TOPCON
POSITIONING SYSTEMS

PC-CDU User's Manual

GPS

Part Number XXXX-XXXX
Rev. A

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Preface

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Please read these Terms and Conditions carefully.

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About This Manual

Welcome to the PC-CDU User's 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 the user's convenience, these features will be explicitly stated. For more information about the differences between PC-CDU MS and PC-CDU Lite, refer to "PC-CDU MS and PC-CDU Lite" on page 1-3.

Symbols and Typographic Conventions

This manual uses the following text conventions

Example	Description
clock offset	This format is used in definitions or when it is necessary to emphasize that the marked term is technical jargon.
Satellites	This format represents titles of dialog windows/boxes, names of menu options.
Internal	This format identifies program interface objects, such as checkboxes, edit boxes, radio buttons, etc.
Ctrl+V	This format is used to specify keys and key combinations.
`Temp`	This format is used to enter various string information (e.g., file and directory names) as well as operator commands.

Also, in this manual you will find four levels of special visual cues to certain types of information.

NOTICE

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

TIP

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

CAUTION

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

WARNING

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 receiver you have connected, operating system used and settings you have specified. This is normal and not a cause for concern.

Manual Organization

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

Chapter 1: Getting Started

- 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: Quick Software Reference

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

Chapter 3: Detailed 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.

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: Output Period Setup Wizard

- Presents the Output Period Setup Wizard, which are used to adjust the periods of generating raw data and position.

Appendix D: Satellite Navigation Status Codes

- Shows the list of all available satellite navigation status codes.

Supplemental Documentation

The table below lists the manuals that can be useful while operating PC-CDU.

For	Read This Document	Part Number
In-depth information about an interface language used for managing a TPS receiver	GPS Receiver Interface Language (GRIL)	n/a
A description on how to use the HiPer GD and GGD	HiPer GD/GGD Operator's Manual	7010-0626
A description on how to use the HiPer+	HiPer+ Operator's Manual	7010-0526
A description on how to use the HiPer Lite&HiPer Lite+	HiPer Lite & HiPer Lite+ Operator's Manual	7010-0557
A description on how to use the HiPer Pro	HiPer Pro Operator's Manual	7010-0681
A description on how to use the Odyssey-E	Odyssey-E Operator's Manual	7010-0507
A description on how to use the Odyssey-RS	Odyssey-RS Operator's Manual	7010-0511

For	Read This Document	Part Number
A description on how to use the GB-500	GB-500 Operator's Manual	31-050506-01
A description on how to use the GB-1000	GB-1000 Operator's Manual	31-050402-01
A description on how to install/update the firmware in a TPS receiver	FLoader User's Manual	n/a

Notes:

Getting Started

PC-CDU is a comprehensive Windows software product designed for controlling GPS+ receivers developed by the Topcon Positioning Systems company. It uses GPS Receiver Interface Language (GRIL) to configure various receiver settings and diagnose the receiver performance.
Before you begin using PC-CDU, you should become familiar with its functions and learn how to install and launch the program.

Introducing PC-CDU

The most current version of PC-CDU MS (as of 2.1.14, October 14, 2004) provides the following functions:

- A way to connect a TPS receiver and a computer via serial, parallel, USB or Ethernet ports (Direct Connection Mode).
- Internet Server feature that provides the ability for Internet Clients to get access to a TPS receiver from a remote distance. To do this, the user can run PC-CDU in Internet Server mode on a computer connected to the Internet.
- Internet Client feature that provides remote access to a TPS receiver connected with Internet Server. In this case the user can run his/her PC-CDU in Internet Client Mode.
- Tracking of the total number and the status of all visible satellites.
- Display 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 be installed on your PC.
- Display, in real time, the 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.)
- Display of the current receiver options and loading of Option Authorization Files into the receiver.
- Creating and uploading configuration script files to the receiver.

Setting up PC-CDU

System Requirements

Before installing and using PC-CDU, take a moment to run through the system requirements listed below.

- PC-compatible 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
- Internet Server/Client applications require your computer has a connection to the Internet

PC-CDU MS and PC-CDU Lite

PC-CDU exists in two implementations: the full-functionality version called PC-CDU MS, and the reduced-functionality version called PC-CDU Lite. Differences between PC-CDU MS and PC-CDU Lite are listed in Table 1-1

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 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, listed in Table 1-1, are automatically disabled so that PC-CDU MS turns into PC-CDU Lite. Table 1-2 on page 1-4 provides a more detailed description of the different scenarios available.

Table 1-2. PC-CDU MS Authorization Algorithm

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).
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.

NOTICE

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

Installing PC-CDU

There is no special installer for the current version of PC-CDU. This tool is a ready-to-run executable.

NOTICE

Below is the procedure for downloading PC-CDU from the Topcon website. If your version of PC-

CDU is on a CD-ROM or on a diskette, please skip to step 6 on page 1-7.

To install PC-CDU on your computer from the Topcon website, take the following steps:

1. Visit the Precision GPS section (http://www.topcongps.com/) of the Topcon website. Click on the **Software** link in the top-left corner of the window. Next, select the **Software Downloads** link. Finally, click on the link **Click here to download pccdu_ms.zip** to start program downloading.

NOTICE

To download PC-CDU Lite, select the Utilities link on the Software Center page.

2. You will see the dialog box ***Enter Network Password*** appears on the screen. You are prompted to enter a username and password. After you type in this information, press **OK** (Figure 1-1).

Figure 1-1. Enter Network Password

NOTICE

PC-CDU Lite is a freely available software. Thus, when you install PC-CDU Lite, the Enter Network Password prompt will not appear on the screen.

3. The ***File Download*** dialog box will be opened. To continue the download process, press **Save** (Figure 1-2).

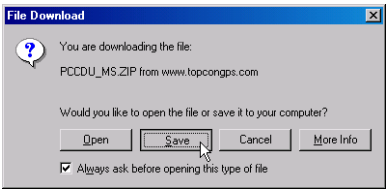


Figure 1-2. Download PC-CDU

4. In the ***Save As*** dialog window, specify the desired destination (disk drive/folder) for the archive `pccdu_ms.zip` (Figure 1-3).

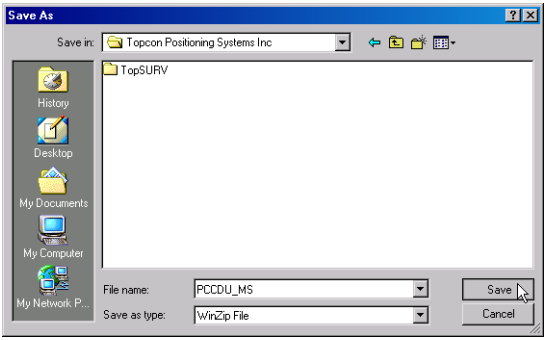


Figure 1-3. Select a Destination for pccdu_ms.zip

5. Wait while the archive is being downloaded onto your system (Figure 1-4).

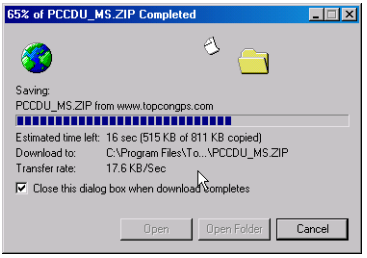


Figure 1-4. Copying PC-CDU to Your Computer's Disk Drive

6. Create a folder on your local disk drive. It is recommended to use `C:\Program Files\TPS\PC-CDU`.
7. Unpack the archive into this folder with WinZip® or another appropriate software. You will see the following files appear in the folder:
   - Executable file `Pccdu.exe`
   - Auxiliary binary file `lptaccess.vxd`

Removing PC-CDU

The simplest way to remove PC-CDU from a system is to delete the whole directory[1] that was created when installing PC-CDU and in which `Pccdu.exe` and all of its components reside. Also, do not forget to delete the PC-CDU shortcut, if available.

1. Assuming this directory is not used for storing any other (i.e., PC-CDU unrelated) data.

Getting Connected

Starting PC-CDU

PC-CDU can be launched, as any other Windows program, for example, with the **Start** button.

NOTICE

After the user first runs PC-CDU, he/she will see the file pccdu.ini appears in the directory from which the executable has been launched. In this .INI file PC-CDU will store all its settings. PC-CDU will automatically modify the contents of the .INI file as the user makes changes through the program's controls. Because this file use only plain text (i.e., ASCII), it can also be edited with any text editor or word processor. Before changing the file it is strongly recommended that you make a backup copy of the original .INI file.

NOTICE

If the user wants to have more than one copy of PC-CDU, each one with its own unique settings, the user can keep these copies in separate directories. Running different copies of PC-CDU from different directories will allow the operator to maintain unique setting for each of the copies.

Once PC-CDU is launched, the ***Connection Parameters*** window will appear (Figure 1-5).

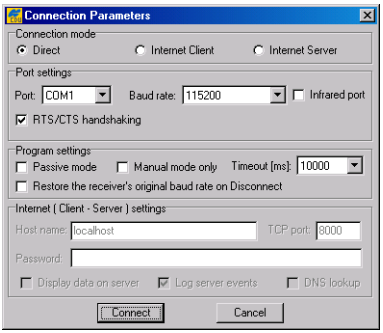


Figure 1-5. Connection Parameters

In this window the user first selects the desired connection mode:

- *Direct*. This mode is used when it is required to connect a computer and a TPS receiver directly, i.e., using the computer and receiver serial, parallel, USB or Ethernet ports and an appropriate cable.

NOTICE

You can use Ethernet ports to establish direct connection between a computer and a TPS receiver using direct cable connection or similar direct connection through the Internet. For more information about communicating via Ethernet, see "Establishing an Ethernet Connection" on page 1-17.

- *Internet Server*. When running PC-CDU in Internet Server mode on a PC connected to the Internet, the software provides the ability to get remote Internet access to the TPS receiver connected to this PC using any direct connection mode (serial, parallel, USB, or Ethernet ports). Current

Internet Server implementation allows for access by only one remote terminal (PC-CDU Client) at a time.

- *Internet Client*. This mode may be used when it is required to access a remote receiver that is directly connected with some other PC and the PC-CDU software is running on that PC in Internet Server mode. Both computers with PC-CDU Internet Server and Internet Client software up and running, should be connected to the Internet to get the remote Client access to Server.

Establishing a Serial Port Connection

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

1. Connect one of the available receiver's port (usually **A**) to a communication port on the computer using a Receiver-to-Computer RS-232 serial cable.
2. Supply power to the receiver and computer, then turn them on.
3. Run PC-CDU.
4. From the **Port** list box, select the computer serial port (**COM1**, **COM2**,...) that you want to use for the connection.
5. From the **Baud Rate** list box, select the desired baud rate.
6. Select the **RTS/CTS handshaking** checkbox.

NOTICE

It is recommended that the user enables RTS/CTS handshaking as this makes data exchange between the receiver and computer more reliable. Prior to selecting this control, make sure that:

•RTS/CTS handshaking is supported both at the computer and at the receiver.

•The cable used allows RTS/CTS handshaking.

7. Press **Connect**. Figure 1-5 on page 1-9 shows an example of the ***Connection Parameters*** window for this connection type.

NOTICE *NOTICE*

By changing the parameters in the Port settings area of the Connection Parameters window, the user configures the communication port of the PC and the desired settings of the receiver's communication port, which will be set up once you click the Connect button.

The **Infrared port** checkbox is selected when the user want to use an infra-red adaptor to establish a connection between a computer and receiver over an infrared data-link.

Connection via an infrared port will be available only if the following conditions are met:

- An appropriate external infrared adaptor is connected to the selected serial port on the computer side.
- Your receiver supports the infrared port hardware-wise.
- The Infrared Port option is enabled in your receiver.

Along with the above listed controls, the user may need to adjust some of the settings in the **Program Settings** area. This area includes the following four controls:

- Passive mode
- Manual mode only
- Timeout

- Restore the receiver's original baud rate on Disconnect

In **Passive mode** PC-CDU is not allowed to change any receiver parameters. Note that in this mode PC-CDU will display in the main window only those satellites whose elevation angles are larger than the elevation mask specified by the parameter **Terminal Elevation Mask** (see Chapter 3 on page 3-35). Once Passive mode is off, PC-CDU will automatically force **Terminal Elevation Mask** to -90^0. Therefore the user will be able to view in PC-CDU's main window (see Chapter 3 on page 3-1) all of the satellites that are being tracked. It is important to remember that this setting (-90^0) will be effective as long as the main window remains open. Note however that the original value of **Terminal Elevation Mask** will not be lost in this case; once the main window is closed, PC-CDU will automatically restore the original mask.

If **Manual mode only** is on, PC-CDU will perform as an input/output terminal, which allows the user to send commands to and receive information from the receiver without performing any connection procedure with the receiver.

With the **Timeout [ms]** drop down list box, the user specifies the number of milliseconds the program will wait before switching to the next baud rate while establishing connection with the receiver through serial ports.

If the user has selected the **Restore the receiver's original baud rate on Disconnect** checkbox, PC-CDU will determine and save the receiver port's original baud rate (i.e., that the receiver port had before running PC-CDU) and then restore this setting automatically on disconnecting the receiver (by pressing the **Disconnect** menu item).

Establishing a Parallel Port Connection

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

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

WARNING

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

To establish a connection between your 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 a supplied Receiver-to-Computer parallel cable.
2. Supply power to the receiver and computer, then turn them on.
3. Run PC-CDU.
4. From the **Port** list box, select the computer parallel port (**LPT1**, **LPT2**,...) that you want to use for the connection.

5. Press **Connect** (Figure 1-6).

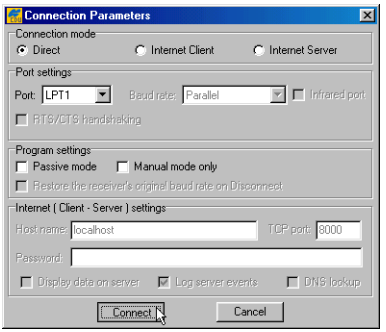


Figure 1-6. Parallel Port Connection Parameters

For a description of the available **Program settings**, see “Establishing a Serial Port Connection” on page 1-10.

Establishing a USB Connection

Before connecting a USB equipped TPS receiver with PC’s USB port, make sure that you have the USB Port option enabled in the receiver and the TPS USB driver installed on the computer.

Checking Option

To verify whether or not the USB Port option is enabled, you can use a direct serial cable connection. Once connected, click **Tools**, then **Receiver options**.

- If enabled, you will see *yes* in the Current column of the USB Port option.
- If disabled, you will see *no* in the Current column of the USB Port option.

Installing Driver

NOTICE

This procedure refers to the USB driver version 2.0.0.2, build date November 24, 2003.

The driver installation procedure varies slightly depending on the operating system used. In general, the installation procedure is as follows:

NOTICE

For detailed information on the driver installation for your specific operating system, refer to the appropriate sections of "How to Install the TPS USB Driver..." on page 2-2.

1. Visit the GPS Precision section (http://www.topcongps.com/) of the Topcon website. Click on the **Software** link in the top-left corner of the window. Next, select the **Software Downloads** link. Finally, click on the **tps_usb.zip** link to start driver downloading.
2. Unpack the archive into a separate, empty folder. You will see the following files appear in the folder:
   - Tpsusbio.inf
   - Tpsusb98.sys
   - Tpsusbio.sys
3. Connect the receiver to the computer through the supplied USB cable. Turn the receiver on.
4. Windows will automatically detect the new hardware device. Follow the on-screen instructions to finish installation process.

After Windows finishes installing the driver, you will be able to connect the receiver and the computer via USB ports.

Connecting

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

1. Insert the USB cable's 5-pin connector 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 computer and receiver.
3. Start PC-CDU.
4. From the **Port** list box, select the computer's USB port (**USB**).
5. From the **Rec ID** list box, select the receiver's ID you want to connect to.
6. Press **Connect** (Figure 1-7).

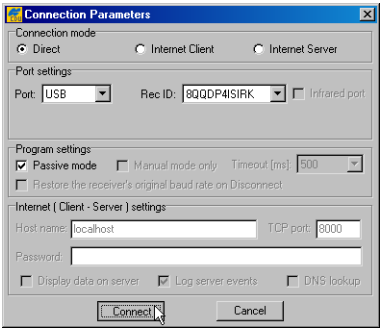


Figure 1-7. USB Connection Parameters

For a description of the available **Program settings**, see "Establishing a Serial Port Connection" on page 1-10.

WARNING

USB connection cannot be established if you run the PC under Windows 95/NT.

Establishing an Ethernet Connection

There are two Ethernet-based methods used for communication with a TPS receiver:

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

Connecting the Receiver Directly to a PC

This method is used when you have a PC, a TPS receiver and have no existing Ethernet network, but would like to communicate with the receiver via Ethernet.

NOTICE

It can be useful to apply this method for preliminary tests if you are going to use the receiver later on a real TCP/IP network.

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

- A PC with an Ethernet card installed and the TCP/IP protocol configured
- A TPS receiver with physically installed and enabled by options Ethernet port
- Appropriate cables:

  –Ethernet adapter (p/n 14-008032-01).

–An Ethernet cross-over cable (this cable is typically available from your local computer store or from many online computer stores).

–You should also have an RS-232 cable (p/n 14-008005-02) to configure IP settings of your receiver.

The following procedure shows you how to connect the receiver directly to a PC using Ethernet ports.

NOTICE

You should have already installed an Ethernet card and configured the TCP/IP protocol on your computer. For definiteness assume that you use a protocol with the following settings: IP address – 192.168.0.1, Gateway – 192.168.0.3 (actually, since you have only two devices connected directly and have no connections to another network, you can set the gateway address all zeros), Subnet mask – 255.255.255.0.

Take these steps to connect the receiver to a PC using the Ethernet ports:

1. Connect your computer and receiver with a serial cable.
2. Run PC-CDU. Select appropriate communication settings for connection via serial ports and then click **Connect**.
3. Go to **Configuration ▸ Receiver ▸ Ports ▸ Ethernet**.
4. Specify IP settings for your receiver.

- **IP Address** – set the same value as the computer's IP address, except for the last number (it must differ from the computer's IP address but lies in the range from 0 to 255, for example, 192.168.0.2)

- **IP Mask** – set exactly the same number as you use for the computer
- **Gateway** – set exactly the same number as you use for the computer

5. In the **Telnet Settings** area leave all settings as they are but make sure that **TCP port** is set to 8002.

   Remember the value in the **Network Password** field (if you do not want to use any password, you may simply clear this field). Click **Apply ▸ OK**.
6. Restart the receiver by selecting **Tools ▸ Reset receiver**.
7. Insert the corresponding end (having seven pins) of the Ethernet adapter into the ETHR port of the receiver. Connect the other end of this adapter with the Ethernet crossover cable (either of its ends can be used). Plug the second end of the crossover cable into the Ethernet jack on the computer's back (Figure 1-8).

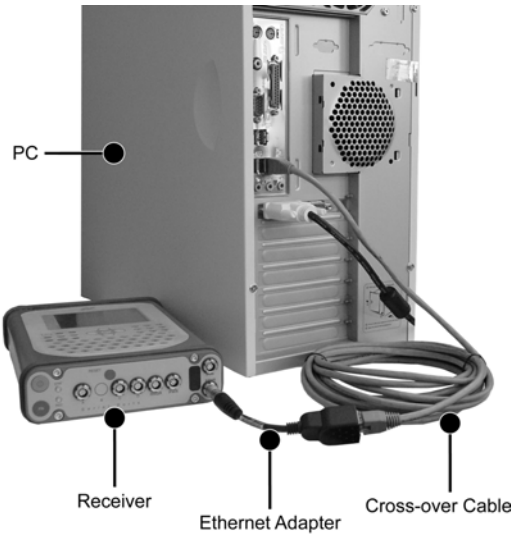


Figure 1-8. Direct Ethernet Connection – Hardware Setup

8. Run PC-CDU. In the ***Connection Parameters*** window, specify the following settings:
   - **Connection mode** – **Direct**
   - **Port** – **ETHR**
   - **TCP port** – **8002**
   - **Host name** – IP address that you have assigned to the receiver in step 4.
   - **Password** – exactly the same series of characters as you have specified for the receiver in step 5 or keep it blank if you do not use a password.
9. Click **Connect** (Figure 1-9).

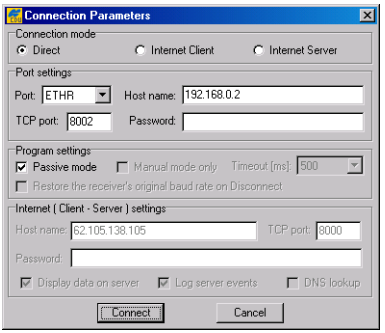


Figure 1-9. Ethernet Connection Parameters

After establishing connection, you will see the current connection type (Ethr) and the receiver's IP address in the bottom left corner of the PC-CDU's main window (Figure 1-10).

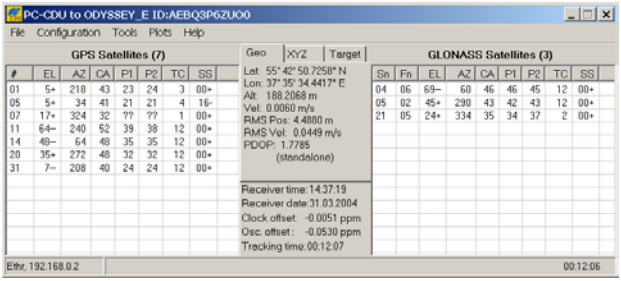


Figure 1-10. PC-CDU Main Window – Ethernet Connection Established

From this moment on, you may interact with the receiver in a *normal* way (i.e., record files into the receiver's memory and onto the computer's drives, send commands into the receiver, and so on).

Connecting the Receiver to an Existing TCP/IP Ethernet Network

This method is used when you have an existing *local area network* (LAN) consisting of a group of computers and network communication devices interconnected and a TPS receiver that you want to place on this LAN. This method is also used to connect a TPS receiver directly to the Internet and access this receiver from a remote PC, connected to the Internet.

Before establishing the connection, make sure you have each of the components listed below:

- An operational TCP/IP LAN or connection to the Internet
- Appropriate cables:

  –Ethernet adapter (p/n 14-008032-01).

–A straight-through Ethernet cable (this cable is typically available from your local computer store or from many online computer stores).

–You should also have an RS-232 cable (p/n 14-008005-02) to configure IP settings of your receiver.

- A TPS receiver with physically installed and enabled by options Ethernet port. To verify whether or not the Ethernet options are enabled, use the ***Option Manager*** window of PC-CDU (click **Tools**, then **Receiver options**). The value of the **Ethernet Port** option in the **Current** column must be set to yes. **TCP Connections** must be in the range from 1 to 5. **FTP Connections** must be set to 1 only if you are going to download receiver files via FTP. For more information about receiver options including Ethernet-related options, see Table 3-9 on page 3-101.

The following procedure shows you how to attach the receiver to an existing network.

NOTICE

It is very important to work closely with your system administrator to make the connection succeed. The system administrator should provide a unique IP address, Subnet mask, and Default gateway for the receiver. Also, make sure the system administrator realizes that each TPS receiver on the network must have a static IP address, whether or not a Dynamic Host Configuration Protocol (DHCP) server is used on the network.

1. Connect your computer and the receiver with a serial cable.

2. Run PC-CDU. Select appropriate communication settings for the connection via serial port and then click **Connect**.
3. Go to **Configuration ▸ Receiver ▸ Ports ▸ Ethernet**.
4. Specify IP settings for your receiver:
   - IP Address
   - IP Mask
   - Gateway

CAUTION

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

5. Configure **Telnet Settings** and **Network Password**. You may use the following settings:
   - **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 (if you do not want to use any password, you may simply leave this field blank).
6. Configure **FTP Settings** (optional). You may 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 ▸ OK**.
8. Restart the receiver by selecting **Tools ▸ Reset receiver**.
9. Insert the Ethernet adapter's 7-pin connector into the ETHR port of the receiver. Connect the opposite end of this adapter with the Ethernet straight-through cable (either of its ends can be used). Plug the second end of the straight-through cable into the appropriate Ethernet port on your LAN hub or switch (Figure 1-11 on page 1-25).

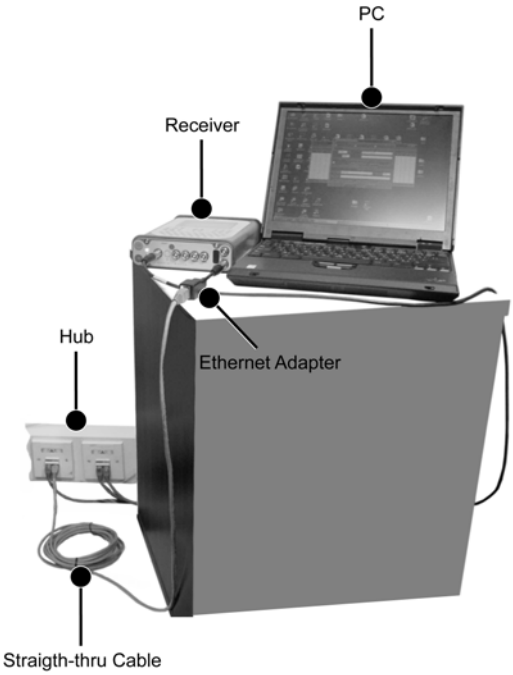


Figure 1-11. Receiver on LAN – Hardware Setup

TIP

At this point, it is a good idea to 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, go to step 10. If it does not respond, double-check the LAN connections and addresses.

10. Run PC-CDU. In the ***Connection Parameters*** window, specify the following settings:
    - **Connection mode** – **Direct**
    - **Port** – **ETHR**
    - **TCP port** – **8002**
    - **Host name** – IP address that you have assigned to the receiver in step 4
    - **Password** – exactly the same series of characters as you have specified for the receiver in step 5 or keep it blank if you do not use a password.
11. Click **Connect** (see Figure 1-8 on page 1-19). After establishing the connection, you will see the current connection type (Ethr) and the receiver's IP address in the bottom left corner of the PC-CDU's main window (see Figure 1-10 on page 1-21). From this moment on, you may interact with the receiver in a *normal* way (i.e., record files into the receiver's memory and onto the computer's drives, send commands into the receiver, and so on) plus some network abilities (i.e., transfer files from the receiver over a TCP/IP network using FTP, connect up to 5 remote terminals to the receiver).

NOTICE

For how to transfer raw data files from the receiver to the remote computer using FTP, refer to Chapter 2 on page 2-26.

Establishing an Internet Client–Server Connection

Internet Server Mode

When running PC-CDU in *Internet Server* mode, the software provides the ability to get access to a TPS receiver

connected to the computer with a direct serial, parallel or USB connection from a remote location. Remote terminals (*PC-CDU clients*) can then access this PC-CDU server via the Internet.

NOTICE

The current implementation of the Server feature allows for access by only one remote terminal (PC-CDU client) at a time.

The parameters **Port**, **Baud rate**, **Infrared port**, **RTS/CTS handshaking**, **Passive mode** serve the same purposes as in *Direct mode* (see "Establishing a Serial Port Connection" on page 1-10). The other group of parameters, **Internet (Client - Server) settings**, are intended for the user to tune PC-CDU for Internet connection: **TCP port**, **Password**, **Display data on server**, **Log server events**, and **DNS lookup**.

Special attention should be given to setting TCP port for PC-CDU servers[2]. Make sure that the selected TCP port does not coincide with any one of the reserved port numbers. The default TCP port number is `8000`.

The **Password** edit box is used to protect the PC-CDU server from unauthorized access. The user can enter in this edit box up to 128 alphanumeric characters.

If the user has selected the **Log server events** checkbox, there will be created a text log file (`pccdu_server.log`) in PC-CDU's working directory. This file will contain some information that has been

2. According to TCP specifications, TCP port number can be up to 64 K. Although the user can formally enter a port number N, which is greater or equal to 64 K, the software will implicitly force it to N mod 64 K.

collected during the communication session between the PC-CDU server and PC-CDU client. New information will be added to the file after another client connects to the PC-CDU server.

If the user wants to view the satellite information and the antenna's current position in the main windows, he/she must select the **Display data on server** checkbox. Otherwise no information will be displayed in the window.

If the **DNS lookup** checkbox is selected, the file `pccdu_server.log` will contain the IP and DNS addresses. Otherwise this file will include the IP addresses only.

Figure 1-12 shows an example of the ***Connection Parameters*** dialog window in *Internet Server* mode.

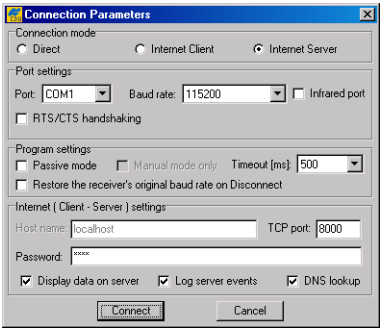


Figure 1-12. Internet Server Connection Parameters

In this example a four-character password and the default TCP port number are used.

After the **Connect** button is pressed, the ***Main*** and ***Server*** dialog windows will be displayed (Figure 1-13).

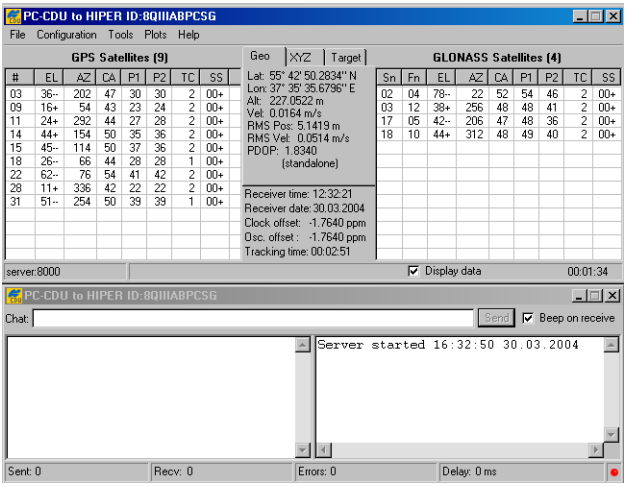


Figure 1-13. Internet Server Started

The ***Server*** window allows an operator running PC-CDU Server to communicate with his/her counterpart who runs the corresponding PC-CDU Client. In addition, this dialog window displays information about the server's current status.

Internet Client Mode

The user selects *Internet Client* mode when it is required to access a remote receiver that is directly connected with and controlled by a computer on which PC-CDU Server is being run (the obvious pre-condition is that both computers must have access to the Internet).

After a connection to the remote receiver is established, the user can control this receiver exactly in the same manner as if the user's computer were directly connected to the receiver, specifically: send commands to the remote receiver, download log files from the receiver's memory,

etc. In order to be able to connect to the remote receiver, the user first needs to configure his/her computer as a PC-CDU Client capable of working with the corresponding PC-CDU Server.

The user is required to know the following information about the PC-CDU Server:

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

Figure 1-14 shows an example of the ***Connection Parameters*** dialog window with the following settings:

- PC-CDU Server's IP address: 194.85.135.59
- TCP port number: 8000
- Password is not used

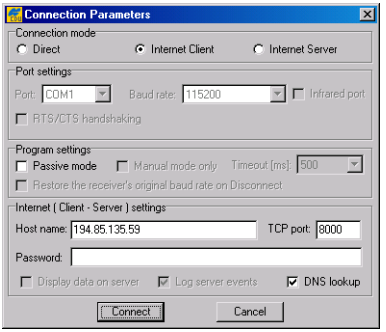


Figure 1-14. Internet Client Connection Parameters

NOTICE

In the Host name edit box the user can enter either the server's IP address (it is 194.85.135.59 in the given example) or its DNS address (it is pab.topconps.com in this case).

After all necessary settings have been entered into this window, press **Connect**. You will see PC-CDU open the ***Main*** window and the ***Client*** window (Figure 1-15).

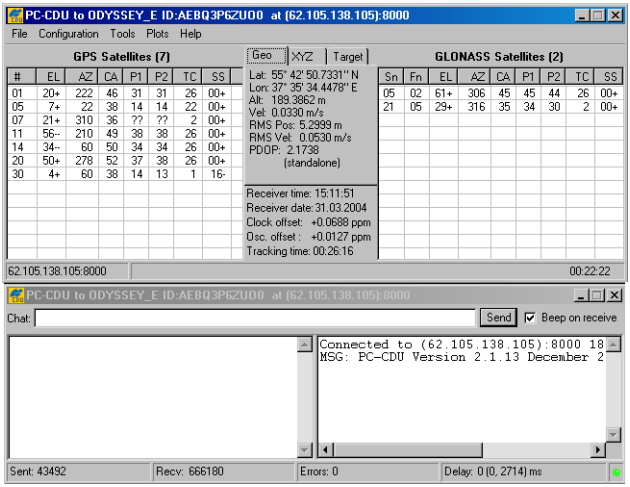


Figure 1-15. Internet Client Started

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

Closing PC-CDU

To disconnect from the receiver, select the **Disconnect** menu item from the **File** menu. Alternatively, you can use the **Ctrl+D** keys to close the connection.

Pressing **Disconnect** will result in

1. Turning off **RTS/CTS handshaking**.

2. Resetting the receiver control **Terminal Elevation Mask** to its original value (only if the **Passive mode** checkbox has not been deselected).
3. Resetting the baud rate to 115200, if the receiver's original baud rate (i.e., that the receiver has before running PC-CDU) exceeded 115200.
4. Restoring the original baud rate, only if the **Restore the receiver's original baud rate on Disconnect** control has been selected.

To quit PC-CDU, select **Exit** from the **File** menu. Alternatively, you can close the program by pressing the **Ctrl+X** keys.

If the receiver has not been disconnected by the time the program is terminated, the connection will be automatically broken before PC-CDU is closed.

NOTICE

It is strongly recommended to close the connection with the receiver and close PC-CDU prior to switching the receiver off and disconnecting the cable.

Quick Software Reference

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

It is addressed to those users wishing to know how to configure a TPS receiver for a particular job using PC-CDU. Because it is a quick reference, this chapter does not contain a detailed description of the settings listed. For a detailed information about the settings used, refer to the corresponding sections of the third chapter.

How to Connect to the Receiver

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

- “Establishing a Serial Port Connection” on page 1-10 for a serial port connection procedure.
- “Establishing a Parallel Port Connection” on page 1-13 for a parallel port connection procedure.
- “Establishing a USB Connection” on page 1-14 for a USB port connection procedure.
- “Establishing an Ethernet Connection” on page 1-17 for an Ethernet port connection procedure.

How to Navigate through the Software

Moving through PC-CDU is like moving through any other Windows program. You can use your mouse to position the cursor

over the desired control and then click a mouse button or you can use the **Tab** key to move around window.

You can also use shortcut keys. These keys are used in menus where an alternate keystroke sequence is defined. These shortcut keys are shown on the right side of the corresponding menu items. For example, the user can select the **Site** item (from the **Configuration** menu) with the keys **Ctrl+I**.

How to Install the TPS USB Driver...

NOTICE

This section describes the first-time installation procedure for the USB driver version 2.0.0.2, build date November 24, 2003. If you already have the previous version of USB driver (as of 1.0.1.0, October 25, 2002) installed, refer to the corresponding section of "How to Update the TPS USB Driver..." on page 2-11 to know how to update the driver for your specific operating system.

On Windows 98 SE

1. Once you connected the receiver and the computer through the USB cable, the ***Add New Hardware Wizard*** window displays. Click **Next**.

Figure 2-1. Windows 98 SE – Add New Hardware Wizard

2. Select **Search for the best driver for your device. (Recommended).** and then click **Next**.

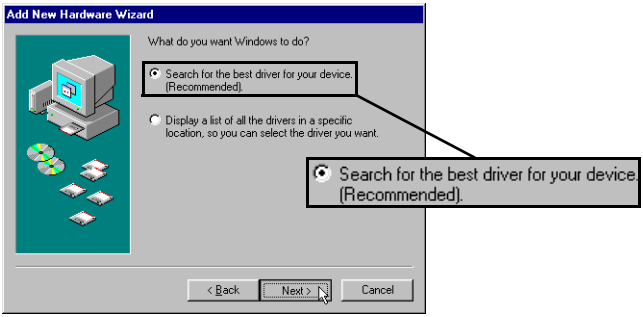


Figure 2-2. Windows 98 SE – Select the Driver Search Method

3. In the next window, select **Specify a location** and click **Browse**.

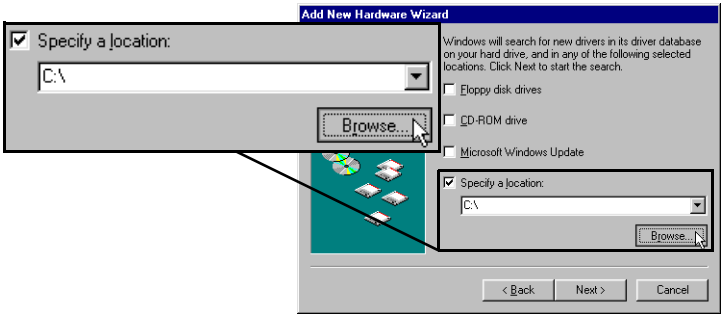


Figure 2-3. Windows 98 SE – Locate Driver Files

4. Select the folder on the computer drive, where the driver resides, click **OK**.

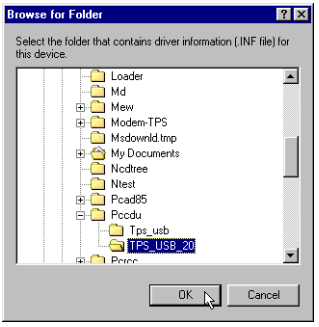


Figure 2-4. Windows 98 SE – Browse for Folder

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

Figure 2-5. Windows 98 SE – Driver Location Specified

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

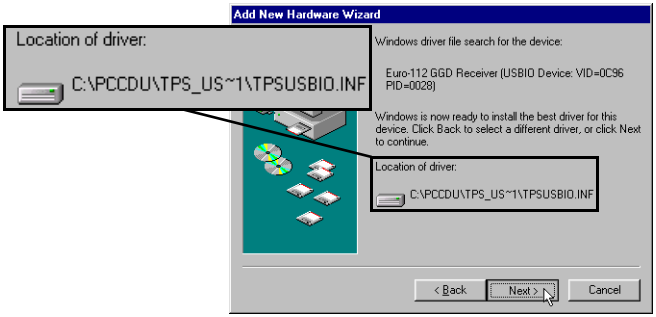


Figure 2-6. Windows 98 SE – Ready to Install Driver

7. When driver installation is completed, the window shown below appears. Click **Finish**.

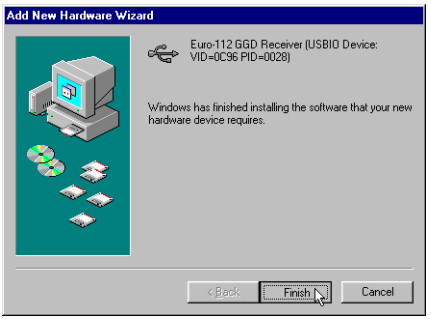


Figure 2-7. Windows 98 SE – USB Driver Installation Complete

On Windows ME

1.
2.
3.
4.

On Windows NT

1.
2.
3.
4.

On Windows 2000

1. Once you connected the receiver and the computer through the USB cable, the ***Found New Hardware Wizard*** window displays. Click **Next**.

Figure 2-8. Windows 2000 – Found New Hardware Wizard

2. On the next Wizard window, select **Search for a suitable driver for my device (recommended)** and then click **Next**.

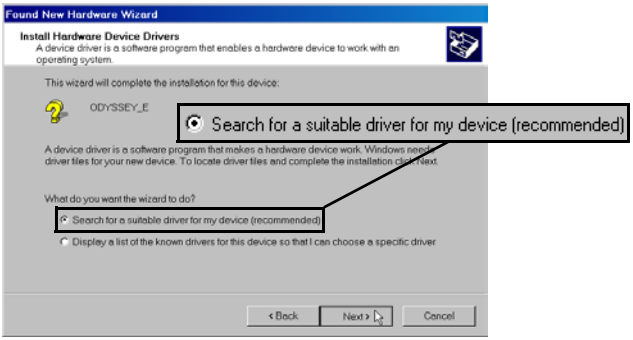


Figure 2-9. Windows 2000 – Install Hardware Device Drivers

3. On the Wizard's ***Locate Driver Files*** window, select **Specify a location** and then click **Next**.

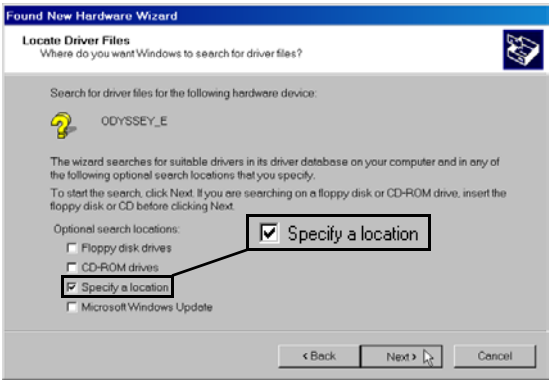


Figure 2-10. Windows 2000 – Locate Driver Files

4. In the next window, click **Browse**.

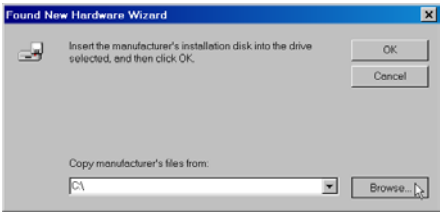


Figure 2-11. Windows 2000 – Click Browse

5. Select the folder on the computer drive, where the driver resides, click **Open**.

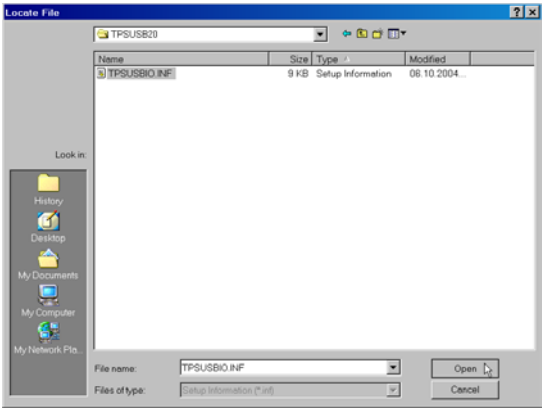


Figure 2-12. Windows 2000 – Browse for Folder

6. Make sure you have selected the correct driver location and then click **OK**.

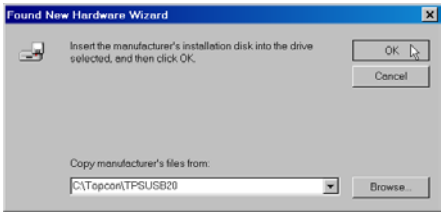


Figure 2-13. Windows 2000 – Driver Location Specified

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

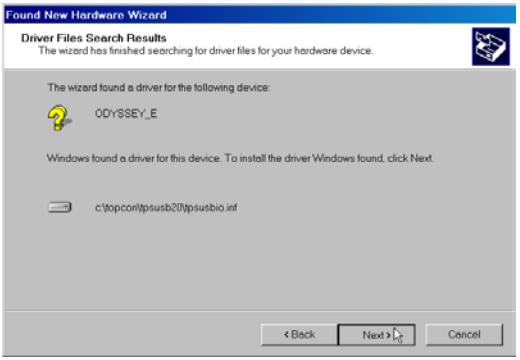


Figure 2-14. Windows 2000 – Ready to Install Driver

8. When driver installation is completed, the window shown below appears. Click **Finish**.

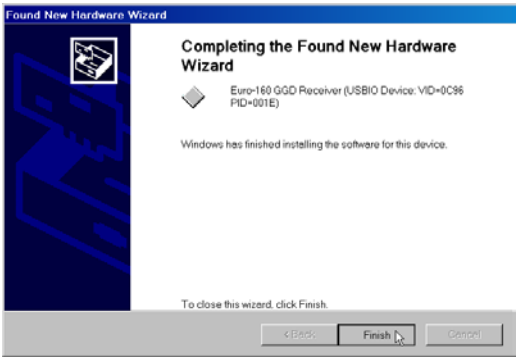


Figure 2-15. Windows 2000 – USB Driver Installation Complete

On Windows XP

1.
2.
3.

How to Update the TPS USB Driver...

You will need to update the TPS USB driver to version 2.0.0.2 if you want to have a USB connection working properly with PC-CDU version 2.1.13 or later.

On Windows 98 SE

1. Use the USB cable to connect the receiver and the USB port on the PC.
2. Open the ***Device Manager*** window, double-click **Universal Serial Bus controllers**, right-click your receiver, and then click **Properties**.

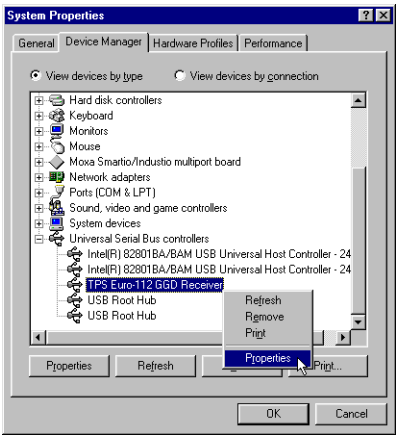


Figure 2-16. Windows 98 SE – Device Manager

3. On the ***Receiver Properties*** window, select the ***Driver*** tab and then click **Update Driver**.

Figure 2-17. Windows 98 SE – Click Update Driver

4. The ***Upgrade Device Driver Wizard*** window displays, click **Next**.

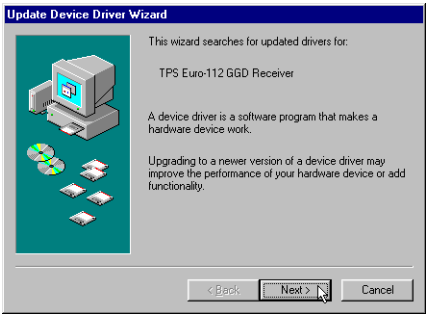


Figure 2-18. Windows 98 SE – Driver Upgrade Wizard Welcome

5. Select **Display a list of the known drivers for this device so that I can choose a specific driver** and then click **Next**.

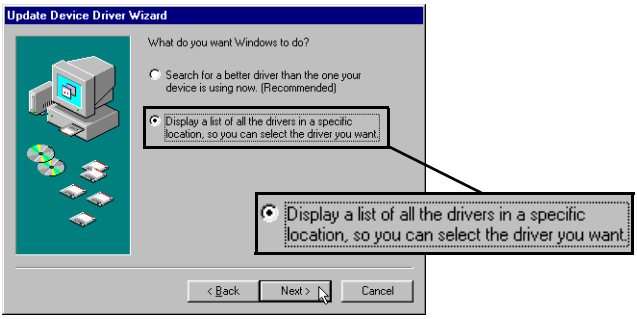


Figure 2-19. Windows 98 SE – Update Hardware Device Drivers

6. On the next window, choose the desired receiver and click the **Have Disk** button.

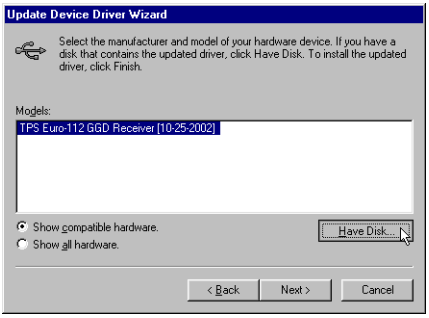


Figure 2-20. Windows 98 SE – Select a Device Driver

7. The ***Open*** window appears. Select the driver and folder from which to install the driver (`TPSUSBIO.INF`) and click **OK**.

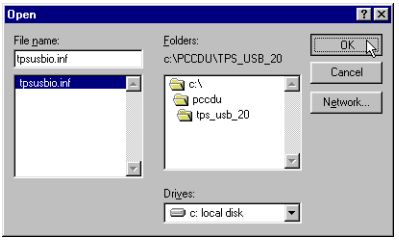


Figure 2-21. Windows 98 SE – Browse for the Driver

8. The ***Install From Disk*** window appears. Click **OK**.

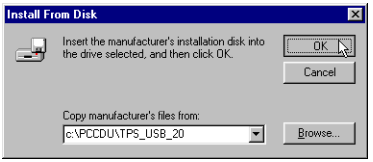


Figure 2-22. Windows 98 SE – Install From Disk->Click OK

9. On the next window, select your receiver model and click **Next**.

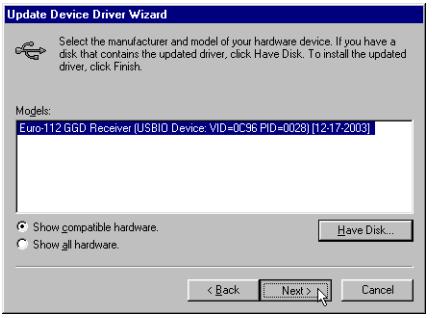


Figure 2-23. Windows 98 SE – Select the receiver model->click Next

10. On the ***Ready to install*** window, click **Next** to begin installation process.

11. When the USB driver installation completes, click **Finish** to close the installation wizard.

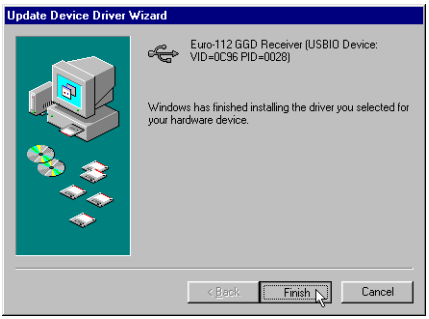


Figure 2-24. Windows 98 SE – USB Driver Installation Complete

On Windows ME

1.
2.
3.
4.

On Windows NT

1.
2.
3.
4.

On Windows 2000

1. Once you connected the receiver and the computer through the USB cable, open the ***Device Manager*** window, double-

click **Universal Serial Bus controllers**, right-click your receiver, and then click **Properties**.

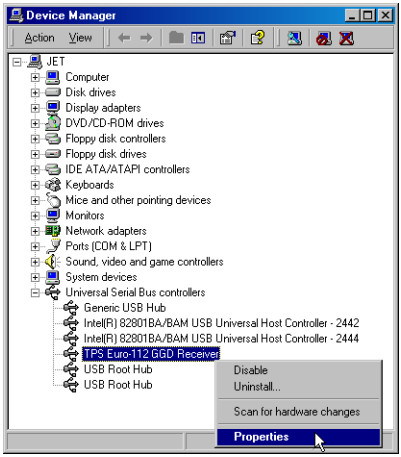


Figure 2-25. Windows 2000 – Device Manager->Select the Receiver

2. On the ***Receiver Properties*** window, select the ***Driver*** tab and then click **Update Driver**.

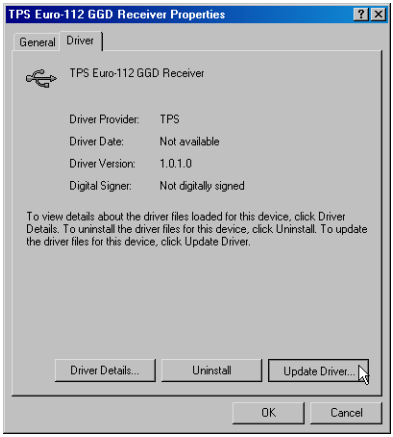


Figure 2-26. Windows 2000 – Receiver Properties->Update Driver

3. The ***Upgrade Device Driver Wizard*** window displays, click **Next**.

Figure 2-27. Windows 2000 – Driver Upgrade Wizard Welcome

4. Select **Display a list of the known drivers for this device so that I can choose a specific driver** and then click **Next**.

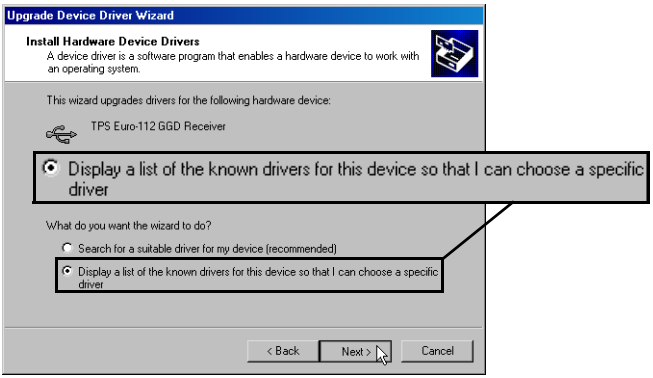


Figure 2-28. Windows 2000 – Install Hardware Device Drivers

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

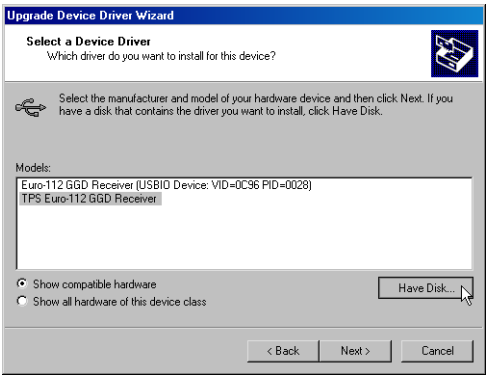


Figure 2-29. Windows 2000 – Select a Device Driver

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

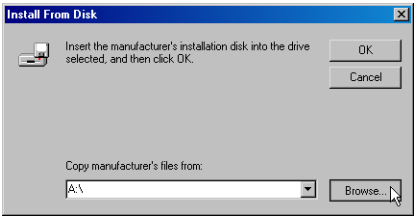


Figure 2-30. Windows 2000 – Install From Disk->Browse

Once you locate the driver, click **Open**. The ***Install From Disk*** window reappears, click **OK**.

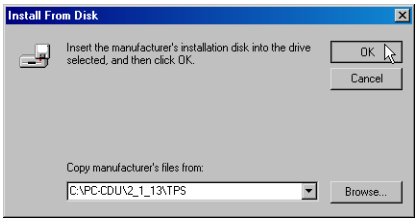


Figure 2-31. Windows 2000 – Install From Disk->OK

7. On the next window, select your receiver model and click **Next**.

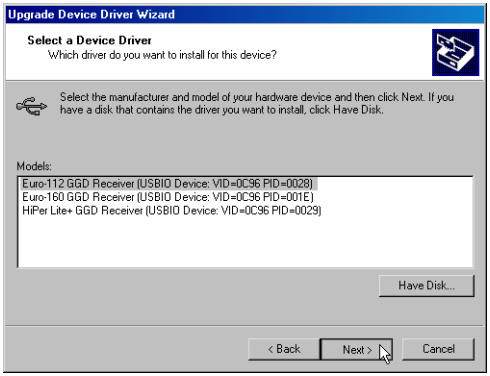


Figure 2-32. Windows 2000 – Select the receiver model->click Next

8. On the ***Start Device Driver Installation*** window, click **Next** to begin installation process.

9. When the USB driver installation completes, click **Finish** to close the installation wizard ().

Figure 2-33. Windows 2000 – USB Driver Installation Complete

On Windows XP

1.
2.
3.
4.

How to Disconnect from the Receiver

From the **File** menu, click **Disconnect**, then click **Exit**.

How to Start Data Logging...

To the Receiver Memory

1. In the **File** menu, select **File Manager** item.
2. Click the ***Current log file*** tab and set the following parameters:
   - File name – type in the 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 this button and in the window appeared, 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 details, see “Current log file Tab” on page 3-18.

On the Computer

1. In the **File** menu, select **Real-Time Logging** item.
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, and then click **Start**.

If *Single file* selected...	If *Multiple files* selected...
• In the **Save to** field, enter the file name. • In the **Recording interval** field, specify the data logging interval. • Click **Site parameters** button and in the window appeared, enter the site name and antenna details, then click **OK**. • In the **Elevation mask** field, set the elevation cut-off angle.	• In the **Prefix** field, enter the prefix part of the filename. • From the **Numbering** filed, select the desired file numbering scheme. –If you select **Ascending Count**, then you can enter initial numeric value of the file count in the **Start Count** filed. • In the **New file every** field, specify the duration, in minutes, hours, or days, of the files during the logging. • Enable the **Overwrite existing files** checkbox if you want this to occur. • To cause the program to automatically convert TPS files to the RINEX format, enable the **Autoconvert to RINEX** checkbox and click the **Setup converter** button to adjust the converter settings. • In the **Recording interval** field, specify the data logging interval. • Click **Site parameters** button and in the window appeared, enter the site name and antenna details, then click **OK**. • In the **Elevation mask** field, set the elevation cut-off angle.

For more detailed information, see “Single file Tab” on page 3-25 and “Multiple files Tab” on page 3-26.

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

1. In the **File** menu, select **Real-Time Logging** item.

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:
   - In the **Prefix** field, enter the prefix part of the filename.
   - From the **Numbering** filed, select the desired file numbering scheme.

     –If you select **Ascending Count**, then you can enter initial numeric value of the file count in the **Start Count** filed.
   - In the **New file every** field, specify the duration, in minutes, hours, or days, of the files during the logging.
   - Enable the **Overwrite existing files** checkbox if you want this to occur.
   - In the **Recording interval** field, specify the data logging interval.
   - In the **Elevation mask** field, set the elevation cut-off angle.
4. Enable the **Autoconvert to RINEX** checkbox, click the **Setup converter** button, adjust the following parameters, then click **OK**:
   - Run by – name of the person who runs the converter.
   - Observer – observer name.
   - Agency – observing agency.
   - Antenna # – serial number of antenna.
   - Antenna type – description of antenna (use only antenna names approved and standardized by NGS).
   - Comment – 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.
- Converter Application – specify the full path to the `tps2rin.exe` file.
- Exclude GPS (Exclude GLONASS) – enable if you want the resulting RINEX files do not contain raw data measurements/ ephemeris data corresponding to GPS (GLONASS).
- Exclude L1 (Exclude L2) – enable if you want the resulting RINEX files do not contain L1 (L2) raw data measurements.
- Delete source JPS files after successful conversation – enable if you want the original tps files removed once their conversion to the RINEX format has been successfully completed.
- Additional options – you can enter any of the command-line switches available for the RINEX converter to modify its behavior.

5. Finally, click the **Start** button.

For more information on the settings listed, refer to “Multiple files Tab” on page 3-26.

How to Stop Data Logging...

To the Receiver Memory

1. In the **File** menu, select the **File Manager** item.
2. Click the ***Current log file*** tab and click the **Stop** button.

On the Computer

1. In the **File** menu, select **Real-Time Logging** item.
2. Click the **Stop** button on the ***Single file*** or ***Multiple files*** tab, depending on the logging method selected.

How to Configure Automatic File Rotation Mode

1. In the **Configuration** menu, select the **Receiver** item.
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 – specify the time duration of the files logged.
   - Phase – specify the constant time shift of the files logged.
   - Files (total) – enter the number of files to be created.
   - Automatically remove old files – tick this checkbox if you want the receiver removes the earliest log file when no free memory is available to log data.
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 Tab" on page 3-40.

How to Download Files to a Computer Using File Manager

1. In the **File** menu, select the **File Manager** item.
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.
5. Select the file(s) to download.
6. Click the **Download** button.

7. Once the files have been successfully downloaded, continue with other operations.

How to Download Files to a Remote Computer Using FTP

1. Configure your Ethernet-enabled receiver as shown in "Connecting the Receiver to an Existing TCP/IP Ethernet Network" on page 1-21, steps 1 through 9.
2. From a computer on which you want the files to be stored, open a Web browser such as Internet Explorer.
3. In the **Address** bar of the browser, type an IP address of the receiver you want to connect to (e.g., ftp://63.106.139.235).
4. The ***Login As*** window appears. Type in an arbitrary **User Name** and the **Password** intended for access. Click **Login**.

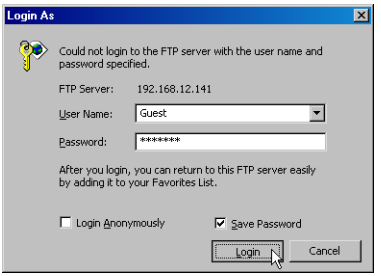


Figure 2-34. Login As Window

5. Once the access has been verified, you will see a list of log files available in the receiver. Select the files you want to download, then right-click anywhere within the selected area and click **Copy To Folder** on the pop-up menu.

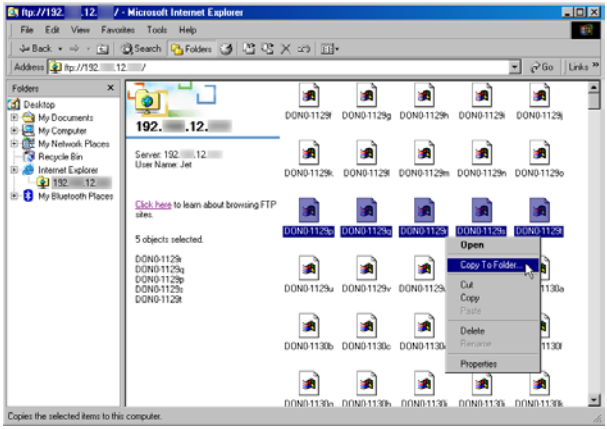


Figure 2-35. Copy Log Files

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

1. In the **File** menu, select the **File Manager** item.
2. On the ***Download files*** tab, select the file(s) you want to delete.
3. Click **Delete** and **Yes** at the delete files 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 restoring a deleted file, keep in mind the following important recommendations:

- Do not record any new raw data files to the internal memory of the receiver from which the file was deleted. Recording new files may overwrite the deleted file and make it permanently lost.
- Do not attempt to 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 cardreader.

1. In the **File** menu, select the **Manual Mode** item.
2. In the command line at the top of the ***Manual Mode*** window, type in the `%%set,/par/dev/blk/a/removed,on` command 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*** window and select the **File Manager** item from the **File** menu.
5. From the list of the deleted files, select the desired file and click **Download**.

NOTICE *NOTICE*

In this mode you will see the deleted file(s) only.

6. After the file has been successfully downloaded, you need to restore the file system to its previous state. For this, do one of the following:
   - Click **Exit** on the ***File Manager*** window and re-open the ***Manual Mode*** window. In the command line, type in the `%%set,/par/dev/blk/a/removed,off` command and click **Send command**.
   - Click **Exit** on the ***File Manager*** window, then select **Disconnect** from the **File** menu. 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 stops blinking), continue with other configuration procedures as needed.

How to Create the Receiver Configuration File

1. In the **Configuration** menu, select the **Receiver** item.
2. Click the **Save** button on any of the eight tabs.
3. From the ***Save setup to a script*** window, navigate to and open the folder in which to save the file.
4. In the **File name** field, enter the name of the configuration file to be created.
5. From the **Save as type** drop-down box, select the extension for the file. It is recommended that you use a .tpc extension.
6. Finally, click the **Save** button.

How to Load the Configuration File to the Receiver

1. In the **File** menu, select the **Manual Mode** item.
2. In the bottom-left corner of the ***Manual Mode*** window, click the **Load script** button.
3. The ***Script file*** window displays. Select the desired configuration file. Then click **Open**. You will see the filename appears in the command line.
4. Click the **Send command** button. The file begins loading. Once the `>Done!` string appears, the loading is completed and the settings are applied to the receiver.

CAUTION

It is not recommended that you load the configuration files other than created specifically for the selected receiver.

How to Enable WAAS Satellites

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Positioning*** tab. In the right-hand section, select the ***WAAS*** subtab.
3. Enable the **Channel 1** checkbox.
4. From the **Set WAAS** and **as GPS** list boxes, select the WAAS satellite PRN code and GPS satellite PRN code, respectively.
5. From the **Interpret message #0 as message:#** list box, select 2 (two).
6. With the **Use Iono Corrections** radio buttons, select the desired ionosphere correction mode.
7. If you want that WAAS satellites have their true WAAS PRNs (not “GPS associated”), enable the **Enable output of "true" WAAS PRN numbers** checkbox.
8. If required, repeat steps 3-6 for the second channel.
9. Click **Apply**.

For details, see “Positioning Tab” on page 3-45.

How to Configure Base Station for Broadcasting...

RTCM Messages

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Base*** tab, set the following parameters and click **Apply**:

- GPS/GLO at one time – enable
- Reference Geodetic Coordinates – enter latitude, longitude, and altitude (ellipsoidal height) values of the antenna position in the selected datum. Do one of the following:

  –If known, type in the values.

  –Enable **Averaged** and enter the **Averaged Span** in seconds, then click **Apply**->**OK**. Click **Tools**->**Reset receiver** and wait until the specified interval (span) 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.
- In the **L1 to L2 Antenna Phase Center offsets** edit boxes, enter the corresponding components of the L1 antenna phase center to L2 antenna phase center vector offset.
- In the **RTCM Settings** area, adjust the desired settings.

3. Either click the **Configuration of Receiver Ports** button or ***Ports*** tab. On the ***Serial*** subtab, set the following parameters for the port on which you want to generate RTCM messages and click **Apply**->**OK**:

- Input – select Command.
- Output – select the message set among the following sets available and depending on differential mode required

  –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

- Period – enter interval at which receiver will generate differential messages.
- Baud rate – select a baud rate (i.e., the rate at which receiver will transmit RTCM messages to modem or any other device connected to this port).
- RTS/CTS – enable/disable, depending on whether a modem connected to the port supports hardware handshaking or not.

CMR Messages

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Base*** tab, set the following parameters and click **Apply**:
   - GPS/GLO at one time – enable
   - Reference Geodetic Coordinates – enter latitude, longitude, and altitude (ellipsoidal height) values of the antenna position in the selected datum. Do one of the following:

     –If known, type in the values.

     –Enable **Averaged** and enter the **Averaged Span** in seconds, then click **Apply**->**OK**. Click **Tools**->**Reset receiver** and wait until the specified interval (span) 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.

- In the **L1 to L2 Antenna Phase Center offsets** edit boxes, enter the corresponding components of the L1 antenna phase center to L2 antenna phase center vector offset.
- In the **CMR Settings** area, adjust the desired settings.

3. Either click the **Configuration of Receiver Ports** button or ***Ports*** tab. On the ***Serial*** subtab, set the following parameters for the port on which you want to generate CMR messages and click **Apply**->**OK**:

- Input – select Command.
- Output – select either RTK CMR {10,0,1} or RTK CMR+ {10,0,9}.
- Period – enter interval at which receiver will generate differential messages.
- Baud rate – select a baud rate (i.e., the rate at which receiver will transmit CMR messages to modem or any other device connected to this port).
- RTS/CTS – enable/disable, depending on whether a modem connected to the port supports hardware handshaking or not.

How to Configure Rover Station for Accepting...

RTCM Messages in DGPS mode

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Rover*** tab, set the following parameters and click **Apply**:

- Positioning Mode – enable DGPS (Code Differential).
- If you use multiple Base stations, adjust the parameters within the **Multi-base** area. For details, see “Rover Tab” on page 3-61.

- CD Corrections max. age – use the default value.
- Iono Corrections max. age – use the default value.
- Use Iono Corrections – use the default state.
- Source – use the default value.

3. Either click the **Configuration of Receiver Ports** button or ***Ports*** tab. On the ***Serial*** subtab, set the following parameters for the port on which you want to accept RTCM messages and click **Apply**->**OK**:

- Input – select RTCM.
- Output – select None.
- Baud rate – select a baud rate (i.e., the rate which will be used by the receiver for data reception from modem or any other device connected to this port).
- RTS/CTS – enable/disable, depending on whether a modem connected to the port supports hardware handshaking or not.

RTCM Messages in RTK mode

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Rover*** tab, set the following parameters and click **Apply**:

- Positioning Mode – enable RTK Fixed.
- Use the default values for other parameters available.

3. Either click the **Configuration of Receiver Ports** button or ***Ports*** tab. On the ***Serial*** subtab, set the following parameters for the port on which you want to accept RTCM messages and click **Apply**->**OK**:

- Input – select RTCM.
- Output – select None.

- Baud rate – select a baud rate (i.e., the rate which will be used by the receiver for data reception from modem or any other device connected to this port).
- RTS/CTS – enable/disable, depending on whether a modem connected to the port supports hardware handshaking or not.

CMR Messages

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Rover*** tab, set the following parameters and click **Apply**:
   - Positioning Mode – enable RTK Fixed.
   - Use the default values for other parameters available.
3. Either click the **Configuration of Receiver Ports** button or ***Ports*** tab. On the ***Serial*** subtab, set the following parameters for the port on which you want to accept CMR messages and click **Apply**->**OK**:
   - Input – select CMR.
   - Output – select None.
   - Baud rate – select a baud rate (i.e., the rate which will be used by the receiver for data reception from modem or any other device connected to this port).
   - RTS/CTS – enable/disable, depending on whether a modem connected to the port supports hardware handshaking or not.

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

1. In the **Tools** menu, select the **Receiver options** item.

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. In the **Configuration** menu, select the **Receiver** item.
4. Select ***Advanced***->***Raw Data Management***, set the following parameters and click **Apply**->**OK**:
   - In the **Raw Measurement Update Rate** area, set the **Update Rate** parameter to 50 ms.
   - In the **Position Update Rate** area, set the **Update Rate** parameter to 50 ms.
   - Click **Refesh** and examine the values in the **Current Update Rate** fields, they should display 50.

From this moment on, the receiver will output the measurement data and position information at 20 Hz.

Alternatively, when you request any data recording or output with a 0.05 second period, PC-CDU will launch Output Period Setup Wizard, that will do the same steps as described above.

How to Enable a 1 PPS Output

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Events*** tab, set the following parameters and click **Apply**:
   - PPS A Enabled – enable.
   - Period – enter the pulse output interval in milliseconds.
   - Offset (ms) – enter the millisecond part of the pulse offset from the selected reference time (if required).
   - Offset (ns) – enter the nanosecond part of the pulse offset from the selected reference time (if required).
   - Period of ‘marked’ pulses – enter the marked pulse output interval in milliseconds (if required).

- Edge – select either the rising or falling edge of the pulse to be synchronized with the selected reference time.
- Ref. Time – select the reference time that the 1PPS signal will be synchronized with.
- Tied with Ref. Time – enable if you want the receiver synchronizes the 1PPS signal with the chosen reference time.

3. Repeat step 2 to enable the PPS B output (if required).

For details, see “Events Tab” on page 3-76.

How to Enable an Event Marker Input

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Events*** tab, set the following parameters and click **Apply**:
   - Event A Enabled – enable.
   - Clock Synchronization – leave default.
   - Edge – select the edge at which the input signal will be time tagged.
   - Ref. Time – select reference time scale that the event reception time will be synchronized with.
   - Tied with Ref. Time – enable to measure the event reception time in the selected reference time with consideration for the computed receiver clock offset.
3. Repeat step 2 to enable the Event B input (if required).

For details, see “Events Tab” on page 3-76.

How to Output Position in a Pre-defined Datum

1. In the **Configuration** menu, select the **Receiver** item.

2. Go to the ***Positioning*** tab, select the desired datum ID from the **Current Datum** drop-down list box and click **Apply**.

NOTICE

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

1. In the **Configuration** menu, select the **Receiver** item.
2. Select the ***Positioning*** tab, click **Datum Parameters** and set the following parameters:
   - Current Datum – select USER.
   - Enter the corresponding values in the **Reference Ellipsoid parameters** and **Transformation parameters** group boxes.
   - Click **Apply**->**OK**.
3. Finally, click **Apply** on the ***Positioning*** tab.

NOTICE

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

How to Restore Receiver Default Settings

Do one of the following:

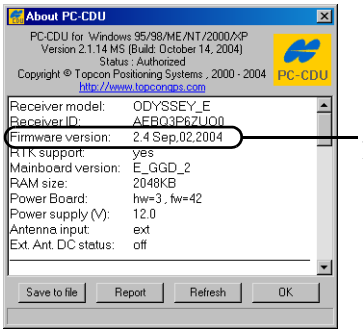
- In the **Configuration** menu, select the **Receiver** item. On either tab, click the **Set all parameters to defaults** button.
- In the **Tools** menu, select the **Clear NVRAM** item.

NOTICE

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 in this case.

How to Check Firmware Version

1. In the **Help** menu, select the **About** item.
2. The ***About PC-CDU*** window opens. Check the **Firmware version** field.



3. When finished, click **OK**, then continue with other configuration or operation functions as needed.

How to Check Receiver Options

1. In the **Tools** menu, select the **Receiver options** item.
2. The ***Option Manager*** window 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
- Leased – if the option is leased or not
- Expiration date – the date the option will be disabled, if applicable

3. When finished, click **Exit** to close this window.

How to Load New OAF to Receiver

1. In the **Tools** menu, select the **Receiver options** item.
2. Click **Load** at the bottom of the ***Option Manager*** window.
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 of the options.

Detailed Software Reference

This chapter provides procedures for using the various software functions, as well as describes each menu, dialog, and field found in the software interface.

Understanding Elements of the Main Window

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

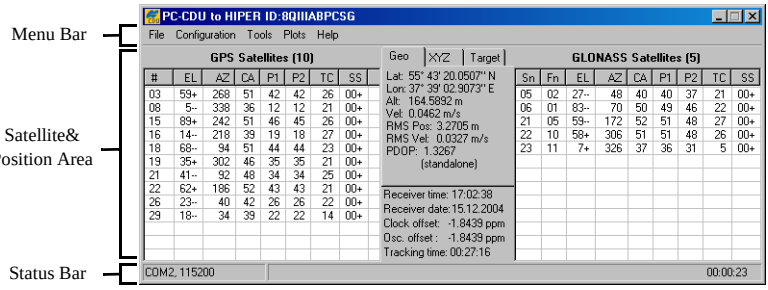


Figure 3-1. Main Window

Menu Bar

The *Menu bar* extends across the top of the ***Main*** window and contains five menu titles through which the user can access the program functions. By hovering the mouse pointer over a menu

title and then clicking the left mouse button will cause the menu to drop down, displaying a list of menu items. Position your pointing device on the desired menu item, then click and release the left mouse button and that function is invoked (Figure 3-2). Alternatively, you can use the shortcut keys (if available).

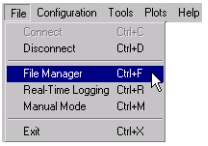


Figure 3-2. Menu Bar with the File Manager Item Highlighted

Satellites and Position Area

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

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

Parameter	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.

Table 3-1. Tracking Parameters Displayed in the GPS Satellites and GLONASS Satellites Panels (Continued)

Parameter	Description
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 sign “??” will be displayed anywhere in the panels where the corresponding parameters are unavailable.

The user can sort data in a column in descending (ascending) order by clicking on the column’s title.

The ***Geo*** tab shows the receiver's antenna's current position and the time-frequency parameters describing the behavior of the receiver's local oscillator (Figure 3-3 (a)).

The ***XYZ*** tab, which is shown in Figure 3-3 (b), is similar to the ***Geo*** tab except for the fact that the position of the receiver's antenna is displayed in Cartesian coordinates here.

The ***Target*** tab is used to display various navigational information (Figure 3-3 (c)).

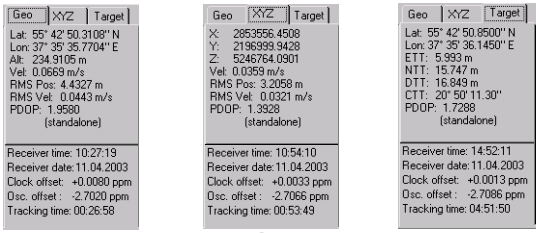


Figure 3-3. Geo|XYZ|Target Tabs

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 related fields	
Lat	Geodetic latitude of the receiver antenna[a].
Lon	Geodetic longitude of the receiver antenna[a].
Alt	Ellipsoidal height of the receiver antenna[a].
XYZ related fields	
X	Earth-Centered-Earth-Fixed WGS-84 X coordinate of the receiver antenna.
Y	Earth-Centered-Earth-Fixed WGS-84 Y coordinate of the receiver antenna.

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

Field	Description
Z	Earth-Centered-Earth-Fixed WGS-84 Z coordinate of the receiver antenna.
Target 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 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 common fields	
PDOP	Position Dilution of Precision.
Solution type	Standalone, Code differential, RTK float, RTK fixed.

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

Field	Description
LQ	This field reflects the status of the received differential messages and contains the following information: •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 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 field LQ 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 day. This value is taken from the message [~~][b]. For more information about [~~], see the GRIL Reference Manual.
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_{rr}), where T_r designates the receiver time, T_{rr} designates the receiver reference time. For more information about T_r and T_{rr}, see the GRIL Reference Manual. 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.

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

Field	Description
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 the GPS time scale only.

NOTICE

To set the target coordinates equal to the current receiver coordinates, double-click on either Lat or Lon field of the Target tab.

NOTICE

To reset the timer in the bottom-right corner of the Main window 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 (e.g., error messages) and time since the connection to the receiver has been established.

Menu Structure & Functional Overview

This section briefly describes the contents of the Menu bar and graphically represents the program structure. Use the references to find further details on the subject of interest.

File Menu

The **File** menu contains six menu items:

- Connect – By clicking this button, you open the ***Connection Parameters*** window through which you establish the communication with a TPS receiver. If the TPS receiver is already connected, this item will not be available.
- Disconnect – When you select this button, the connection with the TPS receiver will be closed. If the TPS receiver is already disconnected, this item will be grayed out.
- File manager – Opens the ***File Manager*** window, which allows the user to start/stop data recording into the receiver's internal memory and to manage log files collected with a TPS receiver. For more information, see "File Manager Window" on page 3-14.
- Real-Time Logging – Displays the ***Real-Time Logging*** window, which allows the user to start/stop data recording into a computer drive. For more information, refer to "Real-Time Logging Window" on page 3-22.
- Manual Mode – Displays the ***Manual Mode*** window, which allows the user to send commands to the receiver and view the responses. For details, see "Manual Mode Window" on page 3-32.
- Exit – Closes PC-CDU.

Configuration Menu

The **Configuration** menu contains four menu items:

- Receiver – Opens the ***Receiver Configuration*** window. This window allows the user to adjust a wide range of receiver settings. For details, see “Receiver Configuration Window” on page 3-33.
- Site – Displays the ***Site Parameters*** window, which allows the user to enter site-specific information. For more details, see “Site Configuration Window” on page 3-89.
- Target position – Displays the ***Target position*** window. For details, see “Target position Window” on page 3-90.
- Radio – When selected, pops up the **RFM96** button. Clicking this button, opens the ***RFM96 Configuration*** window. This window contains the controls that allow the user to configure the RFM96 radio modem from Pacific Crest. For details, see “RFM96 Configuration Window” on page 3-91.

Tools Menu

The **Tools** menu contains four menu items:

- Initialize file system – Initialize the receiver’s file system. For details, see “Initialize file system” on page 3-96.
- Clear NVRAM – Clears the receiver’s NVRAM. For details, see “Clear NVRAM” on page 3-98.
- Reset receiver – Performs the receiver reset. For details, see “Reset receiver” on page 3-99.
- Receiver options – Opens the ***Option Manager*** window. This window allows the user to check the status of the receiver’s options and load an OAF to a connected receiver. For details, see “Receiver options” on page 3-100.

Plots Menu

The **Plots** menu contains four menu items:

- Scatter – Displays the ***Scatter*** window, which shows the graphical representation of the position the receiver computes along with the precision measurement information. For details, see “Scatter Window” on page 3-114.
- Satellites – Displays the ***Satellites*** window, which shows the sky plot of visible satellites. For details, see “Satellites Window” on page 3-116.
- Position – Displays the ***Position*** window. For details, see “Position Window” on page 3-118.
- Configuration – Displays the ***Plots Configuration*** window, which contains the controls related to ***Scatter***, ***Satellites*** and ***Position*** windows. For details, see “Plots Configuration” on page 3-119.

Help Menu

The Help menu contains only one item:

About – Opens the ***About PC-CDU*** window, which provides information about the current version of the program, including its version number, release and expiration dates. Also here the user will find some additional information about a connected receiver. For details, see “About PC-CDU Window” on page 3-122.

Program Structure

The following five figures are for the reference purposes only. They will help you navigate through the program interface while you are familiarizing yourself with the software.

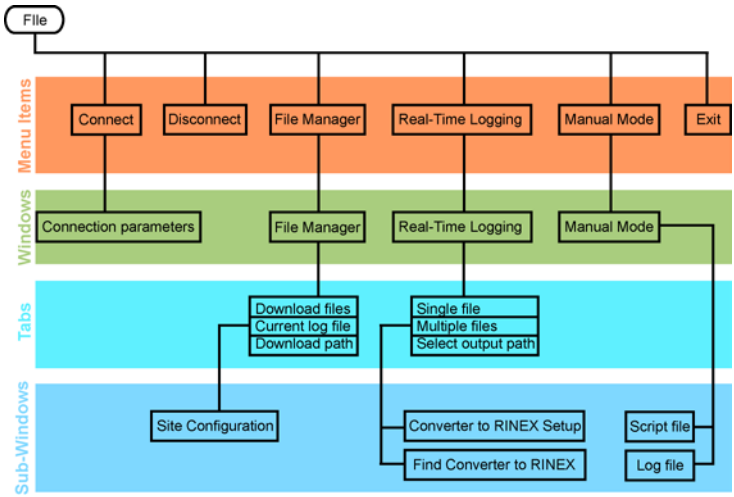


Figure 3-4. File Menu Structure

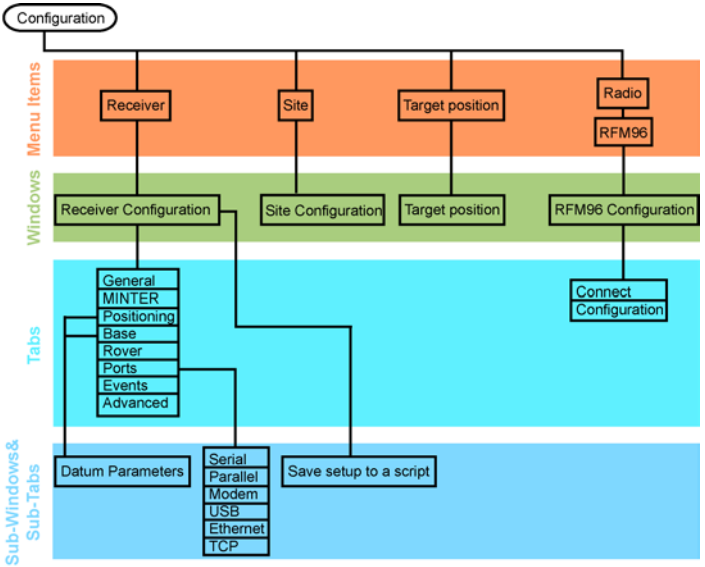


Figure 3-5. Configuration Menu Structure

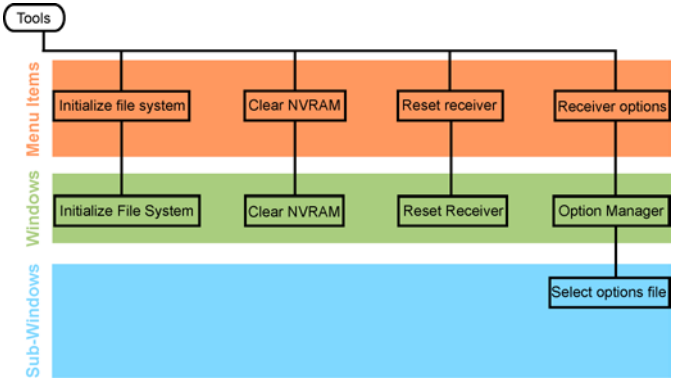


Figure 3-6. Tools Menu Structure

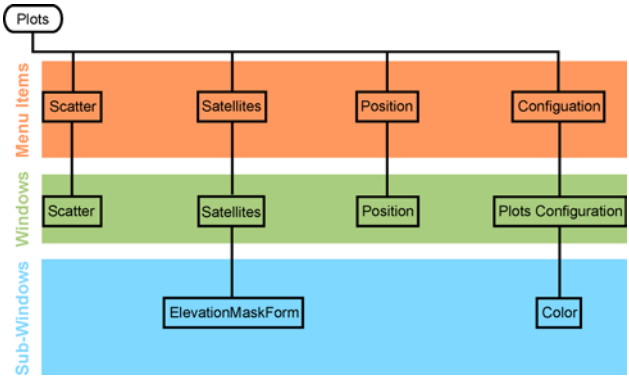


Figure 3-7. Plots Menu Structure

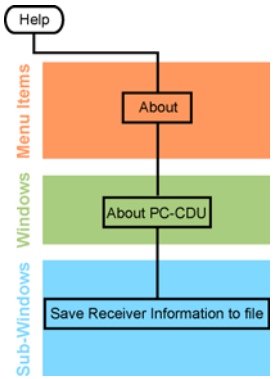


Figure 3-8. Help Menu Structure

File Manager Window

As its name implies, this window allows the user to manage the log files in the receiver.

To open the ***File Manager*** dialog window, select the **File Manager** item from the **File** menu, or press the **Ctrl+F** keys.

The user will be presented with the following tab controls:

- Download files – Allows downloading and deleting the log files from the receiver memory. See “Download files Tab” .
- Current log file – Allows the user to start/stop data logging to a file and to specify data logging rate, elevation mask, and site parameters. See “Current log file Tab” on page 3-18.
- Download path – Lets the user specify the full path and folder for the log files to be downloaded from the receiver. See “Download path Tab” on page 3-22.

Download files Tab

This tab lets the user download log files into a computer, or delete them from the receiver memory (Figure 3-9).

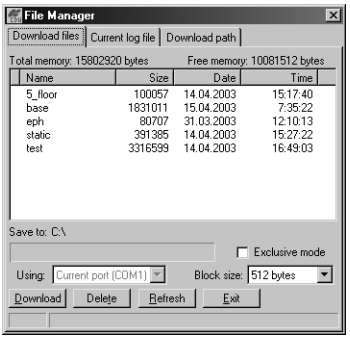


Figure 3-9. Download Files Tab

Before downloading the desired log file(s) onto your computer, select the folder on the PC where you want the file(s) to be stored. To do this, use the ***Download path*** tab. For more

information on ***Download path***, look up “Download path Tab” on page 3-22.

Once the destination has been specified, go to the ***Download files*** tab, highlight file(s) you want to download onto the computer, and press **Download**.

You will see the following color download status indicators in the course of downloading the data:

The green circle (●) indicates the file(s) that have been successfully downloaded.

The red circle (●) marks the file that is being downloaded.

The blue circle (●) indicates the file(s) in the queue for downloading.

The user can interrupt the download by pressing the **Stop** button.

Files in the destination folder will have the same names and extensions as the original receiver log files. Before downloading the current log file in the destination folder, PC-CDU will check if there already exists a file with the same name in this folder. If such a file is found there, the user will be prompted to select either **Append** or **Overwrite** (Figure 3-10). In the first case the contents of the log file downloaded will be appended to the existing file. In the second case the existing file will be replaced with a new file of the same name.

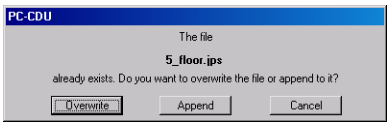


Figure 3-10. Message – a File with the Same Name Already Exists

WARNING

Care should be taken when selecting Append. This option is normally used only if the downloading process has for some reason been interrupted and you want it to be resumed.

The warning `Last warning: Waiting for the 1st block` appearing in the status bar while downloading a log file indicates that PC-CDU cannot for some reason retrieve the next block of data from the receiver. The **Retries** field shows how many attempts to retrieve this block of data have been made so far (Figure 3-11).

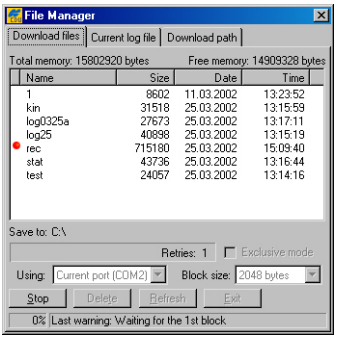


Figure 3-11. Message – Problem with Data Retrieving

If such a problem occurs, you may need to try a higher baud rate and/or a smaller block size.

TIP

Usually, the larger the block size the more efficient the data transfer. On the other hand, if the connection between the computer and receiver is not reliable enough, reducing the

block size can often help to exclude or at least minimize communication errors.

Selecting the **Exclusive mode** checkbox will allow the user to increase considerably the data transfer speed, especially if 115200 or a higher baud rate has been set. Note however that using this option will disable most of the processes running inside the receiver (including the satellite tracking process) in order to ensure the highest possible file transfer speed.

One more note about downloading the receiver log files onto the computer.

If the **Exclusive mode** checkbox is not selected, one can start downloading the current log file without closing it first. The downloading process will stop at the moment when *end-of-file* is reached in the log file.

However the receiver will continue to write new data to the log file after that.

This method has two drawbacks. First, the download progress indicator can occasionally display values exceeding 100%. Second, the last record can be corrupt in the downloaded file. If **Exclusive mode** is on, it is impossible to start downloading the current log file without closing it first. In other words, if the **Exclusive mode** checkbox has been checked and one wants to start downloading the current log file, PC-CDU will automatically close the log file before the download is started.

Use the **Delete** button to erase unnecessary log files in the receiver memory.

To delete a group of log files, click on any one of them, then hold down the **Ctrl** key and select the rest of the files, and finally press **Delete**.

To delete a group of adjacent log files, click on the first of them, then hold down the **Shift** key and click on the last of the files, and finally press **Delete**.

TIP

Log files that have inadvertently been deleted from the receiver memory can be visible with the command set,/par/dev/blk/a/removed,on. This command can be sent to the receiver from the Manual Mode window. The user is able to download deleted files to the computer only if he/she has not recorded any new files in the receiver memory since these files were removed. Otherwise, it cannot be guaranteed that the deleted files can be completely downloaded. See Chapter 2 on page 2-27 for procedure details.

With the **Refresh** button the user can reload the list of the receiver log files.

Press **Exit** to close the ***File Manager*** tab.

Current log file Tab

In this tab the user can create new and delete existing receiver log files (Figure 3-12).

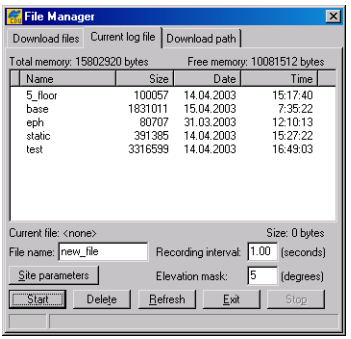


Figure 3-12. Current log file Tab

To create (open) a new log file, take these steps:

1. Enter the desired filename in the **File name** edit box, or select a file from the file list displayed in this window. In the latter case, just double-click on the corresponding filename.
2. Specify the desired data recording interval (i.e., data update interval) in the **Recording interval** edit box.
3. Set the desired **Elevation mask**.
4. Click the **Site parameters** button. The ***Site Configuration*** dialog box will appear (Figure 3-13).

   –Specify the desired **Site Name**.

   –Select the correct **Antenna Status** from the corresponding list box.

   –Set the **Antenna Height** parameter and select/deselect the **Slant** checkbox depending on whether you have specified the slant or vertical antenna height.

   –Select the correct antenna type from the **Antenna Type** box.

   –Set the **Send parameters automatically** checkbox. By default, it is enabled. Disabling this checkbox, will prevent PC-CDU from the automatic sending of the **Site** and **Antenna Parameters** to the receiver on every log file creation event.

   –Press **OK**.

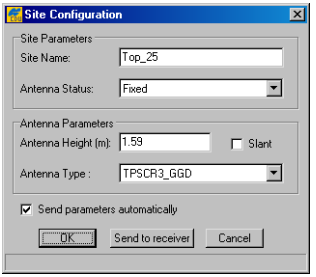


Figure 3-13. Site Configuration Dialog Box

NOTICE *NOTICE*

After pressing the OK button, the Site parameters dialog box will be closed and the parameters that have been specified in the box will be copied to pccdu.ini. If the user then presses the Start button in the File Manager window, these settings will be enabled and inserted into the newly created (current) log file, unless the user disabled the Send parameters automatically button. On the other hand, if the user needs to update the site information for the log file being recorded, it will be sufficient to press the Send to receiver button to send the new site settings (site name, antenna status, antenna height, etc.) directly to both the receiver log file and pccdu.ini.

NOTICE *NOTICE*

If you set a recording interval that is not currently supported by the receiver, PC-CDU will launch a utility Output Period Setup Wizard. For more

information on the Wizard, see Appendix C on page C-1.

To stop data recording and close the file, click the **Stop** button.

The rest of the controls are described in Table 3-3.

Table 3-3. Current log files Controls

Control	Description
Current file	Shows the name of the file the data is being logged to.
Size	Reflects the size of the current log file. To keep track of the data recording process, see how the log-file size varies in time.
Total memory	Shows the total amount of space in bytes (in the receiver) available for data.
Free memory	Displays how much space in the receiver is free for storing data.
Delete, Refresh, Exit	Serve the same purposes as in the Download file tab (see “Download files Tab” on page 3-14).

Download path Tab

In this tab the user selects the destination folder for the files downloaded (Figure 3-14).

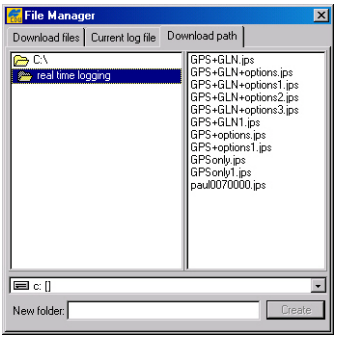


Figure 3-14. Download path tab

Note that the window's right panel is for display only. The user will be prevented from doing any operations on the files in the corresponding directory. If the user has not explicitly selected a destination folder for the files downloaded, these files will be stored based on the last specified download path.

Real-Time Logging Window

The term *real-time logging* means recording receiver data into a PC in real time mode.

To open the ***Real-Time Logging*** window, select **Real-Time Logging** from the **File** menu or press the **Ctrl+R** keys.

The ***Real-Time Logging*** dialog boxes (see Figure 3-15 on page 3-25 and Figure 3-16 on page 3-26) are, structurally, similar to the ***Main*** window. For a description of the GUI components that are identical for the ***Real-Time Logging*** and ***Main*** windows, refer to "Understanding Elements of the Main Window" on page 3-1. Below we will focus on the components specific to the ***Real-Time Logging*** window.

Note the three tabs in the top-left corner of the window: ***Single file***, ***Multiple files*** and ***Select output path***. For information on the ***Select output path*** tab, refer to “Download path Tab” on page 3-22.

Before we getting down to the other two tabs, consider the parameters displayed in the middle of the ***Real-Time Logging*** window, between the ***GPS Satellites*** and ***GLONASS Satellites*** tables.

The **Elapsed time** field shows the time elapsed since the current log file was opened. Every time a new log file is created, this timer is reset to 00:00:00.

The **Received** field shows the log-file size in bytes. This parameter will vary as new data are recorded into the file. After pressing the **Stop** button, one will see the log file's final size in the field.

The **Site parameters** button allows the user to enter various antenna and site parameters. For details, see “Site Configuration Window” on page 3-89.

The **Start** button allows the user to start recording data into the file. After starting the data logging the name on the button will change to **Stop**. Pressing the **Stop** button will close the file.

NOTICE

If the user sets a recording interval that is not currently supported by the receiver, PC-CDU launches a utility called Output Period Setup Wizard. For more information on the Wizard, see Appendix C on page C-1.

By pressing **Exit** you will close the ***Real-Time Logging*** window.

NOTICE

While the value of Recording interval specified in the Real-Time Logging window applies only to

this mode, the Elevation mask edit box also affects the Terminal Elevation Mask setting.

NOTICE

In real-time data logging mode it is recommended that the RTS/CTS handshaking checkbox be selected and the baud rate be set to 115200 or higher.

NOTICE

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

Single file Tab

In this mode PC-CDU will record receiver data into one specific file on the host computer. Figure 3-15 shows an example of the ***Single file*** tab of the ***Real-Time Logging*** window.

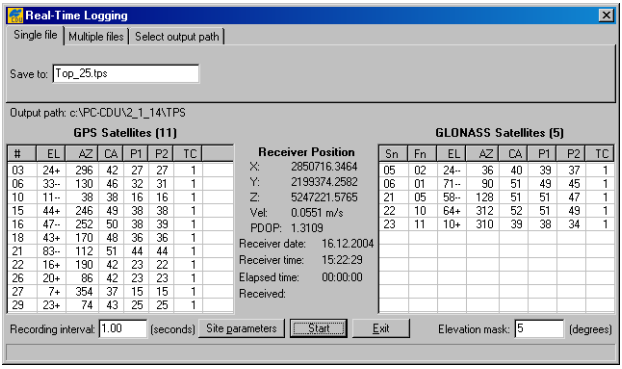


Figure 3-15. Real-Time Logging Window – Single file Tab

To start real-time data logging into a single file on the host computer, follow these steps:

1. In the **Save to** edit box enter the name of the file where the receiver data are to be logged.

NOTICE

By default the name of a TPS file created in real-time logging mode will coincide with the site name from the Site Configuration dialog box.

2. Specify the **Site parameters**, **Recording interval** and **Elevation mask** settings.
3. Click the ***Select output path*** tab and then specify the full path for the file in the **Save to** edit box.
4. Return to ***Single file***. Click **Start** to begin logging.

Multiple files Tab

This function, *real-time logging of multiple log files*, is intended to automate the process of real-time recording of the receiver data to TPS files according to the specified time schedule.

In this mode PC-CDU will automatically open/close TPS files in regular time intervals. A new TPS file will be opened immediately after the previous file is closed. By selecting the ***Multiple files*** tab, the user will be presented with a window that looks like Figure 3-16.

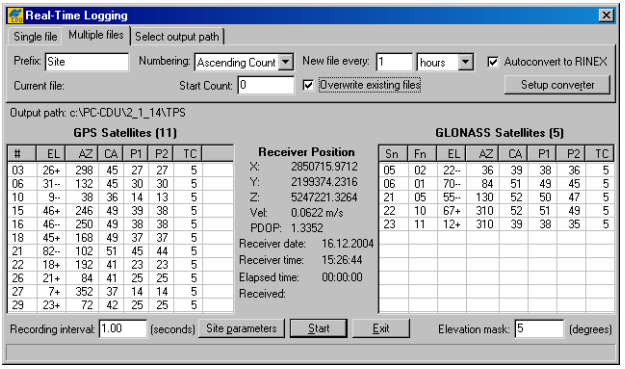


Figure 3-16. Real-Time Logging Window – Multiple files Tab

The filename convention settings **Prefix** and **Numbering** determine how the TPS files created will be named.

As the name of the setting implies, **Prefix** determines the prefix part of the filename. By default, PC-CDU will use the site name specified in the ***Site Configuration*** dialog window as the filename prefix.

The **Numbering** edit box allows the user to select the desired file numbering scheme:

- If the **Date & Time** option is selected, the numeric part of the filename will look as follows:

  YDDDHHMM, where

Y – last digit of the year [0-9]

DDD – day of the year [1-366]

HH – hours in the receiver time scale [00-23]

MM – minutes in the receiver time scale [00-59]

The date and time used for the filename will correspond to the first epoch recorded into the file.

- If the **Ascending Count** option is selected, the numeric part of the filename will vary between 0000 and 231147483647.

  If the **Ascending Count** option has been chosen, the parameter **Start Count** will be enabled. In this edit box the user can enter the starting state of the TPS file count, (i.e., the numeric part of the name of the TPS file created first). This count will be increased as new TPS files are opened.

New file every is associated with a pair of components, an edit box and a drop-down list box. Use the list box to select the desired time unit (day, hour or minute). Use the edit box to specify the interval (in the selected time unit) in which the current TPS file will be closed and the next one will be opened. Note that this interval must be an integer[3]. Also note that some of the multiple files created may be shorter (in terms of their duration in time) than it is specified in the corresponding edit box.

To better understand how multiple files are opened and closed in multiple file mode, let us consider the *artificial* time scale with the origin at 0h00m00s[4] as shown in Figure 3-17 on page 3-28. This time scale is divided into intervals equal to the period as specified by the **New file every** fields.

3. Whatever time unit is selected.
4. That is, at the beginning of the day when multiple file logging is started by pressing the Start button.

The first of the multiple TPS files will be opened immediately after the **Start** button is pressed.

The first file will be closed and the second one opened as the 2nd interval starts, for example, at t=2n (Figure 3-17), etc.

Time duration of the second and all the following multiple files (maybe except the last one) will be exactly equal to the selected file period.

To stop the multiple file data logging, press the **Stop** button. Note that the last file, too, can be shorter than is specified in **New file every**.

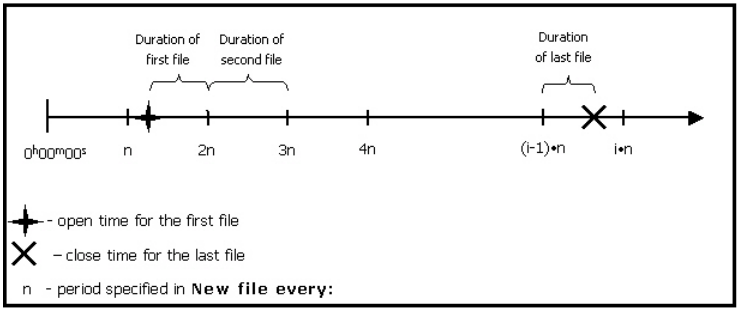


Figure 3-17. Generation of Multiple Files

If the user wants PC-CDU to overwrite the existing files whose names coincide with the names of the newly created files, select the **Overwrite existing files** checkbox before starting real-time logging.

For example, assume that the **Ascending Count** and **Overwrite existing files** options have been selected. If the user

then presses the **Start** button, PC-CDU will display a prompt as in Figure 3-18.

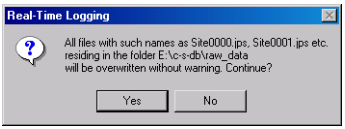


Figure 3-18. Overwrite existing files? Warning

In this example the destination folder is `E:\c-s-db\raw_data`, the filename prefix is `Site`.

Press **Yes** to overwrite the existing files. If you press **No**, you will return to the ***Real-Time Logging*** window. There you will need first to uncheck the **Overwrite existing files** checkbox and then press the **Start** button to start data logging. In this case the numeric parts of the names of the TPS files recorded will be incremented starting from the first unused value, not necessarily from 0000.

If the **Autoconvert to RINEX** checkbox is selected, PC-CDU will automatically convert all newly created TPS files to RINEX. Note that this conversion is performed *on the move*.

NOTICE *NOTICE*

If you want to use the Autoconvert to RINEX function, make sure that the executable file tps2rin.exe is available on your computer.

The **Setup converter** button, which is located immediately below the **Autoconvert to RINEX** checkbox, allows you to set up some of the options used by the `tps2rin.exe` converter.

Pressing this button will open the ***Converter to RINEX Setup*** window (Figure 3-19).

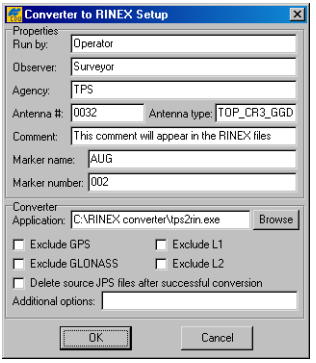


Figure 3-19. Converter to RINEX Setup Window

The information specified in the ***Properties*** panel will be put in the header of the corresponding RINEX files:

- Run by – name of the person or agency launching the converter.
- Observer – name of the person who collected the data.
- Agency – name of the agency responsible for collecting the data.
- Antenna # – antenna number to be copied in the RINEX files.
- Antenna type – antenna type to be copied in the RINEX files.
- Comment – comment line(s).
- Marker name – name of the antenna marker.
- Marker number – number of the antenna marker.

In the **Application** edit box, the full path to `tps2rin.exe` must be entered. Use the **Browse** button to select the desired filename path instead of typing it.

Use the **Exclude GPS** (**Exclude GLONASS**) checkbox to exclude from the resulting RINEX files all raw data measurements/ephemeris data corresponding to GPS (GLONASS).

Use the **Exclude L1** (**Exclude L2**) checkbox to exclude from the resulting RINEX files all L1 (L2) raw data measurements.

The **Delete source JPS files after successful conversion** checkbox means exactly what its name implies.

In the **Additional options** edit box you can enter any of the switches available for the windows console application `tps2rin.exe`. For more information about the switches, refer to the *Free Software* section at http://www.topcongps.com/software/tps2rin.html.

Manual Mode Window

This window, as shown in Figure 3-20, allows direct control of the receiver by using GRIL commands. In manual mode PC-CDU serves as a terminal communicating with the receiver, (i.e., it allows the user to send various receiver commands and get responses to these commands). For a complete list of commands supported by TPS receivers, refer to the *GRIL Reference Manual*. This document is available for download from the TPS website (http://www.topcongps.com/support/manuals.html).

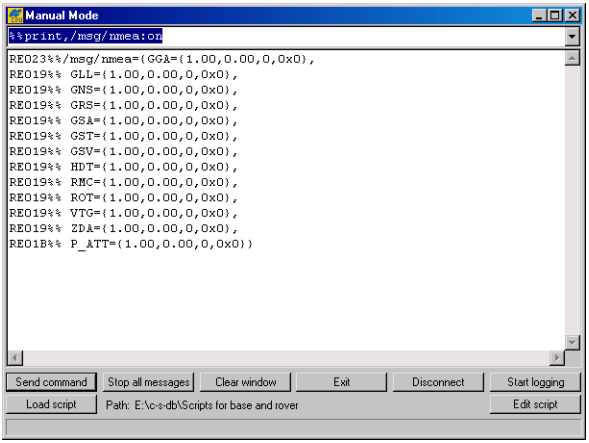


Figure 3-20. Manual Mode Window

To go to the ***Manual Mode*** window, select the **Manual Mode** item from the **File** menu or press the **Ctrl+M** keys.

NOTICE

We recommend that you do not send any commands to the receiver from the Manual Mode window before you familiarize yourself with the GRIL Reference Manual and acquire good knowledge of the receiver parameters.

At the top of the ***Manual Mode*** window there is a command line box in which the user can type a (new) command line. Alternatively, the user can click ▾ to open the combo-box list and select one of the previously used command lines. Note that there may be stored up to twenty (20) command lines in the list. Once the desired command line is typed (or selected), press the **Send command** button in the bottom-left corner of the ***Manual Mode*** window or just click the **Enter** key on your keyboard. The receiver's responses will be displayed in the receiver replies window located under the command line box.

The other controls available on this window are summarized in Table 3-4.

Table 3-4. Controls of Manual Mode Window

Control	Description
Stop all messages	Stops outputting any messages from the receiver to the current terminal. After the button is pressed, PC-CDU will send an appropriate `dm` command to the receiver.
Clear window	Clears the receiver replies window.
Exit	Closes the ***Manual Mode*** window.
Disconnect	Allows the user to disconnect from the receiver without disabling any configuration changes made.
Start logging	Allows the user to copy to a text file all information that has been displayed in the receiver replies window during the session.
Edit script	Allows the user to modify the contents of the script files.
Load script	Loads into the receiver the desired script file.

Receiver Configuration Window

To go to the ***Receiver Configuration*** window, select **Receiver** from the **Configuration** menu, or alternatively press the **Ctrl+V** keys.

The user will see a dialog window comprising eight tabs, as shown in Figure 3-21 on page 3-35.

Each tab has **Apply** and **Refresh** buttons.

- Apply – instructs PC-CDU to accept and send to the receiver settings made in the tab without closing the window.

NOTICE

NOTICE

Each Apply button serves only its own tab and cannot affect the other tabs' settings.

- Refresh – updates the currently displayed window with information from the receiver.

In addition, the following four buttons are available and common for all tabs.

- OK – unlike the individual **Apply** buttons, allows you to accept the selected settings for all eight tabs at a time and once accepted, to close the ***Receiver Configuration*** window.
- Exit – closes the ***Receiver Configuration*** window without accepting the settings you have made since **Apply** was pressed last.
- Save – opens the ***Save setup to a script*** window. In this window you can save the current receiver settings to a script file. Script files normally have the extension .tpc. Later you can load the desired script file to the receiver, thus enabling several necessary receiver settings with a single operation. See Chapter 2 on page 2-29 for details.
- Set all parameters to defaults – does exactly what its name implies.

General Tab

Figure 3-21 shows the ***Receiver Configuration*** window's ***General*** tab.

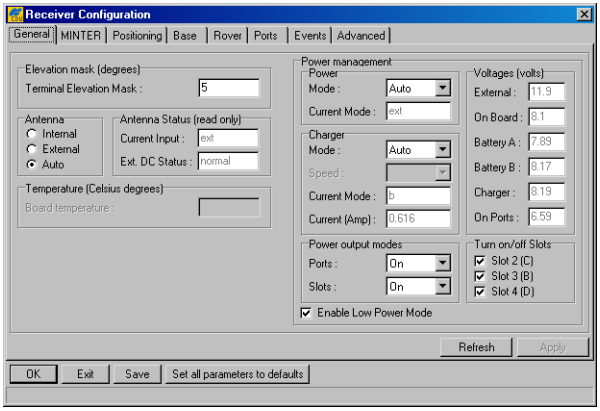


Figure 3-21. General Tab

Elevation mask

In the **Terminal Elevation Mask** edit box the user enters the minimum elevation (i.e., the elevation mask angle) for the satellites whose data will be output to the current terminal (i.e., the receiver port being used for communication).

Antenna

The **Internal**, **External** and **Auto** radio buttons are used to select the desired antenna type. Table 3-5 shows what antenna type settings are allowed for different receiver models and board types.

Table 3-5. Allowed antenna type settings

Receiver model	Board	Default value	Values
any	JPS_3, Eurocard	ext	int, ext
any	JPS_4, JPS_4_2	ext	int, ext, auto

Table 3-5. Allowed antenna type settings (Continued)

Receiver model	Board	Default value	Values
OEM	JGG20	unavailable	unavailable
OEM, LEGACY_H	HE_GG, HE_GD	unavailable	unavailable
HiPer, HiPer GGD, HiPer +, HiPer Lite, HiPer Lite +	HE_GG, HE_GD, HE_GGD, HE_GDL, HE_GGDL	auto	int, ext, auto
OEM, ODYSSEY_E	E_GGD, HE_GG, HE_GD, HE_GGD	unavailable	unavailable

NOTICE

Note that such receiver models as HiPer, Regency with JPS_4 board and Odyssey with JPS_4 board are capable of automatically detecting an external antenna only at receiver start-up time. Therefore if one wants to switch from the internal antenna to an external one while in auto, he/she will have to power the receiver off and then back on.

NOTICE

The Regency and Odyssey receivers with JPS_4_2 board inside are capable of automatically detecting an external antenna without switching the receiver off and back on.

Antenna Status

The **Current Input** indicator shows what antenna type is actually being used by the receiver:

- int – the internal antenna is being used.
- ext – an external antenna is being used.

The **Ext. DC Status** indicator shows if the external antenna draws any DC power:

- off – the external antenna draws no power.
- normal – the external antenna draws normal power.
- overload – the external antenna draws higher power than expected or??? a short circuit occurs in the antenna or antenna cable.

Temperature

The **Board temperature** indicator shows the receiver board's current temperature in degrees of Celsius.

Power management

There are five group boxes that allows the user to adjust/view the power settings for your receiver. Each group box contains a set of related controls.

Power

Use the **Mode** drop-down list box to select 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.

The **Current Mode** indicator shows what power source is being used at the moment.

Charger

Use the **Mode** drop-down list box to select 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.

Use the **Speed** list box to set the desired speed of battery charge cycle (available not for all receiver models). You can select between **Normal** and **Fast** charging modes.

The **Current Mode** flag shows which of the batteries, a, b or none (off) is being charged at the moment.

The **Current (Amp)** field reflects the actual battery charging current in Amperes.

Power output modes

The **Ports A,B** checkbox allows you to turn power on and off for ports A and B. This parameter is applicable to the Odyssey receiver only.

With the **Port C** checkbox you can turn power on and off on port C. This parameter is applicable to the Odyssey receiver only.

The **Ports** list box governs power output on serial ports:

- **On** – the power board will feed all available serial ports via the corresponding pins when the receiver is turned

on. If the receiver is turned off, there will not be any power on the ports.

- **Off** – power, for all available serial ports, will be absent even if the receiver is turned on.
- **Always** – all serial ports will be powered even if the receiver is turned off.

With the **Slots** list box the user governs power output to the receiver internal slots:

- **On** – means that all slots are powered if the receiver is turned on. If the receiver is turned off, there will not be any power on the slots.
- **Off** – means that internal slots will not be powered even if the receiver is turned on.
- **Always** – means that internal slots will be powered even if the receiver is turned off.

NOTICE

The Ports, Slots list boxes are applicable to the HiPer and Odyssey-E receiver families only.

Voltages

The **External** indicator shows the external power supply's voltage.

The **On Board** indicator shows what is the actual voltage presented on the receiver board.

The **Battery A** and **Battery B** indicators show the voltage on batteries A and B, respectively.

The **Charger** indicator shows the output voltage of the internal charger during battery charging.

The **On Ports** indicator displays the output voltage on the first pin of each of the receiver's serial port.

Turn on/off Slots

Select the **Slot 2 (C)**, **Slot 3 (B)** and **Slot 4 (D)** checkboxes to enable the corresponding internal slots.

NOTICE

The Turn on/off Slots group box is applicable to the HiPer and Odyssey-E receiver families only.

If the **Enable Low Power Mode** checkbox is selected, the receiver's processor will go into low power consumption mode.

MINTER Tab

In this tab (Figure 3-22), the user can configure receiver parameters which relate to MINTER (MINimum INTERface).

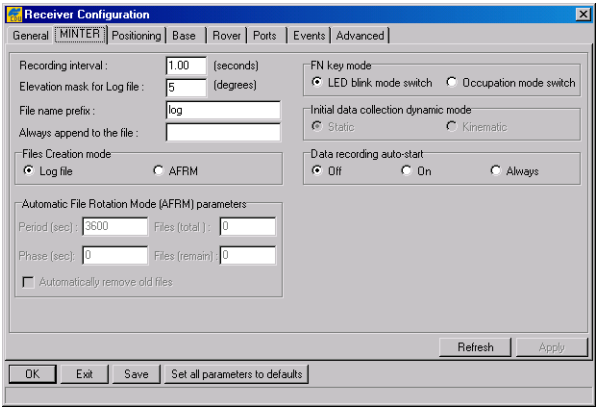


Figure 3-22. MINTER Tab

Recording interval

The recording time interval specified in the **Recording interval** edit box will be used when receiver files are opened and logged via MINTER, (i.e., by pressing the FN button). This setting is used not only when logging a single log file but also when

logging receiver data in AFRM mode. Note that this parameter cannot exceed 86400 seconds.

NOTICE

If an incorrect recording interval is set (the Recording interval edit box), PC-CDU will run a utility called Output Period Setup Wizard. For more in-formation on the Wizard, see Appendix B. Output Period Setup Wizard.

Elevation mask for Log file

This control specifies the minimum elevation angle for the satellites whose data will be put in the receiver files logged when pressing FN.

File name prefix

This setting specifies what prefix will be added to the names of the receiver files created via MINTER, (i.e., by pressing FN). The prefix can be up to 20 characters long. Default is log.

Always append to the file

If the new receiver data are to be appended to an existing log file, enter the desired filename in the **Always append to the file** edit box. The setting can be up to twenty characters long.

Files Creation mode

Two operation modes are possible for the FN button. If the **Log file** radio button has been selected, pressing FN will result in closing the current log file or, if data logging has been off, opening a new log file. If **AFRM** has been selected, pressing FN will enable this mode, if it has been disabled, and vice versa.

Automatic File Rotation Mode (AFRM) parameters

- Period – specifies the time duration of each of the multiple log files created in AFRM mode.
- Phase – specifies the *phase* (i.e., constant time shift) of the multiple log files created in AFRM mode.
- Files (total) – specifies how many multiple log files must be created in AFRM until this mode automatically turns off. Zero means that an unlimited number of log files will be created.
- Files (remain) – shows you how many log files are left for the receiver to create in AFRM.
- Automatically remove old files – if selected, the receiver will start, should there be no free space left in the receiver memory, overwriting the least recent files.

FN key mode

These two radio buttons are used to program how the receiver will react to clicking FN (i.e., keeping the button depressed for less than one (1) second). In **LED blink mode switch** mode, clicking FN will toggle between the Minter's standard and extended information modes. For more details, see the *MINTER User's Manual*. In **Occupation mode switch** you click FN to get the receiver to insert into the corresponding log file a message indicating that the occupation type has been changed from static to kinematic, or vice versa.

Initial data collection dynamic mode

These radio buttons specify the starting occupation type descriptor that will be inserted at the beginning of each receiver files logged via the MINTER. You select **Static** and **Kinematic** to specify that the corresponding log file will start with a static and kinematic occupation, respectively.

Data recording auto-start

The user can program how the receiver will behave in the event of a power failure.

Depending on which of the three radio buttons has been selected, the receiver will behave as given in Table 3-6 (*specified file* refers to the file name entered in the **Always append to the file** field):

Table 3-6. How Data recording auto-start Works

Before Power Failure	Enabled Radio Button Results		
	Off	On	Always
Receiver 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.
Receiver 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.
Receiver 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.

Table 3-6. How Data recording auto-start Works (Continued)

Before Power Failure	Enabled Radio Button Results		
	Off	On	Always
Receiver 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.

Also, if the **Always** option is selected, your receiver will automatically start logging data (to a newly created or an existing file) in the following three cases:

1. After turning on the receiver using the Power key.
2. After resetting the receiver (using PC-CDU or pressing the Reset key).
3. After taking the receiver out of Sleep Mode.

Positioning Tab

This tab contains various controls and fields that allow the user to set elevation and PDOP masks, to select satellites to track, and to specify what measurements to use in position computation (Figure 3-23).

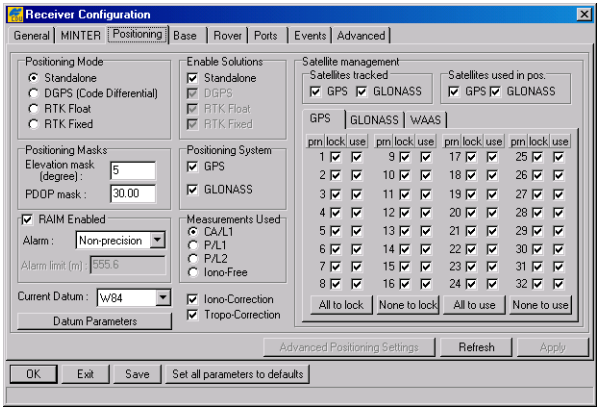


Figure 3-23. Positioning Tab

Positioning Mode

These four radio buttons permit the user to select one of the four available positioning modes.

Enable Solutions

If the **Standalone** checkbox has been checked and the rover receiver is being run in differential mode, the receiver will report its current standalone position instead of the DGPS (or RTK) position if the latter is unavailable in the current epoch.

If the **DGPS (Code Differential)** checkbox has been checked and the rover receiver is running in RTK Float or RTK Fixed mode and is unable to obtain an RTK solution at the current epoch, it will output the current code differential position for the unavailable RTK solution.

NOTICE

If the DGPS (Code Differential) checkbox is enabled and a DGPS solution cannot be obtained, you can instruct the receiver to output single-point position for the unavailable differential. For this, enable the Standalone checkbox.

NOTICE

Code differential mode requires broadcasting the corresponding DGPS (not RTK) messages from the reference receiver and accepting them on the rover receiver. If any of these requirements are not met, then enabling the DGPS (Code Differential) checkbox will not have any effect.

NOTICE

The checkboxes RTK Float and RTK Fixed are always grayed out in this version of PC-CDU.

Positioning Masks

- In the **Elevation mask** edit box you specify the elevation mask angle for the satellites used in position computation. The receiver will not use the satellites below the specified elevation mask to compute the position. The default value is 5 degrees.
- In the **PDOP mask** edit box you specify the threshold value of PDOP that disables position computation. If PDOP exceeds this mask during a period of time, the receiver's

position will not be computed over the corresponding epochs. The default value is 30.

RAIM Enabled

RAIM stands for Receiver Autonomous Integrity Monitoring. When this feature is enabled, the receiver continuously checks whether the signals received from satellites are usable or not. If a fault (measurement outlier) in satellite data has been detected based on the current alarm limit, RAIM excludes this satellite(s) from the positioning calculations, thereby allowing the receiver to continue providing correct position information without an interruption in the service.

- The **RAIM Enabled** checkbox, if selected, activates the RAIM algorithm.
- With the **Alarm** setting, the user specifies alarm limit mode. The alarm limit is a threshold value for the horizontal radial error. There are three pre-defined limits and one that is specified manually:

  –Non-precision stands for Non-precision approach. For this phase of flight the alarm limit is equal to 0.3 nmi. This value means that an error of 0.3 nmi or greater, caused by bad satellite data, will be detected by RAIM.

  –Terminal. For this phase of flight the alarm limit is 1.0 nmi.

  –En route. For this phase of flight the alarm limit is 2.0 nmi.

  –Manual. This mode allows the user to select alarm limit values other than the pre-defined ones.
- The **Alarm limit** edit box is available only if one has selected the **Manual** mode from the **Alarm** list box. Values the user enters in this edit box can vary within the range 10.0…10000.0 meters. The default value is 555.6 and it corresponds to Non-precision approach.

From the **Current Datum** drop-down list box you select the datum used in position computation. Once the desired datum is selected and the **Apply** button is pressed, the receiver begins producing its position expressed in the selected datum. The default datum is WGS 84.

NOTICE

Currently TPS receivers support more than 200 datums. For a list of the supported datums, refer to the GRIL Reference Manual, Appendix H.

NOTICE

The receiver position, which is expressed in a datum other than WGS 84, may be viewed using NMEA messages such as GGA, GLL and so on. Position-related TPS messages (for example [PV]) always contain the coordinates computed in WGS 84.

Pressing the **Datum Parameters** button will open the ***<Datum ID> Datum Parameters*** window (Figure 3-24). In this window the user is able not only view the ellipsoid and transformation parameters of the datums selectable from the **Current Datum** list box but also edit the transformation parameters for a user-defined datum (USER) and the P90 datum[5].

5. P90 is the datum ID of the GLONASS reference frame PZ-90 (*Parametry Zemli* or parameters of the Earth).

In addition the ellipsoid parameters of USER can be edited in this window.

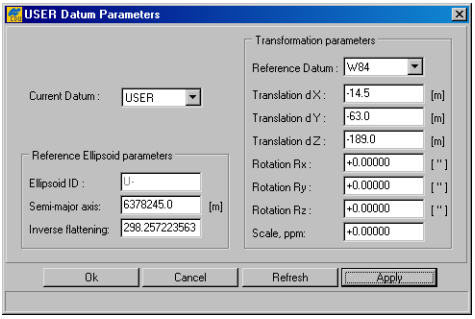


Figure 3-24. <Datum ID> Datum Parameters Window

Current Datum

Select the desired datum ID from the pull-down list to examine (for pre-defined datums) or edit (for user-defined and PZ-90 datums) the ellipsoid and transformation parameters.

Reference Ellipsoid parameters

- Ellipsoid ID – Two-letter identification code. Displays U- for a user-defined ellipsoid.
- Semi-major axis – The semi-major axis length in meters. Ranges from 6300000.0 to 6500000.0.
- Inverse flattening – The reciprocal of the ellipsoid flattening (dimensionless). It must be a positive value between 280.0 and 310.0.

NOTICE

The semi-major axis and Inverse flattening fields are only available for modifying if the selected datum in the Current Datum list is USER or P90.

Transformation parameters

- Reference Datum – The datum relative to which the user specifies the transformation parameters.

NOTICE

This field is only available for modifying if the selected datum in the Current Datum list is USER.

- 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 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 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 from -10000.0 meters to +10000.0 meters.
- Rotation Rx – The rotation angle around the X axis used to relate the orientation of a pre-defined or user-defined datum and the selected reference datum. Ranges from -60" to +60".
- Rotation Ry – The rotation angle around the Y axis used to relate the orientation of the two datums. Ranges 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. It ranges from -1000 ppm to +1000 ppm.

NOTICE

These transformation parameters are only available for modifying if the selected datum in the Current Datum list is USER or P90.

NOTICE

Click Apply, then OK to accept configuration changes and close the window.

Positioning System

Select the **GPS** and **GLONASS** checkboxes if it is desired that the corresponding satellite constellations to be used in position computation.

NOTICE

However the selected satellite constellation will indeed be used in position computation only if the corresponding Satellites used in pos. checkbox from the Satellite management panel is selected as well.

Measurements Used

This radio button group shows what code measurements will be used to compute the receiver's standalone position. This parameter applies only to absolute position computation.

NOTICE

For a single-frequency receiver, the radio buttons P/L1, P/L2 and Iono-Free will be gray.

If the **Iono-Correction** checkbox is selected, the receiver will correct the pseudoranges for ionosphere (based on the model

defined in ICD-GPS-200, Revision C) before using them in position computation. Note that if both **Iono-Free** and **Iono-Correction** are selected, the first overrides the second. This parameter applies only to absolute position computation.

If the **Tropo-Correction** checkbox is selected, the pseudoranges will be corrected for troposphere before being used in position computation. This parameter applies only to absolute position computation.

Satellite management

1. Satellites tracked

   The **GPS** and **GLONASS** checkboxes are used to allow tracking of GPS and GLONASS satellites, respectively.

2. Satellites used in pos.

   Use the **GPS** and **GLONASS** checkboxes to specify what satellite systems (only GPS, only GLONASS, or both) will be used in position computation.

3. GPS | GLONASS | WAAS

   Use these tabs to explicitly specify which of the GPS, GLONASS and WAAS satellites are enabled for tracking and position computation.

   - The first tab, as its name implies, deals with the GPS satellites (Figure 3-25).

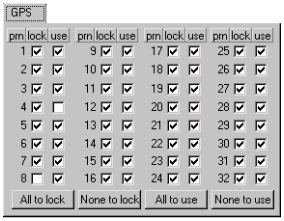


Figure 3-25. GPS Tab

The tab displays three columns, **prn**, **lock** and **use**, which are described in Table 3-7.

Table 3-7. Description of Data Displayed in the GPS Tab

Notation	Meaning
prn	GPS satellites' pseudo-random noise code numbers.
lock	Checkmarks in this column indicate that the corresponding satellites are enabled for tracking. As shown in Figure 3-25, GPS satellite PRN 8 is disabled for tracking.
use	Checkmarks in this column indicate that the corresponding satellites are enabled for position computation. In Figure 3-25, GPS satellite PRN 4 is disabled for position computation.

Use the **All to lock** and **All to use** buttons to select all GPS satellites at one time.

Use the **None to lock** and **None to use** buttons to deselect all GPS satellites at one time.

- The second tab, as its name implies, deals with the GLONASS satellites (Figure 3-26).

Figure 3-26. GLONASS Tab

Satellite Numbering

For user convenience, GLONASS satellites can be displayed ordered either by their **Frequency Channel Number** or by the **Slot Number**.

The tab displays three columns, **fcn**/**sat**, **lock** and **use**, which are described in Table 3-8.

Table 3-8. Description of Data Displayed in the GLONASS Tab

Notation	Meaning
fcn/sat	GLONASS satellites' frequency channel numbers, if the **Frequency Channel Number** checkbox is selected. GLONASS satellites' slot numbers, if the **Slot Number** checkbox is enabled.
lock	Enable GLONASS satellites for tracking.
use	Use this GLONASS satellite for position computation.

Use the **All to lock** and **All to use** buttons to select all GLONASS satellites at one time.

Use the **None to lock** and **None to use** buttons to deselect all GLONASS satellites at one time.

- The third tab, as its name implies, deals with the WAAS/EGNOS satellites (Figure 3-27).

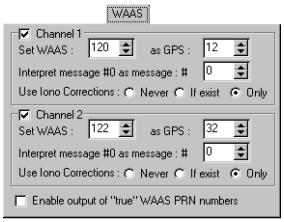


Figure 3-27. WAAS Tab

A WAAS-enabled TPS receiver allows simultaneous tracking of two WAAS satellites. Either of the WAAS satellites is allocated its own channel. Below it will be shown how to set up *Channel 1* (*Channel 2* is handled in the same manner).

- The **Channel 1** checkbox, if selected, allows you to specify necessary settings for the desired WAAS satellite signal reception.
- One uses the **Set WAAS** and **as GPS** spin-boxes to associate the selected WAAS PRN (120-138)[6] with an appropriate GPS PRN (1-32). It is recommended to select for this purpose one of the GPS PRNs that are not used in the current GPS constellation. At writing this manual, the unused GPS PRNs are: 12 and 32.
- The **Interpret message #0 as message: #** spin-box disables message 0.
- The **Use Iono Corrections** radio button group allows the user to set the desired ionosphere correction mode.

  –Never. Ignore any iono corrections received from the WAAS satellite(s).

  –If exist. All acquired satellites will be used in position computation, (i.e., even the satellites whose WAAS Iono Corrections are unavailable).

  –Only. Only satellites whose WAAS Iono Corrections are available will be used in position computation. Note that this is the default option for the radio button group.

  If the **Enable output of "true" WAAS PRN numbers** checkbox is selected, the WAAS satellites will have their true WAAS PRNs (not "GPS associated") in the corresponding *Satellite Indices* messages.

6. WAAS satellites with PRNs 122 and 134. EGNOS satellites with PRNs 120 and 131.

Base Tab

With the ***Base*** tab, the user can configure the receiver for use as a reference station (Figure 3-28).

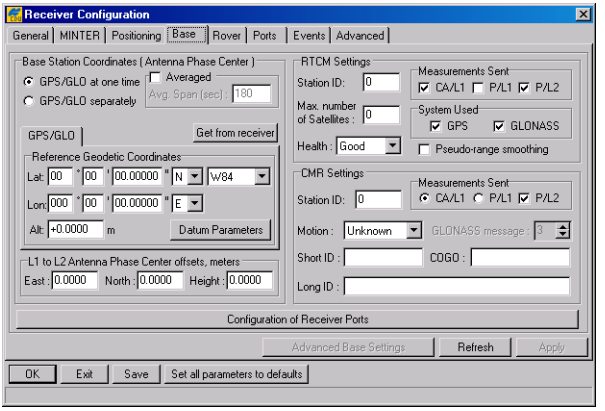


Figure 3-28. Base Tab

Base Station Coordinates (Antenna Phase Center)

As the names of the **GPS/GLO at one time** and **GPS/GLO separately** radio buttons imply, these allow the user to specify for GPS and GLONASS either common reference coordinates or individual reference coordinates. In most cases it is recommended to use the same reference coordinates both for GPS and GLONASS. After the user has selected GPS/GLO separately, he/she will see the ***GLONASS*** tab appear on the screen too.

In the **Reference Geodetic Coordinates** area the user enters the geodetic coordinates of the base antenna's phase center.

- Lat – Antenna latitude in degrees, minutes, and seconds format with a hemisphere letter (N or S).
- Lon – Antenna longitude in degrees, minutes, and seconds format with a hemisphere letter (E or W).
- Alt – Antenna height above the ellipsoid, in meters.

NOTICE

The reference geodetic coordinates specified in this tab will relate to the antenna L1 phase center. To account for the offset between the L1 and L2 antenna phase centers, use the parameter L1 to L2 Antenna Phase Center offsets.

NOTICE

If the coordinates entered are expressed in a datum other than WGS 84, which is default, ensure that the correct datum ID is selected.

There are three ways to enter the coordinates:

1. Type in the precise latitude/longitude and ell. height manually (use the **Lat**, **Lon** and **Alt** edit boxes).
2. Use the absolute coordinates averaged over the specified time interval (with the **Averaged** and **Avg.Span** controls).

   For this, enable **Averaged** and enter the **Averaged Span** in seconds, then click **Apply** and **OK**. Click **Tools**->**Reset receiver** and wait until the specified interval (span) completes. Examine the Base coordinates on the ***Base*** tab, they should correspond to the coordinates obtained from the average. Click **Refresh** if the coordinates are zeros.
3. Use the instant absolute coordinates from the receiver (by pressing the **Get from receiver** button).

Pressing the **Datum Parameters** button will open the **<*Datum ID*> *Datum Parameters*** window that is similar to Figure 3-24 on page 3-49).

NOTICE

Do not confuse the described window and that shown in Figure 3-24 on page 3-49. Although their purposes and structures are similar, they affect different coordinates.

With the controls in the <Datum ID> Datum Parameters window shown on page 3-49 you instruct the receiver to output the currently computed position in the selected datum. Whereas with this window you only define the datum in which the base station's coordinates will be expressed.

L1 to L2 Antenna Phase Center offsets

Use these fields if you need to account for the difference between the L1 and L2 antenna phase offsets.

RTCM Settings

The **Station ID** edit box allows the user to assign a separate station ID to each reference station working in the area. On the rover side, this ID allows easy identification of the reference station whose RTCM messages are being received by the rover receiver. This ID must be an integer from 0 (default) to 1023.

With the **Max. number of Satellites** edit box, the user specifies the maximum number of satellites allowed for use in RTCM messages types 18 through 21. A 0 means that all of the available satellites will be included in the above mentioned RTCM message types. If an RTK system has a slow modem (the baud rate is less than 9600 bps), it is recommended to restrict the number of satellites included in these messages. The limitation allows the user to reduce the amount of data sent by the base station, which helps to avoid the data link overload. If the actual number of satellites in sight exceeds the value entered in this edit box, the RTCM messages will include data

only from the satellites with higher elevations and the number of satellites included in the RTCM messages will not be greater than that specified in the edit box.

The **Health** list box is intended to define the reference station status:

- Good – station is operating normally.
- Bad – station is not working normally.
- Unknown – station health status is unknown.

With the **Measurements Sent** radio buttons, the user specifies the measurement types that will be included into the RTCM message types 18 through 21. Currently, the mentioned RTCM messages always contain C/A measurements. The user can also include either or both P/L1 data and P/L2 data in these messages (on condition that the TPS receiver is configured as a dual-frequency unit).

The **GPS** and **GLONASS** checkboxes, which are grouped together within the **System Used** area, indicate the satellite constellations included in the RTCM message types 18, 19, 20 and 21.

If the **Pseudo-range smoothing** checkbox is selected, the receiver will use smoothed pseudoranges in the RTCM message types 19 through 21.

CMR Settings

With the **Station ID** the user can specify the base station ID, which will be included into the CMR messages transmitted by this base station. On the rover side, this ID allows easy identification of the reference station whose CMR messages are being received by the rover receiver. This ID must be an integer from 0 (default) to 31.

The **Motion** list box characterizes the motion of the reference station:

- Unknown – the motion state is undetermined.
- Static – the receiver is motionless.
- Kinematic – the receiver is in motion.

Use the **Short ID**, **COGO** and **Long ID** to include the reference station's point feature code[7] into CMR message type 2.

The **CA/L1**, **P/L1** radio buttons and the **P/L2** checkbox, which are grouped within the **Measurements Sent** area, allow the user to specify which measurement types will be included into the corresponding CMR messages broadcasted by the reference station. If the receiver is a single-frequency unit, the **P/L1** and **P/L2** controls will not be available.

The **GLONASS message** spin box allows the user to specify which message types will be associated with GLONASS measurements. You can choose any unused message types between 3 and 7.

Click the **Configuration of Receiver Ports** button to go to the ***Ports*** tab. For a description of this tab, refer to “Ports Tab” on page 3-66.

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

Rover Tab

In this tab, the user can configure a receiver as a rover station (Figure 3-29).

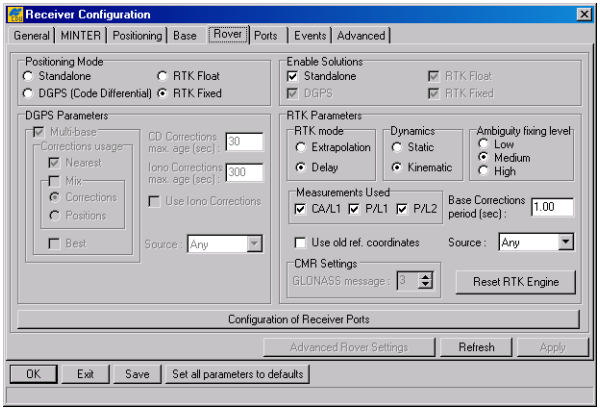


Figure 3-29. Rover Tab

Positioning Mode

These four radio buttons are included in the ***Rover*** tab only for user convenience. They *mirror* the same named buttons from the ***Positioning*** tab. For more information about this radio button group, see “Positioning Tab” on page 3-45.

DGPS Parameters

To switch a roving receiver to *Multi-base* mode, select the **Multi-base** checkbox. In this mode, the rover is able to use differential corrections received from more than one reference station[8].

8. Currently, this mode allows the rover to use up to five reference stations simultaneously.

- Correction usage

  If the user selects the **Nearest** checkbox, the rover will use differential corrections transmitted by the nearest reference station.

NOTICE

NOTICE

When working in the Nearest mode, make sure that the Mix and Best checkboxes are clear.

The **Mix** checkbox allows the user to run the rover station in average mode.

NOTICE

NOTICE

When the rover runs in this mode, the Best checkbox must be unselected.

With the **Corrections** and **Positions** radio buttons, the user specifies which of the averaging modes will be used for position computation.

–If both the **Mix** checkbox and **Corrections** radio button are selected, the rover will be averaging differential corrections received from different reference stations.

–If the user selects the **Mix** checkbox and **Positions** radio button, the receiver will average the computed positions, not the received corrections.

If the **Best** checkbox is selected, the receiver will use differential corrections that correspond to the most precise of the obtained position estimates. Best means that the solution has the least RMS error.

In the **CD Corrections max. age** edit box, the user can set the maximum age (in seconds) of the code differential corrections used for position computation. It must be an integer value

between 1 and 1200. The default is 30. If the age of the corrections exceeds the value specified in this edit box, the rover will compute a stand-alone position.

Use the **Iono Corrections max. age** edit box to specify the maximum age (in seconds) of the ionosphere corrections used for position computation.

If you set the **Use Iono Corrections** checkbox to on, the rover receiver will use in position computation both the ionosphere corrections from RTCM message type 15 and differential corrections from RTCM message types 1 and 31 (or 9 and 34).

The **Source** list box serves to specify the source (port) from which the receiver will use differential corrections for position computation.

NOTICE

The receiver uses this parameter only if Multi-base mode is unchecked.

Enable Solutions

These four checkboxes are included in the ***Rover*** tab only for user convenience. They *mirror* the same named checkboxes from the ***Positioning*** tab. For details, refer to “Positioning Tab” on page 3-45.

NOTICE

At the present time, the RTK Float and RTK Fixed checkboxes are unavailable and checked at the same time demonstrating that these solution types are also enabled.

RTK Parameters

The **RTK mode** radio button group serves to toggle between the extrapolation and delay modes. If **Extrapolation** is

selected, the rover will extrapolate the base station's carrier phase measurements when computing the rover's current RTK position. If **Delay** is selected, the rover will not extrapolate the base station's carrier phase measurements to compute the current rover position. Instead, 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).

To define the rover dynamics, use the **Dynamics** radio button group.

The **Ambiguity fixing level** radio buttons govern the process of the RTK engine fixing integer ambiguities. The RTK engine uses the ambiguity fix indicator when making a decision whether to fix ambiguities or not. **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 integer ambiguity search time. This is the price one pays for the higher reliability of the ambiguity fixed solution.

The **Measurements Used** checkbox group allows the user to select measurement types used by the rover for position computation.

In the **Base Corrections period** edit box, the user can set the differential correction update interval. It should be noted here that for a proper rover setup in RTK Delay mode the user should know the exact rate at which the reference station broadcasts its differential correction data.

NOTICE

The receiver will use the Base Corrections period control only if it runs in Delay mode. Also, this edit box is used to provide more reliable

synchronization between the base station and rover.

If you set the **Use old ref. coordinates** checkbox to on and then launch RTK, the rover receiver immediately starts using the existing reference coordinates in place of expecting when the reference station transmits some updated reference coordinates to the rover side.

NOTICE

Care should be taken when setting this parameter to on. Imagine for a moment that the rover has changed the location and started a new RTK session with a different reference station. Should this parameter be set to on, the rover receiver will be misusing the old reference coordinates for some time, which will most likely result in position blunders until the rover receives a first message with the correct reference coordinates.

The **Source** list box serves to specify the source (port) from which the receiver will use differential data for position computation in RTK mode.

With the **GLONASS message** spin box the user assigns the message type for GLONASS measurements. Make sure that both the reference station and rover receiver use the same message type for GLONASS measurement data. This parameter is applicable only if you use CMR differential messages.

Press the **Reset RTK Engine** button to reset the RTK engine. It means that all of the previously obtained estimates (estimated position, variance-covariance matrix, etc.) will be thrown away and the RTK engine will then start *from scratch*.

To access the tab allowing you to revise and edit port settings, either click the ***Ports*** tab, or press the **Configuration of Receiver Ports** button.

Ports Tab

The ***Ports*** tab, as shown in Figure 3-30, comprises six different sections that are reached via the six subtabs.

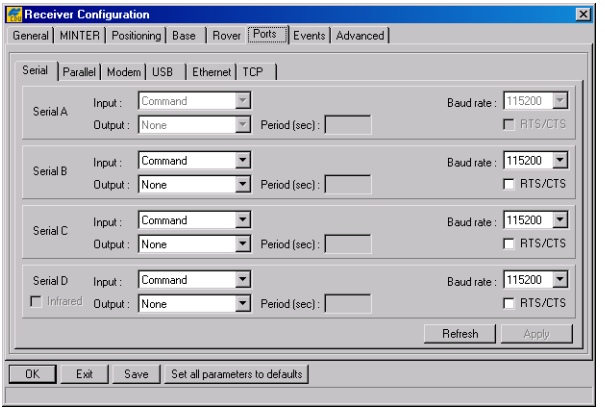


Figure 3-30. Ports Tab

These subtabs are as follows:

- Serial – Used to specify the data the receiver serial ports will transmit/receive. See “Serial” on page 3-67.
- Parallel – Used to specify the data the receiver parallel port will transmit/receive. See “Parallel” on page 3-70.
- Modem – Used for configuration the Legacy and Odyssey receivers’ internal radio modem. For all other receiver models, the settings on this subtab will be unavailable. See “Modem” on page 3-71.
- USB – Used to specify the data the receiver USB port will transmit/receive. See “USB” on page 3-72.

- Ethernet – Used to configure the Ethernet, Telnet, and FTP communication settings. See “Ethernet” on page 3-73.
- TCP – Used to specify the data the receiver will transmit/receive over TCP/IP network. See “TCP” on page 3-75.

Serial

Use this subtab to adjust the settings for serial ports A, B, C and D (Figure 3-30 on page 3-66).

The **Input** list box allows the user to specify what type of data to input on the selected port.

- None – The port will reject any incoming data.
- Command – The port is in command mode. In this mode the port will recognize the commands sent by the user.
- Echo – The port is in echo mode. Being used in this mode the receiver port redirects all incoming data to an *output stream*. Output stream may be either a port or the current log file.
- RTCM 2.x – In this mode, the receiver recognizes and decodes the RTCM version 2.1, 2.2, and 2.3 messages accepted on the corresponding port.
- RTCM 3.x – In this mode, the receiver recognizes and decodes the 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 – The data incoming to the port will be used by the OmniStar VBS or HP to produce DGPS solution type.

The **Output** list box allows the user to specify what 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 port 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 data specified by the user. It means that the user defined an arbitrary message set that will be outputted through the port.

In the **Period** edit box the user sets the message output interval (in seconds).

NOTICE

It is worth noting, however, that the period of RTCM messages types 22, 3 and CMR message type 1 cannot be changed with this edit box. The default period for the mentioned messages is 10 seconds. If the user wants to change the period, he/she should use the em command from the Manual Mode window. For more details on em refer to the GRIL Reference Manual.

NOTICE

If the user sets an incorrect message output interval (the Period edit box), PC-CDU will run a utility called Output Period Setup Wizard. For

more information on the Wizard, see Appendix C on page C-1.

To set the baud rate for the corresponding receiver port, use the **Baud rate** list box.

The checkbox **RTS/CTS** enables/disables hardware handshaking for the port.

In addition to described settings, port D has a unique checkbox **Infrared** that permits the user to utilize this port for infrared connection with an external device.

Use Infrared mode only if the following conditions are met:

- A device you are going to connect to is compatible with the receiver infrared interface (for example, CDU-1).
- Your receiver supports the infrared port hardware-wise.
- The Infrared Port option is enabled in your receiver.

Parallel

The settings represented on this subtab are similar to those in the ***Serial*** subtab except that these settings are intended for managing parallel port (Figure 3-31). For detailed information on each setting, refer to “Serial” on page 3-67.

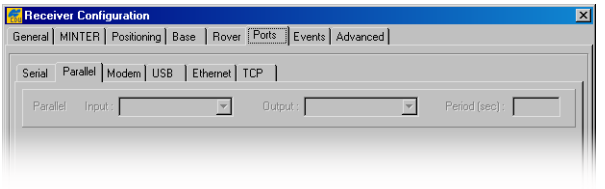


Figure 3-31. Parallel Subtab

Modem

NOTICE

These settings are only available if you have the Legacy or Odyssey receiver with the internal Spread Spectrum modem. Otherwise the settings will be grayed out (Figure 3-32).

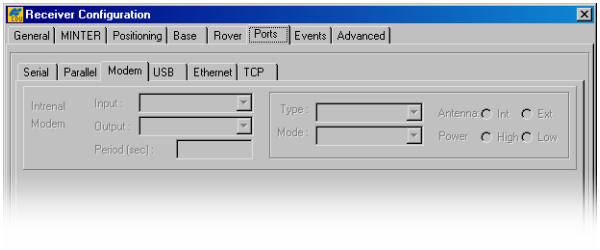


Figure 3-32. Modem Subtab

Internal Modem

Input, **Output** and **Period** are similar in their purposes to the analogous settings in the ***Serial*** and ***Parallel*** subtabs.

The **Type** list box allows the user to set operation modes (Receiving or Transmitting).

The **Mode** list box intends to specify the method used to transmit data:

- Off – internal modem is turned off.
- FHSS – internal modem uses frequency-hopping spread spectrum technique.
- DSS – internal modem uses direct-sequence spread spectrum technique.

With the **Antenna** radio buttons, the user sets the antenna type the modem uses.

- Int – stands for an internal antenna.

- Ext – stands for an external antenna.

The user can set power transmitting mode for the internal modem using the **Power** radio buttons.

USB

This subtab contains settings that allow the user to specify what type of data to input/output on the USB port (Figure 3-33). These settings are the same as those in the ***Serial*** subtab. For more information, refer to “Serial” on page 3-67.

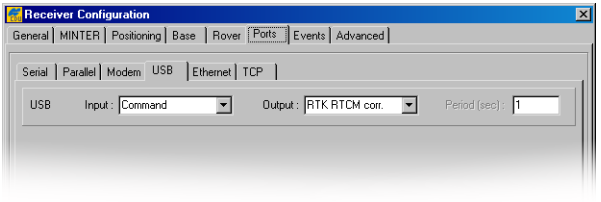


Figure 3-33. USB Subtab

Ethernet

NOTICE

The settings on this subtab are only available if a connected receiver has the Ethernet capability.

Figure 3-34 shows an example of the Ethernet subtab.

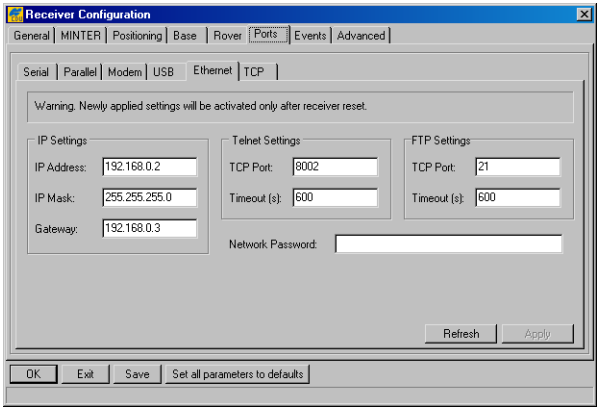


Figure 3-34. Ethernet Subtab

IP Settings

With the settings in this group, the user specifies the IP addressing parameters for a connected receiver.

- IP Address – A unique identifier for your receiver on a TCP/IP network. An IP address comprises four numbers from 0 to 255, separated by periods. The receiver's default IP address is 192.168.2.2.
- IP Mask – Mask used to determine what subnet the receiver belongs to. The default mask is 255.255.255.192.
- Gateway – An IP address for the gateway used to communicate with the devices on another network. The default gateway is 192.168.2.1.

NOTICE

Contact your system administrator if you are not sure what settings are safe to use.

Telnet Settings

These settings allows the user to configure a connected receiver to act as a *telnet server.* Remote devices (*telnet clients*) can then connect to the telnet server over a TCP/IP network and control the server behavior as if it was a direct connection. Currently up to 5 simultaneous telnet clients can be connected to the telnet server.

- TCP Port – This is a TCP/IP port a telnet server listens on for the connection. The default port number is 8002.
- Timeout – This parameter sets the amount of time in seconds the telnet server allows an inactive connection to remain open. After this time, the server terminates the unused connection. The default timeout is 600 seconds.

NOTICE

Contact your system administrator if you are not sure what settings are safe to use.

FTP Settings

These settings allows the user to configure a connected receiver to act as an *FTP server.* A remote device (an *FTP client*) can then connect to the FTP server over a TCP/IP network and download raw data files. Only one simultaneous FTP connection is supported.

- TCP Port – This is a TCP/IP port an FTP server listens on for connection requests. The default port number is 21.

- Timeout – A period of time in seconds that must elapse before an inactive connection will be terminated. The default timeout is 600 seconds.

NOTICE

Contact your system administrator if you are not sure what settings are safe to use.

Network Password

This is a password used in telnet and FTP. The telnet or FTP client must enter password to access the telnet or FTP server. You can enter up to 15 alphanumeric characters.

NOTICE

To activate any configuration change, you should click Apply, then OK and then reset the receiver using the Reset receiver action in PC-CDU or pressing and holding the receiver's Reset button for about one second.

TCP

NOTICE

The settings on this subtab are only available if a connected receiver has the Ethernet capability.

With this subtab the user specifies what type of data to input/output over the corresponding TCP/IP stream (Figure 3-35). These settings are the same as those in the ***Serial*** subtab. For more information, refer to "Serial" on page 3-67.

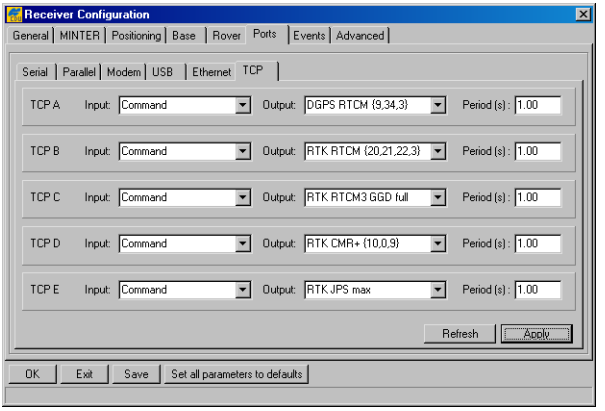


Figure 3-35. TCP Subtab

Events Tab

This tab is used to review and configure the 1PPS signal and Event marker settings (Figure 3-36).

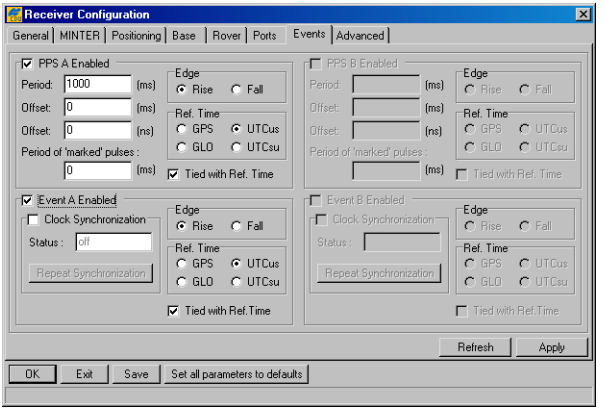


Figure 3-36. Events Tab

The **PPS A Enabled** and **PPS B Enabled** checkboxes enable the receiver to generate 1PPS signals and also

allows the user to modify the settings related to the selected 1PPS signal.

The **Period** edit box determines the rate of generating the 1PPS signals via the corresponding output connector.

The user can determine millisecond and nanosecond parts of PPS signal offsets with respect to the selected reference time grid using the **Offset (ms)** edit box for millisecond part and **Offset (ns)** for nanosecond part.

With the **Period of 'marked' pulses** edit box, the user specifies the period of the marked 1PPS signal.

Using the **Edge** radio button group, the user synchronizes the edge (rising or falling) of the 1PPS signal with the specified reference time.

The **Ref. Time** radio button group allows the user to select the reference time that the 1PPS signal will be synchronized with. There are four available reference time scales:

- GPS means GPS system time.
- GLO means GLONASS system time.
- UTCus means UTC(USNO).
- UTCsu means UTC(SU).

If the user selected the **Tied with Ref. Time** checkbox, the receiver will synchronize the 1PPS signal with the chosen reference time. Otherwise, 1PPS will be synchronized either with the receiver's internal clock or with an external reference frequency applied to the receiver (in the latter case the **Source** setting described on page 3-84 must be set to External).

In order to enable or adjust the event input function, use the controls described below.

The **Event A Enabled** and **Event B Enabled** checkboxes, if selected, allow the receiver to measure and log event times in the specified reference time with high accuracy.

If the **Clock Synchronization** checkboxes are selected, the receiver executes a one-time synchronization of its one-millisecond cycle grid with the corresponding edge of the event signal.

The **Status** indicator shows whether the receiver clock is actually being synchronized with the event signals or not. If you see *on* in the field, it means the synchronization has been done successfully.

In some cases, however, it can be necessary to perform the synchronization again. For this purpose click the **Repeat Synchronization** button several times until *on* appears.

The **Rise** and **Fall** radio buttons serve to measure the time of either the rising edge or falling edge of the input event signal.

The **Ref. Time** radio button group sets the reference time scale that the event reception time will be synchronized with.

With the **Tied with Ref. Time** checkboxes, the receiver is instructed to measure the event reception time in the selected reference time with or without consideration for the computed receiver clock offset.

Advanced Tab

The ***Advanced*** tab is composed of six subtabs, as illustrated in Figure 3-37.

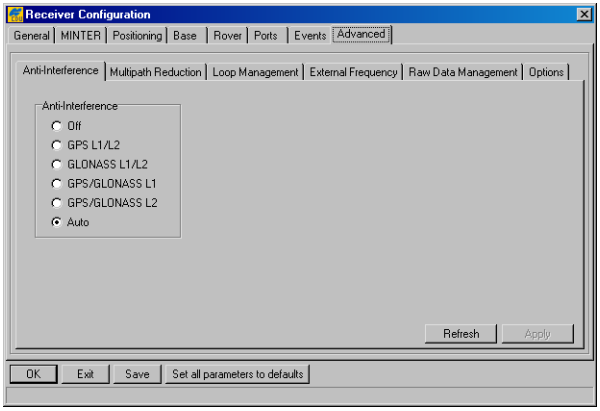


Figure 3-37. Advanced Tab

WARNING

Only change these advanced settings when it is known what they mean. Unsuitable changes to these subtabs can cause the receiver to run improperly. If you are doubtful of any changes you made to these subtabs, click the Set all parameters to defaults button to get the factory default settings back. For a description of these subtabs refer to the corresponding paragraphs below.

Anti-Interference

With the **Anti-Interference** radio button group (Figure 3-37 on page 3-79), the user enables mode allowing the TPS receivers to suppress the impact of narrow-band interferences.

NOTICE

Anti-Interference is only available for JPS_3, JPS_4_x, Euro_x, and E_GGD_x board versions, where x stand for a board revision number.

The user can assess the presence of interference based on the following information:

- 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 Jamming Suppressor detected interference signals within the specified band and also the strength of aggregate in-band interference is characterized as high or hard. This information you can obtain with the command `em,,jps/JI`.

Multipath Reduction

The checkboxes **Code multipath** reduction and **Carrier multipath** reduction are used for mitigation of the multipath phenomenon (Figure 3-38).

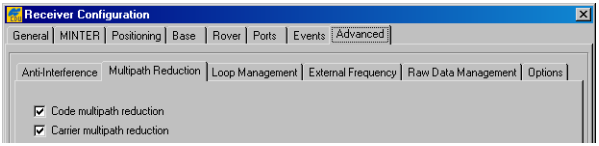


Figure 3-38. Multipath Reduction Tab

When the reference station and rover station run in DGPS mode and they are not free from the impact of multipath, we recommend that you select the **Code multipath**

reduction checkbox for both the reference and rover stations.

If you use a pair of receivers in RTK mode, you can additionally select the checkbox **Carrier multipath reduction** for both receivers.

Loop Management

In this subtab the user can configure the settings that deal with the receiver capability of searching, acquiring and tracking the GPS+ satellite signals (Figure 3-39 on page 3-82).

WARNING

Care should be taken when changing the settings for this subtab. Topcon recommends that users do not change these settings without good reason. For an explanation of this subtab, please see details under Figure 3-39 on page 3-82.

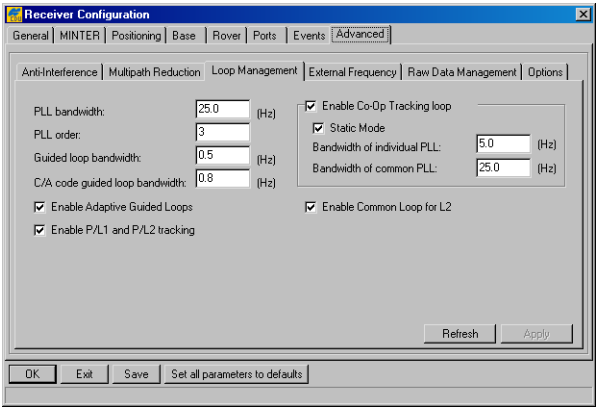


Figure 3-39. Loop Management Tab

The **PLL bandwidth** edit box governs the noise bandwidth of the guiding phase lock loops. In this box, you can enter values between 2 and 50 Hz.

With the **PLL order** edit box, the user can toggle guiding and common lock loop order between 2 and 3. Care should be taken when using a 2nd order PLL because this can adversely affect satellite signal tracking in some cases.

The **Guided loop bandwidth** edit box governs all of the *guided* loops but the C/A DLLs. Here the user can enter values between 0.1 Hz and 10 Hz.

The **C/A code guided loop bandwidth** edit box specifies the bandwidth of the receiver's C/A group delay lock loop. In this box, one can enter the values between 0.1 Hz and 50 Hz.

With the **Enable Adaptive Guided Loops** checkbox, the user enables/disables the use of adaptive guided loops. If the user selects the checkbox, 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.

With the **Enable P/L1 and P/L2 tracking** checkbox the user can adjust tracking settings for the receiver. If one has either a single-frequency receiver or L1 only antenna, it is recommended to disable tracking of the P/L1 and P/L2 signals.

By selecting the **Enable Co-Op tracking** checkbox, you will enable this mode and make the other controls in the group available for modifying. Co-Op tracking mode is used to considerably improve the tracking characteristics of TPS receivers in hostile environments.

- When the receiver is in Co-op tracking mode, one can enable the **Static Mode** checkbox. This mode allows the receiver to acquire satellites with lower signal-to-noise ratios and reduce the reacquisition time for the satellite signals after a temporary loss of lock.

NOTICE

Enable the Static Mode parameter only if the receiver antenna is completely stationary. If your receiver antenna may have some movement, even for a few millimeters, disable the Static Mode parameter. Moving the antenna while in Static Mode may result in a loss of lock to satellites.

- The **Bandwidth of individual PLL** and **Bandwidth of common PLL** edit boxes mean exactly what their names imply.

Select the **Enable L2 common loop** checkbox to avoid the loss of L2 phase tracking in dynamic applications due to antenna rotation around its axis.

External Frequency

The settings on this subtab, allow the operator to configure the use of reference frequency (Figure 3-40). It may be either a high-stability external frequency or the receiver's internal crystal oscillator.

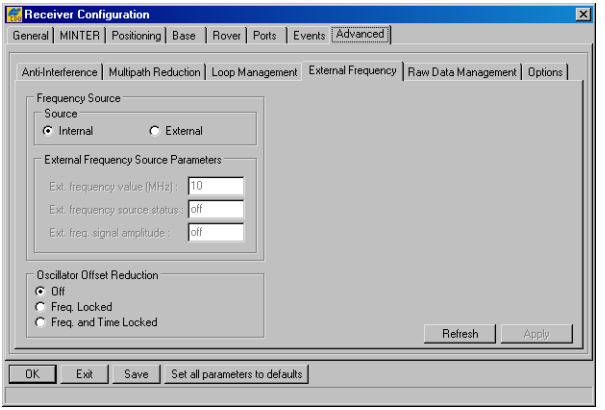


Figure 3-40. External Frequency Tab

With the controls in the **Source** group, the user specifies the reference frequency input that the receiver will use:

- Internal – means the receiver uses the internal oscillator.
- External – means the receiver uses an external frequency.

NOTICE

By switching from Internal to External and vice versa may result in a temporary loss of lock to satellites.

External Frequency Source Parameters

With the **Ext. frequency value** edit box the user specifies nominal external frequency value. Here the user can enter

the integer values between 2 and 40 MHz. The default value is 10 MHz.

The **Ext. frequency source status** field shows whether the external frequency is being used or not:

- off – Indicates that the receiver is using the internal crystal oscillator.
- wait – Indicates that the receiver is waiting for the external frequency lock. More precisely, this value will be returned in the following three cases:

  –If the external frequency oscillator is disconnected

  –If the amplitude of input signal is too low

  –If the actual external frequency is different from that specified in the **Ext. frequency** value edit box
- locked – Indicates that the receiver is using the external frequency.

With the **Ext. freq. signal amplitude** field the user can estimate the external frequency signal amplitude:

- off – Indicates that the internal oscillator is actually being used.
- low – Indicates that the external frequency signal's amplitude is lower than needed.
- ok – Indicates that the external frequency signal's amplitude meets the specs.

The **Oscillator Offset Reduction** group box allows the user to govern the behavior of the internal crystal oscillator.

- The **Off** radio button means that the oscillator frequency offset reduction mode is turned off.
- The **Freq. Locked** radio button means that the receiver will adjust the internal oscillator's frequency until the measured frequency offset is reduced to zero. By using

the 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.

TIP

The user is able to monitor the offset reduction in the Clock offset field of the GEO tab. 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.

- The **Freq. and Time Locked** radio button means that the receiver will adjust both the internal oscillator's frequency until the measured frequency offset is reduced to zero and the internal clock until it gets fully synchronized with the specified reference time scale.

NOTICE

Switching from Freq. Locked or Freq. and Time Locked to Off may result in a temporary loss of lock to satellites.

Freq. Locked guarantees that the receiver's 20 MHz output will have long-term stability, not necessarily short-term stability. However, there is a way to assure that both of these characteristics will be good enough. It can be done by selecting **Enable Co-op tracking** on the ***Loops Management*** subtab.

Raw Data Management

This subtab, which is shown in Figure 3-41, contains the controls for specifying the frequency at which the receiver will update raw measurement and position. Also, the user may set up the controls that affect the signal processing.

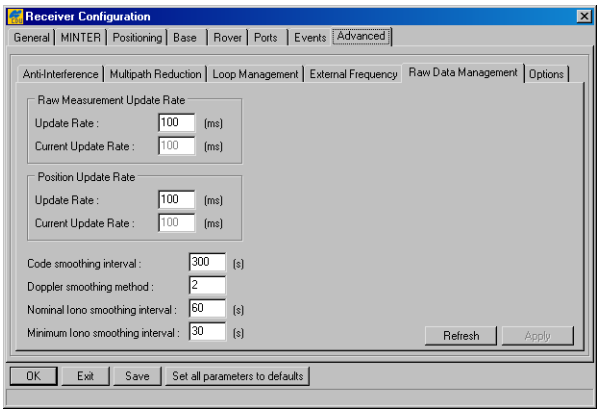


Figure 3-41. Raw Data Management Tab

The **Raw Measurement Update Rate** group allows the user to determine the raw data update period. In the **Update Rate** edit box, enter a value (in milliseconds) to specify the period. With **Current Update Rate**, the user can check which period is actually being used by the receiver.

The **Position Update Rate** group allows the user to determine the receive position update period. In the **Update Rate** edit box, enter a value (in milliseconds) to specify the period. With **Current Update Rate**, the user can check which period is actually being used by the receiver.

The **Code smoothing** interval edit box specifies the interval over which pseudoranges are smoothed by using corresponding carrier phase measurements. Here you can enter values between 0 and 900 seconds. Zero designates that carrier phase measurements will not be used for smoothing pseudo-ranges.

In the **Doppler smoothing** method edit box, the user sets the method used for smoothing Doppler. There are three available methods:

- Receiver outputs raw (unsmoothed) Doppler. Instantaneous yet rather noisy Doppler measurements.
- Doppler is computed using two consecutive carrier phase measurements, CarPhase[i] and CarPhase[i-1], where i stands for the current epoch. Such Doppler measurements are less noisy than in the first case.
- 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.

With **Nominal Iono smoothing interval** edit box, the user specifies the nominal ionospheric correction smoothing interval over which raw ionospheric corrections are smoothed (assuming the receiver has been working for some time and has already obtained enough raw ionospheric corrections to perform such smoothing). This integer parameter varies between 0…900 seconds. The default value is 60.

With the **Minimum Iono smoothing interval** edit box, the user specifies the minimum smoothing interval for the receiver to filter raw ionospheric corrections before they can be used in position computation. This integer parameter ranges between 0 and 900 seconds. The default value is 30 seconds.

Options

Figure 3-42 shows the subtab from which the user can turn on/off the Cinderella option. Every other Tuesday, Cinderella enables the receiver to run as a dual-frequency GPS+GLONASS unit during 24 hours. For information on

scheduling Cinderella Tuesdays, visit the Cinderella Option page on the TPS web site at http://www.topcongps.com/software/cinderella.html.

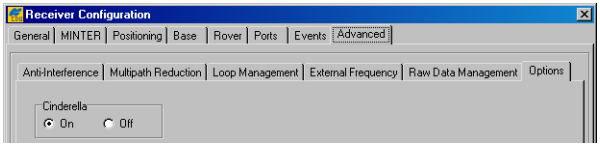


Figure 3-42. Options Tab

Site Configuration Window

This window allows the user to enter an antenna-specific information for the site to be surveyed (Figure 3-43 on page 3-89). The settings you defined on this page will also be reflected on the ***Site Configuration*** window described on page 3-20.

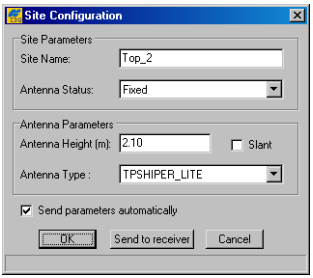


Figure 3-43. Site Configuration Window

To open the ***Site Configuration*** window, select the **Site** item from the **Configuration** menu, or press the keys **CTRL+I**.

- Site Name – The site identification string (up to 20 alphanumeric characters).
- Antenna Status – This control allows the user to define whether the receiver antenna is in motion or is motionless.

- Antenna Height – The height of antenna, measured from the survey marker to the measuring mark of antenna. The measuring mark is the antenna reference point (ARP) if you use the vertical height or a known measuring mark (usually antenna edge) on the antenna if you use the slant height.
- Slant – Enable this checkbox if you measure the slant height. Otherwise, leave it blank.
- Antenna Type – Select the type of antenna you use.
- Send parameters automatically – Select this checkbox if you want PC-CDU to automatically send the above site and antenna parameters to the receiver on every log file creation event.
- OK – Applies the changes and closes this window.
- Send to receiver – Applies the changes when the log file is being recorded.
- Cancel – Closes the window without applying the changes.

Target position Window

This window allows the user to enter the target coordinates (Figure 3-44).

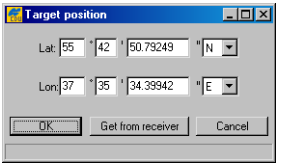


Figure 3-44. Target position Window

To go to the ***Target position*** window, either select the **Target Position** from the **Configuration** menu, or press the keys **CTRL+T**.

- OK – Associates the entered coordinates with the target position and closes the window.

- Get from receiver – Sets the target position to the most recent position produced by the receiver.
- Cancel – Closes the window without applying the coordinates.

RFM96 Configuration Window

If your receiver is equipped with the RFM96 radio modem, use the following windows to adjust its settings.

To open the ***RFM96 Configuration*** window, select the **Radio** item from the **Configuration** menu, then click **RFM96**, as shown in Figure 3-45.

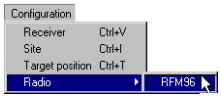


Figure 3-45. Select Radio->RFM96

After you click the **RFM96** item, the following window displays (Figure 3-46).

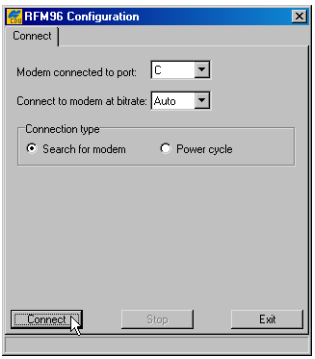


Figure 3-46. RFM96 Configuration – Connect

This tab allows the user to establish a connection with the radio modem.

Use the **Modem connected to port** list box to select the receiver port that the radio modem is connected to. Normally, this is port C

for the Legacy, Legacy-E, Legacy-H, Regency, HiPer family, and port B for the Odyssey.

To set the baud rate with which the modem and receiver will communicate, use the **Connect to modem at bitrate** list box (typically 38400 bps). If you want the receiver automatically detects the baud rate, select **Auto**.

Select the method of modem connection and click **Connect**. For most RFM96 models, you can use **Search for modem**.

If the radio is not found, change **Connection type** to **Power cycle** and click **Connect**. The program will prompt you to turn the modem off and then back on (Figure 3-47 on page 3-92). The program will poll the radio during its power cycle and establish a connection.

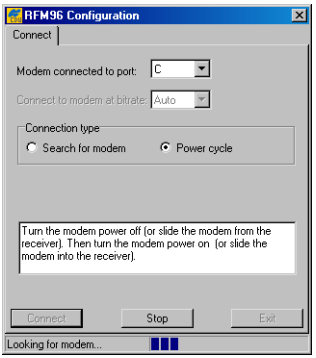


Figure 3-47. RFM96 Configuration – Power Cycle

Once a connection has been established, you will see a window showing the radio link settings and protocol details (Figure 3-48).

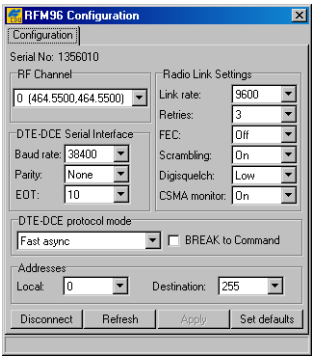


Figure 3-48. RFM96 Configuration – Settings

- In the **RF Channel** list box, the user selects the desired channel.
- In the **DTE-DCE Serial Interface** area, the user specifies the following settings:

  Baud rate – Select the baud rate used for communication with the local DTE device.

  Parity – Select the parity used for communication with the local DTE device.

  EOT – This field is set to the end-of-transmission character or timeout value used to determine when a message that is to be transmitted is complete and ready to transmit. This applies only when the DTE-DCE protocol of the radio-modem is configured for Transparent, Fast Asynch, or TrimTalk modes.

- In the **DTE-DCE protocol mode**, select the desired operation protocol among the following available:

  Transp. w/EOT time out

  Transp. w/EOT character

Packet

Auto-repeater

Fast async

Enable/disable the **BREAK to Command** checkbox. If enabled, a BREAK condition on the RS-232 interface will cause the radio-modem to switch into command mode.

- In the **Addresses** area, specify the **Local** and **Destination** addresses. The **Local** field is set for the local radio modem identifier. 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. Acceptable values are 0 to 254. Do not use address 255 as it is reserved as the broadcast address. **Destination** is used only in transparent mode for addressed transparent operation. When in transparent mode, all data is transmitted to the address specified in this field.
- In the Radio Link Settings area, specify the following settings:

  Link rate – This list box field allows you to select the rate at which data is transmitted over the RF link. Pacific Crest recommend the use of 9600 bps to minimize the power consumption and to maintain the radio transmitter at a low TX duty cycle. You may need to use 4800 bps in order to maintain reliability in difficult transmission circumstances (long range or heavy fade conditions).

  Retries – Enter in this field the number of retries the modem should attempt in the case where the remote modem does not respond or a corrupted data packet causes a negative acknowledgment from the receiving modem. This field is only used 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 – Enable or disable Forward Error Correction (FEC). FEC allows the receiving modem to 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 – This list box is used to enable or disable data scrambling. 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. The radio modem allows the user to select the level at which the radio begins to decode the signal. By adjusting the sensitivity to an RF carrier, the radio modem can be configured to ignore weak signals, or signals from unintentional radiators (computer CRT's, etc.) which would otherwise interfere with reception. Four settings are provided: High, Moderate, Low and Off. Select High for greatest sensitivity. A selection of High will result in the best range of reception. Select Moderate or Low to minimize interference from other transmissions. Note that selecting Moderate or Low will result in poorer reception of weak signals, and lower range. By selecting Off, the radio modem loses its ability to receive signals, and thereby becomes a transmit only unit. Note that selecting Off will allow the radio modem to transmit over other broadcasts, and is generally not recommended, especially at higher power levels where your broadcast will interfere with co-channel users.

CSMA monitor – This field instructs the modem to wait, or not, for the transmit frequency to clear before attempting transmission. This is most useful when the RX and TX frequencies are different. When set to 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. When set to Off, transmission will commence without first checking for clear TX frequency.

Once the change has been made, press the **Apply** button to program the radio.

Pressing the **Set defaults** button returns all radio link and serial interface settings back to their factory default values.

Digisquelch should be set to **Low** on the base and **High** on the rover. If the radio at the rover is suffering from an external interference, then you can set it to **Medium** or **Low**.

NOTICE

For more information on the settings used in this window, refer to the RFM96 Modem Configuration Software help.

Initialize file system

This procedure is to some extent similar to disk formatting. It results in erasing all of the files inside the receiver. In practice, you do not execute this procedure very often.

To initialize the file system in the connected receiver, select the **Initialize file system** item from the **Tools** menu.

After pressing **Initialize file system**, you will be prompted to confirm the command (Figure 3-49).

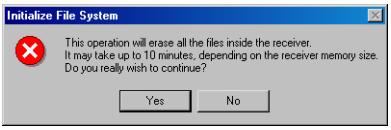


Figure 3-49. Confirm Initialization – 1

On the next window, confirm the initialization by clicking the **Start** button (Figure 3-50).

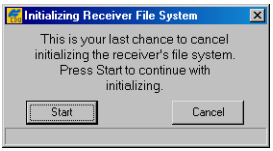


Figure 3-50. Confirm Initialization – 2

Wait until the initialization process completes (Figure 3-51).

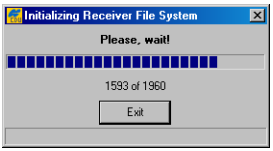


Figure 3-51. File System Initializing

NOTICE

The command's execution time may be up to several minutes depending on the receiver's memory size.

Once completed, the window showing the receiver's file system and physical memory information appears. If you want to save this

information to a text file, click **Save to file**. To close the window, click **OK** (Figure 3-52).

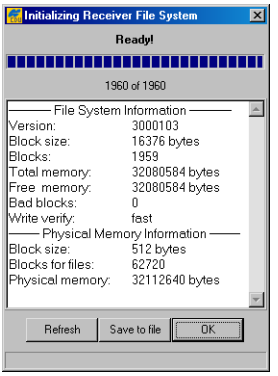


Figure 3-52. File System Has Completely Initialized

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 NVRAM in your receiver can be interpreted as a *soft boot* in your computer.

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

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

To clear the NVRAM, select the **Clear NVRAM** item from the **Tools** menu. PC-CDU then prompts you with a message asking to confirm clearing the NVRAM. Click **OK** to execute this procedure or **Cancel** to return to the main window (Figure 3-53).

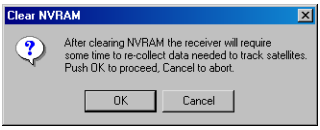


Figure 3-53. Confirm Clear NVRAM

Reset receiver

This operation is similar to computer resetting. It will not clear the receiver's NVRAM.

To reset the receiver, select the **Reset receiver** item from the **Tools** menu. When clicking the **Reset receiver** option, you will be prompted to confirm your command (Figure 3-54 on page 3-99).

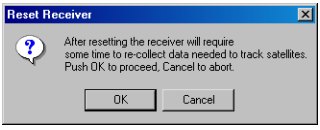


Figure 3-54. Confirm Receiver Reset

After the command is executed, PC-CDU disconnects itself from the receiver and then opens the ***Connection Parameters*** window prompting you to set necessary parameters to connect to the receiver again.

Receiver options

By clicking the **Receiver options** item, the ***Option Manager*** window displays. With this window you can check the status of your receiver's options and load new Option Authorization Files (OAFs) to the receiver (Figure 3-55).

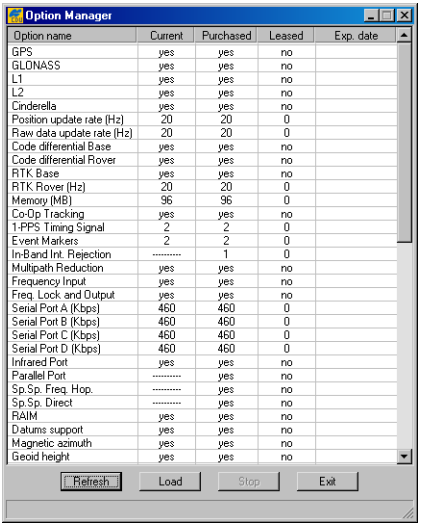


Figure 3-55. Option Manager

Option Manager Window

This window contains the following information (Figure 3-55 on page 3-100):

- Option name – a name/description of 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 option will be disabled, if applicable

Since Options can be both purchased and leased, the «Current» status of the option displays the currently effective value.

Option values can be:

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

Table 3-9 lists all options available for a TPS receiver.

Table 3-9. 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
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

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
Cinderella	Enables/disables the Cinderella option. It 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. Zero means that 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. Zero means that the option is disabled.
Code differential Base	Enables/disables the receiver to be configured as a DGPS Base. This option is obsolete and retains in the program for back-compatibility.	yes – enabled no – disabled
Code differential Rover	Enables/disables the receiver to be configured as a DGPS Rover. This option is obsolete and retains in the program for back-compatibility.	yes – enabled no – disabled
RTK Base	Enables/disables the receiver to be configured as an RTK Base. This option is obsolete and retains in the program for back-compatibility.	yes – enabled no – disabled

Table 3-9. 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 retains in the program for back-compatibility.	0, 1, 2, 5, 10, 20. Zero means that 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

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
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	Enable the receiver to generate a very stable 20 MHz frequency.	yes – enabled no – disabled
Serial Port A (Kbps)	Enables/disables communications through port A and displays a 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 a 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

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
Serial Port C (Kbps)	Enables/disables communications through port C and displays a 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 a 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 infrared port.	yes – enabled no – disabled
Parallel Port	Enables/disables communications through parallel port.	yes – enabled no – disabled
Sp.Sp. Freq. Hop.	Allows use of the internal Spread Spectrum modem in the 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 the spread spectrum mode. For the Legacy and Odyssey only.	yes – enabled no – disabled

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
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 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 satellite differential service.	yes – enabled no – disabled
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

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
RTCM Input	Allows the receiver to accept RTCM messages via a certain number of ports. The option 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 a specified number of ports.
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
JPS Input	Allows the receiver to accept TPS messages via a certain number of ports. The option 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 a specified number of ports.
DGPS mode	Enables/disables the receiver to run in DGPS (Code Differential) mode.	yes – enabled no – disabled

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
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. 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 option RTK mode 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.
FTP Connections	Enables/disables the receiver to establish an FTP connection (1 max.).	0 – disabled 1 – enabled

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
USB Port	Enables/disables communications through 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 the 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+ Combinations of these values are also available.

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
RTK distance [x100m]	This option 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 specified distance For example, 120 means 12 km.
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 are disabled on all ports 1st bit (decimal 1) – serial port A is enabled for differential data input 2nd bit (decimal 2) – serial port B is enabled for differential data input 3rd bit (decimal 4) – serial port C is enabled for differential data input 4th bit (decimal 8) – serial port D is enabled for differential data input Combinations of these values are also available.

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
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
Longitude 2	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
Lat_Lon checksum 1	Checksum of the Latitude1, Longitude1, Latitude2, Longitude2 options. See the GRIL Reference Manual 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

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
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
Longitude 4	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

Table 3-9. Receiver Options (Continued)

Option Name	Description	Values
Lat_Lon checksum 2	Checksum of the Latitude3, Longitude3, Latitude4, Longitude4 options. See the GRIL Reference Manual 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

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

Also this window contains four buttons. Their functions are:

- Refresh – Updates the window.
- Load – Loads a new OAF. For details, see “How to Load New OAF to Receiver” on page 2-40.
- Stop – Terminates loading an OAF.
- Exit – Closes the window.

Scatter Window

This is a useful graphic feature allowing you to monitor the behavior/quality of the receiver trajectory/position in real time.

To go to the ***Scatter*** window, select the **Scatter** item from the **Plots** menu.

The window is divided into the scatter plot and an augmented status bar (Figure 3-56).

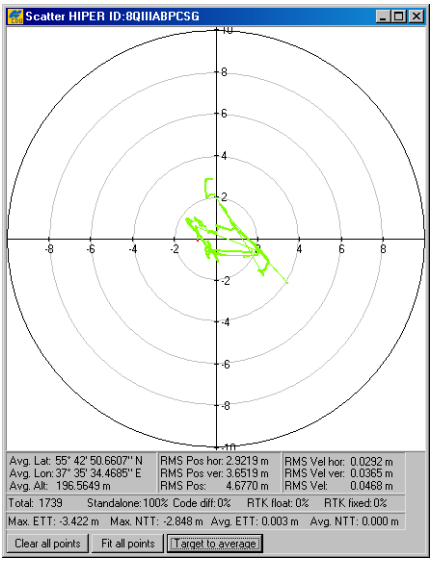


Figure 3-56. Scatter Window

The plot displays the current receiver position relative to the position specified in the ***Target position*** window. The most current receiver position is showed by a red point.

Status bar contains the following information:

- Average latitude, longitude and ellipsoidal height of the receiver's position over the entire set of obtained position estimates
- Horizontal position RMS error

- Vertical position RMS error
- Total position RMS error, i.e. the square root of the trace of the position error variance-covariance matrix
- Horizontal velocity RMS error
- Vertical velocity RMS error
- Total velocity RMS error, the square root of the trace of the velocity error variance-covariance matrix
- The number of the position estimates for each of the four solution types (in %) and their total as well
- The maximum and average Easting to Target and Northing to Target in the local system with the origin at the receiver.

Use the **Clear all points** button to erase all plotted points in the window.

When you click the **Fit all points** button, PC-CDU will automatically change the scale of scatter plot allowing you to view all plotted positions currently gathered by the software.

After you click **Target to average**, PC-CDU sets the target position equal to the average receiver's position.

NOTICE

The scatter plot and information in the status bar are updated once a second, unless you specified a lower position or raw data update rate at your receiver.

NOTICE

If you close this window, the positions displayed in the scatter plot and information in the status bar will not be discarded (unless you disconnect the receiver), thus when you reopen the window

later, it will include both the current position information and data.

Satellites Window

The ***Satellites*** window shows graphic representation of the satellite positions in the sky (Figure 3-57).

To go to the ***Satellites*** window, select the **Satellites** item from the **Plots** menu.

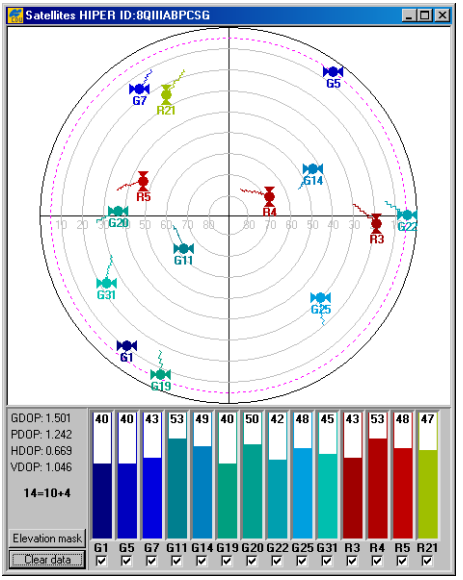


Figure 3-57. Satellites Window

Each concentric circle represents the elevation angle above the horizon.

The outermost circle corresponds to 0 degrees above the horizon.

The center of the sky plot represents 90 degrees above the horizon.

The dotted circle shows the position computation elevation mask angle. In Figure 3-57, the mask angle equals 5 degrees. The user

can adjust the mask angle through the ***Elevation MaskForm*** window which appears immediately after clicking the **Elevation mask** button (Figure 3-58).

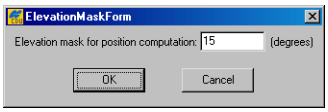


Figure 3-58. ElevationMaskForm Window

Also, the user can see four DOP characteristics, specifically:

- GDOP – Geometrical Dilution of Precision (3 position coordinates plus clock offset in the solution)
- PDOP – Position Dilution of Precision (3 coordinates)
- HDOP – Horizontal Dilution of Precision (2 horizontal coordinates)
- VDOP – Vertical Dilution of Precision (height only)

A dynamically changing histogram shows the signal-to-noise ratio (C/N_0) in the C/A channel. Each vertical bar has a unique color and designates a satellite's PRN (GPS and WAAS) or slot number (GLONASS). Note that GPS/WAAS and GLONASS satellites are marked with G# and R#, respectively. By selecting or clearing the checkbox for each SV, the user can specify which of the GPS, GLONASS and WAAS satellites are enabled/disabled for position computation.

TIP

To view the basic tracking information about a satellite, move the cursor onto the desired satellite's icon and right-click on it. Holding down the right button, you will see a pop-up window,

as shown in Figure 3-59. The values in the window are similar to the values in *Main* window.

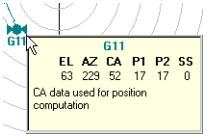


Figure 3-59. Satellites Window – Basic Tracking Information

To clear the ***Satellites*** window, click the **Clear data** button.

Position Window

The ***Position*** window represents continuously updated graphs that show the difference between latitude/longitude of the receiver position and latitude/longitude specified in the ***Target position*** window over a user-defined time interval (Figure 3-60).

To go to the ***Position*** window, select the **Position** item from the **Plots** menu.

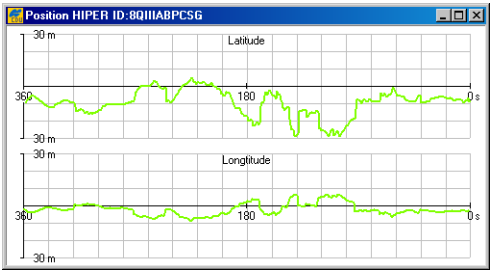


Figure 3-60. Position Window

The *Latitude* and *Longitude* graphs are constructed as follows:

- Horizontal axes

  Display the time interval (in seconds) over which PC-CDU computes the differences.

–The range of a time interval, over which the differences are displayed, varies between 0 seconds (which corresponds to the current moment in time) and a value entered in the **Time interval** parameter from the ***Plots Configuration*** window.

–The interval between values along the axes corresponds to a value of the **Time step** parameter specified in the ***Plots Configuration*** window.

For example, the graphs in Figure 3-60 on page 3-118 show the range of values 0 s to 360 s with the interval of 20 s.

- Vertical axes

  Display the difference (in meters) between a particular position of your receiver and a fixed position of a target.

  –The range of deviations that can be viewed, sets in the **Max. deviation** parameter of the ***Plots Configuration*** window.

  –The interval between values along the axes corresponds to a value of the **Deviation step** parameter in the ***Plots Configuration*** window.

  For example, the graphs in Figure 3-60 on page 3-118 show the range of deviations 0 m to 30 m with an interval of 10 m.

Plots Configuration

With the controls in this window, the user configures the settings in the ***Scatter***, ***Satellites*** and ***Position*** windows (Figure 3-61 on page 3-120).

To go to the ***Plots Configuration*** window, select the **Configuration** item from the **Plots** menu.

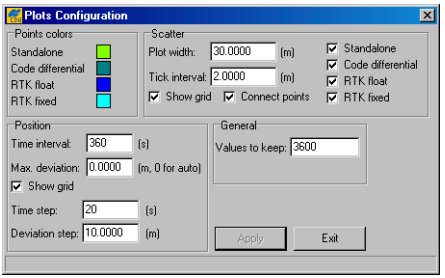


Figure 3-61. Plots Configuration Window

In the **Points colors** area, the user can change the color for the points of the ***Scatter*** window.

For example, if it is desired that the points corresponding to the absolute position estimates, be displayed in red, take the following steps:

1. Move the cursor onto the colored box, which is on the right side of Standalone.
2. Click either mouse button in a fill area of the box.
3. Click the color wanted. If the color desired is not seen, click **Define Custom Colors>>**. To the right of **Basic colors** you will see a custom palette where you can mix your own color. After selecting the color you want, click **Add to Custom Colors**, and then click **OK**.

In the **Scatter** group box, the user can change the settings related to the ***Scatter*** window.

- With the **Plot Width** edit box, the user specifies the length of the axes on the plot.
- The **Tick Interval** edit box specifies the tick size (in meters) between the adjacent concentric circles (i.e., interval between adjacent values on the axis).
- To remove the circle grid from the plot, clear the **Show grid** checkbox.

- With the **Connect points** checkbox, the user can select whether to plot the positions as discrete points (checkbox disabled) or as a trajectory (checkbox enabled).
- With the **Standalone**, **Code Differential**, **RTK float** and **RTK fixed** checkboxes, the user specifies what kinds of solutions will be shown on the plot. It is recommended that you use a unique color for each solution type.

The **Position** group box contains the settings that govern the graphs in the ***Position*** window.

- The **Time interval** edit box specifies the length of the x axis (in seconds).
- The **Max. deviation** edit box specifies the length of the y axis (in meters). Zero means that the vertical axes will always be scaled automatically according to the maximum deviation value within the currently displayed time interval.
- To turn off the grid, clear the **Show grid** checkbox.
- The **Time step** edit box specifies the time (in seconds) between adjacent vertical gridlines.
- The **Deviation step** edit box sets the distance (in meters) between adjacent horizontal gridlines.

The **Values to keep** edit box 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. This circular buffer is used with the aim of saving the computer memory consumption when the graphs have been being monitored for a long time (continuously during several hours, days, etc.).

To commit any changes that you have made, click **Apply**.

About PC-CDU Window

The ***About PC-CDU*** window shows software version information and, after establishing connection, information about the receiver (Figure 3-62).

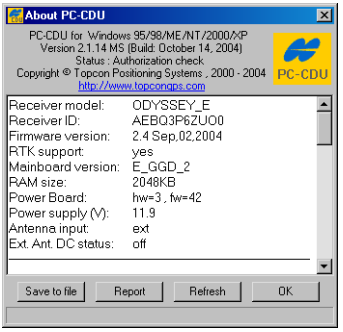


Figure 3-62. About PC-CDU Window

To access the ***About PC-CDU*** window, either select the **About** item from the **Help** menu, or press the keys **CTRL+U**.

Table 3-10 gives a description of each of the fields in this window.

Table 3-10. Connected Receiver Details

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.
RTK support	Shows whether 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 installed on the receiver.

Table 3-10. Connected Receiver Details (Continued)

Field	Description
Power supply (V)	The voltage of the external power supply.
Antenna input	Shows whether the receiver uses internal or external antenna to acquire the GPS/GLONASS signals.
Ext. Ant. DC status	Indicates if an external antenna draws acceptable DC current.
Power source	Shows the power source used by the receiver.
Power cur.source	Displays the power source that is currently being used by the receiver.
Charger status	Displays the mode of an external charger.???
Charger cur.status	Displays the mode in which the external charger is currently working.???
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 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.

Table 3-10. Connected Receiver Details (Continued)

Field	Description
Temperature (°C)	Displays the temperature of the receiver board.
Flash memory size	Displays the amount of available memory in your 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.
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 is currently communicating through with PC-CDU.
Speed	Shows the baud rate at which the receiver communicates with the PC.
Parity	Shows whether parity checking is used or not. 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 hardware handshaking is used or not.
Infrared	Shows the status of the infrared port.
Time from last reset	Shows time elapsed since the last receiver reset.

Table 3-10. Connected Receiver Details (Continued)

Field	Description
Hardware version	Shows Topcon's specific information.
Boot loader version	Shows Topcon's specific information.
Wait states	Shows the flash memory access time expressed in wait states.

Along with the information about the connected receiver, this window contains four buttons that have the following functions:

- Save to file – Records your receiver's configuration information to a text file on the computer drive. For details on how to save this vital receiver information and submit it to Topcon, see "E-mail" on page 4-5.
- Report – Records the contents of the ***About PC-CDU*** window together with the status of receiver options to a text file on the computer drive.
- Refresh – Updates the receiver details list.
- OK – Closes the window.

Notes:

Troubleshooting

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

Things to Check 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:

- Go through all external receiver connections carefully and make sure they are not wrong or loose.
- Double-check the cables. Cables became defective more often than the devices do.
- Check the sections below for available solutions.
- Reset the receiver using PC-CDU (**Tools->Reset receiver**).
- Restore factory default settings using PC-CDU (click **Configuration->Receiver**, then **Set all parameters to defaults**).
- Clear the NVRAM (see “Clearing the NVRAM” on page 4-14).
- Initialize the file system using PC-CDU (click **Tools->Initialize file system**; this will erase all files inside the receiver).

Error Messages

The following are the error messages you may encounter while working with PC-CDU.

Table 4-1. Error 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 the 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, refer to “Internet Server Mode” on page 1-26.
	PC-CDU Internet Server is not properly configured.	Double-check the Internet Server configuration. For details, refer to “Internet Server Mode” on page 1-26.
	PC-CDU Internet Client is not properly configured.	Double-check the Internet Client configuration. For details, refer to “Internet Client Mode” on page 1-29.

Table 4-1. Error Messages

Message	Possible Cause	Corrective Action
•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 “Getting Connected” on page 1-8.
	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 `tps2rin.exe` 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.	Select the correct receiver port. For details, see “RFM96 Configuration Window” on page 3-91.
	There is no radio modem installed in your receiver.	
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 Messages

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 Chapter 2 on page 2-25.
	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	Characters ??? cannot be used in the name of the log file.	Rename the log file using only allowed characters.

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

E-mail

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

Table 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, please send it to support@topcon.com.

TIP

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

Typical steps you should take to provide us with this information are as follows:

1. Reveal the exact conditions when the problem occurs.
   - What receiver model and configuration settings do you use?

     –The easiest way to provide this information is to use the **Save to file** button in the ***About PC-CDU*** window. To do this, run PC-CDU and establish a connection between the receiver and the computer. Click **Help**, then click **About**, or alternatively press **Ctrl+U**. Click **Save to file**. Specify a name of the text file and click **Save**. The file will be saved onto the selected computer's drive.
   - What system/hardware specifications does the computer on which you are running (installing) PC-CDU have?
   - What symptoms and/or error codes/messages do you see?
   - Does the problem happen regularly or occasionally?

2. Document the problem and create *support request package*.
   - Write an e-mail that contains complete explanation of the problem with answers to the questions from Step 1.
   - Attach the file created in Step 1 to this e-mail.
3. Submit e-mail to Customer Support.
   - Send the e-mail you wrote in Step 2 to an appropriate electronic address given in “E-mail” on page 4-5.

NOTICE

Generally, you will receive a response within 24 hours or less, depending on the severity of the problem.

TIP

You can also check our online resources for the latest product support information.

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/

PC-CDU Scripts

This appendix will help you write PC-CDU scripts. It describes:

- 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 each line of which is either a receiver command, or 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 values[9] in scripts. They can then be used in place of the values they store while running the script.

Currently PC-CDU supports the following variables:

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

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

With the command @default, you can assign the default values to these variables unless the corresponding arguments have already

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

been specified through the script command line. Also, you may use the @set command to change the variables' values.

The variable @0, which is read-only, has a special purpose. Initially it 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 (i.e., the most recent of the `RExxx` replies), or remain empty.

After getting `RExxx` from the receiver, PC-CDU will search the received sequence for the last of the «%» symbols it contains. PC-CDU does not assign to the variable @0 the entire RExxx reply, but only the characters following immediately after the last «%» symbol (until the end of this sequence is found). Leading and trailing spaces are trimmed. With the @set command, you can assign the value of @0 to other variables.

PC-CDU Commands

In essence, a PC-CDU command is a single word that instructs the receiver what to do.

Any line starting with the «@» character is interpreted as a PC-CDU command with optional arguments separated by commas or spaces. In Table A-1 you will find the description of supported commands.

Table A-1. List of PC-CDU Commands

Command	Arguments	Description
:<label name>		Specifies a label to which you want the PC-CDU's command interpreter to jump. Label names should not contain spaces or commas. See the `goto` command 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.

Table A-1. List of PC-CDU Commands

Command	Arguments	Description
clear		Removes issued commands and receiver replies from the ***Manual Mode*** window.
default	<variable> <default value>	Defines the default values for those of the script arguments that were not explicitly specified in the command line. For example, `@default @1 a` assigns the value `a` to the variable `@1` unless this argument is already defined in the command line.
disconnect		Stops script execution, disconnects PC-CDU from the receiver and closes the ***Manual Mode*** window. This is the same as pressing the **Disconnect** button.
echo	on off any character sequence	Turns echo on and off, or displays its arguments. If echo is turned on, PC-CDU will display all nonempty 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 preceding them with the «>» character. PC-CDU will not show @echo off and @echo on commands. Default is «on».
exit		Stops script execution, disconnects PC-CDU from the receiver and exists PC-CDU.

Table A-1. List of PC-CDU Commands

<table>
<tr><th>Command</th><th>Arguments</th><th colspan="3">Description</th></tr>
<tr><td>goto</td><td><label name></td><td colspan="3">Jumps to the line following immediately after @:<label name>.
If PC-CDU cannot find such a label in the script, this command is just ignored and PC-CDU continues with the script.</td></tr>
<tr><td>send</td><td><bytes to send></td><td colspan="3">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.</td></tr>
<tr><td></td><td></td><td>Sequence</td><td>Value</td><td>Character</td></tr>
<tr><td></td><td></td><td>\a</td><td>0x07</td><td>BEL</td></tr>
<tr><td></td><td></td><td>\b</td><td>0x08</td><td>BS</td></tr>
<tr><td></td><td></td><td>\f</td><td>0x0C</td><td>FF</td></tr>
<tr><td></td><td></td><td>\n</td><td>0x0A</td><td>LF</td></tr>
<tr><td></td><td></td><td>\r</td><td>0x0D</td><td>CR</td></tr>
<tr><td></td><td></td><td>\t</td><td>0x09</td><td>HT</td></tr>
<tr><td></td><td></td><td>\v</td><td>0x0B</td><td>VT</td></tr>
<tr><td></td><td></td><td>\\</td><td>0x5C</td><td>Backslash</td></tr>
<tr><td></td><td></td><td>\"</td><td>0x22</td><td>Double quote</td></tr>
<tr><td></td><td></td><td>\O</td><td>any</td><td>O – octal character code</td></tr>
<tr><td></td><td></td><td>\xH</td><td>any</td><td>H – hexadecimal character code</td></tr>
<tr><td></td><td></td><td colspan="3">Example:
<code>@send "#OFF#\r\n"</code></td></tr>
</table>

Table A-1. List of PC-CDU Commands

Command	Arguments	Description

set	• rate <new baud rate>
	• rtscts [on,off]
	• <variable> <value>
		With these commands, you can assign both serial ports' parameters and PC-CDU's internal variables.
		Example 1:
		Suppose you have a script with the commands
		….
		`@set @1 "a text"`
		`@echo @1`
		….
		When the script interpreter reaches the echo command, you will get the following reply:
		`>a text`
		Example 2:
		Assign the current terminal's baud rate to @2:
		`%%print,/par/cur/term/rate`
		`@set @2 @0`

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' 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	If a receiver command starts with a «%» symbol, PC-CDU will wait for the receiver to reply within the specified timeout interval. 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, or if after receiving a few bytes PC-CDU gets no more data for 100+ milliseconds, or if PC-CDU keeps receiving *continuous data* for more than 100 milliseconds, @0 will be undefined (however, script execution will continue). In this you may need to adjust the timeout interval to be sure that the variable @0 contains correct information.

Receiver Commands

Using scripts the user can specify receiver commands' arguments either explicitly or through variables.

When you use variables for this purpose, these will be substituted by PC-CDU for some specific values before sending the corresponding command to the receiver. If the user sends a receiver command that starts with «%» (command label), PC-CDU will wait for the receiver to reply and, if a reply is received, it will save the reply to the variable @0.

Currently the character «@» is used in GRIL commands only to delimit the command checksum. It 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. Therefore, if one uses 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), you should either use appropriate @set commands immediately after them, as shown below:

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

or specify such 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.

Below will be found some examples illustrating various applications of scripts.

The following script serves the purpose 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 these lines are saved to a file (e.g., `beacon.jpc`), you can then type in the command line `@beacon` and press **Enter** to instruct the receiver to input RTCM corrections from serial port C and output NMEA messages to the current terminal. If the user wants to use serial port B for inputting corrections, type `@beacon b` and press **Enter**.

The following example illustrates how the `goto` command and labels are used in scripts intended for 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*** window or in any text editor, e.g. Notepad.

To create a script using the ***Manual Mode*** window:

1. In the ***Manual Mode*** window, click the **Edit script** button.
2. Enter the name of a new script in the **File name** field.
3. Click the **Open** button.
4. Type the script commands.
5. Click the **Save script** button.

To edit an existing script using the ***Manual Mode*** window:

1. In the ***Manual Mode*** window, click the **Edit script** button.
2. Navigate to a list of available scripts and select the desired script name from that list.
3. Click the **Open** button.
4. Make necessary changes in the script and then click the **Save script** button.
5. Finally, click the **Close editor** button.

TIP

It is recommended to save scripts using the extension .tpc.

TIP

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

Running Scripts

To run a script through the command line of the ***Manual Mode*** window:

1. Enter the script name with a preceding '@' character (e.g. `@my_script`).

   OR

   Click the **Load script** button and select the required script from the ***Script file*** window.
2. Specify script arguments, if required.
3. Click the **Send command** button.

NOTICE

Script arguments should be delimited by either spaces or commas. If some of the arguments in the command line contain separators (spaces and/or commas), put such arguments into double quotes, e.g.: @myscript "This is one argument".

After PC-CDU starts script execution, it will read the file line by line carrying 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, and;
- sending commands to the receiver and (optionally) waiting for receiver replies.

To abort script execution, click the **Stop script** button.

Running Scripts from Windows Explorer

Files with the extension .tpc are automatically associated with PC-CDU. It means that you can launch PC-CDU (specifically in Manual mode) by clicking on a script in the file/directory tree. It can be achieved with the use of Windows Explorer, My Computer or some other Windows file manager.

After the ***Connection Parameters*** window pops up, you click the **Connect** button to open PC-CDU's ***Manual Mode*** window. Note, however, that the script you selected will not start automatically so that you should type the name of desired script in the command line or select the script through the **Load script** button. After exiting Manual mode, you can continue working with PC-CDU in the usual way.

Notes:

Settings List

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

The default value for a setting is shown in *Italic* (if applicable).

Connection Parameters Window

Table B-1 provides a list of settings that are available in the ***Connection Parameters*** Window. The default value for a setting is shown in *Italic* (if applicable).

Table B-1. Connection Parameters Settings

Parameter	Values/Range	Units	Where to Find Description
Connection Mode	• Direct • Internet Client • Internet Server	–	page 1-9– page 1-31
Port settings Area			
Port	• COM#'s • USB • LPT • ETHR	–	page 1-10, page 1-14, page 1-16, page 1-19, page 1-26

Table B-1. Connection Parameters Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Baud rate	• 4800 • 9600 • 19200 • 38400 • 57600 • 115200 • 230400 • 460800	bps	page 1-10
Infrared port	• enabled • disabled	–	page 1-11
RTC/CTS handshaking	• enabled • disabled	–	page 1-10
TCP port (for Ethernet connection only)	1...*8002*...65536	–	page 1-19, page 1-26
Host name (for Ethernet connection only)	• 0.0.0.0 ... 255.255.255.255 • *not specified*	–	page 1-20, page 1-26
Password (for Ethernet connection only)	• up to 15 a/n characters • *no password*	–	page 1-20, page 1-26
Program Settings Area			
Passive mode	• enabled • disabled	–	page 1-12
Manual mode only	• enabled • disabled	–	page 1-12

Table B-1. Connection Parameters Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Timeout	• 500 • 1000 • 2000 • 3000 • 4000 • 5000 • 10000	milliseconds	page 1-12
Restore the receiver's original baud rate on Disconnect	• enabled • disabled	–	page 1-12
Internet (Client - Server) settings Area			
Host name	• *localhost* • 0.0.0.0 to 255.255.255.255 • DNS addresses	–	page 1-30
TCP port	1...*8000*...65536	–	page 1-27, page 1-30
Password	• up to 128 a/n characters • *no password*	–	page 1-27, page 1-30
Display data on server	• enabled • disabled	–	page 1-28
Log server events	• enabled • disabled	–	page 1-27
DNS lookup	• enabled • disabled	–	page 1-28, page 1-30

File Manager Window

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

Table B-2. File Manager Settings

Parameter	Values/Range	Units	Where to Find Description
Download files Tab			
Exclusive mode	• disabled • enabled	–	page 3-17
Block size	• 512 • 1024 • 2048	bytes	page 3-16
Current log file Tab			
File name	• any string • not specified	–	page 3-19
Recording interval	0...1...86400	seconds	page 3-19
Elevation mask	-90...5...90	degrees	page 3-19
Download path Tab			
New folder	any string	–	page 3-22

Real-Time Logging Window

Table B-3 provides a list of settings that are available in the ***Real-Time Logging*** Window. The default value for a setting is shown in *Italic* (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 3-25
Recording interval	0...1...86400	seconds	page 3-19
Elevation mask	-90...5...90	degrees	page 3-19
Multiple files Tab			
Prefix	up to 16 a/n characters	–	page 2-22, page 3-26
Numbering	• Ascending Count • Date & Time	–	page 2-22, page 3-26
New file every	any integer number	• minutes • hours • days	page 2-22, page 3-27
Autoconvert to RINEX	• enabled • disabled	–	page 2-22, page 2-23, page 3-29
Start Count	0...999999	–	page 2-22, page 3-27
Overwrite existing files	• enabled • disabled	–	page 2-22, page 3-28

Table B-3. Real-Time Logging Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Recording interval	0...1...86400	seconds	page 2-22, page 3-19
Elevation mask	-90...5...90	degrees	page 2-22, page 3-19
Select output path Tab			
New folder	• any string	–	page 3-22

Receiver Configuration Window

Table B-4 through Table B-11 provide a list of settings that are available in the ***Connection Parameters*** window. The default value for a setting is shown in *Italic* (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 3-35
Antenna	• Internal • External • Auto	–	page 3-35
Antenna Status Area			
Current Input	• int • ext	–	page 3-37

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

Parameter	Values/Range	Units	Where to Find Description
Ext. DC Status	• off • normal • overload	–	page 3-37
Temperature Area			
Board temperature	a numeral	°C	page 3-37
Power management Area			
Power->Mode	• *Auto* • Mix • Battery A • Battery B • External	–	page 3-37
Power->Current Mode	• mix • ext • a • b	–	page 3-38
Charger->Mode	• Off • Charge A • Charge B • *Auto*	–	page 3-38
Charger->Speed	• *normal* • fast	–	page 3-38
Charger->Current Mode	• off • a • b	–	page 3-38
Charger->Current	• a numeral	Amperes	page 3-38

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

Parameter	Values/Range	Units	Where to Find Description
Power output modes->Ports A,B (for Odyssey only)	• enabled • *disabled*	–	page 3-38
Power output modes->Port C (for Odyssey only)	• enabled • *disabled*	–	page 3-38
Power output modes->Ports	• Off • *On* • Always	–	page 3-38
Power output modes->Slots	• Off • *On* • Always	–	page 3-39
Voltages-> External	float values	Volts	page 3-39
Voltages-> On Board	float values	Volts	page 3-39
Voltages-> Battery A	float values	Volts	page 3-39
Voltages-> Battery B	float values	Volts	page 3-39
Voltages-> Charger	float values	Volts	page 3-39
Voltages-> On Ports	float values	Volts	page 3-39
Turn on/off Slots ->Slot 2 (C)	• *enabled* • disabled	–	page 3-39

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

Parameter	Values/Range	Units	Where to Find Description
Turn on/off Slots ->Slot 3 (B)	• *enabled* • disabled	–	page 3-39
Turn on/off Slots ->Slot 4 (D)	• *enabled* • disabled	–	page 3-39
Enable Low Power Mode	• *enabled* • disabled	–	page 3-39

Table B-5. Connection Parameters Settings – MINTER Tab

Parameter	Values/Range	Units	Where to Find Description
Recording Interval	0...*1*...86400	seconds	page 3-40
Elevation mask for Log file	-90...*5*...90	degrees	page 3-41
File name prefix	• *log* • up to 20 a/n characters	–	page 3-41
Always append to the file	up to 20 a/n characters	–	page 3-41
FIle Creation mode	• *Log file* • AFRM	–	page 3-41

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

Parameter	Values/Range	Units	Where to Find Description
Automatic File Rotation Mode (AFRM) parameters Area			
Period	60...*3600*...86400	seconds	page 3-42
Phase	*0*...86400	–	page 3-42
Files (total)	*0*... 2^{31}-1	–	page 3-42
Files (remain)	integer values	–	page 3-42
Automatically remove old files	• enabled • *disabled*	–	page 3-42
FN key mode Area			
FN key mode	• *LED blink mode switch* • Occupation mode switch	–	page 3-42
Initial data collection dynamic mode Area			
Initial data collection dynamic mode	• *Static* • Kinematic	–	page 3-42
Data recording auto-start Area			
Data recording auto-start	• *Off* • On • Always	–	page 3-43

Table B-6. Connection Parameters Settings – Positioning Tab

Parameter	Values/Range	Units	Where to Find Description
Positioning Mode Area			
Positioning Mode	• *Standalone* • DGPS (Code Differential) • RTK Float • RTK Fixed	–	page 3-45
Positioning Masks Area			
Elevation mask	-90...*5*...90	degrees	page 3-46
PDOP mask	0...*30*...500	–	page 3-46
RAIM Enabled Area			
RAIM Enabled	• *enabled* • disabled	–	page 3-47
Alarm	• Manual • *Non-precision* • Terminal • En route	–	page 3-47
Alarm limit	10...*555.6*...10000	meters	page 3-47
Current Datum	• datum IDs list • *W84*	–	page 3-48

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

Parameter	Values/Range	Units	Where to Find Description
Enable Solutions Area			
Enable Solutions	• *Standalone* • DGPS • RTK Float • RTK Fixed	–	page 3-45
Positioning System Area			
GPS	• *enabled* • disabled	–	page 3-51
GLONASS	• *enabled* • disabled	–	page 3-51
Measurements Used Area			
Measurements Used	• *CA/L1* • P/L1 • P/L2 • Iono-Free	–	page 3-51
Iono-Correction	• *enabled* • disabled	–	page 3-51
Tropo-Correction	• *enabled* • disabled	–	page 3-52
Satellite management Area			
Satellites tracked ->GPS	• *enabled* • disabled	–	page 3-52
Satellites tracked ->GLONASS	• *enabled* • disabled	–	page 3-52

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

Parameter	Values/Range	Units	Where to Find Description
Satellites used in pos.->GPS	• *enabled* • disabled	–	page 3-52
Satellites used in pos.->GLONASS	• *enabled* • disabled	–	page 3-52
GPS Subtab			
lock	• *enabled* • disabled	–	page 3-52
use	• *enabled* • disabled	–	page 3-52
GLONASS Subtab			
Satellite Numbering	• *Frequency Channel Number* • Slot Number	–	page 3-53
lock	• *enabled* • disabled	–	page 3-54
use	• *enabled* • disabled	–	page 3-54
WAAS Subtab			
Channel 1 or Channel 2	• enabled • *disabled*	–	page 3-54
Set WAAS	*120*...138	–	page 3-54
as GPS	*1*...32	–	page 3-54

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

Parameter	Values/Range	Units	Where to Find Description
Interpret message #0 as message: #	*0*...99	–	page 3-54
Use Iono Corrections	• Never • If exist • *Only*	–	page 3-54
Enable output of «true» WAAS PRN numbers	• enabled • *disabled*	–	page 3-55

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	• *enabled* • disabled	–	page 3-56
GPS/GLO separately	• enabled • *disabled*	–	page 3-56
Averaged	• enabled • *disabled*	–	page 3-57
Avg. Span	0...*180*...32000	–	page 3-57

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 3-56
Lon	180°00’00.000000’’E ... *0°00’00.000000”* ... 180°00’00.000000’’W	DDD MM SS.ssssss	page 3-56
Alt	-20000.000 *...0.0...* +20000.000	meters	page 3-56
L1 to L2 Antenna Phase Center offsets Area			
East	-0.1...*0.0*...+0.1	meters	page 3-58
North	-0.1...*0.0*...+0.1	meters	page 3-58
Height	-0.1...*0.0*...+0.1	meters	page 3-58
RTCM Settings Area			
Station ID	*0*...1023	–	page 3-58
Max. number of Satellites	*0*...	–	page 3-58
Health	• *Good* • Bad • Unknown	–	page 3-59

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

Parameter	Values/Range	Units	Where to Find Description
Measurements Sent Area			
CA/L1	• *enabled* • disabled	–	page 3-59
P/L1	• enabled • *disabled*	–	page 3-59
P/L2	• *enabled* • disabled	–	page 3-59
System Used Area			
GPS	• *enabled* • disabled	–	page 3-59
GLONASS	• *enabled* • disabled	–	page 3-59
Pseudo-range smoothing	• enabled • *disabled*	–	page 3-59
CMR Settings Area			
Station ID	*0*...31	–	page 3-58
Motion	• *Unknown* • Static • Kinematic	–	page 3-59
Measurements Sent Area			
CA/L1	• *enabled* • disabled	–	page 3-59
P/L1	• enabled • *disabled*	–	page 3-59

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

Parameter	Values/Range	Units	Where to Find Description
P/L2	• *enabled* • disabled	–	page 3-59
GLONASS message	*3*...5...7	–	page 3-60
Short ID	• *not specified* • up to 8 a/n characters	–	page 3-60
COGO	• *not specified* • up to 16 a/n characters	–	page 3-60
Long ID	• *not specified* • up to 50 a/n characters	–	page 3-60

Table B-8. Connection Parameters Settings – Rover Tab

Parameter	Values/Range	Units	Where to Find Description
Positioning Mode Area			
Positioning Mode	• *Standalone* • DGPS (Code Differential) • RTK Float • RTK Fixed	–	page 3-61

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

Parameter	Values/Range	Units	Where to Find Description
DGPS Parameters Area			
Multi-base	• *enabled* • disabled	–	page 3-61
Corrections usage Area			
Nearest	• *enabled* • disabled	–	page 3-62
Mix	• enabled • *disabled*	–	page 3-62
Corrections (only if Mix enabled)	• *enabled* • disabled	–	page 3-62
Positions (only if Mix enabled)	• enabled • *disabled*	–	page 3-62
Best	• enabled • *disabled*	–	page 3-62
CD Corrections max. age	1...*30*...1200	seconds	page 3-62
Iono Corrections max. age	1...*300*...1800	seconds	page 3-63
Use Iono Corrections	• enabled • *disabled*	–	page 3-63
Source	• *Any* • Serial A • Serial B • Serial C • Serial D	–	page 3-63

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

Parameter	Values/Range	Units	Where to Find Description
Enable Solutions Area			
Enable Solutions	• *Standalone* • DGPS • RTK Float • RTK Fixed	–	page 3-63
RTK Parameters Area			
RTK mode	• Extrapolation • *Delay*	–	page 3-63
Dynamics	• Static • *Kinematic*	–	page 3-64
Ambiguity fixing level	• Low • *Medium* • High	–	page 3-64
Measurements Used Area			
CA/L1	• *enabled* • disabled	–	page 3-64
P/L1	• *enabled* • disabled	–	page 3-64
P/L2	• *enabled* • disabled	–	page 3-64
Base Corrections period	0.05…*1*…100	seconds	page 3-64
Use old ref. coordinates	• enabled • *disabled*	–	page 3-65

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

Parameter	Values/Range	Units	Where to Find Description
Source	• *Any* • Serial A • Serial B • Serial C • Serial D	–	page 3-65
CMR Settings Area			
GLONASS message	*3*...5...7	–	page 3-65

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	• None • *Command* • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni	–	page 3-67

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

Parameter	Values/Range	Units	Where to Find Description
Output	• *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 3-68
Period	*1*...86400	seconds	page 3-69

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

Parameter	Values/Range	Units	Where to Find Description
Baud rate	• 4800 • 9600 • 19200 • 38400 • 57600 • *115200* • 230400 • 460800	bps	page 3-70
RTS/CTS	• enabled • *disabled*	–	page 3-70
Infrared	• enabled • *disabled*	–	page 3-70
Parallel Subtab			
Input	• None • *Command* • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni	–	page 3-70

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

Parameter	Values/Range	Units	Where to Find Description
Output	• *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 3-70
Period	*1*...86400	seconds	page 3-70

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

Parameter	Values/Range	Units	Where to Find Description
Modem Subtab			
Input	• None • *Command* • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni	–	page 3-71
Output	• *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	–	page 3-71

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

Parameter	Values/Range	Units	Where to Find Description
Output	• RTK RTCM3 GGD full • RTK CMR {10,0,1} • RTK CMR+ {10,0,9} • RTK JPS min • RTK JPS max • User Defined	–	page 3-71
Period	*1*...86400	seconds	page 3-71
Type	• Receiving • Transmitting	–	page 3-71
Mode	• Off • FHSS • DSS	–	page 3-71
Antenna	• Int • Ext	–	page 3-71
Power	• High • Low	–	page 3-72
USB Subtab			
Input	• None • *Command* • Echo • RTCM 2.x • RTCM 3.x	–	page 3-72

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

Parameter	Values/Range	Units	Where to Find Description
Input	• CMR • JPS • Omni	–	page 3-72
Output	• *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 3-72

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

Parameter	Values/Range	Units	Where to Find Description
Period	*1*...86400	seconds	page 3-72
Ethernet Subtab			
IP Settings Area			
IP Address	0.0.0.0... *192.168.2.2*... 255.255.255.255	–	page 3-73
IP Mask	0.0.0.0... *255.255.255.192*... 255.255.255.255	–	page 3-73
Gateway	0.0.0.0... *192.168.2.1*... 255.255.255.255	–	page 3-73
Telnet Settings Area			
TCP Port	1...*8002*...65535	–	page 3-74
Timeout	1...*600*...2147483647	seconds	page 3-74
Network Password	• up to 15 a/n characters • *automatically generated unique value*	–	page 3-75
FTP Settings Area			
TCP Port	1...*21*...65535	–	page 3-74
Timeout	1...*600*...2147483647	seconds	page 3-74

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

Parameter	Values/Range	Units	Where to Find Description
TCP Subtab			
TCP A, TCP B, TCP C, TCP D, TCP E			
Input	• None • *Command* • Echo • RTCM 2.x • RTCM 3.x • CMR • JPS • Omni	–	page 3-75
Output	• *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		

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

Parameter	Values/Range	Units	Where to Find Description
Output	• 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 3-75
Period	*1*...86400	seconds	page 3-75

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	• *enabled* • disabled	–	page 3-76
Period	10...*1000* ...1000000000	milliseconds	page 3-77
Offset	-500000000… *0*…500000000	milliseconds	page 3-77

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

Parameter	Values/Range	Units	Where to Find Description
Offset	-500000…*0*…500000	nanoseconds	page 3-77
Period of ‘marked’ pulses	*0*...20...1000000000	milliseconds	page 3-77
Edge	• *Rise* • Fall	–	page 3-77
Ref. Time	• GPS • GLO • *UTCus* • UTCus	–	page 3-77
Tied with Ref. Time	• *enabled* • disabled	–	page 3-77
Event A Enabled and Event B Enabled Areas			
Event A Enabled or Event B Enabled	• enabled • *disabled*	–	page 3-78
Clock Synchronization	• enabled • *disabled*	–	page 3-78
Status	• on • *off*	–	page 3-78
Edge	• *Rise* • Fall	–	page 3-78
Ref. Time	• GPS • GLO • *UTCus* • UTCsu	–	page 3-77

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

Parameter	Values/Range	Units	Where to Find Description
Tied with Ref. Time	• *enabled* • disabled	–	page 3-77

Table B-11. Connection Parameters Settings – Advanced Tab

Parameter	Values/Range	Units	Where to Find Description
Anti-Interference Subtab			
Anti-Interference	• *Off* • GPS L1/L2 • GLONASS L1/ L2 • GPS/GLONASS L1 • GPS/GLONASS L2 • Auto	–	page 3-79
Multipath Reduction Subtab			
Code multipath reduction	• enabled • *disabled*	–	page 3-80
Carrier multipath reduction	• enabled • *disabled*	–	page 3-80
Loop Management Subtab			
PLL bandwidth	2...*25*...50	Hz	page 3-82

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

Parameter	Values/Range	Units	Where to Find Description
PLL order	• 2 • *3*	–	page 3-82
Guided loop bandwidth	0.1...*0.5*...10	Hz	page 3-82
C/A code guided loop bandwidth	0.1...*0.8*...50	Hz	page 3-82
Enable Adaptive Guided Loops	• *enabled* • disabled	–	page 3-82
Enable Co-Op Tracking Loop Area			
Enable Co-Op Tracking Loop	• enabled • *disabled*	–	page 3-83
Static Mode	• enabled • *disabled*	–	page 3-83
Bandwidth of individual PLL	2...*5*...20	Hz	page 3-83
Bandwidth of common PLL	2...*25*...50	Hz	page 3-83
Enable Common Loop for L2	• *enabled* • disabled	–	page 3-83
External Frequency Subtab			
Frequency Source Area			
Source	• *Internal* • External	–	page 3-84
Ext. frequency value	2...10...40	MHz	page 3-84

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

Parameter	Values/Range	Units	Where to Find Description
Ext. frequency source status	• off • wait • locked	–	page 3-85
Ext. freq. signal amplitude	• off • low • ok	–	page 3-85
Oscillator Offset Reduction Area			
Oscillator Offset Reduction	• *Off* • Freq. Locked • Freq. and Time Locked	–	page 3-85
Raw Data Management Subtab			
Raw Measurement Update Rate			
Update Rate	10...*100*...5000	milliseconds	page 3-87
Current Update Rate	• any integer value between 50?? and 5000	milliseconds	page 3-87
Position Update Rate			
Update Rate	10...*100*...5000	milliseconds	page 3-87
Current Update Rate	• any integer value between 50?? and 5000	milliseconds	page 3-87
Code smoothing interval	0...*300*...900	seconds	page 3-87

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

Parameter	Values/Range	Units	Where to Find Description
Doppler smoothing method	0, 1, *2*	–	page 3-88
Nominal Iono smoothing interval	0...*60*...900	seconds	page 3-88
Minimum Iono smoothing interval	0...*30*...900	seconds	page 3-88
Options Subtab			
Cinderella	• On • *Off*	–	page 3-88

Site Configuration Window

Table B-12 provides a list of settings that are available in the ***Site Configuration*** Window. The default value for a setting is shown in *Italic* (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 3-89
Antenna Status	• Fixed • Moving	–	page 3-89

Table B-12. Site Configuration Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Antenna Parameters Area			
Antenna Height	???	meters	page 3-89
Slant	• enabled • disabled	–	page 3-89
Antenna Type	list of antenna types	–	page 3-89
Send parameters automatically	• enabled • disabled	–	page 3-19, page 3-90

Target position Window

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

Table B-13. Target position Settings

Parameter	Values/Range	Units	Where to Find Description
Lat	90°00’00.000000’’N ... *0°00’00.000000”* ... 90°00’00.000000’’S	DD MM SS.ssssss	page 3-90
Lon	180°00’00.000000’’E ... *0°00’00.000000”* ... 180°00’00.000000’’W	DDD MM SS.ssssss	page 3-90

RFM96 Configuration Window

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

Table B-14. RFM96 Configuration Settings

Parameter	Values/Range	Units	Where to Find Description
Connect Tab			
Modem connected to port	• B • C • D	–	page 3-91
Connect to modem at bitrate	• Auto • 38400 • 19200 • 9600 • 4800 • 2400	bps	page 3-92
Connection type	• Search for modem • Power cycle	–	page 3-92
Configuration Tab			
RF Channel	• list of enabled channels • *0*	MHz	page 3-93

Table B-14. RFM96 Configuration Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
DTE-DCE Serial Interface Area			
Baud rate	• *38400* • 19200 • 9600 • 4800 • 2400	bps	page 3-93
Parity	• *None* • Even • Odd	–	page 3-93
EOT	0...*10*...255	–	page 3-93
Radio Link Settings Area			
Link rate	• 4800 • *9600*	bps	page 3-93
Retries	0...*3*...255	–	page 3-93
FEC	• *Off* • On	–	page 3-93
Scrambling	• Off • *On*	–	page 3-93
Digisquelch	• High • Moderate • *Low* • Off	–	page 3-93
CSMA monitor	• Off • *On*	–	page 3-93

Table B-14. RFM96 Configuration Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
DTE-DCE protocol mode Area			
DTE-DCE protocol mode	• Transp. w/EOT time out • Transp. w/EOT character • Packet • Auto-repeater • *Fast async*	–	page 3-93
BREAK to Command	• enabled • *disabled*	–	page 3-93
Addresses Area			
Local	*0*...254	–	page 3-93
Destination	0...*255*	–	page 3-93

Plots Configuration Window

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

Table B-15. Plots Configuration Settings

Parameter	Values/Range	Units	Where to Find Description
Point colors Area			
Standalone	color palette	–	page 3-120
Code differential	color palette	–	page 3-120
RTK float	color palette	–	page 3-120
RTK fixed	color palette	–	page 3-120
Position Area			
Time interval	1...360...99999999	seconds	page 3-121
Max. deviation	0.0...99999999.0	meters	page 3-121
Show grid	• enabled • disabled	–	page 3-121
Time step	1...30...99999999	seconds	page 3-121
Deviation step	0.0001...0.5... 99999999.0	meters	page 3-121
Scatter Area			
Plot width	0.0001...10.0... 99999999.0	meters	page 3-120
Tick interval	0.0001...1.0... 99999999.0	meters	page 3-120

Table B-15. Plots Configuration Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Show grid	• enabled • disabled	–	page 3-120
Connect points	• enabled • disabled	–	page 3-121
Standalone	• enabled • disabled	–	page 3-121
Code differential	• enabled • disabled	–	page 3-121
RTK float	• enabled • disabled	–	page 3-121
RTK fixed	• enabled • disabled	–	page 3-121
General Area			
Values to keep	3600...2678400	–	page 3-121

Converter to RINEX Setup Window

Table B-16 provides a list of settings that are available in the ***Converter to RINEX Setup*** Window. The default value for a setting is shown in *Italic* (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 2-23, page 3-30
Observer	any a/n characters	–	page 2-23, page 3-30
Agency	any a/n characters	–	page 2-23, page 3-30
Antenna #	any a/n characters	–	page 2-23, page 3-30
Antenna type	any a/n characters	–	page 2-23, page 3-30
Comment	any a/n characters	–	page 2-23, page 3-30
Marker name	any a/n characters	–	page 2-23, page 3-30
Marker number	any a/n characters	–	page 2-24, page 3-30
Converter Area			
Application	path to converter	–	page 2-24, page 3-30
Exclude GPS	• enabled • disabled	–	page 2-24, page 3-31

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

Parameter	Values/Range	Units	Where to Find Description
Exclude GLONASS	• enabled • disabled	–	page 2-24, page 3-31
Exclude L1	• enabled • disabled	–	page 2-24, page 3-31
Exclude L2	• enabled • disabled	–	page 2-24, page 3-31
Delete source JPS files after successful conversation	• enabled • disabled	–	page 2-24, page 3-31
Additional options	list of switches	–	page 2-24, page 3-31

<Datum ID> Datum Parameters Window

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

Table B-17. Datum Settings

Parameter	Values/Range	Units	Where to Find Description
Current Datum	• datum IDs list • *W84*	–	page 3-49
Reference Ellipsoid parameters Area			
Ellipsoid ID	two-letter IDs	–	page 3-49
Semi-major axis	6300000.0... *6378137.0000*... 6500000.0	meters	page 3-49
Inverse flattening	280.0… *298.257223563*... 310.0	–	page 3-49
Transformation parameters Area			
Reference Datum	• *W84* • P90	–	page 3-50
Translation dX	-10000.0... *0.0*... +10000.0	meters	page 3-50
Translation dY	-10000.0... *0.0*... +10000.0	meters	page 3-50

Table B-17. Datum Settings (Continued)

Parameter	Values/Range	Units	Where to Find Description
Translation dZ	-10000.0... *0.0*... +10000.0	meters	page 3-50
Rotation Rx	-60.0...*0.0*...60	seconds of arc	page 3-50
Rotation Ry	-60.0...*0.0*...60	seconds of arc	page 3-50
Rotation Rz	-60.0...*0.0*...60	seconds of arc	page 3-50
Scale	-1000.0...*0.0*...1000	ppm	page 3-50

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 only if you try to specify an incorrect recording interval. Once the Wizard is run, follow the on-screen instructions to adjust the typed values.

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.

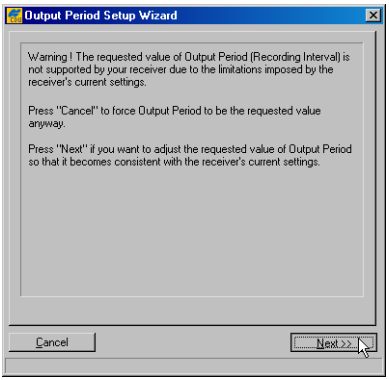


Figure C-1. Wizard's 1st Window

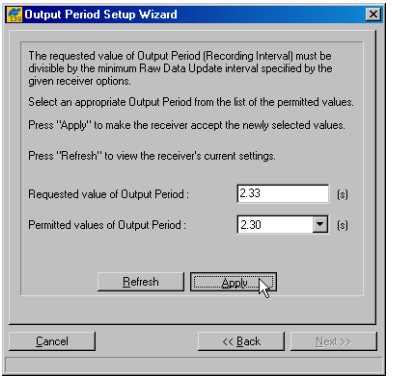


Figure C-2. Wizard's 2nd Window

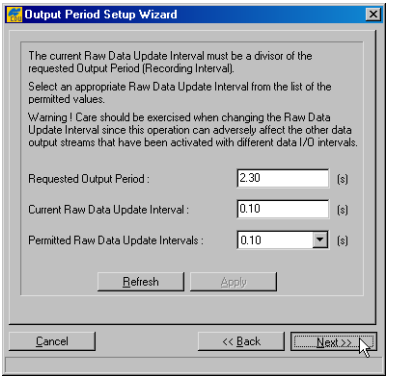


Figure C-3. Wizard's 3rd Window

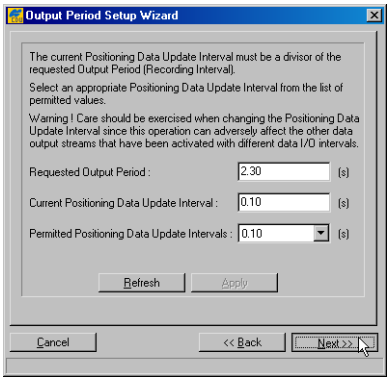


Figure C-4. Wizard's 4th Window

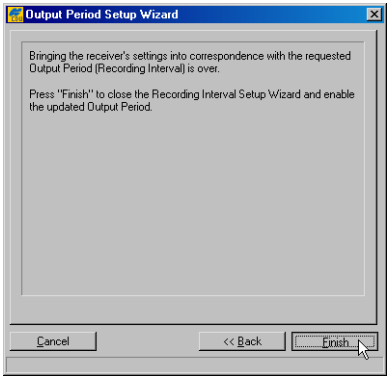


Figure C-5. Wizard's 5th Window

Notes:

Satellite Navigation Status Codes

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

Table D-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]

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

Code	Description
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
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

NOTICE

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.

Notes: