

GETTING STARTED GUIDE

SPSX61 MODULAR GPS HEADING RECEIVER

Version 4.17
Revision A
September 2010



Legal Notices

Corporate Office

Trimble Navigation Limited
935 Stewart Drive
Sunnyvale, CA 94085
USA
www.trimble.com

Heavy Highway business area

Trimble Navigation Limited
Heavy Highway business area
5475 Kellenburger Road
Dayton, Ohio 45424-1099
USA

800-538-7800 (toll free in USA)

+1-937-245-5600 Phone

+1-937-233-9004 Fax

www.trimble.com

E-mail: trimble_support@trimble.com

Legal Notices

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Release Notice

This is the May 2010 release (Revision B) of the SPS Receivers Help. It applies to version 4.15 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

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.



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
PO Box 3642
Sunnyvale, CA 94088-3642
United States
+1-408-481-8000

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.

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 station capability contain an internal radio-modem for transmission or can transmit through an external data communications radio. Regulations regarding the use of the 410 MHz - 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 through Bluetooth wireless technology.

Bluetooth wireless technology, and 900 MHz¹ radio-modems (and 2.4 GHz radio-modems - [Japan only](#)) operate in license-free bands.

The SNM910 cellular modem 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 MHz¹ radio

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 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.

¹ 900 MHz radios are not used in Europe.

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 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 over-voltage 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.

Wet locations

WARNING – This product is not intended to be used outdoors or in a wet location when it is powered by the PoE interface, or by the external power supply. The connection is not waterproof and could be subject to electrical shorting.

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 Ethernet

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.

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Introduction

Trimble SPSx61 Modular GPS Heading receivers are ideal for the following site development and marine construction applications:

- RTK rover on site vehicle or marine vessels that require position and heading
- 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:

- 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.

Batteries and Power

Power over Ethernet (PoE)

The receiver is a PoE-capable device and can be powered using a single Ethernet cable from an IEEE802.3af capable network using one of the following cables/adaptors:

- P/N 57168
- P/N 65791-00, P/N 78235-00

Warning – This product is not intended to be used outdoors or in a wet location when it is powered by the POE interface, or by the external power supply. The product should only be used in these types of environments when operating on its own internal battery.

Warning – When this product is connected to a PoE 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). Otherwise, a shock hazard may exist.

External power

Sources of external power include:

- AC power
- 12 V car or truck battery
- Trimble custom external battery pack
- Generator power
- Solar panel

The SPSx61 does not have an internal battery and must be powered by an external power source using one of the following cables:

Part Number	SPS connection	Power connection	Power source	Other connectors
56653-10	26-pin	Adapter with Hirose	Power from SPS700 total station battery cradle system	None
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

SNM910 only

The cellular modem is powered by an external power source using any one of the following methods:

- Connect cable 46125-20 to the 7-pin Lemo socket and the 'croc-clips' to the 12 V car or truck battery.

- Connect cable 57167, 57168, 77070-00, or 78235-00 to the 26-pin connector and then connect the power jack from the Trimble AC power adapter to the power jack socket on the cable.
- Connect cable 59044 or 67384 to the 7-pin Lemo socket and then connect the power jack from the Trimble AC power adapter to the power jack socket on the cable.

When connected to the SPS852 modular receiver, the SNM910 cellular modem draws power from the internal battery of the SPS852.

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
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

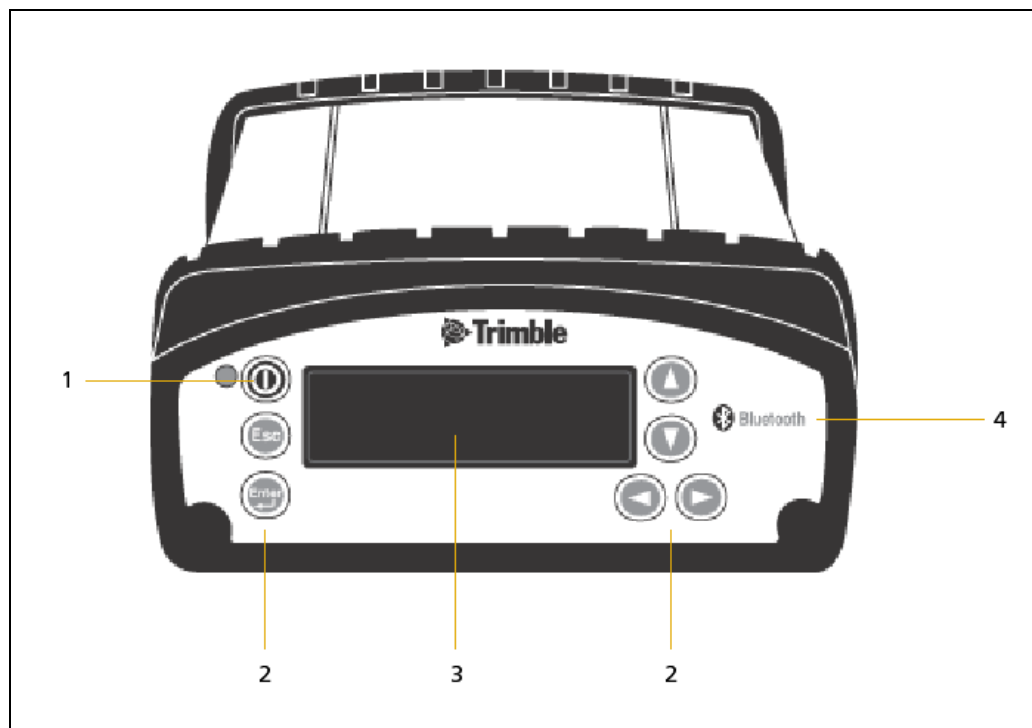
Connecting SPS receivers to a vehicle battery

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, ensure that you 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




Feature	Description
1 Power button	Indicates if the receiver is turned 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 see how the receiver is operating and view the configuration settings.
4 Bluetooth antenna	Location of the Bluetooth antenna.

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  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 defaults and the default application file	35 seconds	The display shows a countdown timer. When the display goes blank, continue to hold the Power button. 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.

Button operations

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

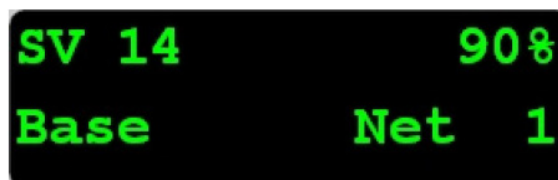
Button	Name	Function
	Power	Turns the receiver on and off and performs reset operations.
	Escape	Returns to the previous screen or cancels changes being made on a screen.
	Enter	Advances to the next screen or accepts changes made on a screen.
	Up	Moves the cursor between multiple fields on a screen or 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. Press this button to enter Edit mode.

Home screen

The Home screen is the main screen displayed on the receiver. If the receiver displays another screen and is left idle for 60 seconds, you are returned to the Home screen. It shows the following information:

- 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, Heading, or Moving Base mode, the Home screen displays the number of satellites used to calculate the position:

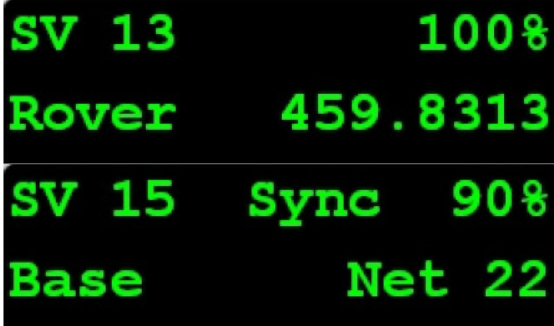


SV 11 100%
MBase Net 10

- If the receiver is set to use SBAS or OmniSTAR corrections, the Home screen displays the number of satellites that corrections have been received for.
- If the receiver is computing an autonomous solution, the Home screen displays all satellites in view, that is, all satellites above the elevation mask.

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

- Internal battery power remaining
- Current mode configuration
- Internal radio activity
 - If the receiver has an internal radio, the Home screen displays the frequency or channel being used and the transmit/receive status:



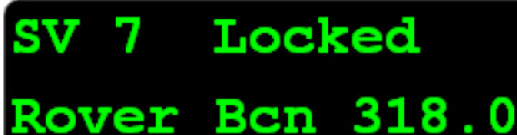
SV 13 100%
Rover 459.8313
SV 15 Sync 90%
Base Net 22

- Current Heading
 - If the receiver is in Heading mode, the Home screen displays the current heading:



SV 12 100%
Heading 340.22

- Beacon status and frequency
 - If the receiver is using MSK Beacon corrections, the Home screen displays the status of the signal and the frequency of the beacon station:





SV 7 Locked
Rover Bcn 318.0

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
- Base name and code or OmniSTAR mode and subscription
- Heading and Slope distance
- Latitude, longitude, and height
- Antenna height
- Horizontal and vertical precision
- Receiver model and hardware version
- Receiver firmware version
- Receiver serial number
- Receiver IP address

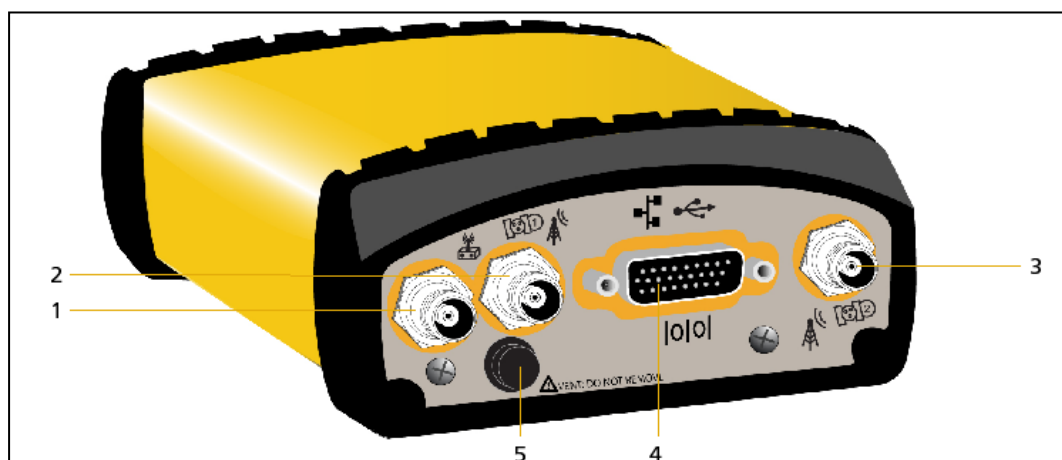
To access these screens from the Home screen, press  or .

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)

Rear Connectors

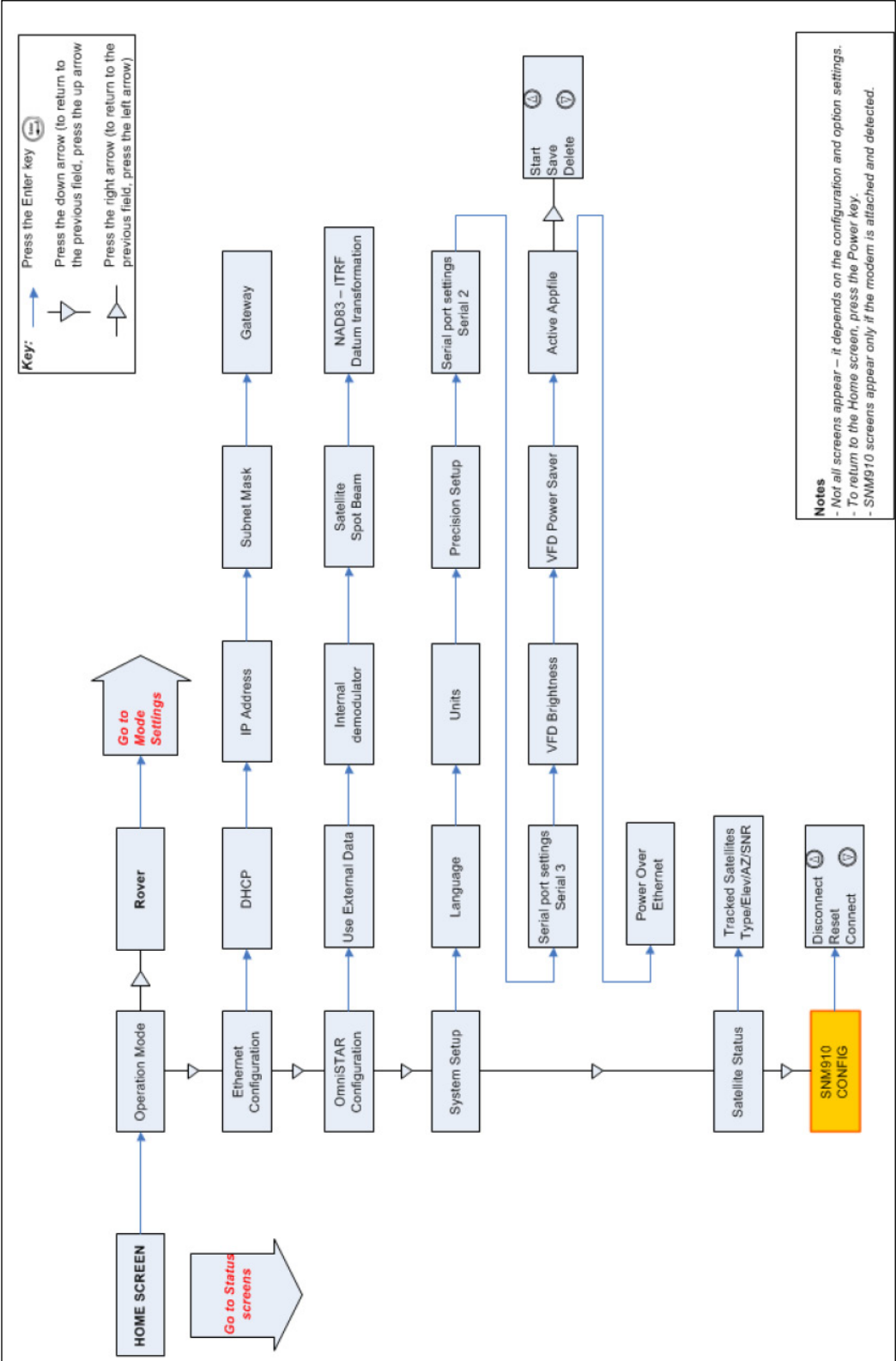


Rear view of the receiver

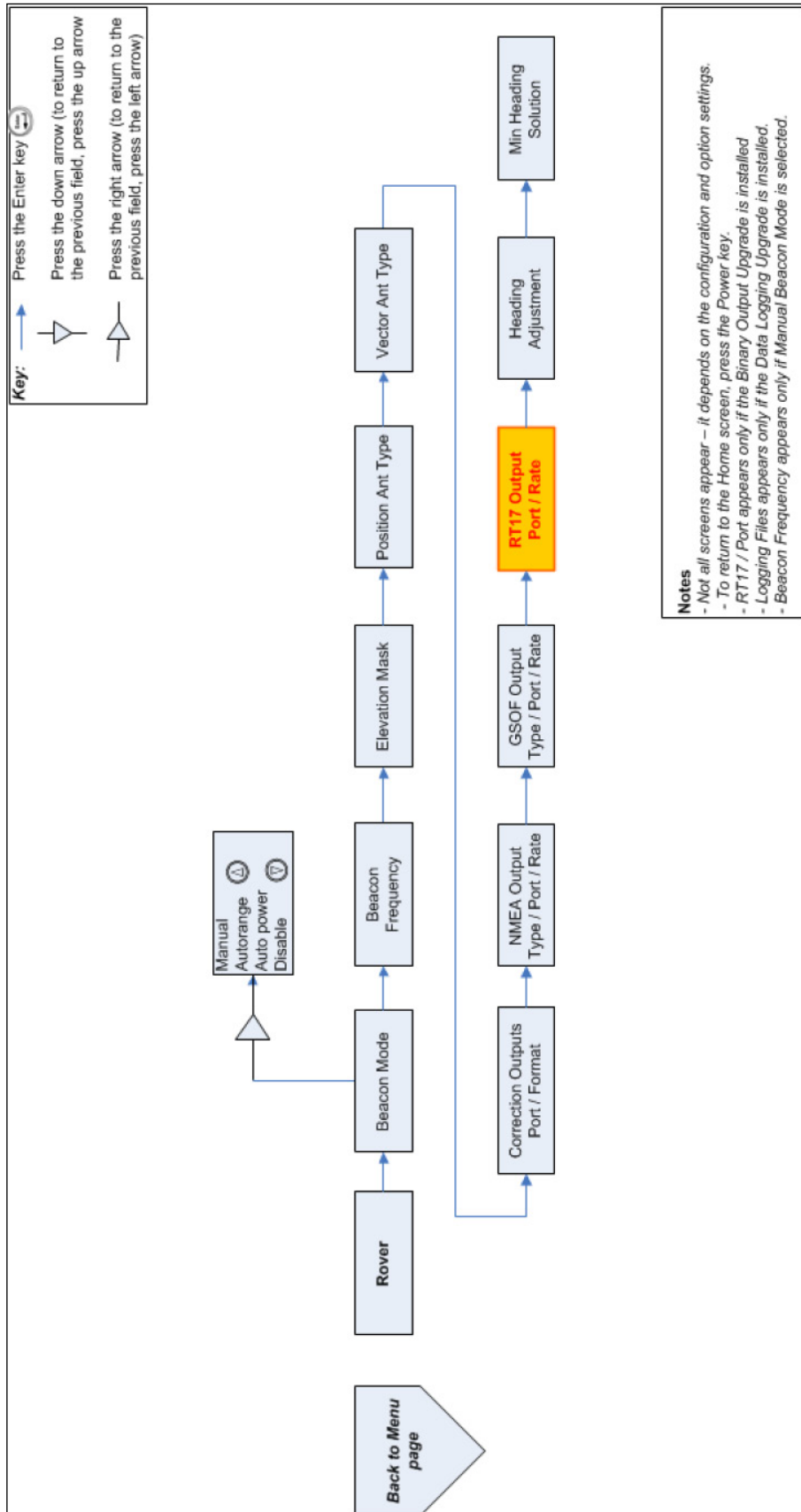
Connector type	Description
1 TNC (450 MHz Internal radio) Reverse polarity TNC (900 MHz internal radio) Not installed, system without internal radio	Connect to the radio antenna
2 TNC	Connect to GPS antenna 1 for position. When connected to a GA530 antenna, it will provide MSK Beacon signal. OmniSTAR correction services are only available on this antenna port.
3 TNC	Connect to GPS antenna 2 for vector and heading. When connected to a GA530 antenna, it will provide MSK Beacon signal. OmniSTAR is <i>not</i> supported on this antenna port.
4 High Density DB26	Ethernet with PoE connectivity to a 10/100 Base-T network through an RJ45 jack on a multiport adaptor (P/N 57167) or cable (P/N 65791-00). Primary power from a Trimble AC/DC power supply (P/N 51695) using the multiport adaptor (P/N 57167) or cable (P/N 65791-00 or 78235-00). Full 9-wire RS-232 serial communications using the 26-9-pin multiport adaptor (P/N 57168) or a 26-pin serial communications cable (P/N 65791-00) 1PPS, 2 x RS-232, input DC, Ethernet cable (P/N 60789-00 or 77070-00)
5 Vent plug	External venting plug for pressure equalization

SPS361 Quick Screen Guide

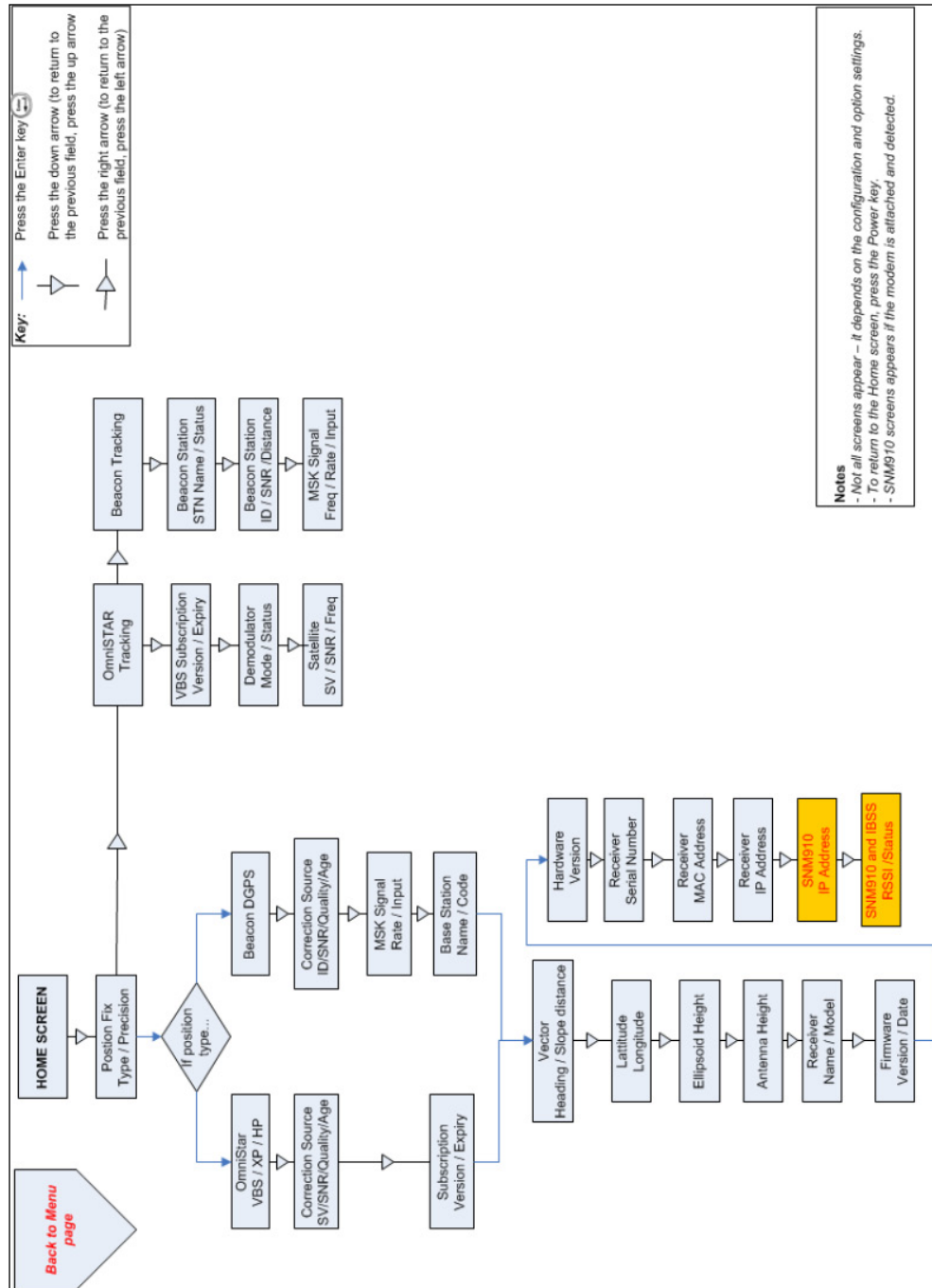
Configuration screens



Mode Settings

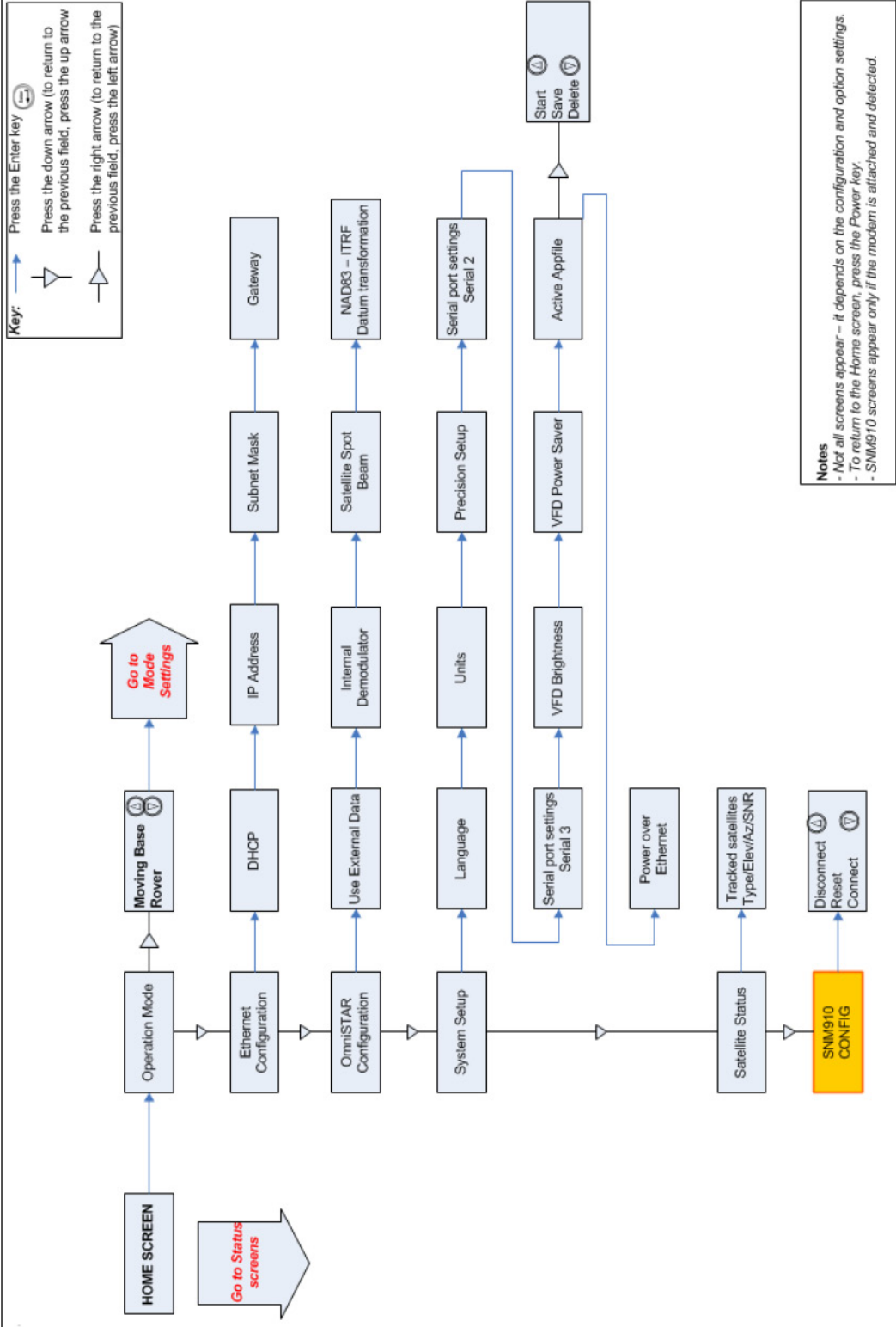


Status screens

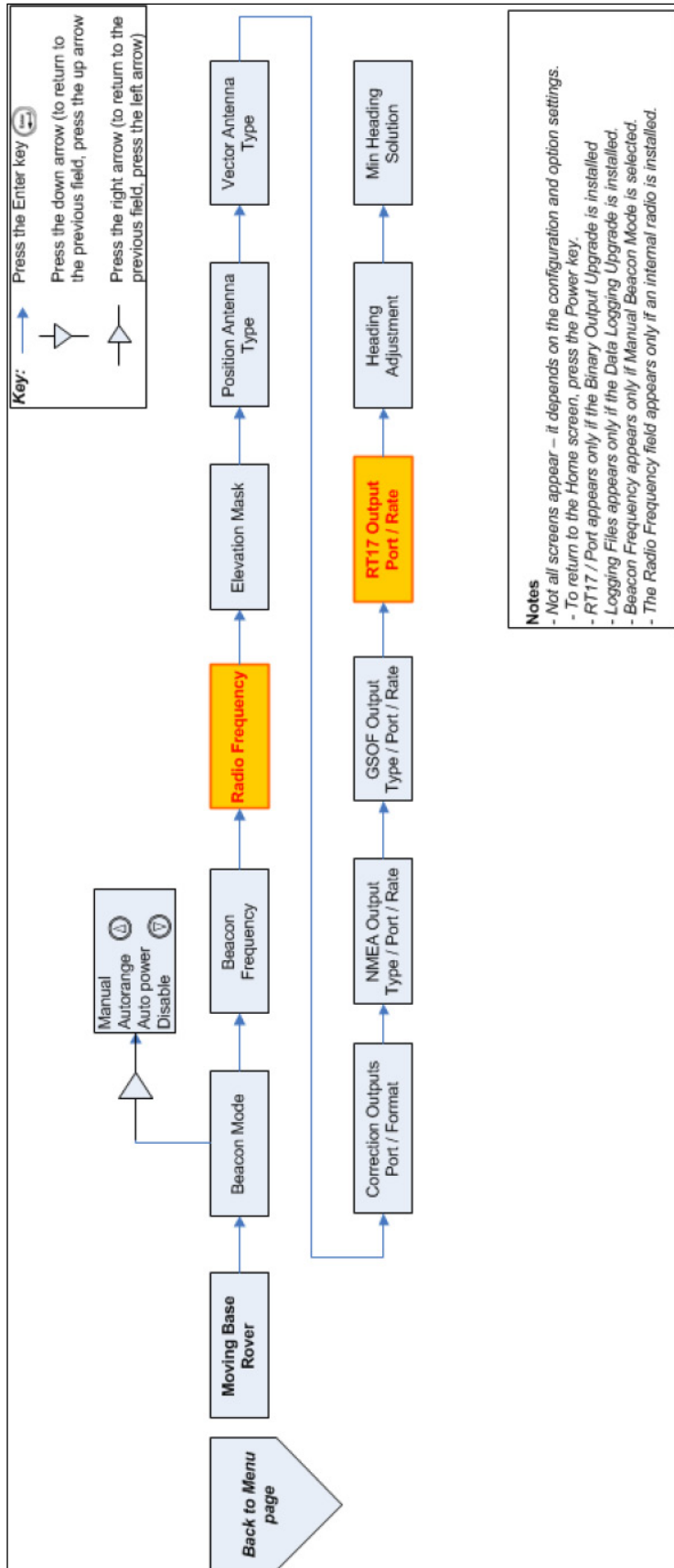


SPS461 Quick Screen Guide

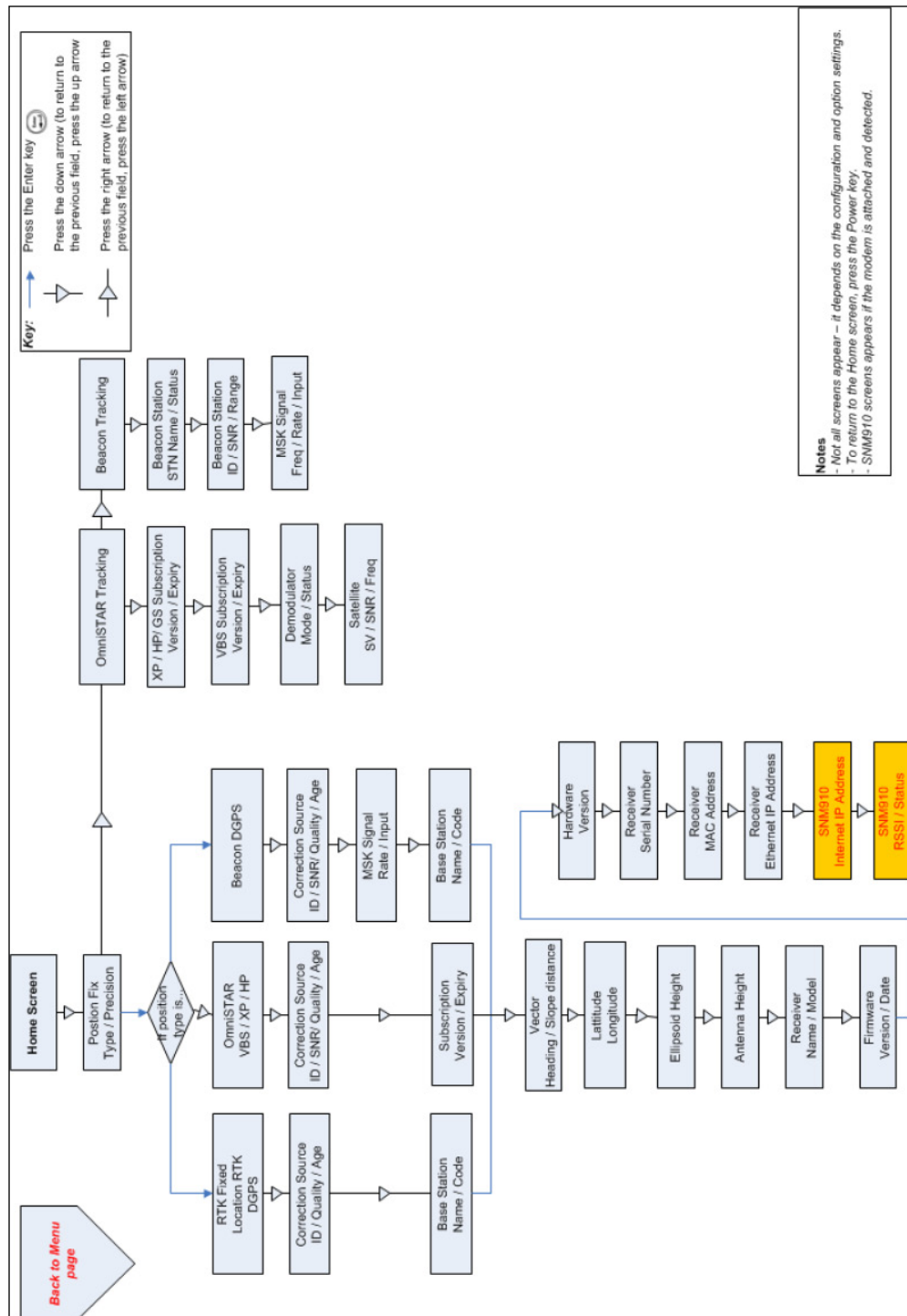
Configuration screens



Mode Settings



Status screens



Signal Tracking

This table shows the signal tracking capability for each receiver in the SPSx61 Modular receiver family.

GPS signal type	Class	SPS361	SPS461 DGPS	SPS461 Location RTK	SPS461 Precise Vertical	SPS461 Precision RTK
GPS signals	L1	✓	✓	✓	✓	✓
	L2	✓	✓	✓	✓	✓
	L2C	✗	Optional	Optional	✓	✓
	L5	✗	✗	✗	✗	✗
GLONASS signals	L1/L2	✗	✗	✗	✗	✗
	GPS SBAS corrections	WAAS	✓	✓	✓	✓
GPS SBAS corrections	EGNOS	✓	✓	✓	✓	✓
	MSAS	✓	✓	✓	✓	✓
	OmniSTAR corrections	XP	✗	✗	✓	✓
HP		✗	✗	✓	✓	✓
VBS		✓	✓	✓	✓	✓
Beacon corrections	MSK	If P/N ends with -30 or -40	If P/N ends with -30 or -40	If P/N ends with -30 or -40	If P/N ends with -30 or -40	If P/N ends with -30 or -40

Variable Configuration Options

This table lists the default options for each receiver in the SPSx61 Modular receiver family.

Configuration option	SPS361	SPS461
Rover options		
Precise horizontal	–	Optional
Precise vertical	–	Optional
Precise heading/vector	✓	✓
Location RTK	–	Optional
RTCM DGPS	✓	✓
Signal options		
L2C		Optional
SBAS	✓	✓
OmniSTAR VBS	✓	✓
OmniSTAR HP/XP		Optional
Beacon	If P/N ends with -30 or -40	If P/N ends with -30 or -40
General options		
VRS support	✓	✓
Max data rate	20 Hz	20 Hz

Upgrading the receiver

Only the SPS461 receiver can be upgraded. There are four levels of positioning precision available:

- SPS461 DGPS and OmniSTAR VBS (Standard)
- SPS461 Location RTK and OmniSTAR HP/XP (Upgrade)
- SPS461 Location RTK with precise vertical measurement (Upgrade)
- SPS461 Precision RTK (Upgrade)

When you purchase the receiver upgrade, your Trimble dealer will provide you with a set of codes to change the receiver configuration.

Managing Application Files

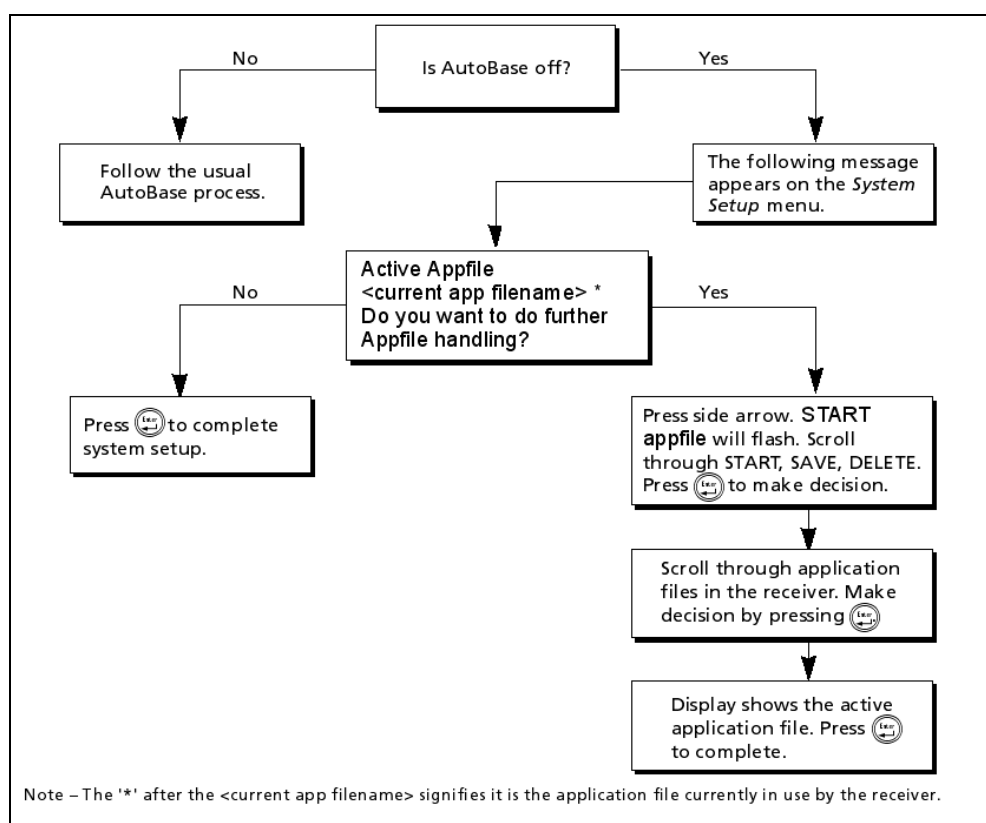
You can use the front panel to manage application files in the receiver. You can see which application file the receiver is currently using and then choose to make changes to it and save it, load a different application file, or delete an application file.

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:

If the receiver is set to the following mode:	The suggested application filename is:
Base	BASE01
Heading	HDG01
Moving Base	MB01
Rover	ROV01

*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.*



Application file handling through the front panel of the receiver

Default Settings

All settings are stored in application files. The default application file, Default.cfg, is stored permanently in the receiver, and contains the factory default settings. Whenever the receiver is reset to its factory defaults, the current settings (stored in the current application file, Current.cfg) are reset to the values in the default application file.


You cannot modify the default application file. However, you can create a power-up application file so that the settings in this file can be applied immediately after the default application file, overriding the factory defaults. For more information, see Configuring the receiver using application files.

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
Serial Port 3	Baud rate	38,400
	Format	8-None-1
	Flow control	None
Serial Port (Modem) 2	Baud rate	38,400
	Format	8-None-1
	Flow control	None
Input Setup	Station	Any
NMEA/ASCII (all supported messages)		GGA, HDT @ 1 Hz on Serial Port 3
Streamed output		All Types Off Offset = 00
RT17/Binary		All ports Off
OmniSTAR	Internal demodulator	Off
	External OmniSTAR data	VBS only
Beacon	Tune mode	Autopower
Position and Vector antenna	Type	GA530
	Height (true vertical)	0.00 m
	Measurement method	Antenna Phase Center

Resetting the receiver to factory defaults

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

- On the receiver, 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.

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.

When starting any of the SPS receivers as a base station or rover receiver using the Trimble SCS900 site controller software or the HYDROpro software, the settings required for those operations are automatically set and configured in that software. To change the receiver settings for special applications or for use with third-party software, use the GPS Configurator software or the Configuration Toolbox software.

Logging data

Data logging involves the collection of GPS measurement data over a period of time at a static point or points, and subsequent postprocessing of the information to accurately compute baseline information. Data logging using receivers requires access to suitable GPS postprocessing software such as the Trimble Business Center software.

Postprocessed GPS data is typically used for control network measurement applications and precise monitoring. GPS measurement data is collected over a period of time at a static point or points and then postprocessed to accurately compute baseline information.

By default, the Data Logging option is turned off. For information on how to enable the Data Logging option, and the required postprocessing software options, contact your Trimble dealer.

Logging data after a power loss

If power is unexpectedly lost while the receiver is logging data, the receiver tries to return to the state it was in immediately before the power loss. The receiver does not reset itself to default settings.

If the receiver was logging data when power was lost, it resumes logging data when power is restored.

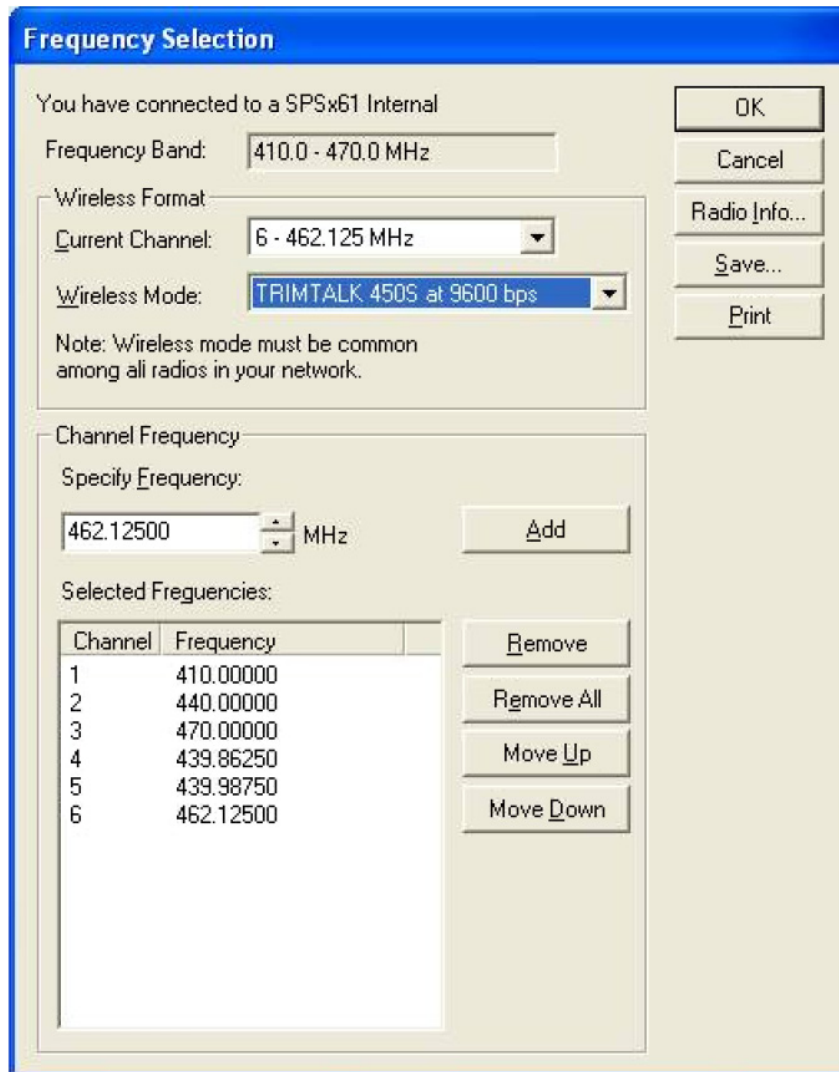
Adding Radio Frequencies

If you have the optional internal 450 MHz receive radio in your GPS receiver, use the WinFlash utility to add the relevant [receive](#) frequencies to the default list of frequencies.

You can also use the web interface to add and manage receive 450 MHz frequencies.

Adding receive frequencies for the 450 MHz internal receive radio

1. Start the WinFlash utility. The *Device Configuration* screen appears.
2. From the *Device type* list, select the required receiver.
3. From the *PC serial port* field, select the serial (COM) port on the computer that the receiver is connected to.
4. Click **Next**. The *Operation Selection* dialog appears. The *Operations* list shows all of the supported operations for the selected device. A description of the selected operation is shown in the *Description* field.
5. Select *Configure Radio Settings* and then click **Next**. Either the *Internal Transceiver Configuration* dialog or *Frequency Selection* dialog appears depending on the receiver:



6. In the *Wireless Format* group, select the appropriate channel and wireless mode. The Wireless mode must be the same for all radios in your network.
7. In the *Specify Frequency* field, enter the frequency you want to add.
8. Click **Add**. The new frequency appears in the *Selected Frequencies* list.

Note - The programmed frequencies must conform to the channel spacing and minimum tuning requirements for the radio. To view this information, click Radio Info. You can select 12.5 kHz or 25 kHz channel spacing. All radios in your network must use the same channel spacing.

9. Once you have configured all the frequencies that you require, click **OK**.

The WinFlash utility updates the receiver radio frequencies and then restarts the receiver.

Setting UHF reception radio frequencies using the web interface

To enter your own Receive (Rx) frequency using the web interface:

1. Select the *Radio* menu.
2. Select the *Frequency Management* submenu.

-
3. Make a note of the details shown in the *Frequency range* and *Tuning step* fields. Any new frequencies must be within the range shown and must also be a multiple of the K Hz shown in the *Tuning step* field.
 4. Select the *Add Channel* option and then enter the new channel frequency.
 5. Click **OK**.


To delete a channel frequency:

1. Select the *Delete channel* option.
2. Select a channel to delete from the list that appears.

You cannot add or delete Transmit channels using the web interface.

Troubleshooting

This topic describes some possible receiver issues, possible causes, and how to solve them.

Issue	Possible cause	Solution
The receiver does not turn on.	External power is too low.	Check the charge on the external power supply and, if applicable, check the fuse.
	Internal power is too low.	Check the charge on the internal battery.
	External power is not properly connected.	Check that the Lemo connector or 26-pin adaptor is seated correctly, and that the cable is secured to the receiver. Check for broken or bent pins in the connector.
	Faulty power cable.	Check that you are using the correct cable for the port/battery. Check that the correct battery is connected to a particular port. The ports on the GPS receiver are optimized for use with different types of battery. The 26-pin connector is optimized for Trimble custom external batteries, and the Lemo port is optimized for external 12 V batteries such as car, motorcycle, or truck batteries. If the wrong type of battery is connected to a port, it is likely that it will cut off earlier than normal. Check pinouts with a multimeter to ensure internal wiring is intact.
The receiver is not responding.	Receiver needs a soft reset.	Turn off the receiver and then turn it back on again.
	Receiver needs a full reset.	Press  for 35 seconds.
Rover receiver is not receiving radio.	Incorrect over-air baud rates between reference and rover.	Connect to the rover receiver radio, and make sure that it has the same setting as the reference receiver. The SCS900 software automatically configures the over-the-air baud rate to 9600.
	Incorrect port settings between roving external radio and receiver.	If the radio is receiving data and the receiver is not getting radio communications, use the SCS900 software to check that the port settings are correct.
	The radio antenna cable and GPS antenna cable are not correctly connected.	Make sure that the external radio antenna cable is connected between the TNC connector marked RADIO and the radio antenna.
The receiver is not receiving satellite signals	The GPS antenna is connected to the wrong antenna connector.	Make sure that the GPS antenna cable is tightly seated in the GPS antenna connection on the receiver and not connected to the wrong/radio antenna connector.
	The GPS antenna cable is loose.	Make sure that the GPS antenna cable is tightly seated in the GPS antenna connection on the GPS antenna.
	The cable is	Check the cable for any signs of damage. A damaged cable can inhibit signal detection from the

	damaged.	antenna at the receiver.
	The GPS antenna is not in clear line of sight to the sky.	Make sure that the GPS antenna is located with a clear view of the sky. Restart the receiver as a last resort (turn off and then turn it on again).
The message PC Loader in Control appears on the front panel	The WinFlash utility is in use.	Complete the WinFlash task and then exit the utility.
	The WinFlash utility was started then the data cable was disconnected.	Plug the data cable back in and then restart the receiver.
	No apparent reason.	If the WinFlash utility is not in use, turn off the receiver using the Power key. If that does not turn it off, apply external DC power and hold down the Power key for 60 seconds.
The message Remote Monitor active appears on the front panel	Internet software	If possible, turn off the receiver. If possible, reload the current firmware. If the above solutions do not resolve this, leave the receiver on with no external power, so the internal battery completely discharges. Then, turn on 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	<p>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.</p> <p>The orbit information is a subset of the ephemeris/ephemerides data.</p>
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 . 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 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 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.
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	<p>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.</p> <p>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.</p> <p>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).</p> <p>All GPS coordinates are based on the WGS-84 datum surface.</p>
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	<p>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.</p> <p>Differential correction can be done in real-time, or after the data is collected by postprocessing.</p>
differential GPS	See real-time differential GPS .
DOP	<p>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.</p> <p>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: $PDOP^2 = HDOP^2 + VDOP^2$.</p>
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.

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 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.
Galileo	Galileo is a GNSS system built by the European Union and the European Space Agency. It is complimentary to PPS 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.
GSOFF	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 SPS 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 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.
POE	Power Over Ethernet. Provides DC power to the SPS Modular receiver using an Ethernet cable.
postprocessing	Postprocessing is the processing of satellite data after it is 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 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 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	<p>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:</p> <ul style="list-style-type: none"> • data STReams (record type STR) • CASters (record type CAS) • NETworks of data streams (record type NET) <p>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.</p>
triple frequency GPS	<p>A type of receiver that uses three carrier phase measurements (L1, L2, and L5).</p>
UTC	<p>Universal Time Coordinated. A time standard based on local solar mean time at the Greenwich meridian.</p>
VRS	<p>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.</p> <p>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.</p>
WAAS	<p>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.</p> <p>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.</p> <p>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.</p> <p>The EGNOS service is the European equivalent and MSAS is the Japanese equivalent of WAAS.</p>
WGS-84	<p>World Geodetic System 1984. Since January 1987, WGS-84 has superseded WGS-72 as the datum used by GPS.</p> <p>The WGS-84 datum is based on the ellipsoid of the same name.</p>