

GPS Pathfinder[®] Controller

Quick Reference Guide for Windows



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Revision A
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About This Manual

Welcome to the *GPS Pathfinder Controller Quick Reference Guide for Windows*. This manual describes how to install and use the Trimble GPS Pathfinder® Controller software on a Windows desktop computer or Windows CE device.

Even if you have used other Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product.

If you are not familiar with GPS, visit our website for an interactive look at Trimble and GPS at:

- www.trimble.com

Trimble assumes that you are familiar with Microsoft Windows and know how to use a mouse, select options from menus and dialogs, make selections from lists, and refer to online help.

Related Information

This section lists sources that provide other useful information.

- [ftp.trimble.com](ftp://ftp.trimble.com) – use the Trimble FTP site to send files or to receive files such as software patches, utilities, service bulletins, and FAQs. Alternatively, access the FTP site from the Trimble web site at www.trimble.com/support/support.htm.
- Trimble training courses – consider a training course to help you use your GPS system to its fullest potential. For more information, visit the Trimble website at www.trimble.com/support/training.htm

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local Distributor*. Alternatively, request technical support using the Trimble website at:

- www.trimble.com/support/support.htm

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Your feedback about the supporting documentation helps us to improve it with each revision. To forward your comments, do one of the following:

- Send an e-mail to ReaderFeedback@trimble.com.
- Complete the Reader Comment Form at the back of this manual and mail it according to the instructions at the bottom of the form.

If the Reader Comment Form is not available, send comments and suggestions to the address in the front of this manual. Please mark the information *Attention: Technical Publications Group*.

Document Conventions

The document conventions are as follows:

Convention	Definition
<i>Italics</i>	Identifies software menus, menu commands, dialog boxes, and the dialog box fields.
Helvetica Bold	Identifies a software command button, or represents information that you must type in a software screen or window.
"Select <i>Italics</i> / <i>Italics</i> "	Identifies the sequence of menus, commands, or dialog boxes that you must choose in order to reach a given screen.

Introduction

The GPS Pathfinder® Controller software is designed to allow you to control a range of Trimble GPS receivers. The program will run on a range of platforms including:

- Handheld PC Professional (H/PC Pro) running Microsoft Windows CE version 2.11
- Pocket PC running Microsoft Windows CE version 3.00
- Microsoft Windows 95
- Microsoft Windows 98
- Microsoft Windows 2000
- Microsoft Windows NT

The GPS Pathfinder Controller software supports the following GPS receivers:

- GPS Pathfinder Pocket
- GPS Pathfinder Pro XRS
- GPS Pathfinder Pro XR
- GPS Pathfinder XRS
- GPS Pathfinder XR

Installation

The installation procedure for Windows CE devices differs from the procedure for other computers. Please read the appropriate section before you attempt to install the GPS Pathfinder Controller software.

Windows 95/98/2000/NT Installation

To install the GPS Pathfinder Controller software on a computer running Windows 95, 98, NT, or 2000, simply run the installation program that you downloaded from the Trimble website. In Windows Explorer, go to the folder where you saved the GPS Pathfinder Controller Desktop.exe file. Double-click this file to run the installation program. Follow the installation dialogs and enter appropriate details when necessary.

Windows CE Installation

To install the GPS Pathfinder Controller software on a Windows CE device, you will need the following:

- A supported Windows CE device
- A desktop computer with:
 - Windows 95, 98, 2000, ME, or NT installed
 - Microsoft ActiveSync installed and a connection established between the desktop computer and the Windows CE device, using the ActiveSync software.
- One of the following connections between the desktop computer and the Windows CE device:
 - Serial cable
 - Cradle
 - Infrared
 - Modem
 - Network card

For information on connecting your Windows CE device to your office computer by one of the above methods, refer to the documentation for your Windows CE device.

ActiveSync

Microsoft ActiveSync is a program that lets you exchange information between your office computer and a Windows CE device. You use ActiveSync whenever you install software on the Windows CE device, move or copy files to or from the Windows CE device, and synchronize data between your office computer and the Windows CE device. Your Windows CE device should be supplied with the ActiveSync software. If you do not have ActiveSync, you can download it from the Microsoft website, www.microsoft.com.

Installing the GPS Pathfinder Controller Software

To install the GPS Pathfinder Controller software:

1. Connect the Windows CE device to the desktop computer.
2. Make sure that the Windows CE device and the desktop computer are switched on.

If an ActiveSync partnership for these two computers exists, ActiveSync starts and the desktop computer connects to the Windows CE device automatically. If there is no partnership, or the computers do not connect, you may need to install or set up ActiveSync on your desktop computer. For more information, refer to the documentation for your Windows CE device.

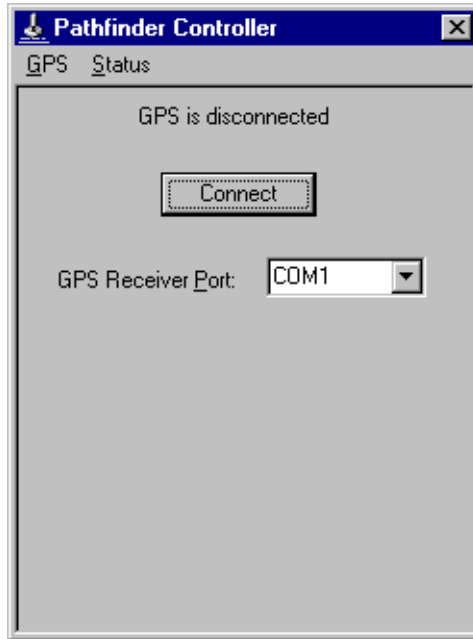
When the two computers are connected, the *Microsoft ActiveSync* window appears and displays the message Connected.

3. Go to the location where you saved the GPS Pathfinder Controller installation file and double-click on the file.
4. Follow the installation dialogs and enter appropriate details when necessary.

Basics of Operation

The GPS Pathfinder Controller software is based around two menus: the *GPS* menu and the *Status* menu. It also includes three dialogs, which can be opened from the *GPS* menu, and a status screen, which displays different information depending on the option that is selected from the *Status* menu.

When you first start the GPS Pathfinder Controller software, the status screen contains only the **Connect** button and the *GPS Receiver Port* field:



Click **Connect** to establish a connection with the GPS receiver.



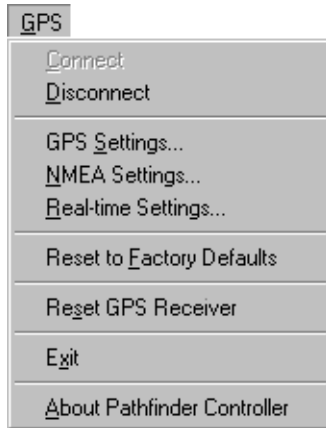
Tip – The *GPS* menu also contains *Connect* and *Disconnect* commands for establishing and ending a connection to the receiver.

Use the *GPS Receiver Port* field to specify the port on the computer or CE device that the GPS receiver is connected to.

Once a connection to a receiver is established, the *GPS Status* screen appears.

GPS Menu

The following commands are available from the *GPS* menu:



Connect

Use the *Connect* command to establish a connection with a GPS receiver. If the GPS receiver is already connected, this command is not available. When you connect to the GPS receiver, the settings from the GPS Pathfinder Controller software will be sent to the GPS receiver to configure its operation.

Disconnect

Use the *Disconnect* command to disconnect the GPS Pathfinder Controller software from the GPS receiver. If the GPS receiver is already disconnected, this command is not available.

GPS Settings

Select *GPS Settings* to open the *GPS Settings* dialog. For more information, see GPS Settings Dialog, page 12.

NMEA Settings

Select *NMEA Settings* to open the *NMEA Settings* dialog. For more information, see NMEA Settings Dialog, page 14.

Real-time Settings

Select *Real-time Settings* to open the *Real-time Settings* dialog. For more information, see Real-Time Settings Dialog, page 16.

Reset to Factory Defaults

Select *Reset to Factory Defaults* to restore the GPS Pathfinder Controller software to its default settings. This causes the receiver to disconnect from the GPS Pathfinder Controller software and then reconnect again.

Reset GPS Receiver

Select *Reset GPS Receiver* to perform a reset of the GPS receiver. You are asked to confirm that you want to reset the receiver. A reset clears the receiver memory, deleting the almanac and any configuration data, and returns the receiver to its default state.

Exit

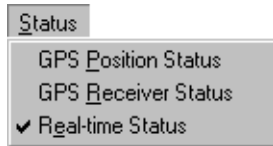
Select *Exit* to close the GPS Pathfinder Controller software.

About Pathfinder Controller

Select *About Pathfinder Controller* to open the *About* dialog. This dialog displays version and copyright information about the GPS Pathfinder Controller software.

Status Menu

The following commands are available from the *Status* menu:



GPS Position Status

Select this command to display the *GPS Status* screen. For more information, see *GPS Status Screen*, page 23.

GPS Receiver Status

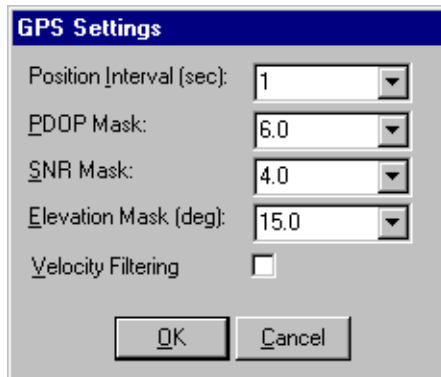
Select this command to display the *GPS Receiver Status* screen. For more information, see *GPS Receiver Status Screen*, page 25.

Real-time Status

Select this command to display the *Real-time Status* screen. For more information, see *Real-Time Status Screen*, page 27.

GPS Settings Dialog

The *GPS Settings* dialog contains parameters that you can configure, which relate to the GPS receiver that you have connected to your computer or Windows CE device.



Position Interval

Use this field to specify the time intervals between positional data being output by the GPS receiver.

Note – You cannot configure the position interval of a GPS Pathfinder Pocket receiver when the receiver is configured to output TSIP positional data.

PDOP Mask

Use this field to set the PDOP mask. A low PDOP indicates that the visible satellites are widely separated in the sky, which allows better position information to be recorded. When the PDOP value rises above the PDOP mask, the GPS receiver stops generating positional data until the PDOP value falls below the PDOP mask.

SNR Mask

Use this field to set the SNR mask. The SNR value is used to determine whether the signal strength of each satellite is sufficient for that satellite to be used by the GPS receiver. If a satellite's SNR is below the SNR mask, it is not used to compute positions.

Elevation Mask

Use this field to set the elevation mask. Use the elevation mask to allow the GPS receiver to only use those satellites above a specified elevation in the sky. The GPS receiver does not use satellites below the set elevation mask to compute positions.

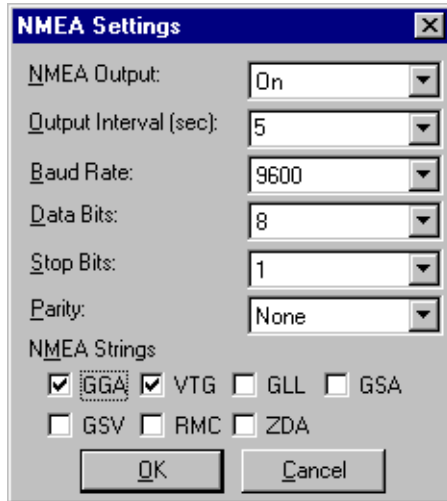
Velocity Filtering

Use this check box to enable or disable the velocity filter. Velocity filtering smooths the positions from the GPS receiver as they are generated, using velocity information. This filter reduces the effects of multipath on positions computed by the GPS receiver.

Note – This check box is only available if the connected receiver is a GPS Pathfinder Pocket receiver. You cannot configure velocity filtering for other receivers.

NMEA Settings Dialog

The *NMEA Settings* dialog contains settings relating to the output of NMEA messages. The NMEA standard, developed by the National Marine Electronics Association, defines a format for communicating data collected or computed by the GPS receiver to external devices



NMEA Output

Use this field to enable or disable NMEA output. When On is selected, NMEA messages are generated by the receiver, and the remaining fields in the dialog appear. When Off is selected, TSIP data is generated, and the *NMEA Output* field is the only field in the dialog.

Note – The following fields are only available if the *NMEA Output* field is set to On.

Output Interval (sec)

Use this field to specify the rate at which NMEA messages are generated.

Baud Rate

Use this field to specify the baud rate the GPS receiver and external source communicate at. The default value is 9600.

Data Bits

Use this field to specify the number of data bits used when the external correction source and GPS receiver communicate. The default value is 8.

Stop Bits

Use this field to specify the number of stop bits used when the external correction source and GPS receiver communicate. The default is 1.

Parity

Use this field to specify the parity setting used when the GPS receiver and external source communicate. The default value is None.

If you want to use NMEA messages and an external real-time source at the same time, the port settings must match. Because you can configure port settings either in the *NMEA Settings* dialog or in the *External* tab of the *Real-time Settings* dialog, you can define conflicting port settings. If this happens, the software displays a message warning you of the conflict, and then automatically updates the port settings to use the values that you just set.

*Note – A GPS Pathfinder Pocket receiver does **not** require matching port settings. If you configure the receiver with different settings for NMEA messages and real-time input, the software does not display a warning or automatically change settings.*

Check boxes

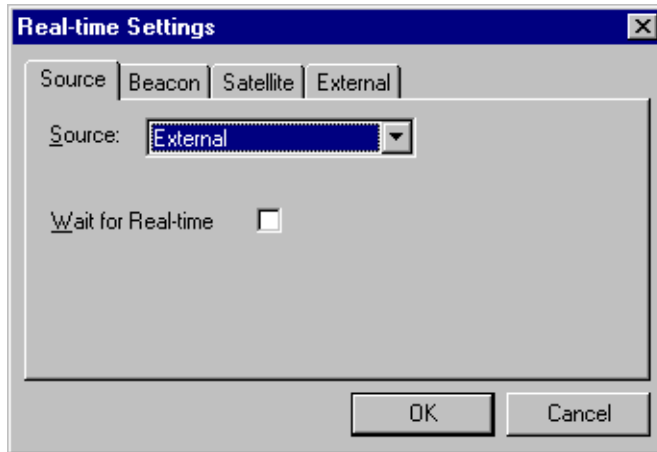
At the bottom of the NMEA Settings dialog is a check box for each NMEA message type that you can configure. Select a check box to generate messages of that type.

Real-Time Settings Dialog

The *Real-time Settings* dialog contains tabs where you can configure settings that control which sources of real-time differential GPS you use, if any, and how your system communicates with each source. The dialog contains four tabs, which are described in the following sections.

Source Tab

The *Source* tab contains fields for selecting a real-time correction source:



Source

Use this field to configure the real-time source that you want to use. There are four options in the *Source* field:

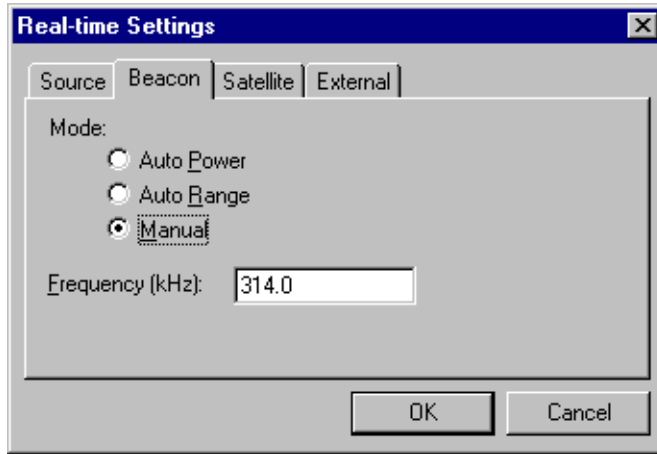
- Use Uncorrected GPS – Log autonomous GPS positions without applying real-time corrections.
- Integrated Beacon – Use corrections from a beacon.
- Integrated Satellite – Use corrections from a satellite differential service.
- External – Use an external correction source such as a Trimble TRIMTALK™ radio.

Wait for Real-time

When this check box is selected, and no real-time corrections are available, the GPS receiver suspends the output of GPS positions until a real-time correction source becomes available. When this check box is cleared, the GPS receiver defaults to using uncorrected GPS positions if the real-time GPS correction source fails.

Beacon Tab

The *Beacon* tab contains fields for configuring and using a beacon signal for real-time GPS:



Note – You can only select this tab if the selected real-time source is *Integrated Beacon*.

Mode

Use these options to specify the radiobeacon signal tracking mode to operate the integrated beacon in. The options are:

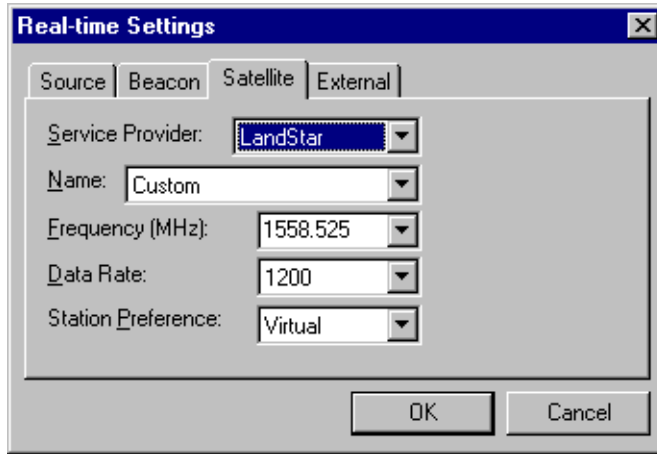
- *Auto Power* – the receiver tracks and locks on to the most powerful radiobeacon signal.
- *Auto Range* – the receiver tracks the nearest radiobeacon signal.
- *Manual* – the receiver tracks only the frequency you specify in the *Frequency* field.

Frequency

Use this field to specify the frequency used with the *Manual* option. This field is only available if the *Manual* option is selected.

Satellite Tab

The *Satellite* tab contains fields for configuring and using a satellite correction service for real-time GPS:



Note – You can only select this tab if the selected real-time source is *Integrated Satellite*.

Service Provider

Use this field to select the satellite differential service provider. The options are:

- OmniSTAR
- LandStar
- None

Name

Use this field to select the satellite used for satellite differential corrections.

Frequency

Use this field to specify the frequency used when you select Custom from the *Name* field.

Data Rate

Use this field to specify the data rate used when you select Custom from the *Name* field.

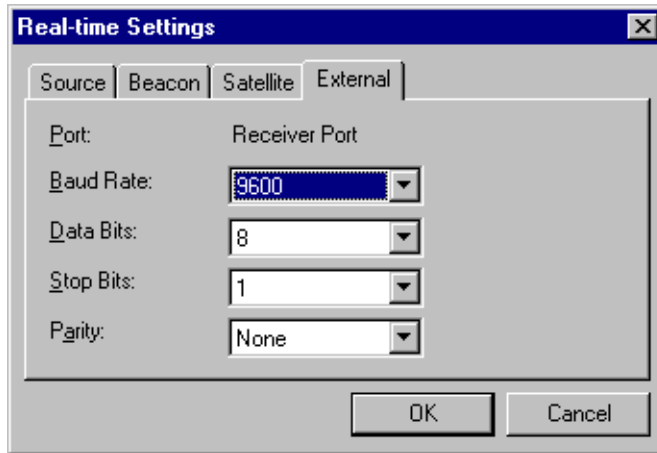
Station Preference

Use this field to specify your preferred reference station type when you select Custom from the *Name* field. The options are:

- Virtual – a position that is calculated from the center of the reference station network. It provides a reference position based on the approximate position of your roving receiver.
- Closest – the nearest reference station position. This may be an actual reference station, a calculated reference position (a “cell”), or the center of the reference station network.

External Tab

The *External* tab contains fields for configuring and using an external source for real-time GPS corrections:



Note – You can only select this tab if the selected real-time source is *External*.

Port

The *Port* field is used to remind you to connect the external correction source to a port on the receiver, not on the computer or Windows CE device. This field is read-only.

Baud Rates

Use this field to specify the baud rate the GPS receiver and external source communicate at. The default value is 9600.

Data Bits

Use this field to specify the number of data bits used when the external correction source and GPS receiver communicate. The default value is 8.

Stop Bits

Use this field to specify the number of stop bits used when the external correction source and GPS receiver communicate. The default value is 1.

Parity

Use this field to specify the parity setting used when the GPS receiver and external source communicate. The default value is None.

If you want to use NMEA messages and an external real-time source at the same time, the port settings must match. Because you can configure port settings either in the *NMEA Settings* dialog or in the *External* tab of the *Real-time Settings* dialog, you can define conflicting port settings. If this happens, the software displays a message warning you of the conflict, and then automatically updates the port settings to use the values that you just set.

Note – A *GPS Pathfinder Pocket receiver* does **not** require matching port settings. If you configure the receiver with different settings for NMEA messages and real-time input, the software does not display a warning or automatically change settings.

GPS Status Screen

This screen displays information about the GPS satellites being tracked:



The *GPS Status* screen contains the following fields:

Status

The *Status* field shows one of the following messages:

- Too few satellites – the GPS receiver has acquired satellites, but too few to compute a position in the current position mode.
- Poor satellite geometry – the current PDOP value is greater than the PDOP mask, so the GPS receiver is not computing GPS positions.

- Calculating positions – the receiver is computing GPS position fixes. The current satellite constellation is therefore acceptable.
- Antenna is not connected – the antenna is not currently connected to the GPS receiver.
- Waiting for real-time – the configured real-time source is not available, and the receiver has been configured to suspend logging until real-time corrections are received.

Type

This field displays the type of GPS position being calculated by the GPS receiver. There are two possible messages:

- Uncorrected
- Real-time corrected

Number of Satellites

This field displays the number of satellites currently being tracked and used by the GPS receiver.

PDOP

This field displays the PDOP value for the current satellite constellation.

GPS Time

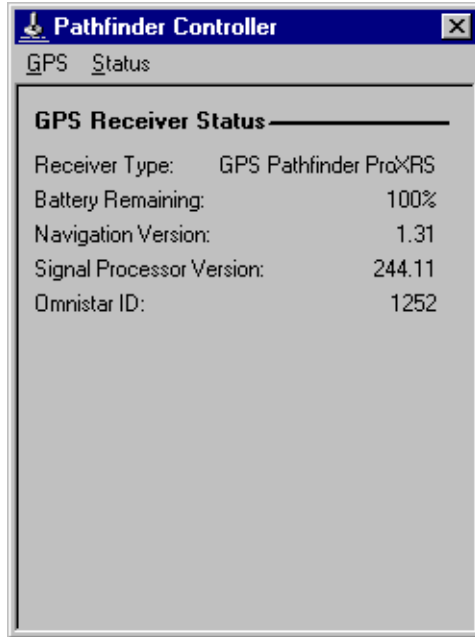
This field displays the current GPS time, which is based on UTC/GMT time.

Position

The fields in this group show the current latitude and longitude with reference to the WGS-84 datum, and the current altitude as height above ellipsoid (HAE).

GPS Receiver Status Screen

This screen displays information about the status of the connected GPS receiver:



The *GPS Receiver Status* screen contains the following fields:

Receiver Type

This field displays the name of the receiver model currently connected to the device running the GPS Pathfinder Controller software.

Battery Remaining

This field displays the current level of charge in the GPS receiver's battery, if available. This value is displayed as a percentage remaining.

Navigation Version

This field displays the version number of the navigation firmware installed in the connected GPS receiver.

Signal Processor Version

This field displays the version number of the signal processing firmware installed in the connected GPS receiver.

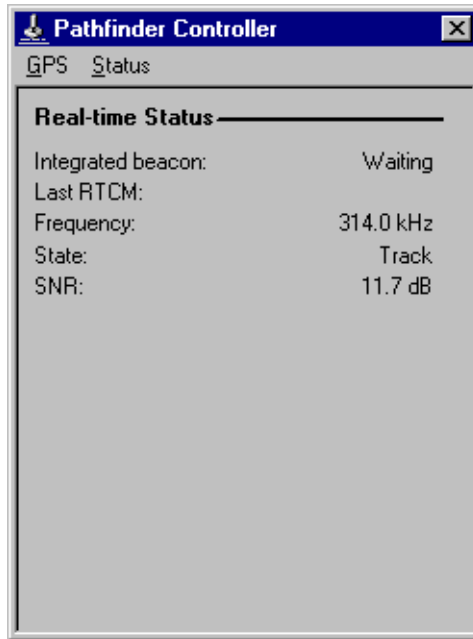
OmniSTAR/LandStar ID

This field displays the activation code for the OmniSTAR or LandStar satellite differential service. You need this code when contacting your OmniSTAR or LandStar provider for activation.

Note – This field only appears if satellite real-time corrections are supported by the connected receiver.

Real-Time Status Screen

This screen displays information about the status of the real-time correction source:



The first line on the *Real-time Status* screen varies depending on what you currently have configured for the real-time source. It may show:

- Integrated beacon
- Integrated satellite
- External source

To the right of the source, one of the following messages appears:

- In Use – this source is being used for real-time corrections.
- Waiting – this source is currently inoperable but is being monitored. No real-time corrections are being applied.
- Not Supported – the currently connected receiver does not support this real-time source.

If no real-time source is configured, the message None selected: Uncorrected GPS only appears, and all other fields are hidden.

Last RTCM

This field displays the time, in seconds, since the last RTCM message was received by the GPS receiver.

Note – This field is not supported by the GPS Pathfinder Pocket receiver.

Frequency

This field displays the frequency the current real-time source is tracking or is locked onto.

State

This field shows the real-time operating status of the GPS receiver. Possible state values are:

- Search
- Lock
- On
- Track
- Idle
- Off

SNR

This field displays the signal-to-noise ratio (SNR) of the real-time source.

Note – The following fields only appear if the selected real-time source is Integrated satellite.

Service Provider

This field displays the name of the satellite differential service provider that the satellite in use belongs to.

User Access

This field indicates whether the selected correction service has been enabled for the GPS receiver. The possible values are:

- Enabled – the service is enabled.
- Disabled – the activation has expired.

Decoder State

This field displays the current status of the OmniSTAR or LandStar activation for the GPS receiver. The possible values are:

- Initializing (0-4)
- Initializing (5)
- Initializing (6)
- Receiving Corrections
- No recent data
- Decoder unavailable
- Decoder reset
- Invalid link
- Invalid region
- Update required
- No offshore permitted

Expiration

This field displays the date on which the satellite differential service subscription expires, or the time remaining until the subscription expires.

A

NMEA Messages

NMEA output is available from Trimble GPS receivers. The NMEA standard, developed by the National Marine Electronics Association, defines a format for communicating data collected or computed by the GPS receiver to external devices. This appendix describes the NMEA messages that can be configured from the GPS Pathfinder Controller software.

All messages conform to the NMEA-0183 Version 2.0 format. All begin with \$ and end with a carriage return and a line feed. Data fields follow comma (,) delimiters and are variable in length. Null fields still follow a comma delimiter but contain no information.

The optional checksum field is the last field in a message and follows the asterisk (*) delimiter. The checksum is the 8-bit *exclusive* OR of all characters in the message, including the commas, between but not including the \$ and asterisk delimiters. The hexadecimal result is converted to two ASCII characters (0–9, A–F). The most significant character appears first.

For an example of an NMEA message, see Common Message Elements, page 32.

Supported NMEA Messages

The supported messages are:

- GGA: Time-, position-, and fix-related data.
- GLL: Position fix, time of position fix, and status.
- GSA: GPS receiver operating mode, SVs used for navigation and DOP values.
- GSV: Number of visible SVs, PRN numbers, elevation, azimuth, and SNR values.
- RMC: Recommended minimum specific GPS/TRANSIT data.
- VTG: Actual track made good and speed over ground.
- ZDA: UTC day, month, year, and local time zone offset.

Common Message Elements

Each message consists of:

- A message ID consisting of *\$GP* followed by the message type. For example, the message ID of the ALM message is *\$GPALM*.
- A comma.
- A number of comma-separated fields, which depend on the message type.
- An asterisk.
- A checksum.

Here is an example of a simple message with six fields plus the message ID and checksum:

```
$GPZDA,004405.25,30,09,1994,00,00*6B
```

Latitude and Longitude

Latitude is represented as *ddmm.mmmm* and longitude is represented as *dddmm.mmmm*, where:

- *dd* or *ddd* is degrees
- *mm.mmmm* is minutes and decimal fractions of minutes

Direction

Direction—north, south, east, or west—is represented by a single character: *N*, *S*, *E*, or *W*.

Time

Time values are presented in Universal Time Coordinated (UTC) and are represented as *hhmmss*, where:

- *hh* is hours, from 00 to 23
- *mm* is minutes
- *ss* is seconds

Messages

The following NMEA-0183 messages can be produced.

GGA: Time-, Position-, and Fix-Related Data

\$GPGGA,004407.00,3723.477595,N,12202.251222,W,2,07,1.2,19.1,
M,-25.7,M,3,0003*55

The fields include:

- UTC of position fix
- Latitude
- Direction of latitude (N or S)
- Longitude
- Direction of longitude (E or W)
- GPS quality indicator:
 - 0 = fix not valid
 - 1 = GPS fix
 - 2 = Differential GPS fix
- Number of SVs in use, 00 to 12
- HDOP
- Antenna height, MSL reference
- *M* is fixed text indicating that altitude is measured in meters
- Geoid separation
- *M* is fixed text indicating that geoid separation is measured in meters
- Age of differential GPS data record, Type 1 or Type 9, null when DGPS not used
- Reference station ID, 0000 to 1023, null when *any reference station ID* is selected and no corrections have been received

GLL: Position Fix, Time of Position Fix, and Status

\$GPGLL,3723.477595,N,12202.251222,W,004407.00,A*1E

The fields include:

- Latitude
- Direction of latitude (N or S)
- Longitude
- Direction of longitude, (E or W)
- UTC of position
- Status: Fixed text A, indicates that data is valid

GSA: GPS Receiver Operating Mode, SVs used for Navigation, and DOP Values

\$GPGSA,A,3,25,15,01,14,29,21,20,,,,,1.9,1.2,1.5*30

The fields include:

- Fix Mode:
 - M = Manual, forced to operate in 2D or 3D
 - A = Automatic, 3D/2D
- Fix Status:
 - 1 = Fix not available
 - 2 = 2D
 - 3 = 3D
- Fields 3 to 14 = PRNs of SVs used in position fix (null for unused fields)
- Field 15 = PDOP
- Field 16 = HDOP
- Field 17 = VDOP

GSV: Number of Visible SVs, PRN Numbers, Elevation, Azimuth, and SNR Values

\$GPGSV,2,1,08,01,32,054,47,14,33,308,45,15,61,261,
52,20,07,054,41*7F

The fields include:

- Total number of messages of this type in this cycle
- Message number
- Total number of visible satellites
- SV PRN number
- Elevation in degrees, 90
- Azimuth, degrees from true north, 000
- SNR (C/N_0) 00 to 99 dB, null when not tracking
- 8 to 11 = Information about second SV, same format as fields 4 to 7
- 12 to 15 = Information about third SV, same format as fields 4 to 7
- 16 to 19 = Information about fourth SV, same format as fields 4 to 7

RMC: Recommended Minimum Specific GPS/TRANSIT Data

\$GPRMC,004407.00,A,3723.477595,N,12202.251222,W,1.2,7.4,071
196,2.0,E*hh

The fields include:

- UTC of position
- Status: Fixed text A, indicates that data is valid
- Latitude
- Direction of latitude (N or S)
- Longitude
- Direction of longitude (E or W)
- Speed over ground in knots
- Track made good in degrees True
- UT date
- Magnetic variation degrees (Easterly var. subtracts from true course)
- E or W
- Checksum

VTG: Actual Track Made Good and Speed Over Ground

\$GPVTG,7.4,T,,000.1,N,000.1,K*2E

The fields include:

- Track made good
- Fixed text T indicates that track made good is relative to true north
- Fields 3 and 4 are null, not used
- Speed over ground in knots
- Fixed text N indicates that speed over ground is in knots
- Speed over ground in kilometers per hour (km/h)
- Fixed text K indicates that speed over ground is in km/h

ZDA: UTC Day, Month, Year, and Local Time Zone Offset

\$GPZDA,004405.25,30,09,1994,00,00*6B

The fields include:

- Time, in UTC
- Day, 01 to 31
- Month, 01 to 12
- Year
- Local time zone offset from GMT, 00 to 23
- Local time zone offset from GMT in minutes

Together, fields 5 and 6 yield the total offset. For example, if field 5 is -5 and field 6 is -15, local time is 5 hours and 15 minutes earlier than GMT.

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