User Guide

Trimble® AG-372 GNSS Receiver

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Part Number 56110-01-ENG

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CHAPTER

1

Introduction

In this chapter:

The *Trimble AG-372 GNSS Receiver User Guide*:

- Describes how to install and configure the Trimble® AG-372 GNSS receiver.
- Provides guidelines for connecting the receiver to an external device.
- Provides guidelines for using the AgRemote utility to view and configure the receiver correction sources and other operating parameters.

Even if you have used another Global Navigation Satellite System (GNSS) product before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product.

If you are not familiar with GNSS, go to the Trimble website at www.trimble.com for an interactive look at Trimble and GNSS.

Warnings

Always follow the instructions that accompany a warning.

WARNING – Indicates a potential hazard or unsafe practice that could result in injury or property damage.

WARNING – For continued protection against the risk of fire, the power source (lead) to the model AG-372 receiver should be provided with a 10 A (maximum) fuse.

Related information

Release notes describe new features, provide information that is not included in the manuals, and identify changes to the manuals. You can download release notes from the Trimble website.

Technical assistance

If you have a problem and cannot find the information you need in the product documentation, ***contact your local Trimble Reseller***

CHAPTER

2

Overview

In this chapter:

This chapter describes the Trimble AG-372 GNSS receiver and gives an overview of GNSS, DGNSS, and related information.

When used with a Real-Time Kinematic (RTK) base station, the Trimble AG-372 GNSS receiver provides RTK positioning for high-accuracy, centimeter-level applications. For physical specifications, see Appendix A, Specifications.

Standard features of the Trimble AG-372 GNSS receiver

A standard Trimble AG-372 GNSS receiver provides the following features:

- 220 GNSS tracking channels, which can track up to 44 satellites
- GLONASS tracking ability
- Submeter differential accuracy (RMS), assuming at least five satellites and a PDOP of less than four
- Combined GNSS/DGNSS receiver and antenna
- AgRemote utility with four-button keypad to configure and view system properties. You can download this utility from the Trimble website at www.trimble.com.
- LED status indicator
- The receiver outputs a 1 PPS (pulse per second) strobe signal on both ports. This signal enables an external instrument to synchronize its internal time with a time derived from the very accurate GNSS system time.
- Radar output
- WAAS and EGNOS differential correction compatibility
- EVEREST™ multipath rejection technology
- OmniSTAR HP, G2, XP, and VBS positioning compatibility
- Trimble CenterPoint™ RTX™ capability
- Two ports that support both CAN 2.0B and RS-232:

  CAN

  – J1939 and NMEA 2000 messages

Note – *The Trimble AG-372 GNSS receiver is ISO 11783 compliant. It supports some ISO 11783 messages.*

  RS-232

  – NMEA-0183 output: GGA, GLL, GRS, GST, GSA, GSV, MSS, RMC, VTG, ZDA, XTE (the default NMEA messages are GGA, GSA, VTG, and RMC)

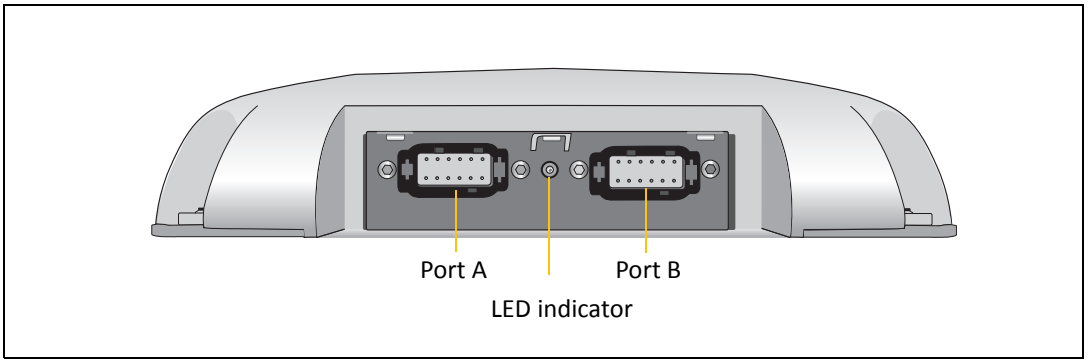
Note – *PTNLDG, PTNLEV, PTNLGGK, PTNLID, and PTNLSM are Trimble proprietary NMEA output messages.*

  – RTCM SC-104 output

  – Trimble Standard Interface Protocol (TSIP) input and output

Receiver connections

The following figure shows the connector ports and the LED indicator on the AG-372 GNSS receiver:



The two connectors (Port A and Port B) can do the following:

- Accept power
- Accept TSIP, RTCM, ASCII, and (if enabled) CMR inputs
- Output RTCM, TSIP, and NMEA messages
- Output 1 PPS signals
- Provide support for the J1939 (CAN) serial bus

For more information about the inputs, outputs, and LED indicators, see the information in the rest of this section.

Receiver input/output

The Trimble AG-372 GNSS receiver data/power cable (P/N 50166) connects to a receiver connector port to supply power. It also enables the following data exchanges:

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

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

- CMR input from an external device

  If the receiver is to be used in RTK mode, set the port that is connected to the radio to the ***RtkLnk*** protocol, see Configuring the Trimble AG-372 GNSS receiver to operate in RTK mode, page 40. This protocol enables the receiver to receive CMR messages.

- TSIP and NMEA output to an external device

  – When you are using an external or integrated radio, the receiver can also receive DGNSS corrections.

  - TSIP is input/output when communicating with AgRemote.
  - NMEA is output when the receiver is exporting GNSS position information to an external device, such as a yield monitor, or to a mapping software program.

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

  - www.nmea.org
  - www.rtcm.org

  On the Trimble website (www.trimble.com), refer to the document called *NMEA-0183 Messages Guide for AgGPS Receivers*.

- 1 PPS output

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

- J1939 (CAN) bus

  Both connection ports on the receiver support the J1939 Controller Area Network (CAN) bus protocol. This protocol standardizes the way multiple microprocessor-based electronic control units (ECUs) communicate with each other over the same pair of wires. It is used in off-highway machines, such as those used in agriculture, construction, and forestry.

  For more information, go to the Society of Automotive Engineers (SAE) International website at www.sae.org/servlets/index.

- ISO 11783 messages

  Both CAN ports support some ISO 11783 messages.

Position output format

The Trimble AG-372 GNSS receiver outputs positions in Degrees, Minutes, and Decimal Minutes (DDD°MM.m'). This is the NMEA standard format and is commonly used worldwide for data transfer between electronic equipment.

LED indicator

The Trimble AG-372 GNSS receiver has an LED light that shows the status of the receiver. The following tables describe the light sequences for each positioning method.

Note – *Fast LED flash is approximately 3 flashes per second. Slow LED flash is approximately 1 flash per second.*

Table 2.1 LED sequences with Satellite Differential GNSS or autonomous positioning

LED color	LED flash	Status
Off	Off	No power
Green	Solid	Normal operation: computing DGNSS positions
Green	Slow	No DGNSS corrections: computing DGNSS positions using old corrections
Green	Fast	No DGNSS corrections approaching DGNSS age limit: computing DGNSS positions using old corrections
Yellow	Solid	DGNSS corrections being received but DGNSS positions not yet being computed: computing autonomous GNSS positions
Yellow	Slow	No DGNSS corrections: computing autonomous GNSS positions
Yellow	Fast	Not enough GNSS signals: not tracking enough satellites to compute position

Note – *WAAS/EGNOS and OmniSTAR VBS use the Satellite Differential GNSS positioning method.*

Table 2.2 LED sequences with RTK positioning

LED color	LED flash	Status
Off	Off	No power
Green	Solid	Normal operation: computing fixed RTK positions
Green	Slow	Receiving CMR corrections but not initialized: computing float RTK positions
Green	Fast	No CMR corrections: computing RTK position using old corrections
Yellow	Solid	Receiving CMR corrections but unable to calculate RTK position: computing DGNSS (if WAAS/EGNOS is unavailable) or autonomous position
Yellow	Slow	No CMR corrections: computing DGNSS or autonomous position
Yellow	Fast	Not receiving CMR corrections: not computing positions

Table 2.3 LED sequences with OmniSTAR HP positioning

LED color	LED flash	Status
Off	Off	No power
Green	Solid	Normal operation: computing converged OmniSTAR HP positions
Green	Slow	Receiving OmniSTAR HP corrections, but only able to compute unconverged position

Table 2.3 LED sequences with OmniSTAR HP positioning (continued)

LED color	LED flash	Status
Green	Fast	Receiving OmniSTAR HP corrections, but an HP error occurred
Yellow	Solid	Receiving OmniSTAR HP corrections but unable to calculate a position: computing DGNSS or autonomous solution
Yellow	Slow	No OmniSTAR HP corrections: computing DGNSS or autonomous position
Yellow	Fast	Not tracking OmniSTAR HP corrections: no positions

GNSS positioning methods

GNSS positioning systems are used in different ways to provide different levels of accuracy. Accuracy is measured in absolute terms, that is, you know exactly where you are in a fixed reference frame.

Table 2.4 summarizes the GNSS positioning methods. The values shown are 2 sigma.

Table 2.4 Absolute accuracy of GNSS positioning methods

GNSS positioning method	Corrections used	Approximate absolute accuracy
Real-Time Kinematic (RTK) GNSS	Trimble CMR corrections broadcast by a local base station	2.5 cm (1 inch) + 2 ppm horizontal accuracy, 3.7 cm (1.5 inch) + 2 ppm vertical accuracy
CenterPoint RTX technology	CenterPoint RTX	4 cm (1.5 inch)
Satellite Differential GNSS	OmniSTAR VBS	78 cm (30.7 inch)
Satellite Differential GNSS	WAAS/EGNOS	95 cm (37.4 inch)
OmniSTAR HP Differential GNSS	OmniSTAR HP	10 cm (3.9 inch) after the signal has fully converged[1]

[1] Convergence time can vary, depending on the environment. Time to the first fix (submeter accuracy) is typically <30 seconds; time to the first high accuracy fix (<10 cm accuracy) is typically <30 minutes.

For more information about each positioning method, see below.

RTK GNSS positioning

The Trimble AG-372 GNSS receiver uses the RTK positioning method to achieve centimeter-level accuracy. To use the RTK method, you must first set up a base station. The base station uses a radio link to broadcast RTK corrections to one or more rover receivers. The Trimble AG-372 GNSS receiver is a rover receiver, so another compatible receiver, such as a Trimble *Ag*GPS 442, *Ag*GPS 542, *Ag*GPS RTK Base 450, or *Ag*GPS RTK Base 900 receiver, must be used as the base station.

The rover receiver uses RTK corrections from the base station to calculate its position to centimeter-level accuracy. As part of this process, the rover receiver must calculate an initialization. This takes a few seconds. While the receiver is initializing, an RTK Float solution is generated. Once initialized, an RTK Fixed solution is generated. It is the RTK Fixed solution that provides centimeter-level accuracy.

The parts per million (ppm) error is dependent on the distance (baseline length) between the base and rover receiver. For example, if the distance is 10 km, a 2 ppm error equals 20 mm.

For more information about RTK positioning, go to the Trimble website at www.trimble.com/GNSS/

CenterPoint RTX positioning (RTX)

Trimble CenterPoint RTX is a GPS and GLONASS-enabled correction service built on patent-pending Trimble RTX technology. This breakthrough technology provides high-accuracy GNSS positioning without the use of traditional reference station-based differential RTK infrastructure.

CenterPoint RTX corrections are provided on as subscription basis.

For more information about the CenterPoint RTX correction service, see http://www.trimble.com/agriculture/CorrectionServices/

For more information on activating a CenterPoint RTX subscription, see Configuring the Trimble AG-372 GNSS receiver to operate in CenterPoint RTX mode, page 35.

Differential GNSS positioning (DGNSS)

For differential positioning, the Trimble AG-372 GNSS receiver uses corrections from WAAS/EGNOS satellites or from OmniSTAR HP, XP, G2, or VBS satellites.

These differential systems use special algorithms to provide differential corrections that allow the rover receiver to calculate its position more accurately. Not all corrections services support the use of GLONASS satellites in their solution.

Free corrections

WAAS corrections are free in North America and EGNOS corrections are free in Europe. For more information about WAAS, go to the Federal Aviation Administration website at http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/waas/

For more information about EGNOS, go to the European Space Agency website at http://www.esa.int/esaNA/egnos.html.

Subscription-based corrections

The Trimble AG-372 GNSS receiver can use OmniSTAR™ HP, XP, G2, or VBS differential corrections.

OmniSTAR corrections are provided on a subscription basis.

For more information about OmniSTAR, go to the OmniSTAR website at www.omnistar.com. For information about activating an OmniSTAR subscription, see OmniSTAR, page 34.

Autonomous GNSS positioning

Autonomous GNSS positioning uses no corrections. The rover receiver calculates its position using only the GNSS signals it receives. This method does not have high absolute accuracy, but the relative accuracy is comparable to the other methods.

Sources of error in GNSS positioning

The GNSS positioning method influences the accuracy of the GNSS position that is output by the Trimble AG-372 GNSS receiver. The factors described in Table 2.5 also affect GNSS accuracy.

Table 2.5 Factors that influence the accuracy of GNSS positions

Condition	Optimum value	Description
Atmospheric effects		GNSS signals are degraded as they travel through the ionosphere. The error introduced is in the range of 10 meters. The error is removed by using a differential or RTK positioning method.
Number of satellites used	> 5	To calculate a 3D position (latitude and longitude, altitude, and time), four or more satellites must be visible. To calculate a 2D position (latitude and longitude, and time), three or more satellites must be visible. For RTK positioning, five satellites are needed for initialization. Once initialized, four or more satellites provide RTK positions. The number of visible satellites constantly changes and is typically in the range 5 through 9. The receiver can track up to 44 satellites simultaneously. ***Note –*** *To see when the maximum number of GNSS satellites are available, use the Trimble Planning software and a current ephemeris (satellite history) file. Both files are available free from the Trimble website at www.trimble.com.*
Maximum PDOP	< 4	Position Dilution of Precision (PDOP) is a unitless, computed measurement of the geometry of satellites above the current location of the receiver. A low PDOP means that the positioning of satellites in the sky is good, and therefore good positional accuracy is obtained.

Table 2.5 Factors that influence the accuracy of GNSS positions (continued)

Condition	Optimum value	Description
Signal-to-noise ratio		Signal-to-noise ratio (SNR) is a measure of the signal strength against electrical background noise. A high SNR gives better accuracy. SNR can be degraded by other electronic equipment operating nearby, including transmitters, cell phones, or data modems. It may also be degraded by solar flares and changing atmospheric conditions.
Minimum elevation	> 10°	Satellites that are low on the horizon typically produce weak and noisy signals and are more difficult for the receiver to track. Satellites below the minimum elevation angle are not tracked.
Multipath environment	Low	Multipath errors are caused when GNSS signals are reflected off nearby objects and reach the receiver by two or more different paths. The receiver incorporates the EVEREST multipath rejection option.
RTCM-compatible corrections		These corrections are broadcast from an *Ag*GPS 442, *Ag*GPS 542, or equivalent reference station.
RTK Base station coordinate accuracy		For RTK positioning, it is important to know the base station coordinates accurately. Any error in the position of the base station affects the position of the rover; every 10 m of error in a base station coordinate can introduce up to 1 ppm scale error on every measured baseline. For example, an error of 10 m in the base station position produces an error of 10 mm over a 10 km baseline to the rover. For more information about how to make sure the position of your base station is accurate, refer to the manual for your base station receiver.
Multiple RTK base stations		If you are using several base stations to provide RTK corrections to a large site area, all base stations must be coordinated relative to one another. If they are not, the absolute positions at the rover will be in error. For more information about how to use several base stations to cover your site, contact your local Trimble Reseller.

Coordinate systems

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

The Trimble AG-372 GNSS receiver outputs position coordinates in several datums and ellipsoids depending on the GNSS positioning method being used. See Table 2.6.

Table 2.6 DGNSS coordinate systems

GNSS positioning method	Datum	Ellipsoid
None – Autonomous mode	WGS-84[1]	WGS-84
OmniSTAR VBS North American Beams	NAD-83[2]	GRS-80
OmniSTAR VBS Rest of World Beams	ITRF 2005[3]	ITRF 2005
OmniSTAR HP, XP, and G2	ITRF 2005	ITRF 2005
WAAS Beams	WGS-84	WGS-84
RTK	WGS-84	WGS-84
RTX	ITRF 2005	ITRF 2005

[1] World Geodetic System (WGS) 1984. Datum and ellipsoid.

[2] North American Datum (NAD) 1983. Equivalent to WGS-84 in North America.

[3] International Terrestrial Reference Frame (ITRF). Contact the DGNSS provider for details.

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

CHAPTER

3

Installing the AG-372 GNSS Receiver

In this chapter:

This chapter describes how to check the equipment that you have received, set up the AG-372 receiver, and connect the receiver to another device.

System components

Check that you have received all components for the system that you purchased. If any containers or components are damaged, immediately notify the shipping carrier. The following components ar included:

Quantity	Description
1	Trimble AG-372 GNSS receiver (P/N 56000-01)
1	System level cable (P/N 50165 or 50166)
1	Mounting plate assembly (P/N 51312-00)
1	Port B plug (P/N 51062)
1	*Trimble AG-372 GNSS Receiver User Guide* (this manual, P/N 56100-00-ENG)

Optional extras

You may also have ordered one of the following receiver options:

- Passcode, AG-372 upgrade: DGPS to OmniSTAR XP/HP (P/N 87855)
- Passcode, AG-372 upgrade: OmniSTAR XP/HP to RTK (P/N 87858)

Mounting the receiver

WARNING – For continued protection against the risk of fire, the power source (lead) to the model Trimble AG-372 GNSS receiver should be provided with a 10 A (maximum) fuse.

Secure the Trimble AG-372 GNSS receiver directly to the mounting plate assembly (P/N 51312-00) and insert three bolts through the holes that are in the housing and in the mounting plate assembly. Torque the bolts to 75–80 inch pounds.

Choosing a location

When choosing a location, consider the following:

Mount the receiver:

- On a flat surface along the centerline of the vehicle
- In any convenient location that is within 5.5 meters (18 ft) of the port on the external instrument; if necessary, use the optional extension cable to connect the receiver and external device

Note – *If you are using a Trimble Autopilot™ system, please refer to the installation instructions that are provided with the Autopilot system.*

- At the highest point on the vehicle, with no metal surfaces blocking the receiver's view of the sky

- In such a way that it is not damaged when you drive the machine into a shed or storage area

Do ***not*** mount the receiver:

- Close to stays, electrical cables, metal masts, CB radio antennas, cellular phone antennas, air-conditioning units (machine cab blower fan), or machine accessory lights
- Near transmitting antennas, radar arrays, or satellite communication equipment
- Near areas that experience high vibration, excessive heat, electrical interference, and strong magnetic fields

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

Environmental conditions

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

- Water
- Excessive heat (> 70 °C or 158 °F)
- Excessive cold (< –30 °C or –22 °F)
- High vibration
- Corrosive fluids and gases

Electrical interference

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

- Gasoline engines (spark plugs)
- Computer monitor screens
- Alternators, generators, or magnetos
- Electric motors (blower fans)
- Equipment with DC-to-AC converters
- Switching power supplies
- Radio speakers
- High-voltage power lines
- CB radio antennas
- Cellular phone antennas
- Machine accessory lights

Connecting to an external device

After installing the receiver and connecting the appropriate cabling, you can connect the receiver to various external devices. For example:

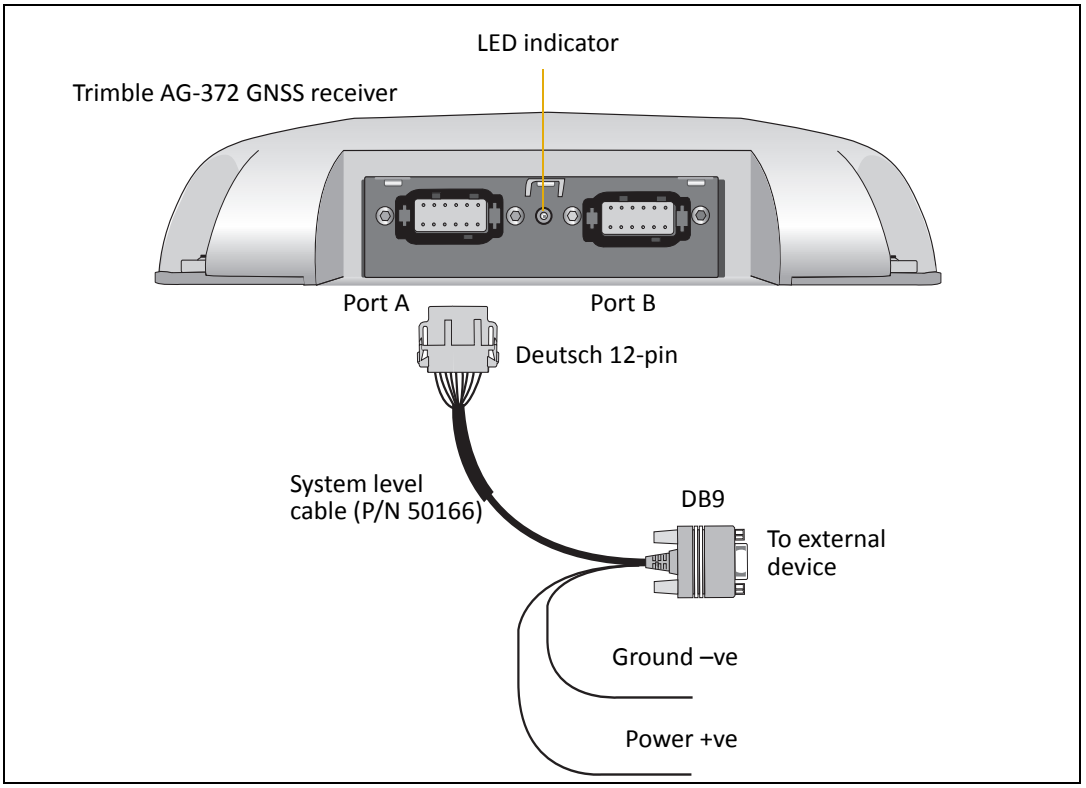
To connect the receiver to ...	use cable ...
an Autopilot system	P/N 50165 (this cable has no DB9 connector)
a Field computer	P/N 50166
a Yield monitor	P/N 50166

To convert the Trimble AG-372 GNSS receiver to a Trimble 12-pin Conxall cable, use the adapter cable (P/N 50581).

Plug the ...	into ...
Deutsch 12-pin connector	Port A on the back of the receiver
straight DB9-pin connector	the external device
power connectors	a power supply

Note – *Do not bend the cable at the Deutsch connector.*

The following figure shows how to connect the receiver to an external device using the system level cable (P/N 50166):



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

- Sharp objects
- Kinks in the cable
- Hot surfaces (exhaust manifolds or stacks)
- Rotating or moving machinery parts
- Sharp or abrasive surfaces
- Door and window jams
- Corrosive fluids or gases

Note – *Do not bend the cable at the Deutsch connector. When you secure the cable, use the supplied P-Clip. The P-Clip provides additional support to the connectors and reduces the risk of damage.*

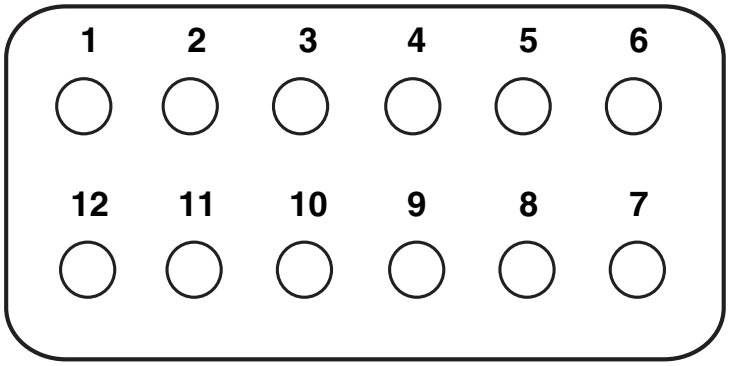
When the cable is safely routed and connected to the receiver, use tie-wraps to secure it at several points, particularly near the base of the receiver, to prevent straining the connection. Coil any slack cable, secure it with a tie-wrap, and tuck it into a safe place.

The external device may have to be configured to work with the receiver. The configuration tools for the external device should be provided with the device. For more information about configuring the receiver, see Chapter 5, Configuring the Receiver. For information about connecting a particular external device, refer to the manual for that device or contact your local Trimble Reseller.

Note – *Use a connector plug (P/N 51062) to cover Port B when that port is not in use. For example, cover Port B when you are using the receiver in a non-RTK mode.*

Connectors and pinouts

Use the following pinout information if you need to wire a cable for use with the Trimble AG-372 GNSS receiver:



Port A

Port A on the receiver has a 12-pin Deutsch DTM connector. For cables, use the mating connector, Deutsch part number DTM06-12SA.

Viewed from outside the receiver, the Port A connector is on the left. It is the port that is typically used to connect to an Autopilot system.

Pin	Name/Function	Comments
1	CAN A High I/O	
2	Port 1 RS232 Tx OUT	When held to ground during power up, puts unit into Monitor mode
3	Port 1 RS232 Rx IN	
4	PPS OUT	
5	Signal GND	Used for RS232 and other signals. Should not be connected to V– (battery negative)
6	Port 1 RTS OUT	
7	Radar OUT / Alarm OUT	
8	Port 1 CTS IN	
9	Event IN	
10	V+ IN	
11	V- IN	
12	CAN A Low I/O	

Port B

This port has the same connector as Port A, see above. Viewed from outside the receiver, the Port B connector is on the right. It is the port that is typically used to connect to the Joey radio.

Pin	Name/Function	Comments
1	CAN B High I/O	
2	Port 2 RS232 Tx OUT	
3	Port 2 RS232 Rx IN	
4	PPS OUT	
5	Signal GND	Used for RS232 and other signals. Should not be connected to V– (battery negative)
6	Port 2 RTS OUT ***or*** Port 3 RS232 Tx OUT	
7	Radar OUT / Alarm OUT	
8	Port 2 CTS IN ***or*** Port 3 RS232 Rx IN	
9	Event IN	
10	V+ IN / OUT	Maximum output current = 1.25 A
11	V– IN / OUT	Maximum output current = 1.25 A
12	CAN B Low I/O	

Radar output

On the Trimble AG-372 GNSS receiver, Pin 7 on both Port A and Port B can be used as Event Out, Alarm out, and Radar out. This pin can supply 5 V at 45 mA and sink up to 200 mA; the switching frequency of the circuit can be up to 10 KHz.

The receiver can output simulated radar pulses at a pre-defined speed pulse output rate that is useful to replace the radar/true ground speed sensor for speed on the vehicle or to send speed to any other agricultural device that requires speed pulses, for example, a yield monitor or variable rate controller.

Please contact your local reseller for cabling options.

CHAPTER

4

Installing the AG-715 Integrated Radio

In this chapter:

This chapter describes how to install the AG-715 integrated radio.

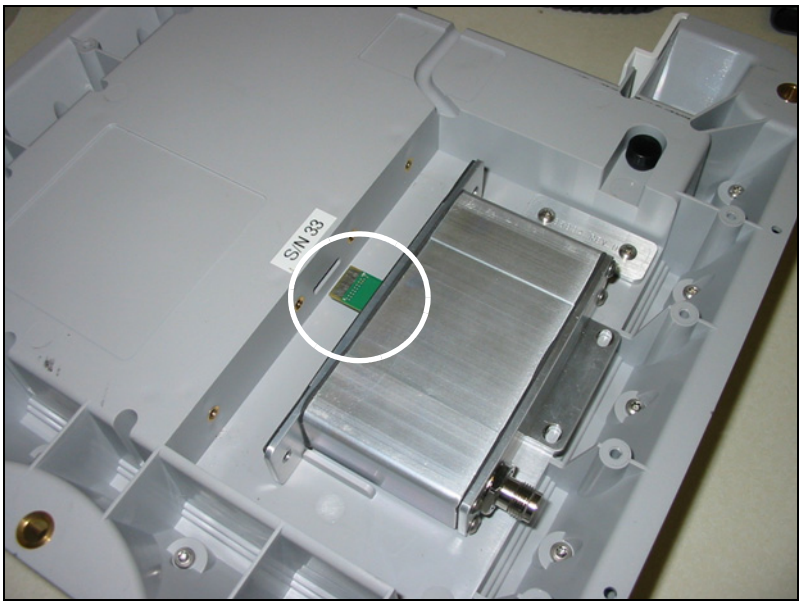
Required tools

#1 (preferred) or #2 Phillips screwdriver.

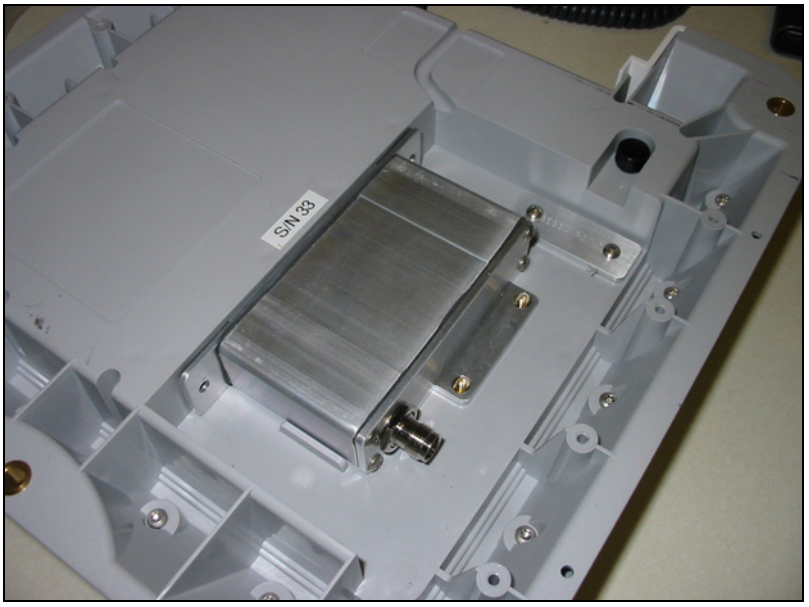
Installation procedure

1. Remove the blanking plate and set it aside:

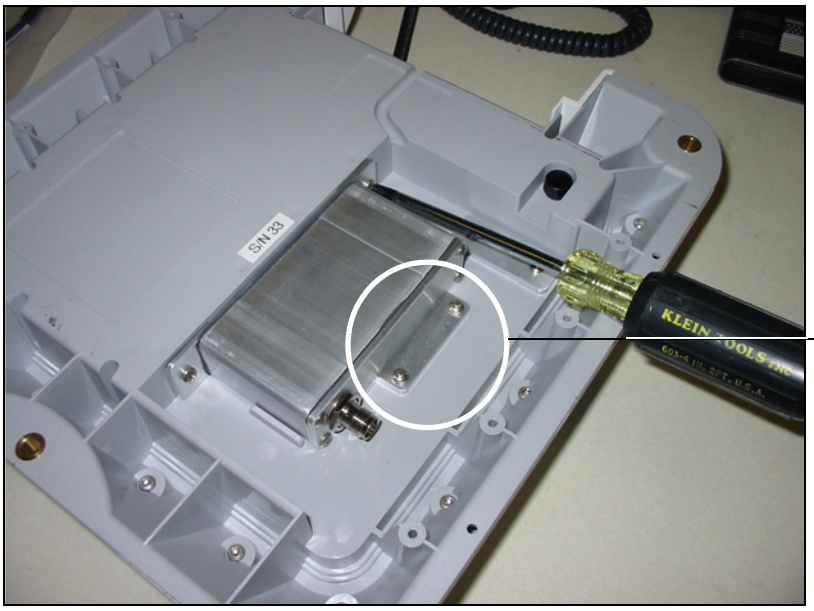
2. Place the integrated radio inside the AG-372 receiver. Ensure that the circuit board is aligned with the slot in the vertical wall of the receiver:



3. Slide the integrated radio back so that it is flush with the vertical wall of the receiver:

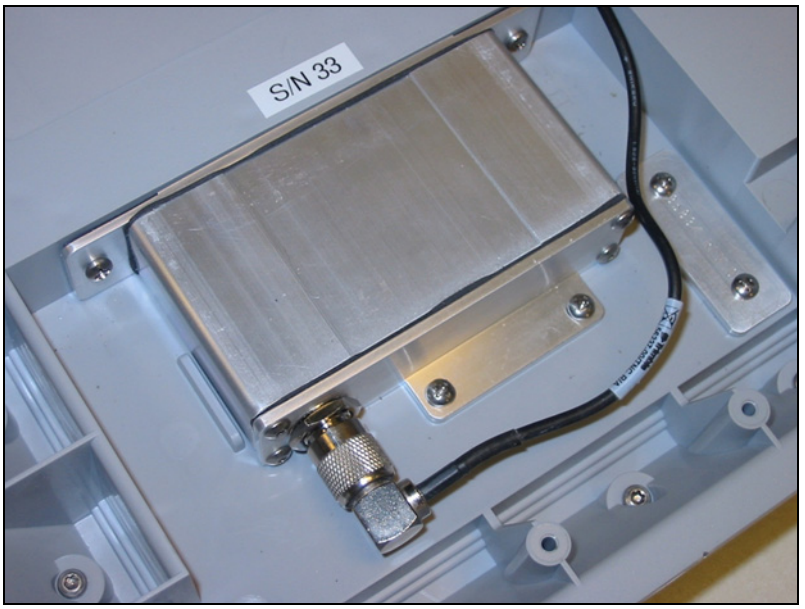


4. Use a #1 or #2 Phillips screwdriver and the supplied screws to install the integrated radio. First insert and tighten the two screws on the horizontal wall and then insert the remaining screws:



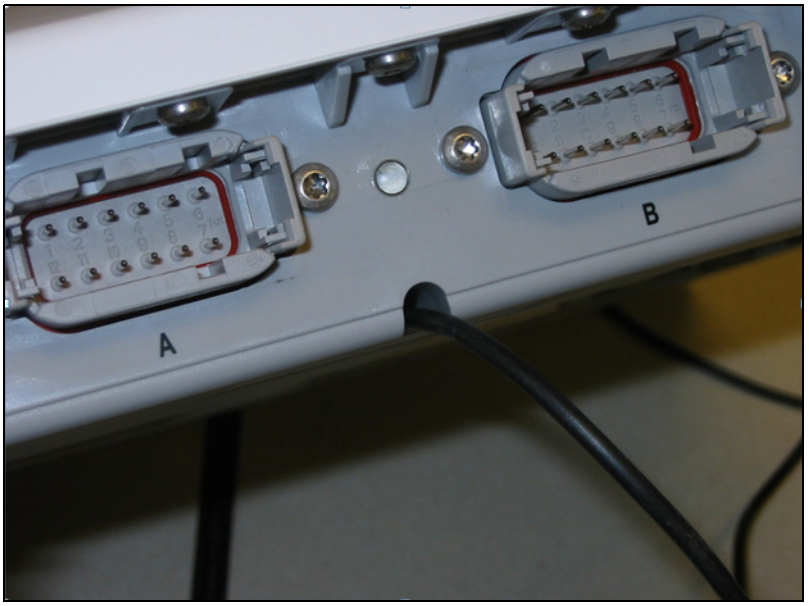
5. Install the supplied antenna cable.

Note – *The housing can accommodate a cable diameter of up to ¼".*



6. Route the cable through the cable channel and then insert the cable cover:

The following image shows the unit once the cable has been routed through the channel:



CHAPTER

5

Configuring the Receiver

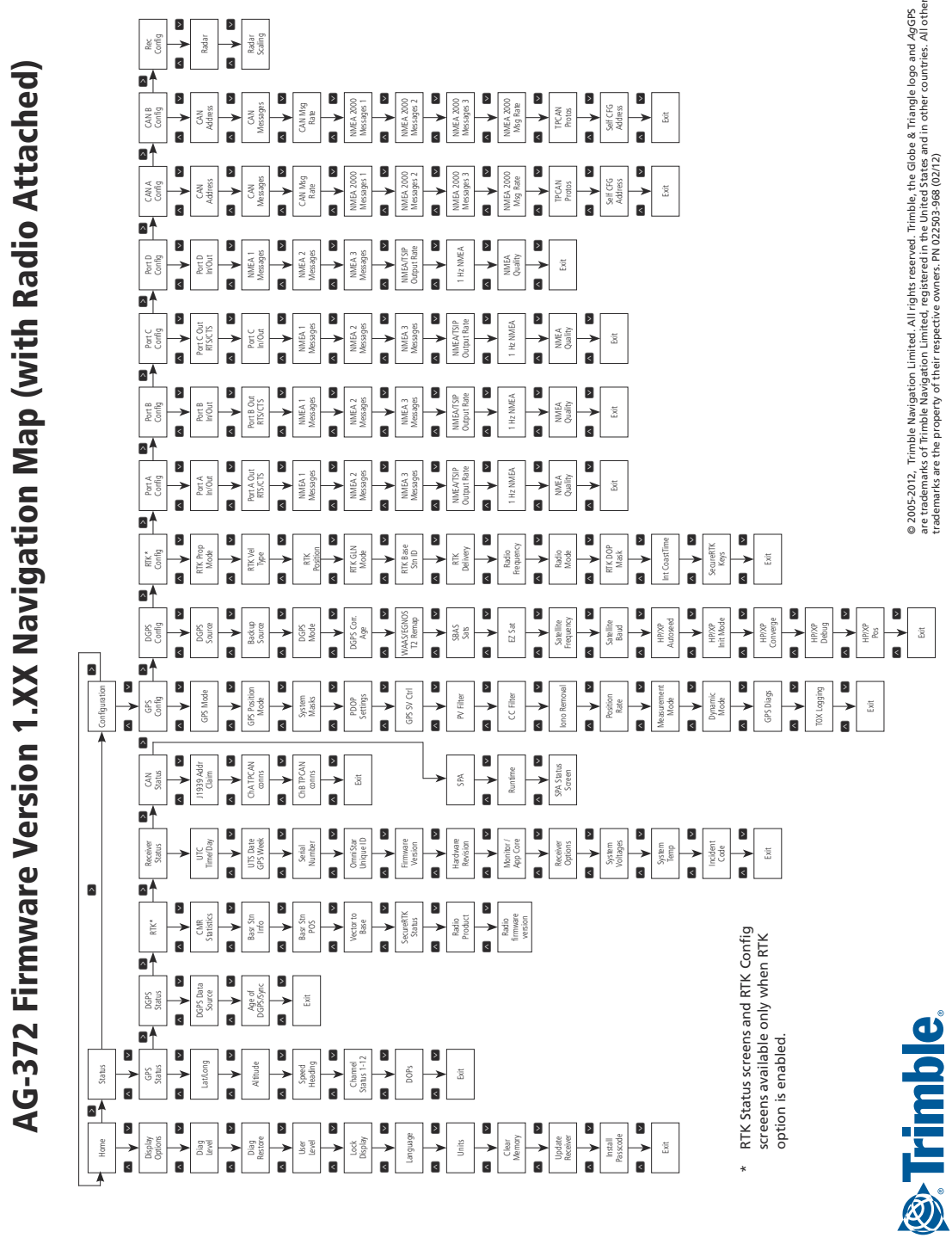
In this chapter:

Use either the Autopilot interface or the Trimble AgRemote utility to change configuration settings in the Trimble AG-372 GNSS receiver. You will need to configure the receiver if you connect to a third-party device:

- If a Trimble Autopilot system is configured to use a Trimble AG-372 GNSS receiver, and the port on the receiver is set to 8-N-1 38.4 K, the Autopilot system automatically configures the receiver.
- The AgRemote utility is available from www.trimble.com. This chapter describes how to use the utility to perform some common configurations.

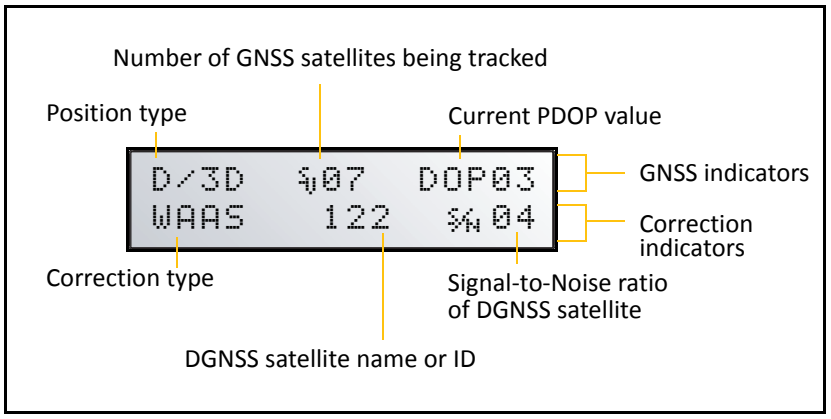
Note – *CenterPoint RTX, OmniSTAR HP, XP, G2, and VBS are subscriber services that must be activated. For more information, see* *OmniSTAR, page 34**.*

Navigation map



AgRemote Home screen

The following figure shows the AgRemote *Home* screen when WAAS corrections are being received:



For more information about these fields and how they change as you change GNSS mode, refer to the document called *AgRemote Software* on the Trimble website (www.trimble.com) or contact your local Trimble Reseller.

Configuring Differential GNSS

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

- WAAS/EGNOS – free service, limited availability

  The Wide Area Augmentation System (WAAS) augments GNSS with additional signals for increasing the reliability, integrity, accuracy, and availability of GNSS in the United States. The European Geostationary Navigation Overlay System (EGNOS) is the European equivalent of WAAS.

- OmniSTAR – paid subscription, available worldwide

  You can use this paid service as an alternative to WAAS/EGNOS. It provides over-the-air DGNSS activation.

For more information, see Differential GNSS positioning (DGNSS), page 13.

OmniSTAR

The Trimble AG-372 GNSS receiver can use OmniSTAR corrections. To do this, you need to configure the receiver and purchase an OmniSTAR™ subscription.

Note – *To track the OmniSTAR satellite, the receiver must be outside with a clear view of the sky, turned on, and configured to receive OmniSTAR VBS or HP corrections.*

To use the AgRemote utility to activate an OmniSTAR subscription:

1. Connect the Trimble AG-372 GNSS receiver to the computer. Turn on the receiver and start the AgRemote utility. For instructions on how to use AgRemote, refer to the AgRemote documentation.
2. In AgRemote, select *Configuration* / *DGPS Config*.
3. Set the *Source Select* field to one of the following:
   - OmniSTAR HP
   - OmniSTAR G2
   - OmniSTAR XP
   - OmniSTAR VBS
4. Set the *EZ Sat: Omni** field to the area you are operating in. For example, if you are working in California, select N. America West.
5. Press 4 then 5 to complete the procedure.
6. Obtain an OmniSTAR licence from OmniSTAR. All licenses are activated over the air. Contact OmniSTAR on
   1-888-883-8476 (USA or Canada) and provide the following details:
   - your billing information
   - serial number and/or OmniSTAR ID
   - satellite beam name

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

WAAS/EGNOS

WAAS is a free satellite-based DGNSS service that is available only in North America; EGNOS is a free satellite-based DGNSS service that is available only in Europe.

To use the WAAS/EGNOS DGNSS signal, you must first configure the receiver.

1. Connect the Trimble AG-372 GNSS receiver to the computer. Turn on the receiver and start the AgRemote utility.
2. In AgRemote, select *Configuration* / *DGPS Config*.
3. Set the *Source Select* field to WAAS.
4. Press > then ^ to complete the procedure.

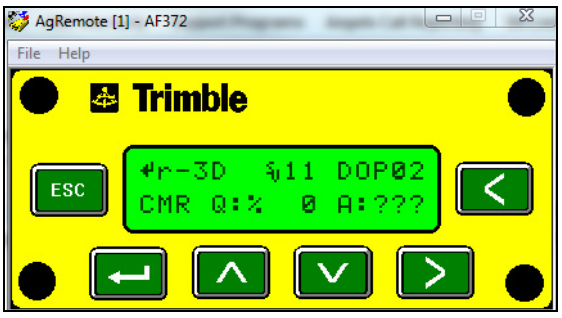
To enable WAAS reception in the field:

1. Take the receiver outside. Make sure that it has a clear southeast and southwest view of the sky.
2. Turn on the receiver. WAAS activation can take two or more minutes. Once activation succeeds, the *Home* screen displays D/3D:

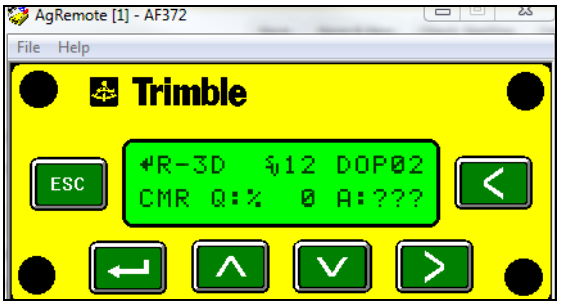
Configuring the Trimble AG-372 GNSS receiver to operate in CenterPoint RTX mode

Configuring the receiver for RTX (std-sat)

1. Ensure that the receiver is unlocked to either the OmniSTAR accuracy level or to the RTK accuracy level.
2. Acquire an RTX passcode from OmniSTAR.
3. Enter the passcode under *Install Passcode.*
4. Use the arrow keys to select *DGPS config / DGPS Source / Set to RTK.*
5. Use the arrow keys to select *RTK config / Delivery / set to RTX.*



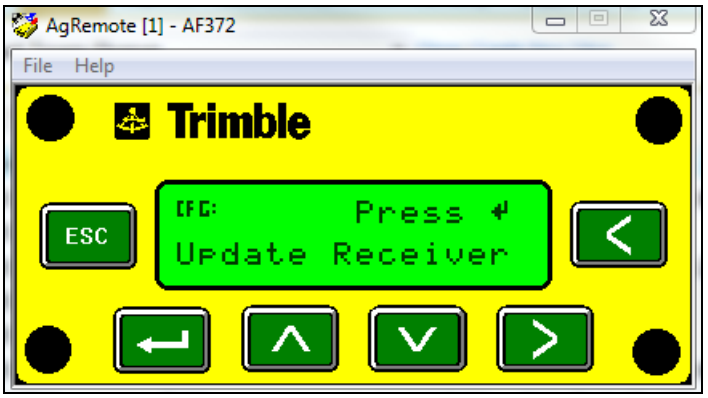
RTX standard converging



RTX standard converged

Configuring the receiver for RTX (std-cell)

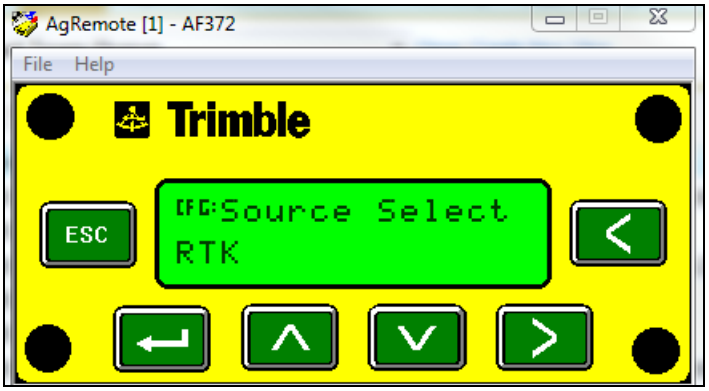
1. From the AgRemote home screen, press [v] until you reach *Update Receiver* and then enter the RTK passcode.



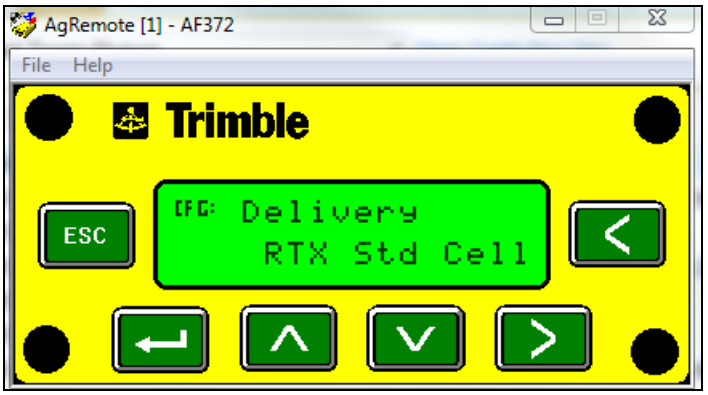
2. From the home screen, press [v] until you reach *Install Passcode* and then enter the RTX passcode. Once you have entered the passcode, turn off and then turn on the receiver:

3. When the receiver reboots, press [<] until you reach *Configuration,* press [v] once and then press [>] once to reach *DGPS Config*.
4. Press [v] once to reach *Source Select* and then press [>].

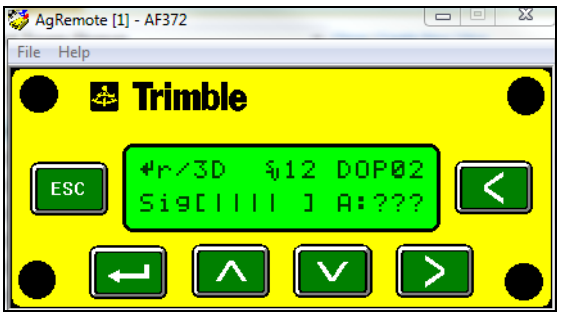
5. Once the cursor is flashing, press [^] or [v] to change the source to RTK and then press the Enter key:



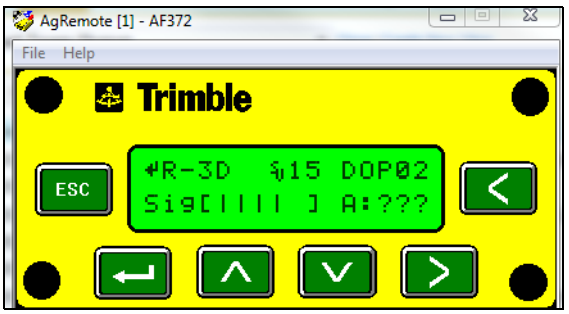
6. Press [ESC] to return to *DGPS Config* and then press [>] to go to *RTK Config*.
7. Press [v] to go to *Delivery*.
8. Change the delivery to *RTX Standard Cell*:



You should see the following when converging:



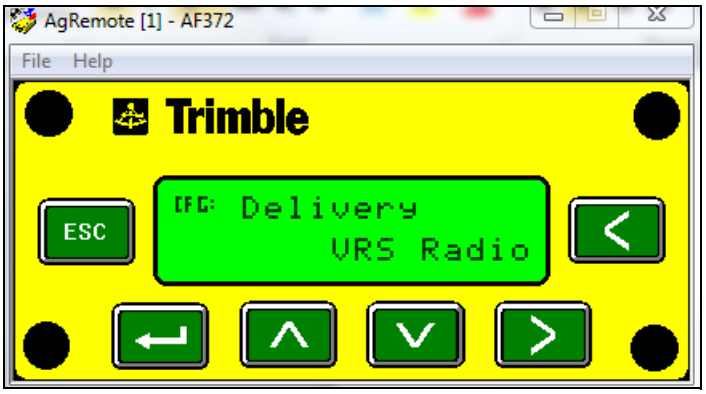
While converging



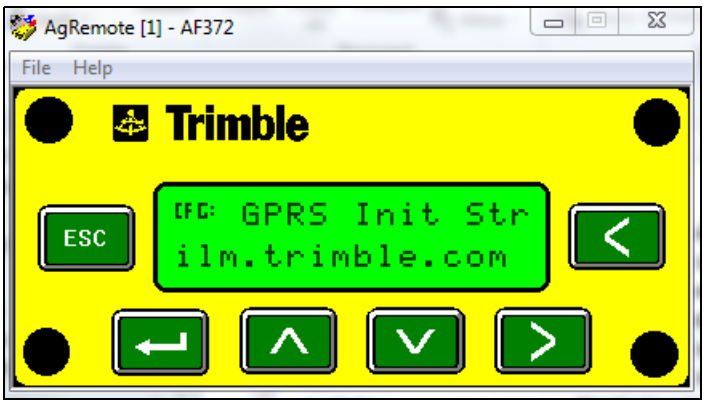
Converged

Configuring the Trimble AG-372 GNSS receiver to operate in VRS mode

1. Navigate to *DGPS Config* and then press [>] to go to *RTK Config*.
2. Press [v] to go to *Delivery*.
3. Change the delivery to *VRS Radio* and then turn off and then turn on the receiver.



4. When the receiver reboots, press [<] until you reach the *RTK Config* menu and then press [v] to reach *GPRS settings*.
5. Make sure that the correct *Initialization String, GPRS User Name*, and *Password* (if required) are entered and then turn off and then turn on the receiver.
6. Press [v] once to reach *Source Select* and then press [>].
7. Once you have turned on the receiver, navigate to the *RTK Configuration* menu and then press [v] to reach *Delivery*.
8. Change the delivery to *VRS*.



9. Enter appropriate information for the following items. The screen shots show example values only—make sure that the values are correct for your data connection supplier.

10. In the *RTK Config* menu press the down arrow until you reach *GPRS settings*. Make sure that the correct *Initialization String*, *GPRS User Name,* and *Password* (if required) are entered.

Configuring the Trimble AG-372 GNSS receiver to operate in RTK mode

Use the AgRemote utility to configure the Trimble AG-372 GNSS receiver for operation in RTK mode. To configure the receiver:

1. Connect the Trimble AG-372 GNSS receiver to the computer. Turn on the receiver and start the AgRemote utility.
2. In AgRemote, select *Configuration* / *DGPS Config*.
3. Set the *Source Select* field to RTK.
4. Press [>] then [^] to complete this part of the procedure.
5. For RTK operation, connect the radio to a port. Change the port input settings for that port to RtkLnk. See Configuring the radio frequency, protocol, and radio link in the AgRemote utility, page 43.

Configuring the communication ports

If the Trimble AG-372 GNSS receiver is to be connected to an external device, configure Ports A and B so that the proper data type is input to and output from the receiver.

To configure Port A:

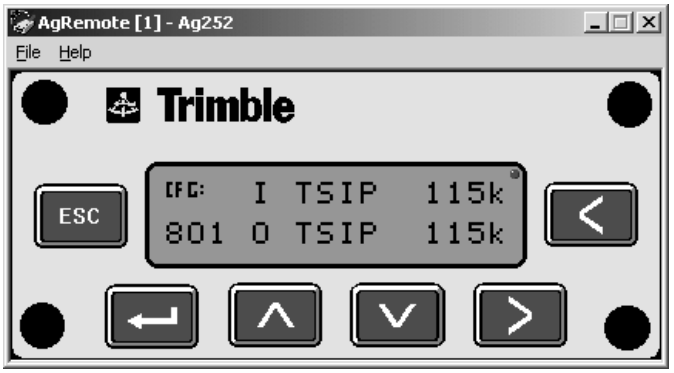
1. Connect the Trimble AG-372 GNSS receiver to the computer. Turn on the receiver and start the AgRemote utility.
2. In AgRemote, select *Configuration* / *Port A Config*.
3. Use the menu commands to configure the communication ports. Ensure that the receiver outputs the correct GNSS position data type for the hardware device or software program that is connected to the receiver.

To configure Port B:

- Repeat the above steps but in Step 2 select *Configuration* / *Port B Config*.

Configuring input/output communication

The port input and output settings appear in the first screen. In the following figure, the port is set to accept TSIP inputs at a baud rate of 115,000 with a parity of 8-Odd-1. The outputs are TSIP, also at a baud rate of 115,000.



Configure the Port Input/Output communication settings for communicating with the Autopilot, other external hardware devices, and software programs. Table 5.1 describes the input settings.

Table 5.1 Port input settings

Setting	Description
None	Inputs nothing to the receiver.
TEXTB	The receiver can accept ASCII data from an external device, such as a chlorophyll meter, on Port A, merge it with NMEA GNSS data, and output the combined data on Port B. The incoming data must be limited to 66 ASCII characters and terminated by a carriage return and line feed (hex characters 0x0D 0x0A). The NMEA string outputs as $PTNLAG001,<up to 66 ASCII characters>*<2 digit checksum><CR><LF>. For the receiver to output the combined NMEA string, NMEA must be selected as the output protocol on Port B.
TEXTA	See the description for the TEXTB setting (above). TEXTA input outputs text on Port A. The default port settings are 8-N-1 TSIP 38.4 K. These may vary by product.
RTCM	The receiver can accept RTCM data from an external DGNSS device, such as an external radio.
TSIP	The receiver can accept or output TSIP data packets from the port when using the optional AgRemote program or using the *Ag*GPS 170 Field Computer.
RtkLnk	The receiver can accept real-time corrections (CMR data) from an external device such as a Trimble radio.

The default port settings are:

		Port A	Port B
Baud rate	**In**	TSIP 38,400	TSIP 38,400
	Out	TSIP 38,400	TSIP 38,400
Data bits		8	8
Parity		None	None
Stop bits		1	1

Note – *The AgRemote utility, when connected to a Trimble AG-372 GNSS receiver receiver, automatically resets the receiver port communication settings to 8-O-1 TSIP 115 K. This enables optimal communication with an office computer. If the receiver is to work with an Autopilot system, however, the receiver port communication settings must be 8-N-1 TSIP 38.4 K. To work with some other devices and software programs, the receiver port communication settings must be 8-N-1 NMEA 4800. If AgRemote has changed the settings, you will need to change them back manually.*

When using a Trimble SNB 900 radio, make sure that the communication settings are correct in the receiver.

The default settings to use with the SNB 900 radio are:

Setting	Description
Baud rate	38,400
Data bits	8
Parity	None
Stop bits	1

Changing the input or output port settings

1. From the *Port A Config* screen, press [v] until the *Port-A Input/Output* screen appears.
2. Ensure that the receiver is configured for RTK:
   - Input: RTKL NK 38.4K, 8N1
   - Output: RTKL NK 38.4 K
3. Press [<] to activate the cursor.
4. Press [v] or [^] to change the value.
5. Press [<].
6. Repeat Step 3 through Step 4 until you have set all the required values.
7. Press [>] to save all the changes.
8. Press [>] to move to the next screen.

NMEA settings

Three screens (NMEA1, NMEA2, and NMEA3) show what NMEA messages are output from the port. Message types shown in upper case are being output; message types shown in lower case are not.

For more information about NMEA message types, refer to the document called *NMEA-0183 Messages Guide for AgGPS Receivers* on the Trimble website (www.trimble.com).

Port output rate

This setting can be used to vary the NMEA and TSIP output rate. A setting of 1 outputs one position each second.

ASAP equals the rate selected on the *Filter and Position Rate* screen under the *GNSS Config* menu. A setting of ASAP outputs positions five or ten times every second. The default (factory) setting is 1 Hz.

Changing the frequency settings

Required equipment / software

- TNC-TNC antenna cable
- 450 MHz antenna
- 450 MHz base station transmitter
- Power / data cable (P/N 50166)
- AgRemote utility, version 3.04 or later

Configuring the radio frequency, protocol, and radio link in the AgRemote utility

1. Ensure that the 450 MHz AG-715 integrated radio is correctly installed to the AG-372 GNSS receiver.
2. Use the power/data cable to connect the AG-372 GNSS receiver to the computer.

Note – *The receiver is connected to the computer,* ***not to the radio****. The radio uses the AG-372 connection to communicate with the computer.*

3. Once connected, run the AgRemote utility:

Note – *To return to the home screen at any time, press* ESC.

4. Press [>] until you reach *Configuration,* press [v] as required to reach *DGPS Config* and then press [>] until *RTK Config* shows on the screen:

5. Press [v] until you reach *Radio Freq* and then press [>] until the cursor blinks:

6. Press [^] to cycle through the frequencies until *New Freq* appears:

7. Press [>] to change the frequency—when the cursor blinks:
   - Press [^] to enter the first three digits (whole number) of the frequency.
   - Press [>] to move the cursor to the right to enter the decimal number of the frequency.
   - Press the enter button to enter the frequency.

Note – *Press* [>] *and* [^] / [v] *to select the new frequency. Once you see the frequency that you programmed press the enter button again to activate it*:

8. To show the radio mode, press [v] once:

9. Press [>] to activate the cursor and then press [^] or [v] to select the appropriate *Protocol* and *Link Rate.*
10. Once selected, press the enter button to activate the mode you selected.
11. Press [ESC] to return to the home screen.

Note – *To set the radio for a 25 k bandwidth, select any protocol at 9600 bps. To set the radio for a 12.5 k bandwidth, select any protocol at 4800 bps.*

CHAPTER

6

Troubleshooting

In this chapter:

This chapter describes some problems that can arise and explains how to solve them. It includes a series of flowcharts to help with troubleshooting.

Note – *As you work through this chapter, you may need to view the receiver status or change values in some fields. For information on how to do this, refer to the document called NMEA-0183 Messages Guide for AgGPS Receivers. This document is on the Trimble website (www.trimble.com)*

Global Navigation Satellite System (GNSS)

Problem	Possible solution
Poor accuracy	
The accuracy of GNSS positions is poor because the receiver is picking up poor quality signals from the satellites. The receiver always calculates the most accurate position it can, given the current GNSS satellite differential operating conditions.	Change some or all of the following GNSS settings: • Minimum elevation – Increase the setting (the default is 8°). • Minimum Signal Strength – Increase the System Mask AMU setting (the default is 3). • Maximum PDOP – Decrease the setting (the default is 13). • GNSS Mode – Change to Manual 3D (the default is Auto 2D/3D). • DGNSS Mode – Change to DGNSS (the default is DGNSS Auto/On/Off).
GNSS signals are reflecting off nearby trees and/or metal buildings and horizontal surfaces.	To reduce multipath noise, mount the GNSS receiver so that it has a clear view of the sky. The receiver must be away from trees and large metal objects.
Intermittent loss of lock on satellite	
The receiver loses the satellite signal from time to time.	Make sure that the receiver is mounted on the highest point of the vehicle and is clear of metal surfaces. Check Maximum PDOP and Minimum Signal Strength settings (see **Poor accuracy**, above).
Intermittent DGNSS signal	
The correction signal strength can drop to unusable levels. Causes include tree canopy cover between the receiver and the differential satellite, radar sets, and microwave transmitters.	Move the receiver away from the tree cover and/or from sources of electromagnetic interference.

Problem	Possible solution
Tracking but not receiving a differential signal The receiver is tracking satellites and tracking an OmniSTAR satellite beam, but is not receiving DGNSS signals. The *Home* screen indicates how many satellites are being tracked, and whether a differential source is being tracked. You see: h-3D for HP not converged H-3D for HP converged r-3D for RTK float R-3D for RTK fixed D-3D for DGNSS HP and RTK also give an indication of positional accuracy on the *Home* screen (AgRemote).	Check that your DGNSS service subscription is still current and enabled. For OmniSTAR service: 1. Use the AgRemote utility to navigate to one of the following screens, depending on what you are using: • the *Omni HP Info* screen • the *Omni VBS Info* screen. 2. Press ▸ until *Stop Date* appears. If the message **Access Unknown** appears, contact OmniSTAR to reactivate your subscription. For more information, see OmniSTAR, page 34. The receiver must be switched on and configured to track the correct satellite coverage beam before it can be reactivated. The receiver automatically tracks the correct beam based on receiver geographic location. If the receiver is manually changed, automatic tracking is deactivated until you perform a hard reset or firmware flash. When a satellite subscription is activated, the *Home* screen displays **D/3D**.
No GNSS position output from the receiver after connecting to AgRemote When the receiver is connected to the AgRemote utility, AgRemote automatically resets the port communication settings on the receiver to 8-O-1 TSIP 115 K for both input and output. This enables optimal communication with an office computer. If the receiver is to work with an Autopilot system, however, the receiver port communication settings must be 8-N-1 TSIP 38.4 K. To work with some other devices and software programs, the receiver port communication settings must be 8-N-1 NMEA 4800. If AgRemote has changed the settings, you will need to change them back manually.	Connect AgRemote. Then reset the port communication settings to NMEA output. For more information, see Configuring the communication ports, page 40.
Long time to initialize In RTK mode, longer baselines require longer initialization times. (The baseline is the distance between the base receiver and the rover receivers.)	Wait for the receiver to initialize or consider repositioning the base receiver to shorten the baseline. Make sure the rover is in a clear area.

Problem	Possible solution
Loss of initialization	
In RTK mode initialization can be lost when the rover receiver is close to trees or buildings and the number of satellites falls below four. Additionally, initialization may be lost if the receiver has not been tracking RTK corrections for some time. For more information, see the next item.	Move away from trees and obstructions to initialize. Once initialized, approach the obstructed area again. If the obstructions are severe, GNSS positioning may not work in that area. Because the GNSS satellites move, there may be times of the day when you are working in an area with obstructions. For more information, see the Trimble Planning software on the Trimble website (www.trimble.com).
Not tracking RTK corrections	
The radio link is down or intermittent.	• Ensure that the line-of-sight between the base and rover receivers is not obstructed. • Ensure that the rover receiver is within range of the radio. • Ensure that the radio power supply is on.

Interference

Problem	Possible solution
Strong magnetic fields Strong magnetic fields have no effect on GNSS or satellite DGNSS signals. However, some computers and other electric equipment radiate electromagnetic energy that can interfere with a GNSS receiver.	If you suspect interference from a local magnetic field, move the receiver away from, or turn off, the suspect electronics while observing the number of satellites being tracked on the receiver or the signal-to-noise ratio (SNR) of the satellite. If the SNR goes up when the electronics are turned off, there may be interference from the local electronics.
FM 2-way radios Transmitting FM 2-way radios can interfere with OmniSTAR, WAAS, and GNSS signal reception.	Make sure that there is at least 1 m (3 ft) between the FM 2-way radio antenna and the receiver.
Engine noise An unshielded ignition system can cause enough noise to block reception of a differential signal.	Use resistor spark plug wires on the vehicle ignition system.
An alternator can cause noise that interferes with a differential signal.	Use bypass capacitors, commonly available in automotive stores for cleaning up interference to CB and other radios. If the problem persists, shield engine components with aluminum foil.
	Relocate the antenna on the machine. Determine the optimal antenna location by watching the SNR value on the AgRemote Home screen.
	Note – *Before replacing engine parts in an attempt to solve this problem, make sure that the problem is not caused by a computer or power source near the receiver. Some computers and their power sources cause noise that disrupts GNSS and satellite DGNSS signals.*

GNSS receiver

Problem	Possible solution
Mounting location The receiver is not picking up a clear signal.	Mount the receiver on the centerline of the vehicle, away from any sources of interference and with a clear view of the sky (see Choosing a location, page 18).
Cables One of the cables seems faulty.	Use an ohmmeter to check the cable. The resistance of a good cable between connector pins at each end of the cable is zero. If the cable is sound, but the problem persists, try exchanging the cable with one that you know is working. If the cable is defective, contact your local Trimble Reseller for an RMA number (if the Trimble product is still under warranty), or to purchase a replacement cable.

Problem	Possible solution
Real-time clock battery A Lithium-ion battery in the receiver powers the internal real-time clock and so enables the receiver to get a first fix faster. The battery has a life of 7.5 years. When the battery fails, the internal clock cannot keep accurate time and the receiver may take longer to output GNSS positions.	Please ***contact your local Trimble Reseller*** to get the batteries replaced. You cannot replace the battery yourself.
Factory defaults You need to restore the receiver factory defaults.	To restore receiver factory default settings: 1. Connect the receiver to a computer. Turn on the receiver. 2. Run the AgRemote utility. 3. Navigate to the *Clear BB RAM* screen. 4. Press 🗗 until **Yes** appears. 5. Press ↵. The factory default settings are restored. The DGNSS service subscription is not lost.

AgRemote utility

Problem	Possible solution
AgRemote cannot communicate with the receiver. All you see is a blank screen.	1. Make sure that: • the receiver is connected to a 12–32 V DC power source • all cable connections between the receiver and the computer are secure • you are using the correct COM port 2. Turn off the receiver then turn it on again. 3. Select *File* / *Connect*.

FlashLoader 200 upgrade utility

Problem	Possible solution
The FlashLoader 200 upgrade utility cannot detect the receiver or download the firmware.	Make sure that: • Other programs, such as AgRemote and Microsoft® ActiveSync® technology, are not using the COM port that the computer is using. • The receiver is connected to a 12–32 V DC power source. • All cables are connected correctly between the device and the computer. • The receiver is connected to the correct computer COM port. To do this: 1. From the FlashLoader 200 menu, select *Settings*. 2. Select the check box for a serial link. 3. At *Port*, select Auto. Click **OK**. 4. Select the *Upload firmware to receiver* check box. 5. Navigate to where the firmware file is saved and select the file. Click **Proceed**. 6. From the *Auto Port Select dialog,* select *Use receiver on port* and then click **OK**. Once you have checked this, turn off the receiver then turn it on again. Try again to connect the FlashLoader 200 utility.

APPENDIX

A

Specifications

In this appendix:

This appendix lists the specifications of the Trimble AG-372 GNSS receiver and its settings.

Physical characteristics

The following table lists the physical characteristics of the Trimble AG-372 combined GNSS/DGNSS receiver and antenna:

Item	Description
Size	300 mm (11.7 in) wide x 309 mm (12.05 in) deep x 70 mm (2.73 in) high
Weight	1.9 kg
Power	Nominal 350 mA at 12 V DC
Operating temperature	–30 °C to +70 °C (–22 °F to +158 °F)
Storage temperature	–40 °C to +85 °C (–40 °F to +185 °F)
Humidity	Complies with Mil 810E Method 507.3 Procedure III Aggravated Cyclic Humidity. Ten 24 hour cycles of constant 95% RH, with cycling temperature and dwells +30 °C (+86 °F) and +60 °C (140 °F). Unit sealed to +/- 5 PSID
Casing	Low-profile UV-resistant plastic. Dust-proof, waterproof, shock resistant, with recessed protected connectors.
Connectors	12-pin Deutsch connectors
Ports	Two connection ports, both of which support RS-232 and CAN
Mounting	Three holes for 10 mm (0.39 in) bolts
Compliance	FCC Part 15 Class A, C-Tick, E-mark, CE-mark

GNSS channels

The following table lists the performance characteristics of GNSS channels:

Item	Description
General	220-channel, parallel tracking L1 1571.42 MHz and L2 1227.60 MHz. C/A code and carrier phase filtered measurement.
Update rate	1, 5, 10 Hz
RTK speed accuracy	0.16 kph (0.10 mph)
RTK position accuracy	Horizontal 2.5 cm (0.98 in) + 2 ppm, 2 sigma, and vertical 3.7 cm (1.46 in) + 2 ppm, 2 sigma, if all of the following criteria are met: • At least 5 satellites • PDOP <4 • CMR corrections • Standard format broadcast from an *Ag*GPS 442, *Ag*GPS 542, or equivalent reference station

Item	Description
RTX position accuracy	Horizontal 4 cm 2 sigma (no ppm for RTX mode) and vertical 6 cm 2 sigma ***RTX standard*** achieves full accuracy within 1 hour with satellite or cellular modem correction delivery. ***RTX fast*** achieves full accuracy within 1 min with satellite correction delivery, if: • There are at least 5 satellites • HDOP <4
Differential speed accuracy	0.16 kph (0.1 mph)
Differential position accuracy	Less than 1 m (3.28 ft) horizontal if all of the following criteria are met: • At least 5 satellites • PDOP <4 • RTCM SC-104 corrections • Standard format broadcast from an *Ag*GPS 442, *Ag*GPS 542, or equivalent reference station
OmniSTAR HP speed accuracy	0.16 kph (0.1 mph)
OmniSTAR HP position accuracy	10 cm (3.94 in) after convergence, 2 sigma, if all the following criteria are met: • At least 5 satellites • PDOP <4 • OmniSTAR HP corrections Convergence time can vary, depending on the environment. Time to the first fix (submeter accuracy) is typically <30 seconds; time to the first useable fix (<10 cm accuracy) is typically <30 minutes.
Time to first fix	<30 seconds, typical
Multipath mitigation	EVEREST technology
Satellite differential compatibility	OmniSTAR, WAAS, and EGNOS
NMEA messages	GGA 1 1[1], GLL, GSA1, GST, GSV, GST, MSS, PTNLDG, PTNL PJK, PTNL PJT, PTNL VGK, PTNL VHD, PTNLEV, PTNLID, PTNLSM, RMC1, VGK, VTG1, XTE, ZDA

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

L-band satellite differential correction receiver

The following table lists the characteristics of the L-band satellite differential correction receiver with OmniSTAR support:

Item	Description
Bit error rate	10^{-5} for Eb/N of >5.5 dB
Acquisition and reacquisition time	<5 seconds, typical
Frequency band	1525–1559 MHz
Channel spacing	0.5 kHz

Receiver default settings

The following table lists the receiver default settings:

Item	Description
DGNSS source	WAAS/EGNOS
GNSS support	GPS/GLONASS
Dynamics	Land
SNR mask	24 dB
Elevation mask	5°
PDOP mask	30
Position rate	10 Hz
DGNSS mode	Auto On/Off
DGNSS correction timeout	250 seconds

APPENDIX

B

Third-Party Interface Requirements

In this appendix:

This appendix describes the interface requirements for third-party software and hardware.

Third-party software

The following table lists the interface requirements for connecting a receiver to third-party software.

Use cable P/N 50166, or cable P/N 30945 with cable P/N 50581, when connecting to the third-party software products listed.

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

Third-party hardware

The following table lists the interface requirements for connecting a receiver to third-party hardware.

Hardware	Company	Protocol	NMEA messages	Baud	Other	Pos rate	Cable P/N
AMS	Raven	NMEA	GGA, VTG	9600	8-N-1	1 Hz	
Ag Navigator	Springhill	RTCM		9600	8-N-1	10 Hz	
Aim Navigator	Case Tyler	NMEA	GGA	19200	8-N-1	5 Hz	50166, or 30945 plus 50581
Contour	Position Inc.	NMEA	GGA	19200	8-N-1	5 Hz	
Marker	RDS or Position Inc.	NMEA	GGA	19200	8-N-1	5 Hz	
Falcon	Ag Chem	NMEA	GGA, VTG	4800	8-N-1	1 Hz	
Falcon w/ Falcon Track LBAR	Ag Chem	NMEA	GGA, VTG	19200	8-N-1	10 Hz	
Swath Smart or RGL 500 (LB-5 for Raven)	Raven, Starlink manufactured	NMEA	GGA, VTG or RMC	19200	8-N-1	10 Hz	50166, or 30945 plus 50581
LB-3, LB-4, and LB-5	Starlink	NMEA	GGA, VTG or RMC	19200	8-N-1	10 Hz	
YM2000 Yield Monitor [1]	Ag Leader	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903 plus 50581
PF3000 Yield Monitor [1]	Ag Leader	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903 plus 50581
PF3000Pro Monitor without internal GNSS [2]	Ag Leader	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903 plus 50581
AFS Yield Monitor	Case-IH (Ag Leader YM2000)	NMEA	GGA, VTG	4800	8-N-1	1 Hz	32609 plus 50581
AFS Yield Monitor	Case-IH YMIU (yield monitor interface unit) manufactured by Ag Leader for Case-IH	NMEA	GGA, VTG	4800	8-N-1	1 Hz	32609 plus 50581
GreenStar Yield Monitor [3]	John Deere	NMEA	GGA, GSA, RMC	4800	8-N-1	1 Hz	34189 plus 50581
New Holland Yield Monitor	New Holland (Ag Leader PF3000)	NMEA	GGA, VTG	4800	8-N-1	1 Hz	39903 plus 50581
VCD (Vision Display Controller)	Rockwell	NMEA	GGA, GLL, VTG, ZDA	4800	8-N-1	1 Hz	50166, or 30945 plus 50581
Swath XL	Midtech	NMEA	GGA	19200	8-N-1	5 Hz	50166, or 30945 plus 50581

Hardware	Company	Protocol	NMEA messages	Baud	Other	Pos rate	Cable P/N
Caterpillar Cebis Yield Monitor	Claus	NMEA	GGA	4800 or 9600	8-N-1	1 Hz	50166, or 30945 plus 50581
AGCO FieldStar Yield Monitor [4]	AGCO	NMEA	GGA, VTG, GSV, GSA	4800	8-N-1	1 Hz	39903 plus 50581

[1] P/N 39903 replaced old Ag Leader cable P/N 30660.

[2] Connect to Aux port.

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

[4] AGCO unit requires a null modem RS-232 connection. Ag Leader cable P/N 39903 is wired correctly for connection.