SPECTRA PRECISION®

EPOCH® 50 GNSS SYSTEM

USER GUIDE

EPOCH® 50 GNSS System

Version 1.00
Revision A
March 2011

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Release notice

This is the March 2011 release (Revision A) of the *EPOCH 50 GNSS System User Guide*. It applies to version 1.00 of the EPOCH 50 GNSS receiver.

Product Limited Warranty Information

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

Product Extended Limited Warranty Information

For applicable product Extended Limited Warranty information, please refer to the Limited Warranty Card included with this Spectra Precision product, or consult your Spectra Precision dealer.

Notices

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

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

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

Canada

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

Europe

This product has been tested and found to comply with the requirements for a Class B device pursuant to European Council Directive 89/336/EEC on EMC, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.

Australia and New Zealand

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

Taiwan – Battery Recycling Requirements

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

廢電池請回收

Notice to Our European Union Customers

For product recycling instructions and more information, please go to www.SpectraPrecision.com/weee_rohs.aspx.

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

Declaration of Conformity

We, Spectra Precision,

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Westminster, CO 80021
United States of America
+1-303-323-4100

declare under sole responsibility that the products:
EPOCH 50 GNSS receiver
comply with Part 15 of FCC Rules.

Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Safety Information

Before you use a Spectra Precision® EPOCH® 50 GNSS system, make sure that you have read and understood this guide, as well as the safety requirements listed in this chapter.

Warnings and Cautions

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

Always follow the instructions that accompany a Warning or Caution. The information they provide is intended to minimize the risk of personal injury and/or damage to the equipment. In particular, observe safety instructions that are presented in the following formats:

WARNING – A Warning alerts you to a likely risk of serious injury to your person and/or damage to the equipment. A warning identifies the nature of the risk and the extent of possible injury and/or damage. It also describes how to protect yourself and/or the equipment from this risk. Warnings that appear in the text are repeated at the front of the manual.

CAUTION – A Caution alerts you to a possible risk of damage to the equipment and/or loss of data. A Caution describes how to protect the equipment and/or data from this risk.

Regulations and safety

The receivers contain an internal radio-modem and can send signals through Bluetooth® wireless technology or through an external data communications radio. Regulations regarding the use of the Ultra High Frequency (UHF) radio-modems vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. Other countries require end-user licensing. For licensing information, consult your local Spectra Precision dealer. Bluetooth operates in license-free bands.

Before operating this receiver, determine if authorization or a license to operate the receiver is required in your country. It is the responsibility of the end user to obtain an operator's permit or license for the receiver for the location or country of use. For FCC regulations, see Legal notices, page 2.

Type approval

Type approval, or acceptance, covers technical parameters of the equipment related to emissions that can cause interference. Type approval is granted to the manufacturer of the transmission equipment, independent from the operation or licensing of the units. Some countries have unique technical requirements for operation in particular

radio-modem frequency bands. To comply with those requirements, Spectra Precision may have modified your equipment to be granted Type approval. Unauthorized modification of the units voids the Type approval, the warranty, and the operational license of the equipment.

Exposure to radio frequency radiation

For UHF radio

For example, a 450 MHz radio.

Safety. Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy.

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

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

For Bluetooth radio

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

Installing antennas

CAUTION – For your own safety, and in terms of the RF Exposure requirements of the FCC, always observe these precautions:
– Always maintain a minimum separation distance of 20 cm (7.8 inches) between yourself and the radiating antenna.
– Do not collocate (place within 20 cm) the radio antenna with any other transmitting device.

This device has been designed to operate with the antennas listed below.

UHF Antennas not included in this list, or having a gain greater than 5 dBi, are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

The antennas that can be used (country dependent) with the UHF radio are 0 dBi and 5 dBi whip antennas for external radio modems.

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

Rechargeable Lithium-ion batteries

These receivers use a rechargeable Lithium-ion battery.

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

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

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

Cautions

CAUTION – Operating or storing the receiver outside the specified temperature range can damage it. For more information, see Physical specifications, page 32.

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CHAPTER

1

Introduction

In this chapter:

- About the EPOCH 50 GNSS system
- Features
- Use and care
- COCOM limits
- Related information
- Technical assistance
- Your comments

Welcome to the *EPOCH 50 GNSS System User Guide*. This manual describes how to install, set up, and use a Spectra Precision® EPOCH® 50 GNSS receiver.

Even if you have used other Global Navigation Satellite System (GNSS) products before, Spectra Precision recommends that you spend some time reading this manual to learn about the special features of your receiver.

This guide assumes that you are familiar with a Windows® operating system and that you know how to use a mouse, select options from menus and dialogs, make selections from lists, and refer to online help.

About the EPOCH 50 GNSS system

The EPOCH 50 GNSS receiver uses an internal GNSS antenna and is designed for GNSS surveying applications.

The GNSS receiver consists of the receiver with integrated GNSS antenna, internal Pacific Crest ADL transceiver, 0 dB gain UHF antenna, and internal Li-Ion battery. The system can also be used with an external radio modem for longer range use. Alternatively, the receiver can operate for short-range work with the internal ADL radio. All EPOCH 50 receivers are equipped with internal Tx/Rx radio modems. When using radios to transmit, Spectra Precision strongly recommends that you use an external battery for power to increase operational time.

An LED screen on the receiver allow you to monitor the satellite tracking, radio reception, and power. Bluetooth® technology in the receiver provides cable-free communications between receiver and controller.

The receiver provides high precision multiple correlator GNSS pseudorange measurements, unfiltered, unsmoothed pseudorange measurement data for low noise, low multipath error, low time domain correlation, and high dynamic response.

The receiver provides 220 channels:

- GPS: Simultaneous L1 C/A, L2E, L2C, L5
- GLONASS: Simultaneous L1 C/A, L1 P, L2 C/A (GLONASS M Only), L2 P
- GIOVE-A and GIOVE-B: Simultaneous L1 BOC, E5A, E5B, E5AltBOC[1]
- SBAS (Satellite-Based Augmentation Systems): Simultaneous L1 C/A, L5

Features

The receiver provides the following features:

- Centimeter-accuracy, real-time positioning with RTK
- 220 channels L1 C/A code, L1/L2 full-cycle carrier
- SBAS capability
- Highly accurate GNSS L1/L2 technology
- Centimeter-accuracy, real-time positioning with RTK/OTF data, up to 20 Hz position updates when configured
- Correction support: CMR, CMR+™, RTCM 2.1, 2.2, 2.3, 3.0, and 3.1
- Radio antenna connector
- Internal UHF transceiver
- Removable and rechargeable Lithium-ion battery
- Cable-free Bluetooth communications

1. Galileo GioVE-A and GioVE-B test satellite support uses information that is unrestricted in the public domain and is intended for signal evaluation and test purposes.

Use and care

The receiver can withstand the rough treatment that typically occurs in the field. However, the receiver is a high-precision electronic instrument and should be treated with reasonable care.

CAUTION – Operating or storing the receiver outside the specified temperature range can damage it. For more information, see Chapter 4, Specifications.

High-power signals from a nearby radio or radar transmitter can overwhelm the receiver circuits. This does not harm the instrument, but it can prevent the receiver from functioning correctly. Do not use the receiver within 400 meters (1312 feet) of powerful radar, television, or other transmitters. Low-power transmitters such as those used in cell phones and two-way radios do not normally interfere with receiver operations.

For more information, contact your Spectra Precision distributor.

COCOM limits

The U.S. Department of Commerce requires that all exportable GNSS products contain performance limitations so that they cannot be used in a manner that could threaten the security of the United States.

The following limitation is implemented on the receiver: Immediate access to satellite measurements and navigation results is disabled when the receiver's velocity is computed to be greater than 1000 knots, or its altitude is computed to be above 18,000 meters (59,055 feet). The receiver continuously resets until the COCOM situation is cleared.

Related information

- Registration – register to automatically receive email notifications of receiver firmware upgrades and new functionality. You can register electronically at www.spectraprecision.com/register/register.shtml.
- Contact your local Spectra Precision distributor for more information about the support agreement contracts for software and firmware, and an extended warranty program for hardware.

Technical assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local distributor*. Alternatively, request technical support using the Spectra Precision website at www.spectraprecision.com.

Your comments

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

CHAPTER

2

Setup, Connection, and Cabling

In this chapter:

- Parts of the receiver
- Setup guidelines
- Base receiver setup
- Rover setup

This chapter provides general information on setup, connection, and cabling for the most common uses of the receiver.

Parts of the receiver

All operating controls on the receiver are located on the front panel. Serial ports and connectors are located on the bottom of the unit.

- The power button controls the receiver's power on or off functions.
- LEDs show the status of power, satellite tracking, and radio reception. See also LED display, page 25.

Ports and connectors

Figure 2.1 shows the two serial ports and the $^{5}/_{8}$-11 threaded insert.

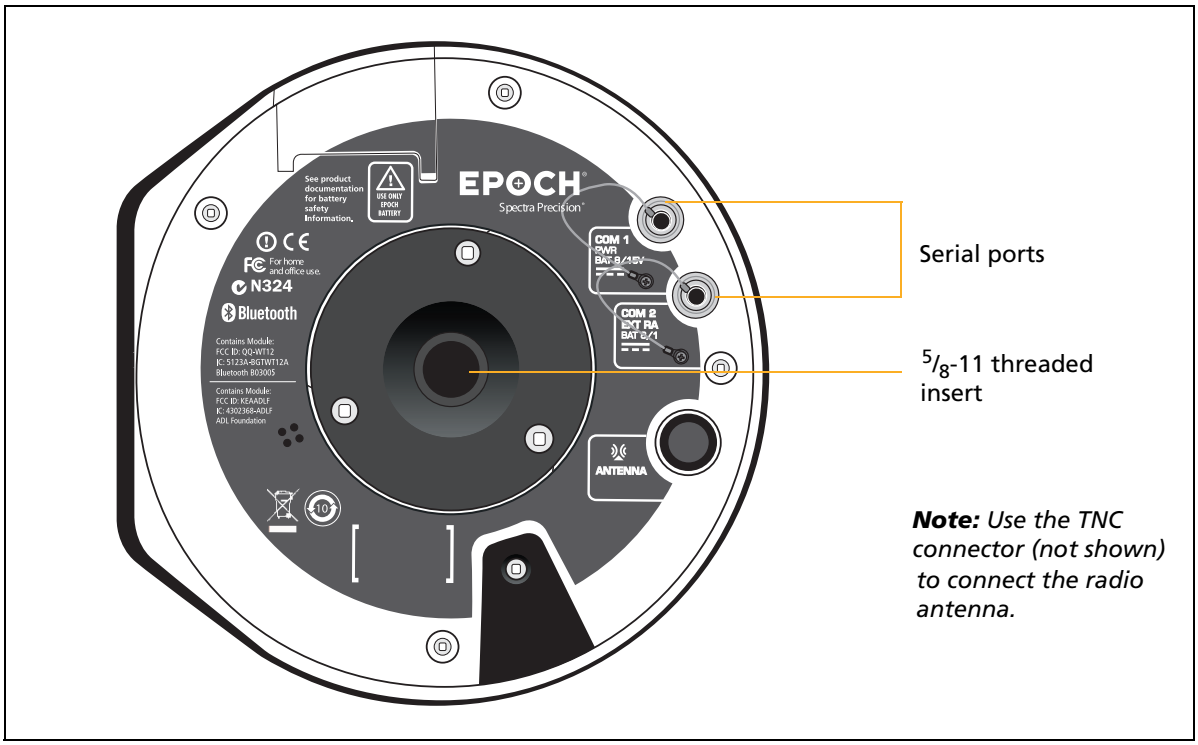


Figure 2.1 Ports and connectors on the receiver

COM 1 and 2 are 7-pin 0-shell LEMO connectors that support serial communications and external power input of 12 -20 VDC with no power output.

For more information, see Chapter 5, Default Settings and Chapter 6, Cables and Connectors.

Setup guidelines

Environmental conditions

Although the receiver has a dust and moisture sealed housing, you must take reasonable care to protect the unit from extreme environmental conditions. Do not:

- use the unit where temperatures are likely to rise above 60 °C (140 °F) or fall below –20 °C (–4 °F). See also temperature specifications on page 32.
- immerse the unit in water
- expose the unit to corrosive fluids and gases

Sources of electrical interference

Avoid the following sources of electrical and magnetic noise:

- Gasoline engines (spark plugs)
- Televisions and PC monitors
- Alternators and generators
- Electric motors
- Equipment with DC-to-AC converters
- Fluorescent lights
- Switching power supplies

General guidelines

WARNING – These receivers use a rechargeable Lithium-ion battery. To avoid personal injury or equipment damage, make sure that you read and understand the Safety Information at the front of the manual.

The following guidelines apply whenever you set up the receiver for operation:

- When disconnecting a LEMO cable, grasp the cable by the sliding collar or lanyard and then pull the cable connector straight out of the port. Do not twist the connector or pull on the cable itself.
- To securely connect a TNC cable or antenna, align the cable connector with the receiver receptacle and then thread the cable connector clockwise onto the receptacle until it is snug.
- To insert the internal battery, place the battery in the battery compartment, ensuring that the contact points are in the correct position to align with the contacts in the receiver. Slide the battery into the receiver until the battery compartment latches are locked into position.

Base receiver setup

WARNING – The receiver uses a rechargeable Lithium-ion battery. To avoid personal injury or equipment damage, make sure that you read and understand the Safety Information on page 3.

You can set up the receiver using an external radio or the internal radio.

Setting up the receiver using an external radio

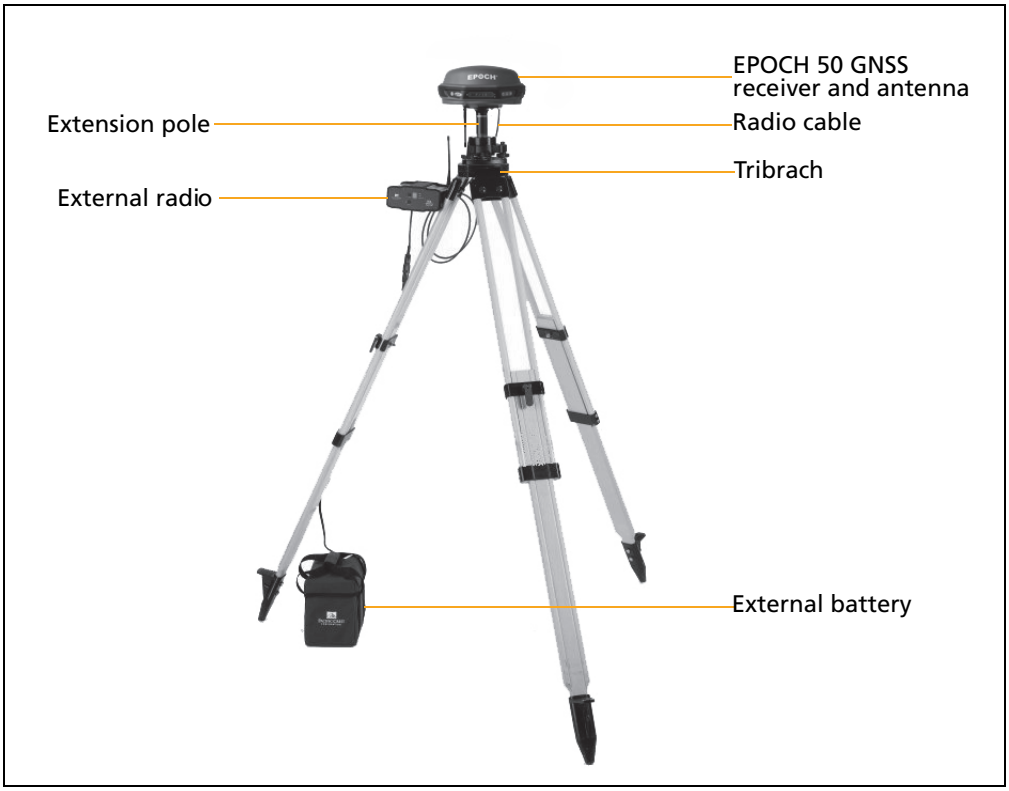


Figure 2.2 EPOCH 50 GNSS receiver, base setup

The base is shown here with the PacificCrest PDL HPB external radio.

1. Set up the receiver on a tripod.
2. Connect the radio's Y cable to the receiver's COM 2 port.
3. Place the external radio on the tripod leg and then connect the Y cable.
4. Connect the SAE connector of the Y cable to the external battery.
5. Attach the whip antenna assembly to the tripod, or to its own tripod, and then connect the antenna cable to the radio.

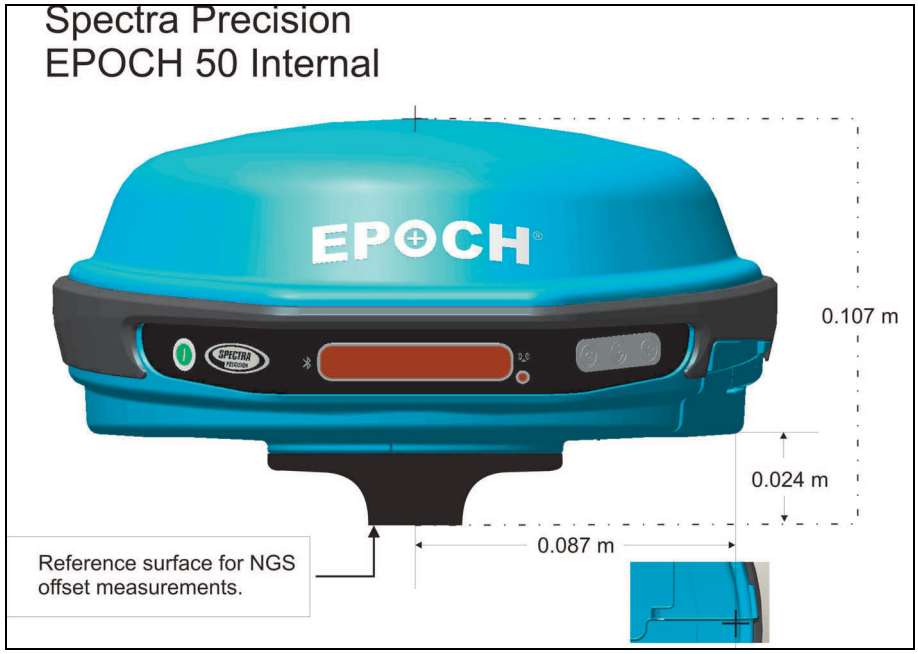
The receiver will now be powered by the external battery via the Y cable.

Setting up the receiver using the internal radio

1. Set up the receiver on a tripod.
2. Connect the 6" flexible antenna to the ANT port.
3. Do one of the following:
   - If you are using external power, connect the Y cable to the receiver COM 2 port.
   - If you are using internal power, insert a battery into the battery compartment.

Note – *When using the internal battery, battery power is limited to a maximum of 2.5 hours. Spectra Precision recommends that you use an external battery.*

When setting up on a tripod, you must use the slant height measurement point on the receiver to get an accurate instrument height, as shown below:



Rover setup

WARNING – The receiver uses a rechargeable Lithium-ion battery. To avoid personal injury or equipment damage, make sure that you read and understand the Safety Information on page 5 at the front of this manual.

To mount the receiver on a range pole:

1. Thread the receiver onto the range pole.
2. Attach the supplied UHF radio antenna to the ANTENNA port on the receiver.
3. Attach the controller bracket to the pole.
4. Insert the controller into the bracket.
5. ***Optional.*** Connect the instrument cable to COM1 if Bluetooth will not be used.

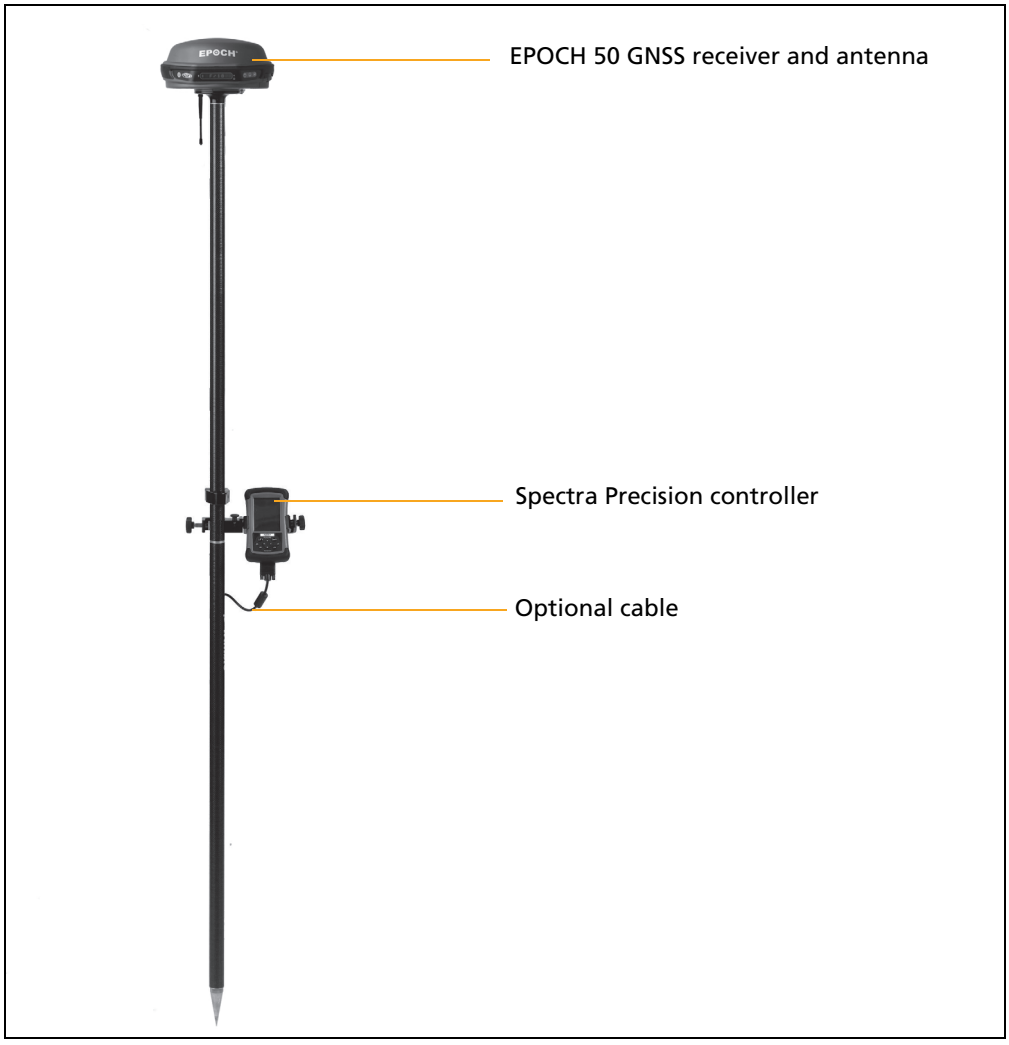


Figure 2.3 EPOCH 50 GNSS receiver set up as a rover receiver

Configuring the internal rover radio

To configure the internal radio in the EPOCH 50 GNSS receiver, use the Pacific Crest office software.

By default, the internal radio has no frequencies installed at the factory. To configure the frequencies of the base or rover, contact your Spectra Precision distributor.

CHAPTER

3

General Operation

In this chapter:

- Batteries and power
- General operation
- Post-processing routine
- Post-processing routine
- Post-processing routine
- Resetting to defaults

This section describes how to use the EPOCH 50 GNSS receiver as well as the controls on the front panel that you need for general operation.

For information about other receiver panels, see Parts of the receiver, page 14.

Batteries and power

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

Receiver power

The rover receiver can be powered by its internal, removable battery or by an external power source connected to Port 1 or Port 2. Typically, one internal 2.4 Ah battery provides approximately 4.0 hours of operation during an RTK survey when the internal radio is used in Rover mode. The basic kit contains three batteries for up to 12 hours of total operation.

If an external power source is connected to Port 1 or Port 2, it is used in preference to the internal battery. When there is no external power source connected, or if the external power supply fails, the internal battery is used.

The receiver configured as a base should be powered by an external 12 V battery, which lasts 12 hours in continuous use, depending on the output power level on the radio.

Charging and storing batteries

All battery types discharge over time when they are not being used. Batteries also discharge faster in colder temperatures. If a Lithium-ion battery is to be stored for long periods of time, make sure it is fully charged before storing and re-charged at least once every three months.

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

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

Charging the Lithium-ion battery

The rechargeable Lithium-ion battery is supplied partially charged. Charge the battery completely before using it for the first time. If the battery has been stored for longer than six months, charge it before use.

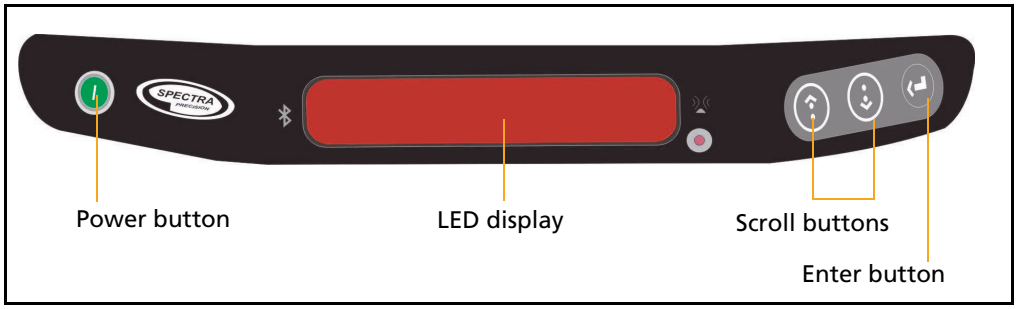
- Fully charge all new batteries prior to use.
- Do not allow the batteries to discharge below 5 V.
- Keep all batteries on continuous charge when not in use. Batteries may be kept on charge indefinitely without damage to the receiver or batteries.
- Do not store batteries in the receiver or external charger unless power is applied.
- If you must store the batteries, fully charge them before storing and then recharge them at least every three months.

Disposing of the rechargeable Lithium-ion battery

Discharge the Lithium-ion battery before disposing of it. When disposing of the battery, be sure to do so in an environmentally sensitive manner. Adhere to any local and national regulations concerning battery disposal or recycling.

General operation

The following figure shows the control panel of the receiver. The LED display provides power, post-processing controls, and SV status information.



Power button

Press the Power button to turn on or turn off the receiver:

To ...	Do this...
Turn on the receiver	Press and then release ⏻. The receiver beeps, followed by a self-test. See page 26. When the test is complete, the GNSS status appears.
Turn off the receiver	Press and then hold ⏻ for at least 5 seconds. **Off** appears and the receiver beeps three times. Release ⏻ when the display turns off. ***Note –*** *You cannot turn the power off during the self-test.*

Scroll buttons

Use the scroll buttons ▲ or ▼ to scroll through the various menu items or options.

Enter (Select) button

Use the enter button ↵ to access choices for the current menu item, or return to the main menu.

LED display

The LED display uses text and symbols to provide information and guide you through various tasks. The symbols include the following:

This symbol ...	Indicates that ...
. (in first position)	Bluetooth technology is used for communicating with the controller.
: (in first position)	A serial cable on COM 1 is used for communicating with the controller.
➡ (in last position)	Press ↵ to perform the action or view the status.
⬆ or ⬇ (in last position)	Additional items or options are available. Use the ▲ or ▼ buttons to access them.
R (in last position)	The unit is logging post-process data to the internal memory.

Self-test procedure

Note – *You cannot turn the power off during the self-test.*

The following messages are displayed during the self-test procedure that occurs each time the receiver is turned on:

Message	Description
EPOCH	Welcome message
	Self-test procedure
V#.#	MPU firmware version
Ready	Self-test passed

The GNSS status is displayed when the self-test is finished. Initially the display shows **0/00** while the receiver is acquiring satellites. It can take several minutes to update, especially if the receiver has been turned off for a long time, or if the physical location of the receiver has changed significantly while the receiver was off. Once the GNSS status is updated, the first character indicates the quality of position as described below, followed by the number of satellites being tracked:

- **0** No GNSS solution
- **A** Autonomous
- **D** RTK float solution (differential)
- **F** RTK fix solution

Far Right position

When the receiver is operating and a post-process data collection is running, the letter **R** appears in the far right position of the display to indicate that data is being recorded.

Main menu

Once the self-test procedure is complete, the screen appears that shows the GNSS status. Use the following scroll buttons to access items in the main menu:

Select this item ...	To ...
Log PP ➡	Start a post-processing session. See Post-processing routine, page 28.
End PP ➡	Stops an active post processing session. This menu item replaces the Log PP menu when a session has been started.
Blue/Cable	Show how the controller is connected to the controller. • When a serial cable is connected between COM1 and a controller, Bluetooth is turned off and **Cable** is displayed. This is the default condition. • If no cable is connected, the unit is connected to a data collector that has Bluetooth wireless technology enabled, **Blue** is displayed.
INT ##%	Show the internal battery charge level.
EXT ##%	Show the external battery charge level.
Memory	Show the available memory for storing post process files in kilobytes when you press ↵.

The following messages may also appear:

If this message appears ...	Then ...
Low Batt	the battery has dropped to a critical low level and should be replaced.
Very Low Battery	the battery is exhausted. This appears prior to automatic shutdown.
Wait	the receiver is detecting a device plugged into a COM port.
COM2 EXT	an external device has been connected to COM2 via a cable.
COM2 INT	an external device has been disconnected from COM2 and the COM2 port is connected to the internal UHF radio.
## °C	the internal temperature is over 80 °C. The internal radio should be turned off if in use to allow the unit to cool. The unit will shut down if it reaches an internal temperature of 85 °C.

Post-processing routine

The post-processing collection routine is very simple. Press ⏎ once to activate the logging data routine and then press ⏎ again to stop logging.

The factory default values are 10° elevation mask, 5 second interval logs, and automatic station naming. These values will be used when starting a static survey with the faceplate.

Static and post-process kinematic surveys can be initiated with Survey Pro™ software running on a data collector. The Survey Pro software allows for full control of all the survey parameters. to start a post-process survey with the faceplate (receiver buttons and display), do the following:

1. Press ↑ or ↓ to scroll up or down in the main menu until **Log PP** ➡ appears in the LED display.
2. Press ⏎.

   A "busy" indicator spins on the right side of the display. **Done** appears once the file is open and logging has been started. The display then returns to the main display—an R appears on the right position. This indicates that a post-processing file is being recorded.
3. When enough data has been logged, scroll to the *End PP* menu and press ⏎. The post-processing logging session ends and the file is closed.

To record additional post-processing sessions, repeat these steps. For each post processing session, a new sequentially-numbered file (NNNNDDD#.T02) is written to the receiver's internal memory, where:

- NNNN is the last four digits of the receiver serial number
- DDD is the day of the year (where 1 January is 001)
- # is the sequential file for that day.

Use the Survey Pro software on your data collector to retrieve post-processing files or to connect the receiver to a computer running the Spectra Precision Survey Office software or Spectra Precision Data Transfer software to download the files. The Survey Office software provides a complete set of tools for post processing, network adjustments, and data analysis.

All post-processing sessions initiated using the faceplate use a 10° elevation mask, 5 second logging interval, and an automatically-generated station name, EPOCH 50 -Log PP.

Resetting to defaults

To reset the receiver to the factory default settings:

1. Press the power button to turn off the receiver.
2. Press and hold the power button. EPOCH appears on the receiver screen and then Factory defaults scrolls across the screen. The receiver counts down from 5—with a beep sounding for each digit.
3. As soon as WAIT appears on screen, release the power button.
4. Off appears on the receiver and it then turns off.
5. Press the power button again to turn on the receiver. The factory defaults are now set.

See also Default settings, page 36.

CHAPTER

4

Specifications

In this chapter:

- Physical specifications
- Positioning specifications
- Technical specifications

This chapter lists the receiver specifications.

Physical specifications

Feature	Specification
Size (W x H x D)	19.0 cm x 10.7 cm x 20.0 cm (7.48 inch x 4.21 inch x 7.87 inch), including connectors
Weight	1.34 kg (2.95 lb), including internal battery and UHF antenna
Average operating times on internal battery	RTK / Static: 4.0 hours (radio in receive mode)
External power input	10 V DC to 20 V DC power with over-voltage protection on Port 1 and Port 2 (7-pin)
Operating temperature	–20 °C to +60 °C (–4 °F to +140 °F) –20 °C to +55 °C (–4 °F to +131 °F), with internal radio transmitting
Storage temperature	–40 °C to +75 °C (–40 °F to +167 °F)
Humidity	SAE J1455
Dust / Water	Sealed against dust and water
Vibration	MIL-STD-810F Fig 514.5C-1

Positioning specifications

Positioning	Specification
Code differential GNSS positioning[1]	
Horizontal	0 25 m + 1 ppm RMS
Vertical	0 50 m + 1 ppm RMS
SBAS differential positioning accuracy[2]	Typically <5 m 3DRMS
Static and FastStatic GNSS surveying[1]	
Horizontal	3 mm + 0.1 ppm RMS
Vertical	3.5 mm + 0.4 ppm RMS
Kinematic surveying[1]	
Horizontal	10 mm + 1 ppm RMS
Vertical	20 mm + 1 ppm RMS
Initialization time[3]	Typically <10 seconds
Initialization reliability[4]	Typically >99 9%

[1]Accuracy and reliability may be subject to anomalies such as multipath, obstructions, satellite geometry, and atmospheric conditions. Always follow recommended survey practices.

[2]SBAS-capable GPS receiver dependant on field software application.

[3]May be affected by atmospheric conditions, signal multimath, obstruction, and satellite geometry.

[4]May be affected by atmospheric conditions, signal multimath, obstruction, and satellite geometry. Initialization reliability is continuously monitored to ensure the highest quality.

Technical specifications

Feature	Specification
Measurements	• Advanced, sixth generation, custom survey GNSS technology • High-precision multiple correlator for GNSS pseudorange measurements • Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response • Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth • Proven Spectra Precision low-elevation tracking technology
Start-up	Cold start: < 60 seconds from receiver activation Warm start: 30 seconds with recent ephemeris
Initialization	Typically < 10 seconds
Communications	
Internal	• Pacific Crest ADL Foundation UHF transceiver modem. 1 W maximum transmit power • Multiple protocols and data rates
External	• Optional Pacific Crest ADL Vantage or Vantage Pro UHF modem, up to 35 W available
Bluetooth	Type approvals are country specific. For more information, contact your Spectra Precision dealer.
RTK Inputs	RTCM 2.1, 2.2, 2.3, 3.0 & 3.1, CMR, CMR+, FPK, NTRIP support
RTK Outputs	RTCM 2.1, 2.2, 2.3, 3.0, CMR, CMR+ ***Note –*** *Not all protocols will work with all radio baud rates and channel spacing.*
NMEA-0183 Output Support	
Internal memory	64 MB, 9 MB reserved for firmware

Use the Pacific Crest ADLConf software to make radio mode and channel selections. The software allows you to set full control of radio channels, transmission modes, power level, and protocol. The receiver's radios are delivered with no channel frequencies set.

Note – *Some functions are restricted for distributor use only—contact your distributor for more information*

CHAPTER

5

Default Settings

In this chapter:

- Default settings

The following describes the default settings shipped with the EPOCH 50 GNSS system.

Default settings

Function		Factory default
Static Survey:	Elevation mask	10°
	Data rate	5 seconds
	Station	Automatic
Serial ports 1 and 2	Baud rate	38,400
	Format	8-None-1
	Flow control	None
Antenna:	Type	Internal
	Antenna height	Dependent on measurement method
	Group	All
	Measurement method	Set by software

CHAPTER

6

Cables and Connectors

In this chapter:

- Port 1 and 2 connectors

This chapter provides pinout information for the EPOCH 50 GNSS receiver standard and optional cables. This information can be used to prepare special cables for connecting the receiver to devices and instruments not supported by the standard and optional cables.

Port 1 and 2 connectors

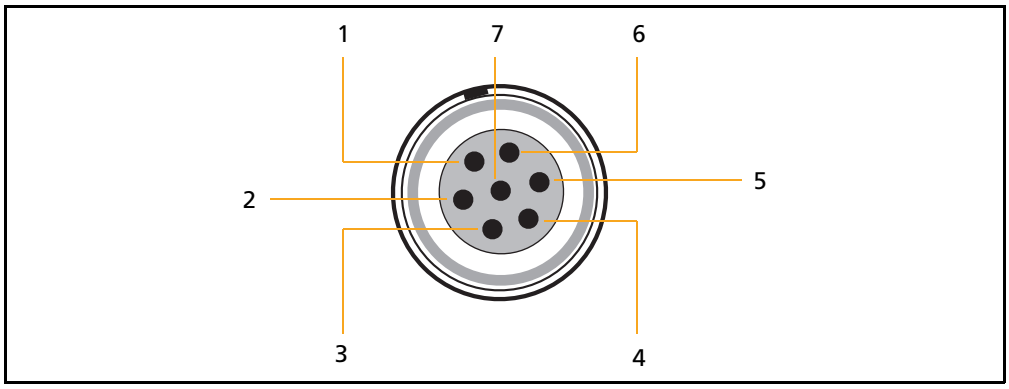


Figure 6.1 Port 1 connector pinouts

Pin	Pinout function, Port 1 – 7-pin LEMO
1	Signal ground
2	Power ground
3	TXD
4	N/C
5	N/C
6	+ Power in
7	TRXD
8	N/A
9	N/A

APPENDIX

A

RTCM Output

In this appendix:

- Generated messages
- Message scheduling

Generated messages

The following table shows the messages that are generated when you select a specific RTCM version. The messages in the table are in the same order as they appear in the GPS Configurator software. For the details of the contents of individual messages, refer to the RTCM documentation.

Selection	Message								
Version 2	1	3				22			59
USCG 9-3		3	9-3						
RTCM/RTK 2.2+2.3	1	3		18	19	22	23	24	59
RTK Only 2.2+2.3		3		18	19	22	23	24	59
RTCM/RTK 2.3	1			18	19		23	24	
RTK Only 2.3				18	19	22			
RTCM/RTK 2.2	1	3		18	19	22			59
RTK Only 2.2		3		18	19	22			59
RTCM/RTK 2.1	1	3		18	19	22			59
RTK Only 2.1		3		18	19	22			59
RTCM/RTK 3.00						1004	1006	1008	1013

Message scheduling

The following table describes the frequency at which messages are generated when they are enabled in a base receiver.

Type	Frequency
1	Every second
3	The 10th second after the first measurement, then every 10 seconds after that
18	Every second
19	Every second
22	The 5th second after the first measurement, then every 10 seconds after that
23	The 4th second after the first measurement, then every 10 seconds after that
24	The 4th second after the first measurement, then every 10 seconds after that
59-sub, 13	The 5th second after the first measurement, then every 10 seconds after that
1004	Every second
1006	Every 10 seconds
1008	Every 10 seconds
1013	Every 300 seconds

APPENDIX

B

Troubleshooting

In this appendix:

- Receiver issues
- Error codes

Receiver issues

The following table describes some possible receiver issues, possible causes, and how to solve them.

Issue	Possible cause	Solution
The receiver does not power up.	External power too low.	Check the charge on the external battery, and check the external power cord fuse if applicable. Replace the battery if necessary.
	Internal power too low.	Check the charge on the internal batteries.
	External power not properly connected.	Check that the 7-pin LEMO connection is seated properly.
		Check for broken or bent pins in the connector.
	Faulty power cable.	Try a different cable.
		Check pinouts with multimeter to ensure internal wiring is intact.
Receiver does not log data.	The receiver is tracking fewer than four satellites.	Wait until at least 4 satellites are tracked.
The receiver is not responding.	Receiver needs soft reset.	Power down the receiver and power back up.
Reference receiver is not broadcasting.	Faulty cable between receiver and radio.	Try a different cable.
		Examine the ports for missing pins.
		Use a multimeter to check pinouts.
	No power to radio.	If the radio has its own power supply, check the charge and connections.
Roving receiver is not receiving radio.	Reference receiver is not broadcasting.	Check radio channel settings.
	Incorrect radio protocol set.	Ensure that the radio protocol set on the rover matches the base.
	If the radio light flashes, but there are no float or fixed positions.	Check to ensure that the same correction format that is set on the base is used on the rover.

Error codes

Code	Description
RcvErr00-03	Unable to revert GNSS board to factory defaults.
BtErr 10-3	Unable to get Bluetooth module configuration.
BtErr 14-16	Unable to configure the Bluetooth module.
GpsErr20	Invalid GNSS serial number.

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