

GETTING STARTED GUIDE

Trimble SPS351 GPS Receiver

Version 4.60
Revision A
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Release Notice

This is the April 2012 release (Revision A) of the SPS Modular Receiver documentation. It applies to version 4.60 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

This notice applies to the SPS351, SPS555H, SPSx61, SPS855, and SPS985 receivers.
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. Some equipment configurations include an optional 410 MHz to 470 MHz UHF radio transceiver module

compliant with 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:

- 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. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitters (except in accordance with the FCC multi-transmitter product procedures).

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

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

This notice applies to the SPSx51 and SPS985 receivers 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.

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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 operation.

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 operation.

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.

Safety information

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



WARNING – This alert warns of a potential hazard which, if not avoided, could result in severe injury or even death.



CAUTION – This alert warns of a potential hazard or unsafe practice that could result in minor injury or property damage or irretrievable data loss.

Note – *An absence of specific alerts does not mean that there are no safety risks involved.*

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

All Trimble receiver models described in this documentation are capable of transmitting data through Bluetooth wireless technology. Bluetooth wireless technology operates in license-free bands.

Before operating a Trimble 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 [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 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.

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.
-



WARNING – The GNSS 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 over-voltage transients, particularly lightning. Such installations require additional protective means that are detailed in national and local electrical codes.

Battery safety

Connecting the receiver 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 the 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.

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Introduction

Trimble SPS351 Modular GPS receivers are ideal for the following marine construction applications:

- DGPS rover receiver on marine vessel
- Site and marine rover applications using Location GPS augmentation, including OmniSTAR, Location RTK, SBAS, Beacon, and DGPS RTCM

The receiver has a keypad and display, so you can configure the receiver without using a controller or computer.

All the receivers can optionally record GPS data to the internal memory, and transfer the data over a serial or Ethernet connection.

Related information

Sources of related information include the following:

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.

External power

Sources of external power include:

- AC power
- 12 V vehicle battery
- Trimble custom external battery pack
- Generator power
- Solar panel

The receiver uses an external power source in preference to its internal batteries. If the receiver is not connected to an external power source, or if the external power supply fails, the internal batteries are used.

While carrying out static measurements for postprocessed computations using the internal memory, if no external power is supplied and the internal battery is drained, the receiver shuts down. No data is lost and when power is restored, the receiver restarts in the same status as it was when power was lost.

It is possible to turn off the internal battery using the web interface. In this case, when external power is switched off, there is a limited time (30 seconds) before the unit turns off.

Supported power cables

Part Number	Receiver Connection	Power Connection	Power Source	Other Connectors
46125-20	7-pin Lemo	'Croc' clips	Power from 12 V vehicle battery	None
59044-HH	7-pin Lemo	Cable with DC plug	Power to host devices from AC adapter	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
60789-00, 77070-00	26-pin	Cable with DC plug	Power from AC adapter	2 x Serial, Ethernet plug, USB(A) plug, 1PPS (BNC)
65791-00, 78235-00	26-pin	Cable with DC plug	Power from AC adapter	2 x Serial, Ethernet socket

Note – SPS855 low voltage cut-offs:

Power applied through the Lemo connector models a standard 12.4 V lead acid battery. Shut-down voltage is temperature-compensated and is designed to prolong the life of a lead acid battery and not place it into a deep discharge state.

Power applied through the 26-pin adaptor cable models a standard 11.1 V lithium-ion battery.

Shut-down voltage is temperature-compensated and is designed to prolong the life of a lithium-ion battery.

The external DC voltage supply can be used by the receiver if it is in the range stated by the label on the receiver.

Connecting the receiver to a vehicle battery



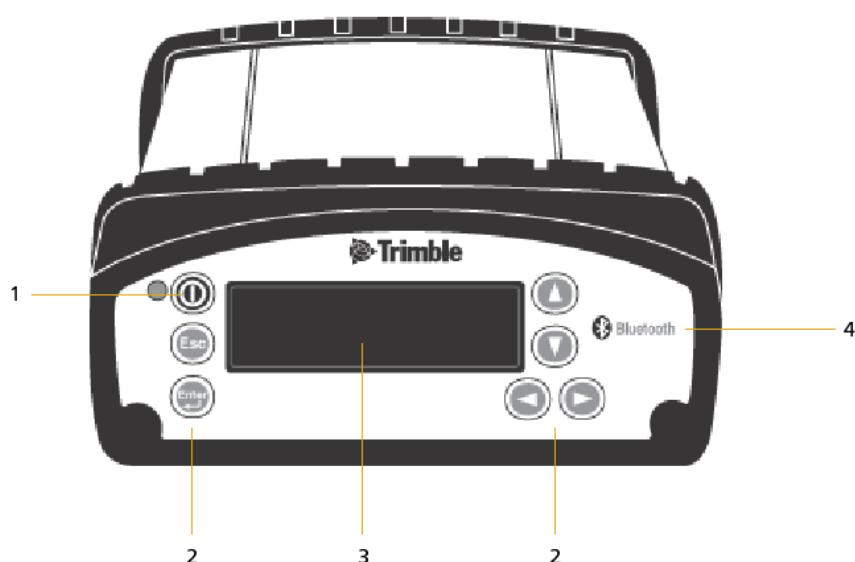
WARNING – Use caution when connecting battery cable's clip leads to a vehicle battery. Do not allow any metal object or jewelry to connect (short) the battery's positive (+) terminal to either the negative (-) terminal or the metal of the vehicle connected to the battery. This could result in high current,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



WARNING – When connecting an external battery, such as a vehicle battery, to the 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.

Front panel guide

Keypad and display



Item	Feature	Description
1	Power button	Indicates if the receiver is on or off.
2	Buttons	Used to turn on and configure the receiver.
3	Display	The receiver has a Vacuum Fluorescent Display that enables you to

Item	Feature	Description
		see how the receiver is operating and view the configuration settings.
4	Bluetooth antenna	Location of the Bluetooth antenna.

Button operations

Use the buttons on the front panel to turn the receiver on and off and to check or change the receiver settings.

Button	Name	Function
	Power	Turns the receiver on and off and performs reset operations.
	Escape	Returns to the previous screen or cancels changes being made on a screen.
	Enter	Advances to the next screen or accepts changes made on a screen.
	Up	Moves the cursor between multiple fields on a screen or makes changes to an editable field.
	Down	Moves the cursor between multiple fields on a screen or makes changes to an editable field.
	Left	Moves the cursor between characters in a field that can be changed.
	Right	Moves the cursor between characters in a field that can be changed.

Power button operations

Press the **Power** button  to turn the receiver on and off.

In addition, you can tap  to return to the *Home* screen, or hold down  to perform the following operations:

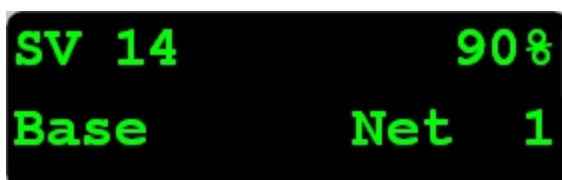
To...	Hold the Power button for...	Notes
turn off the receiver	two seconds	The display shows a countdown timer. When the display goes blank, release the Power button.
clear the almanac, ephemeris, and SV information	15 seconds	The display shows a countdown timer. When the display goes blank, continue to hold the Power button. The display shows a countdown time to clear the almanac and ephemeris. When the counter reaches 0, release the Power button.
reset the receiver to its factory	35 seconds	The display shows a countdown timer. When the display goes blank, continue to hold the Power button.

To...	Hold the Power button for...	Notes
defaults and the default application file		The display show a countdown to clear the almanac and ephemeris. When the counter reaches 0, continue to hold the Power button. The display indicates a countdown to resetting the receiver. When the counter reaches 0, release the Power button.
force the receiver to power down	at least 60 seconds	If the reset method above does not work, use this method to force the receiver to turn off. When the Power LED goes off, release the Power button.

Home screen

The *Home* screen is the main screen displayed on the receiver. If you briefly press the **Power** button, you return to the *Home* screen. It shows the number of satellites being tracked:

- When the receiver is in Base mode, the *Home* screen displays the number of satellites in view, that is, all satellites above the elevation mask. This is the number of satellites that the base station is sending data for:



- When the receiver is in Rover mode, the *Home* screen displays the number of satellites used to calculate the position.



Tip – To view these details using the web interface, select *Receiver Status / Position*.

Status screens

The receiver has several view-only status screens that allow you to review the current settings of the receiver. The status screens provide the following information:

- Position solution and precisions
- CMR and RTCM IDs or OmniSTAR satellite and link status
- Base name and code
- Latitude, longitude, and height
- Antenna height
- Horizontal and vertical precision
- Receiver model and hardware version
- Receiver firmware version

- Receiver serial number
- Receiver IP address

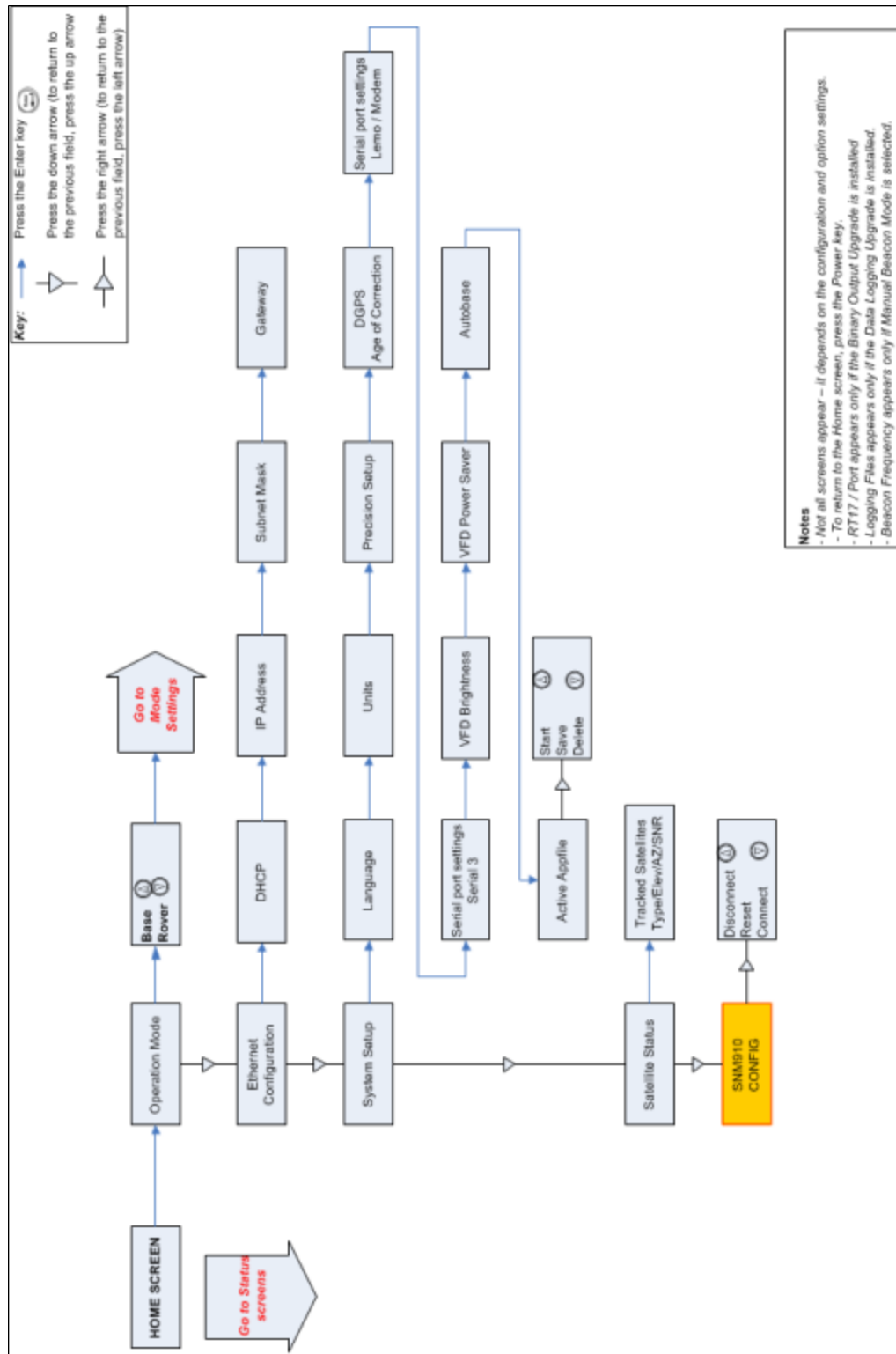
To access these screens from the Home screen, press  or .

Radio status

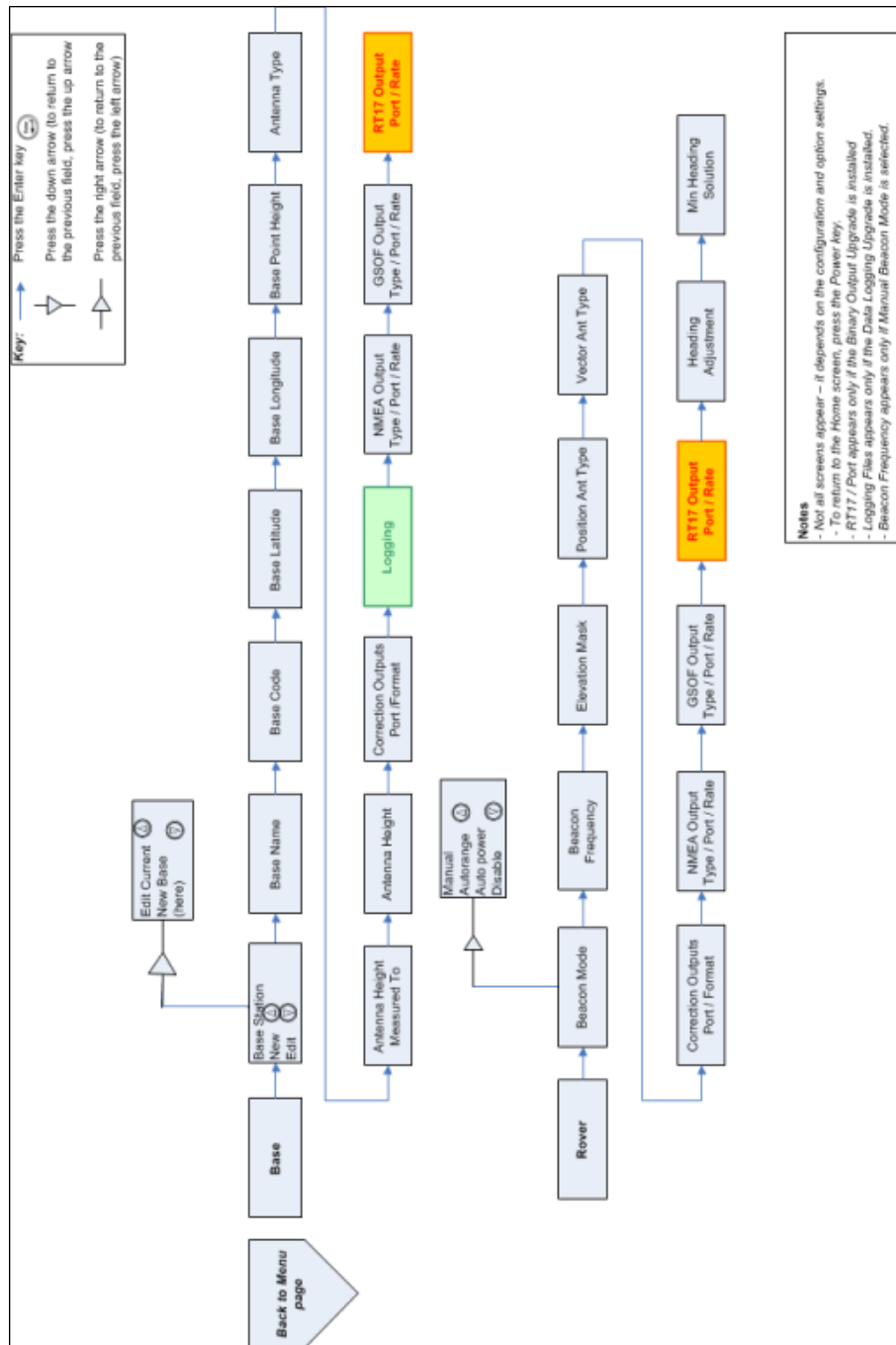
When a radio is installed (either 450 MHz or 900 MHz), the following status messages appear at the top line of the screen:

Message	Description
Tran	Transmitted a frame.
Recv	Received a frame.
Busy	Frame was blocked.
Sync	Got sync with base station.
Rept	Repeated a frame.
Sig	Got carrier detect.
Ovld	Radio bandwidth exceeded (data has probably been lost).

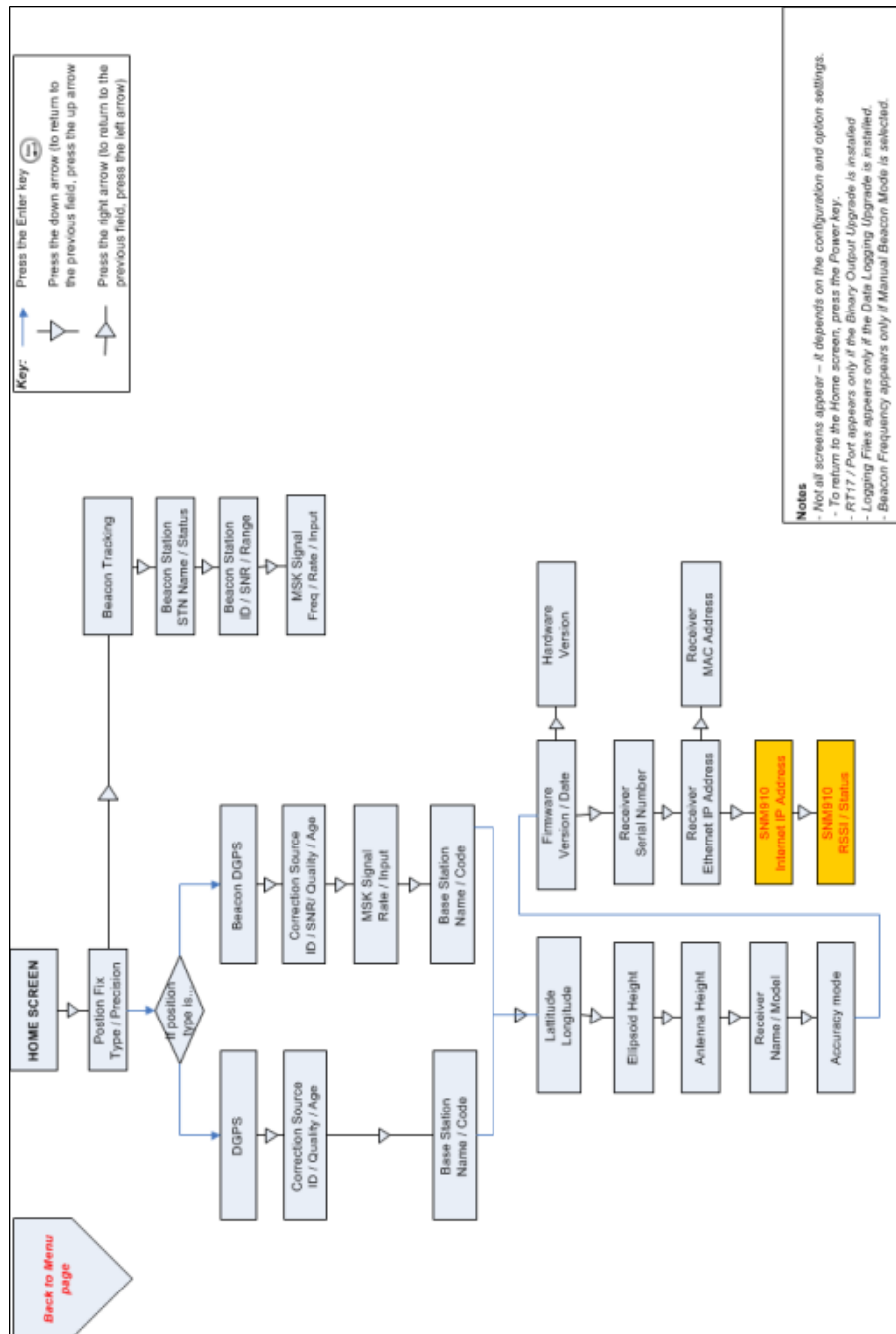
SPS351 configuration screens



SPS351 mode screens



SPS351 status screens



Configuring system settings

You can use the keypad and display of the receiver to configure the following settings:

- Display language
- Display and input units
- Baud rate, parity, data bits, and stop bits for serial ports
- Display power saver
- AutoBase
- Set position precisions

To access the system settings:

1. In the *Home* screen, press . Use the *Operation Mode* screen to configure system settings or mode settings, and to view the SV (satellite) status. Mode Settings is the default setting.
2. Press . When the operation mode begins to flash, the receiver is in Edit mode and you can change this setting.
3. Press  to change to *System Setup*.
4. Press  to accept the change.
5. Press  again.
6. Use the *Display Language* screen, if required, to change the language. Choose English, Finnish, French, German, Italian, Spanish, or Swedish. Press  to accept the change.
7. Press  again. Use the *Display and Input Units* screen, if required, to change the units to Meters or US Feet.
8. Press  to accept the change.
9. Press  again. Use the *Port Settings* screen, if required, to change the port.
10. Press  to accept the change.
11. Press  again. Use the *Screen Pwr Savr* screen to choose On, Off, or Auto. If you use the Auto setting, the screen turns off after 60 seconds of inactivity. The Power LED remains lit so that you can tell if the receiver is on or off. If an error message appears, the screen comes back on. Press  to accept the change and then press  again to move to the next screen.
12. If you are using an SPS Modular RTK base station, the *Autobase warning* screen appears.
13. Press  to accept the change.
14. Press  again. When the *Home* screen appears, the system setup is complete.

Turning off AutoBase technology

To turn off AutoBase technology, use either the receiver's keypad and display or the web interface.

When AutoBase technology is off, you can establish a new base station position in the receiver using the *Edit Current* or *New Base (Here)* menus. This does not automatically generate a new application file, but changes the settings in the current application file. When the receiver is turned on again, the most recent settings are always used.

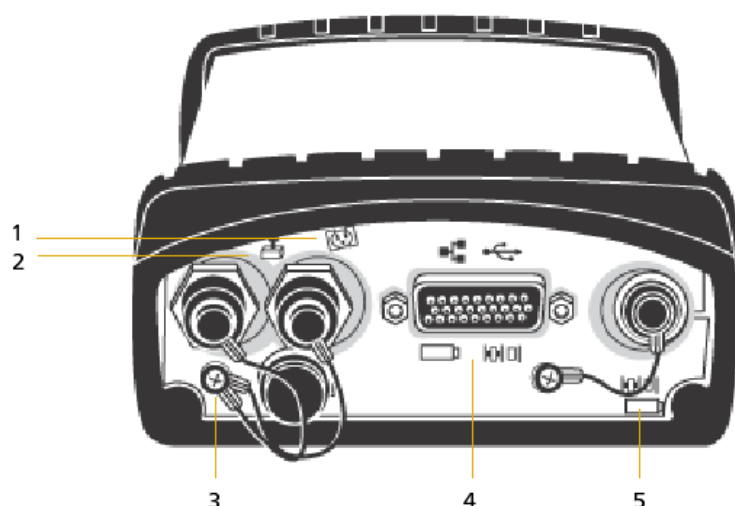
To turn off AutoBase technology using the receiver:

1. In the *Home* screen, press .
2. Press . When the operation mode begins to flash, the receiver is in Edit mode and you can change this setting.
3. Press  to change to *System Setup*.
4. Press  to accept the change.
5. Press  again. You start to scroll through options in the *System Setup* menu.
6. Keep pressing  until *Autobase* appears.
7. Press . The setting On flashes.
8. Press  until it displays Off. Press  to accept the change.
9. Press  again. The *Active Appfile* screen appears.

To change the application file:

- Press to display START Appfile.
- Press to show SAVE Appfile.
- Press to show DELETE Appfile.
- Press to show START Appfile.

Rear connectors



Item	Connector Type	Description
1	TNC	Connect to the GNSS antenna
2	- TNC (450 MHz Internal radio) - Reverse polarity TNC (900 MHz internal radio) - Not installed, system without internal radio	Connect to the radio antenna Note – Not available for the SPS351 receiver.
3	Vent plug	External venting plug for pressure equalization
4	High Density DB26	- Ethernet connectivity to a 10/100 Base-T network through an RJ45 jack on a multiport adaptor (P/N 57167 or P/N 57168) 'Slave' USB communications through the USB type B connector on the multiport adaptor (P/N 57167) 'Host' USB communications through the connector on the 26-pin cable (P/N 58339) - Primary power from an external power supply - External power input from an SPS700 total station battery cradle system - Full 9-wire RS-232 serial communications using the 26-9-pin multiport adaptor (P/N 57168) or a 26-pin serial communications cable 1PPS, 2 x RS-232 input DC, USB, Ethernet plug (P/N 60789-00 or P/N 77070-00) 2 x RS-232, DC, Ethernet socket (P/N 65791 or P/N 78235-00)
5	Lemo (7-pin/0-shell)	3 wire RS-232 serial communications using a 7-pin/ 0 shell Lemo cable - Secondary external power input - CAN

Signal tracking

This table shows the signal tracking capability for the receiver:

Signal Type	Class	SPS351	SPS555H
GPS signals	L1	☒	☒
	L2	☐	☒
	L2C	☐	☒
	L5	☐	Optional
QZSS	L1 C/A, L1C, L1 SAIF, L2C, L5		L5 Optional
GLONASS signals	L1/L2	☐	Optional
Galileo	L1 CBOC, E5A, E5B, and E5AltBOC8	☐	☒
Compass	B1, B2, B3		☒
SBAS corrections	WAAS	☐	☒
	EGNOS	☐	☒
	MSAS	☐	☒
OmniSTAR	XP	☐	N/A
	HP	☐	N/A
	VBS	☐	N/A

Variable configuration options

This table lists the default options for the receiver:

Configuration Option	SPS351	SPS555H	SPS855
Rover options			
Precise horizontal	-	-	Optional
Precise vertical	-	-	Optional
Moving Base/Heading	-	Yes	Optional
Location RTK	-	-	Optional
RTCM DGPS	Yes	-	Optional
Moving Base RTK range limit	-	2.4 km	None
Base options			
Static RTK	-	-	Optional
Moving Base/Heading	-	Yes	Optional
RTCM DGPS	Optional	-	Optional
General options			
Data logging	-	-	Optional
VRS support	DGPS	-	Yes
Max data rate	10 Hz	20 Hz	20 Hz

Upgrading the receiver

When you purchase the upgrade after you have received the receiver, your Trimble dealer will provide you with a code to change the receiver configuration.

The SPS855 can be upgraded as follows:

- With GLONASS, L5, Galileo, Compass.
- Models with 450 MHz UHF internal radio can be upgraded to 2 W transmission power, if it is legally allowed in its country of use.
- To allow internal data logging.
- To Location RTK rover 10/10, Location RTK rover 10/2, Precision RTK rover, Precision RTK base, Precision RTK base/rover, or Moving Base/Heading.

The SPS351 can be upgraded to include DGPS reference station capability.

Managing application files

You can use the front panel to manage application files in the receiver. You can see which application file the receiver is currently using and then choose to make changes to it and save it, load a different application file, or delete an application file.

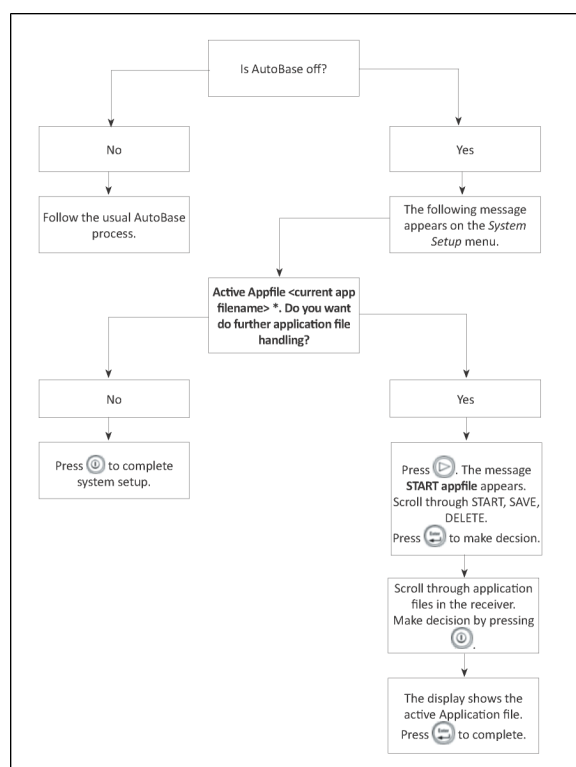
To manage the application files, use the *System Setup* menu (see the figure below). You can only manage application files when the AutoBase feature is turned off.

To save an application file, configure all the settings you need through the front panel and then save the file. When you save the file, the receiver provides a default filename, which you can change, based on the currently set mode. For example:

Receiver mode	Suggested application file name	Notes
Base	BASE01	Does not apply to the SPS555H receiver.
Heading	HDG01	
Moving Base	MB01	Does not apply to the SPS555H receiver.
Rover	ROV01	Does not apply to the SPS555H receiver.

Note – If you start an application file that is saved with AutoBase turned on in the file, then it turns on AutoBase in the receiver, even if it was off before the file was loaded.

The following figure shows how application files are handled through the front panel of the receiver:



Default receiver settings

These settings are defined in the default application file.

Function	Settings	Factory default
SV Enable	-	All SVs enabled
General Controls	Elevation mask	10°
	PDOP mask	99
	RTK positioning mode	Low Latency
	Motion	Kinematic
Lemo Port	Baud rate	38,400
	Format	8-None-1
	Flow control	None
Modem Port	Baud rate	38,400
	Format	8-None-1
	Flow control	None
Input Setup	Station	Any
NMEA/ASCII (all supported messages)		All ports Off
Streamed Output		All types Off
		Offset=00
RT17/Binary		All ports Off
Reference Position	Latitude	0°
	Longitude	0°
	Altitude	0.00 m HAE
Antenna	Type	Zephyr Geodetic Model 2
	Height (true vertical)	0.00 m
	Measurement method	Bottom of antenna mount

Default behavior

If a power-up application file is present in the receiver, its settings are applied immediately after the default settings. This means you can use a power-up file to define your own set of defaults. The factory defaults are also applied when you perform a full reset of the receiver because resetting the receiver deletes the power-up files.

Resetting the receiver to factory defaults

To reset the receiver to its factory defaults, do one of the following:

- Press  for 15 seconds.
- In the GPS Configurator software, select *Connect to Receiver* and then click **Reset Receiver** in the *General* tab.
- In the Configuration Toolbox software, select the *General* tab and then click **Reset Receiver**.

For more information on the GPS Configurator and Configuration Toolbox software, refer to the "Configuring the Receiver Settings" section of the *Trimble SPS Series Receiver Help*.

Troubleshooting receiver issues

This section describes some possible receiver issues, possible causes, and how to solve them. Please read this section before you contact Technical Support.

The receiver does not turn on

Possible cause	Solution
External power is too low.	Check the charge on the external power supply, and check the fuse if applicable. If required, replace the battery.
Internal power is too low.	Do the following: • Check the charge on the internal batteries and replace if required. • Ensure battery contacts are clean.
External power is not properly connected.	Do the following: • Check that the Lemo connection is seated properly. • Check for broken or bent pins in the connector.
Faulty external power cable.	Do the following: • Try a different cable. • Check pinouts with multimeter to ensure internal wiring is intact.

The receiver is not tracking any satellites

Possible cause	Solution
The GNSS antenna does not have clear line of sight to the sky.	Ensure that the antenna has a clear line of sight.
The cable between the receiver and the GNSS antenna is damaged.	Replace the cable.
The cable connections at receiver or antenna are not tightly seated, or are connected incorrectly.	Check all cable connections.

The receiver does not log data

Possible cause	Solution
Insufficient memory in the internal memory.	Delete old files using the GPS Configurator software, or press  for 30 seconds.
The receiver is tracking fewer than	• Wait until the SV Tracking LED is flashing slowly. Use the SCS900

Possible cause	Solution
four satellites.	software. - Go to the SkyPlot screen and press Ctrl+M to access the current elevation mask settings. Reduce the mask value to make more satellites available. - The default mask setting for receiver is 10° above the horizon. Change the value to a lower setting temporarily while you are waiting for a better constellation availability.
The data logging option is not enabled.	Check the original purchase order or the receiver configuration using the WinFlash utility. If data logging is not enabled on the receiver, you can order the option from your local Trimble Site Positioning Systems dealer, and upgrade the receiver using the WinFlash utility.

The receiver is not responding

Possible cause	Solution
The receiver needs a soft reset.	Turn off the receiver and then turn it back on again.
The receiver needs a full reset.	Press  for 30 seconds.

The receiver cannot be set up as a base station using the SCS900 software

Possible cause	Solution
The SPS Modular receiver may have been purchased as a rover receiver rather than with the optional base station capability.	Ask your local dealer to check the Option Bit settings, else check the setting yourself using the WinFlash utility. If required, upgrade the receiver.

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 GNSS satellite to a GNSS receiver, where it facilitates rapid acquisition of GNSS signals when you start collecting data, or when you have lost track of satellites and are trying to regain GNSS signals. The orbit information is a subset of the ephemeris/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 <i>reference station</i> . In construction, a base station 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 GNSS observations are collected over a period of time, for subsequent postprocessing to obtain the most accurate position for the location.
BINEX	Binary EXchange format. BINEX is an operational binary format standard for GPS/ GLONASS / SBAS research purposes. It is 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 satellite corrections resulting from more satellite signals, more constellations, and more satellites. Its compactness means more repeaters can be used on a site.

Compass	The BeiDou Navigation Satellite System (Compass) is a Chinese satellite navigation system. The first BeiDou system (known as BeiDou-1), consists of three satellites and has limited coverage and applications. It has been offering navigation services mainly for customers in China and from neighboring regions since 2000. The second generation of the system (known as Compass or BeiDou-2) consists of 35 satellites. It became operational with coverage of China in December 2011 with 10 satellites in use. It is planned to offer services to customers in Asia-Pacific region by 2012 and the global system should be finished by 2020.
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 <i>geodetic datum</i>. 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 GNSS 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 is collected by postprocessing.
differential GPS	See real-time differential GPS.
DOP	Dilution of Precision. A measure of the quality of GNSS 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 GNSS 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 GNSS. 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.
EHT	Height above ellipsoid.
ephemeris/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 GNSS 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.
Galileo	Galileo is a GNSS system built by the European Union and the European Space Agency. It is complimentary to GPS and GLONASS.
GHT	Height above geoid.
GIOVE	Galileo In-Orbit Validation Element. The name of each satellite for the European Space Agency to test the Galileo positioning system.
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.

GSO	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).
IBSS	Internet Base Station Service. This Trimble service makes the setup of an Internet-capable receiver as simple as possible. The base station can be connected to the Internet (cable or wirelessly). To access the distribution server, the user enter a password into the receiver. To use the server, the user must have a Trimble Connected Community site license.
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 Precision 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 GNSS. 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 GNSS 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 GNSS 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 GNSS 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.
QZSS	Quasi-Zenith Satellite System. A Japanese regional GNSS eventually consisting of three geosynchronous satellites over Japan.
real-time differential GPS	Also known as <i>real-time differential correction</i> or <i>DGPS</i>. 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 GNSS base station to a rover GNSS 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 GNSS 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 GNSS receivers. There are three versions of RTCM correction messages. All Trimble GNSS 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 using 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 GNSS signal and displays the number of satellites tracked by the GNSS 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 GNSS 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 GNSS 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 GNSS receiver, exactly like a GNSS 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.