SNM910 Site-Net Modem Getting Started Guide

Trimble SPS Modular GPS Receivers Help

This Help describes how to use the following products:

- Trimble SPS GPS receivers

  This family of receivers comprise the SPSx52 Modular GPS receiver, the SPSx51 Modular GPS receivers, the SPSx61 Modular Heading GPS receivers, and the SPS882 Smart GPS antenna.

- SNM910 site-net modem

Where necessary, this Help contains references to specific receivers in the product family. When information is specific to a particular model, then the specific model name is used.

Even if you have used other Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with GPS, visit the Trimble website (www.trimble.com) for an interactive look at Trimble and GPS.

Legal Notices

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Release Notice

This is the October 2009 release (Revision A) of the *SPS Receivers Help*. It applies to version 4.00 of the receiver firmware.

Product Limited Warranty Information

For applicable product Limited Warranty information, please refer to the Limited Warranty Card included with this Trimble product, or consult your local Trimble authorized dealer.

COCOM limits

The U.S. Department of Commerce requires that all exportable GPS products contain performance limitations so that they cannot be used in a manner that could threaten the security of the United States. The following limitations are implemented on this product:

- Immediate access to satellite measurements and navigation results is disabled when the receiver velocity is computed to be greater than 1,000 knots, or its altitude is computed to be above 18,000 meters. The receiver GPS subsystem resets until the COCOM situation clears. As a result, all logging and stream configurations stop until the GPS subsystem is cleared.

Notices

Class B Statement – Notice to Users. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules and Part 90. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This apparatus complies with Canadian RSS-GEN, RSS-310, RSS-210, and RSS-119.

Cet appareil est conforme à la norme CNR-GEN, CNR-310, CNR-210, et CNR-119 du Canada.

Europe

CE

The product covered by this guide are intended to be used in all EU member countries, Norway, and Switzerland. Products been tested and found to comply with the requirements for a Class B device pursuant to European Council Directive 89/336/EEC on EMC, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). Contains a Bluetooth radio module. These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment. The 450 MHZ (PMR) bands and 2.4 GHz are non-harmonized throughout Europe.

CE Declaration of Conformity

Hereby, Trimble Navigation, declares that the GPS receivers are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Australia and New Zealand

This product conforms with the regulatory requirements of the Australian Communications and Media Authority (ACMA) EMC framework, thus satisfying the requirements for C-Tick Marking and sale within Australia and New Zealand.

Taiwan – Battery Recycling Requirements

(SPSx51 and SPS882 only)

The product contains a removable Lithium-ion battery. Taiwanese regulations require that waste batteries are recycled.

廢電池請回收

Restriction of Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)

Trimble products in this guide comply in all material respects with DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive) and Amendment 2005/618/EC filed under C(2005) 3143, with exemptions for lead in solder pursuant to Paragraph 7 of the Annex to the RoHS Directive applied.

Waste Electrical and Electronic Equipment (WEEE)

For product recycling instructions and more information, please go to www.trimble.com/ev.shtml.

Recycling in Europe: To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power.), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to:
Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

FCC Declaration of Conformity

We, Trimble Navigation Limited.

935 Stewart Drive
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Sunnyvale, CA 94088-3642
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Declare under sole responsibility that DoC products comply with Part 15 of FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operaton

Unlicensed radios in Products

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operaton.

Licensed radios in Products

This device complies with part 15 of the FCC Rules.

Operation is subject to the condition that this device may not cause harmful interference.

Introduction

Related information

Sources of related information include the following:

- Release notes – The release notes describe new features of the product, information not included in the manuals, and any changes to the manuals. They can be downloaded from the Trimble website (www.trimble.com/support.shtml).
- Trimble training courses – Consider a training course to help you use your GPS system to its fullest potential. For more information, go to the Trimble website at www.trimble.com/training.html.

Technical support

If you have a problem and cannot find the information you need in the product documentation, contact your local dealer. Alternatively, go to the Support area of the Trimble website (www.trimble.com/support.shtml). Select the product you need information on. Product updates, documentation, and any support issues are available for download.

If you need to contact Trimble technical support, complete the online inquiry form at www.trimble.com/support_form.asp.

Your comments

Your feedback about the supporting documentation helps us to improve it with each revision. Email your comments to ReaderFeedback@trimble.com.

Getting Started Guides

SNM910 Site-Net Modem

Safety Information

Before you use your Trimble product, make sure that you have read and understood all safety requirements.

Use and care

This product is designed to withstand the rough treatment and tough environment that typically occurs in construction applications. However, the receiver is a high-precision electronic instrument and should be treated with reasonable care.

Caution – Operating or storing the receiver outside the specified temperature range can damage it.

Regulations and safety

Some SPS receiver models with Base capability contain an internal radio-modem for transmission or can transmit through an external data communications radio. Regulations regarding the use of the 410-470 MHz radio-modems vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. Other countries require end-user licensing. For licensing information, consult your local Trimble dealer.

All SPS receiver models are capable of transmitting data via Bluetooth.

Bluetooth, and 900 MHz[1] , (and 2.4 GHz radio-modems - ***Japan only***) operate in license-free bands.

The SNM910 contains an internal Quad-Band GSM 850/900/1800/1900MHz radio Modem.

Before operating a Trimble GPS receiver or GSM modem, determine if authorization or a license to operate the unit is required in your country. It is the responsibility of the end user to obtain an operator's permit or license for the receiver for the location or country of use.

For FCC regulations, see Legal Notices.

Type approval

Type approval, or acceptance, covers technical parameters of the equipment related to emissions that can cause interference. Type approval is granted to the manufacturer of the transmission equipment, independent from the operation or licensing of the units. Some countries have unique technical requirements for operation in particular radio-modem frequency bands. To comply with those requirements, Trimble may have modified your equipment to be granted Type approval.

Unauthorized modification of the units voids the Type approval, the warranty, and the operational license of the equipment.

Exposure to radio frequency radiation

For 450 MHz radio

Safety. Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment as a result of its actions in General Docket 79-144 on March 13, 1986.

Proper use of this radio modem results in exposure below government limits. The following precautions are recommended:

- *DO NOT* operate the transmitter when someone is within 20 cm (7.8 inches) of the antenna.
- *DO NOT* operate the transmitter unless all RF connectors are secure and any open connectors are properly terminated.
- *DO NOT* operate the equipment near electrical blasting caps or in an explosive atmosphere.
- All equipment must be properly grounded according to Trimble installation instructions for safe operation.
- All equipment should be serviced only by a qualified technician.

For license-free 900 MHz radio1

Caution – For your own safety, and in terms of the RF exposure requirements of the FCC, always observe the precautions listed here.

- *DO NOT* operate the transmitter when someone is within 20 cm (7.8 inches) of the antenna.
- Do not co-locate the antenna with any other transmitting device.

For 2.4 GHz radio2

Safety. Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment as a result of its actions in General Docket 79-144 on March 13, 1986.

Proper use of this radio modem results in exposure below government limits. The following precautions are recommended:

- *DO NOT* operate the transmitter when someone is within 20 cm (7.8 inches) of the antenna.

The maximum gain of the antenna must not exceed 8 dBi.

For Bluetooth radio

The radiated output power of the internal Bluetooth wireless radio is far below the FCC radio frequency exposure limits. Nevertheless, the wireless radio shall be used in such a manner that the Trimble receiver is 20 cm or further from the human body. The internal wireless radio operates within guidelines found in radio frequency safety standards and recommendations, which reflect the consensus of the scientific community. Trimble therefore believes that the internal wireless radio is safe for use by consumers. The level of energy emitted is far less than the electromagnetic energy emitted by wireless devices such as mobile phones. However, the use of wireless radios may be restricted in some situations or environments, such as on aircraft. If you are unsure of restrictions, you are encouraged to ask for authorization before turning on the wireless radio.

For GSM/GPRS radio

Safety. Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment as a result of its actions in General Docket 79-144 on March 13, 1986.

Proper use of this radio modem results in exposure below government limits. The following precautions are recommended:

- *DO NOT* operate the transmitter when someone is within 28 cm (11 inches) of the antenna.
- All equipment should be serviced only by a qualified technician.

Installing antennas

Caution –For your own safety, and in terms of the RF exposure requirements of the FCC, always observe these precautions:
– Always maintain a minimum separation distance of 20 cm (7.8 inches) between yourself and the radiating antenna.
– Do not co-locate the antenna with any other transmitting device.

Caution – The GPS antenna and its cabling should be installed in accordance with all national and local electrical codes, regulations, and practices.

The antenna and cabling should be installed where they will not become energized as a result of falling nearby power lines, nor be mounted where they are subjected to overvoltage transients, particularly lightning. Such installations require additional protective means that are detailed in national and local electrical codes.

Trimble SPS internal radios have been designed to operate with the antennas listed below. Antennas not included in this list are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

The antennas that can be used (country dependent) with the ***450 MHz radio*** are 0 dBi and 5 dBi whip antennas. The antennas that can be used (country dependent) with the ***900 MHz*** *radio* are 0 dBi, 3 dBi, and 5 dBi whip antennas. The antennas that can be used (country dependant) with the***2.4 GHz radio*** are 2 dBi and 8 dBi whip antennas.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

Battery safety

SPS receiver internal lithium-ion battery

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/ or property damage.
To prevent injury or damage:
– Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
– Do not expose the battery to fire, high temperature, or direct sunlight.
– Do not immerse the battery in water.
– Do not use or store the battery inside a vehicle during hot weather.
– Do not drop or puncture the battery.
– Do not open the battery or short-circuit its contacts.

WARNING - Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/ or property damage.
To prevent injury or damage:
– If the battery leaks, avoid contact with the battery fluid.
– If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
– If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

WARNING - Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/ or equipment damage. To prevent injury or damage:
– Do not charge or use the battery if it appears to be damaged or leaking.
– Charge the Lithium-ion battery only in a Trimble product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
– Discontinue charging a battery that gives off extreme heat or a burning odor.
– Use the battery only in Trimble equipment that is specified to use it.
– Use the battery only for its intended use and according to the instructions in the product documentation.

Connecting SPS receivers to a vehicle battery

WARNING – Use caution when connecting battery cable's clip leads to a vehicle battery. Do not allow any metal object or jewelry to connect (short) the battery's positive (+) terminal to either the negative (-) terminal or the metal of the vehicle connected to the battery. This could result in high current, arcing, and high temperatures, exposing the user to possible injury.

WARNING - When connecting an external battery, such as a vehicle battery, to an SPS receiver, be sure to use the Trimble cable with proper over-current protection intended for this purpose, to avoid a safety hazard to the user or damage to the product.

Changing the Radio module

SPS882 only

Trimble requires that you *do not* change from one version of a radio door assembly to another, for the following reasons:

- The regulatory compliance requirements will be violated. Operating such a product is illegal.
- The internal connector on the radio is not intended for multiple insertions or extractions. It may be damaged or break if overused.
- The seal integrity of the whole GPS receiver is compromised when the radio is removed. Users do not have the facilities to test the integrity of the seal.
- If the unit is outside of warranty, you can purchase another radio door, which must be installed by a Trimble authorized Service Provider. There are hardware limitations to this, so be very careful, especially with the 900 MHz doors.

Caution - Because of installation problems and country regulation issues, Trimble does not sell radio doors to end users. Trimble authorized Service Providers must comply with country regulations and install the correct radio only in defined and accepted receivers. Installing a radio in a non-specified GPS product or device voids any warranty of the radio and of the GPS product. It also subjects the service provider to penalties set forth by various government agencies. Trimble shall assume no liability for radios used in non-authorized products.

Wet locations

SPSx61 only

WARNING - This product is not intended to be used outdoors or in a wet location when it is powered by the Power over Ethernet (POE) interface, or by the external power supply.

WARNING - The external power adaptor and its associated power cord and plug are not intended to be installed outdoors, or in a wet location.

Use of Power over Ehternet

SPSx61 only

WARNING - When this product is connected to a Power over Ethernet connection, the source of the Ethernet power must meet IEEE 802.11af, and its DC output (Ethernet power source) must be completely isolated from earth ground (floating), or a shock hazard may exist.

WARNING - The external power adaptor and its associated power cord and plug are not intended to be installed outdoors, or in a wet location.

1. 900 MHz radios are not used in Europe.
2. 2.40 GHz radios are available initially only for Japan.

SNM910 Site-Net Modem: What's in the box

list of items.

Item	Part Number

SNM910 Site-Net Modem: Setting up a SIM card and IP address

Types of SIM cards

<which ones are suitable>

Obtaining a SIM card

How does a user get a card?

IP addresses

<Dynamic or static, public or private - which IP address type is required>

Trimble server?? as a solution

SNM910 Site-Net Modem: Connecting and turning on

Mounting brackets

Before the SNM910 modem can be installed, the correct mounting bracket must be attached to the host device:

1. Remove the rubber end bumpers from the host device to expose the two pairs of fixing holes on the underside of the host end caps.
2. Attach the mounting bracket using the four screws that are provided.
3. Replace the rubber end bumpers.

SIM card

Insert the SIM card into the SNM910 modem before attaching it to the host device:

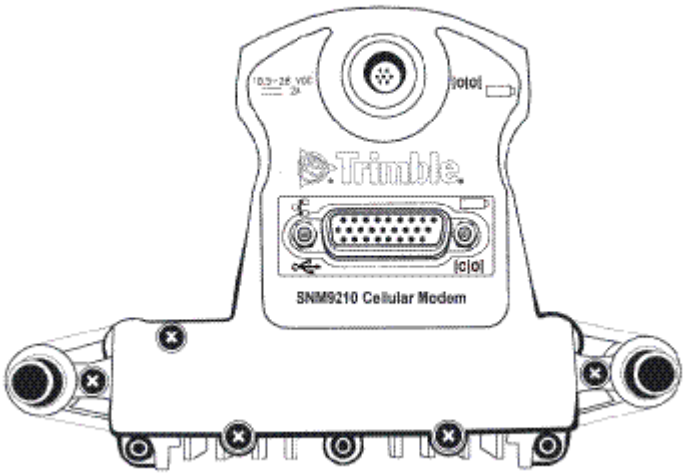
1. Remove the SIM slot cover by unscrewing the two screws.
2. Insert the SIM card with orientation as shown on the SNM910 casing.
3. Push the SIM card into the slot until it locks in place (i.e., it does not spring back when released).
4. Replace the SIM slot cover and tighten the two screws.

Attaching the SNM910 site-net modem to the host device

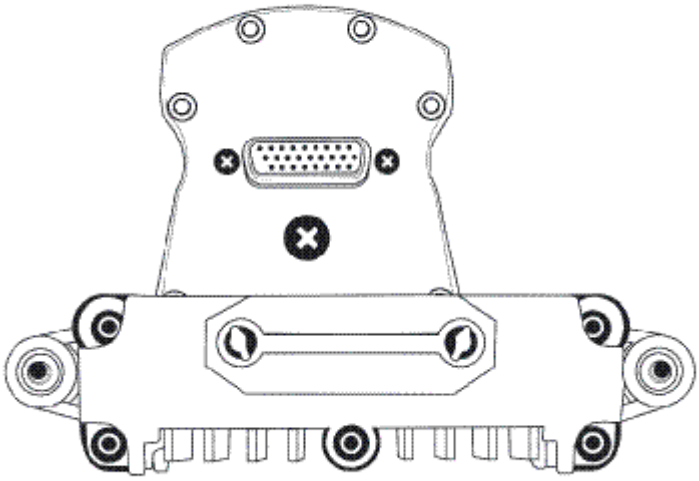
After the bracket has been attached and the SIM card installed, attach the SNM910 site-net modem to the host device:

1. Turn off the power on the host device.
2. Slide the SNM910 site-net modem into the supporting bracket and ensure that the 26-pin connector mates correctly with the host device.
3. Tighten the two thumb screws.
4. Connect an external power cable to the SNM910 site-net modem.
5. Turn on the host device.

Rear view



Front view



Cables

Part Number	SNM910 connection	Power connection	Power Source	Other connectors
46125-20	7-pin Lemo	'Croc' clips	Power from 12 V car battery	None

59044	7-pin Lemo	Cable with DC plug	Power from 12 V car battery	Serial
67384	7-pin Lemo	Cable with DC plug	Power to host devices from AC adapter	Serial-to-serial for Moving Base applications
57167	26-pin	Adapter with DC plug	Power from AC adapter	USB(B) socket and Ethernet socket
57168	26-pin	Adapter with DC plug	Power from AC adapter	Serial and Ethernet socket
77070-00	26-pin	Cable with DC plug	Power from AC adapter	2 x Serial, Ethernet plug, USB(A) plug, 1PPS (BNC)
78235-00	26-pin	Cable with DC plug	Power from AC adapter	2 x Serial, Ethernet socket

Using the SNM910 Site-Net Modem with the SPS Receivers

Using the SNM910 Site-Net Modem with the SPS Receivers

In this section:

- Web interface
- Front panel **<<link yet to be done>>**
- Setting up an iBase
- Setting up an SPS rover receiver

Configuring the SNM910 site-net modem for use with SPS receivers

SPSx61 and SPSx51 only

How to connect to host using a web browser.

Which web browsers are supported.

Description of web UI pages which are releavant to the SNM910:

- GPRS modem
- Network

- PPP
- I/O

Note –

Heading

Setting up a SNM910 site-net modem for use with a SPS rover receiver

SPSx61 and SPSx51 only

Photo of typical rover with an SNM910 on a marine vessel

step-by-step instructions

Note –

Heading

Connecting a SNM910 site-net modem to an SPS receiver using the Web interface

SPSx61 and SPSx51 only

How to connect to host using a web browser.

Which web browsers are supported.

Description of web UI pages which are releavant to the SNM910:

- GPRS modem
- Network
- PPP
- I/O

Note –

Heading

Using the SNM910 Site-Net Modem with the SNB900R Radio Modem

Use cases for a SNM910 site-net modem

Detail some use cases (line art of long road job with SNM910/SNB900 used for CMR rebroadcast)

Note –

Heading

SNB900 front panel

Description of front panel on host SNB900 that relate to the SNM910

Note –

Heading

Setting up a 900 MHz rebroadcaster

<photo of SNM910/SNB900 using AC supply in office>
<photo of SNM910/SNB900 using DC supply in field>
Mounting options - Tripod, benchtop, lighting pole
Step-by-step instructions

Note –

Heading

Getting the best performance

Choosing the best location for radio and cellular.

Note –

Heading

Connecting a SNM910 site-net modem to an SNB900 radio-modem using the Web interface

How to connect to host using a web browser.
Which web browsers are supported.
Description of web UI pages which are releavant to the SNM910:

- GPRS modem
- Network
- PPP
- I/O

Note –

Heading

Glossary

1PPS	Pulse-per-second. Used in hardware timing. A pulse is generated in conjunction with a time stamp. This defines the instant when the time stamp is applicable.
almanac	A file that contains orbit information on all the satellites, clock corrections, and atmospheric delay parameters. The almanac is transmitted by a GPS satellite to a GPS receiver, where it facilitates rapid acquisition of GPS signals when you start collecting data, or when you have lost track of satellites and are trying to regain GPS signals. The orbit information is a subset of the emphemeris/ephemerides data.
AutoBase	AutoBase technology uses the position of the receiver to automatically select the correct base station; allowing for one button press operation of a base station. It shortens setup time associated with repeated daily base station setups at the same location on jobsites.
base station	Also called *reference station*. A base station in construction, is a receiver placed at a known point on a jobsite that tracks the same satellites as an RTK rover, and provides a real-time differential correction message stream through radio to the rover, to obtain centimeter level positions on a continuous real-time basis. A base station can also be a part of a virtual reference station network, or a location at which GPS observations are collected over a period of time, for subsequent postprocessing to obtain the most accurate position for the location.
beacon	Source of RTCM DGPS corrections transmitted from coastal reference stations in the 283.5 to 325.0 kHz range.
BINEX	BInary EXchange format. BINEX is an operational binary format standard for GPS/GLONASS/SBAS research purposes. It has been designed to grow and allow encapsulation of all (or most) of the information currently allowed for in a range of other formats.
broadcast server	An Internet server that manages authentication and password control for a network of VRS servers, and relays VRS corrections from the VRS server that you select.
carrier	A radio wave having at least one characteristic (such as frequency, amplitude, or phase) that can be varied from a known reference value by modulation.
carrier frequency	The frequency of the unmodulated fundamental output of a radio transmitter. The GPS L1 carrier frequency is 1575.42 MHz.

carrier phase	Is the cumulative phase count of the GPS or GLONASS carrier signal at a given time.
cellular modems	A wireless adaptor that connects a laptop computer to a cellular phone system for data transfer. Cellular modems, which contain their own antennas, plug into a PC Card slot or into the USB port of the computer and are available for a variety of wireless data services such as GPRS.
CMR/ CMR+	Compact Measurement Record. A real-time message format developed by Trimble for broadcasting corrections to other Trimble receivers. CMR is a more efficient alternative to RTCM.
CMRx	A real-time message format developed by Trimble for transmitting more statellite corrections resulting from more satellite signals, more constellations, and more satellites. Its compactness means more repeaters can be used on a site.
covariance	A statistical measure of the variance of two random variables that are observed or measured in the same mean time period. This measure is equal to the product of the deviations of corresponding values of the two variables from their respective means.
datum	Also called *geodetic datum*. A mathematical model designed to best fit the geoid, defined by the relationship between an ellipsoid and, a point on the topographic surface, established as the origin of the datum. World geodetic datums are typically defined by the size and shape of an ellipsoid and the relationship between the center of the ellipsoid and the center of the earth. Because the earth is not a perfect ellipsoid, any single datum will provide a better model in some locations than in others. Therefore, various datums have been established to suit particular regions. For example, maps in Europe are often based on the European datum of 1950 (ED-50). Maps in the United States are often based on the North American datum of 1927 (NAD-27) or 1983 (NAD-83). All GPS coordinates are based on the WGS-84 datum surface.
deep discharge	Withdrawal of all electrical energy to the end-point voltage before the cell or battery is recharged.
DGPS	See real-time differential GPS.
differential correction	Differential correction is the process of correcting GPS data collected on a rover with data collected simultaneously at a base station. Because the base station is on a known location, any errors in data collected at the base station can be measured, and the necessary corrections applied to the rover data. Differential correction can be done in real-time, or after

	the data has been collected by postprocessing.
differential GPS	See real-time differential GPS.
DOP	Dilution of Precision. A measure of the quality of GPS positions, based on the geometry of the satellites used to compute the positions. When satellites are widely spaced relative to each other, the DOP value is lower, and position accuracy is greater. When satellites are close together in the sky, the DOP is higher and GPS positions may contain a greater level of error. PDOP (Position DOP) indicates the three-dimensional geometry of the satellites. Other DOP values include HDOP (Horizontal DOP) and VDOP (Vertical DOP), which indicate the accuracy of horizontal measurements (latitude and longitude) and vertical measurements respectively. PDOP is related to HDOP and VDOP as follows: $PDOP^2 = HDOP^2 + VDOP^2$.
dual-frequency GPS	A type of receiver that uses both L1 and L2 signals from GPS satellites. A dual-frequency receiver can compute more precise position fixes over longer distances and under more adverse conditions because it compensates for ionospheric delays.
EGNOS	European Geostationary Navigation Overlay Service. A satellite-based augmentation system (SBAS) that provides a free-to-air differential correction service for GPS. EGNOS is the European equivalent of WAAS, which is available in the United States.
elevation mask	The angle below which the receiver will not track satellites. Normally set to 10 degrees to avoid interference problems caused by buildings and trees, atmospheric issues, and multipath errors.
ellipsoid	An ellipsoid is the three-dimensional shape that is used as the basis for mathematically modeling the earth's surface. The ellipsoid is defined by the lengths of the minor and major axes. The earth's minor axis is the polar axis and the major axis is the equatorial axis.
emphemeris/ ephemerides	A list of predicted (accurate) positions or locations of satellites as a function of time. A set of numerical parameters that can be used to determine a satellite's position. Available as broadcast ephemeris or as postprocessed precise ephemeris.
epoch	The measurement interval of a GPS receiver. The epoch varies according to the measurement type: for real-time measurement it is set at one second; for postprocessed measurement it can be set to a rate of between one second and one minute. For example, if data is measured every 15 seconds, loading data using 30-second epochs means loading every alternate measurement.
feature	A feature is a physical object or event that has a location in the real world, which you want to collect position and/or descriptive information (attributes) about.

	Features can be classified as surface or non-surface features, and again as points, lines/breaklines, or boundaries/areas.
firmware	The program inside the receiver that controls receiver operations and hardware.
GLONASS	Global Orbiting Navigation Satellite System. GLONASS is a Soviet space-based navigation system comparable to the American GPS system. The operational system consists of 21 operational and 3 non-operational satellites in 3 orbit planes.
GNSS	Global Navigation Satellite System.
GSOF	General Serial Output Format. A Trimble proprietary message format.
HDOP	Horizontal Dilution of Precision. HDOP is a DOP value that indicates the accuracy of horizontal measurements. Other DOP values include VDOP (vertical DOP) and PDOP (Position DOP). Using a maximum HDOP is ideal for situations where vertical precision is not particularly important, and your position yield would be decreased by the vertical component of the PDOP (for example, if you are collecting data under canopy).
L1	The primary L-band carrier used by GPS and GLONASS satellites to transmit satellite data.
L2	The secondary L-band carrier used by GPS and GLONASS satellites to transmit satellite data.
L2C	A modernized code that allows significantly better ability to track the L2 frequency.
L5	The third L-band carrier used by GPS satellites to transmit satellite data. L5 will provide a higher power level than the other carriers. As a result, acquiring and tracking weak signals will be easier.
Location RTK	Some applications such as vehicular-mounted site supervisor systems do not require Precison RTK accuracy. Location RTK is a mode in which, once initialized, the receiver will operate either in 10 cm horizontal and 10 cm vertical accuracy, or in 10 cm horizontal and and 2 cm vertical accuracy.
Mountpoint	Every single NTripSource needs a unique mountpoint on an NTripCaster. Before transmitting GNSS data to the NTripCaster, the NTripServer sends an assignment of the mountpoint.
Moving Base	Moving Base is an RTK positioning technique in which both reference and rover receivers are mobile. Corrections are sent from a "base" receiver to a "rover" receiver and the resultant baseline (vector) has centimeter-level accuracy.

MSAS	MTSAT Satellite-Based Augmentation System. A satellite-based augmentation system (SBAS) that provides a free-to-air differential correction service for GPS. MSAS is the Japanese equivalent of WAAS, which is available in the United States.
multipath	Interference, similar to ghosts on an analog television screen, that occurs when GPS signals arrive at an antenna having traversed different paths. The signal traversing the longer path yields a larger pseudorange estimate and increases the error. Multiple paths can arise from reflections off the ground or off structures near the antenna.
NMEA	National Marine Electronics Association. NMEA 0183 defines the standard for interfacing marine electronic navigational devices. This standard defines a number of 'strings' referred to as NMEA strings that contain navigational details such as positions. Most Trimble GPS receivers can output positions as NMEA strings.
NTrip Protocol	Networked Transport of RTCM via Internet Protocol (NTrip) is an application-level protocol that supports streaming Global Navigation Satellite System (GNSS) data over the Internet. NTrip is a generic, stateless protocol based on the Hypertext Transfer Protocol (HTTP). The HTTP objects are extended to GNSS data streams.
NTripCaster	The NTripCaster is basically an HTTP server supporting a subset of HTTP request/response messages and adjusted to low-bandwidth streaming data. The NTripCaster accepts request messages on a single port from either the NTripServer or the NTripClient. Depending on these messages, the NTripCaster decides whether there is streaming data to receive or to send. Trimble NTripCaster integrates the NTripServer and the NTripCaster. This port is used only to accept requests from NTripClients.
NTripClient	An NTripClient will be accepted by and receive data from an NTripCaster, if the NTripClient sends the correct request message (TCP/UDP connection to the specified NTripCaster IP and listening port).
NTripServer	The NTripServer is used to transfer GNSS data of an NTripSource to the NTripCaster. An NTripServer in its simplest setup is a computer program running on a PC that sends correction data of an NTripSource (for example, as received through the serial communication port from a GNSS receiver) to the NTripCaster. The NTripServer - NTripCaster communication extends HTTP by additional message formats and status codes.
NTripSource	The NTripSources provide continuous GNSS data (for example, RTCM-104 corrections) as streaming data. A single source represents GNSS data referring to a specific location. Source description parameters are compiled in

	the source-table.
OmniSTAR	The OmniSTAR HP/XP service allows the use of new generation dual-frequency receivers with the OmniSTAR service. The HP/XP service does not rely on local reference stations for its signal, but utilizes a global satellite monitoring network. Additionally, while most current dual-frequency GPS systems are accurate to within a meter or so, OmniSTAR with XP is accurate in 3D to better than 30 cm.
PDOP	Position Dilution of Precision. PDOP is a DOP value that indicates the accuracy of three-dimensional measurements. Other DOP values include VDOP (vertical DOP) and HDOP (Horizontal Dilution of Precision). Using a maximum PDOP value is ideal for situations where both vertical and horizontal precision are important.
postprocessing	Postprocessing is the processing of satellite data after it has been collected, in order to eliminate error. This involves using computer software to compare data from the rover with data collected at the base station.
real-time differential GPS	Also known as *real-time differential correction* or *DGPS*. Real-time differential GPS is the process of correcting GPS data as you collect it. Corrections are calculated at a base station and then sent to the receiver through a radio link. As the rover receives the position it applies the corrections to give you a very accurate position in the field. Most real-time differential correction methods apply corrections to code phase positions. While DGPS is a generic term, its common interpretation is that it entails the use of single-frequency code phase data sent from a GPS base station to a rover GPS receiver to provide sub-meter position accuracy. The rover receiver can be at a long range (greater than 100 kms (62 miles)) from the base station.
rover	A rover is any mobile GPS receiver that is used to collect or update data in the field, typically at an unknown location.
Roving mode	Roving mode applies to the use of a rover receiver to collect data, stakeout, or control earthmoving machinery in real time using RTK techniques.
RTCM	Radio Technical Commission for Maritime Services. A commission established to define a differential data link for the real-time differential correction of roving GPS receivers. There are three versions of RTCM correction messages. All Trimble GPS receivers use Version 2 protocol for single-frequency DGPS type corrections. Carrier phase corrections are available on Version 2, or on the newer Version 3 RTCM protocol, which is available on certain Trimble dual-frequency receivers. The Version 3 RTCM protocol is more compact but is not as widely

	supported as Version 2.
RTK	real-time kinematic. A real-time differential GPS method that uses carrier phase measurements for greater accuracy.
SBAS	Satellite-Based Augmentation System. SBAS is based on differential GPS, but applies to wide area (WAAS/EGNOS/MSAS) networks of reference stations. Corrections and additional information are broadcast via geostationary satellites.
signal-to-noise ratio	SNR. The signal strength of a satellite is a measure of the information content of the signal, relative to the signal's noise. The typical SNR of a satellite at 30° elevation is between 47 and 50 dBHz.
skyplot	The satellite skyplot confirms reception of a differentially corrected GPS signal and displays the number of satellites tracked by the GPS receiver, as well as their relative positions.
SNR	See signal-to-noise ratio.
Source-table	The NTripCaster maintains a source-table containing information on available NTripSources, networks of NTripSources, and NTripCasters, to be sent to an NTripClient on request. Source-table records are dedicated to one of the following: • data STReams (record type STR) • CASters (record type CAS) • NETworks of data streams (record type NET) All NTripClients must be able to decode record type STR. Decoding types CAS and NET is an optional feature. All data fields in the source-table records are separated using the semicolon character.
triple frequency GPS	A type of receiver that uses three carrier phase measurements (L1, L2, and L5).
UTC	Universal Time Coordinated. A time standard based on local solar mean time at the Greenwich meridian.
VRS	Virtual Reference Station. A VRS system consists of GPS hardware, software, and communication links. It uses data from a network of base stations to provide corrections to each rover that are more accurate than corrections from a single base station. To start using VRS corrections, the rover sends its position to the VRS server. The VRS server uses the base station data to model systematic errors (such as ionospheric noise) at the rover position. It then sends RTCM correction messages back to the rover.
WAAS	Wide Area Augmentation System. WAAS was established by the Federal Aviation Administration (FAA) for flight and approach navigation for civil aviation. WAAS

	improves the accuracy and availability of the basic GPS signals over its coverage area, which includes the continental United States and outlying parts of Canada and Mexico. The WAAS system provides correction data for visible satellites. Corrections are computed from ground station observations and then uploaded to two geostationary satellites. This data is then broadcast on the L1 frequency, and is tracked using a channel on the GPS receiver, exactly like a GPS satellite. Use WAAS when other correction sources are unavailable, to obtain greater accuracy than autonomous positions. For more information on WAAS, refer to the FAA website at http://gps.faa.gov. The EGNOS service is the European equivalent and MSAS is the Japanese equivalent of WAAS.
WGS-84	World Geodetic System 1984. Since January 1987, WGS-84 has superseded WGS-72 as the datum used by GPS. The WGS-84 datum is based on the ellipsoid of the same name.