*Ag*GPS™ 114

Operation Manual

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1. Improper or inadequate maintenance by the buyer
2. Buyer-supplied software or interfacing
3. Unauthorized modification or misuse
4. Operation outside of the environmental specifications of the product
5. Improper installation, where applicable
6. Lightning or other electrical discharge
7. Fresh or salt water immersion or spray
8. Normal wear and tear on consumable parts (for example, batteries)

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Contents

About This Manual

1 Overview

2 Installing the *Ag*GPS 114 Receiver

D NMEA-0183 Sentences

List of Figures

List of Tables

About This Manual

Welcome to the *AgGPS 114 Operation Manual.* This manual describes how to install and configure the *Ag*GPS™ 114 receiver. It includes step-by-step instructions for installing the *Ag*GPS 114 receiver and guidelines for using the AgRemote software program for viewing and configuring receiver operating parameters. Also included are guidelines for interfacing the receiver to a PC, agricultural yield monitors, information about the selection of NMEA messages supported by the receiver, and connector pin-out diagrams for different data cable connections.

Scope and Audience

Even if you have used other Global Positioning System (GPS) products before, we recommend that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with GPS, we suggest that you read the booklet *GPS, A Guide to the Next Utility,* available from Trimble.

The following sections provide a guide to this manual, as well as to other documentation that you may have received with this product.

Organization

This manual contains the following:

- Chapter 1, Overview, provides a brief overview of Differential GPS, and *Ag*GPS 114 components.
- Chapter 2, Installing the AgGPS 114 Receiver, contains installation and interfacing instructions for the *Ag*GPS 114 receiver.
- Chapter 3, Getting Started, gives instructions for using AgRemote's front panel display and keypad.
- Chapter 4, Configuring the AgGPS 114 Receiver, gives instructions for configuring *Ag*GPS 114 operating parameters.
- Chapter 5, Troubleshooting, gives guidelines for solving potential problems.
- Appendix A, Specifications, identifies the physical characteristics and general specifications of the *Ag*GPS 114 receiver.
- Appendix B, Receiver Defaults, contains the default settings for the *Ag*GPS 114 receiver.
- Appendix C, Cables and Connectors, includes pin-out diagrams for the standard and optional cables.
- Appendix D, NMEA-0183 Sentences, describes the structure of NMEA messages generated by the *Ag*GPS 114 receiver and the information included in them.
- Appendix E, Flash Loader 100, explains how to use the Flash Loader 100 software to update the receiver firmware.
- Appendix F, Activating Satellite DGPS Service, provides step-by-step instructions for activating a satellite DGPS service.
- Appendix G, Fast Rate Output, gives instructions for configuring the *Ag*GPS 114 receiver for Fast Rate output.

- Appendix I, AgGPS Menu System, includes the AgGPS Menu System navigation map.

Other Information

This section lists sources that provide other useful information.

World Wide Web (WWW) Site

For an interactive look at Trimble Precision Agricultural Products, visit our site on the World Wide Web:

- http://www.trimble.com/precise/agri/index.htm

Technical Assistance

If you have a problem and cannot find the information you need in this product manual, ***contact the local dealer*** from which you purchased your AgGPS 114 DGPS receiver.

If you need further assistance, contact the Overland Park, Kansas office by phone, fax, or email. A support technician can help determine the cause of the problem and provide technical assistance.

Phone: +1-913-495-2700 (International & North America)

(8:00 am to 5:00 pm Central Standard Time)

Fax: +1-913-495-2750

Email: precision_ag@trimble.com

When you contact Overland Park, Kansas, provide the following information:

- The Trimble product name, any software or firmware version number(s), and if appropriate, the receiver serial number.
- Your specific question or problem.

  Please detail background information, such as the configuration of your receiver, and the exact type, make, and configuration of your computer. Specify the software program on your computer you are using with your GPS receiver. If you have received error messages, please specify the exact wording.

If you need to send a data file with your inquiry, please compress the file using WINZIP software and name the file with the extension.ZIP. WINZIP software is available from:

http://www.winzip.com

To send the file, attach the file to your email message and send it to:

precision_ag@trimble.com

Reader Comment Form

Thank you for purchasing this product. We would appreciate feedback about the documentation. Use the reader comment form at the back of this manual or, if this is not available, send comments and suggestions to the address in the front. All comments and suggestions become the property of Trimble Navigation Limited.

Document Conventions

Italics identify software menus, menu commands, dialog boxes, and the dialog box fields.

SMALL CAPITALS identify DOS commands, directories, filenames, and filename extensions.

`Courier` represents messages printed on the screen.

`Courier Bold` represents information that you must type in a software screen or window.

Helvetica Bold identifies a software command button.

Return or Ctrl + C identifies a hardware function key or key combination that you must press on a PC.

Screen Font is used to show information displayed on the *Ag*GPS 114 LCD display.

 , and Esc are the buttons on the *Ag*Remote software program screen.

Warnings, Cautions, Notes, and Tips

Warnings, cautions, notes, and tips draw attention to important information and indicate its nature and purpose.

Warning – Warnings alert you to situations that could cause personal injury or unrecoverable data loss.

Caution – Cautions alert you to situations that could cause hardware damage or software error.

Note – Notes give additional significant information about the subject to increase your knowledge, or guide your actions.

Tip – Tips indicate a shortcut or other time- or labor-saving hint that can help you make better use of the product.

1 Overview

The *Ag*GPS 114 is a high-performance GPS reception and satellite DGPS capability receiver and antenna in a single, lightweight, durable, waterproof housing.

Additionally, the *Ag*GPS 114 receiver (see Figure 1-1) contains The Choice™ technology, enabling OmniSTAR and Racal-LandStar real-time differential capabilities.

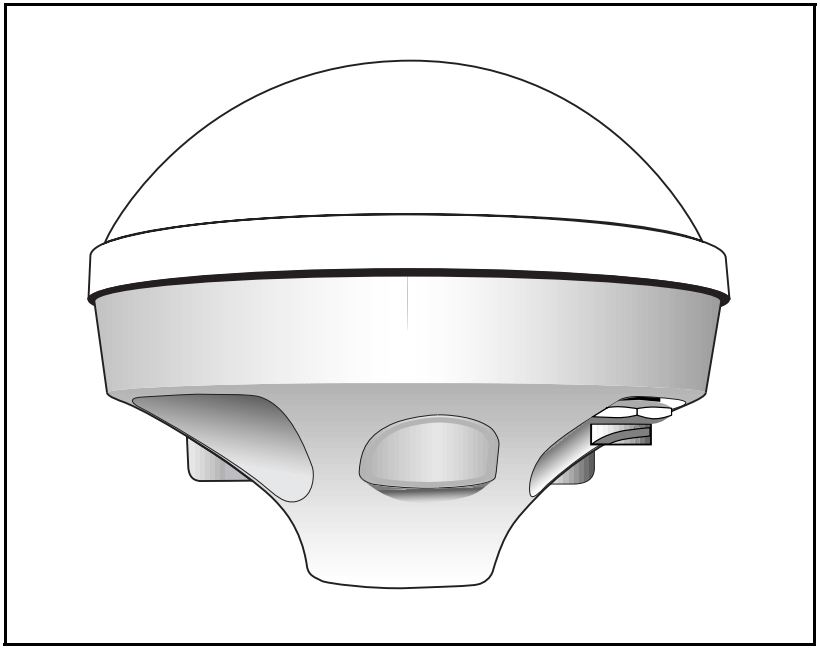


Figure 1-1 *Ag*GPS 114 Receiver

As a part of a precision agriculture system, the *Ag*GPS 114 receiver outputs submeter GPS position information to a variety of farming equipment, including yield monitors, parallel swathing guidance systems, variable rate planters, spray application and soil sampling controllers, and portable field computers.

The *Ag*GPS 114 receiver outputs real-time submeter positions and 0.1 mile-per-hour (0.16 kph) velocity accuracy through NMEA-0183 and TSIP (Trimble Standard Interface Protocol) messages. A 1 PPS (pulse per second) strobe signal can also be used to synchronize time and log event marker input when using external instruments.

1.1 Differential GPS Positioning

The *Ag*GPS 114 receivers use differential GPS (DGPS) to achieve submeter (<3.28 ft) accuracy. DGPS requires two or more receivers. One receiver, called the reference or base station, is located at a known point to determine the GPS measurement errors. An unlimited number of mobile *Ag*GPS 114 receivers, sometimes called rovers, collect data at unknown locations within the transmission range of the reference station. The reference station broadcasts correction values, which are applied to the *Ag*GPS 114 receiver position. Errors common at both the reference and rover receivers are corrected. For more information about DGPS and the different DGPS signals available, review the *Differential GPS Explained* introductory book available from Trimble.

1.1.1 Sources of GPS Error

The largest source of GPS position error is Selective Availability (S/A). S/A is induced by the U.S. government for the purpose of restricting full GPS accuracy to all except authorized users. The magnitude of S/A combined with other error sources results in autonomous (single receiver) horizontal accuracies of up to 100 meters (328 feet). If the U.S. government turns S/A off, autonomous GPS horizontal accuracy would be about 10 meters (32.8 feet).

Atmospheric conditions (especially in the ionosphere), multipath (GPS signals bouncing off objects before reaching the antenna), and receiver (electronic) noise are in large part responsible for the remaining 10 meters (32.8 feet) of error.

DGPS removes most of the errors caused by S/A and the atmosphere. The *Ag*GPS 114 receiver uses the latest advancements in receiver design to minimize these errors. For more information about S/A, atmospheric effects, and other sourced of error, review the *All About GPS* tutorials found on the Trimble web site (WWW.TRIMBLE.COM).

1.1.2 DGPS Accuracy

Accuracy of the *Ag*GPS 114 receiver with differential correction is better than 1 meter RMS (3.2 feet) + 10 ppm times the distance between the reference station and the mobile receiver given the following conditions:

- Number of satellites used: > 5
- PDOP: < 4
- Signal to Noise Ratio: > 6
- Satellite Elevation Mask: > 7.5
- Low multipath environment
- RTCM-compatible corrections broadcast from a Trimble 4000RSi or equivalent

Number of visible satellites

Four or more satellites must be visible to calculate a three-dimensional position (latitude and longitude, altitude, and time). Three or more satellites must be visible to calculate a two-dimensional position (latitude and longitude, and time). One or more satellites must be visible to compute a zero-dimensional (time only) position. Three-dimensional positions are the most accurate. On the *Ag*GPS 114 receiver you can set configurations to determine how many satellites are used to compute GPS positions.

Position Dilution of Precision (PDOP)

PDOP is a unitless measure indicating when the satellite geometry can provide the most accurate results. When satellites are spread around the sky, the PDOP value is low and the computed position is most accurate. When the satellites are grouped closely together, the PDOP is high and positions are less accurate. You can configure a PDOP Mask to control the point at which the *Ag*GPS 114 receiver stops outputting position reports. For submeter accuracy, the PDOP must be 4 or less.

In some agricultural applications, a PDOP Mask of 12 or more can be used to prevent loss of data. However, accuracy can suffer as PDOP rises. There is a trade-off between optimal GPS accuracy and continuous operation.

Signal-to-Noise Ratio

Signal-to-Noise Ratio (SNR) is a measure of the satellite signal strength. Accuracy improves as the signal strength increases. More signal strength with less noise interference equals better accuracy. To compute positions with strong signals, the SNR mask should be set to the default, 6 or more.

Elevation Mask

When a satellite is low on the horizon, the GPS signals must travel a great distance through the atmosphere, delaying reception by the *Ag*GPS 114 receiver. You can minimize noisy data by adjusting (tuning) the Elevation Mask. Satellites below the mask are excluded from the position computation. The recommended setting for highest accuracy is 8°. There is a trade-off between accuracy and continuous operation; lowering the mask ensures continuous operation. Raising the elevation mask ensures a better position fix; less satellites available may cause loss of a required 3-dimensional fix when working in area with an obstructed view of the sky.

Multipath

GPS signals are sometimes reflected off nearby objects, particularly metallic objects, creating false or erroneous results. This phenomenon is known as multipath. Severe multipath can induce errors of many meters, while mild multipath may cause small, undetectable errors. Optimal accuracy is obtained by collecting data in an environment that is devoid of large reflective surfaces, like buildings and trees. The *Ag*GPS 114 receiver's Everest™ multipath reduction option helps reduce the effects of multipath.

1.2 Measuring GPS Accuracy

To measure GPS accuracy you must have some knowledge of coordinates and datums. When comparing geographic data obtained from different sources, the data must be referenced to the same datum and coordinate system. Different datums and coordinate systems provide different coordinate values for any geographic location.

In North America, for example, two different datums, NAD 27 and NAD 83, are commonly used. A particular place on the surface of the earth has different latitude and longitude coordinates in each datum. The *Ag*GPS 114 receivers provide coordinates in the WGS-84 datum. Existing background maps for the NAD 27 datum do not register with GPS data based on the NAD 83 datum.

Note – The North American Datum 1983 (NAD 83) is, for all practical purposes, equivalent to WGS-84 (World Geodetic Survey 1984). GPS data is referenced to the WGS-84 datum.

1.2.1 Receiving Satellite DGPS

Satellite differential GPS signals are sent from a ground station through a satellite transponder to users within view of the satellite. The corrections are sent in a format that allows the construction of a local differential correction applicable to the entire coverage region.

The *Ag*GPS 114 receiver contains both OmniSTAR and Racal-LandStar satellite differential technology. To enable satellite differential capabilities, contact either supplier. Depending on which supplier is involved, the receiver can be activated by an over-the-air signal or an encrypted activation message entered by the *Ag*Remote software program.

Satellite differential signals provide valid corrections over a large area, but are decoded to provide an accurate correction applicable to any location within the satellite view area. This is accomplished by special software algorithms for generating wide area differential corrections. These algorithms, called Virtual Reference Station (VRS)

and Virtual Base Station (VBS), depending on the vendor, compute differential corrections that a base station would generate if it were at the receiver's location. This correction is constantly updated, so as the receiver moves around, the correction remains at full accuracy.

Satellite differential signals are line-of-sight and can be blocked by a mountain, hill, or tree canopy. Wet canopy, from a heavy rain, reduces the signals even more. The same local environmental factors, like radar and microwave transmitters, that affect the GPS signals can interfere with the satellite signals. Power lines usually have no effect.

For specific information about the providers, visit WWW.OMNISTAR.COM or WWW.RACAL-LANDSTAR.COM on the World Wide Web.

1.3 Standard Features

The standard *Ag*GPS 114 system provides the following:

- 12 GPS (C/A-code) tracking channels, carrier-phase filtering
- Submeter differential accuracy (RMS): assumes at least 5 satellites and PDOP less than 4
- Combined GPS/DGPS receiver & antenna
- Magnetic antenna mount
- Data/Power cable
- *Ag*Remote software program that simulates the *Ag*GPS 124/132 LCD display interface with four-button keypad to configure and view system properties
- Two RS-232 serial ports and 1 J1939 CAN-ready port (CAN 2.0B):
  - NMEA-0183 output: ALM, GGA, GLL, GRS, GST, GSA, GSV, MSS, RMC, VTG, ZDA, XTE (The default NMEA messages are GGA, GSA, VTG and RMC)
  - RTCM SC-104 output
  - TSIP input and output
  - Outputs 1 PPS (pulse per second) strobe signal on either serial port, allowing an external instrument to synchronize its internal time with the *Ag*GPS 114 clock oscillator.
- WAAS/EGNOS Differential Correction Upgrade available
- *Ag*GPS 170 Field Computer compatible
- *Ag*GPS 70 Remote Data Logger compatible

1.4 Receiver Enhancements

*Ag*GPS 114 systems contain several point-of-sale purchase options designed to maximize receiver performance. Depending on the system you ordered, the following options may or may not be included.

1.4.1 Fast Rate (P/N 33176-10)

The Fast Rate option enables the *Ag*GPS 114 receiver to output position data up to 10 times per second. Fast Rate output is important in parallel swathing and variable rate applications. (5 Hz Fast Rate option is activated when the Parallel Swathing Option is connected.)

1.4.2 Everest Technology (P/N 33176-40)

The Everest™ multipath reduction option improves DGPS receiver accuracy by filtering reflected GPS signals before they are processed by the DGPS receiver. Everest technology provides maximum accuracy near trees, buildings, and reflective surfaces.
(The Everest multipath reduction option is activated when the Parallel Swathing Option is connected.)

1.5 Application Options

The *Ag*GPS 114 system contains several purchase options that increase the number of applications for which the *Ag*GPS 114 receivers can be used.

1.5.1 Parallel Swathing Option Plus for AgGPS 114 (PN 34623-40)

The *Ag*GPS Parallel Swathing option enhances the *Ag*GPS 114 receiver with an easy-to-use, plug-and-play lightbar. The lightbar indicates off-track error, which the operator uses to steer back on-line.

The *Ag*GPS Parallel Swathing Option helps reduce farm expenses by minimizing redundant applications and skipped areas. Efficient field coverage enables maximum ground coverage in the shortest possible time. Swath coverage maps show the actual field area covered, quality of application & document the date of application.

Independent data ports enable the *Ag*GPS 114 receiver to simultaneously control the lightbar and output data to a variable rate controller or other device.

1.5.2 Ag Field Pack (P/N 32294)

The *Ag* Field Pack includes the backpack, antenna poles, batteries, and cables to keep hands free when operating the *Ag*GPS 114 receiver on foot. The Field Pack is available as either a rigid frame or lumbar pack; ideal for crop scouting and field mapping applications.

1.6 Receiver Connections

Figure 1-2 shows the bottom of the *Ag*GPS 114 receiver and its connection port.

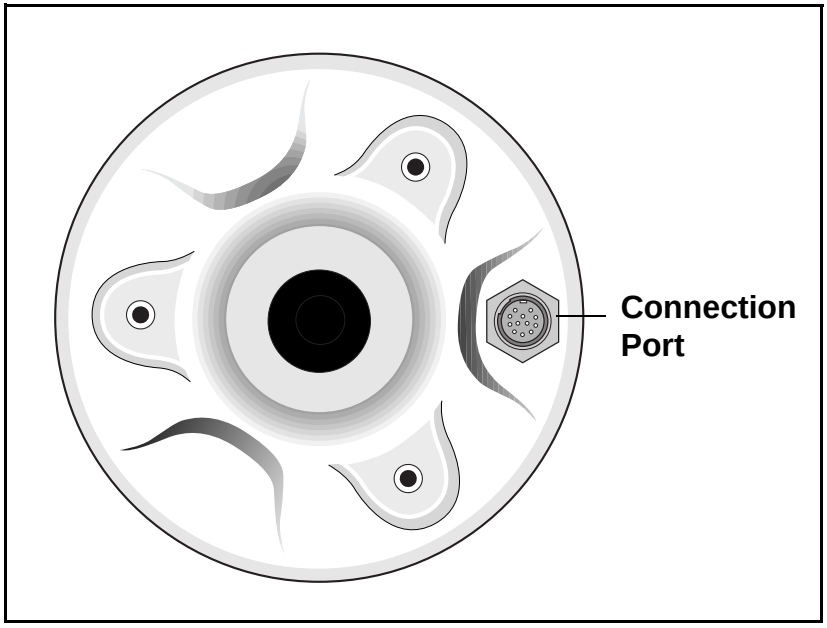


Figure 1-2 *Ag*GPS 114 Bottom View

The connection port can accept power. The *Ag*GPS 114 standard power/data cable (P/N 40947) supplies power and features a data connector for interfacing to an external device. For more information, see Connecting to External Devices, page 2-9.

1.6.1 ASCII and TSIP Input

The connection port can be used to input ASCII, TSIP and CAN data from an external device. ASCII data can be received from an external sensor, converted into a NMEA message, and exported to another device. TSIP command packets are used to set and monitor GPS and Satellite DGPS parameters using the included *Ag*Remote software program.

1.6.2 RTCM, TSIP and NMEA Output

The connection port is used to output RTCM, TSIP, NMEA 0183 or CAN messages to an interface device. RTCM is output when operating in base station mode. TSIP is output when communicating with the included *Ag*Remote software. NMEA is output when exporting GPS position information to an external device, such as a yield monitor or mapping software program. CAN is used when communicating over a CAN bus system to other connected external devices.

1.6.3 1 PPS Output

The connection port can output a 1 PPS (pulse per second) strobe signal to synchronize the external instruments to the receiver's internal clock.

2 Installing the *Ag*GPS 114 Receiver

This chapter shows you how to:

- Unpack and inspect the shipment
- Install the following:
  - *Ag*GPS 114 receiver
  - Connect to the *Ag*GPS Lightbar, *Ag*GPS 70 RDL, field computers and yield monitors

We recommend that you read this chapter before attempting to install your *Ag*GPS 114 receiver.

2.1 Unpacking and Inspecting the Shipment

Inspect the shipping cartons for any signs of damage or mishandling before unpacking the receiver.

Report any damage to the shipping carrier immediately.

2.1.1 Opening the Shipping Carton

The shipment could include one or more cartons, depending on the number of optional accessories ordered. Open the shipping cartons and make sure that all of the components indicated in Tables 2-1 and 2-2 are included.

Table 2-1 *Ag*GPS 114 Receiver

Qty	P/N	Description
1	38198-00	*Ag*GPS 114 Combination Receiver and Antenna

Table 2-2 *Ag*GPS 114 Components

Qty	P/N	Description
1	12920-00	Magnetic Mount for Antenna
1	40947	*Ag*GPS 114 Data/Power Cable
1	38201-00	*Ag*GPS 114 Operation Manual
1	41561	*Ag*GPS Menu System Reference Manual

As shown in Table 2-3, the bill of lading could list one or more of the following factory installed enhancements.

Table 2-3 *Ag*GPS 114 Receiver Enhancements

Qty	P/N	Description
1	33176-10	Fast Rate capability
1	33176-40	Everest Multipath Reduction Technology

As shown in Table 2-4, the bill of lading could list one or more of the following options.

Table 2-4 *Ag*GPS 114 Application Options

Qty	P/N	Description
1	32294-00	Ag Field Pack 120 volts
1	32294-10	Ag Field Pack 240 volts
1	34623-20	Parallel Swathing Option Plus for *Ag*GPS 114 and *Ag*GPS 70 RDL
1	34623-40	*Ag*GPS 21 PSO Plus for *Ag*GPS 114
1	39600-00	*Ag*GPS 70 Remote Data Logger

The bill of lading could include one or more of the items listed in Table 2-5 if optional components or accessories are ordered.

Table 2-5 Optional Components

Qty	P/N	Description
1	39903	Ag Leader Yield Monitor Data/Power Cable
1	30700	3.6-meter (12-foot) Extension Data Cable DE9-M to DE9-F
1	32609	CASE AFS Data/Power Cable
1	34189	John Deere GreenStar Data Cable
1	35142	RDS Yield Monitor Data/Power Cable
1	40572	Null Modem adapter

2.1.2 Reporting Shipping Problems

Report any problems discovered after you unpack the shipping cartons to both Trimble Precision Agricultural Systems and the shipping carrier.

2.2 Installation Guidelines

*Ag*GPS 114 receivers are designed to be mounted on a level, flat surface with the antenna mounted upright. The round magnetic base should be placed on a flat metal surface. The bottom of the receiver has 3 threaded metal insert holes for mounting to a flat surface with screws.

2.2.1 Choosing a Location

The *Ag*GPS 114 receiver can be installed in any convenient location within cable reach of interconnected external devices. The location you choose should:

- be at the highest point of the vehicle with no metal surfaces blocking view of the sky
- be within 3.6 meters (12 feet) of the external instrument port (the optional 3.6-meter (12-foot) extension cable can be used to extend the cable connection distance between the receiver and external devices).
- allow enough clearance between the top of the machine cab and machine shed or storage shed doors for mounting the receiver.

2.2.2 Considering Environmental Conditions

Although the *Ag*GPS 114 receiver is located within a waterproof housing, it should be installed in a dry location. 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
- Avoiding these conditions improves the receiver's performance and long-term product reliability.

2.3 Mounting the Receiver

To mount the receiver, use the following guidelines when selecting a location:

- Place the receiver on a flat surface along the center line of the vehicle (or centerline of machine applicator boom).
- Choose an area with a clear view to the sky above metal surfaces. The top of a mast or pole is recommended.
- Do not mount the antenna close to stays, electrical cables, metal masts, CB radio antennas, Cell phone antennas, air-conditioner units (machine cab blower fan) or machine accessory lights.
- Do not mount the antenna near transmitting antennas, radar arrays, or satellite communication equipment.
- Avoid areas with high vibration, excessive heat, electrical interference, and strong magnetic fields.

Caution – A metal combine grain tank extension may block low elevation satellites.

2.3.1 Sources of Electrical Interference

Several sources of electrical and magnetic noise are:

- 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
- Hydrostatic Transmissions
- High-voltage power lines
- CB radio antennas
- Cellular phone antennas
- Machine accessory lights

2.4 Routing and Connecting the *Ag*GPS 114 Data/Power Cable

A 5-meter (16.5-foot) data/power cable is included with your *Ag*GPS 114 receiver (see Figure 2-1). One end of the cable features a 90-degree connector. The opposite end features a 9-pin connector (Port A) and a straight round 12-pin connector (Port B). Connect the 90-degree connector to bottom the receiver, then route the cable to the external device.

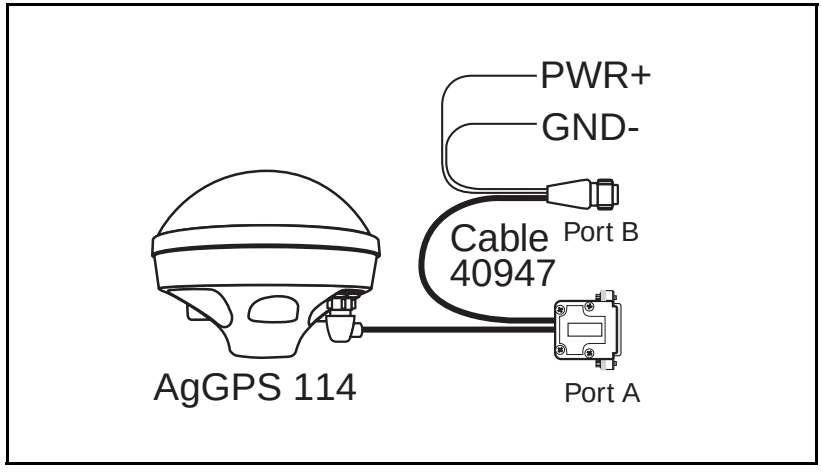


Figure 2-1 *Ag*GPS 114 Standard Data/Power Cable Connections

When routing the data cable, avoid the following hazards:

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

After routing the cable, connect it to the *Ag*GPS 114 receiver. Use tie-wraps to secure the cable at several points along the route. One tie-wrap is required to secure the cable near the base of the receiver. This provides strain relief for the data cable connection.

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

2.5 Connecting to External Devices

After installing the receiver, connect and route the *Ag*GPS 114 Data/Power cable. The receiver can be powered by a vehicle or a customer supplied 10–32 VDC power source.

The following sections contain installation instructions for different power/data cables. Depending on the cable(s) you own, complete the appropriate installation.

2.5.1 Connecting the Optional Parallel Swathing Option Plus for *Ag*GPS 114 and *Ag*GPS 70 RDL (Cable PN 39350)

The *Ag*GPS 114 Parallel Swathing Option cable connects the *Ag*GPS 114 receiver to the *Ag*GPS Lightbar and *Ag*GPS 70 Remote Data Logger (see Figure 2-2).

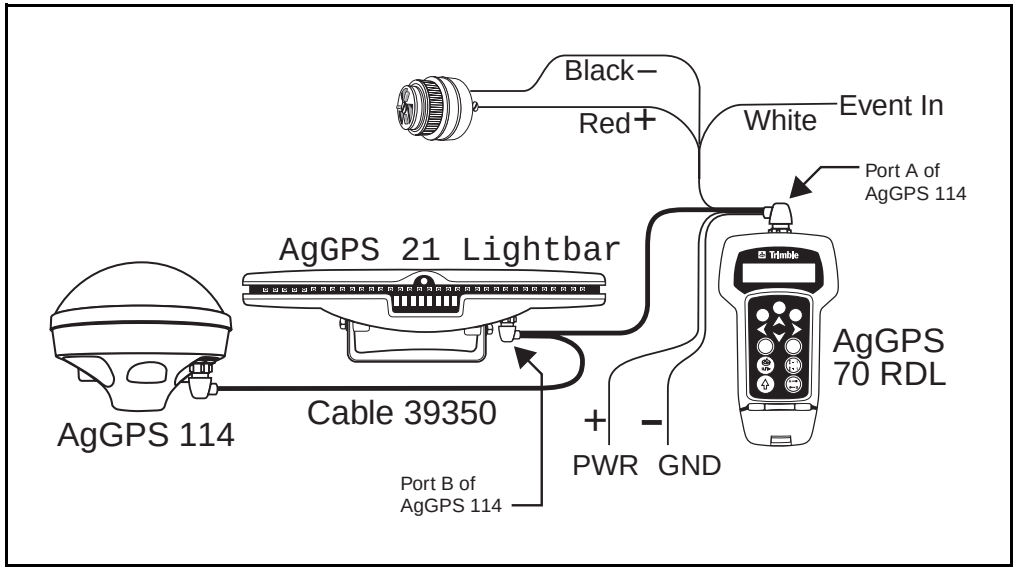


Figure 2-2 Parallel Swathing Option Plus for *Ag*GPS 114 and *Ag*GPS 70 RDL

Note – The red power lead must be connected to the +12 volts DC and the black power lead to Ground.

2.5.2 Connecting the Optional CASE AFS Data/Power Cable (PN 32609)

The 1-meter (3-foot) CASE AFS Data/Power Cable connects the *Ag*GPS 114 receiver to a CASE AFS installation.

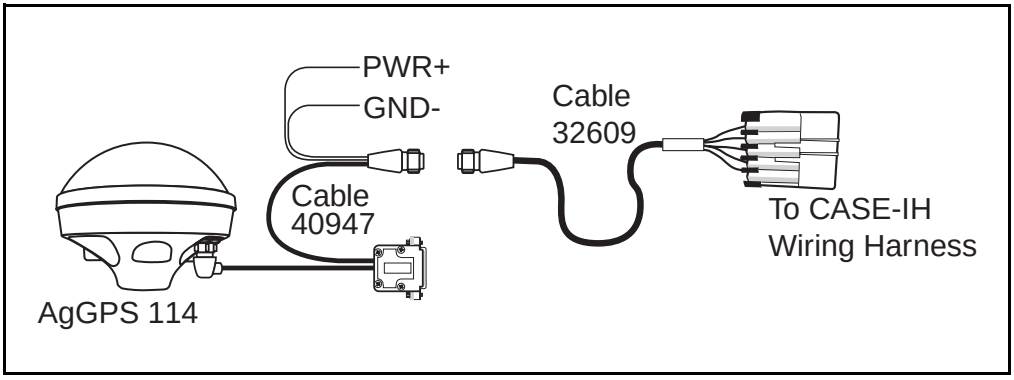


Figure 2-3 CASE AFS Power/Data Cable Connection

To connect the *Ag*GPS 114 receiver to a CASE AFS installation:

1. Connect the flat grey 5-pin connector to the CASE AFS wiring harness.

Warning – The 40947 cable's red power lead and black power leads are not connected to machine power. The CASE AFS wiring harness supplies 12 VDC power to receiver.

2.5.3 Connecting the Optional John Deere GreenStar Data Cable (PN 34189)

The 1-meter (3-foot) John Deere GreenStar Data Cable connects the *Ag*GPS 114 receiver to the John Deere GreenStar system (see Figure 2-4).

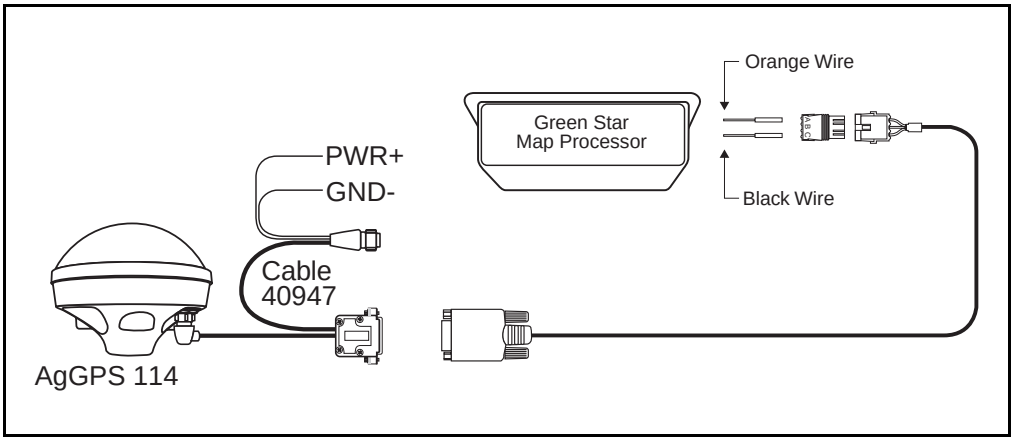


Figure 2-4 GreenStar Data Cable Connection

Before installing the *Ag*GPS 114 receiver, you *must* determine if there is a GPS receiver currently attached to the GreenStar System.

- If there is *not* a GPS receiver attached to the GreenStar system, proceed with Step 1.
- If there is a GPS receiver attached to the GreenStar system, disconnect it from the wiring harness. This is required to activate the GreenStar RS-232 port. The harness can be disconnected from the GreenStar receiver at the antenna base located above the grain tank. When disconnected, proceed with Step 1.

To connect the *Ag*GPS 114 receiver to the John Deere GreenStar system:

1. Inside the cab behind the seat, locate the wiring harness that connects to the GreenStar mapping processor. From this wiring harness, gently pull the three short wires from the black casing. (They are approximately 10 inches long; orange, black and blue; and sealed with shrink wrap). Do not use the blue cable.
2. Connect the orange wire, labeled 967, to the Metripack connector pin. Insert the pin into the Metripack connector slot A (PN 12015793).
3. Connect the black wire, labeled 20E, to the Metripack connector pin. Insert the pin into the Metripack connector slot C (PN 12015793).
4. Connect the *Ag*GPS-GreenStar cable (P/N 34189) to the Metripack connector (PN 12015793).
5. Connect the data/power cable (PN 40947) to the *Ag*GPS-GreenStar cable (PN 34189) 9-pin serial connector.
6. Attach the data power cable (PN 40947) to the connection port on the bottom of *Ag*GPS 114 receiver.
7. Attach the power leads of the data/power cable (PN 40947) to switched DC power. Connect the red wire to positive and the black wire to negative (ground).

2.5.4 Connecting the Optional Ag Leader Data/Power Cable (P/N 39903)

The 3.6-meter (12-foot) Ag Leader Yield Monitor Cable connects *Ag*GPS 114 receivers to both the Ag Leader Yield Monitor 2000 and PS3000 and PF3000 PRO (see Figures 2-5, 2-6, and 2-7).

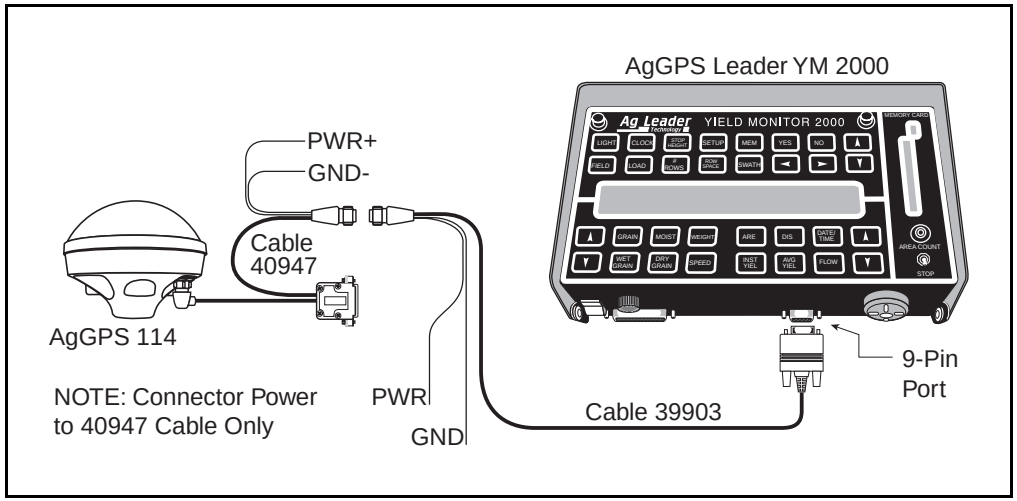


Figure 2-5 Ag Leader Data Cable Connection to YM2000

Note – The 40947 cable's red power lead must be connected to the +12 volts DC and the black power lead to Ground. The 39903 cable's red and black power leads are not connected to machine power.

Note – Install the optional 3.6-meter (12-foot) Extension Cable (PN 30700) to extend the Ag Leader Yield Monitor Cable to 7.2 meters (24 feet).

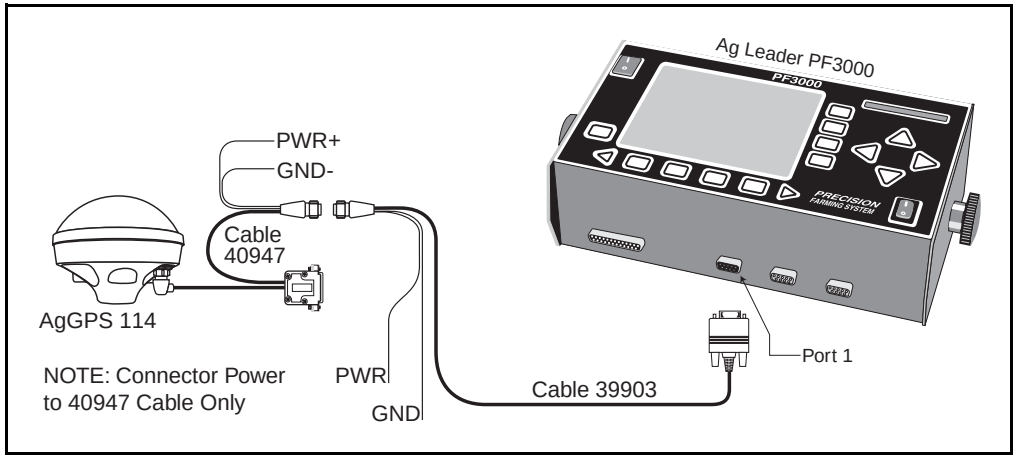


Figure 2-6 Ag Leader Data/Power Cable Connection to PF3000

Note – The 40947 cable's red power lead must be connected to the +12 volts DC and the black power lead to Ground. The 39903 cable's red and black power leads are not connected to machine power.

Note – Install the optional 3.6-meter (12-foot) Extension Cable (PN 30700) to extend the Ag Leader Yield Monitor Cable to 7.2 meters (24 feet).

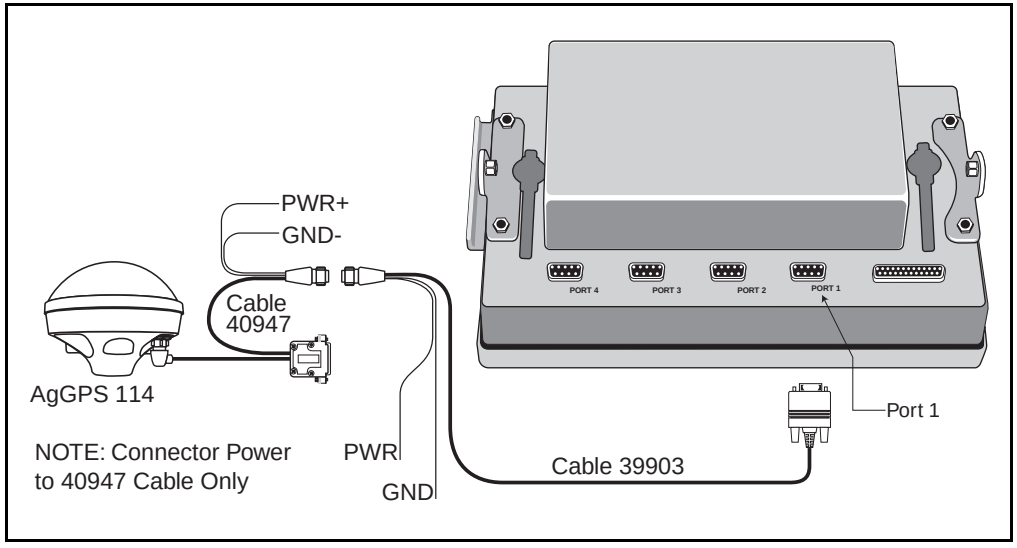


Figure 2-7 Ag Leader Data/Power Cable Connection to PF3000 PRO

Note – The 40947 cable's red power lead must be connected to the +12 volts DC and the black power lead to Ground. The 39903 cable's red and black power leads are not connected to machine power.

Tip – Install the optional 3.6-meter (12-foot) Extension Cable (PN 30700) to extend the Ag Leader Yield Monitor Cable to 7.2 meters (24 feet).

2.5.5 Connecting the Optional RDS Yield Monitor Data/ Power Cable (PN 35142)

The 3.6 meter (12 foot) RDS Yield Monitor Data/Power cable connects an *Ag*GPS 114 receiver to an RDS Ceres Yield Monitor.

To connect the optional RDS cable:

1. Connect the 12-pin CONXALL connector to the bottom of the *Ag*GPS 114 receiver.
2. Attach the 9-pin RS 232 Connector to the RDS Ceres Yield Monitor.

2.5.6 Connecting the *Ag*GPS 114 Data/Power cable (40947) to the RDS Pro Series 8000

Figure 2-8 shows the Data/Power cable (PN 40947) connection to the RDS Pro Series 8000.

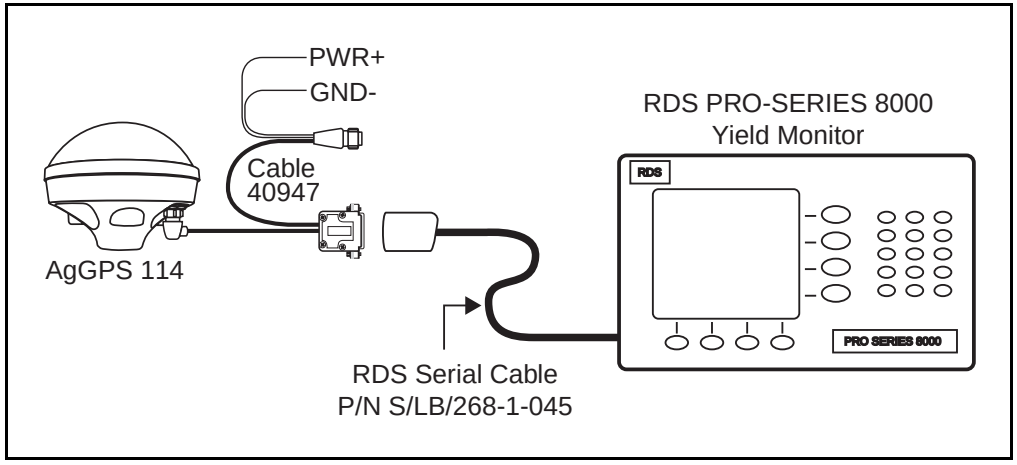


Figure 2-8 *Ag*GPS 114 Data/Power Cable to RDS Pro Series 8000

2.5.7 Connecting the Standard Data/Power Cable to a Laptop Computer (PN 40947)

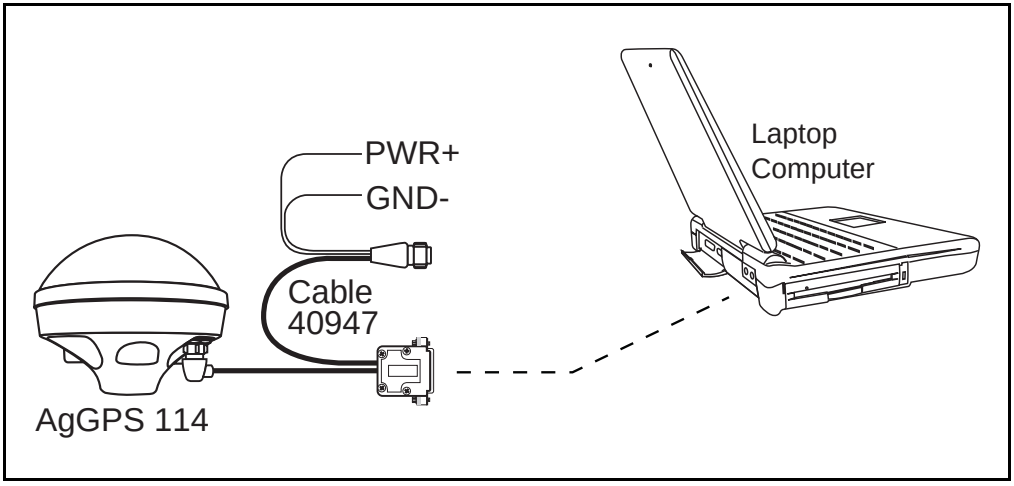


Figure 2-9 *Ag*GPS 114 Data/Power Cable to a Laptop Computer

2.5.8 Connecting the Standard Data/Power Cable to a Windows CE Palmtop Computer (PN 40947 and PN 40572)

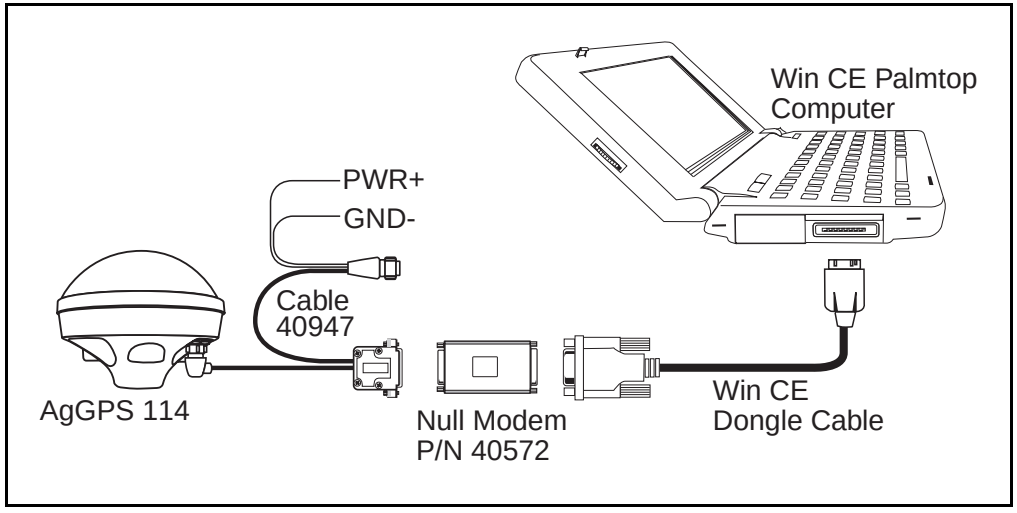


Figure 2-10 *Ag*GPS 114 Data/Power Cable and Null Modem to Windows CE Palmtop Computer

Note – Attach the Null Modem adapter 9-pin RS 232 connector to the Windows CE computer (9-pin female connector).

2.5.9 Connecting the *Ag*GPS 114 Data/Power Cable to a Windows CE Handheld Computer

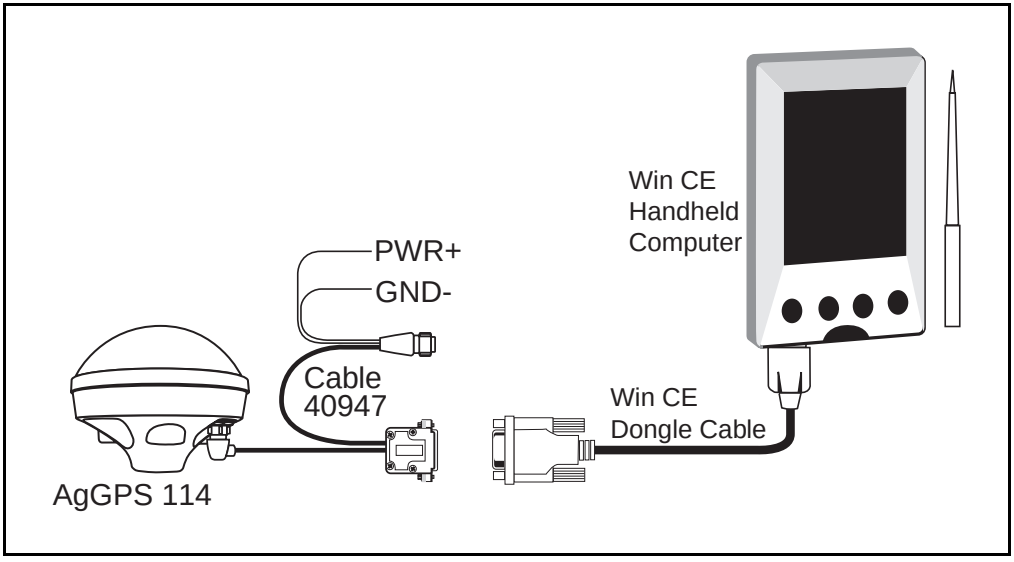


Figure 2-11 *Ag*GPS 114 Receiver to Windows CE Handheld Computer

2.5.10 Connecting the *Ag*GPS 114 to a Micro-Trak Yield Monitor

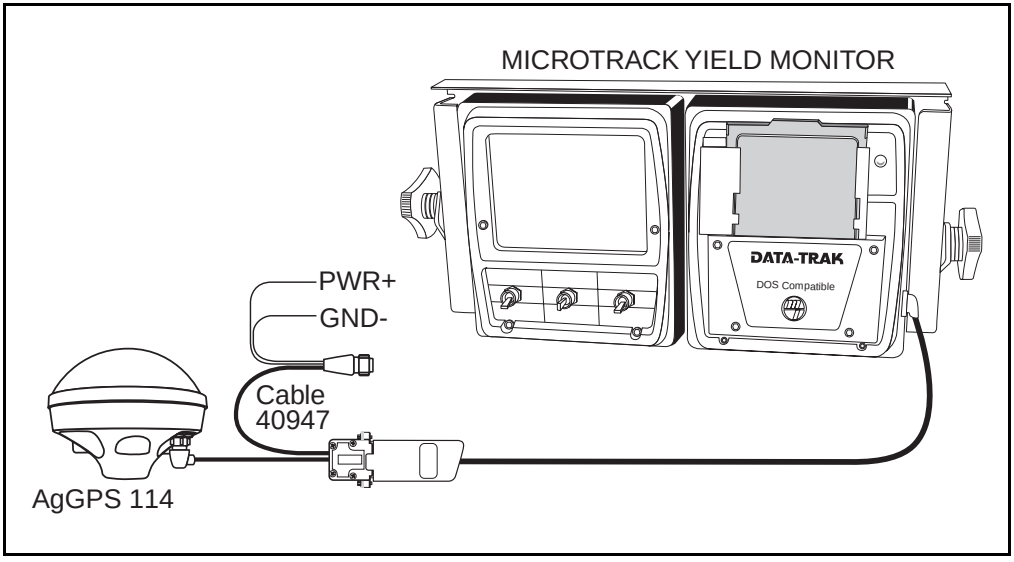


Figure 2-12 *Ag*GPS 114 Receiver to Micro-Trak Yield Monitor

3 Getting Started

This chapter shows you how to use the *Ag*Remote software's:

- Front screen simulator
- *Home* screen

We recommend that you read through this chapter to learn basic menu operations before attempting to use your *Ag*GPS 114 receiver.

3.1 Using the Front Panel

After launching *Ag*Remote from Microsoft Windows 95/98/NT4/ 2000 and powering on the receiver, the *Ag*Remote software displays the *Home* screen. From the *Home* screen, click ⌄ or > to access other *Ag*GPS menu system screens.

Two fold-out navigation maps are included in Appendix I, AgGPS Menu System. Fold open the navigation maps and use them for reference while navigating through the *Ag*GPS menu system.

The remainder of Chapters 3 gives basic instructions for using the menu system, and Chapter 4 shows you how to configure the *Ag*GPS 114 receiver for operation. Detailed information about the entire *Ag*GPS menu system is included in the *AgGPS Menu System Reference*, also included with your *Ag*GPS 114 receiver. Use this manual as a reference guide for learning details about individual *Ag*GPS menu system screens.

3.1.1 Viewing Status Screens

Figure 3-1 shows the front screen simulator and the five keys used to navigate through the *Ag*GPS menu system.

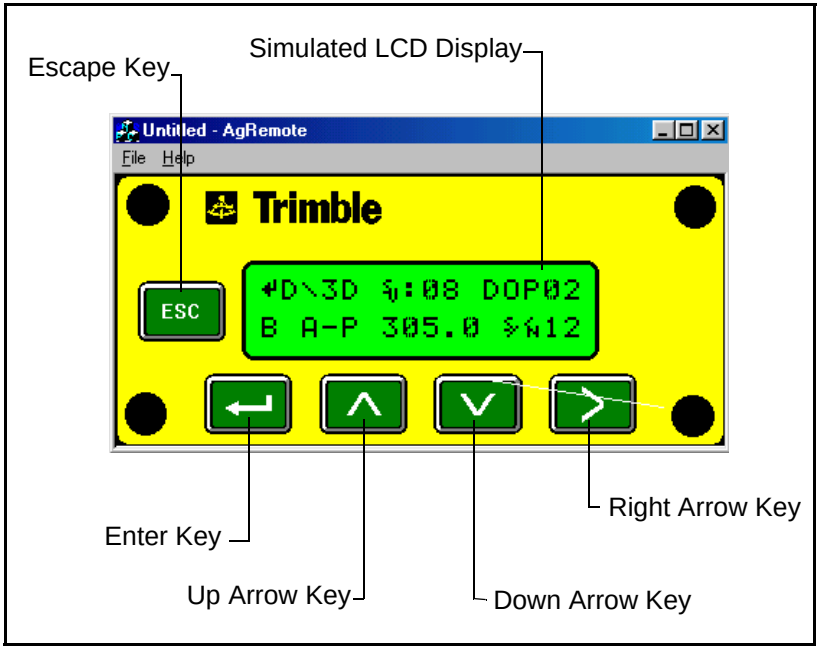


Figure 3-1 *Ag*Remote Front Screen Simulator

Table 3-1 describes the actions performed by the *Ag*Remote keys.

Table 3-1 Keypad Actions

Key	Description
↵	Performs several actions: • Click ↵ to cycle through the options displayed on a screen. When options are available, the ↵ symbol appears in the upper right-hand corner of the screen.
^	Click to cycles through the available screens.

Table 3-1 Keypad Actions (Continued)

Key	Description
⌄	Click to cycles through the available screens.
>	Click to moves through the main menu screens.
Esc	Performs several actions: • Moves back one level in screen hierarchy. Ultimately, it returns you to the *Home* screen. • When in a configuration screen, it returns you to the main menu *Configuration* screen. Click again to return to the *Home* screen.

3.2 The Home Screen

The *Home* screen is just the first option in the main menu. The top line of the *Home* screen displays important GPS status indicators. The bottom line displays important DGPS indicators.

Figure 3-2 shows the *Home* screen and following screens.

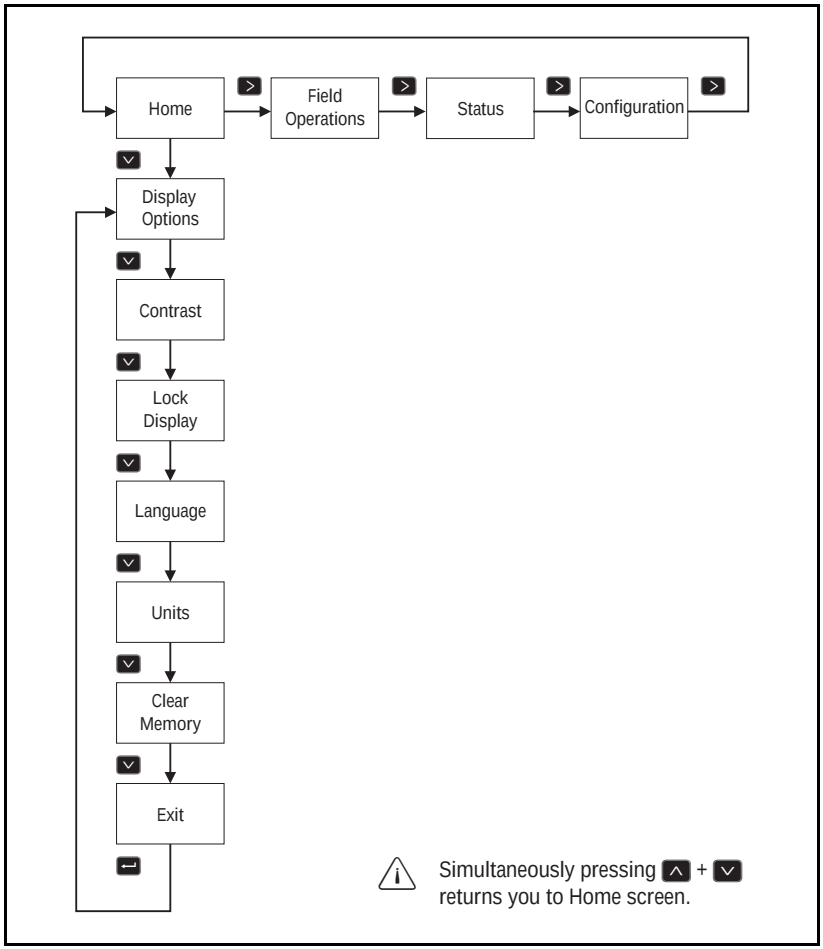


Figure 3-2 Home Screen Hierarchy

3.2.1 Satellite Mode Home Screen

Note – Reference to Satellite DGPS applies only to the *Ag*GPS 114 132.

When satellite DGPS information appears in the *Home* screen, the *Ag*GPS 114 receiver operates in Satellite Differential mode.

The following is a sample *Home* screen with Satellite DGPS:

Figure 3-3 explains the GPS status indicators.

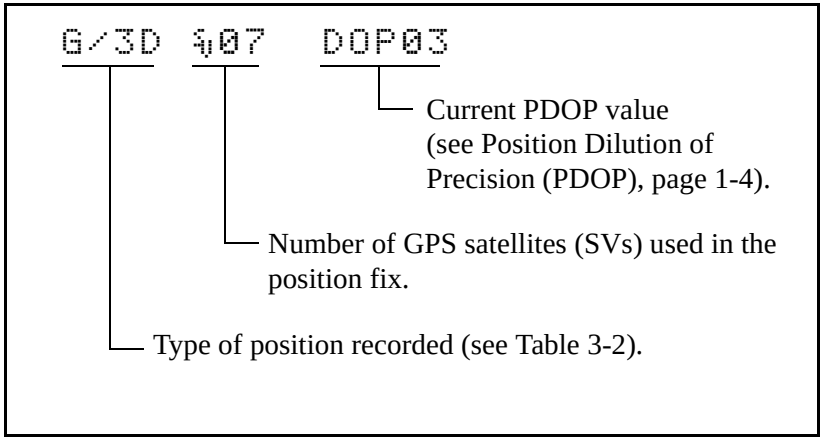


Figure 3-3 GPS Status

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 spins when the receiver is operating properly. When the / symbol is still, an error has occurred.

Figure 3-4 explains the satellite DGPS status indicators.

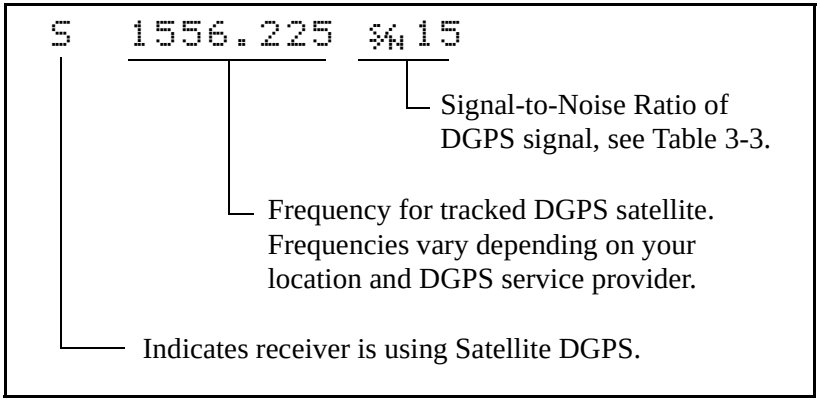


Figure 3-4 Satellite DGPS Status

Table 3-3 explains signal-to-noise ratio values.

Table 3-3 DGPS Signal-to-Noise Values

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

Table 3-4 shows the possible satellite differential mode indicators.

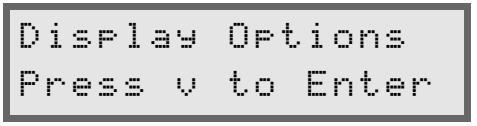
Table 3-4 Satellite Differential Mode Status Indicators

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.

3.3 Below Home Screen Configurables

The *Contrast, Units, Configuration Lockout* and *Language* settings are found under the *Home* screen. To display these screens:

1. Display the *Home* screen.
2. Press ⌄ to view the *Display Options* screen.



3. Press ⌄.

3.3.1 Contrast

As lighting conditions change, the LCD display could become difficult to read. To decrease the contrast, enter a low number. Higher numbers increase screen contrast.

To change the contrast:

1. Press >.
2. Press ^ to lighten the contrast.
3. Press ⌄ to darken the contrast.

3.3.2 Units

The *Units* screen enables the receiver to display either U.S. or Metric units. This setting does not affect data output.

To change the units:

1. Press >.
2. Press v to select the appropriate units.
3. Press ↵ to save.

3.3.3 Configuration Lockout Screen

The *Configuration Lockout* screen provides protection against tampering. To make the configuration screens invisible, input the last five digits of the receiver serial number. To view the configuration screens again, input the five-digit number a second time.

To enter the password:

1. Press ↵ to enter the Lock Display screen.
2. Press ∨ or ∧ to input the values.
3. Press > to input the next number.
4. Continue until complete.
5. Press ↵ to accept.

When complete, Valid Password appears. The configuration screens are not visible. Repeat the procedure above to unlock the configuration screens.

3.3.4 Language Screen

The *Language* screen provides the ability to display English, German, French, Portuguese, and Spanish on the front panel.

To change the display language:

1. Press >.
2. Press ∨ or ∧ to select the desired language.
3. Press ↵.

The screen automatically displays the configured language.

4 Configuring the *Ag*GPS 114 Receiver

This chapter shows you how to:

- Setup the *Ag*GPS 114 receiver for satellite DGPS service
- Configure port parameters for communication with another device

We recommend you read through this chapter before attempting to configure your *Ag*GPS 114 receiver.

4.1 Configuring the *Ag*GPS 114 Receiver

The Satellite Differential operating parameters are not set from the factory. These settings have to be configured to allow the *Ag*GPS 114 receiver to be used immediately after installation. You can use the *Ag*Remote software's front panel to change configuration parameters and activate satellite differential services.

The navigation map for the *Ag*GPS Configuration menu and screens is shown in the fold-out pages in Appendix I. Fold out the second page and use it for reference while accessing the screens described in this chapter.

4.1.1 Using the *Ag*Remote Software to Change Configuration Settings

For more information, see Getting Started, page 3-1, Using *Ag*Remote.

To use a typical configuration screen:

1. From the *Home* screen, navigate to a *Configuration* screen and click ⌄.
2. Click ⌄ to cycle through the *Configuration* screens.
3. Click > to activate the configurable options.

   The first setting option flashes.
4. Click ^ or ⌄ to cycle through the available settings. If there are multiple settings on a single screen, click > to activate the next setting.
5. When all settings are complete, click ↵.
6. Click ⌄ to display the next *Configuration* screen.

4.2 Satellite DGPS Activation Configuration

DGPS Configuration screens determine which differential service provider the *Ag*GPS 114 receiver uses. When using the *Ag*GPS 114 receiver, only the Satellite DGPS screen set is available.

Note – The AgGPS menu system supports both Beacon DGPS and Satellite DGPS configuration and status screen sets. The appropriate configuration and status screen set is automatically selected for each receiver product. The *Ag*GPS 114 receiver uses the Satellite DGPS configuration and status screen set (not the Beacon DGPS screen set).

To display the main menu *DGPS Configuration* screen:

1. From the *Home* screen, click > until the *Configuration* screen appears.
2. Click v until *GPS Config* screen appears.
3. Click > until *DGPS Config* appears.
4. Click v until *DGPS Source* screen appears.

4.2.1 DGPS Source

When using an *Ag*GPS 114 receiver, the DGPS Source setting determines what type of differential corrections are applied. The *Ag*GPS 114 receiver defaults to satellite differential. The *DGPS Source* screen is shown below:

Table 4-1 describes the DGPS source settings.

Table 4-1 DGPS Source Settings

Setting	Description
Satellite Only	Satellite DGPS corrections are used (subscription must be activated to receive data).

4.2.2 Easy Satellite DGPS Configuration

The *Easy Satellite DGPS Configuration* screen automatically sets the satellite frequency and baud rate based on the location specified. Enter your location and the receiver knows what frequency and baud rate to use.

When you obtain your satellite subscription, the service provider tells you which satellite coverage beam to choose. To enter the provider and select the desired beam:

1. Click >.
2. Click v until your provider is listed (Omni* or Racal)
3. Click >.
4. Click v until your location is displayed.
5. Click ↵ to accept and save.

4.2.3 Satellite Frequency

Tip – The *Satellite Frequency* and *Satellite Baud* screens are only used when the satellite frequency is not found under the *Easy Satellite DGPS Configuration* screen. This can occur when the DGPS provider changes frequency or baud rate after the release of the receiver firmware.

To apply corrections from a satellite differential service, you can manually enter the appropriate satellite beam frequency. Change the satellite beam frequency *only* when instructed by the DGPS provider. The *Satellite Freq* screen is shown below:

To set the differential service satellite frequency:

1. Click >.

   The first configurable number flashes.

2. Click ^ or v to change the value.
3. Click > to highlight the next configurable number.
4. Continue until the proper frequency is set, then click ↵.

The satellite frequency depends on your geographic location and differential service provider. For a listing of local satellite frequencies, contact your differential provider.

Two differential service providers are available for use with the *Ag*GPS 114 receiver.

Contact OmniSTAR at: 888-883-8476.

Contact Racal-LandStar at: 888-434-7757.

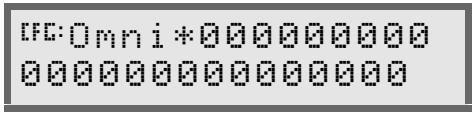
4.2.4 Satellite Baud

The satellite baud must match the output rate set by your differential provider. The satellite baud screen is shown below.

Available baud rates are 600, 1200, and 2400.

4.2.5 OmniSTAR Activation

This setting contains a 24-digit OmniSTAR satellite differential service activation code. The *Omni** screen is shown below.



To activate the OmniSTAR satellite differential service, see Appendix F.

Note – If a receiver is activated automatically over-the-air, the OmniStar activation code will not be displayed.

Note – If an incorrect number (such as all zeros) is input, retry using the correct activation code. Incorrect codes have no effect on receiver operations.

4.3 Racal Solution

In some locations, Racal network DGPS solutions are not available. In these locations the corrections can be received from the nearest reference station. The *Racal Stations* screen is shown below:

Table 4-2 describes the Racal Station settings.

Table 4-2 Racal Station Settings

Setting	Description
Use Network Stn	Uses corrections from the Racal Network. These corrections are usually more accurate than from a single station.
Use Closest Stn	Uses corrections from the closest reference station. These solutions are necessary if you are located outside the network range.

4.4 Configuring Port Parameters

Note – Ports A & B can simultaneously communicate in both RS232 and CAN. The port parameter screens configure RS232 messages.

Port A & B must be configured to make sure the proper data type is input and output from the *Ag*GPS 114 receiver. The configuration of Port A and Port B is identical; therefore, only Port A is discussed in this chapter. Refer to Chapter 2, Section 2.4, Routing and Connecting the *Ag*GPS 114 Data/Power Cable for explanation of the port A & B physical connections.

To display the *Port A Configuration* screen:

1. From the *Home* screen, click > until the *Configuration* screen appears.
2. Click v until *GPS Config* screen appears.
1. Click > until the *Port A Configuration* screen appears.

2. Click v to cycle through the screens. *Port A configuration* screens are described in the following sections.

4.4.1 Setting the Port Input /Output Parameters

Port input parameters are important when communicating with the *Ag*GPS LightBar and other external devices. The *Port-A Input* screen is shown below:

Table 4-3 describes the Port input parameter settings.

Table 4-3 Port Input Parameter Settings

Setting	Description
None	Nothing is input.
TEXTB	ASCII data from an external device, such as a chlorophyll meter, can be input on Port A, merged with NMEA GPS data, and output 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>. 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 inputs on Port A, not Port B.
RTCM	Inputs RTCM data from an external DGPS device, such as an FM pager.
TSIP	Inputs TSIP data packets from the port when using the optional *Ag*Remote software or using the *Ag*GPS 70 Remote Data Logger.
LBAR	Inputs data from the *Ag*GPS LightBar. This setting is required when using the *Ag*GPS Parallel Swathing Option.

The remaining settings configure baud rate, data bits, stop bits, and parity. The output defaults are 4800, 8-N-1.

4.4.2 NMEA 1 Settings

When NMEA data is selected as the port output setting, you can change the selection of NMEA messages output by the receiver. The default messages are GGA, GSA, VTG, and RMC.
The Port A *NMEA-1* screen is shown below:

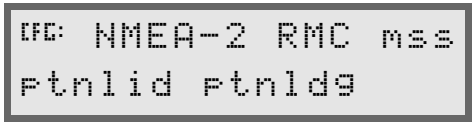
To change the NMEA messages output:

1. Click >. The first three-letter NMEA message type flashes.
2. Click ^ or v to change the capitalization of the NMEA message type. **When capitalized, the NMEA message is output**. **Lower case NMEA message types are not output**.
3. Capitalize the NMEA message(s) to be output, and click ↵ when you are finished.

Note – More NMEA data types are available on the Port A and Port B *NMEA-2* and *NMEA-3* screens.

4.4.3 NMEA 2 Settings

The settings on the Port A *NMEA-2* screen are extensions of the options found on the Port A *NMEA-1* screen. Four NMEA screens are required to present all of the NMEA options. Capitalized NMEA data types on both the *NMEA-1* and *NMEA-2, NMEA-3, and NMEA-4* screens are output. The Port A *NMEA-2* screen is shown below:



4.4.4 NMEA 3 Settings

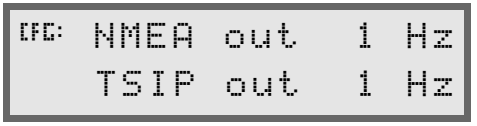
The settings on the Port A *NMEA-3* screen are extensions of the options found on the Port A *NMEA-1* and *NMEA-2* screens. Capitalized NMEA data types on each NMEA screen are output. The Port A *NMEA-3* screen is shown below:

Tip – For detailed information about content and structure of NMEA messages, see Appendix D.

4.4.5 Message Rate

This setting can be used to vary the NMEA and TSIP output rate. For example, if the Parallel Swathing Option was purchased, lightbar data is output at a rate of 5 times per second (5 Hz). Meanwhile, on the other port, NMEA or TSIP data can be output to a computer software package, yield monitor, variable rate controller, or other equipment at a slower rate.

The message rate screen is shown below:



To modify the port output rate, select the NMEA or TSIP message and choose the required rate. ASAP equals the rate selected on the *PV Filter and Position Rate* screens under the *GPS Config* screen. A setting of *1* outputs a position once every 1 second. A setting of *ASAP* outputs positions 5 or 10 times every second. Refer to Appendix G to learn how to setup the *Ag*GPS 114 receiver for fast rate position output.

Warning – No messages are output unless the message type is selected in the *Port Output* screen.

5 Troubleshooting

This chapter covers frequently asked questions and troubleshooting techniques for the *Ag*GPS 114 receiver. Trimble recommends you read through this chapter before calling technical support.

5.1 Increasing GPS Accuracy

The *Ag*GPS 114 receiver always gives the most accurate position under the current GPS, satellite differential operating conditions. By manipulating various GPS masks, some satellite configurations are locked out, preventing less accurate positions from being computed. However, these changes can prevent positions from being output.

If your GPS application can tolerate occasional outages, then more accuracy is possible by changing the various GPS receiver parameters from their default values.

There are many GPS receiver parameters that affect accuracy:

- Elevation Mask

  The default Elevation Mask is 8°. Raising this mask prevents the receiver from using some low elevation satellites, often a source of inaccurate positions.

- Signal Strength Mask

  The default Signal Strength Mask is 6. Increasing the signal strength mask prevents the use of weaker GPS signals that contribute to inaccurate positions.

- PDOP Mask

  The default PDOP Mask is 6. Lowering this mask ensures the receiver uses only satellite constellations that provide the highest accuracy.

- GPS Mode

  The default GPS position mode is Auto 2D/3D. Three-dimensional positions are more accurate than two-dimensional positions, so changing the receiver to Manual 3D prevents 2D positions from being computed.

- DGPS Mode

  The DGPS mode default setting is DGPS Auto/On/Off. Selecting DGPS Only, restricting the receiver to only output differential GPS positions, prevents autonomous (non-differential) positions from being computed.

A relatively uncontrolled source of position inaccuracy is multipath noise, caused by reflections of the GPS signals from nearby buildings and flat surfaces. For best accuracy, mount the GPS receiver so it has a clear view of the sky. Accuracy is best when operating away from buildings and trees.

5.2 Intermittent GPS Loss

When GPS lock is intermittent, the power/data cable may have a loose connection. Check that all connections are secured properly. Water may enter the cable connection and cause intermittent loss of Disconnect the cable and let the connection dry. Reconnect the cable.

If the receiver is connected properly, make sure that it is mounted on the highest point of the vehicle, so that no GPS signals are blocked. Depending on the orientation of the vehicle, the satellites and the possible obstruction, one or more satellites may be blocked. Sometimes blocking shows up when traveling one direction, but not while traveling other directions.

If the receiver seems fine, check the configuration masks. If the PDOP or SNR Masks are set to extreme levels, the receiver could possibly ignore valid satellite data. The default SNR Mask is 6. The default PDOP Mask is 6.

5.3 Power Lines and Strong Magnetic Fields

In North America, the energy from power lines is 60 Hz (50 Hz in Europe). The harmonic energy falls off rapidly as the frequency increases. Thus, power lines have very little effect on the GPS & Satellite Differential Signals.

Strong magnetic fields have no effect on GPS & Satellite Differential signals. 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.

5.4 Choosing an Mounting Location

The receiver must be mounted so that it has a clear view of the sky, on the center line of the vehicle, away from any sources of interference like electric motors. See Choosing a Location, page 2-4.

5.5 Checking for Cable Failure

To check a cable for a short, use an ohmmeter. The resistance of a good cable between connector pins at each end of the cable, is zero.

If the cable checks out fine, but you are confident it is the cable causing the errors, swap out the cable with another known working cable (if possible).

If the cable is defective, contact your local Trimble dealer for an RMA # (if warranty) or to purchase a replacement cable.

5.6 Reducing Engine Noise

An unshielded ignition system can radiate enough noise to block reception of the beacon signal. To solve this problem, use resistor spark plug wires. Sometimes an alternator generates noise that interferes with the beacon. Use bypass capacitors, commonly available in automotive stores for cleaning up interference to CB and other radios. If the problem persists, engine components can be shielded with aluminum foil.

Before purchasing new engine parts, make sure that there is not a PC computer or power source near the *Ag*GPS 114 receiver. Some PCs and their power sources generate noise that is disruptive to the GPS & satellite DGPS signals.

5.7 Why Satellite DGPS Works in Some Places But Not Others

Local canopy cover in the direction of the differential satellite can reduce the correction signal strength to unusable levels. Wet canopy reduces signals even more. The same local environmental factors that affect GPS signals, such as radar sets, microwave transmitters, and the like can interfere with the differential satellite signals.

Differential satellite signals are line-of-sight. This complicates the use of satellite corrections in mountainous regions, especially at higher latitudes when the satellite view angle is closer to the horizon.

5.8 Verifying the Unit is Outputting NMEA Messages

Connect the *Ag*GPS 114 receiver to a PC with the Standard Data/ Power Cable (P/N 30945) and use Windows 95/98's Hyperterminal program to view the NMEA messages input through your computer's serial port. The default NMEA parameters are 4800-N-8-1. View the lat/long changes on your yield monitor.

5.9 Losing Configuration Settings When the Receiver is Powered Off

The *Ag*GPS 114 receiver configuration parameter settings are stored in battery-backed RAM (random access memory). The Lithium battery has a 10-year life span. You can assume the Lithium battery has failed when the receiver no longer retains configuration parameter setting changes.

Note – The receiver can continue to use the default configuration parameters, but does not retain any custom changes to the default settings after it is powered off.

Contact Trimble Navigation Precision Agricultural Systems Technical Support Service to arrange for replacement of Lithium batteries.

5.10 Restoring the Receiver to Factory Defaults

To restore the receiver configurations to factory defaults:

1. Connect the Ag114 to a computer. Make sure the Ag114 is powered.
2. Run the AgRemote software program.
3. From the *Home* Screen, click the ⌄ arrow until *Clear BB Ram* screen appears.

   The receiver asks if you want to “Clear BB Ram”.
4. Click ^ or ⌄ until the display reads yes.
5. Click ↵.

   The receiver returns to factory defaults. The Satellite DGPS service subscription is not lost.

roubleshooting Guides

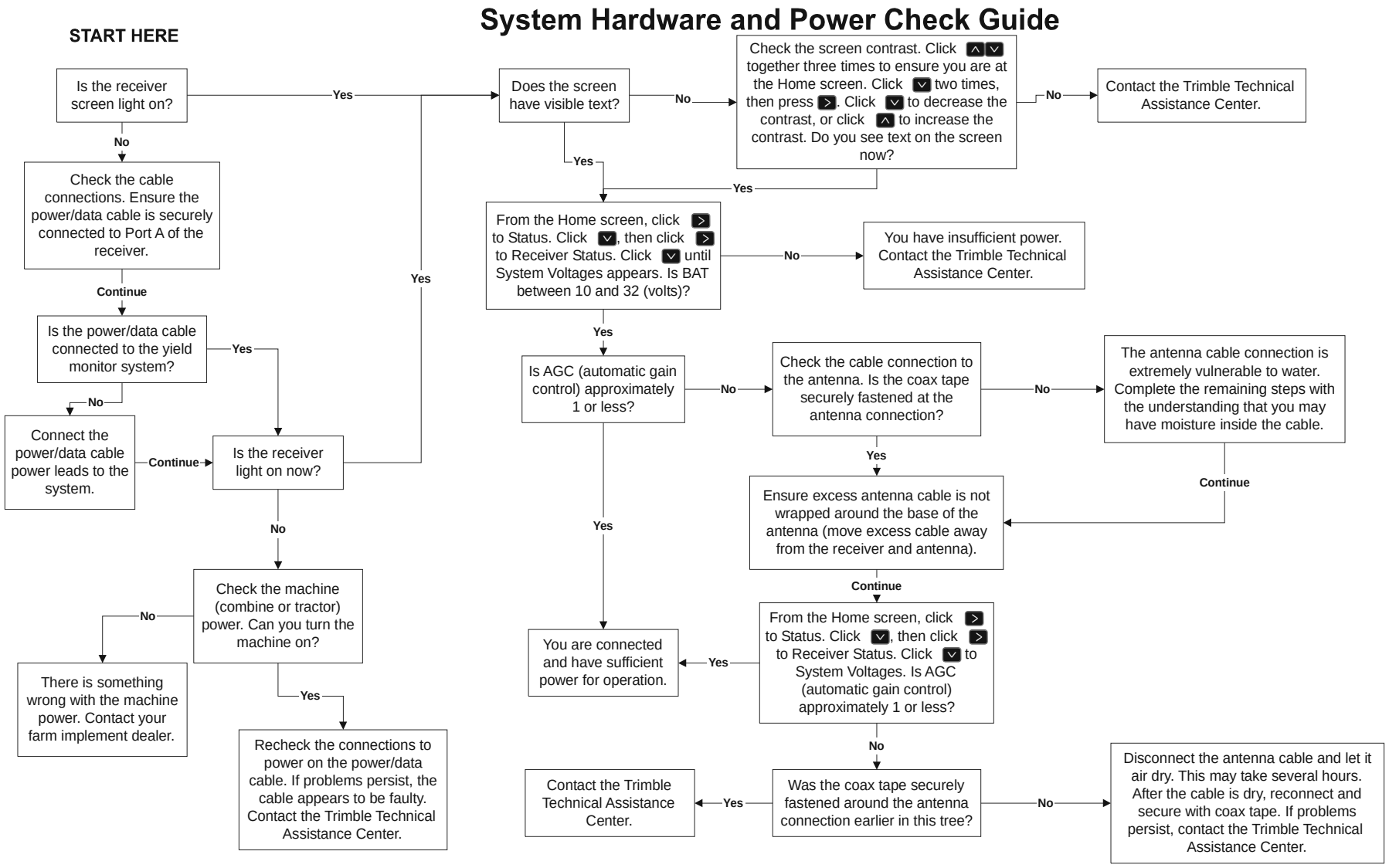


Figure 5-1 System Hardware and Power Check Guide

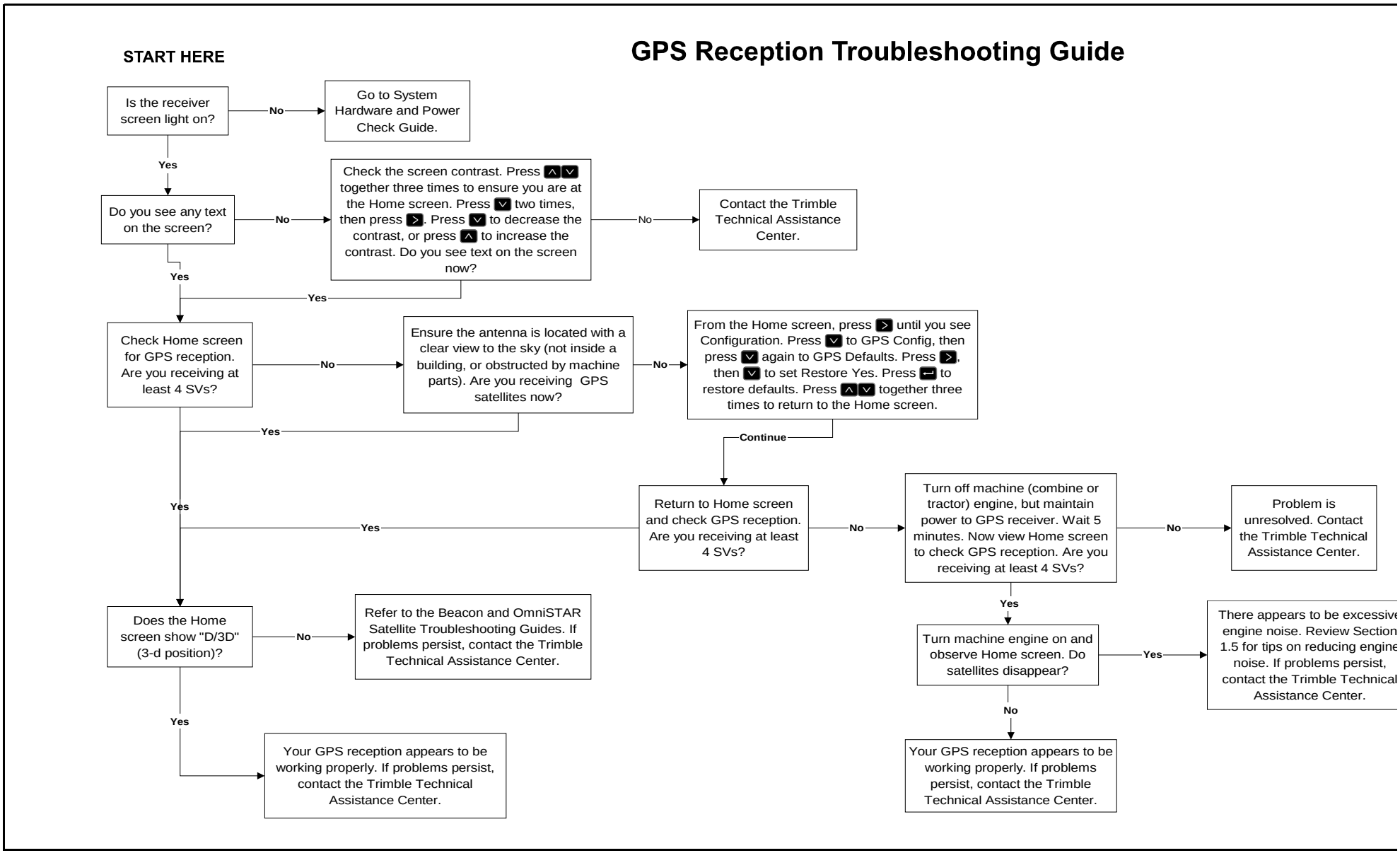


Figure 5-2 GPS Reception Troubleshooting Guide

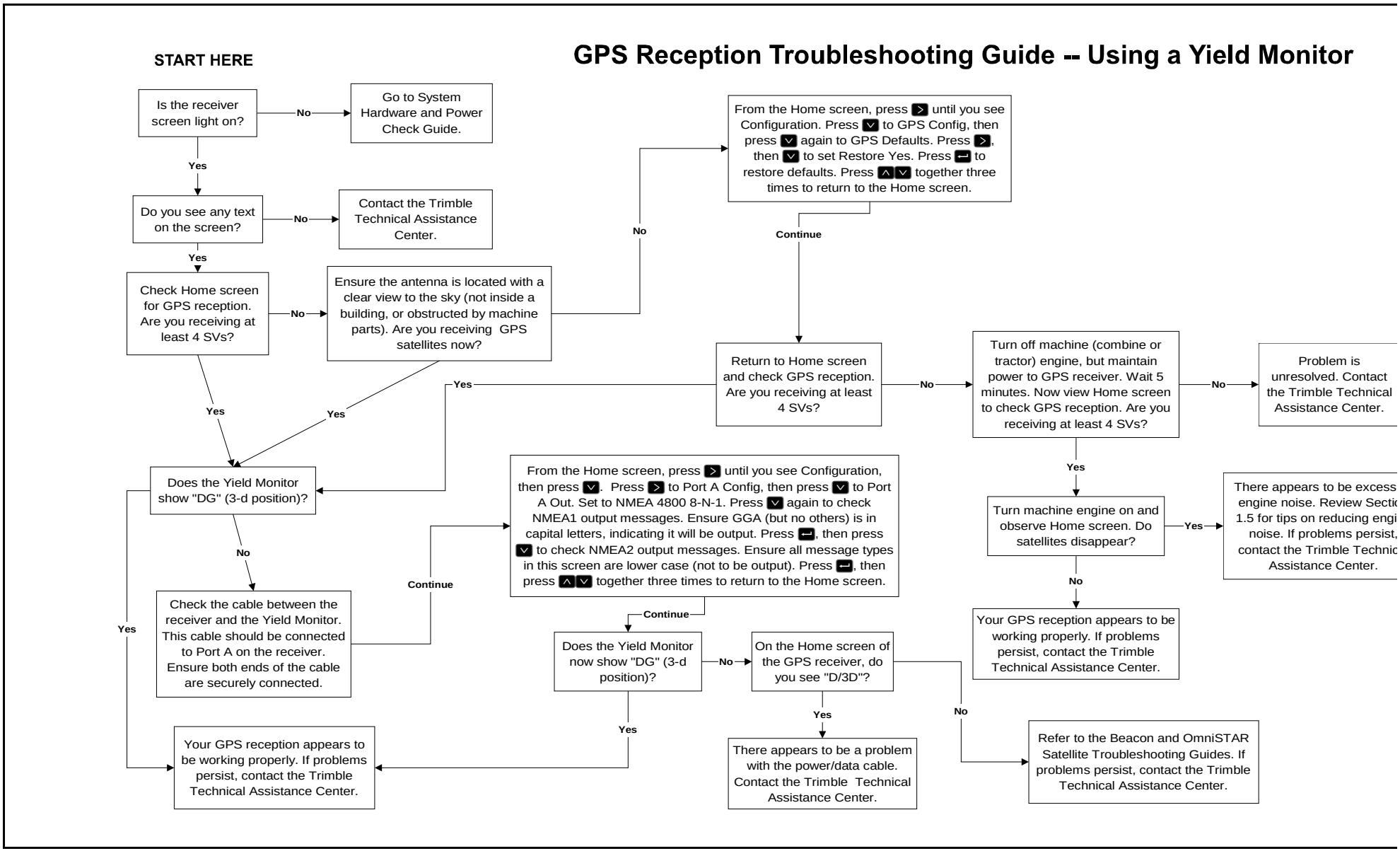


Figure 5-3 GPS Reception Troubleshooting Guide - Using a Yield Monitor

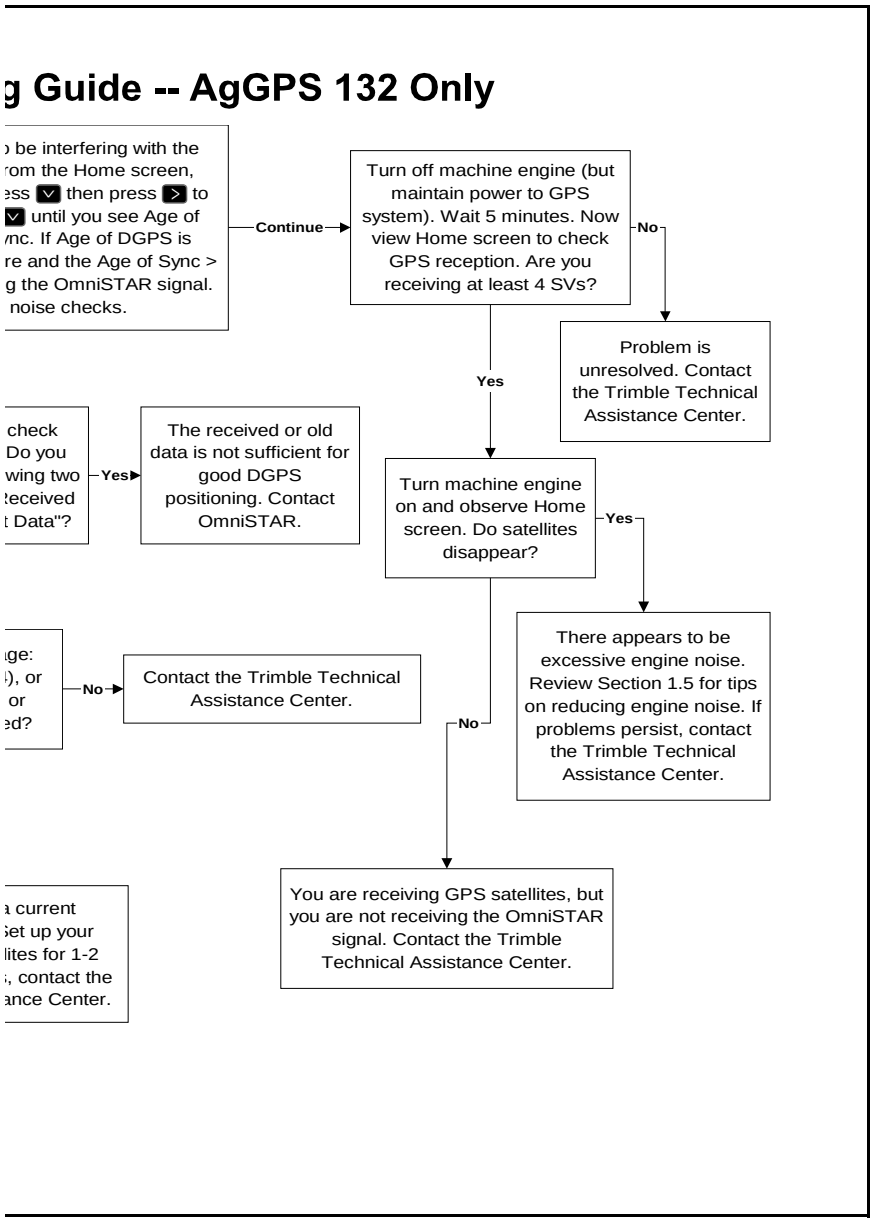


Figure 5-4 OmniSTAR Troubleshooting Guide

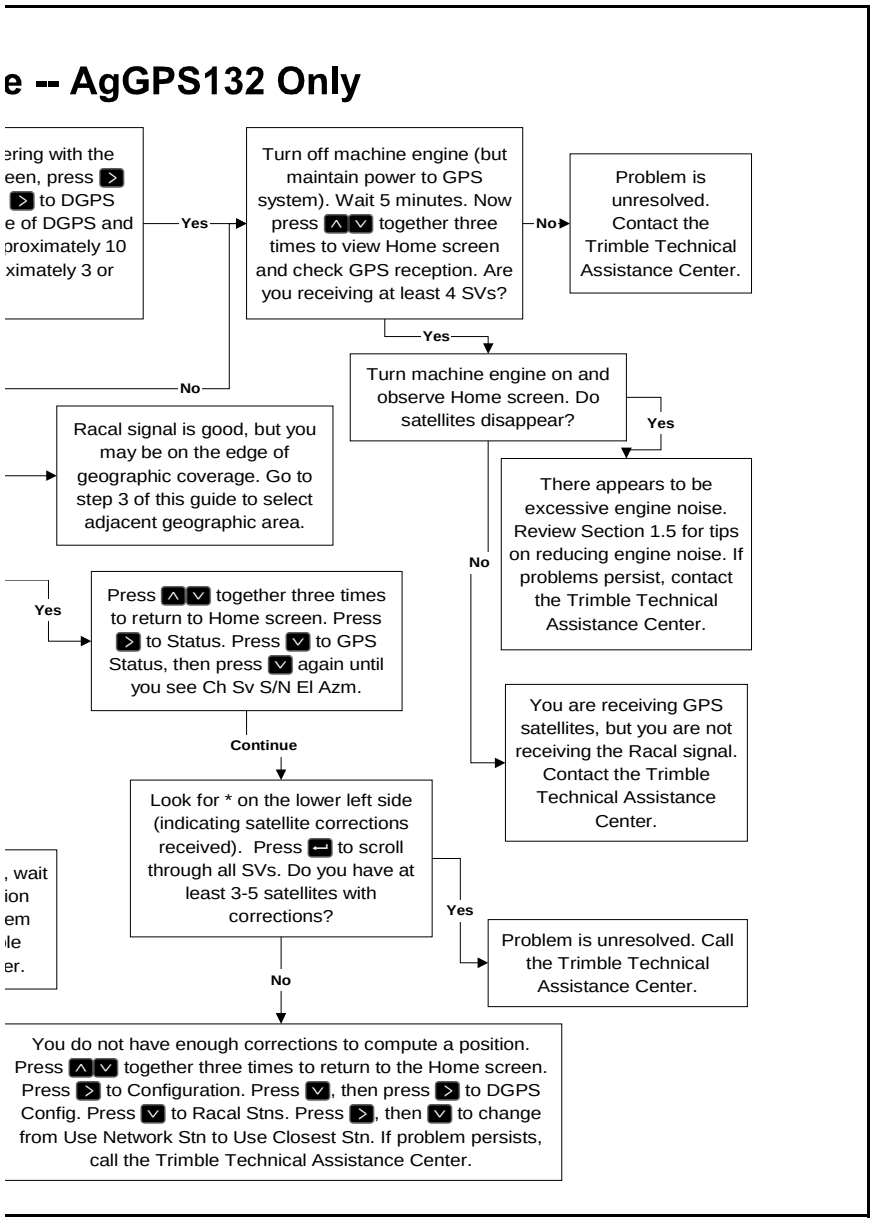


Figure 5-5 Racal-LandStar Troubleshooting Guide

A Specifications

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

Table A-1 *Ag*GPS 114 Receiver

Size	6 in. Diameter x 5 in. Height, (15.24mm D x 12.7 mm H)
Weight	22oz (0.52kg)
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
Compliance	FCC Class B, CE, EP 455

Table A-2 list the performance characteristics of GPS channels.

Table A-2 GPS Channels

General	12-channel, parallel tracking L1 C/A code and carrier phase filtered measurements and multi-bit digitizer
Update Rate	1 Hz standard; 10 Hz optional
Differential Speed Accuracy	0.1 MPH (0.16 KPH)
Differential Position Accuracy	Less than 1 meter horizontal RMS; At least 5 satellites, PDOP < 4 and RTCM SC-104 standard format broadcast from Trimble 4000RSi or equivalent reference station
Time to First Fix	< 30 seconds, typical
NMEA Messages	ALM , GGA,† GLL, GSA, GST,† GSV, GST, MSS, PTNLDG, PTNL, PTNLEV, PTNLID,.PTNLSM, RMC,† VTG, XTE, ZDA
† By default, the *Ag*GPS 114 reciever is configured to output GGA, GSA, VTG, and RMC messages.	

Table A-3 lists the characteristics of the L-Band Satellite Differential Correction Receiver with Multiple Vendor Support.

Table A-3 L-Band Satellite Differential Correction Receiver with Multiple Vendor Support

Bit Error Rate	10^{-5} for Eb/N of >5.5 dB
Acquisition and Reacquisition Time	<2 seconds, typical
Frequency Band	1525–1560 MHz
Channel Spacing	.5 kHz

B Receiver Defaults

Table B-1 lists the default settings for the *Ag*GPS 114 receiver.

Table B-1 Receiver Defaults

DGPS Source	Satellite
Dynamics	Land
Elevation Mask	8°
SNR Mask	6
PDOP Mask	12
PDOP Switch	8
DGPS Mode	Auto On/Off
DGPS Age Limit	30 sec
Pos Fix Rate	1 Hz

C Cables and Connectors

The tables and drawings in this appendix give pin-out information for the *Ag*GPS 114 standard and optional cables. This information can be used to troubleshoot communication problems with the *Ag*GPS 114 reciever and devices not supported by the *standard* and *optional* cables.

The following drawings show pinout requirements for the *standard* and *optional* cables available for the *Ag*GPS 114 reciever.

C.1 *Ag*GPS 114 Power/Data Cable (PN 40947)

Table C-1 gives pin-out requirements for the *Ag*GPS 114 Power/Data Cable Port A and Port B Connectors.

Table C-1 Ag114 Power/Data Cable (PN 40947) Port A (9-Pin) & Port B (12-Pin) Connectors

P1 Conn 12-Pin (F)			P2 Conn DE-9 (F)		7 Cond Cable	P3 Conn 12-Pin (M)		Red/Black
Pin	**Signal**	**Direction**	**Pin**	**Signal**	**Color**	**Pin**	**Signal**	**Wires**
1	EVENT IN	⬅	4	EVENT	Brown			
2	TX	➡	2	RXD	Yellow			
3	RX	⬅	3	TXD	Orange			
4								
5	SIG GND					5	GND	
6	TX	➡			Green	2	RX	
7								
8	RX	⬅			Blue	3	TX	
9								
10	V+	⬅			Red	10	V+	Red V+
11	V-	⬅	5	GND	Black	11	V-	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.

C.2 *Ag*GPS 114 PSO Plus Cable (PN 39350)

gives pin-out information for the *Ag*GPS 114 PSO Plus Data/Power Cable (P/N 39350).

Table C-2 *Ag*GPS 114 PSO Plus Cable Pin-out (P/N 39350)

P1Conn *Ag*GPS 114			7 Cond Cable	P2 Conn Lightbar		7 Cond Cable	P3 Conn RDL		Red/ Black	3 Cond Cable
Pin	**Signal**		**Color**	**Pin**	**Signal**	**Color**	**Pin**	**Signal**	**Wires**	**Color**
1							1	EVENT IN		White
2	TX	➡	Yellow			Yellow	3	TXDA		
3	RX	⬅	Orange			Orange	2	RXDA		
4										
5	SIG GND	⬅➡		5	GND		5	GND		
6	TX	➡	Green	3	RXDB					
7										
8	RX	⬅	Blue	2	TXDB					
9										
10	V+	⬅	Red	10	V+	Red	10	V+	Red V+	
11	V-	⬅	Black	11	V-	Black	11	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.

C.3 Ag Leader Interface Cable (PN 39903)

gives pin-out information for the Ag Leader Yield Monitor Interface Cable (P/N 39903).

Table C-3 Ag Leader Yield Monitor Cable Pin-out (P/N 39903)

P1 Connector 12-pin CONXALL			7 Cond Cable	P2 Connector DE-9 Male		2 Cond Cable
Pin	**Signal**	**Direction**	**Color**	**Pin**	**Signal**	**Wires**
1	EVENT IN	⬅				
2	TX-	➡	Orange	3	RXD	
3	RX-	⬅	Blue	2	TXD	
4	CHG CTRL	⬅				
5	SIG GND	⬅➡	Shield	5	SIG GND	
6	TX+	➡				
7	PWR ON	⬅				
8	CTS	⬅				
9	CHARGE	➡				
10	V+ IN	⬅				Red
11	V- IN	⬅				Black
12	PPS	➡				

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

C.4 Case AFS Cable

Table C-4 gives pin-out information for the Case AFS Dual Data Interface Cable (P/N 32609).

Table C-4 Case AFS Cable Pin-out (P/N 32609)

P2 Connector 12-Pin CONXALL			5 Cond Cable	P1 Connector 5-Pin MetroPack Conn	
Pin	**Signal**	**Direction**	**Color**	**Pin**	**Signal**
2	NMEA OUT	➡	Blue	D	RXD
3	YIELD DATA	⬅	Red	B	TXD
5	DATA GND	⬅➡	Clear	C	DATA GND
10	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.

C.5 John Deere GreenStar Data Cable

Table C-5 gives pin-out information for the John Deere GreenStar Data Cable (P/N 34189).

Table C-5 John Deere GreenStar Data Cable Pin-out (P/N 34189)

P2 Connector DE-9 Male				P1 Connector 3-Pin Metropack	
Pin	**Signal**	**Direction**	**Color**	**Pin**	**Signal**
2	TXD	➡	Red	A	RXD
3	RXD	⬅	Black	B	TXD
5	GND	⬅➡	Blue	C	GND

C.6 RDS Data Power Cable

Table C-6 gives pin-out information for the RDS power data cable (P/N 35142).

Table C-6 RDS Data Power Cable Pin-out (P/N 35142)

P1 Connector 12-Pin CONXALL			7 Cond Cable #1	P2 Connector DE-9 Male	
Pin	**Signal**	**Direction**	**Color**	**Pin**	**Signal**
1	EVENT IN	⬅			
2	TX– (232)	➡	Orange	3	RXD
3	RX– (232)	⬅			
4	CHG CTRL	⬅			
5	SIG GND	⬅➡	Shield	5	SIG GND
6	TX+ (422)	➡			
7	PWR ON				
8	CTS	⬅			
9	CHARGE	➡			
10	V+ IN	⬅	Red	8	V+
11	V– IN	⬅	Black	7	PGND
12	PPS	➡			

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

D NMEA-0183 Sentences

Trimble receivers can output a selection of NMEA-0183 sentences. NMEA-0183 sentences are normally generated and output to Port A, allowing the receiver to interface with external instruments. Only the NMEA-0183 standard and Trimble proprietary sentences configured using TSIP command packets are described here. Some Trimble products support additional NMEA-0183 standard sentences and Trimble proprietary sentences which cannot be configured using TSIP command packets. These are described separately in the receiver's operation manual.

D.1 NMEA-0183 Sentence Structure

NMEA-0183 sentences are strings of comma-delimited text. Figure D-1 shows the structure of an NMEA-0183 sentence.

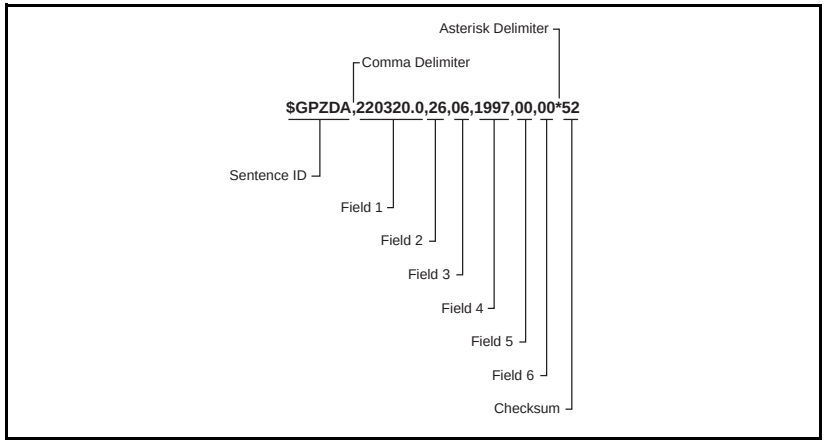


Figure D-1 Sample ZDA Sentence Structure

Each NMEA sentence includes a sentence ID to distinguish the sentence from other NMEA sentences in the data stream. The actual data included in NMEA-0183 sentences is placed in fields. An NMEA sentence contains several fields, and each field is preceded by a comma character. The sample sentence in Figure D-1 contains six fields. The NMEA sentences include a checksum value which is useful for checking the integrity of the data included in the sentence.

The sentence structure of the sample ZDA sentence, shown below and the sentence fields are described in Table D-1.

$GPZDA,220320.0,26,06,1997,00,00*52

Table D-1 Sample ZDA Sentence Structure

Field	Description
1	Time, in UTC. (220320.0 in the sample sentence)
2	Day, 01 to 31. (26 in the sample sentence)
3	Month, 01 to 12. (06 in the sample sentence)
4	Year. (1997 in the sample sentence)
5	Local time zone offset from GMT, 00 to ±13 hours. (00 in the sample sentence)
6	Local time zone offset from GMT, minutes. Fields 5 and 6, together, yield the total offset. For example, if field 5 is '-5' and field 6 is '15', local time is 5 hours and 15 minutes earlier than GMT. (00 in the sample sentence)

The NMEA-0183 sentence examples in this chapter are presented in the format shown in Table D-1. The structure of each sample sentence is shown in the paragraphs preceding the sentence structure table.

The numbers in the Field column represent the sentence fields in left-to-right order. Field 1 is the first field following the first comma delimiter. In the sample sentence, field 1 contains the UTC Time value (220320.0). The last field in the sentence is preceded by the last comma in the sentence (00 in the sample sentence).

D.1.1 Symbols and Delimiters

All sentences conform to the NMEA-0183 Version 2.1 format. Symbols and delimiters are used to identify or separate the various kinds of data included in the sentence.

NMEA-0183 sentences always begin with a dollar sign character ($) followed by a talker ID code and a sentence ID code. For the sample ZDA sentence, GP IS THE TALKER ID, AND ZDA is the sentence ID.

The string of comma delimited text immediately following the sentence ID code is composed of fields containing data. Each field is followed by a comma character (,). For the sample sentence, the data fields are shown below:

220320.0,26,06,1997,00,00

The first field contains the UTC time value (220320.0), the second field contains the Day value (26), and so on.

NMEA-0183 sentences include a checksum value which is preceded by an asterisk character (*). For more information about checksum values, see Checksum Values, page D-4.

NMEA-0183 sentences are always terminated with a carriage return and line feed. The carriage return and line feed pair marks the end of the sentence.

D.1.2 Checksum Values

Newer Trimble receivers conform to NMEA-0183 Version 2.1 which states that checksums are mandatory for all sentences. Checksum values are always included in output sentences, but are optional for input sentences.

Checksum values are used to verify the integrity of the data included in the sentence. The sample sentence, shown in Table D-1, includes a checksum value. An asterisk character (*) is used to delimit the last data field from the checksum value (52 in the sample sentence).

The checksum is the 8-bit exclusive OR of all characters in the sentence, between but not including the '$' and '*' delimiters. Commas are also included. The hexadecimal result is converted to two ASCII characters (0-9, A-F). The most significant character appears first.

D.1.3 Field Formats

The data values included in fields meet the format specifications established for the NMEA-0183, Version 2.1 standard.

D.1.4 Null Fields

Null fields are included in some NMEA sentences when no data is available for a particular field. Null fields are empty and are usually reserved for transmitting data on a periodic or irregular basis. The comma delimiter for the Null field is immediately followed by the comma delimiter for the next field in the sentence string.

The inclusion of Null fields in a sentence is important because many NMEA sentences contain a fixed number of fields. NMEA sentence interpreters (software for processing NMEA sentences) expect to find a fixed number of fields in these sentences, and specific kinds of data in each field. The sentence processing software assumes that no data is available for a particular field when a Null field is encountered while interpreting a sentence.

D.1.5 Talker ID Codes

The Talker ID code identifies the source of the data (GPS, Loran C, Sounder, etc.). The NMEA-0183 standard defines 35 Talker ID codes. The Talker ID codes available for NMEA-0183 output from the most Trimble receivers are described in Table D-2.

Table D-2 Supported Talker ID Codes

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

D.1.6 Latitude and Longitude Values

The latitude and longitude values included in NMEA sentences are presented in degrees, minutes, and decimal minutes. Latitude is presented as ddmm.mmmm in a single field, and longitude is presented as dddmm.mmmm in a single field. Within the field, degree values are in *dd* or *ddd* format, and minutes and fractions of minutes are in *mm.mmmm* format.

Latitude and longitude direction values (north, south, east, or west) are placed in a separate field. Direction is a single character: ‘N’, ‘S’, ‘E’, or ‘W’ for *North, South, East,* or *West.*

D.1.7 Time Values

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

D.1.8 Other Values

The NMEA-0183 standard established the format of the data included in sentence fields.

D.1.9 Reading NMEA String Format

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

D.2 NMEA Sentence Summary

Table D-3 describes the NMEA-0183 sentence set supported by various receivers and identifies the page number where you can find detailed information about each sentence. Some sentences are only supported when specific Trimble options are installed on the receiver. Sentences beginning with PTNL are Trimble proprietary sentences.

Table D-3 Supported NMEA-0183 Sentences

Sentence	Sentence Contents
ALM	GPS week number, SV health, and complete almanac data for one SV. One sentence per SV, up to a maximum of 32
GBS Sentence	GNSS Satellite Fault Detection
GGA Sentence	Time, position, and fix related data
GLL Sentence	Position fix, time of position fix, and status
GRS Sentence	GPS Range Residuals
GSA Sentence	GPS position fix mode, SVs used for navigation and DOP values
GST Sentence	GPS Pseudorange Noise Statistics
GSV Sentence	Number of SVs visible, PRN numbers, elevation, azimuth and SNR values
MSS Sentence	Signal strength, signal-to-noise ratio, beacon frequency, and beacon bit rate
RMC Sentence	UTC time, status, latitude, longitude, speed over ground (SOG), date, and magnetic variation of the position fix
VTG Sentence	Actual track made good and speed over ground
XTE Sentence	Cross-track error
ZDA Sentence	UTC time, day, month, and year, local zone number and local zone minutes.
PTNLAG001 Proprietary Sentence	66 character sentence available when TEXTA or TEXTB are selected as the port input protocol.
PTNLDG Proprietary Sentence	Beacon channel strength, channel SNR, channel frequency, channel bit rate, channel number, channel tracking status, RTCM source, and channel performance indicator.

Table D-3 Supported NMEA-0183 Sentences (Continued)

Sentence	Sentence Contents
PTNLEV Proprietary Sentence	Time, event number, and event line state for time-tagging change of state on a event input line.
PTNL,GGK Sentence	Time, Position, Position Type and DOP Values
PTNLID Proprietary Sentence	Receiver machine ID, product ID, major and minor release numbers, and firmware release date.
PTNLSM	Reference Station Number ID and the contents of the Special Message included in valid RTCM Type 16 records.

D.3 ALM Sentence

(GPS Almanac Data)

The ALM sentence identifies the GPS week, SV health, and contains the almanac for one satellite. The sentence structure is shown below:

```
$GPALM,1,1,03,698,00,6ae6,1d,779f,fdef,a10d
68,6469a6,7c1f62,5f5839,*43
```

Table D-4 identifies the ALM sentence fields.

Table D-4 ALM Sentence Fields

Field	Description
1	Total number of ALM sentences for this cycle
2	Sentence sequence number
3	SV PRN number, 01 to 32
4	GPS week number
5	SV health status
6	Eccentricity
7	Almanac reference time
8	Inclination angle
9	Rate of right ascension
10	Root of semi-major axis
11	Argument of perigee
12	Longitude of ascension node
13	Mean anomaly
14	A f0, clock parameter
15	A f1, clock parameter

D.4 GBS Sentence

(GNSS Satellite Fault Detection)

The GBS sentence is used to support Receiver Autonomous Integrity Monitoring (RAIM). The data structure is shown below:

```
$GBS,183059.30,0.0,0.0,0.0,0.0,0.0,0.0*6F
```

Table D-5 describes the GBS sentence fields.

Table D-5 GBS Sentence Fields

Field	Description
1	UTC time of the GGA or GNS fix associated with this sentence.
2	Expected error in latitude.†
3	Expected error in longitude.†
4	Expected error in altitude.†
5	ID number of most likely failed satellite.
6	Probability of missed detection for most likely failed satellite.
7	Estimate of bias, in meters, on most likely failed satellite.
8	Standard deviation of bias estimate.

† Expected error in meters due to bias with noise equals 0.

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

D.5 GGA Sentence

(GPS Fix Data)

The GGA sentence contains the time, position, and fix related data. The sentence structure is shown below:

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

Table D-6 identifies the GGA sentence fields.

Table D-6 GGA Sentence 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

D.6 GLL Sentence

(Position Data)

The GLL sentence specifies the position fix, time of position fix, and status. The sentence structure is shown below:

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

Table D-7 identifies the GLL sentence fields.

Table D-7 GLL Sentence 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
7	See RMC Sentence, page D-18, row 12.

D.7 GRS Sentence

(GPS Range Residuals)

The GRS sentence is used to support the Receiver Autonomous Integrity Monitoring (RAIM). The sentence structure is shown below:

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

Table D-8 describes the GRS sentence fields.

Table D-8 GRS Sentence 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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.8 GSA Sentence

(GPS DOP and Active Satellites)

The GPS sentence identifies the GPS position fix mode, the SVs used for navigation, and the DOP values. The sentence structure is shown below:

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

Table D-9 identifies the GSA sentence fields.

Table D-9 GSA Sentence 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	ID's of SVs used in position fix (null for unused fields)
15	PDOP
16	HDOP
17	VDOP

D.9 GST Sentence

(GPS Pseudorange Noise Statistics)

The GST sentence is used to support Receiver Autonomous Integrity Monitoring (RAIM). The sentence structure is shown below:

```
$GPGST,220320.0,1.3,0.8,0.5,166.1,0.8,0.5,1
.6,*4F
```

Table D-10 describes the GST sentence fields.

Table D-10 GST Sentence 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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.10 GSV Sentence

(GPS Satellites in View)

The GSV sentence identifies the number of SVs in view, the PRN numbers, elevation, azimuth and SNR values. The sentence structure is shown below:

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

Table D-11 identifies the GSV sentence fields.

Table D-11 GSV Sentence Fields

Field	Description
1	Total number of sentences of this type in this cycle
2	Sentence number
3	Total number of SVs visible
4	SV PRN number
5	Elevation in degrees, 90½ maximum
6	Azimuth, degrees from true north, 000½ to 359½
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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.11 MSS Sentence

(Beacon Receiver Signal Status)

The MSS sentence 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 sentence structure is shown below:

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

Table D-12 describes the MSS sentence fields.

Table D-12 MSS Sentence Fields

Field	Description
1	Signal Strength (SS), dB ref: 1 υV/m
2	Signal-to-Noise Ratio (SNR), dB
3	Beacon Frequency, 283.5 to 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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.12 RMC Sentence

(Recommended Minimum Specific GPS Data)

The RMC sentence identifies the UTC time, status, latitude, longitude, speed over ground (SOG), date, and magnetic variation of the position fix. The sentence structure is shown below:

```
$GPRMC,184804.00,A,3723.476543,N,12202.2397
45,W,000.0,0.0,051196,15.6,E*7C
```

Table D-13 describes the RMC sentence fields.

Table D-13 RMC Sentence 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 sentence)
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 sentence)
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 D-13 RMC Sentence 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

D.13 VTG Sentence

(Course Over Ground and Ground Speed)

The VTG sentence identifies the actual track made good and speed over ground. The sentence structure is shown below:

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

Table D-14 identifies the VTG sentence fields.

Table D-14 VTG Sentence 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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.14 XTE Sentence

(Cross-Track Error)

The XTE sentence reports the vessel's cross-track error. The sentence structure is shown below:

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

Table D-15 describes the XTE sentence fields.

Table D-15 XTE Sentence 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

D.15 ZDA Sentence

(Time and Date)

The ZDA sentence identifies UTC time, day, month, and year, local zone number and local zone minutes. The sentence structure is shown below:

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

Table D-16 identifies the ZDA sentence fields.

Table D-16 ZDA Sentence 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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.16 PTNLAG001 Proprietary Sentence

(Text Message)

The PTNLAG001 sentence is a proprietary Trimble NMEA sentence which sets the 66 character sentence string output when TEXTA or TEXTB are selected as port input options. The sentence structure is shown below:

```
$PTNLAG001,XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX*XX
```

Table D-17 identifies the PTNLAG001 sentence fields.

Table D-17 PTNLAG001 Sentence Fields

Field	Description
1	66 character text string received when TEXTA or TEXTB is enabled as a port input option

D.17 PTNLEV Proprietary Sentence

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 message structure is shown below:

```
$PTNLEV,184804.00,0*XX
```

Table A-2 identifies the PTNLEV message fields.

Table D-18 PTNLEV Sentence Fields

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

The PTNLEV message is enabled using TSIP.

D.18 PTNLID Proprietary Sentence

(Trimble Receiver Identity)

The PTNLID sentence is a Trimble proprietary sentence for identifying the receiver's machine ID, product ID, major and minor release numbers, and firmware release date. The sentence structure is shown below:

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

Table D-19 identifies the PTNLID sentence fields.

Table D-19 PTNLID Sentence 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 sentence is enabled using TSIP. If enabled, the sentence is output every 30 seconds.

D.19 PTNLDG Proprietary Sentence

(Trimble DGPS Receiver Status)

The PTNLDG sentence is a Trimble proprietary sentence 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 sentence structure is shown below:

```
$PTNLDG,XXX.X,XX.X,XXXXXXX.X,XXXXX,XX,X,X,X
XX*XX
```

The PTNLDG sentence fields are defined in free format with the maximum number of characters in the field indicated in above (i.e. 25 bps displayed as xxx,25,xxx instead of xxx,00025,xxx). Additionally, if a channel is disabled, the channel fields may be null fields (commas only). If more than one channel is available, the sentence should be repeated for each channel. Table D-20 identifies the sentence fields.

Table D-20 PTNLDG Sentence 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.

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 1-second interval, the receiver outputs this message at a maximum rate of 1 Hz.

D.20 PTNL,GGK Sentence

(Time, Position, Position Type and DOP Values)

The PTNL,GGK message string is shown below:

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

Table D-21 describes the PTNL,GGK sentence fields.

Table D-21 PTNL,GGK Sentence 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 (e.g. dddmm.mmmmmmm)
4	Direction of latitude: N: North S: South
5	Longitude, in degrees and decimal minutes (e.g. 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

D.21 PTNLSM Proprietary Sentence

(RTCM Special Message)

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

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

Table D-22 describes the PTNLSM sentence fields.

Table D-22 PTNLSM Sentence Fields

Field	Description
1	Reference Station ID number, ranging from 0 to 1023. Leading zeros must be added to fill 4-digit field.
2	ASCII text message sentence contained within the Type 16 RTCM message.

E Flash Loader 100

Flash Loader 100 makes updating the Trimble *Ag*GPS 114 firmware quick and trouble-free. You can also use this utility to review your receiver's configuration, add purchased receiver enhancement options, and, if technical assistance is needed, collect troubleshooting information.

Tip – Flash Loader 100 and the latest *Ag*GPS 114 firmware can be downloaded from Trimble's WWW site. The address is WWW.TRIMBLE.COM/SUPPORT/FILES/INDEX.HTM#AG

E.1 Connecting to the Flash Loader Software

To install the Flash Loader software, do the following:

1. Turn on the computer and run Windows 95/98/2000 or Windows NT4.
2. Select *Run* from the **Start** menu.
3. In the *Run* window, type the following:

   C:\<Flash Loader file name>

   If you are using a different drive or folder, the pathname may be different.
4. Click 

.
5. Follow the instructions provided by the Flash Loader 100 Setup program.

To update receiver firmware, do the following:

1. Using the *Ag*GPS 114 Data/Power Cable (P/N 40947), connect the *Ag*GPS receiver to the PC's serial port (usually COM1 or COM2).
2. From **Start**, select the Flash Loader 100 software.
3. Click 

.

   The Flash Loader 100 software detects the receiver and automatically selects the correct port. A message box indicates on which port the receiver is found.

If Flash Loader 100 is unable to detect the receiver, try the following:

- Make sure that the receiver is connected to an available power source.
- Power receiver OFF, then back ON.
- Check all cable connections between the receiver and PC.

Click 

again.

E.2 Using Flash Loader 100

The main window in the Flash Loader 100 software displays an options checklist. Once the receiver has been successfully detected, select one or more of the available options. Table E-1 describes each option.

Table E-1 Flash Loader 100 Options

Options	Description
Update Receiver with Password	Enables the *Enter Password* screen to appear. Enter Trimble supplied passwords to activate receiver enhancements such as Fast Rate, Everest, and the Base Station option.
Download Configuration	Enables two radio button options that determine how the downloaded information is processed. Read into file: Configuration data is written to a specified text file. Review on-screen: The receiver's configuration settings are detailed on the PC computer screen.
Upload New Firmware	When selecting the Upload New Firmware checkbox for the first time, a file dialog appears. In the file dialog: Navigate to the directory where the new receiver firmware file is stored. Only files that have the TNR (Trimble Navigation ROM) extension are displayed. Select the appropriate file and click  . Flash Loader 100 checks the firmware file to make sure that it is valid. If the file is found invalid, a warning message appears. The Upload New Firmware checkbox is automatically deselected.
Read Error Log	Writes the error log data, stored in the receiver, to a file for use by Trimble technical support personnel. Use the dialog to change the filename or storage folder.

E.3 Running Flash Loader 100

After checking the appropriate options, click Proceed.

The update process will take approximately 5 minutes. Once the process is complete, a message box indicates a successful completion.

If a warning message appears, disconnect the receiver and try again. If the problem persists, contact Trimble Precision Agricultural Systems Technical Support.

F Activating Satellite DGPS Service

This appendix provides step-by-step instructions for activating both OmniSTAR and Racal-LandStar DGPS services.

)mniSTAR Activation

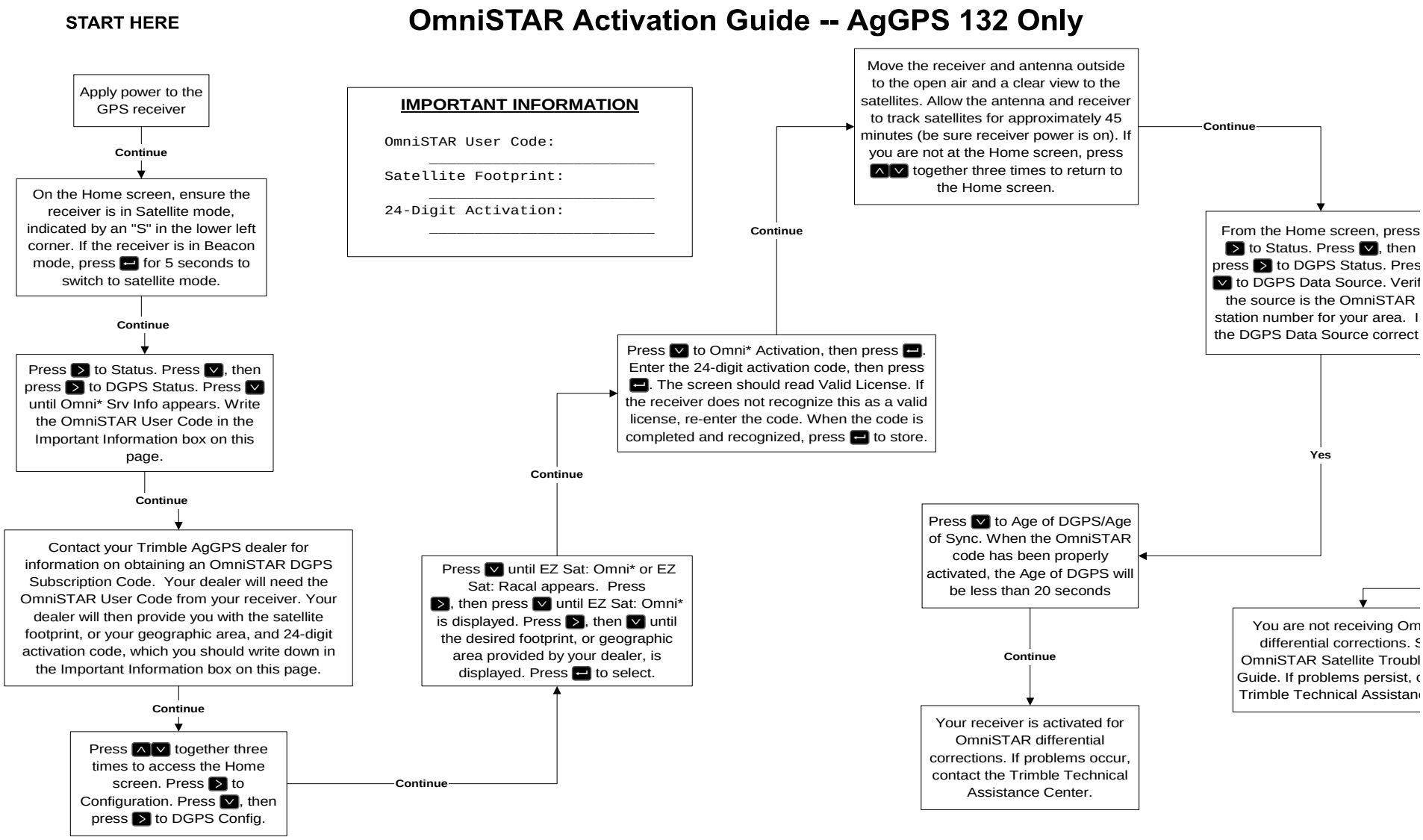


Figure F-1 OmniSTAR Activation Guide

acal Activation

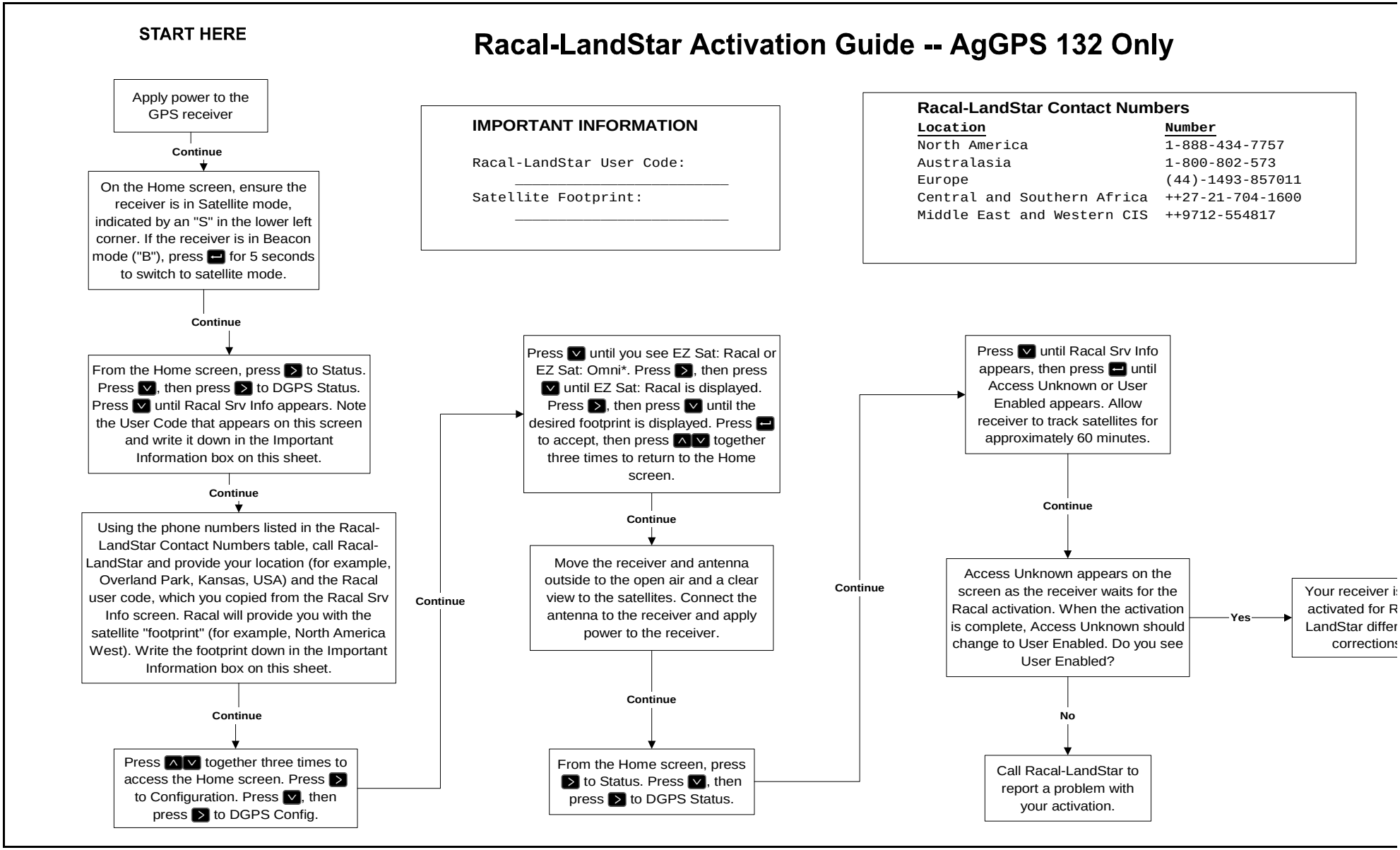


Figure F-2 Racal-LandStar Activation Guide

G Fast Rate Output

These procedures are included for configuring the Fast Rate Option:

- Setting Port A or B for Fast Rate Output
- Configuring the *Ag*GPS 114 reciever for Fast Rate Output

G.1 Setting Port A or B for Fast Rate Output

To set Port A or B for Fast Rate Output using the AgRemote software program:

1. From the *Home* screen, press > until the Configuration appears.
2. Press ∨ until the *Guidance Config* or *GPS Config* screen appears.
3. Press > until the *Port A Config* or *Port B Config* screen appears.
4. Press ∨ until the *NMEA out* screen appears.
5. Press > to activate the cursor. Press > until the cursor flashes on the second numeric digit displayed.
6. Press ∨ until the *ASAP* message is displayed. Press ↵ to save the setting.
7. Press the Esc key to return to the *Home* screen.

G.2 Configuring the *Ag*GPS 114 Receiver for Fast Rate Output

To configure the *Ag*GPS 114 reciever for fast rate output using the AgRemote software program:

1. From the *Home* screen, press > until the *Configuration* screen appears.
2. Press ∨ until the *Guidance Config* or *GPS Config* screen appears.
3. Press > until the *Pos Rate* screen appears.
4. Press > to activate the cursor. Press > until the cursor flashes on the second numeric digit displayed.
5. Press ∧ to set the output rate. Choose 5 or 10 Hz output rate. Press ↵ to save the setting.
6. Press the Esc key to return to the *Home* screen.

H Connecting the *Ag*GPS 114 Using *Ag*Remote Software

This appendix includes instructions for:

- Installing the *Ag*Remote Software
- Connecting the *Ag*GPS 114 receiver
- Troubleshooting the *Ag*GPS 114 / computer connection

H.1 Installing the *Ag*Remote Software

To install the *Ag*Remote software, do the following:

1. Turn on the computer and run Windows 95, 98, 2000 or NT4.
2. Select *Run* from the Start menu.
3. In the *Run* dialog, type:

   C:\agremote.exe

   If you want to use a different drive or folder, specify the desired pathname.
4. Click **Yes** to install the *Ag*Remote program.
5. Follow the instructions appearing on the *Ag*Remote software's Setup screens.

H.2 Connecting the *Ag*GPS 114 Receiver

To connect to the *Ag*GPS 114 receiver, do the following:

1. Using the Standard Data/Power Cable (P/N 40947), connect the right-angle 12-pin conxall connector to the *Ag*GPS 114.
2. Connect the 9-pin female connector to the PC's serial port (usually COM1 or COM2).
3. From the Windows 95, 98, NT, or 2000 desktop, Select *Start / Programs*, and select the *Ag*Remote software option.
4. After the program starts, select *File / Connect.*

   The *Ag*Remote program detects the receiver.
5. Click ^ or v keys to navigate through the menu hierarchy, and configure the *Ag*GPS 114 and Lightbar settings.

H.3 Troubleshooting the Connection

If *Ag*Remote is unable to detect the receiver (screen is blank), try the following:

- Make sure that the receiver is connected to an available 12 VDC power source.
- Check all cable connections between the receiver and PC.
- Click *File / TSIP Break* to force the receiver to communicate the *Ag*Remote software.

I *Ag*GPS Menu System

The figures in this appendix show the navigation maps for *Ag*GPS Menu System, firmware version 1.40.

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

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

More information about all *Ag*GPS Menu System screens can be found in the *AgGPS Menu System Reference Manual*, included with the *Ag*GPS 114 reciever.

Index

Symbols

Numerics

A

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

X

Z

Reader Comment Form

_Ag_GPS 114 Operation Manual **March 2000**
P/N: 38201-00 **Revision A**

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for_____

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I can find the information I want.	1	2	3	4	5
The information in the manual is accurate.	1	2	3	4	5
I can easily understand the instructions.	1	2	3	4	5
The manual contains enough examples.	1	2	3	4	5
The examples are appropriate and helpful.	1	2	3	4	5
The layout and format are attractive and useful.	1	2	3	4	5
The illustrations are clear and helpful.	1	2	3	4	5
The manual is:	too long		just right		too short

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