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DSM™ 132/132RS Receiver

User Guide

Version 1.73
Revision A
Part Number 50979-00-ENG
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– Reorient or relocate the receiving antenna.
– Increase the separation between the equipment and the receiver.
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
– Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

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CHAPTER

1

Welcome

This manual describes how to install and configure the DSM™ 132 receiver. It provides guidelines for using the AgRemote utility to view and configure receiver DGPS and communication operating parameters. The manual also provides guidelines for connecting the receiver to a variety of external devices, information about NMEA messages supported by the receiver, and pin-out diagrams for data cable connections.

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, go to the Trimble website (www.trimble.com) for an interactive look at Trimble and GPS.

Related Information

Other sources of related information are:

- Release notes – the release notes describe new features of the product, information that is not included in the manuals, and any changes to the manuals. You can download release notes from the Trimble website.

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, ***contact your local dealer.*** Alternatively, do one of the following:

- Request technical support using the Trimble website at www.trimble.com/support.html

Your Comments

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CHAPTER

2

Overview

In this chapter:

- Introduction
- The DSM 132 Receiver
- Differential GPS (DGPS)

Introduction

This chapter describes the DSM 132 receiver and gives an overview of GPS, DGPS, and related information. For details of the receiver physical specifications, see Appendix E, Specifications.

The DSM 132 Receiver

The DSM 132 receiver combines high-performance GPS reception with a DGPS-capable receiver in a lightweight, durable, waterproof housing. The DSM 132 receiver also contains technology which enables WAAS/EGNOS, OmniSTAR, Thales, or Coast Guard Beacon (MSK) real-time differential capabilities. See Figure 2.1.

When the connections described above are not available, the DSM 132RS receiver has the capability to be used as a base station for the generation of Differential GPS (DGPS) corrections. A radio link is needed to broadcast the corrections to rover DSM 132 units.

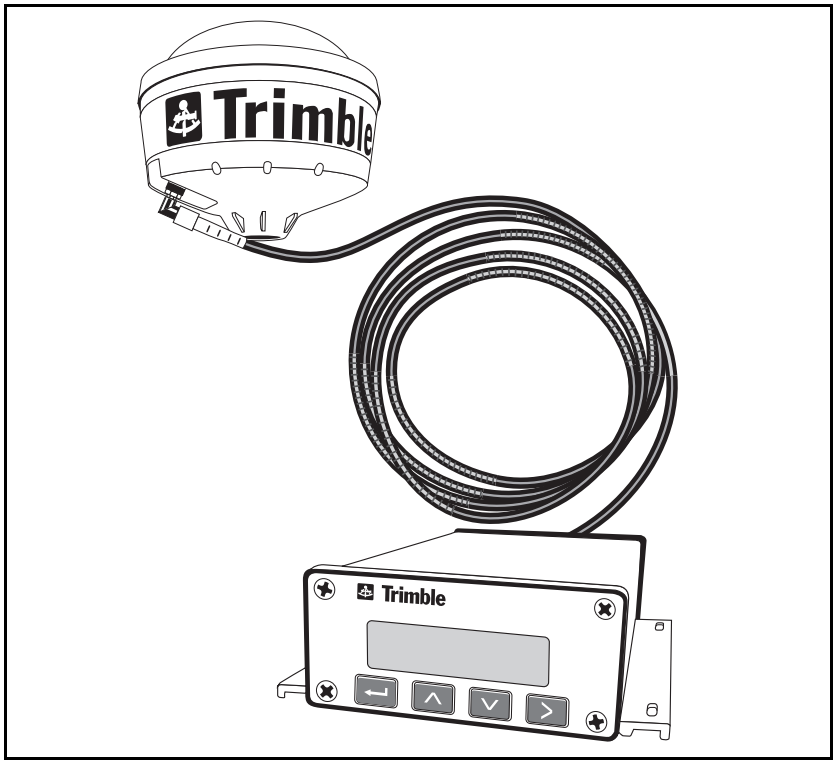


Figure 2.1 DSM 132 receiver

As part of a marine construction or survey system, the receiver provides submeter (less than 3.28 ft) precision whenever differential corrections are applied. You can use a 1 PPS (pulse per second) strobe signal to synchronize time for logging event markers when you are using external instruments.

You can use the receiver with a variety of marine survey equipment, including office software such as HYDROpro™, which also interfaces with echo sounders and magnetometers, for use on waterborne projects.

Standard features

A standard DSM 132 system provides:

- 12-channel L1 1575.42 MHz (C/A code) GPS receiver with carrier phase filtering
- Combined L1 GPS, Satellite differential, and beacon antenna
- L-Band satellite differential correction capable receiver

  Note – *For the DSM 132 to operate with the L-Band corrections, the client must subscribe to a satellite differential service.*
- Dual-channel digital medium frequency beacon receiver
- EVEREST™ technology for multipath rejection (firmware version 1.73 and greater)
- Differential correction input from other RTCM SC-104 sources
- WAAS (U.S.A.) and EGNOS (Europe) differential capable
- Sub-meter differential accuracy
- 2 line, 16 character liquid crystal display
- 4 button keyboard
- 1, 2, 5, and 10 Hz (10 positions per second) output messages
- Operation manual
- 15m antenna cable
- GPS receiver to PC cable
- Magnetic mount for antenna
- Two programmable RS-232 serial ports:
  - NMEA-0183 output
  - RTCM SC-104 input
  - TSIP I/O
  - Baud Rate 2400-38400
  - 1 PPS (pulse per second) output

Standard Features DSM 132RS

A DSM 132RS system provides all the features of the DSM 132 except:

- the L1 Geodetic antenna with ground plane is supplied
- the 30 meter antenna cable is supplied
- the RTCM SC-104 output (base station corrections) is available

Receiver enhancements

Table 2.1 lists the receiver options that you can purchase with the DSM 132 receiver.

Table 2.1 Receiver enhancement options

Option (PN)	Description	Use
Differential Base Station (36429-30)	Outputs RTCM differential corrections. (This option is installed in the DSM 132RS.)	If a radio link is attached, enables the receiver to broadcast corrections for use by other DGPS receivers. This provides submeter positioning.
EVEREST Technology (36429-20)	Reduces multipath interference. (This option is installed in receivers with firmware version 1.73 and greater.)	Improves DGPS receiver accuracy.
RTS/CTS Flow Control Negotiation (36429-50)	Provides hardware flow control	When attached to third-party modems, provides RTS/CTS flow control for correct operation.

Receiver input / output

The DSM 132 standard power/data cable (PN 30945) connects to the receiver ports to supply power. It also enables the following data exchanges:

- ASCII, TSIP, and RTCM input from an external device.

  The receiver is able to receive ASCII data from an external device, convert this data into an NMEA message, and export that message to another device. TSIP command packets configure and monitor GPS and DGPS parameters. The receiver is also able to accept RTCM data from an external device, such as a pager.

- RTCM, TSIP, and NMEA to an external device.

  The receiver is able to output RTCM in base station mode (requires the base station option). When you are using an external radio, it can also receive DGPS corrections. TSIP is input/output when communicating with HYDROpro. NMEA is output when the receiver is exporting GPS position information to an external device or navigation software.

  For more information on the NMEA (National Marine Electronics Association) and RTCM (Radio Technical Commission for Maritime Services) communication standard for GPS receivers, go to the following websites:

  – www.nmea.org

  – www.rtcm.org

- 1 PPS output

  To synchronize timing between external instruments and the receiver's internal clock, either one of the connection ports outputs a strobe signal at 1 PPS (pulse per second). To output this signal, the receiver must be tracking satellites and computing GPS positions.

Differential GPS (DGPS)

The DSM 132 receiver uses DGPS to achieve high accuracy. You can have a DSM 132RS (this is called the reference or base station) located at a known point. This receiver is used to determine GPS signal measurement errors. One or more mobile receivers (called rovers) collect data at unknown locations, while remaining within range of the reference station. The reference station broadcasts correction values, which are applied to the receiver positions. In this way, errors common to the reference and rover receivers are corrected.

For more information about DGPS and the different DGPS signals available, visit the Trimble website (www.trimble.com/gps/dgps.html).

Sources of GPS error

Autonomous (GPS only) horizontal accuracy for the Trimble DSM 132 receiver ranges from approximately 2–9 meters (about 6–30 ft).

The errors that cause this reduced accuracy are produced mainly by atmospheric conditions, multipath error (that is, GPS signals bouncing off objects before reaching the antenna), and electronic or GPS frequency noise interference.

DGPS removes most of the errors caused by atmospheric conditions, errors which are further minimized by the advanced design of the DSM 132 receiver. For more information, see the section on *Error Correction* on the Trimble website at www.trimble.com/gps/errors1.html

DGPS accuracy

Submeter accuracy from the DSM 132 receiver utilizing differential correction is best achieved under the conditions described in Table 2.2.

Table 2.2 DGPS accuracy

Condition	Optimum Value	Description
Number of satellites used	> 5	To calculate a 3D position (latitude and longitude, altitude, and time), four or more satellites must be visible. To calculate a 2D position (latitude and longitude, and time), three or more satellites must be visible. The number of visible satellites constantly changes and is typically in the range 5–9. The DSM 132 receiver can track up to 12 satellites simultaneously. ***Note –*** *To see when the maximum number of GPS satellites are available, use the Quickplan utility and a current ephemeris (satellite history) file. Both files are available free from: www.trimble.com/support_trl.asp?Nav=Collection-3627*
Maximum PDOP	< 4	Position Dilution of Precision (PDOP) is a unitless, computed measurement of the geometry of satellites above the receiver's current location. ***Note –*** *In some agricultural applications that do not require high accuracy, a maximum PDOP of 12 or more can be used.*
Signal to Noise Ratio	> 6	Signal-to-Noise ratio (SNR) is a measure of the satellite signal strength against electrical background noise. A high SNR gives better accuracy.
Minimum Elevation	> 7.5	Satellite that are low on the horizon typically produce weak and noisy signals and are more difficult for the receiver to track. Satellites below the minimum elevation angle are not tracked.
Multipath environment	Low	Multipath errors are caused when GPS signals are reflected off nearby objects and reach the receiver by two or more different paths. The receiver incorporates the EVEREST multipath rejection option.
RTCM-compatible corrections		These corrections are broadcast from a DSM 132RS or equivalent reference station.

Position Output

Geographic data obtained from different sources must be referenced to the same datum, ellipsoid, and coordinate format. Different formats provide different coordinate values for any geographic location. In North America, the datums NAD-27 and NAD-83 are commonly used in marine applications.

The DSM 132 receiver outputs position coordinates in several datums and ellipsoids depending on the source of DGPS being used. See Table 2.3.

Table 2.3 DGPS source

Differential Source	Datum	Ellipsoid
None – Autonomous mode	WGS-84[1]	WGS-84
OmniSTAR 3 North American Beams	NAD-83[2]	–
OmniSTAR Rest of World Beams	ITRF[3]	GRS-80
Thales Beams	ITRF	GRS-80
WAAS Beams	WGS-84	WGS-84

[1]World Geodetic System 1984. Datum and ellipsoid.

[2]North American Datum 1983. Equivalent to WGS-84.

[3]International Terrestrial Reference Frame. Contact the DGPS provider for details.

For more information, go to the National Geodetic Survey website: www.ngs.noaa.gov/faq.shtml#WhatDatum.

Note – *To convert GPS positions in the NAD-83 datum to background maps for the old NAD-27 datum, use the conversion program Corpscon. This is available free from the Topographic Engineering Center (http://crunch.tec.army.mil/software/corpscon/corpscon.html).*

Position Output Format

The DSM 132 receiver outputs positions in Degrees, Minutes, and Decimal Minutes (DDD°MM.m'). This is the NMEA (National Marine Electronic Association) standard format and is commonly used worldwide for data transfer between electronic equipment.

Receiving beacon DGPS

To obtain free radiobeacon differential signals, the DSM 132 receiver uses dual-channel, fully-automatic beacon receiver electronics and tracks broadcasts that conform to the IALA (International Association of Lighthouse Authorities) Standard. When you use beacon DGPS, the receiver selects the closest of the 10 most powerful radiobeacons in the vicinity. You can configure the receiver to search for particular station frequencies, or use the EZ beacon feature to select local beacons.

The receiver continuously monitors the integrity of the data received from the differential radiobeacons. If it finds unacceptable errors in the data stream, the receiver automatically switches to a different radiobeacon, if one is available.

Radiobeacon signal reception is generally not affected by:

- hilly or mountainous terrain
- tree canopy
- location of the receiver inside a canyon (the signal reception depends on the proximity of the receiver to the transmitter)

Radiobeacon signal reception is affected to varying degrees, by:

- natural “noise”, such as lightning
- human-made “noise”, such as alternators, electric fan motors, radio speakers, and high voltage power lines
- Sky wave interference with ground wave

During darkness, when the beacon tower is more than 240–480 kilometers (150–300 miles) from the receiver, the sky wave beacon signal may be reflected off the ionosphere. This causes interference with the ground wave beacon signal. Self-jamming at night may be a problem with stronger beacon stations.

- Geographic de-correlation

  This phenomenon causes radiobeacon signal accuracy to decrease as the distance between the beacon tower and the base station increases. Ionospheric conditions can affect accuracy by as much as 1 meter (3 feet) for every 100 km (60 miles).

Receiving satellite DGPS

The DSM 132 receiver supports subscription-based OmniSTAR, and Thales, satellite differential technology. Contact the service provider for service activation or an encrypted activation passcode.

Note – *For the DSM 132 to operate with these corrections, you must subscribe to one of these services. The service provider may set geographic limits on the use of its service.*

In addition, the WAAS/EGNOS service is available free in North America and Europe. For more information, see Configuring Differential GPS, page 62, or go to the following websites:

- OmniSTAR (www.omnistar.com)
- Thales (www.landstar-dgps.com)
- WAAS (http://gps.faa.gov/Programs/WAAS/waas.htm)
- EGNOS (www.esa.int/export/esaSA/)

Receiving DGPS Corrections from Other Sources

The DSM 132 can also receive RTCM SC-104 corrections from sources such as:

- AM/FM carrier services
- Your own radio data link (from a DSM 132RS reference station)

Generating DGPS Corrections

In locations where MSK beacons or WAAS/EGNOS are not available, or if you decide not to subscribe to L-band correction services, you can install your own reference station and broadcast your own corrections. The DSM 132RS or the firmware option for the DSM 132 allow corrections to be generated. A radio data link (UHF, VHF, and so on) is required to transmit the corrections.

CHAPTER

3

Installing the Receiver

In this chapter:

- System Components
- Mounting the Receiver and Antenna
- Routing and Connecting the Antenna Cable
- Connecting to an External Device
- Laptop Computer

System Components

Check that you have received all the appropriate components for the DSM 132 system that you have purchased. If any containers or components are damaged, immediately notify the shipping carrier, or Trimble Construction Division at the address given in the front of this manual. Components for each system are listed in the following tables.

Table 3.4 DSM 132 Receiver (PN 49086-00)

Qty	P/N	Description
1	33302-33	132 Receiver
1	33580-00	132 Antenna
1	12920-00	Magnetic Mount for Antenna
1	21555	15 m (50 ft) Ruggedized Antenna Cable
1	30945	Power/data Cable
1	50984-00	DSM Support CD (manuals, utilities)

Table 3.5 DSM 132RS Receiver (PN 49086-10)

Qty	P/N	Description
1	33302-33	DSM 132RS Receiver
1	36654-00	Compact L1 Antenna
1	11820-10	30 m (10 ft) Antenna Cable (N-N)
1	30945	Power/data cable
1	50984-00	DSM Support CD (manuals, utilities)

Optional extras (if ordered)

Table 3.6 DSM 132 Receiver options

Qty	P/N	Description
1	36429-30	DGPS Base station Capability
1	36429-20	EVEREST Multipath Rejection Technology
1	36429-50	RTS/CTS Flow Control

Mounting the Receiver and Antenna

Mount the antenna in a clear position free from obstructions.

For some short term installations you can place the antenna upright with the magnetic base on a flat metal surface.

Choosing a location

When choosing a location, consider the following:

Do mount the antenna:

- on a flat surface along the centerline of the vessel.
- in any convenient location within 15 meters (50 feet) of the GPS receiver.
- at the highest point of the vessel with no metal surfaces blocking its view of the sky. Trimble recommends that you position the antenna on the top of a mast or pole.
- in such a way that it is not damaged when you sail under a bridge.

Do not mount the antenna:

- close to stays, electrical cables, metal masts, CB radio antennas, cellular phone antennas, air-conditioning units, active TV antennas, or machine accessory lights.

- near transmitting antennas, radar arrays, or satellite communication equipment.
- near areas that experience high vibration, excessive heat, electrical interference, and strong magnetic fields.

The receiver

To mount the DSM 132 receiver:

4. Drill four holes in the mounting surface. Use the slotted holes in the mounting brackets as a template.
5. Use screws to secure the brackets to the mounting surface.

   Note – *If you use machine screws, tap the mounting holes to fasten the receiver to the mounting surface. Trimble recommends that you use 8-32 UNF socket head cap screws. Alternatively, use self-tapping screws.*

The antenna

Mount the GPS antenna so that it has a clear view of the sky even when the vessel is rolling. Ensure that it is safe from damage during normal operation; that is, mount the antenna solidly for the worst-case pitch, roll, and heave of the vessel.

The base of the rover antenna has a 1" UNC female thread. A steel pipe with a male 1" UNC thread is a suitable pole mounting for the antenna.

Environmental conditions

Although the receiver has a waterproof housing, you should install it in a dry location. To improve the performance and long-term reliability of the receiver, avoid exposure to extreme environmental conditions, including:

- water
- excessive heat (> 65°C or 149°F)
- excessive cold (< –20°C or –4°F)
- high vibration
- corrosive fluids and gases

Electrical interference

As far as possible, when you install the receiver and antenna, you should avoid placing them near sources of electrical and magnetic noise, such as:

- gasoline engines (spark plugs)
- PC monitor screens
- alternators, generators, or magnetos
- electric motors (blower fans)
- equipment with DC-to-AC converters
- switching power supplies
- radars
- active marine TV antennas
- CB radio antennas
- cellular phone antennas
- machine accessory lights

Routing and Connecting the Antenna Cable

A 15 m (50 ft) antenna cable (PN 21555) is included with the receiver. One end is pre-terminated with a straight connector. The other end of the antenna cable is not terminated, so that it can be routed in the vessel through a minimal-sized hole (gland). If excess cable remains, the cable can be cut to size before fitting the right-angle TNC connector. See Figure 3.2.

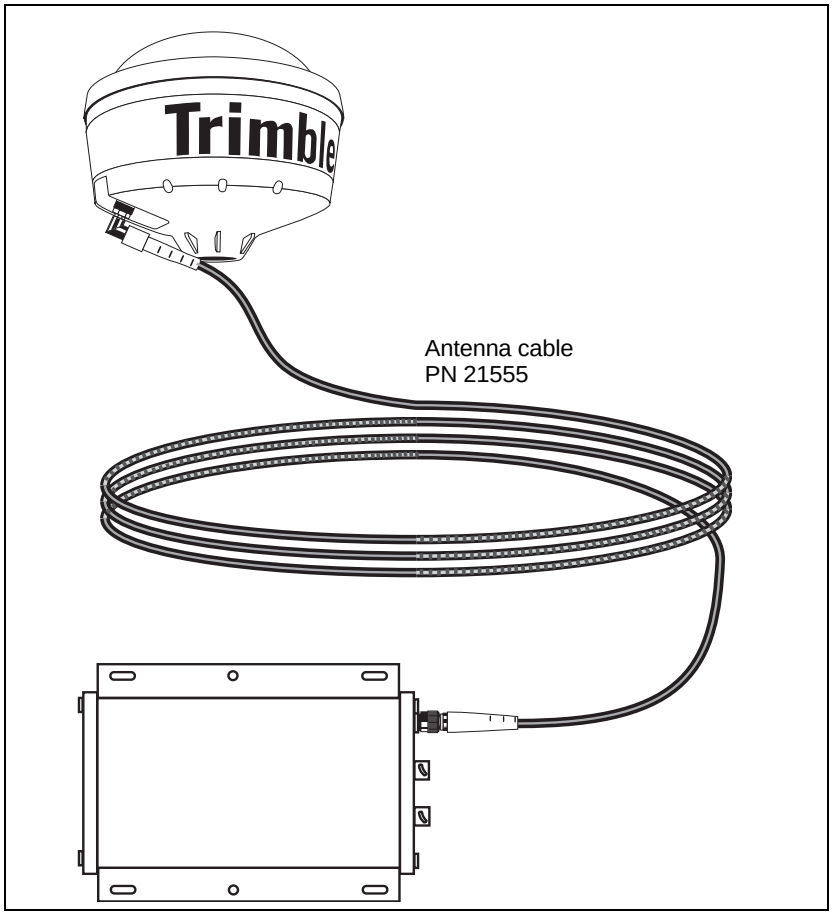


Figure 3.2 Antenna cable connections

When routing the antenna cable, avoid the following hazards:

- sharp objects
- kinks in the cable
- hot surfaces (exhaust manifolds or stacks)
- rotating or moving machinery parts
- sharp or abrasive surfaces
- door and window jams
- corrosive fluids or gases

After routing the cable, connect it to the receiver. Use tie-wraps to secure the cable at several points along the route. One tie-wrap is required to secure the cable near the base of the antenna. This provides strain relief for the antenna cable connection.

When the cable is secured, coil any slack. Secure the coil with a tie-wrap and tuck it into a safe place.



Tip – Use the tape (coax tape seal) that is provided with the antenna to seal the antenna connector at the antenna. The tape prevents moisture from entering the connection.

Connecting to an External Device

After installing the receiver and antenna, connect and route the power/data cable (PN 30945). The receiver can be powered by a vehicle or by a customer-supplied 10–32 VDC power source.

Figure 3.3 shows how to connect the receiver to an external device using the 5.5 m (18 ft) standard power/data cable.

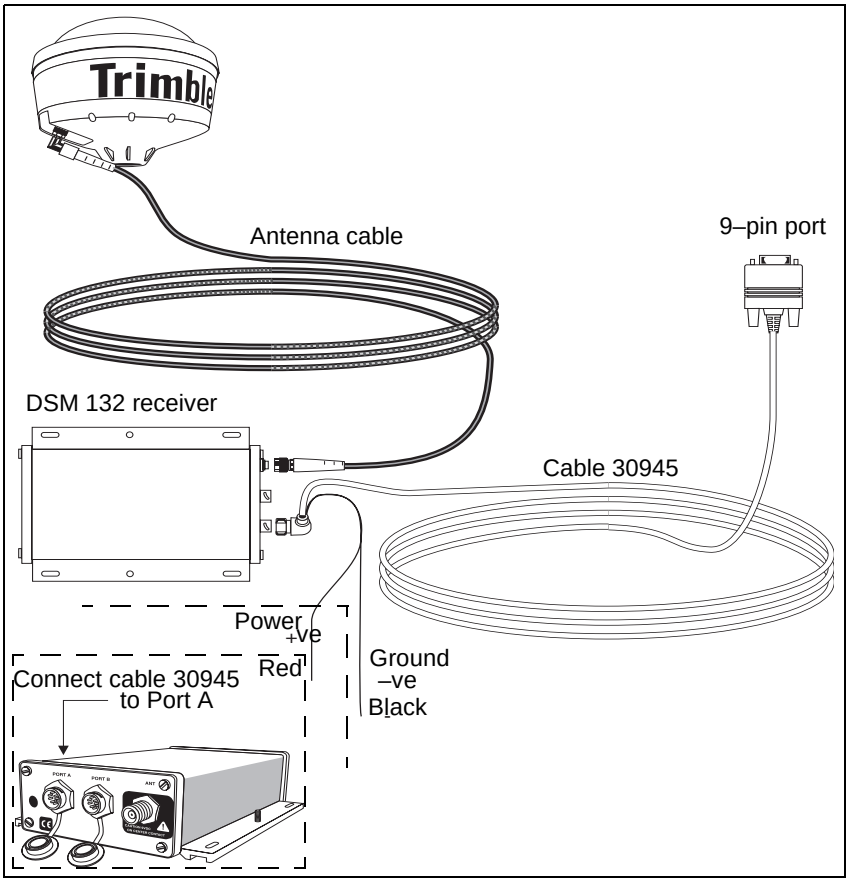


Figure 3.3 Standard power/data cable connections

Plug the:

- right-angle connector into the receiver
- straight 9-pin connector into the external device (such as a PC running HYDROpro software).

When routing the cable from the receiver to the external device, avoid the hazards listed on page 31.

When the cable is safely routed and connected to the receiver, use tie-wraps to secure it at several points, particularly near the base of the receiver to prevent straining the connection. Coil any slack cable, secure it with a tie-wrap, and tuck it into a safe place.

Laptop Computer

Figure 3.4 shows how to connect the receiver power/data cable to a laptop computer.

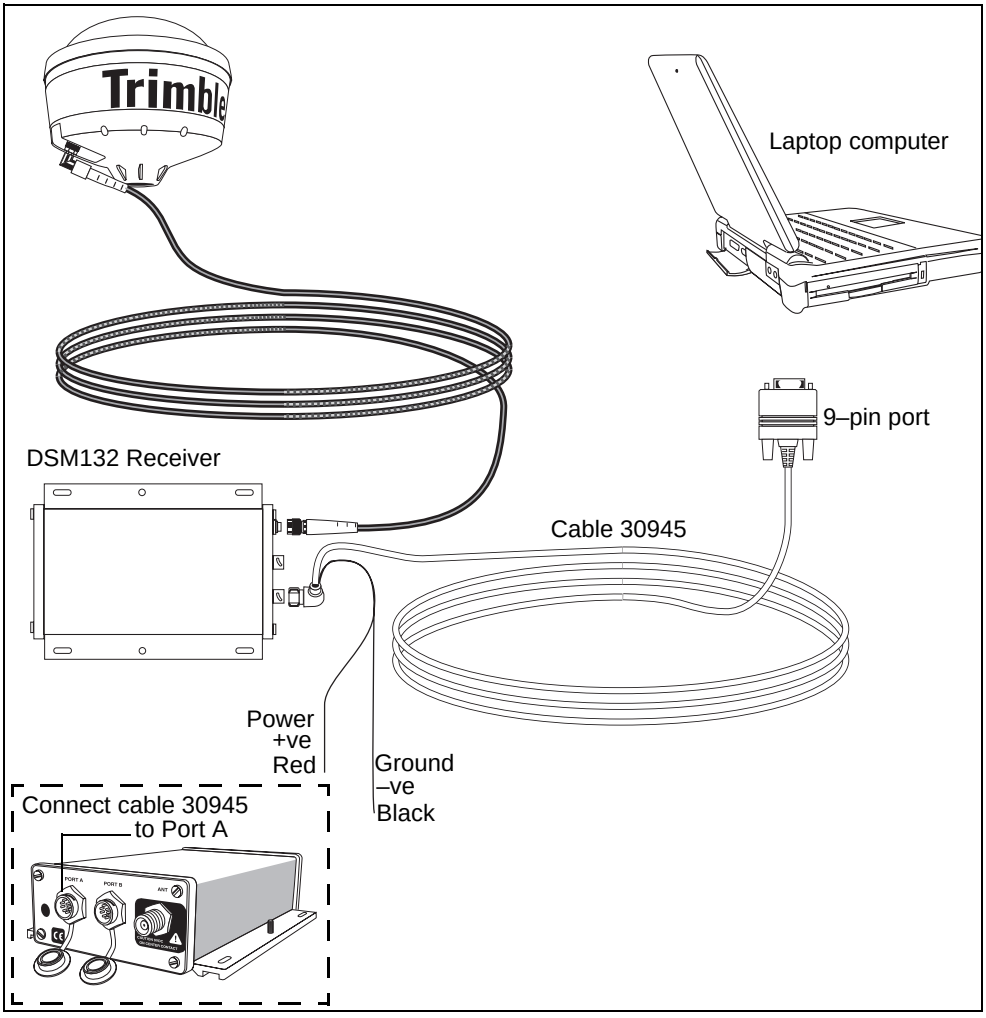


Figure 3.4 Connecting the receiver to a laptop computer

CHAPTER

4

Getting Started

In this chapter:

- Introduction
- Front Panel
- The AgRemote Menu System
- Using AgRemote
- Navigating the Menus and Screens
- Menu System Fields
- The Home Screen
- Updating the Firmware

Introduction

This chapter describes how to set up and begin using the DSM 132 receiver.

Front Panel

The DSM 132 receiver includes an integrated display and keypad for accessing the internal menu system. Use the menus and screens in this system to configure the receiver settings and review receiver status. To view the entire menu system, see Appendix D, Navigation Maps. You can also access the menu system using office computer software, such as AgRemote.

Figure 4.1 shows the LCD display and keypad on the DSM 132 receiver front panel.

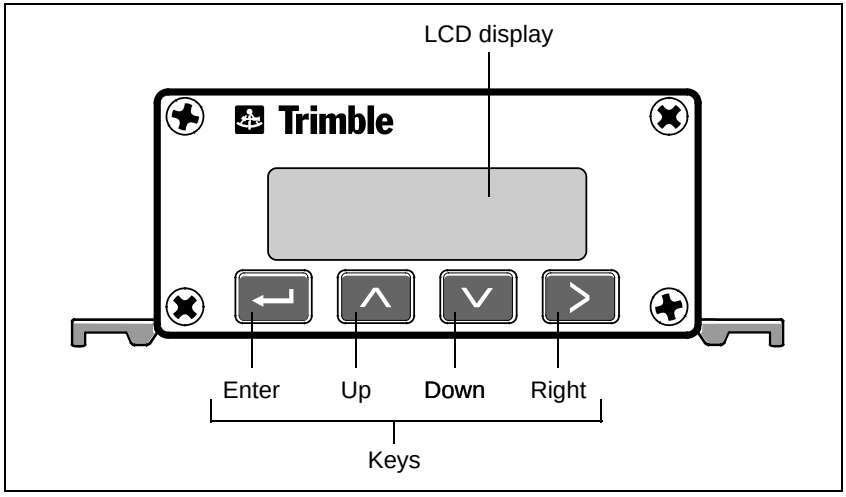


Figure 4.1 DSM 132 receiver front panel

Installing AgRemote

AgRemote requires Microsoft® Windows® 95, 98, Me, Windows 2000, or XP.

To install the latest version of AgRemote:

1. Download the AgRemote software from the Trimble website (www.trimble.com/aggps132_ts.asp?Nav=Collection-4361).
2. Follow the prompts provided by the File Download wizard:
   a. Select *Save this program to disk.*
   b. Click **OK**.

   Save the AgRemote file to *My Documents*, or to another folder of your choice on the hard drive of your computer. Click **Save**.

   The download takes about a minute, depending on your Internet connection speed.
3. Select the folder where you saved the AgRemote file.
4. Double-click the downloaded file to start installing AgRemote.
5. In the *InstallShield* dialog, click **Yes**.
6. Follow the instructions provided by the installation wizard. When completed, click **Finish**.

To use AgRemote:

1. Connect the receiver to the serial port of the office computer, as shown in Figure 4.2.

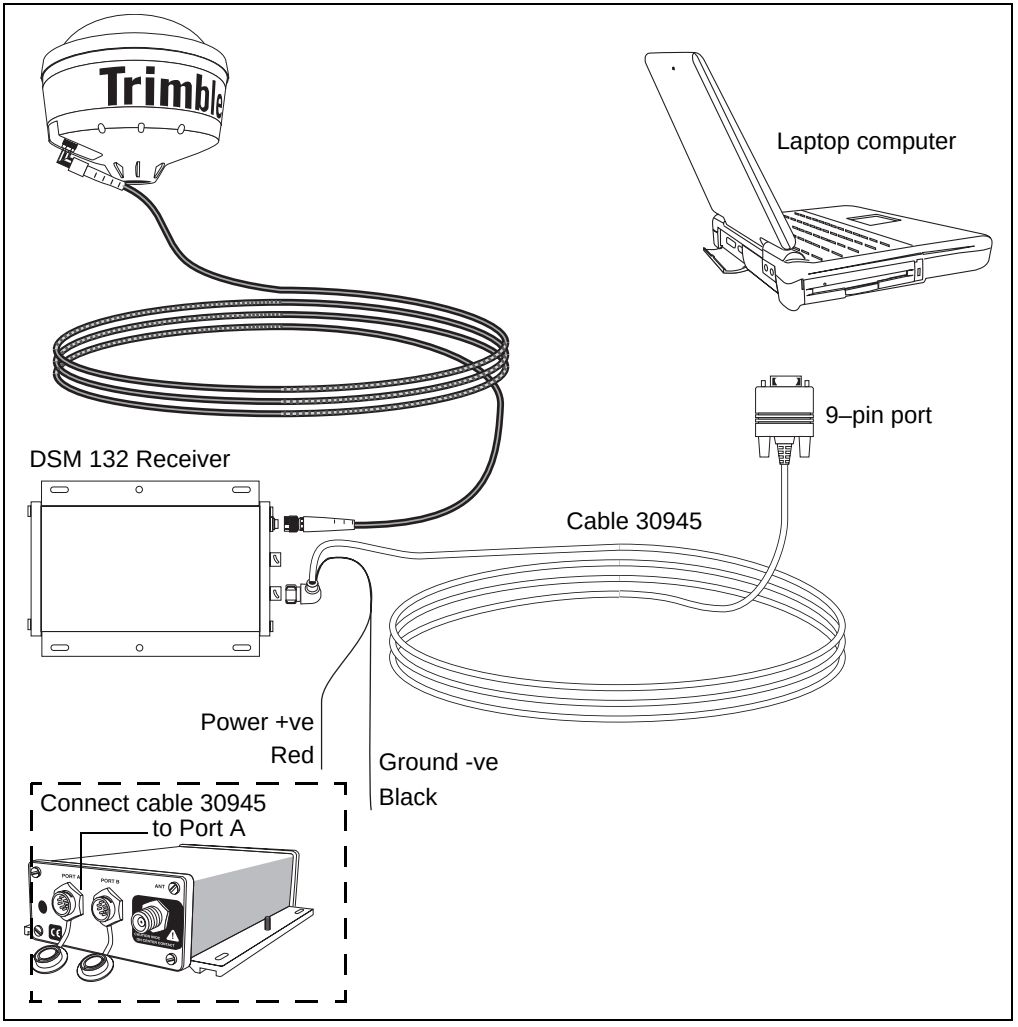


Figure 4.2 Connecting the receiver to an office computer

2. From the Start menu, select *Programs* / *AgRemote* / *AgRemote*.
3. When the program starts, select *File* / *Connect.*

   AgRemote establishes communication with the receiver and displays the *Home* screen of the *Ag*GPS menu system, as shown in Figure 4.3.

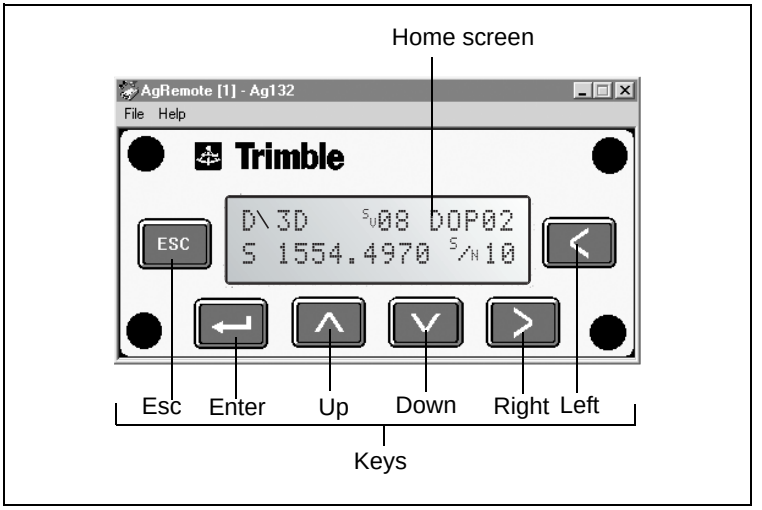


Figure 4.3 AgRemote window and navigation keys.

4. Navigate to the required screen. Use the display to configure the communication ports, differential correction source, and/or *Ag*GPS® lightbar communication settings. For a map showing the full menu system, see Appendix D, Navigation Maps. For more information, see Chapter 5, Configuring the Receiver.

The AgRemote Menu System

Use the commands provided by the *Ag*GPS menu system to:

- monitor the receiver status
- change the receiver configuration

This section describes the menu system and the setting display options. Chapter 5, Configuring the Receiver, describes how to configure the receiver using the menu system.

Using AgRemote

To configure and monitor the receiver:

1. Connect the receiver to the office computer running AgRemote. See page 38.
2. Switch on the receiver.
3. Click Start, then select *Programs* / *AgRemote / AgRemote*.

When the *Home* screen appears, you can press ^ or > to access other screens in the *Ag*GPS menu system.



Tip – Use the navigation maps in Appendix D, Navigation Maps as a reference when navigating the DSM 132 menu system.

The AgRemote keys

The actions of the AgRemote keys depend on whether a menu or screen is displayed. Table 4.1 describes the key actions.

Table 4.1 Key actions

Key	Action if menu displayed	Action if screen displayed
▶	Return to the top of the menu when an *Exit* screen appears after the last screen in a menu.	From the *Home* screen, change Satellite DGPS source mode. From the *Lock Display Cfg* screen, display the *Enter Password* screen. From other screens, perform an action associated with that screen.
🗗	Move down a menu level. Display the first screen from a lower level menu.	Move downward through the screens in a menu. Move downward through the list of options in multiple-choice fields.
🗖	Move up a menu level.	Move upward through the screens in a menu. Move upward through the list of options in multiple-choice fields.
◀ ▼ ▼	Move horizontally through the upper- and lower-level menus. Move from the last upper-level menu to the *Home* screen.	Select the next alphanumeric or multiple-choice field on a screen. When alphanumeric or multiple-choice fields are available, the CFG symbol appears in the corner of the screen. Move to the next letter or digit of a field.
▲	Move up one menu level. Ultimately, return to the *Home* screen.	Move from a screen to the screen's menu. Press again to return to the previous level. Press again to return to the *Home* screen.

Navigating the Menus and Screens

Note – *Use a menu to navigate to screens or other menus. Use a screen to view the receiver status or to change a configuration setting.*

The top level of the AgRemote menu system consists of the *Home*, *Field Operations*, *Status*, and *Configuration* menus. Each of these has one or more lower level menus (sub-menus), which you can use to access screens for selecting options, viewing status information, and entering data. For a map showing the full menu system, see Appendix D, Navigation Maps.

When you are using the receiver front panel keypad to navigate the menu system, press ⌄+⌃ simultaneously to move to the previous menu. Press and hold (or press repeatedly) ⌄+⌃ simultaneously to return to the *Home* screen.

Figure 4.4 shows the structure of a typical sub-menu, such as *Display Options*.

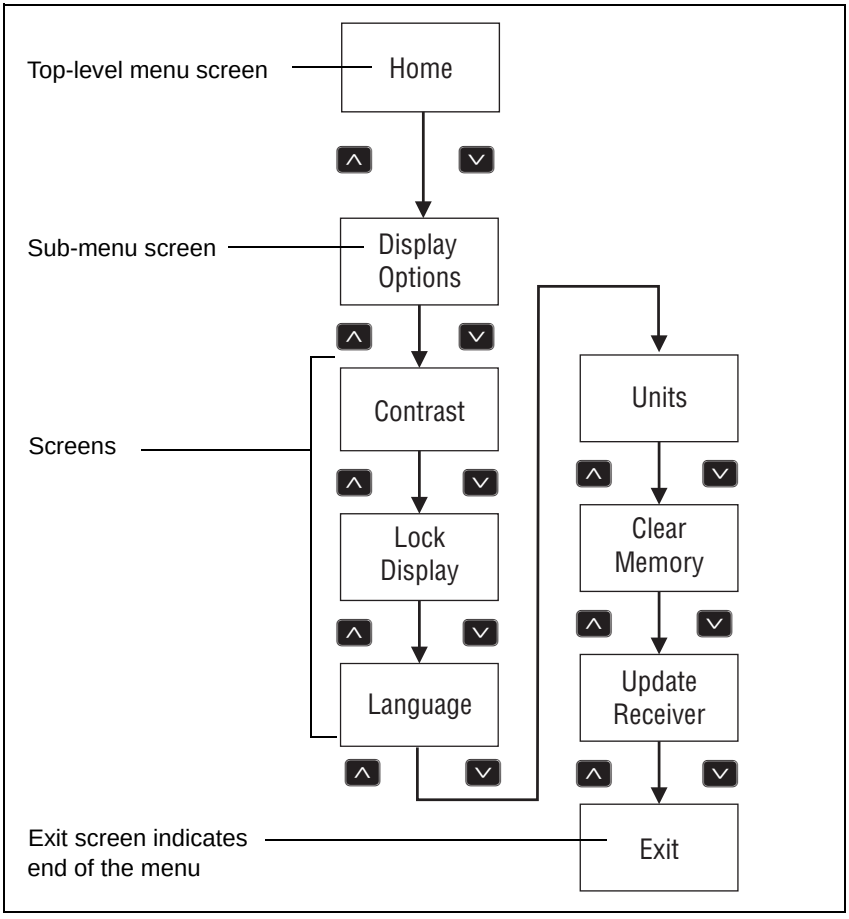


Figure 4.4 Typical menu structure

Press ⌄ or ⌃ to move between screens.
Within screens, select options, view receiver status, or enter data.
When ⇟ appears in a screen, press ↵ to perform the action specified for that screen.

Menu System Fields

Fields in a screen contain status information or configuration settings. Information or settings can appear in fields that are:

- display-only
- multiple-choice
- alpha, numeric, or alphanumeric

Display-only fields

A display-only field shows status information and other data that is automatically generated by the receiver or acquired from satellite signals. You cannot edit this field. Examples include fields that display the DGPS data on the *Home* screen and the fields in the screen in Figure 4.5, which show details of the current receiver options.

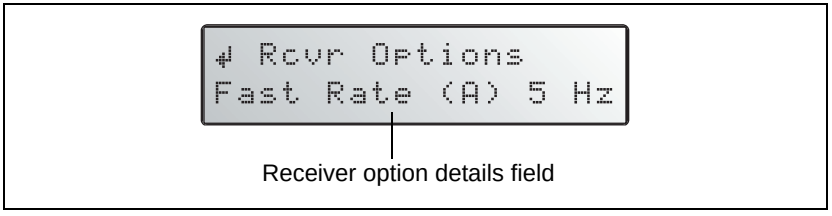


Figure 4.5 Example of a display-only field

Multiple-choice fields

In a mulitple-choice field, you select one option from a list. Only one option can appear in the field at one time. Press > to select a multiple-choice field, the press v or ^ to move through the list. When the required option appears, press ↵ to select it and save the changes.

Examples include the two multiple-choice fields that appear in the *EZ Sat DGPS Configuration* screen (see Figure 4.6). These are the fields which list available satellite providers and satellite coverage beams.

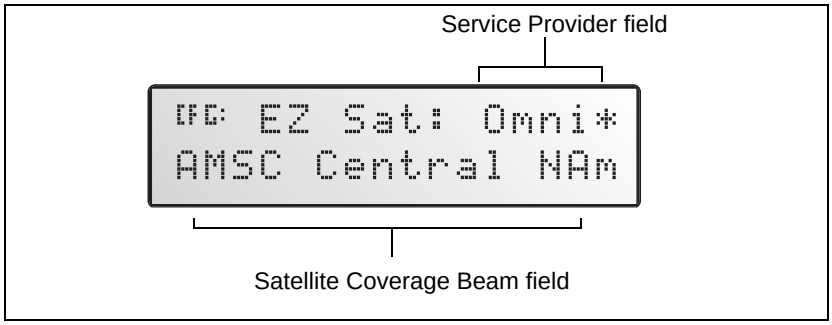


Figure 4.6 Example of a multiple-choice field

Alpha, numeric, and alphanumeric fields

In these fields, you can enter only letters (alpha screens), only numbers (numeric screens), or a combination of the two (alphanumeric screens):

1. Press > to select the field and activate the cursor on the first letter or number.
2. Press ^ or v to move through the list of letters or numbers until the required letter or number appears.
3. Press > to move to the next place in the field.
4. Repeat steps 2 and 3 to enter all required characters.
5. Press ↵ to save the changes.

One example of a numeric field appears in the *Satellite Freq* screen. In this field, you manually enter the broadcast frequency of a satellite service provider. See Figure 4.7.

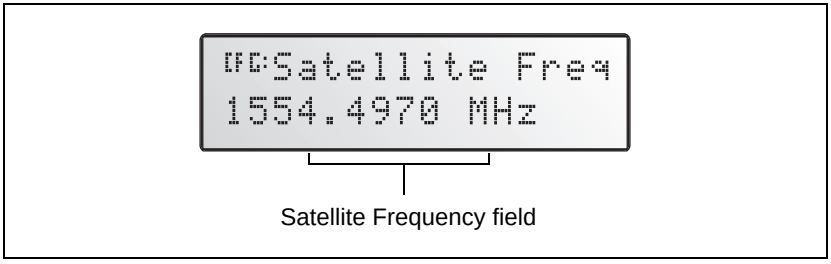


Figure 4.7 Example of a numeric field

The Home Screen

When you start AgRemote, or access the receiver using the *Ag*GPS 70 Remote Display and Logger, the *Home* screen appears. See Figure 4.8.

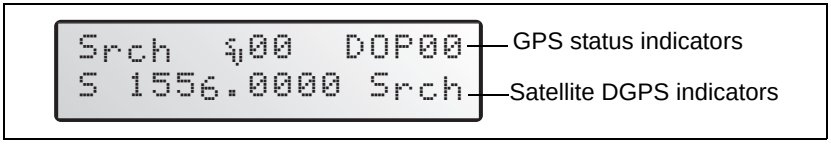


Figure 4.8 Home screen

You can leave this screen running during operation. It enables you to monitor the receiver status. To return to the *Home* screen after viewing other receiver menus and screens, press Esc one or more times.

As the DSM 132 is a combined Beacon and Satellite DGPS receiver, the information that appears on the *Home* screen depends on how the receiver is configured.

Satellite DGPS mode

In this manual, references to Satellite DGPS apply only to the DSM 132 receiver. When the receiver is in Beacon DGPS mode, a B, Beacon Searching, Beacon Tracking, or Beacon FFT message appears in the lower-left corner of the screen. To change between modes, press ↵ and hold for five seconds. To display satellite differential information, press ↵ until an S appears in the lower left corner of the screen.

Satellite and WAAS/EGNOS DGPS mode

The DSM 132 can receive Beacon, L-band, and WAAS/EGNOS DGPS signals. The *Home* screen indicates which mode the receiver is in for differential correction.

Figure 4.9 explains the GPS status indicators that can appear on the first line of the *Home* screen display.

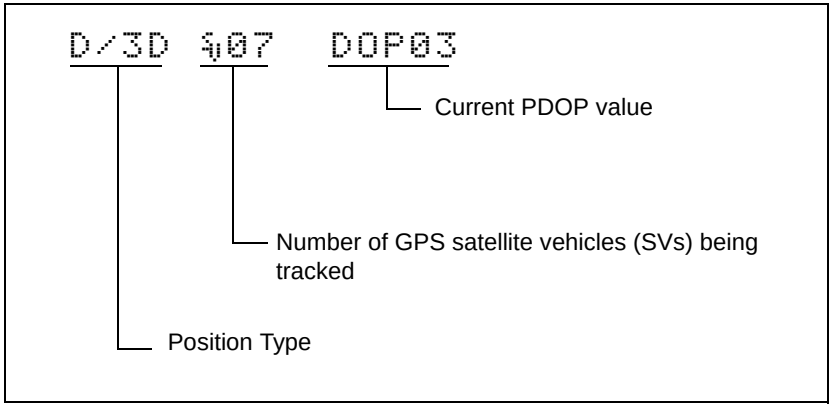


Figure 4.9 GPS status

Table 4.2 explains the indicators that can appear in the *Position Type* field.

Table 4.2 Position types

Display	Description
SRCH	Searching for satellites.
TRCK	Tracking satellites.
G/2D	Outputting 2-dimensional autonomous positions.
G/3D	Outputting 3-dimensional autonomous positions.
D/2D	Outputting 2-dimensional differential positions.
D/3D	Outputting 3-dimensional differential positions.

Note – *The "/" symbol in the position type spins when the receiver is operating correctly.*

Satellite DGPS mode status indicators

When the receiver is in Satellite mode, the second line of the *Home* screen displays the status indicators shown in Figure 4.10.

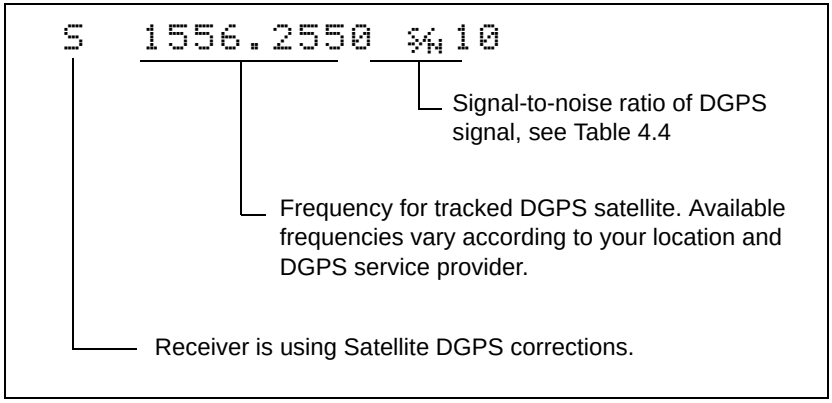


Figure 4.10 Satellite DGPS mode status indicators

Table 4.3 shows the possible satellite differential mode indicators.

Table 4.3 Satellite differential mode status indicators

Indicator	Description
S ####.### S/N ##	Operating in Satellite Differential mode.
S SRCH ###.##	Searching for Satellite Differential signal.
S TRCK ####.##	Tracking satellite without acquiring signal lock.

Table 4.4 explains the signal-to-noise ratio values for both Satellite and WAAS/EGNOS DGPS modes.

Table 4.4 Signal-to-noise values

Value	Description
Below 4	Unusable
4–8	Fair
>8	Excellent

WAAS/EGNOS DGPS mode status indicators

When the receiver is in WAAS/EGNOS DGPS mode, the second line of the *Home* screen displays the status indicators shown in Figure 4.11.

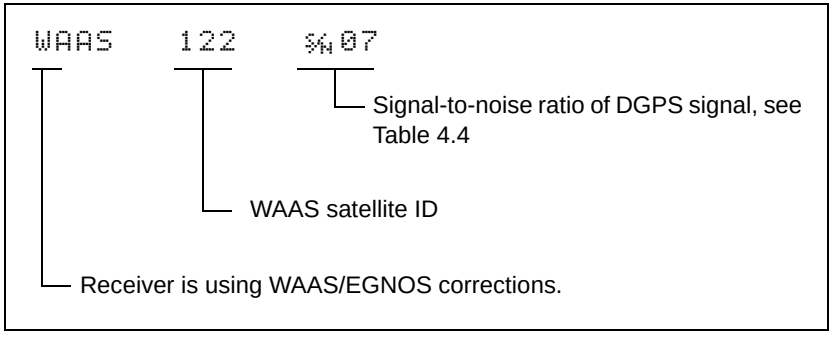


Figure 4.11 WAAS DGPS mode status indicators

Beacon DGPS mode

When in Beacon DGPS mode, the *Home* screen displays “B” (Beacon DGPS) in the lower left corner. Figure 4.12 explains the status indicators that appear on the first line of the *Home* screen display when the receiver is in this mode.

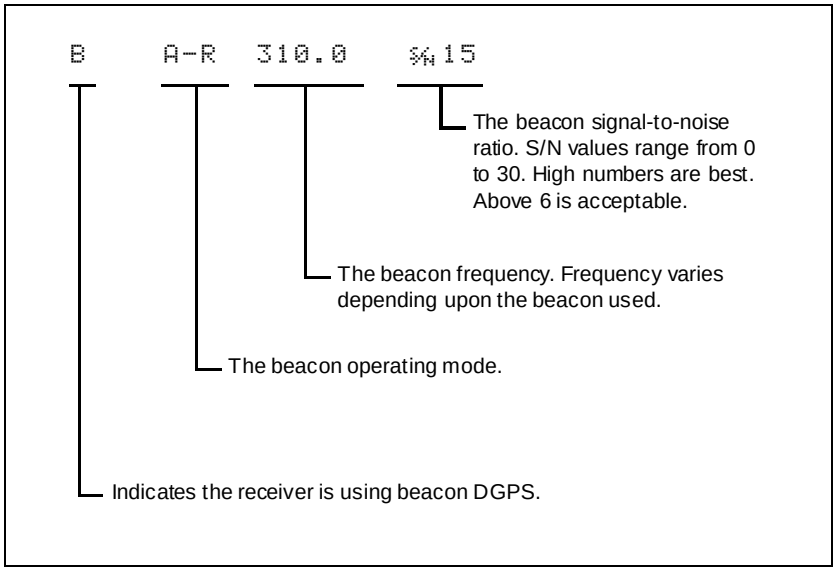


Figure 4.12 Beacon DGPS status

Table 4.5 describes messages that can appear when the receiver is in Beacon DGPS mode.

Table 4.5 Beacon DGPS operating mode messages

Message	Description
B	The receiver is operating in Beacon mode.
Beacon Searching	The receiver is searching for beacon signals.
Beacon Tracking	The receiver is tracking beacon signals and is attempting to gain lock.
Beacon Idle	Beacon DGPS is not active.

Table 4.5 Beacon DGPS operating mode messages (continued)

Message	Description
Beacon FFT	The receiver is looking for a beacon across the signal spectrum.
Beacon Disabled	Beacon DGPS is disabled in the receiver. You will need to change configuration settings to enable Beacon DGPS.
External RTCM	Differential corrections are being provided by an external source, through port A or port B.
Battery is Low	This warning replaces the DGPS information when the input voltage is low.

Updating the Firmware

To update the receiver firmware when a new version is released:

1. Download the upgrade files.
2. Install the FlashLoader100 utility.
3. Connect the receiver to an office computer.
4. Upgrade the firmware from the office computer, using the upgrade files.

For full details of how to do this, refer to the *Release Notes* provided with your receiver firmware.

If you have problems when you update the firmware, see Appendix A, Troubleshooting. For further assistance, contact your local Trimble Reseller.

CHAPTER

5

Configuring the Receiver

In this chapter:

- Introduction
- Display Options
- Configuring the Communication Ports
- Configuring Differential GPS
- Paid Subscription Services
- WAAS/EGNOS
- Configuring Beacon DGPS
- Configuring Other DGPS Corrections
- Configuring DGPS Base Station

Introduction

The Display Options, Satellite Differential Source, and Port Communication parameters must be specific to your particular use, so they are not preset. You only need to configure the receiver once, as the settings you choose are saved to permanent memory.

Tip – Refer to Appendix D, Navigation Maps while navigating the DSM 132 menu system.

To change the receiver configuration settings, connect the receiver to *Ag*Remote. For more information, see Getting Started, page 35

The following sections describe how to change the receiver settings.

Display Options

Use the *Display Options* menu to control how information is displayed in the screens that you can access from the *Field Operations*, *Status* and *Configuration* menus.

To view the *Display Options* menu:

- From the *Home* screen (see page 46), press v:



Setting the language

To change the language used for display:

1. Navigate to the *Language* screen:



2. Press > to select the *Language* field.
3. Press ^ or v until the required language is displayed.
4. Press ↵ to select it and save the changes.
5. Press Esc to return to the *Display Options* menu.

   The screen automatically displays the selected language.

Setting the units

The *Units* screen displays U.S., Metric, or Nautical units in the screens that you access from the *Field Operation*, *Status*, and *Configuration* menus.

Note – *This setting does not affect GPS position data output.*

1. Navigate to the *Units* screen:



2. Press > to select the *Units* field.
3. Press ^ or v until the required unit is displayed.
4. Press ↵ to select it and save the changes.
5. Press Esc to return to the *Display Options* menu.
6. Press Esc again to return to the *Home* screen.

Locking the Configuration menus

To prevent unauthorized changes to the configuration, you can lock the Configuration menus:

1. Navigate to the *Lock Display Cfg* screen.
2. Press ↵ to display the *Enter Password* screen. The cursor is active on the first digit:



3. Use the last five numbers of the receiver serial number as the password (“passcode”).

   Press ^ or v until the first digit of the serial number appears.
4. Press > to select the next digit. Repeat step 3 until all five digits are entered.
5. Press ↵ to save the changes.

   The Valid Password message appears, and the Configuration menus are no longer displayed when you navigate the menus.

   If the message Invalid Password appears, enter the password again.



Tip – When the Configuration menus are locked, you can view most Configuration menu settings from the Status menus.

To unlock the Configuration menus, repeat the above procedure.

Clearing battery-backed RAM



Warning – When you select the Clear BB Ram option, any changes that you have made in the Configuration menus are deleted and cannot be restored.

Use the *Clear BB RAM* screen to remove all configuration settings in the receiver memory (RAM) and return the receiver to its factory default configuration settings:

To delete battery-backed memory:

1. Navigate to the *Clear BB RAM* screen:
2. Press > to activate the cursor.
3. Press ^ or v to select *Yes*.
4. Press ↵ to clear the configuration settings.

Configuring the Communication Ports

The DSM 132 receiver has two serial ports. The receiver can communicate with two devices simultaneously through these ports. To do this, it uses the standard power/data cable (PN 30945).

Configure the communication ports to ensure that the receiver outputs the correct GPS position data type, for the hardware device or software program that is connected to the receiver.

Note – *As both ports are configured identically, this section describes only Port A.*

To display the *Port A Config* menu:

1. From the *Home* screen, press > until the *Configuration* menu appears.
2. Press v to display the *Guidance Config* menu.
3. Press > until the *Port A Config* menu appears:



4. Press v to move through the screens as required.

The following section describes how to configure the appropriate *Port A Config* screens. The menu for Port B is identical. Figure 5.13 shows the menu that you use to access the configuration screens.

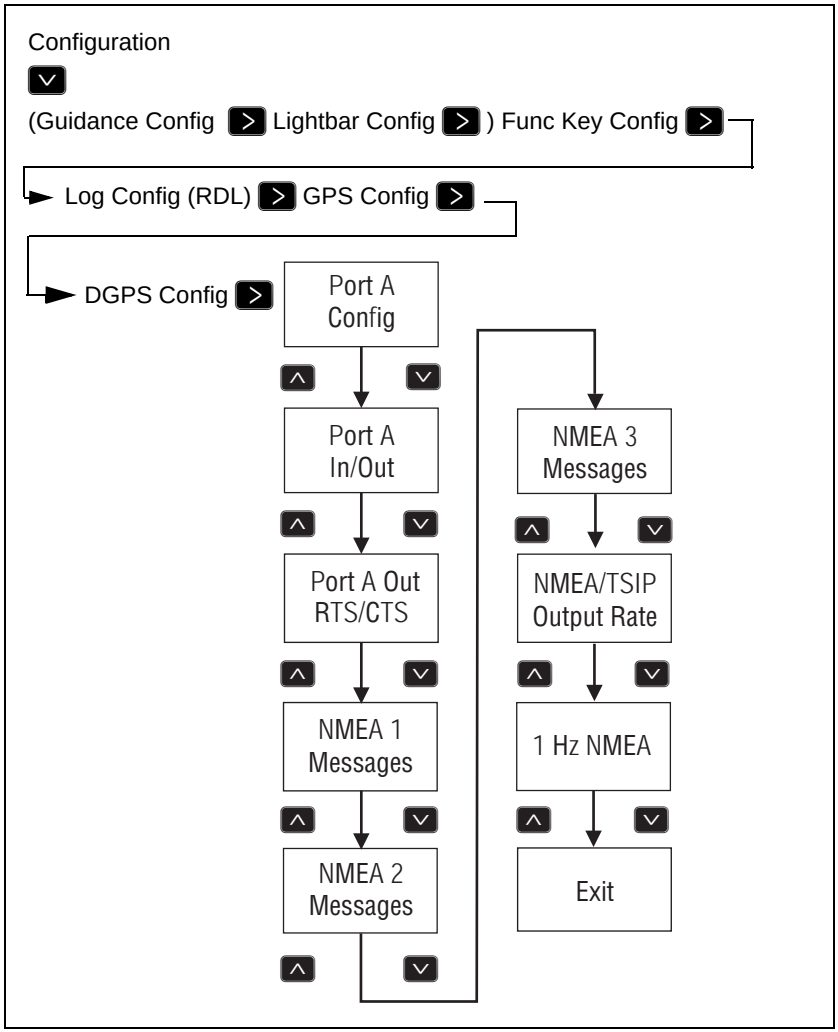


Figure 5.13 Port A Config menu

Configuring input / output communication

Configure the Port Input/Output communication settings for communicating with other external hardware devices, and software programs. Table 5.6 describes the input settings.

Table 5.6 Port input settings

Setting	Description
None	Inputs nothing to the receiver.
TEXTB	The receiver can accept ASCII data from an external device, such as a chlorophyll meter, on Port A, merge it with NMEA GPS data, and output the combined data on Port B. The incoming data must be limited to 66 ASCII characters and must be terminated by a carriage return and line feed (hex characters 0x0D 0x0A). The NMEA string outputs as $PTNLAG001,<up to 66 ASCII characters>*<2 digit checksum><CR><LF>. For the receiver to output the combined NMEA string, NMEA must be selected as the output protocol on Port B.
TEXTA	See the description for the TEXTB setting. TEXTA outputs on Port A, not Port B.
RTCM	The receiver can accept RTCM data from an external DGPS device, such as an FM pager, or DSM 132RS and radio data link.
TSIP	The receiver can accept or output TSIP data packets from the port when using the optional *Ag*Remote program or HYDROpro software.
LBAR	Not used for marine applications.

The default values for the other port settings are:

		Port A	Port B
Baud rate	**In**	RTCM 9600	
	Out	NMEA 4800	
Data bits		8	8
Parity		None	None
Stop bits		1	1

When setting the baud rate, note the following:

- If you are using 19.2 k or 38.4 k, the input rate must match the output rate.
- If Port A is operating at 19.2 k, Port B can operate at 1200, 2400, 9600, or 19.2k (not 38.4 k).
- If Port B is operating at 38.4k, Port A can operate at 1200, 2400, 9600 and 38.4k (not 19.2k).

To change the input or output settings:

1. From the *Port A Config* screen, press ⌄ until the *Port-A Input/Output* screen appears:



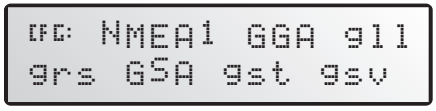
2. Press > to activate the cursor.
3. Press ^ or ⌄ to change the value.
4. Press >.
5. Repeat steps 3 and 4 until you have set all the required values.
6. Press ↵ to save all the changes.
7. Press ⌄ to move to the next screen.

Selecting NMEA messages for output

Use this screen to select the NMEA messages output from the current port. Only upper-case NMEA message types are output. The default messages are GGA, GSA, VTG, and RMC.

To select the NMEA messages for output:

1. From the *Port A Config* menu, press ⌄ until the *NMEA1* screen appears:



2. Press > to activate the cursor on the first NMEA message type.
3. Press ^ or ⌄ until the NMEA message type appears in upper case.
4. Press > to select the next message type.
5. Repeat steps 4 and 5 until all the message types that you want to output appear in upper-case.
6. Press ↵ to save the changes.
7. Repeat this operation as required in the other NMEA screens.

For detailed information about the content and structure of NMEA messages, see Appendix C, NMEA-0183 Messages.

Port output rate

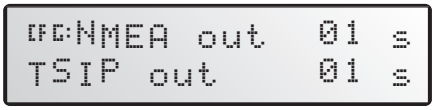
Use the *Message Rate* screen to vary the NMEA and TSIP output rate. The default setting is 01 (1 Hz, or 1 position per second).

You can select faster output rates, such as 2, 5, or 10 positions per second.

Note – *Select ASAP if you want the output rate to be the same as the output rate selected on the Position Rate screen under the GPS Config menu.*

To set the NMEA / TSIP message output rate:

1. From the *Port A Config* menu, press ⌄ until the *Message Rate* screen appears:



2. To set the NMEA output rate, press > twice to place the active cursor on the second digit of the NMEA line.
3. Press:
   a. ⌄ to set the output rate to *ASAP.*
   b. ^ to increase the output rate by one second. Press this key as often as necessary, to a maximum of 99 seconds.
4. To set the TSIP output rate, press > twice to move the cursor to the second digit of the TSIP line. Repeat step 3.
5. Press ↵ to save the changes.

Configuring Differential GPS

For the receiver to output GPS position coordinates of submeter accuracy, you must first select a differential signal from one of the following sources:

- WAAS/EGNOS – free service, limited availability

  The Wide Area Augmentation System (WAAS) augments GPS with additional signals for increasing the reliability, integrity, accuracy, and availability of GPS in the United States. EGNOS (European Geostationary Navigation Overlay System) is the European equivalent of WAAS.
- OmniSTAR – paid subscription, available worldwide
- Thales – paid subscription, available worldwide

You can use one of these paid services as an alternative to WAAS/EGNOS. They both provide over-the-air DGPS activation.

- Other source of RTCM SC-104 corrections; for example, a DSM 132RS over a radio data link.

For more information, see Differential GPS (DGPS), page 19.

To use the differential signal from the selected provider:

1. Configure the receiver.
2. Activate the receiver.
3. Enable the receiver.

For details, see the following sections.

To configure the receiver to receive signals from any provider:

1. Navigate to the *DGPS Config* menu:



2. Press v.
3. Follow the steps in the appropriate section below. Each section describes how to configure, activate, and enable the receiver for a particular provider.

Paid Subscription Services

When you obtain a paid satellite subscription, contact the service provider for the correct satellite coverage beam for your geographic location.

In the U.S. and Canada, contact:

- OmniSTAR at 1- 888-883-8476

  www.omnistar.com

- Thales-LandStar at 1-888-434-7757

  www.landstar-dgps.com/

You will need to provide a serial number and user code:

1. Navigate to the *Serial number* screen.

   Note the serial number here:

   _____

2. Navigate to the *Omni** or *Thales Srv Info* screen.

   Note the user code here:

   _____

To configure the *DGPS Source* for the subscription service:

1. Navigate to the *DGPS Source* screen.
2. Press > to activate the cursor.
3. Press v until *Satellite Only* appears:



4. Press ↵ to save the changes.
5. Press Esc to return to the *DGPS Config* menu.

To configure the provider name and the correct satellite coverage beam:

1. From the *DGPS Config* menu, press v until the *EZ Sat* screen appears.

   Note – *The EZ Sat screen includes the Coverage Beam field and the Geographic Location field.*

2. Press > to activate the cursor.

3. Press ⌄ until the required provider appears (Omni* or Thales).



4. Press > to move to the next field.
5. Press ⌄ until the coverage beam for your location appears.
6. Press ↵ to save the changes.
7. Press Esc to return to the *DGPS Config* menu.

OmniSTAR

To activate OmniSTAR DGPS:

1. Switch on the receiver and make sure it is configured for the correct satellite coverage beam.

   If you do not know the coverage beam for your location, contact OmniSTAR, see Paid Subscription Services, page 63.

2. Contact OmniSTAR on 1-888-883-8476 (USA or Canada). Provide OmniSTAR with:

   – your billing information

   – user code

   – satellite beam name

   OmniSTAR will activate the receiver. Activation can take 5–30 minutes.

3. Once the receiver is activated, the *Home* screen displays D/3D:



If automatic activation fails, try to activate OmniSTAR DGPS manually, as described below. If you cannot activate the OmniSTAR differential service, contact your local Trimble Reseller.

Activating OmniSTAR manually

Note – *If the receiver is activated automatically, this option is not available.*

If over-the-air activation fails, or if you want to activate the OmniSTAR differential service manually, obtain an activation code from OmniSTAR:

1. Contact OmniSTAR for the activation code and satellite coverage beam for your location. See Paid Subscription Services, page 63. You will need to provide a serial number.

   Note the activation number here:

   _____

   Note the satellite coverage beam here:

   _____

2. From the *DGPS Config* screen, press ⌄ until the *Omni** screen appears:

3. Press ↵ twice. In the screen that appears, the active cursor highlights the first digit.
4. Press ^ or ⌄ to change the number.
5. Press > to select the next digit.
6. Repeat steps Step 4 and Step 5 to enter all 24 numbers.
7. Press ↵ to save the changes.
8. Press Esc to return to the *DGPS Config* menu.

Note – *If you enter an incorrect code, try again using the correct numbers. An incorrect code has no effect on receiver operation.*

Thales

To activate Thales DGPS:

1. Switch on the receiver and make sure it is configured for the correct satellite coverage beam.

   If you do no know the coverage beam for your location, contact Thales, see Paid Subscription Services, page 63.

2. Contact Thales at 1-888-434-7757 (USA or Canada). Provide Thales with:

   – your billing information

   – user code

   – satellite beam name

   Thales will activate the receiver. Activation can take 5–60 minutes.

3. Once the receiver is activated, the *Home* screen displays D/3D:



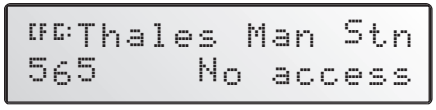
Thales reference stations

To manually select a Thales network reference station:

1. From the *DGPS Config* screen, press ⌄ until the *Thales Stn* screen appears:



2. Press > to activate the cursor.
3. Press ⌄ until *Use Manual Mode* appears.
4. Press ↵ to save the changes.
5. Press ⌄ until *Thales Man Stns* appears:



6. Press > to activate the cursor.
7. Press ⌄ until the correct station appears for the satellite beam you are using. Trimble strongly recommends the stations listed below.

If you are using the satellite beam ...	with this frequency ...	select this reference station ...
North American West	1556.255	565
North American Mountain	1554.350	555
North American East	1553.345	555

Note – *Before you can select a reference station, you must have a current subscription to the Thales DGPS service.*

8. Press ↵ to save the changes.

WAAS/EGNOS

WAAS/EGNOS is a free satellite-based DGPS service that is available only in North America (WAAS) or Europe (EGNOS). To use the WAAS/EGNOS DGPS signal, you must first configure the receiver.

To configure the receiver to use WAAS/EGNOS DGPS:

1. From the *DGPS Config* menu, press ⌄ until the *DGPS Source* screen appears.
2. Press > to activate the cursor.
3. Press ⌄ until *WAAS/EGNOS ONLY* appears:



4. Press ↵ to save the changes.

To enable the WAAS/EGNOS DGPS signal:

1. Press ⌄ until the *WAAS/EGNOS T2 Remap* screen appears.
2. Press > to activate the cursor.
3. Press ⌄ until *On* appears:



4. Press ↵ to save the changes.

To enable WAAS reception in the field:

1. Take the receiver outside. Make sure that it has a clear southeast and southwest view of the sky.
2. Switch on the receiver.

   WAAS activation can take two or more minutes.

3. Once activation succeeds, the *Home* screen displays D/3D:



Configuring Beacon DGPS

DSM 132 receivers are configured by default to use WAAS/EGNOS in Auto Range DGPS mode. To change a DSM 132 receiver to Satellite DGPS mode, see page 66.

Select the frequency of the channels to be used when receiving RTCM SC-104 broadcasts from radiobeacons:

1. Navigate to the *DGPS Source* screen.
2. If the screen does not display *Beacon Only*, press > to select the *Data Source* field. Then press ⌄ until *Beacon Only* appears.
3. Press ↵ to save the changes.
4. Press ⌄ until the *Beacon Mode* screen appears:



5. Press > to activate the cursor. Press ∨ until the required beacon mode appears. See Table 5.7.

Table 5.7 Beacon modes

Mode name	Description
Auto Range mode	Reads the incoming RTCM SC-104 message stream and selects the two closest radiobeacons within range of the *Ag*GPS receiver. The closest radiobeacon is automatically assigned to Beacon DGPS Channel 0, and the second closest is assigned to Channel 1.
Auto Power mode	Detects the signal strength of the two most powerful radiobeacons within range of the DSM 132 receiver. The most powerful radiobeacon is automatically assigned to Beacon DGPS Channel 0, and the second is assigned to Channel 1.
Disabled mode	Disables DGPS and forces the DSM 132 receiver to operate in GPS mode only.
Manual Freq mode	Disables the automatic selection of radiobeacons so that you can manually select the frequency of radiobeacons for Channel 0 and 1.

6. If you selected:

   – *Auto Range Mode* or *Auto Power Mode*, configuration is complete. Press Esc several times to return to the *Home* screen.

     The receiver automatically detects the two closest or two most powerful beacons.

   – *Manual Freq Mode*, see EZ Bcn screens, page 72, or Manually selecting frequencies, page 72

   – *Disabled Mode*, the receiver ignores incoming RTCM SC-104 messages and operates as a GPS-only receiver.

EZ Bcn screens

The *EZ Bcn 0* and *EZ Bcn 1* screens use information in RTCM SC-104 broadcasts to create a list of beacon stations that are within range of the receiver. Use these screens to manually select frequencies for Beacon Channels 0 and 1:

1. Navigate to the *EZ Bcn 0* screen.
2. Press > to select the field for Beacon Channel 0.
3. Press ∨ or ∧ until the required beacon station appears:



4. Press ↵ to save the changes.
5. Press ∨ to display the *EZ Bcn 1* screen.
6. Repeat Step 2 through Step 4 to select the station for Beacon Channel 1.

Manually selecting frequencies

Note – *Use this method only if you cannot find the required radiobeacon name in the list.*

To manually select Beacon DGPS radiobeacon frequencies using the *EZ Bcn* screens:

1. Navigate to the *Man Bcn Freqs* screen.
2. Press > to activate the cursor in the *Beacon Channel 0* field:



3. Press ∨ or ∧ to enter the frequency one number at a time. Press > to move to the next digit.

4. Press ↵ to save the changes.
5. Press > to select the *Beacon Channel 1* field.
6. Repeat step 3 to enter the other required frequency.
7. Press ↵ to save changes.

Configuring Other DGPS Corrections

To configure for RTCM SC104 Differential corrections to be received on Port A or Port B:

1. Navigate to the *Configuration* menu.
2. Navigate to the *Port A Config* screen (or *Port B Config* screen).
3. Select a suitable port (for example, *Port A In/Out*) and then use the menu keys to specify *RTCM* as the input (*I*).
4. The DSM 132 is now configured to use any incoming DGPS corrections on the selected port.

   Note – *This happens even though the data displayed by the DGPS Source screen shows the source of the DGPS to be either Beacon, L-band, or WAAS/EGNOS.*

Configuring DGPS Base Station

You may need this option when working in a remote location where satellite differential correction and/or beacon tower differential correction is not available.

If you have not yet done so, install the latest version of FlashLoader 100 on the office computer. See page 56.

To install the Base Station option:

1. Use the power/data cable to connect the receiver to the serial port on the office computer (this is usually COM1 or COM2).
2. On the office computer, click Start and then select *Programs / FlashLoader100*.
3. Click **Find Device**.

   FlashLoader100 detects the receiver and automatically selects the correct port. A message appears identifying the port which is connected to the receiver. Click **OK**.
4. Enter the password. For more information, see Step 2 through Step 6 on page 82.

To configure the communication port:

1. Navigate to the *Config Port B (*or *Config Port A*) menu.
2. Press ⌄. The *Port Input/Output* screen appears:



3. Press > to activate the cursor.
4. Press > until the cursor highlights the third item on the second line.
5. Press ⌄ until *RTCMI* appears:



6. Press ↵ to save the settings.
7. Press Esc several times to return to the *Home* screen.

8. If necessary, change the baud rate and parity to match the settings used by your base station radio. For more information, see Configuring input / output communication, page 59.

Configure base station output settings

Note – The *Base Stn Config menu is available only when the Base Station option is installed and a communication port is configured correctly for it.*

In Base Station mode, the receiver outputs RTCM (GPS correction) data. The RTCM data can be transmitted to an external radio, which then broadcasts the RTCM information to other DSM 132 “rover” receivers in the field that are within radio range. Generally, all rover units are equipped with an identical radio which enables them to receive the RTCM data from the base station radio.

The DSM 132 receiver has real-time capabilities, so a submeter reference position can be created in seconds. Set the receiver antenna over a known surveyed location, or allow the receiver to compute the reference location. Once the reference position is supplied, the receiver can begin computing PseudoRange correction information. The information is converted to RTCM output data format. This information is used to correct the rover’s final output position, and so provides submeter accuracy.

Base location

You can use the *Base Location* screen to view the current location of the receiver antenna. You can also use this screen to change the setting for the location of the antenna. The screen provides the following options:

- View location, page 76
- Set from here, page 76
- Edit base position, page 77
- Set from averaged positions, page 77

View location

To view the current location of the receiver antenna:

1. Navigate to the *Configuration* / *Base Stn Config* / *Base Location* screen:



2. Press ↵ one or more times to view the current computed reference position, latitude, longitude, and altitude.

   Note – *The reference position coordinates are in latitude/longitude; the datum is WGS-84; altitude is referenced to Mean Sea Level (MSL).*

Set from here

To set the receiver antenna location, select the current computed GPS position as follows:

1. Navigate to the *Base Location* screen.
2. Press > to activate the cursor.
3. Press ^ or v until *Set From Here* is displayed.
4. Press ↵. The receiver displays three screens in succession, showing the current latitude, longitude, and altitude:
   - To save the current coordinate value, press ↵.
   - To change the reference coordinate value, press ^ or v. Press > to move between characters. Press ↵ to save the changes.
5. When you press ↵ to accept the altitude, the receiver asks whether you want to accept the new reference position or not:
   - Press ↵ to accept the new reference position.

– Press ^ or v to reject the new reference position. Press ↵ to finish.

Edit base position

Set the receiver antenna to a particular location. Do this when the antenna is on a surveyed location with known coordinates:

1. Navigate to the *Base Location* screen.
2. Press > to activate the cursor.
3. Press ^ or v until *Edit Base Pos* is displayed.
4. Press ↵. The receiver displays three screens in succession, showing the current latitude, longitude, and altitude:
   – To save the current coordinate value, press ↵.
   – To change the reference coordinate value, press ^ or v. Press > to move between characters. Press ↵ to save the changes.
5. Once you press ↵ to accept the altitude, the receiver asks whether or you want to accept the new reference position or not:
   – Press ↵ to accept the new reference position.
   – Press ^ or v to reject the new reference position. Press ↵ to finish.

Set from averaged positions

To determine the location of the receiver antenna, you can configure the receiver to average the computed position over a period of time:

1. Navigate to the *Base Location* screen.
2. Press > to activate the cursor.
3. Press ^ or v until *Set From Ave* is displayed.
4. Press > to move the cursor to the right.

5. Press ^ or v to select the number of positions required to determine the average current location.
6. Press ↵.

   The receiver begins to average positions.
7. Do one of the following:
   - When all calculated positions are collected, press ↵ to accept the averaged position.
   - Press > to cancel.

Setting the base station mode

To operate the receiver as a base station, set the base position, then select Base Station mode:

1. Navigate to the *Base Stn Config* menu.
2. Press v until the *Base Station Mode* screen appears.
3. Press > to activate the cursor.
4. Press ^ or v to select *ON*.
5. Press ↵ to save the change.

Setting the PRC mode

Use the *PRC Interval* screen (PseudoRange Correction) to set the calculation interval. PseudoRange Correction is applied to the rover receiver's computed GPS position to correct the final position output:

1. Navigate to the *Base Stn Config* menu.
2. Press v until the *PRC Interval* screen appears:



3. Press > to activate the cursor.
4. Press ^ or v to change the PRC interval.
5. Press ↵ to save the changes.

CHAPTER

6

Activating Firmware Options

In this chapter:

- Introduction
- Installing an Option
- Using an Option

Introduction

This chapter describes how to activate and use the firmware options that you can purchase with the DSM 132 receiver (see Table 6.8).

Table 6.8 Firmware options

Part Number	Option
36429-30	Differential Base Station
36429-20	EVEREST Multipath Rejection
36429-50	RTS/CTS Flow Control Negotiation

For more information, see Receiver enhancements, page 17.

Installing an Option

To install and activate an option, use one of the following methods:

- Enter a password
- Use Flashloader100

Enter a password

When you purchase an option, your Trimble Reseller provides the necessary password. Once entered, the password is stored in permanent memory and remains even when the receiver is switched off.

Use the *Update receiver* screen of the DSM 132 menu system to enter the password directly into the receiver and activate the option for immediate field use.

1. If you are using *Ag*Remote, connect the receiver to an office computer.
2. Navigate to the *Update receiver* screen. Press ↵.

   The active cursor highlights the first digit.

3. Press ^ or v to enter the first number of the password.
4. Press > to move to the next digit.
5. Repeat steps 3 and 4 until all numbers are entered.
6. Press ↵ to save changes.

The screen displays the selected option as enabled.

If an error message appears, enter the password again. If you are still unsuccessful, contact your local Trimble Reseller for assistance.

FlashLoader100

If you have not yet done so, install the latest version of FlashLoader 100 on the office computer. See page 51. Use FlashLoader100 to enter one or more passwords:

1. On the office computer, click Start, then select *Programs* / *Flashloader100*.
2. In the dialog that appears, select the *Update receiver with password* check box. Click **Proceed**.
3. The *Flash Progress* dialog appears while FlashLoader100 attempts to find the receiver. When FlashLoader100 finds the receiver, the *Enter Passwords* dialog appears.

   If FlashLoader100 cannot find the receiver, check that the cables are properly connected and try again.
4. In the *Enter Passwords* dialog, enter the 10-digit password into the first blank line. If you have more than one option, enter each password on a separate line. Click **OK**.

   The process takes a few seconds and a message appears when completed.
5. In the dialog that appears, click **Yes** to continue.
6. When the successful operation message appears, click **OK**.

   The option is successfully installed.

If any password operation fails, FlashLoader100 displays a message that identifies the failed option. Disconnect the receiver, then reconnect it and try again. For more information, see FlashLoader100, page 91. If you are still unsuccessful, contact your local Trimble Reseller for assistance.

Using an Option

This section describes how to use *Ag*Remote to configure the receiver for each option.

In each case, first connect to the receiver and start *Ag*Remote.

Fast Rate Output

To configure the receiver:

1. Navigate to the *Configuration* / *GPS Config* / *Position Rate* screen.
2. Press > to activate the cursor.
3. Press ^ or v to set the output rate (1, 2, 5, or 10 Hz).
4. Press ↵ to save the settings.
5. Press Esc several times to return to the *Home* screen.

To configure the communication port:

1. Navigate to the *Port A Config* (or *Port B Config) NMEA out* screen.
2. Press > to activate the cursor in the top line.
3. Press > to move the cursor to the second digit.
4. Press v until ASAP appears.
5. Press ↵ to save the settings.
6. Press Esc several times to return to the *Home* screen.

APPENDIX

A

Troubleshooting

In this appendix:

- Introduction
- Problems and Solutions
- Troubleshooting Flowcharts

Introduction

This appendix describes some issues or problems that can occur and explains how to solve them. It also contains a series of troubleshooting flowcharts to help in problem solving

Problems and Solutions

This table lists some problems that can occur and suggests possible solutions.

Problem / issue	Possible solution
GPS	
Poor accuracy	
The accuracy of GPS positions is poor because the receiver is picking up poor quality signals from the satellites. The receiver always calculates the most accurate position it can given the current GPS satellite differential operating conditions.	Change some or all of the following GPS settings: Minimum elevation – Increase the setting (the default is 8°). Minimum Signal Strength – Increase the System Mask AMU setting (the default is 3). Maximum PDOP – Decrease the setting (the default is 13). GPS Mode – Change to Manual 3D (the default is Auto 2D/3D). DGPS Mode – Change to DGPS (the default is DGPS Auto/On/Off).
GPS signals are reflecting off nearby trees and/or metal buildings and horizontal surfaces.	To reduce multipath noise, mount the GPS receiver so that it has a clear view of the sky. The receiver must be away from trees and large metal objects.

Problem / issue	Possible solution
Intermittent loss of lock	
The receiver loses the satellite signal from time to time.	Check that all cable connections are secure and free of moisture. If necessary, disconnect the cables and allow them to dry. Then reconnect the cables. Make sure that the receiver is mounted on the highest point of the vessel, and is clear of metal surfaces. Try traveling in a different direction. Check Maximum PDOP and Minimum Signal Strength settings (see Poor accuracy above).
Intermittent DGPS signal	
The correction signal strength can be reduced to unusable levels. Causes include tree canopy cover between the receiver and the differential satellite, radar sets, and microwave transmitters.	Make sure that the receiver is mounted away from overhead trees and sources of electromagnetic interference.
Not tracking satellites or differential signal	
The receiver is not tracking satellites, and the *Home* screen displays (Sv:00). The receiver is searching for a satellite or beacon signal.	Check the cable connections at the receiver and antenna.

Problem / issue	Possible solution
Tracking but not receiving a differential signal	
The receiver is tracking satellites and tracking an OmniSTAR or Thales satellite beam, but is not receiving DGPS signals.	You need to check that your DGPS service subscription is still current and enabled. For OmniSTAR service: 1. Navigate to the *Omni Srv Info* screen and press ↵ until *Stop Date* appears. 2. If the message *Access Unknown* appears, contact OmniSTAR to reactivate your subscription. For Thales service: 1. Navigate to the *Thales Srv Info* screen and press ↵ once. 2. If the message *Access Unknown* appears, contact Thales to reactivate your subscription. For more information, see Paid Subscription Services, page 63. The receiver must be switched on and configured to track the correct satellite coverage beam before it can be reactivated. When a satellite subscription is activated the *Home* screen displays D/3D.
No GPS position output from the receiver after connecting to *Ag*Remote	
When the receiver is connected to *Ag*Remote, the port communication settings are automatically reset to TSIP 8-O-1 for both input and output. However most devices and software programs accept NMEA 4800-8-N-1 output as standard.	Connect *Ag*Remote. Then reset the port communication settings to NMEA output. For more information, see Configuring the Communication Ports, page 57.

Problem / issue	Possible solution
Interference	
Strong magnetic fields	
Strong magnetic fields have no effect on GPS or satellite DGPS signals. However, some computers and other electric equipment radiate electromagnetic energy that can interfere with a GPS receiver.	If you suspect interference from a local magnetic field, move the receiver away from, or turn off the suspect electronics while observing the GPS receiver's number of satellites being tracked or satellite's signal-to-noise ratio.
FM 2-way radios	
Transmitting FM 2-way radios can interfere with OmniSTAR, Racal, WAAS and GPS signal reception.	Make sure that there is at least 1 m (3 ft) between the FM 2-way radio antenna and the receiver.
Engine Noise	
An unshielded ignition system can cause enough noise to block reception of a beacon signal.	Use resistor spark plug wires on the ignition system of the vessel.
An alternator can cause noise that interferes with a beacon signal.	Use bypass capacitors, commonly available in automotive stores for cleaning up interference to CB and other radios. If the problem persists, shield engine components with aluminum foil.
	Relocate the antenna on the machine. Determine the optimal antenna location by watching the signal-to-noise ratio (SNR) value on the *Ag*Remote *Home* screen. When using a beacon differential correction signal, aim for a value of 10 or higher.
	Note – *Before replacing engine parts in an attempt to solve this problem, make sure that the problem is not caused by a computer or power source near the receiver. Some office computers and their power sources cause noise that is disruptive to the GPS and satellite DGPS signals.*
Receiver	
Mounting location	
The receiver is not picking up a clear signal.	Mount the receiver on the centerline of the vehicle, away from any sources of interference and with a clear view of the sky (see page 27).

Problem / issue	Possible solution
Cables	
One of the cables seems faulty.	Use an ohmmeter to check the cable. The resistance of a good cable between connector pins at each end of the cable is zero. If the cable is sound, but the problem persists, try exchanging the cable with one that you know is working. If the cable is defective, contact your local Trimble Reseller for an RMA number (if the Trimble product is still under warranty), or to purchase a replacement cable.
Configuration settings	
The receiver configuration settings are stored in RAM, which is supported by a lithium-ion battery that has a life of 10 years. If the battery fails, custom configuration settings are lost. ***Note –*** *When this happens, the receiver starts to use the default configuration settings.*	Contact your local Trimble reseller for replacement batteries.
Factory defaults	
You need to restore the receiver factory defaults.	To restore receiver factory default settings: 1. Connect the receiver to an office computer and switch it on. 2. Run *Ag*Remote. 3. Navigate to the *Clear BB RAM* screen. 4. Press ▽ until *Yes* appears. 5. Press ↵. The factory default settings are restored. The DGPS service subscription is not lost. See page 63.

Problem / issue	Possible solution
FlashLoader100	
The FlashLoader100 upgrade utility cannot detect the receiver or download the firmware.	Make sure that: • the receiver is using the latest firmware version • the receiver is connected to a 12–32 VDC power source • all cables are connected correctly between the device and the office computer • FlashLoader100 is attempting to connect to the correct device. (From the FlashLoader100 menu, select *Options* / *Settings*. Then select the *Receiver* check box). • the receiver is connected to the correct office computer COM port. (From the FlashLoader100 menu, select *Options* / *Settings*. Then select the check box for the required COM port.) • other programs are not using the same COM port as the office computer Once you have checked this, switch off the receiver then switch it on again. Try again to connect FlashLoader100.
***Ag*Remote**	
*Ag*Remote cannot to communicate with the receiver (all you see is a blank screen).	• Make sure that the receiver is connected to a 12–32 VDC power source. • Check all cable connections between the receiver and the office computer. • Make sure that you are using the correct COM port. Once you have checked this, switch off the receiver, then switch it on again. Select *File* / *Connect*.

Troubleshooting Flowcharts

This section contains flowcharts for troubleshooting the following areas:

- System hardware and power
- GPS reception
- OmniSTAR
- Thales

As you proceed through these guides, you may need to view the receiver status or change values in some fields. For information on how to do this, see Menu System Fields, page 44.

In addition, you may find it useful to review Chapter 3, Installing the Receiver.

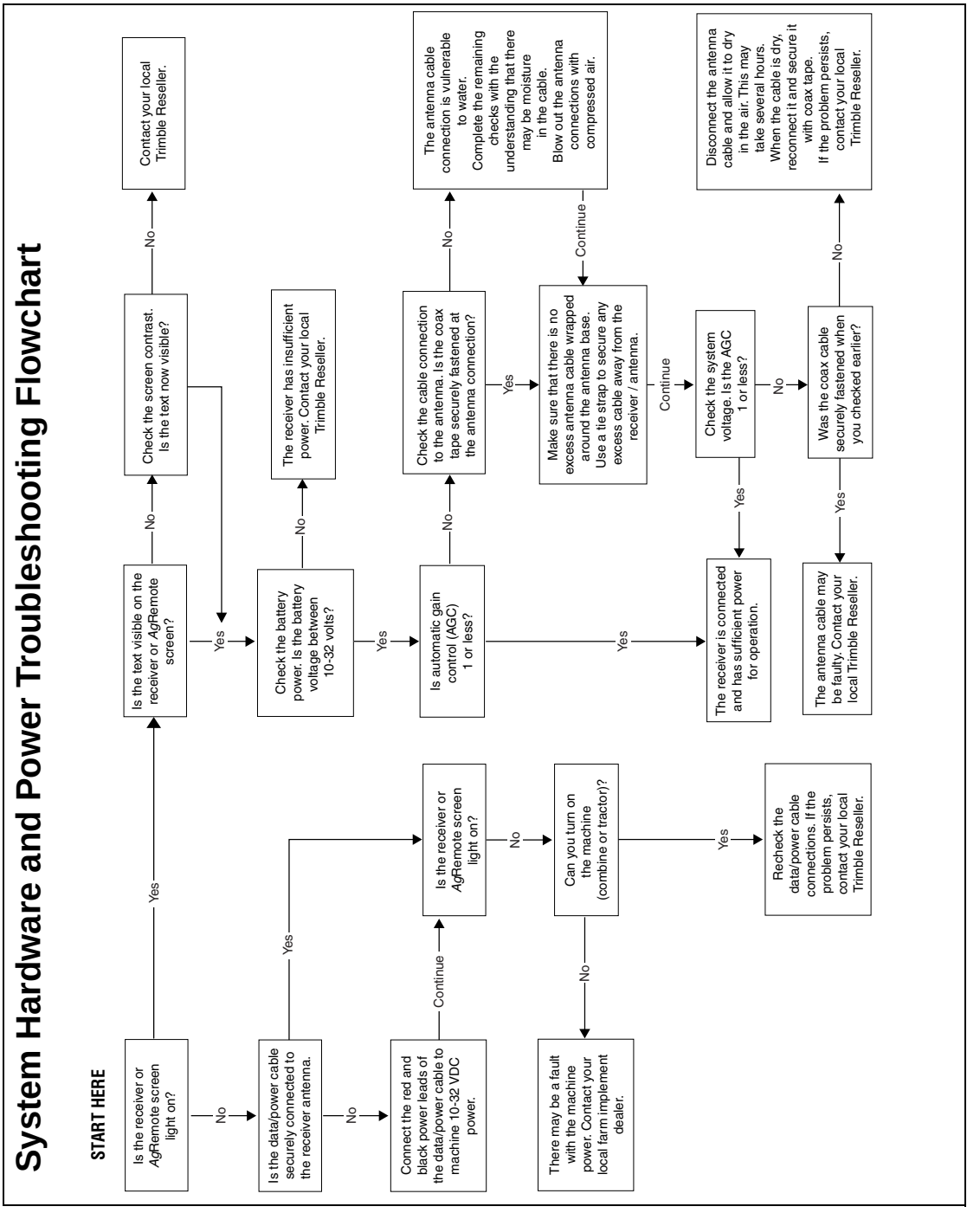


Figure A.1 System hardware and power troubleshooting flowchart

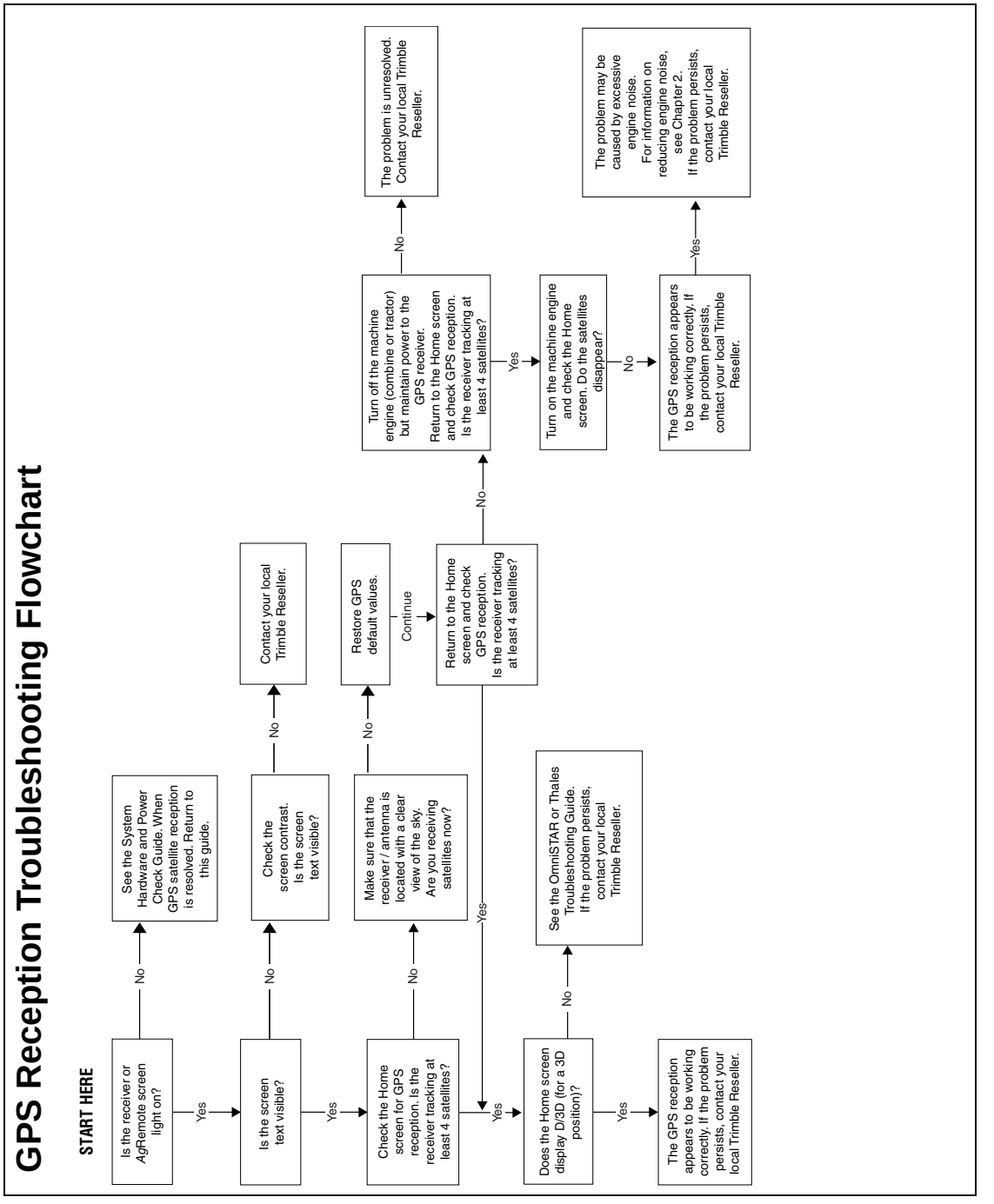


Figure A.2 GPS reception troubleshooting flowchart

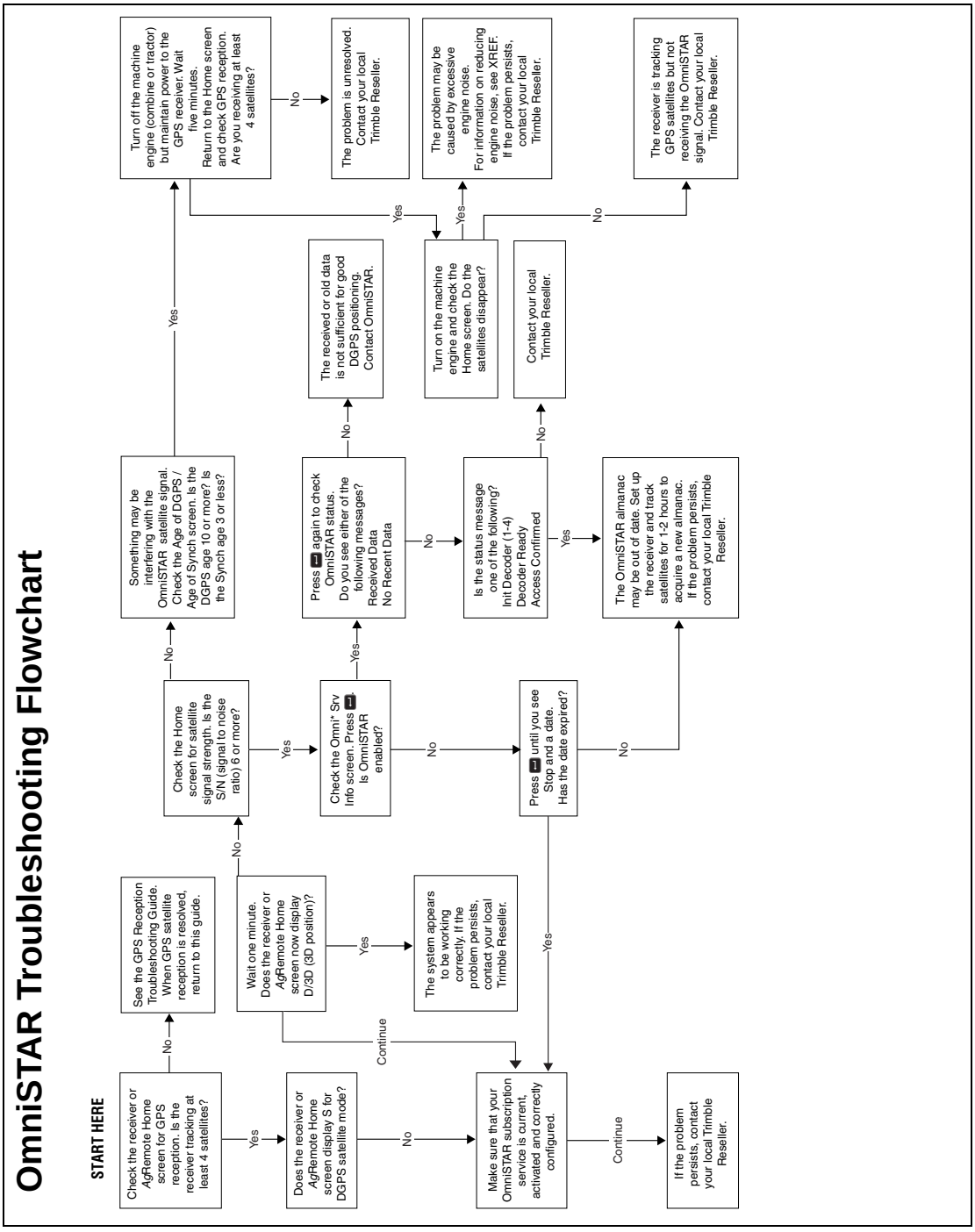


Figure A.3 OmniSTAR troubleshooting flowchart

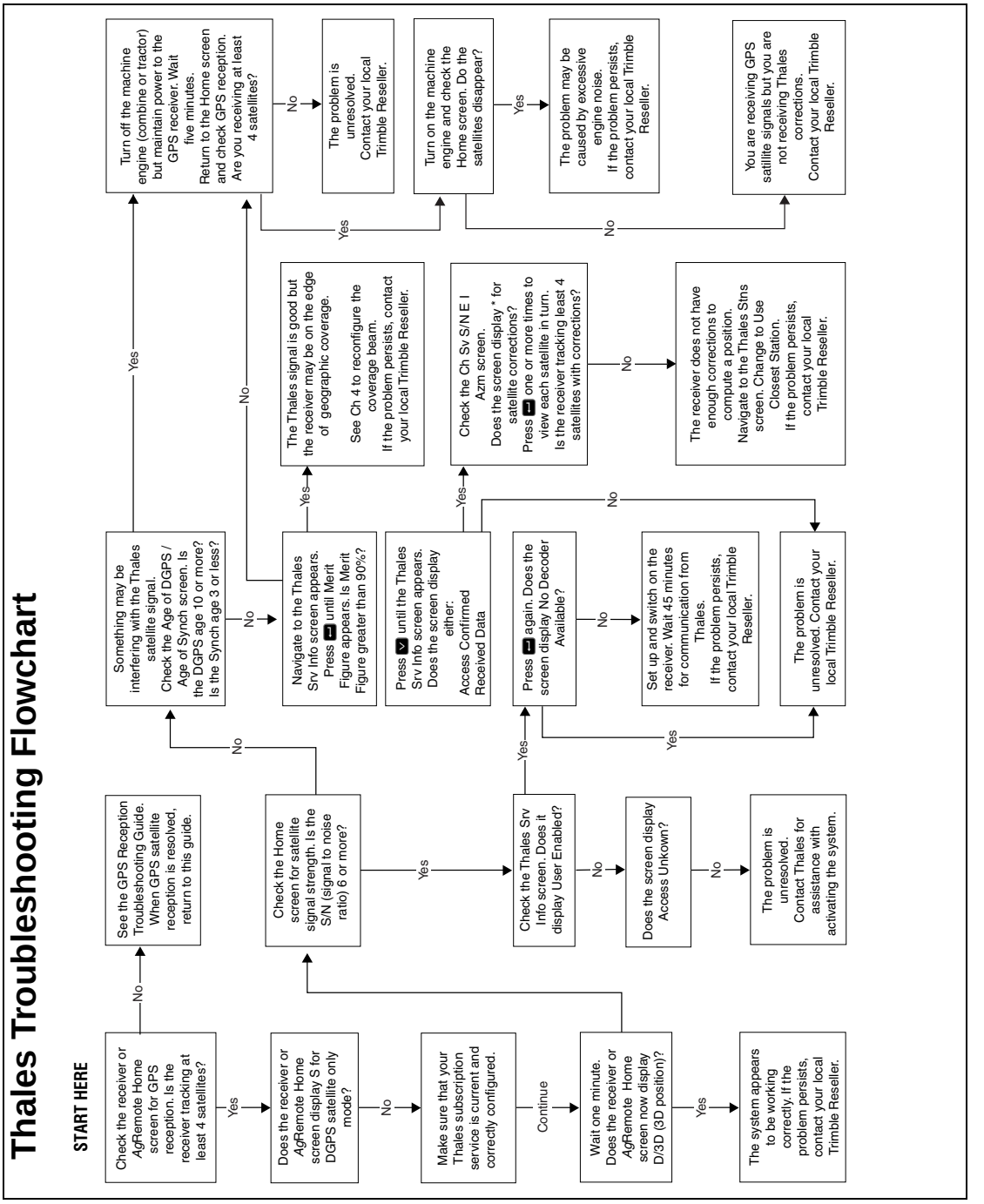


Figure A.4 Thales troubleshooting flowchart

APPENDIX

B

Cables and Connectors

In this chapter:

- Introduction
- Port A and Port B Connectors
- Standard Power/Data Cable

Introduction

This appendix contains pin-out information for the DSM 132 receiver standard and optional cables. Use the information to troubleshoot communication problems with the receiver and devices not supported by the *standard* and *optional* cables.

Port A and Port B Connectors

Table B.1 gives pin-out requirements for the DSM 132 receiver Port A and Port B connectors.

Table B.1 DSM 132 Port A and Port B

Pin	Port A connector	Port B connector
1	Event In	Event In
2	RS-232 B Out	RS-232 A Out
3	RS-232 B In	RS-232 A In
4	CAN Hi	CAN Hi
5	Ground	Ground
6	RTS Out	RTS Out
7	Power On/Off	Power On/Off
8	CTS In	CTS In
9	CAN Low	CAN Low
10	Battery +V	Battery +V
11	Battery –V	Battery –V
12	1 PPS Output	1 PPS Output

Standard Power/Data Cable

Table B.2 gives pin-out information for the standard power/data cable (PN 30945).

Table B.2 Standard power/data cable

To receiver P1 connector 12-pin (female)			**7 cond cable**	**To computer P2 connector DE9 (female)**		**To DC power 2 conductor cable**	
Pin	**Signal**		**Color**	**Pin**	**Signal**	**Color**	**Signal**
1	Event In	←	Black	4	DTR		
2	TXD	→	Orange	2	RXD		
3	RXD	←	Red	3	TXD		
4							
5	SIG GND	↔	Shield	5	SIG GND		
6	RTS	→	Yellow	8	RTS		
8	CTS	←	Green	7	CTS		
9							
7[1]	PWR ON	←					
10[1]	V+ IN	←	Red			Red	V+ IN
11	V– IN	←	Black			Black	V– OUT
12	PPS	→	Blue	9	PPS		

[1]Pins 7 and 10 of the P1 connector are jumpered with a 5 kOhm, 5% resistor

APPENDIX

C

NMEA-0183 Messages

In this appendix:

- Introduction
- NMEA-0183 Message Structure
- NMEA Message Summary
- GGA (GPS Fix Data)
- GLL (Position Data)
- GRS (GPS Range Residuals)
- GSA (GPS DOP and Active Satellites)
- GST (GPS PRN)
- GSV (GPS Satellites in View)
- MSS (Beacon Receiver Signal Status)
- RMC (Recommended Minimum Specific GPS Data)
- VTG (Course Over Ground and Ground Speed)
- XTE (Cross-Track Error)
- ZDA (Time and Date)
- PTNLEV Proprietary (Event Marker)

- PTNLID Proprietary (Trimble Receiver ID)
- PTNLDG Proprietary (Trimble DGPS Receiver Status)
- PTNL,GGK (Time, Position, Position Type, and DOP)
- PTNLSM Proprietary (RTCM Special)

Introduction

Trimble DSM 132 receivers output NMEA (National Marine Electronic Association) messages for GPS position data transfer between electronics equipment. Information on the NMEA-0183 communication standard for GPS receivers is available at: www.nmea.org.

This appendix describes NMEA-0183 standard messages that are configured using TSIP command packets.

Other messages are supported only when specific Trimble options are installed on the receiver. Messages beginning with PTNL are Trimble proprietary messages.

NMEA-0183 Message Structure

NMEA-0183 messages are strings of comma-delimited text. Figure C.5 shows the structure of an NMEA-0183 message.

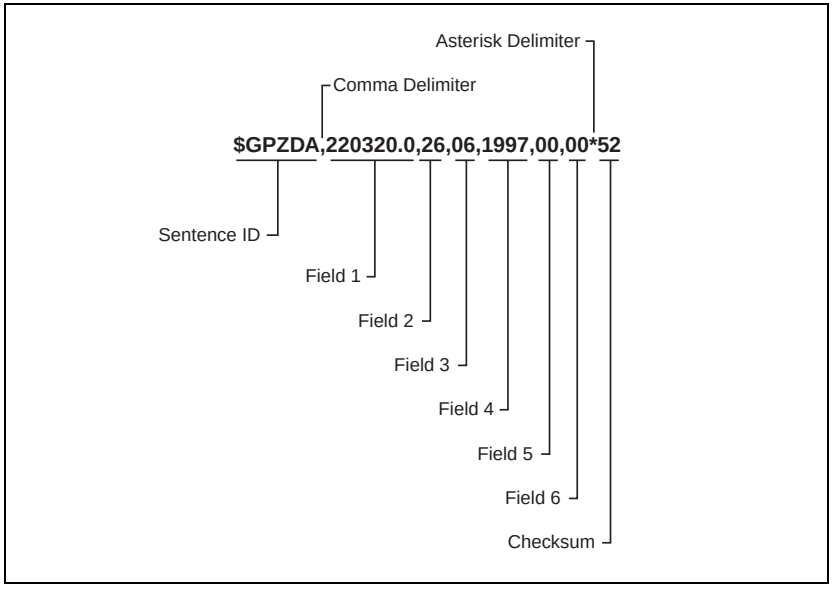


Figure C.5 Example showing NMEA-0183 message structure — ZDA

Each NMEA message includes:

- an identifier to distinguish it from other messages in the data stream
- one or more fields of data, separated by a comma
- a checksum (preceded by *) to validate the data

Table C.3 explains the fields in the ZDA example shown in Figure C.5.

Table C.3 Fields in an NMEA-0183 message — ZDA

Field	Data	Description
1	220320.0	Time in UTC
2	26	Day (01 to 31)
3	06	Month (01 to 12)
4	1997	Year
5	-5	Local time zone offset from GMT (in hours 00 to ±13 hours)
6	15	Local time zone offset from GMT (in minutes)

Fields 5 and 6 together give the total offset. Local time is 5 hours and 15 minutes earlier than GMT.

Symbols and delimiters

All messages follow the NMEA-0183 Version 2.1 format, in which symbols and delimiters identify or separate the message data.

NMEA-0183 messages always:

- begin with a dollar sign ($) followed by a talker ID code (for example GP) and a message ID code (for example, ZDA)
- end with a carriage return and line feed

Checksum values

Newer Trimble receivers conform to the NMEA-0183 Version 2.1 format, in which checksums are mandatory for all messages.

The checksum is calculated from all characters in the message, including commas but excluding the “$” and “*” delimiters. The hexadecimal result is converted to two ASCII characters (0–9, A–F), of which the most significant appears first.

Field formats

The data values output by Trimble *Ag*GPS receivers meet the NMEA-0183 Version 2.1 standard.

Null fields

If a message contains a fixed number of fields, null (empty) fields are included if no data is available. These fields are usually reserved for data that is transmitted on a periodic or irregular basis.

Talker ID codes

Talker ID code identifies the source of the data (for example, GPS, Loran C, or Sounder). Table C.4 describes the Talker ID codes that are available for NMEA-0183 output from most Trimble receivers.

Table C.4 Supported Talker ID codes

Code	Description
GP	GPS
LG	Loran C/ GPS
LC	Loran C
II	Integrated Instrumentation

Latitude and longitude values

The latitude and longitude values in NMEA-0183 messages are presented in degrees, minutes, and decimal minutes, in a single field:

- latitude (ddmm.mmmm)
- longitude (dddmm.mmmm)

Latitude and longitude direction values are sent in a separate field as N, S, E, or W.

Time values

Time values in Universal Time Coordinated (UTC) are presented in hhmmss.ss format, where hh is hours (00–23), mm is minutes, and ss.ss is seconds and fractions of seconds.

Reading NMEA string format

Be aware that NMEA strings can be of varying length, depending on how the receiver is configured. Comma delimited parsing is recommended.

NMEA Message Summary

Table C.5 describes the NMEA-0183 message set that is supported by the DSM 132 receivers.

Note – *Some messages are only supported when specific Trimble options are installed on the receiver.*

Messages beginning with PTNL are Trimble proprietary messages.

Table C.5 NMEA message summary

Message	Message Contents
GGA (GPS Fix Data)	Time, position, and fix related data
GLL (Position Data)	Position fix, time of position fix, and status
GRS (GPS Range Residuals)	GPS range residuals
GSA (GPS DOP and Active Satellites)	GPS position fix mode, SVs used for navigation and DOP values
GST (GPS PRN)	GPS Pseudorange Noise (PRN) statistics
GSV (GPS Satellites in View)	Number of SVs visible, PRN numbers, elevation, azimuth and SNR values
MSS (Beacon Receiver Signal Status)	Signal strength, signal-to-noise ratio, beacon frequency, and beacon bit rate
RMC (Recommended Minimum Specific GPS Data)	UTC time, status, latitude, longitude, speed over ground (SOG), date, and magnetic variation of the position fix
VTG (Course Over Ground and Ground Speed)	Actual track made good and speed over ground
XTE (Cross-Track Error)	Cross-track error
ZDA (Time and Date)	UTC time, day, month, and year, local zone number and local zone minutes
PTNLDG Proprietary (Trimble DGPS Receiver Status)	Beacon channel strength, channel SNR, channel frequency, channel bit rate, channel number, channel tracking status, RTCM source, and channel performance indicator
PTNLEV Proprietary (Event Marker)	Time, event number, and event line state for time-tagging change of state on an event input line

Table C.5 NMEA message summary (continued)

Message	Message Contents
PTNL,GGK (Time, Position, Position Type, and DOP)	Time, Position, Position Type and DOP values
PTNLID Proprietary (Trimble Receiver ID)	Receiver machine ID, product ID, major and minor release numbers, and firmware release date
PTNLSM Proprietary (RTCM Special)	Reference Station Number ID and the contents of the Special Message included in valid RTCM Type 16 records

All messages in this appendix are presented in the format shown in Table C.3. In each example, the structure is shown in the paragraph before the table.

GGA (GPS Fix Data)

The GGA message contains the time, position, and fix related data.

The GGA message structure is:

$GPGGA,151924,3723.454444,N,12202.269777,
W,2,09,1.9,–17.49,M,–25.67,M,1,0000*57

Table C.6 describes these fields.

Table C.6 GGA message fields

Field	Description
1	UTC of position fix in HHMMSS.SS format
2	Latitude in DD MM,MMMM format (0-7 decimal places)
3	Direction of latitude N: North S: South
4	Longitude in DDD MM,MMMM format (0-7 decimal places)

Table C.6 GGA message fields (continued)

Field	Description
5	Direction of longitude E: East W: West
6	GPS Quality indicator 0: fix not valid 1: GPS fix 2: DGPS fix
7	Number of SVs in use, 00-12
8	HDOP
9	Antenna height, MSL reference
10	“M” indicates that the altitude is in meters
11	Geoidal separation
12	“M” indicates that the geoidal separation is in meters
13	Age of differential GPS data record, Type 1; Null when DGPS not used
14	Base station ID, 0000-1023

GLL (Position Data)

The GLL message specifies the position fix, time of position fix, and status.

The GLL message structure is:

$GPGLL,3723.4543,N,12202.2696,W,151933,
A*3E

Table C.7 describes these fields.

Table C.7 GLL message fields

Field	Description
1	Latitude in dd mm,mmmm format (0-7 decimal places)
2	Direction of latitude N: North S: South
3	Longitude in ddd mm,mmmm format (0-7 decimal places)
4	Direction of longitude E: East W: West
5	UTC of position in hhmmss.ss format
6	Fixed text “A” shows that data is valid

GRS (GPS Range Residuals)

The GRS message is used to support the Receiver Autonomous Integrity Monitoring (RAIM).

The GRS message structure is:

$GPGRS,220320.0,0,-0.8,-0.2,-0.1,
-0.2,0.8,0.6,,,,,,*55

Table C.8 describes these fields.

Table C.8 GRS message fields

Field	Description
1	UTC time of GGA position fix
2	Residuals 0: Residuals used to calculate position given in the matching GGA line 1: Residuals recomputed after the GGA position was computed
3-14	Range residuals for satellites used in the navigation solution, in meters

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

GSA (GPS DOP and Active Satellites)

The GSA message identifies the GPS position fix mode, the SVs used for navigation, and the Dilution of Precision values.

The GSA message structure is:

$GPGSA,A,3,19,28,14,18,27,22,31,29,,,,,
1.7,1.0,1.3*35

Table C.9 describes these fields.

Table C.9 GSA message fields

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

GST (GPS PRN)

The GST message is used to support Receiver Autonomous Integrity Monitoring (RAIM).

The GST message structure is:

$GPGST,220320.0,1.3,0.8,0.5,166.1,0.8,0.5,1.6,*4F

Table C.10 describes these fields.

Table C.10 GST message fields

Field	Description
1	UTC time of GGA fix
2	RMS value of the standard deviation of the range inputs to the navigation process (range inputs include pseudoranges and DGPS corrections)
3	Standard deviation of semi-major axis of error ellipse, in meters
4	Standard deviation of semi-minor axis of error ellipse, in meters
5	Orientation of semi-major axis of error ellipse, in degrees from true north
6	Standard deviation of latitude error, in meters
7	Standard deviation of longitude error, in meters
8	Standard deviation of altitude error, in meters

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

GSV (GPS Satellites in View)

The GSV message identifies the number of SVs in view, the PRN numbers, elevation, azimuth and SNR values.

The GSV message structure is:

$GPGSV,4,1,13,02,02,213,,03,
-3,000,,11,00,121,,14,13,172,05*67

Table C.11 describes these fields.

Table C.11 GSV message fields

Field	Description
1	Total number of messages of this type in this cycle
2	Message number
3	Total number of SVs visible
4	SV PRN number
5	Elevation in degrees, 90^0 maximum
6	Azimuth, degrees from true north, 000^0 to 359^0
7	SNR, 00-99 dB (null when not tracking)
8–11	Information about second SV, same format as fields 4–7
12–15	Information about third SV, same format as fields 4–7
16–19	Information about fourth SV, same format as fields 4–7

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

MSS (Beacon Receiver Signal Status)

The MSS message identifies the status of the beacon signal, including the beacon signal strength, beacon signal-to-noise ratio (SNR), beacon frequency, and beacon bit rate.

The MSS message structure is:

$GPMSS,52.5,23.7,287.0,100*4C

Table C.12 describes these fields.

Table C.12 MSS message fields

Field	Description
1	Signal strength (SS), dB ref: 1 υV/m
2	Signal-to-Noise Ratio (SNR), dB
3	Beacon frequency, 283.5–325.0 kHz
4	Beacon bit rate (25, 50, 100, 200), bits per second
5	Channel number

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

RMC (Recommended Minimum Specific GPS Data)

The RMC message identifies the UTC time, status, latitude, longitude, speed over ground (SOG), date, and magnetic variation of the position fix.

The RMC message structure is:

$GPRMC,184804.00,A,3723.476543,N,
12202.239745,W,000.0,0.0,051196,15.6,E*7C

Table C.13 describes these fields.

Table C.13 RMC message fields

Field	Description
1	Time: UTC time of the position fix in hhmmss.ss format
2	Status A: Valid V: Navigation Receiver Warning (V is output whenever the receiver suspects something is wrong)
3	Latitude coordinate (the number of decimal places, 0–7, is programmable and determined by the numeric precision selected in TSIP Talker for a RMC message)
4	Latitude direction N = North, S = South
5	Longitude coordinate (the number of decimal places, 0–7, is programmable and determined by the numeric precision selected in TSIP Talker for a RMC message)
6	Longitude direction W: West E: East
7	Speed Over Ground (SOG) in knots (0–3 decimal places)
8	Track Made Good, True, in degrees
9	Date in dd/mm/yy format
10	Magnetic Variation in degrees

Table C.13 RMC message fields (continued)

Field	Description
11	Direction of magnetic variation E: Easterly variation from True course (subtracts from True course) W: Westerly variation from True course (adds to True course)
12	Mode indication A: Autonomous D: Differential N: Data not valid

VTG (Course Over Ground and Ground Speed)

The VTG (Velocity True Ground) message identifies the actual track made good and speed over ground.

The VTG message structure is:

$GPVTG,0,T,,,0.00,N,0.00,K*33

Table C.14 describes these fields.

Table C.14 VTG message fields

Field	Description
1	Track made good
2	Fixed text “T” shows that track made good is relative to true north
3	Not used
4	Not used
5	Speed over ground in knots (0–3 decimal places)
6	Fixed text “N” shows that speed over ground is in knots
7	Speed over ground in kilometers/hour (0–3 decimal places)
8	Fixed text “K” shows that speed over ground is in kilometers/hour

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

XTE (Cross-Track Error)

The XTE message reports the cross-track error of the vessel.

The XTE message structure is:

$GPXTE,A,A,0.050,L,N*5E

Table C.15 describes these fields.

Table C.15 XTE message fields

Field	Description
1	A: Valid (fixed)
2	A: Valid (fixed)
3	Cross-track error, in nautical miles
4	Direction to steer L: Left R: Right
5	N: Nautical mile units

ZDA (Time and Date)

The ZDA message identifies UTC time, day, month, and year, local zone number and local zone minutes.

The ZDA message structure is:

$GPZDA,184830.15,05,11,1996,00,00*66

Table C.16 describes these fields.

Table C.16 ZDA message fields

Field	Description
1	UTC time
2	Day
3	Month

Table C.16 ZDA message fields (continued)

Field	Description
4	Year
5	Local zone number (– for East Longitude)
6	Local zone minutes

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

PTNLEV Proprietary (Event Marker)

The PTNLEV message is a Trimble proprietary message for time-tagging and marking when an event input occurs. If enabled, this event message is output whenever an event is detected.

The PTNLEV message structure is:

$PTNLEV,184804.00,0*XX

Table C.17 describes these fields.

Table C.17 PTNLEV message fields

Field	Description
1	Time: UTC time of the position fix in hhmmss.ss format
2	Event number, starting with event 0

PTNLID Proprietary (Trimble Receiver ID)

The PTNLID message is a Trimble proprietary message for identifying the machine ID, product ID, major and minor release numbers, and firmware release date of the receiver.

The PTNLID message structure is:

$PTNLID,097,01,XXX,XXX,DD/MM/YY*XX

Table C.18 describes these fields.

Table C.18 PTNLID message fields

Field	Description
1	Machine ID
2	Product ID
3	Major firmware release number
4	Minor firmware release number
5	Firmware release date, in dd/mm/yy format

The PTNLID message, if enabled, is output every 30 seconds.

PTNLDG Proprietary (Trimble DGPS Receiver Status)

The PTNLDG message is a Trimble proprietary message for identifying the DGPS receiver channel strength, channel SNR, channel frequency, channel bit rate, channel number, channel tracking status, RTCM source, and channel performance indicator for either beacon DGPS or satellite DGPS.

The PTNLDG message structure is:

$PTNLDG,87.0,5.2,1558510.0,1200,2,4,1,25,,,*01

Table C.19 describes these fields.

Table C.19 PTNLDG message fields

Field	Description
1	Channel signal strength, in 1 dBuV/m. For beacon, this is the electromagnetic field intensity level. For satellite, this is the ADC input voltage level.
2	Channel signal to noise (SNR) level, in dB
3	Channel frequency, in kHz
4	Channel bit rate, in bits per second (bps)
5	Channel number, 0–99
6	Channel tracking status 0: Channel idle 1: Wideband FFT search 2: Searching for signal 3: Channel has acquired signal 4: Channel has locked on signal 5: Channel disabled
7	Specified channel is used as RTCM source 0: Not used 1: Used
8	Channel tracking performance indicator. For beacon, this is the number of errors in the last 255 words. For satellite, this is the time since last sync, in tenths of seconds ranging from 0–255.

The PTNLDG message fields are defined in free format.

The maximum number of characters in each field is indicated above (for example, 25 bps displayed as xxx,25,xxx instead of xxx,00025,xxx).

If a channel is disabled, the channel fields can be null fields (showing commas only). If more than one channel is available, the message should be repeated for each channel.

This message can be enabled using TSIP. If enabled, it is output at the NMEA report rate.

Note – *Because the contents of this NMEA message do not change significantly during a one-second interval, the receiver outputs this message at a maximum rate of 1 Hz.*

PTNL,GGK (Time, Position, Position Type, and DOP)

The PTNL,GGK message structure is:

$PTNL,GGK,172814.00,071296,3723.46587704,
N,12202.26957864,W,3,06,1.7,EHT-6.777,M*48

Table C.20 describes these fields.

Table C.20 PTNL,GGK message fields

Field	In this appendix:Description
1	UTC of position fix, in hhmmss.ss format
2	UTC Date of position, in mmddyy format
3	Latitude, in degrees and decimal minutes (for example, dddmm.mmmmmmm)
4	Direction of latitude N: North S: South
5	Longitude, in degrees and decimal minutes (for example, dddmm.mmmmmmm)

Table C.20 PTNL,GGK message fields (continued)

Field	In this appendix:Description
6	Direction of longitude E: East W: West
7	GPS quality indicator 0: Fix not available or invalid 1: Autonomous GPS fix 4: Differential, code phase only solution (DGPS)
8	Number of satellites used in GPS solution
9	DOP of fix
10	Ellipsoidal height of fix (antenna height above ellipsoid)
11	M: Ellipsoidal height is measured in meters

PTNLSM Proprietary (RTCM Special)

The PTNLSM message is a Trimble proprietary message for identifying the Reference Station ID and the ASCII Text message that is included in an RTCM Type 16 Special Message. The PTNLSM message is generated anytime an RTCM stream receives a valid Type 16 Special Message.

The PTNLSM message structure is:

$PTNLSM,0022,This is a message,*.XX

Table C.21 describes these fields.

Table C.21 PTNLSM message fields

Field	Description
1	Reference station ID number, ranging from 0 to 1023. Leading zeros must be added to fill four-digit field.
2	ASCII text message contained within the Type 16 RTCM message.

APPENDIX

D

Navigation Maps

In this appendix:

- DSM132 Menu System
- Navigation map for DSM 132 receiver — Home, Field Operations, and Status menu
- Navigation map for DSM 132 receivers — Configuration menu

DSM132 Menu System

The figures in this appendix show the navigation maps for the DSM132 Menu System, and relate to firmware version 1.7.

Basic instructions for navigating through the menu system are included in Chapter 4, Getting Started.

Basic instructions for configuring the receiver for operation are included in Chapter 5, Configuring the Receiver.

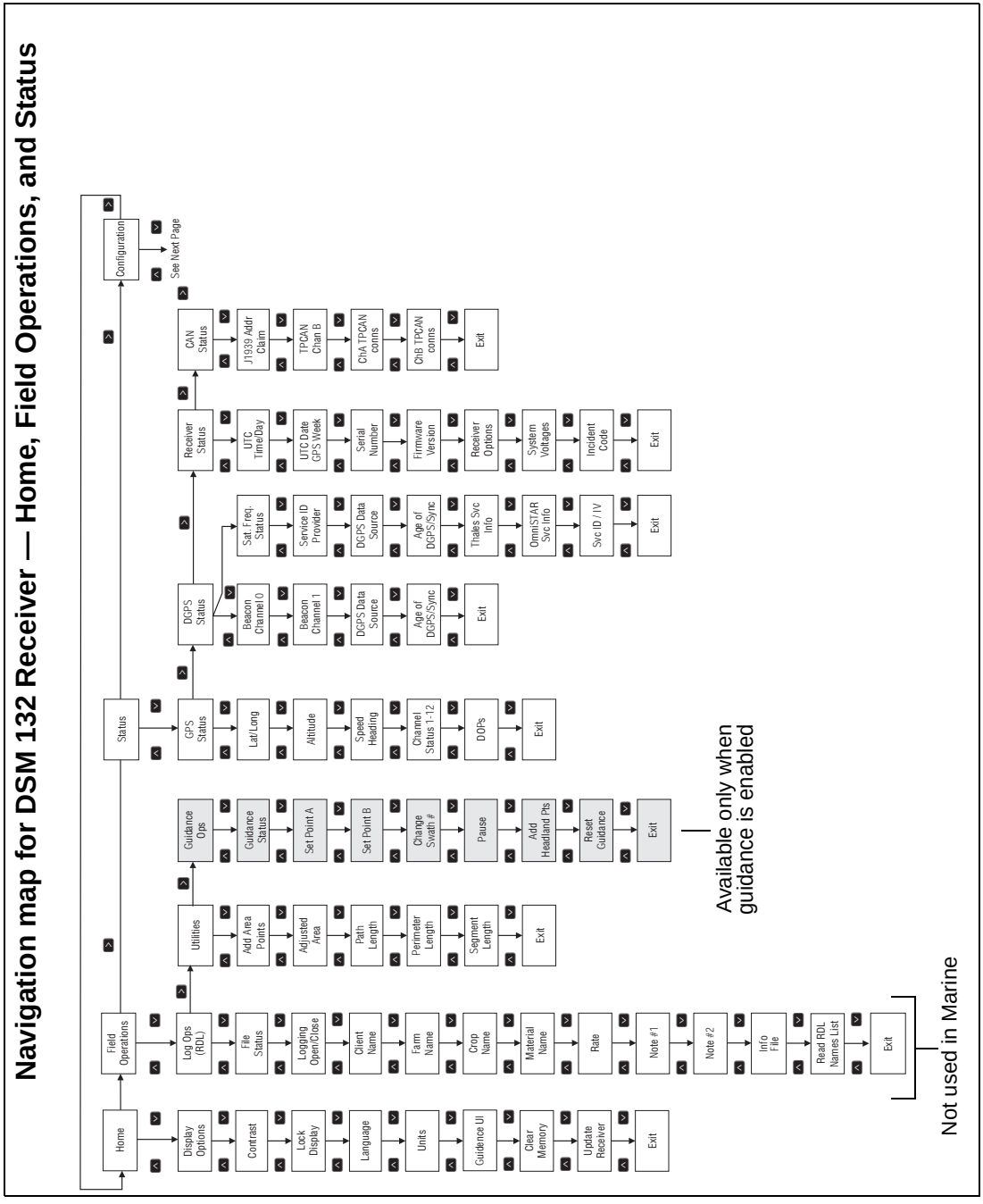


Figure D.6 Navigation map for DSM 132 receiver — Home, Field Operations, and Status menu

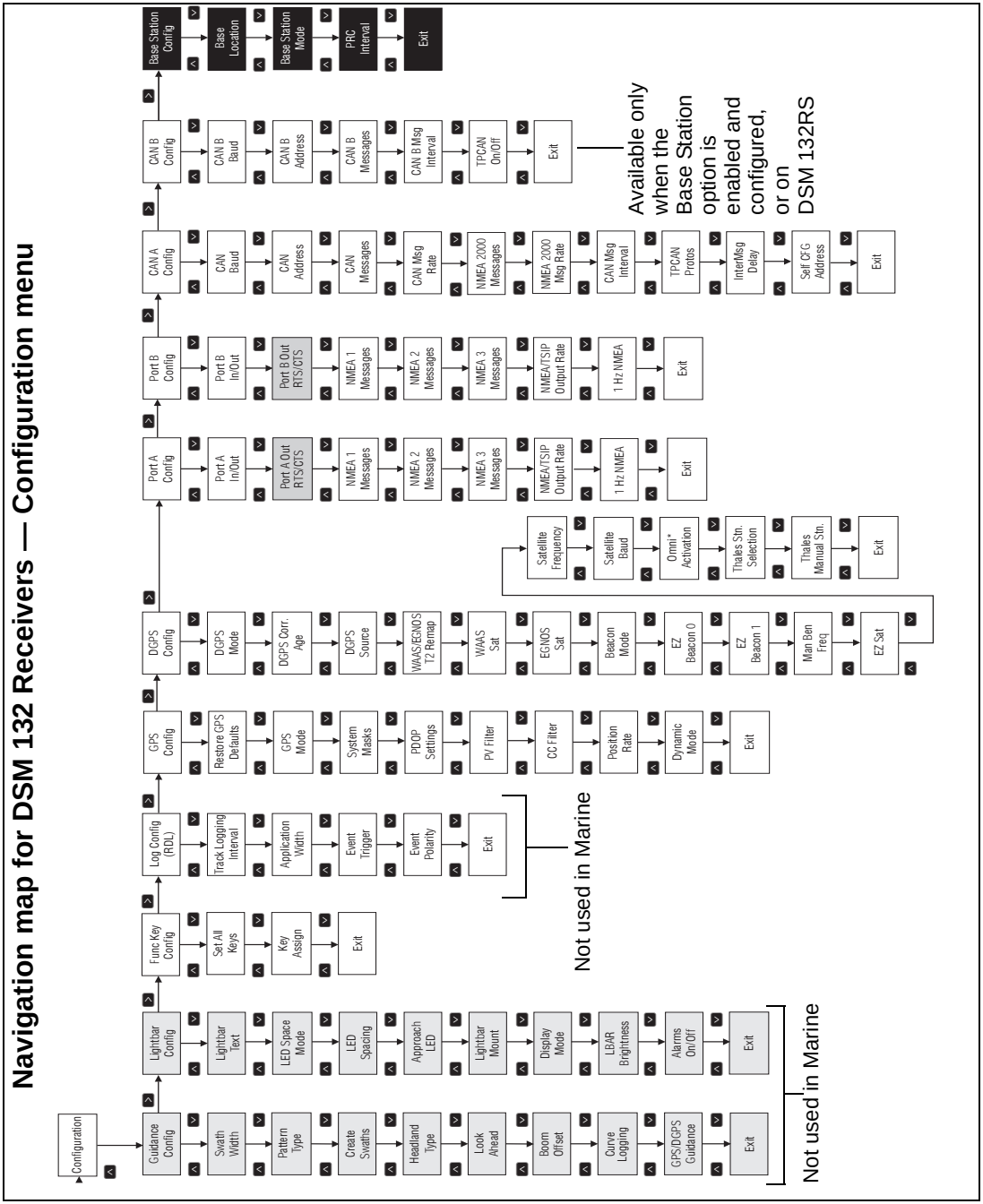


Figure D.6 Navigation map for DSM 132 receivers — Configuration menu

APPENDIX

E

Specifications

In this appendix:

- DMS 132 Receiver
- Combined Antenna
- GPS Channels
- Beacon Channels
- L-Band Satellite Differential Correction Receiver
- Receiver Default Settings

DMS 132 Receiver

Table E.1 lists the characteristics of the DSM 132.

Table E.1 DMS 132 Receiver characteristics

Size	14.5 cm W x 5.1 cm H x 19.5 cm D (5.7 in W x 2.0 in H x 7.7 in D)
Weight	0.76 kg (1.68 lb)
Power	7 Watts (max), 10–32 VDC
Operating temperature	–20 °C to +65 °C (–4 °F to +149 °F)
Storage temperature	–30 °C to +85 °C (–22 °F to +185 °F)
Humidity	100% condensing, unit fully sealed
Casing	Dust-proof, waterproof, shock resistant

Combined Antenna

Table E.2 lists the physical characteristics of the combined antenna.

Table E.2 Combined antenna characteristics

	DSM 132 Receiver
Size	15.5 cm D x 14.0 cm H (6.1 in D x 5.5 in H)
Weight	0.55 Kg (1.2 lb)
Operating temperature	–30 °C to +65 °C (–22 °F to +149 °F)
Storage temperature	–40°C to +80°C (–40 °F to +176 °F)
Humidity	100% condensing, unit fully sealed
Casing	Dust-proof, waterproof, shock resistant

GPS Channels

Table E.3 lists the performance characteristics of GPS channels.

Table E.3 GPS channels performance characteristics

General	12-channel, parallel tracking L1 1571.42 MHz C/A code and carrier phase filtered measurements and multi-bit digitizer
Update rate	Selectable 1, 2, 5, or 10 Hz output rate)
Differential speed accuracy	0.16 kph (0.1 mph)
Differential position accuracy	Less than 1 m horizontal RMS if all the following criteria are met; At least 5 satellites, PDOP < 4 RTCM SC-104 Standard format broadcast from a Trimble DSM 132RS or equivalent reference station
Time to first fix	< 30 seconds, typical
NMEA messages	GGA,[1] GLL, GSR, GSA[1], GST, GSV, MSS, PTNLDG, PTNL, PTNLEV, PTNLID, PTNLSM, RMC[1], VTG[1], XTE, ZDA

[1]By default, the receiver is configured to output GGA, GSA, RMC, and VTG messages at an 1 Hz (1 position/second) update rate.

Beacon Channels

Table E.4 lists the characteristics of the beacon channels.

Table E.4 Beacon Channels

Frequency range	283.5 kHz to 325.0 kHz
Channel Spacing	500 Hz
Beacon modulation	50, 100, and 200 bits/second
Signal strength	10 μV/meter minimum
Dynamic range	100 dB
Channel selectivity	70 dB @ > 500 Hz offset

Table E.4 Beacon Channels (continued)

Frequency offset	17 ppm maximum
3rd order intercept	+15 dBm @ RF input (min. AGC setting)
Beacon acquisition time	<5 seconds, typical
Operating modes	Auto Power, Auto Range, and Manual

L-Band Satellite Differential Correction Receiver

Table E.5 lists the characteristics of the L-band satellite differential correction receiver with multiple vendor support.

Table E.5 L-Band satellite differential correction receiver with multiple vendor support characteristics

Bit error rate	10^{-5} for Eb/N of >5.5 dB
Acquisition and reacquisition time	<5 seconds, typical
Frequency band	1525–1560 MHz
Channel spacing	5 kHz

Receiver Default Settings

Table E.6 lists the receiver default settings.

Table E.6 Receiver default settings

DGPS Source	WAAS/EGNOS
Dynamics	Land
Minimum elevation	8°
AMU mask	3
PDOP Mask	13°
PDOP 2D/3D switch	11
PV Filter	D&S (Dynamic and Static mode)

Table E.6 Receiver default settings (continued)

C.C. Filter	Enhanced
DGPS mode	Auto On/Off
DGPS correction age limit	30 seconds
Pos fix rate	1 Hz

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