Frequency: Nominal carrier frequency [Hz] of beam as entered by the user.
Symbol Rate: Symbol rate of beam as entered by the user.
You can change the nominal frequency and symbol rate. In the **OmniSTAR Satellite Selection** dialog box, you can either select a satellite from the list or enter the nominal frequency and the symbol rate manually.
- The **Information** button displays information about the OmniSTAR subscription: the receiver Fugro ID, the library version, and the date of Subscription End for both VBS and HP engines.

Positioning

Click the **Positioning** icon  to manage positioning mode and the desired solution type.

General Parameters

The **General** tab allows you to change positioning mode and enabling solutions:

- Positioning Mode – selects a positioning mode for the receiver.
- Enable Solutions – selects the type of solution to use for Rover receivers.
 - Standalone: for a Rover receiver operated in differential mode, reports the current standalone position if a DGPS (or RTK) position is unavailable in the current epoch.
 - Code Differential (DGPS): for a Rover receiver run in RTK Float or RTK Fixed mode unable to obtain an RTK solution at the current epoch, outputs the current code differential position. If enabled and you cannot obtain a Code Differential solution, enable Standalone to have the receiver output single-point positions for the unavailable differential positions. This mode requires the Base (Reference) receiver to broadcast Code Differential (not RTK) messages and the Rover receiver to receive these messages. If either of these requirements is not met, enabling Code Differential has no effect.
- DION: selects mode in which the DION engine operates. DION is an enhanced absolute positioning engine that allows you to use a single Topcon receiver to compute smoothed and consistent position solutions. Instead of using instantaneous yet rather noisy pseudorange measurements of an ordinary single point positioning, you can activate the DION engine to get more accurate and reliable results without the requirement of any additional hardware or software.
 - 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.

RTK Parameters

The **RTK** tab allows setting up the RTK rover.

- **RTK Mode** – Position output mode. Controls which output mode is enabled. Default value: Delay.
 - **Delay:** the RTK engine does not extrapolate the base station's carrier phases in position computation. Instead, the engine either computes a delayed position or simply output the current stand-alone position (while waiting for new RTK messages from the base station). Note that the delayed position is computed for the time (epoch) to which the last received base station's carrier phase measurements correspond. Accuracies achievable in delay mode are normally on a level with those of post-processing kinematic.
 - **Extrapolation:** the RTK engine extrapolates the base station's carrier phase measurements to the current epoch (note that the truth carrier phases measured at the base cannot be transmitted and received at the rover instantly). The final positioning accuracy may be somewhat lower due to additional extrapolation errors, which may be up to a few millimeters vertical and horizontal for a one second extrapolation time. Note that extrapolate mode could be used only when the reference station is static (i.e., not moving).
- **Extrapolation Time, s** - Maximum extrapolation time. In extrapolation mode, if the time elapsed since differential corrections were last received exceeds this value, RTK stops calculating positions. Default value: 30 seconds.
- **Base Corrections Period, s** - Differential correction update interval (period) for reference station. Instructs the rover receiver to output the RTK position (not the single point position) at the same rate at which differential corrections are updated. Default value: 1 second.
- **Dynamics** - User defined rover dynamics.
 - **Static:** the engine uses a running average over a few consecutive solutions to decrease the resulting position's noise error.
 - **Kinematic:** the engine uses only the current epoch of observations to compute the instantaneous position (i.e., no averaging is performed).
 - **Stop And Go:** the new RTK engine monitors the rover dynamics and automatically selects between static and kinematic models. The receiver immediately switches to kinematic in two cases:

- a. if the difference between previous and current instantaneous position estimates changes over 3 centimeters in 3-D vector components;
 - b. if the difference between an averaged position estimate and a current instantaneous position estimate changes over 4.5 centimeters in 3-D vector components.
- **Ambiguity Fixing Level** - Specifies a level of confidence when fixing integer ambiguities. The RTK engine has 3 levels of confidence when fixing integer ambiguities, Low, Medium and High which correspond to the indicator's 95%, 99.5% and 99.9% thresholds, respectively.
The higher the confidence level specified the longer the integer ambiguity search time.
Assume you have set this parameter too high. The receiver's RTK engine constantly updates the confidence level indicator as new measurements arrive. Once this parameter exceeds the 99.9% threshold, the engine fixes up all or some of the integer ambiguities. The corresponding position estimate is marked as fixed RTK solution although some of the ambiguities (usually a small part of them) may remain float. Default value: Medium.

Advanced RTK Parameters¹

The **Adv. RTK** tab is designed to tune the RTK engine.

- **VRS Mode** – Enables or disables the receiver VRS mode.
 - Enabled (checked) – RTK assumes that the reference station in use is Virtual Reference Station (VRS).
 - Disabled (unchecked) – RTK assumes that the reference station is a real one.
- **IF Baseline, m** – The threshold value for the RTK ionospheric modeling. The ionospheric delay is modeled by RTK only if the baseline length is greater or equal to the specified value. Default: 4000 meters (old RTK), 20000 meters (new RTK).
- **Weighting Based On Residuals** – Controls applying weights to measurements based on VRS residuals (RTCM 3.1 MT1030, MT1031). Default: Disabled.

1. These settings are intended for advanced users only and must be left at their default value unless otherwise instructed by technical support personnel associated with your local distribution and/or Topcon.

- Maximum Residual Value, mm - Threshold in [mm] for rejecting measurements based on value of VRS residual (RTCM 3.1 MT1030, MT1031). "0" means no rejection. Default: 0.

Base Station Parameters

The **Base** tab enables you to configure a reference base station.

- Antenna Type – Antenna type descriptor for RTCM 2.3 and 3.0. The Antenna Type combo box is populated with values, which are read from the receiver antennae database.
- Base Station Coordinates – This parameter specifies coordinates of the Antenna Reference Point or Phase Center L1.



Coordinates of ARP and Phase Center L1 are interrelated. When a valid Antenna Type is selected, secondary (not selected) coordinates are calculated based on information about the selected antenna from the receiver database. When no antenna is selected or the receiver database does not contain information about the antenna, secondary coordinates are set equal to primary (selected) ones.

HD2 Parameters

The HD2 tab allows you to configure a rover receiver in a dual-receiver setup for a 2-D attitude determination.

- HD2 Rover – enables the receiver to compute 2-D attitude parameters, heading, and inclination.
- Distmode – instructs the receiver to compute and use the inter-antenna distance for 2-D attitude determination.
- Smoothing – enables the receiver to smooth heading results. You can specify the highest possible accuracy in radian with which the receiver will smooth the heading. The smaller the value, the greater the smoothness of the heading.

You can view computed 2-D attitude parameters. See "Heading" on page 67.

VISOR Parameters

The VISOR tab allows you to configure the MR-1 receiver/OEM-1 board for 2-D attitude determination (heading and inclination).

- VISOR Engine – enables the receiver to compute 2-D attitude parameters and select the initialization type. The following types are available:
 - Velocity Vector – initializes VISOR by moving the platform with rigidly mounted antennas.
 - Twin Antenna Rotation – initializes VISOR by rotating a platform with rigidly mounted antennas in a plane parallel to horizon.
 - Manual – enters initial heading and inclination with the GRIL command.
 - Auto – initializes using initial heading and inclination computed by the auxiliary RTK engine running in the background.
- Baseline – specify the inter-antenna distance in **Length**. Check the **Distmode** setting to instruct the auxiliary RTK engine to compute and use the inter-antenna distance.
- Advanced – specify some advanced VISOR settings. See “Advanced VISOR Parameters” on page 50.

You can view computed 2-D attitude parameters at “Heading” on page 67.

For more information about VISOR configuration, limitations, and guidelines, see the *OEM-1 Integrator’s Guide, Enabling VISOR and Understanding Results*.


Advanced VISOR Parameters

- Initial Angles – specifies the initial values of heading and inclination formatted as decimal degrees. These values are used in the initialization type manual.
- Shifts – specifies the heading and inclination offsets formatted as decimal degrees. These values are used in the initialization type Velocity Vector.
- Advanced – configures line bias estimation, smoothing, and only heading.
 - Dlock – enables the receiver to save the estimated line biases to the NVRAM.
 - Adaptive Smoothing – enables the receiver to use an adaptive smoothing for the slowly changing or constant attitude parameters.
 - Heading Only – enables the receiver to estimate only one attitude parameter – heading.

You can view computed 2-D attitude parameters at “Heading” on page 67.

For more information about VISOR configuration, limitations, and guidelines, see the OEM-1 Integrator’s Guide, Enabling VISOR and Understanding Results.

Ports

The **Ports** icon  opens the **Receiver Ports** dialog box, which displays all ports available in the connected receiver.

TRU, with the Base license, supports Serial, USB, Network, Bluetooth, and Ntrip ports (expand the tree for details).

Double-tap a desired port name or use the pop-up menu to change settings of the selected port.

Receiver Ports

For Serial, USB, TCP, Bluetooth, and Ntrip ports, you can change Input Mode, Output Mode, and Period. You can also view and edit a set of messages, which are output to the port.

- Input Mode: specifies the type of data to input on the selected port:
 - **none**: the port rejects any incoming data
 - **cmd**: the port is in command mode and recognizes user-sent commands
 - **echo**: the port is in echo mode and redirects all incoming data to an output stream, either another port or the current log file
 - **rtcm**: the receiver recognizes and decodes RTCM version 2.1, 2.2, and 2.3 messages accepted on the corresponding port
 - **rtcm3**: the receiver recognizes and decodes RTCM version 3.0 messages accepted on the corresponding port
 - **cmr**: the port recognizes and decodes accepted CMR messages
 - **jps**: the port recognizes and decodes accepted TPS messages
 - **omni**: the port recognizes and decodes OmniSTAR VBS corrections
 - **dtp**: the port is in Data Transfer Protocol mode, which is used for data transfer to/from the receiver
 - **term**: the port is in PPP mode



To connect to the receiver through a port, input mode of the port should be command (cmd). You may not modify input mode of the port, which you are currently using to connect to the receiver.

- **Output Mode:** specifies a predefined message set to output into the selected port. The following predefined message sets are available:

Message Set/Output Mode	Messages	Period, s
DGPS RTCM 2.x	1	Variable
	31	Variable
	3	10
RTK RTCM 2.1	18	Variable
	19	Variable
	22	10
	3	10
	59t	10
RTK RTCM 2.3	18	Variable
	19	Variable
	23	10

Message Set/Output Mode	Messages	Period, s
	24	10
	59t	10
RTK RTCM 3.x	1004	Variable
	1012	Variable
	1006	10
	1008	10
	1033	10
RTK CMR	10	Variable
	0	Variable
	1	10
	5	10

Message Set/Output Mode	Messages	Period, s
RTK RTCM 3 MSM	1074	Variable
	1084	Variable
	1114	Variable
	1124	Variable
	1006	10
	1008	10
	1033	10
RTK CMR+	10	Variable
	0	Variable
	9	Variable

Message Set/Output Mode	Messages	Period, s
HD2 TPS	RT	Variable
	SI	Variable
	rc	Variable
	2r	Variable
	cp	Variable
	2p	Variable
	PO	Variable
	ET	Variable
NMEA	GGA	Variable
	GSA	Variable
	ZDA	Variable
	VTG	Variable

- Period, s: specifies in seconds the interval at which the receiver generates messages included into the currently selected predefined message set (Output Mode), in seconds.
- Messages: opens the **Messages** dialog box to configure output messages on the corresponding port manually.

Serial Ports

Serial ports have additional settings, which can view and modify on the **Serial property** screen.

- Baud Rate, Byte Size, Stop Bits, Parity: serial port parameters for communication with an external device connected to this port.
- RTS/CTS: enables/disables hardware handshaking for the port (if enabled, make sure that the external device supports this mode).

Network Settings

The **Network Settings** dialog box (**Network ▶ General Settings**) allows editing general network settings:

- IP Address: Identifies the receiver on a TCP/IP network by specifying its IP address.
- IP Mask: Specifies the network mask.
- Gateway: Specifies the gateway.
- Password: Sets a password for telnet-like TCP connections.

FTP Settings

The **FTP Settings** dialog box (**Network ▶ FTP ▶ General Settings**) allows editing FTP related settings:

- FTP Port: Specifies the TCP port the receiver is listening on for FTP connection. Values: 1...65535. Default value: 21.
- Timeout, s: Specifies a period of time that must elapse before an inactive connection terminates. Values: 1...231-1 seconds. Default value: 600 seconds.

TCP Settings

The **TCP Settings** dialog box (**Network ▶ TCP ▶ General Settings**) enables you to edit global TCP settings (which are not related to a specific TCP port of the receiver):

- **TCP Port:** Specifies the TCP port number on which the receiver is listening on for raw TCP connections. Values: 1...65535. Default value: 8002.
- **Timeout, s:** Specifies the amount of time that the TCP server waits for data before terminating TCP connections. Values: 0...2000 seconds. Default value: 0 seconds.
- **Enable Authentication:** Specifies whether you need to enter the password when accessing the receiver via a raw TCP port.



If the GNSS firmware supports individual TCP Port and Enable authentication settings for each TCP port of the receiver, the TCP Setting dialog box does not contain these settings. The TCP Port Settings property sheet for each TCP port of the receiver contains a screen with individual settings for the port.

Messages

Use this dialog box to configure output messages on the corresponding port manually.

The pop-up menu enables you to add, edit, or remove messages. The receiver keeps the customized message set in the NVRAM for further usage.

- **Add new messages:** opens the **Receiver Message List** dialog box to add new messages to the message list. You can select one or more messages to add to the list of messages, which is sent to the selected port.
- **Edit message:** opens the **Receiver Message** dialog box. In this dialog box you can specify the schedule of the message. The **Schedule Specification** fields are used to define the output scheme for the message.

- Delete messages: removes selected messages from the list.
- Delete all messages: removes all the messages from the list.

Receiver Message List

The **Receiver Message List** dialog consists of upper tree control and lower list control. The tree control displays all the messages supported by the currently connected receiver. The list control displays the messages to be added.

To add a message from the upper tree control to the lower list control you can double-click it, press <space> or use the pop-up menu.



You can change the order of the messages in the list control using the clipboard. The computer version also supports the drag-and-drop method.

Receiver Message

In this dialog box you specify the schedule of the message. The **Schedule Specification** fields are used to define the output scheme for the message.

- **Period:** specifies the message output interval. If set to zero, the corresponding message outputs at the highest possible rate.
- **Phase:** specifies a time shift in the output of a message with respect to the moment when the receiver time is a multiple of the specified period.

- **Count:** serves two purposes. First, if set to a positive number, specifies how many times the message outputs. Zero means an unlimited number of times the message outputs. Second, if set to a negative number, instructs the receiver to encapsulate a message into >> message before output.
- **Flags:** provides further adjustment of the way the message is output. They are briefly explained below.


Flag	Description
Out	If the flag is selected, the first of the messages invoked by the corresponding command outputs at the epoch closest to the command execution time (whatever the specified "period" option).
Change	If the flag is selected, the corresponding message outputs only if the message data have changed.
Out On Add	If this flag is set, then the (first) message outputs immediately after executing the corresponding em or out command.
Notena	The receiver uses this flag in order not to output the file header every time you change the "period" value when recording data into the log file.
Fix Per	If these flags are selected, you cannot change the option values (Period, Phase, Count, and Flags).
Fix Ph	
Fix Cnt	
Fix Fl	

Bluetooth (HiPer SR only)

The Bluetooth branch enables you to configure the Bluetooth ports of the HiPer SR receiver.

- **Bluetooth Serial Ports:** Bluetooth Serial Port, which accepts one incoming connection from a remote device. For the HiPer SR Rover this is the port to which the computer or field controller is connected. For the HiPer SR Base, this is the port that either the PC/Field Controller or the HiPer SR Rover is connected to when configuring the base.
- **Bluetooth Client Ports:** Bluetooth Client Port which is available when the outgoing connection is established by the Bluetooth Client. When enabled, the Bluetooth Client tries to establish a connection to the remote Bluetooth device port according to current Client settings. This port is used in the HiPer SR Rover configuration to maintain connection to the HiPer SR Base - either to configure it or to receive corrections.
- **Bluetooth Service Ports:** Bluetooth Service Port used to accept up to three incoming connections and provide services (i.e. corrections) to remote devices. This port is used in the HiPer SR Base configuration. Corrections enabled on this port transfer to the Bluetooth Client port of the connected HiPer SR Rover.

Power

The **Power** icon  opens the **Power** dialog box, which sets power output on the internal slot.


- **Slots:** governs power output to the receiver's internal slots (the slot name is shown below).
 - y: when the receiver is on, the internal slot receives power. If the receiver is turned off, no power is sent to the slots.
 - n: the internal slot is not powered, even if the receiver is turned on.
 - always: the internal slot is powered even if the receiver is turned off.

- **Miscellaneous:**
 - **Enable power up script:** available for selection only for Topcon HiPer II and HiPer V receivers. Enables the receiver to power up by a script file loaded into the receiver.

Power (HiPer SR Cellular Model Only)

The **Power** icon opens the Power dialog box, which manages power output (on/off setting) for the integrated cellular model.

Auto Seed

The **Auto Seed** icon  opens the Auto Seed dialog box, which enables the Auto-Seed functionality for the base receiver.

The Auto-Seed feature provides you the ability to quickly setup and begin RTK operations without using an external interface to localize the base receiver. You just set up over a mark and power up. The base receiver automatically selects a new position gathered by autonomous averaging and saves it for later re-occupation. If the point has been previously occupied and the receiver position falls within proper tolerance, it selects a point from positions stored in memory.

- **Enable Auto Seed:** when selected, enables the Auto-Seed functionality.
- **Maximum distance:** tolerance for the distance from the previously occupied point.
- **Enable averaging mode:** when selected, enables averaging autonomous positions for a occupation point.
- **Position averaging interval:** sets the interval for autonomous averaging
- **View the point list:** opens a list of previous occupations saved in the receiver memory.

Point List


The **Auto Seed, Point List** contains information about all occupations which are stored in the receiver memory: names, date and time, coordinates of phase center and/or antenna reference point, whether the point was auto determined and protected from deleting.

Hold your stylus on a highlighted point line in the list to open a context menu. This menu performs various operations on the point list:

- Add New Point: opens a dialog box to add a new point.
- Edit Point: opens a dialog box to edit information on the highlighted point.
- Delete the point from the list: erases the selected point in the list if it is not protected.
- Delete all the points: deletes all points except protected ones.
- Enable/Disable point protection: enables/disables protection of the selected point from deleting.
- Refresh: renews the list
- Export the point list: opens a dialog box to select an XML file in which to export the point list.
- Import the point list: opens a dialog box to select an XML file from which to import a point list.

Add New Point

Enter the name of the new point. Select the **Auto** check box to enable the averaging mode to auto detect the coordinates of the phase center.

Click the corresponding  button to enter the appropriate coordinates in the **Cartesian Coordinates** dialog box. You can also use this dialog box to edit the coordinates of existing points.




You can enter the coordinates manually or you can use the coordinates obtained from the receiver in real time. When the second option is chosen, TRU gets the current coordinates from the receiver every second, and then averages them unless you click **Stop** or **OK**.



Antenna Reference Point and Phase Center L1 coordinates are interconnected. When one coordinate is change, the other one is calculated based on the current antenna offsets.

Volume Control

The **Volume Control** icon  opens the **Volume Control** dialog box, which allows you to adjust the volume level of the sounds on various receiver operations. This feature is available only for Topcon HiPer II and HiPer V receivers.

Hold your stylus on the slider and drag it in the bar to the left or right to turn the sound low or loud, respectively.

Holding the stylus on the highlighted **Sound** name opens a context menu that contains three options:


- **Master volume:** opens a dialog to set the volume for all sounds at a time.
- **Play sound:** plays the selected sound.

- **Refresh:** renews the sound volume

Master Volume

Use this dialog to set the volume for all sounds at one time.

Bluetooth

The **Bluetooth** icon  opens the **Bluetooth** dialog that allows changing parameters of the receiver Bluetooth module and accessibility options:

- **Name:** user-friendly name of the receiver.
- **PIN:** PIN code of the receiver.
- **Encryption:** when selected, secures all data sent over Bluetooth.
- **Authentication:** when selected, authenticates the receiver's identity.
- **Identification:** shows Bluetooth module name, address, firmware base, and version

Bluetooth (HiPer II and HiPer V only)

The **Bluetooth** icon opens the **Bluetooth** dialog box that enables you to change the receiver Bluetooth module parameters and accessibility options:

- **Editable Name and PIN.**
- **Permanent Address and Firmware.**
- **Bluetooth Power:** when selected, turns on the Bluetooth module power.
- **Multiplexing Mode:** when selected, allows multiplexing data.

Bluetooth (HiPer SR only)

The **Bluetooth** icon opens the **Bluetooth** dialog box that enables you to change the receiver Bluetooth module parameters and accessibility options:


- Editable Name and PIN.
- Permanent Address.

Dual SIM Management

The SIM Management dialog box enables you to configure dual SIM card operation supported in the HiPer SR+ receiver. With this functionality, you can easily switch between cellular connections. Only one SIM card can work at a time.

- Active SIM card – Specify the SIM card the receiver will use for cellular connections. The default SIM card is SIM 1 inserted to SIM slot #1.
- SIM Cards Presence – Shows you whether a SIM card is present in the corresponding slot.

Status

The **Status** icon  opens the **Status** screen with the following tabs: **Position**, **Data Link**, **Heading**, **SV List**, **Sky Plot**, **Scatter Plot**, **Position in Time**, and **Logging**.

Position

The **Position** tab displays the following information:

- The current receiver date and time synchronized to GPS system time.

- Solution type (Standalone, DGPS, RTK Float, RTK Fixed, DION, OmniSTAR HP, OmniSTAR XP, OmniSTAR VBS, Variable Fixed, Variable Float). When the DION engine is working, the Smooth text is being displayed next to the solution type.
- WGS84 measured position of the antenna L1 phase center.
- PDOP value, a factor that depends solely upon satellite geometry and is proportional to the estimated position uncertainty.
- HRMS and VRMS values, the RMS (the square root of the trace of position error covariance matrix) values of the horizontal and vertical coordinates, respectively.
- A distance between the rover and the base estimated by the RTK engine. The distance is shown in RTK positioning only.
- The numbers of tracked satellites for each satellite system. Each satellite system is marked in a certain color.
 - GPS in green (🛰️)
 - GLONASS in yellow-orange (🛰️)
 - Galileo in cyan (🛰️)
 - BeiDou in magenta (🛰️)
 - SBAS in purple (🛰️)
 - QZSS in blue (🛰️)



The “wings” on the satellite icon designate that the satellite is used in position computation. The absence of “wings” on the satellite icon means that the satellite is not used in the computation for some reason (e.g. it is below the elevation mask).

Heading

The Heading tab displays the current heading and inclination computed by HD2 or VISOR engines. The Heading information is displayed on a dial with major and intermediate cardinal points. The **Heading** field and the green triangle at the top of the dial indicate the current heading. No heading is displayed if the receiver cannot compute it.

Inclination information is displayed on a tape with a black horizon line as a zero inclination. Major inclination marks and numeric labels are displayed at intervals of 20 degrees. Minor inclination marks are displayed at intervals of 10 degrees. The Inclination field and the green line with a triangle at the right end indicate the current inclination. No inclination is displayed if the receiver cannot compute it.

Data Link

The **Data Link** screen displays the live statistics of the data communication links used for receiving DGNSS/RTK measurements from various sources, including physical reference stations, network software, such as TopNET, Ntrip casters, etc.

Use this screen to determine data loss and link viability. Based on this statistics you can see how well your data communication link is performing.

SVs List

The **SVs** screen displays the list of the satellites with satellites parameters:

- SVC – satellite icon and system (constellation GPS, GLONASS, Galileo, BeiDou, SBAS, and QZSS).
- USI – Universal Satellite Identifier.

- EL – Elevation angle in degrees. The signs "+" and "-" immediately following the elevation angle indicate that the corresponding satellites are either ascending or descending, respectively. If a satellite is at maximum elevation, it is marked with "^".
- AZ – Azimuth in degrees.
- L1C – Signal-to-Noise Ratio in the L1 CA channel [dB*Hz].
- L1P – Signal-to-Noise Ratio in the L1 P channel [dB*Hz].
- L2P – Signal-to-Noise Ratio in the L2 P channel [dB*Hz].
- L2C – Signal-to-Noise Ratio in the L2 C channel [dB*Hz].
- L5 – Signal-to-Noise Ratio in the L5 channel [dB*Hz]
- TC – Time elapsed since the last loss-of-lock in the CA channel for the corresponding satellite. This time is given in minutes or, if the symbol ":" is specified in the column, in seconds.
- SS – Satellite navigation status. For a complete description of the satellite navigation status, see GRIL Appendix D.
- FCN – Frequency Channel Number (valid for GLONASS satellites only).
- SN – Satellite's orbital slot number (valid for GLONASS satellites only).

Clicking a satellite in the list opens a tool tip for the satellite. The tool tip displays all the satellite information the list control contains; the Satellite Navigation Status is decoded to display a legible description. The tip closes after clicking on it, or automatically after 5 seconds.

The list of satellites is updated once a second. If TRU does not receive any information from a satellite, the satellite does not disappear immediately from the list, but is still displayed in the paling color for 10 seconds. If there is no signal from the satellite during these 10 seconds, the satellites completely disappear.









In Real-Time Logging mode, Elevation Mask for raw measurements is set. Because of this elevation mask, some satellites may be absent in the list. Still, they are used for position computation.

Sky Plot

The **Sky Plot** tab displays the graphic position of satellites on the sky.

Each satellite system is marked in a certain color:

- GPS in green ()
- GLONASS in yellow-orange ()
- Galileo in cyan ()
- BeiDou in magenta ()
- SBAS in purple ()
- QZSS in blue ()



The “wings” on the satellite icon designate that the satellite is used in position computation. The absence of ‘wings’ on the satellite icon means that the satellite is not used in the computation for some reason (e.g. it is below the elevation mask).

The USI (Universal Satellite Identifier) of each satellite is displayed under satellite icons.

Red circle designates the elevation mask.

Clicking on a satellite icon displays a tool tip that shows the information about the satellite.

Scatter Plot






The **Scatter** tab displays the receiver's trajectory/position in real time.

The scatter plot is updated each second. The current position is displayed in the form of pictogram. Each solution type is designated by a respective pictogram.

○ – Standalone, DION	● – RTK Float, Variable Float
× – Code Differential, OmniSTAR VBS	+ – RTK Fixed, Variable Fixed, OmniSTAR HP, OmniSTAR XP

You can apply a unique color to each solution type using **Status** tab of the **Setup** dialog box.

Use tool buttons in the lower part of the screen to customize the graphic view.

Button	Description
	Zooms the plot inwards.
	Zooms the plot outwards.
	Clears all points from the screen.
	Fits all points in the plot.
	Moves the center of the plot to the average of all points.



It is possible to click and drag the plot to change the center point. On a computer version, you can use the mouse wheel to change the scale.




Position in Time

The **Position in Time** tab displays the receiver position in real time.

Three graphs in the screen represent 3D position in time: Latitude, Longitude, and Altitude. Each graph shows both absolute and relative values and the time scale. The time scale varies from 1 to 5 hours.


You can apply a unique color to each solution type using **Status** tab of the **Setup** dialog box.

Use tool buttons in the lower part of the screen to customize the graphic view.

Button	Description
	Zooms the plot inwards.
	Zooms the plot outwards.
	Clears all points from the screen.

Logging

The **Logging** tab allows logging real-time measurements into files and saving them in the computer.

- **File Path:** full path to the file in which data is logged. Use the  button to navigate.
- **Raw Measurement:** Elevation Mask, Period: defines the minimum angle for satellites from which the receiver outputs raw data to a stream and sets the recording interval in seconds (for this, clear Default).
- **Statistics:** shows file logging statistics in progress after logging has begun.
- **Start Logging:** click the button to start Logging the file. After clicking, the button changes to **Stop Logging**.
- **Logging Messages:** opens the Logging Messages screen to view/edit a list of messages being logged into the file and logging parameters.
- **Site Parameters:** opens the Site Configuration dialog box to apply antenna parameters for data logging purposes at the site.



If one or more message(s) in the list has a period less than the position or raw measurements update rate of the receiver, an error message displays. To log a file with such a period you have to change the update rates in the property sheet Tracking Options, Msint tab.

Logging Messages

The **Logging Messages** screen enables you to edit a list of messages being logged into the file and also parameters of a selected message. You can add or remove messages or modify their scheduling parameters using the pop-up menu options. The receiver keeps the customized message set in the NVRAM for further usage.

- **Add new messages:** opens the Receiver Message List dialog to add new messages to the message list.
- **Edit message:** opens the Receiver Message dialog to edit the highlighted message.
- **Delete messages:** deletes the highlighted messages.


- **Restore Defaults:** restores the list of output messages to the factory defaults.
- **Refresh:** renews the list output messages with the last made changes.

Site Configuration

The **Site Configuration** dialog allows editing site and antenna parameters for data logging purposes.

- **Site Name:** the name of the jobsite.
- **Description:** additional information about the site.
- **Antenna Parameters:**
 - **Antenna Type:** the type of antenna.
 - **Antenna Height, m:** the height of the antenna in meters measured from the survey marker to the measuring mark on the antenna (either ARP or SHMM).
 - **Slant:** if selected, indicates that the height of the antenna was measured at a slant (to the slant height measurement mark - SHMM). When not selected, indicates a vertical measurement (to the antenna reference point - ARP).
 - **Dynamics:** select either Static or Dynamic to set the status of the antenna; either fixed or moving, respectively.
 - **Send parameters automatically:** send site and antenna parameters to the receiver each time a log file is created.

File Explorer

The **File Explorer** icon  opens the **File Explorer** screen, which contains four tabs:

- Files - to manage files.
- Logs - to log current files.
- MINTER - to set logging parameters for MINTER operation.
- AFRM - to enable Automatic File Rotation Mode. Unavailable for the HiPer II and HiPer V.
- UMS Files – displays and manages raw data files stored on the USB Mass Storage Device (UMS). This tab is available for the Net-G3A receiver only.
- UMS Cfg – configures a connected UMS device. This tab is available for the Net-G3A receiver only.

Files

The **Files** tab displays the list of raw data files stored in the receiver memory. Along with the file names, this list contains the file sizes in bytes, and date and time the files were recorded.

The **Files** tab allows managing files. The pop-up menu displays the options:

- **Refresh**: reloads the list of files.
- **Delete**: deletes the selected log files. A confirmation message displays.
- **Download**: begins downloading selected log files to the computer. A download path must be specified. Clicking **OK** starts downloading process.
- **Upload**: begins uploading files from the computer to the receiver. A full path to the file on the computer must be specified before beginning the upload process.

- **Copy to UMS:** copies the selected files from the receiver to a connected UMS device. This setting is available for the Net-G3A receiver only.
- **Initialize File System:** initializes the file system. Initializing the file system of a connected receiver erases all of the receiver's data files. A warning message appears to confirm the operation.
- **File System Info:** displays information on the file system and physical memory of the internal memory card in the receiver.
- **Mode of Operation:** selects operational mode for File Explorer:
 - Normal - this mode allows all operations on the files (deleting, downloading and uploading).
 - Deleted Files Recovery - this mode allows retrieving deleted files from the internal memory of the receiver.

To recover a deleted file:

- Open this mode to view all deleted files.
- Download the desired file to a selected folder on the controller.
- Select Normal mode and upload the deleted file from the controller to the receiver.



Deleted log files can be retrieved from the receiver internal memory only if the receiver has not been initialized.

Information about File System

The **File System Info** dialog displays information on the file system and physical memory of the internal memory card in the receiver.

Files (HiPer II and HiPer V only)

The **Files** tab displays the list of raw data files stored in a removable memory card.

Along with the file names, this list contains the file sizes in bytes, and date and time the files were recorded.

You can also use this tab to manage files. The pop-up menu displays the following managing options:

- **Refresh:** reloads the list of files.
- **Delete:** deletes the selected log files. A confirmation message displays.
- **Download:** begins downloading selected log files to the computer. A download path must be specified. Clicking **OK** starts downloading process.
- **Initialize File System:** initializes the file system. Initializing the file system of a connected receiver erases all of the receiver's data files. A warning message appears to confirm the operation.
- **File System Info:** displays information on the file system and physical memory of the internal memory card in the receiver.

Logs

The **Logs** tab allows recording log files.

- **Log File:** selects current file - /cur/file/a or /cur/file/b.
- **File Name:** specifies the name of the file, which will be created.
- **Elevation Mask, deg:** sets the elevation masks for TPS messages output to the file.
- **Periods:** specifies the rate at which the receiver records the log files.
 - Clicking **Start** begins recording data into the file with the recording interval of 1 second by default. Uncheck the **Default** box to change the interval.
- **Logging Messages:** displays the list of messages outputting into the current log files.
- **Site Parameters:** sets the jobsite and antenna parameters.



If one or more message(s) in the list has a period less than the position or raw measurements update rate of the receiver, an error message displays. To log a file with such a period you have to change the update rates in the property sheet **Tracking Options, Msint** tab.

Logs (HiPer II and HiPer V only)

The **Logs** tab allows recording log files.

- **File Name:** specifies the name of the file, which will be created.
- **Elevation Mask, deg:** sets the elevation masks for TPS messages output to the file.
- **Period,s:** specifies the rate at which the receiver records the log files.
- Clicking **Start** begins recording data into the file with the recording interval of 1 second by default. Uncheck the **Default** box to change the interval.
- **Logging Messages:** displays the list of messages outputting into the current log files.
- **Site Parameters:** sets the jobsite and antenna parameters.



If one or more message(s) in the list has a period less than the position or raw measurements update rate of the receiver, an error message displays. To log a file with such a period you have to change the update rates in the property sheet **Tracking Options, Msint** tab.

MINTER

The **MINTER** tab sets the receiver parameters that correspond to MINTER operation and data logging.

- Prefix: determines the file name prefix used as the beginning part of the name of the new file the receiver creates when the MINTER FN button is pressed to start data recording. The prefix can include up to 20 characters; the default is "log".
- Period: specifies the interval to use for logging data after pressing the MINTER FN key. This parameter also applies to AFRM mode. It can be set to the values from 0 to 86400 seconds; the default is 1 second.
- Log File Controllable via AFRM and MINTER: select either one of the concurrent files or both to allow controlling them by MINTER and through the automatic file rotation algorithm.
- Advanced: opens the MINTER dialog.

Advanced Settings

The **MINTER** dialog allows editing advanced settings

- FN Key Mode: Programs the receiver's reaction after pressing the FN key. For the HiPer SR+, this setting is called Function/Power Key Mode.
 - Led blink mode switch: pressing and holding down the FN key for less than a second, you switch the receiver between standard and extended information modes. Refer to the receiver's Operator's Manual for details about these modes. This is default value.
 - Occupation mode switch: pressing and holding down the FN key for less than a second, switches the receiver between static and kinematic survey modes when recording a file. The receiver outputs an appropriate freeform event to the current log file every time you switch the survey mode.
- Initial Data Collection Dynamic Mode: Specifies the initial dynamic mode for all of the new files opened through MINTER when FN Key Mode is set to the Occupation mode switch mode. Default value: Static.
- Data Recording Auto-start: Programs the receiver's behavior in the event of a power failure. Default value is Off.

- Off: The receiver does not resume data logging on start-up.
- On: Should a power failure occur when the receiver is logging data, the receiver automatically opens a new file and resumes data recording when power has been returned. From a functional point of view, this is equivalent to pushing the FN button once the receiver is powered on again.
- Always: This case is similar to the previous one except that the autostart mechanism launches at the receiver start time irrespective of whether the power failure occurred while data recording or not.
- Always Append to the File: Specify the name of an existing file to append new data to. The file name can be up to 20 characters.

MINTER (HiPer II and HiPer V only)

The **MINTER** tab sets the receiver parameters that correspond to MINTER operation and data logging.

- Prefix: determines the file name prefix used as the beginning part of the name of the new file the receiver creates when the power button is pressed to start data recording. The prefix can include up to 20 characters; the default is `log`.
- Period: specifies the interval to use for logging data after pressing the power button. It can be set to the values from 0 to 86400 seconds; the default is 1 second.

AFRM

The **AFRM** tab enables Automatic File Rotation Mode (AFRM). This option is unavailable for HiPer II and HiPer V receivers. In this mode the receiver closes the current log file and open a new one according to a schedule defined by the parameters File Rotation Period and File Rotation Phase:

- Enable AFRM: when selected, activates AFRM.
- Automatically Remove Old Files: when selected, the receiver removes log files with the earliest creation time/date if no free memory is available for recording data.

- File Rotation Period: sets the time duration of each log-file created in AFRM.
- File Rotation Phase: sets the phase (constant time shift) of creating multiple log-files in AFRM.
- File Rotation Counter: sets how many log files must be created in AFRM before AFRM mode turns off.
- File Rotation Running Counter: reports the number of files remaining before AFRM mode turns off.
- Force File Rotation: forces the receiver to execute file rotation immediately. AFRM must be enabled.

UMS Files

The **UMS Files** tab displays the list of raw data files stored on the UMS device.

Along with the file names, this list contains the file sizes in bytes, and date and time the files were stored.

The **UMS Files** tab is also used to manage the files. The pop-up menu displays the following settings:

- Refresh: reloads the list of files.
- Delete: deletes the selected files. A confirmation message displays.
- UMS Device Info: displays information about the UMS device connected to the receiver, including its name, firmware version, file system details, and more.

UMS Device Information


The UMS Device Info dialog box displays information about the UMS device connected to the receiver, including its name, firmware version, file system details, and more.

The **UMS Cfg** tab allows you to activate the connected UMS device and manage how you want to copy files.

- Activate the UMS Device: makes the connected UMS device ready (active) for copying the raw data files.
- Overwrite Existing Files: overwrites any previous raw data files on the UMS device with the new files of the same names when copying them from the receiver's memory to the UMS device.

- Automatically Copy the Current File: automatically copies the current file on the UMS device after closing the file.
- Automatically Copy All Files: automatically copies all files, including the current file, immediately after the active UMS device is connected to the turned-on receiver or the receiver is power cycled with the UMS device being connected.

Modem Driver

The **Modem Driver** icon  opens the **Modems** dialog that displays internal modems connected to the receiver.

If no modem has already been detected (there is no information about a modem in the permanent NVRAM), once you open the dialog, modem detection process starts. When TRU finds a modem, the name displays in the dialog. If it is a cell modem or detected radio modem has a cell module, TRU prompts you to install a driver for this modem.



Topcon applications may need a driver to use the internal cell modem installed in the receiver. The driver represents a set of scripts, which the GNSS firmware executes to connect to the modem, to make a call, etc. Some applications can use cell modems directly and do not need a driver, but it is recommended to install a driver for all the internal modems with the cell module.



If the internal modem is replaced, or if the baud rate of the internal radio or cell modem has been changed, you need to update the driver.

The pop-up menu in the **Modems** dialog includes the following options.

- Scan for hardware changes - This option can be used to detect whether the radio or cell modems (or their baud rates) have been changed. If TRU detects any changes, it updates information about the modems in the permanent NVRAM of the receiver, and offers to the user to update the driver.
- Properties - Displays the **Modem Properties** window where you can view information about the modems and drivers.
- Update Driver - Displays a Wizard, which helps the user to update the cell modem Driver.

Modem Properties: Modem

The **Modem** screen displays the physical port of the receiver, which the modem connect to, names of primary (usually radio) modem, secondary (usually cell) modem, and baud rate of each module.

Clicking the **Detect Modems** button initiates modem detection process. TRU searches for modems and update information about them in the permanent NVRAM.

Modem Properties: Driver

The **Driver** screen displays information about the currently installed driver, and allows updating or uninstalling the driver.

- Driver Name - an internal name of the driver
- Driver Version - the version of the driver
- Driver Description - a user friendly name of the driver
- Driver Details shows a list of files which the driver consists of.
- Update Driver shows a Wizard, which helps the user to update the driver or install a new one.
- Uninstall erases the driver, its internal variables and the information about the modem from permanent NVRAM of the receiver.

Updating Modem Driver: Selecting Driver Source

This screen allows you to select a driver source. When it is selected, TRU displays the file version.



The driver source is an XML file, which consists of one or more drivers.

The file version is required to support service. The version increases when any changes to the file are made and it is not related to the version of the driver for your specific modem(s). The driver version is displayed on the second screen.

Every TRU installation includes a default driver library for all the officially supported equipment as of the release date of TRU. If you have a newer library, you may use it instead of the default one.

Updating Modem Driver: Selecting Driver

This screen allows you to select a driver from a list of all the drivers found in the file specified on the first screen.



The Wizard does not actually detect modems. It uses information about the modems previously stored in the permanent NVRAM of the receiver. If your modem(s) have not been detected yet, it is recommended to detect them using the Scan for hardware changes menu item in the Modems dialog, or using the Detect Modems button of the Modem Properties property sheet.

If there is only one driver, which is compatible with the hardware, TRU highlights it. Otherwise you must select a driver manually.

Updating Modem Driver: Variables

This screen displays and allows editing variables of the driver.



Default variable values are recommended for most of the users.

Do not modify variable values unless it is really needed, you know what to do or received instructions from Topcon dealer or Topcon support. If the variables have not been initialized properly, the driver will not function.

There are two types of variables. If there is a physical name, this variable is a real variable stored in the NVRAM, and it can be read or modified by applications. If there is no a physical name, this variable is a constant and its value cannot be read or modified after the driver has been installed.

Updating Modem Driver: Installing Driver

When you see the fourth screen, the Wizard starts to install the driver. On this step the Wizard uninstalls old driver, compiles and uploads files of the driver to the receiver.

GRS Tools

When running on GRS-1 platform, the **Device** drop-down menu of the **Main Window** contains the **GRS Tools** item.

The **GRS Tools** item opens the **GRS Tools** screen that can manage the receiver, modem and compass.

- The **Receiver** tab controls power parameters of the internal GNSS receiver.
- The **Modem** tab controls power parameters of the internal modem.
- The **Compass** tab displays the current North/South direction and the angle to North, displays the tilt of the unit, and calibrates the compass.

Receiver

The **Receiver** tab controls power parameters of the internal GNSS receiver.

- **Current Power State** – shows the current power state of the internal GPS board, either ON or OFF.
- **Power ON/OFF** – turns on/off the GPS receiver power.
- **Reset The Receiver** – performs a hardware reset of the internal GNSS receiver. From a functional point of view, the hardware reset is equivalent to turning the power off and then back on.
- **Clear NVRAM** - clears the receiver's NVRAM. All receiver parameters are set to their default values. Almanacs, ephemerides, etc., are erased. This operation does not delete any raw data files stored in the receiver's memory.
- **Turn power ON when connecting to the internal receiver** – check mark this box for TRU to turn ON the internal GPS board, when connecting to it.
- **Turn power OFF when disconnecting from the internal receiver** – check mark this box for TRU to turn OFF the internal GPS board, when disconnecting from it.
- **Turn power OFF on exit** – check mark this box for TRU to always turn OFF the internal GPS receiver power on exit.

Modem

The **Modem** tab controls power parameters of the internal modem.

- **Model** – shows the model type of the modem.
- **Current Power State** – shows the current power state of the internal modem, either ON or OFF.
- **Power ON/OFF** – turns on/off the modem power.
- **Turn power ON when connecting to the internal modem** – check mark this box for TRU to turn ON the internal modem, when connecting to it.

- **Turn power OFF when disconnecting from the internal modem** – check mark this box for TRU to turn OFF the internal modem, when disconnecting from it.
- **Turn power OFF on exit** – check mark this box for TRU to always turn OFF the modem power on exit.

Compass

The **Compass** tab displays the current direction, tilt of the unit. This tab also calibrates the compass.

- **Pointer** – North (red portion of pointer) and South (black portion of pointer) directions.
- **Compass** – the angle (azimuth) from North, in degrees.
- **Tilt** – the roll and pitch, from level, in degrees and minutes.



The compass is very sensitive to the tilt of controller. To measure precise azimuth values, make sure that both vertical and horizontal tilt values equal zero, and the tilt pointer is located within the crosshair.

- **Calibrate** – The compass may need to be calibrated if you notice that its precision is no longer accurate. The calibration procedure depends upon the compass hardware.



The GRS -1 controller keeps the compass calibration data.

The Calibration procedure excludes magnetic influence of the surroundings in the place where the compass is used. The factory calibration is performed with a separate utility.

Backpack Tools

When running on Tesla RTK platform, the **Device** drop-down menu of the **Main Window** contains the **Backpack Tools** item.

The **Backpack Tools** item opens a screen to control power parameters of the Topcon GNSS receiver in the backpack attached to the controller.

- **Current Power State** – shows the current power state of the internal GPS board, either ON or OFF.
- **Power ON/OFF** – turns on/off the GPS receiver power.
- **Reset The Receiver** – performs a hardware reset of the internal GNSS receiver. From a functional point of view, the hardware reset is equivalent to turning the power off and then back on.
- **Turn power ON when connecting to the internal receiver** – check mark this box for TRU to turn ON the internal GPS board, when connecting to it.
- **Turn power OFF when disconnecting from the internal receiver** – check mark this box for TRU to turn OFF the internal GPS board, when disconnecting from it.
- **Turn power OFF on exit** – check mark this box for TRU to always turn OFF the internal GPS receiver power on exit.

Modem Managing



Modem Managing mode is intended for configuring Topcon and 3rd party modems.

In Modem Managing mode, you see the **Settings** icon  in the tools area.



Initially, the Tools area is inactive. To make the tools area active, first establish a port connection on the PC using the **Connect** option from the **Device** menu. See "Connection" on page 8.



See "Appendix B" "Digital UHF Radio Firmware v2.0 Upgrade Process" on page 129 for information on upgrading your Digital UHF radio firmware.

When in Modem Managing mode, TRU tries to detect a modem at the time of connection. If there is no modem, or if it doesn't respond, a connection cannot be established.

The **Settings** icon opens a dialog that displays the modem's settings, and allows changing the settings and invoking modem functions (Figure 15).

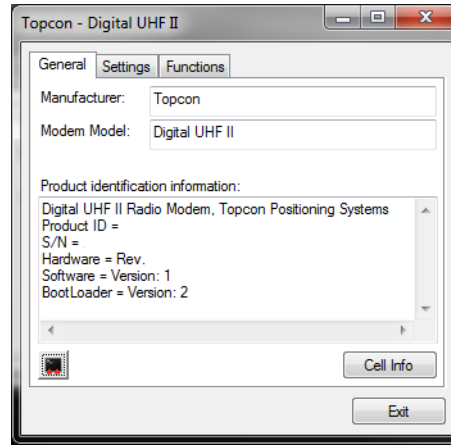




Figure 15: Modem Settings Dialog Box



It is important to pay attention to the Hardware listing in the Modem Settings dialog box to fully understand the hardware installed on your receiver. For example, the Digital UHF I radio is reported as Aw-401Tc or Aw-401Hi, while the Digital UHF II radio is reported as DUHF II. You are required to specify radio hardware and firmware information, along with details on the problem, when contacting the Topcon support or service group for troubleshooting.

General Information

The **General** tab shows the modem model, and the product identification information.

- Clicking the **Terminal** icon  opens the **Terminal** dialog.
- When you click the **Cell Info** button , TRU detects the cell modem, and, if it finds the modem, connects to it and opens the **Settings** property sheet for the cell modem.







If currently connected modem cannot have a cell module, the Cell Info button is disabled.

Modem Settings

The **Settings** tab shows a list of parameters specific for a connected modem. The settings list may vary depending on the modem model and possibly the firmware version.

Four icons on this tab serve the following purposes:

-  renews the list.
-  imports settings from a file.
-  saves settings in a file.
-  writes new setting into the modem.

The settings can be read-only (marked by the  icon) or changeable (marked by the  icon).

Modem Functions

The **Functions** tab allows you to invoke a modem's functions.

- Function – shows a list of available functions.
- Execute – starts executing the selected function.
- Input Parameters – shows a list of incoming parameters for the selected function. These parameters should be initialized properly before the function is executed.
- Output Parameters – shows a list of values returned by the function.

Modem Types

The following sections describe specific parameters and functions for each modem. See “Modem Managing” on page 89 for general information and features commonly available for all modem types.

FH915 Plus

Settings

- General parameters:
 - Baud Rate, bps – specifies the baud rate of the modem's serial port connected internally with the receiver's serial port. It can be 19200, 38400 (default), or 57600.
 - Flow Control – enables/disables the RTS line of the modem's serial port connected internally with the receiver's serial port. It can be either RTS/CTS (default) or None.
- Radio parameters are accessible only if GSM mode is Off:
 - Protocol – sets an operation protocol. It can be either FH915 (default) or FH915 Ext.
 - Location – adjusts the frequency range and RF power level depending on the country. It can be USA/Canada (default), Australia or New Zealand.
 - Operation Mode – specifies the mode in which the radio modem will be functioning. It can be Receiver (default), Transmitter, Repeater or None.
 - Power, mW – sets the transmission power for the base radio modem. It can be either 250 or 1000 mW (default).

- Link Rate, bps – specifies the rate at which data is transmitted over the RF link in FH915 protocol. It can be 9600 (default), 12000, 17000, 24000, or 51000 bauds.
- Ext Link Rate, bps – specifies the rate at which data is transmitted over the RF link in FH915 Ext. protocol. It can be 3600, 4800, 6600, 9600 (default), 19200 bauds.
- Channel – this feature allows up to ten simultaneously transmitting radio modems, without interference, at the jobsite (1- default).
- GSM parameters:
 - Mode – specifies the GSM modem operation mode. It can be Off (default), Slave, Master, or Direct.
 - PIN – specifies the PIN code for access to the GSM modem. It can be a 4-digit number.
 - Dial – specifies the phone number that the GSM modem, in Master Cell mode, dials in to the remote Slave modem. It can be a number of 0..14 digits.
 - Send Time, s – specifies a time interval from 0 to 255 in seconds, is used to ensure reliable communication between the pair of modems (Master - Slave) and avoid unnecessary modem reinitialization. The transmitting modem sends the service word to the receiving modem in every "sndtime" seconds. Note that the service word will not affect the differential corrections (RTCM or CMR messages) in any way. If the parameter is set to zero, the service word is not used in data transmission.
- Advanced parameters:
 - H/W Version – queries the hardware version of the board.
 - Net ID – sets network ID. A radio link can only be established between modems having the same Net ID. It can be the number in the range from 0 (default) to 255.
 - Rep Net ID – sets a new Rep Net ID parameter for Repeater type. A modem with Repeater type set carries out retransmission with other Rep Net ID that is different from receiving Net ID. In this mode, it is possible to set different Net IDs for received and retransmitted signals. It can be the number in the range from 0 (default) to 255.

- Hot Lock, s – sets time to keep synchronization after signal drop. It can be 5, 10, 20, 30 (default), or 40 seconds.
- Save Power – enables/disables (default) Power Saving mode. The transmitter and receiver must be set to the same mode.

Topcon UHF460

Settings

- General parameters:
 - BaudRate – select a baud rate for the modem’s serial port. The baud rate is adjustable. This is the flow rate on the serial port connecting the modem to the GPS board. It can be 19200 or 38400 (default) rate with this radio.
- Radio parameters:
 - Protocol – sets the protocol for data transmission. Select between TPS and PDL. Select TPS if all of the radio-modems at the jobsite are manufactured by Topcon Positioning Systems. Select PDL if using PDL radio-modem(s) together with TPS radio-modem(s) at the jobsite.
 - Type – select a modulation scheme that will be used by the base radio-modem. It can be either OFF or 4-Level-FSK (Frequency Shift Keying) or GMSK (Gaussian Minimum Shift Keying). Refer to “Appendix A” on page 123 for link, rate, channel spacing, protocol, and modulation information.
 - RadioLink – select the rate at which data is transmitted over the RF link. The UHF radio-modem supports 4800, 9600 (default), and 19200 baud. Note that this setting affects the Modulation Type control and vice versa. Must be the same for the base and rover.
 - LinkProtocol – select the appropriate link protocol among the following available: FastAsn, TimeOut, and CharOut.

- TimeOut – enter an integer value between 1 (corresponds to 10 ms) and 50 (corresponds to 500 ms). Once the timeout between incoming data exceeds the specified value, the modem begins data transmission.
- ControlChar – enter a decimal value (usually a control character). Once the specified character is found in the incoming data stream, the modem begins data transmission.
- Scrambler – If set to ON, provides more robust data communications over the areas with possible interference. Must be the same for the base and rover.
- FEC – For a maximum data communication reliability, set the Forward Error Correction to ON (default). In this case, the rover radio-modem has the capability to check and correct transmission errors (if any) in an incoming data stream.
- RxChannel – select the operating frequency that will be used by the rover radio-modem to receive differential data. Must be the same for the base and rover.
- TxChannel – select the operating frequency that will be used by the base radio-modem to transmit differential data.
- Power – select the transmission power for the base radio from 10, 20, 50, 100, 250, 500 mW, 1 or 2 W.
- FcsMode – select between OFF (default), RxSlave, TxMaster
- FcsNoiseDb – select between 70, 85, 100 dBm, or Custom to specify a threshold value for the noise level for the current operating frequency in Free Channel Scan mode.
- GSM parameters for the GSM module integrated into a receiver:
 - GsmMode– set the mode control to OFF (default), Slave, Master, or Direct.
 - GsmPin– enter a Personal Identification Number (PIN) if required.
 - GsmDial– on the rover side, enter the phone number of the base GSM modem.
 - GsmSndTime– enter a period of time in seconds with which the base/rover GSM modem sends a service word to the rover/base GSM modem. This parameter is used to maintain reliable communication between the pair of modems and avoid unnecessary modem reinitialization.

Digital UHF

Settings

- General Digital UHF¹ parameters:
 - Mode – selects Radio or Cell to use for communication (the UHF or GSM/CDMA band, respectively).
 - Baud rate, bps – selects a baud rate for the modem's serial port.
 - Flow Control – enables hardware flow control.
- Radio parameters:
 - Frequency, MHz – assigns an operating channel to the radio modem. Select the desired frequency from the list.
 - Protocol – sets the protocol for data receiving/transmitting.
 - Modulation – selects a modulation type for the base radio modem.
 - Link rate, baud – data transfer speed between the base and rover. This parameter depends on the modulation and the space value.
 - Network has Repeater – enables retransmission in the wireless cluster only for Simplex Transmitter protocol.
 - Power, mW – sets the transmission power for the base radio.
 - Scrambler – when enabled, provides more robust data communication over high interference areas.
 - FEC – (Forward Error Correction) Enable to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream.

1. Digital UHF I modem with radio firmware version 1.6 or earlier.

Functions

- **BootConfiguration:** This command is intended to reboot the unit using selected user settings. Two options are available, to use the default user settings defined by dealer or to use the settings defined by the end-user.
- **UploadCCXFile:** Intended to upload the factory and dealer configurations along with the user defined radio settings. After uploading the CCX file, the uploaded file takes into effect after the configuration reboot (see the previous function).

Digital UHF II

Settings

- **General parameters:**
 - Mode – selects Radio or Cell to use for communication (the UHF or GSM/CDMA band, respectively).
 - Baud rate, baud – selects a baud rate for the modem's serial port.
 - Flow Control – enables hardware flow control.
- **Radio parameters:**
 - Frequency, MHz – assigns an operating channel to the radio modem. Select the desired frequency from the list.
 - Protocol – sets the protocol for data receiving/transmitting.
 - Modulation – selects a modulation type for the base radio modem.
 - Spacing, kHz – selects the channel spacing.
 - Link rate, baud – data transfer speed between the base and rover. This parameter depends on the modulation and the space value. Refer to "Appendix A" on page 123 for channel spacing, protocol and modulation information.

- Power, mW – sets the transmission power for the base radio.
- Scrambler – when enabled, provides more robust data communication over high interference areas.
- FEC – (Forward Error Correction) Enable to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream.
- Callsign
- Satel parameters:
 - FCS Net ID, hex: Configures network ID.
 - Address Receiving: Configures address receiving.
 - Address Transmission: Configures address transmission.
 - RX Address, hex: Configures the receiving primary address.
 - TX Address, hex: Configures the transmission primary address.

Functions

The following functions are available for executing in this modem:

- **BootConfiguration:** This command is intended to reboot the unit using selected user settings. Two options are available, to use the default user settings defined by dealer or to use the settings defined by the end-user.
- **FactoryReset:** Resets all the parameters to their default values.
- **UploadFile:** Intended to upload Country Configuration File (CCF) or Dealer Configuration File (DCF).



Be aware that the Digital UHF II modem supports a wide UHF frequency range of between 400-470 MHz, and has been delivered to you in a default factory configuration. The default factory configuration to support operation in 400-470 MHz is achieved through CCF configuration file. You are not supposed to update or modify existing CCF file until instructed by Topcon professional.

Before operating a receiver equipped with a Digital UHF II radio, you must upload the frequencies needed for radio communication in your specific region. UHF frequencies in your region may be licensed or unlicensed, but are always subject to some level of restriction within the overall 400-470 MHz range. Your dealer should load the DCF before giving you the receiver integrated Digital UHF II radio. If your receiver is not loaded with UHF frequencies specific to your region, contact your local dealer and request that he supplies you with a DCF containing licensed UHF frequencies and channel spacings.

Once you receive the DCF from the dealer (refer to "Appendix C" on page 133), you must have the latest release version of TRU and do the following:

1. Install TRU on your mobile device or computer.
2. Copy the DCF provided by your dealer and paste it into the hard drive of your mobile device or computer.
3. Run TRU.
4. Connect to the internal radio modem of the receiver, using the Modem Managing mode of TRU.
5. Click on the **Functions** tab, and select **UploadFile** in the **Function** control.
6. In the **File** property of **Input Parameters**, select the DCF saved on a local drive and select DCF as the type of file.
7. Click **Execute** to load the radio frequencies into the radio.
8. Click **Execute** once more on **Settings** to ensure that all frequencies are correctly loaded and appear available for use.



A valid DCF configuration is mandatory before using the product. Failure to understand and apply this procedure may result in non-operation of the Digital UHF II radio or breach of local regulatory laws that govern radio communications. If you have further questions or concerns, contact your local Topcon representative.



Satel® UHF Modem

Settings

The UHF Satel radio modem offers a transmitter/receiver/repeater functionality with a maximum 1W power output for data transmission. The frequency range of the modem depends on the country in which the receiver is used.



The default settings for radio configuration are sufficient for most jobsites. Changing these settings can affect the operation of the radio modem and communication between receivers.

The settings can be read-only (marked by the  icon) or changeable (marked by the  icon). Clicking on the corresponding line in the Value column of any editable parameter opens a field to enter or select from the drop-down list a needed value.

- General parameters:
 - Model – the product model identification text.
 - Hardware Version – the hardware revision of the modem.
 - Firmware Version – the firmware version of the modem.
 - Product Code – specifies the product code.
 - Serial Number – specifies the serial number unique for the modem.
 - Baud Rate, baud - specifies the baud rate of the modem's serial port connected internally with the receiver's serial port, by default with hardware flow control.
- Radio parameters:
 - Frequency, MHz - the operating frequency used for data transmission and reception.

- Protocol - selects a protocol and a modulation type.
- Spacing, kHz - displays the channel spacing. This is determined by the hardware.
- Satel FEC - Forward Error Correction technique to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream.
- Power, mW - sets the appropriate level of output power.
- Repeater - Enables/Disables repeater function.
- TX Delay, ms - Specifies TX delay.
- TX Addressing - Specifies TX address mode.
- TX1 Address, hex – Specifies primary transmit address.
- TX2 Address, hex – Specifies secondary transmit address.
- RX Addressing – Specifies RX address mode.
- RX1 Address, hex – Specifies primary receive address.
- RX2 Address, hex – Specifies secondary receive address. FCS parameters:
- FCS Mode - Allows enabling Free Channel Scan mode.
In free channel scan mode, the Base radio modem regularly scans the current operating frequency to determine the degree of a radio noise (interference). If the level of noise on the current operating frequency is greater than the threshold specified in the Signal Threshold field, the transmitter stops broadcasting and switch to the next frequency.
- Net ID- sets Free Channel Scan Net ID.



Occasionally, the receivers may encounter interference if a jobsite has more than one set of receivers. In this case, enter a different net ID for each set of receivers.

To properly communicate, the Base and Rover radios require the same settings for Current Frequency, FCS and Net ID.

Functions

- AddChannel: This command is intended to add an operating frequency from a list defined by the dealer to the list defined by the user.
- DeleteAllChannel: Intended to delete all operating frequencies from the list defined by the user.
- FactoryReset: Resets all the parameters to their default values.

Q2

Settings

- General parameters:
 - Baud rate, baud – selects a baud rate for the modem's serial port connected internally with the receiver's serial port.
- Radio parameters:
 - Band - Indicates the frequency band and spacing.
 - RX Frequency, MHz - the operating frequency used for data reception.
 - TX Frequency, MHz - the operating frequency used for data transmission.
 - Protocol - current protocol.
 - Modulation - current modulation type.
 - Link rate, baud – specifies the rate at which data is transmitted over the RF link. This parameter depends on the modulation and the space value. Refer to "Appendix A" on page 123 for channel spacing, protocol and modulation information.
 - Scrambling - indicates use of the scrambler.

- FEC - (Forward Error Correction) Enable to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream.
- CRC Checking - indicates the checksum use (CRC="Cyclic Redundancy Check") when receiving a package. If the checksum is wrong (the package was received with errors), the data is not applied.
- Power, mW - the transmission power for the base radio.
- FCS - the operation mode in the Free Channel Scan mode.
- Satel parameters (applied to Satel-compatible protocols):
 - Satel Mode - the modem operation mode.
 - Satel FEC - Forward Error Correction.
 - Satel CRC Checking - indicates the checksum use.
 - Satel TX Addressing - Configures address transmission.
 - Satel TX Address, hex - Configures the transmission primary address
 - Satel RX Addressing - Configures address receiving.
 - Satel RX Address, hex - Configures the receiving primary address.
- GSM parameters
 - Mode - specifies the GSM modem operation mode.
 - PIN - specifies the PIN code for access to the GSM modem. It can be a 4-digit number.
 - Dial - specifies the phone number that the GSM modem, in Master Cell mode, dials in to the remote Slave modem. It can be a number of 0..14 digits.

- Send Time, s - specifies a time interval from 0 to 255 in seconds, is used to ensure reliable communication between the pair of modems (Master - Slave) and avoid unnecessary modem reinitialization. The transmitting modem sends the service word to the receiving modem in every "Send Time" seconds..



Note that the service word will not affect the differential corrections (RTCM or CMR messages) in any way. If the parameter is set to zero, the service word is not used in data transmission.

Functions

- AddChannel: This command is intended to add an operating frequency from a list defined to the user's list.
- DelChannel: Intended to delete an operating frequency from the list defined by the user.
- FactoryReset: Resets all the parameters to their default values.
- GetChannelFCS: Shows if a channel can be used in the FCS mode.
- SetChannelFCS: Enables/Disables use of a channel in the FCS mode.
- SetBand: Changes the current band (and the step).



Supported bands depend on the hardware.

GSM/HSPA Modems

This section describes the settings and features for the following GSM modems:

- Motorola H24 HSPA
- Motorola G24 GSM
- Cinterion HC25/HC28/HC28J¹
- Wavecom Q24
- Wavecom Q26 GSM

Settings

- Manufacturer – the manufacturer identification text.
- Model – the product model identification text.
- Firmware Version – the product firmware version.
- IMEI – the International Mobile Equipment Identity (IMEI) of the module.
- IMSI – the International Mobile Subscriber Identity (IMSI).
- Authentication – the string indicating whether or not network authentication is required.

SIM PIN authentication	
READY	PIN has already been entered. No further entry needed.
SIM PIN	The modem is waiting for SIM PIN1.
SIM PUK	The modem is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1.

1. Used in the GRS-1 GNSS receiver.

SIM PIN2	The modem is waiting for PIN2.
SIM PUK2	The modem is waiting for PUK2 to unblock a disabled PIN2.
Phone security locks set by client or factory	
PH-SIM PIN	The modem is waiting for phone-to-SIM card password if "PS" lock is active and the client inserts other SIM card than the one used for the lock. ("PS" lock is also referred to as phone or antitheft lock).
PH-FSIM PIN	The modem is waiting for phone-to-very-first-SIM card. Necessary when "PF" lock was set. When powered up the first time, The modem locks itself to the first SIM card put into the card holder. As a result, operation of the mobile is restricted to this one SIM card (unless the PH-FSIM PUK is used as described below).
PH-FSIM PUK	The modem is waiting for phone-to-very-first-SIM card unblocking password to be given. Necessary when "PF" lock is active and other than first SIM card is inserted.
PH-NET PIN`	The modem is waiting for network personalization password.
PH-NET PUK	The modem is waiting for network personalization unblocking password.
PH-NETSUB PIN	The modem is waiting for network subset personalization password.
PH-NETSUB PUK	The modem is waiting for network subset unblocking password.
PH-SP PIN	The modem is waiting for service provider personalization password.
PH-SP PUK	The modem is waiting for service provider personalization unblocking password.
PH-CORP PIN	The modem is waiting for corporate personalization password.
PH-CORP PUK	The modem is waiting for corporate personalization un-blocking password.

- Operator - the name of the operator in which network the modem is registered.
- Security Status - the Network Registration Status.
 - Not registered, ME is not searching for a new operator
 - Not registered, ME is searching for a new operator
 - Registered, home network
 - Registered, roaming
 - Registration denied
- UnknownSignal Quality - indicates the quality of the received signal strength in dBm.

Functions

- PIN Authentication – this function allows the modem to store the entered password. This may be for example the SIM PIN1 to register to the GSM network, or the SIM PUK1 to replace a disabled SIM PIN1 with a new one, or the PH-SIM PIN if the client has taken precautions for preventing damage in the event of loss or theft etc. If no PIN1 request is pending (for example if PIN1 authentication has been done and the same PIN1 is entered again) the modem responds "ERROR: operation not allowed"; no further action is required. Each time a password is entered the module starts reading data from the SIM. The duration of reading varies with the SIM card. This may cause a delay of several seconds before all commands which need access to SIM data are effective.
 - Input Parameters:
 - PIN – Password (string type), usually SIM PIN1.
If the requested password was a PUK, such as SIM PUK1 or PH-FSIM PUK or another password, then <PIN> must be followed by <new PIN>. If the requested code was a PUK: specify a new password or restore the former disabled password.
 - Output Parameters:
 - Return Value – the result code (string type): OK or an error description.



Successful PIN authentication only confirms that the entered PIN was recognized and correct. The output of the result code OK does not necessarily imply that the mobile is registered to the desired network. Typical example: PIN was entered and accepted with OK, but the modem fails to register to the network. This may be due to missing network coverage, denied network access with currently used SIM card, invalid roaming agreement between home network and currently available operators etc.



What to do if PIN authentication fails?

PIN1 / PUK1:

After three failures to enter PIN 1, the SIM card is blocked (except for emergency calls). ERROR: 12 prompts the client to unblock the SIM card by entering the associated PUK (= PIN Unblocking Key / Personal Unblocking Key). After ten failed attempts to enter the PUK, the SIM card will be invalidated and no longer operable. In such a case, the card must be replaced. PIN1 consists of 4 to 8 digits, PUK1 is an 8-digit code only.

To unblock a disabled PIN1, enter <PUK1>,<new PIN1>.

- Facility Lock - this function can be used to enable or disable PIN verification by the SIM card.
 - Input Parameters:
 - Lock – Boolean variable which shows whether you want to enable or disable PIN verification.
 - PIN – Password, usually SIM PIN1.
 - Output Parameters:
 - Return Value – the result code (string type): OK or an error description.

CDMA Modems

This section describes the settings and features for the following GSM modems:

- Motorola C24 CDMA
- Wavecom Q26 Elite
- Wavecom Q2438 CDMA



Topcon GNSS receivers with integrated CDMA cellular module are authorized to operate only on the Verizon™ wireless network in the USA¹.

-
1. Wavecom Q26 Elite is only used in Topcon GRS-1 GNSS receiver.

Settings

- Manufacturer – the manufacturer identification text.
- Model – the product model identification text.
- Hardware Version – the product hardware version.
- Firmware Version – the product firmware version.
- MEID/ESN – the Mobile Equipment Identifier or Electronic Serial Number of the product.
- Module Serial Number – the serial number of the module.
- IMSI – the International Mobile Subscriber Identity (IMSI) of the module.
- Signal Quality - indicates the quality of the signal strength in dBm.

Functions

To use the CDMA modem, the user must activate it. For a start, contact the service provider, and set up a data plan. You will need either the MEID or ESN, which is displayed on the **Settings** tab.

Then you must activate the module on the Verizon network. To do that, open the **Functions** tab, choose the **Activate** (Verizon) function, and click the **Execute** button.



If you are not able to activate the module on your own, contact the service provider.

SRL-35 Modem

This section describes the settings and functions for the SRL-35 modem.





The SRL-35 modem does not have a cell module.

Settings

The Settings tab shows: general information about the modem type, software and hardware revisions, product code and serial number, and displays a list of settings for the modem.

The SRL-35 radio modem offers a transmitter/receiver/repeater functionality with a maximum 35 W power output for data transmission. The frequency range of the modem depends on the country in which the receiver is used.

The settings can be read-only (marked by the ) or changeable (marked by the ) icon). Clicking on the corresponding line in the Value column of any editable parameter opens a field to enter or select from the drop-down list a needed value.

- General parameters:
 - Model – the product model identification text.
 - Hardware Version – the hardware revision of the modem.
 - Firmware Version – the firmware version of the modem.
 - Product Code – specifies the product code.
 - Serial Number – specifies the serial number unique for the modem.
 - Baud Rate, baud – specifies the baud rate of the modem's serial port connected internally with the receiver's serial port, by default with hardware flow control.
- Radio parameters:
 - RX Frequency, MHz – the operating frequency used for data reception.
 - TX Frequency, MHz – the operating frequency used for data transmission.
 - Protocol – selects a protocol and a modulation type.
 - Spacing, kHz – displays the channel spacing.
 - Satel FEC – Forward Error Correction technique to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream.
 - Call Sign
 - Power, W – sets the appropriate level of output power.
 - Repeater – Enables/Disables repeater function.
 - TX Delay, ms – Specifies TX delay.
 - TX Addressing – Specifies TX address mode.

- TX1 Address, hex – Specifies primary transmit address.
- TX2 Address, hex – Specifies secondary transmit address.
- RX Addressing – Specifies RX address mode.
- RX1 Address, hex – Specifies primary receive address.
- RX2 Address, hex – Specifies secondary receive address.
- FCS parameters:
 - FCS Mode - Allows enabling Free Channel Scan mode.
In free channel scan mode, the Base radio modem will regularly scan the current operating frequency to determine the degree of a radio noise (interference). Should the level of noise on the current operating frequency be greater than the threshold specified in the Signal Threshold field, the transmitter will stop broadcasting and switch to the next frequency.
 - Net ID- sets Free Channel Scan Net ID.



Occasionally, the receivers may encounter interference if a jobsite has more than one set of receivers. In this case, enter a different net ID for each set of receivers.

To properly communicate, the Base and Rover radios require the same settings for Current Frequency, FCS and Net ID.

Functions

The UploadFile function is intended to upload the Modem Configuration File (MCF).



Be aware that the SRL-35 modem supports a wide UHF frequency range of 403-473 MHz with selectable channel spacing and has been provided to you in default factory configuration.

Before operating the SRL-35 radio, you must upload the frequencies needed for radio communication in your specific region. UHF frequencies in your region may be licensed or unlicensed but are always subject to some level of restriction within the overall 403-473 MHz range. Your dealer should load the MCF before giving you the SRL-35 radio. If your radio is not loaded with UHF frequencies specific to your region, contact your local dealer and request the MCF containing licensed UHF frequencies, channel spacing, and output power.

Once you receive the MCF from the dealer (see "Appendix C" on page 133), you must have version 2.8 of TRU or later to load the MCF file:

1. Install TRU on your mobile device or computer.
2. Copy the MCF provided by your dealer, and paste it in the hard drive of your mobile device or computer.
3. Run TRU.
4. Connect to the receiver's internal radio modem using TRU's Modem Managing mode.
5. Click the **Functions** tab, and select **UploadFile** in the **Function** control.
6. In the **File** property of **Input Parameters**, select the MCF saved on a local drive and select MCF as the file type.
7. Click **Execute** to load the radio frequencies into the radio.
8. Click **Execute** again on **Settings** to ensure all frequencies are correctly loaded and appear available for use.



A valid MCF configuration is mandatory before using the product. Failure to understand and apply this procedure may result in non-operation of the SRL-35 radio or breach the local regulatory laws that govern radio communications. Refer to the *SRL-35 Operator's Manual* for more details on the SRL-35 radio. If you have questions or concerns, contact your local Topcon representative or dealer.

Firmware Loader

Firmware Loader mode is used to load the firmware onto various devices within a Topcon GNSS receiver.

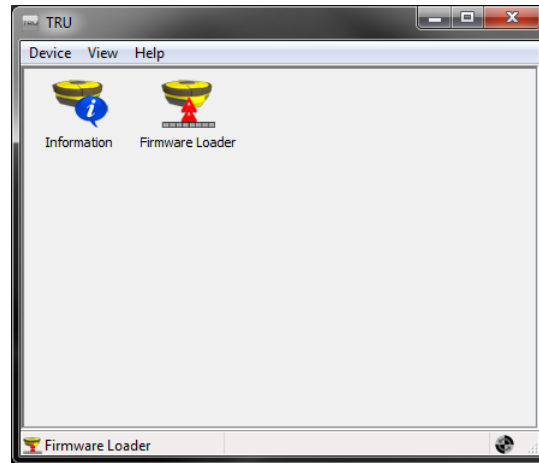


Figure 16: Firmware Loader

GNSS receivers require firmware to properly operate and provide appropriate functionality. As TPS releases firmware updates, loading these updates into the receiver ensures that the receiver operates at its full potential.

Using TRU, you can load the firmware to all boards inside the receiver, including:

- GNSS board
- Modem board
- Bluetooth
- Power board

You can load the firmware to a GNSS board using a serial/USB/Bluetooth/network connection.

Firmware for the modem, Bluetooth, and power boards can be loaded using a serial port connection only.

Loading Firmware Using Serial Port

Use of the serial port connection is the only way to update Power Board, Modem or Bluetooth firmware.

Be extremely attentive when selecting firmware updating parameters, especially when updating modem firmware. Some modem models do not allow terminating of the firmware updating process. So if you choose incorrect parameter combinations, or interrupt the firmware updating process, it may damage your equipment. If this happens, and you cannot update firmware using the Power On capture, you must have the hardware serviced.

1. Click **Device** ▶ **Application Mode** ▶ **Firmware Loader**.

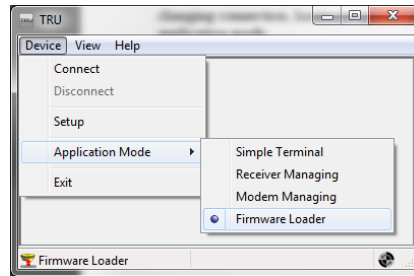


Figure 17: Firmware Loader Mode

2. Click **Device** ► **Connect**, specify the corresponding connection parameters, and click **Connect**.

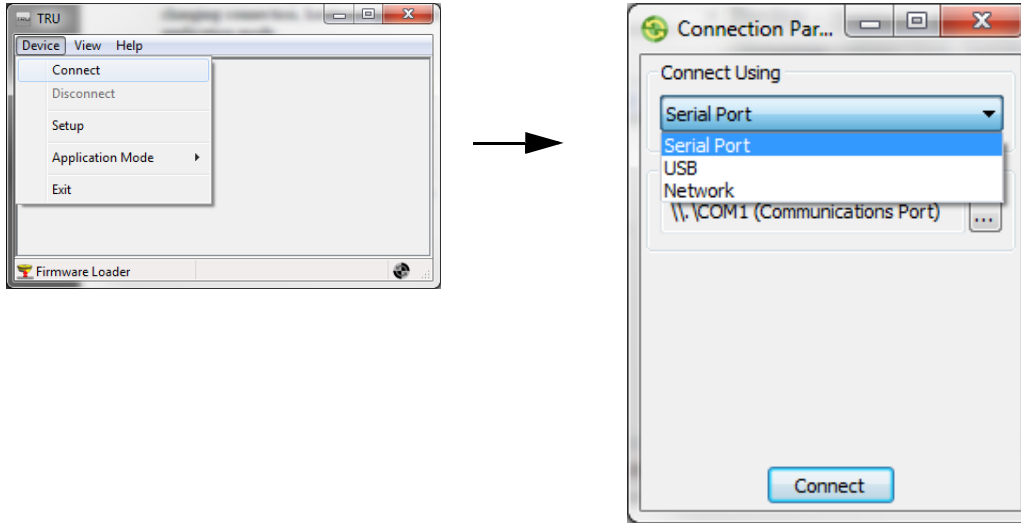


Figure 18: Firmware Loader Connect - Connection Parameters

3. Click the **Firmware Loader** icon  .

4. For **Device**, select either **Receiver/Modem/Bluetooth** or **Power Board**.
 - If you are updating firmware for a power board, you must select **Power Board** from the combo box.
 - In other cases (if you are updating GNSS receiver, modem, or Bluetooth firmware), you must select the **Receiver/Modem/Bluetooth** option.

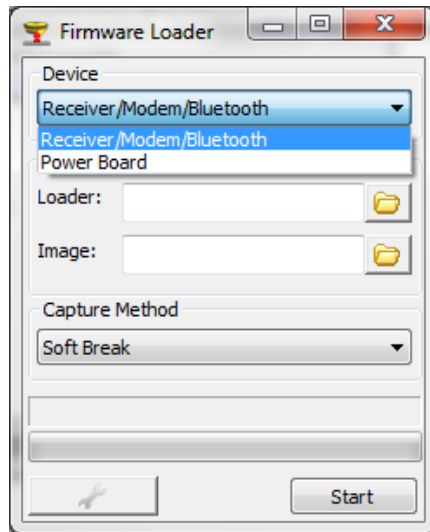



Figure 19: Firmware Loader - Device

5. For **Firmware**, specify the full path to firmware files for the device by clicking the open folder icon  or enter the full path manually.
 - If you are updating power board firmware, specify only the path to the **Loader** file (it usually has an .ldr extension).
 - In other cases, specify full paths to both **Loader** and **Image** files (the image file usually has an .ldp extension).

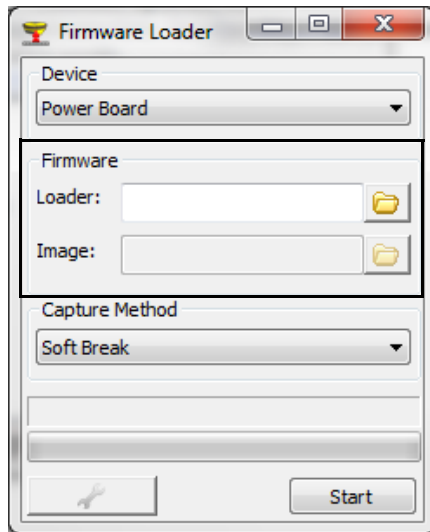


Figure 20: Firmware Loader - Firmware

6. For **Capture Method**, select either the **Soft Break**, or the **Power ON capture** method.
 - If you select the **Soft Break** method, the receiver switches into firmware updating mode through the software.
 - If you select the **Power ON capture** method, after you click the **Start** button, you will need to reset or power cycle the receiver.



Attention GRS-1 and Tesla users: When you are updating firmware of a TPS receiver integrated into a controller using the Power ON capture method, you do not need to reset the receiver. TRU does it automatically.


7. Click **Next** to select the firmware files.
8. Specify the full path to firmware files for the device by pressing the open folder icon  or enter the full path manually.
 - If you are updating power board firmware, you should specify only the path to the Loader file (it usually has an .ldr extension).
 - In other cases you should specify full paths to both Loader and Image files (the image file usually has an .ldp extension).
9. Click **Next** to verify the device type, its hardware and current firmware versions before you start the firmware loading.
10. Click **Next** to begin uploading firmware to the receiver. Pressing the **Cancel** button terminates the firmware updating process. If the firmware updating process for a device has not been completed, the device may become inoperative.
11. If the firmware has been uploaded, a successful message displays, and TRU disconnects from the receiver. Otherwise, one of the error messages in Table 1 displays. To detect and fix the problem, use troubleshooting procedures described in Table 1.

Table 1. Firmware Troubleshooting

Error Message	Troubleshooting
Unknown error	Repeat firmware updating. If the error repeats, contact your dealer or manufacturer. It usually means that there is a hardware problem, or your Flash file was corrupted.
The Loader file is not compatible with the hardware	The Loader (.ldr) file you selected is not compatible with your hardware. Select an appropriate .ldr file and repeat firmware updating.
The Flash file is not compatible with the hardware	The Flash (.ldp) file you selected is not compatible with your hardware. Select the appropriate .ldp file and repeat firmware updating.
The specified device requires a newer version of the loader	The version of TRU you are using cannot upload the firmware to your device. You need to get a more recent Application version from your dealer.
The Loader file, checksum is incorrect	Repeat firmware updating. If the error repeats, it means that the Loader file you have is corrupted, and it must be replaced with a correct Loader file.
No response from the device	This usually means that the device was disconnected from the controller. Make sure that a serial cable is reliably attached to both the device, and the controller, and then repeat firmware updating.

Loading Firmware Using USB, Bluetooth, and Network Connections

Using USB, Bluetooth, and network connection, you can load the firmware to the GNSS receiver only.

- **Device** – this field cannot be changed, and it always displays Receiver.
- **Firmware** – specify the full path to a firmware file corresponding to the device by clicking the **Open Folder** icon or enter the full path manually. You should specify full path to the Image file only (the Image file usually has an .ldp extension).
- **Start** - click to begin uploading firmware to the receiver. After you click the button, it toggles to **Cancel**. Clicking this button terminates the firmware updating process.

If the firmware has been uploaded, a successful message displays, and TRU disconnects from the receiver.



To update the firmware through a connection other than serial one, TRU first needs to copy the Image (.ldp) file to an internal memory card of the receiver. If the receiver does not have the internal memory card or there is not enough free memory on the card, firmware updating process will fail.

Appendix A

The following table describes the channel spacing, protocol and modulation for each modem.

Table 2. Modem Channel Spacing, Protocol, and Modulation

RX Modem	Channel Spacing	Protocol	Modulation
Digital UHF	12.5 kHz	PDL	GMSK
		TrimTalk	GMSK
	25 kHz	PDL	GMSK
		TrimTalk	GMSK

Table 2. Modem Channel Spacing, Protocol, and Modulation

Digital UHF II	12.5 kHz	Satel 3AS	4-Level-FSK
		PDL	4-Level-FSK
			GMSK
	TrimTalk*	GMSK	
	25 kHz	Satel 3AS	4-Level-FSK
		PDL	4-Level-FSK
GMSK			
TrimTalk*	GMSK		
SATELLINE-3AS	12.5 kHz	Satel 3AS	4-Level-FSK
		PDL	4-Level-FSK
			GMSK
	25 kHz	Satel 3AS	4-Level-FSK
		PDL	4-Level-FSK
			GMSK

Table 2. Modem Channel Spacing, Protocol, and Modulation

Topcon Q2	12.5 kHz	Satel 3AS	4-Level-FSK
		PDL	4-Level-FSK
			GMSK
	25 kHz	Satel 3AS	4-Level-FSK
		PDL	4-Level-FSK
			GMSK
12.5 kHz	Satel 3AS	4-Level-FSK	
	PDL	4-Level-FSK	

*Use of PDL protocol is recommended in applications where possible. Note that a minimum baud rate of 9600 bps is recommended for all RTK operations. Compatibility with TrimTalk is subject to some restrictions for radios listed above.

* TrimTalk protocol is supported on revision C of Satel-3AS boards(with FW3.39) integrated in Topcon GNSS receivers.

* Topcon Digital UHF is representative of systems that use Digital UHF I hardware with radio FW version 1.6 or previous.



Protocol, modulation, channel spacing and link rate should match between transmitting and receiving radios for radio operations.

Cell Module Details

Table 3 lists cellular specifications.

Table 3. Cellular Specifications

Quad Band GSM/GPRS/EDGE Module	
Supported Bands	GSM 850/900/1800/1900 MHz
TX Power	850/900 MHz – Class 4 (2 Watt) 1800/1900 MHz – Class 1 (1 Watt)
Data Features	GPRS, Multi-slot Class 10, <i>Max downlink 85.6 kbps, max uplink 42.8 Kbps</i> EDGE, Multi-slot Class 10, <i>Max BR downlink 236.5 Kbps</i> CSD, <i>Max BR 14.4 Kbps</i>
AT Command Set	GSM 07.05, 07.07 and 07.10
Regulatory and Approvals	FCC, IC ANATEL (Brazil) COFETEL (Mexico) CMII (China) PTECRB R&TTE/CE GCF QS9000 manufacturing RoHS/WEEE/CCC

Table 3. Cellular Specifications (Continued)

Dual Band CDMA 1xRTT Module	
Supported Bands ¹	CDMA 800/1900 MHz
TX Power	800 MHz – Class 3 (24 dBm) 1900 MHz – Class 2 (24 dBm)
Data	1x/QNC/HSPD CSD, <i>Max BR 14.4 Kbps</i>
AT Command Set	N/A
Regulatory and Approvals	CDG1, CDG2 FCC, IC, CCC EMC QS9000 manufacturing RoHS/WEEE

¹Topcon GNSS receivers equipped with integrated C24 wireless modules are authorized to operate in the US only on the Verizon™ wireless network.

3.5G Wireless Module (Quad-band GSM and UMTS/HSPA)	
Supported Bands	GSM 850/900/1800/1900 MHz UMTS/HSPA 850/1900/2100 MHz

Table 3. Cellular Specifications (Continued)

TX Power	UMTS/HSPA - Class 3 (0.25 Watt) GSM 850/900 MHz – Class 4 (2 Watt) GSM 1800/1900 MHz – Class 1 (1 Watt) EDGE 850/900 MHz – Class E2 (0.5 Watt) EDGE 1800/1900 MHz – Class E2 (0.4 Watt)
Data Features	UMTS/HSDPA/HSUPA 3GPP, Release 6 GSM/GPRS 3GPP, Release 9 Max uplink 5.76 Mbps, max downlink 7.2 Mbps EDGE, Multi-Slot class 12 CSD, <i>Max BR 14.4 Kbps GSM, Max BR 14.4 Kbps UMTS</i>
AT Command Set	GSM 07.05, 07.07
Regulatory and Approvals	FCC, IC ANATEL (Brazil) PTCRB R&TTE/CE GCF RoHS/WEEE ACMA BABT

Appendix B

Digital UHF Radio Firmware v2.0 Upgrade Process

Supported Platforms

Digital UHF I Based Systems

- Original HiPer (I) series
- HiPer II/GRX1
- GR-3
- GR-5
- MC-R3 Controller/Receiver

Digital UHF II Based Systems

- HiPer II
- HiPer V
- GR-3
- GR-5
- MC-R3 Controller/Receiver

Identification of Radio Installed on the Receiver

1. Identify Digital UHF radio version number (i.e. Digital UHF I or II)
2. Connect receiver with the data collector or PC
3. Run TRU mobile or PC version
4. Connect with the internal modem of the receiver in modem managing mode of TRU
5. Click **Settings** ▶ **General Tab**
 - If the hardware listed in the Receiver Identification section is Aw-401Hi or Aw-401Tc, it is a Digital UHF I radio based device.
 - If the hardware information reports DUHFII, the receiver is installed with Digital UHF II modem.

FW 2.0 Activation on Digital UHF I Radio Modem

1. The user determines whether loading FW 2.0, on Digital UHF I radio based products listed above, is free of charge. A Digital UHF I Modem with serial number F3000000000 and higher for Digital UHF I modem does NOT require unlock code i.e. Firmware 2.0 can be upgraded on the Digital UHF I radio installed on the receiver free of cost.
2. Acquire the Modem serial number by connecting the modem to TRU Modem Managing mode (**Settings** ▶ **General Tab**).



FW 2.0 is available for free for all Digital UHF II radios.



It is important to know whether your receiver is eligible for free upgrade before loading the firmware 2.0. FW 2.0 will not be operational on units which require security code for activation of firmware on Digital UHF I based receivers. The user will have choice to revert back to v1.6 of the firmware on Digital UHF I based receivers, if the security code for FW 2.0 is not available.

3. If the modem serial number for Digital UHF I does not fall in the serial number cutoff mentioned in above step, firmware 2.0 requires a security code to activate the firmware.
4. The user must record following information and send it to their local distribution:
 - Serial number of the receiver
 - Serial number of the modem board installed on the receiver
5. To order FW 2.0 upgrade and to get security code for this activation, the Dealer is required to submit a PO to Topcon with following information:
 - Upgrade part number (listed below*)
 - Serial number(s) of the receiver and Digital UHF I radio modem

Part Number	Description	Business Unit
1002754-01	Upgrade, FW v2.0, Digital UHF I Radio	Survey
1002755-01	Upgrade, FW v2.0, Digital UHF I Radio	Construction/MC
1002756-01	Upgrade, FW v2.0, Digital UHF I Radio	AG
1002757-01	Upgrade, FW v2.0, Digital UHF I Radio	MOEM

*Please select appropriate part number as per your associated business unit.



Contact your local Topcon dealer for more information about these part numbers.

6. Request for security code will be processed by options@topcon.com.
7. Once you receive security code for Digital UHF I modem installed on your receiver, upload Firmware 2.0 using Firmware Loader application mode in TRU 2.8 or later.
8. Once firmware is loaded on the modem, connect receiver in Modem Managing Mode in TRU. TRU will ask user to enter valid security code. Entering invalid or no security code will result into non-activation of the firmware 2.0 for Digital UHF I radio; as mentioned above, user will have an option to revert back to previously released FW 1.6.

Creating a Configuration File (MCF/CCF/CCX)

To create necessary regional or licensed frequencies through a Configuration File (DCF/MCF or CCX) you need a dealer/advanced license of TRU. The dealer/advanced license is only available to your **Topcon representative or dealer**.

Contact your Topcon representative or dealer to obtain a configuration file for your external radio or receiver with integrated radio. You will need to inform the dealer the specific frequencies on which you plan to operate your radio. Remember to make sure that these frequencies are compliant with your regional radio regulations. Once you provide the operational frequencies, the dealer can provide the configuration file to work with your radio. With TRU 2.8 or later, the dealer does not need to access your external radio or receiver to create a configuration file for you.



DCF/MCF or CCX creation is only available in Dealer/Advanced license of TRU.



Topcon Positioning Systems, Inc.
7400 National Drive, Livermore, CA 94550
800-443-4567 www.topconpositioning.com

<http://www.topcontotalcare.com>

TRU Reference Manual

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