



PC-CDU

Reference Manual





PC-CDU Reference Manual

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Preface

Thank you for purchasing your Topcon receiver, survey product or accessory (the “Product”). The materials available in this manual (the “Manual”) have been prepared by Topcon Positioning Systems, Inc. (“TPS”) for owners of Topcon products. This Manual is designed to assist owners with the use of software (the “Software”) to be used with the Product and its use is subject to these terms and conditions (the “Terms and Conditions”).



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About This Manual

Welcome to the PC-CDU Reference Manual.

This manual explains how to install, set up, and use the PC-CDU software. For best performance of this software, please read all of the instructions carefully. They were especially designed to help you correctly install and operate this program. This manual assumes that you are familiar with GPS and also have some knowledge of working with TPS receivers.

The information contained in this manual applies to both PC-CDU MS and PC-CDU Lite; however, there are some features unique to PC-CDU MS. For more information about the differences between the two versions, see “PC-CDU MS and PC-CDU Lite” on page 1-2.

Symbols and Typographic Conventions

This manual uses the following text conventions.

Example	Description
File ► Exit	Click the File menu and click Exit .
<i>Satellites</i>	Indicates the name of a dialog box or screen.
<i>clock offset</i>	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.
Internal	Press or click the button or key labeled Internal .
Ctrl+V	Indicates shortcut/hot key combinations to press.
Temp	Indicates string information (for example, file and directory names) and operator commands.

The following visual cues describe certain types of information throughout the manual.



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



Supplementary information that can help you configure, maintain, or set up a system.



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



Notification that an action has the potential to adversely affect system operation, system performance, data integrity, or personal health.



Notification that an action *will* result in system damage, loss of data, loss of warranty, or personal injury.

Screen Captures

This manual includes sample screen captures. Your actual screen can look slightly different from the sample screen due to the connected receiver, operating system used, and specified settings.

Manual Organization

The manual is divided into four chapters and five appendixes. The table of contents and index provide manual navigation.

Chapter 1: Introduction

- Tells the user about purposes and features of the program.
- Explains how to install and remove PC-CDU. Also provides information about system requirements and differences between PC-CDU MS and PC-CDU Lite.
- Shows how to launch and close the program.

Chapter 2: PC-CDU Getting Started

Provides a list of configuration procedures most likely to be used.

Chapter 3: PC-CDU Software Reference

- Describes the content of the main window.
- Provides information describing each tab, field and control you can access via the program interface.

Chapter 4: Troubleshooting

Helps you in diagnosing, correcting and avoiding problems, as well as contacting TPS customer support for further help.

Appendix A: PC-CDU Scripts

Introduces readers to the PC-CDU scripts and describes how to use them.

Appendix B: Settings List

Provides complete list of settings supported PC-CDU.

Appendix C: Installing and Updating the TPS USB Driver

Provides procedures for installing and updating the TPS USB driver on various operating systems.

Appendix D: Output Period Setup Wizard

Presents the Output Period Setup Wizard, which is used to adjust the periods for generating raw data and position.

Appendix E: Satellite Navigation Status Codes

Shows the list of available satellite navigation status codes.

Supplemental Documentation

The table below lists other the manuals that can be useful while using for configuring a receiver.

For...	Read This Document
In-depth information about the interface language used for managing a TPS receiver	GPS Receiver Interface Language (GRIL) Reference Manual
A description on how to install/update the firmware in a TPS receiver	FLoader User's Manual
A description on how to configure the Bluetooth wireless technology module in a TPS receiver	BTCONF User's Manual
A description on how to configure the radio modem in a TPS receiver	Modem-TPS User's Manual
Operational and procedural information on the TPS receiver	The TPS receiver's Operator's Manual

These manuals are available on the GPS+ CD (except the receiver's manual) or the TPS GPS website. Note that the *GRIL Reference Manual* requires password access: contact TPS for details.

Notes:

[illegible]

Introduction

PC-CDU™ is a comprehensive Windows® software product designed for controlling GPS+ receivers developed by TPS. PC-CDU uses the GPS Receiver Interface Language (GRIL) to configure various receiver settings and diagnose receiver performance.

PC-CDU MS (as of the publication of this manual) provides the following functions:

- Connecting a TPS receiver and a computer via serial, parallel, USB or Ethernet ports (Direct Connection Mode).
- Internet Server and Internet Client features that provides remote access to a TPS receiver. These features work when running PC-CDU in Internet Server Mode or Internet Client Mode on a computer connected to the Internet.
- Tracking the total number and status of all visible satellites.
- Displaying the receiver's current position and time in real time.
- Controlling the recording of raw data measurements into the receiver's internal memory.
- Downloading collected raw data measurements (log files) from the receiver's internal memory onto the computer's disk drives.
- Recording, in real time, the receiver's raw data measurements on the computer's disk in TPS and RINEX formats. To generate RINEX files, the executable file "tps2rin.exe" must also be installed on your computer.
- Displaying, in real time, a graph of the receiver's current position and the satellite sky plot.
- Displaying and programming the receiver's settings (such as Data Recording Interval, Position Computation Mode, etc.).
- Displaying the current receiver options and loading an Option Authorization File into the receiver.
- Creating and uploading configuration script files to the receiver.

PC-CDU MS and PC-CDU Lite

PC-CDU exists in two implementations: a full-functionality version called PC-CDU MS and a reduced-functionality version called PC-CDU Lite. Table 1-1 lists the differences between PC-CDU MS and PC-CDU Lite.

Table 1-1. Differences Between PC-CDU MS and PC-CDU Lite

Function	PC-CDU MS	PC-CDU Lite
Remote connection to a receiver via the Internet	yes	no
Direct connection to a receiver via an Ethernet port	yes	no
Record data on a PC's disk drive in real time ("Real-Time Data Logging")	yes	no
Graphical presentation of the receiver's current position & the satellite sky plot	yes	no

PC-CDU MS may have a limited lifetime as a full-functionality tool. After the current version of PC-CDU MS expires, its extended functions are automatically disabled so that PC-CDU MS turns into PC-CDU Lite. Table 1-2 provides a more detailed description of the different scenarios available.

Table 1-2. PC-CDU MS Authorizations

If the Firmware Version Installed on the Receiver Is...	And the Connected Receiver Is...	Then...
2.3 or newer	Authorized	PC-CDU MS will never expire and will always work as MS (full functionality) when connected to this authorized receiver.
2.3 or newer	Not authorized	PC-CDU MS will work as Lite (reduced functionality).

Table 1-2. PC-CDU MS Authorizations (Continued)

If the Firmware Version Installed on the Receiver Is...	Then...
2.2p3 or older	PC-CDU MS will work as MS until the expiration date. Once this date has been reached, the program changes into Lite mode.

PC-CDU Lite will never turn into PC-CDU MS and never expires.

Installing PC-CDU

Before installing and using PC-CDU, ensure that the system has the following requirements.

- PC-compatible computer with Intel® Pentium® 100 MHz or faster
- 5 Mbyte free disk space
- 16 Mbyte RAM or more (32 Mbyte recommended)
- 32-bit operating system, such as MS Windows 95/98/Me/NT/2000/XP
- Color monitor with minimum 640x480 screen resolution
- For Internet Server/Client applications, a connection to the Internet

PC-CDU comes as a ready-to-run executable. When downloading PC-CDU MS from the Topcon website, a username and password are required. Follow the instructions at the top of the Software Downloads web page for obtaining this information.



The procedure below is for downloading PC-CDU from the Topcon website. If your version of PC-CDU is on a CD, skip to step 5 on page 1-5.

1. Visit the Precision GPS page (<http://www.topcongps.com/>) on the Topcon website. Click the **Software** link in the left pane of the window.
 - To download PC-CDU MS – Click the **Software Downloads** link near the top of the page. In the PC-CDU MS section of the page, select **Click here to download pccdu_ms.zip** to begin downloading the program.
 - To download PC-CDU Lite – Click the **Utilities** link near the top of the page. In the PC-CDU Lite section of the page, select **Click here to download pccdu_lite.zip** to begin downloading the program.
2. On the **Enter Network Password** dialog box, enter a username and password for PC-CDU MS, then click **OK**.

PC-CDU Lite is a freely available utility. During installation, the Enter Network Password prompt will not display on-screen.

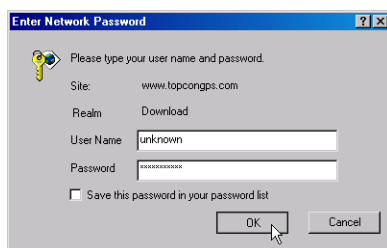


Figure 1-1. Enter Network Password

3. Click **Save** to continue with the download.

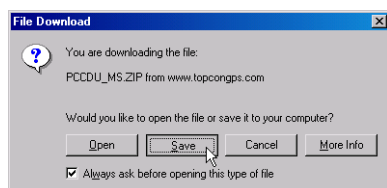


Figure 1-2. Download PC-CDU

- Specify the destination (disk drive/folder) for the archive file (pccdu_ms.zip) and click **Save**. Wait for the archive file to download onto your system.

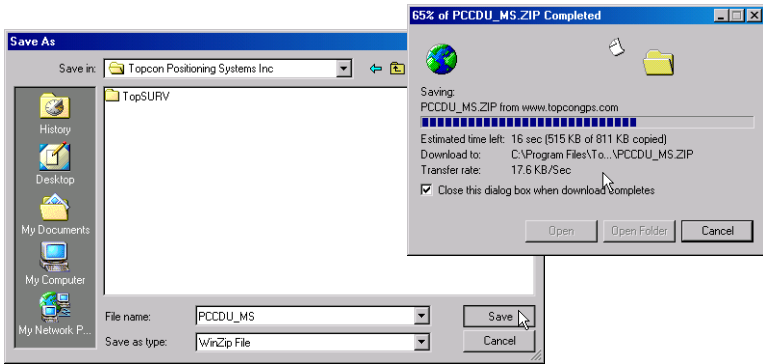


Figure 1-3. Select a Destination, Then Save to Computer

- On your computer, create a “PC-CDU” folder inside the “TPS” folder in the Program Files directory. The folder path will be as follows:
C:\Program Files\TPS\PC-CDU
- Extract the program into this folder using WinZip® or another appropriate software. The following files appear in the folder:
 - Executable file – Pccdu.exe
 - Auxiliary binary file – lptaccess.vxd
- If desired, create a shortcut for PC-CDU and place it on the computer’s desktop.

Removing PC-CDU

The simplest way to remove PC-CDU from a system is to delete the folder in which the executable file (Pccdu.exe) and its components reside. Also, delete the PC-CDU shortcut, if available.



Before deleting the PC-CDU folder, move any items you want to keep.

Starting PC-CDU

When first running PC-CDU, a “pccdu.ini” file is created and stored in the PC-CDU directory. This file stores user settings and is automatically updated as changes are made in the program. Settings and information are recorded using plain text (ASCII), so any text editor can be used to edit the information as well. Before making any changes directly to the pccdu.ini file, save a backup copy of the original to an easily accessible location.



Keep copies of PC-CDU in separate directories to maintain unique settings for different purposes.

To start PC-CDU, do one of the following, double-click the “pccdu.exe” file or the PC-CDU shortcut.

Once PC-CDU is launched, the *Connection Parameters* dialog box displays (Figure 1-4).

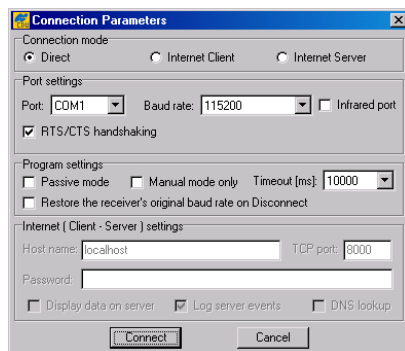


Figure 1-4. Connection Parameters

This dialog box contains the following parameters needed to connect a computer and a TPS receiver:

- Connection mode – used to set the type of connection.
 - *Direct*: used when the computer and TPS receiver are directly connected using a serial, parallel, USB or Ethernet port and a cable.

Ethernet ports establish a direct connection between a computer and a TPS receiver using a cable connection or similar connection through the Internet. For more information about communicating via Ethernet, see “Establishing an Ethernet Connection” on page 1-14.

- *Internet Client*: used to get remote access to a TPS receiver via the Internet. The remote receiver must be connected to a computer, and this remote computer must be running PC-CDU in Internet Server mode.
- *Internet Server*: used to provide access to a connected TPS receiver via the Internet and a remote computer running PC-CDU in Internet Client mode. Currently, Internet Server mode only accesses one remote PC-CDU Internet Client at a time. Both the Internet Server computer and the Internet Client computer must have PC-CDU running in the appropriate mode, as well as be connected to the Internet.
- **Port settings** – used to configure the computer’s communication port and to set the desired settings of the receiver’s communication port. These settings are applied after clicking Connect.
 - See the following sections for details on these settings for the different connection types available with PC-CDU.
 - *RTS/CTS handshaking*: ensures reliable data exchange between the receiver and computer. Prior to selecting this option, make sure that 1) both the computer and receiver support RTS/CTS handshaking and 2) the serial cable being used allows RTS/CTS handshaking.
 - *Infrared port*: establishes an infrared connection when 1) an appropriate external infrared adaptor is connected to the selected serial port on the computer side, 2) the receiver’s hardware supports an infrared port option, and 3) the Infrared Port option is enabled in the receiver.
 - *Rec ID*: only available for USB connections, used to select the receiver, based on its unique electronic ID, to make a connection with.

- Program settings – used to apply configuration settings when connecting to or disconnecting from the receiver.
 - *Passive mode*: prevents PC-CDU from making changes to receiver parameters. In this mode, the receiver's pre-set elevation mask defines the elevation angle for displaying satellites on the Main window.

When turned off, PC-CDU automatically forces the Terminal Elevation Mask to -90°, and all tracked satellites displays (rather than just those above the mask angle). This setting remains as long as PC-CDU is open. After closing PC-CDU, the original mask is restored to the receiver. See “General” on page 3-27 for information on setting the elevation mask.
 - *Manual mode only*: allows PC-CDU to act as input/output terminal for sending user commands to the receiver and receiving information from the receiver without connecting to the receiver.
 - *Timeout*: establishes the number of milliseconds to wait before trying the next baud rate while establishing a connection with the receiver through a serial port.
 - *Restore the receiver's original baud rate on Disconnect*: determines the receiver port's original baud rate (before running PC-CDU) and restores this setting after disconnecting the receiver from PC-CDU.
- Internet (Client - Server) settings – used to enter Internet connection parameters for connecting to or disconnected from a remote receiver.
 - *Hostname*: the name or IP address of the remote computer running PC-DU Internet Server.
 - *TCP port*: used to set the port needed through which to connect to the Internet.
 - *Password*: used to protect the PC-CDU server from unauthorized access. Up to 128 alphanumeric characters may be used.
 - *Display data on server*: displays satellite information and the antenna's current position in the Main window.

- *Log server events*: creates a text log file (pccdu_server.log) in PC-CDU's working directory. This file contains some information collected during the communication session between the PC-CDU server and PC-CDU client. New information is added to the file after another client connects to the PC-CDU server.
- *DNS lookup*: includes the DNS address in the "pccdu_server.log" file; otherwise, this file includes the IP addresses only.

Establishing a Serial Port Connection

To establish a connection between a computer and the receiver using serial ports, follow these steps:

1. Connect an available receiver port (usually port A) to a communication port on the computer using a receiver-to-computer RS-232 serial cable.
2. Turn on the receiver.
If the receiver does not have power, connect it to a power source. Refer to the receiver's documentation for this information.
3. Start PC-CDU and select the following parameters:
 - Port list – select the computer serial port (COM1, COM2,...) to use for the connection.
 - Baud rate – select the desired baud rate for communication between the receiver port and computer port.
 - RTS/CTS handshaking – enable
 - Infrared port – enable only if establishing a connection between the receiver and computer via an infrared adaptor. See the requirements on page 1-7 for details.
4. Click **Connect**. See Figure 1-4 on page 1-6 for an example of the *Connection Parameters* dialog box for this connection type.

Establishing a Parallel Port Connection

Before connecting the receiver and computer using parallel ports and the corresponding cable, make sure the following requirements are met:

- The computer runs under Windows 95, 98 or ME.
- The computer's parallel port has been configured as ECP or ECP+EPP.
- The Parallel Port option has been enabled in the receiver.



If run on a Windows NT/2000/XP computer, PC-CDU does not allow connection to the receiver via parallel ports.

To establish a connection between the computer and the receiver using parallel ports, follow these steps:

1. Connect the receiver's parallel port (usually marked "Parallel") to a parallel port on the computer using the receiver-to-computer parallel cable.
2. Turn on the receiver.
If the receiver does not have power, connect it to a power source. Refer to the receiver's documentation for this information.
3. Start PC-CDU and select the following parameters:
 - Direct – enable.
 - Port list – select the computer serial port (LPT1, LPT2,...) to use for the connection.
4. Click **Connect** (Figure 1-5 on page 1-11).

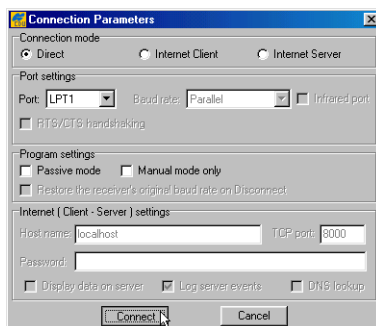


Figure 1-5. Parallel Port Connection Parameters

Establishing a USB Connection

Before connecting a USB equipped TPS receiver with the computer's USB port, make sure that the USB port option is enabled in the receiver and that the TPS USB driver is installed on the computer.

Checking for the USB Option

Even if the receiver has a USB port, the option may not be enabled. To verify whether or not the USB Port option is enabled, use a direct serial cable connection. Once connected, click **Tools ► Receiver options**.

- If enabled, “yes” displays in the *Current* column of the USB Port option.
- If disabled, “no” displays in the *Current* column of the USB Port option.

Installing the TPS USB Driver

The driver installation procedure varies slightly depending on the operating system used. For detailed information on the driver installation for your specific operating system, see the appropriate section in Appendix C.



The procedure below refers to the USB driver version 2.0.0.2 or newer.

In general, the installation procedure is as follows:

1. Visit the TPS website (<http://www.topcongps.com/>). Click the **Software** link in the left pane of the window.

To download the TPS USB driver, click the **Software Downloads** link near the top of the page. In the PC-CDU MS section of the page, click **tps_usb.zip** to begin downloading the driver.

2. Extract the following files into a new folder.
 - Tpsusbio.inf
 - Tpsusb98.sys
 - Tpsusbio.sys
3. Connect the receiver to the computer through the supplied USB cable. Turn on the receiver.
4. The Windows operating system automatically detects the new hardware device. Follow the on-screen instructions to finish the installation process.

After Windows finishes installing the driver, you are now able to connect the receiver and the computer using USB ports.

Connecting via USB



A USB connection cannot be established if using a computer with Windows 95/NT operating system.

To establish a connection with the receiver using USB ports, follow these steps:

1. Insert the USB cable into the USB port of the receiver. Plug the opposite end of this cable into the USB port on the computer.
2. Turn on the receiver (and the computer, if needed).

If the receiver does not have power, connect it to a power source. Refer to the receiver's documentation for this information.

3. Start PC-CDU and select the following parameters:
 - Direct – enable.
 - Port list – select the computer's USB port (USB) to use for the connection.
 - Rec ID – select the electronic ID of the receiver to connect with.
4. Click **Connect** (Figure 1-6).

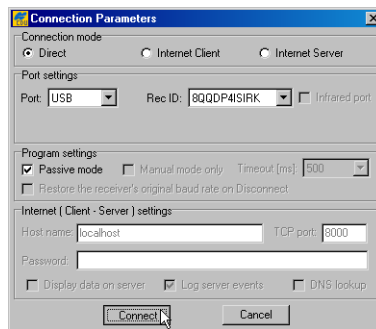


Figure 1-6. FUSB Connection Parameters

Establishing an Ethernet Connection

TPS receivers can use the following two Ethernet-based methods for communication:

- Communication with a receiver directly connected to a computer.
- Communication with a receiver connected to an existing TCP/IP Ethernet network.

Connecting Directly via Ethernet

Use a direct Ethernet connection to test this connection before connecting to an active TCP/IP network, or when an Ethernet network is unavailable.



Use this method for preliminary tests before using the receiver on an active TCP/IP network.

Before establishing the connection, make sure you have the following:

- A computer with an Ethernet card installed and the TCP/IP protocol configured.
- A TPS receiver with a physically installed Ethernet port and the Ethernet port option enabled.
- The following cables:
 - Ethernet adapter (p/n 14-008032-01)
 - an Ethernet cross-over cable (this cable is typically available from a local computer store or an online computer stores)
 - an RS-232 cable (p/n 14-008005-02) to configure the IP settings of the receiver

The following procedure describes how to connect the receiver directly to a computer using Ethernet ports. The example in this procedure uses a protocol with the following settings:

- IP address – 192.168.0.1

- Gateway – 192.168.0.3 (because only two devices are directly connected and have no connections to another network, the gateway address can be set to all zeros).
- Subnet mask – 255.255.255.0

You should have already installed an Ethernet card and configured the TCP/IP protocol on your computer.

1. See “Establishing a Serial Port Connection” on page 1-9 for connecting the computer and receiver using a serial cable.
2. Once connected, click **Configuration ▶ Receiver ▶ Ports ▶ Ethernet**.
3. Select the following *IP settings* for the receiver:
 - IP Address – enter the same value as the computer’s IP address, but increment the last number by one. The last number must differ from the computer’s IP address but be within the 0 to 255 range (for example, 192.168.0.2).
 - IP Mask – enter the same number used for the computer.
 - Gateway – enter the same number used for the computer.
4. In the *Telnet Settings* area, leave all settings as is, but ensure that TCP port is set to 8002.

Record the value in the Network Password field (if no password is needed, leave this field blank).

5. Click **Apply** then **OK** to set the parameters.
6. Click **Tools ▶ Reset receiver** to restart the receiver.
7. Click **File ▶ Disconnect**.
8. Connect the Ethernet cables (Figure 1-7 on page 1-16):
 - Insert the seven pin connector of the Ethernet adapter into the ETHR port of the receiver.
 - Connect the other end of this adapter to the Ethernet crossover cable (either end).
 - Plug the second end of the crossover cable into the Ethernet jack on the back of the computer.

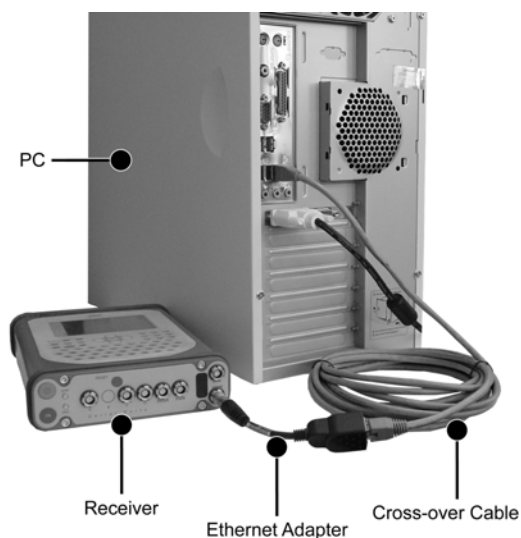


Figure 1-7. Direct Ethernet Connection – Hardware Setup

9. In PC-CDU, click **File ► Connect** and select or enter the following settings:
 - Connection mode – Direct
 - Port – ETHR
 - TCP port – 8002
 - Host name – IP address assigned to the receiver in step 3 on page 1-15
 - Password – the same series of characters specified for the receiver in step 4 on page 1-15, or leave blank if no password
10. Click **Connect** (Figure 1-8 on page 1-17).

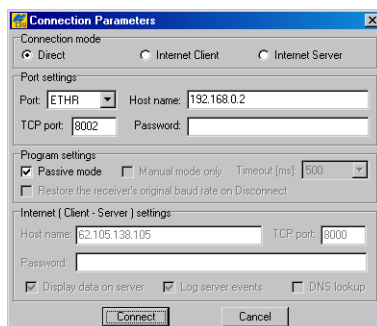


Figure 1-8. Ethernet Connection Parameters

After establishing a live connection, the current connection type (Ethr) and the receiver's IP address display in the bottom left corner of the PC-CDU Main window (Figure 1-9).

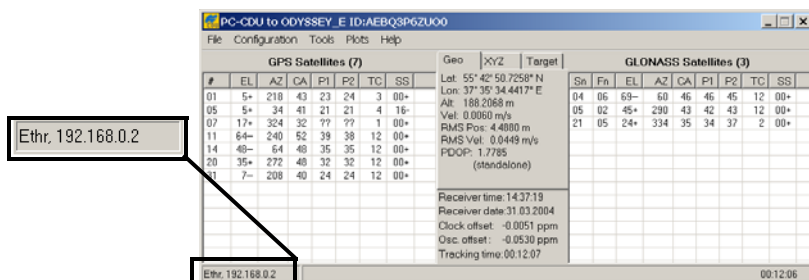


Figure 1-9. PC-CDU Main Window – Ethernet Connection Established

Connecting via an Existing TCP/IP Ethernet Network

Use this method to connect the receiver to the Internet and to access the receiver over a local area network (LAN). Before establishing the connection, make sure the following components are available:

- An operational TCP/IP LAN or a connection to the Internet
- The following cables:
 - Ethernet adapter (p/n 14-008032-01)
 - straight-through Ethernet cable (this cable is available from a local computer store or from many online computer stores)

- an RS-232 cable (p/n 14-008005-02) to configure the receiver's IP settings
- A TPS receiver with an installed Ethernet port and the corresponding option enabled. To verify whether or not the Ethernet options are enabled using the *Option Manager* dialog box in PC-CDU (click **Tools ▶ Receiver options**).
 - “Ethernet Port” must be set to “yes” the *Current* column. TCP Connections must range from 1 to 5.
 - “FTP Connections” must be set to 1 (for FTP connections only).
- For more information about receiver options, including Ethernet-related options, see Table 3-6 on page 3-78.

The following procedure describes attaching the receiver to an existing network.



When connecting TPS receivers to a network, work closely with the system administrator to ensure successful connections. Each receiver requires the following: A unique static IP address whether or not a Dynamic Host Configuration Protocol (DHCP) is used on the network, a subnet mask, and a default gateway.

1. Connect the computer and the receiver using the RS-232 serial cable.
 2. Run PC-CDU. Select appropriate communication settings for connection via serial port and then click **Connect**. See “Establishing a Serial Port Connection” on page 1-9 for details.
 3. Click **Configuration ▶ Receiver ▶ Ports ▶ Ethernet**.
 4. Specify the IP Address, IP Mask, and Gateway settings for the receiver.
-



If in doubt about which IP settings are safe to use, consult your system administrator.

5. Configure **Telnet Settings** and **Network Password**. The following settings may be used:
 - TCP port – 8002 (default value). This is the port on which the receiver listens for telnet-like connections. The receiver allows up to five simultaneous telnet-like connections.
 - Timeout – 600 (default value). This parameter sets the amount of time in seconds the receiver allows an inactive connection to remain open. After this time, the receiver terminates the unused connection.
 - Network Password – an arbitrary sequence of characters (to not use a password leave this field blank).
6. Configure **FTP Settings** (optional). Use the following settings:
 - TCP port – 21 (default value). This is the port on which the receiver listens for FTP connection. The receiver allows only one FTP connection at a time.
 - Timeout – 600 (default value). This parameter sets the length of time in seconds the receiver allows an inactive connection to remain open. After this time, the receiver terminates the unused connection.
7. Click **Apply** then click **OK**.
8. Click **Tools ► Reset receiver** to restart the receiver.
9. Click **File ► Disconnect**.
10. Connect the Ethernet cables (Figure 1-10 on page 1-20).
 - Insert the seven pin connector of the Ethernet adapter into the ETHR port of the receiver.
 - Connect the other end of this adapter to the Ethernet straight-through cable (either end).
 - Plug the second end of the straight-through cable into the Ethernet jack on the LAN hub or switch.

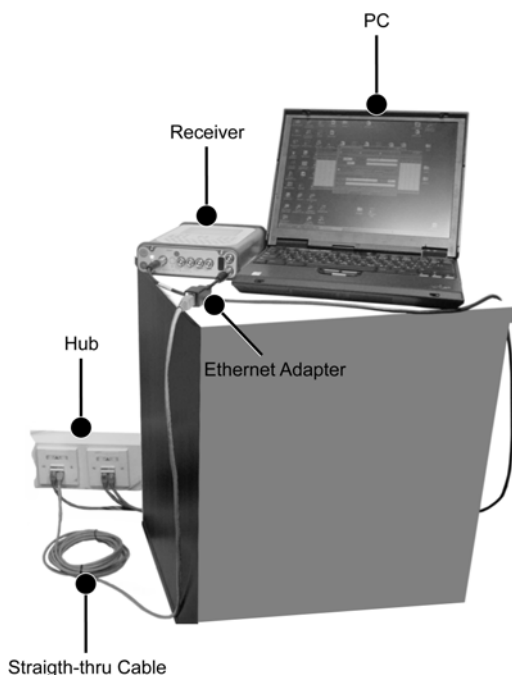


Figure 1-10. Receiver on LAN – Hardware Setup



At this point, check that the receiver responds to the ping command. From the Windows command prompt or **Run** dialog box, type: “ping [receiver’s IP address]” (for example, ping 195.105.138.43). If the receiver responds, continue with step 11. If it does not respond, double-check the LAN connections and addresses.

11. In PC-CDU, click **File ► Connect** and specify the following settings:

- Connection mode – Direct
- Port – ETHR
- TCP port – 8002
- Host name – IP address assigned to the receiver in step 4.

- Password – the same series of characters specified for the receiver in step 5 or leave it blank to not use a password.

12. Click **Connect** (Figure 1-8 on page 1-17).

After establishing the connection and the current connection type (Ethr), the receiver's IP address displays in the bottom left corner of the PC-CDU Main window.

Connecting to the receiver over a TCP/IP network provides the same functionality as a cable connection. Other functionality includes transferring files from the receiver over a TCP/IP network using FTP and connecting up to five remote telnet-like terminals to the receiver.

For transferring raw data files from the receiver to the remote computer using FTP, see “How to Download Files to a Remote Computer Using FTP” on page 2-6.

Establishing an Internet Client-Server Connection

An Internet connection can be used to connect to a remote receiver connected to a computer running PC-CDU in “server” mode. A client-server connection allows a remote receiver to be accessed, maintained, managed, and updated as if the “client” were directly connected to the receiver.

Internet Server Mode

In Internet Server Mode, the receiver must be directly connected to the computer running PC-CDU server using one of the cable or ethernet connections described above. The computer running PC-CDU must have a live connection to the Internet.

To establish a connection with the receiver using PC-CDU, follow these steps:

1. Start PC-CDU and select the following settings:
 - Internet Server – enable.
 - TCP port – enter the TCP port number (if needed); 8000 is the default.

- Password – enter the password needed to access the connected receiver.
- Log server files – enable.

2. Click **Connect** (Figure 1-11).

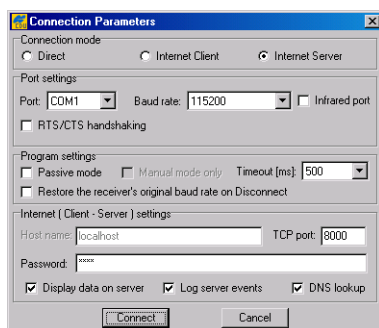


Figure 1-11. Internet Server Connection Parameters

After connecting to the receiver, the main screen and server screen displays (Figure 1-12).

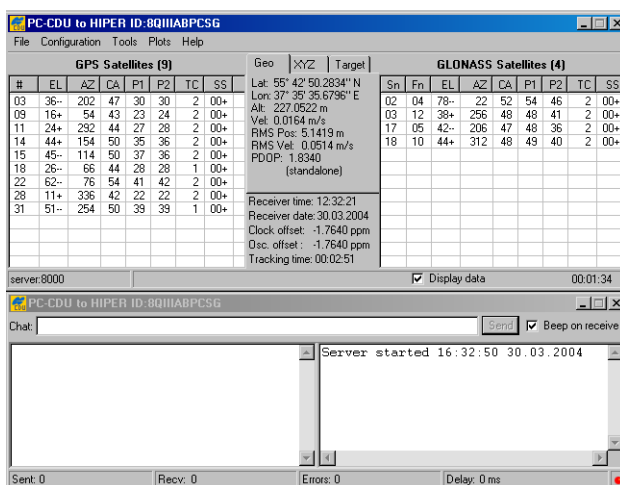


Figure 1-12. Internet Server Started

The **Server** dialog box allows a user running PC-CDU Server to communicate with the corresponding PC-CDU Client. In addition, the server screen displays information about the server's current status.

Internet Client Mode

In Internet Client Mode, a remote receiver may be accessed for monitoring, configuring, and managing the receiver. The computer running PC-CDU must have a live connection to the Internet.

After establishing a connection to the remote receiver, the user can control this receiver as if the user's computer were directly connected to the receiver, such as send commands to the remote receiver, download log files from the receiver's memory, and so on. Before configuring the PC-DCU client parameters, have the following information about the PC-CDU server available:

- IP or DNS address
- TCP port number
- Password (if necessary)



In the Host name edit box, enter either the server's IP address (such as, 194.135.59) or its DNS address (such as, pab.topconps.com).

1. Start PC-CDU and select the following settings:
 - Internet Client – enable.
 - Host name – enter the IP address of the computer running PC-CDU Server
 - TCP port – enter the TCP port number (if needed); 8000 is the default
 - Password – enter the password needed to connect with the server.
 - DNS lookup – enable.
2. Click **Connect** (Figure 1-13 on page 1-24).

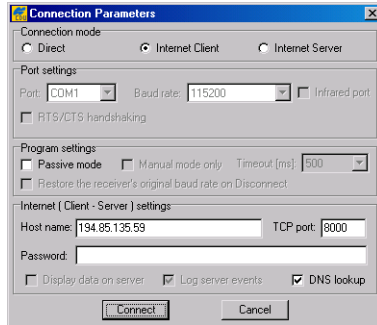


Figure 1-13. Internet Client Connection Parameters

After connecting to the receiver, the main screen and the client screen display (Figure 1-14).

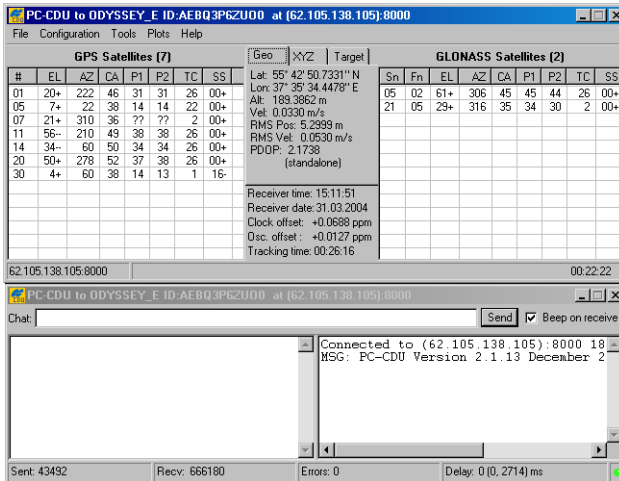


Figure 1-14. Internet Client Started

The *Client* dialog box allows a user running PC-CDU Client on one end to exchange messages with a user running PC-CDU Server on the other end. Messages sent from the client to the server are preceded by the character “>”. Messages sent from the server to the client begin with the character “<”. The last received message is topmost in the list.

Closing PC-CDU



Disconnecting the receiver from the computer before exiting prevents conflicts with serial port management.

To disconnect from the receiver, click **File ► Disconnect**. The disconnect process results in the following:

- Turning off **RTS/CTS handshaking**.
- Resetting the receiver control **Terminal Elevation Mask** to its original value (only if the **Passive mode** checkbox has not been deselected).
- Resetting the baud rate to 115200 if the receiver's original baud rate that the receiver has before running PC-CDU exceeded 115200.
- Restoring the original baud rate if the Restore the receiver's original baud rate on Disconnect parameter has been selected.

To quit PC-CDU, click **File ► Exit**.

Although the connection is broken if exiting before disconnecting, conflicts may occur with the serial port because the items in the list above are still active.

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.

PC-CDU Getting Started Guide

This chapter contains a number of step-by-step instructions that will walk you through the most frequently used software procedures, focusing only on the configuration procedures most likely to be used.

Because it is a quick reference, this chapter does not contain a detailed description of the settings and parameters. For detailed information about the dialog boxes and fields in PC-CDU, refer to the corresponding sections in Chapter 3.

How to Connect to the Receiver

Physically connect the receiver and a computer using either a serial, parallel, USB, or Ethernet cable.

- See “Establishing a Serial Port Connection” on page 1-9 for a serial port connection procedure.
- See “Establishing a Parallel Port Connection” on page 1-10 for a parallel port connection procedure.
- See “Establishing a USB Connection” on page 1-11 for a USB port connection procedure.
- See “Establishing an Ethernet Connection” on page 1-14 for an Ethernet port connection procedure.

How to Navigate through the Software

Moving through PC-CDU is like moving through any other Windows program: use the mouse to select desired functions and options; use the Tab key to move from field to field.

Shortcut keys provide a quick way to perform common functions. If a menu function has associated shortcut keys, the key combination will be shown to the right side of the menu item (Figure 2-1).

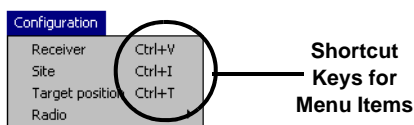


Figure 2-1. Example of Shortcut Keys Associated with Menu Items

How to Start Data Logging...

The primary purpose for configuring the receiver is to manage data logging, either to the receiver's memory or directly to the computer.

...To the Receiver Memory

1. Click **File** ► **File Manager**.
2. Click the *Current log file* tab and set the following parameters:
 - File name – type name of the file to which the receiver will log data
 - Recording interval – set the data logging interval
 - Elevation mask – set the elevation cut-off angle
 - Site parameters – click to enter the site name and antenna details
3. Click **OK** and then **Start**. A new log file will be created and the receiver will start recording data into the file.

For more information, see “Current Log File” on page 3-13.

...On the Computer

1. Click **File ► Real-Time Logging**.
2. Click the *Select output path* tab and navigate to and open the folder in which to download and store log files.
Or, type a new folder in which to download and store files.
3. Select the desired file creation mode, set the following parameters (Table 2-1), and click **Start**.

Table 2-1. File Creation Mode Options

If “Single file” selected...	If “Multiple files” selected...
<ul style="list-style-type: none"> • Save to • Recording interval field (data logging interval) • Site parameters (click and enter the site name and antenna details, then click OK) • Elevation mask 	<ul style="list-style-type: none"> • Prefix • Numbering • Start Count (if Ascending Count selected) • New file every • Overwrite existing files (as needed) • Autoconvert to RINEX (click Setup converter to adjust the converter’s settings) • Recording interval • Elevation mask • Site parameters (click and enter the site name and antenna details, then click OK) • Elevation mask

For more information, see “Single File” on page 3-18 and “Multiple Files” on page 3-19.

How to Automatically Convert Real-Time TPS Raw Data Files to RINEX

While logging receiver raw data files to the computer, PC-CDU can automatically convert the files from TPS format to RINEX format.

Deleting source files (if raw data files are not required) after a successful conversion will save computer disk space.

1. Click **File ► Real-Time Logging**.
2. Click the *Select output path* tab and navigate to and open the folder in which to download and store the original tps log files and their RINEX counterparts.

Or, type a new folder in which to download and store files.

3. Select the **Multiple files** tab, and set the following parameters:
 - Prefix
 - Numbering
 - Start Count (if *Ascending Count* selected)
 - New file every
 - Overwrite existing files (as needed)
 - Recording interval
 - Elevation mask
4. Enable the *Autoconvert to RINEX* and click **Setup converter**.
5. Set, if required, the following RINEX converter parameters and click **OK**:
 - Run by
 - Observer
 - Agency
 - Antenna # (serial number)
 - Antenna type (antenna's NGS description)
 - Comment
 - Marker name
 - Converter Application
 - Exclude GPS and/or Exclude GLONASS
 - Exclude L1 and/or Exclude L2
 - Delete source JPS files...
 - Additional options
6. Click **Start**.

For more information, see “Multiple Files” on page 3-19 and “Converter to RINEX Setup” on page 3-21.

How to Stop Data Logging...

Once the data logging session has completed, stopping the data logging will prevent files from being erased or the receiver's/computer's memory from becoming full.

...To the Receiver Memory

1. Click **File ▶ File Manager**.
2. Click the *Current log file* tab and click **Stop**.

...On the Computer

Click **File ▶ Real-Time Logging** and click **Stop**.

How to Configure Automatic File Rotation Mode

Automatic file rotation will close and open new files in the receiver memory, logging raw data to these files according to the user-specified schedule. AFRM may delete the earliest files when no free memory remains to make space for new data logs.

1. Click **Configuration ▶ Receiver**.
2. Select the *Minter* tab.
3. In the *File Creation mode* area, select *AFRM*.
4. In the *Automatic File Rotation Mode (AFRM) parameters* area, set the following parameters and click **Apply**:
 - Period
 - Files (total)
 - Phase
 - Automatically remove old files
5. To start data logging in AFRM mode, use the MINTER's FN button as you usually do for recording a single raw data file.

For more information on AFRM mode, refer to "MINTER" on page 3-31.

How to Download Files to a Computer Using File Manager

When logging data to the receiver, files will need to be downloaded for post-processing and to manage the receiver's memory (through file deletion). This procedure downloads files to a computer directly connected to the receiver.

1. Click **File ► File Manager**.
2. Select the *Download path* tab.
3. Navigate to and open the folder in which to download and store files.
Or, type a new folder name and click **Create** to create a new folder in which to download and store files. Open this new folder.
4. Select the *Download files* tab and select the file(s) to download.
5. Click **Download**.
6. Once the files have been successfully downloaded, continue with other operations.

How to Download Files to a Remote Computer Using FTP

When logging data to the receiver, files will need to be downloaded for post-processing and to manage the receiver's memory (through file deletion). This procedure downloads files to a remote computer connected through an FTP site.

1. Configure your Ethernet-enabled receiver as shown in "Connecting via an Existing TCP/IP Ethernet Network" on page 1-17.
2. From a computer on which you want the files to be stored, open a Web browser (for example, Internet Explorer).
3. In the Address bar of the browser, type the IP address of the receiver to connect with (for example, ftp://63.106.139.235).

4. Enter a *User Name* and the *Password* intended for access. Click **Login**.
5. Once the access has been verified, a list of log files in the receiver displays. Select the files to download and right-click within the selected area. Click **Copy To Folder** on the pop-up menu.

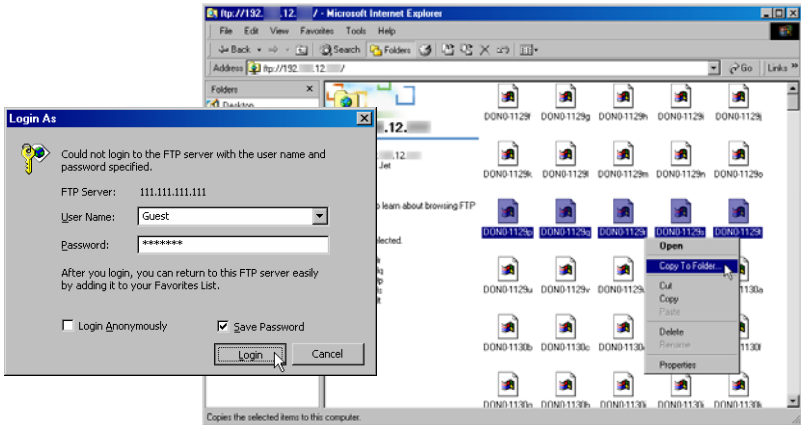


Figure 2-2. Login As Dialog Box and Copy Log Files

6. Navigate to and open the folder in which to download and store files. Click **OK** and wait until all the selected files copy to the computer.
7. Once the files have been successfully copied, continue with other operations.

How to Delete Files from the Receiver

Deleting files from the receiver's memory creates space for new files.

1. Click **File ► File Manager**.
2. On the *Download files* tab, select the file(s) to delete.
3. Click **Delete** and **Yes** at the confirmation dialog box. PC-CDU deletes the selected files.
4. Once the files have been successfully deleted, continue with other operations.

How to Recover Deleted Files

Before recovering a deleted file, note the following important recommendations:

- Do not record any new raw data files to the internal memory of the receiver from which the file(s) was deleted. Recording new files may overwrite (and permanently delete) the deleted file(s).
- Do not initialize the file system. This procedure permanently erases all files inside the receiver.
- Do not try to remove the receiver's Compact Flash card and read its contents with a card reader.

1. Click **File ► Manual Mode**.
2. In the command line at the top of the *Manual Mode* dialog box, type `%%set , /par/dev/blk/a/removed , on` and click **Send command**.
3. Wait while the receiver re-mounts its file system (during this process the REC LED blinks orange).
4. Once the file system is successfully re-mounted (the REC LED stops blinking), close the *Manual Mode* dialog box and click **File ► File Manager**.
5. Select the desired file and click **Download**.
In this mode, only the deleted file(s) will display.
6. After successfully downloaded the deleted file, restore the file system to its normal state using one of the following procedures:
 - Click **Exit** on the *File Manager* dialog box and open the *Manual Mode* dialog box. In the command line, type `%%set , /par/dev/blk/a/removed , off` and click **Send command**.
 - Click **Exit** on the *File Manager* dialog box, then click **File ► Disconnect**. Finally, power cycle the receiver.
7. Wait while the receiver re-mounts its file system (during this process the REC LED blinks orange).
8. Once the file system is successfully re-mounted, the REC LED will stop blinking.

How to Create a Receiver Configuration File

Creating and saving a receiver configuration file makes it easy to apply quickly a pre-set configuration.

1. Click **Configuration ▶ Receiver** and click **Save**.
2. From the *Save setup to a script* dialog box, navigate to and open the folder in which to save the file.
3. Enter the name of the configuration file to be created.
4. Select the extension for the file (usually “.tpc”).
5. Click **Save**.



In the Configuration file, PC-CDU will store only the current settings in the *Receiver Configuration* dialog box and its sub-tabs.

How to Load the Configuration File to the Receiver

Loading a saved configuration helps to quickly prepare the receiver for surveying.

1. Click **File ▶ Manual Mode**.
2. In the bottom-left corner of the *Manual Mode* dialog box, click **Load script**.
3. The *Script file* dialog box displays. Select the desired configuration file and click **Open**. The filename displays in the command line.
4. Click **Send command**. The file begins loading. Once the >Done ! string appears, the loading has completed and the settings are applied to the receiver.



Avoid loading the configuration files other than those created specifically for the selected receiver.

How to Enable WAAS Satellites

WAAS satellites provide error-corrected signals for improving GPS positioning.

1. Click **Configuration ▶ Receiver**.
2. Select the *Positioning* tab then the *WAAS* tab and set the following parameters
 - Channel 1 – enable
 - Set WAAS – select the WAAS satellite PRN code
 - Set GPS – select the GPS satellite PRN code
 - Interpret message #0 as message # – select 2
 - Use Iono Corrections
 - Enable output of “true” WAAS PRN numbers
3. If required, repeat step 2 for the second channel.
4. Click **Apply**.

For details, see “Positioning” on page 3-34.

How to Configure a Base Station for Broadcasting...

The Base station broadcasts messages that contain correction information to Rover receivers. Topcon receivers support industry standard RTCM and CMR message formats.

...RTCM Messages

1. In the **Configuration** menu, select the **Receiver** item.
2. Click the *Base* tab, set the following parameters and click **Apply**:
 - GPS/GLO at one time
 - L1 to L2 Antenna Phase Center offsets
 - L1 to L2 Antenna Phase Center offsets
 - RTCM settings

3. Enter the latitude, longitude, and altitude (ellipsoidal height) coordinates of the antenna position in the selected datum using one of the following methods.
 - If the Reference Geodetic Coordinates are known, enter the coordinates.
 - Enable *Averaged* and enter the *Averaged Span* in seconds. Click **Apply** then **OK**. Click **Tools ► Reset receiver** and wait until the specified interval completes. Examine the Base coordinates on the *Base* tab, they should correspond to the coordinates obtained from the average.
 - Click **Get from receiver** to use the current antenna position (that is, the most recent position produced by the receiver).
4. Click the *Ports* tab. On the *Serial* tab, set the following parameters for the port from which to generate RTCM messages and click **Apply** then **OK**:

• Input – select Command	• Baud rate
• Output – select one of the RTCM message types	• RTS/CTS – enable if modem supports hardware handshaking
• Period	

For details on the Base tab and Ports tab settings, see “Base” on page 3-40 and “Ports – Serial” on page 3-47.

...CMR Messages

1. Click **Configuration ▶ Receiver**.
2. Click the *Base* tab, set the following parameters and click **Apply**:
 - GPS/GLO at one time
 - L1 to L2 Antenna Phase Center offsets
 - L1 to L2 Antenna Phase Center offsets
 - CMR settings
3. Enter the latitude, longitude, and altitude (ellipsoidal height) coordinates of the antenna position in the selected datum using one of the following methods.
 - If the Reference Geodetic Coordinates are known, enter the coordinates.
 - Enable *Averaged* and enter the *Averaged Span* in seconds. Click **Apply** then **OK**. Click **Tools ▶ Reset receiver** and wait until the specified interval completes. Examine the Base coordinates on the *Base* tab, they should correspond to the coordinates obtained from the average.
 - Click **Get from receiver** to use the current antenna position (that is, the most recent position produced by the receiver).
4. Click the *Ports* tab. On the *Serial* tab, set the following parameters for the port from which to generate CMR messages and click **Apply** then **OK**:
 - Input – select Command
 - Output – select one of the CMR message types
 - Period
 - Baud rate
 - RTS/CTS – enable if modem supports hardware handshaking

For details on the Base tab and Ports tab settings, see “Base” on page 3-40 and “Ports – Serial” on page 3-47.

How to Configure Rover Station for Accepting...

The Rover station receives messages that contain correction information from the Base station. Topcon receivers support industry standard RTCM and CMR message formats.

...RTCM Messages in DGPS mode

1. Click **Configuration ▶ Receiver**.
2. Click the *Rover* tab, set the following parameters and click **Apply**:
 - Positioning Mode – enable DGPS (Code Differential).
 - Multi-base – adjust settings if using two to five Base stations.
 - Use the default values for the remaining settings.
3. Click the *Ports* tab. On the *Serial* tab, set the following parameters for the port on which to accept RTCM messages and click **Apply** then **OK**:

• Input – select RTCM	• RTS/CTS – enable if modem supports hardware handshaking
• Output – select None	
• Baud rate	

For details on the Rover tab and Ports tab settings, see “Rover” on page 3-44 and “Ports – Serial” on page 3-47.

...RTCM Messages in RTK mode

1. Click **Configuration ▶ Receiver**.
2. Click the *Rover* tab, set the following parameters, and click **Apply**:
 - Positioning Mode – enable RTK Fixed.
 - Use the default values for the remaining settings.
3. Click the *Ports* tab. On the *Serial* tab, set the following parameters for the port on which to accept RTCM messages and click **Apply** then **OK**:

• Input – select RTCM	• RTS/CTS – enable if modem supports hardware handshaking
• Output – select None	
• Baud rate	

For details on the Rover tab and Ports tab settings, see “Rover” on page 3-44 and “Ports – Serial” on page 3-47.

...CMR Messages

1. Click **Configuration ▶ Receiver**.
2. Click the *Rover* tab, set the following parameters, and click **Apply**:
 - Positioning Mode – enable RTK Fixed.
 - Use the default values for the remaining settings.
3. Click the *Ports* tab. On the *Serial* tab, set the following parameters for the port on which to accept CMR messages and click **Apply** then **OK**:

• Input – select CMR	• RTS/CTS – enable if modem supports hardware handshaking
• Output – select None	
• Baud rate	

For details on the Rover tab and Ports tab settings, see “Rover” on page 3-44 and “Ports – Serial” on page 3-47.

How to Set Raw Data & Position Update Rates to 20 Hz

This procedure will set the receiver to output measurement data and position information at 20 Hz.

1. Click **Tools ▶ Receiver options**.
2. Make sure that the “Position update rate (Hz)” and “Raw data update rate (Hz)” options display 20 in the *Current* column, then click **Exit**.
3. Click **Configuration ▶ Receiver**.
4. Click the *Advanced* tab then the *Raw Data Management* tab, set the following parameters, and click **Apply** then **OK**:
 - Raw Measurement Update Rate, Update Rate – set to 50 ms.
 - Position Update Rate, Update Rate – set to 50 ms.
5. Click **Refresh** and examine the values in the *Current Update Rate* fields, they should display 50.

When requesting any data recording or output with a period—that is, a recording or output not directly supported by the current state of the receiver—PC-CDU will launch the Output Period Setup Wizard. This wizard will perform the same steps described above. For details on the wizard, see Appendix D.

How to Enable a 1 PPS Output

For precise time information for synchronization or time transfer, enable 1PPS output. 1PPS signals provide a precise time reference for external devices.

1. Click **Configuration ▶ Receiver**.
2. Click the *Events* tab, set the following parameters, and click **Apply**:
 - PPS A Enabled
 - Period
 - Offset (ms)
 - Offset (ns)
 - Period of ‘marked’ pulses (if required)
 - Edge
 - Ref. Time
 - Tied with Ref. Time
3. Repeat step 2 to enable the PPS B output (if required).

For details, see “Events” on page 3-56.

How to Enable an Event Marker Input

To have the receiver precisely record the time that an external event occurs, enable event marker input. The source of events may be an aerial camera, sounding equipment, etc.

1. Click **Configuration ▶ Receiver**.
2. Click the *Events* tab, set the following parameters, and click **Apply**:
 - Event A Enabled
 - Clock Synchronization (leave default)
 - Edge
 - Ref. Time
 - Tied with Ref. Time
3. Repeat step 2 to enable the Event B input (if required).

For details, see “Events” on page 3-56.

How to Output Position in a Pre-defined Datum

Pre-defined datums are those embedded in the receiver firmware. TPS receivers contain more than 200 pre-defined datums.

1. Click **Configuration ▶ Receiver**.
2. Click the *Positioning* tab, select the desired datum ID from the *Current Datum* drop-down list, and click **Apply**.



To view or log the receiver position in the selected datum, use NMEA messages, for example GGA.

How to Output Position in a User-defined Datum

Selecting a user-defined datum will set up the receiver to compute a position using defined ellipsoid and transformation values.

1. Click **Configuration ▶ Receiver**.
2. Click the *Positioning* tab and click **Datum Parameters** to set the following parameters:
 - Current Datum – select USER.
 - Enter the corresponding values in the *Reference Ellipsoid parameters* and *Transformation parameters* fields.
3. Click **Apply** then **OK**.
4. Click **Apply** on the *Positioning* tab.



To view or log the receiver position in the selected datum, use NMEA messages, for example GGA.

For more details on these settings, see “USER Datum Parameters” on page 3-38.

How to Restore Receiver Default Settings

To restore the receiver's default settings, do one of the following:

- Click **Configuration ▶ Receiver**. Click **Set all parameters to defaults**.
- Click **Tools ▶ Clear NVRAM**.



Clearing the NVRAM causes the receiver to delete any data stored in its nonvolatile memory, including receiver parameters, ephemeris and almanac data, and receiver position. No raw data files will be deleted.

How to Check Firmware Version

You may need to know the firmware version of the GPS receiver in certain situation, such as troubleshooting with TPS customer support or determining which new firmware to upload.

1. Click **Help ▶ About**. The *About PC-CDU* dialog box displays.
2. Record the *Firmware version* field and click **OK** when done.

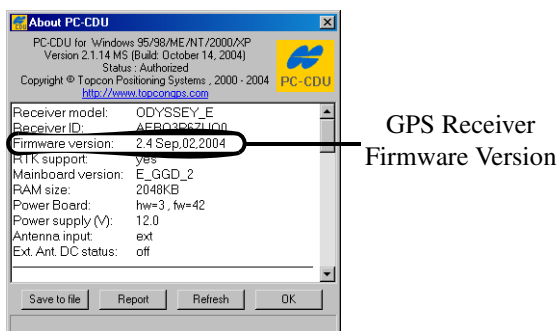


Figure 2-3. Check GPS Receiver Firmware Version

How to Check Receiver Options

Receiver options enable or disable the various features available for the receiver. Options can be purchased or leased.

1. Click **Tools ► Receiver options**. The *Option Manager* dialog box displays and 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 purchased.
 - Leased – if the option is leased or not leased.
 - Expiration date – the date a leased option will be disabled, if applicable.
2. When finished, click **Exit** to close this dialog box.

How to Load New OAF to Receiver

The Option Authorization File (OAF) contains the permissions needed to enable (through a purchase or lease) the features available for the receiver.

1. Click **Tools ► Receiver options**.
2. Click **Load** at the bottom of the *Option Manager* dialog box.
3. Navigate to the location of the new Option Authorization File. OAFs have .tpo or .jpo extensions and are unique to each receiver.
4. Select the appropriate file and click **Open**. The new receiver options will load onto the receiver and the *Option Manager* table will update.
5. When finished, PC-CDU will restart the receiver to activate new values for the options.

How to Disconnect from the Receiver

Disconnecting from the receiver before exiting PC-CDU will prevent management issues with the port PC-CDU used to access the receiver.

1. Click **File ▶ Disconnect**.
2. Click **File ▶ Exit**.

PC-CDU Software Reference

This chapter provides detailed reference information on the Main window, dialog boxes, tabs, parameters, and settings found throughout the PC-CDU software interface.

Elements of the Main Window

After PC-CDU has established a connection between the computer and receiver, the Main window displays (Figure 3-1). This window has three areas: the Menu bar, the Satellites and Position area, which is the largest part of the window, and the Status bar.

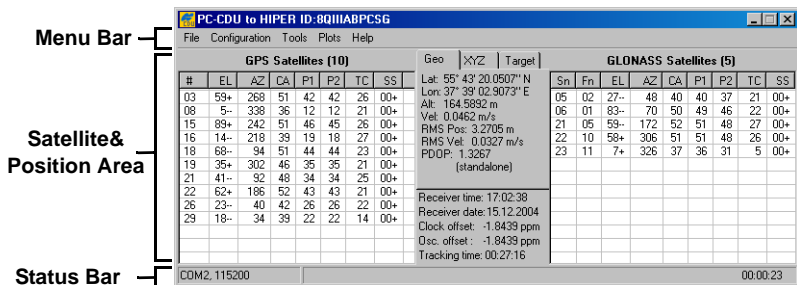


Figure 3-1. Main Window

Menu Bar

The Menu bar extends across the top of the Main window and contains five menus (File, Configuration, Tools, Plots, and Help) through which to access program functions. Alternatively, you can use the shortcut keys (if available). The menu options are discussed in more detail in later sections.

Satellites and Position Area

The Satellites and Position area comprises of two panels, the GPS Satellites panel on the left and the GLONASS Satellites on the right. Between the two panels is the Geo|XYZ|Target box. The panels display basic tracking information (parameters) for locked satellites. These tracking parameters are described in Table 3-1. The Geo|XYZ|Target box displays the antenna's current position (if available) and time-frequency parameters.

Table 3-1. Tracking Parameters Displayed in the Satellites Panels

Column	Description
#	GPS SV PRN. If the character “*” is shown next to PRN in the column, this means that almanac data are unavailable for the corresponding satellite.
Sn	GLONASS SV Orbital Slot Number. If the character “*” is shown next to Sn in the column, this means that almanac data are unavailable for the corresponding satellite.
Fn	GLONASS SV Frequency Number.
EL	Elevation angle in degrees. The signs “+” and “-” immediately following the elevation angle indicate that the corresponding satellites are either ascending or descending, respectively. If a satellite is at maximum elevation, it is marked with “^”.
AZ	Azimuth in degrees.
CA	Signal-to-Noise Ratio (C/No) in the C/A channel [dB*Hz].
P1	Signal-to-Noise Ratio (C/No) in the P1 channel [dB*Hz].
P2	Signal-to-Noise Ratio (C/No) in the P2 channel [dB*Hz].
TC	Time elapsed since the last loss-of-lock in the C/A channel for the corresponding satellite. This time is given in minutes or, if the symbol “:.” is specified in the column, in seconds.
SS	Satellite navigation status. For a complete description of the satellite navigation status structure, see Appendix D on page D-1. If a satellite is not used in position computation, its SS flag will be set to “-”. Otherwise “+” will be displayed.

The satellites panels have the following functionality

- Double question marks (??) will display in the cells of a column when parameters are unavailable for the satellite.
- Click the column's heading to sort data in descending/ascending order.

The Geo|XYZ|Target box has the following tabs (Figure 3-2):

- Geo – displays the current position of the receiver's antenna and the time-frequency parameters describing the behavior of the receiver's local oscillator.
- XYZ – displays the position of the antenna in Cartesian coordinates.
- Target – displays various navigational information.

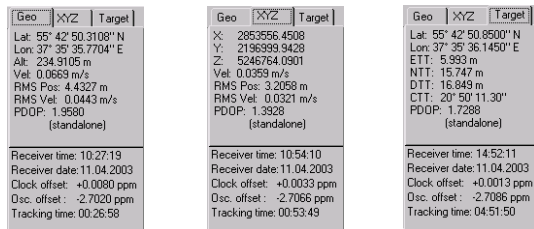


Figure 3-2. Geo|XYZ|Target Tabs

Table 3-2 provides a description of each of the values in these tabs.

Table 3-2. Elements of the Geo|XYZ|Target Tabs

Field	Description
Geo tab related fields ^a	
Lat	Geodetic latitude of the receiver antenna.
Lon	Geodetic longitude of the receiver antenna.
Alt	Ellipsoidal height of the receiver antenna.
XYZ tab related fields	
X	Earth-Centered-Earth-Fixed WGS-84 X coordinate of the receiver antenna.

Table 3-2. Elements of the Geo|XYZ|Target Tabs (Continued)

Field	Description
Y	Earth-Centered-Earth-Fixed WGS-84 Y coordinate of the receiver antenna.
Z	Earth-Centered-Earth-Fixed WGS-84 Z coordinate of the receiver antenna.
Target tab related fields	
Lat	Geodetic latitude of the target or of the receiver's antenna.
Lon	Geodetic longitude of the target or of the receiver's antenna.
ETT	Easting-to-Target in the local system with the origin at the receiver.
NTT	Northing-to-Target in the local system with the origin at the receiver.
DTT	Distance-to-Target.
CTT	Course-to-Target.
Geo and XYZ tabs common fields	
Vel	(Magnitude of the) velocity (m/s).
RMS Pos	RMS position error (m). More precisely, this is the square root of the trace of the position error covariance matrix.
RMS Vel	RMS velocity error (m/s). More precisely, this is the square root of the trace of the velocity error covariance matrix.
Geo, XYZ, and Target tabs common fields	
PDOP	Position Dilution of Precision.
Solution type	Standalone, Code differential, RTK float, or RTK fixed.
LQ	<p>This field reflects the status of the received differential messages and contains the following information:</p> <ul style="list-style-type: none"> • Data link quality in percentage • Time (in seconds) elapsed since the last received message • Total number of received correct messages • Total number of received corrupt messages

Table 3-2. Elements of the Geo|XYZ|Target Tabs (Continued)

Field	Description
LQ (continued)	If the receiver is not (for some reason) receiving differential corrections or if none of the ports has been configured to receive differential corrections, the LQ field will either be empty or it will look like this: 100%(999,0000,0000). Currently the values for this field are obtained from the [MS] message.
Receiver time	This field shows the receiver's current time within the day. This value is taken from the message [~~] ^b . For more information about [~~], refer to the <i>GRIL Reference Manual</i> .
Receiver date	This field shows the receiver's current date as specified in the corresponding [RD] message.
Clock offset	This field describes the time derivative of ($T_r - T_{tr}$), where T_r designates the receiver time and T_{tr} designates the receiver reference time. For more information about T_r and T_{tr} refer to the <i>GRIL Reference Manual</i> . This parameter is obtained from the [DO] message and is expressed in parts per million (ppm).
Osc. offset	The parameter describes the difference between the VCO's nominal and quiescent frequencies. It is derived from the message [OO] and is expressed in ppm.
Tracking time	This field shows the time elapsed since the last complete loss-of-lock event in the receiver's C/A channels as specified in the corresponding [TT] message.

- a. These geodetic coordinates are always computed in WGS-84.
- b. Currently, the message [~~] reports the time within day in GPS time scale only.

The Geo|XYZ|Target box has the following functionality

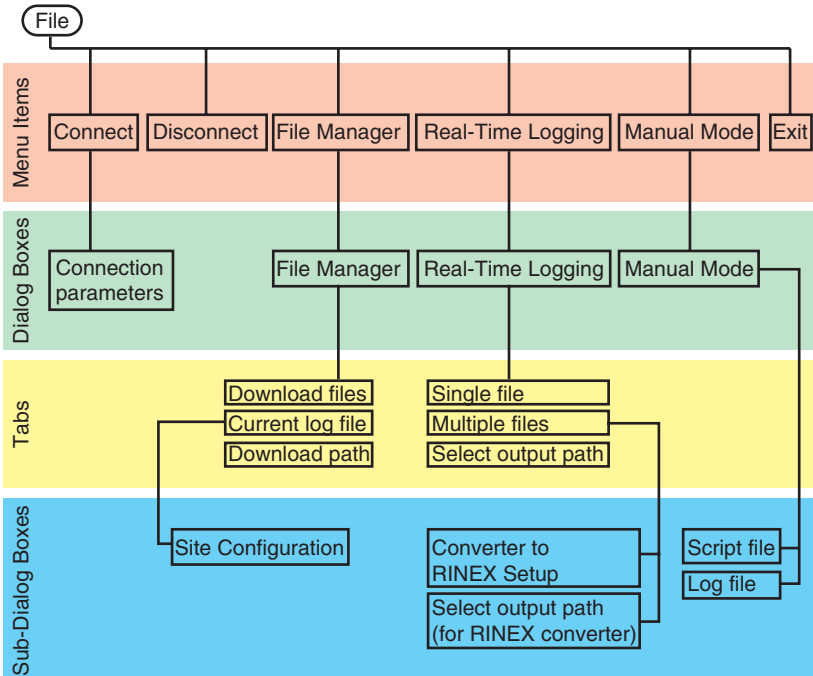
- To set the target coordinates equal to the current receiver coordinates, double-click on the Lat or Lon field of the Target tab.
- To reset the timer to 00:00:00, double-click somewhere in the hour:min:second area.

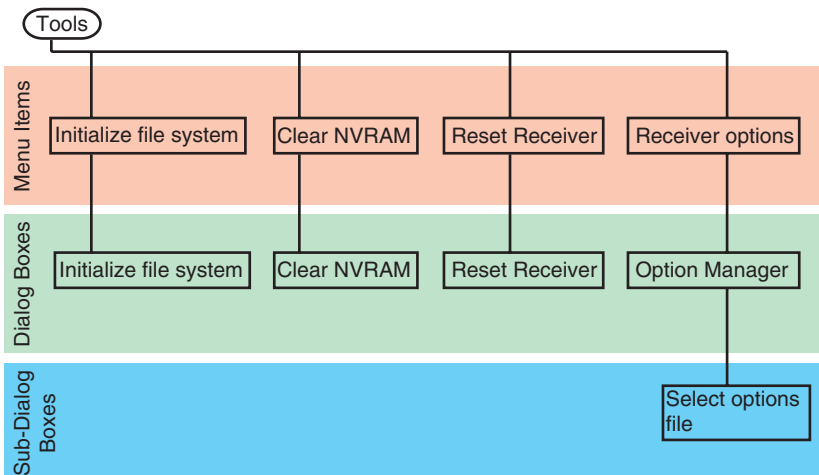
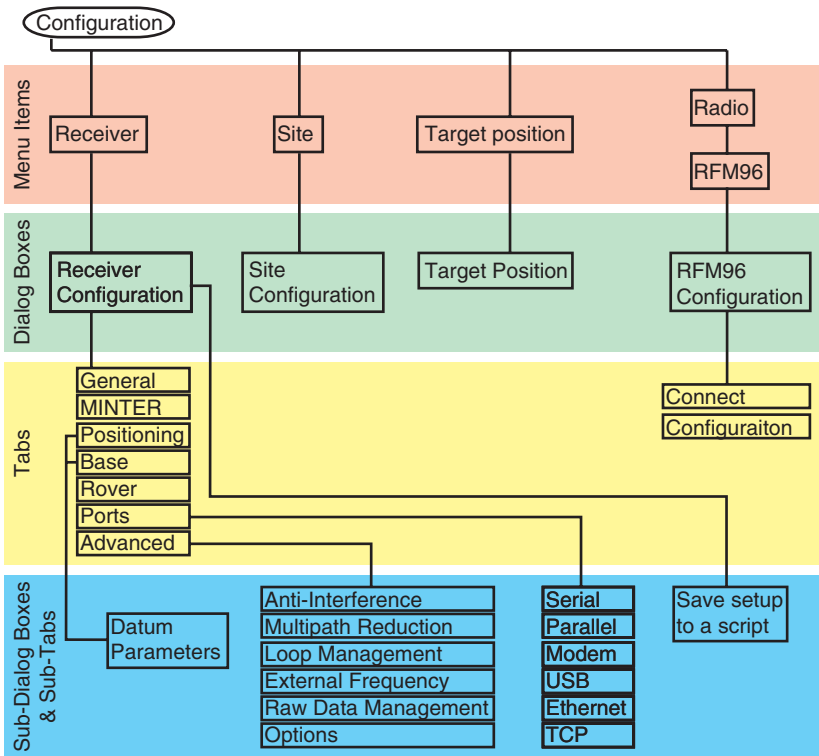
Status Bar

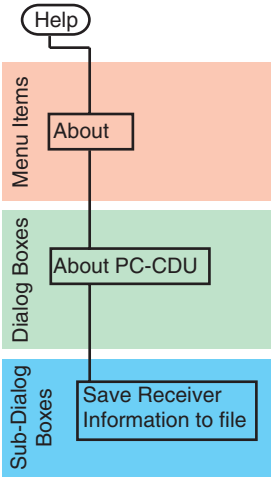
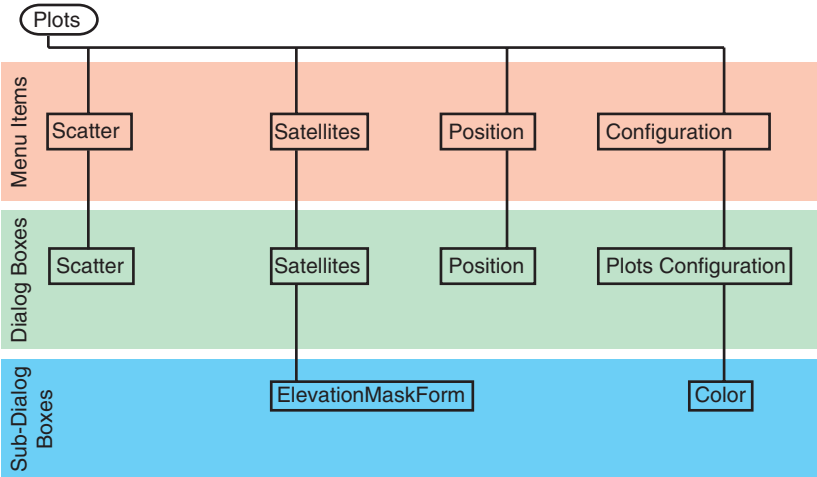
The *Status bar* provides auxiliary information while using PC-CDU. This information includes the connection status, current communication settings, various types of messages (for example, error messages) and time since the connection to the receiver has been established.

Quick Menu Reference

The following graphs show the menu structure for the five PC-CDU menus. The remaining sections in this chapter describe these menus, options, and parameters in detail.







File Menu

The File menu contains options for connecting with/disconnecting from the receiver, managing the download and real-time logging of data files, putting the receiver in Manual Mode, and exiting the program.

Connect

The *Connection Parameters* dialog box contains parameters for establishing a connection between the receiver and a computer.

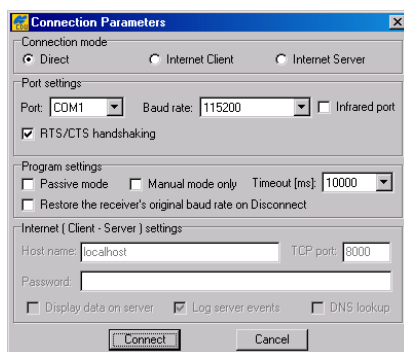


Figure 3-3. Connection Parameters

See “Starting PC-CDU” on page 1-6 for more information on the parameters available for connection.

Disconnect

The Disconnect menu option closes the connection between a receiver and computer.



Disconnecting the receiver from the computer before exiting prevents conflicts with serial port management.

See “Closing PC-CDU” on page 1-25 for more information.

File manager

The *File Manager* dialog box manages data logging and log files collected with a TPS receiver.

Download Files

The *Download files* tab displays files for download to a computer or deletion from the receiver's memory.

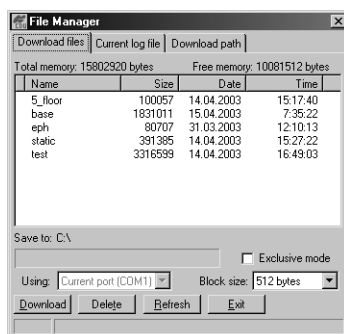


Figure 3-4. Download Files

The upper portion of the *Download files* tab has the following fields:

- Total memory – the total amount of memory available in the connected receiver.
- Free memory – the amount of memory currently available in the connected receiver.

The primary portion of the *Download files* tab has the following fields:

- Name – the name of the log file.
- Size – the size of the log file.
- Date – the date the log file was recorded.
- Time – the time the log file was recorded.
- Download status – during a download session, indicates the following status of the file(s) being downloaded:
 - Blue icon: during download, indicates that the file is in the queue for downloading.

- Red icon: during download, indicates that the file is currently being downloaded.
- Green icon: during download, indicates that the file was successfully downloaded.

The lower portion of the *Download files* tab has the following fields:

- Save to – the path and location on the computer to which files will be downloaded. Use the *Download path* tab to select the location.
- Exclusive mode – when enabled, increases the speed of data transfer, especially if a baud rate of 115200 or higher has been set. Using this option will disable most processes running inside the receiver (including the satellite tracking process) in order to ensure the highest possible file transfer speed. PC-CDU will automatically close the current log file before downloading.

When disabled, the current log file can be downloaded without being closed. This means that the download process will proceed until the “end-of-file” point has been reached; however, new data will continue to be logged to the file. This can cause the following when downloading a file:

- Occasionally cause the download indicator to display values greater than 100%.
- Cause the last record in the downloaded file to be corrupt.
- Using – the computer port used for downloading files (the same port used to connect with the receiver and computer).
- Block size – the amount of data, in bytes, to download at a time.

The buttons on the *Download files* tab have the following functions:

- Download – begins the download process for selected log files. A download path must be specified before beginning the download process. See “Download Path” on page 3-15 for details.
- Stop – stops the download process.
- Delete – deletes the selected log files. Inadvertently deleted log files can be retrieved if the receiver has not been initialized or its NVRAM cleared.
- Refresh – reloads the list of log files.
- Exit – closes the ***File Manager*** dialog box.

To select log files for downloading or deletion, use one of the following methods:

- For adjacent files, click the first file. While holding the **Shift** key, click the last file. All files between the two selected files will also be selected.
- For a non-adjacent files, click the first file. While holding the **Ctrl** key, click each desired file.

When downloading log files from a receiver, the files will retain their original names and PC-CDU checks the destination folder for existing files of the same name. If the destination folder already contains a file with the same name as a file being downloaded, PC-CDU will ask to overwrite the existing file or append new data to the existing file.

- If overwriting a file, the new file will replace the current file.
- If appending a file, the contents of the new file will be added onto the contents of the existing file.



Typically, only use the Append option if the download process has been interrupted and is now resuming.

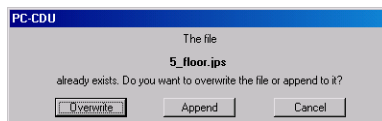


Figure 3-5. Overwrite Confirmation Message

The status bar at the bottom of the *Download files* tab displays error and other messages on the download status of log files.

Current Log File

The *Current log file* tab displays current files and has fields for creating new files.

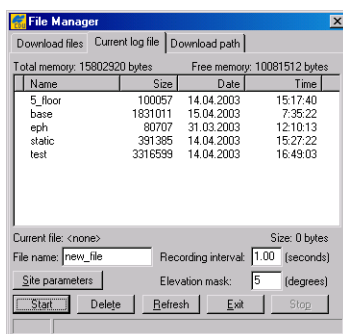


Figure 3-6. Current Log File

The upper and primary portions of the *Current log file* tab have the same fields as the *Download files* tab. See “Download Files” on page 3-10 for details.

The lower portion of the *Current log file* tab has the following fields:

- Current file – the name of the file that data is being logged to.
- Size – the size of the current log file.
- File name – either the entered name of a new file or the name of a selected file (double-click the file to select it for this field).
- Recording interval – the time in seconds between logging recording. If the receiver does not support the entered interval, the Output Period Setup Wizard will launch (see Appendix D for details).
- Site parameters – opens the *Site Configuration* dialog box. See “Site Configuration” on page 3-14 for details.
- Elevation mask – the minimum angle above the horizon, in degrees, for satellites from which the receiver will record data.

The bottom row of buttons on the *Current log file* tab have the same functions as those on the *Download files* tab. See “Download Files” on page 3-10 for details.

Site Configuration

The *Site Configuration* dialog box applies antenna parameters to the pccdu.ini file for data logging purposes.

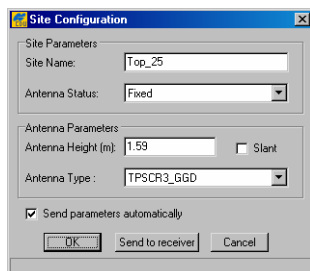


Figure 3-7. Site Configuration

- Site Name – the name of the jobsite (up to 20 alphanumeric characters).
- Antenna Status – the status of the antenna; either fixed or moving.
- Antenna Height – the height of the antenna measured from the survey marker to the measuring mark on the antenna (either ARP or SHMM).
- Slant – if selected, indicates that the height of the antenna was measured at a slant (to the slant height measurement mark). When not selected, indicates a vertical measurement (to the antenna reference point).
- Antenna Type – the type of antenna.
- Send parameters automatically – sends site and antenna parameters to the receiver each time a log file is created.
- OK – copies the settings to the pccdu.ini file and closes the dialog box. After clicking Start on the *File Manager* dialog box, these settings will be enabled and inserted into the newly created log file (unless *Send parameters automatically* has been disabled).
- Send to receiver – sends new site parameters to the receiver log file and the pccdu.ini file during logging.
- Cancel – closes the dialog box without saving the settings.

Download Path

The *Download path* tab displays the destination path and folder in which to download files.



Figure 3-8. Current Log File

- Left panel – contains the computer's hard drive directory and associated folders. Use the directory tree to navigate to the desired location in which to download log files.
- Right panel – displays the files currently in the selected folder.
- Drive selection – selects the drive that contains the location in which to download files.
- New folder – specifies the name of a new folder.
- Create – creates a folder with the entered name on the selected drive.

Files will be stored in the last specified download path.

Real-Time Logging

The *Real-Time Logging* dialog box starts/stops logging data directly to a computer connected to a TPS receiver.

Real-Time Logging

Single file | Multiple files | Select output path

Save to:

Output path: c:\PC-CDU\2_1_14\TPS

#	EL	AZ	CA	P1	P2	TC
03	24+	296	42	27	27	1
06	33--	130	46	32	31	1
10	11--	38	38	16	16	1
15	44+	246	49	38	38	1
16	47--	252	50	38	39	1
18	43+	170	48	36	36	1
21	83--	112	51	44	44	1
22	16+	190	42	23	22	1
26	20+	86	42	23	23	1
27	7+	354	37	15	15	1
29	23+	74	43	25	25	1

Sn	Fn	EL	AZ	CA	P1	P2	TC
05	02	24--	36	40	39	37	1
06	01	71--	90	51	49	45	1
21	05	58--	128	51	51	47	1
22	10	64+	312	52	51	49	1
23	11	10+	310	39	38	34	1

Receiver Position

X: 2850716.3464
Y: 2199374.2582
Z: 5247221.5765
Vel: 0.0551 m/s
PDOP: 1.3109
Receiver date: 16.12.2004
Receiver time: 15:22:29
Elapsed time: 00:00:00
Received:

Recording interval: (seconds) Site parameters: Elevation mask: (degrees)

Figure 3-9. Real-Time Logging

- **GPS Satellites** – displays information on signals from GPS satellites. See “Elements of the Main Window” on page 3-1 for more information.
- **Receiver Position** – along with information from the *Geo* tab (see “Elements of the Main Window” on page 3-1 for more information), the following log file details display:
 - **Elapsed time**: the amount of time that has passed since the current log file opened. The time is reset to 00:00:00 for each new file.
 - **Received**: the size of the log file in bytes. Click **Stop** to view the final size of the log file.
- **GLONASS Satellites** – displays information on signals from GLONASS satellites. See “Elements of the Main Window” on page 3-1 for more information.
- **Recording interval** – the time in seconds between logging recording. If the receiver does not support the entered interval, the Output Period Setup Wizard will launch (see Appendix D for details).

This setting only affects files recorded in this mode.

- Site parameters – opens the *Site Configuration* dialog box. See “Site Configuration” on page 3-14 for details.
- Start/Stop – starts or stops recording data to the file. When stopping data logging, the file will also be closed.
- Exit – closes the dialog box.
- Elevation mask – the minimum angle above the horizon, in degrees, for satellites from which the receiver will record data. This setting also affects the Terminal Elevation Mask setting (see “General” on page 3-27 for further information on this setting).



In real-time data logging mode, enable the RTS/CTS handshaking checkbox and set the baud rate to 115200 or higher when connecting the receiver and computer.



Unlike downloading recorded log files from the receiver onto the computer, real-time data logging does not use error detection/correction protocol in the course of the data transfer. As a result, some messages in the created TPS files may be corrupt (due to the serial port overrun or similar problems); that is, some of the transferred bytes may be lost on the computer end.

Single File

The *Single file* tab displays satellite and log file information, as well as applies file parameters to a single file during real-time data logging to the computer.

Real-Time Logging

Single file | Multiple files | Select output path |

Save to:

Output path: c:\PC-CDU\2_1_14\TPS

#	EL	AZ	CA	P1	P2	TC
03	24+	296	42	27	27	1
06	33-	130	46	32	31	1
10	11-	38	38	16	16	1
15	44+	246	49	38	38	1
16	47-	252	50	38	39	1
18	43+	170	48	36	36	1
21	83-	112	51	44	44	1
22	16+	190	42	23	22	1
26	20+	86	42	23	23	1
27	7+	354	37	15	15	1
29	23+	74	43	25	25	1

Receiver Position

X: 2850716.3464
 Y: 2199374.2582
 Z: 5247221.5785
 Vel: 0.0551 m/s
 PDOP: 1.3109
 Receiver date: 16.12.2004
 Receiver time: 15:22:29
 Elapsed time: 00:00:00
 Received:

Sn	Fn	EL	AZ	CA	P1	P2	TC
05	02	24-	36	40	39	37	1
06	01	71-	90	51	49	45	1
21	05	58-	128	51	51	47	1
22	10	64+	312	52	51	49	1
23	11	10+	310	39	38	34	1

Recording interval: (seconds) Site parameters Elevation mask: (degrees)

Figure 3-10. Real-Time Logging – Single File

Along with the fields and button discussed in “Real-Time Logging” on page 3-16, the *Single file* tab has the following fields:

- Save to – the name of the file in which to log data. By default, this name will be the same as the name entered in the *Site Configuration* dialog box.
- Output path – the location in which files will be saved. See “Select Output Path” on page 3-23 for selecting this location.

Multiple Files

The *Multiple files* tab displays satellite and log file information, as well as applies file parameters to a multiple files during real-time data logging to the computer.

Real-Time Logging

Single file: ☐ Multiple files: ☒ Select output path:

Prefix: Numbering: Ascending Count New file every: 1 hours ☒ Autoconvert to RINEX

Current file: Start Count: 0 ☒ Overwrite existing files

Output path: c:\PC-CDUV2_1_14\TPS

GPS Satellites (11)

#	EL	AZ	CA	P1	P2	TC
03	26+	236	45	27	27	5
06	31-	132	45	30	30	5
10	9-	38	36	14	13	5
15	46+	246	49	39	38	5
16	46-	250	49	38	38	5
18	45+	168	49	37	37	5
21	82-	102	51	45	44	5
22	18+	192	41	23	23	5
26	21+	84	41	25	25	5
27	7+	352	37	14	14	5
29	23+	72	42	25	25	5

Receiver Position

X: 2850715.9712
Y: 2199374.2316
Z: 5247221.3264
Vel: 0.0622 m/s
PDOP: 1.3352
Receiver date: 16.12.2004
Receiver time: 15:26:44
Elapsed time: 00:00:00
Received:

GLONASS Satellites (5)

Sn	Fn	EL	AZ	CA	P1	P2	TC
05	02	22-	36	39	38	36	5
06	01	70-	84	51	49	45	5
21	05	55-	130	52	50	47	5
22	10	67+	310	52	51	49	5
23	11	12+	310	39	38	35	5

Recording interval: 1.00 (seconds) Elevation mask: 5 (degrees)

Figure 3-11. Real-Time Logging – Multiple Files

Along with the fields and button discussed in “Real-Time Logging” on page 3-16, the *Multiple files* tab has the following fields:

- **Prefix** – the beginning part of the name for each file. By default, the site name entered in the *Site Configuration* dialog box will be used.
- **Numbering** – the numbering scheme for file names. This number will be added to the prefix of the file name.
 - **Date & Time:** YDDDHHMM; where “Y” is the last digit of the current year, “DDD” is the day of the year, “HH” is the hour in the receiver time scale, and “MM” is the minutes in the receiver time scale.
The date and time used for the filename corresponds to the first epoch recorded into the file
 - **Ascending Count:** the numeric portion of the file name will vary between 0000 and $2^{31} - 1$. This number will increase by one with each file. (Selecting this option enables *Start Count*.)

- New file every – the interval between closing one file and opening the next file. Note that files may be shorter than the interval entered in these fields.
 - Enter an integer to measure the interval.
 - Select the unit of time (day, hour, or minute).
- Autoconvert to RINEX – automatically converts new TPS files to RINEX after closing the file. Some agencies and third-party software only process RINEX files.



The “tps2rin.exe” file is required for the Autoconvert to RINEX function to work properly.

- Current file – the name of the current file being recorded.
- Start count – enabled when Ascending Count selected, the first number to use for file counts. This number is added to the prefix to create file names.
- Overwrite existing files – writes over existing files that have the same name as new files. A warning will display after clicking Start.

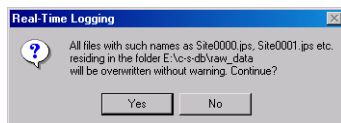


Figure 3-12. Overwrite Existing Files?

- Setup converter – accesses setup options for the tps2rin.exe converter. For more information, see “Converter to RINEX Setup” on page 3-21.
- Output path – the location in which files will be saved. See “Select Output Path” on page 3-23 for selecting this location.

Figure 3-13 on page 3-21 shows an example of recording multiple files. The graph shows a time scale divided into intervals equal to the period specified in the *New file every* fields. After clicking Start, the file records the time and file name and begins logging data. Once the time interval has been reached, the file will be closed and a new file

will open. The time duration of the second and all following files will equal the selected file period.

After clicking Stop, PC-CDU will close the last file. Because the end of the time interval may not have been reached, the last file can be shorter than previous files.

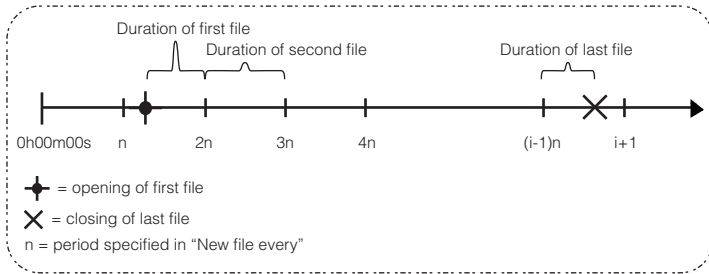


Figure 3-13. Generation of Multiple Files

Converter to RINEX Setup

The *Converter to RINEX Setup* dialog box applies options to the tps2rin.exe converter for the TPS file-to-RINEX data conversion.

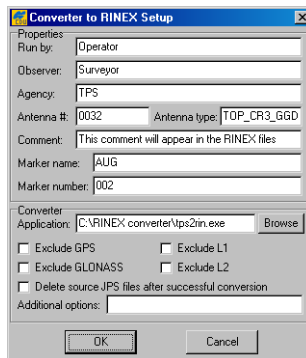


Figure 3-14. Converter to RINEX Setup

Information entered here will be included in the header of the corresponding RINEX files.

- Run by – name of the person or agency launching the converter.
- Observer – name of the person collecting the data.
- Agency – name of the agency responsible for collecting the data.

- Antenna # – serial number of antenna. This number will be copied into the RINEX files.
- Antenna type – description of antenna (use only antenna names approved and standardized by NGS). This description will be copied into the RINEX files.
- Comment – further notes about the job. Any text entered here will appear in the header of each RINEX file to be generated.
- Marker name – survey marker name.
- Marker number – survey marker identification number.
- Application – the full path to the “tps2rin.exe” file.
- Browse – opens Windows Explorer for navigating to and selecting the “tps2rin.exe” file.
- Exclude GPS and Exclude GLONASS – during the conversion, leaves out all raw data measurements/ephemeris data corresponding to GPS and/or GLONASS satellites from the resulting RINEX files.
- Exclude L1 and Exclude L2 – during the conversion, leaves out all L1 and/or L2 raw data measurements from the resulting RINEX files.
- Delete source JPS files after successful conversion – remove the original *.tps files once the conversion to RINEX format successfully completes. Deleting source files (if raw data files are not required) after a successful conversion will save computer disk space.
- Additional options – applies any of the command-line switches available for the RINEX converter to modify the converter’s behavior. For more information about the switches, refer to the Free Software section on the TPS GPS website (<http://www.topcongps.com/software/tps2rin.html>).

Select Output Path

The *Select output path* tab displays the path (disc and folder) where logged raw data will be stored.

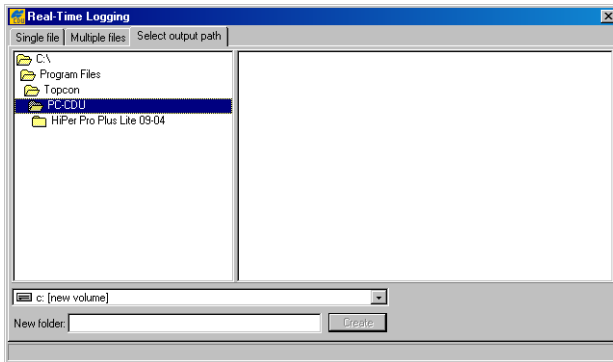


Figure 3-15. Real-Time Logging – Select Output File

- Left panel – contains the computer's hard drive directory and associated folders. Use the directory tree to navigate to the desired location in which to download log files.
- Right panel – displays the files currently in the selected folder.
- Drive selection – selects the drive that contains the location in which to download files.
- New folder – specifies the name of a new folder.
- Create – creates a folder with the entered name on the selected drive.

Files will be stored in the last specified download path.

Manual Mode

The **Manual Mode** dialog box provides an interface to manually send commands to a connected receiver and view the responses. For a complete list of commands TPS receivers support, refer to the *GRIL Reference Manual*.



Become familiar with the *GRIL Reference Manual* before sending commands via Manual Mode.

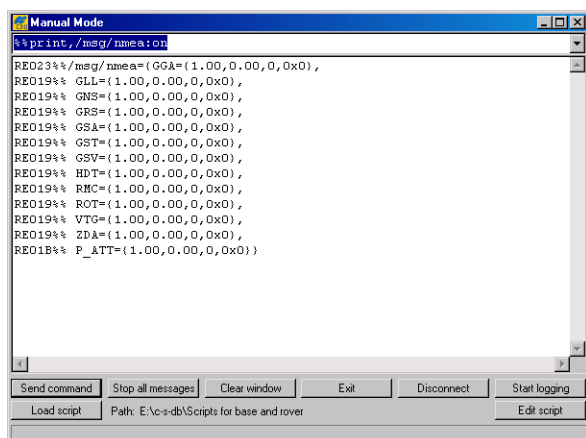


Figure 3-16. Manual Mode (with Sample Commands/Responses)

- Command line (and drop down box) – the currently entered command to send to the receiver. The drop-down box contains the last 20 command lines entered since connecting with the receiver.
- Main window – displays commands sent to the receiver and responses from the receiver.
- Send command – sends the entered/selected command to the receiver.
- Stop all messages – stops outputting messages from the receiver to the current terminal.
- Clear window – clears all messages from the main window.

- Exit – closes the dialog box.
- Disconnect – disconnects the computer and receiver and keeps any configuration changes.
- Start logging – copies the current Manual Mode session's commands and responses to a file on the computer.
- Load Script – sends a pre-recorded script file to the receiver. The location of a loaded script displays next to the button.



Script files make sending commands to the receiver a quick process.

- Edit Script – creates/modifies a script file of commands.

Exit

Closes PC-CDU.



Simply closing PC-CDU does not disconnect the receiver from the computer. For serial port management, click File ► Disconnect before exiting.

Configuration Menu

The Configuration menu contain options for configuring the receiver as a Base or Rover, configuring the receiver's ports, configuring raw data logging, configuring the internal and an external antenna, and entering target coordinates.

Receiver

The *Receiver Configuration* dialog box displays the receiver's current configuration, as well as provides fields and settings for editing a configuration for a job.

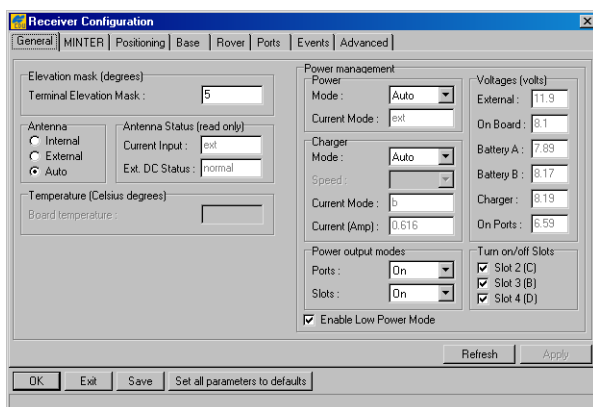


Figure 3-17. Receiver Configuration

Buttons common to all tabs include the following:

- Refresh – updates the current tab with the latest information from the receiver.
- Apply – sends configuration settings from the current tab to the receiver without closing the dialog box.
- Ok – sends configuration settings from all tabs to the receiver and closes the dialog box.
- Exit – closes the dialog box without saving changes (since the last time the Apply button was used).

- Save – saves the current receiver configuration to a script file.

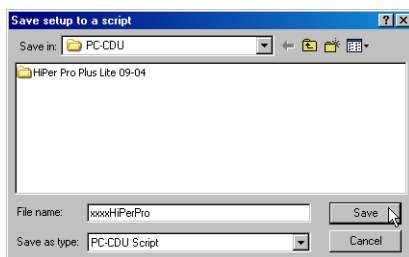


Figure 3-18. Save Setup to a Script

- Set all parameters to defaults – returns all settings to factory defaults.

General

The *General* tab contains basic antenna and power parameters common to all receiver configurations.

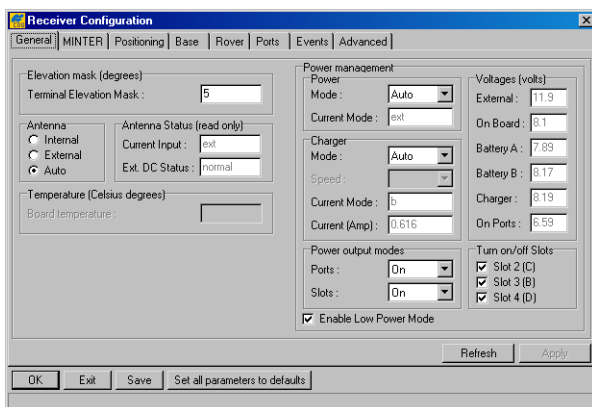


Figure 3-19. Receiver Configuration – General

- Elevation mask (degrees) – the minimum angle above the horizon, in degrees, for satellites from which the receiver will record data.

- **Antenna** – selects the antenna type, either *Internal*, *External*, or *Auto*. Table 3-3 lists the antenna type setting that corresponds to receiver types and board models.

Table 3-3. Antenna Type Settings for Receivers

Receiver Model	Board	Default Value	Allowed Values
any	JPS_3, Eurocard	external	internal, external
any	JPS_4 ^a , JPS_4_2 ^b	external	internal, external, auto
OEM	JGG20	unavailable	unavailable
OEM, LEGACY_H	HE_GG, HE_GD	unavailable	unavailable
HiPer, HiPer GD, HiPer GGD, HiPer+, HiPer Lite, HiPer Lite+, HiPer Pro, HiPer XT	HE_GG, HE_GD, HE_GGD, HE_GDL, HE_GGDL	auto	internal, external, auto
OEM, ODYSSEY_E	E_GGD, HE_GG, HE_GD, HE_GGD	unavailable	unavailable

- HiPer, Regency with JPS_4 board, and Odyssey with JPS_4 board receivers detect an external antenna only at start-up. To switch from internal to external antenna, power-cycle the receiver.
- Regency and Odyssey receivers with JPS_4_2 board automatically detect an external antenna.

- **Antenna Status** – shows the actual antenna the receiver uses.
 - **Current Input:** either “int” for internal antenna or “ext” for external antenna.
 - **Ext. DC Status:** shows if the external antenna draws DC power; either “off” for no power, “normal” for normal power, or “overload” if the antenna draws higher power than expected or a short circuit occurs in the antenna or antenna cable.

- Temperature – shows the receiver board's current temperature in degrees of Celsius.
- Power – selects and shows the source of power.
 - Mode: sets the desired power source for the connected receiver.
 - Auto – receiver will automatically select the power source.
 - Mix – receiver will automatically consume power from the source with the highest voltage.
 - Battery A – receiver will consume power only from battery A.
 - Battery B – receiver will consume power only from battery B.
 - External – receiver will use an external power supply.
 - Current mode: shows the current power source.
- Charger – applies charging settings for the battery.
 - Mode: the battery charging mode.
 - Off – receiver will not charge the batteries.
 - Charge A – receiver will charge only battery A.
 - Charge B – receiver will charge only battery B.
 - Auto – receiver will automatically detect and charge the detected batteries.
 - Speed: sets the speed for a battery charge cycle (not available for all receiver models); either “Normal” or “Fast”.
 - Current mode: displays the battery currently being charged.
 - Current (Amp): displays the actual battery charging current in Amperes.
- Power output modes – only applicable to Odyssey, Odyssey-E, and HiPer family receivers, governs power output to ports and slots.
 - Ports A, B: available for the Odyssey receiver, turns power on/off for ports A and B.

- Port C: available for the Odyssey receiver, turns power on/off for port C.
- Ports: governs power output on the serial ports.
 - On – when the receiver is turn on, the power board power all available serial ports. If the receiver is turn off, no power will be sent to the ports.
 - Off – power will not be powered, even if the receiver is turned on.
 - Always – all serial ports will be powered even if the receiver is turned off.
- Slots: governs power output to the receiver's internal slots.
 - On – when the receiver is on, all internal slots will receiver power. If the receiver is turned off, no power will be sent to the slots.
 - Off – internal slots will not be powered, even if the receiver is turned on.
 - Always – all internal slots will be powered even if the receiver is turned off.
- Voltages – the current power voltage state of the external power supply (only if connected), receiver board (actual voltage), batteries, charger (internal charger), and ports (first pin of each port).
- Turn on/off Slots – only applicable to Odyssey-E and HiPer family receivers, enables the corresponding internal slots.
- Enable Low Power Mode – enables the receiver's processor for low power consumption.

MINTER

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

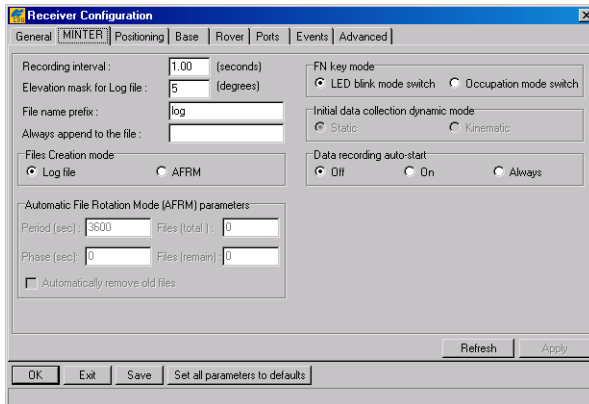


Figure 3-20. Receiver Configuration – MINTER

- Recording interval – specifies the interval to use for logging data after pressing the FN key. This parameter applies to both Log file and AFRM modes. If an incorrect recording interval is set for the connected receiver, the Output Period Wizard will start (see Appendix D for details). Values are 0 to 86400 seconds; the default is 1 second.
- Elevation mask for Log file – specifies the minimum angle for the satellites whose data will be logged after pressing the FN key. The default is 5 degrees.
- File name prefix – specifies the prefix added to data files after pressing the FN key. Log files have a “<prefix><month><day><sequential alphabet letter>” format. The prefix can be up to 20 characters long; the default is “log”.
- Always append to the file – specifies the name of an existing file to append new data to. The file name can be up to 20 characters.
- File Creation mode – determines the process for creating new files after pressing the FN key.
 - Log file: if enabled, closes the current log file; if disabled, opens a new log files.

- AFRM: if enabled, disables this mode; if disabled, enables this mode.
- Automatic File Rotation Mode (AFRM) parameters – closes current files and opens new files (file rotation) according to the entered parameters.
 - Period (sec): specifies the time duration for log files created in AFRM mode. Values are 60 to 86400; the default is 3600.
 - Phase (sec): specifies the constant time shifts of log files created in AFRM mode. Values are 0 to 86400; the default is 0 (zero).
 - Files (total): specifies the total number of files to create before turning off AFRM mode (not including the first file created). Values are 0 to $[2^{31}-1]$; the default is 0 (zero). A zero value will create an unlimited number of log files.
 - Files (remain): specifies the number of files remaining before AFRM mode turns off.
 - Automatically remove old files: when no memory remains, automatically removes the earliest log file. The receiver will erase the file with the earliest time/date. The default is disabled.
- FN Key mode – programs the receiver's reaction to the FN key.
 - LED blink mode switch: switches the receiver between standard and extended information modes.

In standard mode, the STAT LED shows tracking information.

In Extended Information Mode (EIM), the STAT LED shows the status of different internal modules and algorithms. Refer to the receiver's Operator's Manual for details.
 - Occupation mode switch: switches the receiver between static and kinematic survey modes. A message will be inserted into the log file indicating this switch.
- Initial data collection dynamic mode – specifies the starting occupation type, either Static or Kinematic. For Static mode, the log file will indicate "STOP"; for Kinematic mode, the log file will indicate "GO, TRAJECTORY".

- Data recording auto-start – programs how the receiver will behave in the event of power failure. If Always enabled, the receiver will automatically start logging data to a new or existing file in the following situations:
 - After turning on the receiver using the power key.
 - After resetting the receiver (using PC-CDU or the Reset key).
 - After taking the receiver out of sleep mode.

Table 3-4 describes receiver behavior and data logging in the event of power failure (“specified file” refers to the file name entered in the *Always append to file* field).

Table 3-4. Receiver Behavior Due to Power Failure

Before Power Failure	Enabled Radio Button Results		
	Off	On	Always
Data logged to file specified.	Data logging will not resume when power is restored.	Receiver will resume data logging to the same file when power is restored.	Receiver will resume data logging to the same file when power is restored.
Data logged to default file.	Data logging will not resume when power is restored.	A new log file will open when power is restored and data will log to this file.	A new log file will open when power is restored and data will log to this file.
Data logging not started and file specified.	No file will open with this name. Data logging will not start when power is restored.	No file will open with this name. Data logging will not start when power is restored.	A log file with this name will open and data logging will start after power is restored.
Data logging is off and no file specified.	Data logging will not start when power is restored.	Data logging will not start when power is restored.	A log file with a default name will open and data logging will start after power is restored.

Positioning

The *Positioning* tab contains parameters that correspond to elevation and PDOP masks, the satellites to track, and the measurements to use in position computation.

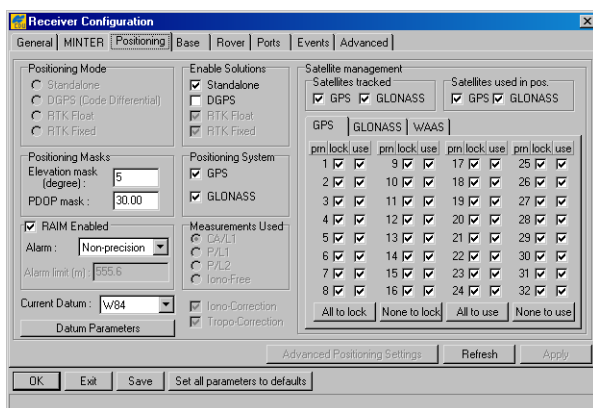


Figure 3-21. Receiver Configuration – Positioning

- **Positioning Mode** – selects a positioning mode for the receiver.
- **Positioning Masks** – specifies the elevation positioning mask for position computation and PDOP mask for disabling position computation.
 - **Elevation mask:** the minimum angle above the horizon, in degrees, for satellites from which the receiver will record data. The default is 5 degrees.
 - **PDOP mask:** the receiver will not compute positions over the corresponding epochs while PDOP exceeds the entered threshold value. The default is 30.
- **RAIM Enabled** – (Receiver Autonomous Integrity Monitoring) the receiver continuously checks whether or not signals received from satellites are usable. If a fault is detected, this parameter will exclude the satellite(s) from positioning calculations.
 - **Alarm:** specifies the alarm limit mode. “Non-precision” has an alarm limit of 0.3 nmi, “Terminal” has an alarm limit of 1.0 nmi, “En route” has an alarm limit of 2.0 nmi, and “Manual” sets a user-defined alarm limit.

- Alarm limit: specifies the threshold value for the horizontal radial error; RAIM will detect errors equal to or greater than the entered value.
Editable only available if “Manual” selected from the *Alarm* drop-down list, a range of 10.0 to 10000.0 meters can be entered. The default is 555.6 and corresponds to Non-precision approach.
- Current Datum – selects the datum to use in position computation. The default is WGS 84.
Currently, TPS receivers support more than 200 datums. Refer to the *GRIL Reference Manual* for a list of supported datums.
NMEA messages (such as, GGA, GLL, etc.) can be used to view the receiver position when computed in a datum other than WGS 84. Position-related TPS messages (for example, PV) always contain coordinates computed in WGS 84.
- Datum Parameters – opens the ***USER Datum Parameters*** dialog box for view and edit ellipsoid and transformation parameters.
Only user-defined and P90¹ datums can be edited. See “USER Datum Parameters” on page 3-38 for more information.
- Enable Solutions – selects the type of solution to use for Rover receivers.
 - Standalone: for a Rover receiver run in differential mode, reports the current standalone position if a DGPS (or RTK) position is unavailable in the current epoch.
 - DGPS (Code Differential): for a Rover receiver run in RTK Float or RTK Fixed mode unable to obtain an RTK solution at the current epoch, outputs the current code differential position.
If enabled and DGPS solution cannot be obtained, enable Standalone to have the receiver output single-point positions for the unavailable differential positions.

1. P90 is the datum ID for the GLONASS reference frame PZ-90 (PZ stands for *Parametry Zemli* or “Parameters of the Earth”).

This mode requires the Base (Reference) receiver to broadcast DGPS (not RTK) messages and the Rover receiver to receive these messages. If either of these requirements are not met, enabling DGPS (Code Differential) will have no effect.

- **Positioning System** – enables using either or both GPS/GLONASS satellite systems during position computation. The corresponding *Satellites used in pos.* parameter must also be enabled.
- **Measurements Used** – not available for single-frequency receivers, selects the code measurement to use when computing the receiver's standalone position. This parameter applies only to absolute position computation.
- **Iono-Correction** – pseudoranges will be corrected for ionosphere (based on the model defined in ICD-GPS-200, Revision C) before being used in position computation. This parameter applies only to absolute position computation.

If both *Iono-Free* and *Iono-Correction* fields are selected, the Iono-Free parameter overrides the Iono-Correction parameter.s

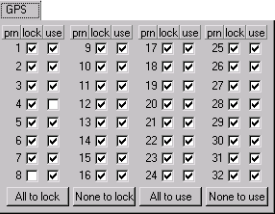
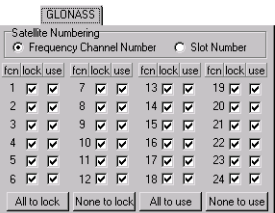
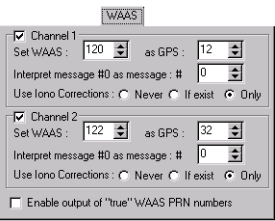
- **Topo-Correction** – pseudoranges will be corrected for troposphere before being used in position computation. This parameter applies only to absolute position computation.
- **Satellites tracked** – enables tracking either or both GPS/GLONASS satellite systems.
- **Satellites used in pos.** – enables using either or both GPS/GLONASS satellite in position computation.
- **GPS, GLONASS, and WAAS** – specifies the satellites to track and use for position computation.

Table 3-5 on page 3-37 describes the fields and parameters on these tabs.

The GPS and GLONASS tabs have the following common selections:

- All to lock and All to use – selects all satellites.
- None to lock and None to use – deselects all.

Table 3-5. Descriptions of GPS, GLONASS, and WAAS Tabs

<p>GPS tab</p> 	<ul style="list-style-type: none"> • prn – pseudo-random noise code numbers for GPS satellites. • lock – indicates that the satellite is enabled/disabled for tracking. • use – indicates that the satellite is enabled/disabled for using in position computations.
<p>GLONASS tab</p> 	<ul style="list-style-type: none"> • Frequency Channel Number – displays the <i>fcn</i> column • Slot Number – displays the <i>sat</i> column • fcn/sat – the frequency channel numbers or the slot numbers for GLONASS satellites. • lock – indicates that the satellite is enabled/disabled for tracking. • use – indicates that the satellite is enabled/disabled for using in position computations.
<p>WAAS (EGNOS) tab</p> <p>A WAAS/EGNOS-enabled receiver will simultaneously track two WAAS or two EGNOS satellites. Each satellite is allocated its own channel.</p> 	<ul style="list-style-type: none"> • Channel 1 and Channel 2 – specifies the settings for receiving WAAS (EGNOS)^a satellite signals. • Set WAAS (EGNOS) – associates a WAAS (EGNOS) PRN with a GPS PRN. • as GPS – the GPS PRN to associate the WAAS/EGNOS PRN with. • Interpret message #0 and message # – disables message 0 (zero). • Use Iono Corrections – applies an ionosphere correction mode. <ul style="list-style-type: none"> – Never: ignores any iono corrections. – If exist: all acquired satellites will be used in position computation, even if iono correction are unavailable. – Only: only satellites with available iono corrections will be used in position computation. This is the default. • Enable output of “true” WAAS PRN numbers – WAAS satellites will be indicated with their true PRN numbers in satellite indices messages rather than associated with a GPS PRN number.

- a. WAAS satellites with PRNs 122 and 134 or EGNOS satellites with PRNs 120 and 131.

USER Datum Parameters

Accessed from the *Positioning* tab, the *USER Datum Parameters* dialog box contains fields for editing ellipsoid and transformation parameters.

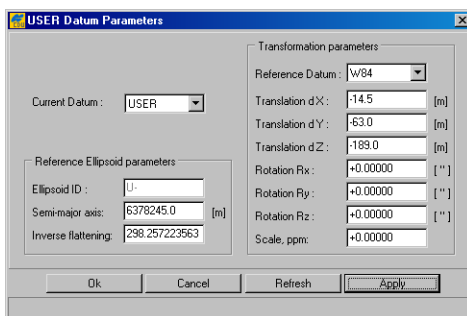


Figure 3-22. USER Datum Parameters

- **Current Datum** – selects pre-defined datums or allows setting user-defined and PZ-90 datums.
- **Reference Ellipsoid parameters** – defines the ellipsoid.
 - **Ellipsoid ID:** the two-letter identification code for the ellipsoid. Display “U-” for user-defined ellipsoids.
 - **Semi-major axis:** only available for “User” or “P90” datums, the length in meters of the semi-major axis of the ellipsoid; This value has a 6300000.0 to 6500000.0 range.
 - **Inverse flattening:** only available for “User” or “P90” datums, the reciprocal of the ellipsoid flattening (dimensionless). This value has a 280.0 to 310.0 range.
- **Transformation parameters** – only available for “User” or “P90” datums, applies transformation settings to the selected datum.
 - **Reference Datum:** only available for “User” datums, the datum relative to the user-specified transformation parameters.
 - **Translation dX:** the shift value along the X axis used to relate the origins of a pre-defined or user-defined datum and the selected reference datum. Ranges are from -10000.0 meters to +10000.0 meters.

- Translation dY: the shift value along the Y axis used to relate the origins of the two datums. Ranges are from -10000.0 meters to +10000.0 meters.
 - Translation dZ: the shift value along the Z axis used to relate the origins of the two datums. Ranges are from -10000.0 meters to +10000.0 meters.
 - Rotation Rx: the rotation angle around the Y axis used to relate the orientation of the two datums. Ranges are from -60" to +60".
 - Rotation Ry: the rotation angle around the Y axis used to relate the orientation of the two datums. Ranges are from -60" to +60".
 - Rotation Rz: the rotation angle around the Z axis used to relate the orientation of the two datums. Ranges from -60" to +60".
 - Scale: the scale factor used to account for any changes in scale between the two datums. Ranges are from -1000 ppm to +1000 ppm.
- OK – saves changes and closes the dialog box.
 - Cancel – closes the dialog box without saving changes.
 - Refresh – reloads/updates the setting on the dialog box.
 - Apply – saves changes without closing the dialog box.

Base

The *Base* tab contains parameters for configuring the receiver as a reference station.

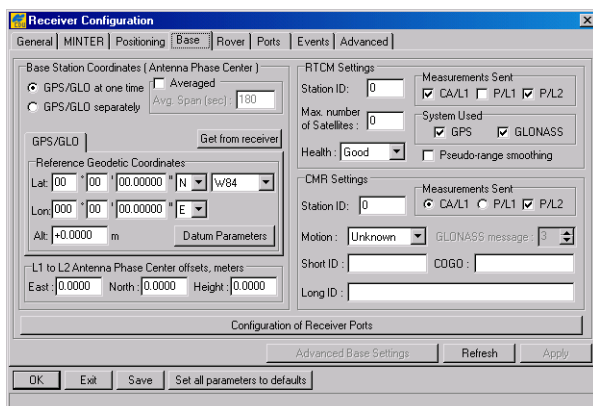


Figure 3-23. Receiver Configuration – Base

- GPS/GLO at one time – uses common (the same) reference coordinates for both satellite systems. Corresponds to the *GPS/GLO* tab below this field. Recommended for most cases.
- GPS/GLO separately – uses individual (different) reference coordinates. Corresponds to the *GPS* tab and *GLONASS* tab below this field.
- Averaged – an alternate way to enter coordinates; applies absolute coordinates averaged over the specified time interval. When enabled, activates the *Avg. Span* field.
- Avg. Span (sec) – the time interval to average coordinates over.
- GPS/GLO, GPS, and GLONASS tabs and Reference Geodetic Coordinates – an alternate way to enter coordinates; the geodetic coordinates of the base antenna's phase center.
 - Lat: the latitude of the antenna in degrees, minutes, seconds; the hemisphere (N or S) in which the antenna resides; the datum that corresponds to the entered coordinates.
 - Lon: the longitude of the antenna in degrees, minutes, and seconds; the hemisphere (E or W) in which the antenna resides.

- Alt: the height of the antenna above the ellipsoid, in meters.
- Datum Parameters: opens the **<Datum ID> Datum Parameters** dialog box for defining the datum in which the Base receiver's coordinates will be expressed. See “<Datum ID> Datum Parameters” on page 3-43 for more information.

These coordinates relate to the antenna's L1 phase center. To account for the L1 antenna phase center to L2 antenna phase center vector offset, enable the *L1 to L2 Antenna Phase Center offsets* parameter.

- L1 to L2 Antenna Phase Center offsets – accounts for the difference between the L1 and L2 antenna phase offsets, in meters and *East, North, Height* measurements.
- RTCM Settings – applies parameters to RTCM messages.
 - Station ID: assigns a separate station ID to each reference station working in the area. The values can be 0 (zero) to 1023; the default is zero.
This ID allows the Rover receiver to easily identify the reference station from which it receives RTCM messages.
 - Max. number of Satellites: the maximum number of satellites allowed for use in RTCM messages types 18 through 21; 0 (zero) indicates that all available satellites will be included in these RTCM messages.
For RTK systems with a modem baud rate of less than 9600 bps, restrict the number of satellites used in these messages. This will limit the amount of data the Base transmits to the Rover and prevent data link overload.
If the number of satellites in view exceeds the value entered, RTCM messages will include data only from satellites with a higher elevations. Also, the number of satellites included in RTCM messages will not exceed the value entered.
 - Health: defines the status of the Base receiver (“Good” for normal operation, “Bad” for abnormal operation, or the health status “Unknown”).

- Measurements Sent: the measurements types to include in RTCM message types 18 through 21.

Currently, C/A measurements will always be included (corresponds to single-frequency receivers). For dual-frequency receivers, P/L1 and P/L2 measurements can be included.

- Systems Used: the satellite systems included in RTCM message types 18 through 21.
- Pseudo-range smoothing: smoothed pseudo-ranges will be used in RTCM message types 19 through 21.

- **CMR Settings** – applies parameters to CMR messages.

- Station ID: assigns a separate station ID to each reference station working in the area. The values can be 0 (zero) to 31; the default is zero.

This ID allows the Rover receiver to easily identify the reference station from which it receives CMR messages.

- Motion: determines the motion status of the Base station (“Unknown” for an undetermined motion state, “Static” for a motionless receiver, or “Kinematic” for a receiver in motion).
- Short ID: a short description (feature code²) of the object being surveyed to include in CMR message type 2.
- Long ID: a long description (feature code) of the object being surveyed to include in CMR message type 2.
- Measurements Sent: the measurements types to include in CMR message.
Currently, C/A measurements will always be included (corresponds to single-frequency receivers). For dual-frequency receivers, P/L1 can be selected instead and P/L2 measurements can be included.
- GLONASS message: specifies which message types (any unused message type between 3 and 7) will be associated with GLONASS measurements.

2. Feature code is an alphanumeric code used to describe an object to be surveyed.

- COGO: a coordinate geometry (feature code) description of the object being surveyed to include in CMR message type 2.
- Configuration of Receiver Ports – displays the *Ports* tab. See “Ports” on page 3-47 for more information.
- Advanced Base Settings – not available for this version of PC-CDU.

<Datum ID> Datum Parameters

Accessed from the *Base* tab, the <Datum ID> *Datum Parameters* dialog box contains fields for defining the datum in which the Base receiver’s coordinates will be expressed.

See “USER Datum Parameters” on page 3-38 for a description of the fields on this dialog box. For pre-defined datums, these fields are read-only.

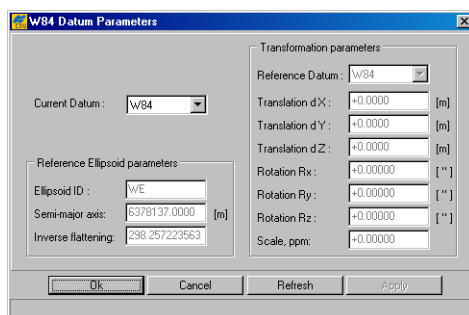


Figure 3-24. <Datum> Datum Parameters

Rover

The *Rover* tab contains parameters for configuring the receiver as a Rover station.

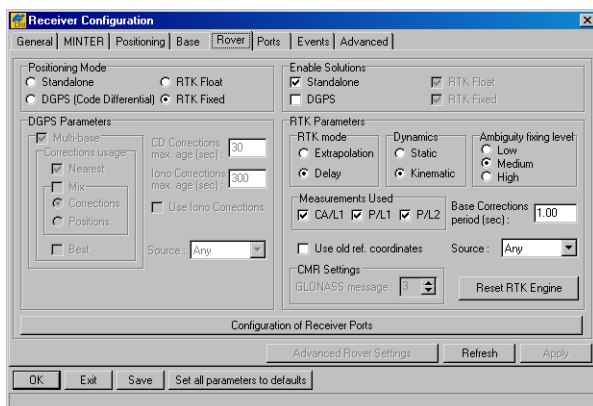


Figure 3-25. Receiver Configuration – Rover

- **Positioning mode** – selects the positioning mode for the receiver. See “Positioning” on page 3-34 for more information on these settings.
- **DGPS Parameters** – applies multi-base and various correction parameters.
 - **Multi-base**: activates settings for applying parameters specific to jobs that use more than one Base.
 - **Correction usage**: determines which Base the Rover will use differential corrections from. Either the *Nearest* station, *Mix* for up to 5 stations simultaneously to average differential *Corrections* from the stations or average computed *Positions* from the stations, or *Best* for the station that transmits the most precise position estimates and the solution has the least RMS error.
If selecting *Nearest*, disable *Mix* and *Best*. If selecting *Mix*, disable *Best*.
 - **CD Corrections max. age (sec)**: sets the maximum age (in seconds) of code differential corrections used for position computation. Values are from 1 to 1200; the default is 10.

If the age of corrections exceeds the value specified, the rover will compute a stand-alone position.

- Iono Corrections max. age (sec): specifies the maximum age (in seconds) of the ionosphere corrections used for position computation.
- Use Iono Corrections: both ionosphere corrections from RTCM message type 15 and differential corrections from RTCM message types 1 and 31 (or 9 and 34) will be used in position computation.
- Source: not available in Multi-base mode; the port from which the receiver will use differential corrections for position computation.
- Enable Solutions – selects the type of solution to use for Rover receivers. See “Positioning” on page 3-34 for more information on these settings.
- RTK Parameters – applies parameters for RTK surveys.
 - RTK mode: determines whether or not to extrapolate the Base station’s carrier phase measurements when computing the rover’s current RTK position.
 If *Delay* selected, the RTK engine will compute either a delayed RTK position (for the epoch to which the newly received RTCM/CMR message corresponds) or the current stand-alone position (while waiting for new RTCM/CMR messages coming from the base).
 - Dynamics: defines the current action of the Rover receiver, either *Static* or *Kinematic*.
 - Ambiguity fixing level: governs the RTK engine when determining whether or not to fix ambiguities. *Low*, *Medium* and *High* correspond to the indicator’s 95%, 99.5% and 99.9% states, respectively. The higher the specified confidence level, the longer the ambiguity search time.
- Measurements Used – the measurements types used for position computation.

- Use old ref. coordinates – during an RTK survey, the Rover receiver will immediately begin using the existing reference coordinates rather than waiting for updated reference coordinates from the Base.



Use care when setting this parameter. If the position of the Rover has changed and a new session has begun, the Rover could be using old reference coordinates from a different Base. In this case, position blunders will occur until the Rover receives a message with the correct reference coordinates.

- GLONASS messages – only applicable if using CMR differential messages, assigns the message type for GLONASS measurements. Both the Base and Rover must use the same message type.
- Base corrections period (sec) – sets the differential correction update interval. Before entering a value, know the exact rate at which the reference station broadcasts differential correction data.

This interval will only be used if the receiver is run in *Delay* mode.

The interval also provides more reliable synchronization between the Base station and Rover receiver.

- Source – the port from which the receiver will use differential data for position computation in RTK mode.
- Reset RTK Engine – reloads the RTK engine. All previously obtained estimates (estimated position, variance-covariance matrix, etc.) will be discarded and the RTK engine will start over.
- Configuration of Receiver Ports – displays the *Ports* tab. See “Ports” on page 3-47 for more information.
- Advanced Rover Settings –not available for this version of PC-CDU.

Ports

The *Ports* tab contains parameters for configuring the various ports available on the receiver.

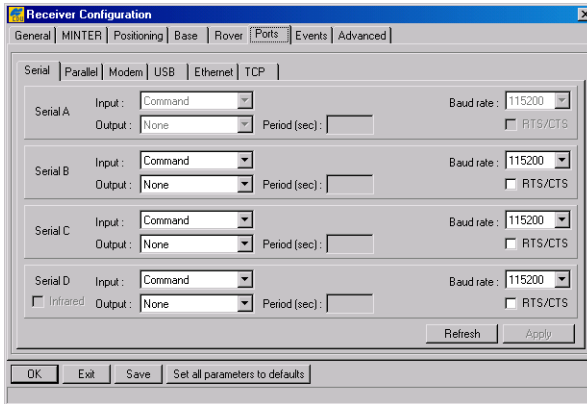


Figure 3-26. Receiver Configuration – Ports (with Serial Sub-tab)

The following six sections describe the fields on these tabs.

Ports – Serial

Accessed from the *Ports* tab, the *Serial* tab (Figure 3-26) specifies data the receiver's serial ports (A, B, C, and D) will transmit/receive.

- Input – specifies the type of data to input on the selected port.
 - None: the port will reject any incoming data.
 - Command: the port is in command mode and will recognize user-sent commands.
 - Echo: the port is in echo mode and will redirect all incoming data to an output stream, either another port or the current log file.
 - RTCM 2.x: the receiver recognizes and decodes RTCM version 2.1, 2.2, and 2.3 messages accepted on the corresponding port.
 - RTCM 3.x: the receiver recognizes and decodes RTCM version 3.0 messages accepted on the corresponding port.

- CMR: the port is in Compact Measurement Record (CMR) messages input mode.
- JPS: the port is in JPS messages input mode.
- Omni: OmniStar VBS will used to produce DGPS solution type.
- Output – specifies the type of data to output on the selected port.
 - None: the port outputs nothing.
 - DGPS RTCM {1,31,3}: the port outputs RTCM message types 1, 31, and 3.
 - DGPS RTCM {9,34,3}: the port outputs RTCM message types 9, 34, and 3.
 - RTK RTCM {18,19,22,3}: the port outputs RTCM message types 18, 19, 22, and 3.
 - RTK RTCM {20,21,22,3}: the port outputs RTCM message types 20, 21, 22, and 3.
 - RTK RTCM {18,19,23,24}: the port outputs RTCM message types 18, 19, 23, and 24.
 - RTK RTCM {20,21,23,24}: the outputs RTCM message types 20, 21, 23, and 24.
 - RTK RTCM3 GD min: the port outputs RTCM message types 1003, 1006, 1008. These messages provide minimum service operation for precision GPS RTK on L1 & L2.
 - RTK RTCM3 GD full: the port outputs RTCM message types 1004, 1006, 1008. These messages provide full service operation for precision GPS RTK on L1 & L2.
 - RTK RTCM3 GGD min: the port outputs RTCM message types 1003, 1011, 1006, 1008. These messages provide minimum service operation for precision GPS and GLONASS RTK on L1 & L2.
 - RTK RTCM3 GGD full: the port outputs RTCM message types 1004, 1012, 1006, 1008. These messages provide full service operation for precision GPS and GLONASS RTK on L1 & L2.

- RTK CMR {10,0,1}: the port outputs CMR message types 10, 0, 1.
 - RTK CMR+ {10,0,9}: the port outputs CMR + message types 10, 0, 9.
 - RTK JPS min: the port outputs JPS message types RT, SI, rc, cp, 2r, 2p, BI, ET. These messages provide the minimum adequate message set for an RTK system.
 - RTK JPS max: the port outputs JPS message types RT, SI, rc, cp, DC, EC, 2r, 2p, D2, E2, BI, ET. These messages provide the complete message set for an RTK system.
 - User Defined: the port outputs user-specified data. That is, an arbitrary message set has been defined that will be outputted through the port.
- Period (sec) – enter interval at which the receiver will generate differential messages (in seconds).

To change the period for RTCM message types 3, 22, and CMR message type 1, use the “em” command while in Manual Mode. Refer to the *GRIL Reference Manual* for details.

If an incorrect message output interval has been entered, the Output Period Setup Wizard will begin. See Appendix D for more information.
 - Baud rate – the rate at which the receiver will transmit messages to a modem or any other device connected to this port.
 - RTS/CTS – enables/disables hardware handshaking for the port (if enabled, the modem must support this mode).
 - Infrared – only available for port D, enables an infrared connection between the receiver and an external device via this port. Only use this mode if the following conditions have been met:
 - The external device is compatible with the receiver’s infrared interface (for example, CDU-1).
 - The receiver’s hardware supports the infrared port.
 - The “Infrared Port” option has been enabled in the receiver.

Ports – Parallel

Accessed from the *Ports* tab, the *Parallel* tab specifies data the receiver's parallel port will transmit/receive.

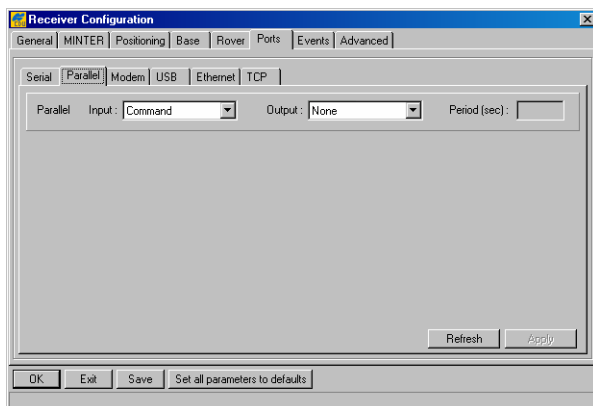


Figure 3-27. Receiver Configuration – Ports with Parallel Sub-tab

The *Input*, *Output*, and *Period* settings on this tab are the same as those seen on the *Serial* tab, but configures the parallel port. See “Ports – Serial” on page 3-47 for information on these settings.

Ports – Modem

Accessed from the *Ports* tab, the *Modem* tab configures the receiver's internal radio modem for Legacy and Odyssey receivers with an internal Spread Spectrum modem.

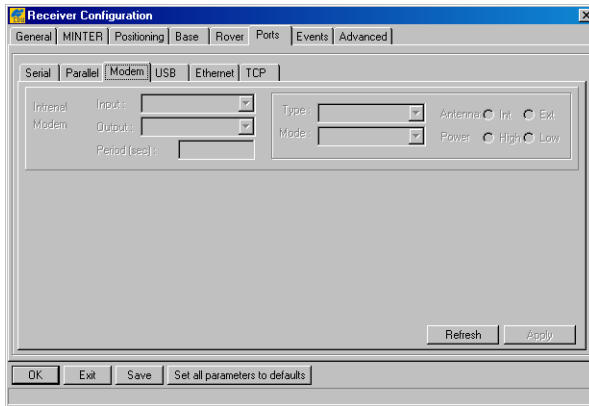


Figure 3-28. Receiver Configuration – Ports with Modem Sub-tab

- **Internal Modem** – specifies data the receiver's modem will transmit/receive.

The *Input*, *Output*, and *Period* settings on this tab are the same as those seen on the *Serial* tab, but configures the modem port. See "Ports – Serial" on page 3-47 for information on these settings.

- **Type** – sets the operation mode, either "Receiving" or "Transmitting".
- **Mode** – specifies the method used to transmit data.
 - Off: the internal modem is turned off.
 - FHSS: the internal modem is a frequency-hopping spread spectrum modem type.
 - DSS: the internal modem is a direct-sequence spread spectrum modem type.
- **Antenna** – the type of antenna the modem uses, either Internal or External.
- **Power** – the transmission mode for an internal modem (the amount of power to use for transmission), either High or Low.

Ports – USB

Accessed from the *Ports* tab, the *USB* tab specifies data the receiver's USB port will transmit/receive.

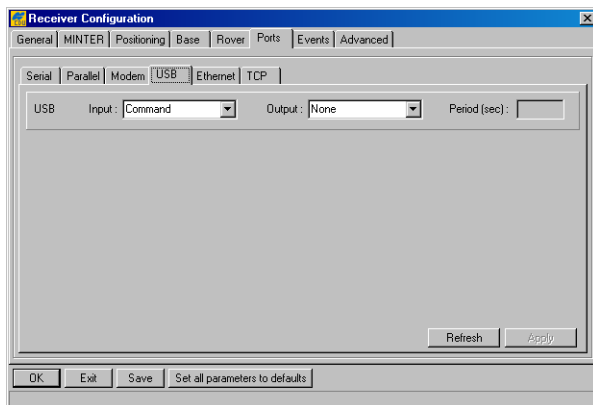


Figure 3-29. Receiver Configuration – Ports with USB Sub-tab

The *Input*, *Output*, and *Period* settings on this tab are the same as those seen on the *Serial* tab, but configures the USB port. See “Ports – Serial” on page 3-47 for information on these settings.

Ports – Ethernet

Accessed from the *Ports* tab, the *Ethernet* tab configures Ethernet, Telnet, and FTP communication settings.

These settings are only available when the connected receiver has the Ethernet option enabled.

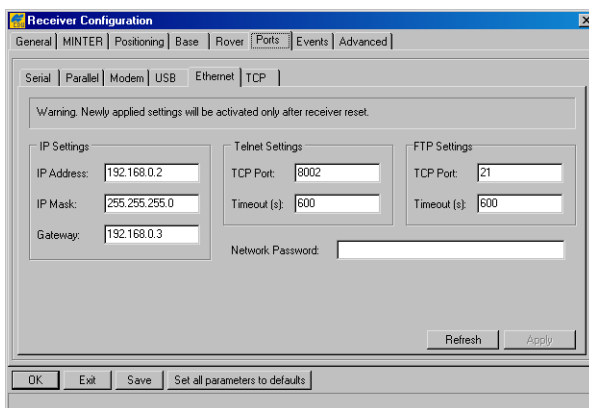


Figure 3-30. Receiver Configuration – Ports with Ethernet Sub-tab



For any of these settings, contact the system administrator about which settings are safe to use.

- IP Settings – specifies the IP addressing parameters for a connected receiver.
 - IP Address: a unique identifier for the receiver on a TCP/IP network. An IP address comprises four numbers from 0 to 255 and separated by periods. The receiver’s default IP address is “192.168.2.2”.
 - IP Mask: a mask used to determine what subnet the receiver belongs to. The default mask is “255.255.255.192”.
 - Gateway: the IP address for the gateway used to communicate with devices on another network. The default gateway is “192.168.2.1”.

- **Telnet Settings** – configures the connected receiver to act as a telnet server. Up to five remote devices (telnet clients) can simultaneously connect to the telnet server receiver over a TCP/IP network. Once a connection has been established, the telnet clients can control the telnet server receiver as if through a direct connection.
 - **TCP Port:** the TCP/IP port the telnet server monitors for the connection. The default port number is 8002.
 - **Timeout:** the amount of time in seconds that must elapse before an inactive connection will be terminated. The default timeout is 600 seconds.
- **FTP Settings** – configures the connected receiver to act as an FTP server. One remote device (FTP client) can connect to the FTP server over a TCP/IP network for downloading raw data files.
 - **TCP Port:** the TCP/IP port the FTP server monitors for the connection. The default port number is 21.
 - **Timeout:** the amount of time in seconds that must elapse before an inactive connection will be terminated. The default timeout is 600 seconds.
- **Network Password** – used in Telnet and FTP configurations, the password that the client must enter to access the server. The password can be up to 15 alphanumeric characters.

Ports – TCP

Accessed from the *Ports* tab, the *TCP* tab specifies data the receiver will transmit/receive over a TCP/IP network.

These settings are only available when the connected receiver has the Ethernet option enabled.

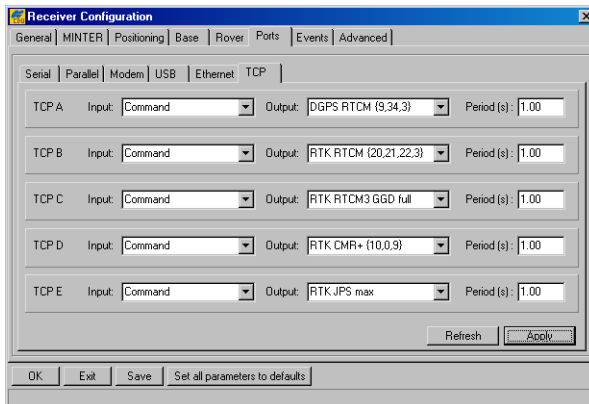


Figure 3-31. Receiver Configuration – Ports with TCP Sub-tab

The *Input*, *Output*, and *Period* settings on this tab are the same as those seen on the *Serial* tab, but configures the TCP ports. See “Ports – Serial” on page 3-47 for information on these settings.

Events

The *Events* tab configures the 1PPS signal and Event marker settings.

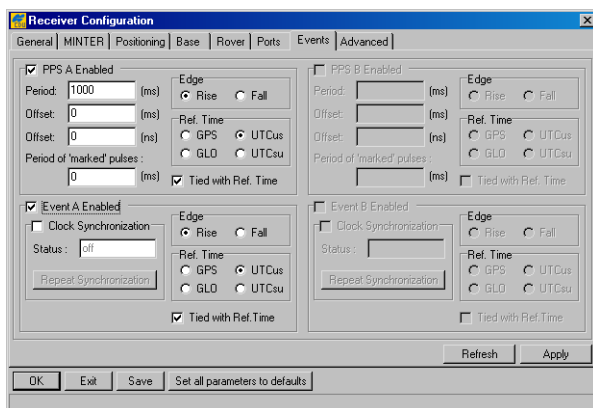


Figure 3-32. Receiver Configuration – Events

- **PPS A Enabled and PPS B Enabled** – enables the receiver to generate 1PPS signals, as well as modify the settings related to the selected 1PPS signal.
 - **Period:** determines the rate of generating 1PPS signals via the corresponding output connector.
 - **Offset (ms) and Offset (ns):** the milliseconds and/or nanoseconds to use for PPS signal offsets in reference to the selected reference time grid.
 - **Period of ‘marked’ pulses:** specifies the period of the marked 1PPS signal in milliseconds.
 - **Edge:** synchronizes the edge (rising or falling) of the 1PPS signal with the specified reference time.
 - **Ref. Time:** selects the reference time that the 1PPS signal will be synchronized with; either GPS system time, GLONASS system time, UTCus (UTC USNO) system time, or UTCsu (UTC SU) system time.
 - **Tied with Ref. Time:** the receiver synchronizes the 1PPS signal with the chosen reference time. Otherwise, 1PPS will synchronize with either the receiver's internal clock or with an external reference frequency applied to the receiver.

If synchronizing with an external reference frequency, the *Source* field on the *Advanced* tab and *External Frequency* sub-tab must be set to “External”.

- **Event A Enabled and Event B Enabled** – enables the receiver to measure and log event times, in the specified reference time, with high accuracy.
 - **Clock Synchronization**: the receiver executes a one-time synchronization of its one-millisecond cycle grid with the corresponding edge of the event signal.
 - **Status**: indicates whether or not the receiver clock is actually being synchronized with the event signals. “On” means that the synchronization has been done successfully.
 - **Repeat Synchronization**: manually performs a synchronization.
 - **Edge**: measures the time of either the rising edge or falling edge of the input event signal.
 - **Ref. Time**: selects the reference time that the event reception time will be synchronized with; either GPS system time, GLONASS system time, UTCus (UTC USNO) system time, or UTCsu (UTC SU) system time.
 - **Tied with Ref. Time**: the receiver measures the event reception time in the selected chosen reference time, regardless of the computed receiver clock offset.

Advanced

The *Advanced* tab contains parameters for configuring the various ports available on the receiver.

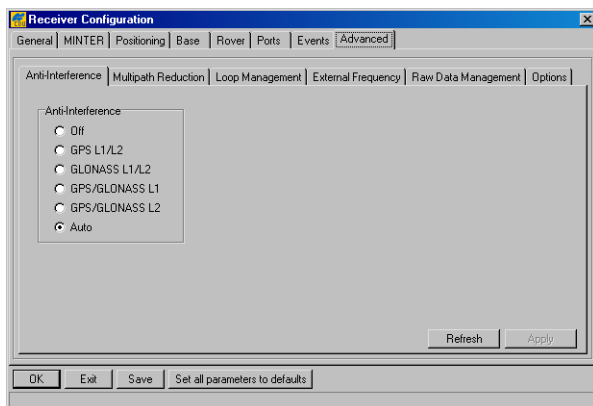


Figure 3-33. Receiver Configuration – Advanced (with Anti-Interference Sub-tab)

The following six sections describe the fields on these tabs.



Be sure to understand the settings on these tabs before making changes. Applying incorrect *Advanced* tab settings can cause the receiver to run improperly.

If needed, click Set all parameters to defaults to return the settings to factory defaults.

Advanced – Anti-Interference

Accessed from the *Advanced* tab, the *Anti-Interference* tab (Figure 3-33 on page 3-58) enables suppression of narrow-band interference.

Anti-interference is only available for JPS_3, JPS_4_x, Euro_x, E_GGD, and EGGDT_x receiver board versions, where “x” stands for the board revision number.

Use the following assessments to determine the presence of interference:

- When the number of tracked satellites is fewer (by 2 or greater) than the number of satellites in view.
- When the signal-to-noise ratio (C/N0) in the C/A channel for the satellites having elevations above 30 degrees does not exceed 40 dB/Hz.
- When the information about interferences indicates that the “Jamming Suppressor” has detected interference signals within the specified band. Also, the strength of aggregate in-band interference is characterized as high or hard.

In Manual Mode, use the “em.,jps/JI” command to view this information.

Advanced – Multipath Reduction

Accessed from the *Advanced* tab, the *Multipath Reduction* tab contains settings for the mitigation of the multipath phenomenon.

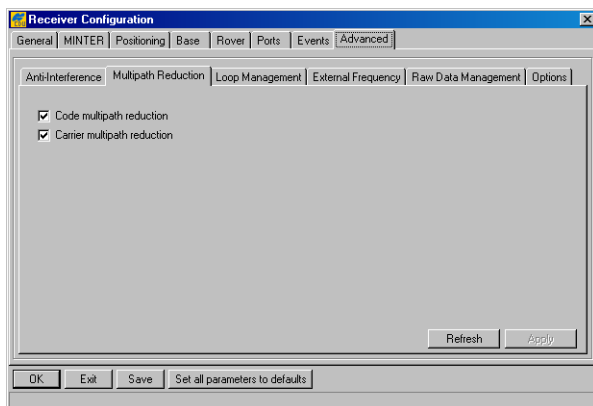


Figure 3-34. Receiver Configuration – Advanced with Multipath Reduction Sub-tab

- Code multipath reduction – recommended setting for receivers (Base/Reference and Rover) in DGPS mode on jobsites that contain multipath.
- Carrier multipath reduction – recommended setting for receivers (Base/Reference and Rover) in RTK mode on jobsites that contain multipath.

Advanced – Loop Management

Accessed from the *Advanced* tab, the *Loop Management* tab contains settings for configuring the receiver's capability of searching, acquiring and tracking the GPS+ satellite signals.

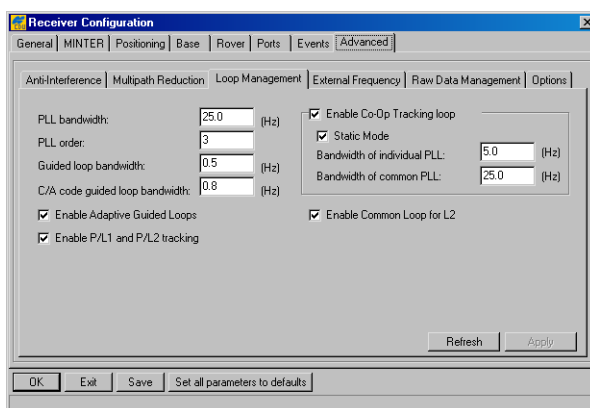


Figure 3-35. Receiver Configuration – Advanced with Loop Management Sub-tab



The defaults are recommended for most receiver configurations.

- PLL bandwidth – governs the noise bandwidth of the guiding phase lock loops. Values are from 2 to 50 Hz; the default is 25 Hz.
- PLL order – alternates the guiding and common lock loop order. Values are 2 and 3; the default is 3.
Using a 2nd order PLL can adversely affect satellite signal tracking in some cases.
- Guided loop bandwidth – governs all guided loops except C/A DLLs. Values are from 0.1 Hz to 10 Hz; the default is 0.5 Hz.
- C/A code guided loop bandwidth – specifies the bandwidth of the receiver's C/A group delay lock loop. Values are from 0.1 Hz to 50 Hz; the default is 0.8 Hz.

- Enable Adaptive Guided Loops – when enabled, the receiver will adjust the guided loops bandwidths depending on the actual strengths of the signals tracked; the weaker the signals, the narrower the bandwidths.
- Enable P/L1 and P/L2 tracking – adjusts tracking settings for the receiver.

For single-frequency receivers or L1 only antennas, disable this setting.

- Enable Co-Op tracking loop – improves tracking characteristics of TPS receivers in hostile environments.
 - Static Mode: the receiver will acquire satellites with lower signal-to-noise ratios and reduce the reacquisition time for the satellite signals after a temporary loss of lock.

Only enable this setting if the receiver's antenna remains completely stationary throughout the survey. Any movement may result in losing the satellite lock.
 - Bandwidth of individual PLL: sets the bandwidth for one PLL. Available values are 2 to 20 Hz; the default is 5.0 Hz.
 - Bandwidth of common PLL: sets the bandwidth for a set of PLLs. Available values are 2 to 50 Hz; the default is 25.0 Hz.
- Enable Common Loop for L2 – allows the antenna to continue L2 phase tracking in dynamic applications despite antenna rotation around its axis.

Advanced – External Frequency

Accessed from the *Advanced* tab, the *External Frequency* tab contains settings for configuring the reference frequency; either a high-stability external frequency or the receiver's internal crystal oscillator.

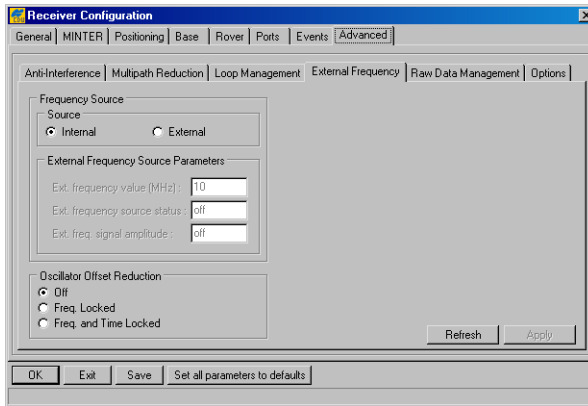


Figure 3-36. Receiver Configuration – Advanced with External Frequency Sub-tab

- **Source** – specifies the reference frequency input that the receiver will use. Switching from Internal to External may result in temporary loss of lock to satellites.
 - **Internal:** the receiver uses the internal oscillator.
 - **External:** the receiver uses an external frequency. Enables the *External Frequency Source Parameters* fields.
- **Ext. frequency value** – the nominal external frequency value. Values are from 2 to 40 MHz; the default is 10 MHz.
- **Ext. frequency source status** – shows whether or not the external frequency is being used.
 - **off:** the receiver is using the internal crystal oscillator.
 - **wait:** the receiver is waiting for the external frequency lock because the external frequency oscillator is disconnected, the amplitude of input signal is too low, or the actual external frequency is different from that specified in *Ext. frequency value*.
 - **locked:** the receiver is using the external frequency.

- Ext. freq. signal amplitude – an estimate of the external frequency signal amplitude.
 - off: the internal oscillator is being used.
 - low: the external frequency signal's amplitude is lower than needed.
 - ok: the external frequency signal's amplitude meets the specs.
- Oscillator Offset Reduction – governs the behavior of the internal crystal oscillator.
 - Off: the oscillator frequency offset reduction mode is turned off.
 - Freq. Locked: the receiver will adjust the internal oscillator's frequency until the measured frequency offset is reduced to zero.

Using incoming satellite signals, the receiver will force the internal oscillator to generate a very stable 20 MHz frequency signal. This frequency output is available via the corresponding receiver output pin.

Use the GEO tab and Clock offset field on the Main Screen to monitor the offset reduction. After selecting *Freq. Locked* the value in Clock offset starts to reduce and soon (usually in a few minutes) it will become equal to zero, while in contrast Osc. Offset will not change much.

Enabling this parameters guarantees that the receiver's 20 MHz output will have long-term stability, but not necessarily short-term stability. To ensure that both of these characteristics are sufficient, enable *Enable Co-op tracking* on the *Loop Management* sub-tab.

- Freq. and Time Locked: the receiver will adjust the internal oscillator's frequency and the internal clock until the measured frequency offset is reduced to zero and the clock is fully synchronized with the specified reference time scale.

Advanced – Raw Data Management

Accessed from the *Advanced* tab, the *Raw Data Management* tab contains settings for specifying the frequency at which the receiver will update raw measurements and positions, as well as settings that affect signal processing.

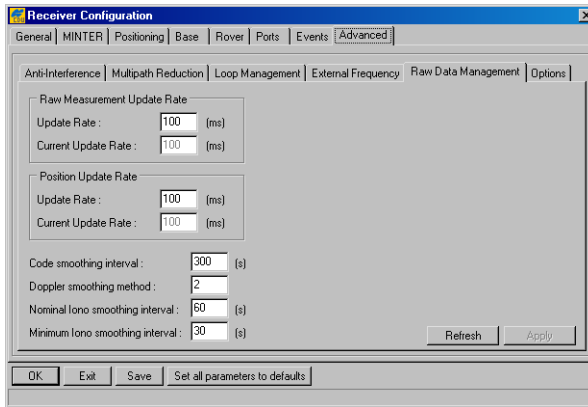


Figure 3-37. Receiver Configuration – Advanced with Raw Data Management Sub-tab

- **Raw Measurement Update Rate** – determines the raw data update period.
 - **Update Rate:** the time in milliseconds for the update rate.
 - **Current Update Rate:** the update actually being used.
- **Position Update Rate** – determines the receiver position update period.
 - **Update Rate:** the time in milliseconds for the update rate.
 - **Current Update Rate:** the update actually being used.
- **Code smoothing interval** – specifies the interval over which pseudoranges are smoothed using the corresponding carrier phase measurements. Values are from 0 (zero) to 900 seconds. Zero designates that carrier phase measurements will not be used for smoothing pseudo-ranges.

- Doppler smoothing method – the method used for smoothing Doppler measurements. Values range from 1 to 3 and correspond to the following descriptions; the default is 2.
 - 1: Receiver outputs raw (unsmoothed) Doppler. Instantaneous and rather noisy Doppler measurements.
 - 2: Doppler is computed using two consecutive carrier phase measurements, `CarPhase[i]` and `CarPhase[i-1]`, where `i` stands for the current epoch. Doppler measurements are less noisy than in the first case.
 - 3: Doppler is computed using three consecutive carrier phase measurements, `CarPhase[i]`, `CarPhase[i-1]` and `CarPhase[i-2]`, where `i` stands for the current epoch. Doppler measurements obtained in this mode are least noisy.
- Nominal Iono smoothing interval – specifies the nominal ionospheric correction smoothing interval over which raw ionospheric corrections are smoothed. Values range from 0 (zero) to 900 seconds; the default is 60 seconds.

When enabled, this setting assumes that the receiver has been working for some time and has already obtained enough raw ionospheric corrections to perform such smoothing.

- Minimum Iono smoothing interval – specifies the minimum smoothing interval for the receiver to filter raw ionospheric corrections before the corrections can be used in position computation. Values range from 0 (zero) to 900 seconds; the default is 30 seconds.

Advanced – Options

Accessed from the *Advanced* tab, the *Options* tab contains settings turning on and off the temporary dual-frequency option.

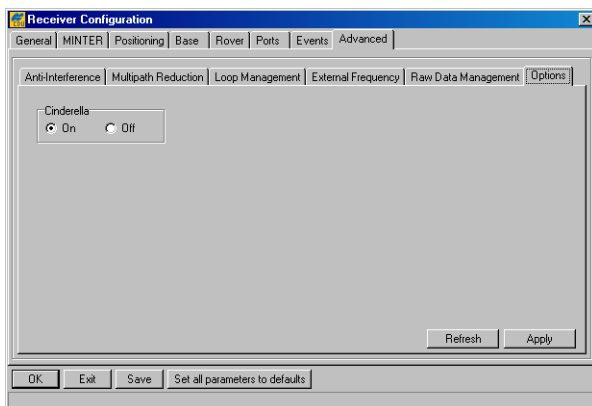


Figure 3-38. Receiver Configuration – Advanced with Options Sub-tab

- On – enables the receiver to run as a dual-frequency GPS+GLONASS unit for 24 hours every other Tuesday (known as “Cinderella”).

Visit the Cinderella Option page on the TPS web site (<http://www.topcongps.com/software/cinderella.html>) to schedule Cinderella days.

- Off – disables the Cinderella option.

Site Configuration

The *Site Configuration* dialog box applies antenna parameters to the pccdu.ini file for data logging purposes.

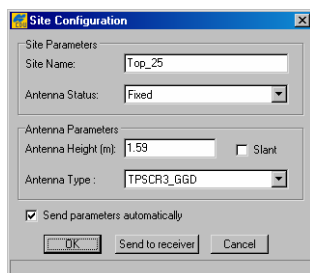


Figure 3-39. Site Configuration

- Site Name – the name of the jobsite (up to 20 alphanumeric characters).
- Antenna Status – the status of the antenna; either fixed or moving.
- Antenna Height – the height of the antenna measured from the survey marker to the measuring mark on the antenna (either ARP or SHMM).
- Slant – if selected, indicates that the height of the antenna was measured at a slant (to the slant height measurement mark). When not selected, indicates a vertical measurement (to the antenna reference point).
- Antenna Type – the type of antenna.
- Send parameters automatically – sends site and antenna parameters to the receiver each time a log file is created.
- OK – copies the settings to the pccdu.ini file and closes the dialog box. After clicking **Start** on the *File Manager* dialog box, these settings will be enabled and inserted into the newly created log file (unless *Send parameters automatically* has been disabled).
- Send to receiver – sends new site parameters to the receiver log file and the pccdu.ini file.
- Cancel – closes the dialog box without saving the settings.

Target Position

The *Target position* dialog box contains fields for entering target coordinates.

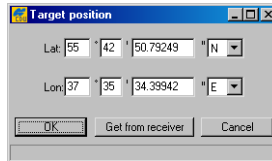


Figure 3-40. Target Position

- Lat – the latitude of the antenna in degrees, minutes, and seconds; the hemisphere (N or S) in which the antenna resides; the datum that corresponds to the entered coordinates.
- Lon – the longitude of the antenna in degrees, minutes, and seconds; the hemisphere (E or W) in which the antenna resides.
- Ok – associates the entered coordinates with the target position and closes the dialog box.
- Get from receiver – sets the target position to the most recent position the receiver produced.
- Cancel – closes the dialog box without applying the coordinates.

Radio > RFM96

For receiver's equipped with an RFM96 radio modem, the **RFM96 Configuration** dialog box

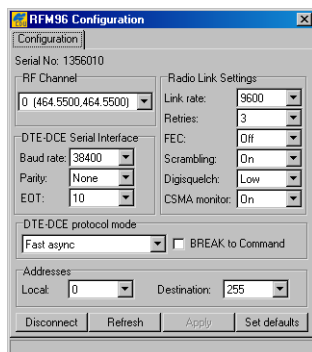


Figure 3-41. RFM96 Configuration (After Connection)

Connect

The *Connect* tab establishes a connection between PC-CDU and the RFM96 radio modem.

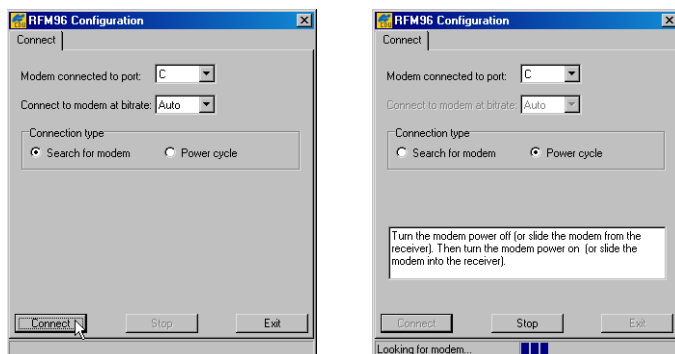


Figure 3-42. RFM96 Configuration – Connect

- Modem connected to port – the receiver port that the radio modem is connected to. Usually port C for the Legacy, Legacy-E, Legacy-H, Regency and HiPer family receivers, and port B for the Odyssey family receivers.

- **Connect to modem at bitrate** – sets the baud rate with which the modem and receiver will communicate. Usually 38400 bps, but to have the receiver automatically detect the baud rate, select “Auto”.
- **Search for modem** – searches for a connected radio modem after clicking **Connect**. Sufficient for most RFM96 models.
- **Power cycle** – polls the radio during a power cycle and establishes a connection. The dialog box also displays instructions for this process.

Use this setting if the radio is not found, and after checking receiver-to-computer connections (cable/wireless and PC-CDU), then click **Connect**.

- **Connect** – connects to the detected RFM96 radio modem.
- **Stop** – stops searching for/connecting to an RFM96 modem.
- **Exit** – closes the dialog box without connecting to an RFM96 modem.

Configuration

The *Configuration* tab (Figure 3-41 on page 3-70) contains settings for configuring an RFM96 radio modem.

- **RF Channel** – the radio’s frequency channel.
- **DTE-DCE Serial Interface** – applies various data transfer and communication parameters to the serial interface.
 - **Baud rate**: the data transfer rate used for communication with the local DTE device.
 - **Parity**: checks data to ensure its validity during communication with the local DTE device.
 - **EOT**: sets the end-of-transmission character or timeout value used to determine when a message is complete and ready to transmit. This parameter only applies when the DTE-DCE protocol of the radio-modem is configured for Transparent, Fast Asynch, or TrimTalk mode.

- Radio Link Settings – the settings for sending corrections data via an RFM96 radio modem.

- Link rate: the rate at which data is transmitted over the RF link.

For Pacific Crest radios, use 9600 bps to minimize power consumption and to maintain the radio transmitter at a low TX duty cycle.

If needed, use 4800 bps in order to maintain reliability in difficult transmission circumstances (long range or heavy fade conditions).

- Retries: the number of retries the modem should attempt if a remote modem does not respond or a corrupted data packet causes a negative acknowledgment from the receiving modem.

Only use this setting when the modems are in packet mode or operation, or when the modems are in transparent mode with a designated destination address other than 255.

- FEC: (Forward Error Correction) the receiving modem will correct burst and single bit errors in the incoming data stream.

When enabled, an additional 4 bits per byte of data is transferred over the RF link. This effectively reduces the data throughput in proportion to the overhead bytes.

Leave FEC enabled unless the data throughput requirements make the overhead unacceptable.

- Scrambling: enables/disabled data scrambling for secure transmission.

For optimal operation of the GMSK modulation, data should be scrambled. When enabled, the radio modem scrambles and unscrambles the data on transmission or reception via an exclusive-OR operation with a pseudo-random bit stream.

Do not disable *Scrambling* unless the DTE performs data scrambling and produces a data stream with approximately the same number of 1's and 0's.

- Digisquelch: the receiving modem attempts to decode the radio information only in conditions where the radio signal is of a certain power level.

Adjusting the sensitivity to an RF carrier allows the radio modem to be configured to ignore weak signals, or signals from unintentional radiators (computer CRT's, etc.) which would otherwise interfere with reception.

- High – the best range of reception.
 - Moderate – minimize interference from other transmissions. Results in poorer reception of weak signals and lower range.
 - Low – minimize interference from other transmissions. Results in poorer reception of weak signals and lower range.
 - Off – the radio modem loses its ability to receive signals and becomes a transmitter. This will cause the radio modem to transmit over other broadcasts, and is generally not recommended, especially at higher power levels where the broadcast will interfere with co-channel users.
- CSMA monitor: sets the mode for checking for a clear transmission frequency.
 - On – the modem will check for clear TX frequency. If the TX frequency is busy, the modem waits a random time period and repeats the check. When the TX frequency is clear, transmission will commence.
 - Off – transmission will commence without first checking for clear TX frequency.
 - DTE-DCE protocol mode – the operation protocol for data transfer; either Transp. w/EOT time out, Transp. w/EOT character, Packet, Auto-repeater, or Fast async.
 - Break to Command: if enabled, a BREAK condition on the RS-232 interface will cause the radio-modem to switch into command mode.

- Addresses – the address for the radio modem.
 - Local: the identifier of the radio modem connected to the computer through PC-CDU.

In packet switched and addressed transparent operation, each modem should be assigned a unique address. Packets may be sent to a specific address, or broadcast to a group of modems. Values are from 0 to 254.

Do not use address 255, it is reserved as the broadcast address.
 - Destination: used only in transparent mode, the address to transmit data to.
- Disconnect – disconnects the RFM96 configuration wizard from the radio modem and returns to the *Connect* tab.
- Refresh – reloads the settings on the ***RFM96 Configuration*** dialog box.
- Apply – applies settings to the radio modem without exiting the dialog box.
- Set defaults – sets the default radio modem settings on the ***RFM96 Configuration*** dialog box.



Refer to the help section of the RFM96 Modem Configuration Software for more information on these settings and how they relate to the radio modem.

Tools Menu

The Tools menu contains options for managing the receiver's file system, internal memory, and options.

Initialize File System

Initializing the file system of a connected receiver will erase all of the receiver's data files. This process requires two confirmations before beginning, and may take several minutes depending on the receiver's memory size.

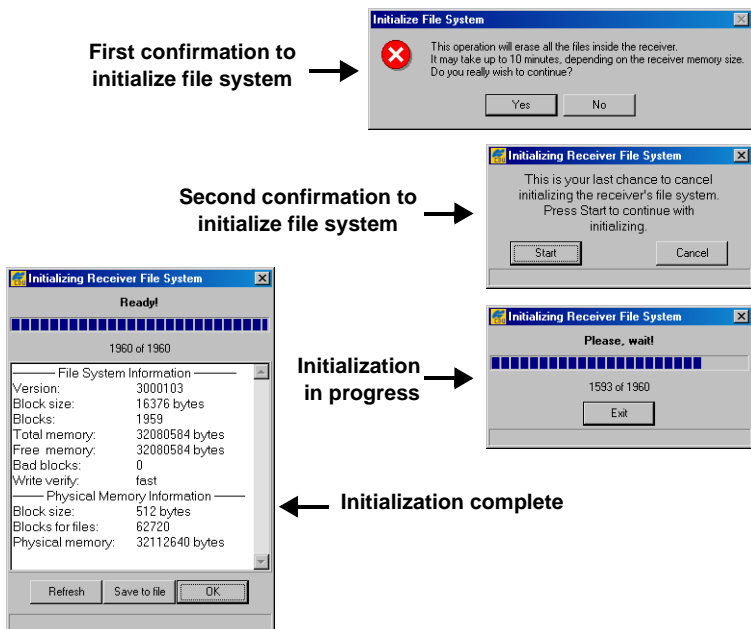


Figure 3-43. Initializing the File System

When the receiver's memory is initialized, information on the file system and physical memory displays.

- Refresh – reloads the information.
- Save to file – saves the files system and physical memory information to a text file.
- Ok – closes the dialog box.

Clear NVRAM

The receiver's Non-Volatile Random Access Memory (NVRAM) holds data required for satellite tracking, such as ephemeris data, almanac 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 receiver's NVRAM can be interpreted as a soft boot in your computer.

Clearing the NVRAM of your receiver will not delete any files already recorded in the receiver's memory. However, it will reset the receiver's parameters 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.

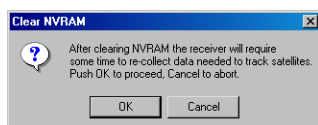


Figure 3-44. Clear NVRAM

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

Reset Receiver

Resetting the receiver is similar to a computer re-boot, but without going through a power cycle. This process will leave all files intact.

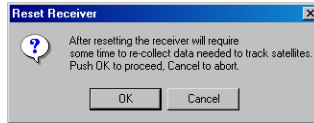


Figure 3-45. Reset Receiver

After a receiver reset, the receiver will require a few seconds to a few minutes to begin tracking satellites and logging data.

Receiver Options

The *Option Manager* dialog box displays current and available options for the receiver, the status of the receiver's options, and loads a new OAF to the receiver.

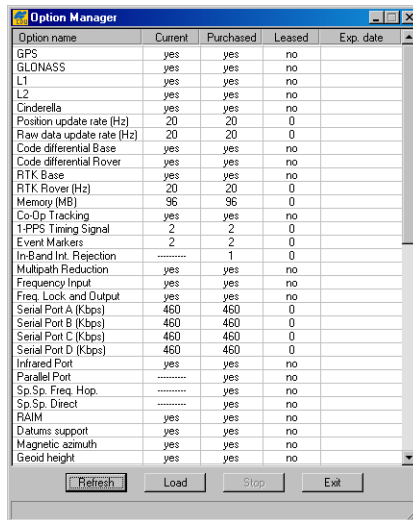


Figure 3-46. Option Manager

- Options table – the list of available options. See “Option Manager” on page 3-78 for more information.
- Refresh – updates the information in the options table.

- Load – loads a new OAF. See “Select Options File” on page 3-88 for more information.
- Stop – terminates loading an OAF.
- Exit – closes the dialog box.

Option Manager

The *options* table in the *Option Manager* dialog box (Figure 3-46) has the following columns:

- Option name – the name/description for the option.
- Current – shows if the option is in force at the present or not.
- Purchased – if the option is purchased or not.
- Leased – if the option is leased or not.
- Expiration date – the date the leased option will be disabled, if applicable.

Since Options can be both purchased and leased, the *Current* column of the option displays the currently effective value. Option values can be the following:

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

Table 3-6 lists all options available for a TPS receiver.

Table 3-6. Receiver Options

Option Name	Description	Values
GPS	Enables/disables the use of GPS satellites.	yes – enabled no – disabled
GLONASS	Enables/disables the use of GLONASS satellites.	yes – enabled no – disabled

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
L1	Enables/disables the receiver to track the L1 carrier frequency and use the C/A-code measurements for position computation.	yes – enabled no – disabled
L2	Enables/disables the receiver to track the L2 carrier frequency and use the P-code measurements on L1 and L2 for position computation.	yes – enabled no – disabled
Cinderella	Enables/disables the Cinderella option. This option turns a single frequency, GPS receiver into a dual-frequency, GPS+GLONASS receiver for 24 hours every other Tuesday at GPS midnight ^a .	yes – enabled no – disabled
Position update rate (Hz)	Displays the maximum allowable position update rate for autonomous and code differential positioning. Measured in Hertz.	0, 1, 2, 5, 10, 20. 0 (zero) means the option is disabled.
Raw data update rate (Hz)	Displays the maximum allowable raw measurement update rate. Measured in Hertz.	0, 1, 2, 5, 10, 20. 0 (zero) means the option is disabled.
Code differential Base	Enables/disables the receiver to be configured as a DGPS Base. This option is obsolete and remains for compatibility.	yes – enabled no – disabled
Code differential Rover	Enables/disables the receiver to be configured as a DGPS Rover. This option is obsolete and remains for compatibility.	yes – enabled no – disabled
RTK Base	Enables/disables the receiver to be configured as an RTK Base. This option is obsolete and remains for compatibility.	yes – enabled no – disabled

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
RTK Rover (Hz)	Enables/disables the receiver to be configured as an RTK Rover with the desired RTK position update rate. Measured in Hertz. This option is obsolete and remains for compatibility.	0, 1, 2, 5, 10, 20. 0 (zero) means the option is disabled.
Memory (Mb)	Displays the maximum amount of storage space for raw data files. Measured in Mbytes.	0 – disabled 1...6256 – enabled for specified memory space
Co-Op Tracking	Enables/disables the use of the Co-Op tracking feature.	yes – enabled no – disabled
1-PPS Timing Signal	Enables/disables the receiver to output 1 PPS signal.	0 – no 1 PPS output 1 – single 1 PPS output 2 – dual 1 PPS output
Event Markers	Enables/disables the receiver to accept event marker inputs.	0 – no event marker input 1 – single event marker input 2 – dual event marker input
In-Band Int. Rejection	Enables/disables the receiver to use Jamming Suppressor.	0 – disabled 1 – enabled outside USA 2 – enabled for USA only
Multipath Reduction	Enables/disables the use of a special signal processing technique that significantly reduces the effects of multipath.	yes – enabled no – disabled
Frequency Input	If enabled, allows the receiver to operate with an external high-stability frequency source.	yes – enabled no – disabled
Freq. Lock and Output	Enables the receiver to generate a very stable 20 MHz frequency.	yes – enabled no – disabled

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
Serial Port A (Kbps)	Enables/disables communications through port A and displays the maximum available baud rate at which the receiver communicates with an external device. Measured in Kbits per second.	0 – port disabled 9 – 9600 19 – 19200 38 – 38400 56 – 56700 115 – 115200 230 – 230400 460 – 460800
Serial Port B (Kbps)	Enables/disables communications through port B and displays the maximum available baud rate at which the receiver communicates with an external device. Measured in Kbits per second.	0 – port disabled 9 – 9600 19 – 19200 38 – 38400 56 – 56700 115 – 115200 230 – 230400 460 – 460800
Serial Port C (Kbps)	Enables/disables communications through port C and displays the maximum available baud rate at which the receiver communicates with an external device. Measured in Kbits per second.	0 – port disabled 9 – 9600 19 – 19200 38 – 38400 56 – 56700 115 – 115200 230 – 230400 460 – 460800
Serial Port D (Kbps)	Enables/disables communications through port D and displays the maximum available baud rate at which the receiver communicates with an external device. Measured in Kbits per second.	0 – port disabled 9 – 9600 19 – 19200 38 – 38400 56 – 56700 115 – 115200 230 – 230400 460 – 460800
Infrared Port	Enables/disables communications through an infrared port.	yes – enabled no – disabled
Parallel Port	Enables/disables communications through a parallel port.	yes – enabled no – disabled

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
Sp.Sp. Freq. Hop.	Allows use of the internal Spread Spectrum modem in frequency hopping mode. For the Legacy and Odyssey only.	yes – enabled no – disabled
Sp.Sp. Direct	Allow use of the internal Spread Spectrum modem in spread spectrum mode. For the Legacy and Odyssey only.	yes – enabled no – disabled
RAIM	Enables/disables Receiver Autonomous Integrity Monitoring.	yes – enabled no – disabled
Datums support	Enables/disables the receiver to output position information in a datum other than WGS 84 or PE-90.	yes – enabled no – disabled
Magnetic azimuth	Enables/disables the receiver to output the magnetic course.	yes – enabled no – disabled
Geoid height	Enables/disables the receiver to use an embedded low-accuracy geoid model with RMS of about 3 m.	yes – enabled no – disabled
Way Point Navigation	N/A	always disabled
WAAS	Enables/disables the receiver to use the WAAS service.	yes – enabled no – disabled
OMNISTAR	Enables/disables the receiver to use the OmniSTAR VBS satellite differential service.	yes – enabled no – disabled

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
RTCM Output	Allows the receiver to output RTCM messages.	0 – RTCM output disabled 1 – DGPS RTCM output enabled 2 – RTK RTCM output enabled 3 – DGPS&RTK RTCM output enabled
RTCM Input	Allows the receiver to accept RTCM messages via a certain number of ports. The value represents the number of ports from which the receiver is able to simultaneously accept RTCM messages.	0 – RTCM input disabled 1, 2, 3, 4, 5 – RTCM input enabled on the indicated number of ports.
RTCM3 Output	Allows the receiver to output RTCM 3.0 messages.	0 – RTCM 3.0 output disabled 1 – DGPS RTCM 3.0 output enabled 2 – RTK RTCM 3.0 output enabled 3 – DGPS&RTK RTCM 3.0 output enabled
RTCM3 Input	Allows the receiver to accept RTCM 3.0 messages via a certain number of ports. Currently can be set to 0 and 1.	0 – RTCM 3.0 input disabled 1 – RTCM 3.0 input enabled on a port.
CMR Output	Allows the receiver to output CMR messages.	0 – CMR output disabled 1 – CMR output enabled
CMR Input	Allows the receiver to accept CMR messages	0 – CMR input disabled 1 – CMR input enabled
JPS Output	Allows the receiver to output TPS messages.	0 – TPS output disabled 1 – TPS output enabled

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
JPS Input	Allows the receiver to accept TPS messages via a certain number of ports. The value represents the number of ports from which the receiver is able to simultaneously accept TPS messages.	0 – TPS input disabled 1, 2, 3, 4, 5 – TPS input enabled on the indicated number of ports.
DGPS mode	Enables/disables the receiver to run in DGPS (Code Differential) mode.	yes – enabled no – disabled
RTK mode (Hz)	Enables/disables the receiver to run in RTK mode at a specified rate. Values are given in Hertz.	0 – disabled 1 – enabled @ 1 Hz 2 – enabled @ 2 Hz 5 – enabled @ 5 Hz 10 – enabled @ 10 Hz 20 – enabled @ 20 Hz
Carrier Phase	Enables/disables true carrier phase output. <ul style="list-style-type: none"> • If the option is enabled, true carrier phase is output. • If the option is disabled, integral Doppler is output for true carrier phase. In this case the RTK mode option will not be fully available because only float solutions can be obtained when RTK using integral Doppler for true carrier phase. In TPS receivers other than JGG20 and HEGG, this option is always enabled.	yes – enabled no – disabled
Ethernet Port	Enables/disables the receiver to communicate over Ethernet.	yes – enabled no – disabled
TCP Connections	Enables/disables the receiver to establish a certain number (5 max.) of simultaneous Telnet-like connections.	0 – disabled 1, 2, 3, 4, 5 – number of enabled Telnet connections.

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
FTP Connections	Enables/disables the receiver to establish an FTP connection (1 maximum).	0 – disabled 1 – enabled
USB Port	Enables/disables communications through the USB port.	no – disabled yes – enabled
ADU	Enables/disables the receiver to act as an attitude determination unit.	0 – disabled 1 – enabled for heading and pitch computation 2 – enabled for heading, pitch, and roll computation
CDU Support	Enables/disables the receiver to be connected to a CDU-1 device.	no – disabled yes – enabled
Reserved	For internal purposes only.	no – disabled
Authorization	Enable/disables the receiver to be authorized to work with a number of programs. This is a bit-field option, where each bit corresponds to a specified software.	0 – not authorized 1st bit (decimal 1) – authorized for Pinnacle 2nd bit (decimal 2) – authorized for PC-CDU MS 3rd bit (decimal 4) – authorized for TopNET+ A combination of these values is also available.
RTK distance [x100m]	Determines the maximum allowed distance in hundreds of meters between the reference and rover stations. If the distance between the reference and rover stations exceeds the specified limit, the receiver will not provide the RTK position.	0 – disabled 511 – enabled without restriction 1...510 – enabled for the specified distance (for example, 120 means 12 km).

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
Corrections inputs	Enables/disables the corresponding port to be set to any differential data input mode. This is a bit-field option, where each bit corresponds to a specified port.	0 – differential data inputs disabled on all ports 1st bit (decimal 1) – serial port A enabled for differential data input 2nd bit (decimal 2) – serial port B enabled for differential data input 3rd bit (decimal 4) – serial port C enabled for differential data input 4th bit (decimal 8) – serial port D enabled for differential data input A combination of these values is also available.
Latitude 1	Specifies the latitude of the upper left corner of the rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from -90 to 90
Longitude 1	Specifies the longitude of the upper left corner of the rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from 0 to 360
Latitude 2	Specifies the latitude of the lower right corner of the rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from -90 to 90

Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
Longitude 2	Specifies the longitude of the lower right corner of the rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from 0 to 360
Lat_Lon checksum 1	Checksum of the Latitude1, Longitude1, Latitude2, Longitude2 options. Refer to the <i>GRIL Reference Manual</i> for details on how the checksum is calculated.	from 0 to 511 0 – indicates that the receiver is disabled to compute its position and output raw data measurements
Latitude 3	Specifies the latitude of the upper left corner of the second rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from -90 to 90
Longitude 3	Specifies the longitude of the upper left corner of the second rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from 0 to 360
Latitude 4	Specifies the latitude of the lower right corner of the second rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from -90 to 90

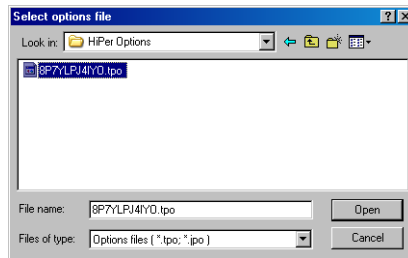
Table 3-6. Receiver Options (Continued)

Option Name	Description	Values
Longitude 4	Specifies the longitude of the lower right corner of the rectangle area within which the receiver can produce the position information and output measurement data. Measured in degrees.	from 0 to 360
Lat_Lon checksum 2	Checksum of the Latitude3, Longitude3, Latitude4, Longitude4 options. Refer to the <i>GRIL Reference Manual</i> for details on how the checksum is calculated.	from 0 to 511 0 – indicates that the receiver is disabled to compute its position and output raw data measurements
mmGPS	Enables/disables the receiver to use mmGPS.	no – disabled yes – enabled
Open mmGPS	Not used at this time.	n/a

- a. Cinderella activates only if the receiver hardware supports GLONASS and the L2 frequency.

Select Options File

Receiver options have either a *.tpo or *.jpo extension.


Figure 3-47. Select Options File

- Look in – the directory/folder in which the OAF resides on the computer.
- Open – loads the selected OAF to the connected receiver.
- Cancel – terminates the process and closes the dialog box.

Plots Menu

The Plots menu contains options for configuring and view satellite positions in relation to the current position of the receiver, as well as the position information.

Scatter

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

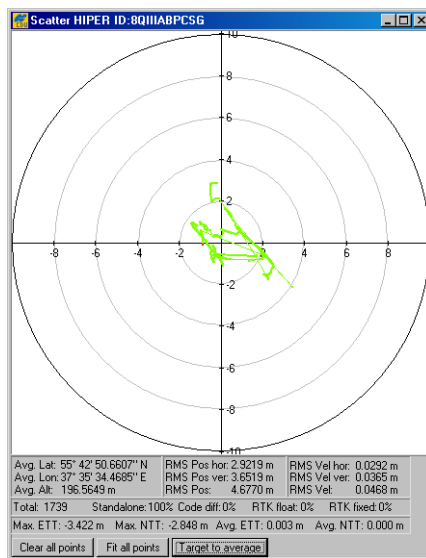


Figure 3-48. Scatter <Receiver ID>

To set the parameters to use for the *scatter* plot and *status bar*, see “Configuration” on page 3-95 and the *Plots Configuration* dialog box for details.

- Scatter plot – displays the current receiver position, as a red point, relative to the position specified in the *Target position* dialog box (see “Target Position” on page 3-69 for specifying this position).

The scatter plot is updated each second, unless a lower position or raw data update rate has been specified.

- Status bar – displays position information for the connected receiver.
 - Avg. Lat, Avg. Lon, and Avg. Alt: the average latitude, longitude and ellipsoidal height of the receiver's position over the entire set of obtained position estimates.
 - RMS Pos hor, RMS Pos ver, and RMS Pos: the horizontal, vertical, and total position RMS errors. The total position RMS error is the square root of the trace of the position error variance-covariance matrix.
 - RMS Vel hor, RMS Vel ver, and RMS Vel: the horizontal, vertical, and total velocity RMS errors. The total velocity RMS error is the square root of the trace of the velocity error variance-covariance matrix.
 - Total: the number of position estimates for each of the four solution types.
 - Standalone, Code, RTK float, and RTK fixed: the percentage that this solution type contributes to the *Total* number of position estimates.
 - Max ETT and Max NTT: the maximum Easting to Target and Northing to Target in the local system with the origin at the receiver.
 - Avg. ETT and Avg. NTT: the average Easting to Target and Northing to Target in the local system with the origin at the receiver.

The status bar is updated each second, unless a lower position or raw data update rate has been specified.

- Clear all points – removes all plotted points from the *scatter plot*.
- Fit all points – changes the scale of the scatter plot to display all plotted positions currently gathered with PC-CDU.
- Target to average – sets the target position equal to the average receiver's position.

The *scatter plot* and *status bar* will continue to update with current information, even after closing the dialog box, until the receiver is disconnected from PC-CDU.

Satellites

The *Satellites* dialog box displays a graphic representation of satellite positions, DOP information, and the satellites' signal-to-noise ratios.

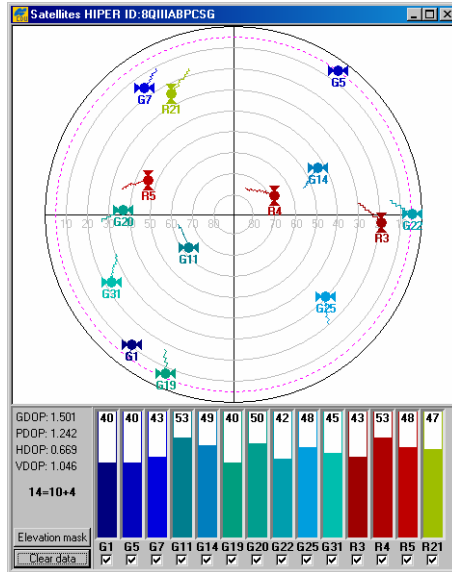


Figure 3-49. Satellites <Receiver ID>

- Satellite plot – displays elevation angles and satellite location.
 - Concentric circles: represents the elevation angle above the horizon in 10 degree increments. The outermost circle corresponds to 0 degrees above the horizon; the center of the sky plot represents 90 degrees above the horizon.
 - Dotted circle: the position/angle of the elevation mask. See “Elevation Mask Form” on page 3-93 for more information. (In Figure 3-49, the elevation mask is set to 5 degrees.)
 - GPS and GLONASS satellite icons: displays the type of satellite begin tracked, the direction of travel for the satellite, and the satellite’s ID (Figure 3-50 on page 3-92). The color of the satellite icon corresponds to the colored bars in the *signal-to-noise ratio histogram*.

In PC-CDU, GPS/WAAS satellite IDs begin with a “G”; GLONASS satellite IDs begin with an “R”.

See “Satellite Pop-up” on page 3-93 for details on viewing basic tracking information for individual satellites.

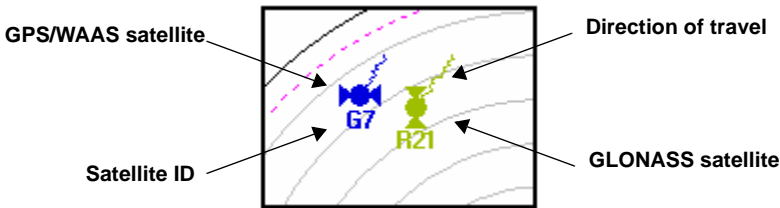


Figure 3-50. GPS and GLONASS Satellite Icons

- DOP characteristics – displays Dilution of Precision information.
 - GDOP: the Geometrical Dilution of Precision (3 position coordinates plus clock offset in the solution).
 - PDOP: the Position Dilution of Precision (3 coordinates).
 - HDOP: the Horizontal Dilution of Precision (2 horizontal coordinates).
 - VDOP: the Vertical Dilution of Precision (height only).
 - Number of satellites in view: the total number of satellites in view, including the number of GPS and GLONASS satellites. (In Figure 3-49, 10 GPS satellites are in view and 4 GLONASS satellites are in view for a total of 14 satellites.)
- Signal-to-noise ratio histogram – displays the continuously updated signal-to-noise ratio (C/N_0) in the C/A channel for tracked satellites.
 - Histogram bars – displays the corresponding satellites PRN (for GPS and WAAS) or slot number (for GLONASS). The bar’s color corresponds to the satellite’s icon color in the *satellite plot*.
 - Satellite checkboxes: enables/disables the corresponding GPS, GLONASS, and WAAS satellite for position computation.

In PC-CDU, GPS/WAAS satellite IDs begin with a “G”; GLONASS satellite IDs begin with an “R”.

- Elevation mask – the minimum angle above the horizon, in degrees, for satellites that the receiver will use for position computation. See “Elevation Mask Form” on page 3-93 for more information.
- Clear data – clears the current data from the dialog box; equivalent to a refresh of data. As the receiver continues to track satellites, new information will display on the *Satellites* dialog box.

Elevation Mask Form

The *ElevationMaskForm* dialog box describes a minimum angle above the horizon, in degrees, for satellites that the receiver will use for position computation.

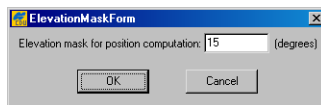


Figure 3-51. ElevationMaskForm

- Elevation mask for position computation – applies an elevation mask angle in degrees above the horizon.
- Ok – applies/saves this setting and closes the dialog box.
- Cancel – closes the dialog box without applying an elevation mask.

Satellite Pop-up

The satellite pop-up displays basic tracking information for the selected satellite. This information is similar to that seen on the Main screen.

Click and hold a satellite to view the pop-up.

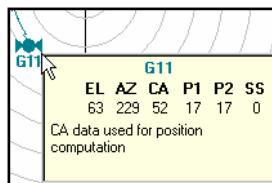


Figure 3-52. Basic Tracking Information Satellite Pop-up

Position

The **Position** dialog box displays continuously updated graphs that show the difference between latitude/longitude of the receiver position and latitude/longitude specified in the **Target position** dialog box over a user-defined time interval.

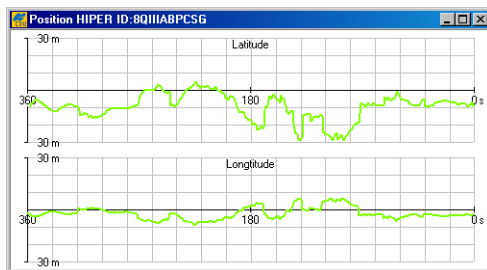


Figure 3-53. Position <Receiver ID> (<receiver type>)

To set the intervals used on these graphs, see “Configuration” on page 3-95 and the **Plots Configuration** dialog box for details.

- Horizontal axis – displays the time interval (in seconds) over which PC-CDU computes the differences.
 - The time interval range, over which the differences are displayed, varies between 0 seconds (the current moment in time) and a value entered in the *Time interval* parameter.
 - The interval between values along the axes corresponds to the value entered in the *Time step* parameter.

For example, the graphs in Figure 3-53 show a range of values from 0 seconds to 360 seconds with an interval of 20 seconds.

- Vertical axis – displays the difference (in meters) between a particular position of the receiver and a fixed position of a target.
 - The range of deviations that can be viewed is set using the *Max. deviation* parameter.
 - The interval between values along the axes corresponds to the value entered in the *Deviation set* parameter.

For example, the graphs in Figure 3-53 show the range of deviations from 0 meters to 30 meters with an interval of 10 meters.

Configuration

The *Plots Configuration* dialog box configures the settings used to display information in the *Scatter* and *Position* dialog boxes.

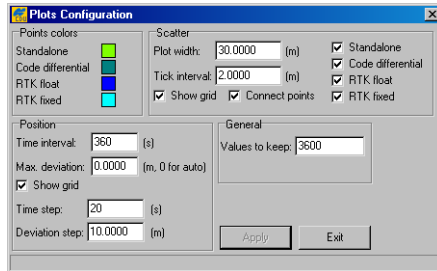


Figure 3-54. Plots Configuration

- **Points colors** – applies specific colors to *Standalone*, *Code differential*, *RTK float*, and *RTK fixed* points displayed in the *Scatter* dialog box.

To change the color, click the **color box** next to the point type. Click the desired color or define a custom color, then click **Ok**.

- **Scatter** – applies settings and parameters used to display information in the *Scatter* dialog box.
 - **Plot Width:** specifies the length of the axes on the plot.
 - **Tick Interval:** specifies the tick size (in meters) between the adjacent concentric circles (that is, interval between adjacent values on the axis).
 - **Show grid:** shows/hides the circle grid from the plot.
 - **Connect points:** if disabled, plots positions as discrete points; if enabled, plots positions as a trajectory.
 - **Standalone, Code differential, RTK float, RTK fixed:** specifies the type of solution to display on the plot. Use a unique color for each solution type.

- **Position** – governs the display of information on the graphs in *Position* dialog box.
 - Time interval: specifies the length of the x axis (in seconds).
 - Max. deviation: specifies the length of the y axis (in meters). Zero (0) means that the vertical axes will always be scaled automatically according to the maximum deviation value within the currently displayed time interval.
 - Show grid: shows/hides gridlines for the graphs.
 - Time step: specifies the time (in seconds) between adjacent vertical gridlines.
 - Deviation step: sets the distance (in meters) between adjacent horizontal gridlines.
- **General** – sets the circular buffer size for managing computer memory during long graph monitoring sessions.
 - Values to keep: determines the size of a circular buffer used to store the positions of the receiver's antenna. The default value is 3600.

When the buffer is full, the new values overwrite the oldest values. This circular buffer is used to save computer memory consumption when the graphs have been monitored for a long time (continuously during several hours, days, etc.).
- **Apply** – saves/applies the settings and closes the dialog box.
- **Cancel** – closes the dialog box without applying changes.

Help Menu

The Help menu contains options for viewing software information and receiver specifics.

About

The *About PC-CDU* dialog box displays software version and receiver information (after establishing connection).

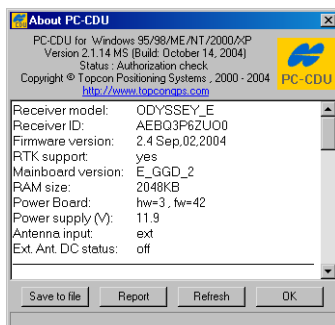


Figure 3-55. About PC-CDU

- Software information – displays information for PC-CDU on supported operating systems, version and build date, software status, copyright and publisher, and the TPS website.
- Receiver information – displays a list of information about the connected receiver. Table 3-7 gives a description of the items in this list.

Table 3-7. Receiver Information List

Field	Description
Receiver model	The model of the connected receiver.
Receiver ID	The electronic identifier of the connected receiver.
Firmware version	The firmware version installed on the receiver board.
RTK support	Shows whether or not the receiver can work in RTK mode.
Mainboard version	The version of the GPS board.
RAM size	The size of the receiver RAM in kilobytes.
Power Board	The hardware and firmware version of the power board.

Table 3-7. Receiver Information List (Continued)

Field	Description
Power supply (V)	The voltage of the external power supply.
Antenna input	Shows whether the receiver uses an internal or external antenna to acquire GPS/GLONASS signals.
Ext. Ant. DC status	Indicates if an external antenna draws acceptable DC current.
Power source	Shows the receiver's power source.
Power cur.source	Displays the receiver's current source of power.
Charger status	Displays the mode of a charger used to restore power to internal batteries.
Charger cur.status	Displays the current mode of a charger.
Battery A(V)	Shows the voltage of the battery A.
Battery B(V)	Shows the voltage of the battery B.
On board (V)	Displays the voltage that the receiver board draws.
Charger (V)	Displays the output voltage of the internal charger during battery charging.
On ports (V)	Displays the output voltage on the first pin of each of the receiver's serial port.
Digital part 3.3V (V)	Displays the voltage across the digital part of the receiver board.
Analog part 3.3V (V)	Displays the voltage across the analog part of the receiver board.
Digital part 5V (V)	Displays the voltage across the digital part of the receiver board.
Analog part 5V (V)	Displays the voltage across the analog part of the receiver board.
Temperature (°C)	Displays the current temperature of the receiver board.
Flash memory size	Displays the amount of available memory in the receiver for raw data storage.
Flash memory free	Displays how much receiver memory is free.
Number of files	Shows the number of raw data files in the receiver memory.
Bad blocks	Displays the number of bad blocks (if any) in the receiver memory.
Write verify	Displays the state of the "write verify" feature.
Block size	Displays the block size of the receiver's memory.

Table 3-7. Receiver Information List (Continued)

Field	Description
Blocks for files	Displays the total amount of the receiver's physical memory in blocks.
Physical memory	Displays the total amount of the receiver's physical memory in bytes.
Current port	Shows the port the receiver currently uses for communication with PC-CDU.
Speed	Shows the baud rate at which the receiver communicates with the computer.
Parity	Shows whether or not parity checking is being used. If used, displays the form of parity checking.
Stop bits	Shows the number of bits used to mark the end of a byte.
RTS/CTS	Shows whether or not hardware handshaking is being used.
Infrared	Shows the status of the infrared port.
Time from last reset	Shows the time elapsed since the last receiver reset.
Hardware version	Shows Topcon specific information.
Boot loader version	Shows Topcon specific information.
Wait states	Shows the flash memory access time expressed in wait states.

- **Save to file** – records the receiver's configuration information to a text file to the computer. This information is useful when contacting TPS for troubleshooting and service.
- **Report** – records the contents of this dialog box and the status of the receiver's options to a text file on the computer. This information is useful when contacting TPS for troubleshooting and service.
- **Refresh** – updates the *receiver information* list.
- **Ok** – closes the dialog box.

Notes:

[illegible]

Troubleshooting

This chapter provides information on how to identify and remedy minor software problems.

Check This First!

Before contacting TPS Customer support about any problems with the PC-CDU software, refer to the following list of basic suggestions that may help:

- Check all external receiver connections carefully and make sure they are securely and properly connected.
- Double-check all cables; cables become defective more often than the devices do.
- See the section below for solutions to various error messages.
- 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.
- Initialize the file system using PC-CDU (click **Tools ▶ Initialize file system**; this will erase all files inside the receiver).

Error and Warning Messages

Table 4-1 lists some of the error messages and warning dialog boxes that PC-CDU may display, along with possible causes and corrective actions. Error messages usually display in the status bar of the current dialog box or screen.

Table 4-1. Error and Warning Messages

Message	Possible Cause	Corrective Action
Can't find receiver	The receiver is turned off.	Apply power and turn the receiver on.
	The wrong computer port specified.	Select the correct computer port.
	The receiver port you are trying to connect to is not in command mode.	Use another free receiver port to connect with a computer.
Can't connect to the server	PC-CDU Internet Server is not started.	Configure and run PC-CDU in Internet Server mode. For details, see "Internet Server Mode" on page 1-21.
	PC-CDU Internet Server is improperly configured.	Check the Internet Server configuration. For details, see "Internet Server Mode" on page 1-21.
	PC-CDU Internet Client is improperly configured.	Check the Internet Client configuration. For details, see "Internet Client Mode" on page 1-23.

Table 4-1. Error and Warning Messages (Continued)

Message	Possible Cause	Corrective Action
<ul style="list-style-type: none"> • Can't set <parameter> • Can't set <value> for <parameter> • Incorrect <parameter> value • Invalid <parameter> • Invalid value for <parameter> 	PC-CDU and the receiver are disconnected.	Check the cable connection between the receiver and computer and restore the connection. For details, see “Starting PC-CDU” on page 1-6.
	The parameter value is out of acceptable range.	Specify the value within the range of the selected parameter.
Converter application file not found!	PC-CDU cannot locate the <code>tps2rin.exe</code> file in the specified path.	Make sure you have this file on the computer and double-check the file location.
Modem not found	The wrong receiver port is being used for connection.	Select the correct receiver port. For details, see “Radio > RFM96” on page 3-70.
	The receiver does not have a radio modem installed.	
Open COMx port failed: Access is denied (where x = 1, 2, 3, 4,...)	Another application uses the computer port dedicated for connection	Close the application, then re-connect. Alternatively, connect the receiver via another, unused computer port.

Table 4-1. Error and Warning Messages (Continued)

Message	Possible Cause	Corrective Action
Unable to create file	The receiver has no free space for files.	Download receiver files to a computer and then delete unnecessary files from the receiver. For details, see “How to Download Files to a Computer Using File Manager” on page 2-6.
	The receiver has no memory.	Contact your dealer to equip the receiver with memory.
	The receiver has already logged 512 files into the internal memory.	Delete unnecessary files.
File name contains not allowed characters	Certain characters cannot be used in the name of the log file.	Rename the log file using only allowed characters. The following characters cannot be used in the name of the log file: space, comma, { }, (), @, &, ", /\.
The <filename.tps> already exists. Do you want to overwrite the file or append to it?	<p>During file download, PC-CDU has detected that a file with the same name already exists in the destination folder.</p> <p>Note that PC-CDU keeps the same file names and extensions during a download.</p>	<p>Click Overwrite to replace the file.</p> <p>Click Append to add data from the new file to the current file. Only select this option when continue the process after an interruption.</p> <p>Click Cancel to stop the download. To keep new and old files separate, select a different folder in which to download data file.</p>

Table 4-1. Error and Warning Messages (Continued)

Message	Possible Cause	Corrective Action
Last warning: Waiting for 1st block	<p>During a file download, PC-CDU cannot retrieve the next block of data from the receiver.</p> <p>Usually, a larger block size will assist with efficient data transfer. However, if the connection between the computer and receiver is unreliable, reducing the block size can minimize communication errors.</p>	<p>Select a higher baud rate for transferring data.</p> <p>Select a smaller block size for retrieving data.</p>
All files with such names as <file name(s)> etc. residing in the folder <folder name> will be overwritten without warning. Continue?	The “Overwrite existing files” field has been enabled on the Real-Time Logging tab. This message will display after clicking Start.	<p>To pick the files to overwrite, click No and disable this field. After clicking Start, the names of recorded files will increment starting from the first unused value, not necessarily from 0000.</p> <p>Click Yes to perform this action.</p>

Obtaining Technical Support

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

Phone

To contact TPS Customer Support by phone, call:

1-866-4TOPCON (1-866-486-7266)

Monday through Friday, 7am to 5pm, Pacific Time

E-mail

To contact TPS Customer Support via e-mail, use the following electronic mail addresses (Table 4-2).

Table 4-2. Technical Support E-mail

For Questions Related To...	Use...
PC-CDU	pccdu@topcon.com
Hardware (receivers, antennas, firmware)	hardware@topcon.com

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



To provide you with quick and effective support, provide a detailed description of the problem.

When emailing TPS customer support, provide the following information for more efficient service:

1. The receiver model and configuration settings.
In PC-CDU, click **Help ► About** and click **Save to file**. Enter a name for the file and save it to your computer. Attach this file to the email.
2. The system/hardware specifications for the computer running PC-CDU; such as, operating system and version, memory and storage capacity, processor speed, etc.

3. The symptoms and/or error codes/messages that precede and follow the problem.
4. The activities being tried when the problem occurs. If possible, include the exact steps being taken up to when the error message or other problem occurs.
5. How regularly the problem occurs.

Generally, a customer support representative will reply within 24 hours, depending on the severity of the problem.

Web Site

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

To visit the support area, use:

<http://www.topcongps.com/support/>

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.

PC-CDU Scripts

This appendix will help you write PC-CDU scripts and describes following:

- the script language components, including variables and commands
- the syntax of the commands, their function and usage

Introduction to Scripting

Script is a plain text file where each line is either a receiver command, a PC-CDU command, or a comment. Scripts allow you to save a set of manual commands into one file. You can then load this single script instead of typing each individual command.

Variables

Variables are special character sequences that allow you to store some specific values³ in scripts. They can then be used in place of the values they store while running the script.

Currently PC-CDU supports the following ten variables:

@1, @2, @3, @4, @5, @6, @7, @8, @9, @0

The first nine of these variables initially contain the values of the script's command line arguments.

The “@0” is read-only and initially contains the script name specified in the command line. In the course of script execution, it will either contain the last of the receiver's positive acknowledgements (that is, the most recent of the RExxx replies), or remain empty.

3. Specified by the user and stored by PC-CDU.

After getting a “RExxx” reply from the receiver, PC-CDU will search the received sequence for the last «%» symbol it contains. PC-CDU will assign to the variable @0 only the characters following immediately after the last «%» symbol (until the end of this sequence is found). Leading and trailing spaces are trimmed.

Other commands include the following:

- The command “@default” assigns default values to these variables unless the corresponding arguments have already been specified through the script command line.
- The “@set” command changes the value associated with a variable. The @set command also assigns the value of @0 to other variables.

PC-CDU Commands

Essentially, a PC-CDU command is a single word that instructs the receiver to perform a certain function.

Any line starting with the “@” character is interpreted as a PC-CDU command with optional arguments separated by commas or spaces. Table A-1 describes the supported commands.

Table A-1. List of PC-CDU Commands

Command	Arguments	Description
:<label name>		Specifies a label to have the PC-CDU’s command interpreter jump to. Label names should not contain spaces or commas. See the “goto” command on page A-3 for how to use labels.
call	<script name> [<arguments>]	Executes another script from within the current script. The maximum number of recursive calls is 200.
clear		Removes issued commands and receiver replies from the Manual Mode dialog box.

Table A-1. List of PC-CDU Commands

Command	Arguments	Description
default	<variable> <default value>	<p>Defines the default values for those script arguments not explicitly specified in the command line.</p> <p>For example,</p> <pre>@default @1 a</pre> <p>assigns the value “a” to the variable @1, unless this argument is already defined in the command line.</p>
disconnect		<p>Stops script execution, disconnects PC-CDU from the receiver, and closes the Manual Mode dialog box. This is the same clicking Disconnect.</p>
echo	on off any character sequence	<p>Turns echo on and off, or displays its arguments.</p> <ul style="list-style-type: none"> • If echo is turned on, PC-CDU will display all non-empty lines entered in the script, specifically, PC-CDU commands, receiver commands, and the corresponding reply messages. • If echo is turned off, PC-CDU will display only replay messages with the “>” preceding character. <p>PC-CDU will not show @echo off and @echo on commands.</p> <p>Default is “on”.</p>
exit		<p>Stops script execution, disconnects PC-CDU from the receiver, and exists PC-CDU.</p>
goto	<label name>	<p>Jumps to the line following immediately after @:<label name>.</p> <p>If PC-CDU cannot find such a label in the script, this command is ignored and PC-CDU continues with the script.</p>

Table A-1. List of PC-CDU Commands

Command	Arguments	Description		
send	<bytes to send>	Sends the argument to the receiver as is, without making any substitutions. This string may contain escape sequences in a C-like style to represent non-printable characters.		
		Sequence	Value	Character
		\a	0x07	BEL
		\b	0x08	BS
		\f	0x0C	FF
		\n	0x0A	LF
		\r	0x0D	CR
		\t	0x09	HT
		\v	0x0B	VT
		\\	0x5C	Backslash
		\"	0x22	Double quote
		\O	any	O (octal character code)
		\xH	any	H (hexadecimal character code)
		Example: @send "#OFF#\r\n"		

Table A-1. List of PC-CDU Commands

Command	Arguments	Description
set	<ul style="list-style-type: none"> • rate <new baud rate> • rtscts [on,off] • <variable> <value> 	<p>These commands assign both serial port parameters and PC-CDU's internal variables.</p> <p>Example 1: a script has the following commands:</p> <pre>... @set @1 "a text" @echo @1 ...</pre> <p>When the script interpreter reaches the echo command, the following reply displays:</p> <pre>>a text</pre> <p>Example 2: assign the current terminal's baud rate to @2:</p> <pre>%%print,/par/cur/term/rate @set @2 @0</pre>
sleep	integer number of milliseconds	PC-CDU interrupts script execution for a specified number of milliseconds.
stop		Stops script execution.
stoponerrors	on off	Enables/disables PC-CDU's stop-on-error option. This indicates whether PC-CDU will stop script execution after getting an ERxxx message from the receiver. Default is "on".

Table A-1. List of PC-CDU Commands

Command	Arguments	Description
timeout	integer value in milliseconds, default is 5000	<p>If a receiver command starts with a “%” symbol, PC-CDU will wait for the receiver to reply within the specified timeout interval.</p> <ul style="list-style-type: none"> • If a reply is received during this time, it will be saved to the variable @0. • If no reply is received over the timeout interval, if after receiving a few bytes PC-CDU gets no more data for 100+ milliseconds, or if PC-CDU receives continuous data for more than 100 milliseconds, @0 will be undefined (however, script execution will continue). In this case, you may need to adjust the timeout interval to be sure that the variable @0 contains correct information.

Receiver Commands

Scripts can specify arguments for receiver commands, either explicitly or through variables.

When using variables to specify arguments, PC-CDU will substitute the variable for some specific value before sending the command to the receiver. If sending a receiver command that starts with “%” (command label), PC-CDU will wait for the receiver to reply and, if a reply is received, will save the reply to the variable @0.

Currently the character “@” is used in GRIL commands to delimit the command checksum. This character should not cause any problems since PC-CDU automatically adds a checksum for every command sent to the receiver.

PC-CDU does not interpret receiver commands. For example, if using receiver commands that change the baud rate and/or handshaking for the current receiver port (that is, the port to which PC-CDU is connected), use the appropriate @ set commands immediately after the receiver command, as shown on the next page.

```
%%set,/par/cur/term/rtscts,off
@set rtscts,off
%%set,/par/cur/term/rate,9600
@set rate,9600
```

Or specify these types of receiver commands at the end of the script, immediately before @disconnect or @exit. Otherwise, PC-CDU may be locked up waiting for the receiver to reply.

The following examples illustrate various script applications.

- The following script configures the TPS receiver with a third party beacon receiver for serial port output. described in the article *Using the Coast Guard Beacon for Differential Corrections* (<http://www.topcongps.com/support/how-to/beaconsetup.html>).

```
@default @1,c
%%set,dev/ser/@1/imode,rtcm
%%set,dev/ser/@1/rate,9600
%%set,/par/pos/mode/cur,cd
%%em,,/msg/nmea/GGA:1
@exit
```

After saving these lines to a file (for example, beacon.jpc), type in the command line @beacon and click **Enter** to instruct the receiver to input RTCM corrections from serial port C and output NMEA messages to the current terminal. To use serial port B for inputting corrections, type @beacon b and press **Enter**.

- The following script illustrates how the goto command and labels are used in scripts intended to work with different receiver models.

```
%/par/rcv/model%print,/par/rcv/model
@goto Is@0
@echo Unknown receiver model.
@stop
@:IsOdyssey
@echo Receiver is Odyssey!
@goto end
```

```
@:IsLegacy
@echo Receiver is Legacy!
@goto end
@:IsEurocard
@echo Receiver is Eurocard!
@:IsHIPER
@echo Receiver is HIPER!
@goto end
@:end
@stop
```

Writing and Editing Scripts

You can create and edit scripts directly in the PC-CDU's *Manual Mode* dialog box or in any text editor, such as Notepad.

To create a script:

1. Navigate to the *Manual Mode* dialog box and click **Edit script**.
2. Enter the name of a new script in the *File name* field.
3. Click **Open**.
4. Type the script commands.
5. Click the **Save script** button.



Save scripts using the extension “.tpc”.

To edit an existing script:

1. Navigate to the *Manual Mode* dialog box and click **Edit script**.
2. Navigate to a list of available scripts, select the desired script name, and click **Open**.

3. Make the necessary changes in the script and click **Save script**.
4. Click **Close editor**.



For easy access to scripts, keep them all in one directory, for example in PC-CDU's working directory.

Running Scripts via PC-CDU

In PC-CDU, the *Manual Mode* dialog box loads and runs scripts.

1. Type @ and enter the script name (for example, @my_script) in the command line.

OR

Click the **Load script** button and select the required script from the *Script file* dialog box.

2. Specify script arguments, if required.



Delimit script arguments using either spaces or commas. If an argument in the command line contains separators (spaces and/or commas), put quotes around the argument; for example, @myscript "This is one argument".

3. Click **Send command**.

After clicking Send command, PC-CDU will read the script file line by line and carry out the following operations, if necessary:

- skipping empty and comment lines
- replacing variables with their specific values
- echoing non-empty lines to the screen (if echo is enabled)
- interpreting PC-CDU internal commands
- sending commands to the receiver and (optionally) waiting for receiver replies

To abort a script execution, click **Stop script**.

Running Scripts via Windows Explorer

Files with the extension “.tpc” are automatically associated with PC-CDU, meaning that clicking on a scrip file from Windows Explorer will launch PC-CDU in Manual mode.

When the *Connection Parameters* dialog displays, click **Connect** to open the *Manual Mode* dialog box.

Note, however, that the selected script will not automatically start. The name of the script must be entered into the command line and Load script clicked.

After exiting Manual mode, you can continue working with PC-CDU in the usual way.

Settings List

This appendix provides a complete list of PC-CDU settings including their values and ranges (if applicable), units (if applicable), and dialog boxes/windows/panes on which these parameters are described in detail.

Connection Parameters

Table B-1 provides a list of settings that are available in the **Connection Parameters** dialog box. If applicable, the default value for a setting is shown in *italics*.

Table B-1. Connection Parameters Settings

Parameter	Values/Range	Units	Where to Find Description
Connection Mode	<ul style="list-style-type: none"> • Direct • Internet Client • Internet Server 	–	page 1-6
Port settings Area			
Port	<ul style="list-style-type: none"> • COM#'s • USB • LPT • ETHR 	–	page 1-9, page 1-10, page 1-13, page 1-16, page 1-20

Table B-1. Connection Parameters Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Baud rate	<ul style="list-style-type: none"> • 4800 • 9600 • 19200 • 38400 • 57600 • 115200 • 230400 • 460800 	bps	page 1-9
Infrared port	<ul style="list-style-type: none"> • enabled • disabled 	–	page 1-7
RTC/CTS handshaking	<ul style="list-style-type: none"> • enabled • disabled 	–	page 1-7
TCP port (for Ethernet connection only)	1...8002...65536	–	page 1-16, page 1-20
Host name (for Ethernet connection only)	<ul style="list-style-type: none"> • 0.0.0.0 ... 255.255.255.255 • not specified 	–	page 1-16, page 1-20
Password (for Ethernet connection only)	<ul style="list-style-type: none"> • up to 15 a/n characters • no password 	–	page 1-16, page 1-21
Program Settings Area			
Passive mode	<ul style="list-style-type: none"> • enabled • disabled 	–	page 1-8
Manual mode only	<ul style="list-style-type: none"> • enabled • disabled 	–	page 1-8
Timeout	<ul style="list-style-type: none"> • 500 • 1000 • 2000 • 3000 • 4000 • 5000 • 10000 	milliseconds	page 1-8

Table B-1. Connection Parameters Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Restore the receiver's original baud rate on Disconnect	<ul style="list-style-type: none"> • enabled • disabled 	—	page 1-8
Internet (Client - Server) settings Area			
Host name	<ul style="list-style-type: none"> • localhost • 0.0.0.0 to 255.255.255.255 • DNS addresses 	—	page 1-8, page 1-23
TCP port	1...8000...65536	—	page 1-8, page 1-23
Password	<ul style="list-style-type: none"> • up to 128 a/n characters • no password 	—	page 1-8, page 1-23
Display data on server	<ul style="list-style-type: none"> • enabled • disabled 	—	page 1-8
Log server events	<ul style="list-style-type: none"> • enabled • disabled 	—	page 1-9
DNS lookup	<ul style="list-style-type: none"> • enabled • disabled 	—	page 1-9, page 1-23

File Manager

Table B-2 provides a list of settings that are available in the **File Manager** dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-2. File Manager Settings

Parameter	Values/Range	Units	Where to Find Description
Download files Tab			
Exclusive mode	<ul style="list-style-type: none"> disabled enabled 	–	page 3-11
Block size	<ul style="list-style-type: none"> 512 1024 2048 	bytes	page 3-11
Current log file Tab			
File name	<ul style="list-style-type: none"> any string not specified 	–	page 3-13
Recording interval	0...1...86400	seconds	page 3-13
Elevation mask	-90...5...90	degrees	page 3-13
Download path Tab			
New folder	any string	–	page 3-15

Real-Time Logging

Table B-3 provides a list of settings that are available in the ***Real-Time Logging*** dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-3. Real-Time Logging Settings

Parameter	Values/Range	Units	Where to Find Description
Single file Tab			
Save to	up to 24 a/n characters	–	page 3-18
Recording interval	0...1...86400	seconds	page 3-16
Elevation mask	-90...5...90	degrees	page 3-17
Multiple files Tab			
Prefix	up to 16 a/n characters	–	page 3-19
Numbering	<ul style="list-style-type: none"> • Ascending Count • Date & Time 	–	page 3-19
New file every	any integer number	<ul style="list-style-type: none"> • minutes • hours • days 	page 3-20
Autoconvert to RINEX	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-20
Start Count	0...999999	–	page 3-20
Overwrite existing files	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-20
Recording interval	0...1...86400	seconds	page 3-16
Elevation mask	-90...5...90	degrees	page 3-17
Select output path Tab			
New folder	• any string	–	page 3-23

Receiver Configuration

Table B-4 through Table B-11 on page B-26 provide a list of settings that are available in the **Connection Parameters** dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-4. Connection Parameters Settings – General Tab

Parameter	Values/Range	Units	Where to Find Description
Elevation mask Area			
Terminal Elevation Mask	-90...5...90	degrees	page 3-27
Antenna	<ul style="list-style-type: none"> • Internal • External • Auto 	–	page 3-28
Antenna Status Area			
Current Input	<ul style="list-style-type: none"> • int • ext 	–	page 3-28
Ext. DC Status	<ul style="list-style-type: none"> • off • normal • overload 	–	page 3-28
Temperature Area			
Board temperature	a numeral	°C	page 3-29
Power management Area			
Power->Mode	<ul style="list-style-type: none"> • Auto • Mix • Battery A • Battery B • External 	–	page 3-29
Power->Current Mode	<ul style="list-style-type: none"> • mix • ext • a • b 	–	page 3-29

Table B-4. Connection Parameters Settings – General Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Charger->Mode	<ul style="list-style-type: none"> • Off • Charge A • Charge B • Auto 	–	page 3-29
Charger->Speed	<ul style="list-style-type: none"> • normal • fast 	–	page 3-29
Charger->Current Mode	<ul style="list-style-type: none"> • off • a • b 	–	page 3-29
Charger->Current	<ul style="list-style-type: none"> • a numeral 	Amperes	page 3-29
Power output modes->Ports A,B (for Odyssey only)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-29
Power output modes->Port C (for Odyssey only)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-30
Power output modes->Ports	<ul style="list-style-type: none"> • Off • On • Always 	–	page 3-30
Power output modes->Slots	<ul style="list-style-type: none"> • Off • On • Always 	–	page 3-30
Voltages-> External	float values	Volts	page 3-30
Voltages-> On Board	float values	Volts	page 3-30
Voltages-> Battery A	float values	Volts	page 3-30
Voltages-> Battery B	float values	Volts	page 3-30

Table B-4. Connection Parameters Settings – General Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Voltages-> Charger	float values	Volts	page 3-30
Voltages-> On Ports	float values	Volts	page 3-30
Turn on/off Slots - >Slot 2 (C)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-30
Turn on/off Slots - >Slot 3 (B)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-30
Turn on/off Slots - >Slot 4 (D)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-30
Enable Low Power Mode	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-30

Table B-5. Connection Parameters Settings – MINTER Tab

Parameter	Values/Range	Units	Where to Find Description
Recording Interval	0...1...86400	seconds	page 3-31
Elevation mask for Log file	-90...5...90	degrees	page 3-31
File name prefix	<ul style="list-style-type: none"> • log • up to 20 a/n characters 	–	page 3-31
Always append to the file	up to 20 a/n characters	–	page 3-31
File Creation mode	<ul style="list-style-type: none"> • Log file • AFRM 	–	page 3-31
Automatic File Rotation Mode (AFRM) parameters Area			
Period	60...3600...86400	seconds	page 3-32

Table B-5. Connection Parameters Settings – MINTER Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Phase	0...86400	–	page 3-32
Files (total)	0... $2^{31}-1$	–	page 3-32
Files (remain)	integer values	–	page 3-32
Automatically remove old files	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-32
FN key mode Area			
FN key mode	<ul style="list-style-type: none"> • LED blink mode switch • Occupation mode switch 	–	page 3-32
Initial data collection dynamic mode Area			
Initial data collection dynamic mode	<ul style="list-style-type: none"> • Static • Kinematic 	–	page 3-32
Data recording auto-start Area			
Data recording auto-start	<ul style="list-style-type: none"> • Off • On • Always 	–	page 3-33

Table B-6. Connection Parameters Settings – Positioning Tab

Parameter	Values/Range	Units	Where to Find Description
Positioning Mode Area			
Positioning Mode	<ul style="list-style-type: none"> • Standalone • DGPS (Code Differential) • RTK Float • RTK Fixed 	–	page 3-34

Table B-6. Connection Parameters Settings – Positioning Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Positioning Masks Area			
Elevation mask	-90...5...90	degrees	page 3-34
PDOP mask	0...30...500	–	page 3-34
RAIM Enabled Area			
RAIM Enabled	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-34
Alarm	<ul style="list-style-type: none"> • Manual • Non-precision • Terminal • En route 	–	page 3-34
Alarm limit	10...555.6...10000	meters	page 3-35
Current Datum	<ul style="list-style-type: none"> • datum IDs list • W84 	–	page 3-35
Enable Solutions Area			
Enable Solutions	<ul style="list-style-type: none"> • Standalone • DGPS • RTK Float • RTK Fixed 	–	page 3-35
Positioning System Area			
GPS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
GLONASS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
Measurements Used Area			
Measurements Used	<ul style="list-style-type: none"> • CA/L1 • P/L1 • P/L2 • Iono-Free 	–	page 3-36

Table B-6. Connection Parameters Settings – Positioning Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Iono-Correction	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
Topo-Correction	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
Satellite management Area			
Satellites tracked ->GPS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
Satellites tracked ->GLONASS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
Satellites used in pos.->GPS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
Satellites used in pos.->GLONASS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-36
GPS Subtab			
lock	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-37
use	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-37
GLONASS Subtab			
Satellite Numbering	<ul style="list-style-type: none"> • Frequency • Channel Number • Slot Number 	–	page 3-37
lock	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-37
use	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-37

Table B-6. Connection Parameters Settings – Positioning Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
WAAS Subtab			
Channel 1 or Channel 2	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-37
Set WAAS	120...138	–	page 3-37
as GPS	1...32	–	page 3-37
Interpret message #0 as message: #	0...99	–	page 3-37
Use Iono Corrections	<ul style="list-style-type: none"> • Never • If exist • Only 	–	page 3-37
Enable output of «true» WAAS PRN numbers	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-37

Table B-7. Connection Parameters Settings – Base Tab

Parameter	Values/Range	Units	Where to Find Description
Base Station Coordinates (Antenna Phase Center) Area			
GPS/GLO at one time	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-40
GPS/GLO separately	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-40
Averaged	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-40
Avg. Span	0...180...32000	–	page 3-40

Table B-7. Connection Parameters Settings – Base Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
GPS/GLO, GPS, and GLONASS Subtabs			
Lat	90°00'00.000000"N ... 0°00'00.000000" ... 90°00'00.000000"S	DD MM SS.ssssss	page 3-40
Lon	180°00'00.000000" E ... 0°00'00.000000" ... 180°00'00.000000" W	DDD MM SS.ssssss	page 3-40
Alt	-20000.000 ...0.0... +20000.000	meters	page 3-41
L1 to L2 Antenna Phase Center offsets Area			
East	-0.1...0.0...+0.1	meters	page 3-41
North	-0.1...0.0...+0.1	meters	page 3-41
Height	-0.1...0.0...+0.1	meters	page 3-41
RTCM Settings Area			
Station ID	0...1023	—	page 3-41
Max. number of Satellites	0...	—	page 3-41
Health	<ul style="list-style-type: none"> • Good • Bad • Unknown 	—	page 3-41

Table B-7. Connection Parameters Settings – Base Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Measurements Sent Area			
CA/L1	<ul style="list-style-type: none"> • <i>enabled</i> • disabled 	–	page 3-42
P/L1	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
P/L2	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
System Used Area			
GPS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
GLONASS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
Pseudo-range smoothing	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
CMR Settings Area			
Station ID	0...31	–	page 3-42
Motion	<ul style="list-style-type: none"> • Unknown • Static • Kinematic 	–	page 3-42
Measurements Sent Area			
CA/L1	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
P/L1	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
P/L2	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-42
GLONASS message	3...5...7	–	page 3-42

Table B-7. Connection Parameters Settings – Base Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Short ID	<ul style="list-style-type: none"> • not specified • up to 8 a/n characters 	–	page 3-42
COGO	<ul style="list-style-type: none"> • not specified • up to 16 a/n characters 	–	page 3-43
Long ID	<ul style="list-style-type: none"> • not specified • up to 50 a/n characters 	–	page 3-42

Table B-8. Connection Parameters Settings – Rover Tab

Parameter	Values/Range	Units	Where to Find Description
Positioning Mode Area			
Positioning Mode	<ul style="list-style-type: none"> • Standalone • DGPS (Code Differential) • RTK Float • RTK Fixed 	–	page 3-44
DGPS Parameters Area			
Multi-base	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-44
Corrections usage Area			
Nearest	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-44
Mix	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-44
Corrections (only if Mix enabled)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-44

Table B-8. Connection Parameters Settings – Rover Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Positions (only if Mix enabled)	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-44
Best	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-44
CD Corrections max. age	1...30...1200	seconds	page 3-44
Iono Corrections max. age	1...300...1800	seconds	page 3-45
Use Iono Corrections	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-45
Source	<ul style="list-style-type: none"> • Any • Serial A • Serial B • Serial C • Serial D 	–	page 3-45
Enable Solutions Area			
Enable Solutions	<ul style="list-style-type: none"> • Standalone • DGPS • RTK Float • RTK Fixed 	–	page 3-45
RTK Parameters Area			
RTK mode	<ul style="list-style-type: none"> • Extrapolation • Delay 	–	page 3-45
Dynamics	<ul style="list-style-type: none"> • Static • Kinematic 	–	page 3-45
Ambiguity fixing level	<ul style="list-style-type: none"> • Low • Medium • High 	–	page 3-45
Measurements Used Area			
CA/L1	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-45

Table B-8. Connection Parameters Settings – Rover Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
P/L1	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-45
P/L2	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-45
Base Corrections period	0.05...1...100	seconds	page 3-46
Use old ref. coordinates	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-46
Source	<ul style="list-style-type: none"> • Any • Serial A • Serial B • Serial C • Serial D 	–	page 3-46
CMR Settings Area			
GLONASS message	3...5...7	–	page 3-46

Table B-9. Connection Parameters Settings – Ports Tab

Parameter	Values/Range	Units	Where to Find Description
Serial Subtab			
Serial A, Serial B, Serial C, Serial D			
Input	<ul style="list-style-type: none"> • None • Command • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni 	–	page 3-47

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Output	<ul style="list-style-type: none"> • None • DGPS RTCM {1,31,3} • DGPS RTCM {9,34,3} • RTK RTCM {18,19,22,3} • RTK RTCM {20,21,22,3} • RTK RTCM {18,19,23,24} • RTK RTCM {20,21,23,24} • RTK RTCM3 GD min • RTK RTCM3 GD full • RTK RTCM3 GGD min • RTK RTCM3 GGD full • RTK CMR {10,0,1} • RTK CMR+ {10,0,9} • RTK JPS min • RTK JPS max • User Defined 	–	page 3-48
Period	1...86400	seconds	page 3-49
Baud rate	<ul style="list-style-type: none"> • 4800 • 9600 • 19200 • 38400 • 57600 • 115200 • 230400 • 460800 	bps	page 3-49
RTS/CTS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-49

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Infrared	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-49
Parallel Subtab			
Input	<ul style="list-style-type: none"> • None • Command • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni 	–	page 3-47
Output	<ul style="list-style-type: none"> • None • DGPS RTCM {1,31,3} • DGPS RTCM {9,34,3} • RTK RTCM {18,19,22,3} • RTK RTCM {20,21,22,3} • RTK RTCM {18,19,23,24} • RTK RTCM {20,21,23,24} • RTK RTCM3 GD min • RTK RTCM3 GD full • RTK RTCM3 GGD min • RTK RTCM3 GGD full • RTK CMR {10,0,1} • RTK CMR+ {10,0,9} • RTK JPS min • RTK JPS max • User Defined 	–	page 3-48

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Period	1...86400	seconds	page 3-49
Modem Subtab			
Input	<ul style="list-style-type: none"> • None • Command • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni 	–	page 3-47
Output	<ul style="list-style-type: none"> • None • DGPS RTCM {1,31,3} • DGPS RTCM {9,34,3} • RTK RTCM {18,19,22,3} • RTK RTCM {20,21,22,3} • RTK RTCM {18,19,23,24} • RTK RTCM {20,21,23,24} • RTK RTCM3 GD min • RTK RTCM3 GD full • RTK RTCM3 GGD min • RTK RTCM3 GGD full • RTK CMR {10,0,1} • RTK CMR+ {10,0,9} • RTK JPS min • RTK JPS max • User Defined 	–	page 3-48

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Period	1...86400	seconds	page 3-49
Type	<ul style="list-style-type: none"> • Receiving • Transmitting 	–	page 3-51
Mode	<ul style="list-style-type: none"> • Off • FHSS • DSS 	–	page 3-51
Antenna	<ul style="list-style-type: none"> • Int • Ext 	–	page 3-51
Power	<ul style="list-style-type: none"> • High • Low 	–	page 3-51
USB Subtab			
Input	<ul style="list-style-type: none"> • None • Command • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni 	–	page 3-47
Output	<ul style="list-style-type: none"> • None • DGPS RTCM {1,31,3} • DGPS RTCM {9,34,3} • RTK RTCM {18,19,22,3} • RTK RTCM {20,21,22,3} • RTK RTCM {18,19,23,24} • RTK RTCM {20,21,23,24} • RTK RTCM3 GD min 	–	page 3-48

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Output (continued)	<ul style="list-style-type: none"> • RTK RTCM3 GD full • RTK RTCM3 GGD min • RTK RTCM3 GGD full • RTK CMR {10,0,1} • RTK CMR+ {10,0,9} • RTK JPS min • RTK JPS max • User Defined 		
Period	1...86400	seconds	page 3-49
Ethernet Subtab			
IP Settings Area			
IP Address	0.0.0.0... 192.168.2.2... 255.255.255.255	–	page 3-53
IP Mask	0.0.0.0... 255.255.255.192... 255.255.255.255	–	page 3-53
Gateway	0.0.0.0... 192.168.2.1... 255.255.255.255	–	page 3-53
Telnet Settings Area			
TCP Port	1...8002...65535	–	page 3-54
Timeout	1...600...2147483647	seconds	page 3-54

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Network Password	<ul style="list-style-type: none"> up to 15 a/n characters <i>automatically generated unique value</i> 	–	page 3-54
FTP Settings Area			
TCP Port	1...21...65535	–	page 3-54
Timeout	1...600...2147483647	seconds	page 3-54
TCP Subtab			
TCP A, TCP B, TCP C, TCP D, TCP E			
Input	<ul style="list-style-type: none"> None Command Echo RTCM 2.x RTCM 3.x CMR JPS Omni 	–	page 3-47
Output	<ul style="list-style-type: none"> None DGPS RTCM {1,31,3} DGPS RTCM {9,34,3} RTK RTCM {18,19,22,3} RTK RTCM {20,21,22,3} RTK RTCM {18,19,23,24} RTK RTCM {20,21,23,24} RTK RTCM3 GD min RTK RTCM3 GD full 	–	page 3-48

Table B-9. Connection Parameters Settings – Ports Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Output (continued)	<ul style="list-style-type: none"> • RTK RTCM3 GGD min • RTK RTCM3 GGD full • RTK CMR {10,0,1} • RTK CMR+ {10,0,9} • RTK JPS min • RTK JPS max • User Defined 		
Period	1...86400	seconds	page 3-49

Table B-10. Connection Parameters Settings – Events Tab

Parameter	Values/Range	Units	Where to Find Description
Events Tab			
PPS A Enabled and PPS B Enabled Areas			
PPS A Enabled or PPS B Enabled	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-56
Period	10...1000 ...1000000000	milliseconds	page 3-56
Offset	-500000000... 0...500000000	milliseconds	page 3-56
Offset	-500000...0...500000	nanoseconds	page 3-56
Period of 'marked' pulses	0...20...1000000000	milliseconds	page 3-56
Edge	<ul style="list-style-type: none"> • Rise • Fall 	–	page 3-56

Table B-10. Connection Parameters Settings – Events Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Ref. Time	<ul style="list-style-type: none"> • GPS • GLO • UTC_{us} • UTC_{us} 	–	page 3-56
Tied with Ref. Time	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-56
Event A Enabled and Event B Enabled Areas			
Event A Enabled or Event B Enabled	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-57
Clock Synchronization	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-57
Status	<ul style="list-style-type: none"> • on • off 	–	page 3-57
Edge	<ul style="list-style-type: none"> • Rise • Fall 	–	page 3-57
Ref. Time	<ul style="list-style-type: none"> • GPS • GLO • UTC_{us} • UTC_{su} 	–	page 3-57
Tied with Ref. Time	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-57

Table B-11. Connection Parameters Settings – Advanced Tab

Parameter	Values/Range	Units	Where to Find Description
Anti-Interference Subtab			
Anti-Interference	<ul style="list-style-type: none"> • Off • GPS L1/L2 • GLONASS L1/L2 • GPS/GLONASS L1 • GPS/GLONASS L2 • Auto 	–	page 3-59
Multipath Reduction Subtab			
Code multipath reduction	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-60
Carrier multipath reduction	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-60
Loop Management Subtab			
PLL bandwidth	2...25...50	Hz	page 3-61
PLL order	<ul style="list-style-type: none"> • 2 • 3 	–	page 3-61
Guided loop bandwidth	0.1...0.5...10	Hz	page 3-61
C/A code guided loop bandwidth	0.1...0.8...50	Hz	page 3-61
Enable Adaptive Guided Loops	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-62
Enable Co-Op Tracking Loop Area			
Enable Co-Op Tracking Loop	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-62
Static Mode	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-62

Table B-11. Connection Parameters Settings – Advanced Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Bandwidth of individual PLL	2...5...20	Hz	page 3-62
Bandwidth of common PLL	2...25...50	Hz	page 3-62
Enable Common Loop for L2	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-62
External Frequency Subtab			
Frequency Source Area			
Source	<ul style="list-style-type: none"> • Internal • External 	–	page 3-63
Ext. frequency value	2...10...40	MHz	page 3-63
Ext. frequency source status	<ul style="list-style-type: none"> • off • wait • locked 	–	page 3-63
Ext. freq. signal amplitude	<ul style="list-style-type: none"> • off • low • ok 	–	page 3-64
Oscillator Offset Reduction Area			
Oscillator Offset Reduction	<ul style="list-style-type: none"> • Off • Freq. Locked • Freq. and Time Locked 	–	page 3-64
Raw Data Management Subtab			
Raw Measurement Update Rate			
Update Rate	10...100...5000	milliseconds	page 3-65
Current Update Rate	any integer value between 10 and 5000	milliseconds	page 3-65

Table B-11. Connection Parameters Settings – Advanced Tab (Continued)

Parameter	Values/Range	Units	Where to Find Description
Position Update Rate			
Update Rate	10...100...5000	milliseconds	page 3-65
Current Update Rate	any integer value between 10 and 5000	milliseconds	page 3-65
Code smoothing interval	0...300...900	seconds	page 3-65
Doppler smoothing method	0, 1, 2	–	page 3-66
Nominal Iono smoothing interval	0...60...900	seconds	page 3-66
Minimum Iono smoothing interval	0...30...900	seconds	page 3-66
Options Subtab			
Cinderella	<ul style="list-style-type: none"> • On • Off 	–	page 3-67

Site Configuration

Table B-12 provides a list of settings that are available in the *Site Configuration* dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-12. Site Configuration Settings

Parameter	Values/Range	Units	Where to Find Description
Site Parameters Area			
Site Name	up to 20 a/n characters	–	page 3-14, page 3-68
Antenna Status	<ul style="list-style-type: none"> • Fixed • Moving 	–	page 3-14, page 3-68
Antenna Parameters Area			
Antenna Height	0.0...100.0	meters	page 3-14, page 3-68
Slant	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-14, page 3-68
Antenna Type	list of antenna types	–	page 3-14, page 3-68
Send parameters automatically	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-14, page 3-68

Target Position

Table B-13 provides a list of settings that are available in the *Target position* dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-13. Target position Settings

Parameter	Values/Range	Units	Where to Find Description
Lat	90°00'00.000000"N ... <i>0°00'00.000000"</i> ... 90°00'00.000000"S	DD MM SS.ssssss	page 3-69
Lon	180°00'00.000000"E ... <i>0°00'00.000000"</i> ... 180°00'00.000000"W	DDD MM SS.ssssss	page 3-69

RFM96 Configuration

Table B-14 provides a list of settings that are available in the **RFM96 Configuration** dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-14. RFM96 Configuration Settings

Parameter	Values/Range	Units	Where to Find Description
Connect Tab			
Modem connected to port	<ul style="list-style-type: none"> • B • C • D 	–	page 3-70
Connect to modem at bitrate	<ul style="list-style-type: none"> • Auto • 38400 • 19200 • 9600 • 4800 • 2400 	bps	page 3-71
Connection type	<ul style="list-style-type: none"> • Search for modem • Power cycle 	–	page 3-71
Configuration Tab			
RF Channel	<ul style="list-style-type: none"> • list of enabled channels • 0 	MHz	page 3-71
DTE-DCE Serial Interface Area			
Baud rate	<ul style="list-style-type: none"> • 38400 • 19200 • 9600 • 4800 • 2400 	bps	page 3-71
Parity	<ul style="list-style-type: none"> • None • Even • Odd 	–	page 3-71
EOT	0...10...255	–	page 3-71

Table B-14. RFM96 Configuration Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Radio Link Settings Area			
Link rate	<ul style="list-style-type: none"> • 4800 • 9600 	bps	page 3-72
Retries	0...3...255	–	page 3-72
FEC	<ul style="list-style-type: none"> • Off • On 	–	page 3-72
Scrambling	<ul style="list-style-type: none"> • Off • On 	–	page 3-72
Digisquelch	<ul style="list-style-type: none"> • High • Moderate • Low • Off 	–	page 3-73
CSMA monitor	<ul style="list-style-type: none"> • Off • On 	–	page 3-73
DTE-DCE protocol mode Area			
DTE-DCE protocol mode	<ul style="list-style-type: none"> • Transp. w/EOT time out • Transp. w/EOT character • Packet • Auto-repeater • Fast async 	–	page 3-73
BREAK to Command	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-73
Addresses Area			
Local	0...254	–	page 3-74
Destination	0...255	–	page 3-74

Plots Configuration

Table B-15 provides a list of settings that are available in the **Plots Configuration** dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-15. Plots Configuration Settings

Parameter	Values/Range	Units	Where to Find Description
Point colors Area			
Standalone	color palette	–	page 3-95
Code differential	color palette	–	page 3-95
RTK float	color palette	–	page 3-95
RTK fixed	color palette	–	page 3-95
Position Area			
Time interval	1...360...99999999	seconds	page 3-96
Max. deviation	0.0...99999999.0	meters	page 3-96
Show grid	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-96
Time step	1...30...99999999	seconds	page 3-96
Deviation step	0.0001...0.5...99999999.0	meters	page 3-96
Scatter Area			
Plot width	0.0001...10.0...99999999.0	meters	page 3-95
Tick interval	0.0001...1.0...99999999.0	meters	page 3-95
Show grid	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-95
Connect points	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-95

Table B-15. Plots Configuration Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Standalone	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-95
Code differential	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-95
RTK float	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-95
RTK fixed	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-95
General Area			
Values to keep	3600...2678400	–	page 3-96

Converter to RINEX Setup

Table B-16 provides a list of settings that are available in the *Converter to RINEX Setup* dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-16. Converter to RINEX Setup Settings

Parameter	Values/Range	Units	Where to Find Description
Properties Area			
Run by	any a/n characters	–	page 3-21
Observer	any a/n characters	–	page 3-21
Agency	any a/n characters	–	page 3-21
Antenna #	any a/n characters	–	page 3-22
Antenna type	any a/n characters	–	page 3-22
Comment	any a/n characters	–	page 3-22

Table B-16. Converter to RINEX Setup Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Marker name	any a/n characters	–	page 3-22
Marker number	any a/n characters	–	page 3-22
Converter Area			
Application	path to converter	–	page 3-22
Exclude GPS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-22
Exclude GLONASS	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-22
Exclude L1	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-22
Exclude L2	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-22
Delete source JPS files after successful conversation	<ul style="list-style-type: none"> • enabled • disabled 	–	page 3-22
Additional options	list of switches	–	page 3-22

<Datum ID> Datum Parameters

Table B-17 provides a list of settings that are available in the **<Datum ID> Datum Parameters** dialog box. The default value for a setting is shown in *italics* (if applicable).

Table B-17. Datum Settings

Parameter	Values/Range	Units	Where to Find Description
Current Datum	<ul style="list-style-type: none"> datum IDs list W84 	–	page 3-38
Reference Ellipsoid parameters Area			
Ellipsoid ID	two-letter IDs	–	page 3-38
Semi-major axis	6300000.0... <i>6378137.0000...</i> 6500000.0	meters	page 3-38
Inverse flattening	280.0... <i>298.257223563...</i> 310.0	–	page 3-38
Transformation parameters Area			
Reference Datum	<ul style="list-style-type: none"> W84 P90 	–	page 3-38
Translation dX	-10000.0... <i>0.0...</i> +10000.0	meters	page 3-38
Translation dY	-10000.0... <i>0.0...</i> +10000.0	meters	page 3-39
Translation dZ	-10000.0... <i>0.0...</i> +10000.0	meters	page 3-39
Rotation Rx	-60.0... <i>0.0...</i> 60	seconds of arc	page 3-39

Table B-17. Datum Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Rotation Ry	-60.0...0.0...60	seconds of arc	page 3-39
Rotation Rz	-60.0...0.0...60	seconds of arc	page 3-39
Scale	-1000.0...0.0...1000	ppm	page 3-39

Notes:

This image shows a single 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.

Installing and Updating the TPS USB Driver

To connect a USB equipped TPS receiver with the computer's USB port, the USB port option must be enabled in the receiver and the TPS USB driver must be installed on the computer.

Newer receivers, or receivers with the latest firmware, may require the TPS USB driver to be updated.

Installing the TPS USB Driver

The following sections describes first-time installation procedures for the USB driver version 2.0.0.2 (build date November 24, 2003) or newer on various operating systems.

If you have a previous version of the USB driver (as of 1.0.1.0, October 25, 2002) installed, refer to your operating system's section in "Updating the TPS USB Driver" on page C-11.

Installing the USB Driver on Windows 98 SE

1. Using the USB cable, connect the receiver and computer. Click **Next** on the *Add New Hardware Wizard* dialog box.
2. Select *Search for the best driver for your device. (Recommended)*. and then click **Next** (Figure C-1 on page C-2).

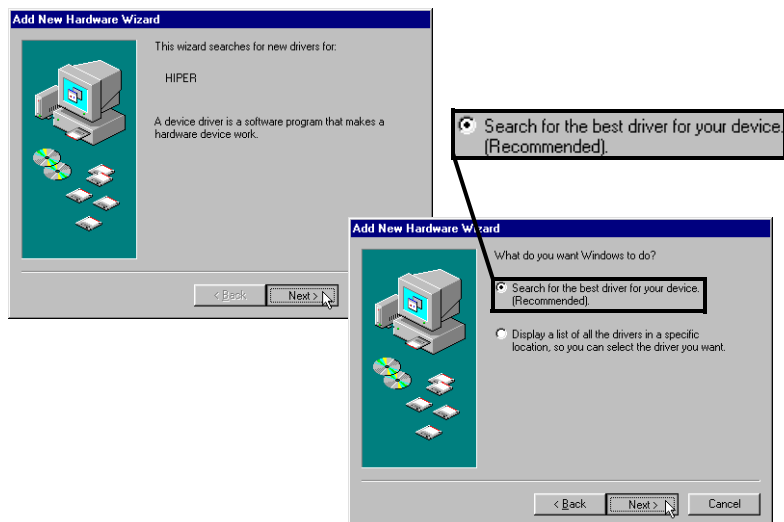


Figure C-1. Windows 98 SE – Add New Hardware Wizard and Select the Driver Search Method

3. In the next dialog box, select *Specify a location* and click **Browse**.
4. Select the folder on the computer drive in which the driver resides and click **OK**.

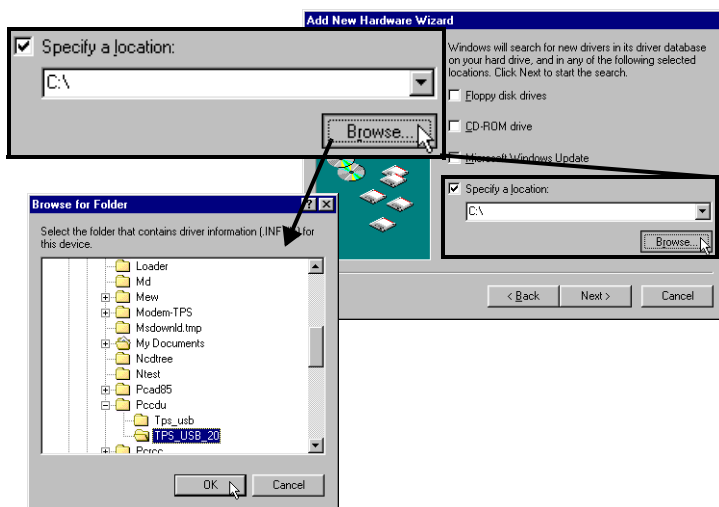


Figure C-2. Windows 98 SE – Locate Driver Files

- Make sure you have selected the correct driver location and then click **Next**.

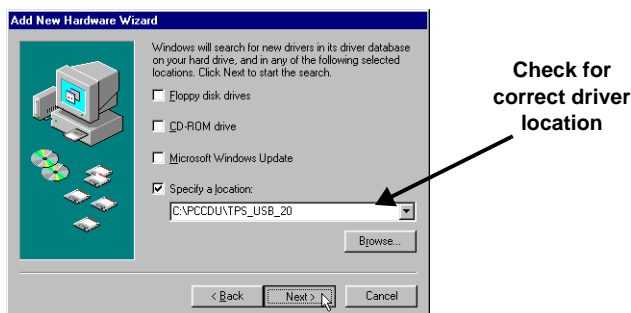


Figure C-3. Windows 98 SE – Driver Location Specified

- Make sure that `TPSUSBIO.INF` has been detected and then click **Next**.

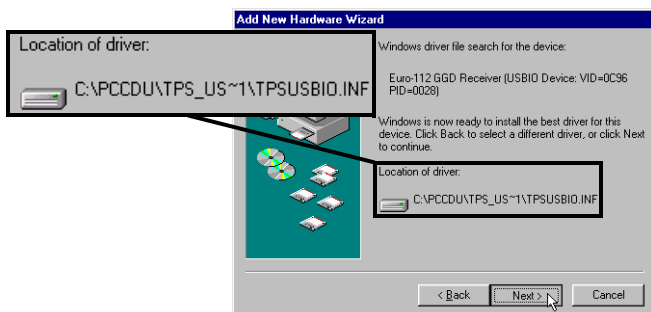


Figure C-4. Windows 98 SE – Ready to Install Driver

- When driver installation completes, click **Finish**.

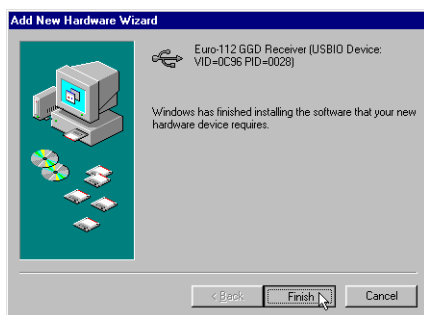


Figure C-5. Windows 98 SE – USB Driver Installation Complete

Installing the USB Driver on Windows ME

1. Use the USB cable to connect the receiver and the computer. The **Add New Hardware Wizard** dialog box displays. Select *Specify the location of the driver (Advanced)* and click **Next**.

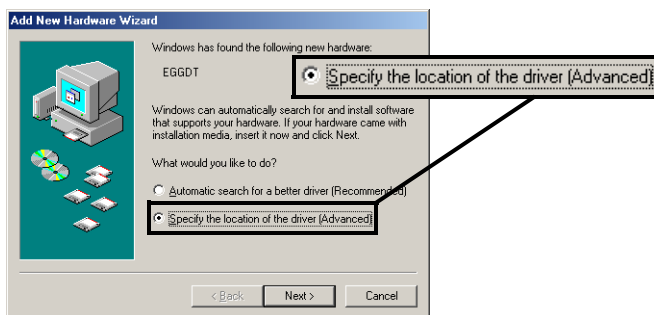


Figure C-6. Windows ME – Select the Driver Search Method

2. Select *Search for the best driver for your device. (Recommended)*. and *Specify a location*. Click **Browse** and select the folder on the computer drive in which the driver resides. Click **Next**.



Figure C-7. Windows ME – Locate Driver Files

3. Make sure you have selected the correct driver location and then click **Next**.



Figure C-8. Windows ME – Ready to Install Driver

4. When driver installation completes, click **Finish**.



Figure C-9. Windows ME – USB Driver Installation Complete

Installing the USB Driver on Windows 2000

1. Use the USB cable to connect the receiver and the computer. The *Found New Hardware Wizard* dialog box displays. Click **Next**.
2. On the next dialog box, select **Search for a suitable driver for my device (recommended)** and then click **Next**.

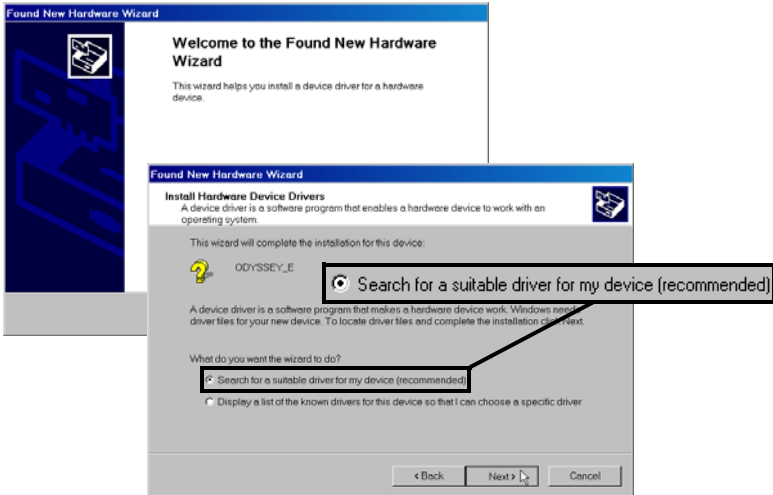


Figure C-10. Windows 2000 – Found New Hardware Wizard and Install Hardware Device Drivers

3. Select *Specify a location* and click **Next**, then click **Browse**.

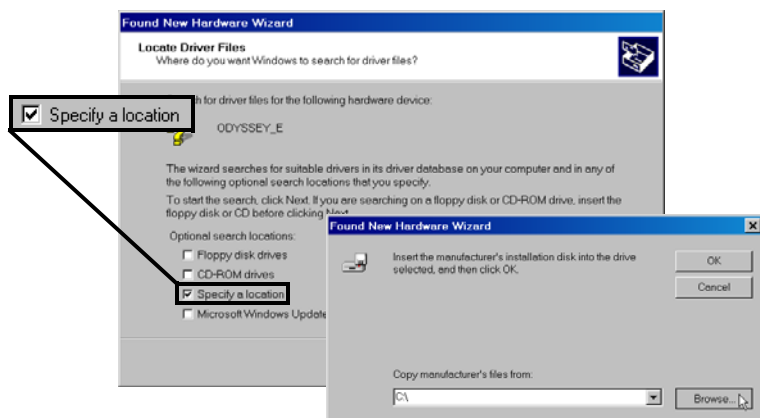


Figure C-11. Windows 2000 – Locate Driver Files and Click Browse

4. Select the folder on the computer drive in which the driver resides and click **Open**.
5. Make sure you have selected the correct driver location and click **OK**.

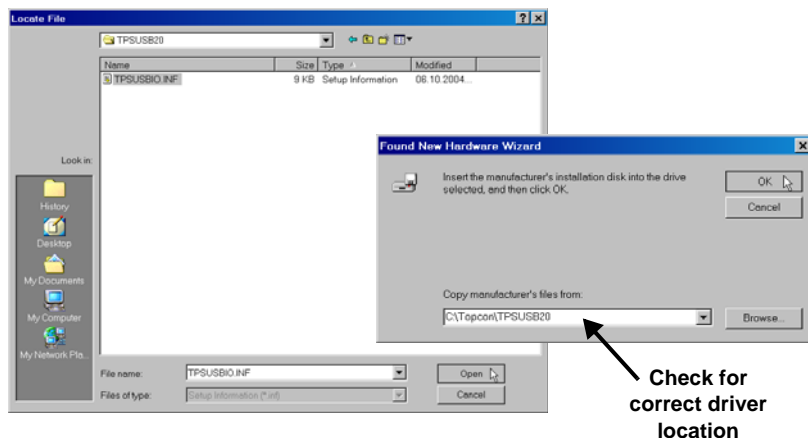


Figure C-12. Windows 2000 – Browse for Folder and Driver Location Specified

6. Make sure that `TPSUSBIO.INF` has been detected and click **Next**.

- When driver installation completes, click **Finish**.

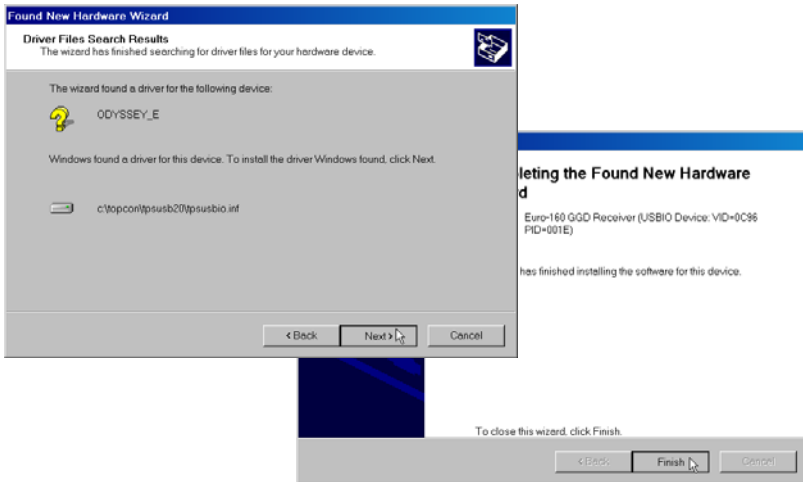


Figure C-13. Windows 2000 – Ready to Install Driver and USB Driver Installation Complete

Installing the USB Driver on Windows XP

- Use the USB cable to connect the receiver and the computer. The *Found New Hardware Wizard* dialog box displays. Select *No, not this time* and click **Next**.
- Select *Install from a list or specific location (Advanced)* and click **Next** (Figure C-14 on page C-9).

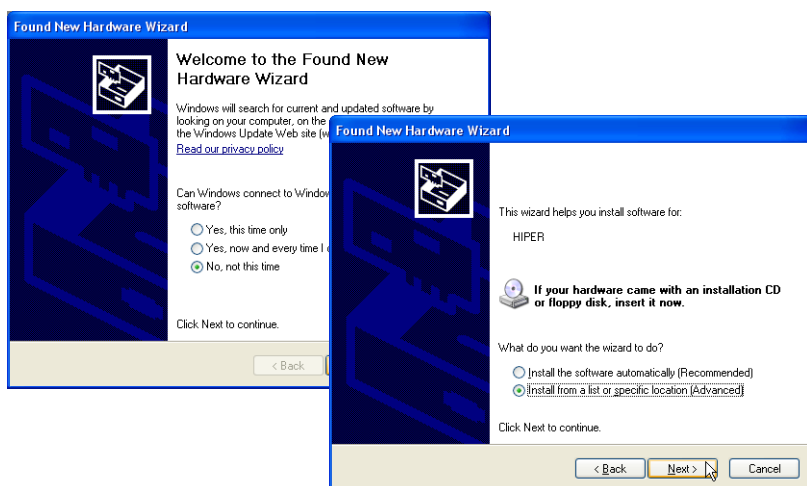


Figure C-14. Windows XP – Found New Hardware Wizard and Select Installation Method

3. Select *Search for the best driver in these locations.* and *Include this location in the search.* Click **Browse**.
4. Select the folder from which to install the driver and click **OK**.

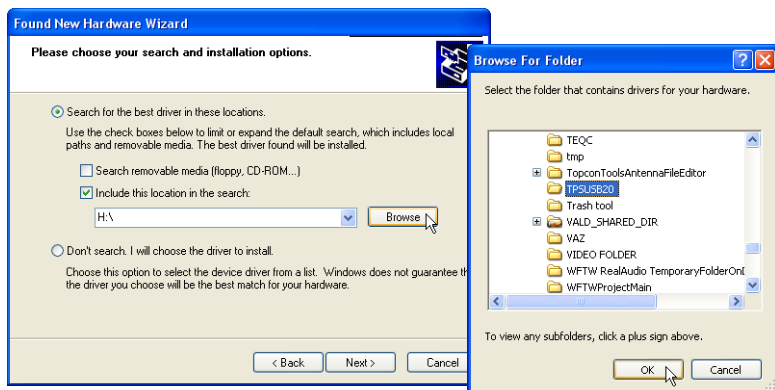


Figure C-15. Windows XP – Select Search Options and Navigate to Driver Location

5. Make sure you have selected the correct driver location and then click **Next**.
6. Click **Continue Anyway**.

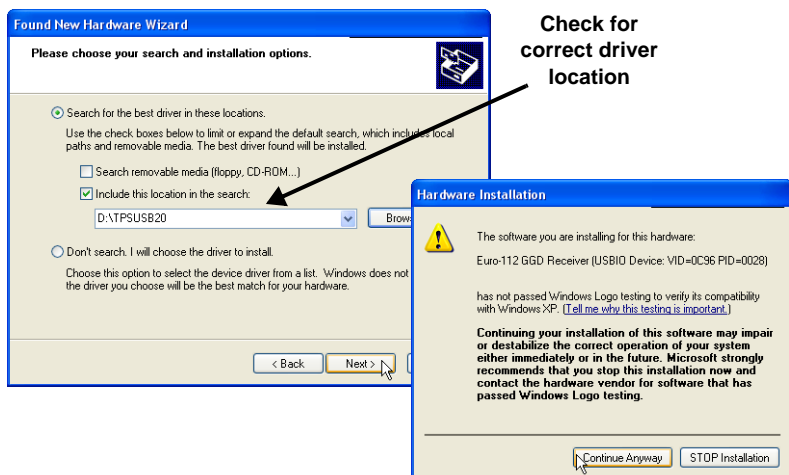


Figure C-16. Windows XP – Driver Location Specified and Continue Installation

7. Wait while the driver installation completes.
8. When driver installation completes, click **Finish**.

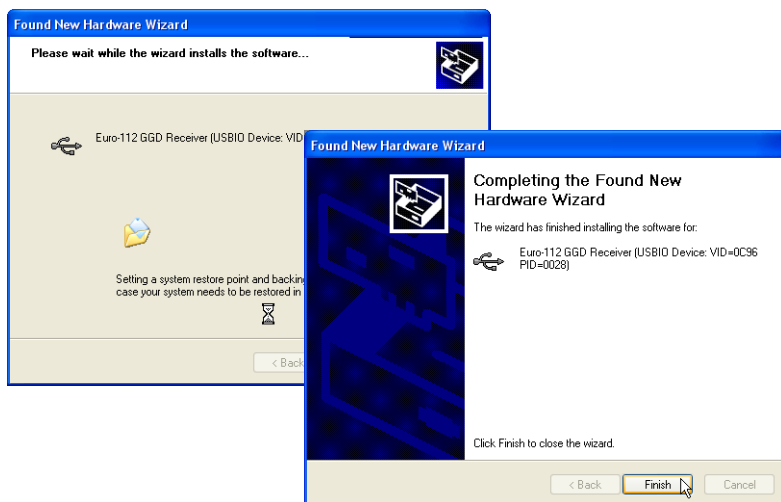


Figure C-17. Windows XP – Driver Is Being Installed and USB Driver Installation Complete

Updating the TPS USB Driver

To properly use PC-CDU version 2.1.13 or later using a USB connection with the receiver, update the TPS USB driver to version 2.0.0.2 or newer.

Updating the USB Driver on Windows 98 SE

1. Use the USB cable to connect the receiver computer. Right-click the **My Computer** icon on the desktop. Click **Properties** and then **Device Manager**.
2. On the *Device Manager* dialog box, double-click **Universal Serial Bus controllers**, right-click your receiver, and then click **Properties**.
3. On the *Receiver Properties* dialog box, click the *Driver* tab and then click **Update Driver**.

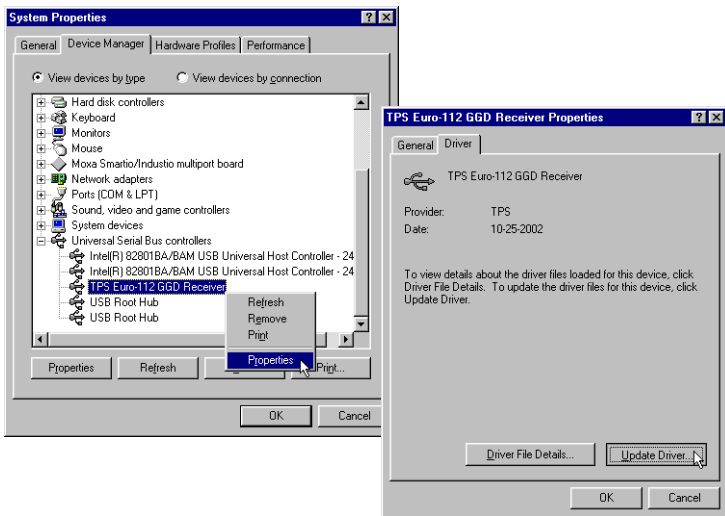


Figure C-18. Windows 98 SE – Device Manager and Click Update Driver

4. Click **Next** on the *Upgrade Device Driver Wizard* dialog box.
5. Select *Display a list of the known drivers for this device so that I can choose a specific driver* and click **Next**.

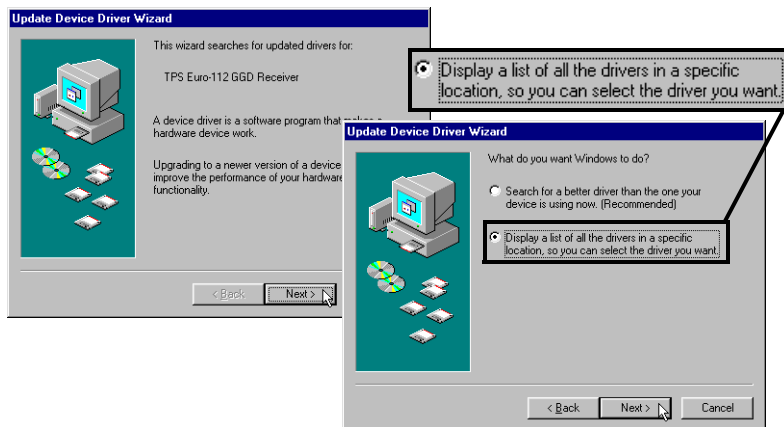


Figure C-19. Windows 98 SE – Driver Upgrade Wizard Welcome and Update Hardware Device Drivers

6. On the next dialog box, choose the desired receiver and click **Have Disk**.
7. On the *Open* dialog box appears, select the driver and folder from which to install the driver (TPSUSBIO . INF) and click **OK**.

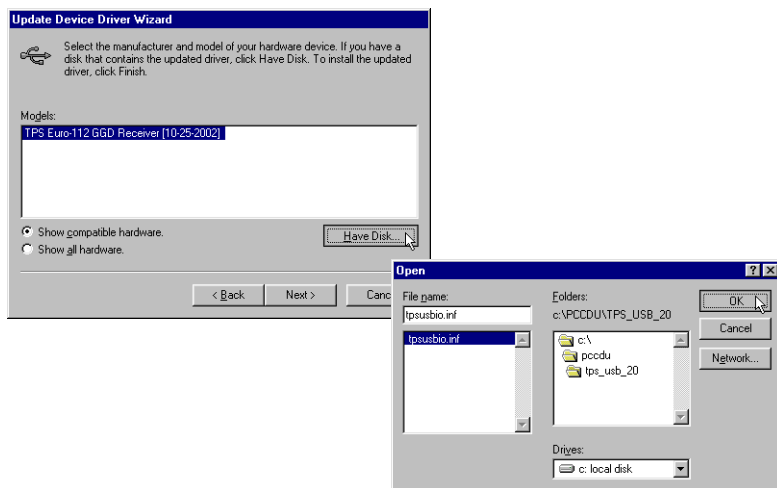


Figure C-20. Windows 98 SE – Select a Device Driver and Browse for the Driver

8. Click **OK** on the *Install From Disk* dialog box.
9. On the next dialog box, select your receiver model and click **Next**.

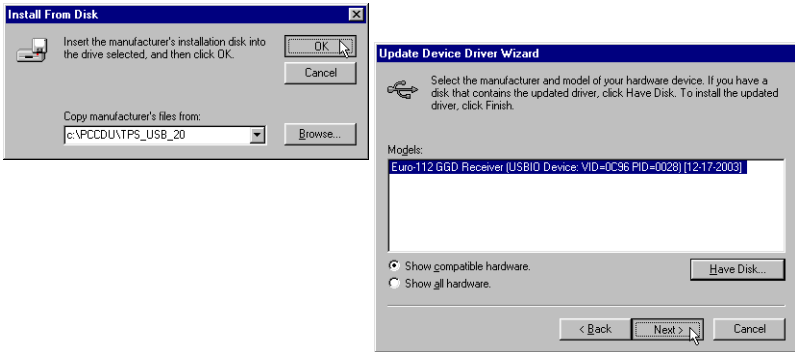


Figure C-21. Windows 98 SE – Install From Disk and Select Receiver Model

10. On the *Ready to install* dialog box, click **Next** to begin installation process.
11. When the USB driver update completes, click **Finish** to close the installation wizard.



Figure C-22. Windows 98 SE – USB Driver Update Complete

Updating the USB Driver on Windows ME

1. Use the USB cable to connect the receiver and computer.
2. Right-click the **My Computer** icon on the desktop. Click **Properties** then **Device Manager**.
3. On the **Device Manager** dialog box, double-click **Universal Serial Bus controllers**, right-click your receiver, and then click **Properties**.
4. On the **Receiver Properties** dialog box, click the **Driver** tab and click **Update Driver**.

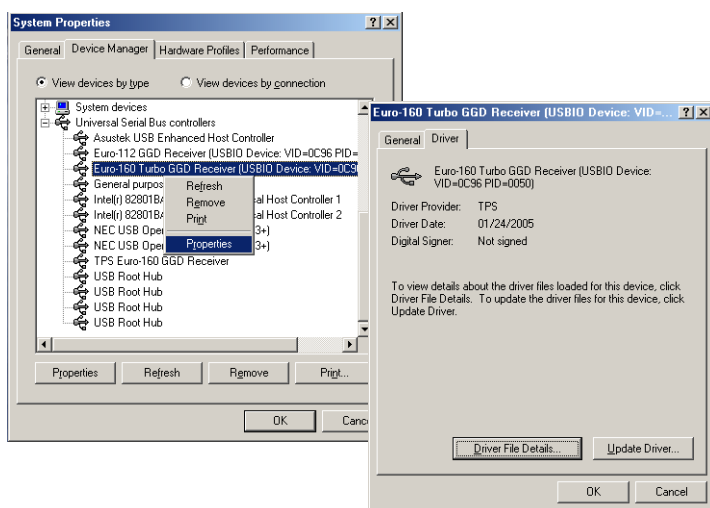


Figure C-23. Windows ME – Device Manager and Update Driver

5. Select *Specify the location of the driver (Advanced)* and click **Next** (Figure C-24 on page C-15).
6. Select *Search for a better driver than the one your device is using now. (Recommended)* and *Specify a location*. Click **Browse** and select the folder on the computer drive in which the driver resides. Click **Next** (Figure C-24 on page C-15).

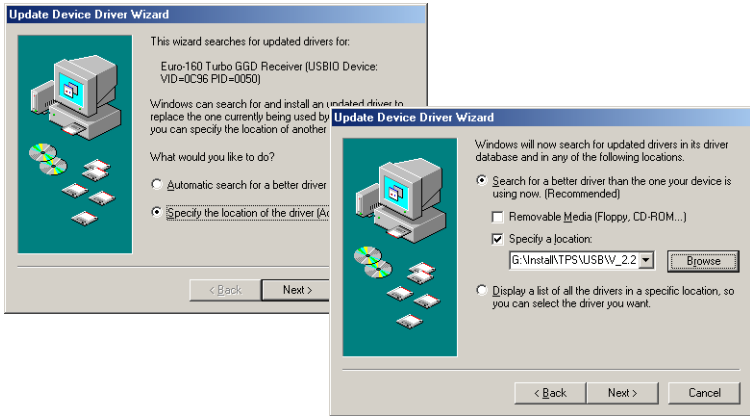


Figure C-24. Windows ME – Select Driver Search Method and Locate Driver Files

7. Make sure you have selected the correct driver location and then click **Next**.
8. When the USB driver update completes, click **Finish** to close the installation wizard.

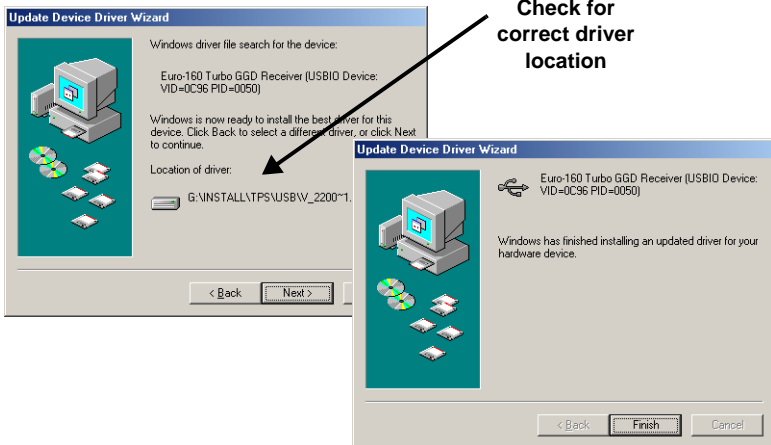


Figure C-25. Windows ME – Ready to Install Driver and USB Driver Update Complete

Updating the USB Driver on Windows 2000

1. Use the USB cable to connect the receiver and the computer. On the **Device Manager** dialog box, double-click **Universal Serial Bus controllers**, right-click your receiver, and click **Properties**.
2. On the **Receiver Properties** dialog box, select the **Driver** tab and then click **Update Driver**.

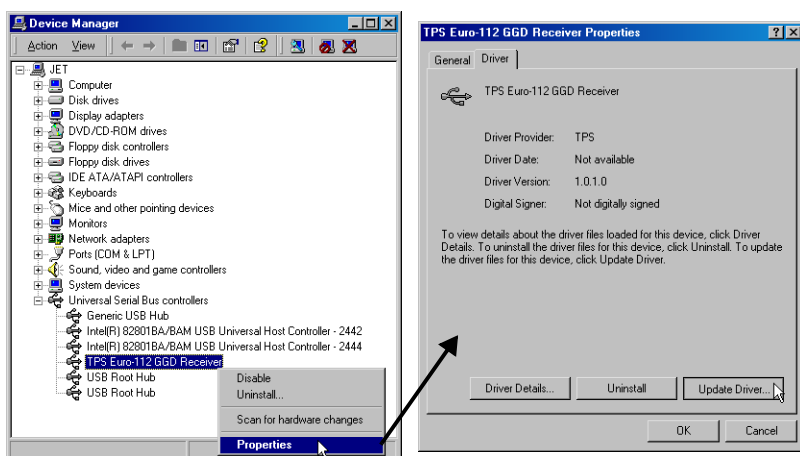


Figure C-26. Windows 2000 – Select Receiver and Update Driver

3. On the **Upgrade Device Driver Wizard** dialog box, click **Next**.
4. Select *Display a list of the known drivers for this device so that I can choose a specific driver* and click **Next** (Figure C-27 on page C-17).

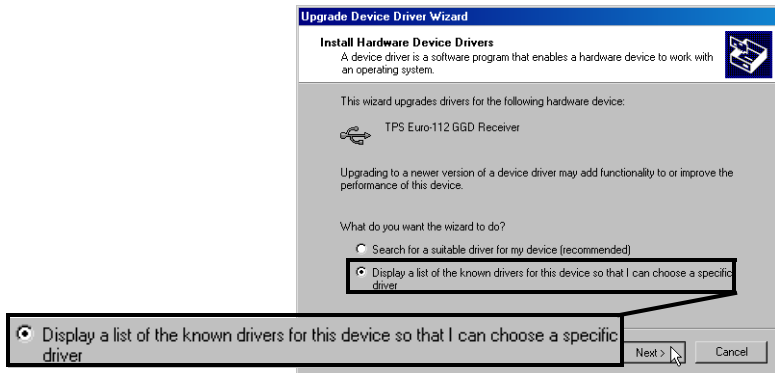


Figure C-27. Windows 2000 – Install Hardware Device Drivers

5. On the *Select a Device Driver* dialog box, choose the desired receiver and click the **Have Disk** button.

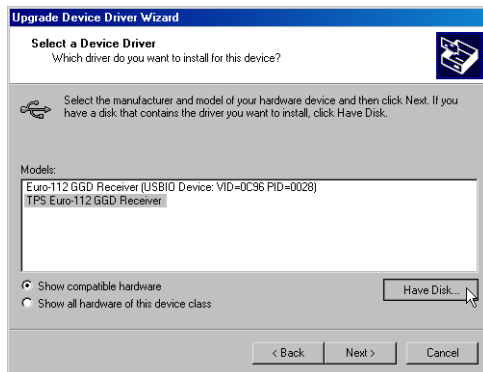


Figure C-28. Windows 2000 – Select a Device Driver

6. The *Install From Disk* dialog box appears. Click the **Browse** button and select the folder from which to install the driver (TPSUSBIO.INF).

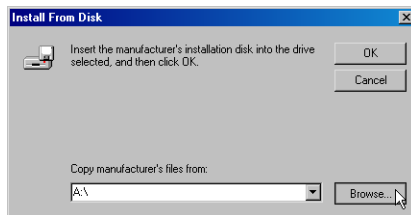


Figure C-29. Windows 2000 – Install From Disk->Browse

7. After locating the driver, click **Open**. Click **OK** on the ***Install From Disk*** dialog box.

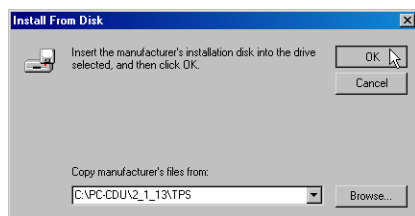


Figure C-30. Windows 2000 – Install From Disk->OK

8. On the next dialog box, select your receiver model and click **Next**.

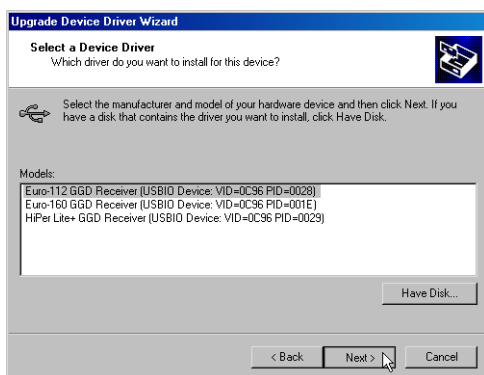


Figure C-31. Windows 2000 – Select the receiver model->click Next

9. On the ***Start Device Driver Installation*** dialog box, click **Next** to begin installation process.
10. When the USB driver update completes, click **Finish** to close the update wizard.

Updating the USB Driver on Windows XP

1. Right-click **My Computer** on your desktop and click **Properties**.
2. On the *System Properties* dialog box, click *Hardware* then click **Device Manager**.

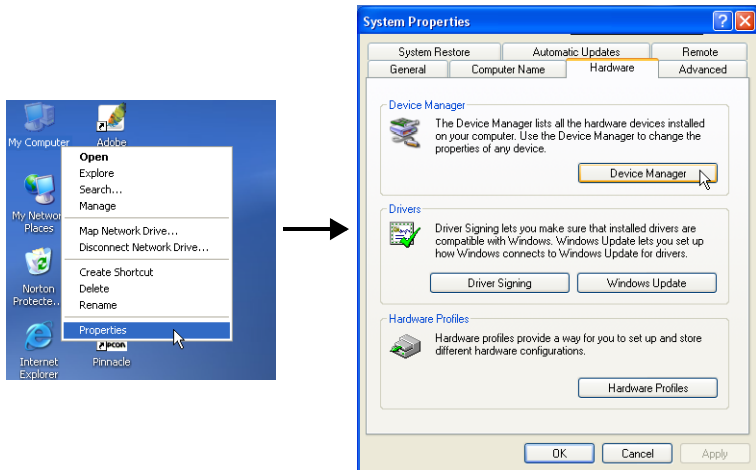


Figure C-32. Windows XP – Open Properties and Device Manager

3. Double-click **Universal Serial Bus controllers**, right-click your receiver, then click **Update Driver**.

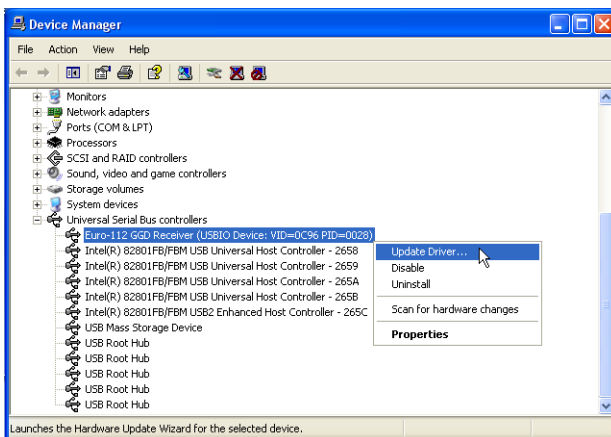


Figure C-33. Windows XP – Update Driver

4. Select *No, not this time* and click **Next**.



Figure C-34. Windows XP – Hardware Update Wizard

5. Select *Install from a list or specific location (Advanced)*. Click **Next**.
6. Select *Don't search. I will choose the driver to install*. Click **Next**.

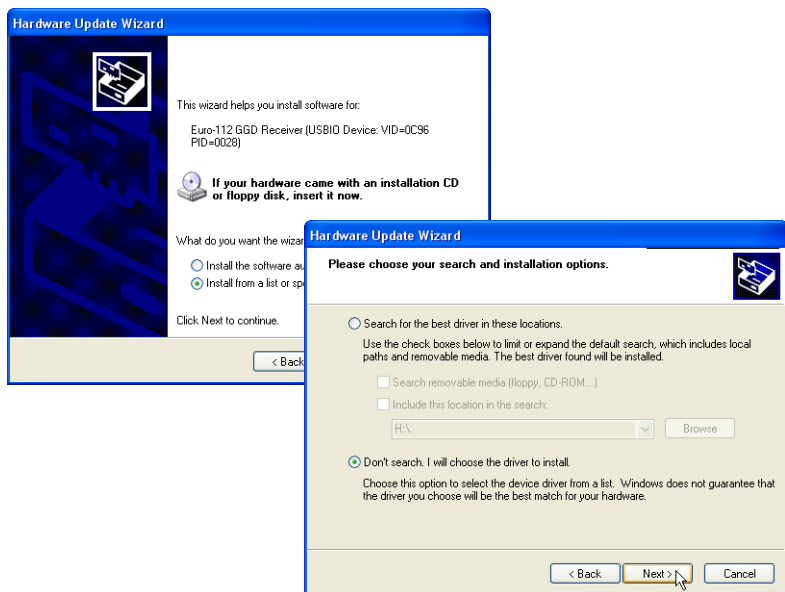


Figure C-35. Windows XP – Select Install Method and Select Driver Search Method

7. Choose the desired receiver and click **Have Disk**.

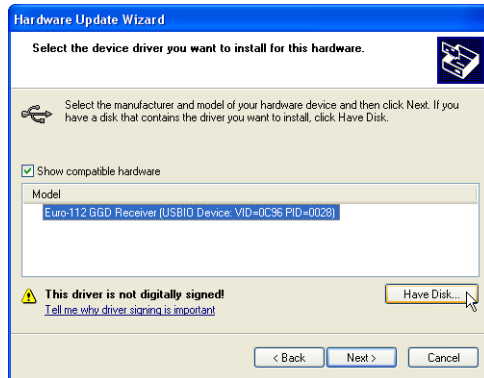


Figure C-36. Windows XP – Select the Receiver

8. Click **Browse** on the *Install From Disk* dialog box appears. Select the folder from which to install the driver (TPSUSBIO.INF).
9. Browse for and select the driver. Click **Open**.

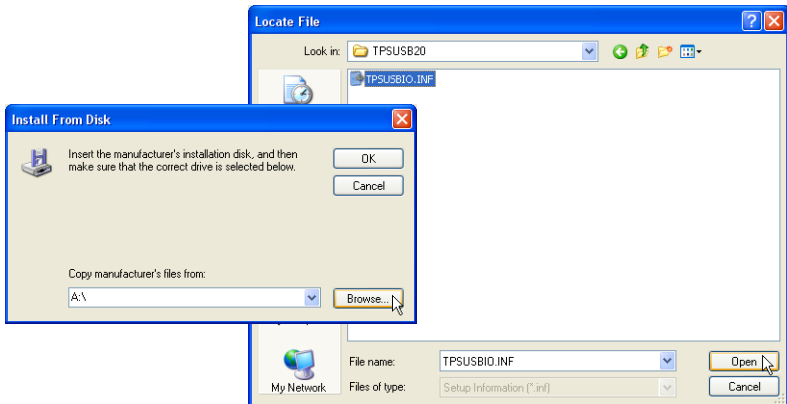


Figure C-37. Windows XP – Install From Disk and Select USB Driver

10. Make sure the driver is selected and click **OK**.

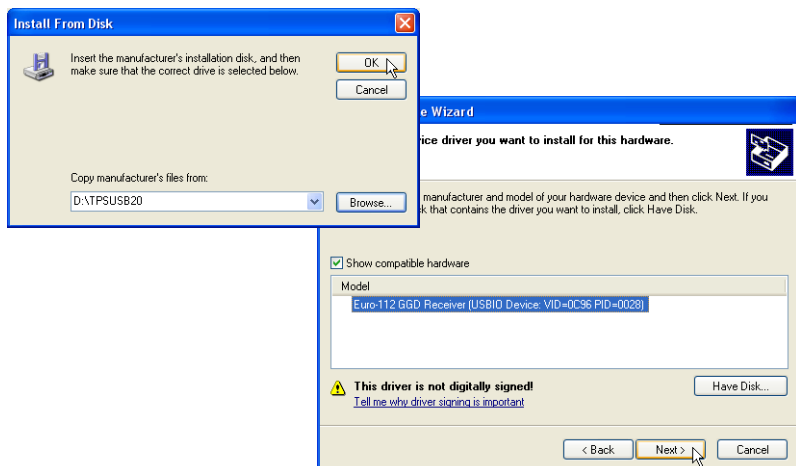
11. Choose the desired receiver and click **Next**.

Figure C-38. Windows XP – Install From Disk and Select Receiver

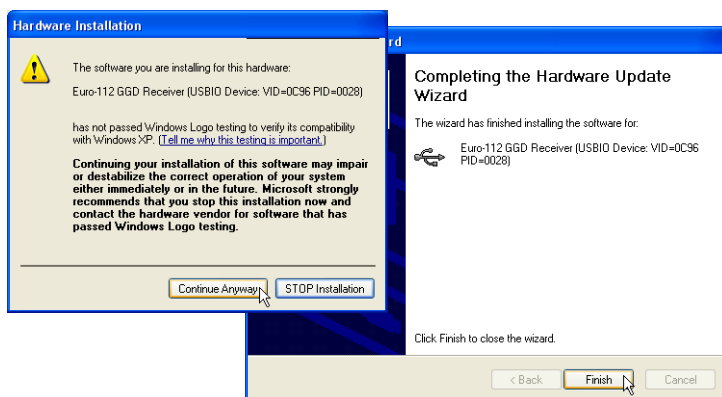
12. Click **Continue Anyway**.13. When the USB driver update completes, click **Finish** to close the update wizard.

Figure C-39. Windows XP – Continue Driver Installation and USB Driver Update Complete

Output Period Setup Wizard

The *Output Period Setup Wizard* is a feature that helps you select and set the correct values for generating raw data and updating the receiver position.

PC-CDU will open this Wizard when specifying an incorrect recording interval for the connected receiver. Once the Wizard starts, follow the on-screen instructions to adjust the recording interval.

The following five figures, which are given here just for your convenience, show how the Output Period Setup Wizard windows look. These windows are listed in order of appearance.

1. Once the *Output Period Setup Wizard* starts, read the warning. Click **Cancel** or click **Next**.

If clicking **Next**, continue below.

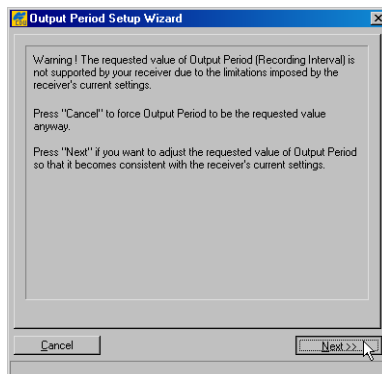


Figure D-1. Begin Output Period Setup

- Follow the on-screen instructions for selecting an appropriate Output Period. Click **Next**.
Click **Refresh** to view the receiver's current settings.

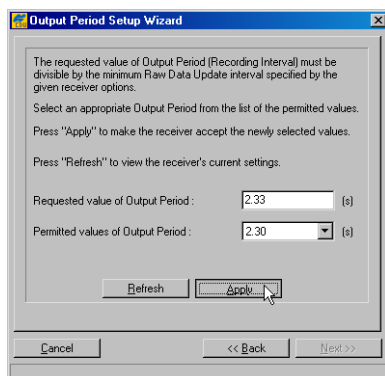


Figure D-2. Select Output Period

- Follow the on-screen instructions for selecting an appropriate Raw Data Update. Click **Next**.
Click **Refresh** to view the receiver's current settings.

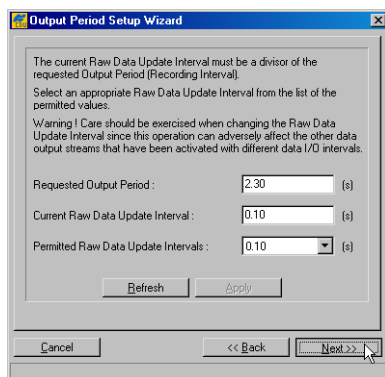


Figure D-3. Select Raw Data Update

4. Follow the on-screen instructions for selecting an appropriate Positioning Data Update. Click **Next**.
Click **Refresh** to view the receiver's current settings.

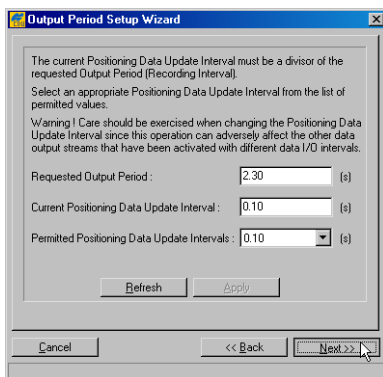


Figure D-4. Select Positioning Data Update

5. Click **Finish**.

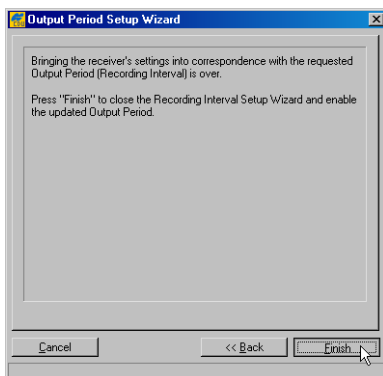


Figure D-5. Output Period Setup Complete

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.

Satellite Navigation Status Codes

Table E-1 lists the codes seen in the SS column on the *Main* window in the PC-CDU software.

Table E-1. Satellite Navigation Status Structure

Code	Description
00	C/A data used for position computation
01	P1 data used for position computation
02	P2 data used for position computation
03	Ionosphere-free combination used for position computation
04	Measurements unavailable
05	Ephemeris unavailable
06	Unhealthy SV (as follows from operational (=ephemeris) SV health)
07	Time-Frequency parameters from the ephemeris data set may be wrong ^a
08	Initial conditions (position and velocity vectors) from the ephemeris data set may be wrong ^a
09	Almanac SV health indicator unavailable for this satellite ^a
10	Unhealthy SV [as follows from the almanac SV health indicator] ^a
11	“Alert” flag (from the word “HOW”) is set ^b
12	URA indicates the absence of accuracy prediction for this SV ^b
13	User excluded this SV from position computation
14	User excluded this SV with this frequency channel number from position computation ^a
15	This SV is excluded from solution since its system number is unknown ^a
16	This SV has an elevation lower than the specified mask angle
17	Reserved

Table E-1. Satellite Navigation Status Structure (Continued)

Code	Description
18	Ephemeris data is too old
19	This SV does not belong to the constellation the user has selected
20	Differential data from Base Station unavailable for given satellite (applicable only when receiver runs in DGPS)
21	Reserved
22	RAIM has detected wrong measurements
23	SNR below specified minimum level
24, 25	Reserved
26	DLL not settled
27	Ionospheric corrections are not received from Base Station
28	Coarse code outlier has been detected
29	Reserved
30	SV is not used in RTK processing (similar to code 20 but is used specifically for RTK)
31	The same as 30
32-50	Reserved
51	C/A slot used in RTK processing
52	P L1 slot used in RTK processing
53	P L2 slot used in RTK processing
54	P L1 & P L2 measurements used in RTK processing
55	C/A & P L2 measurements used in RTK processing
56-62	Reserved
63	Satellite navigation status is undefined

- a. GLONASS only
- b. GPS only



Codes 0-3 and 45-62 will show for the given satellite which raw data measurements have been used in position computation. The rest codes will indicate why this satellite has been excluded from position computation.

[illegible]

Notes:

[illegible]



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