

# Operation

This chapter describes standard receiver operating procedures:

- Using the MINTER
- Downloading receiver files to a computer
- Deleting files from the receiver
- Checking and loading OAFs
- Managing receiver memory
- Clearing the NVRAM
- Changing receiver modes
- Checking and loading firmware

Topcon receivers are built to operate independent of the receiver type. Any minor exceptions for the HiPer XT are noted.

## Using the MINTER

The MINTER (Figure 4-1) is Topcon's Minimum INTERface used to display and control data input and output, and is the same for all HiPer family receivers.

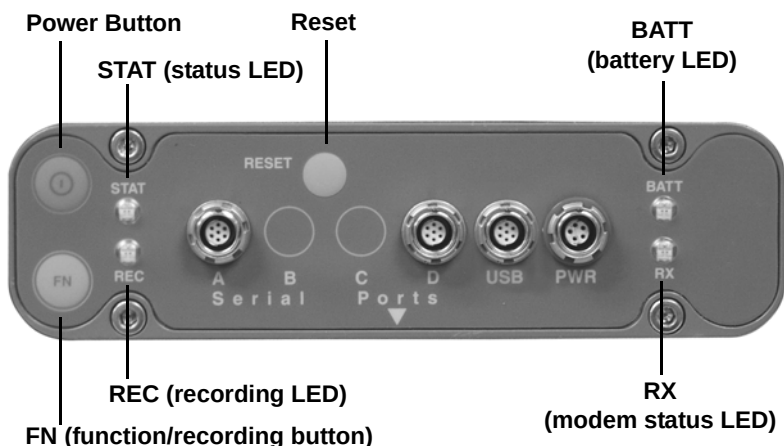


Figure 4-1. MINTER

## Power Key

Pressing the **power** key turns the receiver on and off.

## Status LED

- When the receiver is on and no satellites are tracked, the STAT LED will blink red.
- When satellites are tracked, the STAT LED will produce one blink for each tracked satellite (green for GPS, orange for GLONASS).

## Reset Key

Pressing and holding the **reset** key for about one second causes:

- a hard reset of the receiver.
- the receiver to leave Zero Power Mode and return to Normal Mode.



### NOTICE

*Only use this procedure if the receiver does not respond to commands or does not charge the internal batteries (is in Zero Power Mode).*

## FN Key and Record LED

Table 4-1 on page 4-5 summarizes FN key functions and REC LED statuses. See “FN Key Mode parameter” on page 2-23 for information on setting FN key modes.

- Pressing the **FN** key for less than one second switches the receiver between different information modes (normal and extended information), or between static and dynamic post-processing modes, depending on the receiver's configuration.  
During the first second of pressing the **FN** key, the REC LED is orange.

- Pressing and holding the **FN** key for more than one and less than five seconds will start/stop data recording.

During data recording the REC LED is green.

If the REC LED is red, the receiver has run out of memory, has a hardware problem, or contains an improper OAF (see “Option Authorization File (OAF)” on page 1-16 for more information on OAFs).

- The REC LED blinks green each time data is written to the internal receiver's memory.

You set the data recording time interval using PC-CDU. See “Recording Interval parameter” on page 2-20 for information on setting this function.

Each time you turn off or on data recording, either a new file opens or data appends to a particular file. See “Always Append to the File parameter” on page 2-21 and “Files Creation Mode parameter” on page 2-21 for information on setting this function.

- Pressing and holding the **FN** key for more than five and less than eight seconds will turn the baud rate of serial port A to 9600. After about five seconds of pressing the **FN** key, the REC LED becomes red. Release the **FN** key while the REC LED is red (during the next three seconds).

Pressing and holding the **FN** key for more than eight seconds has no impact.

- After loading new firmware or clearing the receiver’s NVRAM, the receiver checks its internal file system.

During this operation, the REC LED flashes orange, and the file system is not accessible for CDU (control display unit) applications or for data recording. This operation may require from fractions of a second to several minutes, depending on the circumstances and the amount of internal memory.

**Table 4-1. FN Key Functions and REC LED Status**

| <b>FN Key</b>                                    | <b>REC LED</b>                             | <b>Status</b>                                                                    |
|--------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------|
| When data recording is off, and the FN key is... |                                            |                                                                                  |
| Not pressed                                      | No light                                   | No data recording.                                                               |
|                                                  | Orange blink                               | Internal file system test in progress.                                           |
|                                                  | Red                                        | No free memory; hardware problem with data recording.                            |
| Pressed for < 1 second                           | If FN key mode is “LED blink mode switch”  |                                                                                  |
|                                                  | Orange                                     | Release to change information mode.                                              |
|                                                  | If FN key mode is “Occupation mode switch” |                                                                                  |
|                                                  | Orange                                     | No function.                                                                     |
| Pressed for 1–5 seconds                          | If FN key mode is “LED blink mode switch”  |                                                                                  |
|                                                  | Green                                      | Release to start data recording (post-processing occupation mode undefined).     |
|                                                  | If FN key mode is “Occupation mode switch” |                                                                                  |
|                                                  | Green                                      | Release to start recording (Kinematic or Static post-processing occupation mode) |
| Pressed for 5–8 seconds                          | Red                                        | Release to turn serial port A baud rate to 9600 bps.                             |
| Pressed for > 8 seconds                          | No light                                   | No function.                                                                     |

**Table 4-1. FN Key Functions and REC LED Status (Continued)**

| FN Key                                          | REC LED                                    | Status                                                                |
|-------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------|
| When data recording is on, and the FN key is... |                                            |                                                                       |
| Not pressed                                     | Red                                        | No free memory; hardware problem with data recording.                 |
|                                                 | If FN key mode is “LED blink mode switch”  |                                                                       |
|                                                 | Green                                      | Data recording started (post-processing occupation mode undefined).   |
|                                                 | If FN key mode is Occupation mode switch   |                                                                       |
|                                                 | Green                                      | Data recording started (Kinematic post-processing occupation mode).   |
|                                                 | Orange                                     | Data recording started (Static post-processing occupation mode).      |
| Pressed for < 1 second                          | If FN key mode is “LED blink mode switch”  |                                                                       |
|                                                 | Orange                                     | Release to change information mode.                                   |
|                                                 | If FN key mode is “Occupation mode switch” |                                                                       |
|                                                 | Orange                                     | Release to toggle between Static and Kinematic post-processing modes. |
| Pressed for 1–5 seconds                         | No light                                   | Release to stop data recording.                                       |
| Pressed for 5–8 seconds                         | Red                                        | Release to turn serial port A baud rate to 9600 bps.                  |
| Pressed for > 8 seconds                         | No light                                   | No function (data recording still on).                                |

## Battery LED

The color of the BATT LED indicates the level of internal battery charge in the HiPer XT:

- Green – indicates greater than 85% charge.
- Orange – indicates an intermediate charge.
- Red – indicates less than 15% charge.

The pattern of blinks of the BATT LED also indicates the source of power.

- Solid light – an external power supply is used and the batteries are not being charged.
- Blinking once a second – the batteries are being charged.
- Blinking once every five seconds – the HiPer XT uses the internal batteries for power.
- Not blinking – the receiver is in Zero Power Mode or the internal batteries are completely discharged and no external power is connected.



### NOTICE

*When the internal batteries have completely discharged and no external power is connected, the receiver will go into Zero Power Mode to prevent the batteries from over discharging.*

## Modem LED

The color of the TX/RX modem LED indicates if the modem has power, is receiving signals, or is turned off.

For the UHF modem:

- No light – modem is turned off
- Solid Red – the modem is in transmitter mode; the modem is transmitting data.
- Red flashes plus Green flashes – the modem is in command mode. This mode allows the operator to send/query commands to/from the modem.
- Solid Green – the modem is in receiver mode.
- Solid Orange (Red and Green) – the modem is receiving data.
- Red flashes – a fault condition has been detected. Check the condition of the radio modem's antenna to ensure it is undamaged, and is connected properly and securely. Also make sure that there are no conduction objects near the antenna location.

For the GSM modem:

- Solid Orange (Red and Green) – the modem is initializing.
- Green flashes – the modem is on, registered on the network, and is waiting for incoming calls (Slave mode).
- Solid Red – a connection has been established.
- Green flashes – the modem is in direct control mode (Daisy Chain).
- Orange flashes – an error has occurred (initialization error, wrong PIN code, etc.).

## Information Modes

The receiver has two information modes: Normal and Extended Information Mode (EIM).

### Normal

In normal mode, the STAT LED indicates the number of tracked satellites and the position's computation status.

### Extended Information Mode (EIM)

Extended Information Mode (EIM) is used for receiver testing purposes. In this mode, the receiver continues to work as usual, but the STAT LED indicates “extended” information using a delimiter.

The Delimiter is a distinguishable double-blink that shows the overall status of tests performed in EIM. The LED color for delimiter is calculated from the colors of other LED blinks, and will be one of the following colors when the tests complete:

- Orange – at least one blink is orange.
- Red – no orange blink and at least one red blink.
- Green – all other cases.

The delimiter double-blink is followed by six LED blinks corresponding to six receiver tests, where each blink indicates the following information:

Blink 1. Sufficient data for position computation.

Blink 2. GPS S/N ratios are good (Table 4-2 on page 4-10).

Blink 3. GLONASS S/N ratios are good (Table 4-2 on page 4-10).

Blink 4. Oscillator's frequency offset is less than three ppm.

Blink 5. Oscillator's Allan Variance is better than  $2.7e-10$ .

Blink 6. Continuous tracking time is more than 15 minutes.

**Table 4-2. Signal-to-Noise (S/N) “Good” Ratios**

|         | CA/L1 | P/L1 | P/L2 |
|---------|-------|------|------|
| GPS     | 51    | 39   | 39   |
| GLONASS | 51    | 49   | 40   |

The color of the blink indicates that information for test is unavailable (orange), the receiver passed the test (green), or the receiver failed the test (red).

1. To switch to EIM, press and quickly release (within one second) the **FN** key on the MINTER.
2. Watch for the delimiter double-blink. With good receiver, antenna, and observation conditions, all blinks should be green within 15 minutes of powering on.
  - Green – ok
  - Orange – wait
  - Red – some tests failed
3. To switch back to normal mode, press the **FN** key.

## Downloading Files to a Computer

When your survey finishes, you can download survey files to a computer for storage, post-processing, or backup. Also, the receiver memory holds a finite amount of files and information, so downloading the files prevents files from being lost.

You should download files as soon as possible after collecting data at the jobsite. PC-CDU provides a File Manager to download files to your computer and delete files from the receiver.

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 2-10 for this procedure.

- On the **Connection Parameters** dialog box, enable *RTS/CTS handshaking* and click **Connect** (Figure 4-2).

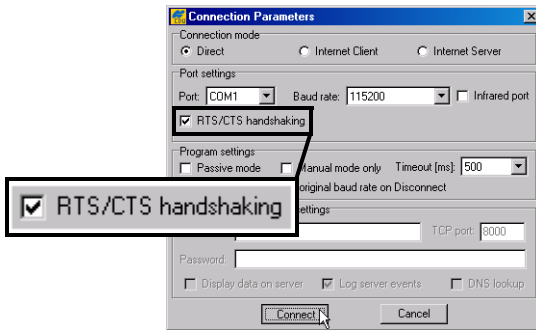


Figure 4-2. Connection Parameters – RTS/CTS Handshaking

- Click **File ► File Manager**, then click the **Download path** tab on the **File Manager** dialog box (Figure 4-3).

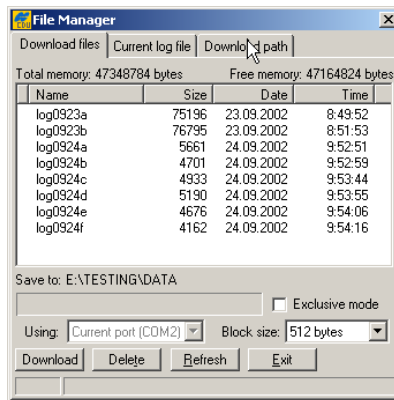


Figure 4-3. Find Files to Download

- Navigate to or create (using the **Create** button) the folder in which to download and store files.
- Click the **Download files** tab and select the file(s) to download (Figure 4-4 on page 4-12).

To select multiple files, hold down the **shift** key and click on non-sequential files to select several files at once; or, hold down the **Ctrl** key and click on individual files.

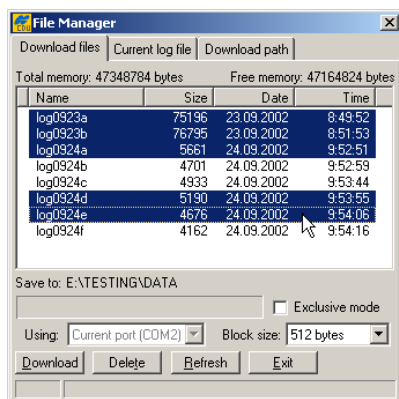


Figure 4-4. Download Files

6. Click the **Download** button. During the download, status indicators display next to each file (Figure 4-5).

  - Blue indicator – file in queue for downloading.
  - Red indicator – file currently downloading.
  - Green indicator – file has successfully downloaded.

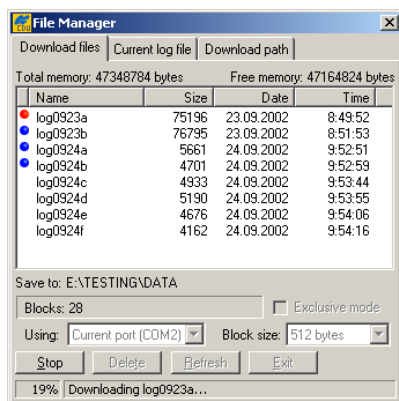


Figure 4-5. Download Files – Status Indicators

7. Click **Exit** on the File Manager dialog box.
8. Continue with other operations. Or, click **File ► Disconnect**, then **File ► Exit** to quit PC-CDU.

# Deleting Files

Use the following steps to delete files from your receiver.

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 2-10 for this procedure.
2. On the **Connection Parameters** dialog box, enable *RTS/CTS handshaking* (Figure 4-6).

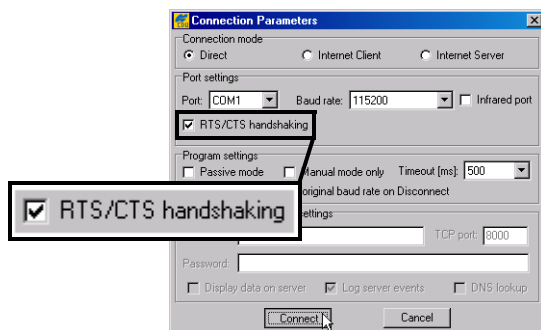


Figure 4-6. Connection Parameters – RTS/CTS Handshaking

3. Click **File ► File Manager** and select the file(s) to delete on the *Download files* tab (Figure 4-7).

To select multiple files, hold down the **shift** key and click on non-sequential files to select several files at once; or hold down the **Ctrl** key and click on individual files.

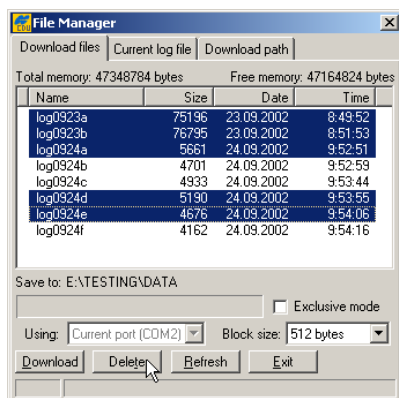


Figure 4-7. Delete Files

4. Click **Delete** (Figure 4-7 on page 4-13).
5. Click **Yes** at the delete files confirmation dialog box. PC-CDU deletes the selected files.
6. Click **Exit** on the File Manager screen.
7. Continue with other operations. Or Click **File ► Disconnect**, then **File ► Exit** to quit PC-CDU.

## Checking Receiver Options



### TIP

For a complete list of options and their details, visit the Topcon website.

You can check the status of your receiver's options, and load any new OAFs, using the RS232 cable, a computer, and PC-CDU. Refer to the *PC-CDU User's Manual* for a more complete description of the PC-CDU software.

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 2-10 for this procedure.
2. Click **Tools ► Receiver Options** (Figure 4-8).

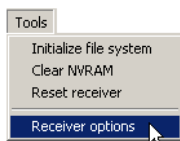


**Figure 4-8. Open Receiver Options**

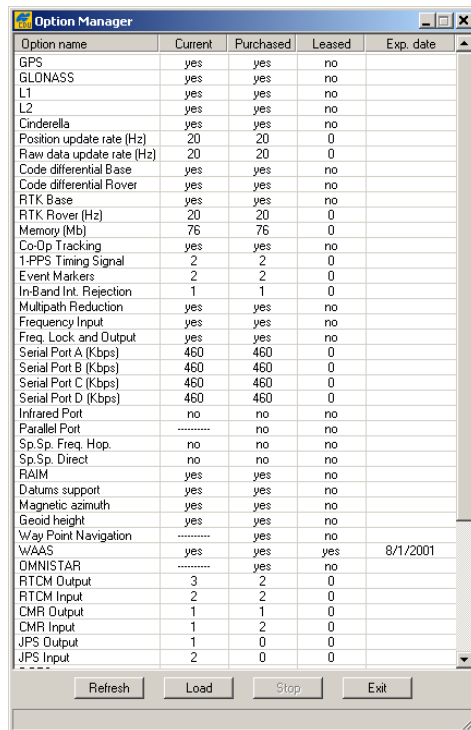
The *Options Manager* dialog box (Figure 4-9 on page 4-15) contains the following information:

- Option name – a name/description of the option
- Current – the current status of the option
- Purchased – if the option is purchased or not
- Leased – if the option is leased or not

- Expiration date – the date the option will be disabled, if applicable

Since Options can be both purchased and leased, the “Current” status of the option displays the currently effective value. Option values can be:

- -1 or “-----” – the firmware version does not support this option.
- 0 – the receiver option is disabled.
- positive integer – the option is enabled.
- yes or no – the option is either enabled or disabled.



| Option name               | Current | Purchased | Leased | Exp. date |
|---------------------------|---------|-----------|--------|-----------|
| GPS                       | yes     | yes       | no     |           |
| GLONASS                   | yes     | yes       | no     |           |
| L1                        | yes     | yes       | no     |           |
| L2                        | yes     | yes       | no     |           |
| Cinderella                | yes     | yes       | no     |           |
| Position update rate (Hz) | 20      | 20        | 0      |           |
| Raw data update rate (Hz) | 20      | 20        | 0      |           |
| Code differential Base    | yes     | yes       | no     |           |
| Code differential Rover   | yes     | yes       | no     |           |
| RTK Base                  | yes     | yes       | no     |           |
| RTK Rover (Hz)            | 20      | 20        | 0      |           |
| Memory (Mb)               | 76      | 76        | 0      |           |
| Co-Op Tracking            | yes     | yes       | no     |           |
| 1-PPS Timing Signal       | 2       | 2         | 0      |           |
| Event Markers             | 2       | 2         | 0      |           |
| In-Band Int. Rejection    | 1       | 1         | 0      |           |
| Multipath Reduction       | yes     | yes       | no     |           |
| Frequency Input           | yes     | yes       | no     |           |
| Freq. Lock and Output     | yes     | yes       | no     |           |
| Serial Port A (Kbps)      | 460     | 460       | 0      |           |
| Serial Port B (Kbps)      | 460     | 460       | 0      |           |
| Serial Port C (Kbps)      | 460     | 460       | 0      |           |
| Serial Port D (Kbps)      | 460     | 460       | 0      |           |
| Infrared Port             | no      | no        | no     |           |
| Parallel Port             | -----   | no        | no     |           |
| Sp.Sp. Freq. Hop.         | no      | no        | no     |           |
| Sp.Sp. Direct             | no      | no        | no     |           |
| RAIM                      | yes     | yes       | no     |           |
| Datums support            | yes     | yes       | no     |           |
| Magnetic azimuth          | yes     | yes       | no     |           |
| Geoid height              | yes     | yes       | no     |           |
| Way Point Navigation      | -----   | yes       | no     |           |
| WAAS                      | yes     | yes       | yes    | 8/1/2001  |
| OMNISTAR                  | -----   | yes       | no     |           |
| RTCM Output               | 3       | 2         | 0      |           |
| RTCM Input                | 2       | 2         | 0      |           |
| CMR Output                | 1       | 1         | 0      |           |
| CMR Input                 | 1       | 2         | 0      |           |
| JPS Output                | 1       | 0         | 0      |           |
| JPS Input                 | 2       | 0         | 0      |           |

Buttons: Refresh Load Stop Exit

Figure 4-9. Option Manager

- When finished, click **Exit** on the Option Manager screen, then click **File ► Disconnect** to prevent conflicts with serial port management.

## Loading OAFs

Topcon Positioning System dealers provide customers with OAF files. For any OAF related questions, E-mail TPS at [options@topconps.com](mailto:options@topconps.com). Please have your receiver ID number available (see “Checking Firmware Version” on page 4-20).

1. To load a new OAF, follow steps one and two in “Checking Receiver Options” on page 4-14.
2. Click **Load** at the bottom of the *Option Manager* dialog box (see Figure 4-9 on page 4-15).
3. Navigate to the location of the new Option Authorization File. OAFs have .jpo or .tpo extensions and are unique to each receiver (Figure 4-10).

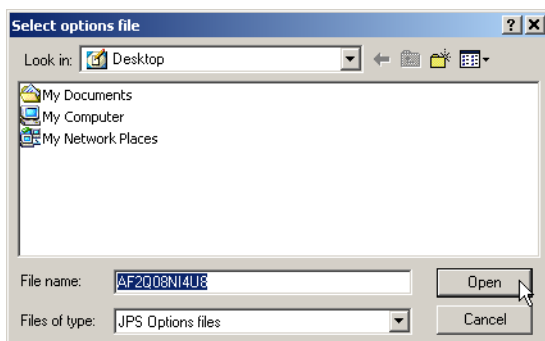


Figure 4-10. Load OAF

4. Select the appropriate file and click **Open** (Figure 4-10). The new receiver option loads onto the receiver and the Option Manager table updates.
5. When finished, click **Exit** on the *Option Manager* dialog box, then click **File ► Disconnect** to prevent conflicts with serial port management.

# Managing Receiver Memory

When using the receiver in static or dynamic applications, you may need to know the amount of memory the receiver's log file occupies. The specific memory size depends on the type of data being recorded. Use the formulas below to compute the approximate size of the receiver's log files. These equations are based on the default set of messages.

- SS – the estimated size of one epoch of raw data in the receiver's log file (expressed in bytes).
- N – the number of observed satellites per epoch.

When recording only L1 data:

$$SS = 183 + 22 * N$$

When recording L1 and L2 data:

$$SS = 230 + 44 * N$$

## Clearing the NVRAM

The receiver's Non-Volatile Random Access Memory (NVRAM) holds data required for satellite tracking, such as ephemeris data and receiver position. The NVRAM also keeps the current receiver's settings, such as active antenna input, elevation masks and recording interval, and information about the receiver's internal file system.

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

After clearing the NVRAM, your receiver will require some time to collect new ephemerides and almanacs (around 15 minutes).

Clearing the NVRAM of your receiver will not delete any files already recorded in your HiPer XT's memory. However, it will reset your receiver to factory default values.

In addition, the NVRAM keeps information about the receiver file system. Note that after clearing the NVRAM, the receiver's STAT LED will flash orange for a few seconds indicating that the receiver is scanning and checking the file system.

## Using MINTER to Clear NVRAM

1. Press the **power** key to turn off the receiver.
2. Press and hold the **FN** key.
3. Press and hold the **power** key for about one second. Release the **power** key while continuing to hold the **FN** key.
4. Wait until the STAT and REC LEDs are green
5. Wait until the STAT and REC LEDs blink orange.
6. Release the **FN** key while the STAT and REC LEDs blink orange.

## Using PC-CDU to Clear NVRAM

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 2-10 for this procedure.
2. Click **Tools ▶ Clear NVRAM** (Figure 4-11). The REC LED flashes green and red; the STAT LED flashes red.

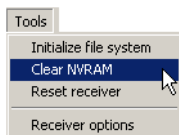


Figure 4-11. Clear NVRAM with PC-CDU

The receiver automatically disconnects when finished.

## Changing Receiver Modes

The HiPer XT receiver has four modes, two information modes and two power modes:

- Normal Mode
- Extended Information Mode
- Sleep Mode
- Zero Power Mode

See “Information Modes” on page 4-9 for a description of Normal Mode and Extended Information Mode.

## Sleep Mode

In sleep mode, the power board and Bluetooth module will continue to draw power from the batteries, causing the batteries to drain over time. Put the receiver in Zero Power Mode to prevent this (see “Zero Power Mode” on page 4-19). Follow these steps to put the HiPer XT into sleep mode.

1. Turn on your receiver.
2. Press and hold the receiver’s **power** key for more than four seconds and less than eight seconds.
3. Release the **power** key when both the REC and STAT LEDs become orange. The receiver enters Sleep Mode.
4. Any activity on the RS232 port will turn the receiver on.



### NOTICE

*If you press and hold the power key for more than 14 seconds, it will be ignored. This protects receiver operation against stuck keys.*

## Zero Power Mode

When your receiver is off, even in Sleep Mode, the power board will continue to draw power from the batteries. This means that if you fully charge your receiver, turn it off and store it, the receiver will drain its battery power in less than two months. To stop the power

board from draining the batteries, you can put your receiver in Zero Power Mode.

1. Turn on your receiver.
2. Press and hold the **power** key for more than 8 seconds, but less than 14 seconds.
3. Release the **power** key when both LEDs become red. When the LEDs turn off, your receiver will be in Zero Power Mode.
4. Press the **Reset** key for about one second to return to Normal mode.



### NOTICE

*When the internal batteries have completely discharged and no external power is connected, the receiver will go into Zero Power Mode automatically to prevent the batteries from over discharging.*

## Checking Firmware Version

Use PC-CDU to check the firmware version of the receiver.

1. Connect the receiver and a computer. See “Connecting the Receiver and a Computer” on page 2-10 for this procedure.
2. Click **Help ► About**.

The *About PC-CDU* dialog box opens (Figure 4-12).

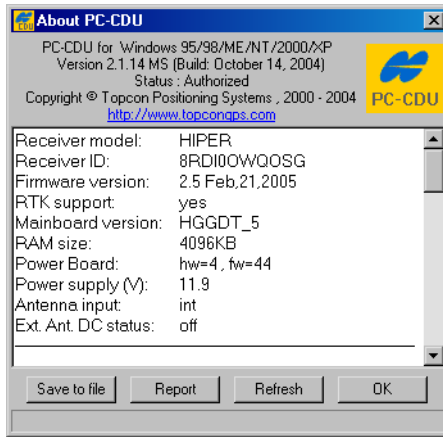


Figure 4-12. About PC-CDU

The *About PC-CDU* dialog box lists important information about the different hardware accessories and software properties. This list includes the following, which you will need if you contact TPS or your dealer:

- Receiver model
  - Receiver ID
  - Firmware version
3. When finished, click **OK**, then click **File ► Disconnect** to prevent conflicts with serial port management.

## Loading New Firmware

Base and Rover receivers must be loaded with the same firmware version. Use the latest firmware version, available for download from the TPS website, to ensure your receiver has the most recent updates.

**NOTICE**

*The HiPer XT receiver should be loaded with firmware version 2.5 or newer.*

**CAUTION**

***Do not use firmware versions 2.4 or older.***

The receiver board and power board must be loaded with firmware from the same package. The Bluetooth module's firmware is independent of the receiver card and power board, and has a different firmware package.

The receiver uses FLoader, a Windows®-based utility, to load firmware onto the receiver and power boards. You can download FLoader to your computer from the TPS website. For more information, refer to the *FLoader User's Manual*, also available on the TPS website.

1. Download and install FLoader, if applicable.
2. Download the new firmware package to your computer.
3. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 2-10 for this procedure.
4. Activate FLoader.
5. On the *Connection* tab, select the COM port on your computer that connects with your receiver and select its speed (usually 115200) (Figure 4-13 on page 4-23).

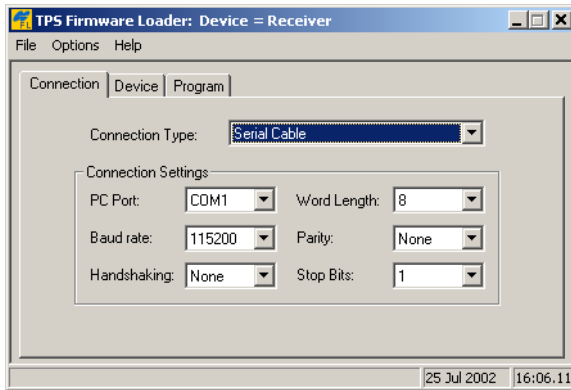


Figure 4-13. FLoader Main Screen

See the following sections to load the appropriate firmware.

## Receiver and Power Board Firmware

Receiver and power board firmware is released as a compressed file that you download and decompress. This file contains the following three files:

- ramimage.ldr – the Receiver board RAM file
- main.ldr – the Receiver board Flash file
- powbrd.ldr – the Power board RAM file



### NOTICE

*You must load all three files when loading new firmware. These files must come from the same firmware package.*

1. In FLoader, click the **Device** tab and set the *Device Type* as “Receiver”. Then click **Get from Device** for device information (Figure 4-14 on page 4-24).

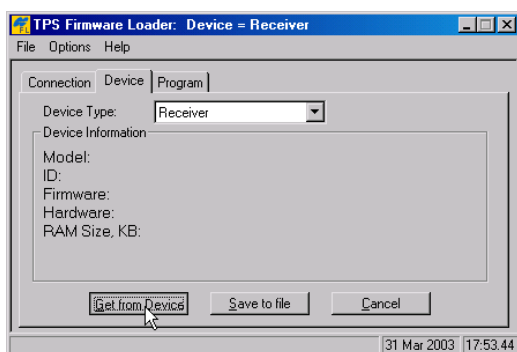


Figure 4-14. Set Device Type

2. Click the **Program** tab and set the *Capture Method* to “Soft Break Capture” (recommended) (Figure 4-15).

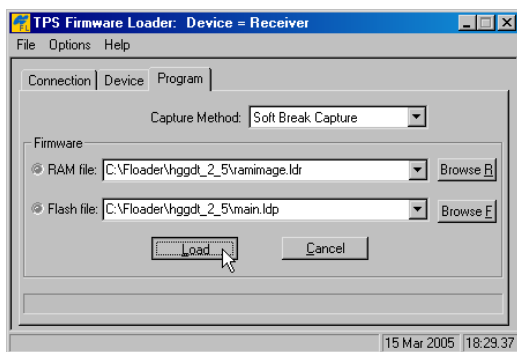


Figure 4-15. Program Tab Settings

3. Browse for and select the receiver board’s RAM file and Flash file (Figure 4-15).
4. Click **Load** and wait until 100% of the files load into the receiver.

**NOTICE** NOTICE

*If you selected an incorrect file, an error message displays at the bottom of the dialog box. Select the correct file.*

- Click the **Device** tab and set the *Device Type* as “Receiver’s Power Board”. Then click **Get from Device** for device information (Figure 4-16).



Figure 4-16. Set Device Type

- Click the **Program** tab and set the *Capture Method* to “Soft Break Capture” (recommended) (Figure 4-17).

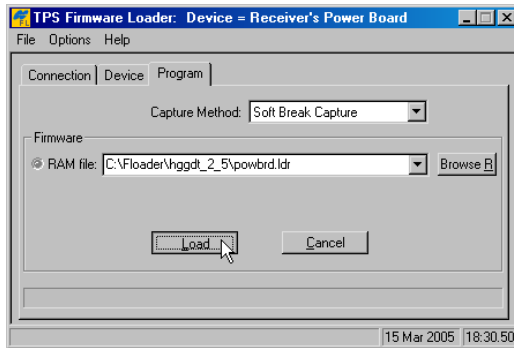


Figure 4-17. Program Tab Settings

- Browse for and select the Power board’s RAM file (Figure 4-17).
- Click **Load** and wait until 100% of the power board file loads into the receiver.



### NOTICE

*If you selected an incorrect file, an error message displays at the bottom of the dialog box. Select the correct file.*

9. Click **File ► Exit**.
10. Clear the receiver's NVRAM (see "Clearing the NVRAM" on page 4-17) and update the almanac (see "Collecting Almanacs" on page 2-48) after loading new firmware.

## Bluetooth Module Firmware

Bluetooth module firmware is released as a compressed file that you download and decompress. This file contains the following two files:

- btloader.ldr – the Bluetooth module RAM file
- btmain.ldp – the Bluetooth module Flash file

### **NOTICE** NOTICE

*You must load both files when loading new firmware. These files must come from the same firmware package.*

1. In FLoader, click the **Device** tab and set the *Device Type* as "Receiver". Then click **Get from Device** for device information (Figure 4-18).

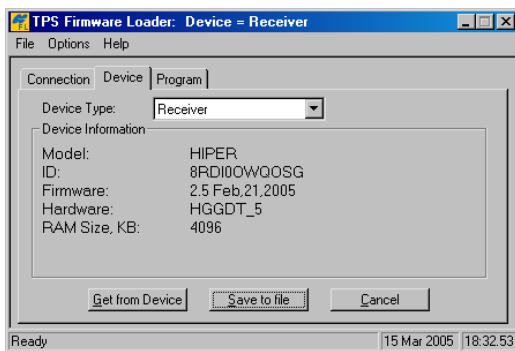


**Figure 4-18. Get Device Type**

2. Click the **Program** tab and set the *Capture Method* to "Soft Break Capture" (recommended) (Figure 4-19 on page 4-27).
3. Browse for and select the Bluetooth module's RAM file and Flash file (Figure 4-19 on page 4-27).

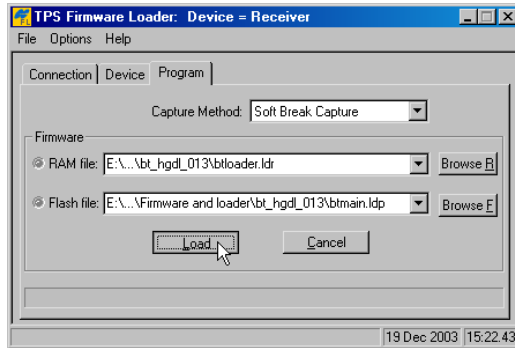


Figure 4-19. Program Tab Settings

4. Click **Load** and wait until 100% of the files load into your receiver (Figure 4-20).

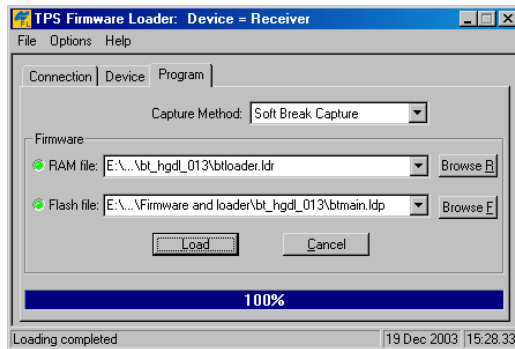


Figure 4-20. Bluetooth Firmware Load Complete

**NOTICE**

*If you selected an incorrect file, an error message displays at the bottom of the dialog box. Select the correct file.*

5. Click **File ► Exit**.

## Notes:

[illegible]

# Troubleshooting

In general, as long as you follow the maintenance and safety instructions provided in this manual, you should have few problems with your receiver. This chapter will help you diagnose and solve some common problems you may encounter with your receiver.



## WARNING

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

## Check This First!

Before contacting TPS Customer support about any problems with the receiver, try the following:

- First, check all external receiver connections carefully to ensure correct and secure connections.
- Second, double check for worn or defective cables.
- Next, see the sections below for more specific solutions.

If the problem persists, try the following:

- Reset the receiver using PC-CDU (**Tools ▶ Reset receiver**).
- Restore default settings using PC-CDU (**Configuration ▶ Receiver**, then click **Set all parameters to defaults**).
- Clear the NVRAM (see “Clearing the NVRAM” on page 4-17).
- Initialize the file system (click **Tools ▶ Initialize file system**). This will erase all files inside the receiver.

## Power Problems

All receivers are preset in the factory as “Auto Mode” for both the power and charger. If you want to check these settings, use the following procedure:

1. Connect your receiver and computer and run PC-CDU (see “Connecting the Receiver and a Computer” on page 2-10).
2. Once connected, click **Configuration ▶ Receiver**.
3. On the *General* tab, view the *Power* and *Charger* fields. These fields should be set to “Auto”. If not, change them to Auto and click **Apply**.



### TIP

Clearing the NVRAM will also return the receiver to Auto Mode (see “Clearing the NVRAM” on page 4-17).

| Problem                                                                           |                                                                                                                                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| The receiver does not power up.                                                   |                                                                                                                                  |
| Causes                                                                            | Solutions                                                                                                                        |
| The receiver may be in Zero Power Mode.                                           | Press the <b>Reset</b> key.                                                                                                      |
| If no external power source used, batteries may be discharged.                    | Connect a fully charged external power source and retry. See “Powering the Receiver” on page 2-2.                                |
| The receiver has an external power source, but internal batteries are discharged. | Charge the batteries overnight. See “Powering the Receiver” on page 2-2.                                                         |
| The receiver may have a defective charger or defective internal batteries.        | If after charging your internal batteries overnight, and your receiver is not powering, contact TPS Customer Support for advice. |

# Receiver Problems

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

| Problem                                                                          |                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The receiver cannot establish a connection to a computer or external controller. |                                                                                                                                                                                                                                                                                                                                                              |
| Causes                                                                           | Solutions                                                                                                                                                                                                                                                                                                                                                    |
| The cable is not properly plugged in.                                            | <ul style="list-style-type: none"> <li>• Check that the cable connector is attached to the correct serial port.</li> <li>• Unplug the cable, then securely and properly reconnect it to the receiver.</li> <li>• See “External Components” on page 1-13 and “Connector Specifications” on page A-11 for information on the receiver’s connectors.</li> </ul> |
| The cable is damaged                                                             | Use an undamaged cable. Contact your Dealer to replace the cable.                                                                                                                                                                                                                                                                                            |
| The receiver port used for connection is not in Command mode.                    | <ol style="list-style-type: none"> <li>1. Connect your receiver and a computer using a free port (see “Connecting the Receiver and a Computer” on page 2-10) and start PC-CDU.</li> <li>2. Click <b>Configuration ▶ Receiver ▶ Ports</b>.</li> <li>3. Change the Input for the serial port used for connection to Command.</li> </ol>                        |
| Problem                                                                          |                                                                                                                                                                                                                                                                                                                                                              |
| The receiver does not lock on to satellites for a long period of time.           |                                                                                                                                                                                                                                                                                                                                                              |
| Causes                                                                           | Solutions                                                                                                                                                                                                                                                                                                                                                    |
| The receiver stores an old almanac.                                              | <ul style="list-style-type: none"> <li>• Update the almanac.</li> <li>• See “Collecting Almanacs” on page 2-48.</li> </ul>                                                                                                                                                                                                                                   |

| <b>Problem</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The receiver tracks too few satellites.                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Causes</b>                                                                  | <b>Solutions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| The elevation mask value is too high (e.g., above 15 degrees).                 | <ul style="list-style-type: none"> <li>• Lower the elevation mask.</li> <li>• See page 2-20 for information on setting the elevation mask.</li> </ul>                                                                                                                                                                                                                                                                                                                                                    |
| The survey is conducted near obstructions (tree canopy, tall buildings, etc.). | <ul style="list-style-type: none"> <li>• Check that the Multipath Reduction boxes have been enabled.                             <ol style="list-style-type: none"> <li>1. Connect your receiver and a computer and start PC-CDU. See “Connecting the Receiver and a Computer” on page 2-10.</li> <li>2. Click <b>Configuration</b><br/> ▶ <b>Advanced</b> ▶ <b>Multipath Reduction</b> and enable the two boxes.</li> </ol> </li> <li>• Move to an area free of obstructions, if applicable.</li> </ul> |
| <b>Problem</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| The receiver cannot obtain Code Differential and/or RTK solutions.             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Causes</b>                                                                  | <b>Solutions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Incorrect Base coordinates entered.                                            | Specify the correct coordinates for the Base station using PC-CDU or other suitable field data collection software.                                                                                                                                                                                                                                                                                                                                                                                      |
| The receiver is not configured as a Base or Rover.                             | <ul style="list-style-type: none"> <li>• If the receiver should function as a Base, ensure it has the proper configuration. See “Surveying with the Receiver” on page 3-5 for further information.</li> <li>• If the receiver should function as a Rover, ensure it has the proper configuration. See “Surveying with the Receiver” on page 3-5 for further information.</li> </ul>                                                                                                                      |

|                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The corresponding receiver options may be disabled or expired.                                                                                | <ul style="list-style-type: none"> <li>• See “Checking Receiver Options” on page 4-14 for details on how to check current options.</li> <li>• Enable or prolong the validity of the corresponding receiver options by ordering a new OAF with the desired options activated.</li> </ul>                                                   |
| There are not enough common satellites. In order to obtain a fixed solution, the Base and Rover should track at least five common satellites. | <ul style="list-style-type: none"> <li>• Ensure that both the Rover and Base receivers use the same, and updated, almanac. See “Collecting Almanacs” on page 2-48.</li> <li>• Check the elevation masks of the Rover and Base receivers; they should be the same. See page 2-20 for information on setting the elevation mask.</li> </ul> |
| Poor satellite geometry (PDOP/GDOP values are too high).                                                                                      | Conduct your survey when PDOP values are low.                                                                                                                                                                                                                                                                                             |
| The elevation mask is above 15 degrees.                                                                                                       | <ul style="list-style-type: none"> <li>• Lower the elevation mask.</li> <li>• See page 2-20 for information on setting the elevation mask.</li> </ul>                                                                                                                                                                                     |
| The receiver and the antenna have a poor connection.                                                                                          | <ul style="list-style-type: none"> <li>• Ensure the cable is undamaged.</li> <li>• Check the cable connector attachment to the receiver. Remove and reattach the cable connector to ensure a secure connection.</li> </ul>                                                                                                                |
| The Base and Rover modems are set to different radio channels.                                                                                | Set the Base and Rover receivers to the same radio channel.                                                                                                                                                                                                                                                                               |

|                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A discrepancy exists between the differential standards used at the Base and Rover receivers.</p>                                                                                                         | <p>Ensure the Base and Rover receivers use the same corrections input/output format:</p> <ol style="list-style-type: none"> <li>1. Connect your receiver and a computer and start PC-CDU. See “Connecting the Receiver and a Computer” on page 2-10.</li> <li>2. Click <b>Configuration ▶ Receiver ▶ Ports</b> and set the same input/output format for both receivers.</li> </ol> |
| <p>The specified link rate is not compatible with the link rates the modem supports.</p> <p>The link rate is the rate at which data transmits over the RF link.</p>                                          | <ul style="list-style-type: none"> <li>• Change the link rate to that which your modem supports. See the modem’s manual for link rate support information.</li> </ul>                                                                                                                                                                                                              |
| <p>The specified baud rate is not compatible with the baud rates the modem supports.</p> <p>The baud rate is the rate at which the receiver transmits differential messages to the modem and vice versa.</p> | <ul style="list-style-type: none"> <li>• Change the baud rate to that which your modem supports. See the modem’s manual for baud rate support information.</li> </ul>                                                                                                                                                                                                              |
| <p>The modem battery is low.</p>                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Attach an external power source to the receiver. See “External Batteries” on page 2-3.</li> <li>• See “Powering the Receiver” on page 2-2.</li> </ul>                                                                                                                                                                                     |
| <p>The distance between Base and Rover is too far.</p>                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Close the distance between the Base and Rover.</li> <li>• Use repeaters to increase radio coverage.</li> </ul>                                                                                                                                                                                                                            |

| <b>Problem</b>                                                      |                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The receiver does not start data logging.                           |                                                                                                                                                                                                                                                                                                                    |
| <b>Causes</b>                                                       | <b>Solutions</b>                                                                                                                                                                                                                                                                                                   |
| The receiver has no free space for files.                           | <ul style="list-style-type: none"> <li>• Download receiver files to a computer (if needed) and delete files (see “Downloading Files to a Computer” on page 4-10 and “Deleting Files” on page 4-13).</li> <li>• Use the AFRM feature. See “Automatic File Rotation Mode (AFRM) parameters” on page 2-21.</li> </ul> |
| The receiver has already logged 512 files into the internal memory. | <ul style="list-style-type: none"> <li>• Delete unnecessary files (see “Deleting Files” on page 4-13).</li> <li>• Use the AFRM feature. See “Automatic File Rotation Mode (AFRM) parameters” on page 2-21.</li> </ul>                                                                                              |

## Bluetooth Problems

The following are some of the most commonly encountered error messages. BTCONF reports the error messages in the status bar.

| <b>Error Message</b>                                              |                                                                                                                                                                                                                  |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Can't find receiver.                                              |                                                                                                                                                                                                                  |
| <b>Causes</b>                                                     | <b>Solutions</b>                                                                                                                                                                                                 |
| The receiver is turned off.                                       | Ensure the receiver has power and is turned on.                                                                                                                                                                  |
| If using a cable, the cable's connectors are improperly attached. | <ul style="list-style-type: none"> <li>• Check that the cable connector is attached to the correct serial port.</li> <li>• Unplug the cable, then securely and properly reconnect it to the receiver.</li> </ul> |
| If using a cable, the cable is damaged.                           | <ul style="list-style-type: none"> <li>• Use an undamaged cable.</li> <li>• Contact your Dealer to purchase a new cable.</li> </ul>                                                                              |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The COM port the receiver is attached to differs from the one selected in BTCONF. | Ensure that the RS232 cable is attached to the COM port specified in the BTCONF communication port drop-down list. See “Bluetooth Module Configuration” on page 2-43 for details.                                                                                                                                                     |
| The receiver port used for connection is not in Command mode.                     | <ol style="list-style-type: none"> <li>1. Connect your receiver and a computer using a free port (see “Connecting the Receiver and a Computer” on page 2-10) and start PC-CDU.</li> <li>2. Click <b>Configuration ▶ Receiver ▶ Ports</b>.</li> <li>3. Change the Input for the serial port used for connection to Command.</li> </ol> |
| The settings for Port B may have been changed.                                    | <ul style="list-style-type: none"> <li>• The settings for Port B are: 115200 baud rate, 8 data bits, 1 stop bit, no parity, and no handshaking.</li> <li>• Try enabling RTS/CTS handshaking for Port B. Do not change other settings.</li> </ul>                                                                                      |
| The corresponding receiver options may be disabled or expired.                    | <ul style="list-style-type: none"> <li>• See “Checking Receiver Options” on page 4-14 for details.</li> <li>• Enable, or prolong, the corresponding receiver options. Contact your dealer to order an OAF with desired receiver options.</li> </ul>                                                                                   |
| <b>Error Message</b>                                                              |                                                                                                                                                                                                                                                                                                                                       |
| Can't find Bluetooth.                                                             |                                                                                                                                                                                                                                                                                                                                       |
| <b>Causes</b>                                                                     | <b>Solution</b>                                                                                                                                                                                                                                                                                                                       |
| The receiver's Slot 3 is turned off.                                              | <ol style="list-style-type: none"> <li>1. See “Establishing an RS232 Cable Connection” on page 2-12 to connect the computer and receiver.</li> <li>2. Click <b>Configuration ▶ Receiver ▶ General</b>.</li> <li>3. In the Turn on/off Slots area, enable the Slot 3 (B) check box.</li> </ol>                                         |

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The Bluetooth module is linked with another device.                 | Close the connection with the device, then connect to your receiver.                                                                                                                                                                                                                                                                                                    |
| The Bluetooth module's processor is overloaded.                     | <ol style="list-style-type: none"> <li>1. Put your receiver in Zero Power Mode. See "Zero Power Mode" on page 4-19 for details.</li> <li>2. Press and hold the <b>Reset</b> key for about one second to return the receiver to normal mode.</li> <li>3. Re-connect to the Bluetooth module.</li> </ol>                                                                  |
| The receiver does not have a Bluetooth module.                      | Contact your dealer to purchase a Bluetooth enabled receiver.                                                                                                                                                                                                                                                                                                           |
| <b>Error Message</b>                                                |                                                                                                                                                                                                                                                                                                                                                                         |
| Open COM# port failed: Access is denied.                            |                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Causes</b>                                                       | <b>Solution</b>                                                                                                                                                                                                                                                                                                                                                         |
| Another application uses the computer port dedicated for connection | <ul style="list-style-type: none"> <li>• Close the application, then re-connect.</li> <li>• Connect the receiver via another, unused computer port.</li> </ul>                                                                                                                                                                                                          |
| <b>Problem</b>                                                      |                                                                                                                                                                                                                                                                                                                                                                         |
| After searching for available devices, none are discovered.         |                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Causes</b>                                                       | <b>Solution</b>                                                                                                                                                                                                                                                                                                                                                         |
| The receiver is not receiving power.                                | <ul style="list-style-type: none"> <li>• Check that the receiver is getting power and is turned on.</li> <li>• Check that the power cable is attached to the port marked "PWR".</li> <li>• Unplug the cable, then securely and properly reconnect it to the receiver.</li> <li>• If the power cable is damaged, contact your Dealer to purchase a new cable.</li> </ul> |

|                                                   |                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The receiver's Slot 3 is turned off.              | <ol style="list-style-type: none"> <li>1. Connect your receiver and a computer using an RS232 cable (see "Establishing an RS232 Cable Connection" on page 2-12).</li> <li>2. Click <b>Configuration ▶ Receiver ▶ General</b>.</li> <li>3. In the Turn on/off Slots area, enable the Slot 3 (B) check box.</li> </ol> |
| The devices may be out of acceptable radio range. | <ul style="list-style-type: none"> <li>• Verify that your devices are within acceptable radio range.</li> <li>• Move the devices within radio range.</li> </ul>                                                                                                                                                      |

### Problem

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

| Causes                                      | Solution                                                                                                                                                                                                                                                                                   |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device security settings probably differ.   | <ul style="list-style-type: none"> <li>• Make sure your Bluetooth enabled devices use the same security settings.</li> <li>• See "Bluetooth Module Configuration" on page 2-43, specifically Figure 2-31 on Figure 2-31 for details on changing security settings.</li> </ul>              |
| Bluetooth module settings may have changed. | <ol style="list-style-type: none"> <li>1. If you changed settings for your Bluetooth module, remove it from the list of discovered Bluetooth devices using the Bluetooth manager program (supplied with the device used to manage the receiver).</li> <li>2. Repeat the search.</li> </ol> |

# Radio Modem Problems

The following are some of the most commonly encountered radio modem problems.

| Problem                              |                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| For UHF modems: RX LED flashes red.  |                                                                                                                                                                                                                                                                                                                                                                                 |
| Causes                               | Solutions                                                                                                                                                                                                                                                                                                                                                                       |
| A fault condition has been detected. | <ul style="list-style-type: none"> <li>• Check that the radio modem's antenna is undamaged. Contact your dealer to replace the antenna.</li> <li>• Check that the radio modem's antenna is securely and properly connected to the antenna connector on the radome.</li> <li>• Move the antenna/receiver away from conducting objects (such as, large metal objects).</li> </ul> |
| The cable is damaged.                | <ul style="list-style-type: none"> <li>• Use an undamaged cable.</li> <li>• Contact your Dealer to replace the cable.</li> </ul>                                                                                                                                                                                                                                                |

| Problem                                                         |                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| For GSM modems: RX LED flashes orange.                          |                                                                                                                                                                                                                                                                                                                                                  |
| Causes                                                          | Solutions                                                                                                                                                                                                                                                                                                                                        |
| The Rover uses the wrong PIN code, or no PIN code was selected. | <ol style="list-style-type: none"> <li>1. In TopSURV, click <b>Job ▶ Config ▶ Survey</b>.</li> <li>2. Click the “...” (continue) button and press <b>Next</b> to navigate to the <b>Rover Radio</b> configuration screen.</li> <li>3. Press <b>Configure GSM</b>.</li> <li>4. Select the PIN of the Base Station and press <b>OK</b>.</li> </ol> |

|                                       |                                                                                                                                                                                                                                                                               |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| An initialization error has occurred. | <ul style="list-style-type: none"> <li>• Check that the radio modem's antenna is undamaged. Contact your dealer to replace the antenna.</li> <li>• Check that the radio modem's antenna is securely and properly connected to the antenna connector on the radome.</li> </ul> |
| Anything else??                       | <ul style="list-style-type: none"> <li>•</li> </ul>                                                                                                                                                                                                                           |

## Obtaining Technical Support

If the troubleshooting hints and tips in this Operator's Manual fail to remedy the problem, contact TPS Customer Support.

Before contacting TPS Customer support about any problems with the receiver, try the following:

- Reset the receiver using PC-CDU (**Tools ▶ Reset receiver**).
- Restore factory default settings using PC-CDU (click **Configuration ▶ Receiver**, then **Set all parameters to defaults**).
- Clear the NVRAM (see "Clearing the NVRAM" on page 4-17).
- Initialize the file system (click **Tools ▶ Initialize file system**; this will erase all files inside the receiver).

## Phone

To get in contact with TPS Customer Support by phone, call 1-866-4TOPCON (1-866-486-7266).

## E-mail

To get in contact with TPS Customer Support by e-mail, use the following electronic mail addresses.

**Table 5-1. Technical Support E-mail**

| For Questions Related To...              | Use...              |
|------------------------------------------|---------------------|
| Hardware (receivers, antennas, firmware) | hardware@topcon.com |
| GPS+ and 3DMC                            | psg@topcon.com      |
| OAF                                      | options@topcon.com  |
| RTK                                      | rtk@topcon.com      |
| PC-CDU                                   | pccdu@topcon.com    |

If in doubt about which e-mail address to use for your particular question, please send it to support@topcon.com.

## Website

The Topcon Positioning Systems website provides current information about Topcon's line of products. The support area of the website provides access to frequently asked questions, configuration procedures, manuals, e-mail support, etc.

To access the TPS website home page, use:

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

To visit the support area, use:

[www.topcongps.com/support/](http://www.topcongps.com/support/)

## Notes:

[illegible]

# Specifications

This TPS product is a 20-channel GPS receiver with an internal TPS UHF radio modem, a Bluetooth® wireless technology module, an optional GMS module, and a rugged aluminum housing complete with MINTER and cable connectors.

 **NOTICE** NOTICE

*Performance specifications assume a minimum of 6 GPS satellites above 15 degrees in elevation and adherence to the procedures recommended in this manual.*

 **NOTICE** NOTICE

*In areas of high multipath, during periods of large PDOP, and during periods of increased ionospheric activity, performance may degrade.*

 **NOTICE** NOTICE

*Use robust checking procedures in areas of extreme multipath or under dense foliage.*

# Receiver Specifications

The following sections provide specifications for the receiver and its internal components.

## General Details

Table A-1 table lists the receiver's general specifications.

**Table A-1. Receiver General Specifications**

| <b>Physical</b>       |                                                                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Enclosure             | Aluminum extrusion, rainproof                                                                                                         |
| Color                 | Topcon Yellow and Topcon Grey                                                                                                         |
| Dimensions            | W:158.5 x H:113 x D:173 mm                                                                                                            |
| Weight                | ?? kg                                                                                                                                 |
| Antenna               | Internal                                                                                                                              |
| Battery               | Two internal                                                                                                                          |
| Controller            | External                                                                                                                              |
| Mounting              | 5/8-11                                                                                                                                |
| Seals                 | Silicon (molding in Color)                                                                                                            |
| Keys                  | Three keys:<br>Power – On/Off<br>Function (FN) – start/stop data logging; switch information mode.<br>Reset – receiver hardware reset |
| LEDs                  | Four LEDs:<br>STAT – satellite and receiver status<br>REC – record and data status<br>BATT – battery status<br>RX – modem status      |
| <b>Environment</b>    |                                                                                                                                       |
| Operating temperature | -?? C° to +?? C° with batteries                                                                                                       |

**Table A-1. Receiver General Specifications (Continued)**

|                              |                                                                                                                    |
|------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Storage temperature          | -20 C° to +35 C° with batteries                                                                                    |
| Humidity                     | 95%                                                                                                                |
| <b>Power</b>                 |                                                                                                                    |
| Internal battery             | Li-ion, 4000 mAh, 7.4 V<br>Not removable                                                                           |
| Battery size                 | 132 x 35 x 18 (mm)                                                                                                 |
| Battery weight               | 165 g (1 battery)                                                                                                  |
| Number of built-in batteries | 2 batteries                                                                                                        |
| Operating time               | With TX mode ON (2W):<br>~??<br>With TX mode ON (1W):<br>~??<br>With RX mode ON:<br>~??<br>With radio OFF:<br>~??  |
| External power               | 1 port                                                                                                             |
| Input voltage                | 6 to 28 V DC (for work)<br>9 to 28 V DC (for charge battery)<br>Maximum Charge Current <=2 Amp                     |
| Consumption                  | ~?? W in TX mode (2W)<br>~?? W in TX mode (1W)<br>~?? W in RX mode<br>~?? W with radio off                         |
| Battery charge               | Connect the AC adaptor to charge the internal battery.<br>Available run charge when connected to external battery. |
| Charging time                | ~8 hours for full charge<br>~7 hours for 90% charge                                                                |
| On-board                     | Backup battery for timekeeping and almanac data storage;<br>10 years minimum operation                             |

**Table A-1. Receiver General Specifications (Continued)**

| <b>I/O</b>           |                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Communication Ports  | Two high speed RS232 serial ports (A and D), a USB port, and an internal Bluetooth communication port (port B).                                                                                                                                                                                                                                                                    |
| Port specifications  | <p>Ports A and D</p> <p>Baudrate: 460800,230400,115200(Default),57600, 38400,19200,9600,4800,2400,1200,600, 300</p> <p>Flow control: RTS/CTS</p> <p>Length: 7,8 (default)</p> <p>Sop bit: 1 (default), 2</p> <p>Parity: None (default), Odd, Even</p> <p>Bluetooth port</p> <p>Available</p> <p>USB port</p> <p>Version 1.1</p>                                                    |
| Connectors           | Modem Antenna (BNC), Optional antenna connector (TNC), PWR, USB                                                                                                                                                                                                                                                                                                                    |
| MINTER               | Four external LEDs<br>ON/OFF control input                                                                                                                                                                                                                                                                                                                                         |
| <b>Data Features</b> |                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | <p>Up to 20 Hz update rate for real time position and raw data (code and carrier)</p> <p>10cm code phase and 0.1mm carrier phase precision</p> <p>RTCM SC104 version 2.1, 2.2, 2.3, and 3.0 I/O</p> <p>Multiple Base RTCM</p> <p>Geoid and Magnetic Variation models</p> <p>RAIM</p> <p>Different DATUMs support</p> <p>Output of grid coordinates</p> <p>CMR and CMR+ support</p> |
| <b>Technology</b>    |                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | <p>Co-Op tracking</p> <p>Low signal tracking</p> <p>Advanced Multipath mitigation</p> <p>WAAS</p> <p>Adjustable PLL and DLL parameters</p>                                                                                                                                                                                                                                         |

**Table A-1. Receiver General Specifications (Continued)**

|                                          |                                                                                |
|------------------------------------------|--------------------------------------------------------------------------------|
| <b>NMEA</b>                              |                                                                                |
| NMEA version                             | Ver. 2.1, 2.2, 2.3, 3.0 output                                                 |
| Messages                                 | GGA, GLL, GNS, GRS, GSA, GST, GSV, HDT, RMC, VTG, ZDA, ROT, GMP                |
| Output interval                          | 1Hz standard; 5, 10, 20Hz optional                                             |
| <b>DGPS</b>                              |                                                                                |
| Correction format                        | RTCM SC104 Ver 2.1, 2.2, 2.3, and 3.0                                          |
| RTCM message type                        | 1, 3, 9, 31, 32, 34; user selectable                                           |
| Process interval                         | 1Hz standard; 5, 10, 20Hz optional                                             |
| Output interval for RTCM correction data | 1Hz standard; 5, 10, 20Hz optional                                             |
| Elevation mask                           | 0 to 90 deg (independent of data logging)                                      |
| Multi-base DGPS                          | Differential correction select mode: Nearest, Mix, Best (optional)             |
| <b>RTK</b>                               |                                                                                |
| Correction format                        | CMR2/CMR+ (Trimble compatible), RTCM SC104 Ver 2.2, 2.3, or 3.0                |
| RTCM message type                        | 3, 18, 19, 20, 21, 22; user selectable                                         |
| Ambiguity initialize                     | OTF (L1, L1/L2)                                                                |
| Baseline Length                          | Up to 50km in the morning and evening.<br>Up to 32 km at noon.                 |
| Initialize time                          | 5 seconds to 10 min depending on the base line length and multipath conditions |
| Output interval for CMR/RTCM             | 1Hz standard; 5, 10, 20Hz optional                                             |
| Elevation                                | 0 to 90 degrees (independent of data logging)                                  |

**Table A-1. Receiver General Specifications (Continued)**

|                                           |                                                                                                                                         |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Solution mode                             | Delay (synchronization)<br>Extrapolation (not synchronized)                                                                             |
| Process interval                          | 1Hz standard; 5, 10, 20Hz optional                                                                                                      |
| Latency                                   | Delay mode – 20 msec to 20 sec (depends on latency which receives corrections data from base receiver)<br>Extrapolation – 20 to 30 msec |
| Raw Data logging                          | The receiver can record raw data at another interval during RTK operation                                                               |
| Status                                    | Fix, Float, DOP, Data Link Status, Modem Latency, Common satellites, Percentage of fixing                                               |
| Results                                   | RTK coordinates, HRMS, VRMS, Covariance Matrix                                                                                          |
| Ambiguity fixing level                    | Selectable thresholds<br>Low: 95%; Medium: 99.5%; High: 99.9%                                                                           |
| <b>Survey Modes</b>                       |                                                                                                                                         |
| Base or Rover                             | Static<br>Kinematic (Stop and Go)<br>RTK (Real-time Kinematic)<br>DGPS (Differential GPS)<br>WASS/EGNOS DGPS                            |
| <b>Survey Accuracy</b>                    |                                                                                                                                         |
| Static, Fast Static                       | For L1+L2 – H: 3mm + 0.5ppm (x baseline length);<br>V: 5mm + 0.5ppm (x baseline length)                                                 |
| Kinematic, RTK                            | For L1+ L2, L1 – H: 10mm + 1.0ppm (x baseline length);<br>V: 15mm + 1.0ppm (x baseline length)                                          |
| DGPS                                      | Post processing: typically 0.3m<br>DGPS/RTCM based: typically less than 0.5m                                                            |
| Cold Start<br>Warm Start<br>Reacquisition | < 60 sec<br>< 10 sec<br>< 1 sec                                                                                                         |

## GPS Board Details

Table A-2 lists the GPS board's general specifications.

**Table A-2. GPS Board Specifications**

| <b>Receiver Type (set by activating the proper OAF)</b> |                                                                                                                                                                                              |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal board:<br>Euro-112T<br>(HGGDT)                 | G: GPS L1<br>GD: GPS L1/L2<br>GG: GPS/GLONASS L1<br>GGD: GPS/GLONASS L1/L2                                                                                                                   |
| Hardware type:<br>country/region/<br>purpose dependent  | with UHF TX/RX 410-430MHz<br>with UHF TX/RX 430-450MHz<br>with UHF TX/RX 450-470MHz<br>with UHF TX/RX 410-430MHz + GSM<br>with UHF TX/RX 430-450MHz + GSM<br>with UHF TX/RX 450-470MHz + GSM |
| <b>Tracking Specifications</b>                          |                                                                                                                                                                                              |
| Standard Channels                                       | 20 channels (G, GG, GD, GGD)<br>L1 GPS, L1/L2 GPS, L1 GLONASS, L1 GPS + L1<br>GLONASS, WAAS/EGNOS, PCode and Carrier                                                                         |
| Optional                                                | Cinderella days (see page A-8 for details)                                                                                                                                                   |
| Tracked Signals                                         | GPS/GLONASS, L1/L2 C/A and P-Code and Carrier,<br>WAAS/EGNOS                                                                                                                                 |
| <b>Tracking Functions</b>                               |                                                                                                                                                                                              |
| Multi-path<br>reduction                                 | Code and Carrier                                                                                                                                                                             |
| PLL/DLL setting                                         | Bandwidth, order, adjustable                                                                                                                                                                 |
| Co-op tracking loop<br>setting                          | On/Off, Static Mode, Bandwidth of individual PLL,<br>Bandwidth of common PLL                                                                                                                 |
| Smoothing interval                                      | Code and Carrier                                                                                                                                                                             |
| WAAS/EGNOS                                              | WAAS optional<br>EGNOS optional                                                                                                                                                              |
| <b>Data Features</b>                                    |                                                                                                                                                                                              |
| Formats                                                 | TPS, NMEA, RTCM, CMR, BINEX                                                                                                                                                                  |

**Table A-2. GPS Board Specifications (Continued)**

|                  |                                                                                                                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Features         | Up to 20 Hz update rate for real time position and raw data (code and carrier)<br>10cm code phase and 0.1mm carrier phase precision<br>RTCM SC104 version 2.1, 2.2, 2.3, and 3.0 I/O<br>Multiple Base RTCM<br>Geoid and Magnetic Variation models<br>RAIM<br>Different DATUMs support<br>Output of grid coordinates<br>CMR and CMR+ support |
| <b>Memory</b>    |                                                                                                                                                                                                                                                                                                                                             |
| Internal Memory  | Compact flash card (not removable)                                                                                                                                                                                                                                                                                                          |
| Capacity         | Standard – 0 MB<br>Optional – 1 to 128 MB                                                                                                                                                                                                                                                                                                   |
| Logging Time     | 53 hours (8 MB, 15sec, L1/L2, 7 satellites)                                                                                                                                                                                                                                                                                                 |
| Logging Interval | 0.05 to 86400 seconds, depending on purchased options                                                                                                                                                                                                                                                                                       |

Cinderella days is an option that turns a single frequency, GPS receiver into a dual-frequency, GPS+GLONASS receiver for 24 hours every other Tuesday at GPS midnight. Refer to Topcon’s website for more information and specific Cinderella day dates.

## Bluetooth Module Details

Table A-3 lists the Bluetooth wireless technology module’s general specifications.

**Table A-3. Bluetooth Module Specifications**

|                        |                          |
|------------------------|--------------------------|
| Type                   | Class 2                  |
| Service classes        | Miscellaneous            |
| Supported profiles     | LM, L2CAP, SDP, PPP      |
| Frequency Country Code | North America and Europe |

## Internal TPS UHF Modem Details

Table A-4 lists the internal TPS UHF modem's general specifications.

**Table A-4. Internal TPS UHF Modem Specifications**

| <b>General</b>                                          |                                                                                                                                       |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Range<br>country/region/<br>purpose dependent | 410 MHz to 430 MHz<br>430 MHz to 450 MHz<br>450 MHz to 470 MHz                                                                        |
| Channel spacing                                         | 12.5 kHz / 25 kHz                                                                                                                     |
| Frequency<br>reference                                  | 2.5 ppm                                                                                                                               |
| Carrier Power<br>Stability                              | + 1 dB / -2 dB                                                                                                                        |
| Data Speed of<br>Serial interface                       | Max 38400 bps                                                                                                                         |
| Transmission Rate                                       | 19200 or 9600 bps (Four-level FSK)<br>9600 or 4800 bps (GMSK)                                                                         |
| Transmission<br>Protocols                               | Packet switched, fast asynchronous                                                                                                    |
| Forward Error<br>Correction(FEC)                        |                                                                                                                                       |
| Modulation                                              | Gaussian Minimum Shift Keying (GMSK) with BT of 0.3,<br>0.5 (4800, 9600 bps link rate);<br>Four-level FSK (9600, 19200 bps link rate) |
| Communication<br>Mode                                   | Half-Duplex                                                                                                                           |
| Serial port                                             | Two RS232 (Data and Command)                                                                                                          |
| <b>Transmitter (TX)</b>                                 |                                                                                                                                       |
| Carrier power                                           | 0.01 W(+10 dBm), 0.02W (+13 dBm), 0.05 W(+17 dBm),<br>0.1 W(+20 dBm), 0.25 W (+24 dBm), 0.5 W (+27 dBm),<br>1 W (+30dBm), 2W (+33dBm) |
| Carrier power<br>stability                              | +2dB / -3 dB                                                                                                                          |

Table A-4. Internal TPS UHF Modem Specifications (Continued)

| Receiver (RX)                |                                        |
|------------------------------|----------------------------------------|
| Sensitivity                  | -116...-110 dBm (BER<10 E-3)           |
| Adjacent channel selectivity | >-60 dB @ 12.5 kHz<br>>-70 dB @ 25 kHz |

## Optional GSM/GPRS Module Details

Table A-5 lists the internal TPS UHF modem’s general specifications.

Table A-5. GSM/GPRS Module Specifications

|                   |                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Operating systems | EGSM: 900/1800 MHz;<br>GSM: 850/1900 MHz;                                                                                     |
| TX power          | 0.6 W (850 MHz); 2 W (900 MHz); 1 W (1800/1900 MHz);                                                                          |
| GPRS              | Multi-slot class 8 (4 down; 1 up);<br>Max BR 85.6 Kbps;<br>Class B GSM 07.10 multiplexing protocol;<br>Coding scheme CS1-CS4; |
| CSD               | Max BR 14.4 Kbps;                                                                                                             |
| SMS               | MO/MT Text and PDU modes;<br>Cell broadcast;                                                                                  |

# Connector Specifications

The following sections list HiPer XT connector details.

## Radio (Modem) RF Connector

The TPS UHF modem connector type (Table A-6) is a BNC female RF connector.

Table A-6. UHF Modem Connector Specifications

| Type | Signal Name | Dir | Details                      |
|------|-------------|-----|------------------------------|
| BNC  | Modem I/O   | I/O | RF output from modem antenna |

## Power Connector

The power connector (Figure A-1) is a sealed receptacle, 5 pin, ODU part number G80F1C-T05QF00-0000.



Figure A-1. Power Connector

Table A-7 gives power connector specifications.

Table A-7. Power Connector Specifications

| Number | Signal Name | Dir | Details                |
|--------|-------------|-----|------------------------|
| 1      | Power_INP   | P   | 6 to 28 volts DC input |
| 2      | Power_INP   | P   | 6 to 28 volts DC input |
| 3      | Power_GND   | P   | Ground, power return   |
| 4      | Power_GND   | P   | Ground, power return   |

Table A-7. Power Connector Specifications (Continued)

| Number | Signal Name | Dir | Details  |
|--------|-------------|-----|----------|
| 5      |             |     | Not used |

## Serial C-RS232 Connector

For ports A and D. The RS232 connectors (Figure A-2) are sealed receptacle, 7 pin, ODU part number G80F1C-T07QC00-0000.



Figure A-2. RS232 Connector

Table A-8 gives the RS232 cable connector specifications.

Table A-8. RS232 Connector Specifications

| Number | Signal Name | Dir | Details                            |
|--------|-------------|-----|------------------------------------|
| 1      | Power_OUT   | P   | Power Output<br>(Supplied Voltage) |
| 2      | GND         | -   | Signal ground                      |
| 3      | CTS         | I   | Clear to send                      |
| 4      | RTS         | O   | Request to send                    |
| 5      | RXD         | I   | Receive data                       |
| 6      | TXD         | O   | Transmit data                      |
| 7      |             |     | Not used                           |

## USB Connector

The USB connector is a sealed receptacle, 5 pin TPS cable connector (Figure A-3).

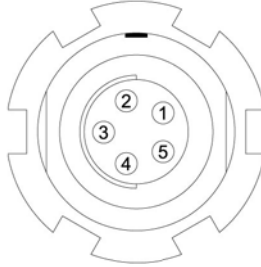


Figure A-3. USB Connector for GGD Options

Table A-9 gives the USB connector specifications.

Table A-9. USB Specifications

| Number | Signal Name | Dir | Details         |
|--------|-------------|-----|-----------------|
| 1      |             |     | Not used        |
| 2      | USB_PWR     | P   | Bus power input |
| 3      | GND         | -   | Ground          |
| 4      | USB D+      | I/O | Data plus       |
| 5      | USB D-      | I/O | Data minus      |



# Safety Warnings

## General Warnings



### NOTICE

*To comply with RF exposure requirements, maintain at least 25cm between the user and the GSM radio modem.*



### WARNING

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

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



### DANGER

**TPS RECEIVERS SHOULD NEVER BE USED IN DANGEROUS ENVIRONMENTS. USE IN RAIN OR SNOW FOR A LIMITED PERIOD IS PERMITTED.**

# Internal Battery Pack Warnings



## DANGER

**NEVER ATTEMPT TO OPEN THE RECEIVER'S CASING OR REPLACE THE BATTERIES! LITHIUM-ION BATTERIES CAN BE DANGEROUS IF MISHANDLED!**



## DANGER

**DO NOT INCINERATE OR HEAT BATTERY PACK ABOVE 212 DEGREES FAHRENHEIT (100 DEGREES CELSIUS). EXCESSIVE HEAT CAN CAUSE SERIOUS DAMAGE AND POSSIBLE EXPLOSION.**



## WARNING

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

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

# Usage Warnings



## CAUTION

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

*The owner should periodically test this product to ensure it provides accurate measurements.*

*Inform TPS immediately if this product does not function properly.*



## CAUTION

*Only allow authorized TPS warranty service centers to service or repair this product.*

## Notes:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# UHF Radio Usage



## NOTICE

*Many countries require a license for radio users (such as the United States). Be sure you comply with all local laws while operating a UHF radio.*

Surveying in RTK mode has made UHF the most popular choice for communications between Base and Rover receivers. Know the strengths and weaknesses of this technology to get the best use out of your receiver.

The quality and strength of the UHF signals translates into range for UHF communications.

1. The system's range will greatly depend on the local conditions. Topography, local communications and even meteorological conditions play a major role in the possible range of RTK communications.

If needed, use a scanner to find clear channels for communication.

2. Your system's range will increase by adjusting the antenna of your Base station in one of the following ways.
  - Ensure the Base radio has a fully charged battery.
  - Use directional antennas and/or repeaters to increase your system's range. Directional antennas concentrate the signal power within a more narrow direction, significantly increasing the range of your system.
  - Check out the TPS accessory line for various items to raise your Base radio.

## Notes:

[illegible]

# Warranty Terms

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

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

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

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

---

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

## Notes:

[illegible]

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## Notes:

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