AgGPS® 114 Receiver

User Guide

Firmware Version 1.70
Part Number 38201-10-ENG
Revision A
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Trimble®

Agriculture Division

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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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4 Configuring the Receiver

5 Activating Firmware Options

A Troubleshooting

B Cables and Connectors

C NMEA-0183 Messages

About This Manual

Welcome to the *Ag*GPS 114 Receiver User Guide. This manual describes how to install and configure the *Ag*GPS® 114 receiver. It provides guidelines for using the *Ag*Remote 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 Trimble Reseller***.

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- Send an e-mail to ReaderFeedback@trimble.com.
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Document Conventions

The document conventions are as follows:

Convention	Definition
Italics	Identifies software menus, menu commands, dialog boxes, and the dialog box fields.
Helvetica Narrow	Represents messages printed on the screen.
Helvetica Bold	Identifies a software command button, or represents information that you must type in a software screen or window.
	Is an example of a hardware key (hard key) that you must press on the *Ag*GPS 70 RDL keypad.

Convention	Definition
“Select *Italics* / *Italics*”	Identifies the sequence of menus, commands, or dialog boxes that you must choose in order to reach a given screen.
Ctrl	Is an example of a hardware function key that you must press on an office computer (PC). If you must press more than one of these at the same time, this is represented by a plus sign, for example, Ctrl+C.
Screen Font	Represents information on the display screen for your receiver.
^ v > ↵	Represents buttons on the *Ag*Remote screen.

CHAPTER

1

Overview

In this chapter:

- Introduction
- The *Ag*GPS 114 receiver
- Differential GPS (DGPS)

Introduction

This chapter describes the *Ag*GPS 114 receiver and gives an overview of GPS, DGPS, and related information. For details of the receiver physical specifications, see Appendix F, Specifications.

The *Ag*GPS 114 Receiver

The *Ag*GPS 114 receiver is a combined GPS receiver and antenna. It provides Differential GPS capability, in a lightweight, durable, and waterproof housing. See Figure 1.1.

The receiver contains The Choice™ technology, which enables WAAS/EGNOS, OmniSTAR, or Thales real-time differential corrections. For more information on DGPS options, see Configuring Differential GPS, page 78.

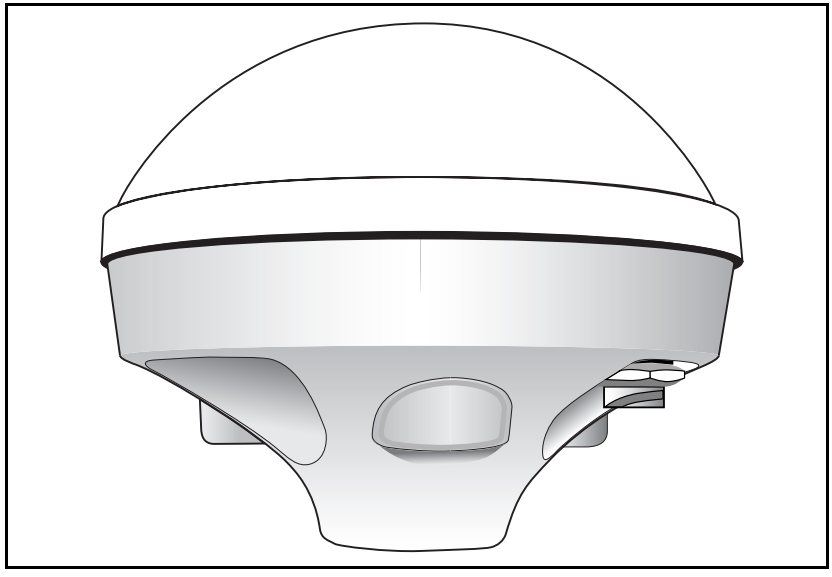


Figure 1.1 *Ag*GPS 114 receiver

As part of a Precision Agriculture System, the receiver provides submeter (less than 3.28 ft) static HRMS accuracy. To achieve this, the receiver uses NMEA-0183 and TSIP (Trimble Standard Interface Protocol) messages. The dynamic pass-to-pass accuracy is better than the static accuracy. You can also 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 farming equipment, including yield monitors, parallel swathing guidance systems, variable-rate planters, spray application controllers, and portable field computers for field mapping and soil sampling.

Standard features

A standard *Ag*GPS 114 system provides the following features:

- Combined GPS/DGPS receiver and antenna
- 12 GPS L1 1575.42 MHz (C/A-code) parallel tracking channels, carrier-phase filtering
- Submeter static HRMS DGPS accuracy (with WAAS/EGNOS, Thales, or OmniSTAR differential correction)
- 10 Hz (10 positions per second) output rate (Only in receivers manufactured after 2001)
- *Ag*Remote software program. This simulates a receiver LCD screen interface to configure and view *Ag*GPS 114 receiver settings.
- Magnetic antenna mount
- Power/data cable
- Two RS-232 serial ports. These provide:
  - NMEA-0183 output: GGA, GLL, GRS, GST, GSA, GSV, MSS, RMC, VTG, ZDA, XTE
  - Trimble Proprietary NMEA messages: PTNLDG, PTNLEV, PTNL,GGK, PTNLID, PTNLSM

  - RTCM SC-104 input
  - TSIP (Trimble Standard Interface Protocol) input and output
  - 1 PPS (pulse per second) strobe signal output
  - Baud Rate: 2400-38400
- Two J1939 (CAN 2.0B) compatible ports
- Compatibility with:
  - *Ag*GPS 170 Field Computer
  - *Ag*GPS 160 Field Computer
  - *Ag*GPS 70 Remote Display and Logger
  - *Ag*GPS 23 Exterior Lightbar
  - *Ag*GPS 21 Internal Lightbar
  - *Ag*GPS EZ-Map on an iPaq

Receiver enhancements

Table 1.1 lists the receiver options that you can purchase with the *Ag*GPS 114 receiver.

Table 1.1 Receiver enhancement options

Option (PN)	Description	Use
Fast Rate (33176-10)	Output position data up to 10 times per second.	Provides parallel swathing (PSO) and variable rate applications Enabled by default in receivers manufactured after July 2001. Activated when the Trimble PSO Lightbar is physically connected.
Differential Base Station (33176-30)	Outputs RTCM differential corrections.	If a radio link is attached, enables the receiver to broadcast corrections for use by other DGPS receivers. This provides submeter positioning.
EVEREST™ Technology (33176-40)	Reduces multipath interference	Improves DGPS receiver accuracy. Activated when the lightbar is connected.

Table 1.1 Receiver enhancement options (Continued)

Option (PN)	Description	Use
RTS/CTS Flow Control Negotiation (33176-50)	Provides hardware flow control	When attached to third-party modems, provides RTS/CTS flow control for correct operation.
Point/Line/Area (33176-80)	Makes it possible to add point, line, and area data logging	Enables you to record points, lines, and areas. The software writes ESRI Shape files to the CompactFlash card of an attached *Ag*GPS 70 RDL. You can then view the Shapefiles using software such as ESRI's ArcView or Delta Data System's AGIS.
	Makes it possible to add, store, delete, and navigate to waypoints.	Enables you to: – store up to 20 waypoints in the receiver memory. – use the lightbar to navigate to waypoints – read from a user-defined list on the CompactFlash card of an attached *Ag*GPS 70 RDL

Application options

Table 1.2 lists the application options that you can purchase with the *Ag*GPS 114 receiver.

Table 1.2 Application options

Option (PN)	Description	Use
*Ag*GPS Parallel Swathing Option (34623-20)	Lightbar	Indicates off-swath distance error. This minimizes redundant applications and skipped areas, and maximizes field coverage.
	Independent data ports	Enables you to simultaneously control the lightbar and output data to a variable rate controller or mapping software program.
*Ag*GPS PSO Plus for the *Ag*GPS 114 (34623-40)	Standard PSO, plus: Handheld *Ag*GPS 70 Remote Display and Logger	Use this option to record a swath coverage map. Actual field area covered, and the quality and date of application is shown. Use with the Point/Line/Area option.
*Ag*GPS Field Pack (32294-xx)	Backpack (rigid frame or lumbar pack), antenna poles, batteries, and cables.	Provides hands-free receiver operation. Useful for crop scouting and field mapping when on foot, for example.

Receiver input / output

The *Ag*GPS 114 standard power/data cable (PN 40947-18) connects to the single receiver connector 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.

- TSIP and NMEA output to an external device.

  The receiver is able to output RTCM in base station mode. When you are using an external radio, it can also receive DGPS corrections. TSIP is input/output when communicating with *Ag*Remote. NMEA is output when the receiver is exporting GPS position information to an external device, such as a yield monitor or to a mapping software program.

  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

- Lightbar protocol

  LBAR is a Trimble proprietary protocol for communication between *Ag*GPS receivers and lightbars in guidance applications.

- 1 PPS output

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

- J1939 (CAN) serial bus

  Both serial ports support the J1939 CAN (Controller Area Network) bus protocol. This protocol standardizes the way multiple microprocessor-based electronic control units (ECUs) communicate with each other over the same pair of wires. It is used in off-highway machines, such as those used in agriculture, construction, and forestry.
  For more information, visit the SAE International website (www.sae.org/servlets/index)

Differential GPS (DGPS)

The *Ag*GPS 114 receiver uses DGPS to achieve high accuracy. One receiver (this is called the reference or base station) is 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 Trimble *Ag*GPS receivers ranges from approximately 3–9 meters (about 10–30 ft).

The errors that cause this reduced accuracy are produced mainly by atmospheric conditions, multipath, (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 *Ag*GPS 114 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 *Ag*GPS 114 receiver utilizing differential correction is best achieved under the conditions described in Table 1.3.

Table 1.3 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. *Ag*GPS receivers 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 reduction option.
RTCM-compatible corrections		These corrections are broadcast from a Trimble 4000RSi™ 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 GIS mapping applications.

The *Ag*GPS 114 receiver outputs position coordinates in several datums and ellipsoids depending on the source of DGPS being used. See Table 1.4.

Table 1.4 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 *Ag*GPS 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 satellite DGPS

The *Ag*GPS 114 receiver supports subscription-based OmniSTAR, and Thales, satellite differential technology. Contact the service provider for service activation or an encrypted activation passcode. In addition, the WAAS/EGNOS service is available free in North America and Europe. For more information, see Configuring Differential GPS, page 78, or go to the following websites:

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

CHAPTER

2

Installing the Receiver

In this chapter:

- System components
- Mounting the receiver
- Connecting to an external device
- CASE-IH
- John Deere GreenStar
- Ag Leader
- AGCO FieldStar
- RDS Ceres yield monitor
- RDS Pro Series 8000 yield monitor
- Laptop computer
- Windows CE palmtop
- Windows handheld computer
- Micro-Trak yield monitor

System Components

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

Table 2.1 *Ag*GPS 114 Receiver (PN 38200-00)

Qty	PN	Description
1	38198-00	*Ag*GPS 114 Receiver
1	12920-00	Magnetic Mount for Antenna
1	40947-18	Power/data Cable
1	38201-10-ENG	*AgGPS 114 Receiver User Guide*
1	25110-00	Warranty Activation Card

Optional extras (if ordered)

Table 2.2 Receiver options

Qty	P/N	Description
1	33176-10	Fast Rate Capability
1	33176-30	DGPS Reference Station (Base Station Capability)
1	33176-40	EVEREST Multipath Reduction Technology

Table 2.3 Application options

1	34623-00	*Ag*GPS Parallel Swathing Option
1	34623-20	Parallel Swathing Option Plus for *Ag*GPS 114 Receiver and *Ag*GPS 70 RDL

Table 2.3 Application options (continued)

1	34623-40	*Ag*GPS 21 PSO Plus for *Ag*GPS 114 Receiver
1	39600-00	*Ag*GPS 70 Remote Display and Logger

Table 2.4 Accessory options

Qty	P/N	Description
1	32294-00	*Ag*GPS Lumbar Field Pack 120 volts
1	32294-10	*Ag*GPS Lumbar Field Pack 240 volts
1	32294-40	*Ag*GPS Rigid Frame Field Pack 120 volts
1	32294-50	*Ag*GPS Rigid Frame Field Pack 240 volts

Table 2.5 Component options

Qty	P/N	Description
1	39903	Ag Leader Yield Monitor Power/Data Cable
1	32609	CASE AFS Power/Data Cable
1	34189	John Deere GreenStar Data Cable
1	35142	RDS Yield Monitor Power/Data Cable
1	40572	Null Modem Adaptor

Mounting the Receiver

To mount the receiver, secure the round magnetic base to a flat metal surface. To fasten the receiver to the surface, thread machine screws into the three M5 x 0.8 (5mm with 0.8mm pitch) metal inserts on the bottom of the receiver. The inserts are 10 mm (.39 inch) deep.

Choosing a location

When choosing a location, consider the following:

Do mount the receiver:

- on a flat surface along the centerline of the vehicle or machine applicator boom.
- in any convenient location within 5.5 meters (18 feet) of the external instrument port. If necessary, use the optional extension cable to connect the receiver and external device.
- at the highest point of the vehicle with no metal surfaces blocking its view of the sky. Trimble recommends that you position the receiver on the top of a mast or pole.
- in such a way that it is not damaged when you drive the machine into a shed or storage area.

Do not mount the receiver:

- close to stays, electrical cables, metal masts, CB radio antennas, cellular phone antennas, air-conditioning units (machine cab blower fan), 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.

Note – *A metal combine grain tank extension can block satellites.*

Figure 2.1 shows the recommended location for sprayer boom applications.

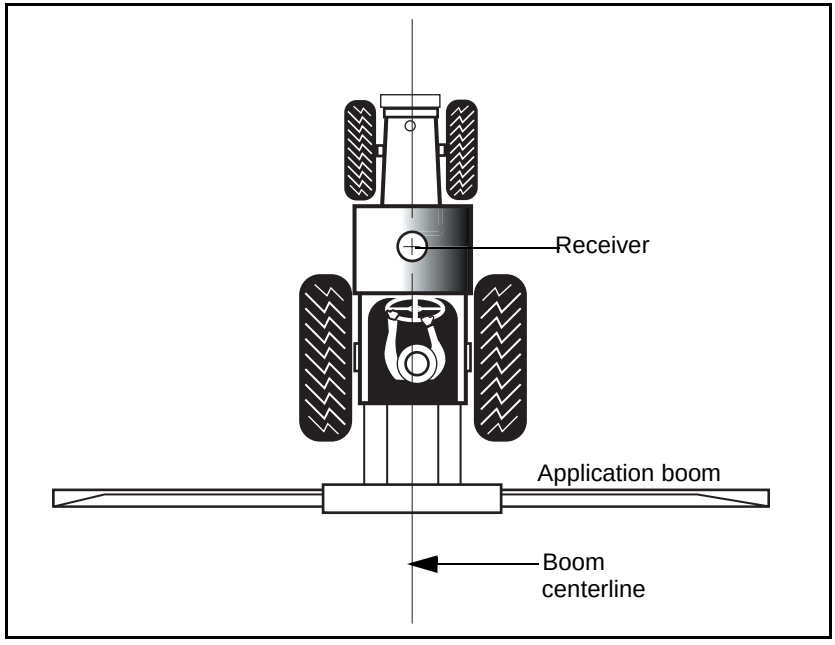


Figure 2.1 *Ag*GPS 114 receiver mounting for ground sprayer boom applications

Environmental conditions

Although the receiver has a waterproof housing, you should install it in a dry location. To improve the receiver's performance and long-term reliability, 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, you should avoid placing it 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
- radio speakers
- high-voltage power lines
- CB radio antennas
- cellular phone antennas
- machine accessory lights

Connecting to an External Device

After installing the receiver, connect and route the power/data cable (PN 40947-18). The receiver can be powered by a vehicle or by a customer-supplied 10–32 VDC power source.

Figure 2.2 shows how to connect the receiver to an external device using the 5.5 m (18 ft) standard power/data cable.

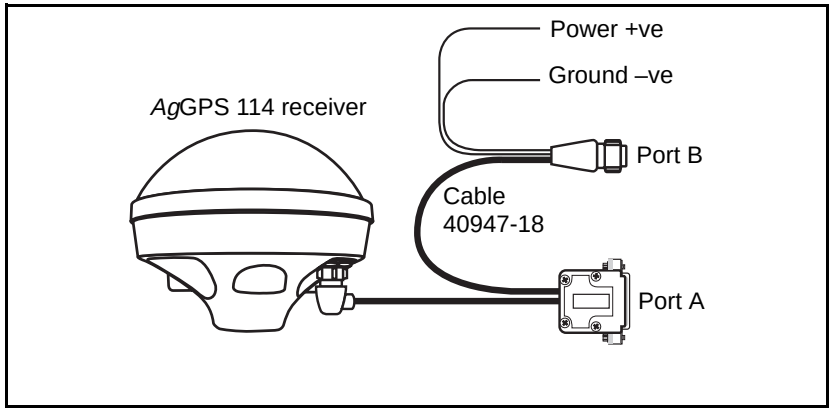


Figure 2.2 Standard power/data cable connections

Plug the:

- right-angle connector into the single port on the bottom of the receiver
- straight 9-pin connector (Port A) into one external device
- round 12-pin connector (Port B) into another external device

See Figure 2.3

When routing the cable from the receiver to the external device, avoid:

- 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

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.

Customized connections

This section shows how to connect The *Ag*GPS PSO (lightbar) and *Ag*GPS PSO Plus (lightbar and *Ag*GPS 70 RDL) to other elements, according to the optional extras in your system.

*Ag*GPS Parallel Swathing Option

The *Ag*GPS PSO cable (PN 35204) connects the *Ag*GPS 21A Lightbar to the *Ag*GPS 114. See Figure 2.3.

Note – *Connect the red power lead of the power/data cable (PN 40947-18) to +12 or +24 VDC power. Connect the black power lead to ground. Do not connect the lightbar to power.*

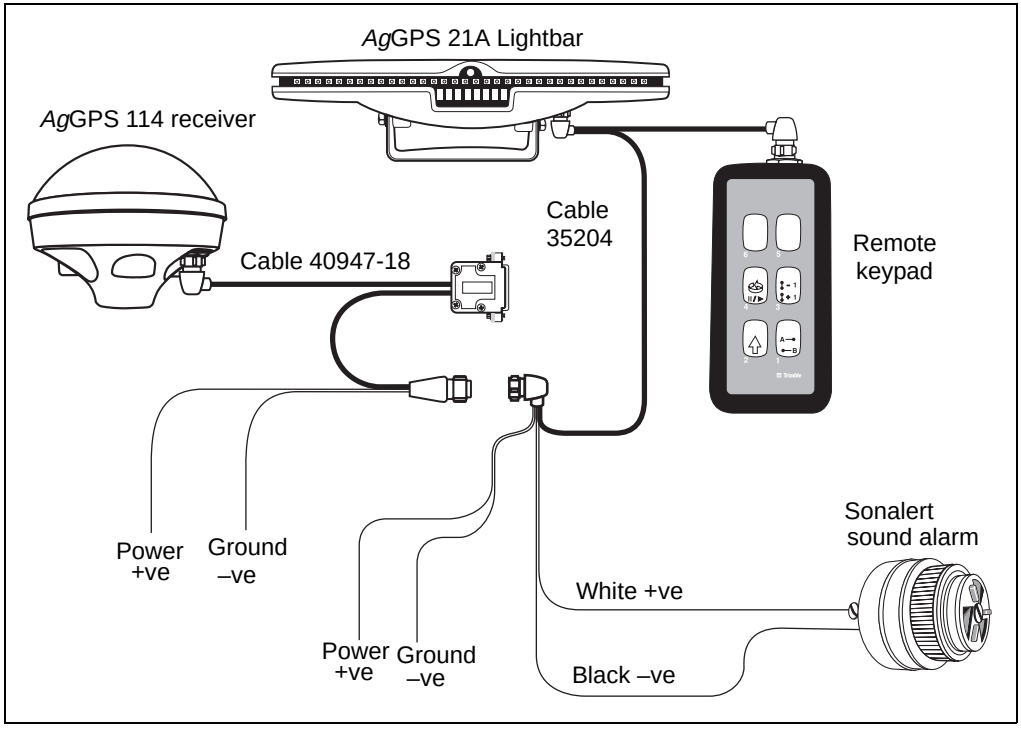


Figure 2.3 Connecting the *Ag*GPS 114 to the *Ag*GPS PSO

*Ag*GPS Parallel Swathing Option Plus

The *Ag*GPS 114 Parallel Swathing Option Plus cable (PN 39350-18) connects the *Ag*GPS 21A Lightbar to the *Ag*GPS 114 and to the *Ag*GPS 70 Remote Display and Logger. See Figure 2.4.

Note – *Connect the red power lead of the power/data cable (PN 40947-18) to +12 VDC power. Connect the black power lead to ground.*

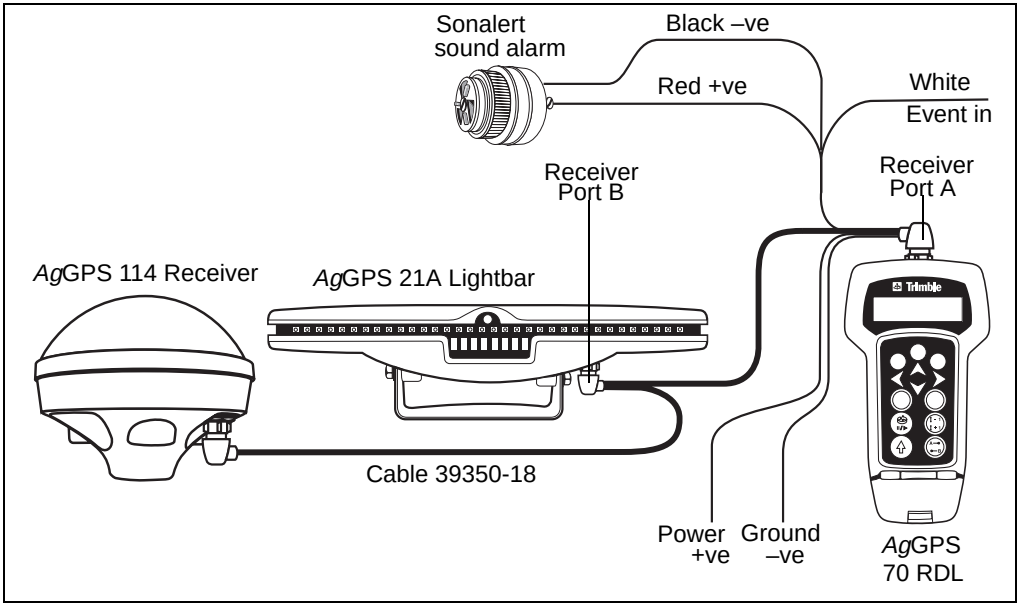


Figure 2.4 Connecting the *Ag*GPS 114 to the *Ag*GPS PSO Plus and the *Ag*GPS 70 RDL

*Ag*GPS 170 Field Computer and *Ag*GPS PSO

The power/data cable (PN 40947-18) connects the *Ag*GPS 114 to the *Ag*GPS 170 Field Computer. See Figure 2.5.

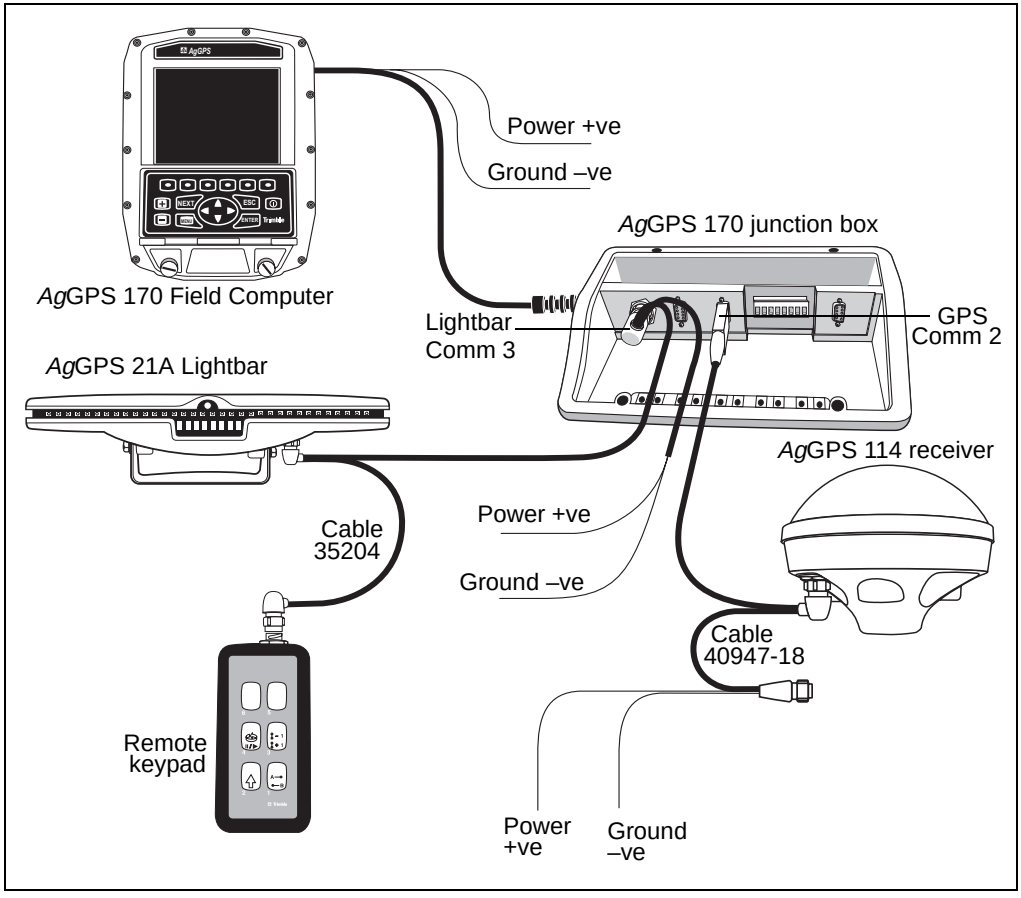


Figure 2.5 Connecting the *Ag*GPS 114 to the *Ag*GPS 170 Field Computer

CASE-IH

This section describes how to connect the receiver to a CASE-IH combine.

Connecting the optional power/data cable

The 1 m (3 ft) CASE AFS power/data cable (PN 32609) connects the receiver to a CASE AFS Yield Monitor or Universal Display through the combine's wiring harness. See Figure 2.6.

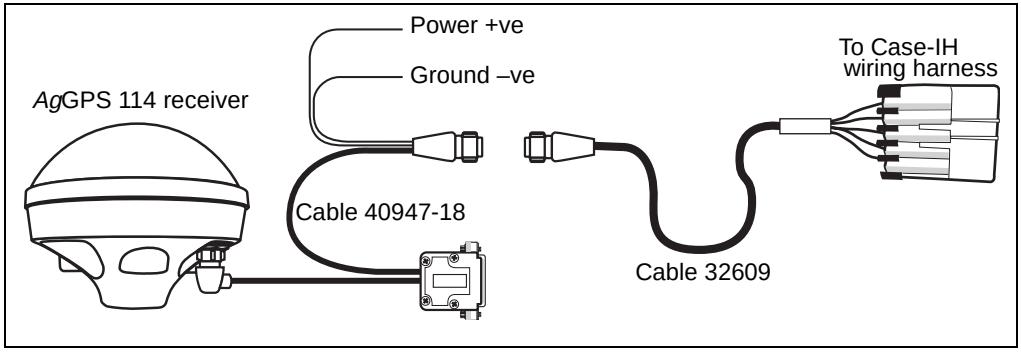


Figure 2.6 CASE AFS power/data cable connection

CASE-IH combines

Warning – Do not connect the red and black power leads on the power/data cable to machine power. The CASE AFS wiring harness supplies 12 VDC power to the receiver through the cable (PN 32609).

Combines manufactured before 2000

To connect the receiver to the combine:

1. Locate the CASE wiring harness connection. This harness is outside and behind the right-hand cab door. Pull open the access door to expose the machine wiring. See Figure 2.7.

Figure 2.7 CASE wiring harness access door

2. Attach the flat, gray 5-pin connector on the CASE AFS power/data cable to the matched female AFS connector (see Figure 2.8).

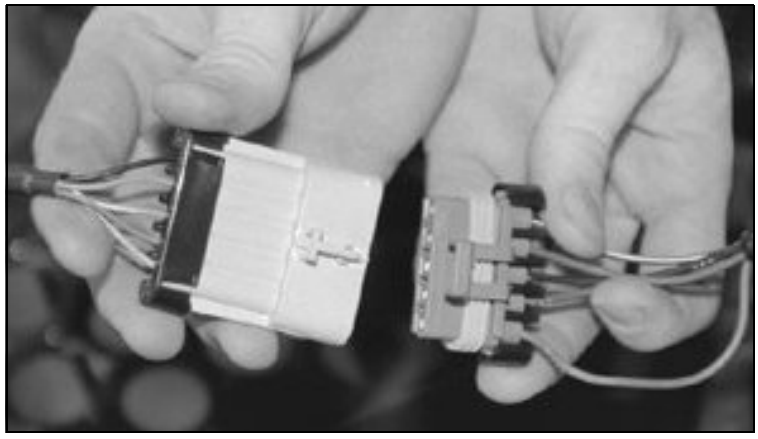


Figure 2.8 CASE power/data cable connection

3. Configure the receiver Port B output for NMEA 4800-8-N-1. For more information, see Chapter 3, Getting Started.

Combines manufactured in or after 2000

To connect the receiver to the combine:

1. Locate the CASE wiring harness. This harness is under the right-hand seat console. Lift the access lid to expose the machine wiring under the operator's seat. See Figure 2.9 and Figure 2.10.

Figure 2.9 CASE wiring harness access lid

Figure 2.10 CASE wiring harness under seat console

2. Connect the flat, gray 5-pin connector on the CASE AFS power/data cable to the matched female AFS connector. See Figure 2.8 on page 28.
3. Configure the receiver Port B output for NMEA 4800-8-N-1. For more information, see Chapter 3, Getting Started.

John Deere GreenStar

This section describes how to connect the receiver to the John Deere GreenStar system.

Connecting the receiver

Before you install the receiver, disconnect any other GPS receiver from the wiring harness of the GreenStar system. The harness must be available for the GreenStar RS-232 port. The GreenStar GPS receiver is mounted above the machine cab and bolted to the grain tank. Disconnect the harness from the GreenStar receiver at the antenna base.

To connect the receiver to a John Deere GreenStar system, use the optional 1 m (3 ft) John Deere GreenStar data cable (PN 34189).

John Deere combines (00 and 10 Series)

Note – *John Deere offers a retrofit kit that enables you to install the newer 50 Series GreenStar yield monitor into 00 and 10 Series combines that do not have yield monitors. If the 50 Series GreenStar yield monitor system is installed, the yield monitor PC card slot is in the back of the GreenStar display. In this case, follow the installation instructions for a 50 Series combine. See page 34.*

Figure 2.12 on page 33 shows how to connect the receiver to the GreenStar system on a 00 or 10 Series John Deere combine.

1. Locate the wiring harness on the bottom of the GreenStar mapping processor (see Figure 2.11). This processor is on the right side of the cab, behind the operator's seat.

Figure 2.11 GreenStar mapping processor

2. From the point where the wire bundle enters the mapping processor, connect the wires as follows:

   a. Gently pull the two 46 cm (18 in) wires from the black plastic casing. Strip back approximately 6.5 mm (1/4 in) of insulation from the end of each wire and crimp on a supplied round connector pin.

   b. Identify the wire labeled CC967. Insert the end into slot A of the 3-slot black Weatherpack tower connector.

c. Identify the wire labeled CC20. Insert the end into slot C of the 3-slot black Weatherpack tower connector.

3. Connect the Trimble GreenStar cable (PN 34189) to the 3-pin end of the Weatherpack tower connector.
4. Connect the receiver power/data cable (PN 40947-18) to the GreenStar Data cable 9-pin serial connector.
5. Connect the receiver power/data cable to the receiver.
6. Attach the power leads of the power/data cable to switched +12 or +24 VDC power. Connect the red wire to positive and the black wire to negative (ground).

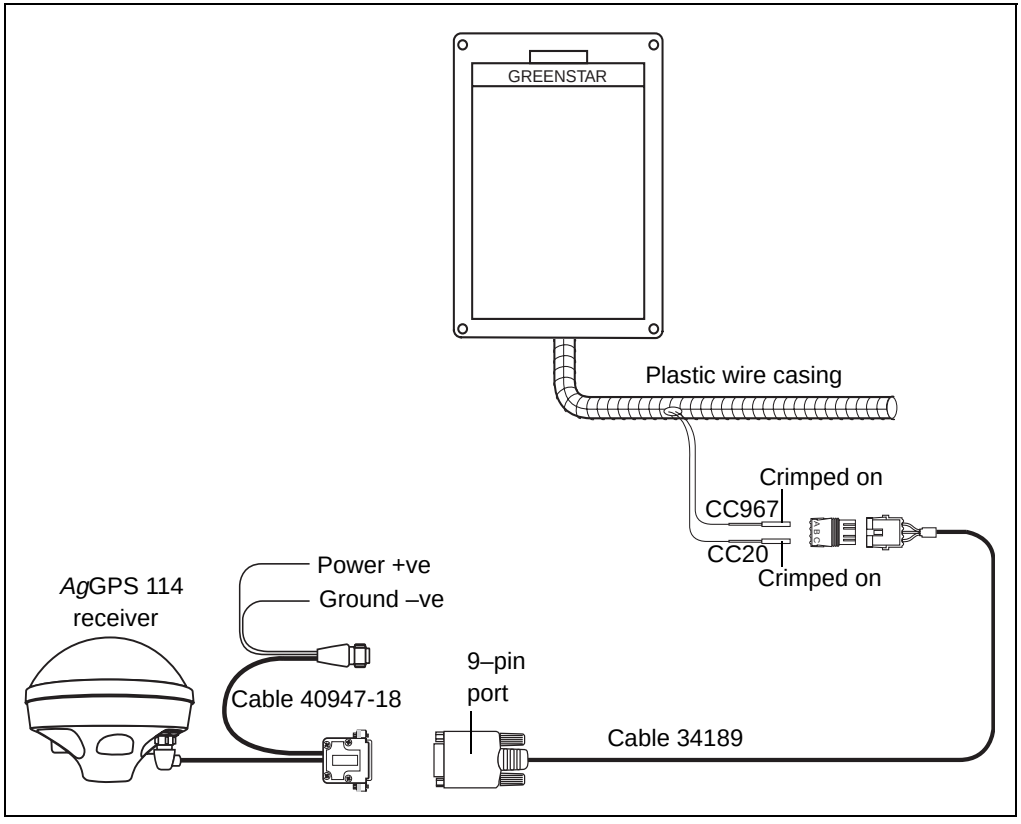


Figure 2.12 GreenStar connection on John Deere 00 and 10 Series combines

Checking the mapping processor version

To check which version of the GreenStar mapping processor software is installed on the GreenStar display, do the following:

1. Press **Setup**.
2. Press **Yield Mapping**.
3. Press **PAGE** four times.

   The *SETUP – YIELD MAP-PAGE 4* screen appears. It shows the current version number.

Configuring the receiver

Configure the receiver as follows:

GreenStar version	Port A NMEA output	NMEA messages
5.3P	9600-8-N-1	GGA, GSA, and RMC
5.3R	4800-8-N-1	

For more information, see Appendix C, NMEA-0183 Messages.

John Deere combines (50 Series)

Note – *John Deere offers a retrofit kit that enables you to install the newer 50 Series GreenStar yield monitor into 00 and 10 Series combines that do not have yield monitors. If the 50 Series GreenStar yield monitor system is installed, the yield monitor PC card slot is in the back of the GreenStar display. In this case, install the receiver for a Series 00 or 10 combine according to the following instructions.*

Figure 2.14 on page 37 shows how to connect the receiver to GreenStar system on a 50 Series John Deere combine.

1. Locate the mobile processor on the back of the GreenStar Display. The Display is mounted on the right-hand cab post.
2. Disconnect the gray connector from the 10-slot MetriPak connector on the back of the mobile processor (see Figure 2.13).

Figure 2.13 Mobile processor connector

3. Prepare two 15 cm (6 in) lengths of 14-gauge stranded wire. To do this, strip 65 mm (1/4 in) of insulation from both ends of each wire.
4. Locate Slot C on the 10-slot MetriPak connector. Slot C has a connecting black wire:
5. Connect the first prepared 14-gauge wire:
    a. Insert one end into the splice connector. Squeeze the splice connector onto the insulated black wire of Slot C.
    b. Crimp the supplied round connector pin onto the other end of the same wire.

c. Insert the round connector pin into Slot C of the supplied 3-slot black Weatherpack tower connector.

6. Connect the second prepared 14-gauge wire:

   a. Crimp the square female connector pin (John Deere PN R104846) onto one end.

   b. Insert the square connector into Slot F of the 10-slot MetriPak connector.

      Alternatively, seal the connector pin in the MetriPak connector with the optional grommet (John Deere PN 57M7258).

   c. Crimp the supplied round connector pin onto the other end of the same wire.

   d. Insert the round connector pin into Slot A of the supplied 3-slot black Weatherpack tower connector.

7. Connect the Trimble GreenStar cable (PN 34189) to the 3-pin end of the black Weatherpack tower connector.

8. Connect the receiver power/data cable (PN 40947-18) to the GreenStar data cable 9-pin serial connector.

9. Attach the receiver power/data cable to the receiver.

10. Attach the power leads of the receiver power/data cable to switched +12 or +24 VDC power. Connect the red wire to positive and the black wire to negative (ground).

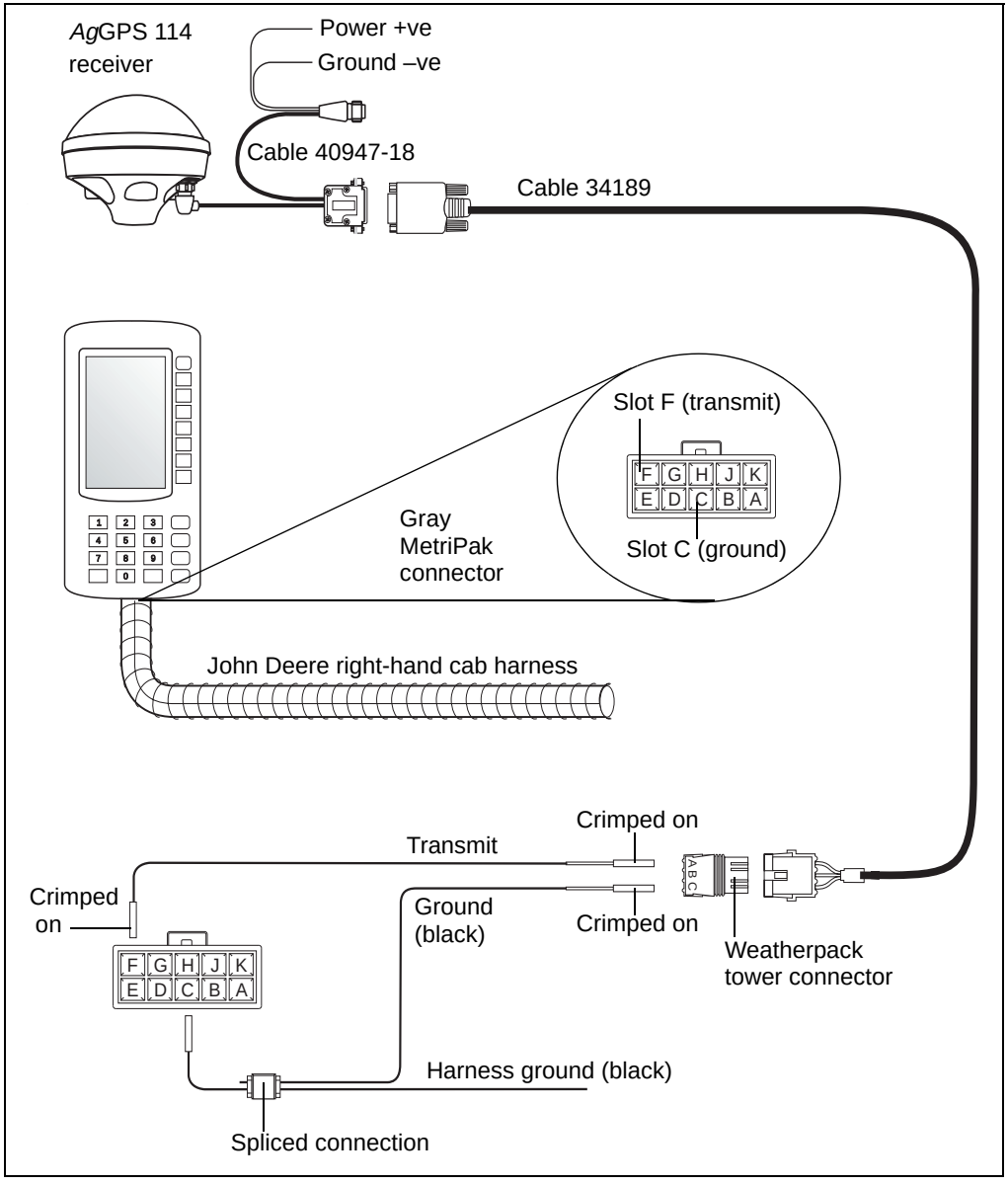


Figure 2.14 GreenStar connection on John Deere 50 Series combines

Configuring the receiver

Use *Ag*Remote to configure the receiver as follows:

- Port A output: NMEA 4800-8-N-1
- NMEA messages: GGA, GSA, and RMC

For more information, see Appendix C, NMEA-0183 Messages.

Ag Leader

This section describes how to connect the receiver to an Ag Leader yield monitor.

Connecting the optional data cable

To connect the receiver to the Ag Leader Yield Monitor 2000 or PS3000, use the optional 3.6 m (12 ft) Ag Leader power/data cable (PN 39903) as shown in Figure 2.15 and Figure 2.16.

Note – *Connect the power/data cable (PN 40947-18) red power lead to +12 or +24 VDC power. Connect the black power lead to ground. Do not connect the red and black leads from cable PN 39903 to machine power.*

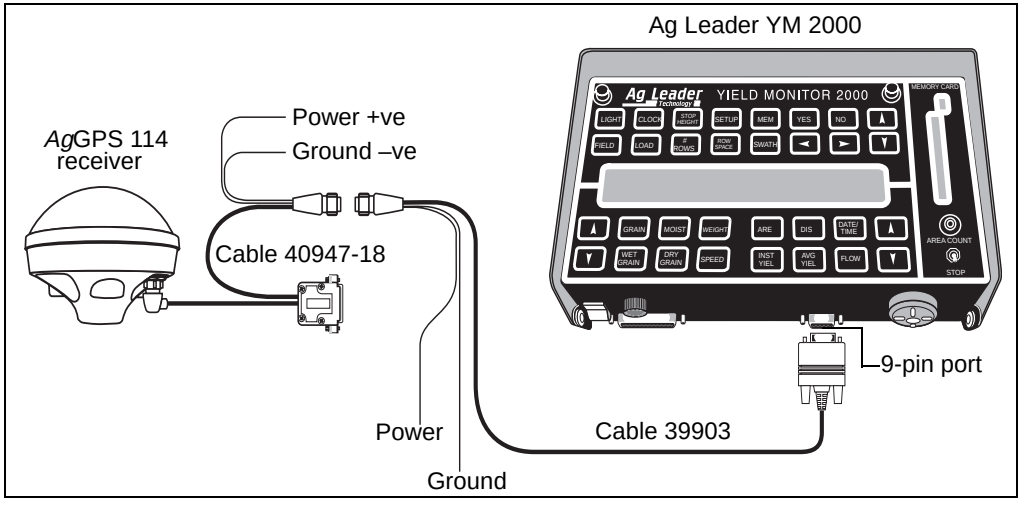


Figure 2.15 Connecting the receiver to the Ag Leader YM2000

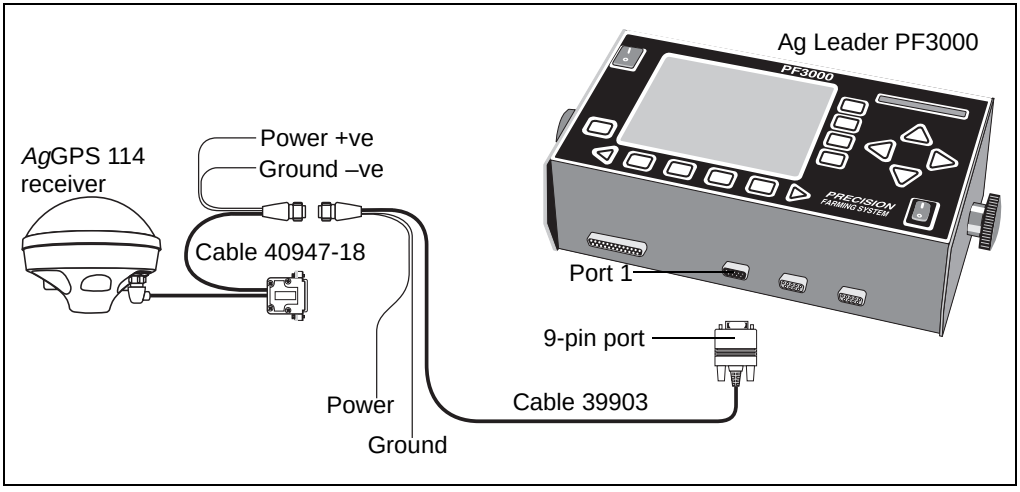


Figure 2.16 Connecting the receiver to the Ag Leader PF3000

Ag Leader PF3000 Pro

To connect the receiver to an Ag Leader PF3000 Pro monitor without internal GPS, you must purchase a 9-pin to 15 adaptor cable (PN 2000985) from Ag Leader Technology. See Figure 2.17

Note – *Connect the receiver power/data cable red power lead to the +12 or +24 VDC. Connect the black power lead to ground. Do not connect the red and black power leads to machine power.*

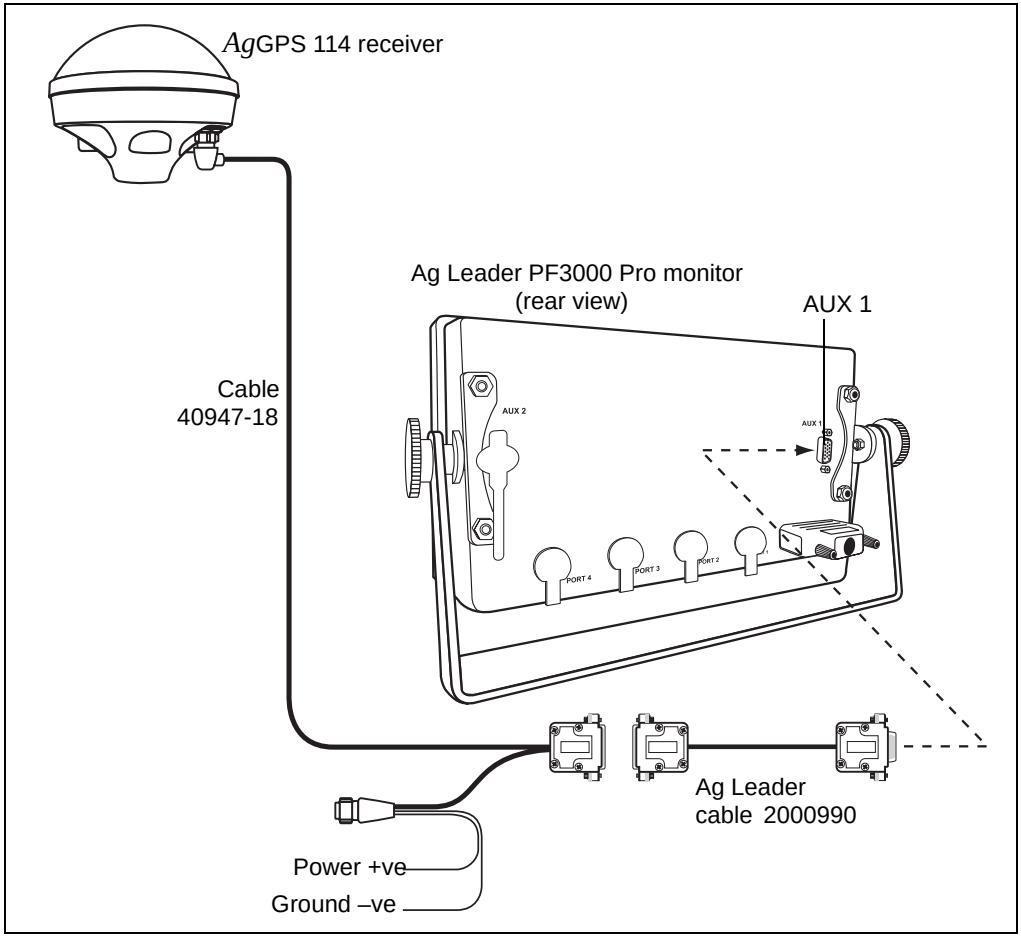


Figure 2.17 Connecting the receiver to the Ag Leader PF3000 Pro

AGCO FieldStar

This section deals with the AGCO FieldStar System on Gleaner and Massey Ferguson combines. It describes how to set up and configure the components to receive GPS position information.

For more information, visit the AGCO website (www.fieldstar.agcocorp.com).

Locating the FieldStar ComUnit

Gleaner series combines

Look in the overhead upper right corner of the cab. Remove the four screws that attach the front headliner. The screws are along the upper windshield area. Power for the DGPS receiver is supplied through a 2-way MetriPak connector, where A = 12V, and B = Ground.

Massey Ferguson series combines

For models before 2001, look in the storage area behind the seat. For later models (8780XP), look on the floor to the right side of the seat base and attached to it. Power for the DGPS receiver is supplied through a 2-way MetriPak connector, where A = 12V, and B = Ground.

Connecting the receiver

Gleaner and Massey Ferguson combines (manufactured before 2001)

The 9-pin connector on the ComUnit is male. Connect the receiver power/data cable to cable PN 39903. Use a null modem adaptor to plug the 9-pin male connector of cable 39903 into the ComUnit.

Gleaner and Massey Ferguson combines (manufactured in or after 2001)

The 9-pin connector on the ComUnit is female. Connect the receiver power/data cable to cable PN 39903. Plug the 9-pin male connector of cable 39903 into the ComUnit.

Configuring the receiver

Gleaner and Massey Ferguson combines (manufactured before 2001)

Configure the receiver as follows:

- Port A output: NMEA 4800-8-N-1
- NMEA messages: GGA, VTG, GSV, and GSA

Gleaner and Massey Ferguson combines (manufactured in or after 2001

Configure the receiver as follows:

- Port B output: NMEA 4800-8-N-1
- NMEA messages: GGA, VTG, GSV, and GSA

Configuring the FieldStar ComUnit

To configure FieldStar on a Gleaner combine that is running FieldStar software version 4.30 and later:

1. Check which version of the software is installed. On the FieldStar display, go to the *System Information* screen.

   Note – *Version 4.30 software can handle 4800 and 9600 baud rates and 1 Hz or 5 Hz input rates.*

2. To change the settings, press the keys in the following order:

   Main Menu

   Basic Settings

   Next

   GPS source

   GPS via Comunit

3. Press **Up** or **Down** to highlight *External NMEA*.
4. Press **Enter**.

RDS Ceres Yield Monitor

To connect the receiver to an RDS Ceres yield monitor, use the optional 3.6 m (12 ft) RDS yield monitor power/data cable (PN 35142):

1. Plug the 12-pin CONXALL connector into the receiver.
2. Plug the 9-pin RS 232 connector into the RDS Ceres yield monitor.
3. Configure the receiver Port B for NMEA 4800–8–N–1. For more information, see Chapter 3, Getting Started.

RDS Pro Series 8000 Yield Monitor

Figure 2.18 shows how to connect the receiver power/data cable to the RDS Pro Series 8000 yield monitor.

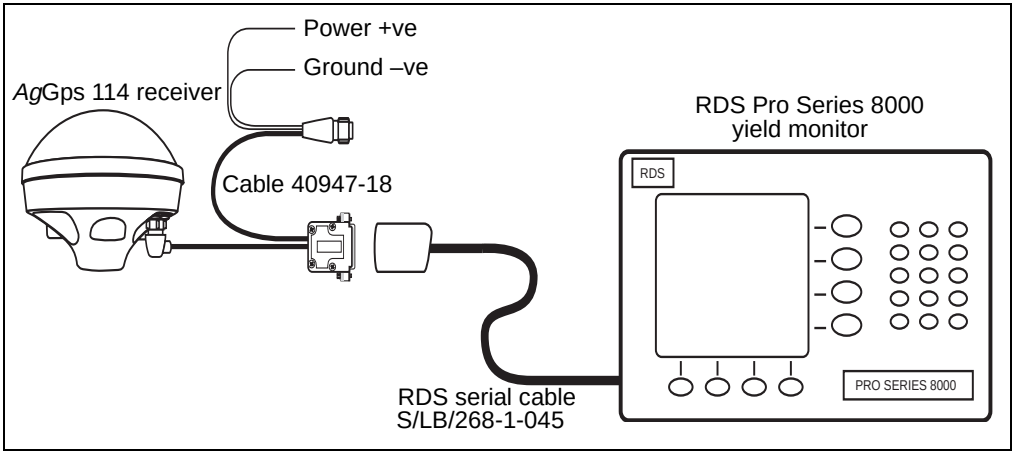


Figure 2.18 Connecting the receiver to the RDS Pro Series 8000

Laptop Computer

Figure 2.19 shows how to connect the receiver power/data cable to a laptop computer.

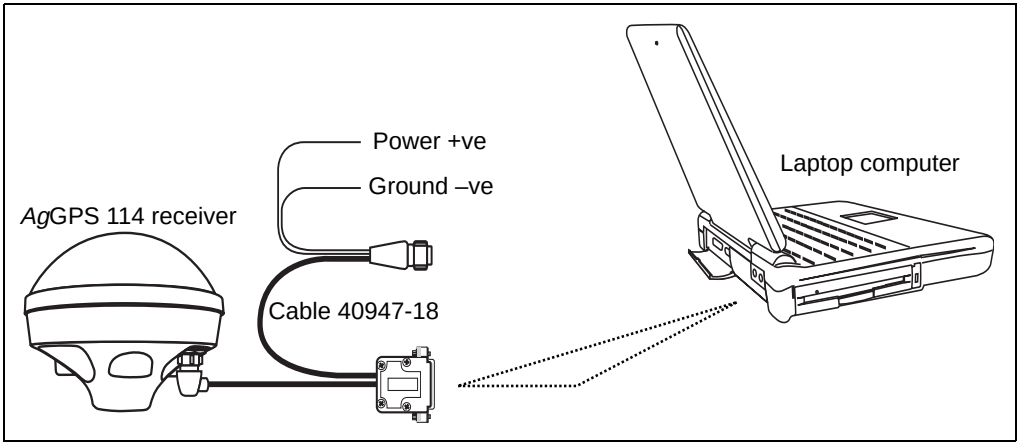


Figure 2.19 Connecting the receiver to a laptop computer

Windows CE Palmtop

Figure 2.20 shows how to connect the receiver power/data cable to a Windows CE palmtop computer.

Note – *Attach the null modem adaptor 9-pin RS 232 connector to the 9-pin female connector of the Windows CE computer.*

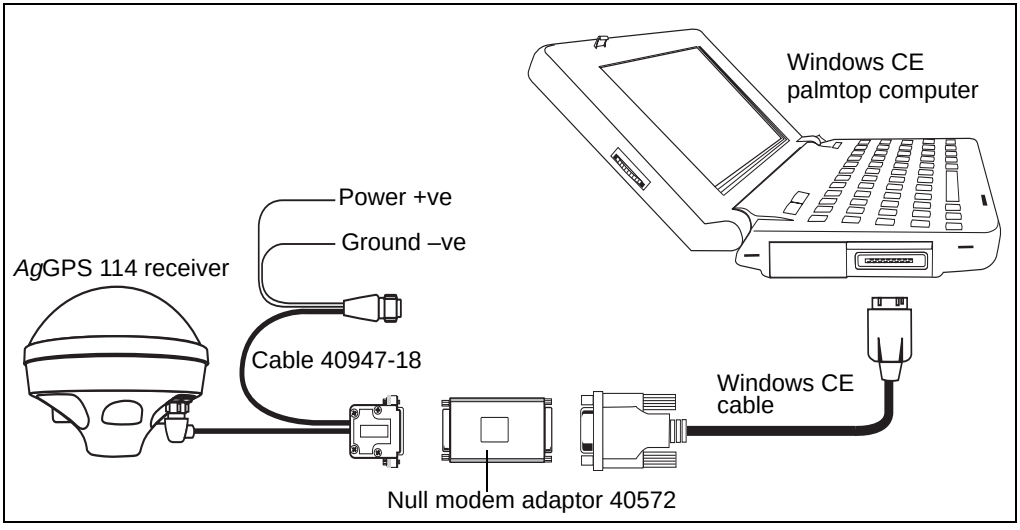


Figure 2.20 Connecting the receiver to a Windows CE palmtop computer

Windows Handheld Computer

Figure 2.21 shows how to connect the receiver power/data cable to a Windows CE handheld computer.

Note – *To connect the receiver to a Compaq I-Paq handheld computer, you require a RS232 9-pin serial cable (PN 236251-B21). This cable is available from Compaq.*

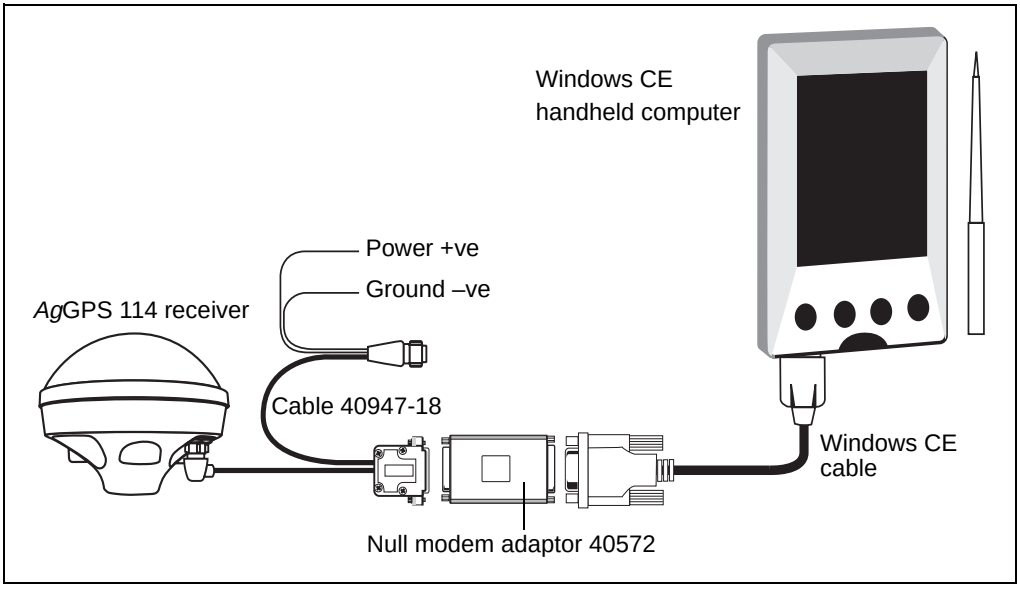


Figure 2.21 Connecting the receiver to a Windows CE handheld computer

Micro-Trak Yield Monitor

Figure 2.22 shows how to connect the receiver power/data cable to a Micro-Trak yield monitor.

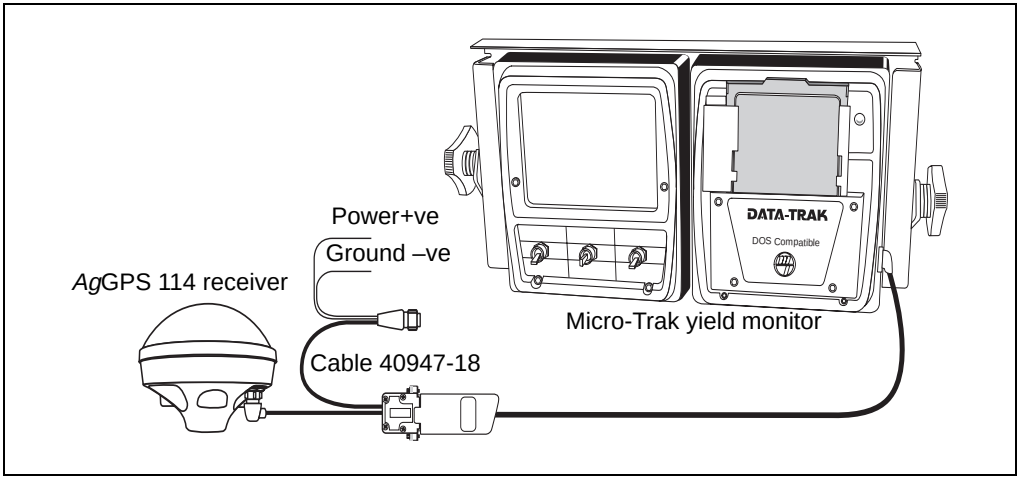


Figure 2.22 Connecting the receiver to a Micro-Trak yield monitor

CHAPTER

3

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 *Ag*GPS 114 receiver. It includes an overview of the *Ag*GPS Menu system.

Because the *Ag*GPS 114 receiver does not include a physical display or keypad, you must connect the receiver to the *Ag*Remote utility to configure the receiver settings and view its status. The *Ag*Remote front panel displays the *Ag*GPS menu system, which is the interface for receiver operations. You can also access the menu system using the *Ag*GPS 70 RDL. See Figure 3.1. To view the entire *Ag*GPS menu system, see Appendix D, Navigation Maps.

Figure 3.1 shows the *Ag*GPS 70 RDL keypad.

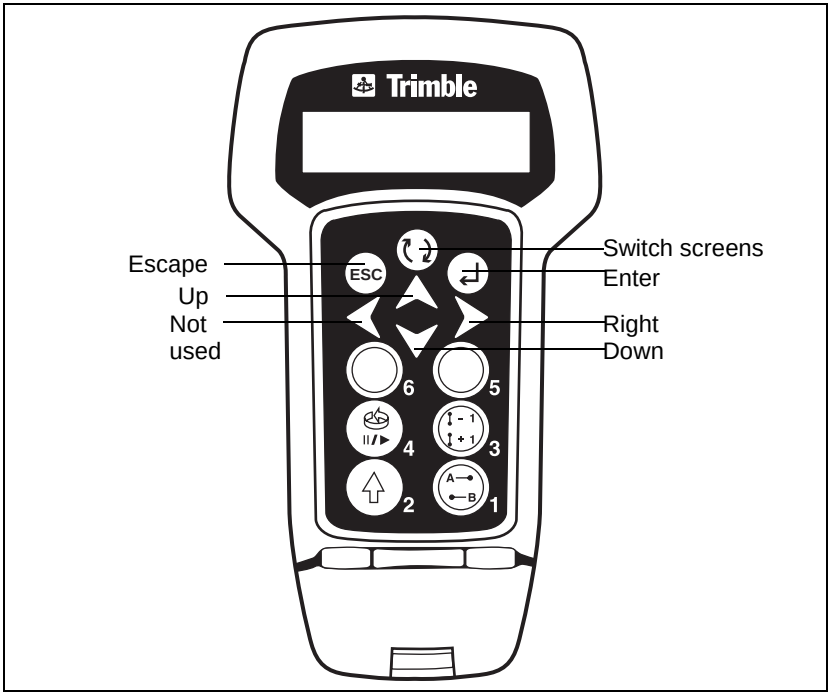


Figure 3.1 *Ag*GPS 70 RDL keypad

Installing *Ag*Remote

*Ag*Remote requires Microsoft Windows 95, 98, ME, 2000, or XP.

To install the latest version of *Ag*Remote:

1. Download the *Ag*Remote software from the Trimble website (www.trimble.com/aggps114_ts.asp?Nav=Collection-4345).
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 5–20 minutes, depending on your Internet connection speed.
3. Select the folder where you saved the *Ag*Remote file.
4. Double-click the downloaded file to start installing *Ag*Remote.
5. In the *InstallShield* dialog, click **Yes**.
6. Follow the instructions provided by the installation wizard. When completed, click **Finish**.

To use *Ag*Remote:

1. Connect the receiver to the serial port of the office computer, as shown in Figure 3.2.

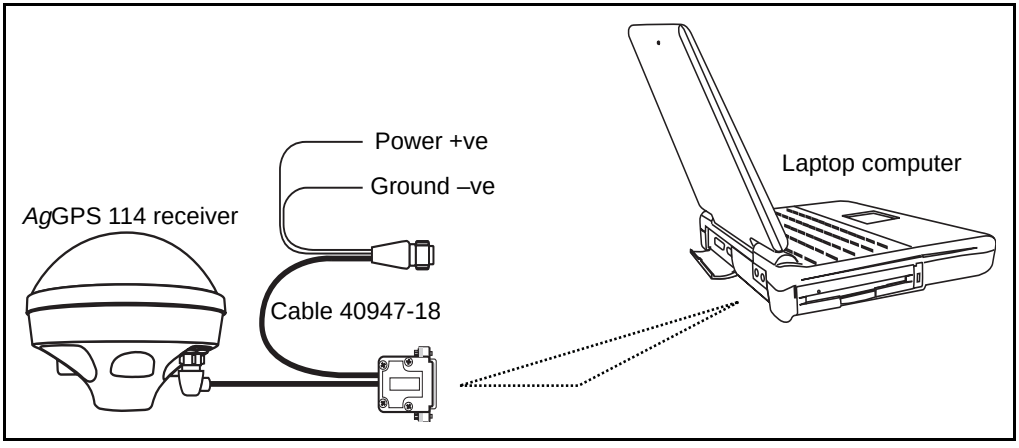


Figure 3.2 Connecting the receiver to an office computer

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

   *Ag*Remote establishes communication with the receiver and displays the *Home* screen of the *Ag*GPS menu system, as shown in Figure 3.3.

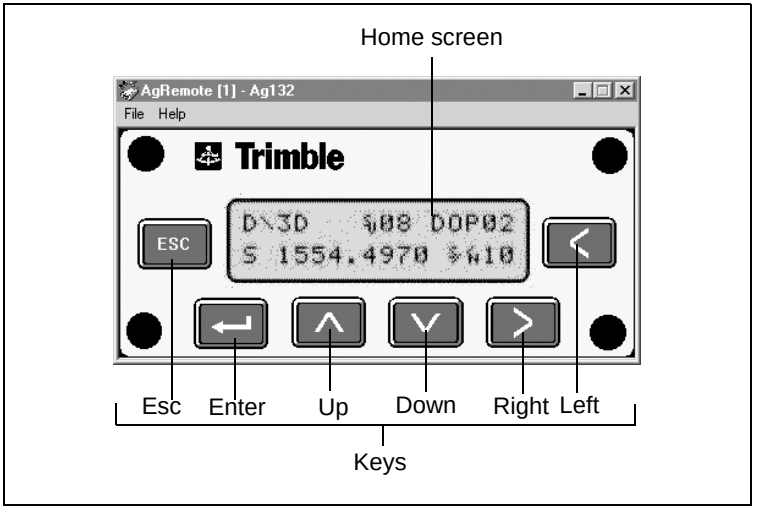


Figure 3.3 *Ag*Remote window and navigation keys.

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

The *Ag*Remote Menu System

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

- monitor the receiver status
- change the receiver configuration
- control the receiver utility/guidance functions

This section describes the menu system and the setting display options. Chapter 4, Configuring the Receiver, describes how to configure the receiver using the menu system.
For information about the *Ag*GPS 70 RDL, refer to the *Ag*GPS 70 RDL *Operation Manual*. To download that manual, go to: www.trimble.com/aggps70_ts.asp?Nav=Collection-4366

Using *Ag*Remote

To configure and monitor the receiver:

1. Connect the receiver to the office computer running *Ag*Remote. See page 54.
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 *Ag*GPS menu system.

The *Ag*Remote keys

The actions of the *Ag*Remote keys depend on whether a menu or screen is displayed. Table 3.1 describes the key actions.

Table 3.1 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.
v	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 [F] symbol appears in the corner of the screen. Move to the next letter or digit of a field.
Esc	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 *Ag*Remote menu system consists of the *Home*, *Field Operations*, *Status*, and *Configuration* menus. Each of these has one or more lower level menus (sub-menu) 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.

Figure 3.4 shows the structure of a typical sub-menu, for example *Display Options*.

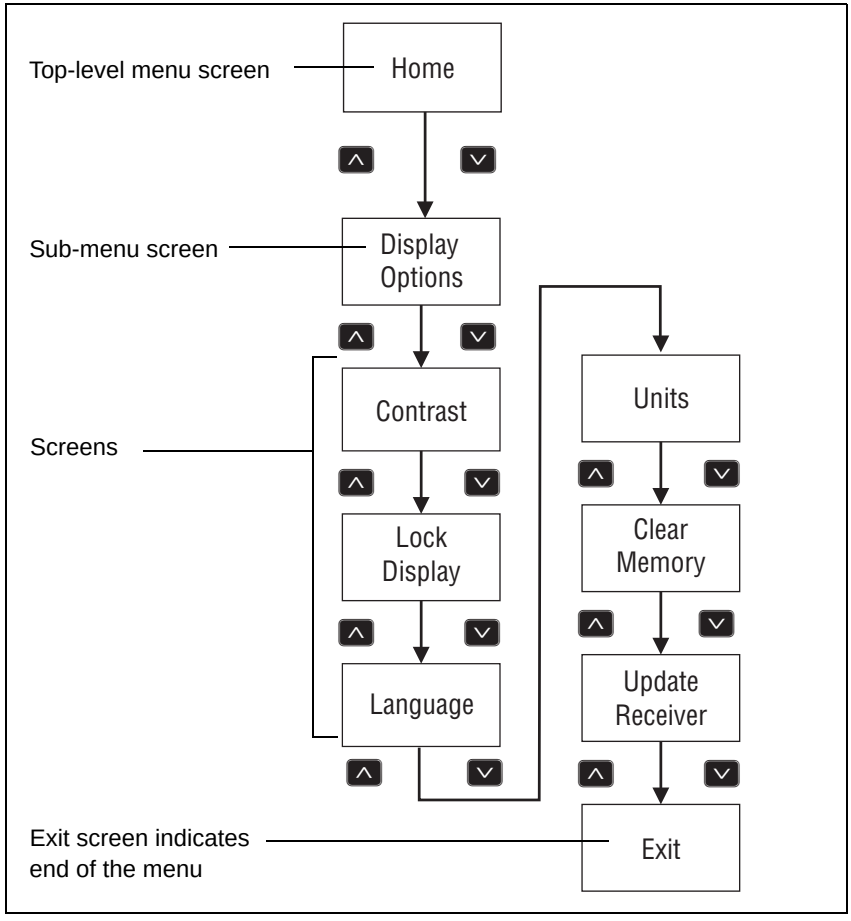


Figure 3.4 Typical menu structure

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. The information or settings 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 3.5, which show details of the current receiver options.

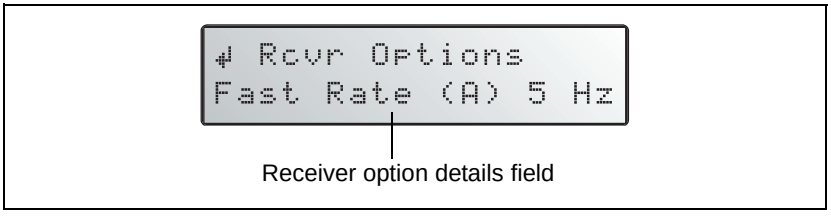


Figure 3.5 Example of a display-only field

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 3.6). These are the fields which list available satellite providers, and satellite coverage beams.

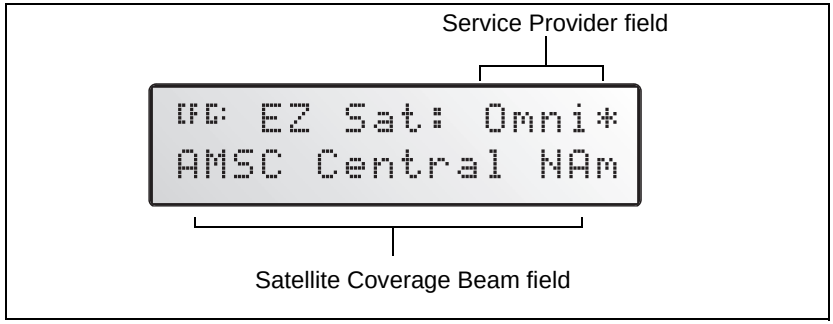


Figure 3.6 Example of a multiple-choice field

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. You manually enter the broadcast frequency of a satellite service provider. See Figure 3.7.

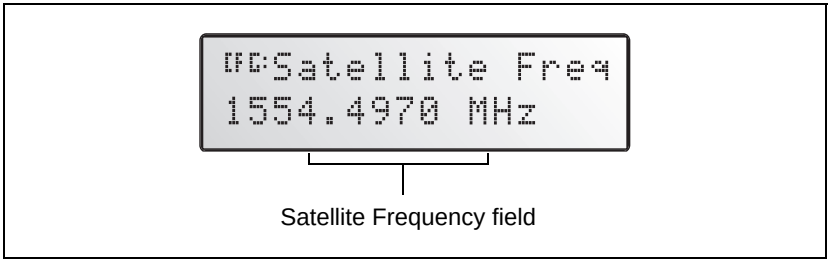


Figure 3.7 Example of a numeric field

The Home Screen

When you start *Ag*Remote, or access the receiver using the *Ag*GPS 70 RDL, the *Home* screen appears. See Figure 3.8.

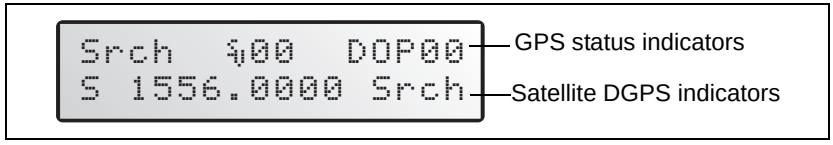


Figure 3.8 Home screen

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.

Satellite and WAAS/EGNOS DGPS mode

The *Ag*GPS 114 can receive WAAS/EGNOS DGPS signals. The *Home* screen indicates which mode the receiver is in for differential correction.

Figure 3.9 explains the GPS status indicators that can appear on the first line of the *Home* screen display.

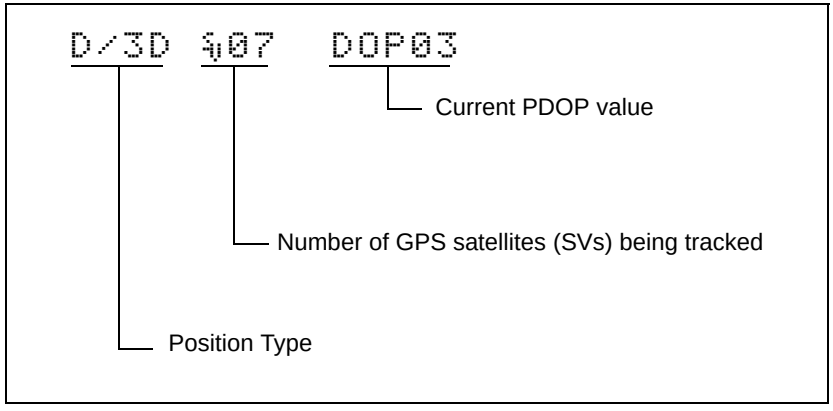


Figure 3.9 GPS status

Table 3.2 explains the indicators that can appear in the *Position Type* field.

Table 3.2 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 3.10.

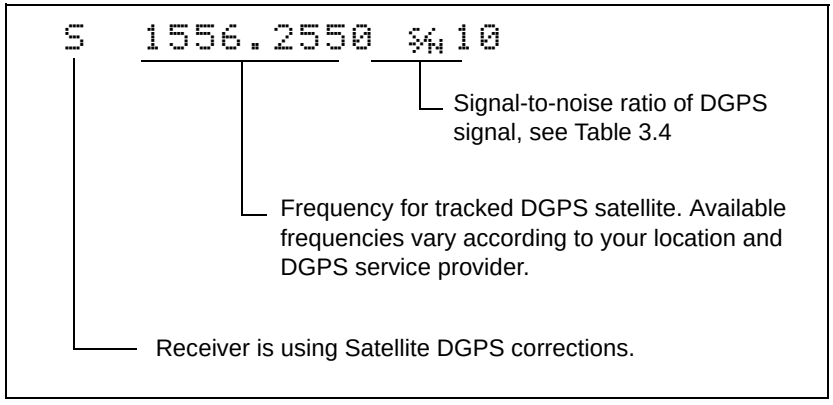


Figure 3.10 Satellite DGPS mode status indicators

Table 3.3 shows the possible satellite differential mode indicators.

Table 3.3 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 3.4 explains the signal-to-noise ratio values for both Satellite and WAAS/EGNOS DGPS modes.

Table 3.4 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 3.11.

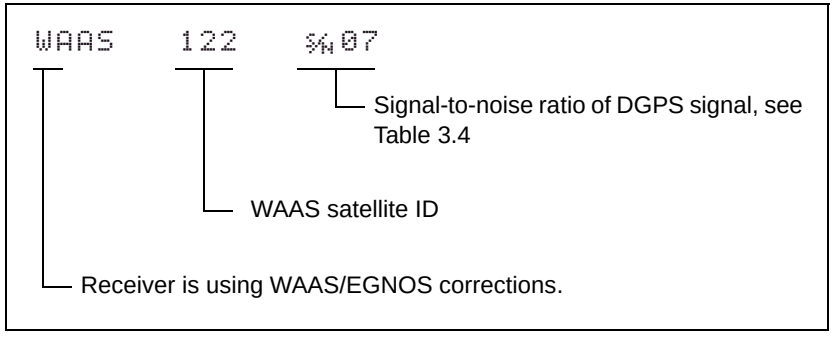


Figure 3.11 WAAS DGPS mode status indicators

Updating the Firmware

To ensure that the receiver and office computer connect, when you are ready to update the firmware, do one of the following:

- If you use a Windows CE or pocket PC device with the computer, make sure that Microsoft Active Sync is disabled from using the COM port on the computer.
- If you use a Palm Pilot with the computer, make sure that the Palm Synchronization program is disabled from using the COM port on the computer.

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

4

Configuring the Receiver

In this chapter:

- Introduction
- Display options
- Configuring the communication ports
- Configuring Differential GPS
- Paid subscription services
- WAAS/EGNOS
- Using an *Ag*GPS 70 RDL to activate the lightbar

Introduction

The Display Options, Satellite Differential Source, and Port Communication parameters need to be specific to your particular use, so are not preset. For the receiver to operate correctly after installation, use *Ag*Remote or the *Ag*GPS 70 RDL to configure the receiver. You only need to do this once, as the settings you choose are saved to permanent memory.

Tip – Refer to Appendix D, Navigation Maps while navigating the *Ag*GPS menu system.

To change the receiver configuration settings, connect the receiver to *Ag*Remote or to the *Ag*GPS 70 RDL. For more information:

- see Getting Started, page 51
- refer to "*Autoconnecting to an Ag*GPS *receiver"* in the *Ag*GPS 70 RDL *Operation Manual*. To download this manual, go to www.trimble.com/aggps70_ts.asp?Nav=Collection-4366

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 58), press :

Setting the language

To change the language displayed:

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.

Setting the display contrast

Adjusting the contrast may make the display easier to read in some conditions.

To change the contrast:

1. Navigate to the *Contrast* screen:

2. Press > to activate the cursor.
3. Press ∨ to decrease the contrast. Press ∧ to increase the contrast.
4. Press ↵ to save the changes.

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 ∨ 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 *Ag*GPS 114 receiver has one connector. Through this connector, the receiver can communicate with two devices simultaneously. To do this, it uses the two ports (RS-232 and CANBUS) of the standard power/data cable (PN 40947-18).

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.*

For more information, see Customized connections, page 23.

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 4.1 shows the menu that you use to access the configuration screens.

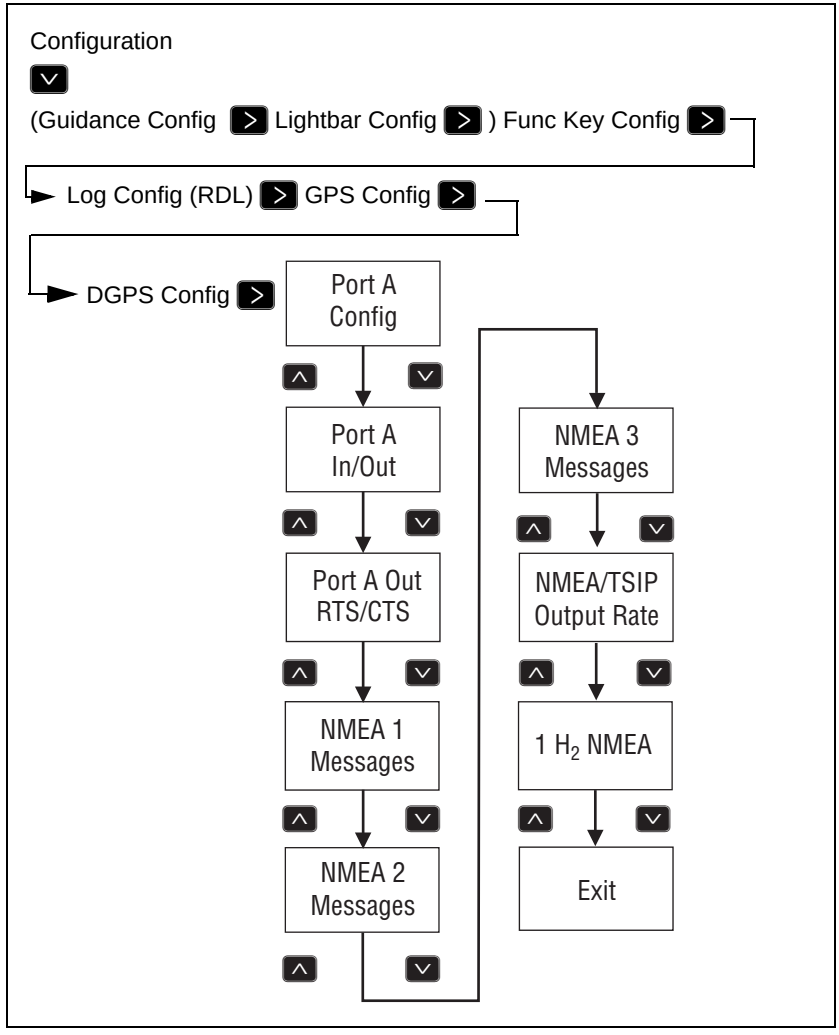


Figure 4.1 Port A Config menu

Note – *The Port A Out RTS/CTS screen is not available on the AgGPS 114 receiver.*

Configuring input / output communication

Configure the Port Input/Output communication settings for communicating with the *Ag*GPS Lightbar, other external hardware devices, and software programs. Table 4.1 describes the input settings.

Table 4.1 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.
TSIP	The receiver can accept or output TSIP data packets from the port when using the optional *Ag*Remote program or using the *Ag*GPS 70 RDL.
LBAR	The receiver can accept or output data from the *Ag*GPS Lightbar. You must select this setting when you use the *Ag*GPS Parallel Swathing Option.

The default values for the other port settings are:

		Port A	Port B
Baud rate	**In**	RTCM 9600	LBAR 38.4 K
	Out	NMEA 4800	LBAR 38.4 K
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. For example, if the *Ag*GPS Parallel Swathing Option is connected, *Ag*GPS Lightbar data is output 5 times per second (5 Hz). At the same time, on the other port, NMEA or TSIP data can be output to a computer software package, yield monitor, variable rate controller, or other equipment. That data can be output at the same rate, or at a slower rate than the lightbar data.

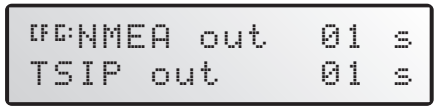
The default setting is 01 (1 Hz, or 1 position per second).

If you require an output rate of 2, 5, or 10 positions per second, you must have the Fast Rate Option installed in the receiver. For more information, see page 90.

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.

For more information, see Differential GPS (DGPS), page 9.

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  .

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 ⌄ 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 ⌄ 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 79.

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 79. 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 79.

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":

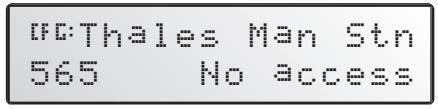
Thales reference stations

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.

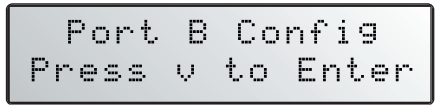
3. Once activation succeeds, the *Home* screen displays “D/3D”:

Using an *Ag*GPS 70 RDL to Activate the Lightbar

When you connect the *Ag*GPS 21 Lightbar to the receiver, the lightbar should automatically be activated. If it is not, use the *Ag*GPS 70 RDL to activate the lightbar manually.

Do the following:

1. Make sure that you have selected LBAR in the *Port B Config (*or *Port A Config)* menu. Otherwise the lightbar will not operate and *Guidance Config* screens will not be available.
2. Navigate to the *Port B Config (*or *Port A Config)* menu:



3. Press ⌄ until the *Port B In/Out* screen appears.
4. Press > to activate the cursor.
5. Press ⌄ until LBAR appears in the top line:

6. Press > several times to move the cursor to the third field of the second line.
7. Press ⌄ until LBAR appears:

8. Press ↵ to save the changes.

CHAPTER

5

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 *Ag*GPS 114 receiver (see Table 5.1).

Table 5.1 Firmware options

Part Number	Option
33176-30	Differential Base Station
33176-40	EVEREST Multipath Rejection
33176-10	Fast Rate Position Output
33176-80	Point/Line/Area
33176-50	RTS/CTS Flow Control Negotiation

For more information, see Receiver enhancements, page 5.

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 *Ag*GPS menu system to enter the password directly into the receiver and activate the option for immediate field use.

1. Do one of the following:
   - Connect the receiver to an *Ag*GPS 70 RDL using the AgGPS PSO Plus cable.
   - 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 66. 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 121. 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 ∨ until ASAP appears.
5. Press ↵ to save the settings.
6. Press Esc several times to return to the *Home* screen.

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 66.

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 89.

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 74.

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 *Ag*GPS 114 “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 *Ag*GPS 114 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, see below
- Set from here, page 94
- Edit base position, page 94
- Set from averaged positions, page 95

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 ⌄ until the *Base Station Mode* screen appears.
3. Press > to activate the cursor.
4. Press ^ or ⌄ 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 ⌄ until the *PRC Interval* screen appears:

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

Waypoints option

Note – *To use the Waypoints option, you must have:*
– the Points/Lines/Areas option on an AgGPS receiver
– an AgGPS 70 RDL attached to the receiver
– an AgGPS 21 or AgGPS 23 Lightbar attached to the receiver

For more information, see Receiver enhancements, page 5.

A waypoint is a marked location that is stored as GPS position. When you create a waypoint, give it a meaningful name so that you can later select it and navigate back to it. Figure 5.5 on page 102 shows how to navigate to a waypoint.

You can record waypoints in the field, using an *Ag*GPS receiver with an *Ag*GPS 70 RDL attached, or you can enter known locations (GPS positions) manually into a text file, using a text editor. The receiver can store up to 20 waypoints. You select these waypoints from the *Nav Waypnt* screen.

The *Waypoint Ops* menu includes screens for adding and deleting waypoints, viewing waypoint names, and loading a waypoint file list into the *Ag*GPS receiver memory.

Waypoints that are recorded in the field are added to the receiver memory, and they are automatically recorded to a Waypoint.txt file on the CompactFlash card that is in the *Ag*GPS 70 RDL.

Waypoints that you enter manually are also saved to the CompactFlash card that is in the *Ag*GPS 70 RDL.

Waypoints text file

You can download a sample waypoint text file from the Trimble website. To do this:

1. Go to www.trimble.com/aggps70_ts.asp?Nav=Collection-4369
2. Click RDLSample_Files.zip.
3. Select the Save this file to disk option. Click **OK**.
4. Save the sample.zip file to a folder on the office computer.

5. Extract the waypoint.txt file from the zip file on the office computer. Save the waypoint.txt file to the CompactFlash card on the *Ag*GPS 70 RDL.

The waypoint.txt file is similar to the example in Figure 5.1.

```
wp01, N 38 57 37.858, W 94 43 11.240, 1,
wp01, N 38 57 37.845, W 94 43 11.246, 1,
wp01, N 38 57 37.877, W 94 43 11.229, 1,
```

Figure 5.1 Sample waypoints.txt file

Each line in the file is a single waypoint. The format used is:

Waypoint Name, N Latitude, W Longitude, 1,

Note – *Substitute S for N in the southern hemisphere (south of equator), and E for W in the eastern hemisphere (east of Greenwich meridian, 0 Longitude – Greenwich, England).*

If you add new waypoints:

- end each text line with a “1,”
- limit each name to a maximum of 16 characters
- enter latitude and longitude as degrees, minutes, seconds, and decimal seconds (*DD MM SS.SSS*)

For more information, refer to the *AgGPS 70 RDL Operation Manual*.

Waypoint Ops menu

Figure 5.2 shows the *Waypoint Ops* menu. Press the keys shown to view individual screens.

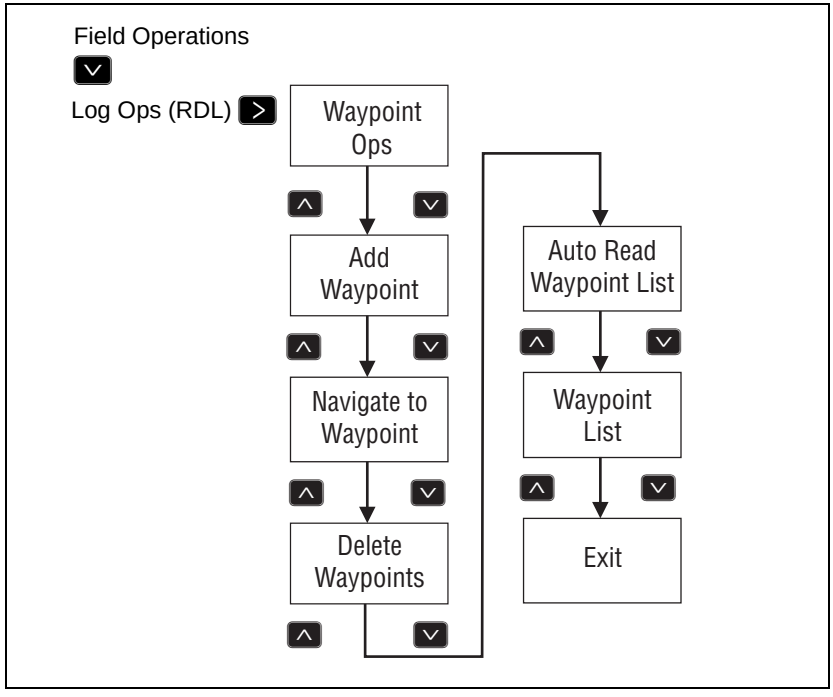


Figure 5.2 Waypoint Ops menu

Adding waypoints

Use the *Add Waypoint* screen to add waypoints to the list or to replace an existing waypoint with another one. Figure 5.3 shows the fields in this screen.

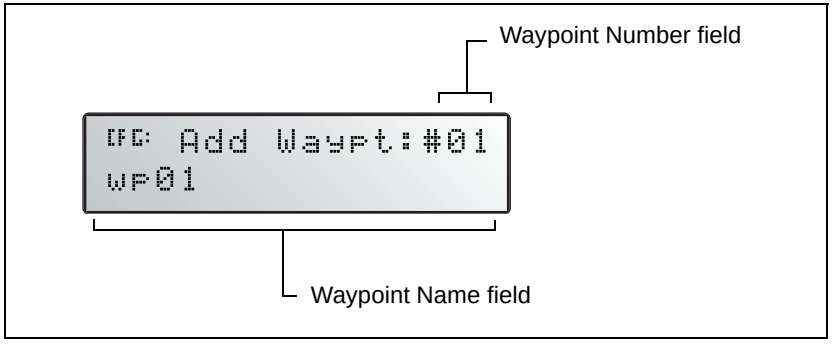


Figure 5.3 Add Waypoint screen

To add a new waypoint:

1. Navigate to the *Add Waypoint* screen. See Figure 5.2 on page 99.
2. Press > to activate the cursor in the *Waypoint Name* field.
3. To enter a name, press ^ or v to change each character. Press > to move to the next character.
4. Press ↵ to record the waypoint location. The screen displays the message Updating Waypoints List, then the message Waypoints Stored.
5. The waypoint number is automatically incremented, ready for the next name and location to be recorded.

Navigating to waypoints

Use the *Navigate to Waypoint* screen to select a name from the waypoints list and navigate back to the waypoint.

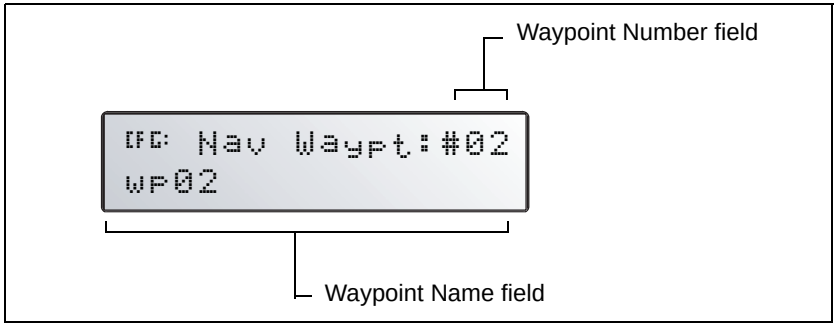


Figure 5.4 Navigate to Waypoint screen

To navigate to a waypoint:

1. Navigate to the *Navigate to Waypoint* screen. See Figure 5.2 on page 99.
2. Press > to activate the cursor on the *Waypoint Name* field.
3. Press ^ or v until the required name appears.

   The corresponding number appears in the *Waypoint Number* field.
4. Press ↵ to navigate to the waypoint. The message Guiding to Wpt appears. For more information, see Figure 5.5.
5. When you reach the waypoint, press ↵ to stop navigating.

Figure 5.5 illustrates how to steer to a waypoint.

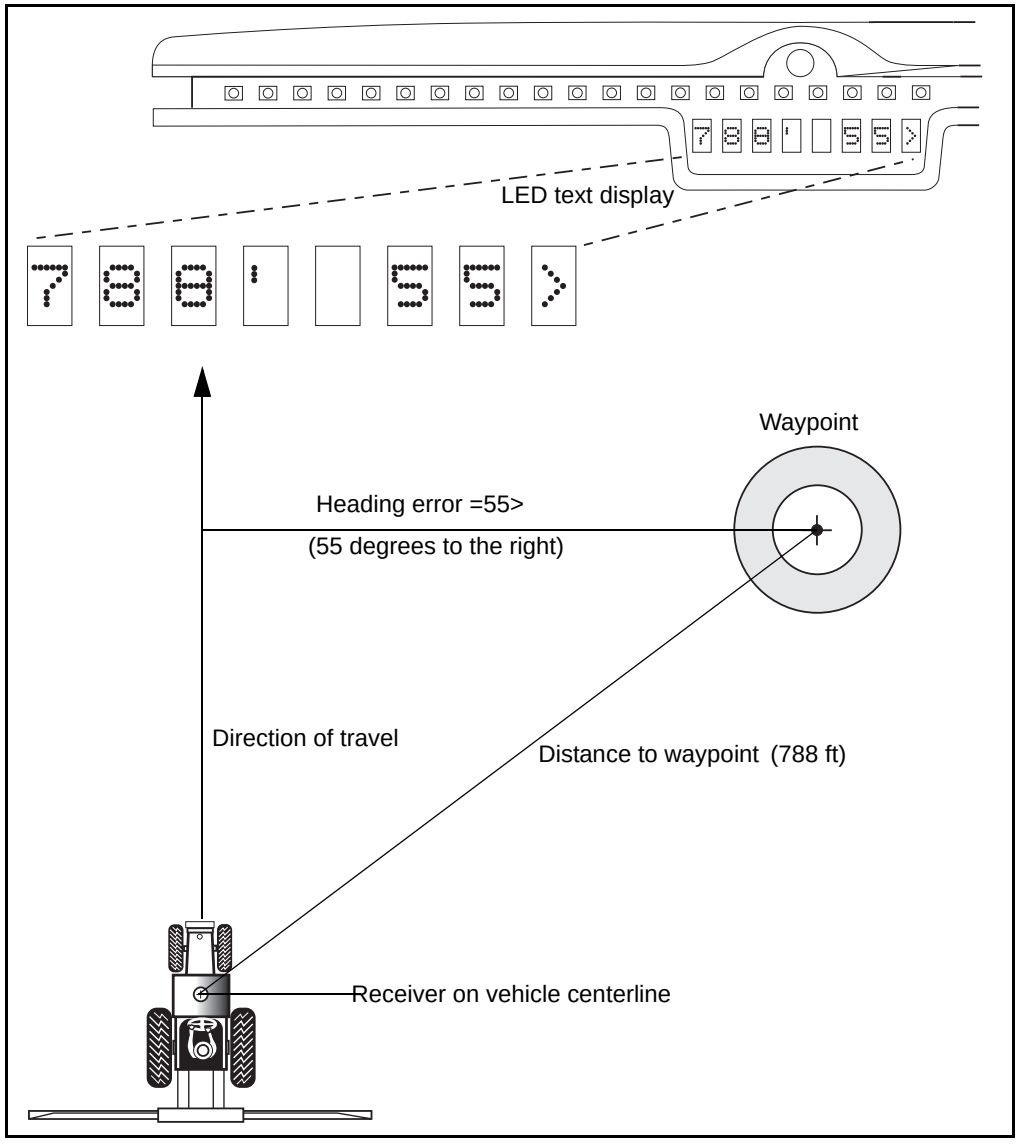


Figure 5.5 Steering to a waypoint

Deleting waypoints

Use the *Delete Waypoints* screen to delete all stored waypoints.

Note – *This also deletes the Waypoint.txt file.*

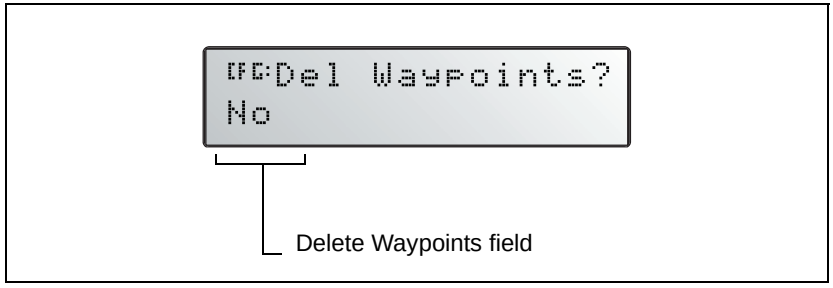


Figure 5.6 Delete Waypoint screen

To delete all waypoints:

1. Navigate to the *Delete Waypoints* screen. See Figure 5.2 on page 99.
2. Press > to activate the cursor on the *Delete Waypoints* field.
3. Press ^ or v to select *Yes, Delete All*.
4. Press ↵. The message Deleting Waypoints List appears.

Reading the waypoints list

Use the *Read Waypoints List* screen to load the Waypoint.txt file from the CompactFlash card in the *Ag*GPS 70 RDL to the receiver's memory:

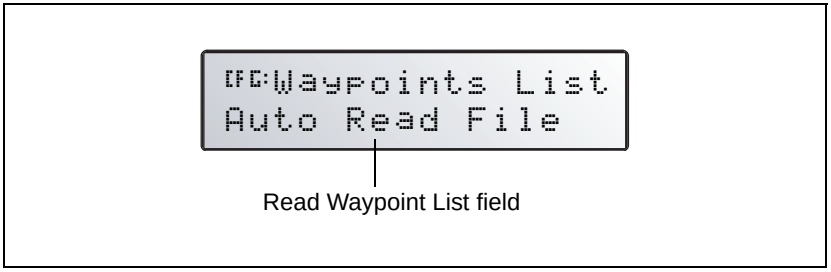


Figure 5.7 Read Waypoints List Screen

The *Read Waypoints List* screen is set to automatically transfer the Waypoint.txt file from the CompactFlash card into the receiver whenever you open the *Waypoints Ops* menu.You can then select the names from a list when adding or navigating to a waypoint.

If you modify the waypoint.txt field using a PC, and then reinsert the CompactFlash card into the *Ag*GPS 70 RDL without switching off the receiver, you must manually transfer the new waypoint file:

1. Switch off the receiver then switch it on again.
2. Navigate to the *Read Waypoints List* screen.
3. Press > to activate the cursor.
4. Press v to select *Read Files Now.*
5. Press ↵ to read the new waypoints file. The message Checking for Waypoints List appears.

Viewing the waypoint list

Use the *Waypoints List* screen to view a list of all waypoints that are currently stored in the receiver:

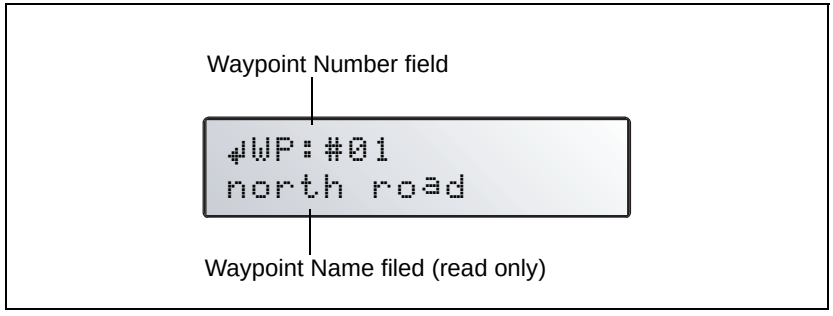


Figure 5.8 Waypoint List screen

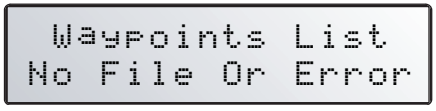
To view the waypoint list:

1. Navigate to the *Waypoints List* screen. See Figure 5.2 on page 99.
2. Press ↵ repeatedly to display the latitude and longitude (GPS position) for each waypoint in turn:

Error message

An error message similar to that shown below appears during any waypoint operation if any of the following conditions occur:

- The *Ag*GPS 70 RDL is not connected to a receiver.
- The *Ag*GPS 70 RDL does not contain a CompactFlash card.
- The CompactFlash card does not contain a waypoint file.
- There is an error in the waypoint file.



Point/Line/Area option

Note – *This option is appears under the Field Ops menu. The option is only available when you are using an AgGPS 70 RDL.*

When you install this option the *Point/Line/Area* menu becomes available. The menu contains screens for creating point, line, and area files on the CompactFlash card in the *Ag*GPS 70 RDL. It also contains screens for loading a list of point/line/area names into the receiver memory:

Point, line, and area features are stored as Shape files, which consist of the file types, *.shp, *.shx, and *.dbf.

To create a list of point/line/area names on the *Ag*GPS 70 RDL CompactFlash card use any spreadsheet program.

The lists are called POINTS.DBF, LINES.DBF, and AREAS.DBF files. Select these names later in the *Add Point*, *Add Line*, and *Add Area* screens when you need to record a point, line, or area feature.

Alternatively, you can download these files and save them directly to the CompactFlash card. Go to http://www.trimble.com/aggps70_ts.asp

Note – *The AgGPS 70 RDL must be connected to an AgGPS receiver before you can use it to record point, line, or area shape files or to select feature names.*

Working with .dbf files

A DBF file contains user-defined feature attribute names that you can use to record point, line, and area shape files using the *Ag*GPS 70 RDL. Each DBF file is a list of feature attribute names that you can select in the appropriate screen. An *Ag*GPS receiver can store a total of 60 names (20 each for point, line, and area).

You can create a list of point, line, and area names on the *Ag*GPS 70 RDL CompactFlash card by using one of the following spreadsheet programs. However, you must save the file as .dbf (***not*** as the spreadsheet format):

- Microsoft Excel
- Microsoft Works
- Lotus 1-2-3
- Quattro Pro

Save the files directly to a CompactFlash card for use in the *Ag*GPS 70 RDL. When you access the *Point/Line/Area* menu, the receiver automatically reads the .dbf files into memory.

If there are no DBF files on the CompactFlash card that is in the *Ag*GPS 70 RDL, you can select a name from a list of default names in the receiver memory.

Each .dbf file must contain an *ID*, *NAME*, and *CLASS* column. These columns must have the following values.

- ID – Unique identifier, numbered sequentially starting at 1
- NAME – Attribute name, up to 16 characters long
- CLASS – 1

Figure 5.9 shows an example of a .dbf file.

ID	NAME	CLASS
1	Pond	1
2	Rocks	1
3	Clover	1
4	Alfalfa	1
5	Weed 1	1
6	Weed 2	1
7	Broadleaf weed	1
8	Mustard Weed	1
9	Crabgrass	1
10	Pigweed	1
11	Slough	1
12	Grassed Waterway	1
13	Roundup Rdy	1
14	Non-Rndup Rdy	1
15	Sink Hole	1
16	Watermelon	1
17	Organic grown	1
18	CRP	1
19	Timber	1
20	GM	1

Figure 5.9 Sample .dbf file (Area.dbf)

Point/Line/Area menu

Figure 5.10 shows the *Point/Line/Area* menu. Press the keys shown to view individual screens.

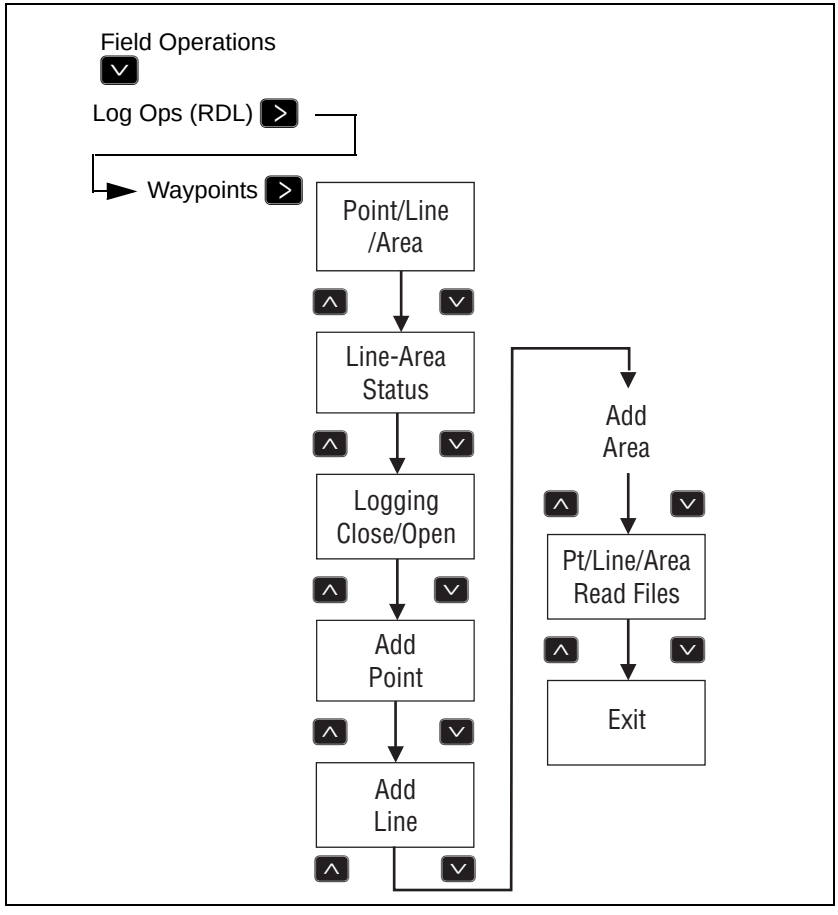


Figure 5.10 Point/Line/Area menu

Viewing line and area status

Use the *Point/Line/Area* screen to view the status of line and area logging.

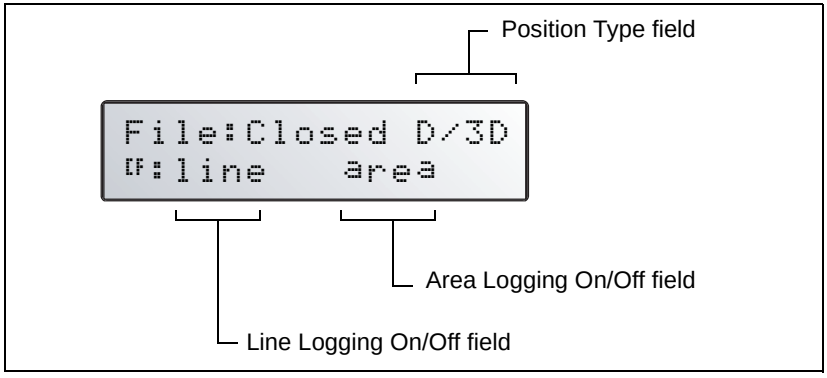


Figure 5.11 Point/Line/Area screen

Upper case letters in the bottom line indicate that a line or area is currently being recorded to the *Ag*GPS 70 RDL's CompactFlash card. Lower case letters indicate that no line or area is being recorded.

Table 3.2 on page 64 lists information that can appears in the *GPS Status* field, which is in the upper-right corner of screen. GPS must be in *D/3D* mode to record a point, line, or area.

Open point/line/area logging

Use the *Point/Line/Area Logging* screen to open or close point, line, and area shape files on the *Ag*GPS 70 RDL's CompactFlash card.

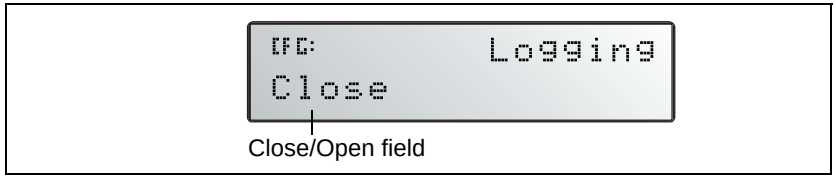


Figure 5.12 Point/Line/Area On/Off screen

When you set the *Logging* screen to Open, three empty Shape files are automatically created on the CompactFlash card in the *Ag*GPS 70 RDL. A file is created for points, another for lines, and another for areas. Data is automatically recorded to each of these separate files at the same time.

When you set the *Logging* screen to Close, any empty Shape files are deleted from the CompactFlash card. Only Shape files that contain recorded information remain.

To set the *Logging* screen to Open:

1. Navigate to the *Point/Line/Area Logging* screen.
2. Press > to select the *Open/Close* field.
3. Press ^ or v to select *Open*.
4. Press ↵ to save the changes.

Adding a point

Figure 5.13 shows the *Add Point* screen.

Note – *You can record point, line, and area shape files simultaneously. The Add Line and Add Area screens contain the same fields as those shown here.*

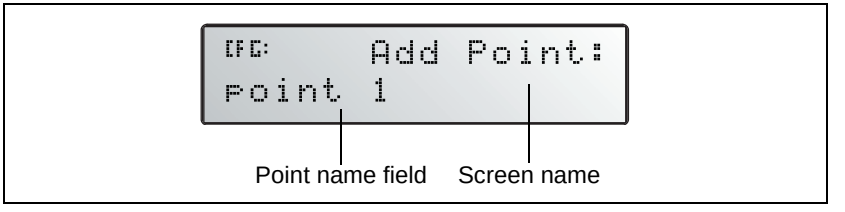


Figure 5.13 Add Point screen

Use the *Add Point* screen to record a point to the CompactFlash card. When you open the *Add Point* screen, the name of the last point defined appears briefly.

To add a point called “section corner”:

1. Set *Logging* to Open. See page 110.
2. Navigate to the *Add Point* screen.
3. Press > to select the *Point List* field.
4. Press ^ or v to select the name from the list.

   Alternatively, to enter a name manually (for example “section corner”), press >, then press ^ or v to change each character. Press > to move the cursor to the next character.
5. Press ↵ to save the changes.
6. Navigate your vehicle to the point to be recorded.
7. When prompted, press ↵ to store the current GPS position for the point named “section corner” in the POINT.DBF Shape file. The *Add Point* screen briefly displays the message Defining Pt. The screen then displays the message Point Stored.

Adding a line

Use the *Add Line* screen to record a line to the CompactFlash card.

To add a line called “fence”:

1. Follow Step 1 through Step 5 in the *Adding a point* section. Use the *Add Line* screen instead of the *Add Point* screen described there.
2. Navigate your vehicle to the start of the line to be recorded.
3. When prompted, press ↵ to start recording the current GPS position for the line named “fence”. The *Add Line* screen displays the message Defining Line.
4. Navigate your vehicle to the end of the line. Press ↵ to stop recording. The *Add Line* screen displays the message Line Stored.

Adding an area

Use the *Add Area* screen is used to record an area (such as a pond) to the CompactFlash card.

To add an area called “pond”:

1. Follow Step 1 through Step 5 in the *Adding a point* section. Use the *Add Area* screen instead of the *Add Point* screen described there.
2. Navigate the vehicle to the start of the area to be recorded. When prompted, press ↵ to start recording the current GPS position for the area named “pond”. The *Add Area* screen displays the message Defining Area.
3. Navigate the vehicle to the end of the area. Press ↵ to stop recording. The *Add Area* screen displays the message Area Stored.

To view recorded points, lines, and areas later, use a GIS software program such as ESRI’s ArcExplorer.

Reading the Point/Line/Area list

The *Read Point/Line/Area* screen is set to automatically transfer point, line, and area names from the .dbf files on the CompactFlash card to the receiver whenever you open the *Point/Line/Area* menu. This enables you to select a name from a list when adding a point, line, or area.

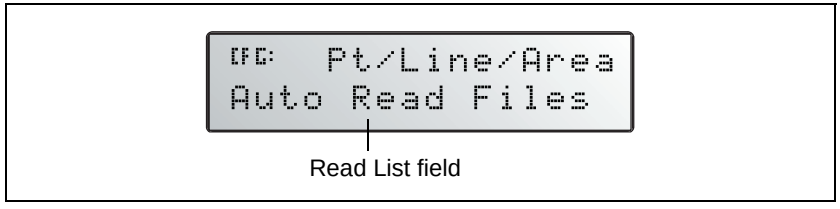


Figure 5.14 Point/Line/Area screen

If you modify .dbf files using an office computer, and then reinsert the CompactFlash card into the *Ag*GPS 70 RDL, and you do not switch off the receiver, you must manually transfer the new .dbf files to the receiver:

1. Navigate to the *Point/Line/Area Read Files* screen.
2. Press > to activate the cursor.
3. Press ∨ to select *Read Files Now.*
4. Press ↵ to read the new *.DBF files.

If the receiver successfully reads the new files, the message Files Read OK appears.

Otherwise, the message Using Defaults appears.

Error message

The error message No Card Or Error appears in any point, line, or area operation if:

- The *Ag*GPS 70 RDL is not connected to a receiver
- The *Ag*GPS 70 RDL does not contain a CompactFlash card
- The CompactFlash card does not contain any .dbf files
- There is an error in a .dbf file

APPENDIX

A

Troubleshooting

In this appendix:

- Introduction
- GPS
- Interference
- Receiver
- FlashLoader100
- *Ag*Remote
- Troubleshooting guides

Introduction

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

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.
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 vehicle, and is clear of metal surfaces. Try traveling in a different direction. Check Maximum PDOP and Minimum Signal Strength settings (see Poor accuracy above).

Problem / issue	Possible solution
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.
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 79. 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*.

Problem / issue	Possible solution
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 72.
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 vehicle ignition system.

Problem / issue	Possible solution
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 18).
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.

Problem / issue	Possible solution
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 79.

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 Guides

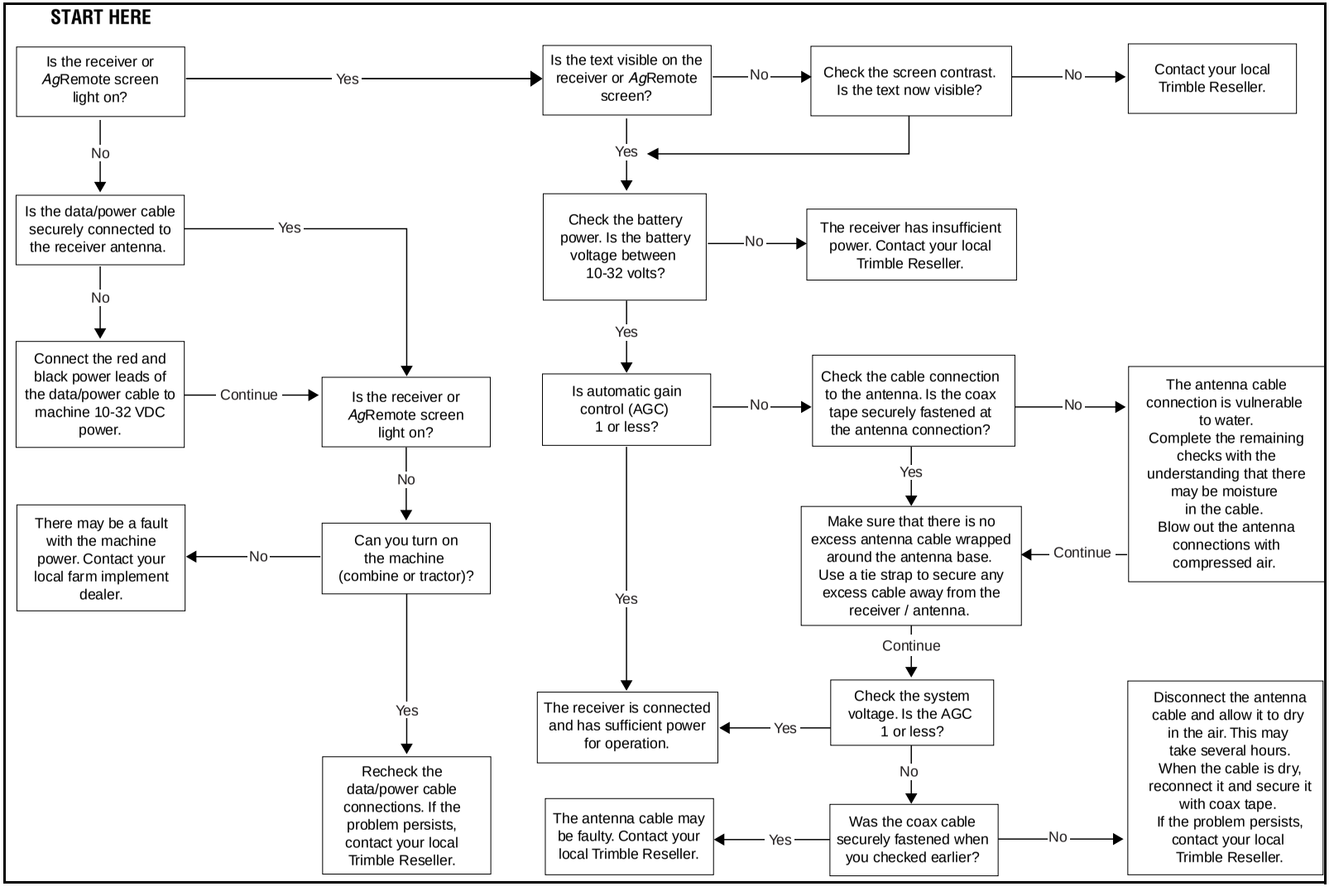
This section contains flowcharts for troubleshooting the following areas:

- System hardware and power
- GPS reception (with no Yield Monitor attached to the receiver)
- GPS reception (with a Yield Monitor attached to the receiver)
- OmniSTAR
- Thales

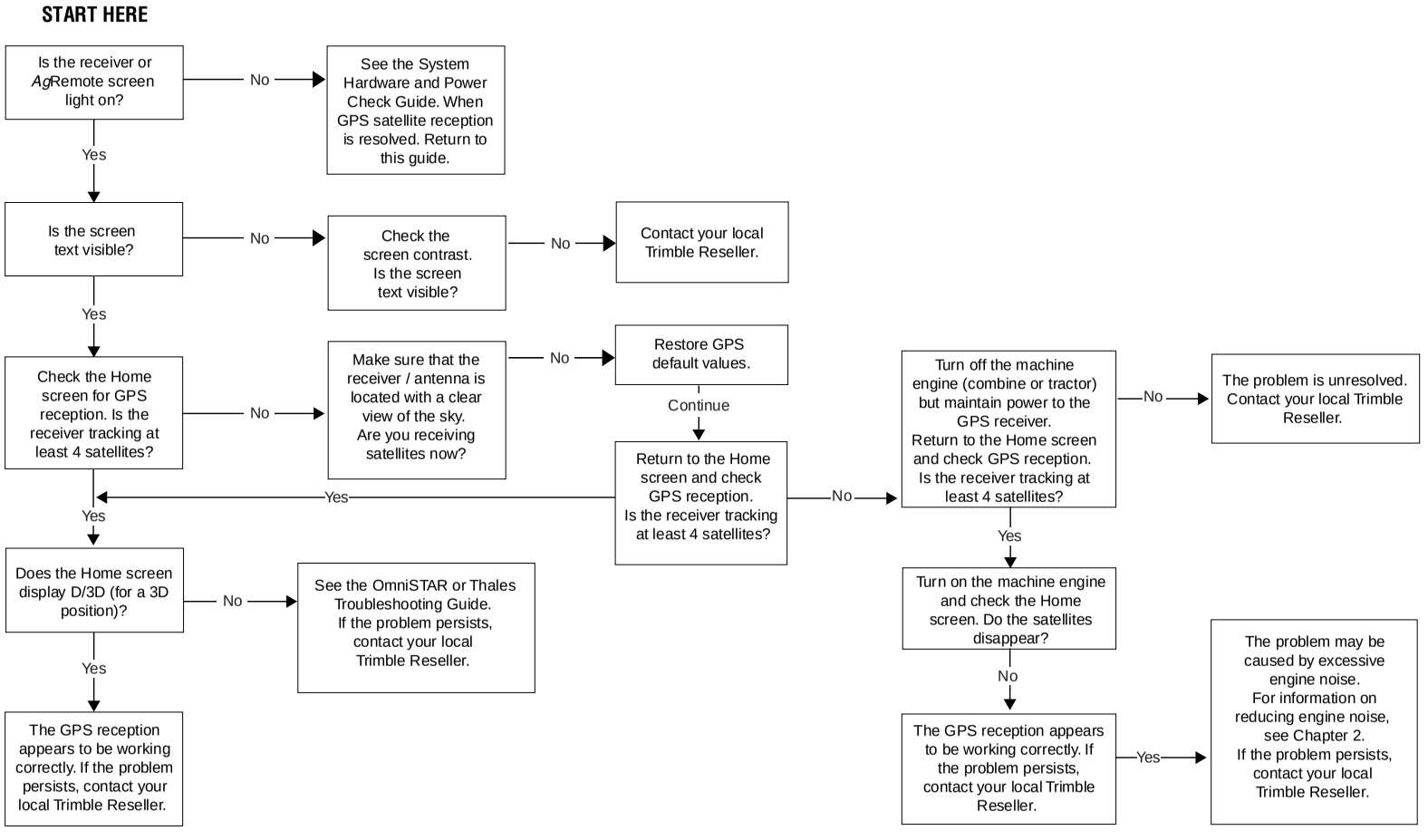
As you proceed through these guides, you may need to view the receiver status or change values in some fields. For information on how to do this, see Menu System Fields, page 60.

In addition, you may find it useful to review Chapter 2, Installing the Receiver.

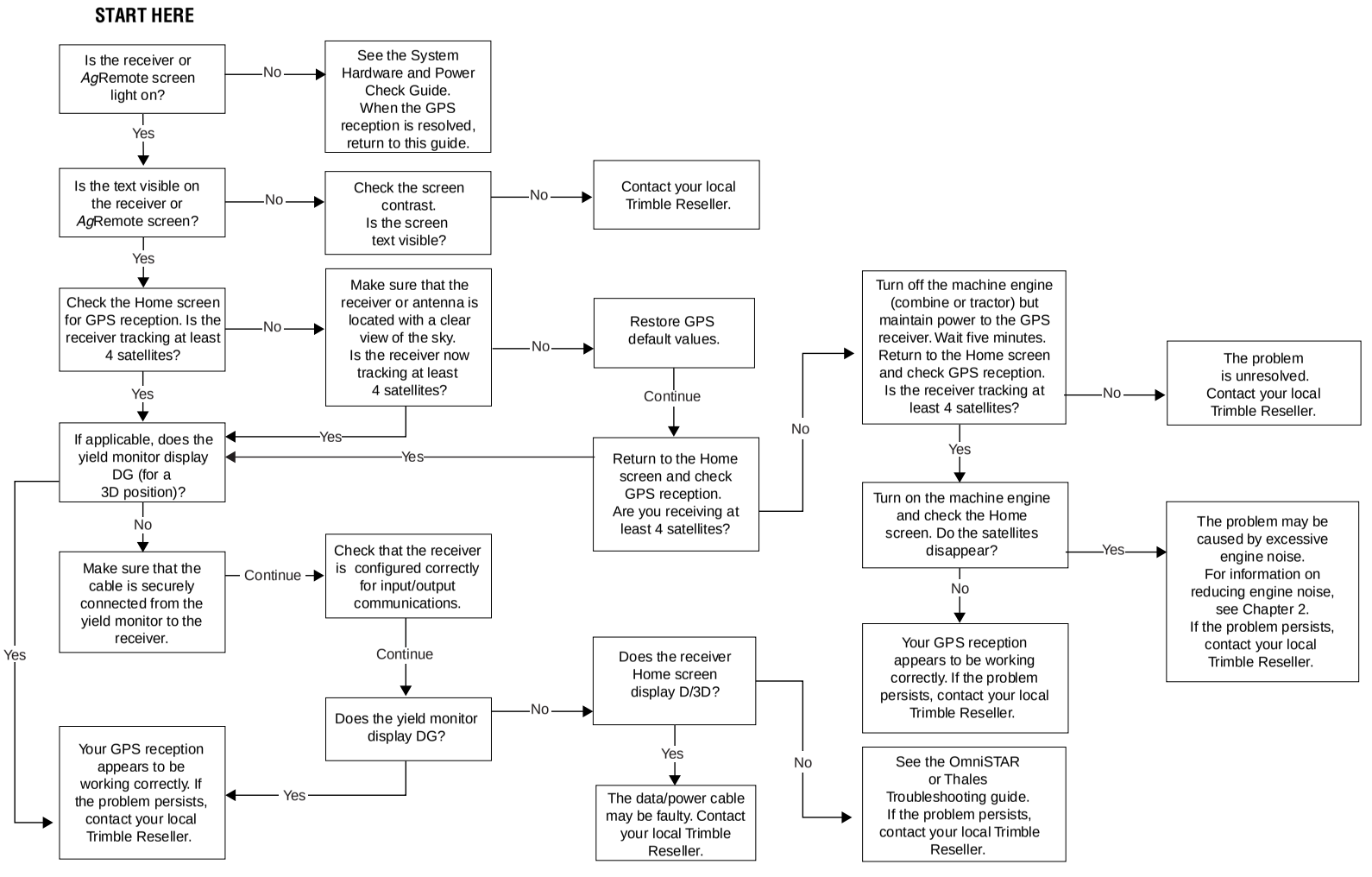
System Hardware and Power Troubleshooting Guide



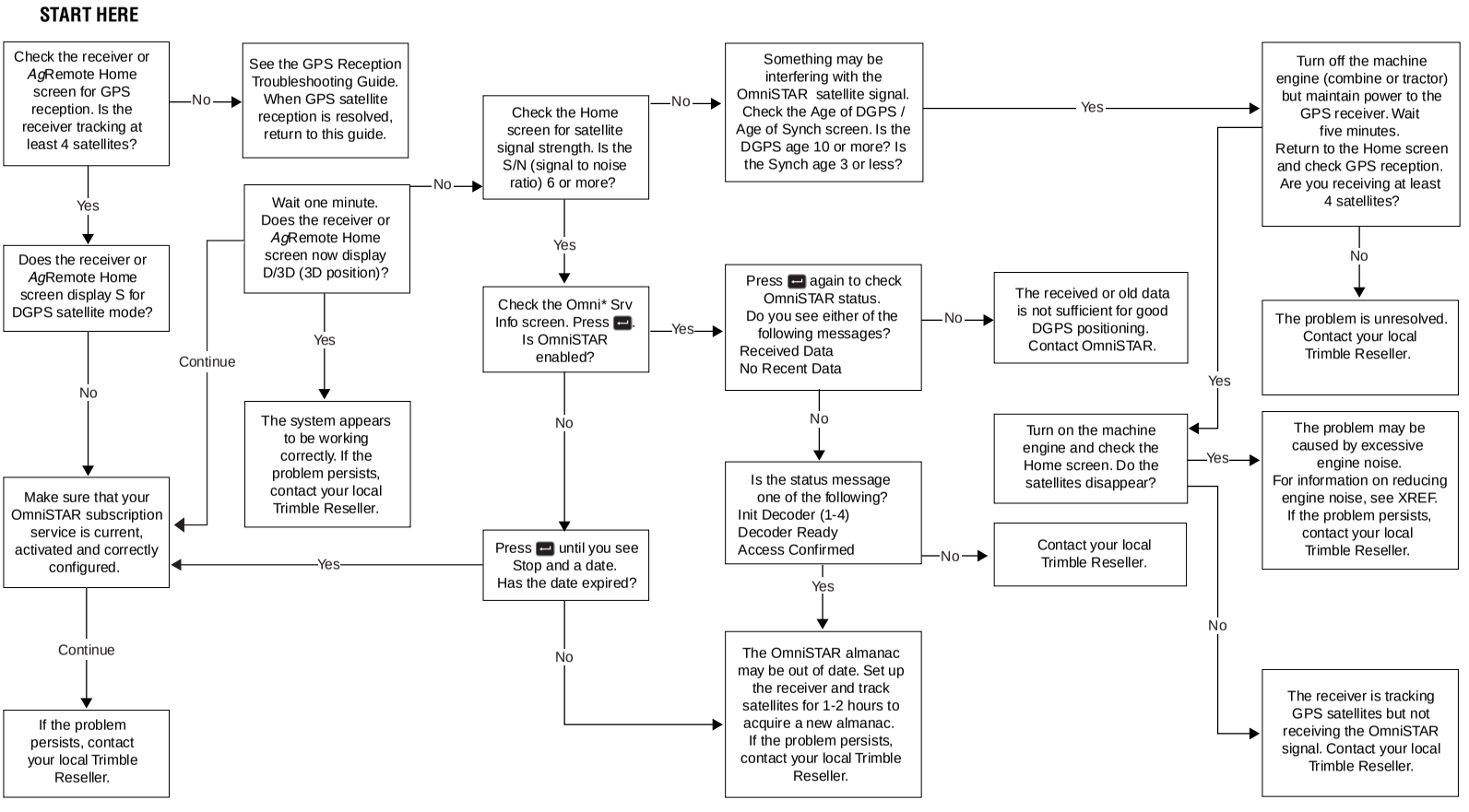
GPS Reception (No Yield Monitor) Troubleshooting Guide



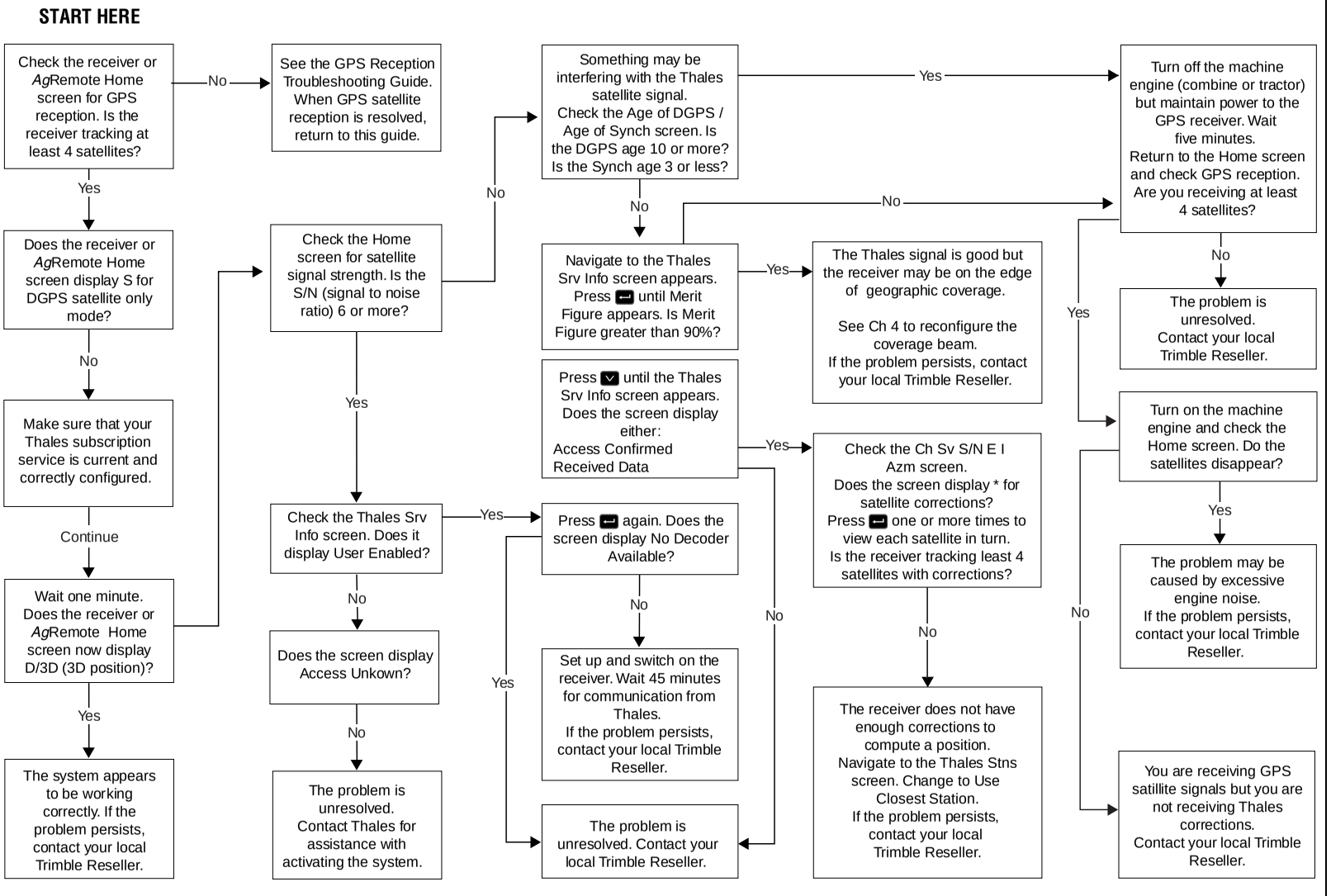
GPS Reception (With Yield Monitor) Troubleshooting Guide



OmniSTAR Troubleshooting Guide



Thales Troubleshooting Guide



APPENDIX

B

Cables and Connectors

In this appendix:

Introduction

This appendix contains pin-out information for the *Ag*GPS 114 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 *Ag*GPS 114 power/data cable (PN 40947-18) Port A and Port B connectors.

Table B.1 *Ag*GPS 114 power/data cable

To receiver P1 connector 12-pin (female)			**Port A to computer P2 connector DE-9 (female)**		**7 conductor cable**	**Port B to computer or lightbar P3 connector 12-pin (male)**		**To DC power 2 conductor cable**
Pin	**Signal**		**Pin**	**Signal**	**Color**	**Pin**	**Signal**	**Wires**
1	EVENT IN	←	4	EVENT	Brown			
2	TXA	→	2	RXA	Yellow			
3	RXA	←	3	TXA	Orange			
4								
5[1]	SIG GND					5[2]		
6	TXB	→			Green	2		
7[3]								
8	RXB	←			Blue	3		
9								
10[3]	V+	←			Red	10		Red V+
11[1]	V-[1]	←	5	GND	Black	11[2]		Black V-
12								

[1]Pins 5 and 11 of connector P1 are jumpered together

[2]Pins 5 and 11 of connector P3 are jumpered together

[3]Pins 7 and 10 of connector P1 are jumpered together with a 5k Ohm, 1/8 watt, 5% resistor

*Ag*GPS PSO Plus Power/Data Cable

Table B.2 gives pin-out information for the *Ag*GPS PSO Plus power/data cable (PN 39350-18).

Table B.2 *Ag*GPS 114 PSO Plus power/data cable

To receiver				**Port B to lightbar**			**Port A to *Ag*GPS 70**		**DC power**	**Alarm/ event**
P1 connector 12-pin (female)			**7 cond cable**	**P2 connector 12-pin (female)**		**7 cond cable**	**P3 connector 12-pin (female)**		**2 cond cable**	**3 cond cable**
Pin	**Signal**		**Color**	**Pin**	**Signal**	**Color**	**Pin**	**Signal**	**Wires**	**Color**
1							1	EVENT IN		White
2	TXA	→	Yellow			Yellow	3	TXA		
3	RXA	←	Orange			Orange	2	RXA		
4										
5[1]	SIG GND	←		5[2]	SIG GND		5[3]	SIG GND		
		→								
6	TXB	→	Green	3	RXB					
7[4]										
8	RXB	←	Blue	2	TXB					
9										
10[4]	V+	←	Red	10	V+	Red	10	V+	Red V+	
11[1]	V-	←	Black	11[2]	V-	Black	11[3]	V-	Black V-	Black
12				12	Alarm	Blue				Red

[1]Pins 5 and 11 of the P1 connector are jumpered together

[2]Pins 5 and 11 of the P2 connector are jumpered together

[3]Pins 5 and 11 of the P3 connector are jumpered together

[4]Pins 7 and 10 of the P1 connector are jumpered together with a 5 kOhm, 1/8 watt, 5% resistor

Ag Leader Yield Monitor Interface Cable

Table B.3 gives pin-out information for the Ag Leader Yield Monitor interface cable (PN 39903).

Table B.3 Ag Leader yield monitor interface cable

To receiver P1 connector 12-pin (Female)			**7 conductor cable**	**To Ag Leader yield monitor P2 connector DE-9 male**		**To DC power, 2 conductor cable**
Pin	**Signal**		**Color**	**Pin**	**Signal**	**Wires**
1	EVENT IN	←				
2	TX	→	Orange	3	RX	
3	RX	←	Blue	2	TX	
4						
5	SIG GND	↔	Shield	5	SIG GND	
6						
7[1]						
8						
9						
10[1]	V+ IN	←				Red V+
11	V- IN	←				Black V-
12						

[1]Pins 7 and 10 of the P1 connector are jumpered together with a 5 kOhm, 1/8 watt, 5% resistor

Case AFS Dual Data Interface Cable

Table B.4 gives pin-out information for the Case AFS dual data interface cable (PN 32609).

Table B.4 Case AFS dual data interface cable

To receiver P2 connector 12-pin (female)			**5 conductor cable**	**To Case combine wiring harness P1 connector 5-Pin MetriPak conn (male)**	
Pin	**Signal**		**Color**	**Pin**	**Signal**
2	TX	→	Blue	D	RX
3	RX	←	Red	B	TX
5	SIG GND	↔	Clear	C	SIG GND
10[1]	PWR IN	→	Green	A	+12 VDC
11	PWR GND	↔	Black	E	PWR GND

[1]Pins 7 and 10 of the P2 connector are jumpered together with 5 kOhm, 1/8 watt, 5% resistor

John Deere GreenStar Data Cable

Table B.5 gives pin-out information for the John Deere GreenStar data cable (PN 34189-00).

Table B.5 John Deere GreenStar data cable

To receiver **P2 connector** **DE-9 male**			**3 conductor cable**	**To GreenStar yield monitor wiring harness** **P1 connector** **3-pin Weatherpack tower (male)**	
Pin	**Signal**		**Color**	**Pin**	**Signal**
2	TX	→	Red	A	RX
3	RX	←	Black	B	TX
5	GND	↔	Blue	C	GND

RDS Ceres Yield Monitor Power/Data Cable

Table B.6 gives pin-out information for the RDS Ceres Yield Monitor power/data cable (PN 35142).

Table B.6 RDS data power cable

To receiver P1 connector 12-pin (female)			**7 conductor cable**	**To RDS Ceres yield monitor P2 connector DE-9 male**	
Pin	**Signal**		**Color**	**Pin**	**Signal**
1	Event In	←			
2	TX	→	Orange	3	RX
3	RX	←			
4					
5	SIG GND	↔	Shield	5	SIG GND
6					
7[1]					
8					
9					
10[1]	V+ IN	←	Red	8	V+
11	V– IN	←	Black	7	PGND
12					

[1]Pins 7 and 10 of the P1 connector are jumpered together with 1 kOhm, 1/4 watt, 5% resistor

APPENDIX

C

NMEA-0183 Messages

In this appendix:

- Introduction
- NMEA-0183 message structure
- NMEA message summary
- NMEA messages

Introduction

Trimble *Ag*GPS 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.1 shows the structure of an NMEA-0183 message.

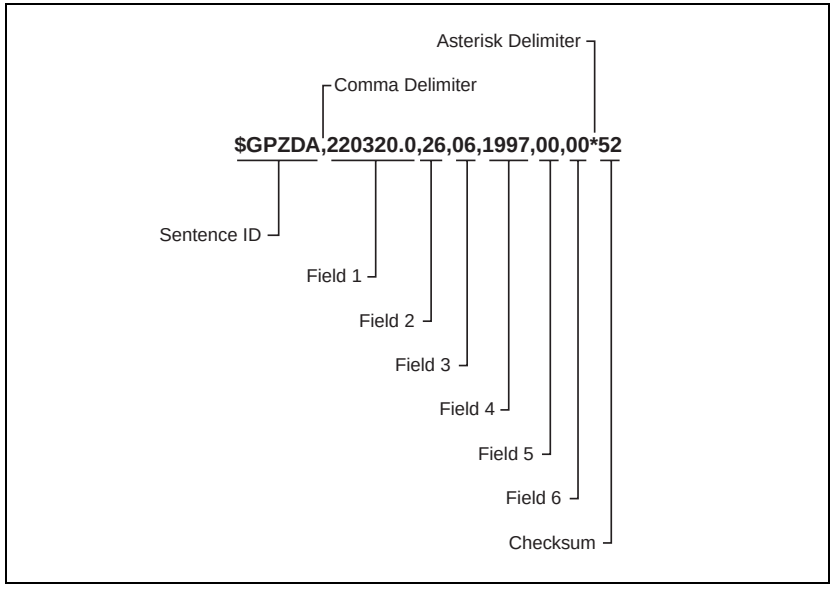


Figure C.1 Example showing NMEA-0183 message structure — ZDA

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.1 explains the fields in the ZDA example shown in Figure C.1.

Table C.1 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.

C.2.1 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

C.2.2 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.

C.2.3 Field formats

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

C.2.4 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.

C.2.5 Talker ID codes

Talker ID code identifies the source of the data (for example, GPS, Loran C, or Sounder). Table C.2 describes the Talker ID codes that are available for NMEA-0183 output from most Trimble receivers.

Table C.2 Supported Talker ID codes

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

C.2.6 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.

C.2.7 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.

C.2.8 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.3 describes the NMEA-0183 message set that is supported by the *Ag*GPS 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.3 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

Table C.3 NMEA message summary (Continued)

Message	Message Contents
PTNLEV Proprietary (Event Marker)	Time, event number, and event line state for time-tagging change of state on an event input line
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.1. 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.4 describes these fields.

Table C.4 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)
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.5 describes these fields.

Table C.5 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.6 describes these fields.

Table C.6 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.7 describes these fields.

Table C.7 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.8 describes these fields.

Table C.8 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.9 describes these fields.

Table C.9 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.10 describes these fields.

Table C.10 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.11 describes these fields.

Table C.11 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.11 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.12 describes these fields.

Table C.12 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 vessel's cross-track error.

The XTE message structure is:

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

Table C.13 describes these fields.

Table C.13 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.14 describes these fields.

Table C.14 ZDA message fields

Field	Description
1	UTC time
2	Day
3	Month
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 A-2 describes these fields.

Table C.15 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 receiver's machine ID, product ID, major and minor release numbers, and firmware release date.

The PTNLID message structure is:

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

Table C.16 describes these fields.

Table C.16 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.17 describes these fields.

Table C.17 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.18 describes these fields.

Table C.18 PTNL,GGK message fields

Field	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)
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.19 describes these fields.

Table C.19 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:

- *Ag*GPS Menu System
- Navigation map *Ag*GPS 114 receiver – Home, Field Operations, and Status menus
- Navigation map *Ag*GPS 114 receiver – Configuration menu

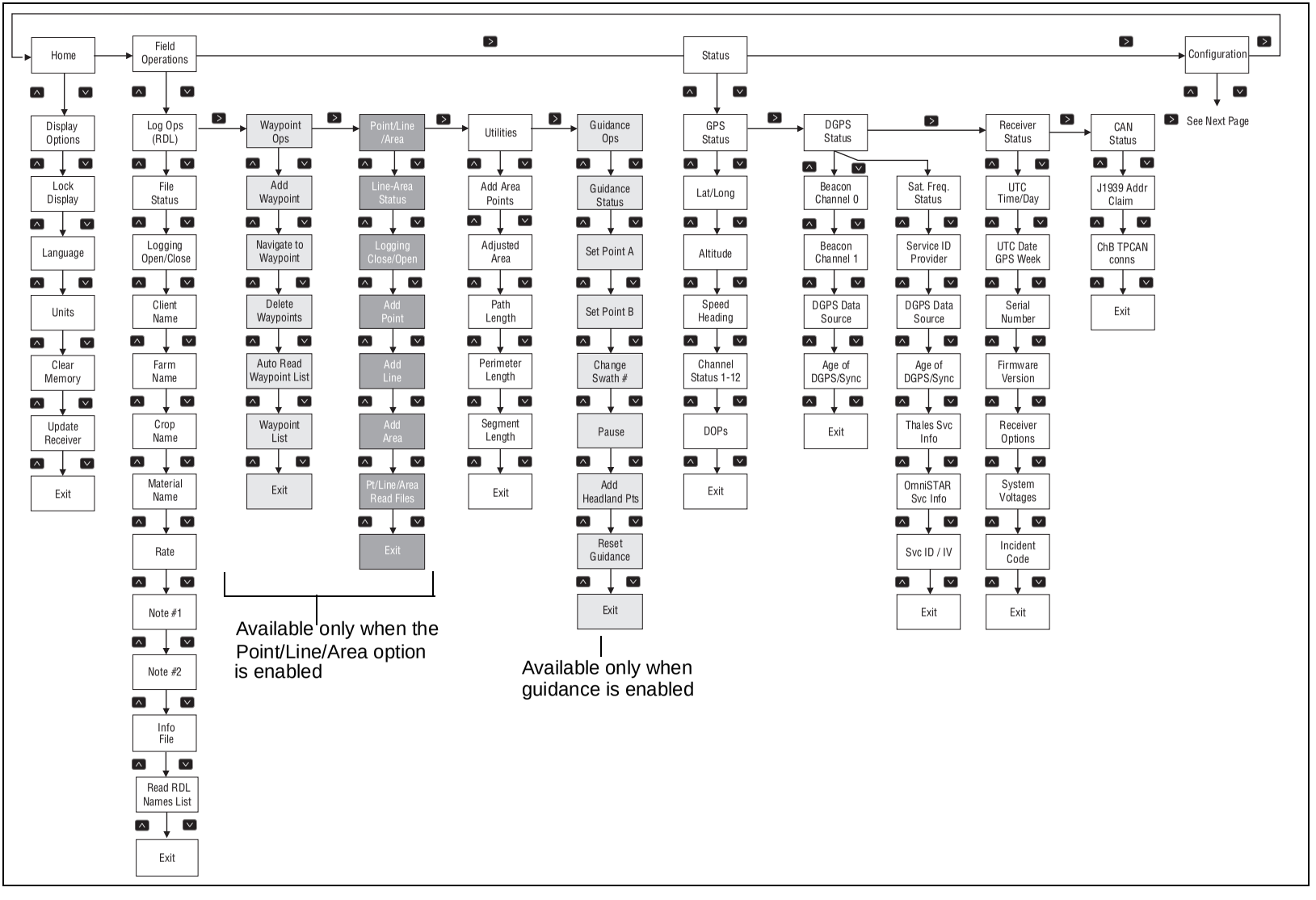
*Ag*GPS Menu System

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

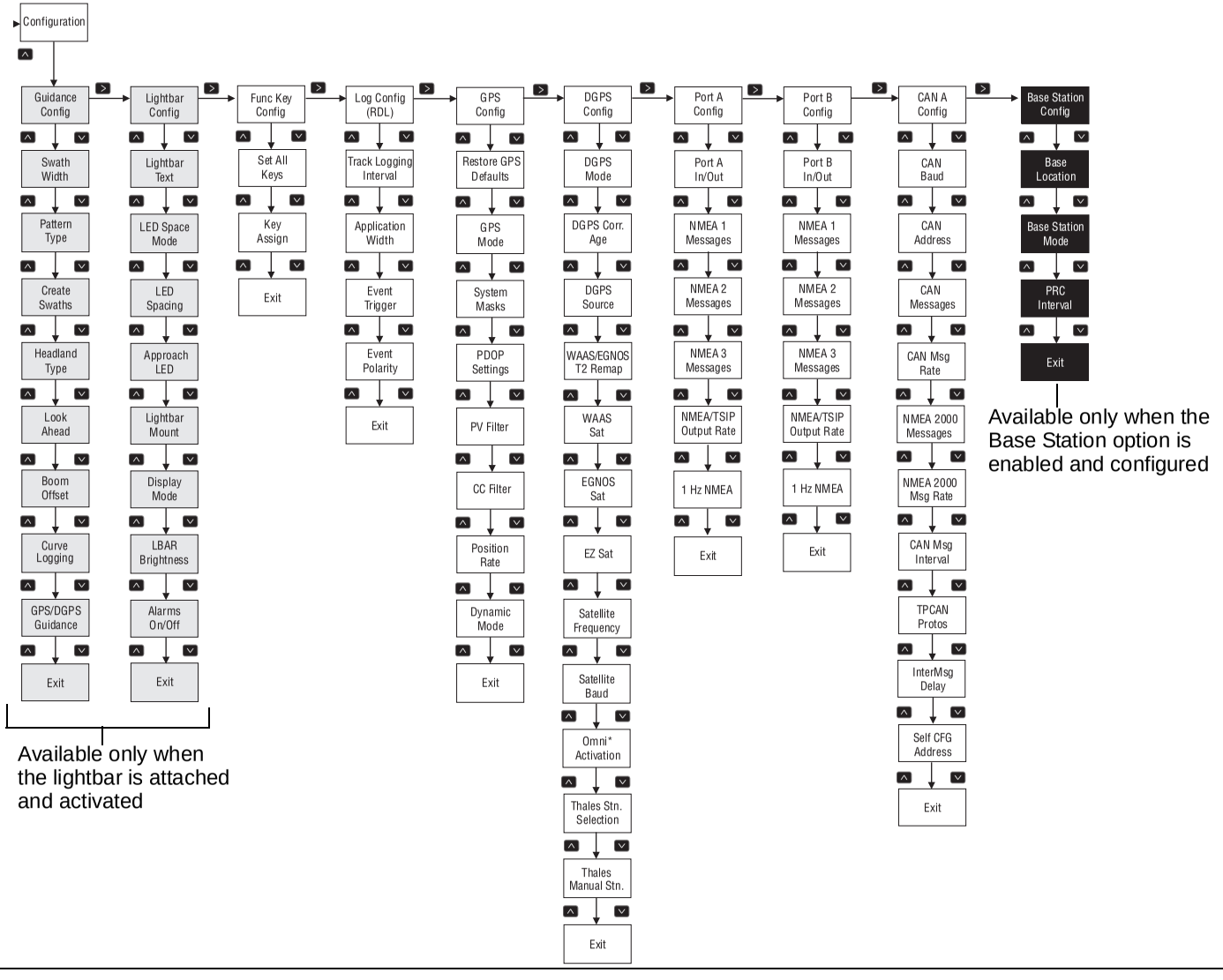
Basic instructions for navigating through the menu system are included in Chapter 3, Getting Started.

Basic instructions for configuring the *Ag*GPS 114 receiver for operation are included in Chapter 4, Configuring the Receiver.

Navigation map for the *Ag*GPS 114 Receiver — Home, Field Operations, and Status menus



Navigation map for the *Ag*GPS 114 Receiver — Configuration menu



APPENDIX

E

Third-Party Interface Requirements

In this appendix:

- Third-party software
- Third-party hardware

Third-Party Software

Table E.1 lists the interface requirements for connecting an *Ag*GPS receiver to third-party software.

Table E.1 Third-party software interface requirements

Software	Company	Protocol	NMEA messages	Baud	Other	Pos rate	Cable PN
AgView	GIS Solutions	NMEA	VTG, GLL	4800	8-N-1	1Hz	30945
FarmGPS	Red Hen	NMEA	GGA, GSA, VTG	4800	8-N-1	1Hz	30945
Field Rover[1]	SST Dev Group	NMEA	GGA, GSA, GSV, VTG	4800	8-N-1	1Hz	30945
FieldLink DOS	Agris	NMEA	GGA, GSA, VTG	4800 or 9600	8-N-1	1Hz	30945
FieldLink Windows	Agris	NMEA	GGA, GSA, VTG	4800 or 9600	8-N-1	1Hz	30945
Field Worker Pro	Field Worker	NMEA	GGA, GLL, RMC, VTG	4800 or 9600	8-N-1	1Hz	30945
HGIS	Starpal	NMEA	GGA, RMC	4800 or 9600	8-N-1	1Hz	30945
Instant Survey	Agrilogic (Case-IH)	NMEA	GGA, GSA, RMC	4800	8-N-1	1Hz	30945
Pocket Survey	Agrilogic (Case-IH)	NMEA	GGA, GSA, RMC	4800	8-N-1	1Hz	30945
Sitemate	Farmworks	NMEA	GGA, VTG	4800	8-N-1	1Hz	30945

[1]Make sure MSS message is not output.

Third-Party Hardware

Table E.2 lists the interface requirements for connecting an *Ag*GPS receiver to third-party hardware.

Table E.2 Third-party hardware interface requirements

Hardware	Company	Protocol	NMEA messages	Baud	Other	Pos rate	Cable PN
AMS	Raven	NMEA	GGA, VTG	9600	8-N-1	1Hz	30945
Ag Navigator[1]	Springhill	RTCM		9600	8-N-1	10Hz	30945
Aim Navigator	Case Tyler	NMEA	GGA	19200	8-N-1	5Hz	30945
Contour	Position Inc.	NMEA	GGA	19200	8-N-1	5Hz	30945
Marker	RDS or Position Inc.	NMEA	GGA	19200	8-N-1	5Hz	30945
Falcon	Ag Chem	NMEA	GGA, VTG	4800	8-N-1	1Hz	30945
Falcon w/ Falcon Track LBAR	Ag Chem	NMEA	GGA, VTG	19200	8-N-1	10Hz	30945
Swath Smart or RGL 500 (LB-5 for Raven)	Raven (Starlink manufactured)	NMEA	GGA, VTG or RMC	19200	8-N-1	10hz	30945
LB-3, LB-4 & LB-5	Starlink	NMEA	GGA, VTG or RMC	19200	8-N-1	10hz	30945
TrimFlight GP400	Trimble	RTCM		9600	8-N-1	1Hz	34903
TrimFlight TF300	Trimble	RTCM		9600	8-N-1	1Hz	34903
Del Norte Aerial Guidance[2]	Del Norte	RTCM		9600	8-N-1	1Hz	30945

Table E.2 Third-party hardware interface requirements (Continued)

Hardware	Company	Protocol	NMEA messages	Baud	Other	Pos rate	Cable PN
YM2000 Yield Monitor[3]	Ag Leader	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903
PF3000 Yield Monitor[4]	Ag Leader	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903
PF3000Pro Monitor without internal GPS[5]	Ag Leader	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903
AFS Yield Monitor	Case-IH (Ag Leader YM2000)	NMEA	GGA, VTG	4800	8-N-1	1 Hz	32609
AFS Yield Monitor	Case-IH YMIU (yield monitor interface unit) manufactured by Ag Leader for Case-IH	NMEA	GGA, VTG	4800	8-N-1	1 Hz	32609
GreenStar Yield Monitor[6]	John Deere	NMEA	GGA, GSA, RMC	4800	8-N-1	1 Hz	34189
New Holland Yield Monitor	New Holland (Ag Leader PF3000)	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903
VCD (Vision Display Controller)	Rockwell	NMEA	GGA, GLL, VTG, ZDA	4800	8-N-1	1 Hz	30945
Swath XL	Midtech	NMEA	GGA	19200	8-N-1	5 Hz	30945
Caterpillar Cebis Yield Monitor	Claus	NMEA	GGA	4800 or 9600	8-N-1	1 Hz	30945

Table E.2 Third-party hardware interface requirements (Continued)

Hardware	Company	Protocol	NMEA messages	Baud	Other	Pos rate	Cable PN
AGCO FieldStar Yield Monitor[7]	AGCO	NMEA	GGA, VTG, GSV, GSA	4800	8-N-1	1 Hz	39903

[1]Connect to COM1, make sure that Pin 9 is not connected

[2]Also requires null modem adaptor

[3]PN 39903 replaced old Ag Leader cable PN 30660

[4]PN 39903 replaced old Ag Leader cable PN 30660

[5]Connect to Aux port

[6]Older GreenStars with version 5.3P mapping processor software require 9600 baud. Older GreenStars with version 5.3R mapping processor software require 4800 baud

[7]AGCO unit requires a null modem RS-232 connection. Ag Leader cable PN 39903 is wired correctly for connection

APPENDIX

F

Specifications

In this appendix:

- *Ag*GPS 114 Receiver
- GPS channels
- L-band satellite differential correction receiver
- Receiver default settings

*Ag*GPS 114 Receiver

Table F.1 lists the physical characteristics of the *Ag*GPS 114 combined GPS/DGPS receiver and antenna.

Table F.1 *Ag*GPS 114 Receiver characteristics

Size	15.24 mm (6 in) diameter x 12.7 mm (5 in) height
Weight	0.52 kg (22 oz or 1.375 lbs)
Power	3.1 Watts, 9–32 VDC
Operating temperature	–30°C to +60°C
Storage temperature	–40°C to +80°C
Humidity	100% condensing, unit fully sealed
Casing	UV-resistant plastic, dust-proof, waterproof, shock resistant
Mount thread size	5/8 in, 11 threads/inch
Compliance	FCC Class B

GPS Channels

Table F.2 lists the performance characteristics of GPS channels.

Table F.2 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	1 Hz standard; 10 Hz optional (selectable 1, 2, 5 or 10 Hz output rate[1])
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 4000RSi or equivalent reference station
Time to first fix	< 30 seconds, typical
NMEA messages	GGA,[2] GLL, GSA[2], GST, GSV, GST, MSS, PTNLDG, PTNL, PTNLEV, PTNLID, PTNLSM, RMC[2], VTG[2], XTE, ZDA

[1]With 10 Hz firmware option installed

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

L-Band Satellite Differential Correction Receiver

Table F.3 lists the characteristics of the L-band satellite differential correction receiver with multiple vendor support.

Table F.3 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 F.4 lists the receiver default settings.

Table F.4 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)
C.C. Filter	Enhanced
DGPS mode	Auto On/Off
DGPS correction age limit	30 seconds
Pos fix rate	1 Hz

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38201-10-ENG **Revision A**

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