GPS Receiver System

SOKKIA

GSR2600

Operations Manual

Part Number 750-1-0093 Rev 1

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GSR2600 FCC and CE Notice
The equipment described in this manual has been tested and found to comply with the radiated and conducted emission limits for a Class B digital device, for both CISPR 22 and Part 15 of the FCC rules. 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 communications.

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 to 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

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◆ **Important!** To maintain compliance with the limits of a Class B digital device, it is required to use properly shielded interface cables (such as Belden #9539 or equivalent) when using the serial data ports, and double-shielded cables (such as Belden #9945 or equivalent) when using the I/O strobe port.

WARNING
Changes or modifications to this equipment not expressly approved by POINT, Inc. could result in violation of Part 15 of the FCC rules

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Chapter 1 Introduction

Welcome! The GSR2600 Operations Manual provides you with complete information about your Sokkia GSR2600 GPS receiver and its functions.

The GSR2600 is a high-performance GPS receiver for use in both RTK and post-processing applications. This receiver is capable of receiving and tracking up to 12 GPS satellites on L1 and L2 channels, has fast data update rates, and integrates memory (Compact Flash Card) for data logging.

The GSR2600 is ready for the most demanding applications – such as surveying, high precision surveying, roading, mining, and construction stakeout. It is engineered to provide years of reliable operation.

Don't worry if you have to collect data where signal obstructions are present and frequent interruption of signals are expected, the excellent acquisition and re-acquisition times of the GSR2600 enables this receiver to operate in those environments. As well, the GSR2600 features a rugged, reliable design for use in adverse conditions.

Once you connect the GSR2600 receiver to an antenna and power supply, and press the receiver power button, the GSR2600 begins operating as a fully functional GPS receiver.

Optionally, a handheld data collector can be used with the GSR2600 to aid in data collection. When used together, the GSR2600 receiver and the handheld provide powerful state-of-the-art technology, and an intuitive, easy-to-use GPS system.

1.1 Ports and Icons

The following icons are located on the front or rear panel of the GSR2600 receiver. The icons identify the:

Icon	Description
Rear Panel	
 PWR	Power port
 COM1	Data collector communications port
 COM2	Radio communications port
 GPS	Antenna port
Front Panel	
	**Power** button
	**Escape** button
	**Enter** button
	Arrow buttons

1.2 Features

The GSR2600 has the following standard features:

Table 1: Feature Summary

GSR2600 Features
Rugged shock, water, and dust-resistant enclosure when access door is closed
L1/L2 GPS technology (L1 Channels = C/A code & L2 Channels = P code)
Capability to log data to a removable CompactFlash Card
LCD panel and keypad for on-the-fly data information
Two bi-directional COM ports that support data transfer rates of up to 115,2000 bps
Field upgradeable software

1.3 Where to Find Information

This manual provides sufficient information to enable you to effectively use the GSR2600. In addition to this manual, several other forms of documentation serve as supporting documents.

- **GSR2600 Advanced Reference Materials.** Located on the *Complete Product CD*. This document lists the GSR2600 cable and pinout specifications, as well as an advanced glossary of definitions.
- **GSR2600 Menu Quick Reference.** This fold-out document displays the menu and screens listed in the GSR2600 LCD.
- **Planning Reference Manual.** This document shows how to use *Planning* software to help determine satellite availability as well as information for understanding and setting schedules and configurations.
- **Spectrum Survey® Suite Reference Manual.** This document provides information for processing and adjusting your collected data.

1.4 Obtaining Technical Assistance

When contacting customer support, have available:

- Firmware version number
- Concise description of the problem

Technical support for this product is available from the distributor where you purchased it. You also may contact one of the Sokkia subsidiaries listed below.

Europe
Sokkia B.V.
Businesspark De Vaart
Damsluisweg 1, 1332 EA Almere
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Phone +31-36-53.22.880
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Fax +1-913-492-0188
www.sokkia.com

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1050 Stacey Court
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Phone +1-905-238-5810
Fax +1-905-238-9383
www.sokkia.com/Retail/canada.htm

Central & South America
Sokkia Central & South America
2232 NW 82nd Avenue
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Singapore 149598
Phone +65-6479-3966
Fax +65-6479-4966
www.sokkia.com.sg/

1.5 Notes, Cautions, and Warnings

Notes, Cautions, and Warnings stress important information regarding the installation, configuration, and operation of the GSR2600 receiver.

Note

✉ **Note:** Notes outline important information of a general nature.

Caution

CAUTION
Cautions inform of possible sources of difficulty or situations that may cause damage to the product.

Warning

WARNING
Warnings inform of situations that may cause you harm.

1.6 GSR2600 Usage Cautions

CAUTION	
1	This device incorporates circuitry to absorb most static discharges. However, severe static shock may cause inaccurate operation of the unit. Use anti-static precautions where possible.
2	This device is a precision instrument. Although it is designed for rugged operating conditions, it performs best when handled with care.
3	When the access door for the data card is screwed closed, the enclosure is sealed to provide protection against adverse environmental conditions. To minimize the possibility of damage, always keep this cover closed except when exchanging data cards. **Any attempt to remove this access door or the end-caps impairs the water-resistant qualities of the enclosure, and voids the warranty.**
4	Do not eject the data card while the GSR2600 is logging data, or you may lose part of, or your entire, data file.
5	The GSR2600 can accept an input supply voltage in the range +6 to +18 V DC. This may not be the same range that other Sokkia products have. Do not operate the GSR2600 outside of the specified voltage range.
6	Drawing more than the specified maximum current (1 amp) from COM2 will cause an internal fuse to interrupt the current. If this happens, you will have to return the unit to Sokkia for the receiver to be returned to normal operations.

Chapter 2 Quick Start System Setup

It is quite simple to set up the GSR2600 to collect data and to configure the GSR2600 to transfer the collected data to your PC for post-processing. This chapter explains briefly how to set up the GSR2600 in the field or office.

CAUTION

See Section 1.6, *GSR2600 Usage Cautions*, on Page 6 for a list of items you should be aware of as you set up and use the GSR2600.

2.1 Setting Up at the Office

In a typical GSR2600 office setup, the PC is connected to the receiver's COM1 port, and a 12 V power supply is connected to the receiver's PWR port.

Use the office setup to:

- Load a schedule on the receiver using *Planning* software
- Transfer collected data from the receiver to your PC

The following steps describe how to configure a typical office setup:

1. Place the GSR2600 on a desk, or other suitable work surface.

2. Use the PC Data cable to connect the PC to COM1 on the GSR2600.

3. Connect the AC/DC converter or battery to the PWR port on the GSR2600.

4. Press the power button to turn on the receiver. The GSR2600 will begin an initialization sequence.

5. **Before data collection:** Optionally set up a data-collection schedule and transfer it to the GSR2600 using the *Planning* software (Refer to your *Planning Reference Manual*).

6. **After data collection:** Use any Sokkia software to download the data from the GSR2600 to the PC (For example, *Spectrum Survey*).

2.2 Setting Up in the Field

The following explains how to typically set up your GSR2600 to collect static or kinematic data in the field.

These steps assume that schedule and logging parameters have already been loaded to the GSR2600, and that an optional handheld data collector is not being used.

✉ **Note:** If a data collector was being used, then at *Step 8* when power was supplied, the GSR2600 would accept configuration commands from the data collector.

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1. Where possible, select a location with a clear view of the sky to the horizon so that each satellite above the horizon can be tracked without obstruction (minimize the effect of multipath interference).

2. Mount or place the GSR2600 on a secure, stable structure that will not sway or topple.

✉ **Note:** Although the unit has a moisture and dust-resistant enclosure, shelter it from adverse environmental conditions when possible.

3. Position the antenna over the desired location.

4. Mount the antenna on a stable structure that will not sway or topple.

5. Route and connect the RF coaxial cable between the antenna and GSR2600.

✉ **Note:** For static surveys, skip *Step 6*.

6. Connect a radio communications cable to the GSR2600's COM2 port. For example, this might be a radio modem for receiving differential GPS messages from a base station.

7. Insert a CompactFlash card into the GSR2600.

8. Connect a power source (For example, battery) to the GSR2600's PWR port.

9. Press the power button to turn on the GSR2600. If available, the GSR2600 will begin logging according to the stored configuration.

10. Monitor the status indicators on the LCD display.

Chapter 3 General Components

The following sections introduce the general GSR2600 physical components.

3.1 GSR2600 Front View

The following is an illustration of the GSR2600 main features located on the front of the receiver.

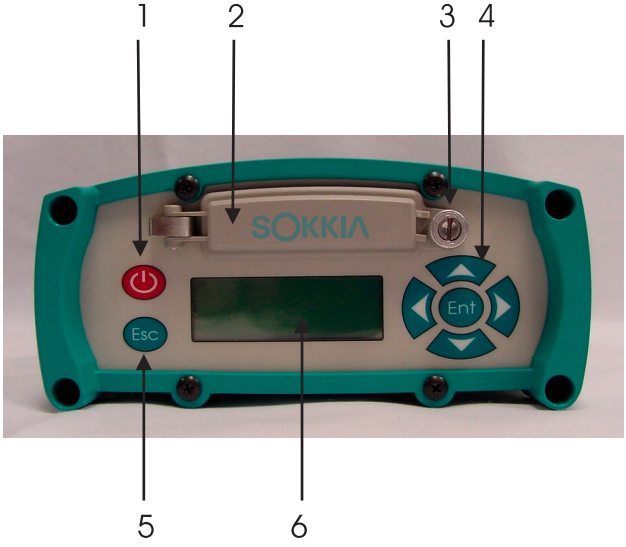


Figure 1: GSR2600 Front View

#	Description	#	Description
1	Power button	4	Enter and navigation buttons
2	Data card access door	5	Escape button
3	Screw closing access door	6	LCD display

3.2 GSR2600 Back View

The following is an illustration of the GSR2600 main features located on the back of the receiver.

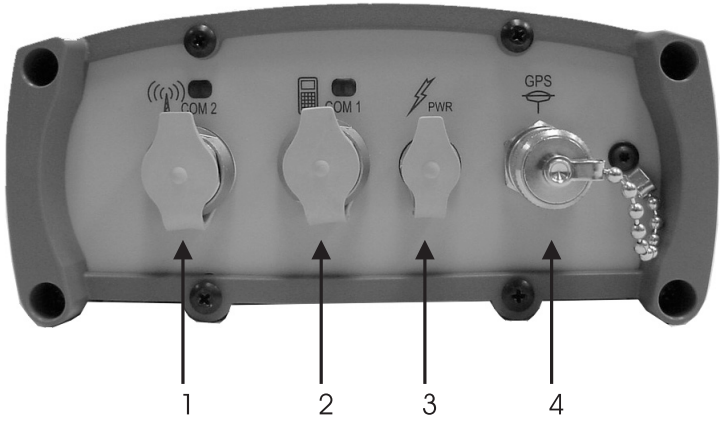


Figure 2: GSR2600 Back View

#	Description	#	Description
1	COM2 Port (radio communications)	3	Power Port
2	COM1 Port (handheld communications port)	4	GPS Port (antenna communications)

3.3 Data Card Access Door

The GSR2600's access door, when properly closed and secured, provides a dust and waterproof seal around the data card compartment.

Figure 3: Access Door

WARNING
To minimize the possibility of damage, always keep the access door closed and secured except when exchanging data cards.

To close the door, turn the screw clockwise until it is fully tightened (finger-tight). To open the door, turn the screw counter-clockwise until it springs upward to release the door.

CAUTION
If the screw resists turning, do not force it. Turn the screw counter-clockwise one turn and try again.

3.3.1 Data card

Data can be stored on a 3.3 V or 5 V-compliant CompactFlash data card, which can be accessed, exchanged, and replaced when needed.

The GSR2600 can store data to the card automatically, according to pre-configured parameters, without any user intervention. In applications when continuous user interaction is required, a data collector can be used with the GSR2600.

You can swap data cards while the GSR2600 is on, providing that data logging is not in progress. If the card is accidently removed while data is logging, (or if you experience a power interruption or similar disruptive event), the GSR2600 may lose several seconds, up to a maximum of one minute, of data. When possible, error messages are generated to identify problems as they arise.

The GSR2600 is supplied with a CompactFlash data card, but you have the flexibility of choosing the data card with the storage capacity that is the most appropriate for your needs, based on the selected data collection rate. The GSR2600 has been tested with SanDisk ATA-Type CompactFlash 8 MB, 20 MB, 40 MB, and 80 MB data cards.

✉ **Note:** If you choose to use a data card that has not been tested with the GSR2600, Sokkia cannot guarantee performance with the untested card.

3.3.1.1 Inserting and removing the data card

When the access door is open, you have unobstructed access to the data card compartment.

To insert the data card, follow these steps:

1. Open the access door.

2. Ensure that the logo side of the card is face-up, and the card is correctly aligned.

3. Slide the card into the slot.

4. Push the card in until it locks in place (the eject button, located to the right side of the data card compartment, will extend).

✉ **Note:** If you attempt to insert the card incorrectly, the card will not go all the way in, and the eject button will not extend. In this case, do not force the card! Remove it, orient it properly, and then re-insert it.

5. After the card is locked in place, close and secure the access door.

To remove the data card, follow these steps:

1. Open the access door.

2. Push in on the eject button to the right of the card to partially eject the card.

3. Grasp the card and pull it all the way out.

CAUTION

Ejecting the data card during a data-recording session may cause data to be lost. If you are unsure if the data card is actually logging data, look at the top right corner of the display in the LCD screen. If the word "LOGGING" is flashing, then data is currently being recorded. For more information, see Section 5.5, *LCD Front Panel*, Page 37.

3.4 GPS Antenna

The GSR2600 receiver is capable of receiving satellite signals transmitted at two frequencies, 1227.60 MHz (L2) and 1575.42 MHz (L1), by using an L1/L2 antenna.

Figure 4: SK-600 Antenna

The SK-600 is an L1/L2 GPS antenna that is ideal for use in surveying and other kinematic positioning applications. The SK-600 antenna offers exceptional phase-center stability (within 1 mm of its geometric center), as well as a significant measure of immunity against multipath interference. This antenna uses Pinwheel™ technology and is comparable to a choke ring antenna.

The SK-600 antenna can compensate for up to 13 dB of cable loss. Higher cable loss can be used, but you should expect an increased degradation in signal strength. For more information on cables, see Section 3.6.3.1, *Antenna cables,* Page 27.

WARNING
The performance specifications of the GSR2600 are guaranteed only when the receiver is used with a Sokkia model SK-600 antenna.

For complete specifications on this antenna, refer to your product CD for the *L1/L2 GPSAntenna Model SK-600 Antenna Quick Start*, Part Number 790-0-0064.

3.5 Battery Pack

The optional battery pack hooks onto the bottom of the GSR2600 to power the receiver. When the battery pack is connected, your receiver behaves as though it has an internal battery compartment, enabling you to have a more compact and portable device.

Figure 5: Battery Pack Attached to Receiver

The battery pack holds three internal BDC46 Li-Ion batteries (or equivalent). While one battery is powering the GSR2600 (as indicated by its LED flashing red), the two non-active batteries can be replaced without disrupting operation.

If you install three batteries, the GSR2600 will choose the first battery installed as its power source. If that battery becomes exhausted (for example, the battery drains), the GSR2600 will switch to the next available battery without any interruption in logging activities.

3.5.1 Battery pack LEDs

Located on the front of the battery pack are three LEDs.

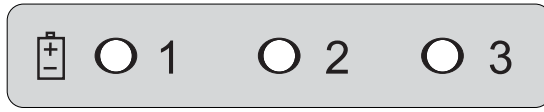


Figure 6: Battery Pack LEDs

For the LEDs to work, the battery pack must be fully connected to a GSR2600 that is turned on. For more information, see Section 3.5.3, *Connecting the battery pack*, Page 20.

For easy identification, each battery compartment (when the battery pack is open) lays directly above its associated LED.

Each LED displays the status of the battery inside its corresponding compartment and appears in one of three states: **On**, **Off**, or **Flashing**.

Table 2: Battery Pack LEDs

State	Color	Description
Off	N/A	Battery in compartment is discharged, or no battery is present
On	Red	Battery in compartment has a useable charge but not currently in use
Flashing	Red	Battery in compartment is currently being used by the receiver

3.5.2 Inserting and removing batteries

Batteries are inserted and removed from the battery pack in much the same way as a battery charger. Up to three batteries can be installed in the battery tray at a time.

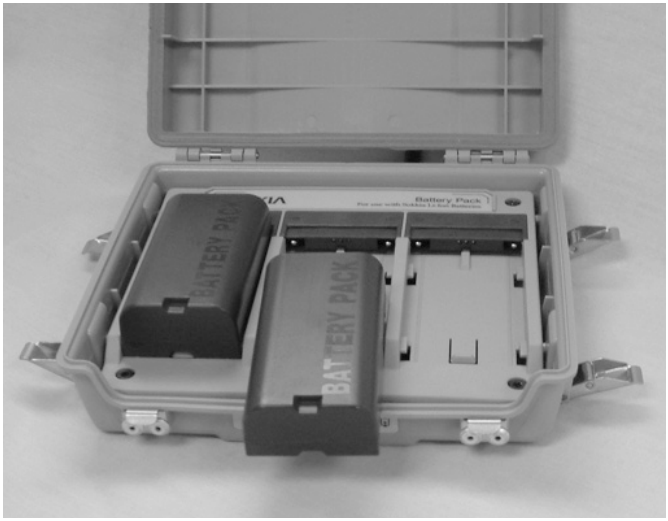


Figure 7: Insert Batteries

To insert a battery, follow these steps:

1. To access the battery compartments, open the battery pack by releasing the two clamps holding the compartment closed.

Figure 8: Battery Pack Front Clamps

2. Orient the battery flat side down with the connector end facing the rear of the battery compartment.

3. Slide the battery into the compartment until it fully connects with the compartment connectors.

4. Press down on the battery to ensure it is properly seated.

✉ **Note:** If the battery does not seat properly, do not force it. Simply remove the battery, reorient it, and try again.

---

5. Close the battery pack and re-attach the front clamps to create a seal around the battery compartment that is resistant to dust and water.

To remove a battery, follow these steps:

1. Open the battery pack.

✉ **Note:** If the LED associated with the battery you want to remove is flashing red, then that battery is currently in use and should not be removed.

---

2. Apply pressure to the top of the battery with your fingers.

3. Push the battery away from the compartment connectors.

4. When the battery is no longer seated in the compartment, lift it out of the battery pack.

5. Close the battery pack and re-attach the front clamps.

3.5.3 Connecting the battery pack

The battery pack is connected easily to the GSR2600 by four sturdy clamps (two on either side of the battery pack).

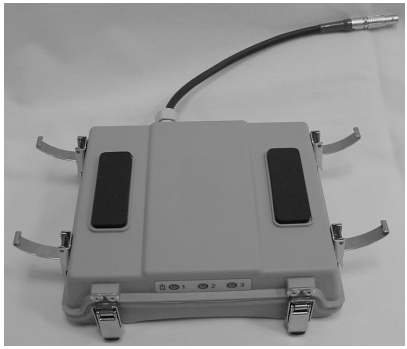


Figure 9: Battery Pack Side Clamps

To attach the pack to the GSR2600, follow these steps:

1. Lay the battery pack on a flat surface with the two surface pads facing up.

2. Ensure the battery pack power cable and latches are extended out.

3. Place the GSR2600 on top of the battery pack and aligned so that the back of the receiver's front bumper touches the front edge of the battery pack.

Figure 10: Battery Pack Alignment

4. Lift the hook of each clamp into the groove on the side of the GSR2600 and press down on their handles to lock them in place.

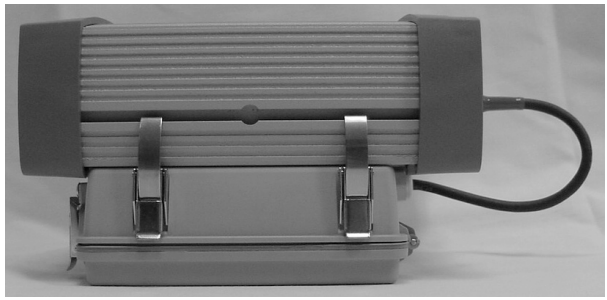


Figure 11: Connect Side Clamps

5. Connect the battery pack power cable to the PWR port on the GSR2600.

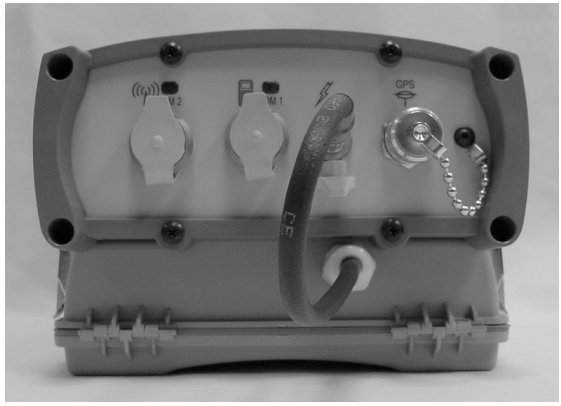


Figure 12: Connect Power Cable

6. Your battery pack is now fully connected to your GSR2600 receiver.

✉ **Note:** In order for the battery pack to function, the GSR2600 must be turned on.

3.6 Ports and Cables

As shown in Figure 2, *GSR2600 Back View*, Page 11, the rear end-cap has four labeled ports: **COM2**, **COM1**, **PWR**, and **GPS**.

Each GSR2600 cable connector is keyed to ensure that the cable can be inserted only one way to prevent damage to both the GSR2600 and the cables. In addition, the connectors that are used to secure the cables to the GSR2600 have a locking mechanism that requires careful insertion and removal.

Observe the following when handling cables:

- Before inserting the cable, make certain you are using the appropriate cable for the port.
- Line up the red dot on the connector shell with the red index mark on the GSR2600's receptacle.
- Insert the connector until it seats with a click; it is now locked in place.
- To remove the cable, grasp the connector by the knurled ring and pull. DO NOT PULL DIRECTLY ON THE CABLE.

✉ **Note:** Cables should be handled with care. They should not be routed over surfaces where they could be stepped on, pinched, or cut.

The following sections introduce the GSR2600 ports, and their applicable cables. For more information, refer to the *GSR2600 Advanced Reference Materials* document on your *Sokkia Complete Product CD*.

3.6.1 Communication ports

There are two color indicators above each of the communication ports that mean the following:

Table 3: COM Port Indicators

Indicator Glowing	Meaning
Red	Data is being received on the port
Green	Data is being transmitted on the port
Red and Green	Data is being received and transmitted simultaneously on the port

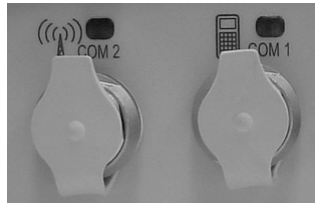
For communication to occur, the GSR2600 COM port configuration must match that of the external device's. The GSR2600's default port settings are:

- RS232C
- 9600 bps
- No parity
- 8 data bits
- 1 stop bit
- No handshaking
- Echo off

For information on configuring the port, see Section 6.8, *CFG COM > Home*, Page 75.

3.6.1.1 Communication cables

The two COM ports are bi-directional in that they accept communications and output information through the same port.



The COM ports are intended to be used with the following cables:

COM1

- **PC Data Cable.** Connects COM1 to the PC, null modem
- **SDR Data Cable, Coiled.** Connects COM1 to the SDR8100 MicroD port
- **SDR Data Cable, Straight.** Connects COM1 to the SDR8100 MicroD port
- **DAP Data Cable, Coiled.** Connects COM1 to the DAP CE5320
- **DAP Data Cable, Straight.** Connects COM1 to the DAP CE5320

COM2

- **PC Data Cable.** Connects COM2 to the PC, null modem
- **Rover PDL Radio Cable.** Connects COM2 to the Pacific Crest PDL radio for rover setup
- **Base PDL Radio Cable.** Connects COM2 to the Pacific Crest PDL radio for base setup, includes pig tail SAE

CAUTION

The power output has a 3-amp fuse. Drawing power greater than 3 amps will cause the internal fuse to interrupt the power current. If this happens, reduce the load and allow the unit to automatically reset its protection circuitry.

For further information on the signals or connector pin-outs for the serial ports or cables, see your ***GSR2600 Advance Reference Materials***.

3.6.2 Power port (PWR)

The GSR2600 requires power input to operate.

Figure 13: Power Port

Power can be supplied to the GSR2600 in two ways:

- **AC power supply** (For example, cables connected to a wall outlet. This is explained in Section 3.6.2.1, *Power cables*)
- **DC power supply** (For example, batteries. See Section 3.5, *Battery Pack*, Page 16)

As well, the GSR2600 monitors the power supply in three ways:

- Filters and regulates the supply voltage
- Protects against over-voltage, over-current, and high-temperature conditions
- Provides automatic reset circuit protection

WARNING
Do not supply the GSR2600 with an input voltage that is outside the allowable range (+6 V to +18 V DC).

3.6.2.1 Power cables

The following power cables can be used with the GSR2600:

- **Camcorder Power Cable.** Connects the PWR port to two (2) camcorder battery clips

- **SAE Power Cable.** Connects the PWR port to an SAE connector on a PDL base battery or to other power cables that have an SAE connector. Can be used with cable 403-0-0065

- **Battery Pack Cable.** Connects the optional battery pack to the PWR port. This cable comes attached at one end to the battery pack. For more information on the battery pack see Section 3.5, *Battery Pack,* Page 16

Further cable information can be obtained from the ***GSR2600 Advanced Reference Materials***.

For a listing of the voltage levels that the GSR2600 switches from one source to the other, or at which the GSR2600 shuts off, see ***Appendix A, GSR2600 Specifications***.

3.6.3 GPS port

The GPS port is bi-directional in that it accepts RF signals from the antenna and supplies DC power to the antenna for powering the low noise amplifier (LNA). The GPS port has a TNC female connector.

Figure 14: GPS Port

3.6.3.1 Antenna cables

Sokkia offers high-quality flexible antenna cables in the following lengths: 3.5 m, 5 m, and 10 m.

- **Antenna Base Cable.** Connects the GPS port to the Antenna, 5 meters long, straight connectors both ends

- **Antenna Rover Cable.** Connects the GPS port to the Antenna, 3.5 meters long, one connector right-angle and one straight

If your application requires a longer cable, contact your dealer for information on additional cable lengths. The performance specifications of the GSR2600 are guaranteed only when it is used with supplied RF cables.

✉ **Note:** The cable should be connected to the antenna and GSR2600 *before* power is supplied. If the antenna cable becomes disconnected from the antenna or GSR2600, turn the GSR2600 off before reconnecting the cable.

3.6.4 General cable

The following cable is a general purpose cable that is SAE to alligator clip ends. Some possible uses include connecting the base receiver to an external battery, or connecting the receiver to the radio.

- **General Purpose Cable.** SAE to alligator clip

Chapter 4 Basic Operations

Before using the GSR2600 for the first time, ensure that you have followed the setup instructions in *Chapter 2, **Quick Start System Setup**.*

CAUTION

See Section 1.6, *GSR2600 Usage Cautions*, on Page 6 for a list of items and conditions that you should be aware of as you use the GSR2600.

In this chapter, all discussions about the GSR2600 being turned off are with the understanding that the GSR2600 is still connected to a power source (internal batteries or external source).

The following sections explain how to use your GSR2600 to manually and automatically collect data.

4.1 Turn On System

The GSR2600 receiver has a power button that, when pushed, will turn on or off the GSR2600 receiver and system peripherals. For more information on power settings, see Section 5.1, *Power Button*, on Page 33.

4.2 System Inactivity

Using the **SETTINGS > Sleep** menu, you can set the GSR2600 to automatically turn off if left inactive for a period of five minutes (in other words, if there is no COM port activity and no data recording). For more information on **Sleep**, see Section 6.6.2, *Sleep*, Page 70.

The GSR2600 will remain off unless one of the following happens:

- Time arrives for a scheduled session to begin
- COM port activity is detected
- Power button is pressed

If either happens, the GSR2600 will automatically turn back on.

4.3 Scheduled Session

The GSR2600 can be set up to run schedules at specific time, and even to turn off between schedules to conserve battery power. These options are configured using the **SETTINGS > Sleep** (see Section 6.6.2, *Sleep*, Page 70) and **CFG RCVR > Sched** (see Section 6.4.3, *Sched*, Page 61) menus.

When both **Sleep** and **Sched** are enabled, the following is the behaviour of the GSR2600 receiver:

- When the receiver is on, if a schedule is to start within the next five minutes, the GSR2600 will remain on. If the schedule is not set to start for more than five minutes, the GSR2600 will conserve battery power by turning itself off.
- When the time is five minutes before the schedule is to begin, the GSR2600 will turn on.
- When you use the **Sched** menu to enable the scheduler, the GSR2600 LCD will flash **SCHED** in the upper right corner of the screen. This is a quick way to assure yourself that the GSR2600 has been set to automatically run schedules.

✉ **Note:** The reason the GSR2600 can turn off between data-collection sessions is because of an internal clock that is synchronized to GPS time. This clock acts like an alarm to turn on the GSR2600.

4.4 Power Consumption

For the GSR2600 to perform important automatic features (such as turning on to run schedules and detecting COM port activity), it must be connected to a valid power supply. The automatic features depend on internal components of the GSR2600 (such as its clock) to be constantly working. As a result, when the GSR2600 is off, the receiver will consume a small amount of power to maintain automatic operation.

The GSR2600 is designed to minimize its power usage, which is especially important when the system is set to conduct scheduled data-collection sessions over a period of several days, while connected to batteries. When automatic data collection is enabled, the GSR2600 will do the following:

- Turn on early enough so that satellite tracking is established prior to the scheduled logging session
- Stay on while data is being logged
- Turn off when the session is complete

✉ **Note:** Exceptional conditions may delay the acquisition of satellites beyond the start of the logging session.

It is important to remember that as long as the GSR2600 is connected to batteries, the GSR2600 is drawing power. When left unused, the GSR2600 will drain the batteries completely after five to ten days.

To extend the life of your batteries, disconnect them from the GSR2600 between use. If the batteries do happen to drain, simply recharge them to resume operation.

4.5 Insufficient Power

If either the internal batteries or the external power input voltage are below minimum operating parameters (if the GSR2600 experiences drained batteries or power failure) the GSR2600 will turn off and become inactive.

If this happens, the GSR2600 will not turn on until you connect it to a healthy power supply, and then press the receiver's power button.

CAUTION
The GSR2600 may also become inactive if the external power input is greater than the power specified. See Section 1.6, *GSR2600 Usage Cautions*, on Page 6 for more information.

✉ **Note:** If you were logging data during the power interruption, see Section 3.3.1, *Data card*, Page 12 for information on data loss.

4.6 Operation Overview

The following explains how the GSR2600 operates using the data collector and schedules. For more information on collecting data and using schedules, see Chapter 7, **Collecting Data**.

1. Apply power to the GSR2600 (connect it to a battery pack or an external power supply). Once the GSR2600 is connected to a proper power supply, it is ready to use.
2. Turn the system on by pressing the power button. The GSR2600 will acquire GPS time and then automatically start collecting data based on commands in the POWERUP configuration (See Section 7.2.2, *Using the POWERUP configuration*, Page 84).

3. If you want to start a new configuration, use the menu system, accessible through the GSR2600's LCD display, to stop the POWERUP group and select a new configuration. For more information, see Section 6.4, *CFG RCVR > Home*, Page 58.

4.6.1 When using data collectors

If a data collector is connected to the GSR2600, all configurations and schedules currently running on the system will be disabled when the data controller takes control of the receiver.

Receivers are intended to be used as kinematic or static, but not both at one time. You should run configurations and schedules only on the GSR2600 when it is being used as a static receiver (base station). If you need to enter any data on the base station receiver, do so in the office, using *Planning* software, before you go into the field. Never use the data collector to communicate with any receiver that is set to run a schedule. Doing so will disable the schedule.

Chapter 5 Display Panel Operations

The following sections explain how to operate the display panel.

5.1 Power Button

The GSR2600 power button is used for turning the GSR2600 on or off. As well, the power button will enable you to delete all files on your data card, or reset the receiver back to factory settings. You can see the power button in Figure 1, *GSR2600 Front View*, Page 10.

The number of seconds that the power button is held determines how the receiver will behave. As well, at each time interval, the receiver will beep to guide you through the process. For more information about sound signals, see Section 5.2, *Audible Annunciator*, on Page 35.

The power button options are as follows:

Action	# Seconds	Description
Disregard	25	• Hold the button past **25 seconds** to cancel any action by the power button. Release the button when the LCD displays *Rel to continue*. This option is your safeguard in case you start holding the power button, but then decide that you do not want to perform the action after all. • Release the button and the receiver will not turn off, the data files will not be erased, and the settings will not revert to factory settings.
Turn on	1	• Hold button for **1 second** and release to turn on the GSR2600. • To indicate that the GSR2600 is on, the LCD will first display a Sokkia screen, followed by the message *Starting up*. After initialization, the GSR2600 will beep once to indicate that the system is operational, and the LCD will display the **STATUS** menu.
Turn off	3	• Hold the button for **3 seconds** until the GSR2600 beeps twice and the LCD displays *Rel to pwr down*. • Release the button to turn the GSR2600 off.
Factory reset	10-15	• Hold the power button for **10-15 seconds** until the GSR2600 beeps twice (for the second time) and the LCD displays *Rel to factory reset*. • Release the button to reset all stored parameters on the receiver to their default values.

Action	# Seconds	Description
Erase memory	20	• Hold the button for **20 seconds** until the GSR2600 beeps twice (for the third time) and the the LCD displays *Rel to clear flash*. • Release the button to delete all the files on the installed data card.

5.2 Audible Annunciator

The GSR2600 is equipped with an audible annunciator that issues a series of beeping noises to alert you to the system status and to warn of errors.

The severity of the situation is indicated by the number of beeps in each pattern.

Note .....Noteworthy information is presented to you with **one** or **two beeps**

Warning .....A warning is indicated by **three beeps**

Error.....An error is indicated by **four beeps**

✉ **Note:** When you hear a three or four beep pattern, check your system right away.

The duration of the beep pattern depends on the message. The annunciator may beep a pattern of beeps one time, or it may repeat the beeps over-and-over until you respond.

The following table explains the message delivered by the receiver for single and continuous beep patterns:

# of beeps	Duration	Condition
1	single	Receiver on and ready for operation, initiated whenever you initially press the power button to turn the receiver on
2	single	Receiver is turning off, initiated by pressing power button
2	single	Data card erase, initiated by power button pressed
2	single	Factory reset, initiated by power button pressed
2	single	Acceptable data quality
3	single	Insufficient data quality
3	continuous	Remaining battery life is below 15 minutes
3	continuous	Memory card more than 80% full
4	continuous	Memory card error
4	continuous	Power button stuck

5.3 Escape Button

Press the **<Esc>** button to go backwards through menu items in the LCD. With continued pressing, you will eventually return back to the top of the menu where you started. For more information, see Section 6.1.1, *Navigating the menus,* Page 42.

5.4 Enter Button and Navigation Arrows

Use the navigation arrows to move through the LCD menu, and press the **<Ent>** button to select commands from the LCD screen. Press this button to activate a cursor within the **Data Description** field. For more information, see Section 5.5.1, *Navigation aids*, Page 40.

5.5 LCD Front Panel

The LCD screen, located on the front of the display panel, shows a menu for you to communicate with the GSR2600. This section explains the LCD interface, but for information on how to use the menu layout and screens, see Chapter 6, **LCD Display**.

The main menu functions of the LCD are:

- Status
- GPS Data
- Configure Receiver
- Files
- Settings
- Configure Site
- Configure Communications

Figure 15 shows the layout of the LCD area.

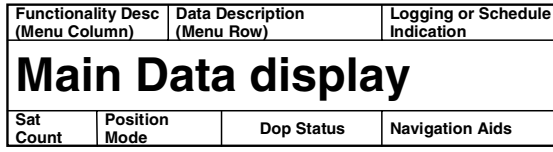
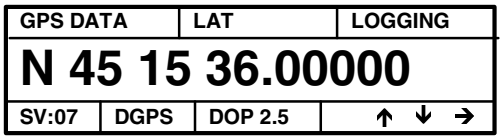


Figure 15: LCD Interface

Example:



The LCD is divided into eight sections that display the following information:

Functionality Description Box

Lists the name of the menu you are in. Generally, the menu name indicates the type of information found in the screens for that menu. For example, when this box reads **STATUS**, all the screens found in that menu display information regarding the status of the unit.

Data Description

Lists the name of the screen you are on, which tells you the type of information being displayed. For example, if this field displays **GPS Lat**, you would know that you are currently on the GPS latitude screen, and when you looked at the screen's main window, you would see the receiver's current GPS latitude.

Logging or Schedule Indicator

Shows information about the logging status of the receiver, such as whether or not the receiver is logging data to a file. Because the receiver is capable of running more than one operation at a time, this field may display more than one indicator. For example, if the receiver is logging data to a file, and it is also in a site occupation, the logging indicator will flash **Logging** followed by **Site**.

The following table show all the possible indicators for this field:

Table 1: Logging Status

Logging Status Indicator	Description
LOGGING	A data file is open
SCHED	The scheduler is enabled
SITE	The receiver is occupying a site
CONFIG	A configuration (group) is running on the receiver. **Note:** The status indicator shows for all groups except the POWERUP group that starts automatically when you first turn on the receiver.

Satellite Count

Displays the number of satellites currently being tracked by the receiver.

Position Mode

Displays the current solution status computed by the receiver.

Table 2: Position Mode

Position Mode Indicator	Description	GPS Position Type *
NONE	No solution	NONE
HOLD	Position has been fixed by the FIX POSITION command or by position averaging	FIXED
SING	Single point position	SINGLE
DGPS	Pseudorange differential solution	PSRDIFF

* Information on **GPS Position Type** is for advanced users that wish to interpret logs output by the OEM4 card. For more information, see the *OEM4 Command Description Manual*.

Table 2: Position Mode

Position Mode Indicator	Description	GPS Position Type *
FLT	Floating L1 ambiguity solution	L1_FLOAT
FLT	Floating ionospheric-free ambiguity solution	INONOFREE_FLOAT
FLT	Floating narrow-lane ambiguity solution	NARROW_FLOAT
FIX	Integer L1 ambiguity solution	L1_INT
FIX	Integer wide-lane ambiguity solution	WIDE_INT
FIX	Integer narrow-lane ambiguity solution	NARROW_INT

* Information on **GPS Position Type** is for advanced users that wish to interpret logs output by the OEM4 card. For more information, see the *OEM4 Command Description Manual*.

DOP Status

Displays the current position dilution of precision value.

Navigation Aids

Indicates which keys on the receiver's front panel are valid for the current menu. For more information on this field, see Section 5.5.1, *Navigation aids,* Page 40.

5.5.1 Navigation aids

The arrow indicators in the **navigation aids** field are used to help you navigate the menu system (also known as **navigation mode**), and to guide you when editing fields (also known as **edit mode**). For more information see Figure 15, *LCD Interface*, Page 37.

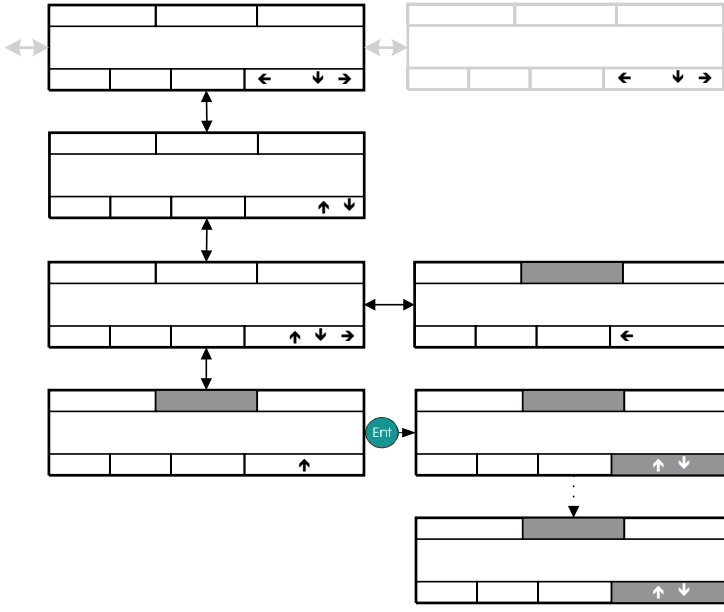
Navigation mode

The arrow indicators show which direction you can move about in the menu layout. For example, the up and down arrows are shown in the navigation aids field when there are menus above and below the current displayed menu.

Edit Mode

When you are in edit mode (press **<Ent>** while you are on an editable screen), the arrow indicators are used as editing aids. In edit mode, the arrows change to a light color on a dark background, and indicate which arrows can be used to edit the field.

The following illustrations explains the concept of navigation by showing you the arrows that would appear in the **navigation aids** field for the illustrated menu system and how the arrows appear when you are in edit mode.



Chapter 6 LCD Display

The LCD is your tool for interacting with the GSR2600 receiver during a survey. By navigating through the LCD's menu system, you can monitor information such as GPS position, or send commands to the receiver such as a factory reset.

Because of the LCD and its corresponding navigation buttons, you can work with the receiver in the field without the use of a handheld controller. As a result, you now have one less piece of equipment to set up and carry to the field, making your surveying job easier.

6.1 Menu Layout

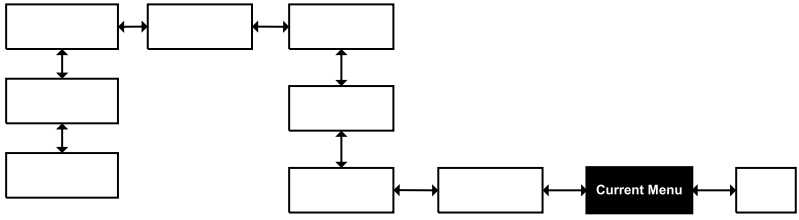
The LCD displays menus that enable you to navigate to and edit information. The following sections explain how to move through the different LCD screens, and how to edit information.

6.1.1 Navigating the menus

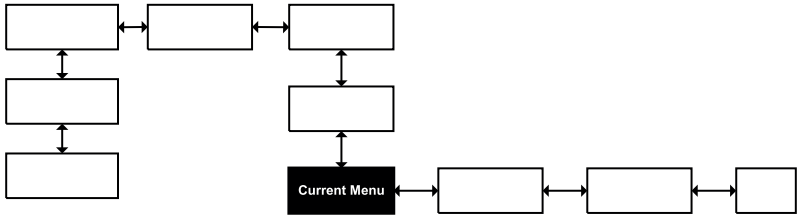
The arrow keys on the GSR2600's front panel enable you to move back and forth through the menus and screens. As a shortcut, at any point while navigating the menu layout, you can press **<Esc>** to exit your current screen and move to the previous screen, the menu screen, or to the main status information menu.

To better understand this concept, the following illustrations show the results of pressing the **<Esc>** button from four levels into the menu system.

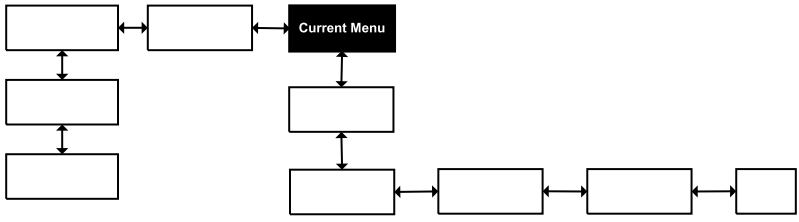
Current position



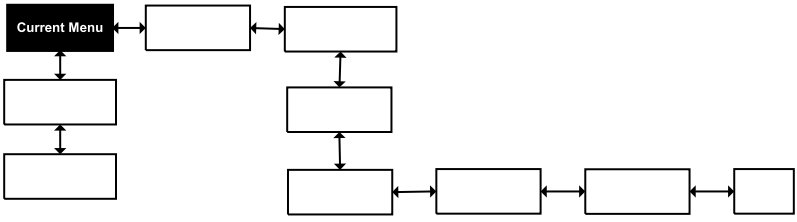
After pressing <Esc> one time



After pressing <Esc> two times



After pressing <Esc> three times



6.1.2 Editing screen information

You can use the **<Ent>** key on screens that have fields you can modify, such as the **STATUS > Contrast** screen (see Section 6.2.5, *Contrast,* Page 52).

The following steps summarize the editing process:

1. Press **<Ent>** to enter edit mode.

2. Use the arrow keys to make changes.

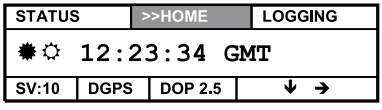
3. Press **<Ent>** to simultaneously accept the changes and leave the edit mode.

✉ **Note:** The **<Esc>** key is your way to exit the edit mode without making any changes. If you press this key, the fields original value will remain.

6.2 STATUS > Home

After the GSR2600 turns on and acquires satellites, the LCD displays the **STATUS** menu, on by default, the **Home** screen.

The **STATUS > Home** screen displays the current system time, as well as a message about the system's status.



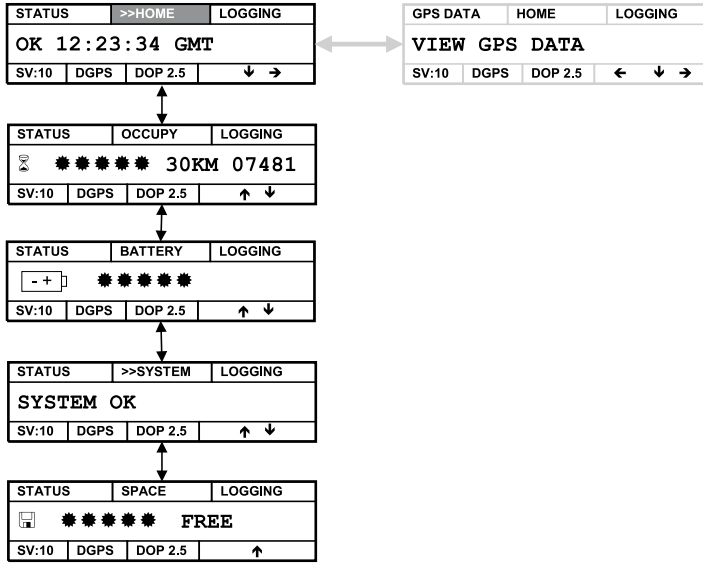
The following may display in this screen:

OK.....If this message displays on the screen, the system is operating normally.

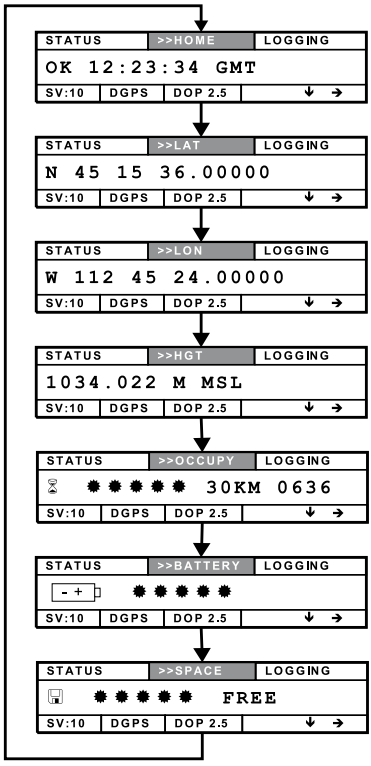
Circles .....If two blinking circles display on the screen, then the GSR2600 has a system message (either error or notice) to display.

✉ **Note:** To view all the system messages, see Section 6.2.3, *System,* Page 49.

By using the down arrow key, you can see the following screens:



The **STATUS > Home** screen is also an auto-scrolling menu.



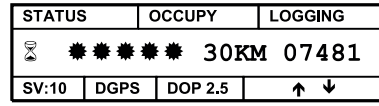
Without your interaction, this screen will continually cycle through screens that display the following information:

- Current system time
- Current GPS latitude
- Current GPS longitude
- Current GPS height
- Current occupation status
- Battery status
- Disk free space on the CompactFlash card

Each screen will be displayed for 5 seconds before automatically switching to the next screen.

6.2.1 Occupy

The **Occupy** screen displays the occupation status and the number of epochs saved to disk.



The following is displayed on this screen:

Circles .....When filled, the circles indicate that you have collected sufficient data to successfully post-process, using the baseline indicated to the right of the circles (For example, 30KM).

> ✉ **Note:** For successful post-processing, it is assumed that there are no adverse environmental conditions and you have a data logging range of at least 0.1Hz.

The following table shows the meaning of each possible display on the **Occupy** screen:

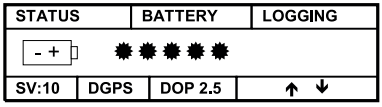
Table 3: Occupation Status

Status Occupy Display	Description
☼☼☼☼☼ 0Km	Insufficient data collected for post processing
✹☼☼☼☼ 5Km	Sufficient data collected for post processing a 5 Km baseline
✹✹☼☼☼ 10Km	Sufficient data collected for post processing a 10 Km baseline
✹✹✹☼☼ 15Km	Sufficient data collected for post processing a 15 Km baseline
✹✹✹✹☼ 20Km	Sufficient data collected for post processing a 20 Km baseline
✹✹✹✹✹ 30Km	Sufficient data collected for post processing a 30 Km baseline

Numbers .....The last field in this menu displays numbers which tell how many epochs of data have been recorded to disk. For example, 01792.

6.2.2 Battery

When the GSR2600 is connected to Lithium Ion batteries, this menu displays the estimated battery life remaining.

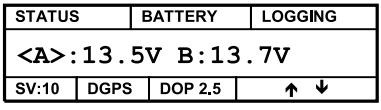


The battery life estimation is accurate to ± 30 minutes and is explained in the following table:

Table 4: Battery Status

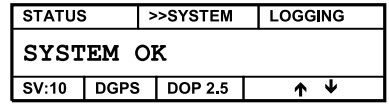
Status Battery Display	Description
✹✹✹✹✹	4 hours or less of operating time remaining
✹✹✹✹☼	At least 3 hours of battery life remaining
✹✹✹☼☼	At least 2 hours of battery life remaining
✹✹☼☼☼	At least 1 hour of battery life remaining
✹☼☼☼☼	Less than one hour of battery life remaining

The Battery menu only displays the active battery when the power supply is less than 9 V. When the power supply is greater than 9 V, the **Battery** menu will display the voltage for the power input, and will place <> around the active power input. For example, if the GSR2600 is being powered by 13.7 V, the **Battery** menu will display the voltage as <A> 13.7 V.

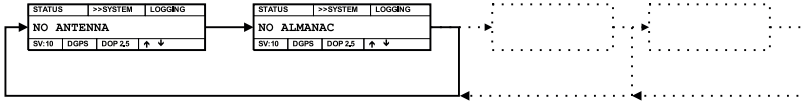


6.2.3 System

The **System** menu displays the system status, such as system errors, warnings, or notices.



The **STATUS > System** menu is also an auto-scrolling menu, and will automatically scroll through all status messages on the system. In other words, once you arrive at this menu, the GSR2600 will automatically scroll through all the messages it is currently reporting.



The following table shows all the status messages that can be displayed through this menu:

Table 5: System Status

Status System Display	Description
SYSTEM OK	System is operating normally
GPS ERROR	An error occurred with the GPS engine
TEMPERATURE ERR	Temperature not within specifications
LOW INPUT VOLTAGE	Supply voltage is low
ANT NOT POWERED	Antenna not powered
LNA FAILURE	LNA status failed
ANTENNA MISSING	Antenna connection is open
ANTENNA SHORTED	Antenna is shorted
CPU OVERLOAD	CPU overload
COM1 OVERRUN	COM1 buffer overrun

Table 5: System Status

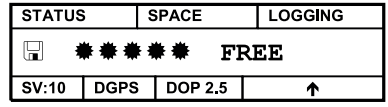
Status System Display	Description
COM2 OVERRUN	COM2 buffer overrun
COM3 OVERRUN	COM3 buffer overrun
RF1 JAMMED	RF1 jammed
RF1 AGC BAD	RF1 AGC bad
RF2 JAMMED	RF2 jammed
RF2 AGC BAD	RF2 AGC bad
ALMANAC INVALID	Almanac is invalid
POS SOL INVALID	Position solution is invalid
POSITION FIXED	Receiver position has been fixed with a “Fix” command, or by a configuration. *This message is normal for receivers acting as base stations.*
CLK STR DISBLD	Clock steering disabled
CLK MDL INVALID	Clock model invalid
AUX2 STATUS	Aux2 status event
AUX1 STATUS	Aux1 status event
UNKNOWN GPS ERR	Unknown GPS engine error
HARDWARE FAIL	Controller hardware fail
GPS COMM FAIL	Controller-GPSCard communication fail
EXT POWER FAIL	External power source fail
INT POWER WARNING	Expected battery life low warning (both internal batteries combined)
INT POWER FAIL	Battery failure (both internal batteries combined)
TEMPERATURE WARN	Controller high-temperature warning
TEMPERATURE FAIL	Controller temperature fail
NVM FAILURE	Controller NVM fail
PC CARD ERROR	PCCard error

Table 5: System Status

Status System Display	Description
SOFTWARE ERROR	Controller unrecoverable software error
CPU OVERLOAD	Controller CPU overload
BUFFER OVERRUN	Controller buffer overrun
TIMER FAIL	Timer fail on last powerup
LOW POWER SUBSYS	Low-power subsystem fail
PERIPH OVERLOAD	Peripheral power overload
FILENAME ERROR	Logfile name conflict
UNKNOWN PDC	Unknown controller error

6.2.4 Space

The **Space** menu displays the amount of free space left on the removable disk.



The following table explains the meaning of the circles in the **Space** screen:

Table 6: Space Status

Status Space Display	Description
✹✹✹✹✹	The card has at least 80% of its memory free
✹✹✹✹☼	The card has at least 60% of its memory free
✹✹✹☼☼	The card has at least 40% of its memory free
✹✹☼☼☼	The card has at least 20% of its memory free
✹☼☼☼☼	The card has less than 20% of its memory free. Replace the disk now.

✉ **Note:** When the card runs out of space, the GSR2600 will also send out double beeps to notify you that the card is full.

6.2.5 Contrast

To change the contrast of the LCD, follow these steps:

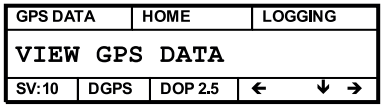
1. Press **<Ent>** while on the **STATUS > Home** screen.
2. Use the GSR2600's **<Up>** and **<Down>** arrow keys to change the contrast level
3. Press **<Ent>** to set the new contrast (or **<Esc>** if you change your mind and do not want to make changes) and return to the **STATUS** menu.

✉ **Note:** The contrast value is not saved when the receiver is turned off.

For more information on the **Contrast** menu, see Section 6.6, *SETTINGS > Home,* Page 68.

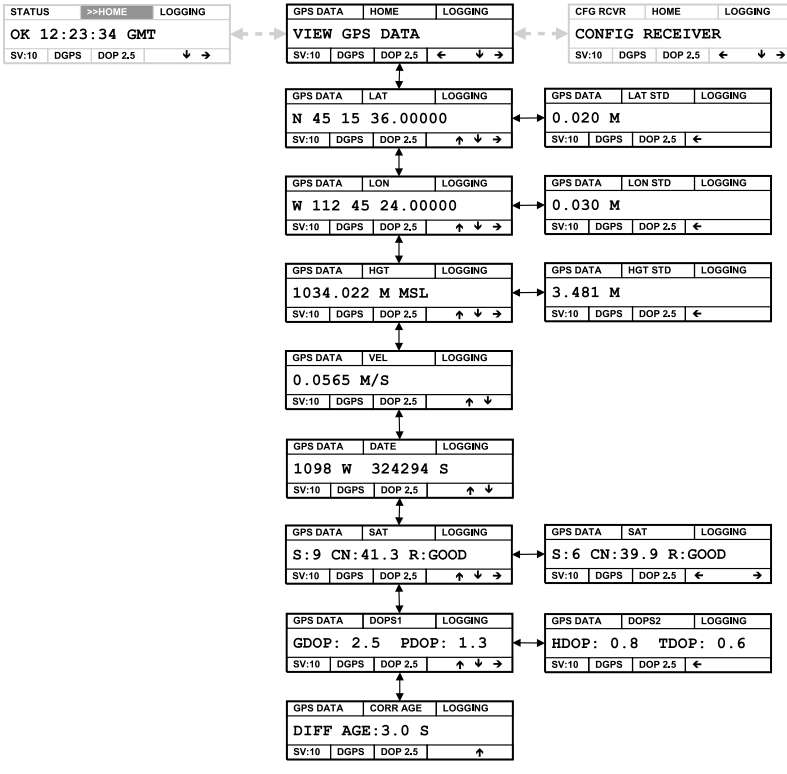
6.3 GPS DATA > Home

The **GPS DATA** menus provide you with specific GPS data, such as the current position or the satellites being tracked.



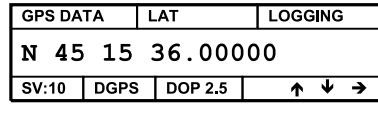
To get to this screen, make sure you are on the **STATUS > Home** screen, or the **CFG RCVR > Home** screen, and press the right or left arrow, respectively.

From the **GPS DATA** menu, use the arrow keys to move down through the menu items.



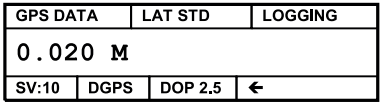
6.3.1 Lat

This menu displays the current calculated GPS latitude.



6.3.1.1 Lat Std

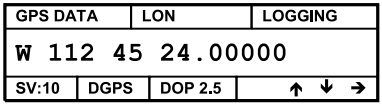
This menu displays the standard deviation for the current calculated GPS latitude.



To access this menu, make sure you are currently on the **GPSDATA > Lat** screen, and then press the right arrow on the GSR2600's display panel.

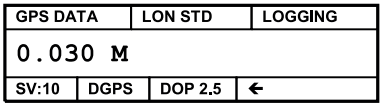
6.3.2 Lon

This menu displays the current calculated GPS longitude.



6.3.2.1 Lon Std

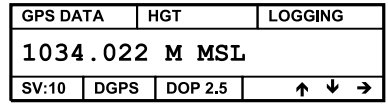
This menu displays the standard deviation for the current calculated GPS longitude.



To access this menu, make sure you are currently on the **GPSDATA > Lon** screen, and then press the right arrow on the GSR2600's display panel.

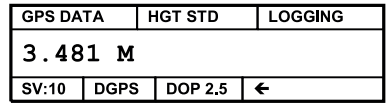
6.3.3 Hgt

This menu displays the current height above mean sea level.



6.3.3.1 Hgt Std

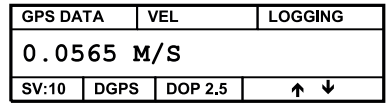
This menu displays the standard deviation for the current calculated GPS height.



To access this menu, make sure you are currently on the **GPSDATA > Hgt** screen, and then press the right arrow on the GSR2600's display panel.

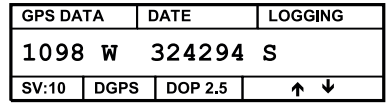
6.3.4 Vel

This menu shows the horizontal speed over ground, in metres per second.



6.3.5 Date

This menu shows the current date displayed as GPS week and GPS seconds.



6.3.6 Sat

This is a list of menus that shows information regarding the satellites that the receiver is currently tracking.

To view information on each satellite, make sure you are currently on the **GPSDATA > Sat** screen, and then press the right arrow on the GSR2600's display panel. Each time you press the arrow, another satellite's information will display.

The **Sat** menu displays information in the following three fields:

S.....PRN number of the satellite

CN.....Number that represents the carrier to noise (dB-Hz)

R.....Message concerning the health of the satellite being tracked

The following table shows the messages that can appear on the **Sat** screen, along with the message description.

Table 7: GPS Satellite Messages

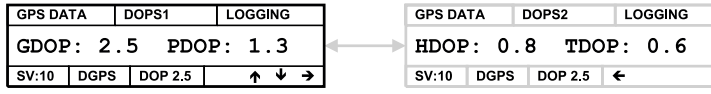
GPS Satellite Display	Description
GOOD	Observations are good
BADH	Bad satellite health is indicated by ephemeris data
OLDE	Old ephemeris due to date not being updated during the last 3 hours
ECCE	Eccentric anomaly error during computation of the satellite's position
TANA	True anomaly error during computation of the satellite's position

Table 7: GPS Satellite Messages

GPS Satellite Display	Description
SCOE	Satellite coordinate error during computation of the satellite's position
ELER	Elevation error due to the satellite being below the cut-off angle
MISC	Misclosure too large due to excessive gap between estimated and actual positions
NODF	No compatible differential correction is available for this particular satellite
NOEP	Ephemeris data for this satellite has not yet been received
INVI	Invalid IODE (Issue Of Data Ephemeris) due to mismatch between differential stations
LOCK	Locked out: satellite is excluded by the user (LOCKOUT command)
LOWP	Low power: satellite is rejected due to low carrier/noise ratio
OBS2	L2 measurements are not being used by the filter
NOIO	No compatible ionospheric correction is available for this particular satellite
NA	No observation (a reject code is not applicable)

6.3.7 DOPS

The **DOPS1** and **DOPS2** menus display various dilution of precision values.



To access the **DOPS2** menu, make sure you are currently on the **GPSDATA > DOPS1** screen, and then press the right arrow on the GSR2600's display panel.

The **DOPS1** screen displays the following fields:

GDOP.....Geometric dilution of precision

PDOP.....Position dilution of precision

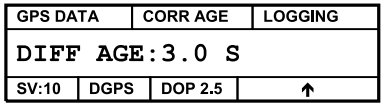
The **DOPS2** screen displays the following fields:

HDOP.....Horizontal dilution of precision

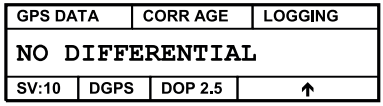
TDOP .....Time dilution of precision

6.3.8 Corr Age

This menu displays the differential corrections' lag time.

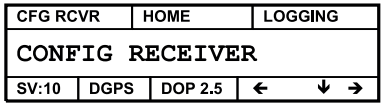


The **Corr Age** menu will display "NO DIFFERENTIAL" if no differential corrections are being received.



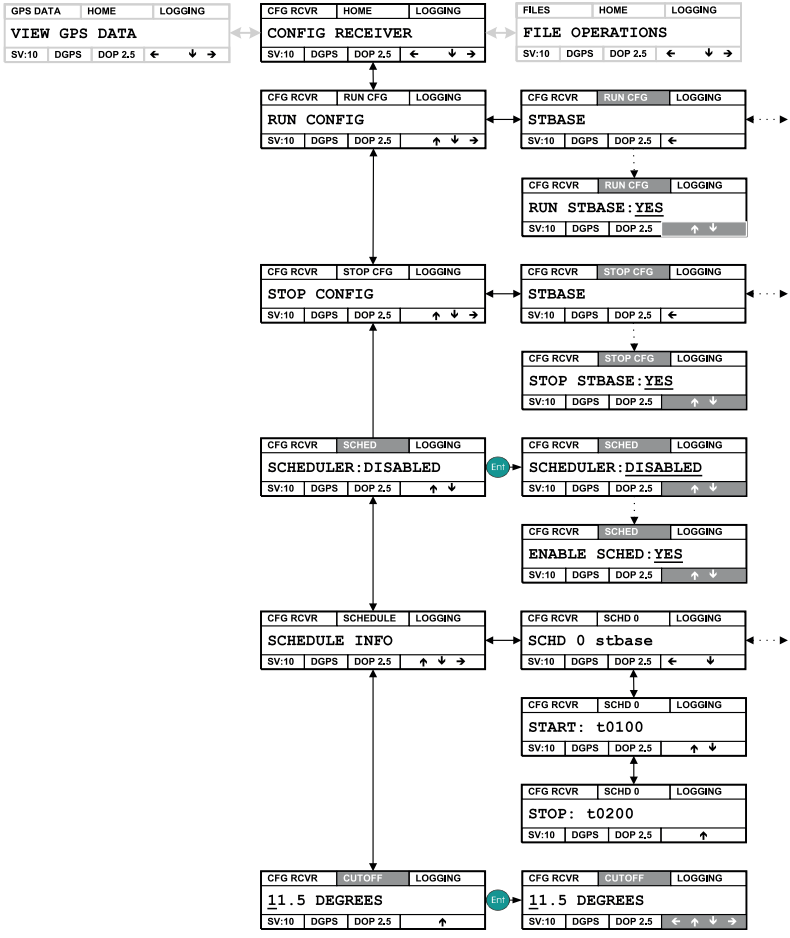
6.4 CFG RCVR > Home

The configure receiver menus are used to control the data logging configuration of the system.



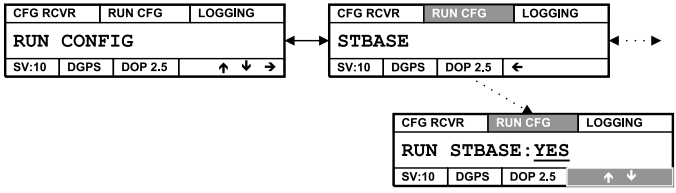
From this menu, you can start or stop configurations, enable or disable the scheduler, and view schedule information. Refer to your *Planning Reference Manual* for more information on configurations and schedules.

From the **CFG RCVR** menu, use the arrow keys and **<Ent>** button to move down through the following screens:



6.4.1 Run Cfg

This screen is actually a series of screens that display all of the configurations currently stored on the receiver.



Use the right and left arrows to navigate through the screens.

To run a configuration, follow these steps:

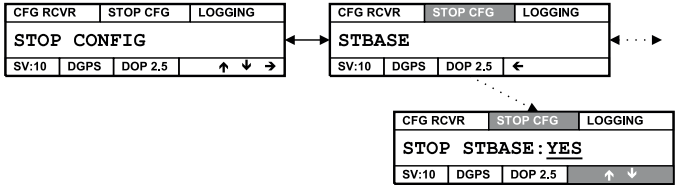
1. Using the left and right arrow keys, navigate to the configuration name you want to run.

2. Press **<Ent>**.

3. A menu will appear, asking you to confirm that you want to run the configuration. Press **<Ent>** to confirm, or **<Esc>** to cancel the operation.

6.4.2 Stop Cfg

This screen is actually a series of screens that display all of the configurations currently stored on the receiver.



To stop a configuration, follow these steps:

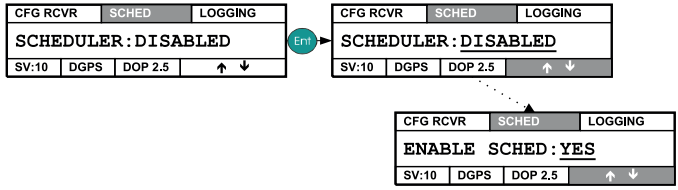
1. Using the left and right arrow keys, navigate to the configuration name you want to stop.

2. Press **<Ent>**.

3. You will be prompted to confirm that you want to stop the configuration. Press **<Ent>** to confirm, or **<Esc>** to cancel.

6.4.3 Sched

This menu displays the current state of the scheduler.



When the scheduler is disabled, the GSR2600 will not run schedules. To set the GSR2600 so that it will run schedules, follow these steps:

1. Press **<Ent>**.

2. Use the up and down arrow keys to set the scheduler to **ENABLED**.

3. Press **<Ent>**.

4. You will be prompted to confirm that you are sure you want to enable the scheduler. If you are, press **<Ent>**. If no, press **<Esc>**.

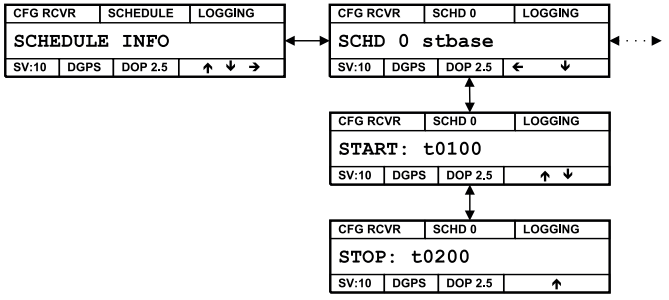
5. The LCD will now display **SCHEDULER:ENABLED**. Follow these same steps to disable the scheduler.

> ✉ **Note:** There are times when the GSR2600 may override the state of the scheduler, such as when the receiver is first turned on. At this time, if there is no powerup group present, the receiver will enable the scheduler even if you disabled it previously.

For more information on schedules, see Section 7.1.2, *Scheduled data collection*, Page 81 and refer to your *Planning Reference Manual*.

6.4.4 Schedule

This screen is actually a series of screens that shows information about all schedules stored on the receiver.



The first screen "SCHED 0 stbase" displays the schedule number and the configuration that will run.

The next two screens display the schedule's start and stop times. The start time and stop time are specified in the following UTC format:

```
ddddddhhmm
```

where:

ddddddd .....Represents up to 7 days of the week.

hh .....Represents the hour (in 24-hour notation).

mm .....Represents the minute.

The following apply to schedule timings:

- The stop time will not display the days if the schedule is set to start on multiple days of the week.
- If a day of the week is not specified in the start time, the event is repeated every day.
- ddddddd consists of the combination of different character codes, each representing a day of the week as follows:

Weekday	Code
Sunday	d
Monday	m
Tuesday	t
Wednesday	w
Thursday	r
Friday	f
Saturday	s

Examples:

START: t0100 STOP: t0200

Schedule starts at 01:00 and stops at 02:00 every Tuesday.

START: mw1800 STOP: 2000

Schedule starts at 18:00 and stops at 20:00 every Monday and Wednesday.

START: 0700 STOP: 1800

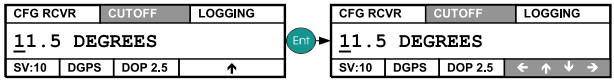
Schedule starts at 07:00 and stops at 18:00 every day.

START: m0205 STOP: f1215

Schedule starts at 02:05 on Monday and stops at 12:15 on Friday.

6.4.5 Cutoff

This menu shows the elevation cut-off angle for tracked satellites.



When you set a cutoff angle, all satellites that fall below the angle will be ignored by the GSR2600 when determining position. The **Cutoff** screen enables you to change the elevation cutoff value by following these steps:

1. Press the **<Ent>** key
2. Use the left and right arrow keys to the position of the value you want to set.
3. Use the up and down keys to change the number higher or lower.
4. When satisfied with the new elevation, press **<Ent>** to set the new value and return to the **Cutoff** screen.

✉ **Note:** Changes you make to the elevation cutoff angle are not saved when the receiver is shutdown. The receiver will default to a 5 degree cutoff angle on startup.

6.4.5.1 Cutoff angles and configurations

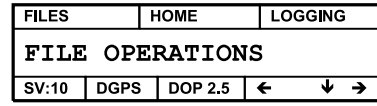
When a configuration is started, the elevation cutoff is automatically set to the configuration's cutoff angle, and any changes you made to the elevation cutoff angle is overwritten.

Example:

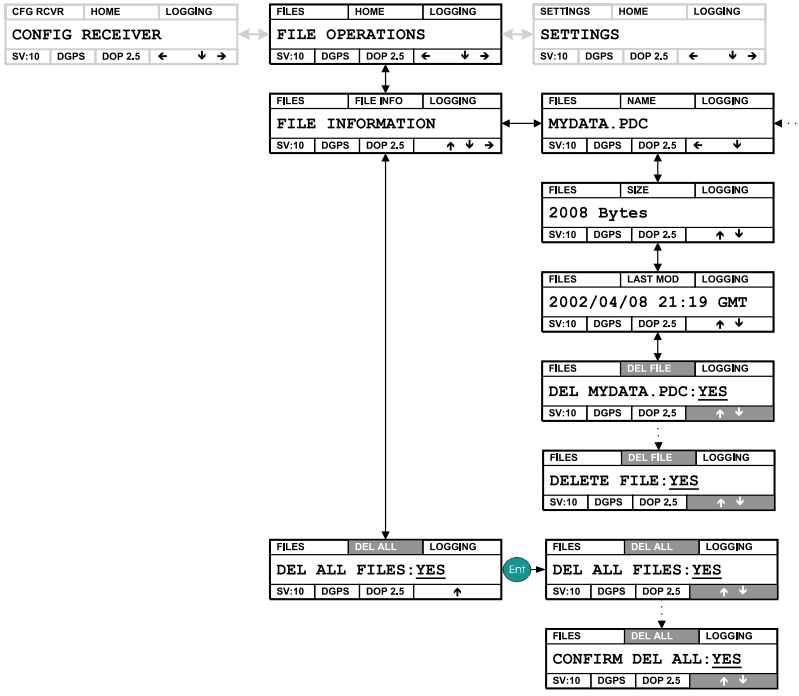
The elevation cutoff angle will be changed to 20.0 degrees when a configuration that has an elevation cutoff angle of 20.0 degrees is started, even if you previously set the elevation cutoff angle to 5.5 degrees.

6.5 FILES > Home

The **FILES** menu enables you to view information regarding a specific file. As well, you can delete a single file, or all files, from the removable disk.

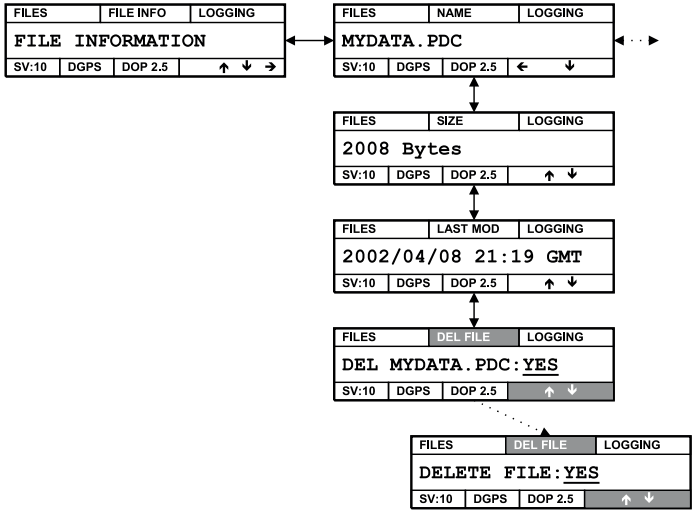


From the **FILES** menu, use the arrow keys and **<Ent>** button to move down through the following screens:



6.5.1 File information

The **File Information** screen enables you to display a list of files currently stored on the removable disk.

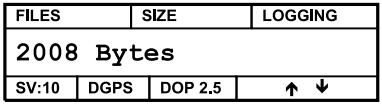


You can navigate through the list of files by using the left and right arrow keys.

On the **FILES > Name** screen, you can use the up and down arrows to see that file's information.

6.5.1.1 Size

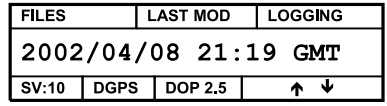
This screen displays the size of the file in bytes.



✉ **Note:** The **FILES > Size** menu is not updated for files that are still open and logging data.

6.5.1.2 Last Mod

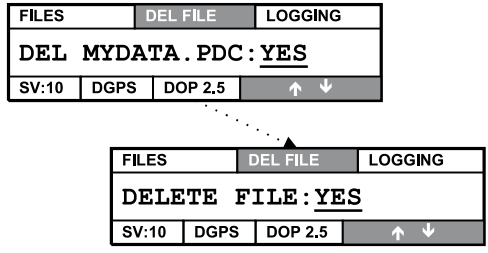
This screen displays the time (in UTC format) that the file was last altered.



✉ **Note:** The **Last Mod** menu is not updated for files that are still open and logging data.

6.5.1.3 Del File

You can delete the selected file using the **Delete File** screen.



To delete a file, follow these steps:

1. Press **<Ent>**.

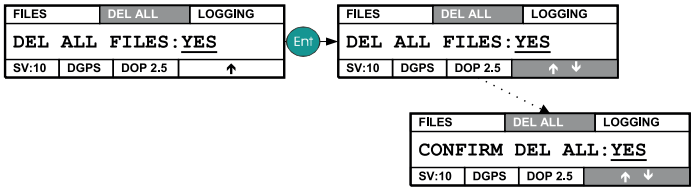
2. Use the up and down arrows to change the delete status to **Yes**.

3. Press **<Ent>**.

4. You will be asked if you are sure that you want to delete the file. Press **<Ent>** to continue with the deletion, or **<Esc>** to abort.

6.5.2 Del all files

Instead of deleting files individually from the removeable disk, you can delete them all at one time using the **Del All** screen.



To delete all files, follow these steps:

1. Press **<Ent>**.

2. Use the up and down arrow keys to choose **Yes**.

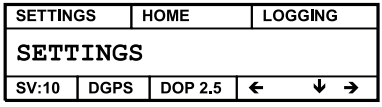
3. Press **<Ent>**.

4. You will be asked if you are sure that you want to delete the file. Press **<Ent>** to continue with the deletion, or **<Esc>** to abort.

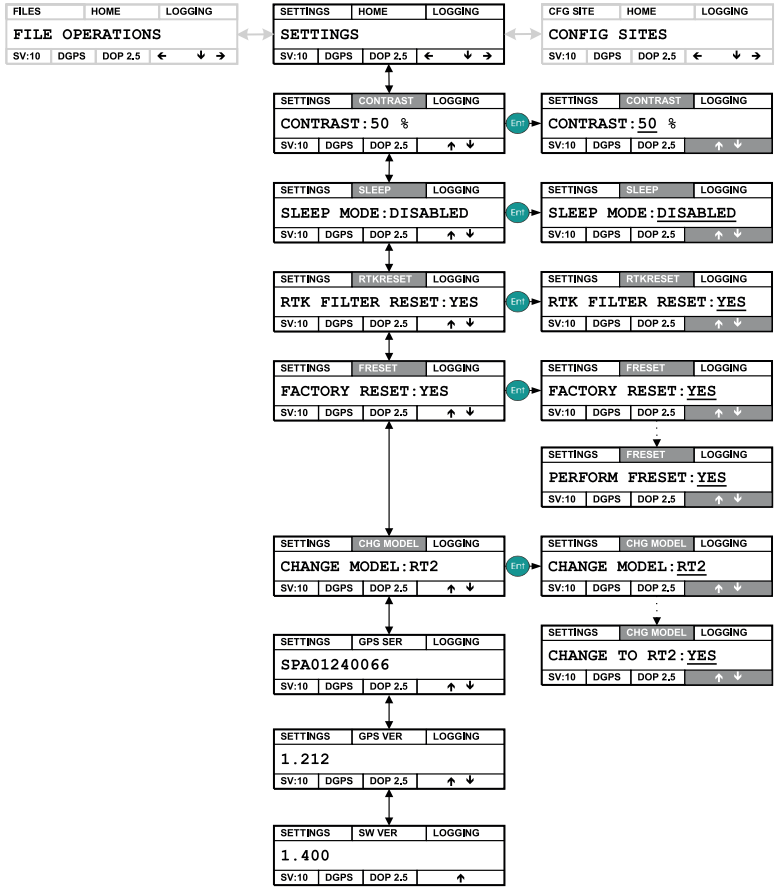
When you choose to delete all files, the GSR2600 will close any open data files, and then delete the files from the disk.

6.6 SETTINGS > Home

The **SETTINGS** menu displays system settings and information, such as the serial numbers for the receiver, and the contrast value for the display.



From the **SETTINGS** menu, use the arrow keys and **<Ent>** button to move down through the following screens:

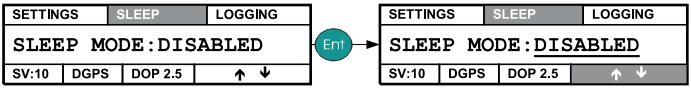


6.6.1 Contrast

This menu displays the screen's current contrast value. You can modify the contrast of the screen using the **<Ent>** key. For instructions see Section 6.2.5, *Contrast*, Page 52.

6.6.2 Sleep

This menu displays the current state of the sleep mode.



While on the **Sleep** screen, press **<Ent>** to enable editing of the sleep mode settings. Use the up and down arrow keys to switch between **ENABLED** and **DISABLED**. By default, the sleep mode is **DISABLED**.

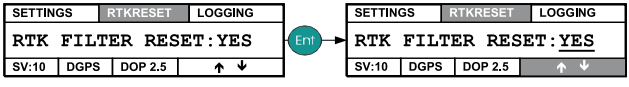
✉ **Note:** If you set the sleep mode to **ENABLED**, that setting will not be saved when the receiver is shut down. The receiver's sleep mode will default to **DISABLED** every time the receiver is turned on using the power button. This is exactly the opposite behaviour to the 6100 IS, which defaults to **ENABLED** when turned on. If you use both receivers, it is important to keep this difference in mind.

When sleep mode is **ENABLED**, the receiver will turn off during times of inactivity to conserve power. An automatic scheduler (if enabled) will turn the receiver back on for scheduled sessions, and the receiver will shut itself down after running the scheduled session. The sleep mode will remain enabled until you manually turn off the receiver by pressing its power button.

For more information on the sleep mode and the automatic scheduler, see Chapter 4, **Basic Operations**.

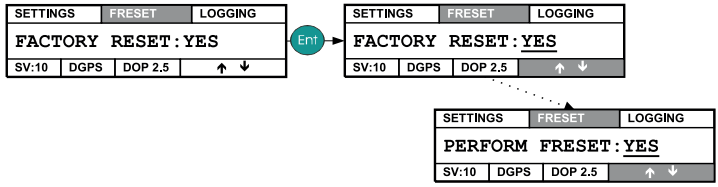
6.6.3 RTKReset

This menu enables you to reset the RTK filter, forcing the system to restart the ambiguity resolution calculations.



6.6.4 Freset

This menu enables you to reset the receiver back to a factory default state.

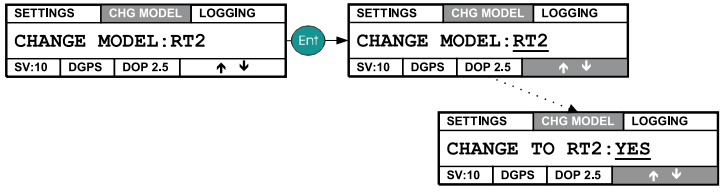


To perform a factory reset, follow these steps:

1. Press **<Ent>**.
2. Use the up and down arrow keys to select **Yes**.
3. Press **<Ent>**.
4. You will be asked to confirm that you want to perform the factory reset. Press **<Ent>** to continue, or **<Esc>** to abort.

6.6.5 Chg Model

This menu enables you to switch between models that are present on the receiver.



To change the firmware model of your receiver, follow these steps:

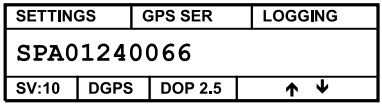
1. Press **<Ent>**.
2. Use the up and down arrow keys to select the model.

3. Press **<Ent>**.

4. You will be asked to confirm that you want to change to the model selected. Press **<Ent>** to continue, or **<Esc>** to abort.

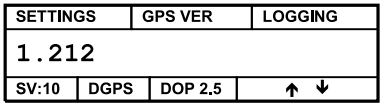
6.6.6 GPS Ser

This menu shows the serial number for the GPS engine.



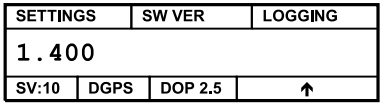
6.6.7 GPS Ver

This menu displays the software version used by the GPS engine.



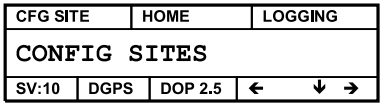
6.6.8 SW Ver

This menu displays the version associated with both the software for data collection and the user interface.

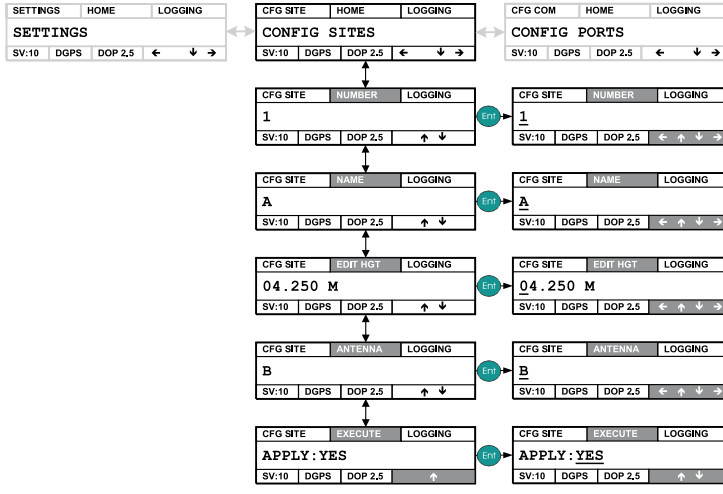


6.7 CFG SITE > Home

Use the **CFG SITE** menu to configure and set site information, as well as to enter or leave sites.



From the **CFG SITE** menu, use the arrow keys and **<Ent>** button to move down through the following screens:



All information entered in the **Number**, **Name**, **Edit Hgt**, and **Antenna** screens will not take effect until you choose **Yes** in the *SITE > Execute* screen. See Section 6.7.5, *Execute*, Page 74.

As well, none of the **CFG SITE** menu values are saved when you turn off the receiver. The **CFG SITE** number, name, antenna height, and antenna type menu values all revert to defaults when the receiver is turned back on.

Example:

If you enter a site name for an occupation, that name will exist until you turn off the receiver. The next time you turn on the receiver, the site name will default to the value "A", and you will have to re-enter a site name for the occupation.

Cfg Site and configurations

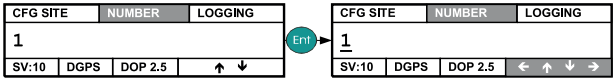
The various **CFG SITE** menu values can be changed without your intervention when a configuration is started, but these changes will not be updated in the **CFG SITE** menus.

Example:

The site name will be set to the site name of the configuration when the configuration is started, but the **CFG SITE > Name** menu value will not reflect the new site name.

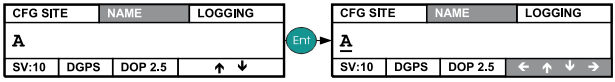
6.7.1 Number

Use this screen to enter a number for the site.



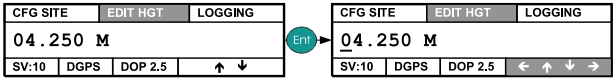
6.7.2 Name

Use this screen to enter a name for the site.



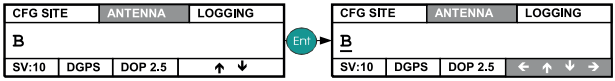
6.7.3 Edit Hgt

Use this screen to configure the antenna height for the site.



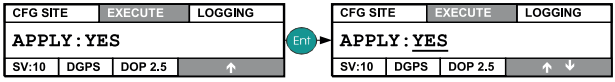
6.7.4 Antenna

Use this screen to configure the site's antenna type.



6.7.5 Execute

Use this screen to apply to the site the information you set up in the **Number**, **Name**, **Edit Hgt**, and **Antenna** screens.



To start a site occupation, follow these steps:

1. Press **<Ent>**.

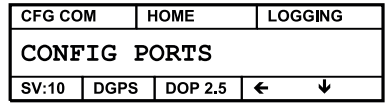
2. Use the arrow keys to change **Apply** to **Yes**.

3. Press **<Ent>**. The receiver will start a site using the information you provided.

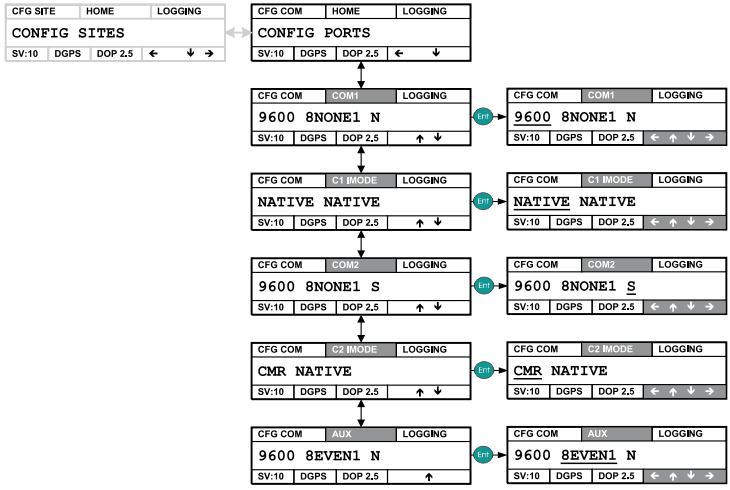
To stop a site, simply follow the steps above, but change the **Apply** field to **No**.

6.8 CFG COM > Home

Use this menu to configure the receiver's communication ports, which may be used to communicate with a hand controller, or to a radio for providing differential corrections.



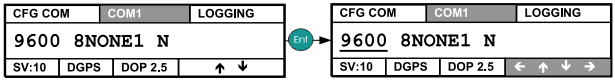
From the **CFG COM** menu, use the arrow keys and **<Ent>** button to move down through the following screens:



✉ **Note:** Communication port settings are not saved when the receiver is shut down. For **COM1**, **COM2**, and **AUX**, the receiver will default to "9600 8NONE1 N" every time the receiver is turned on.

6.8.1 COM1

This screen displays the current settings for the receiver's COM1 serial port.



The **COM1** screen displays the following fields:

Field 1.....Serial port's baud rate. The following shows the settings available for the field.

Baud Rate
9600
19200
38400
57600
115200

Field 2.....Number of data bits, the parity, and the number of stop bits. The following shows the settings available for the field.

Data Bits, Parity and Stop Bits	Description
8NONE1	8 data bits, no parity, 1 stop bit
8EVEN1	8 data bits, even parity, 1 stop bit
8ODD1	8 data bits, odd parity, 1 stop bit

Field 3.....Handshake protocol. The following shows the settings available for the field.

Handshake Protocol	Description
N	No handshaking
S	XON/XOFF software handshaking
H	CTS/RTS hardware handshaking

Example:

9600 8NONE N	
Baud Rate:	9600
Data Bits:	8
Parity:	NONE
Stop Bits:	1
Handshake:	N (No handshaking)

To change the settings for COM1, follow these steps:

1. Press **<Ent>**.

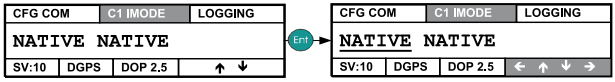
2. Use the right and left arrow keys to position the change line under the field you want to modify.

3. Use the up and down keys to change the field to a new value.

4. Press **<Ent>** to change to the new setting or **<Esc>** to leave the original settings.

6.8.2 C1 IMode

This screen displays the current interface mode for the COM1 communications port.



The **C1 IMode** screen displays the following two fields:

Field 1.....Receive interface mode.

Field 2.....Transmit interface mode.

The following table shows the possible interface modes:

Table 8: Interface Modes

Interface Mode	Description
NONE	The port accepts/generates nothing
NATIVE	The port accepts/generates system commands and logs
RTCM	The port accepts/generates RTCM corrections
RTCA	The port accepts/generates RTCA corrections
CMR	The port accepts/generates CMR corrections

The following example shows a possible setup for COM1.

Example:

CMR RTCM		
CMR	Receive Interface Mode	This port will accept only CMR format data
RTCM	Transmit Interface Mode	This port will only transmit RTCM format data

To change the settings for the communications port, follow these steps:

1. Press **<Ent>**.

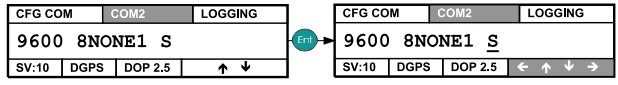
2. Use the right and left arrow keys to position the change line under the field you want to modify.

3. Use the up and down keys to change the field to a new value.

4. Press **<Ent>** to change to the new setting or **<Esc>** to leave the original settings.

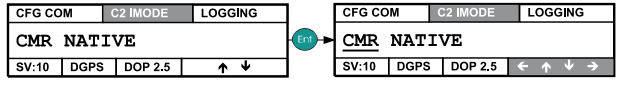
6.8.3 COM2

The description of this screen is analogous to that for **COM1** with the exception that the settings apply to communications port **COM2**. See Section 6.8.1, *COM1*, Page 76.



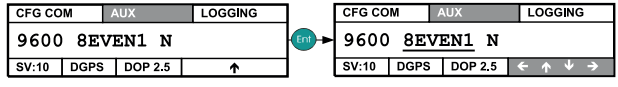
6.8.4 C2 IMode

The description of this screen is analogous to that for **C1 IMode** with the exception that the settings apply to communications port **COM2**. See Section 6.8.2, *C1 IMode*, Page 78.



6.8.5 Aux

The description of this screen is analogous to that for **COM1** with the exception that the settings apply to the **AUXCOM** communications port. See Section 6.8.1, *COM1*, Page 76.



Chapter 7 Collecting Data

The GSR2600 receiver is an extremely versatile GPS device that enables you to collect data several ways and to define the type of information stored during data collection. The following sections explain data collection.

7.1 Collecting Data

The most basic activity you will perform using your GSR2600 is collecting raw data. Each collection session (one uninterrupted period of time) is stored in a single, unique file on a data card. This file can subsequently be transferred to a PC for post-processing and adjustment using Sokkia's Spectrum Survey Suite software package.

The GSR2600 records raw data in the form of logs, which are written to the data file on a periodic basis. Sokkia's software interprets these logs and the data that they contain.

The GSR2600 receiver collects data in three ways:

- **Manual** data collection (Page 80)
- **Scheduled** data collection (Page 81)
- **Handheld** data collection (Page 82)

7.1.1 Manual data collection

To turn on the receiver, press the power button. When the receiver acquires GPS time, the GSR2600 will automatically start collecting data based on the POWERUP configuration (see Section 7.2.2, *Using the POWERUP configuration*, Page 84).

If you want to run a configuration other than POWERUP, you can use the CFG RCVR menu to start and stop configurations, as well as to enable the scheduler (see Section 6.4, *CFG RCVR > Home*, Page 58).

7.1.2 Scheduled data collection

A scheduled configuration is set to run at a specified time (see Section 4.3, *Scheduled Session*, Page 29). By setting a schedule, you can quickly and easily set your receiver to collect data unattended in the field.

You can schedule your GSR2600 to collect data repetitively (For example, every day from 15:00 to 17:00), or customized (For example, tomorrow from 10:00 to 11:00 and the day after from 17:00 to 18:00).

✉ **Note:** In order for a schedule to automatically run, the GSR2600's scheduler must be enabled. For more information, see Section 6.4, *CFG RCVR > Home*, Page 58.

7.1.2.1 Schedule guidelines

The following are the guidelines for setting schedules:

- You can schedule data collection for up to seven days in a one-week period, with up to 35 sessions per day.
- The scheduler operates perpetually (For example, if an event is scheduled to occur on a Monday, this event is serviced every Monday that the system is in operation).
- Start and stop times must be provided with a resolution of 1 minute.
- The minimum time interval per data collection session is 5 minutes (300 seconds).

- If you do not provide file names in advance, a unique file name is automatically generated for each set of recorded logs (see Section 7.2.2, *Using the POWERUP configuration*, Page 84).
- If there is sufficient time between sessions, the GSR2600 will power off to conserve power (see Section 4.4, *Power Consumption*, Page 30).
- When setting schedules, you may not specify overlapping time intervals. All scheduled entries rely on day of the week and time references.

7.1.3 Handheld data collection

Optionally, you can use the GSR2600 receiver with a data collector to configure and initiate data collection.

When you connect the data collector to the receiver, a communication link is established and the handheld controls the behavior of the receiver. If you turned on the GSR2600 by pressing its power button, the POWERUP configuration (if it exists) will run until the data collector takes control of the receiver.

Commands issued to the system through the data collector will supersede any configuration, such as POWERUP, that is resident on the receiver (see Section 7.2.2, *Using the POWERUP configuration*, Page 84).

Use the handheld options in the ***Instrument Setup*** screen to determine whether data is stored on the receiver or on the data collector.

✉ **Note:** If you communicate with the GSR2600 using the data collector, any scheduled sessions residing on the GSR2600 will be disabled. To override the data collector and enable the scheduler, see Section 6.4, *CFG RCVR > Home*, Page 58.

7.2 Defining Data to be Collected

You can define what type of information should be collected during a data collection session by using tools available in the Sokkia *Planning* software to create configurations for the GSR2600. The following sections give an overview of using configurations. For more information, refer to your *Planning Reference Manual*.

7.2.1 Using receiver configurations

Receiver configurations are groups or sets of data that tell your receiver what type of information should be stored during a data collection session. A configuration consists of the following:

Logs .....List of what type of data to collect (ephemeris-rawephemb)

Destination .....Where the data should be stored (data card, COM1 or COM2)

Interval.....When the data should be collected (every 10 seconds - ontime 10)

The configuration can also identify position (none, fixed or averaged) and point information such as the antenna height and elevation mask.

Configurations are transferred to the receiver from the *Planning* software (refer to your *Planning Reference Manual* for information on setting up schedules).

The *Planning* software provides several predefined configurations based on different data collection methods. You can simply select one of these predefined configurations (For example, **Static**) for your session, or you can define your own configuration.

Schedules transferred to the receiver will be run by the receiver. If the receiver is off when the time approaches the beginning of a scheduled session (see Section 4.3, *Scheduled Session*, Page 29), the receiver will power on five minutes prior to the scheduled event, establish GPS time, and then run the schedule.

✉ **Note:** If the receiver is inactive because of insufficient power, schedules will not run.

7.2.2 Using the POWERUP configuration

The GSR2600 receiver initially operates on a default configuration called POWERUP (for more information on configurations, see Section 7.2, *Defining Data to be Collected*, Page 83, or refer to your *Planning Reference Manual*).

The POWERUP configuration is the GSR2600 default configuration, and it is always present on the receiver unless you remove it using the *Planning* software. Although you can remove or change the POWERUP configuration using *Planning* software, resetting the receiver back to factory defaults will discard any changes and revert the POWERUP configuration back to factory settings.

When you look at the factory setup for the POWERUP configuration, you will notice that it consists of log names and recording intervals. Although configurations may look confusing, once you understand the meaning of the logs they are quite easy to set up.

The following is the factory setup for the POWERUP configuration and an explanation of the meaning of each log:

Table 4: Powerup Configuration Settings

Type of Information	Interval	Description
almanacb	onchanged	Current almanac
ionutcb	onchanged	Ionospheric and UTC clock parameters
rangecmpb	ontime 10	Compressed channel range measurements, revised
rawephemb	onchanged	Raw ephemeris
rtcaobs	ontime 1	RTCA reference station satellite observations
rtcaref	ontime 10	RTCA reference station position information

The first four types of information (almanacb, ionutcb, rangecmpb, and rawephemb) are typically used for post-processing and are logged to the PCMCIA card. The last two (rtcaobs and rtcaref) are typically used for an RTK base station and are transmitted out of COM port 2.

✉ **Note:** Though some of the logs in the POWERUP group are useful for post-processing and others are useful for a base RTK system, the GSR2600 will perform as a static/kinematic receiver if a radio/modem is not present, or as an RTK base if the radio/modem is present. By including all necessary logs for either configuration into the one POWERUP group, you will not have to change the default logs if your GSR2600 is switched between static and RTK base.

7.3 Data File Naming

Although file name conventions are explained in this section, you must refer to your *Planning Reference Manual* for instructions on setting up a schedule.

When scheduling a single data collection event, you can provide a name for the data file in advance. If you are scheduling a series of events, you must allow the GSR2600 to generate names automatically.

All files have a *.pdc extension, and must consist of one to eight characters. Auto-generated filenames always consist of eight-characters which are derived as shown in Table 5.

Table 5: Auto-Generated File Name Convention

####$$$%.pdc	Comments
####	last 4 digits of the GSR2600 serial number
$$$	UTC day of the year (001 – 366)
%	session ID assigned in sequence (0.. 9, A.. Z) based on the presence of files previously logged on a particular day.

For example, if the GSR2600 has a serial number such as NPV01450087, then the first four digits of the auto-generated name will be **0087**.

If the day is January 25, then the next three digits of the auto-generated name (the UTC day-of-year) will be represented as **025**.

Finally if, this is the fifteenth schedule of the day, the last digit would be **E**.

The resulting name of your file will be:

0087025E.PDC

In the event that a conflict should occur between an auto-generated file name or a file name specified in a scheduled entry, the GSR2600 will resolve the conflict by creating a file name whose first character is a tilde (“~”), followed by a 7-digit random number, and a *.pdc extension. For example:

~9368412.PDC

7.4 Data Storage Requirements

Based on the POWERUP default settings, Table 6 displays the approximate number of hours of logging available using an 8MB CompactFlash data card at epoch rates ranging from 1-60.

Table 6: 8 MB Data Card Logging Capacity

Hours of Storage on the GSR2600							
Epoc Rate	Average # of Satellites						
	6	7	8	9	10	11	12
1	8	7	6	6	5	5	4
2	17	14	13	11	10	9	8
5	42	36	31	28	25	23	21
10	83	71	63	56	50	45	42
15	125	107	94	83	75	68	63
30	250	214	188	167	150	136	125
60	500	429	375	333	300	273	250

7.5 Data Logging Interruption

If you press the power button to turn off the GSR2600 while it is logging data, the GSR2600 will save any open data files before turning off.

7.6 Resetting the Receiver

A POWERUP configuration (refer to your *Planning Reference Manual* for more information) is provided for default data collection. Holding the power button down for approximately 10-15 seconds will restore the default factory configuration.

The receiver will beep twice to indicate that a reset has occurred. For more information on audio features, see Section 5.2, *Audible Annunciator*, Page 35.

WARNING
Holding the power button for approximately 20 seconds will erase all data off the data card. For more information, see Section 5.1, *Power Button*, Page 33.

Appendix A GSR2600 Specifications

GSR2600 SPECIFICATIONS	
Physical	
Size	246 mm (0.81 ft) x 125 mm (0.41 ft) x 65 mm (0.21 ft)
Description of Enclosure	The enclosure is constructed of extruded powder coated aluminum. It is sealed by two end-caps, made of aluminum, covered with a membrane. The entire unit is closed with 12 mounting screws. An access cover on the front end-cap allows the insertion and removal of data cards. Seals are made of electrically conductive rubber.
Weight	1.5 kg (3.3 lb)
Environmental	
Operating Temperature	Receiver: -40° C (-40° F) to +55° C (131° F) Display: -20° C (-4° F) to +55° C (131° F)
Storage Temperature	-45°C (-49° F) to +85°C (185° F)
Resistance Characteristics	Dust and water resistant
Humidity	85% RH at +38°C (100.4° F), 95% RH at +65°C (149° F)
Altitude	Sea level to 5,000 m (16,404 ft) [This receiver may operate above 5,000 m in a controlled environment, but it is not certified as such.]
Vibration (Random Profile)	
The GSR2600 can acquire and track satellites while undergoing vibration levels as shown below. It assumes that C/No > 45 dB-Hz and that the GSR2600 is in high-dynamics mode. Assuming appropriate mounting, the GSR2600 conforms to random vibration templates for RTCA/DO-160C, Section 8.6.2 (Curve C template), MIL-STD-202F, Test Condition I (Letter A nominal template), and ASAE EP455, Section 5.15.1 nominal template.	
Frequency	< 10 Hz, 10 Hz, 40 Hz, 1000 Hz, 2000 Hz, > 2000 Hz
Magnitude (g2/Hz)	+ 80 dB/decade, 0.00125, 0.02, 0.02, 0.005, - 80 dB/decade

GSR2600 SPECIFICATIONS	
Acceleration (Dynamics)	
Acceleration	6g (0.21 oz) maximum (sustained tracking)
Power Requirements	
Voltage	+6 to +18 V DC
Power	4 W (typical while logging), 200 mW (off)
Peripheral Power Output	
Voltage	≅ supplied voltage
Current	≤1A
Power Management	
If the GSR2600 is connected to a battery pack, it begins using the first battery installed. When this voltage drops below 6.5 V DC, the battery is unusable, and the GSR2600 will switch to the next available battery. Once battery reserves are depleted, the GSR2600 shuts itself off.	
Real-Time Clock	
A real-time internal clock allows the GSR2600 to go into low-power "sleep mode" between scheduled data-collection sessions. When the GSR2600 is on, this clock is synchronized to GPS time of ±1 second.	
Performance (Subject To GPS System Characteristics)	
Frequency	1575.42 MHz (L1) & 1227.60 MHz (L2)
Codes tracked	C/A and P (or Y) codes
Channels	12 L1/L2 channel pairs
Time to First Fix	100 s (95% probability) 70 s typical (cold start: no initial time or almanac)
Re-acquisition	L1: 1 s typical L2: 10 s typical
Computed Data Update Rate	10 solutions per second
Measured Data Update Rate	10 data records per second
Point Positioning	SA On: 40 m (131.2 ft) SA Off: 15 m (49.2 ft)

GSR2600 SPECIFICATIONS	
Accuracy[a] Carrier Phase Post-Processed	Static Horizontal: 5mm + 1ppm * D Vertical: 10mm + 1ppm * D Occupation: 4SVs, 30sec rate, >1h Rapid-Static Horizontal: 5mm + 1ppm * D Vertical: 10mm + 1ppm * D Occupation: 5SVs, 15sec rate, >20min Stop-and-Go Horizontal: 10mm + 1ppm * D, D ≤10km 10mm + 2ppm * D, D > 10km Vertical: 20mm + 1ppm * D Kinematic Horizontal: 10mm + 1ppm * D, D ≤10km 10mm + 2ppm * D, D > 10km Vertical: 20mm + 1ppm * D
Accuracy[b] Carrier Phase RTK 1-sigma	RTK Rapid Logs Horizontal: 1.5cm + 2ppm Vertical: 3cm + 2ppm Logging Rate: 10 Hz maximum RTK Matched Logs Horizontal: 1cm + 1ppm * D, D ≤10km Vertical: 2cm + 1ppm * D, D ≤10km Logging Rate: 10 Hz maximum
RTK	Pseudorange & carrier-phase double differencing (fixed < 2 cm RMS accuracies with RTK carrier-phase positioning). Conditions: <10 km baseline length; ≥ 6 satellites at an elevation > 12°; after 2 minutes convergence.
Time Accuracy (relative)	250 ns (SA on) – does not include delays due to cable on RF section
Height Limit	Up to 18,288 m (60,000 feet), in accordance with export licensing
Velocity Limit	Up to 515 m/s (1000 Nmi/hr), in accordance with export licensing
RF Input / LNA Power Output	
Connector on GSR2600	Standard 50 Ω TNC female type
RF Input	1575.42 MHz, 1227.60 MHz
Power Output to LNA	4.25 - 5.25 V DC @ 0 - 90 mA. **Note:** if the antenna draws current above this limit, power to the antenna is disabled and the antenna self-test status flag is set to zero. Refer to the documentation for the RVSA log for more information.

GSR2600 SPECIFICATIONS	
Input/Output Data Interface	
Electrical format	EIA/TIA-232-E
EIA/TIA-232-E Baud Rate	4800, 9600, 19200, 57600, 115200 bps (9600 bps default)
Signals supported	TX, RX, RTS, CTS, DCD
Input/Output Strobes	
PPS Output *	A one-pulse-per-second time synchronization output. This is a normally high, active low pulse (1 ms ± 50 ns) where the falling edge is the reference.
Mark Input *	An input mark (negative pulse > 55 ns), time tags output log data to the time of the falling edge of the mark input pulse.
The electrical specifications of the strobe signals are as follows:	
Output	Voltage: Standard TTL levels Sink Current: 64 mA Source Current: 15 mA
Input	Voltage: Standard TTL levels Current: ≤5mA
Classifications	
FCC and CE	Complies with the radiated and conducted emission limits for a Class B digital device, for both CISPR 22 and Part 15 of the FCC rules. For full details see *GSR2600 FCC and CE Notice* on Page 2.

a. Accuracy depends on number of satellites visible, obstructions, satellite geometry (DOP), occupation time, multipath effects, atmospheric conditions, baseline length, survey procedures, and data quality. 95% confidence level. Baseline not exceeding 10Km (except for Static survey type).

b. With Base/Rover sharing at least 6 common satellites > 14 ° elevation, lock times > 3 min and GDOP < 4. Base station using choke-ring antenna, and Rover station using supplied dual-frequency antenna (SK-600). Typical multipath, ionospheric, and tropospheric errors. Baseline not exceeding 10Km. For RTK rapid logs, not greater than 1 sec. correction latency.

* Additional cable required. Ask your dealer for a Command Descriptions Manual.

Appendix B Glossary

Adjusted position - The final position of a survey point derived from an adjustment of the measurements used to derive the position.

Almanac - A set of orbit parameters that allows calculation of approximate GPS satellite positions and velocities. The almanac contains data that is used by a GPS receiver to determine satellite visibility and as an aid during acquisition of GPS satellite signals. The almanac data is downloaded from each satellite over the course of 12.5 minutes. The data contains orbital parameter approximations for all satellites, GPS to universal time conversion parameters, and single-frequency ionospheric model parameters

Ambiguity - The unknown integer number of cycles of the reconstructed carrier phase contained in an unbroken set of measurements from a single satellite pass at a single receiver. Also known as integer ambiguity and integer bias.

Antenna - The antenna is the component of a GPS system that collects the analog signal from the GPS satellite and sends this signal to the GPS receiver for processing.

Autonomous position - An autonomous position is derived from a single receiver without using any differential correction. This is the least accurate method of positioning.

Azimuth - The angle formed (in a clockwise direction) between True North (0 degrees) typically, and a chosen point.

Baseline - The three-dimensional vector distance between a pair of stations for which simultaneous GPS data has been collected and processed with differential techniques. The most accurate GPS result.

Base Station - In differential positioning, a base station is the end of the baseline that is assumed known and its position fixed.

Carrier Phase - The phase of either the L1 or L2 carrier of a GPS signal, measured by a receiver while locked-onto the signal (also known as integrated Doppler).

Cartesian coordinates - Values representing a point's location within a plane in relation to three mutually perpendicular coordinate axes which intersect at a common point or origin. The point is located by measuring its distance from each axis along a parallel to the axis.

Circular Error Probable (CEP) - The radius of a circle, centered at the user's true location, that contains 50 percent of the individual position measurements made using a particular navigation system.

CMR - Compact Measurement Record, a standard communications protocol format used in Real-Time kinematic systems to transfer GPS carrier phase and code observations from a reference station to one or more rover stations.

Coarse Acquisition (C/A) Code - The Course/Acquisition (or Clear/Acquisition) code modulated onto the GPS L1 signal.

Control Segment - The Master Control Station and the globally dispersed reference Stations used to manage the GPS satellites, determine their precise orbital parameters, and synchronize their clocks.

Cycle slip - A loss of the count of carrier cycles as they are being measured by a GPS receiver. Loss of signal, ionospheric interference, obstructions and other forms of interference cause cycle slips to occur (see carrier phase).

Datum - See Geodetic datum

Differential GPS (DGPS) - A technique to improve GPS accuracy that uses pseudorange errors at a known location to improve the measurements made by other GPS receivers within the same general geographic area.

Differential positioning - Determines the relative coordinates using two or more receivers that are simultaneously tracking the same satellites. Dynamic differential positioning is a real-time calibration technique achieved by sending corrections to the

roving user from one or more reference stations. Static differential GPS involves determining baseline vectors between pairs of receivers.

Dilution of Precision (DOP) - The geometry of the visible satellites is an important factor in achieving high quality results. The geometry changes with time due to the relative motion of the satellites. An accuracy measure for the geometry is the Dilution of Precision (DOP) factor.

DOP is a description of the effect of satellite geometry on position and time computations. Values that are considered to be 'good' are small, approximately 3. Values greater than 7 are considered poor. Thus, a small DOP is associated with widely separated satellites. Standard DOP terms for GPS include:

GDOP (Geometric Dilution of Precision)	GDOP is a composite measure reflecting the effects of satellite geometry on position and time computations.
PDOP (Position Dilution of Precision)	PDOP reflects the effects of satellite geometry on position computation.
HDOP (Horizontal Dilution of Precision)	HDOP reflects the effects of satellite geometry on the horizontal component of the position computation.
HTDOP (Horizontal Position and Time Dilution of Precision)	2D parameters and time are uncertain (latitude, longitude, time). The lower the HTDOP value, the greater the confidence factor.
VDOP (Vertical Dilution of Precision)	VDOP reflects the effects of satellite geometry on the vertical component of the position computation.
TDOP (Time Dilution of Precision)	TDOP reflects the effects of satellite geometry on the time computation.
NDOP (North Dilution of Precision)	This is related to GDOP. It describes the effects of geometry on the northern component of positioning accuracy.

Doppler - The change in frequency of sound, light or other wave caused by movement of its source relative to the observer.

Double-Difference Carrier Phase Ambiguity (or sometimes double difference ambiguity or ambiguity, for short) - Carrier phase ambiguities which are differenced between receiver channels and between the reference and remote receivers. They are estimated when a double difference mechanism is used for carrier phase positioning.

Earth-Centered-Earth-Fixed (ECEF) - Earth-Centered-Earth-Fixed. This is a coordinate-ordinate system which has the X-coordinate in the earth's equatorial plane pointing to the Greenwich prime meridian, the Z-axis pointing to the north pole, and the Y-axis in the equatorial plane 90° from the X-axis with an orientation which forms a right-handed XYZ system.

Elevation - Height above a reference datum. The reference datum may be an ellipsoid (ellipsoidal elevation), a geoid (orthometric elevation), above mean-sea-level, or above a locally defined reference plane.

Elevation mask angle - An adjustable feature of GPS receivers that specifies a satellite must be at least a specified number of degrees above the horizon before the signals from the satellite are to be used. Satellites at low elevation angles (five degrees or less) have lower signal strengths and are prone to loss of lock thus causing noisy solutions.

Ellipsoid - A smooth mathematical surface which represents the earth’s shape and very closely approximates the geoid. It is used as a reference surface for geodetic surveys.

Ellipsoidal Height - Height above a defined ellipsoid, approximating the surface of the earth.

Ephemeris - A set of satellite orbit parameters that is used by a GPS receiver to calculate precise GPS satellite positions and velocities. The ephemeris is used in the determination of the navigation solution and is updated periodically by the satellite to maintain the accuracy of GPS receivers. Available as "broadcast ephemeris" or as post-processed "precise ephemeris."

Epoch - Same as measurement time epoch. The local time at which a GPSCard takes a measurement. For example, 15 seconds, 30 seconds.

Fixed solution - Processing of GPS vectors produces many solutions for the vector at different stages of the processing. One of the parameters being solved for during the processing is the integer ambiguities. A fixed solution is a vector solution where the integer ambiguities have been correctly determined and fixed. The fixed solution for a vector is most often the best solution. If for some reason the ambiguities could not be solved, the final solution for the vector will be a float solution.

Float solution - Processing of GPS vectors produces many solutions for the vector at different stages of the processing. One of the parameters being solved for during the processing is the integer ambiguities. A float solution is a vector solution where the integer values for the ambiguities could not be determined, therefore they are not fixed to a specific integer value (left to float as a whole number).

Geodetic Coordinates - A coordinate system where the position of a point is defined using the elements latitude, longitude and geodetic height.

Geodetic Datum - A model of the earth used for Geodetic calculations

Geodetic Height (ellipsoidal height) - The height of a point above an ellipsoidal surface. The difference between a point's geodetic height and its orthometric height (height above ellipsoid) equals the geoidal separation.

Geoid - A gravity based surface used to represent the physical surface of the earth. The center of the geoid coincides with the true center of the earth, and its surface is an equipotential surface, meaning that at any point the geoid is perpendicular to the direction of gravity. The geoid can be visualized by imagining the earth completely covered by water. This water surface is an equipotential surface since the water flows to compensate for height differences.

Geoidal Separation (or Geoidal Height) - The height difference between the ellipsoidal height and orthometric height at a given point on the earth’s surface. Worded differently, it is the separation between the geoid surface and the ellipsoid surface at a given point on the earth’s surface.

Global Positioning System (GPS) - Full name NAVSTAR Global Positioning System, a space-based radio positioning system which provides suitably equipped users with accurate position, velocity and time data. When fully operational, GPS will provide this data free of direct user charge worldwide, continuously, and under all weather conditions. The GPS constellation will consist of 24 orbiting satellites, four equally spaced around each of six different orbiter planes. The system is being developed by the Department of Defense under U.S. Air Force management. GPS consists of the following:

- Space segment (up to 24 NAVSTAR satellites in 6 different orbits)
- Control segment (5 monitor stations, 1 master control station and 3 upload stations)
- User segment (GPS receivers)

NAVSTAR satellites carry extremely accurate atomic clocks and broadcast coherent simultaneous signals.

GPS Time - The time system upon which GPS is based. GPS time is an atomic time system and is related to International Atomic Time in the following manner:

International Atomic Time (IAT) = GPS + 19.000 sec. Note: IAT and Universal Time Coordinated (UTC) are closely related. The difference is that UTC has leap seconds put in to adjust for changes in the earth's rotation. see *Universal Time Coordinated (UTC)*.

GPS Week - GPS time started at Saturday/Sunday midnight, January 6, 1980. The GPS week is the number of whole weeks since GPS time zero.

Greenwich Mean Time (GMT) - Time based on the Greenwich meridian as reference. In distinction from time based on a local meridian or the meridian of a time zone.

HI - Height of Instrument

IODE - Issue of Data (Ephemeris)

Iono-free Carrier Phase Observation - A linear combination of L1 and L2 carrier phase measurements which provides an estimate of the carrier phase observation on one frequency with

the effects of the ionosphere removed. It provides a different ambiguity value (non-integer) than a simple measurement on that frequency.

Ionosphere - The layers of ionized air in the atmosphere extending from 70 kilometers to 700 kilometers and higher. Depending on frequency, the ionosphere can either block radio signals completely or change the propagation speed. GPS signals penetrate the ionosphere but are delayed. This delay induces error in the GPS measurements that can result in poor survey results. Most GPS receivers/processing software model the ionosphere to minimize its affects. Also, the effects of ionosphere can be nearly eliminated by using dual frequency receivers which can calculate the delay due to ionosphere.

Ionospheric delay - A wave propagating through the ionosphere [which is a non-homogeneous (in space and time) and dispersive medium] experiences delay. Phase delay depends on electron content and affects carrier signals. Group delay depends on dispersion in the ionosphere as well and affects signal modulation (codes). The phase and group delay are of the same magnitude but opposite sign.

Kinematic - The user's GPS antenna is moving. In GPS, this term is typically used with precise carrier phase positioning, and the term dynamic is used with pseudorange positioning.

Kinematic surveying - A form of continuous differential carrier-phase surveying requiring only short periods of data observations. Operational constraints include starting from or determining a known baseline and tracking a minimum of four satellites. One receiver is statically located at a control point, while others are moved between points to be measured.

L1 - The 1575.42 MHz GPS carrier frequency, which contains the course acquisition (C/A) code, as well as encrypted P-code, and navigation, messages used by commercial GPS receivers.

L2 - A secondary GPS carrier, containing only encrypted P-code, used primarily to calculate signal delays caused by the ionosphere. The L2 frequency is 1227.60 MHz.

Latitude - An angle generated by the intersection of the semi-major axis of the datum reference ellipsoid and the ellipsoid normal (line running perpendicular to the ellipsoid surface) at the point of interest. Latitude is one of the positional elements when defining the geodetic coordinates of a point.

Longitude - The length of the arc or portion of the Earth's equator between the meridian of a given place and the prime meridian expressed in degrees west or east of the prime meridian to a maximum of 180 degrees.

Low-latency Solution - A position solution which is based on a prediction. A model (based on previous reference station observations) is used to estimate what the observations will be at a given time epoch. These estimated reference station observations are combined with actual measurements taken at the remote station to provide a position solution.

Mask Angle - See Elevation mask angle.

MSL - Mean Sea Level

Multipath - The reception of a satellite signal both along a direct path and along one or more reflected paths. The reflected signals are caused by reflecting surfaces near the GPS antenna. The resulting signal results in an incorrect pseudorange measurement. Multipath Errors are GPS positioning errors caused by the interaction of the GPS satellite signal and its reflections.

NMEA - National Marine Electronics Association, an organization that created industry standard ASCII log types that are used by all receivers.

Observable - In GPS surveying, the observable is another name for the raw data being collected (observed) by the GPS receiver.

Obstruction - Physical feature that blocks the satellite direct line of site from the point of observation. GPS signals are very weak. They can be blocked from reaching the GPS antenna by objects between the antenna and the satellites. Classic examples of obstructions are trees and buildings.

Occupation - The period of recorded data for a site. For example, a 1-hour period of data collection on a survey point is considered an occupation. Occupation is usually interchangeable with the term observation.

Orthometric elevation (orthometric height) - The height of a point above the geoid. Orthometric elevation is often equated with mean-sea-level elevation.

P-Code (precise or protected) - The protected or precise code used on both LI and L2 GPS frequencies. This code is made available by the DOD only to authorized users. The P code is a very long (about 1014 bits) sequence of pseudo-random binary biphase modulations on the GPS carrier at a chipping rate of 10.23 MHz which does not repeat itself for about 38 weeks. Each satellite uses a one-week segment of this code which is unique to each GPS satellite, and is reset each week.

Phase Center - The phase center of a GPS antenna is the physical location on the antenna where the raw GPS signals are observed. This is the physical location where the computed position will be determined. GPS antennas are manufactured to place the phase center as closely as possible to the physical center of the antenna housing. To determine the position of a survey marker on the ground, the GPS antenna (and thus the phase center) is centered over the marker and the HI is measured to the survey marker for use during processing.

Precise Positioning Service (PPS) - The GPS positioning, velocity, and time service which will be available on a continuous, worldwide basis to users authorized by the U.S. Department of Defense (typically using P-Code).

PRN - Pseudo Random Noise number. A number assigned by the GPS system designers to a given set of pseudorandom codes. Typically, a particular satellite will keep its PRN (and hence its code assignment) indefinitely, or at least for a long period of time. It is commonly used as a way to label a particular satellite.

Pseudolite - An Earth-based transmitter designed to mimic a satellite. May be used to transmit differential corrections.

Pseudorange - The calculated range from the GPS receiver to the satellite determined by taking the difference between the measured satellite transmit time and the receiver time of

measurement, and multiplying by the speed of light. This measurement generally contains a large receiver clock offset error.

Pseudorange Measurements - Measurements made using one of the pseudorandom codes on the GPS signals. They provide an unambiguous measure of the range to the satellite including the effect of the satellite and user clock biases.

Raw data - GPS data which has not been processed or differentially corrected.

Recording interval - The time interval between the recording of GPS raw data to the GPS receiver memory. For example, a recording interval of 10 seconds indicates GPS raw data will be stored to the GPS receiver memory once every 10 seconds.

Reference Station - The GPS receiver which is acting as the stationary reference. It has a known position and transmits messages for the "remote" receiver to use to calculate its position.

Remote Receiver - The GPS receiver that does not know its position and needs to receive measurements from a reference station to calculate differential GPS positions.

Residual - In the context of measurement, the residual is the misclosure between the calculated measurements, using the position solution and actual measurements.

RINEX - Receiver INdependent EXchange format. A set of standard definitions and formats to promote the free exchange of GPS data and facilitate the use of data from any GPS receiver with any software package. The format includes definitions for three fundamental GPS observables: time, phase and range. A complete description of the RINEX format is found in the Commission VIII International Coordination of Space Techniques for Geodesy and Geodynamics "GPSBULLETIN" May-June, 1989.

Root-Mean-Square (RMS) - A statistical measure of the scatter of computed positions about a "best fit" position solution. RMS can be applied to any random variable.

Rover - The GPS receiver that moves from site to site during a kinematics GPS survey.

RTCA - Radio Technical Commission for Aeronautics, an organization which developed and defined a message format for differential positioning.

RTCM - Radio Technical Commission for Maritime Services, an organization which developed and defined the SC-104 message format for differential positioning.

RTK - Real-time kinematic, a type of differential positioning based on observations of carrier phase.

Selective Availability (SA) - The method used by the United States Department of Defense to control access to the full accuracy achievable by civilian GPS equipment (generally by introducing timing and ephemeris errors).

A Department of Defense program controls the accuracy of pseudorange measurements, whereby the user receives a false pseudorange which is in error by a controlled amount. Differential GPS techniques can reduce these effects for local applications.

Site - A location or survey point where GPS data is collected.

Slant height - The distance from the survey marker to the edge of the antenna ground plane. Using the slant height and radius of the GPS antenna, the true vertical height or HI of the antenna can be determined. The HI is used in the processing to determine the location of the survey marker on the ground.

Spherical Error Probable (SEP) - The radius of a sphere, centered at the user's true location, that contains 50 percent of the individual three-dimensional position measurements made using a particular navigation system.

Spheroid - Sometimes known as ellipsoid; a perfect mathematical figure which very closely approximates the geoid. Used as a surface of reference for geodetic surveys. The geoid, affected by local gravity disturbances, is irregular.

Standard Positioning Service (SPS) - A positioning service made available by the United States Department of Defense which will be available to all GPS civilian users on a continuous, worldwide basis (typically using C/A Code).

Static Surveying - A method of GPS surveying that involves simultaneous observations between stationary receivers. Post-processing computes the vector between points.

SV - Space Vehicle. In GPS, the space vehicle refers to satellites.

Time-To-First-Fix (TTFF) - The actual time required by a GPS receiver to achieve a position solution. This specification will vary with the operating state of the receiver, the length of time since the last position fix, the location of the last fix, and the specific receiver design.

Undulation - The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid (spheroid). Also known as geoidal separation, geoidal undulation, and geoidal height.

Universal Time Coordinated (UTC) - Time as maintained by the U.S. Naval Observatory. Because of variations in the Earth's rotation, UTC is sometimes adjusted by an integer second. The accumulation of these adjustments compared to GPS time, which runs continuously, has resulted in an 13 second offset between GPS time and UTC at the start of 1999. After accounting for leap seconds and using adjustments contained in the navigation message, GPS time can be related to UTC within 20 nanoseconds or better.

WGS84 - World Geodetic System 1984 is an ellipsoid designed to fit the shape of the entire Earth as well as possible. It is often used as a reference on a worldwide basis, while other ellipsoids are used locally to provide a better fit to the Earth in a local region. GPS uses the center of the WGS84 ellipsoid as the center of the GPS ECEF reference frame.

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CE Declaration of Conformity

In accordance with EMC Directive 89/336/EEC of the European Community

We herewith declare that the undermentioned instrument, in view of its design and type of construction, fully complies with the relevant basic radio interference requirements of the EMC Directive.

Should the instrument be modified without agreement, this declaration becomes invalid.

Instrument Description: GPS receiver (Surveying Instrument)

Model Name: GSR2600

Relevant EC Directive: EMC Directive (89/336/EEC)

Version 92/31/EEC

Applied Harmonized Standards:

- EN55022 Class B
- EN50082-1 (1998)

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