USER GUIDE

GPS Pathfinder® Pro series

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GPS Pathfinder® Pro series

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Trimble

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The GPS Pathfinder Pro series is protected under the following USA patents:
5,187,450, 5,311,149, 5,345,244, 5,402,450, 5,493,588.

Release Notice

This is the May 2005 release (Revision A) of the GPS Pathfinder Pro series User Guide. It applies to version 1.50 of the GPS Pathfinder Pro series receivers (ProXT and ProXH receivers).

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Trimble Navigation Limited warrants that this hardware product (the "Product") will perform substantially in accordance with published specifications and be substantially free of defects in material and workmanship for a period of one (1) year starting from the date of delivery. The warranty set forth in this paragraph shall not apply to software products.

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USA

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. Contains FCC ID Q23104001. 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). Contains Infineon radio module ROK 104001. 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.

Trimble and the Environment

At Trimble, we recognize the importance of minimizing the environmental impacts of our products. We endeavor to meet your needs, not only when you purchase and use our products, but also when you are ready to dispose of them. That is why Trimble is actively pursuing, and will continue to pursue, the expanded use of environmentally friendly materials in all its products, and why we have established a convenient and environmentally friendly recycling program.

As Trimble makes additional recycling facilities available for your use, we will post their locations and contact information to our Recycling Instructions web page.

For product recycling instructions and more information, please go to www.trimble.com/environment/summary.html.

Europe

To recycle Trimble WEEE (Waste from Electrical and Electronic Equipment), do one of the following:

- call +31 497 53 2436, and ask for the WEEE Associate
- mail a request to:
  Trimble Europe BV
  c/o Menlo Worldwide Logistics
  Meerheide 455521 DZ Eersel, NL

Taiwan - Battery Recycling Requirements

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

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Safety and Warnings

Battery Safety

The rechargable Lithium-ion battery that is used in the GPS Pathfinder® Pro series receivers (the ProXT™ and ProXH™ receivers) is supplied partially charged. Charge the battery completely (see **Charging the Battery, page 10)** before using it for the first time. If the battery has been stored for longer than six months, charge it before use (see **Storage, page 32**).

See also **Disposing of the battery, page 8**.

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

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

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

WARNING – When the battery is charged outside the receiver, the contacts may become very hot and there is a risk that you could burn yourself on the exposed metal.

AC Adaptor Safety

An international AC adaptor kit is provided with the GPS Pathfinder Pro series receivers.

WARNING – To use AC adaptors safely:
- Use only AC adaptors intended for the ProXT and ProXH receiver. Using any other external power source can damage your product and may void your warranty.
- Make certain that the input voltage on the adaptor matches the voltage in your location.
- Make certain that the adaptor has prongs compatible with your outlets.
- AC adaptors are designed for indoor use only. Avoid using the AC adaptor in wet outdoor areas.
- Unplug the AC adaptor from power when not in use.
- Do not short the output connector.

Magnetic mount

The GPS Pathfinder Pro series receiver can be mounted on top of a magnetic mount and placed on top of a vehicle.

WARNING – If you mount a GPS Pathfinder Pro series receiver on top of a vehicle, make sure that the retaining screw is firmly fastened. If the receiver detaches during travel, it could seriously injure you and other road users.

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Introduction

Welcome to the *GPS Pathfinder Pro series User Guide*. This manual describes how to use a Trimble® GPS Pathfinder® Pro series receiver (a ProXT™ or ProXH™ receiver).

The GPS Pathfinder Pro series receivers are high-performance GPS receivers. They have an integrated antenna and receiver, a user-removable battery, and Bluetooth® wireless technology for connectivity with field computers.

Related information

Sources of related information include the following:

- Help - the GPS Controller software that is provided with the receivers has built-in, context-sensitive help that lets you quickly find the information you need.

  For more information on other software and hardware, refer to the documentation provided with the product as well as the product pages on the Trimble website at **www.trimble.com/product.shtml**.

- For more information on GPS, go to **www.trimble.com/gps.**
- For more information on Bluetooth wireless technology, go to **www.bluetooth.com**.
- Trimble training courses – consider a training course to help you use your GPS system to its fullest potential. For more information, go to the Trimble website at **www.trimble.com/training.html**.

Technical assistance

If you have a problem and cannot find the information you need in the product documentation, go to the Trimble technical support website (**www.trimble.com/support_trl.asp)**, which contains extra support documentation.

If you cannot find the information you need, you can purchase Priority Support by going to **www.trimble.com/mgis_rqst_home.asp**. If you already have Priority Support, you can also use this link to request support from your Trimble Dealer.

Your comments

Your feedback about the supporting documentation helps us to improve it with each revision. E-mail your comments to **ReaderFeedback@trimble.com.**

Getting Started with a GPS Pathfinder Pro series Receiver

This section describes how to set up and get started with a GPS Pathfinder Pro series receiver.

What's in the box?

When you receive a GPS Pathfinder Pro series receiver, check that you have received all the components, as detailed on the packing list, see **Figure 1.1**.

The standard components are shown below. Depending on the system that you have purchased, you may have received additional components.

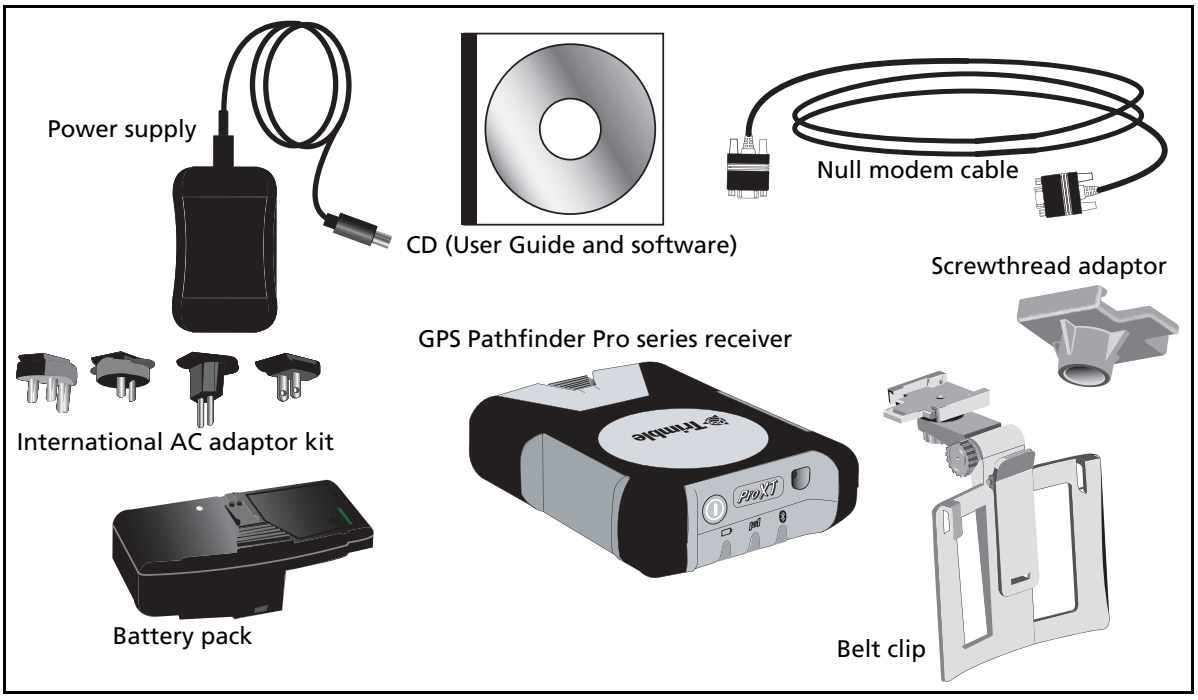


Figure 1.1 GPS Pathfinder Pro series receiver components

Inspect all contents for visible damage (scratches or dents). If any components appear damaged, notify the shipping carrier. Keep the shipping and packaging material for the carrier's inspection.

Accessories

The following optional accessories are available:

- Backpack
- Range pole
- Range pole bracket
- Zephyr™ GPS antenna kit
- External patch antenna with 1.5 meter cable
- External patch antenna with 5 meter cable
- Hard carry case
- Serial port splitter cable
- Spare battery pack
- Spare belt clip
- Spare screwthread adaptor
- Spare power supply and adaptor kit

For more information, go to the Trimble website at **www.trimble.com/.**

Software provided with the receiver

GPS Controller software

The GPS Controller software runs on a desktop or field computer and enables you to:

- configure a GPS Pathfinder Pro series receiver's GPS settings, for example PDOP, Elevation, and Signal-to-Noise ratio masks
- configure the GPS Pathfinder Pro series receiver to use real-time DGPS sources
- configure the GPS Pathfinder Pro series receiver to output NMEA data
- view status information about the GPS Pathfinder Pro series receivers, satellites, and real-time correction sources
- view satellite prediction information in the field to help you plan your data collection session

See also the *GPS Controller Software Quick Reference Guide.*

Installing the GPS Controller software

To install the GPS Controller software on an office computer or field computer, follow the installation instructions provided on the *GPS Pathfinder Pro series CD.*

The software provided with the receivers will run on the following Microsoft platforms:

- Microsoft® Windows Mobile™ 2003 software (or later)
- Windows® CE .NET version 4.0 or later
- Windows 2000
- Windows XP Home, Professional, and Tablet PC Edition

Bluetooth Activation Manager

The GPS Pathfinder Pro series receivers are shipped with Bluetooth wireless technology activated. The Bluetooth Activation Manager runs on the desktop only and enables you to:

- deactivate the Bluetooth radio in a GPS Pathfinder Pro Series receiver to prevent it being accidentally turned on in the field.
- deactivate the Bluetooth radio on a GPS Pathfinder Pro series receiver if you have to turn it off due to the country or area in which you are working
- reactivate the Bluetooth radio if it has been deactivated

Note – *Once you reactivate Bluetooth, turn on the receiver and then turn on the Bluetooth radio. For more information, see* **Turning on or turning off the Bluetooth radio independently of the receiver, page 14**.

Installing the Bluetooth Activation Manager

Follow the installation instructions provided on the *GPS Pathfinder Pro series CD.*

This utility runs only on a desktop computer.

Software used with the GPS Pathfinder Pro series receiver

You can use the following software with the GPS Pathfinder Pro series receivers:

- TerraSync™ software, version 2.50 or later
- GPS Analyst™ extension for ESRI ArcGIS software, version 1.10 or later
- GPScorrect™ extension for ESRI ArcPad software, version 1.10 or later
- GPS Controller software, version 2.00 or later
- NMEA applications
- Applications developed with the GPS Pathfinder Tools SDK, version 2.00 or later

Parts of the GPS Pathfinder Pro series receivers

The hardware features of a GPS Pathfinder Pro series receiver are shown in **Figure 1.2** and **Figure 1.3, page 6**.

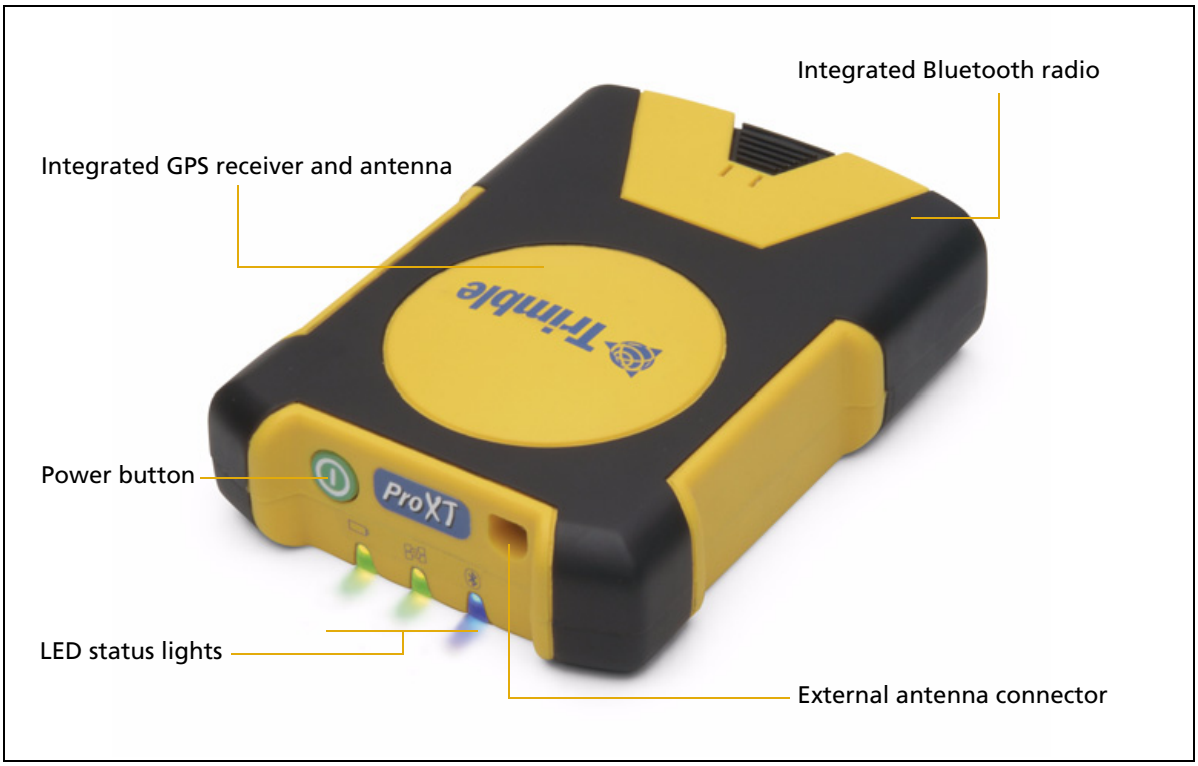


Figure 1.2 Top view of a GPS Pathfinder Pro series receiver

Feature	Description
Integrated GPS receiver and antenna	Integrated SBAS receiver EVEREST™ multipath rejection technology **ProXT** - L1 internal antenna and receiver **ProXH** - L1 internal antenna, L1/L2-aided GPS receiver using H-Star™ technology
Integrated Bluetooth radio	Cable-free connections to a range of Bluetooth-enabled field computers
Power button	Press to turn on or turn off the receiver and the Bluetooth radio (if enabled)
External antenna connection	Connect to the optional external antenna
LED status lights	Power, GPS, and Bluetooth

Figure 1.3 Bottom view of a GPS Pathfinder Pro series receiver

Feature	Description
Accessory interface	Common interface to accessories (belt clip or range pole)
Serial port	Serial (COM) connection to a field computer or real-time source. Contains two bi-directional serial ports (requires a splitter cable)
Power - battery connector	Charge the battery in or out of the receiver
Rechargeable Lithium-ion battery	User-replaceable - no tools required All-day operation with GPS and Bluetooth wireless technology Own LED (not shown) shows charging status when the battery is charged outside the receiver.

Using a GPS Pathfinder Pro series Receiver

To start using a GPS Pathfinder Pro series receiver, complete the following steps:

1. Charge the rechargeable Lithium-ion battery (see **page 10**).
2. Install the GPS Controller software on your office computer and/or field computer.
3. Turn on the receiver and the Bluetooth radio (see **page 13**).
4. Mount the receiver (see **page 16**).
5. Connect the receiver to a field computer (see **page 20**).
6. Connect the receiver to a real-time device, if required (see **page 23**).
7. Collect GPS data (see **page 25**).

Batteries and Power

Introduction

The GPS Pathfinder Pro series receivers use a rechargeable Lithium-ion battery that is user replaceable. Additional battery packs can be carried and quickly changed in the field.

When fully charged, the internal battery of the receiver provides enough power for a full working day.

The rechargeable Lithium-ion battery is supplied partially charged. Use the AC power adaptor to 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. See **Charging the Battery, page 10.**

Safety warnings

Battery safety

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

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

WARNING – Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage.

To prevent injury or damage:
- Do not charge or use the battery if it appears to be damaged or leaking.
- Charge the Lithium-ion battery only in a Trimble product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
- Discontinue charging a battery that gives off extreme heat or a burning odor.
- Use the battery only in Trimble equipment that is specified to use it.
- Use the battery only for its intended use and according to the instructions in the product documentation.

AC adaptor safety

An international adaptor kit is provided with the GPS Pathfinder Pro series. This is used to charge the battery both in and out of the receiver.

WARNING – To use AC adaptors safely:
- Use only AC adaptors intended for the GPS Pathfinder Pro series. Using any other external power source can damage your product and may void your warranty.
- Make certain that the input voltage on the adaptor matches the voltage in your location.
- Make certain that the adaptor has prongs compatible with your outlets.
- AC adaptors are designed for indoor use only. Avoid using the AC adaptor in wet outdoor areas.
- Unplug the AC adaptor from power when not in use.
- Do not short the output connector.

Disposing of the 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. See **Trimble and the Environment, page iii**

Removing and replacing the battery

The GPS Pathfinder Pro series has a replaceable Lithium-ion battery.

To remove the battery:

1. Turn off the receiver (press and briefly hold the Power button).
2. Firmly press the ridges on both sides of the battery (1) and then pull the battery out of the cavity (2), see **Figure 1.4**.

Figure 1.4 Removing the battery

To replace the battery:

- Align the battery and then push it carefully into the battery cavity. The spring clip holds the battery in position. See **Figure 1.5**.

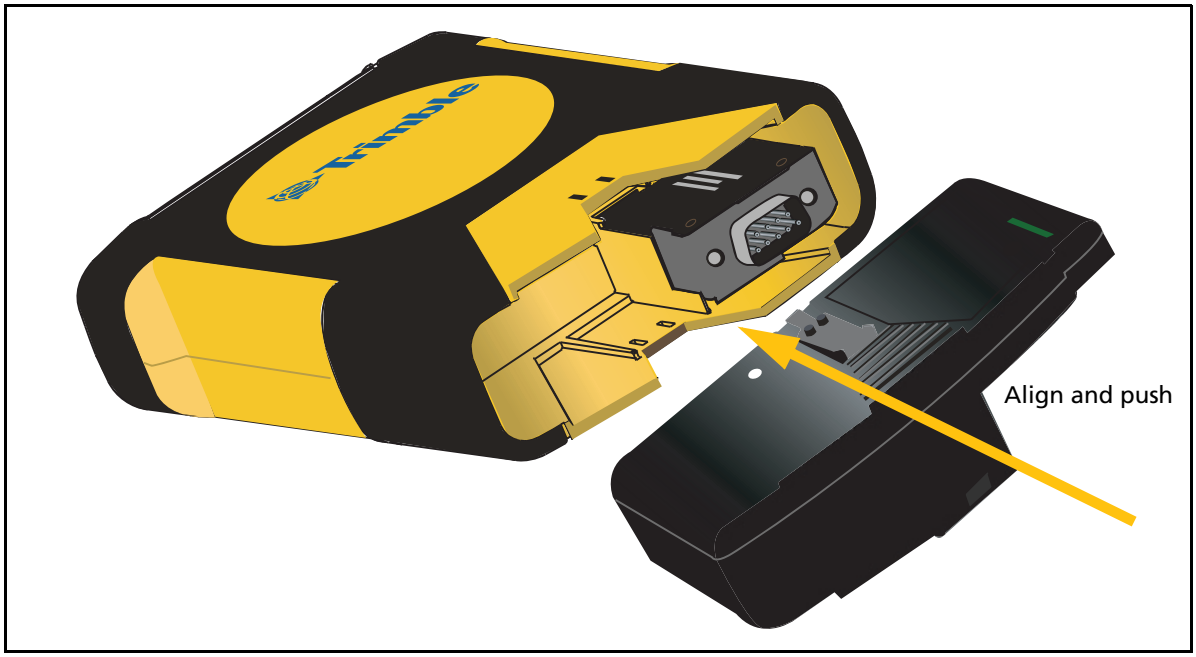


Figure 1.5 Replacing the battery

Note – *If you accidental short the battery's output terminals together, the battery will shut down for self-protection, and the output voltage will be zero. To reset the battery, plug it into the wall charger for a few moments to supply current, which resets the internal protector.*

Charging the Battery

The battery takes approximately five hours to charge fully. You can charge the battery while it is in the receiver, or you can remove the battery and charge it out of the receiver.

Note – *Trimble recommends that you charge the battery in the receiver with the receiver switched on. If the receiver is on, the battery reporting is recalibrated at the end of the charging process.*

Charging the battery in the receiver

1. Insert the battery into the receiver.
2. Turn on the receiver.

3. To connect the battery to power, plug one end of the power connector into the battery connector, and use the appropriate wall plug adaptor to connect the power supply to mains power. See **Figure 1.6**.
4. Charge the battery fully until it is running on external power.

   The power LED will be solid amber when the battery is fully charged and running on external power.
5. Disconnect the power adaptor.

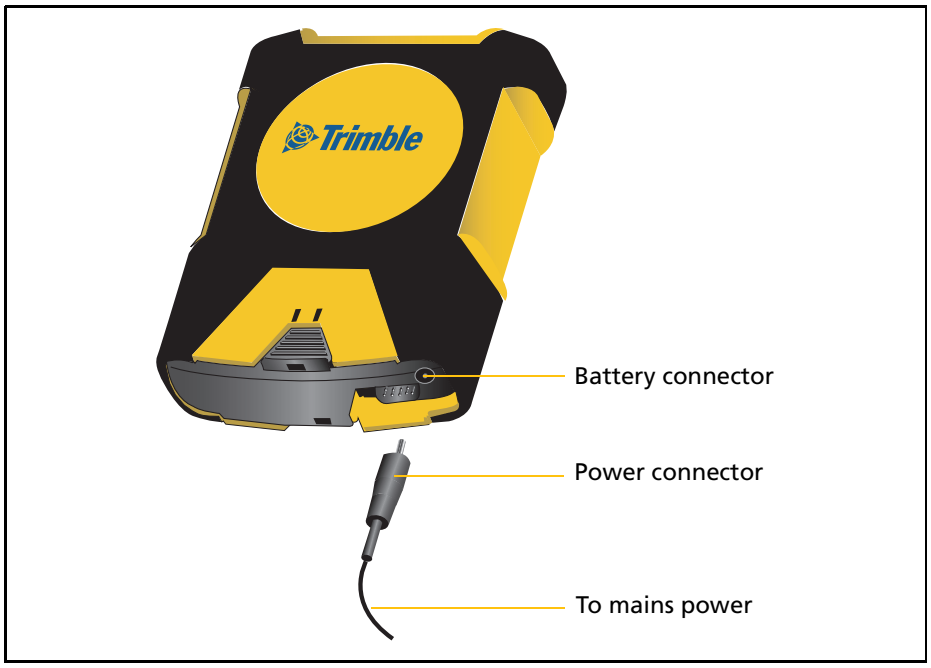


Figure 1.6 Charging the battery

Charging the battery out of the receiver

WARNING – When the battery is charged outside the receiver, the contacts may become very hot and there is a risk that you could burn yourself on the exposed metal.

1. Connect the battery to power. Plug one end of the power connector into the battery connector and use the appropriate wall plug adaptor to connect the power supply to mains power.
2. Charge the battery fully until it is running on external power.

   The power LED will be solid amber when the battery is fully charged and running on external power.

Note – *The battery has its own LED which flashes when charging, and then becomes solid when fully charged. See* **Power status (see page 12)**.

3. Disconnect the power adaptor.
4. To replace the battery, align the battery and then push it carefully into the battery cavity. The spring clip holds the battery in position.

Power status

There are three indicators of the power status of the receiver:

- The power LED on the front of the receiver, see **Status information, page 14**.
- The battery icon in the status bar of the field software (for example the GPS Controller or TerraSync software or the Trimble GPScorrect extension for ESRI ArcPad software).

  The left half of the battery icon indicates the charge level of the receiver battery (the right half indicates the charge level of the field computer battery).

  – When the receiver battery is fully charged, the left half of the battery icon appears green. The level of green drops as the battery charge level drops.

  – When the receiver battery level is low, the left half of the battery is yellow.

  – When the receiver battery level is critical, the left half of the icon is red and the icon flashes.
- The LED on the battery pack. This LED is only visible when the battery is removed from the receiver.

The battery pack LED status modes are as follows:

Mode	Status
Long flash[1]	Charging
On	Fully charged and on external power
Off	No status shown when the charger is not connected.

[1]Long flash - one flash per second

Conserving power

The battery can usually operate for a full day without recharging. However, if you are away from the office for an extended period, you may require a spare battery pack.

To conserve battery power as much as possible:

- Use the software or the Power button to turn off the receiver when it is not in use.
- Turn off the integrated Bluetooth radio whenever you are not using it **(see page 14)**.

General Operation

If you use Bluetooth wireless technology to connect to the receiver, then you must use the Power button to turn on and turn off the receiver.

Turning on the receiver and the Bluetooth radio

Do one of the following:

- Press the Power button briefly, see **Figure 1.7**. If you use Bluetooth wireless technology to connect to the receiver, you must use this method.
- Use the software (for example GPS Controller or TerraSync software) installed on your field computer to turn the receiver on. For details, refer to the software documentation.

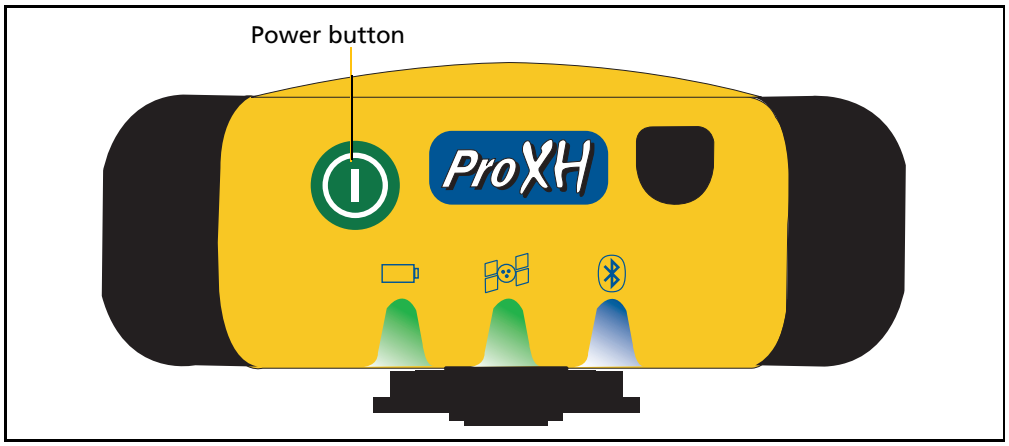


Figure 1.7 Front panel - Power button

On startup, the three LEDs on the front panel should light up briefly. If they do not light up, check that the battery is installed correctly and is charged. After startup, the LED patterns show the **Status information (see page 14)** of the receiver.

When you first receive the GPS Pathfinder Pro series receiver, the Bluetooth radio is activated by default. If the receiver is turned on, the Bluetooth radio is on and ready to be used. If the Bluetooth radio is ***deactivated***, the Bluetooth LED will not be lit after startup, and you must first activate the radio, see **Bluetooth Activation Manager, page 4**.

When the receiver is turned off and back on again, the Bluetooth radio will be in the same state it was in before the power was turned off. For example if the Bluetooth radio was turned off when the receiver was turned off, then when the receiver is turned back on, the radio will still be off.

Turning off the receiver and the Bluetooth radio

Do one of the following:

- Press and hold the Power button briefly. If you use Bluetooth wireless technology to connect to the receiver, you must use this method.
- Use the software (for example GPS Controller or TerraSync software) installed on your field computer to turn off the receiver. For details refer to the software documentation.

Note – *If a GPS Pathfinder Pro series receiver is connected to a field computer with a cable, and has been turned on or off by the software, you can still use the Power button to independently turn on or turn off the receiver.*

Turning on or turning off the Bluetooth radio independently of the receiver

If the receiver is turned on, press the Power button and hold it for 5 seconds to turn on or turn off the Bluetooth radio.

Note – *If you toggle Bluetooth off, this turns off the radio, but does not deactivate Bluetooth. For more information, see* **Bluetooth Activation Manager, page 4**.

Status information

When you turn the receiver on, the Power, GPS, and Bluetooth LEDs on the front panel light up as the receiver starts up, see **Figure 1.8**.

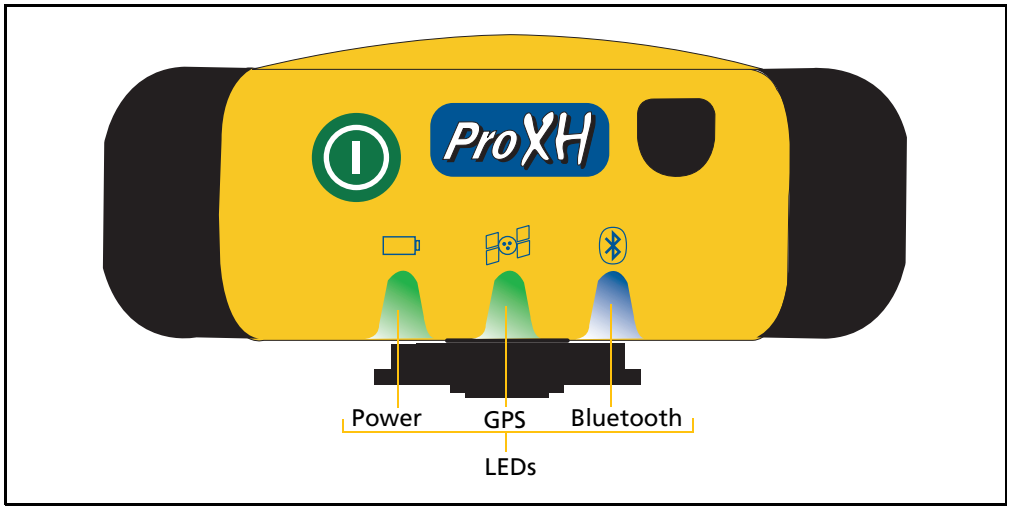


Figure 1.8 Front panel - LEDs

During operation, the LEDs provide the following status information:

LED	Color	Mode	Status
Power	Green	Solid	Good
	Red	Short flash[1]	Low
	Amber	Short flash	Charging
	Amber	Solid	Fully charged and on external power
GPS	Green	Long flash[2]	Generating positions
	Green	Rapid flash[3]	Too few satellites or poor geometry
Bluetooth	Blue	Waiting heartbeat flash[4]	Activated and waiting
	Blue	Long flash	Activated and connected
	Blue	Off	Bluetooth has not been activated or has been turned off
	Blue	Toggle flash[5]	Bluetooth toggled on and off event

[1] Short flash - one flash ever three seconds
[2] Long flash - one flash per second
[3] Rapid flash - two flashes per second
[4] Waiting heartbeat flash - one flash every three seconds
[5] Toggle flash - five short flashes over two seconds

The battery also has an LED, which is visible only if the battery is charged out of the receiver. See **Power status, page 12**.

Mounting the GPS Pathfinder Pro series Receiver

The receiver has an accessory interface that enables you to mount the receiver on a range of equipment, and easily change between them.

The receiver can be mounted:

- on a screwthread adapter (a standard accessory, provided with the GPS Pathfinder Pro series receiver) for use on a backpack, range pole, or vehicle magnetic mount
- on a belt clip (a standard accessory, provided with the GPS Pathfinder Pro series receiver)
- on the side of a range pole, with a Zephyr antenna on top of the pole

Mounting the receiver on top of a backpack, range pole or magnetic mount

WARNING – If you mount a GPS Pathfinder Pro series receiver on top of a vehicle, make sure that the retaining screw is firmly fastened. If the receiver detaches during travel, it could seriously injure you and other road users.

Note – *The rangepole bracket contains an insert, which can be reversed to allow the bracket to attach to 1" or 1 1/4" diameter poles.*

1. Make sure that the insert in the rangepole bracket is the correct size to allow the bracket to be used with 1" or 1 1/4" diameter poles.
2. Attach the screw thread adaptor to the pole on a backpack, range pole, or magnetic mount.
3. Slide the receiver onto the screwthread adaptor, see **Figure 1.9**.

4. If you are mounting the receiver onto a vehicle roof, make sure that the retaining screw is firmly fixed.

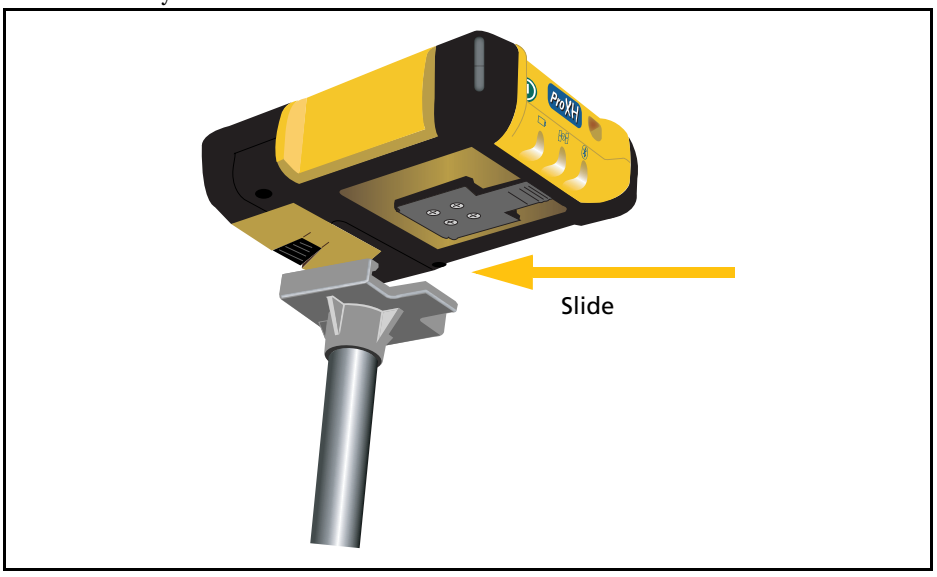


Figure 1.9 Mounting the receiver onto the screwthread adaptor

To unclip the receiver, lift the tab of the accessory interface to release the receiver and then slide the receiver off the mounting attachment.

Mounting the receiver on the belt clip

If you use the internal antenna, you can mount the receiver horizontally with the antenna facing toward the sky. If you use the external patch antenna, you can mount the receiver vertically.

1. Position the belt clip for vertical or horizontal use.
2. Slide the receiver onto the belt clip.

To unclip the receiver, lift the tab of the accessory interface to release the receiver and then slide the receiver off the mounting attachment.

Mounting the ProXH receiver on the side of a range pole with the Zephyr Antenna

1. Fix the range pole bracket to the side of the range pole.
2. Slide the receiver onto the bracket.

3. Attach the Zephyr antenna to the top of the pole and then connect the antenna cable to the antenna and the receiver, see **Figure 1.10**.

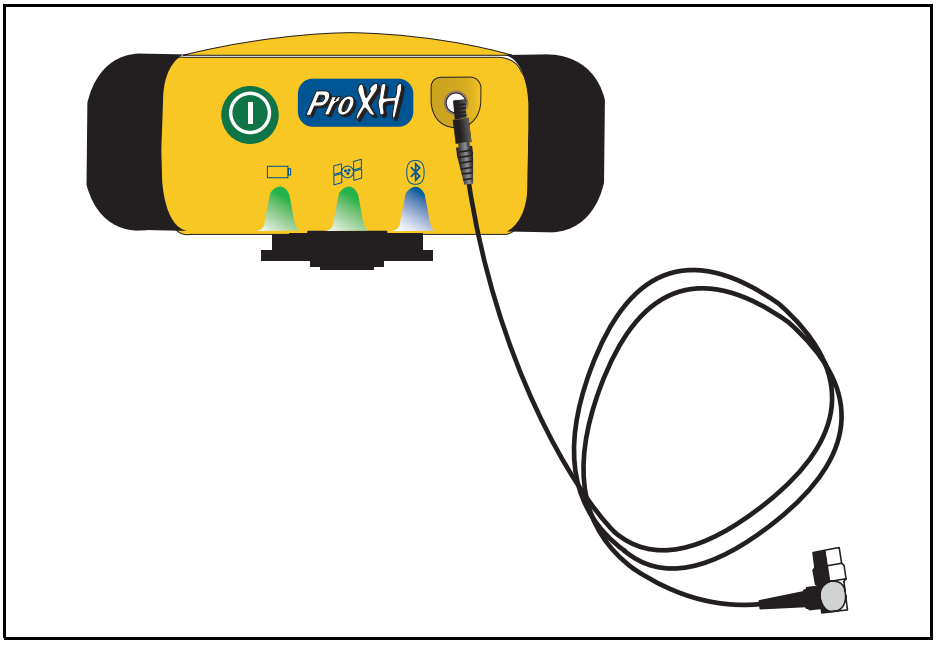


Figure 1.10 Attaching the external antenna

To unclip the receiver, lift the tab of the accessory interface to release the receiver and then slide the receiver off the mounting attachment.

Connecting the GPS Receiver

You can connect devices to a GPS Pathfinder Pro series receiver using Bluetooth wireless technology, or through the serial port, or by a combination of the two methods. To access both receiver serial ports, use a splitter cable. Connection options are as follows:

Receiver port	Description
Port 1 (serial cable)	TSIP (default), NMEA, or RTCM
Port 2 (splitter cable)	NMEA (out) or RTCM (in) These settings are Off by default
Bluetooth Port 1	NMEA or TSIP
Bluetooth Port 2	NMEA or TSIP

Note the following:

- You cannot have more than one TSIP or RTCM connection.
- To configure the receiver to output NMEA on port 1, use the GPS Controller software.
- To configure the receiver to use RTCM on port 1 when you use Bluetooth wireless technology, use the GPS Controller or TerraSync software, or the GPScorrect extension.

Connecting to the GPS Receiver with Bluetooth Wireless Technology

Bluetooth wireless technology is an industry standard specification that eliminates the need for cables between Bluetooth-enabled mobile devices. See **Figure 1.11, page 20**.

To communicate using a Bluetooth connection, a field computer (a ***client***) scans the Bluetooth radio frequency to discover other Bluetooth devices. Once it discovers a ***host*** (for example a GPS receiver), the client selects the service that it will use. A service defines what type of information can be transferred to or from the host, and how to transfer it.

The GPS Pathfinder Pro series receivers use an integrated Bluetooth radio to establish a short-range wireless connection to a Bluetooth-enabled field computer that is within range. The receivers support only a serial port profile (SPP). When you first receive the GPS Pathfinder Pro series receiver, the Bluetooth radio is activated by default. If the receiver is turned on, the receiver is on and ready to be used. This means that a Bluetooth-enabled field computer can connect to a GPS Pathfinder Pro series receiver.

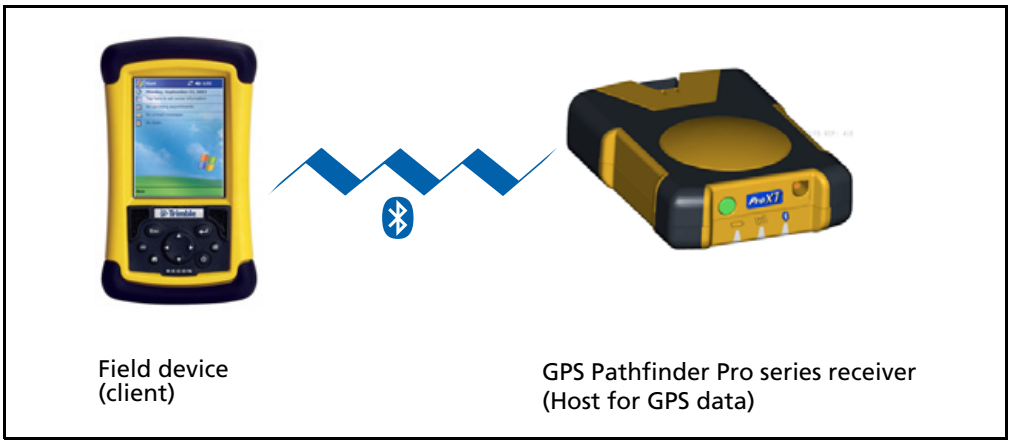


Figure 1.11 Bluetooth wireless connection

Setting up the Bluetooth radio

On the field computer, configure the computer to not require authentication or secure connection. The receiver cannot exchange a password during connection to authenticate, bond, or pair devices.

Make a note of the field computer's COM port that you use for this connection.

Connecting to the receiver

Note – *Before you can start using Bluetooth technology, you must ensure that it is set up on your field computer or office computer. Use the Bluetooth Manager software provided with your field or office computer to set up the serial port connections on your field or office computer.*

On the field computer:

1. Scan for devices.
2. Select the Pro series receiver from the list of devices.
3. Depending on the software that is running on your computer, you may need to select the service to connect to. The Pro series receivers offer two Bluetooth ports for NMEA or TSIP. If required, double-click to access the list of services.
4. As required, confirm the connection to the device and the service.

Once you establish this connection between the field computer and the receiver, configure the field software to use the connection. The Bluetooth LED shows that Bluetooth technology is connected to the port but you must set the software to use this connection and data.

Field software (Bluetooth connection)

1. Open the field software.
2. Select the COM port assigned on the field computer for this Bluetooth connection.
3. If required, select NMEA or TSIP.
4. Connect to the receiver.

Note – *Unless the software is a TSIP application, the system automatically outputs NMEA.*

Note – *If you use Bluetooth technology to connect to the receiver, then you must use the Power button to turn on and turn off the receiver.*

For more information, refer to the documentation for your software.

Multiple Bluetooth connections

You can connect to both Bluetooth ports on the receiver but you cannot have more than one TSIP connection.

Connecting to the GPS Receiver using a Serial Port

You can connect devices to a GPS Pathfinder Pro series receiver using the serial port. To access both receiver serial ports, use the optional splitter cable, which contains two bi-directional ports.

1. Make sure that you have all the required accessories to enable a serial connection. If you are using a splitter cable, make sure that it is connected to the correct port.
2. To connect to the receiver TSIP or NMEA serial port, connect the system as shown in **Figure 1.12** to **Figure 1.14**.
   a. Connect the null-modem cable supplied with your receiver (or the custom serial cable supplied with your field computer) into the serial (COM) port of the office computer or field computer.
   b. Select the appropriate COM port on your field computer.

CAUTION – Using a null modem cable to provide NMEA output from port 2 of a GPS Pathfinder Pro series receiver can cause serial communications to jam on some field computers. The communications problem can cause the field computer to slow down or stop responding. To provide NMEA output to another device, Trimble recommends that you connect the optional NMEA/RTCM splitter cable (P/N 55443-00) to the receiver, connect the receiver to the field computer and then enable NMEA output.

Note – *If you use the software to turn on the receiver, then you can use the software* ***or*** *the Power button to turn off the receiver. If you used the Power button to turn on the receiver, and then used the software to connect or disconnect the receiver, you must use the Power button to turn off the receiver.*

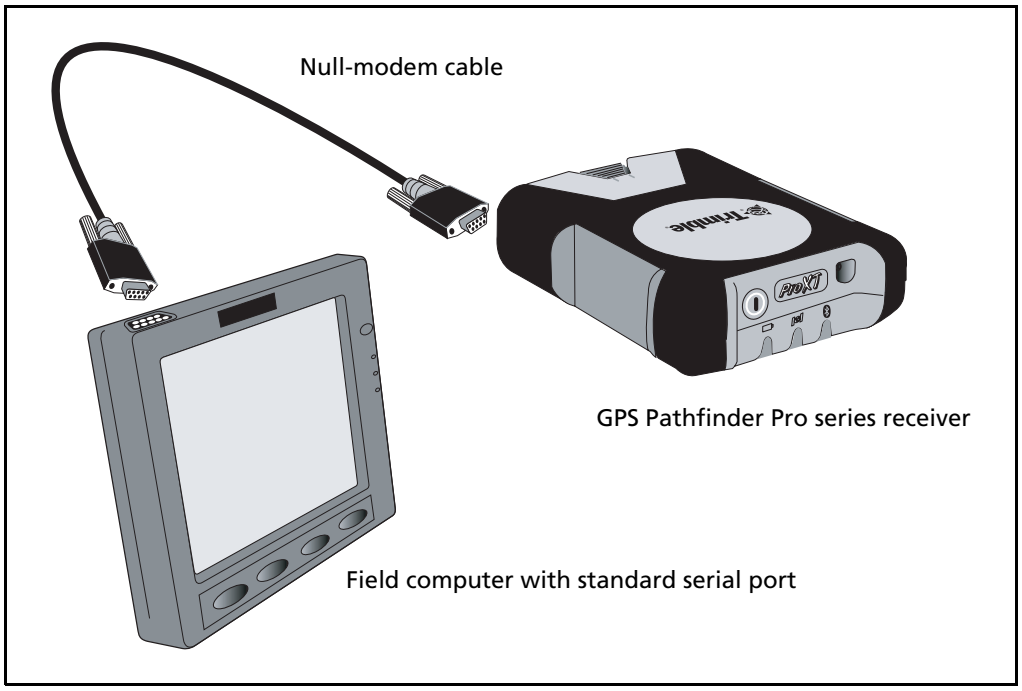


Figure 1.12 Connecting a GPS Pathfinder Pro series receiver to a field computer with a standard serial port

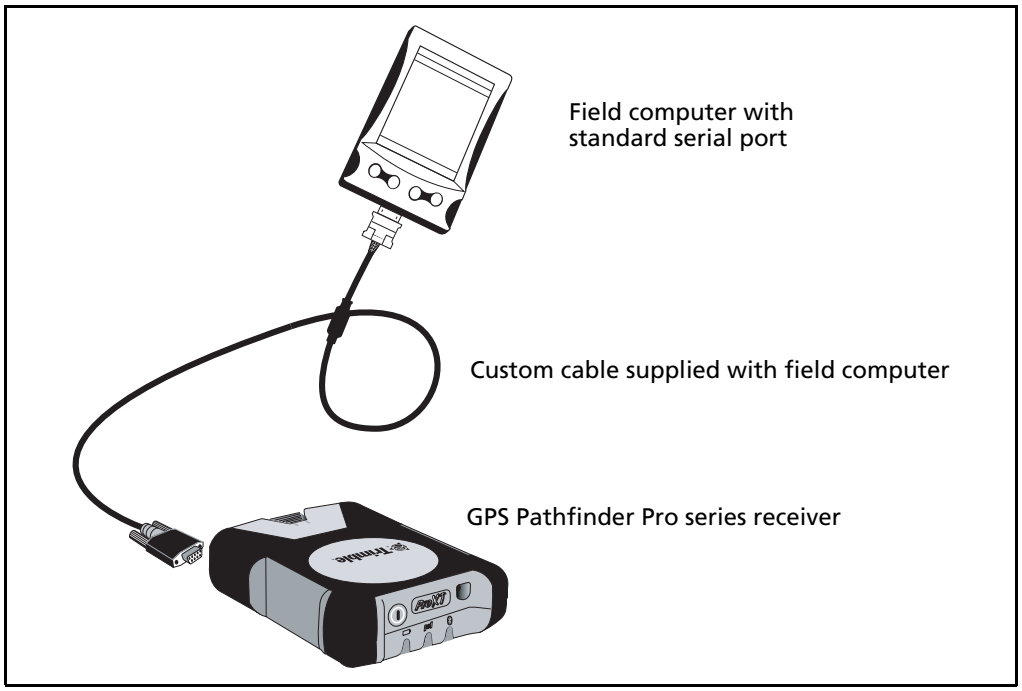


Figure 1.13 Connecting a GPS Pathfinder Pro series receiver to a field computer with a custom serial port

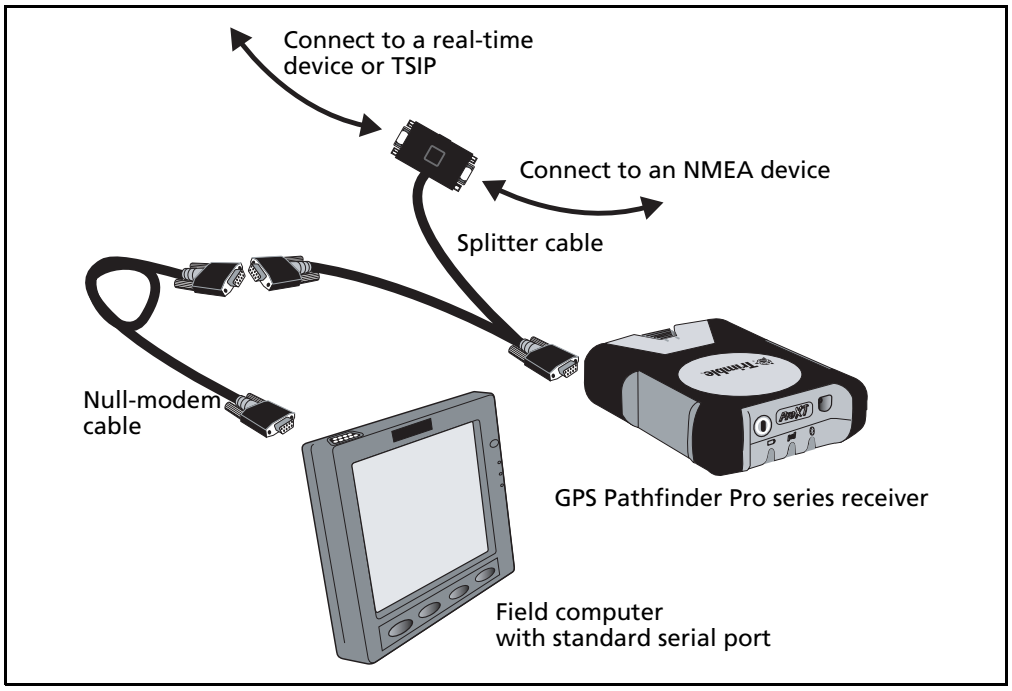


Figure 1.14 Connecting a GPS Pathfinder Pro series receiver to a field computer using a serial port splitter cable

Field software (serial connection)

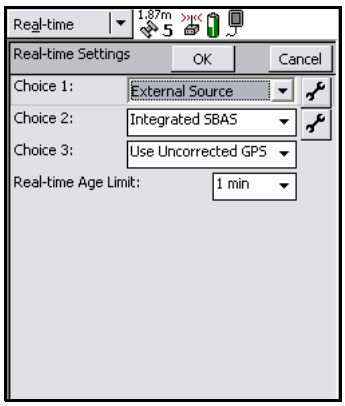
The settings on the field software are similar to those made when connecting to a field computer using Bluetooth wireless technology. See **Field software (Bluetooth connection), page 21.**

Connecting a real-time device to the GPS receiver

You can configure the receiver to use RTCM from an external source on port 1 (serial cable) if you are using Bluetooth wireless technology to connect to your field computer, or on port 2 (splitter cable) if you are using a serial connection to your field computer.

1. Make sure that you have all the required accessories to enable a serial connection.
2. Do one of the following:
   - If you are using Bluetooth wireless technology, connect the serial cable between the device and port 1 on the receiver.
   - Connect the serial cable between the device and the Data In port on the splitter cable's port 2.

3. In the GPS Controller or TerraSync software, or the GPScorrect extension:



   a. Select Setup from the Status list button.

   b. Tap **Real-time Settings**. The *Real-time Settings* form appears.

   c. In the *Choice 1* field, select External Source.

   d. To open the *External Source Settings* form, tap the setup button next to the *Choice 1* field.

   e. In the *Connections Method* field of the *External Source Settings* form, select Receiver Port.

   f. To open the *Receiver Port Settings* form, tap the setup button next to the *Port* field.

   g. Select the port to which your real-time device is connected:

      – Port 1 (serial), if connecting directly with a null modem cable

      – Port 2 (splitter), if connecting to the Data In port on the splitter.

4. Configure the Baud rate, parity, stop bits, and flow control as required for the real-time source.

5. Tap **OK**.

Collecting GPS Data

What is GPS?

The Global Positioning System (GPS) is a satellite-based positioning system operated by the U.S. Department of Defense (DoD). A constellation of operational NAVSTAR satellites orbit the earth every 12 hours, providing worldwide, all-weather, 24-hour time and position information.

For more information about GPS concepts, refer to the *Mapping Systems General Reference* at **www.trimble.com/gps/**.

This section provides information on using GPS in an application:

- **GPS COM Ports, page 25**
- **Configuring a GPS Application, page 25**
- **Getting a Clear View of the Sky, page 26**
- Configuring GPS quality control settings to suit your requirements and the current GPS conditions, see **GPS Quality Control with the GPS Controller Software, page 26**
- Using mission planning to identify the best times of the day for working with GPS, see **Planning a data collection session, page 28**
- **Using Real-time Corrections from other sources, page 29**

GPS COM Ports

The GPS Pathfinder Pro series receivers have four COM ports for communicating with software field computers or external devices. Each port is used for a particular type of communication, but some protocols can be used on different ports. The Bluetooth radio and the serial ports can be used concurrently to output NMEA data.

For more information on which protocols can be used on each port, see the table on **page 19**.

Configuring a GPS Application

Irrespective of whether you are using Bluetooth or a serial port connection, you must select the appropriate COM port on your field computer for the connection you require. See **Field software (Bluetooth connection), page 21** or **Field software (serial connection), page 23**.

Getting a Clear View of the Sky

To receive signals from GPS satellites, the receiver must have a clear view of the sky. The internal antenna is located under the Trimble logo. You do not have to have the receiver perfectly level, but keep the antenna facing upward, not downward or sideways.

Anything that blocks light also blocks signals. Satellite signals can be blocked by people, buildings, heavy tree cover, large vehicles, or powerful transmitters. GPS signals can go through leaves, plastic, and glass, but these all weaken the signal.

Although the receiver can be used on a belt clip, you will achieve better results when you mount the receiver on a backpack or rangepole, as this will give the receiver a better view of the sky.

GPS Quality Control with the GPS Controller Software

Note – *The GPS Controller software duplicates the status and setup features of the TerraSync software and the GPScorrect extension for ESRI ArcPad software. If one of these applications is installed on your field computer, it can be used instead of the GPS Controller software. Version 2.00 of the GPS Controller software also enables you to output NMEA data from the receiver.*

By default, the receiver is configured to receive satellite signals in most conditions. To check the current GPS status, or to configure the GPS receiver, connect your field computer using the GPS Controller software, which is provided with the receiver.

The GPS Controller software also includes a Plan section for mission planning (see **page 28**) and a Real-time section for configuring and monitoring real-time correction sources.

Use the graphical Skyplot section, see **Figure 1.15**, or the Satellite Info section to view detailed GPS information, and to adjust the quality and yield of the GPS positions you are receiving. Use the GPS slider to select predefined settings, or configure customized settings.

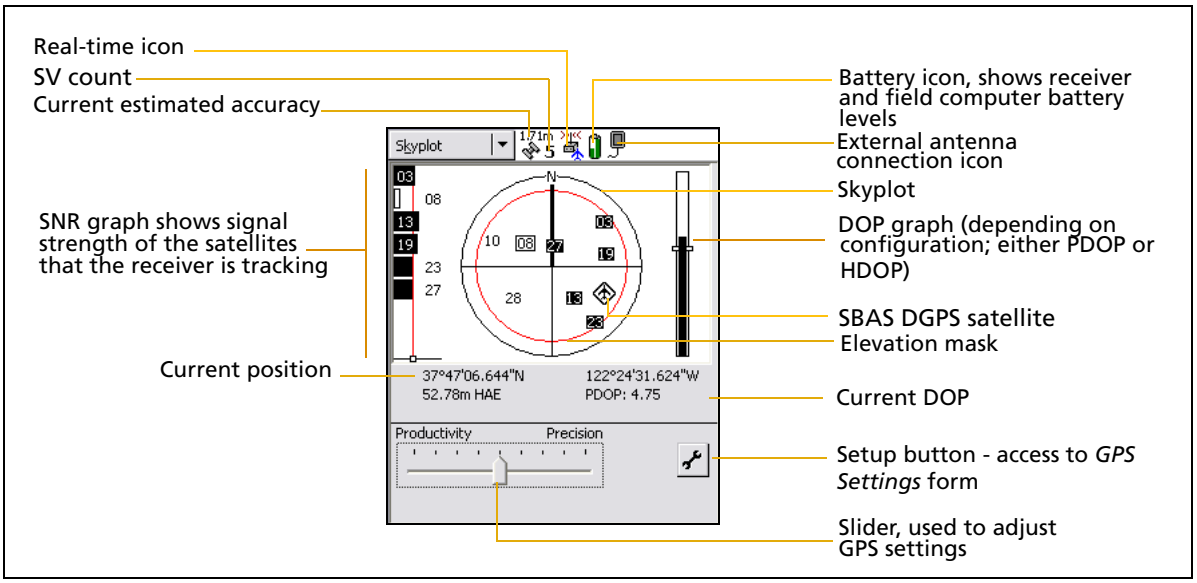
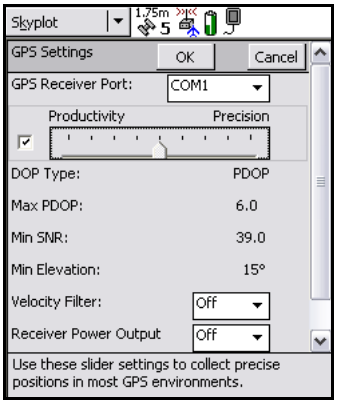


Figure 1.15 Details on the Skyplot screen

For more information on the software used on your field computer, refer to the documentation for that application.

GPS Settings form

Use the *GPS Settings* form in the GPS Controller software to configure the settings you require for GPS positions in either Slider or Custom mode.



You can also use the GPS Controller software to configure the receiver to use velocity filtering or to output NMEA data.

To open the *GPS Settings* form, do one of the following:

- Tap **GPS Settings** in the Setup section.
- Tap in the Skyplot section, Satellite Info section, or Plan section.

Configuring GPS settings in Slider mode

Select the slider check box. The slider control appears on the GPS slider, and some fields in the form become read-only. The values in these fields change as the slider control position changes.

The GPS slider is the same as the slider in the Setup area of the Skyplot and Satellite Info sections. If you change the slider control position in the *GPS Settings* form, it also changes in the Setup area.

Configuring GPS settings in Custom mode

Clear the slider check box. The slider control disappears from the GPS slider, and the remaining fields change to editable numeric fields. To specify the required GPS settings, enter values in these fields.

Configuring velocity filtering

You can use velocity filtering to smooth GPS positions when collecting lines or areas in high multipath environments. To apply velocity filtering, you must:

- configure Velocity Filtering to Auto on the *GPS Settings* form
- use real-time corrections, or collect data with SuperCorrect set to On in the TerraSync software or GPScorrect extension

Configuring the receiver to output NMEA data

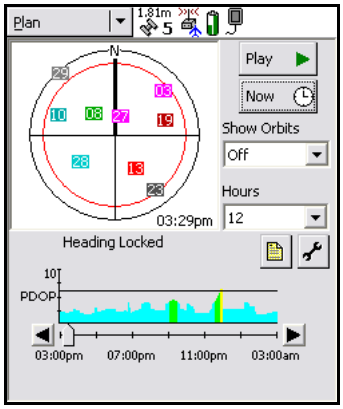
You can configure the receiver to output NMEA data on the serial port, including Port 2 when using the splitter cable, or with Bluetooth wireless technology. You can also configure the serial port settings, the types of messages to output, and the output interval.

Planning a data collection session

To maximize productivity, plan GPS data collection around the times of the day when satellite geometry is best.

The GPS Controller software has a Plan section with an animated skyplot and DOP (satellite geometry) graph for your position for the next 12 hours.

In the Plan section, you can check the planning skyplot as you play a session, then use the timeline to zoom in on times when geometry is poor. As you adjust GPS settings, the Plan section is updated, so you can see the effect of different quality control settings.



Note – *If TerraSync software or the GPScorrect extension for ArcPad is installed, you can use the planning feature in that application instead of in GPS Controller software.*

Using Satellite Based Augmentation System (SBAS) corrections

The GPS Pathfinder Pro series receivers have an integrated SBAS receiver that uses WAAS (Wide Area Augmentation System), or EGNOS (European Geostationary Navigation Overlay System) correction messages to improve GPS accuracy.

The receiver tracks the following by default in Auto mode:

- WAAS satellites between 40° West and 180° West, and between 10° North and 90° North.
- EGNOS satellites between 40° West and 60° East, and between 10° North and 90° North.

Note – *You can use the default zones, or configure the receiver to use particular SBAS satellites in the Integrated SBAS Satellite form (select GPS Controller / Setup / Real-time Settings). Refer to the GPS Controller Software Quick Reference Guide.*

Using Real-time Corrections from other sources

You can use corrections from an external correction source, such as an external beacon receiver, or a DGPS radio, directly into the receiver's serial ports, or you can connect a mobile phone to a field computer and pass the corrections onto the receiver.

Use the GPS Controller software to set up and monitor the real-time input source that you want to use (see **page 24**).

Note – *If the TerraSync software or the GPScorrect extension for the ESRI ArcPad software is installed, configure real-time settings in that application instead of in the GPS Controller software.*

Antennas

The GPS Pathfinder Pro series receivers contain an internal antenna, which is suitable for use in most conditions. You can also connect an external patch antenna if you wear the receiver on the belt clip, or when you work in a vehicle. When you collect H-Star data with a ProXH receiver, you can connect an external Zephyr antenna for improved accuracy.

Accuracy

The GPS Pathfinder Pro series receivers are high performance GPS receivers that calculate very accurate GPS positions. The GPS Pathfinder ProXT receiver provides reliable submeter (RMS) positioning with both real-time and postprocessed differential correction. The GPS Pathfinder ProXH receiver with H-Star technology provides postprocessed accuracies of subfoot (30 cm RMS) or eight inches (20 cm RMS) when used with a with an optional Zephyr antenna. In real-time, the ProXH receiver delivers submeter (RMS) accuracy. For more information about H-Star technology, refer to the white paper at **www.trimble.com/PathfinderProXH_WP.asp**.

Note – *RMS means that approximately 63% of the positions are within the specified value.*

Factors that affect accuracy

The accuracy that you obtain from your GPS Pathfinder Pro series receiver depends on several factors, including:

- Receiver type (ProXT or ProXH)
- Number of visible satellites
- Multipath
- Position Dilution of Precision (PDOP)
- Signal-to-Noise Ratio (SNR)
- Satellite elevations
- Occupation time at a point
- Data collection and postprocessing techniques
- Type of antenna

Differential GPS positioning techniques

Differential GPS (DGPS) requires two or more receivers. One receiver, called the reference station, is located at a known point to determine the GPS measurement errors and compute corrections to these errors. An unlimited number of mobile GPS receivers, commonly called rovers, collect GPS data at unknown locations within the vicinity of the reference station. Errors common at both the reference and rover receivers are corrected with DGPS either in real time or during postprocessing.

The following differential GPS positioning techniques can be used with the GPS Pathfinder Pro series receivers:

- Real-time DGPS - in real-time DGPS, the reference station calculates and broadcasts the error for each satellite as each measurement is received, permitting rover users to immediately see differentially corrected data.

  Real-time DGPS sources include external beacon and radio sources, as well as Satellite Based Augmentation Systems (SBAS) such as WAAS in the US and EGNOS in Europe, and Virtual Reference Station (VRS®) systems. SBAS and VRS systems use multiple reference stations in a network to calculate the DGPS corrections which are then delivered to the user from a Geostationary satellite (SBAS) or from a radio or cell phone (VRS).

- Postprocessed DGPS - in postprocessed DGPS, measurements from the reference station are logged to a computer so that users can download the correction files and differentially correct their data on return to the office.

  Postprocessed DGPS typically uses only one reference station, however, when differentially correcting data collected with ProXH receivers with H-Star technology logging enabled, you can select multiple reference stations to correct the file against for improved accuracy.

- Postprocessed real-time DGPS - postprocessed DGPS positions are generally more accurate than DGPS positions obtained in real time. If you collect SuperCorrect records, or H-Star data with the ProXH receiver, as well as GPS positions using the TerraSync software or the GPScorrect extension, or applications developed using the GPS Pathfinder Tools SDK, you can postprocess your files in the GPS Pathfinder Office software or the GPS Analyst extension to improve accuracy.

  The accuracy using postprocessed real-time DGPS is the same as for postprocessed DGPS (see the previous section).

Note – *For more information about GPS and DGPS, review the All About GPS tutorial on the Trimble website at* **www.trimble.com/gps.**

Factors that affect postprocessed DGPS accuracy

Postprocessed differential correction improves the accuracy of GPS positions. In addition to general factors that affect accuracy, there are other factors that affect the accuracy of postprocessed DGPS positions including:

- Distance between reference station and rover receivers
- Receiver type at reference station
- Accuracy of the reference station position
- The logging interval at the reference station
- The reference station uses the correct antenna

Factors that affect real-time DGPS accuracy

Real-time DGPS offers similar accuracies to postprocessed GPS. However, in addition to the factors listed under **Factors that affect real-time DGPS accuracy (see page 31)**, there are other factors that affect the accuracy of real-time DGPS positions, including:

- Update rate of the corrections
- Corrections based on a different datum

Resetting GPS

The GPS Controller and TerraSync software, and the GPScorrect extension all have options to reset the receiver to:

- delete the almanac
- delete information stored on the last known position
- restart the receiver
- reset the GPS receiver to factory defaults

Caring for and Storing the GPS Pathfinder Pro series receivers

Servicing

If the receiver requires servicing, contact your support provider.

Cleaning

Keep the outer surface, the external antenna port, and the serial port free of dirt and dust.

To clean the GPS Pathfinder Pro series receiver, wipe it with a clean dry cloth.

Storage

If you are not going to use the receiver for some time, charge the battery to approximately 30% and then turn off the receiver.

To use the receiver after storage, turn on the receiver and then:

1. Fully recharge the battery in the receiver, ***with the receiver turned on***, see **Charging the Battery, page 10**.
2. Check that the Bluetooth radio is activated and on, see **Turning on the receiver and the Bluetooth radio, page 13**.

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