Common ways to set up a rover receiver

You can set up a rover receiver in different ways depending on the application. The components that make up a rover receiver are:

- GPS receiver
- GPS antenna
- controller/computer
- rod mounting equipment, including a rod, receiver bracket, and controller bracket
- vehicle mounting equipment, including a suction cup and ball joint, extension arm, controller bracket, magnetic antenna mount, and necessary cables.
- backpack equipment, including backpack and antenna-mounting rod
- marine vessel mounting equipment, including receiver bracket, cables, antenna, and radio antenna brackets.

Setting up the rover receiver on a jobsite vehicle

⚠️ **CAUTION –** This following rover setup is suited only to offroad (jobsite) vehicle use. Do not use this method on a vehicle that is driven at speed or in traffic.

1. Do one of the following, depending on your receiver:

   - SPSx50 or SPS770: Mount the GPS antenna for the receiver on the roof of the vehicle. Use a single magnetic mount or a 5/8"×11 thread bolt attached to the roof bars. Run the GPS antenna cable for the receiver into the vehicle either through a rubber grommet in the roof, or through the passenger door window, which needs to be left slightly open during operation.

   - SPSx80: Mount the receiver on the roof of the vehicle. Use a triple magnetic mount or a 5/8"×11 thread bolt attached to the roof bars.

2. Place and secure the GPS receiver in a convenient location in the vehicle.

   The GPS receiver can be controlled through the controller connected using Bluetooth wireless technology (SPSx50 or SPSx80) or a cable connected to a port on the receiver (SPS770).

   The receiver needs to be accessed only to turn it on at the start of each measurement session. It may be more convenient if the SPSx50 is placed in a location where the vehicle operator can see the keypad and display, to monitor receiver status and to configure settings as required. Most receiver capability can be controlled using the SCS900 Site Controller software.

3. Attach the suction cup to the front windscreen, dashboard, or other convenient location in the vehicle, making sure that it does not obstruct the driver's view.

4.   Attach the RAM extension arm to the suction cup, and the controller bracket to the RAM extension arm.

5.   Lock the controller into the controller bracket and then adjust the bracket until the controller is in the most convenient location. Make sure that the controller does not restrict visibility through the front windscreen during vehicle use.

6.   Lock the brackets so that the controller is held securely. If required, connect either the GPS receiver or the controller to an in-vehicle power supply as needed.

Figure 5.5   Configuring SPSx50 from the cab. A Zephyr Model 2 antenna is mounted on the roof

Setting up the rover receiver on a rod

For rod-based operation, mount the SPSx50 Modular GPS receiver as follows:

1. Mount the two rod brackets on the rod.

2. Tighten the top bracket, making sure that it is at a convenient height for the receiver.

3. Place the receiver in the slot in the rod bracket, and secure with the tripod clip.

4. Move the lower rod bracket down until it is over the second tripod clip on the receiver, and then tighten the rod bracket onto the rod. The receiver is held in place between the two brackets.

5. Insert the controller into the controller bracket as shown opposite.

6. Use the 5/8" thread to attach the GPS antenna to the top of the rod.

7. Use the GPS antenna cable to connect GPS antenna to the receiver.
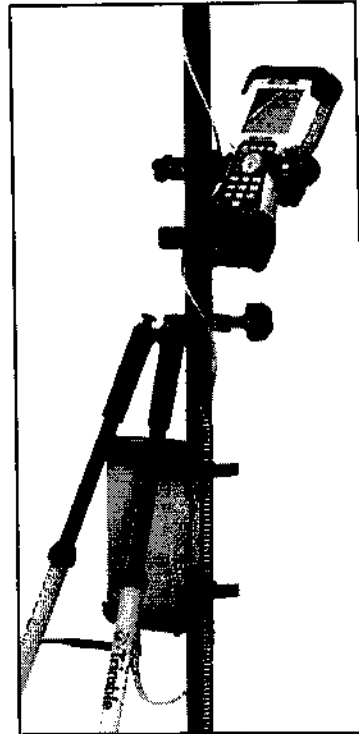
For rod-based operation, mount the SPSx80 Smart GPS antenna as follows:

1. Mount the receiver on the top of the rod using the 5/8"×11 thread in the base of the SPSx80.

2. Insert the controller into the controller bracket.

3. The SPSx80 and controller communicates through Bluetooth wireless technology. However, if a cable is required, connect the cable between the controller and receiver (see Figure 5.6 through Figure 5.7).
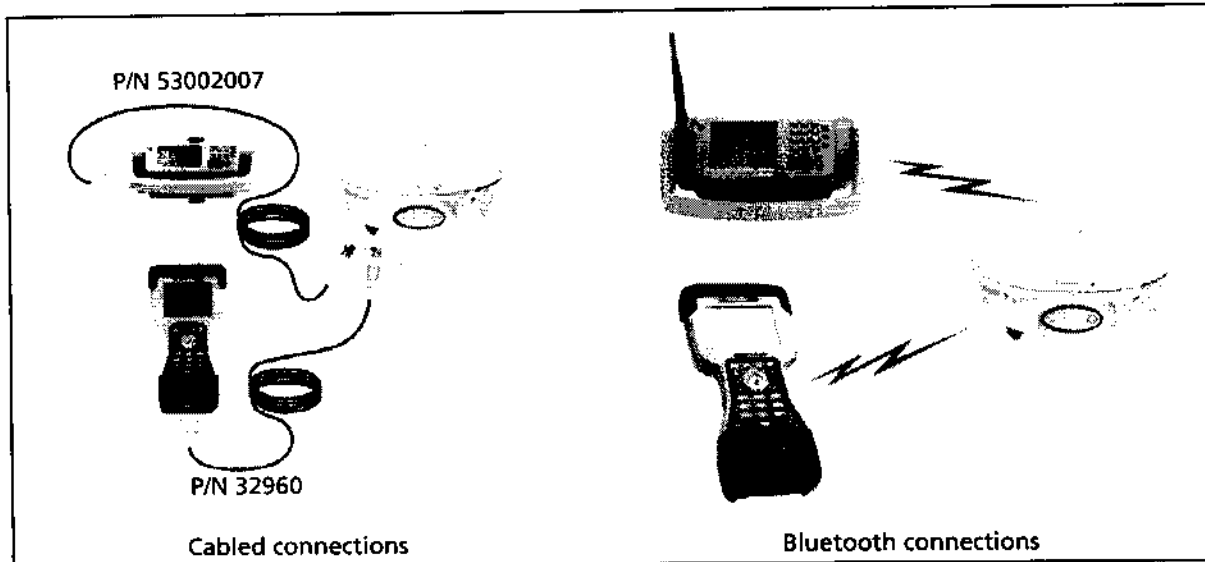
P/N 53002007

P/N 32960

Cabled connections

Bluetooth connections

Figure 5.6   Connections for a rover SPSx80 setup, a TSC2 or TCU controller, and a 450 Mhz base station

P/N 53002007
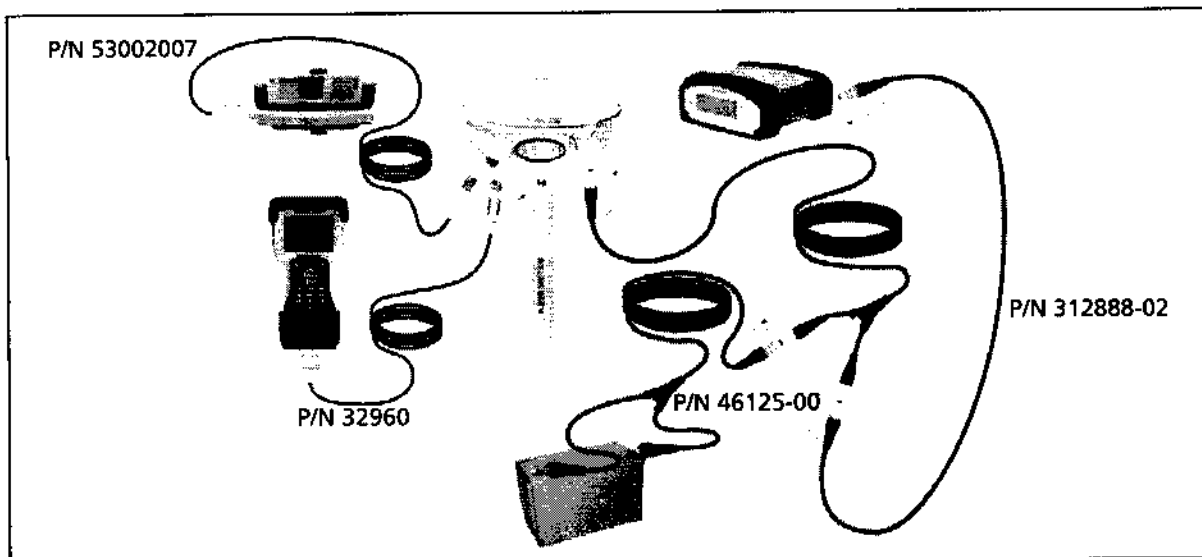
P/N 312888-02

P/N 46125-00

P/N 32960

Figure 5.7   Cabled connections for an SPSx80 setup, a TSC2 or TCU controller, and a 900 Mhz base station (with external power)

Setting up a rover receiver on a belt or in a backpack

If you prefer to work free of the weight of a pole, you can mount the rover receiver on a belt (SPS770 or SPSx50 only) or carry it in/on a backpack (all receivers). When you wear the receiver on a belt, ensure that the display is always visible so that you can easily check the status of the receiver. If you carry the receiver in a backpack, use an external radio antenna mount to allow for optimal radio signal reception. If you use a low gain antenna mounted directly on the receiver in a backpack, it may affect the radio signal reception and reduce the likelihood of obtaining an RTK Fixed solution.

Setting up a pair of SPSx50 GPS receivers to provide heading

The SPS550H receiver is permanently in Heading mode and, when combined with a suitable Trimble receiver, provides GPS heading. Other SPSx50 GPS receivers can be used for heading only if they can operate in Heading mode (see Configuring the receiver pair, page 57).

The SPS550H is a dual-frequency GPS receiver with a dual-frequency antenna, but it does not operate as a stand-alone DGPS receiver. To compute a true north heading and to be capable of positioning, the receiver requires an output message from another SPSx50 receiver. To determine the precise vector between two moving objects, pair the SPS550H Heading add-on with any one of the following SPSx50 receivers:

- SPS550
- SPS750 Max
- SPS850

Connect the antenna on the SPS550H to the other SPSx50 receiver to determine the precise GPS heading between the two antennas. The SPS550H GPS receiver shows the heading on the two-line display, and outputs the heading data in NMEA or binary format.

☀ **Tip** – To create a single, compact GPS position and heading unit, use the mounting frame provided to stack the SPS550H GPS receiver on top of another SPSx50 GPS receiver. See below. Use the Marine Heading Cable (P/N 57169) provided.

The Moving Baseline RTK positioning technique

In most RTK applications, the reference receiver remains stationary at a known location and the rover receiver can move. However, Moving Baseline RTK is an RTK positioning technique in which both reference and rover receivers can move about. Moving Baseline RTK is useful for GPS applications that require vessel orientation.
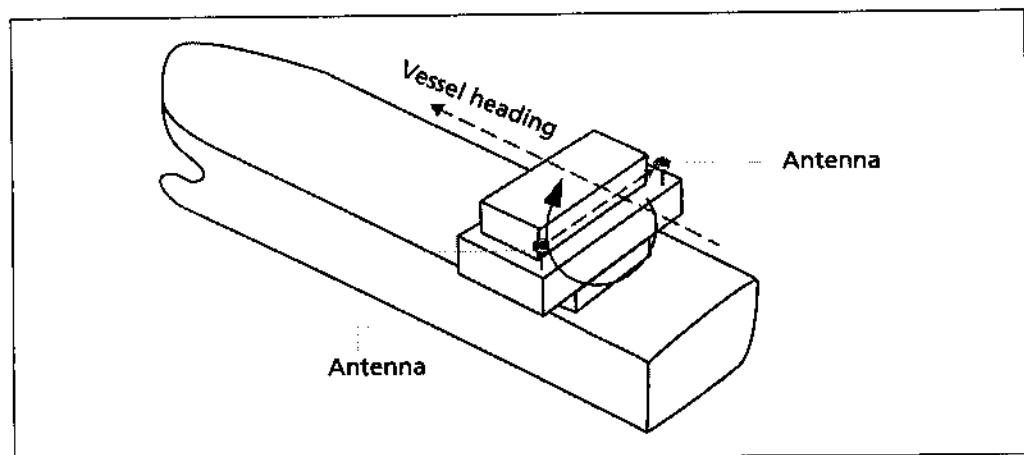
Figure 5.8   Vessel heading from Moving Baseline RTK

With Moving Baseline RTK, the reference receiver broadcasts Compact Measurement Record (CMR™) data every epoch, while the rover receiver performs a synchronized baseline solution at 10 Hz. The resultant baseline solution has centimeter-level accuracy. To increase the accuracy of the absolute location of the two antennas, the Moving Reference receiver can use differential corrections from a static source, such as a shore-based reference station.

Mounting a pair of SPSx50 GPS receivers

To obtain a position and heading solution, you need to connect two SPSx50 receivers to make one compact unit. A mounting bracket and interconnecting cable is supplied with the SPS550H receiver. Set up the receivers, antennas, and cables as shown in Figure 5.9.
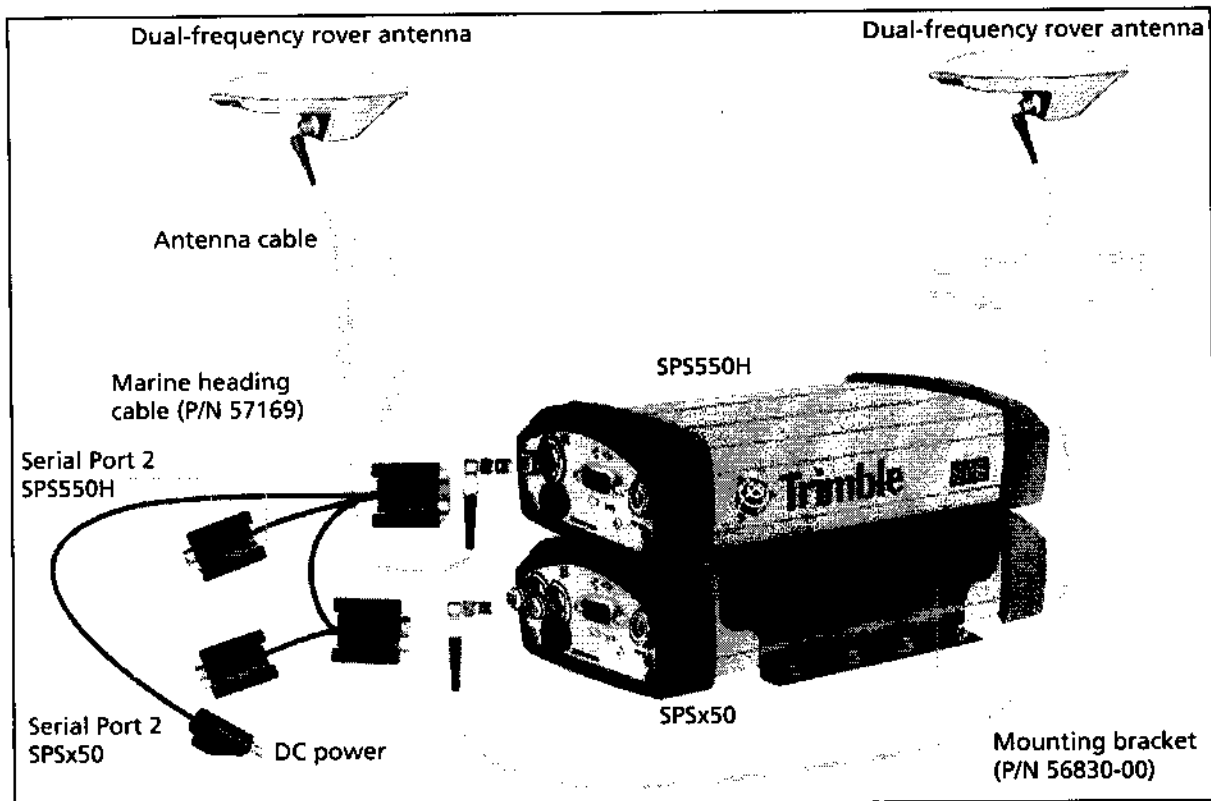
Figure 5.9   Installation setup for the SPS550H with another SPSx50 receiver for position and heading

Assembling the receivers

Figure 5.10 shows an SPS550 and an SPS550H set up to provide a Heading solution. To assemble the receivers, you need a Phillips head #1 screwdriver and a 1/4" socket set or wrench (spanner).

SPS550H GPS receiver

Other SPSx50 GPS receiver
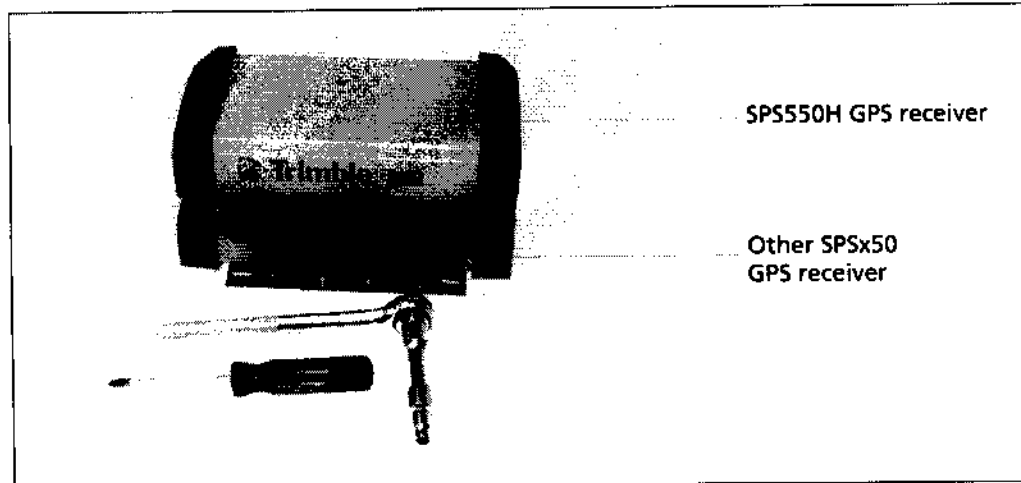
Figure 5.10   Completed assembly with the SPS550H GPS receiver on top

To assemble the receivers using the mounting frame that is provided:

1.   Invert the SPSx50 GPS receiver and then remove the rubber endcaps.
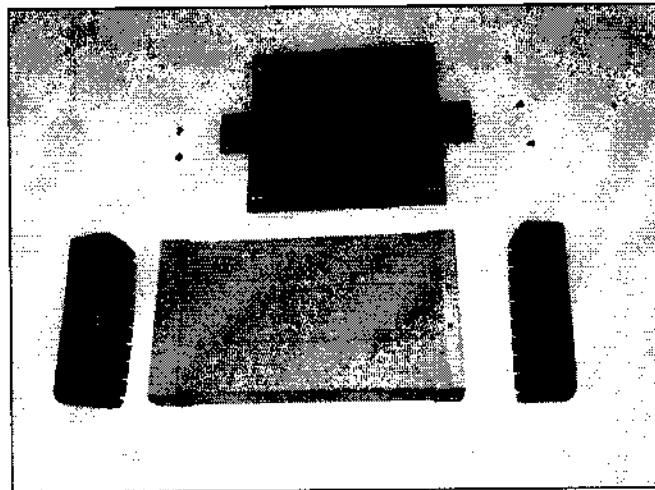
2.   Prepare the flat black plate and the four Posi screws. (These are part of the mounting frame.)

3.   Position the black plate on the SPSx50 GPS receiver.

4. Use the four Posi screws to secure the plate to the receiver. (Secure two screws at each end.) The black plate is now attached to the bottom of the SPSx50 GPS receiver.
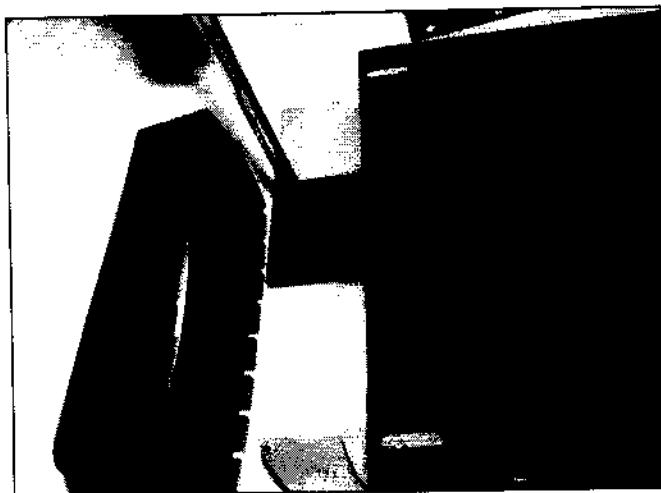
5. Replace the rubber endcaps.

6. Invert the SPSx50 receiver again. This returns the receiver to its normal orientation.

7. Set aside the SPSx50 receiver.

8. Invert the SPS550H receiver and then remove the rubber endcaps.
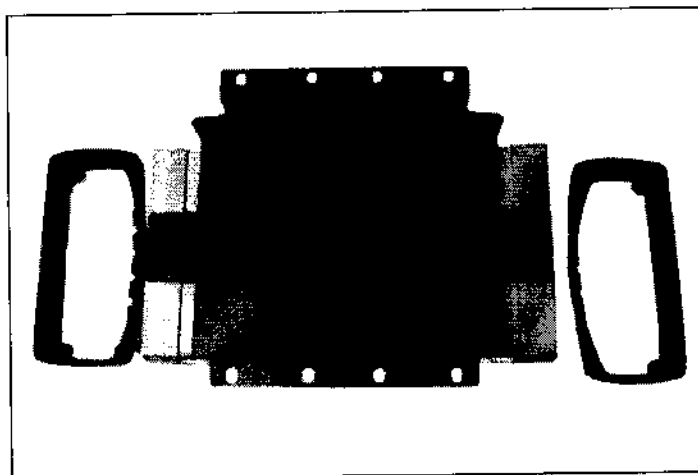
9. Position the black cradle on the SPS550H GPS receiver. (The black cradle is part of the mounting frame.)

10. Use the four Posi screws to attach the black cradle to the receiver. The black cradle is now attached to the bottom of the SPS550H.

11. Replace the rubber endcaps.
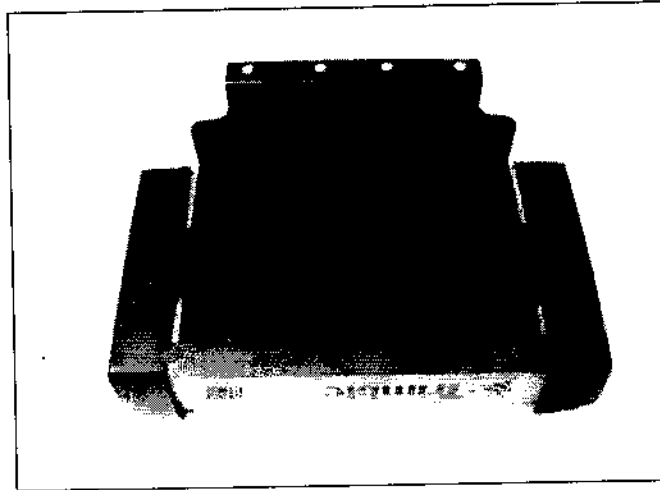
12. Place the black cradle on the black base plate. This places the SPS550H GPS receiver on top of the SPSx50 GPS receiver.
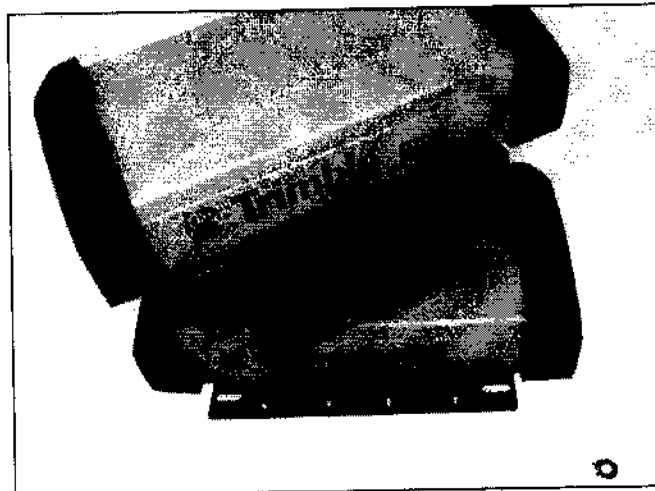
13. Make sure that the display is facing in the same direction on both receivers.

14. Prepare the eight nuts, spring washers, and flat washers.

15. Insert the first bolt. Attach the flat washer, the spring washer, and finally the nut and then tighten firmly. Secure all eight bolts in this way.
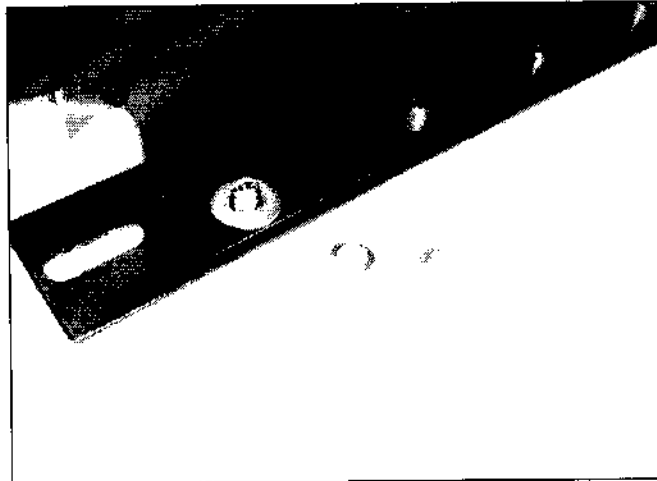
16. Attach one connector from the Marine Heading Cable (P/N 57169) to the 26-pin connector on the rear of the SPS550H GPS receiver. Attach the other connector from the cable to the 26-pin connector on the rear of the SPSx50 receiver. The cable can be connected either way around.
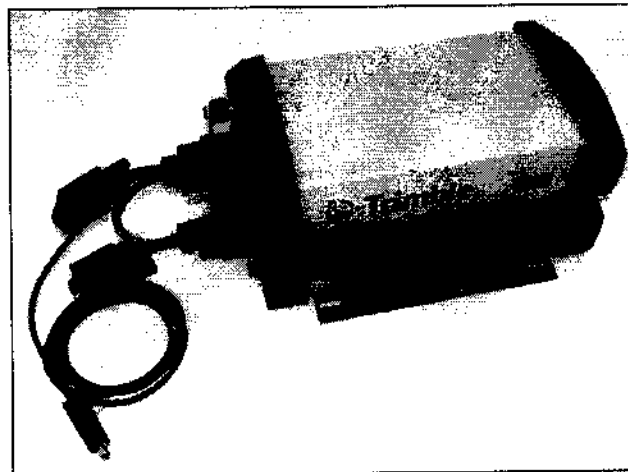
The cable connects the two GPS receivers so that the Heading solution is available. The DC power lead on the cable supplies power to both receivers in the stack. The two DB9 female connectors on the cable access serial port 2 on each receiver.

Installing the receiver

Select a location at which all of the following conditions are met:

- the receiver is not exposed to temperature extremes
- the receiver is not exposed to moisture extremes (such as rain, snow, water blasters, or wash systems)
- the receiver is protected from mechanical damage
- you can connect and disconnect cables without placing undue stress on them

Mounting the antennas

You *must* install each antenna at the correct location. Poor or incorrect placement can influence accuracy and reliability.

Ideally, mount the two antennas as far apart as possible and at about the same height on the structure. Mount the antennas fore and aft along the vessel centerline or on a line that is at a known orientation to the centerline. Always mount an antenna at a location that ensures a good view of the sky.

Follow these guidelines to select the antenna location:

- Choose an area with a clear view of the sky. The antenna must be above any metallic objects.
- Do not mount the antenna close to stays, electrical cables, metal masts, or other antennas.
- Do not mount the antenna near a transmitting antenna, a radar array, or near satellite communication equipment.
- Avoid areas with high vibration, excessive heat, electrical interference, and strong magnetic fields.

Use a 5/8"×11 stainless steel bolt to mount each of the antennas. There is a threaded bolt hole in the base of the antenna.

Configuring the receiver pair

One of the receivers must be nominated as a Heading unit. The other receiver is nominated as a Moving Base unit. For this configuration to work, you must use the Marine heading cable (P/N 57169).

To set up the Heading unit:

1. From the Home screen, press ⊖ twice. The *Mode* screen appears.

2.   Select *Heading* mode. The SPSx50 display shows two extra settings for heading:

–   *Heading Adjustment.* Enter a positive value in decimal degrees. The value is applied to the raw heading value before it is output in the NMEA HDT message or displayed on the front panel of the receiver. This value is used when the two antennas are not mounted parallel to the vessel axis.

–   *Minimum Heading Solution.* Enter the minimum requirement for the GPS solution that will provide the heading value. The default of RTK Fixed provides the highest precision, but in conditions of extreme multipath or obstruction, an RTK Fixed solution may not be continuously available. In such conditions, select RTK Float if a lower precision is acceptable.

To set up the Moving Base unit:

1.   From the Home screen, press ⊜ twice. The *Mode* screen appears.

2.   Select Moving Base mode.

Interfacing using the NMEA protocol

The SPS550H GPS receiver can output messages such as NMEA HDT for heading, and NMEA GGA for position. The SPS550H always reports the solution status of the moving baseline solution that is being used to compute the heading. For example, the Modem (serial port 2) on the SPS750, which is typically RTK Fixed Integer. However, if the external computer must know the exact quality of the position, you can use the NMEA output from the base receiver. The base receiver reports the solution status of the position, for example, Fixed Integer, Floating, or DGPS.

6

Configuring the SPSx50 Using the Keypad and Display

In this chapter:

■ Button functions

■ Power button operations

■ Home screen

■ Status screens

■ Configuring the SPSx50 as a base receiver

■ Configuring the SPSx50 as a rover receiver

■ Configuring system settings

The receiver features a keypad and display (see Keypad and display, page 22) so that you can configure the receiver without using a controller or computer.

Button functions

The SPSx50 has seven buttons on the front panel to control the receiver. Use the buttons 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. To turn the receiver off, hold the **Power** button for two seconds.
Esc	Escape	Returns to the previous screen or cancels changes being made on a screen.
Enter	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.

Power button operations

Press the Power button ⊙ to turn the receiver on and off. In addition, you can tap the Power button to return to the Home screen, or hold down the Power button 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 show 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 show 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 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 SPSx50 receiver. If the receiver is displaying 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
- Internal battery power remaining
- Current mode configuration
- Internal radio activity
- Internal radio channel or network

Status screens

The SPSx50 GPS receivers have 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
- CMR and RTCM IDs
- Base name and code
- Latitude, longitude, and height
- Antenna height
- Horizontal and vertical precision
- Receiver firmware version
- Receiver serial number
- Receiver IP address

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

Configuring the SPSx50 as a base receiver

To set up the SPSx50 as a base receiver, use AutoBase technology, the Trimble SCS900 Site Controller software, or the receiver keypad.

The AutoBase feature automatically configures the receiver settings for you; there is no need to use the keypad. The receiver obtains a position and outputs RTK corrections on the internal radio (if available) or on the LEMO port. See Chapter 8, Automatically Setting up a Mobile Base Station Using AutoBase Technology.

The receiver is configured step-by-step to ensure that all appropriate settings are configured. To move between steps in the configuration process, press ⊖.

Configuring the receiver

1. In the Home screen, press ⊜. Use the *Operation Mode* screen to configure system settings, mode settings, or to view the SV (satellite) status. Mode Settings is the default setting.

2. Press ⊜. Use the *Mode* screen to select whether the receiver will operate as a base or rover. Base is the default setting.

3. Press ⊜. Use the *Base Station* screen to select whether the receiver is going to use a "Here" position or if the current coordinates in the receiver will be changed.

4. Press ⊘. When **Edit Current** begins to flash, the receiver is in Edit mode and you can change the current setting.

5. Press ⓥ. The setting changes to New Base (Here).

6. Press ⊜ to accept the change.

7. Press ⊜ again. The *Base Name* screen appears. See next.

Changing the name and description of the base station

In the *Base Name* screen:

1. Press ⊘. When the first character of the base name begins to flash, the receiver is in Edit mode and you can change the current setting.

2. Press ⓐ or ⓥ to change the value of the character.

3. Press ⊘ to move the cursor to the next character.

4. Repeat Step 2 through Step 3 to enter the name of the base station. The name can be up to 16 characters. Press ⊜ to accept the change.

5. Press ⊜ again. Use the *Base Code* screen to change the code (description) for the base station.

6. Press ⊘. When the first character of the base code begins to flash, the receiver is in Edit mode and you can change the current setting.

7. Press ⓐ or ⓥ to change the value of the character.

8. Press ⊘ to move the cursor to the next character.

9. Repeat Step 7 through Step 8 to enter the code of the base station. The code can be up to 16 characters.

10. Press ⊜ to accept the change.

11. Press ⊜ again. The *Base Latitude* screen appears. See next.

Setting the reference latitude, longitude, and height of the base station

In the *Base Latitude* screen:

1. The base was set up with a "Here" position, so press 😊.

2. The *Base Longitude* screen is used to change the reference longitude of the base station. The base was set up with a "Here" position, so press 😊.

3. The *Point Height* screen is used to change the reference height of the base station. The base was set up with a "Here" position, so press 😊.

4. Use the *Antenna Type* screen to select the type of antenna used with the receiver. Press 🔄. When the antenna name begins to flash, the receiver is in Edit mode and you can select an antenna.

5. Press 🔽 to scroll through the antenna models.

6. Once the correct antenna name appears, press 😊 to accept the change.

7. Press 😊 again. The *Measured To* screen appears. See next.

Measuring and changing the antenna height

In the *Measured To* screen:

1. Press 🔄. When the antenna measurement method begins to flash, the receiver is in Edit mode and you can select an antenna measurement method.

2. Press 🔽 to scroll through the measurement methods. Once the correct measurement method appears, press 😊 to accept the change.

3. Press 😊.

4. Use the *Antenna Height* screen to change the height of the antenna. Press 😊. When the first character of the antenna height begins to flash, the receiver is in Edit mode and you can change the antenna height.

5. Press 🔼 or 🔽 to change the value of the character.

6. Press 🔄 to move the cursor to the next character.

7. Repeat Step 5 through Step 6 to enter the height of the antenna.

8. Press 😊 to accept the change.

9. Press 😊 again. The *Output* screen appears. See next.

Outputting corrections

In the *Output* screen:

1. Press 🔄 to enter Edit mode for the port.

2. Press 🔼 or 🔽 to change which port will be used to output corrections.

3. Press 😊 to accept the change.

4. Press 🔽 to move the cursor to the *Format* field.

5.   Press ⊙ to enter Edit mode for the format.

6.   Press ⊘ or ⊙ to change which correction message will be output on the port.

7.   Press ⊜ to accept the change.

8.   Press ⊜ again.

9.   Use the *NMEA* screen to set up NMEA outputs from the receiver. Press ⊜ to accept the default of no NMEA messages.

10.   Use the *GSOF* screen to set up GSOF outputs from the receiver. Press ⊜ to accept the default of no GSOF messages.

11.   Use the *RT17* screen to set up RT17 outputs from the receiver. Press ⊜ to accept the default of no RT17 messages. The Home screen appears and the base setup is complete.

Configuring the SPSx50 as a rover receiver

You can use the Trimble SCS900 Site Controller software or the receiver keypad to set up the SPSx50 base receiver.

The receiver is configured step by step to ensure that all appropriate settings are configured. To move between steps in the configuration process, press ⊜.

Configuring the receiver

1.   In the Home screen, press ⊜. Use the *Operation Mode* screen to configure system settings, mode settings, or to view the SV (satellite) status. Mode Settings is the default setting.

2.   Press ⊜. Use the *Mode* screen to select whether the receiver will operate as a base or rover.

3.   Press ⊙. When the mode begins to flash, the receiver is in Edit mode and you can change this setting.

4.   Press ⊙ to change to Rover.

5.   Press ⊜ to accept the change.

6.   Press ⊜ again to move to the *Elevation mask and RTK mode* screen. See next.

Changing the elevation mask and RTK mode

1.   Press ⊙. When the value for the current elevation mask begins to flash, the receiver is in Edit mode and you can change the setting.

2.   Press ⊙ to change the elevation mask to the required value.

Note – Trimble recommends that you do not set the elevation mask to a value lower than 10 degrees.

3.   Press ⊜ to accept the change.

4. Press ⓥ.

5. In the *Mode* field, press ⊙. When the current mode begins to flash, the receiver is in Edit mode and you can change this setting.

6. Press ⓥ to change the desired RTK mode of the receiver.

7. Press ⊜ to accept the change.

8. Press ⊜ again. The *Antenna Type* screen appears. See next.

Selecting the antenna

In the *Antenna Type* screen:

1. Press ⊙. When the antenna name begins to flash, the receiver is in Edit mode and you can select the type of antenna that is to be used with the receiver.

2. Press ⓥ to scroll through the antenna models.

3. Once the correct antenna name appears, press ⊜ to accept the change.

4. Press ⊜ again. The *NMEA* screen appears. See next.

Outputting corrections

In the *NMEA* screen, set up outputs from the receiver:

1. Press ⊜ to accept the default of no NMEA messages.

2. Use the *GSOF* screen to set up GSOF outputs from the receiver. Press ⊜ to accept the default of no GSOF messages.

3. Use the *RT17* screen to set up RT17 outputs from the receiver. Press ⊜ to accept the default of no RT17 messages. The Home screen appears, and the base setup is complete.

Configuring system settings

You can use the keypad and display of the SPSx50 receiver to configure the following receiver settings:

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

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 necessary, to change the language. Choose English, French, German, Italian, or Spanish. Press ⊖ to accept the change.

7. Press ⊖ again. Use the *Display and Input Units* screen, if necessary, to change the units to Meters or Feet.

8. Press ⊖ to accept the change.

9. Press ⊖ again. Use the *Port Settings* screen, if necessary, 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 SPS750 or SPS850, the *Autobase warning* screen appears. See Chapter 8, Automatically Setting up a Mobile Base Station Using AutoBase Technology.

13. Press ⊖ to accept the change.

14. Press ⊖ again. When the Home screen appears, the system setup is complete.

7

Configuring the Receiver Settings

In this chapter:

- Using the SCS900 Site Controller software to configure the base station, the rover, and the radios

- Configuring the receiver to log data for postprocessing

- Configuring Ethernet settings

- Configuring the SPSx50 receiver using a web browser

You can configure the SPS GPS receiver family in a variety of ways. This chapter describes the different configuration methods, and explains when and why each method is used.

The SCS900 Site Controller software is likely to be your main tool to set up and operate the receiver on a daily basis. All necessary field configurations are handled through the SCS900 software running on a TSC2 or TCU controller. For more information, refer to the *Trimble SCS900 Site Controller Software Getting Started Guide* or the *Trimble SCS900 Site Controller Software Office Guide.*

The external software detailed in this chapter is primarily used to update the receiver firmware and to configure upgrades or radio channels.

Using the SCS900 Site Controller software to configure the base station, the rover, and the radios
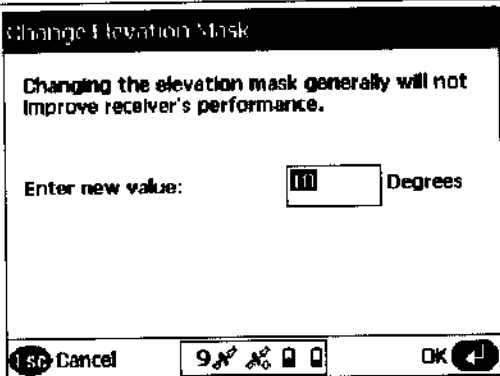
As part of a total system solution for construction applications, the SPS GPS receivers are operated by a TSCe, ACU, TCU, or TSC2 controller running the SCS900 Site Controller software. The SCS900 Site Controller software provides the tools to configure and start the GPS receiver in the modes used by the SCS900 system: Base Station, RTK Rover, DGPS Rover, OmniSTAR rover, SBAS Rover (using WAAS/EGNOS and MSAS). Wizards help you through the process and, where possible, assign suitable default operational parameters to the system. This eliminates the need for an operator to know how to configure the receiver with the right settings.

The SCS900 Site Controller software manages:

- the radio, whether internal or external

- all cellular communications components, such as modems and cellphones

- the use of the Bluetooth wireless technology

The software also scans communication ports on the receiver to identify connected devices. If the software cannot automatically identify the connected component, for example, a GPS antenna, it offers options (often with graphics) to help you manually select the correct component.

The SCS900 Site Controller software allows you to set operational tolerances and settings (such as those shown below), which must be achieved before measurements can be accepted. When outside of these tolerances, the SCS900 Site Controller software warns you through on-screen messages or indications, and the non-automatic acceptance of recorded positions. To set operational tolerances, go to the the *Settings* menu in the SCS900 Site Controller software.
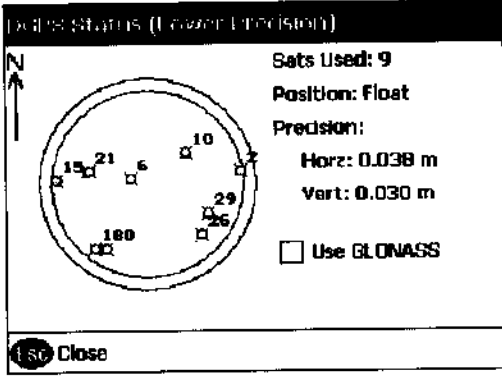
Example 1: From the Sky Plot screen, press Ctrl+M to open this screen and change the angle below which the receiver will not track satellites

Example 2: Use the Sky Plot screen to set if the receiver will track GLONASS satellites

Configuring the receiver to log data for postprocessing

The SPS GPS receivers do not come equipped with the Data Logging option. The receivers can have this added either at the time of purchase, or at a later date as an option. With the Data Logging option enabled, the receiver has available memory that facilitates the collection of GPS observations over a period of time, and that can be used with GPS postprocessing software such as the Trimble Geomatics Office™ for the computation of control networks and baselines.

Note – The SCS900 system does not support postprocessed applications. Trimble recommends that you use either the front panel keypad and display, the Web User Interface, or (SPS770, SPSx80 only) the GPS Configurator software to configure the receiver for postprocessed measurement sessions.

Configuring Ethernet settings

The SPSx50 receiver has an Ethernet port so that the receiver can connect to an Ethernet network. You can use the Ethernet network to access, configure, and monitor the receiver. No serial cable connection to the receiver is necessary.

The SPSx50 receiver requires the following Ethernet settings:

- IP setup: Static or DHCP
- IP address
- Netmask
- Broadcast
- Gateway
- DNS address
- HTTP port

The default setting for the HTTP port is 80. The HTTP port is not assigned by the network. HTTP port 80 is the standard port for web servers. This allows you to connect to the receiver by entering only the IP address of the receiver in a web browser. If the SPSx50 receiver is set up to use a port other than 80, you will need to enter the IP address followed by the port number in a web browser.

Example of connecting to the receiver using port 80: http://169.254.1.0

Example of connecting to the receiver using port 4000: http://169.254.1.0:4000

The default setting of the SPSx50 receiver is to use DHCP. Using DHCP enables the receiver to obtain the IP address, Netmask, Broadcast, Gateway, and DNS address from the network.

When an SPSx50 receiver is connected to a
network using DHCP, an IP address is assigned
to the receiver by the network. To verify the IP
address of the receiver, select the up button
from the keypad when the *Home* screen is
displayed. The Ethernet IP address appears as shown.

If your network installation requires the receiver to be configured with a static IP
address, you can configure the Ethernet settings using the web server or the WinFlash
utility. The web server can be only used when the receiver is connected to a network
and has a valid Ethernet configuration.

Use the WinFlash utility to configure the Ethernet settings of a receiver that is to be
connected to a network that requires static IP addresses:

1. Contact the network administrator for the correct settings for the SPSx50
    receiver.

2. Connect the SPSx50 receiver to a computer running the WinFlash utility using
    the serial cable provided with the receiver.

3. Turn on the SPSx50 receiver.

4. On the computer, start the WinFlash utility.

5. From the *Device Configuration* screen, select Trimble SPSx50 Receiver. From the
    PC serial port list, select the appropriate PC serial port. Click **Next:**
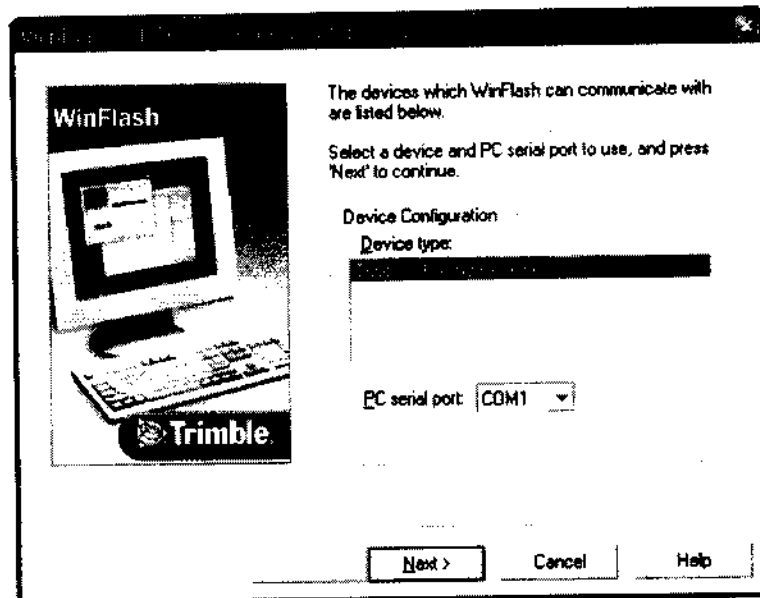
6. From the *Operation Selection* screen, select Configure ethernet settings, and then click **Next**:
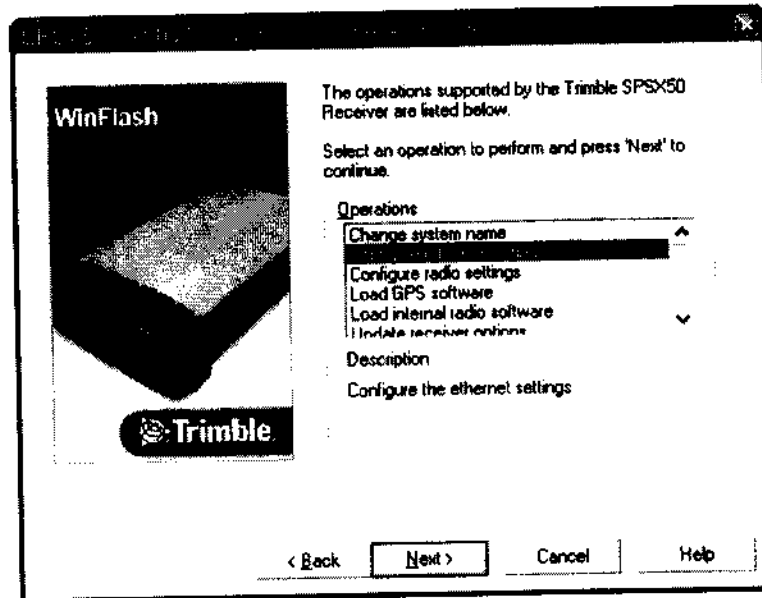
7. From the *Settings Review* screen, click **Finish**:
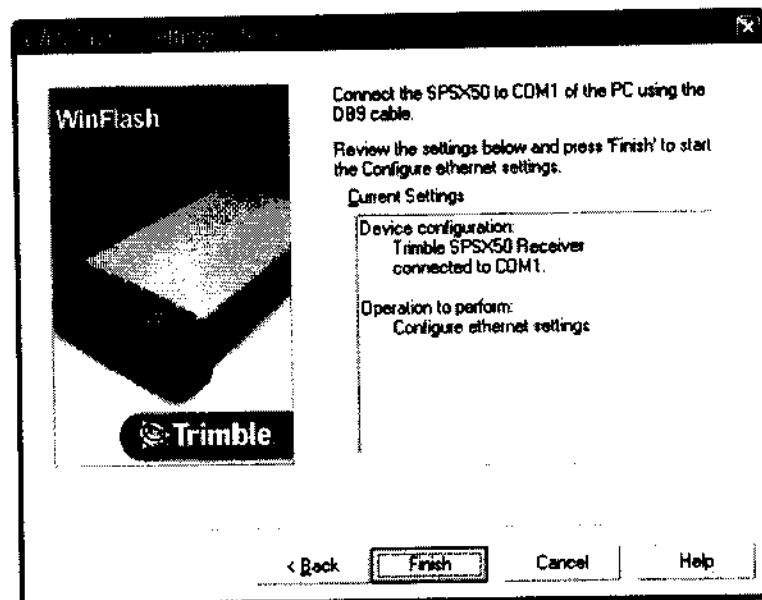
Once the WinFlash utility connects to the receiver, the *Ethernet Configuration* dialog appears.

8. Enter the network settings in the *Ethernet Configuration* dialog. Click **OK**:
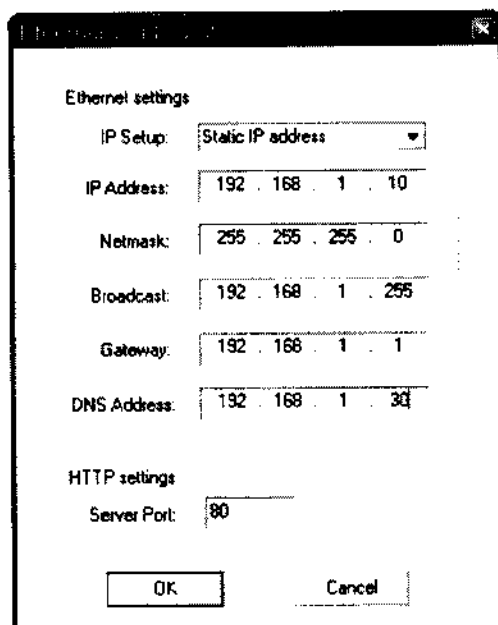
The Broadcast setting is the IP address that is used to broadcast to all devices on the subnet. This is usually the highest address (usually 255) in the subnet.

Configuring the SPSx50 receiver using a web browser

The SPSx50 receiver can be configured using the keypad and display, Trimble SCS900 Site Controller software, or a web browser. This section describes how to set up the receiver using a web browser.

Supported browsers

- Mozilla Firefox version 1.07 or later (version 1.50 is recommended for Windows, Macintosh, and Linux operating systems)

- Microsoft Internet Explorer version 6.00 or later for Windows operating systems

To connect to the receiver using a web browser:

1. Enter the IP address of the receiver into the address bar of the web browser as shown:

2. If security is enabled on the receiver, the web browser prompts you to enter a username and password:
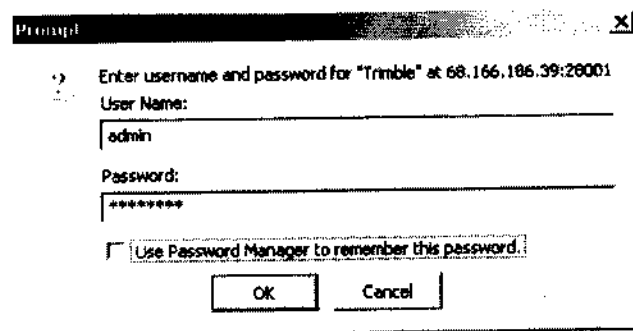
The default login values for the SPSx50 receiver are:

–   User Name: admin

–   Password: password

If you cannot connect to the receiver, the password for the root account may have been changed, or a different account may be being used. Contact your receiver administrator for the appropriate login information.

Once you are logged in, the welcome web page (see Figure 7.1) appears.

Model name of receiver
Serial number of receiver
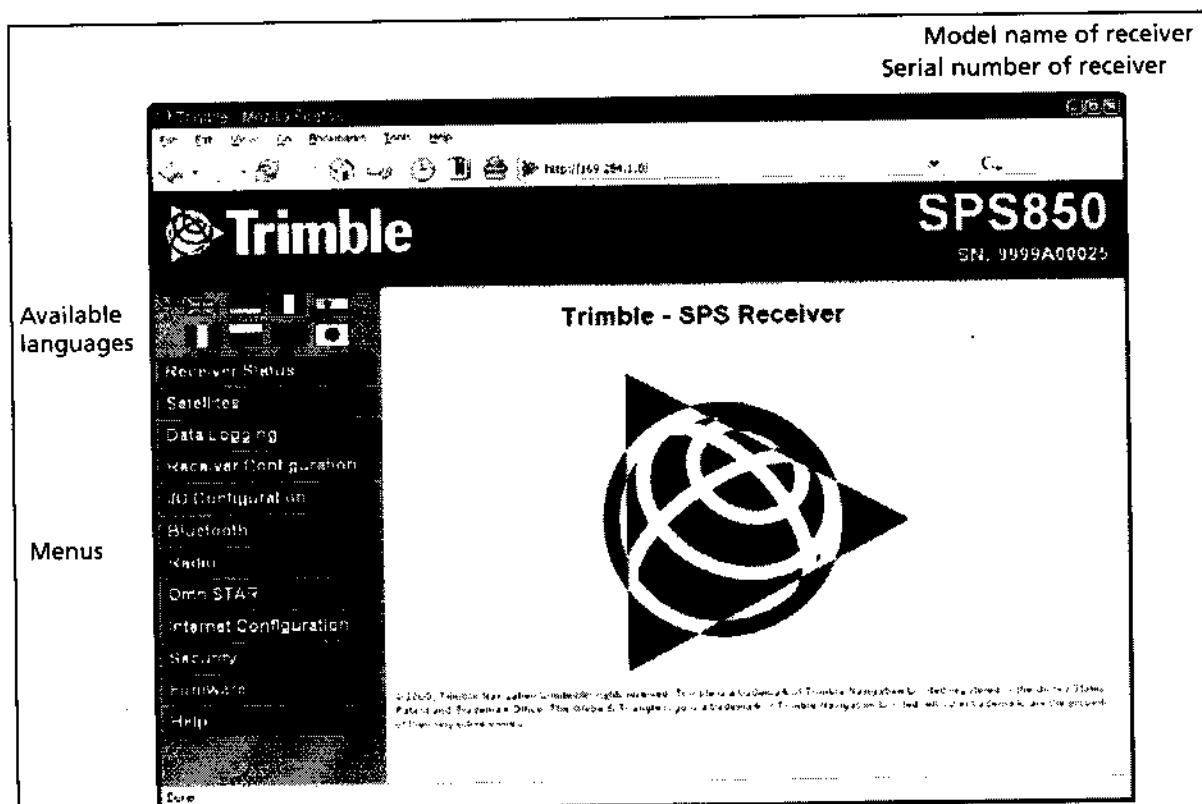
Figure 7.1   SPS GPS receiver Home webpage

Changing the settings

Use the webpage to configure the receiver settings. The web interface shows the configuration menus on the left of the browser window, and the settings on the right. Each configuration menu contains related submenus to configure the receiver and monitor receiver performance.

Note – The configuration menus available vary based on the version of the SPSx50 receiver.

A summary of each configuration menu is provided here. For more detailed information about each of the receiver settings, select the *Help* menu.

To display the web interface in another language, click the corresponding country flag. The web interface is available in the following languages:

- English
- German
- French
- Spanish

- Italian
- Russian
- Chinese
- Japanese

Receiver Status menu

The *Receiver Status* menu provides a quick link to review the receiver's available options, current firmware version, IP address, temperature, runtime, satellites tracked, current outputs, available memory, position information, and more.

This figure shows an example of the screen that appears when you select *Receiver Status / Identity*.

Satellites menu

Use the *Satellites* menu to view satellite tracking details and enable/disable GPS, GLONASS, and SBAS (WAAS/EGNOS and MSAS) satellites.

Note – To configure the receiver for OmniSTAR, use the OmniSTAR menu. See page 82.

This figure shows an example of the screen that appears when you select *Satellite / Tracking (Sky Plot)*.
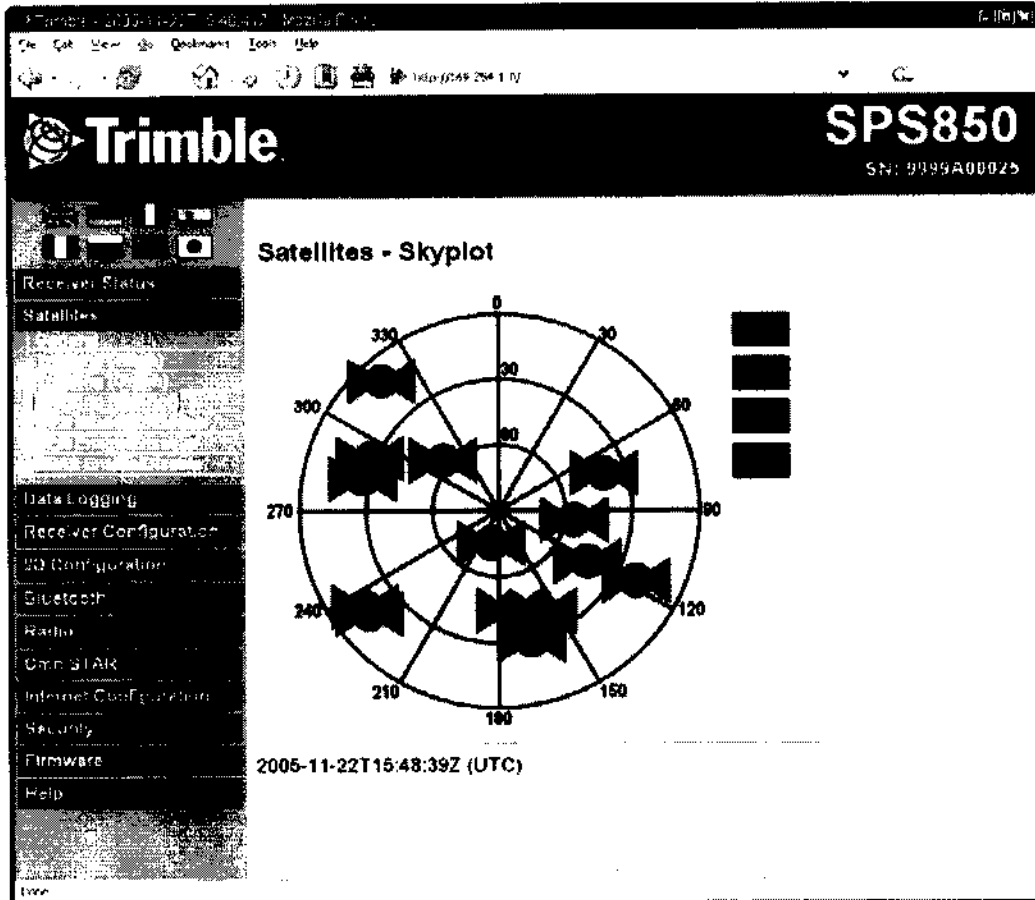
Data Logging menu

Use the *Data Logging* menu to set up the SPSx50 receiver to log static GPS data. This menu is available only if the receiver has the Data Logging option enabled. You can also configure settings such as observable rate, position rate, continuous logging, continuous logging rate, and whether to auto delete old files if memory is low.

This figure shows an example of the screen that appears when you select *Data Logging / Configuration*.
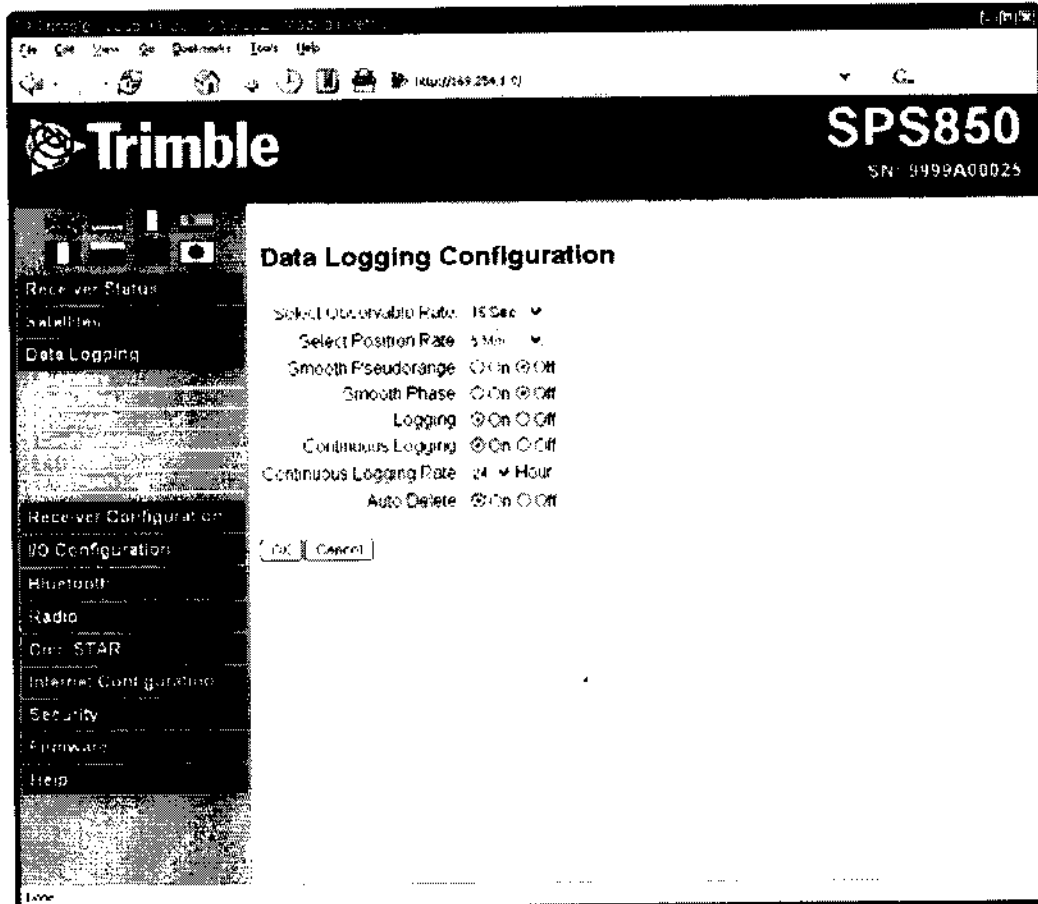
Receiver Configuration menu

Use the *Receiver Configuration* menu to configure such settings as elevation mask and PDOP mask, the antenna type and height, the reference station position, and the reference station name and code.

This figure shows an example of the screen that appears when you select *Receiver Configuration / Summary*.
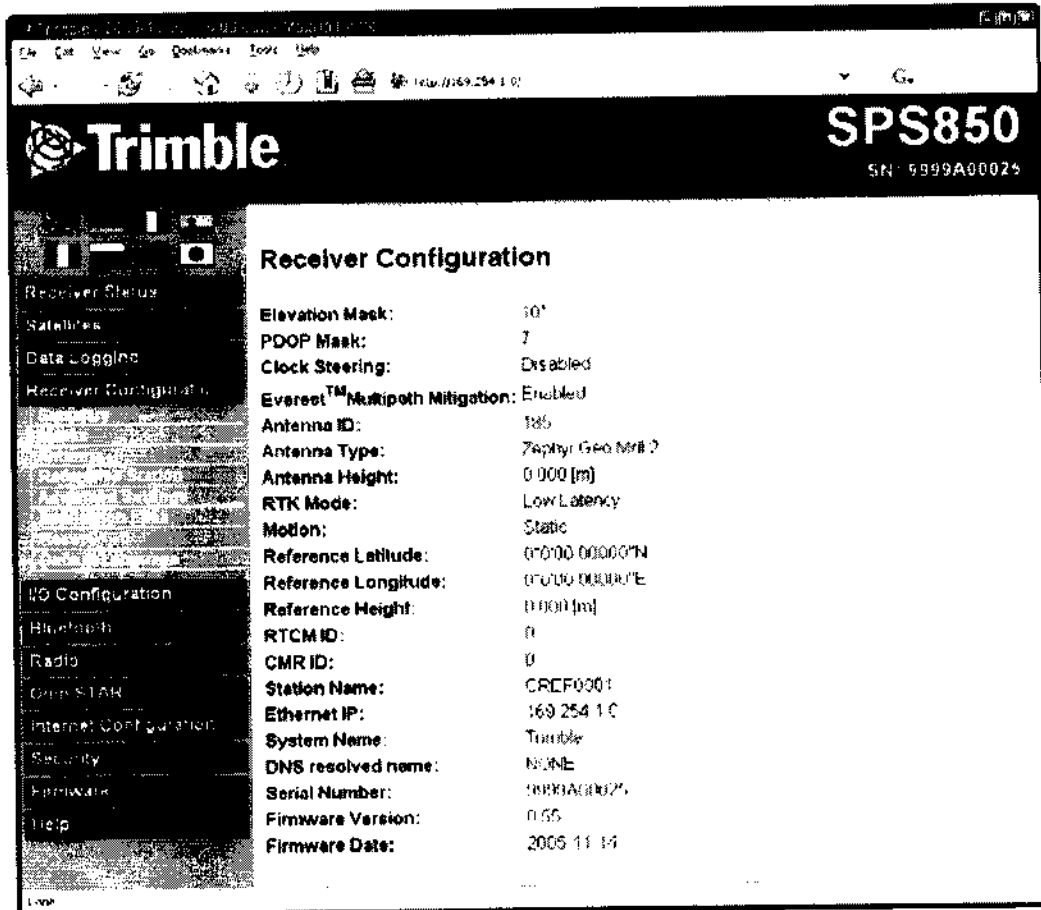
I/O Configuration menu

Use the *I/O Configuration* menu to set up all outputs of the SPSx50 receiver. The receiver can output CMR, RTCM, NMEA, GSOF, RT17, or BINEX messages. These messages can be output on TCP/IP, UDP, serial, Bluetooth, or radio ports.

This figure shows an example of the screen that appears when you select *I/O Configuration / Port Summary.*
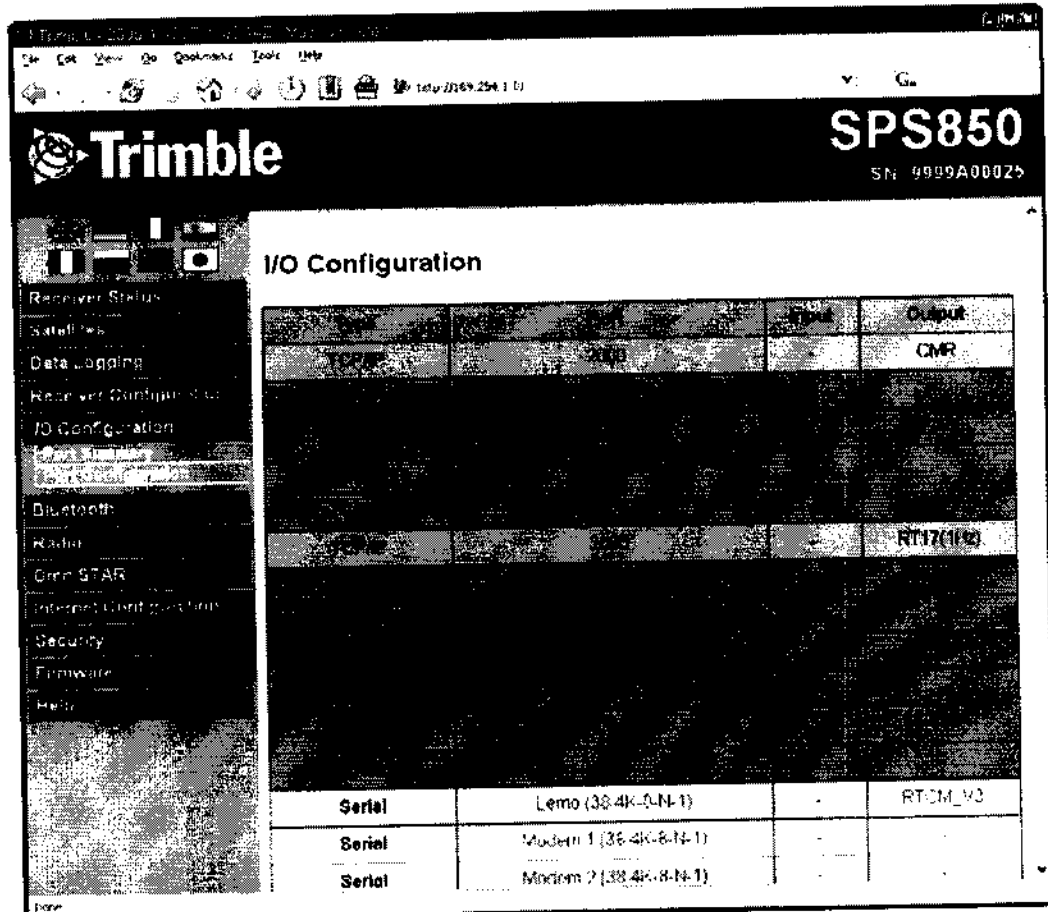
Bluetooth menu

Use the *Bluetooth* menu to configure the receiver to connect to other Trimble devices that use Bluetooth wireless technology. These devices can be used to configure the receiver, and generate or receive corrections. The following Trimble devices can be connected to the SPSx50 receiver using Bluetooth wireless technology:

- TSC2 controller
- TCU controller
- TSCe controller
- ACU controller
- SNB900 radio-modem
- Other Bluetooth-enabled SPS GPS receivers

This figure shows an example of the screen that appears when you select *Bluetooth / Info.*
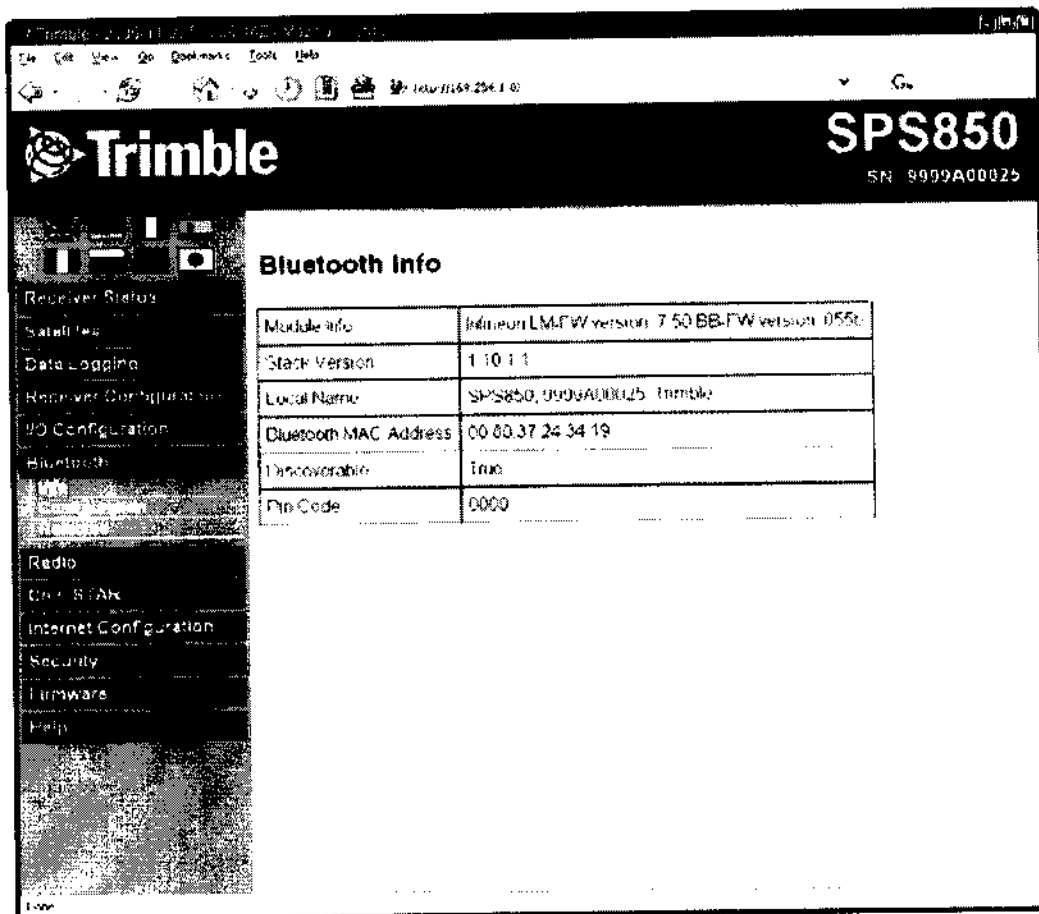
Radio menu

Use the *Radio* menu to configure the internal radio of the receiver, if applicable. The SPSx50 receivers are available with 410–430 MHz, 430–450 MHz, 450–470 MHz, or 900 MHz radios. The SPS550H receiver does *not* have an internal radio.

This figure shows an example of the screen that appears when you select *Radio*.
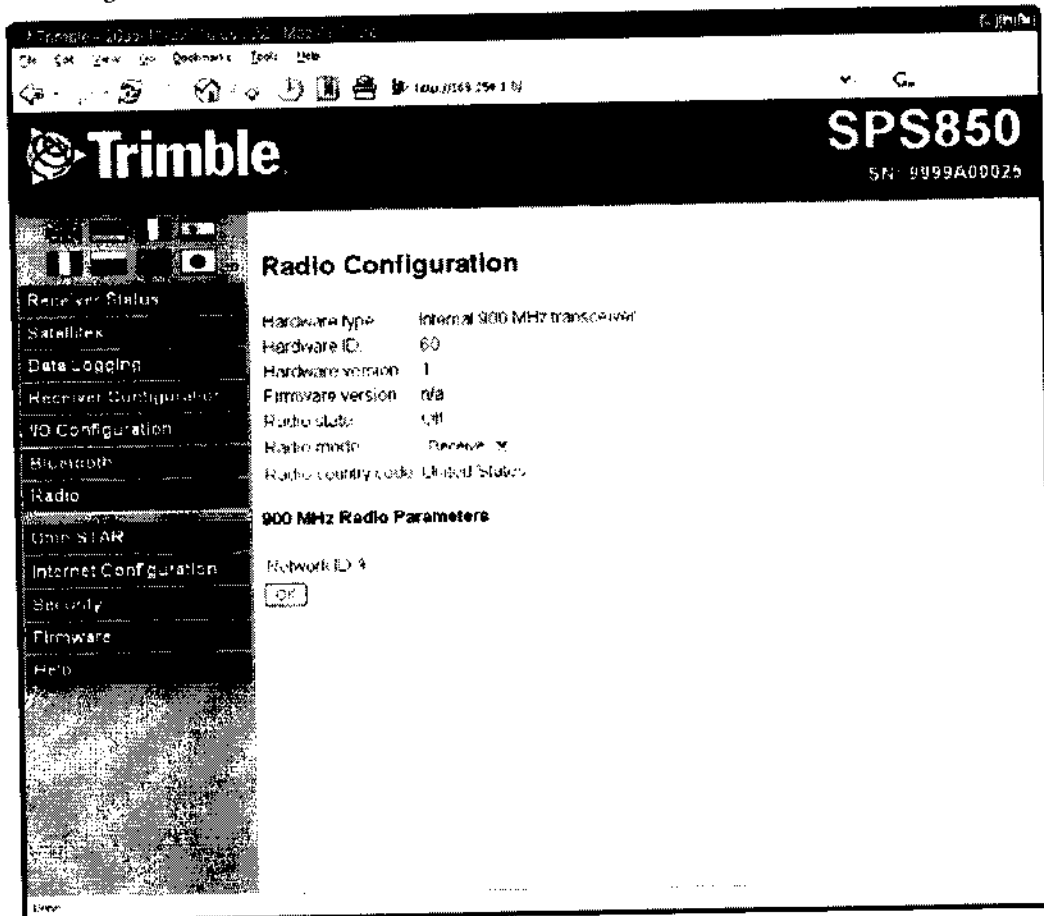
OmniSTAR menu

All SPSx50 receivers, except the SPS550H, can receive OmniSTAR corrections. By default, OmniSTAR tracking is turned on in the receiver. To receive OmniSTAR corrections, you must set the receiver to track OmniSTAR satellites and it must have a valid OmniSTAR subscription. The receiver can position with OmniSTAR XP or HP. To purchase a subscription for your receiver, contact OmniSTAR at:

www.OmniSTAR.com
North & South America, 1-888-883-8476 or 1-713-785-5850
Europe & Northern Africa, 31-70-317-0900
Australia & Asia, 61-8-9322 5295
Southern Africa, 27 21 552 0535

This figure shows an example of the screen that appears when you select *OmniSTAR / Configuration*.
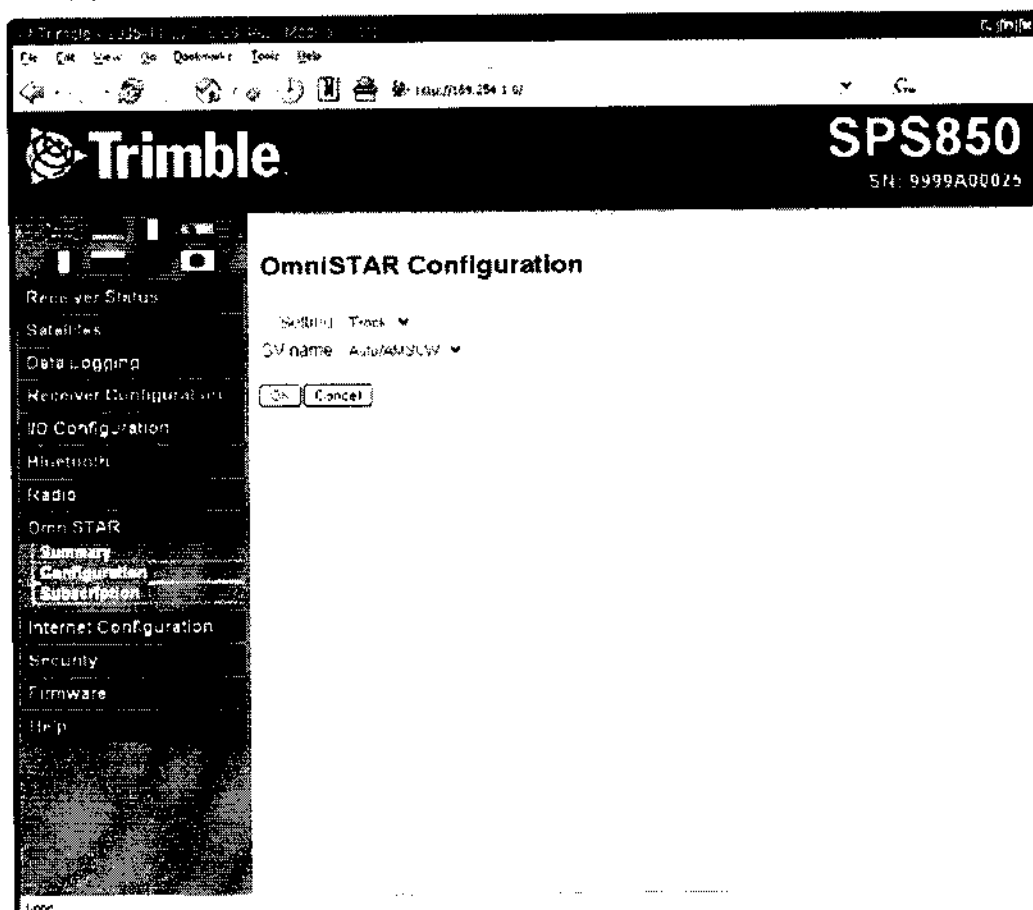
Internet Configuration menu

Use the *Internet Configuration* menu to configure Ethernet settings, e-mail alerts, PPP connection, HTTP port, FTP port, and VFD port settings of the receiver. For information on the Ethernet settings, see Configuring Ethernet settings, page 69.

The VFD port allows you to use the SPSx50 Remote Control application to view and navigate the SPSx50 receiver through a mock display and keypad interface. To allow the SPSx50 Remote Control to connect to the receiver, you need to enable the VFD port. To do this, select *Internet Configuration / VFD*.

This figure shows an example of the screen that appears when you select *Internet Configuration / Ethernet*.
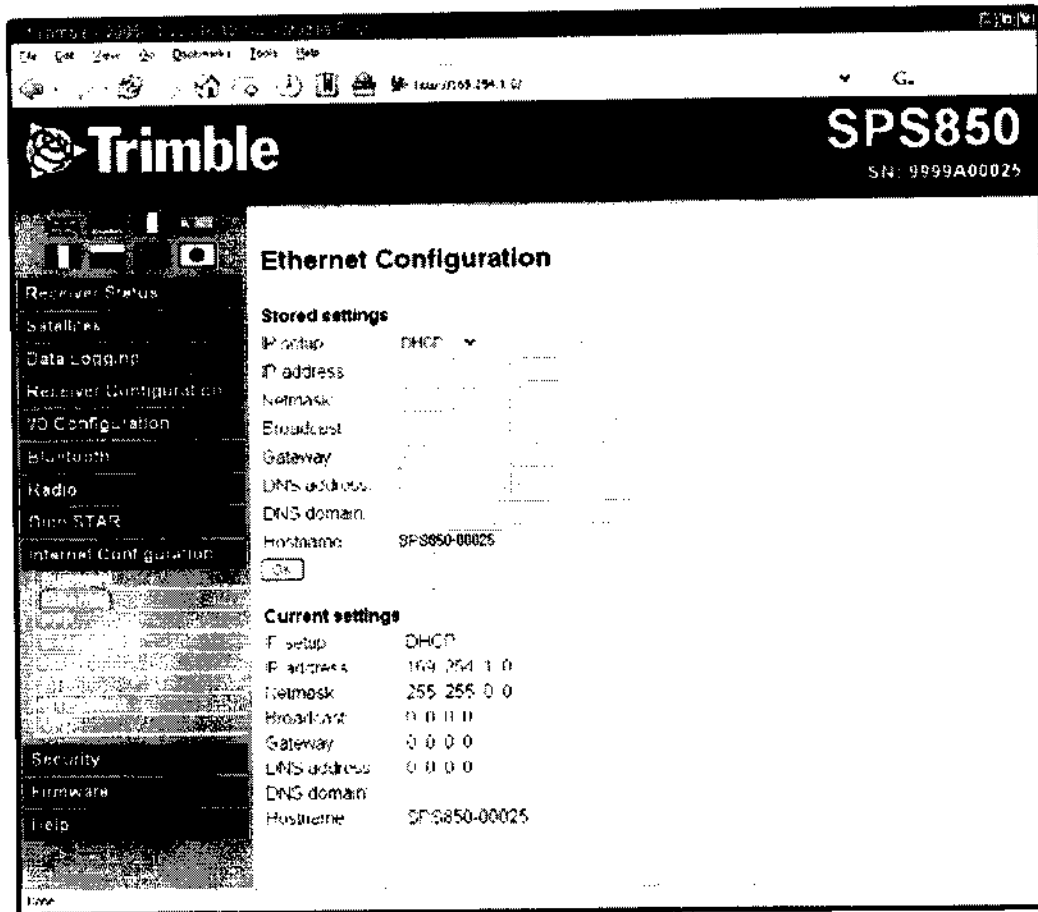
Security menu

Use the *Security* menu to configure the login accounts for all users who will be permitted to configure the SPSx50 receiver using a web browser. Each account consists of a username, password, and permissions. Administrators can use this feature to limit access to other users. Security can be disabled for a receiver. However, Trimble discourages this as it makes the receiver susceptible to unauthorized configuration changes.

This figure shows an example of the screen that appears when you select *Security / Configuration.*
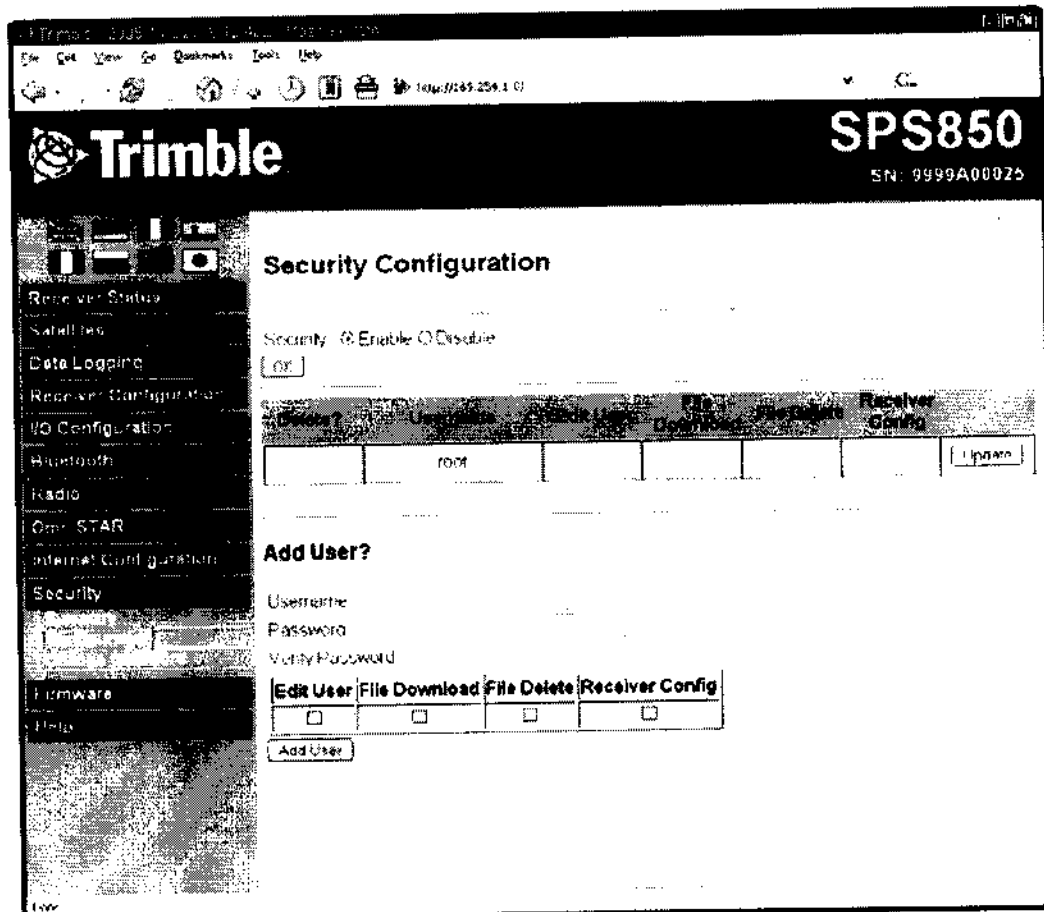
Firmware menu

Use the *Firmware* menu to verify the current firmware and load new firmware to the SPSx50 receiver. You can upgrade firmware across a network or from a remote location without having to connect to the receiver with a serial cable.

This figure shows an example of the screen that appears when you select *Firmware*.
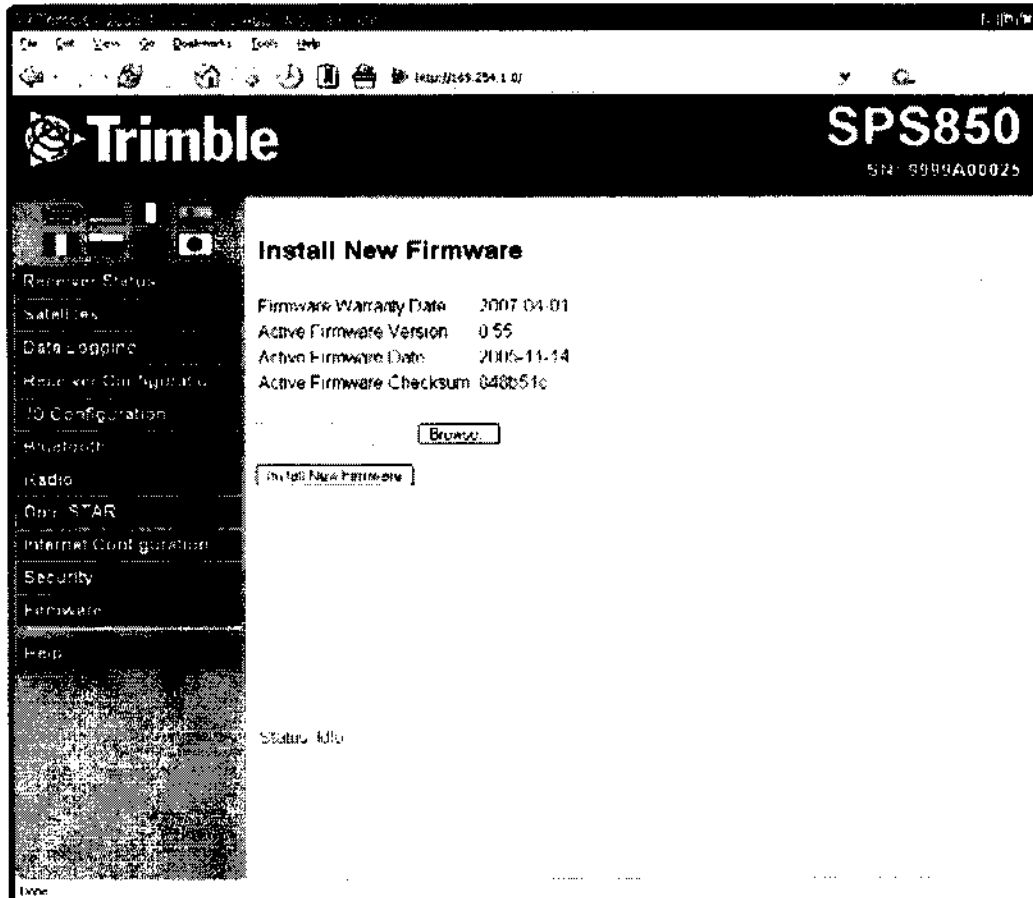
Help Menu

The *Help* menu provides information on each of the receiver settings available in a web browser. Selecting the *Help* menu opens new windows. Select the section of the Help that you want to view. The Help files are stored on the Trimble Internet site and are updated between firmware releases. If you do not have access to the Internet, there is also a copy of the receiver Help files on the *Trimble SPS GPS Receiver CD*. (This copy shows the Help files as they were when the CD was published).

This figure shows an example of the screen that appears when you select *Help*.

8
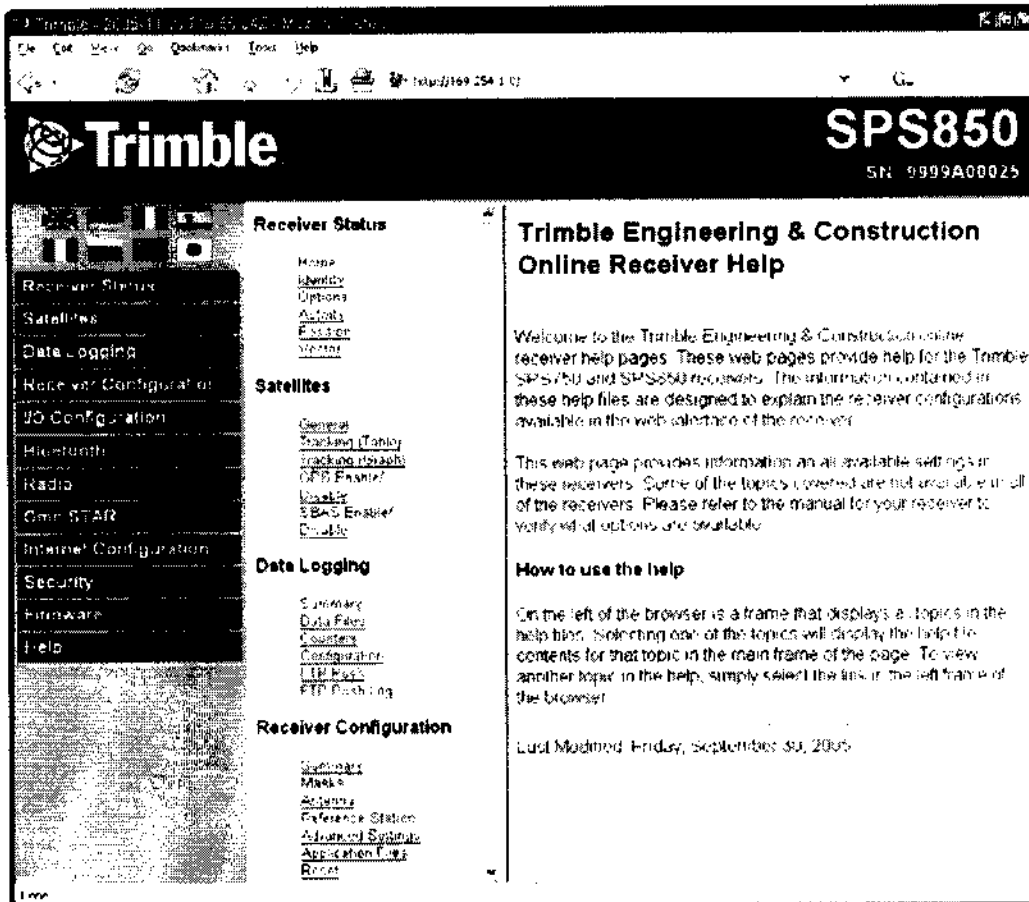
Automatically Setting up a Mobile Base Station Using AutoBase Technology

In this chapter:

- AutoBase Warning

- Working with AutoBase technology

    - Scenario One: First visit to a site with AutoBase Warning turned off

    - Scenario Two: First visit to a site with AutoBase Warning turned on

    - Scenario Three: Repeat visit to a site with AutoBase Warning turned off

    - Scenario Four: Repeat visit to a site with AutoBase Warning turned on

- Flowchart showing the AutoBase process

The AutoBase technology is a feature of the Trimble SPSx50 receivers that enables you to reduce daily setup time for mobile base stations and to reduce the likelihood of using incorrect base station coordinates during setup.

The AutoBase feature allows you to set up a SPSx50 receiver as a base station receiver and save you time so you do not need to reconfigure the receiver at the start of each day. It also allows you to set up the base station on a new site without needing to configure the settings in the receiver.

Even if you have used the AutoBase feature in other Trimble receivers, Trimble recommends that you read this chapter carefully because new functions in this feature provide greater benefit to you.

AutoBase Warning

The AutoBase Warning, when enabled, prevents the receiver from creating a new base station position and begin operating as an RTK base station when no previous base station position exists that corresponds to the current position of the receiver.

When the AutoBase Warning is on, the receiver will not begin transmitting RTK corrections from a base position (latitude, longitude, and height) that is not a part of the GPS site calibration. When the AutoBase Warning is off, the receiver begins transmitting RTK corrections from a new base position. You need only turn on the receiver the first time on a point, and you do not need to manually configure the base station settings.

By default, the SPSx50 receivers have the AutoBase Warning turned on. The receiver uses the AutoBase Warning setting to control how the receiver performs when different criteria are met. You can turn the AutoBase Warning on or off using the keypad and display. For more information, see Configuring system settings, page 65.

Working with AutoBase technology

This section contains some example scenarios. In each section, there is a step-by-step process that explains what you will experience in each scenerio.

Scenario One: First visit to a site with AutoBase Warning turned off

The following actions occur when you set up the base station for the first time on a new point and the AutoBase Warning is turned off:

1. Turn on the receiver.

2. The receiver begins tracking satellites.

3. The receiver determines the current position.

4. The receiver reviews the previous base station positions stored in the receiver.

5. The receiver does not find any base station that corresponds to the current position.

6. The receiver creates a new base station location for the current location.

7. The receiver sets the antenna height to 0. The antenna height is measured to the antenna phase center.

⚠ **CAUTION** – On each reoccupation of the point, you must ensure that the receiver antenna is set up in exactly the same location and at exactly the same height. Trimble also recommends that you use a T-bar or Fixed height tripod so that the position is easy to re-establish. Failure to achieve the same height position for the antenna results in errors in heights in subsequent measurements.

Where you set up each time with potentially different antenna heights, Trimble recommends that on the first setup after AutoBase has completed its process, that you edit the antenna height (using the receiver keypad and display). The updated antenna height changes the AutoBase setup, so that on subsequent setups, when you again change the antenna height, you will get correct height information during measurement. At the first setup, Trimble recommends that you change the AutoBase setup and antenna height *before* you carry out a site calibration.

8. The receiver begins generating RTK CMR+ corrections.

9. The RTK corrections begin streaming over the internal radio. If there is no internal radio, the receiver defaults to streaming the corrections on the Lemo port.

Scenario Two: First visit to a site with AutoBase Warning turned on

The following actions occur when you set up the base station for the first time on a point, and the AutoBase Warning is turned on:

1. Turn on the receiver.

2. The receiver begins tracking satellites.

3. The receiver determines the current position.

4. The receiver reviews the base positions stored in the receiver.

5. The receiver does not find any base station that corresponds to the current position.

6. The receiver displays a warning that AutoBase has failed.

7. No RTK corrections are streamed until the base station is set up using the keypad and display or an SCS900 controller.

Scenario Three: Repeat visit to a site with AutoBase Warning turned off

The following actions occur when you repeat a base station setup on a point, and the AutoBase Warning is turned off:

1. Turn on the receiver.

2. The receiver begins tracking satellites.

3. The receiver determines the current position.

4. The receiver reviews the base station positions stored in the receiver.

5. The receiver finds a base station position that corresponds to the current position.

6. The receiver loads the previous base information.

7. The antenna type, antenna height and measurement method used in the previous setup of this base station are applied.

⚠ **CAUTION –** If the antenna height is different to the previous setup, then you must enter the corrected height for the antenna (using the keypad and display) before starting measurements. Failure to achieve the correct antenna height position for the antenna results in errors in heights in subsequent measurements.

8. The receiver begins generating RTK CMR+ corrections.

9. The RTK corrections begin streaming on the radio or port defined in the application file.

Scenario Four: Repeat visit to a site with AutoBase Warning turned on

The following actions occur when you repeat a base station setup on a point, and the AutoBase Warning is turned on:

1. Turn on the receiver.

2. The receiver begins tracking satellites.

3. The receiver determines the current position.

4. The receiver reviews the base station positions stored in the receiver.

5. The receiver finds a base station position that corresponds to the current position.

6. Since a base station position is found, the AutoBase warning does not appear.

7. The receiver loads the previous base information.

8. The antenna type, antenna height, and measurement method used in the previous setup of this base station are applied.

⚠ **CAUTION –** If the antenna height is different from the previous setup, then you must enter the corrected height for the antenna (using the keypad and display) before starting measurements. Failure to achieve the correct antenna height position for the antenna results in errors in heights in subsequent measurements.

9. The receiver begins generating RTK CMR+ corrections.

10. The RTK corrections begin streaming on the radio or port defined in the previous setup of this base station.

Note – Autobase recalls base station positions that are stored in the receiver. If the receiver has been previously set up on a control point but the stored base station position is not found in the receiver, it is possible that the information may have accidently been deleted. In this case, use the display and keypad or the SCS900 system to manually set up the base station. Make sure that you use the same base station latitude, longitude, and height as in the previous setup otherwise you will experience position or height errors in all subsequent measurements.

Trimble recommends that after any new base station setup, or at the start of each measurement session, you measure a known point to verify that position and height errors are within tolerance. This is good practice and it takes just a few seconds to eliminate potentially gross errors typically associated with repeated daily base station setups.

Flowchart showing the AutoBase process

Figure 8.1 shows the AutoBase process.
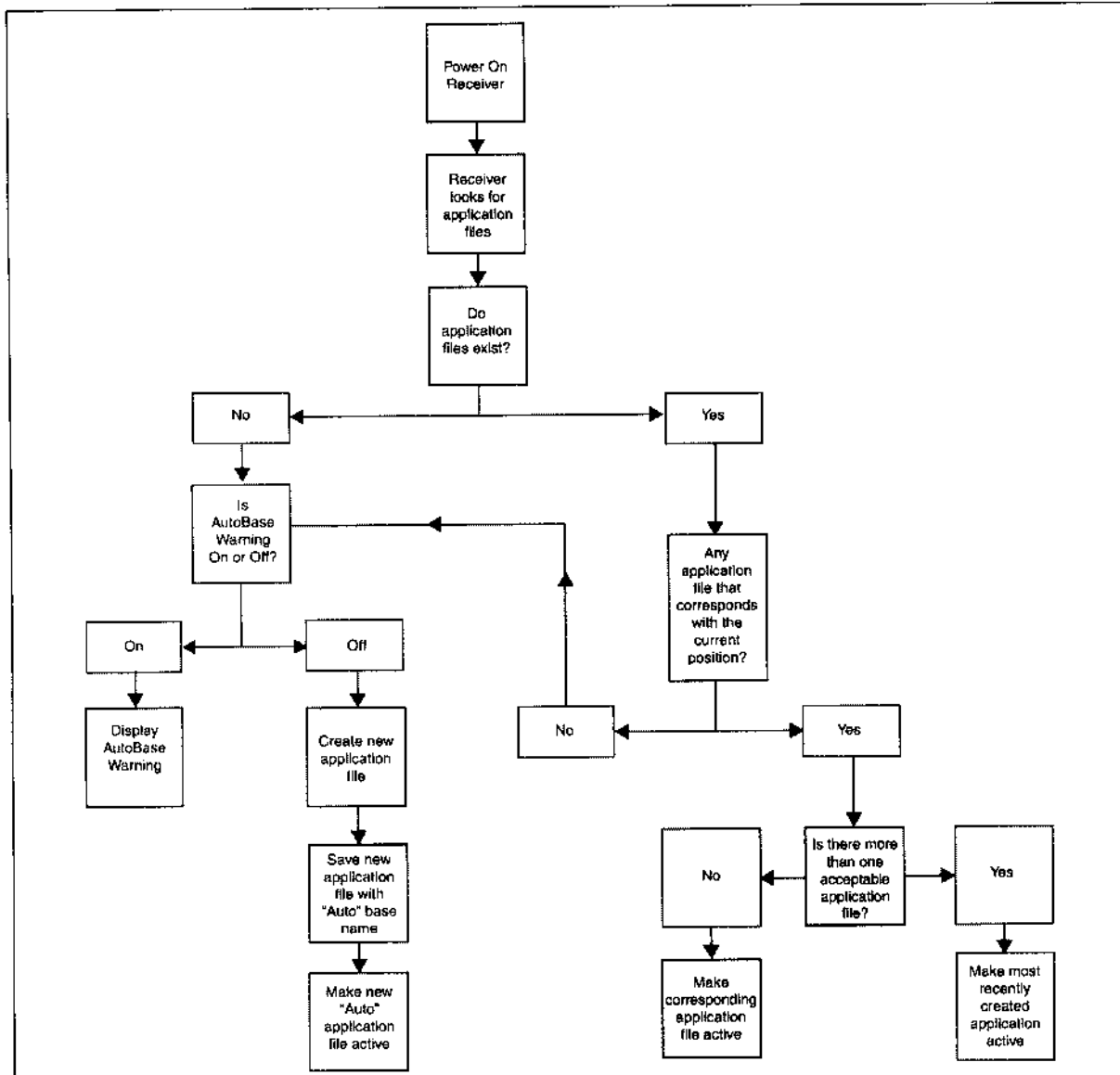
Figure 8.1   Autobase feature

9

Default Settings

In this chapter:

- Default receiver settings
- Resetting the receiver to factory defaults
- Data Logging option

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 for the SPSx50. 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.

Default receiver settings

These settings are defined in the default application file.

Function		Factory default
SV Enable		All SVs enabled
General Controls:	Elevation mask	10°
	PDOP mask	7
	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 (Height above ellipsoid)
Antenna:	Type	Zephyr Geodetic Model 2
	Height (true vertical)	0.00 m
	Measurement method	True vertical

Resetting the receiver to factory defaults

To reset the receiver to its factory defaults, press ⓞ for 35 seconds.

Data Logging option

By default, the Data Logging option is turned off in SPS GPS receivers. If you choose to log data using a GPS receiver, you must enable the option and acquire suitable GPS postprocessing software, such as the Trimble Geomatics Office software. For more information, please contact your Trimble dealer.

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.

Logging data after a power loss

If power is unexpectedly lost while the receiver is logging data, once power is restored, 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, data logging is not resumed. To resume data logging after a power loss:

1. Restart the receiver. When power is cycled on the receiver, the receiver will turn on but with data logging off.

2. Use the web browser or the keypad and display to turn data logging back on.

Specifications

In this chapter:

■ General specifications

■ Physical specifications

■ Electrical specifications

■ Communication specifications

■ GPS satellite signal tracking

■ Integrated radio options

■ Variable configuration options

This chapter details the specifications for the SPSx50 GPS receiver.

Specifications are subject to change without notice.