



USER GUIDE



**Trimble® R6/R7 GPS Receivers**  
**Trimble® R8 GNSS Receiver**



# USER GUIDE

## **Trimble® R6/R7 GPS Receivers Trimble R8 GNSS Receiver**

Version 2.30 (Trimble R7 GPS Receiver)  
Version 3.23 (Trimble R8 GNSS and Trimble R6 GPS Receivers)  
Revision A  
October 2006



## Corporate office

Trimble Navigation Limited  
Engineering and Construction group  
5475 Kellenburger Road  
Dayton, Ohio 45424-1099  
USA

800-538-7800 (toll free in USA)  
+1-937-245-5600 Phone  
+1-937-233-9004 Fax  
www.trimble.com

## Legal notices

© 2004-2006, Trimble Navigation Limited. Trimble, the Globe & Triangle logo, BlueCap, and Terramodel are trademarks of Trimble Navigation Limited, registered in the United States Patent and Trademark Office and in other countries. CMR, CMR+, eRTK, Micro-Centered, Maxwell, SiteNet Survey Pro, Trimble Geomatics Office, Trimble Survey Controller, TRIMMARK, TRIMTALK, TRS, TSC2, TSCe, Zephyr, and Zephyr Geodetic are trademarks of Trimble Navigation Limited. The Bluetooth word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by Trimble Navigation Limited is under license. Microsoft, Windows, and Windows NT are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other trademarks are the property of their respective owners.

## Release notice

This is the October 2006 release (Revision A) of the *Trimble R6/R7 GPS and Trimble R8 GNSS Receivers User Guide*. It applies to versions 2.30 (Trimble R7 GPS receiver) and 3.23 (Trimble R8 GNSS and Trimble R6 GPS receivers).

## Product Limited Warranty Information

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

## Product Extended Limited Warranty Information

For applicable product Extended Limited Warranty information, please refer to the Limited Warranty Card included with this Trimble product, or consult your Trimble 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). Contains **Infinion 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.



## 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.trimble.com/ev.shtml](http://www.trimble.com/ev.shtml).

Recycling in Europe: To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to:



Trimble Europe BV  
c/o Menlo Worldwide Logistics  
Meerheide 45  
5521 DZ Eersel, NL

## Declaration of Conformity

We, Trimble Navigation Limited,

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

declare under sole responsibility that the product:  
**Trimble R6/R7 GPS receivers and Trimble R8 GNSS receiver**  
complies 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 the Trimble® R6/R7 GPS or Trimble R8 GNSS receiver, make sure that you have read and understood this publication, as well as all safety requirements.

## 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.

---

## Exposure to radio frequency radiation

You must maintain a minimum separation distance of 20 cm (approximately 8 in.) between yourself and the radiating GSM antenna for this device to satisfy the RF Exposure requirements of the FCC. For mobile operation, the maximum gain of the GSM antenna must not exceed 0 dBi.

## 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 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.
- 

## Other Warnings



---

**WARNING** – Operating or storing the receiver outside the specified temperature range can damage it. For more information, see Physical specifications, page 8-56.

---



---

**WARNING** – When there is no USB cable connected, or when using the receiver in a harsh environment, keep this door closed to keep moisture, dust, and dirt out of the ports. The temperature rating of the receiver applies only when all doors on the receiver are closed.

---



---

**WARNING** – The receiver allows for a maximum of 512 files on the CompactFlash card, regardless of the card's capacity. The file names must be in 8.3 format, otherwise, files copied to the CompactFlash card may cause data corruption or loss of data when logging.

---



---

**WARNING** – If the card does not seat into the pins correctly, do **not** use force or you may damage the pins. Remove the card and carefully reinsert it.

---



---

**WARNING** – Do not hold down the power button for more than 30 seconds. After 30 seconds, any application files stored in the receiver are deleted and the CompactFlash card is reformatted.

---



---

**WARNING** – Formatting a CompactFlash card while it is in the receiver deletes all the data files on the card and all the application files in the receiver.

---



---

**WARNING** – Upgrading the firmware deletes all application files on the receiver.

---



---

**WARNING** – Operating or storing the receiver outside the specified temperature range can damage it. For more information, see [Chapter 8, Specifications](#) and [Chapter 17, Specifications](#).

---



---

**WARNING** – The receiver allows a maximum of 200 files on the internal memory. The filenames must be in 8.3 format, otherwise, files copied to the internal memory may cause data corruption or loss of data when logging. Data is logged using the current logging settings configured in the receiver. Data files logged internally are named automatically.

---





# Contents

<b>0</b>	<b>Safety Information</b>	<b>iii</b>
	Warnings and Cautions	iii
	Exposure to radio frequency radiation	iii
	Rechargeable Lithium-ion batteries	iii
	Other Warnings	iv
<b>1</b>	<b>Introduction</b>	<b>1</b>
	Related information	1
	Technical assistance	2
	Your comments	2
	<b>Trimble R7 GPS Receiver</b>	<b>3</b>
<b>2</b>	<b>Overview</b>	<b>5</b>
	Features	6
	Use and Care	6
	COCOM Limits	7
<b>3</b>	<b>Setting up the Receiver</b>	<b>9</b>
	Parts of the receiver	10
	Front panel	10
	Rear panel	11
	Top panel	11
	Bottom panel	13
	Setup guidelines	14
	Environmental conditions	14
	Sources of electrical interference	14
	General guidelines	14
	Postprocessed setup	15
	Pole-mounted setup	16
	Backpack setup	20
	Other system components	22
	Radios	22
	Cellular modems	24
	Antennas	25
	CompactFlash cards	25
<b>4</b>	<b>General Operation</b>	<b>27</b>
	Front panel controls	28
	Button functions	28
	LED behavior	29
	Logging/memory LED	29
	SV tracking LED	29

Radio LED . . . . .	30
Battery 1 LED and battery 2 LED . . . . .	30
Starting and stopping the receiver . . . . .	30
Logging data . . . . .	30
Logging internally . . . . .	30
Logging to a Trimble controller . . . . .	31
Resetting to defaults . . . . .	32
Formatting a CompactFlash card . . . . .	32
Batteries and power . . . . .	32
Battery charging and storage . . . . .	34
Operating with the TSCe controller . . . . .	35
Power output . . . . .	36
Firmware . . . . .	36
<b>5 Configuration . . . . .</b>	<b>37</b>
Configuring the receiver in real Time. . . . .	38
Configuring the receiver using application files . . . . .	38
Application files . . . . .	38
Special application files . . . . .	39
Timed application files . . . . .	40
Applying application files. . . . .	41
Storing application files. . . . .	41
Naming application files . . . . .	42
<b>6 Transferring Data . . . . .</b>	<b>43</b>
Connecting to the office computer . . . . .	44
Transferring data . . . . .	45
Transferring files directly from a CompactFlash card . . . . .	46
Deleting files in the receiver . . . . .	47
Supported file types . . . . .	47
<b>7 Software Utilities . . . . .</b>	<b>49</b>
The GPS Configurator software . . . . .	50
Installing the GPS Configurator software . . . . .	50
Configuring the Trimble R7 GPS receiver using the GPS Configurator software . . . . .	50
The WinFlash utility . . . . .	50
Installing the WinFlash utility . . . . .	51
Upgrading firmware . . . . .	51
Adding frequencies for the 450 MHz internal radio . . . . .	52
Configuring the radio network using the Trimble Survey Controller software. . . . .	53
Configuring the radio network using the WinFlash utility . . . . .	53
<b>8 Specifications. . . . .</b>	<b>55</b>
Physical specifications . . . . .	56
Positioning specifications. . . . .	56
Technical specifications . . . . .	57

<b>9</b>	<b>Default Settings</b>	<b>59</b>
	Default settings	60
	Resetting to factory defaults	61
	Examples	61
	Default behavior	61
	Power up settings	61
	Logging after power loss	62
	Disabling logging	62
	Application files	63
<b>10</b>	<b>Cables and Connectors</b>	<b>65</b>
	Port 1, 2, and 3 connectors	66
	Power/serial data cable	67
	Event marker/1PPS cable	67
	GPS antennas and cables	69
<b>11</b>	<b>Event Marker Input and 1PPS Output</b>	<b>71</b>
	Event marker input	72
	Enabling and configuring event marker input	72
	1PPS output	73
	1PPS pulse definition	73
	ASCII time tag definition	73
	Enabling and configuring 1PPS output in real time	74
	<b>Trimble R6 GPS R8 GNS Receivers</b>	<b>75</b>
<b>12</b>	<b>Overview</b>	<b>77</b>
	Features	78
	Use and care	78
	COCOM limits	79
<b>13</b>	<b>Setting up the Receiver</b>	<b>81</b>
	Parts of the receiver	82
	Front panel	82
	Lower housing	82
	Setup guidelines	84
	Environmental conditions	84
	Sources of electrical interference	84
	General guidelines	85
	Pole-mounted setup	85
	Other system components	86
	Radios	86
	Cellular modems and external radios	87

<b>14</b>	<b>General Operation</b>	<b>89</b>
	Front panel controls	90
	Button functions	90
	LED behavior	90
	LED flash patterns	91
	Starting and stopping the receiver	91
	Logging data	91
	Logging internally	91
	Logging to a Trimble controller	92
	Resetting to defaults	93
	Batteries and power	93
	Battery charging and storage	93
	Power output	94
	Firmware	95
<b>15</b>	<b>Configuration</b>	<b>97</b>
	Configuring the receiver in real time	98
	Configuring the receiver using application files	98
	Application files	98
	Special application files	99
	Applying application files	100
	Storing application files	100
	Naming application files	101
<b>16</b>	<b>Software Utilities</b>	<b>103</b>
	The GPS Configurator software	104
	Installing the GPS Configurator software	104
	The WinFlash Utility	105
	Installing the WinFlash utility	105
	Upgrading firmware	105
	Adding frequencies for the 450 MHz internal radio	106
	Configuring the internal transceiver	108
<b>17</b>	<b>Specifications</b>	<b>111</b>
	Physical specifications	112
	Positioning specifications	112
	Technical specifications	113
<b>18</b>	<b>Default Settings</b>	<b>115</b>
	Default settings	116
	Resetting to factory defaults	116
	Default behavior	117
	Power up settings	117

---

<b>19</b>	<b>Cables and Connectors</b> . . . . .	<b>119</b>
	Port 1 and 2 connectors . . . . .	120
	Power/serial data cables . . . . .	121
	<b>Appendixes:</b>	
	<b>Trimble R6/R7 GPS Receivers</b>	
	<b>Trimble R8 GNSS Receiver.</b> . . . . .	<b>123</b>
<b>A</b>	<b>NMEA-0183 Output.</b> . . . . .	<b>125</b>
	NMEA-0183 Outputs . . . . .	126
	Common Message Elements . . . . .	127
	Message values . . . . .	127
	NMEA Messages . . . . .	128
<b>B</b>	<b>RTCM Output</b> . . . . .	<b>137</b>
	Generated messages . . . . .	138
	Message scheduling . . . . .	139
<b>C</b>	<b>Troubleshooting</b> . . . . .	<b>141</b>
	LED conditions . . . . .	142
	Receiver issues. . . . .	143
	<b>Index.</b> . . . . .	<b>145</b>



# Introduction

Welcome to the *Trimble R6/R7 GPS and Trimble R8 GNSS Receivers User Guide*. This manual describes how to install, set up, and use a Trimble® R6/R7 GPS receiver or a Trimble R8 GNSS receiver.

Even if you have used other Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of your receiver.

If you are not familiar with GPS, visit our website for an interactive look at Trimble and GPS at [www.trimble.com](http://www.trimble.com)

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

## Related information

An electronic copy of this manual is available in portable document format (PDF) on the receiver CD-ROM. Use Adobe Reader to view the contents of this file.

Other sources of related information are:

- Release notes – the release notes describe new features of the product, information not included in the manual, and any changes to the manual. They are provided as a PDF on the CD. Use Adobe Reader to view the contents of the release notes.
- Registration – register your receiver to automatically receive e-mail notifications of receiver firmware upgrades and new functionality. To register, do one of the following:
  - Run the receiver CD.
  - Register electronically at [www.trimble.com](http://www.trimble.com).
  - Print the registration form that is on the CD, fill it in, and fax or mail it to the address shown.

Contact your local Trimble Dealer for more information about the support agreement contracts for software and firmware, and an extended warranty program for hardware.

- Trimble training courses – consider a training course to help you use your GPS system to its fullest potential. For more information, visit the Trimble website at [www.trimble.com/training.html](http://www.trimble.com/training.html).

## Technical assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local Dealer*. Alternatively, request technical support using the Trimble website at ([www.trimble.com/support.html](http://www.trimble.com/support.html)).

## Your comments

Your feedback about the supporting documentation helps us to improve it with each revision. E-mail your comments to [ReaderFeedback@trimble.com](mailto:ReaderFeedback@trimble.com).



# TRIMBLE R7 GPS RECEIVER

## In this section:

- Chapter 2, Overview
- Chapter 3, Setting up the Receiver
- Chapter 4, General Operation
- Chapter 5, Configuration
- Chapter 6, Transferring Data
- Chapter 7, Software Utilities
- Chapter 8, Specifications
- Chapter 9, Default Settings
- Chapter 10, Cables and Connectors
- Chapter 11, Event Marker Input and 1PPS Output



## Overview

### In this chapter:

- [Features](#)
- [Use and Care](#)
- [COCOM Limits](#)

This chapter introduces the Trimble® R7 GPS receiver. This receiver is designed for GPS surveying applications. The receiver features one-touch logging for ease of use, and five LEDs that enable you to monitor the survey in progress and the available battery capacity.

The receiver tracks GPS satellites on both the L1 and L2 frequencies to provide precise position data for land survey applications. The receiver records GPS data on an internal CompactFlash card and makes all data available through serial or USB ports.

You can use the Trimble R7 GPS receiver alone by logging data internally, or as part of the GPS Total Station® system, which logs GPS data from the receiver to a Trimble controller running the Trimble Survey Controller™ or Trimble Survey Pro™ software.

## Features

The receiver provides the following features:

- Trimble R-track technology, which enables the receiver to track the L2 Civil signal (L2C)
- Centimeter-accuracy real-time positioning with RTK/OTF data, and up to 10 Hz position updates
- Submeter-accuracy real-time positioning using pseudorange corrections
- Adaptive dual-frequency RTK engine
- WAAS/EGNOS capability (Wide Area Augmentation System/European Geostationary Navigation System)
- Automatic OTF (on-the-fly) initialization while moving
- 1PPS (One Pulse Per Second) output
- Dual event-marker input
- USB port for data transfer
- Type I CompactFlash card for data storage
- Internal charging of batteries (no external battery charger required)
- Three RS-232 serial ports for:
  - NMEA output
  - RTCM SC-104 input and output
  - Trimble Format (CMR™) input and output
- Two TNC ports for connecting to the GPS and radio antennas

## Use and Care

The Trimble R7 GPS 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.



---

**WARNING** – Operating or storing the receiver outside the specified temperature range can damage it. For more information, see [Physical specifications, page 56](#).

---

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 electronics from functioning correctly. Avoid using the receiver within 400 meters of powerful radar, television, or other transmitters. Low-power transmitters such as those used in cellphones and two-way radios normally do not interfere with receiver operations.

For more information, contact your local Trimble distributor.

## COCOM Limits

The U.S. Department of Commerce requires that all exportable GPS products contain performance limitations so that they cannot be used in a manner that could threaten the security of the United States. The following limitations are implemented on the Trimble R7 GPS 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. The receiver continuously resets until the COCOM situation is cleared.



## Setting up the Receiver

### In this chapter:

- Parts of the receiver
- Setup guidelines
- Postprocessed setup
- Pole-mounted setup
- Backpack setup
- Other system components

This chapter provides general setup information, connection information, and cabling diagrams for the most common uses of the Trimble R7 GPS receiver.

## Parts of the receiver

All operating controls, ports, and connectors on the receiver are located on its four main panels, as shown in [Figure 3.1](#). This section provides a brief overview of the features of each of these panels.

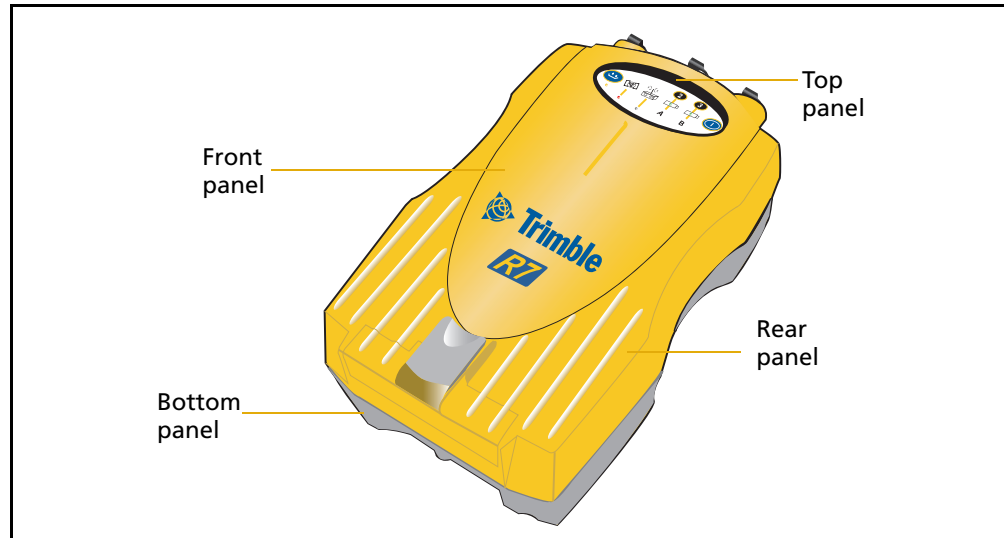


Figure 3.1 Panels on the Trimble R7 GPS receiver

### Front panel

[Figure 3.2](#) shows the front panel of the Trimble R7 GPS receiver. This panel contains the five indicator LEDs, the two buttons, and the catch for the CompactFlash/USB door.

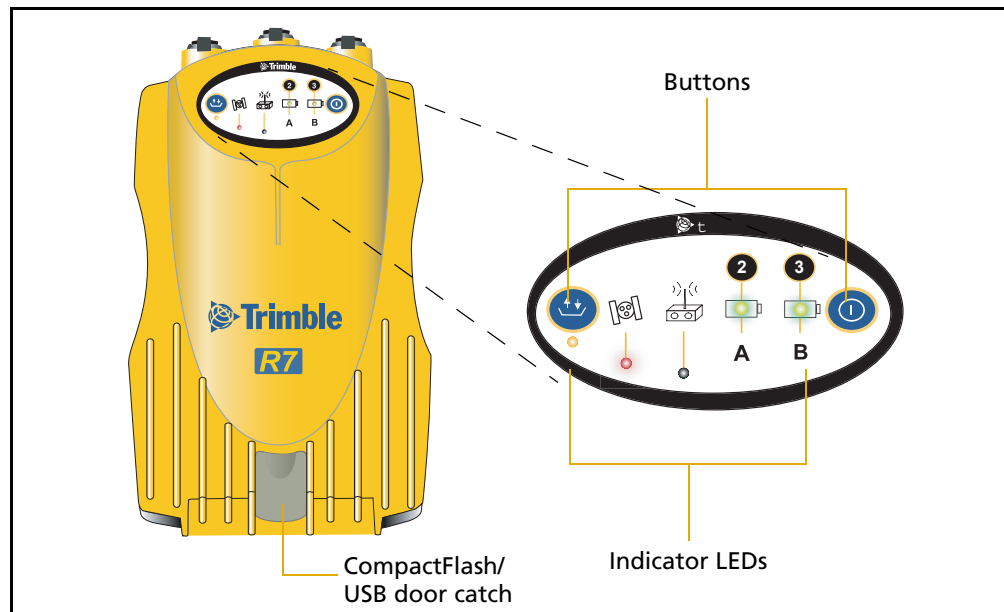


Figure 3.2 Front panel



The two buttons control data logging, data management, power, and settings. For more information, see [Button functions](#), page 28.

The indicator LEDs show the status of logging, power, satellite tracking, and radio reception. For more information, see [LED behavior](#), page 29.

## Rear panel

[Figure 3.3](#) shows the rear panel of the Trimble R7 GPS receiver. This panel contains a slot for attaching the receiver catch lock, and the catches for the two battery compartments on the bottom panel. The catch lock should already be attached to your receiver.

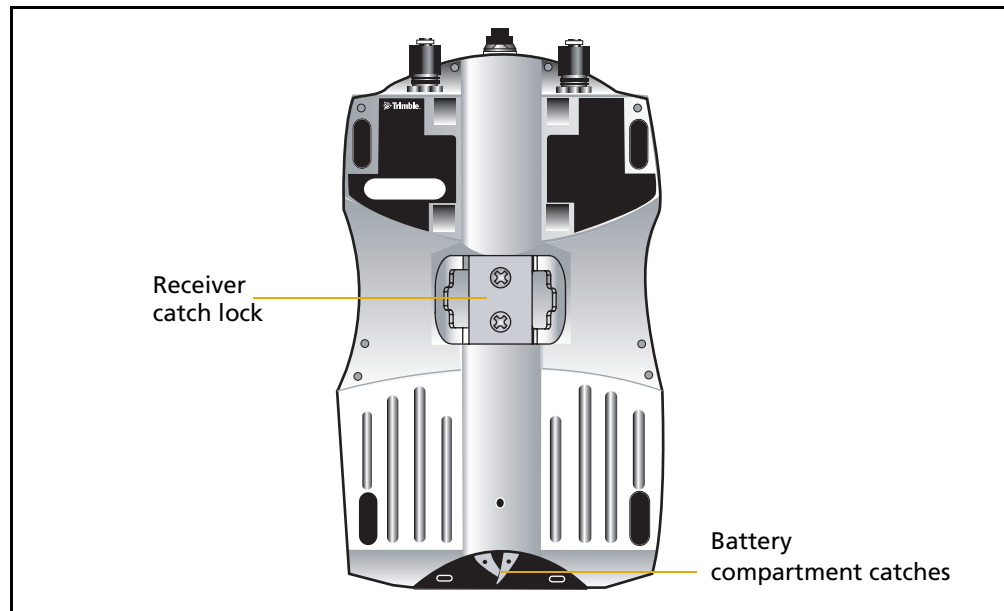


Figure 3.3 Rear panel

To mount the receiver on a pole, attach the receiver bracket to the pole and then insert the catch lock into the bracket. For more information, see [Pole-mounted setup](#), page 16.

## Top panel

[Figure 3.4](#) shows the top panel of the Trimble R7 GPS receiver. This panel contains the three power/serial data ports and (TNC) ports for GPS and radio antenna connections.

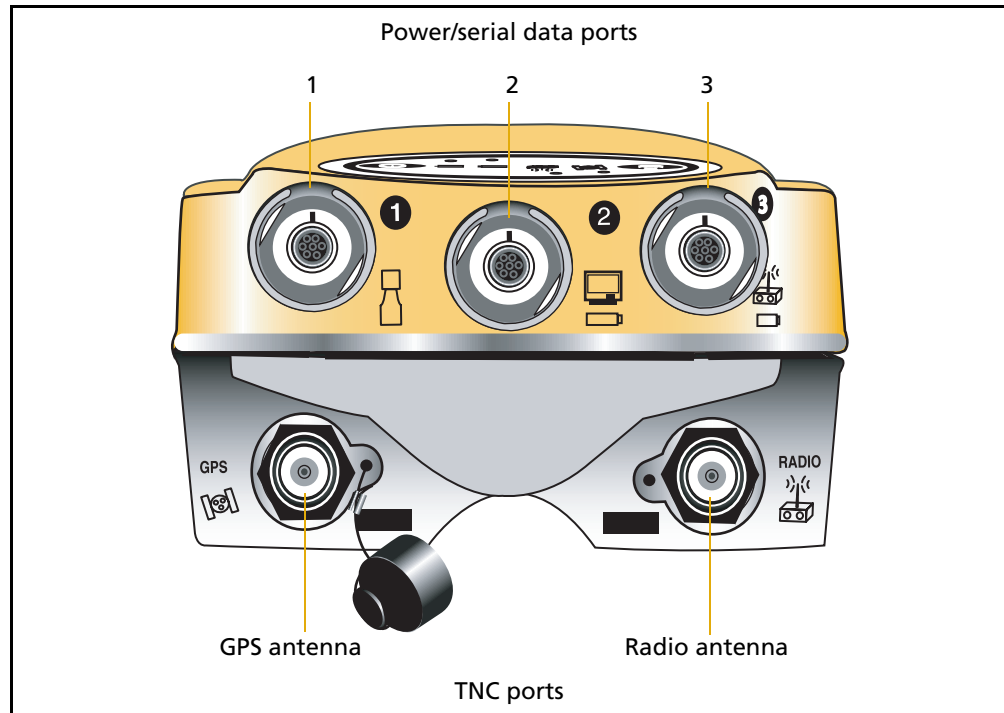







Figure 3.4 Top panel

Each port on the top panel is marked with an icon to indicate its main function, as shown below.

Icon	Name	Connections
	Port 1	Trimble controller, event marker, or computer
	Port 2	Power in, computer, 1PPS, or event marker
	Port 3	External radio, power in
	GPS	GPS antenna
	RADIO	Radio communications antenna

The power/serial data ports are all 7 pin 0-shell Lemo connectors. Both Port 2 and Port 3 can accept external power. For more information, see [Default settings, page 60](#) and [Cables and Connectors, page 65](#).

The TNC port connectors are color-coded for easy system setup. Connect the yellow GPS antenna cable to the yellow TNC port marked GPS, and connect the blue Range Pole antenna (RPA) cable to the blue TNC connector marked RADIO. For more information on connecting the Trimble R7 GPS receiver, see the following sections in this chapter.

## Bottom panel

Figure 3.5 shows the bottom panel of the Trimble R7 GPS receiver. This panel contains the USB port, the CompactFlash port, and the compartments for the two internal batteries.

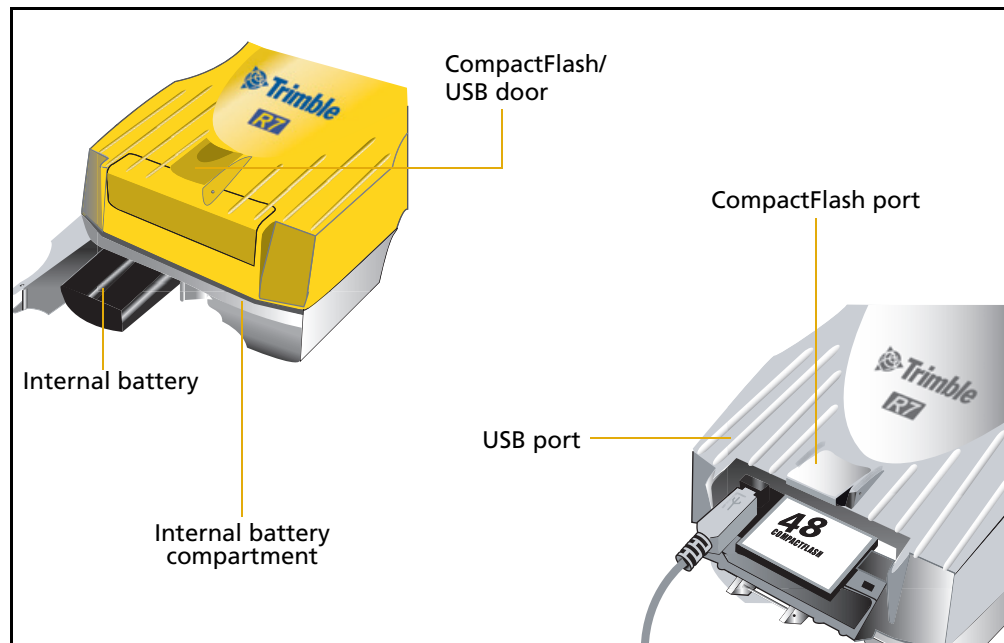


Figure 3.5 Bottom panel

The CompactFlash/USB door conceals the CompactFlash port and USB port. To open the door, push down the catch on the front panel.



**WARNING** – When there is no USB cable connected, or when using the receiver in a harsh environment, keep this door closed to keep moisture, dust, and dirt out of the ports. The temperature rating of the receiver applies only when all doors on the receiver are closed.

## Setup guidelines

Follow these guidelines when setting up the Trimble R7 GPS receiver.

### Environmental conditions

Although the Trimble R7 GPS receiver has a waterproof housing, reasonable care should be taken to keep the unit dry. Avoid exposure to extreme environmental conditions, including:

- Water
- Heat greater than 65° C (149° F)
- Cold less than -40° C (-40° F)
- Corrosive fluids and gases

Avoiding these conditions improves the receiver performance and long-term reliability.

### Sources of electrical interference

Avoid the following sources of electrical and magnetic noise:

- Gasoline engines (spark plugs)
- Televisions and computer 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 on [page iii](#) at the front of this manual.

---

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

- When plugging in a Lemo cable, make sure that the red dots on the receiver port and the cable connector line up. **Do not** use force to plug cables in, as this may damage the connector pins.
- When disconnecting a Lemo cable, grasp the cable by the sliding collar or lanyard and 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, align the cable connector with the receiver receptacle and thread the cable connector onto the receptacle until snug.
- Insert the internal batteries with the battery contacts facing the CompactFlash/USB door. The undersides of the batteries have a center groove for alignment when being inserted into the receiver.

## Postprocessed setup

For a postprocessed survey, you only need:

- the Trimble R7 GPS receiver
- a Zephyr™ or Zephyr Geodetic™ antenna
- a GPS antenna cable

Other equipment, as described below, is optional.

To set up the Trimble R7 GPS receiver for a postprocessed survey:

1. Set up the tripod with the tribrach and antenna adapter over the survey mark.  
Instead of a tripod, you can use a range pole with a bipod. However, Trimble recommends that you use a tripod for greater stability.
2. Mount the antenna on the tribrach adapter.
3. Use the tripod clip to hang the receiver on the tripod.
4. Connect the yellow GPS antenna cable to the Zephyr antenna.
5. Connect the other end of the GPS antenna cable to the yellow TNC port on the receiver.
6. If external power is required, connect a battery with an 0-shell Lemo connection to Port 2 or Port 3 on the receiver.

Figure 3.6 shows the Trimble R7 GPS receiver postprocessed setup.



Figure 3.6 Postprocessed setup

**Note** – Instead of hanging the receiver on the tripod, you can place the receiver in its base case. Run the antenna cable out of the portal in the side of the base case to the antenna so that the case can stay closed while the receiver is running.

## Pole-mounted setup

To mount the Trimble R7 GPS receiver on a pole, you need to do the following:

1. Mount the eRTK™ Range Pole antenna (RPA).
2. Mount the receiver.
3. Mount the Trimble controller.

This section provides detailed instructions on each of these three steps.

### Mounting the range pole antenna (RPA)

To mount the RPA on the pole:

1. Install the RPA bracket 7.5 cm (3") from the pole top by placing the two pieces together and securing with screws. If you are using a 1" diameter pole, place the bracket inserts inside the bracket before securing.

**Note** – Instead of the RPA, you can use a quarter-wave whip (“rubber duck”) antenna attached directly to the receiver.

2. Connect the yellow TNC-to-TNC GPS cable and run it through the RPA bracket clips where it is labeled on the bracket. Make sure that the right-angle connector is at the top.

**Note** – The cable must be routed inside the RPA, through the bracket, or it will affect the RPA radio reception performance.

3. Align the TNC connector on the RPA with the GPS antenna cable on the bracket, and while feeding the cable through the RPA, slide the RPA onto the bracket until it clicks.

Figure 3.7 shows the Trimble R7 GPS receiver pole-mounted setup.

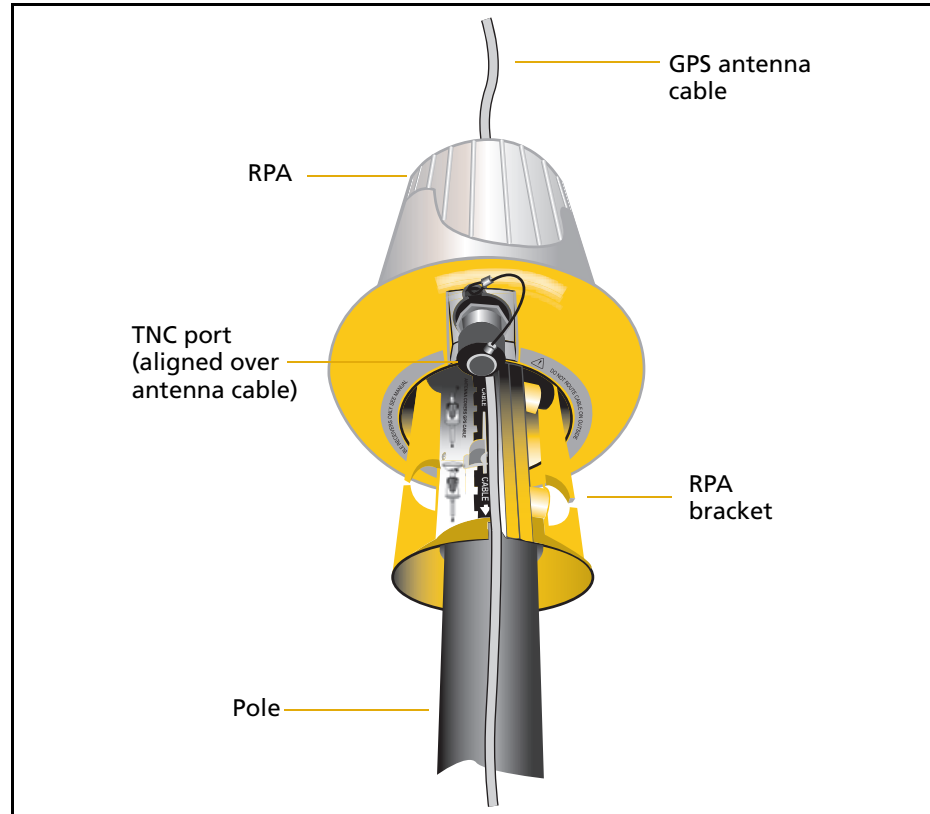


Figure 3.7 RPA and bracket

4. Mount the Zephyr antenna on the range pole.
5. Connect the GPS antenna cable. Make sure that the GPS cable is not hanging over the top of the RPA.
6. Connect the blue TNC-to-TNC radio cable to the RPA.

### Mounting the Trimble R7 GPS receiver

To mount the receiver on the pole:

1. Attach the receiver bracket to the pole:
  - a. Place the bracket against the pole, approximately 0.5 m from the ground.

**Note** – If you are using a 1" diameter pole, flip the bracket insert around inside the bracket, as shown in [Figure 3.8](#).

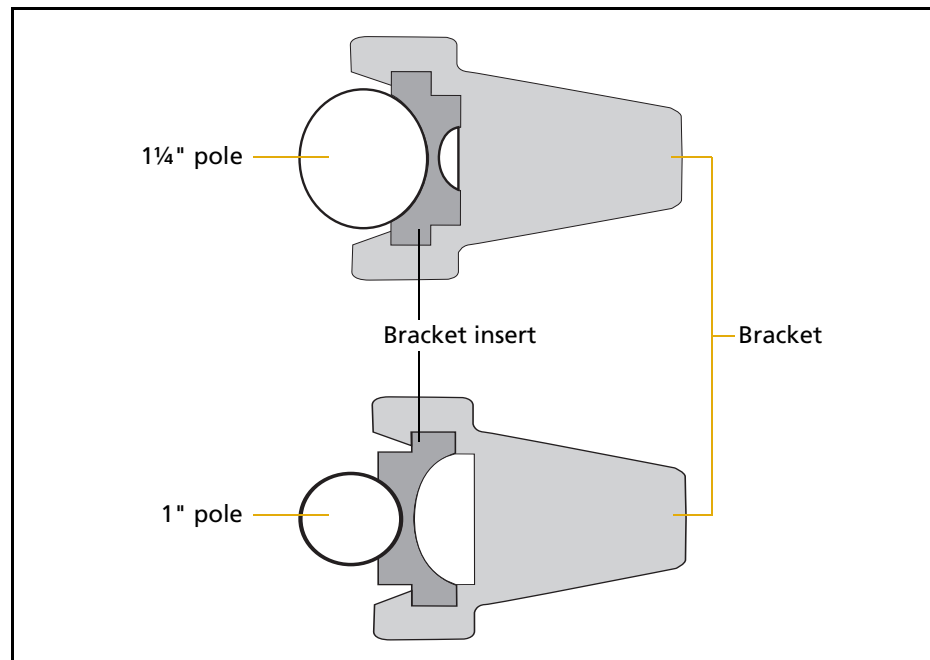


Figure 3.8 Receiver bracket insert

- b. Close the gates of the bracket around the pole.
  - c. Seat the base of the clip lock in the opposite gate.
  - d. Lock the clip lock.

If the clip lock is too tight to be locked, turn it one or two turns counterclockwise and try again. If it is too loose, turn it one or two turns clockwise and try to lock it again.

2. Mount the receiver on the bracket:
  - a. Pull the bracket side locks in towards the pole.
  - b. Set the receiver catch lock in the bracket.
  - c. Holding the receiver in the bracket, pull the side locks back to their original positions, as shown in [Figure 3.9](#).



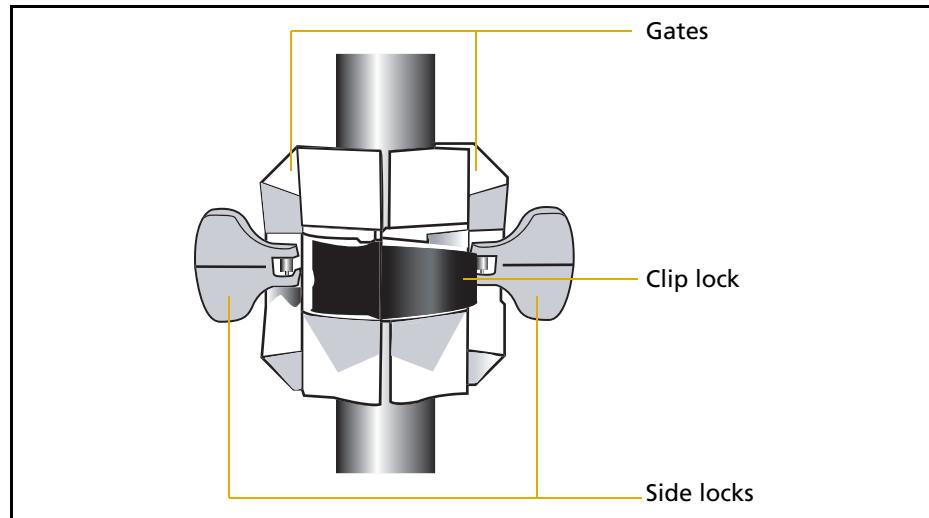


Figure 3.9 Trimble R7 GPS receiver bracket

3. Connect the blue TNC radio communications cable to the blue TNC port on the receiver. If necessary, adjust the position of the receiver to remove cable slack.
4. Connect the yellow TNC GPS antenna cable to the yellow TNC port on the receiver. If necessary, adjust the position of the receiver to remove cable slack.

### Mounting the TSCe controller

1. Mount the TSCe™ controller bracket on the pole:
  - a. Place the bracket against the pole at a comfortable height.
  - b. Rotate the clamping screw on the bracket pole until tight.
  - c. Place the controller into the cradle assembly and tighten the clamping mechanism.
  - d. If there are any cables running down the pole, run them through the machined groove on the inside of the controller bracket.
  - e. To put the controller in the preferred position for operation, press the spring-loaded release button on the cradle, pull the assembly outward, and then rotate the cradle assembly to the required angle. To rest the cradle in the proper position, line up the alignment pins and push them inward until the release button locks.
2. Connect one end of the 2 ft 0-shell to 0-shell Lemo cable to the controller.
3. Connect the other end of the Lemo cable to Port 1 on the receiver.
4. Place the hand grip below the controller bracket (or above it, depending on the position of the bracket), with the cables running through the grip.
5. Secure any loose cables, using the velcro cable ties.

Figure 3.10 shows the pole-mounted setup.

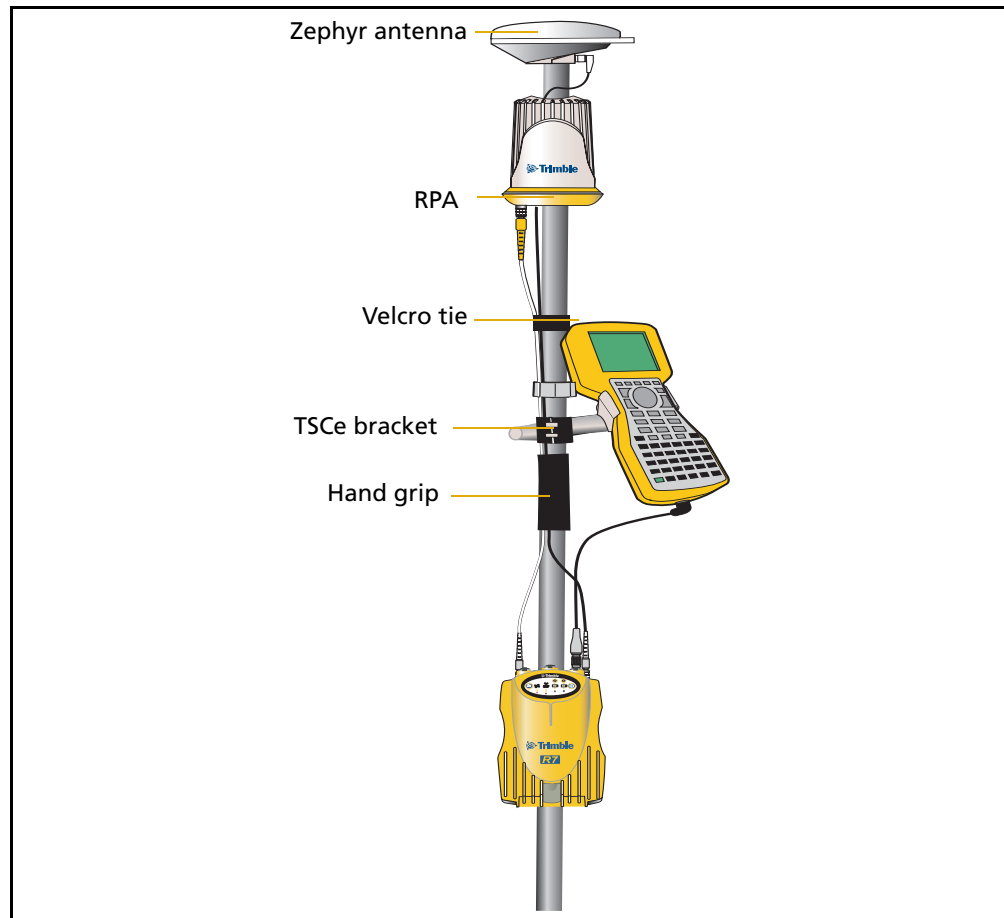


Figure 3.10 Pole-mounted setup

## Backpack setup

Both the whip and RPA antennae are suitable for use in a backpack. The RPA is installed in the same manner as for the pole-mounted setup (see [Pole-mounted setup, page 16](#)).



**Tip** – The RPA is tuned for operation with the GPS antenna cable running through it. Operating it from a backpack may reduce its operating range. Trimble recommends that you use the whip antenna.

To set up the Trimble R7 GPS receiver for use in a backpack:

1. Insert the receiver into the backpack with the ports on the top panel facing upwards and the front panel facing outwards. Secure the receiver around the middle with the velcro strap.
2. Attach the Zephyr™ antenna to a range pole.
3. Attach the whip antenna mount to one of the fittings on the top of the backpack.

4. The backpack has a feedthrough on both sides at the top and on both sides near the bottom to allow cables to be positioned out of the way of the main zipper. Run the radio communications cable through at the top, and connect it to the blue TNC port on the receiver.
5. Connect the straight end of the yellow GPS cable to the yellow TNC port on the receiver.
6. Run the right-angle connector on the yellow GPS cable through the top or side slot on the backpack, and then connect it to the Zephyr antenna.
7. Connect one end of the 6 ft 0-shell to 0-shell cable to Port 1 on the receiver.
8. Run the 0-shell cable through the side slot of the backpack and connect it to the TSCe controller.

Figure 3.11 shows the backpack setup.

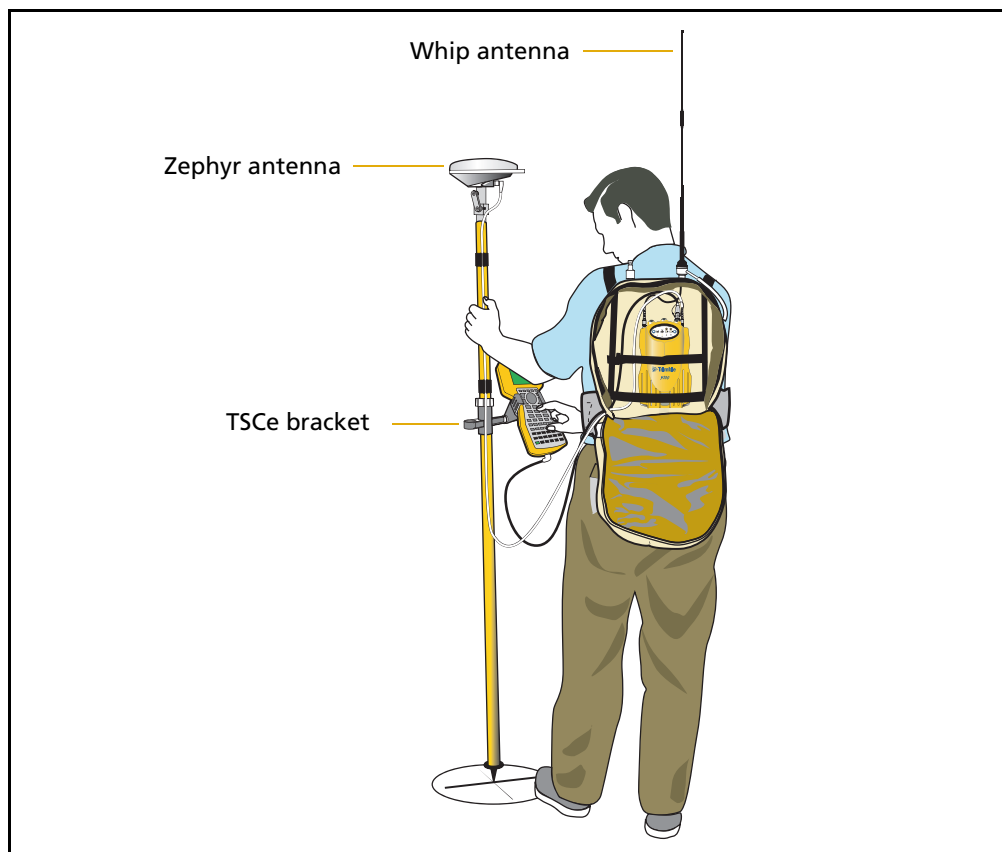


Figure 3.11 Backpack setup

## Other system components

This section describes optional components that you can use with the Trimble R7 GPS receiver.

### Radios

Radios are the most common data link for Real-Time Kinematic (RTK) surveying. The Trimble R7 GPS receiver is available with an optional internal radio in the 450 MHz UHF band. You can also connect an external radio to Port 3, whether or not the internal radio is installed.

The Trimble R7 GPS receiver supports the following Trimble base radios when using the internal receiver radio:

- TRIMMARK™ 3
- TRIMMARK IIe
- TRIMTALK™ 450S
- SiteNet™ 450
- Trimble R6 GPS and Trimble R8 GNSS receiver internal transmitter (base)
- Trimble HPB450 radio-modem

### Internal radio setup

You can configure the Trimble R7 GPS receiver optional internal radio using any of the following:

- the GPS Configurator software
- the WinFlash utility
- the Trimble Survey Controller software

For more information, refer to the *GPS Configurator Help*, the *WinFlash Help*, or the *Trimble Survey Controller User Guide*.

By default, the internal UHF radio has only a few frequencies installed. Use the WinFlash utility to configure additional frequencies. For more information, see [Adding frequencies for the 450 MHz internal radio, page 52](#).

### External radio setup

To use an external radio with the Trimble R7 GPS receiver, you need an external power source for the radio.

To set up a Trimble R7 GPS receiver using an external radio:

1. Connect one end of the yellow GPS antenna cable to the yellow TNC port on the receiver.
2. Connect the other end of the GPS antenna cable to a Zephyr or Zephyr Geodetic antenna.
3. Connect the external radio to Port 3 on the receiver.
4. Connect a radio antenna to the external radio.

Figure 3.12 shows a TRIMMARK 3 radio connected to a Trimble R7 GPS receiver.

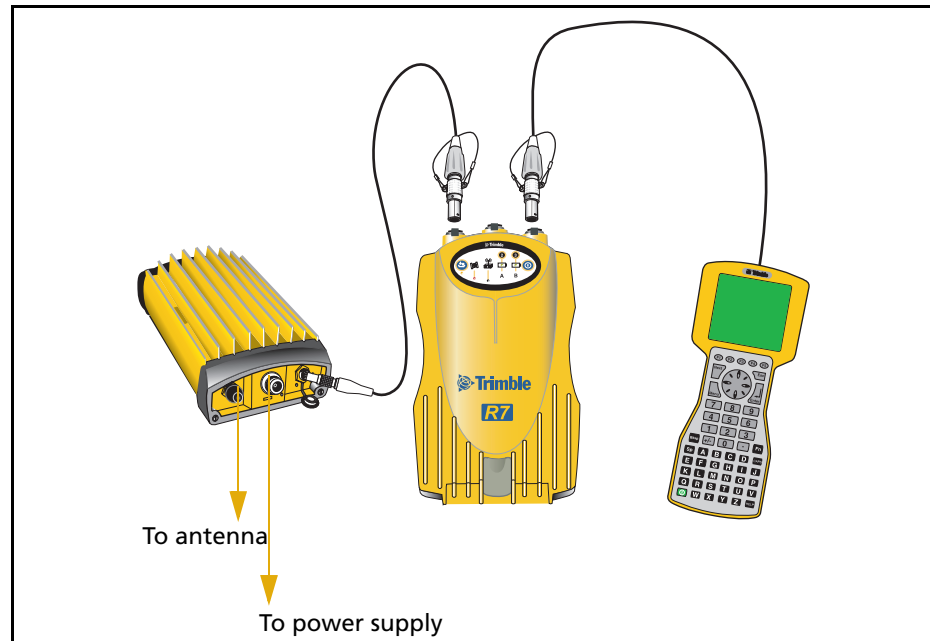


Figure 3.12 Connecting an external radio

5. Connect an external power source to Port 2 on the receiver.

**Note** – External rover radios must have their own power source because the internal Lithium-ion batteries do not supply enough voltage. Alternatively, supply external power to Port 2 of the receiver, and enable power out on Port 3. Base radios must have their own power source because of their high power consumption.

Alternatively, you can apply external power directly to the radio, if it supports it.

You can use a 10 Ah battery, a 6 Ah battery, or camcorder batteries. The choice of power supply depends on the application, and whether you are using the radio as a reference or rover radio. For more information about the power capabilities of the Trimble R7 GPS receiver, see [Batteries and power, page 32](#).

6. Configure the external radio using Trimble Survey Controller software. Alternatively, you can configure a TRIMMARK 3 radio using the WinFlash utility or the configuration software supplied with the radio.

For more information, refer to the *Trimble Survey Controller User Guide* or the appropriate Help.

7. Set up any other equipment as required, depending on whether you are using the radio as a reference or a rover radio.

### Cellular modems

You can use a cellular modem instead of a radio as your data communications link. Cellular modems and other radio links can be used to extend the limits of your surveys.

To connect a cellular modem to a Trimble R7 GPS receiver, you need the following:

- A Trimble R7 GPS receiver
- A custom-designed cellular modem, or a cellphone that can transmit and receive data
- Serial (cellphone to DB9) cable (supplied with the cellular modem or phone)
- Trimble DB9 to 0-shell Lemo cable

**Note** – This cable is suitable only if flow control can be disabled on the cellular modem. If the cellular modem does not support this functionality, a special cable is required. For more information, refer to the document *Using Cellular and CDPD Modems for RTK*, which is available from your local Trimble Distributor.

Figure 3.13 shows the components required to connect a cellphone to a Trimble R7 GPS receiver.

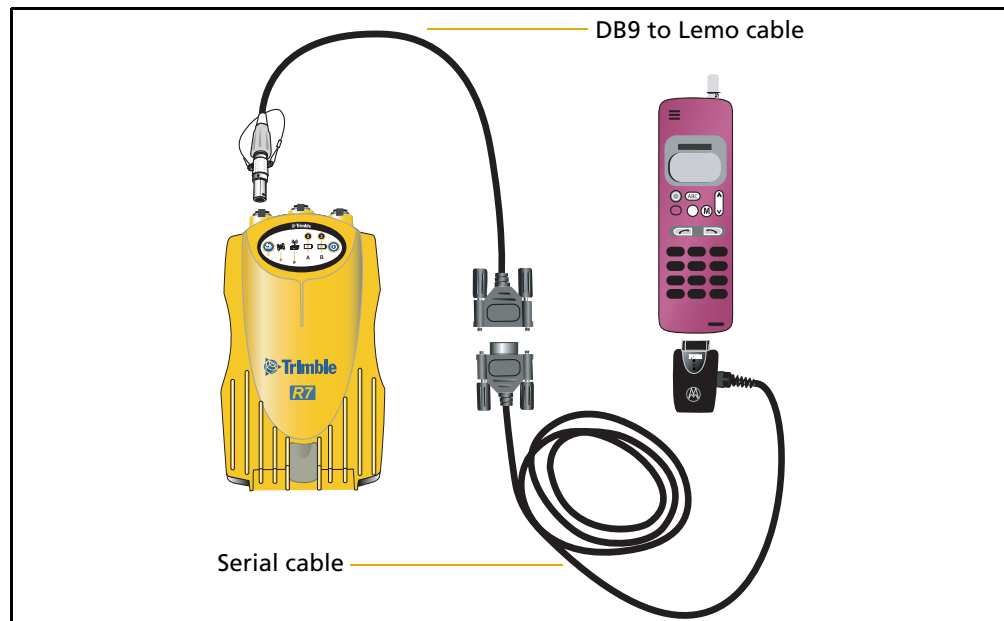


Figure 3.13 Connecting a cellphone

For more information on using a cellular modem as a data link, refer to the *Trimble Survey Controller User Guide*.

## Antennas

The Trimble R7 GPS receiver should normally be used with a Zephyr or Zephyr Geodetic antenna, which have been designed specifically for use with this receiver.

Use [Figure 3.14](#) as a guide for measuring the height of the Zephyr and Zephyr Geodetic antennas. The Zephyr antenna is designed to be measured to the top of the notch. The Zephyr Geodetic (shown) has been designed to be measured to the bottom of the notch.

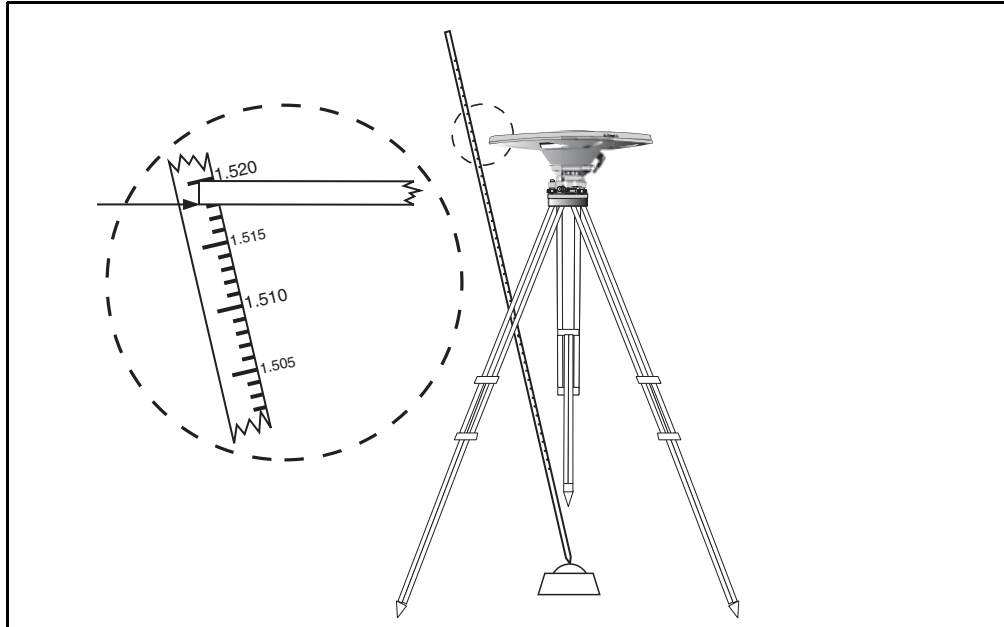


Figure 3.14 Measuring antenna height

Older models of antennas, such as the Choke Ring or Micro-Centered™ L1/L2 antennas, need more power to operate than the Zephyr models. To configure the receiver to output more power on the antenna port, select the correct antenna type in GPS Configurator, or through the Trimble controller. For information on how to do this, contact your local Trimble Service Provider.

## CompactFlash cards

The Trimble R7 GPS receiver logs data internally on a CompactFlash card. However, it only support the Type I CompactFlash card. Trimble recommends that you use an industrial-rated CompactFlash card, as commercial cards have a limited operating temperature range.

Before logging data to a CompactFlash card, format the card to ensure the integrity of the file system. To format the card, insert it in the receiver and then hold down the power button for 30 seconds.

**Note** – Make sure that you format your CompactFlash card in the receiver. This prevents data on the card from being corrupted if the card is removed while data is being logged. Formatting the card in your computer may cause data corruption, or loss of data.

When inserting the card, make sure that it slides into the card slot properly.



---

**WARNING** – The Trimble R7 GPS receiver allows for a maximum of 512 files on the CompactFlash card, regardless of the card's capacity. The file names must be in 8.3 format, otherwise, files copied to the CompactFlash card may cause data corruption or loss of data when logging.

---



---

**WARNING** – If the card does not seat into the pins correctly, do **not** use force or you may damage the pins. Remove the card and carefully reinsert it.

---



# General Operation

## In this chapter:

- Front panel controls
- Button functions
- LED behavior
- Starting and stopping the receiver
- Logging data
- Resetting to defaults
- Formatting a CompactFlash card
- Batteries and power

All the controls that you need for general operation of the Trimble R7 GPS receiver are located on the front panel.

For more information about other panels of the Trimble R7 GPS receiver, see [Parts of the receiver](#), page 10.

## Front panel controls

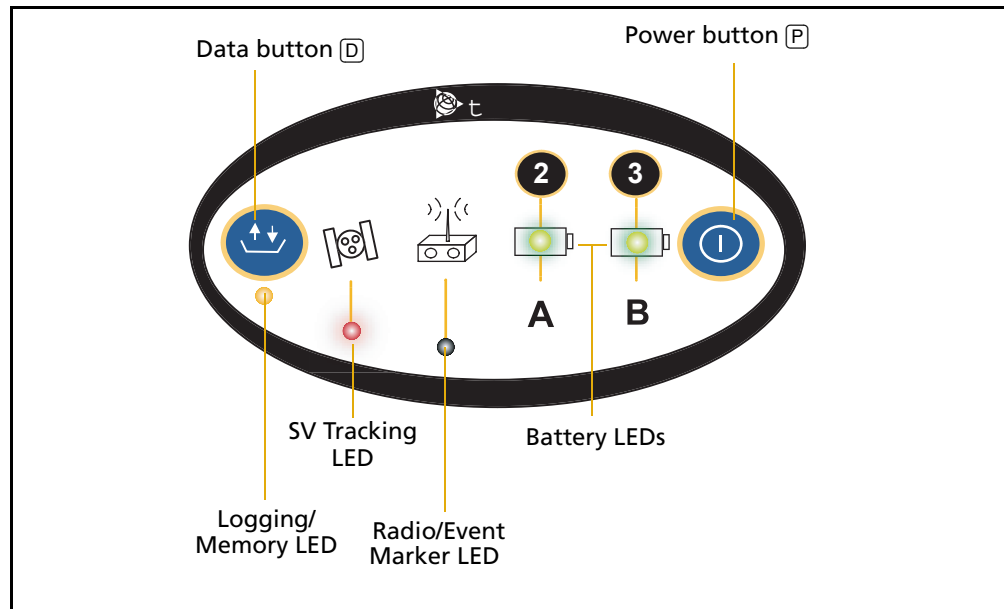


Figure 4.1 Controls on the front panel of the Trimble R7 GPS receiver

## Button functions

The Trimble R7 GPS receiver has only two buttons: in this manual, the Power button is represented by **P**, and the Data button by **D**.

Press **P** to switch the receiver on or off, and to perform data management functions such as deleting files or resetting the receiver.

Press **D** to start or stop logging. This button is only effective when the receiver is switched on and has completed any power-up and initialization tasks.

Table 4.1 describes the main functions of the two buttons.

Table 4.1 Button functions

Action	Power button	Data button
Turn on the receiver	Press	
Turn off the receiver	Hold for 2 seconds	
Start logging data internally		Press
Stop logging data internally		Hold for 2 seconds
Delete the ephemeris file	Hold for 15 seconds	
Reset the receiver to factory defaults	Hold for 15 seconds	
Delete application files	Hold for 30 seconds	
Format the CompactFlash card	Hold for 30 seconds	


**Note** – The term “press” means to press the button and release it immediately. The term “hold” means to press the button and hold it down for the given time.

## LED behavior

The five LEDs on the top panel of the receiver indicate various operating conditions. Generally, a lit or slowly flashing LED indicates normal operation, an LED that is flashing quickly indicates a condition that may require attention, and an unlit LED indicates that no operation is occurring. The following table defines each possible LED state.

The term ...	means that the LED ...
Flash	is lit briefly every 3 seconds
Slow flash	alternates slowly between being lit and unlit
Fast flash	alternates rapidly between being lit and unlit
On	is lit
Off	is unlit

## Logging/memory LED

The yellow Logging/memory LED below the  button indicates the status of data logging and memory usage.


Behavior	Meaning
On	Data is being logged.
Slow flash	Enough FastStatic data has been logged. Alternatively, if the red SV tracking LED is on solid at the same time, the receiver is in Monitor mode, and is checking for new firmware to install.
Fast flash	Data is being logged but memory is low.
Flash	The receiver is in Sleep mode, and will wake up five minutes before the scheduled start time of a timed application file.
Off	Data is not being logged, or the CompactFlash card is full.

## SV tracking LED

The red SV tracking LED below the SV icon  indicates the status of satellite tracking.


Behavior	Meaning
Slow flash	Tracking four or more satellites.
Fast flash	Tracking three or fewer satellites.
Off	Not tracking any satellites.
On	The receiver is in Monitor mode, and is checking for new firmware to install.

## Radio LED

The green Radio LED below the Radio icon  indicates the status of data input and output.

Behavior	Meaning
Slow flash	A data packet or event marker has been received.


## Battery 1 LED and battery 2 LED

The Battery LEDs inside the two Battery icons  indicate the status of the two internal batteries, or the power sources connected on Ports 2 and 3.

By default, each battery LED indicates the status of the external power source on the corresponding port. If no external source is detected, each LED indicates the status of an internal battery. The color of the LED indicates whether the power source is currently in use (green) or is on standby (yellow).

Color	Meaning	Behavior	Meaning
Green	Power source is in use	On	Healthy
		Fast flash	Low power
		Off	No power source is present
Yellow	Power source is on standby	On	Healthy
		Fast flash	Low power
		Flash	Dead
		Off	No power source is present

## Starting and stopping the receiver

To turn on the receiver, press .

To turn off the receiver, hold down  for two seconds.

## Logging data

You can log data to the CompactFlash card in the receiver, or to the survey device.

### Logging internally

The Trimble R7 GPS receiver logs GPS data internally on a CompactFlash card. You can then use the Trimble Data Transfer utility to transfer logged data files to your office computer. The transferred files are in Trimble DAT (.dat) format.



**WARNING** – The Trimble R7 GPS receiver allows for a maximum of 512 files on the CompactFlash card, regardless of the card's capacity. The file names must be in 8.3 format, otherwise, files copied to the CompactFlash card may cause data corruption or loss of data when logging.

Data is logged using the current logging settings configured in the receiver. Data files logged internally are named automatically.

To begin internal logging, press [D]. The Logging/memory LED lights up.

To stop logging, hold down [D] for at least two seconds. The Logging/memory LED turns off.

**Note** – When the CompactFlash card is full, the receiver stops logging data, and the Logging/memory LED turns off. Existing data files are not overwritten.

Approximate storage requirements for different logging rates are shown below. The values shown are for a one-hour logging session with six satellites visible.

Logging rate	Memory required
10 Hz	2,588 KB
1 Hz	335 KB
5 seconds	87 KB
15 seconds	37 KB

**Note** – If power is lost, or the CompactFlash card is removed while logging, the file system is designed so that a maximum of ten seconds of data will be lost, regardless of the logging rate. To ensure that this behavior occurs, use GPS Configurator to perform a quick format of the CompactFlash card before logging data to the card for the first time.

## Logging to a Trimble controller

When the Trimble R7 GPS receiver is connected to a Trimble controller, you can log GPS data from the receiver to the controller, or to a PC card inserted in the controller. When you use a Trimble controller, you do not use the receiver's controls. Instead, you use the controller functions to set logging options, specify filenames, and to control when logging occurs.

Data is stored in job files, which can be transferred to your office computer using the Trimble Data Transfer utility.

For more information on logging data from a receiver using a Trimble controller, refer to the user guide for your particular controller.

## Resetting to defaults




---

**WARNING** – Do not hold down **[P]** for more than 30 seconds. After 30 seconds, any application files stored in the receiver are deleted and the CompactFlash card is reformatted.

---

To reset the receiver to its factory default settings, hold down **[P]** for at least 15 seconds.

Resetting the receiver to its factory defaults also deletes any ephemeris file in the receiver.

For more information, see [Chapter 9, Default Settings](#).

## Formatting a CompactFlash card




---

**WARNING** – Formatting a CompactFlash card while it is in the receiver deletes all the data files on the card and all the application files in the receiver.

---

To format a CompactFlash card for use in a Trimble R7 GPS receiver, insert the card in the CompactFlash port and then hold down **[P]** for at least 30 seconds. After 15 seconds, the receiver is reset to its factory defaults, and any ephemeris file is deleted. After 30 seconds, any files stored on the card are deleted and the CompactFlash card is reformatted.

***Note** – When you use **[P]** to format the CompactFlash card, a quick format is performed. A quick format reformats the card for use with the Trimble R7 GPS receiver and deletes all data on the card. A full format checks the card for errors or bad sectors, and is only necessary if the card is corrupted. To perform a full format, use the GPS Configurator software. For more information, see [The GPS Configurator software, page 50](#).*

## 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.
-

The Trimble R7 GPS receiver can be powered either by its two internal batteries or by an external power source connected to Port 2 or Port 3. The charge provided by the internal batteries depends on the type of survey and operating conditions. Typically, one battery provides about 3.5 hours of power during an RTK survey using the internal radio, and about 5 hours during a survey without the internal radio.

The external power source is always used in preference to the internal batteries. When there is no external power source connected, or if the external power supply fails, the internal batteries are used. The internal batteries are drained in turn, and the receiver automatically switches to the full battery when the first battery is drained.

If no external power is supplied and both internal batteries are drained, none of the data that you have logged is lost. When internal or external power is restored, the receiver restarts in the same state as when power was lost. For example, if the receiver was logging data, the data file is not corrupted, and when power is restored the receiver resumes logging with the same settings as before.

The power supply that comes with the Trimble R7 GPS receiver charges the internal batteries while they are still in the receiver. To do this, connect the power supply to the power/serial data cable, connect the cable to Port 2 on the receiver and then connect the power supply to an AC power source, as shown in [Figure 4.2](#).

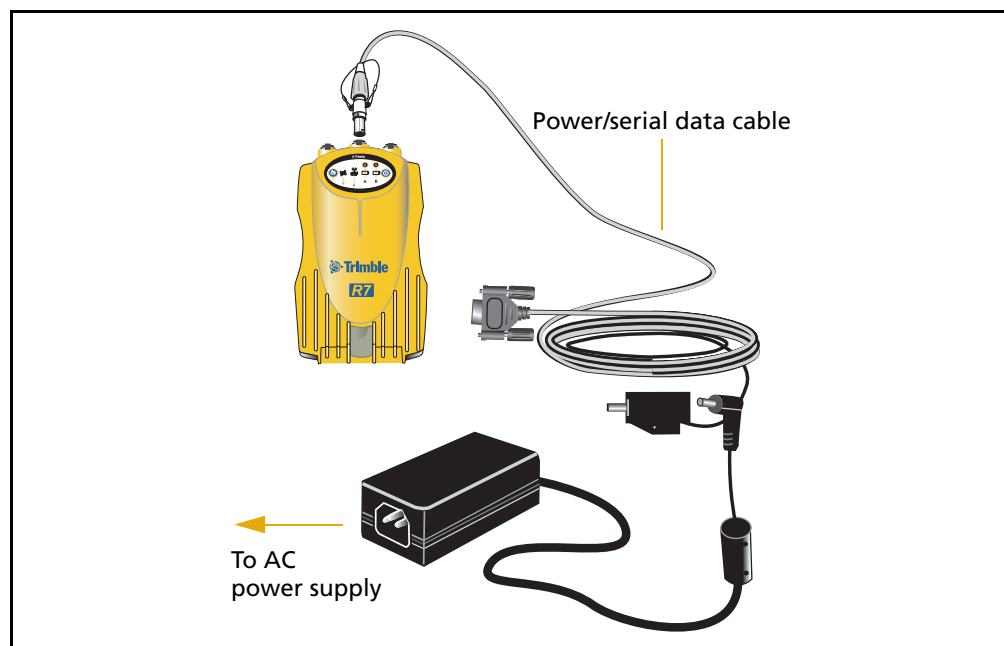


Figure 4.2 Charging the batteries

The two internal batteries take approximately eight hours to charge. They are charged individually, so each battery takes approximately four hours to charge. The internal batteries start charging whenever an external power supply of greater than 15 V is detected.



**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.

Each receiver in your system is supplied with two internal Lithium-ion battery packs. To charge both sets of batteries, connect both receivers to power supplies as shown in Figure 3.2.

### Battery charging and storage

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 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 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.

### 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.

To protect the battery from deep discharge (5 V or less), the Trimble R7 GPS receiver is designed to switch batteries or cease drawing power when the battery pack discharges to 5.9 V.

A battery that has reached the deep discharge level cannot be recharged and must be replaced. The following recommendations provide optimal performance and extend the life of your batteries:

- Fully charge all new batteries before use.



- Do not allow the batteries to discharge below 5 volts.
- 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.

### Operating with the TSCe controller

If the receiver is being powered by its internal batteries, it does not supply power to the TSCe controller when they are connected. However, the TSCe controller batteries and the Trimble R7 GPS receiver batteries can be charged at the same time from the same power supply. To charge both sets of batteries, use two standard power/serial data cables to connect the TSCe controller and the receiver to a power supply, as shown in Figure 4.3.

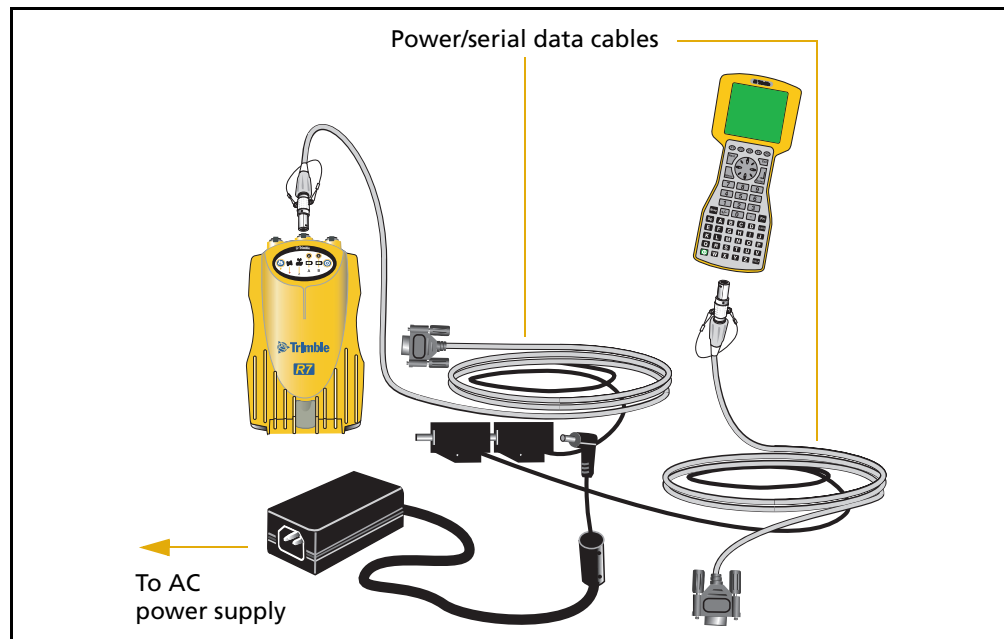


Figure 4.3 Charging receiver and TSCe batteries

## Power output

If the receiver is being supplied with power from an external source, power is automatically output on Port 1. The output voltage is approximately 0.5 V less than the input voltage. Port 1 outputs a maximum voltage of 20 V, even if the input voltage is higher.

You can use GPS Configurator or Trimble Survey Controller software to enable power output on Port 3. Port 3 can be enabled for power output regardless of whether power is supplied internally or externally.

On Port 3, the output voltage is approximately 0.5 V less than the input voltage. For example, if power is being supplied from the internal Lithium-ion batteries, the maximum battery voltage is 8.4 V, so the maximum output voltage is 7.9 V.

**Note** – When you start a survey using the Trimble Survey Controller software, and you are using an external radio, the software automatically enables power output on Port 3.

## Firmware

A receiver's *firmware* is the program inside the receiver that makes the receiver run and controls the hardware. When you need to upgrade the firmware for your Trimble R7 GPS receiver, Trimble recommends that you use the WinFlash utility. For more information, see [The WinFlash utility, page 50](#).




---

**WARNING** – Upgrading the firmware deletes all application files on the Trimble R7 GPS receiver.

---

An alternative method of upgrading your firmware is to copy the .elf file directly to the CompactFlash card from your computer:

1. Connect the CompactFlash card to your desktop computer.
2. Using Windows Explorer, copy the .elf file from your computer to the CompactFlash card.
3. Disconnect the CompactFlash card from your computer and insert it into the receiver.
4. Turn the receiver off.
5. Hold down **[D]** and press **[P]**.

The receiver starts up in Monitor mode, automatically detects the newer version of the firmware, and installs it. In Monitor mode, the red SV tracking LED is lit solidly and the yellow Logging/memory LED flashes slowly.

The upgrade takes about two minutes. Once the upgrade procedure is complete, the receiver restarts automatically.

# Configuration

## In this chapter:

- [Configuring the receiver in real Time](#)
- [Configuring the receiver using application files](#)
- [Application files](#)

The Trimble R7 GPS receiver has no controls for changing settings. To configure the receiver, use external software, such as GPS Configurator or Trimble Survey Controller.

To configure the Trimble R7 GPS receiver, do one of the following:

- Configure the receiver in real time
- Apply the settings in an application file

This chapter provides a brief overview of each of these methods, and describes the contents and use of application files.

## Configuring the receiver in real time

The GPS Configurator and Trimble Survey Controller software support real-time configuration of the Trimble R7 GPS receiver.

When you configure the receiver in real time, you use one of these software applications to specify which settings you want to change. When you apply the changes, the receiver settings change immediately.

Any changes that you apply to the receiver are reflected in the current application file, which is always present in the receiver. The current application file always records the most recent configuration, so if you apply further changes (either in real time or using an application file) the current file is updated and there is no record of the changes that you applied originally.

For more information on configuring the receiver in real time, see [Chapter 7, Software Utilities](#).

## Configuring the receiver using application files

An application file contains information for configuring a receiver. To configure a receiver using an application file, you need to create the application file, transfer it to the receiver, and then apply the file settings. The GPS Configurator software does this for you automatically when you work with configuration files.

For more information on applying application files, see [Chapter 7, Software Utilities](#).

## Application files

An application file is organized into records. Each record stores configuration information for a particular area of receiver operation. Application files can include the following records:

- File Storage
- General Controls
- Serial Port Baud/Format
- Reference Position
- Logging Rate
- SV Enable/Disable
- Output Message
- Antenna
- Device Control
- Static/Kinematic
- Input Message

- Timed Activation

An application file does not have to contain all of these records. When you apply an application file, any option that is not included in the records in the file remains at its current setting. For example, if you apply an application file that only specifies the elevation mask to use, all other settings remain as they were before the application file was applied.

You can store up to twenty different application files in battery-backed memory on the receiver. You can apply an application file's settings at the time it is transferred to the receiver, or at any time afterwards.

## Special application files

The Trimble R7 GPS receiver has three special application files, which control important aspects of the receiver's configuration.

### Default application file

The default application file (Default.cfg) contains the original receiver configuration, and cannot be changed. This file configures the receiver after it is reset. To reset the receiver, hold down **[P]** for at least 15 seconds, or use the reset option in the GPS Configurator software.

For more information, see [Default settings, page 60](#).

Although you cannot change or delete the default application file, you can use a power up application file to override any or all of the default settings.

### Current application file

The current application file (Current.cfg) reflects the current receiver configuration. Whenever you change the receiver's configuration, either in real time or by applying an application file, the current file changes to match the new configuration.

You cannot delete the current file or change it directly, but every change to the receiver's current configuration is applied to the current file as well.

When you turn off the receiver then turn it on again, all the settings from the current application file are applied, so you do not lose any changes that you have made. The only exceptions are the following logging parameters:

- Logging rate
- Position rate
- Elevation mask

These parameters are always reset to the factory default values whenever the receiver is switched off.

## Power up application file

the power up application file (Power\_up.cfg) is optional. If a power up file is present, its settings are applied whenever the receiver is turned on.

In this file, you can specify that the receiver is reset to defaults before the power up settings are applied. This ensures that restarting the receiver always results in the same configuration. This method is useful for defining “default” settings for the receiver that differ from those in the default file, which cannot be changed.

Alternatively, you can specify that the power up settings are applied immediately after the current application file’s settings have been applied. Restarting the receiver results in a configuration that uses your default settings for the options you define in the power up file, but the current settings for all other options.

By default, there is no power\_up application file on the receiver. To use a power up application file, you must create and save a power\_up application file in the GPS Configurator software. If you save this file to disk, the file is called power\_up.cfg. The extension .cfg is used by convention to identify application files on the office computer. When you transfer this file to the receiver, the file is saved on the receiver as power\_up, and becomes the new power up file.

The power up file is the only special application file that you can overwrite or delete from the receiver.

## Timed application files

A timed application file contains a Timed Activation record which specifies when this file is to be applied. The main use of a timed application file is to automatically start or stop logging at a predefined time.

The Timed Activation record specifies:

- the UTC date and time when the application file is to be applied for the first time
- the interval at which the file is to be reapplied

If you do not specify a repeat interval, the settings are applied only once, at the specified time. If the file specifies a repeat interval, the file’s settings are reapplied at the specified interval until the file is deactivated.

**Note** – *If the receiver is logging continuously, the current logging takes precedence over any timed application file stored in the receiver.*

## Defining timed application files

To send timed application files to a Trimble R7 GPS receiver, set up scheduled survey sessions in the GPS Configurator software. You can define multiple sessions, each specifying:

- basic logging parameters (data logging rate, position logging rate, and elevation mask)

- a starting time
- a duration

When you apply the current settings in the GPS Configurator software, each defined survey session is sent to the Trimble R7 GPS receiver as a pair of timed application files: the first includes the logging settings and start time, and the second contains settings that stop logging at the end time (which is calculated automatically from the duration you specify).

For more information on scheduled survey sessions, refer to the GPS Configurator Help.

The receiver can store up to 20 application files, so you can define a maximum of 10 scheduled survey sessions (10 pairs of start/stop timed application files).

### Sleep mode

Whenever you press  $\text{P}$  to turn off the Trimble R7 GPS receiver, the receiver checks for a timed application file that is due to be activated in the future. If one exists, the receiver goes into Sleep mode instead of turning off.

In Sleep mode, the yellow Logging/Memory LED flashes every three seconds. The receiver wakes up five minutes before the scheduled activation time, so that it is ready to begin logging at the scheduled time.

### Applying application files

An application file's settings do not affect the receiver's configuration until you **apply** the application file. You can do this at the same time that you save the file. Alternatively, save the file on the computer or in the receiver, then open it later and apply its settings.

***Note** – If the application file is a timed file, its settings do not take effect as soon as you apply the file, but at the time that the file specifies for its activation.*

### Storing application files

You can store application files that you create in the GPS Configurator software on the receiver and on the computer. For example, each file can represent a different user sharing the same receiver, or a particular mode of operation or survey style. Saving application files on your computer as well as in your receiver is optional, but it is useful because:

- it gives you a permanent copy of the settings you have sent to a receiver, for audit or your own reference.
- you can use the same file to configure multiple receivers identically.
- you can use an existing application file as a template to create other application files with similar settings.

## Naming application files

The application filename in the office computer and in the receiver is always the same. This makes it easier to recognize and keep track of your application files.

When you change the name of the application file in the receiver, this changes the application filename on your computer. When you transfer an application file from the receiver and save it to the computer, the system renames the file to match the internal receiver file. However, if you use Windows Explorer, for example, to change the .cfg filename on the computer, this **does not** change the internal receiver filename. This means that the GPS receiver does not recognize the change to the filename on the computer.



## Transferring Data

### In this chapter:

- Connecting to the office computer
- Transferring data
- Transferring files directly from a CompactFlash card
- Deleting files in the receiver
- Supported file types

The Trimble R7 GPS receiver keeps satellite measurements and other data in files stored on a CompactFlash card. These files cannot be processed until you transfer them to your office computer.

*Note – The receiver supports a maximum of 512 files on the CompactFlash cards.*

When you return to the office with a completed survey, transfer the field data to a computer that has the Trimble Geomatics Office™ software installed. You can then process the survey data in the Trimble Geomatics Office software to produce baselines and coordinates.

## Connecting to the office computer

The Trimble R7 GPS receiver has three serial (COM) ports and one USB port to connect to the office computer. A USB connection is up to ten times faster than normal serial communications.

Use the standard power/serial data cable to connect the receiver to the computer, as shown in [Figure 6.1](#).

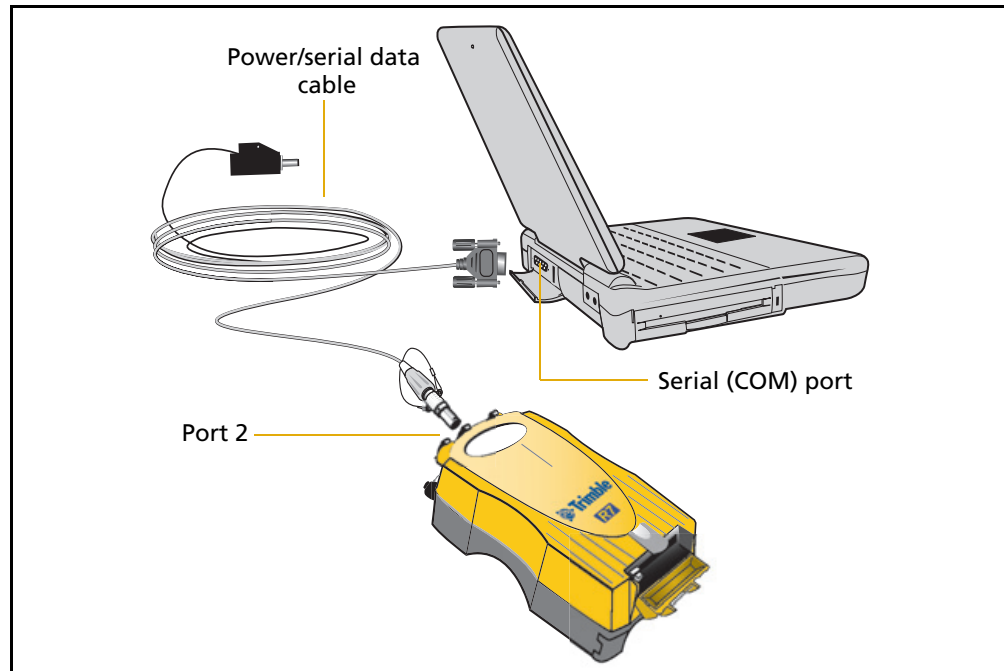


Figure 6.1 Connecting the Trimble R7 GPS receiver to a computer for serial data transfer

Use the USB cable to connect the receiver to the computer, as shown in [Figure 6.2](#).

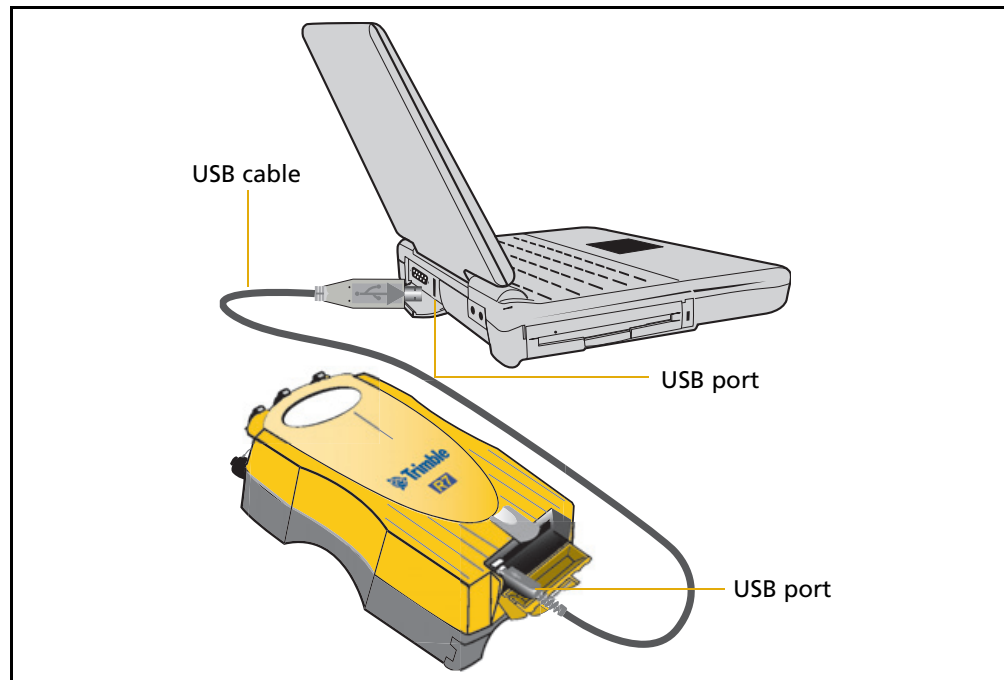


Figure 6.2 Connecting the Trimble R7 GPS receiver to a computer for USB data transfer

**Note** – When the receiver is connected to a USB port on a computer, it is treated as a peripheral device of the computer. If the receiver is unplugged or turned off, a warning message appears on the computer.

## Transferring data

Transfer the data files to the computer using the Trimble Data Transfer utility. You can run this utility as a standalone program or from within the Trimble Geomatics Office software. For more information, refer to the *Data Transfer Help*.

**Note** – When you connect to a receiver in the Data Transfer utility, you must use a GPS Receiver (R/5000 Series) device definition. If you use a GPS Receiver (4000 Series) device definition, the Data Transfer utility cannot establish communication with the receiver.

When transfer is complete, the Data Transfer utility automatically converts the file to the DAT format. If you are using Data Transfer from within the Trimble Geomatics Office software, the *Check-in* dialog appears. For more information, refer to the *Trimble Geomatics Office User Guide*.

**Note** – A file in DAT format is approximately six times the size of the corresponding file in the Trimble R7 GPS receiver internal format. Before transferring files, make sure that there is enough space on your computer.

## Transferring files directly from a CompactFlash card

In a Trimble R7 GPS receiver, all data is stored on an internal CompactFlash card. There are two ways to transfer files between the receiver and the office computer:

- Connect the receiver to the office computer and use the Data Transfer utility to transfer files.
- Remove the CompactFlash card from the receiver and connect it directly to your office computer, where it functions like a normal disk drive. Use Windows Explorer to transfer files.

When you use the Data Transfer utility to transfer data files from the CompactFlash card while it is still inserted in the receiver, the Data Transfer utility converts the raw receiver data (.T01) files you select into the Trimble DAT file format.

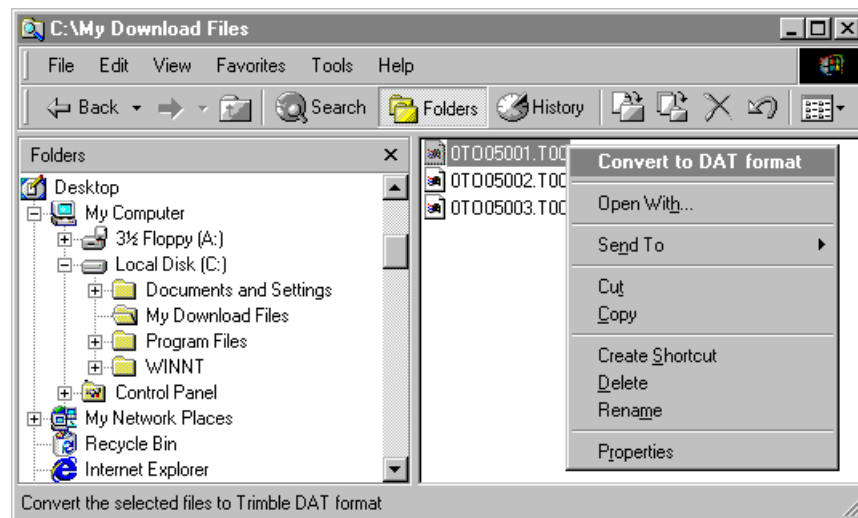
However, if you connect the CompactFlash card to your computer and then copy or move files to your computer, it treats the card like any other disk drive, and transfers the files without converting them. You need to convert these raw receiver files to DAT format files before you can use them on your office computer.

You can convert receiver data files using a Windows Explorer extension, which is installed on your computer when you install the Data Transfer utility.

**Note** – *Although this extension is only available if you have the Data Transfer utility installed, you do not have to run the Data Transfer utility to use it.*

To convert a .T01 file on your office computer into the DAT format:

1. On your office computer, open Windows Explorer and navigate to the location of the .T01 file.
2. Right-click the file, and select *Convert to DAT format* from the shortcut menu:



The *DAT File Conversion* dialog appears while the file is converted. When the dialog disappears, the file conversion is complete.

A new file with the same filename but a .dat extension appears in the same folder as the .T01 file.

## Deleting files in the receiver

You can delete files stored in the receiver at any time. Do one of the following:

- Use the Data Transfer utility in the Trimble Geomatics Office software.
- Use the TSCe controller.
- Turn on the receiver and then hold down **[P]** for 30 seconds. When you use this method, **all** data is deleted, and the CompactFlash card is reformatted.
- Use the GPS Configurator software.

## Supported file types

Table 6.1 shows the file types that you can transfer to or from a Trimble R7 GPS receiver, and the software or utility that you must use to transfer each file type.

Table 6.1 Supported file types

File Type	Extensions	Transfer from Trimble R7 GPS receiver?	Transfer to Trimble R7 GPS receiver?	Software / utility
Ephemeris	.eph	Yes	No	Data Transfer
Raw observations	.T01, .dat	Yes	No	Data Transfer
Receiver firmware files	.elf	No	Yes	WinFlash
Application files	.cfg	Yes	Yes	GPS Configurator

**Note** – The Trimble R7 GPS receiver supports a maximum of 512 files on the CompactFlash card. Files stored on the compact flash must be 8.3 format. The Trimble R7 GPS receiver does not support extended file names.



## Software Utilities

### In this chapter:

- [The GPS Configurator software](#)
- [The WinFlash utility](#)

This chapter provides information on the software utilities that you can use with the Trimble R7 GPS receiver.

## The GPS Configurator software

GPS Configurator is office software that configures selected Trimble GPS receivers.

This software enables you to:


- edit and save configuration files to the receiver and the computer
- check current receiver settings and operation
- change receiver settings in real time

### Installing the GPS Configurator software

A copy of the GPS Configurator software is included on the receiver CD.

1. Insert the disk into the CD drive on your office computer.
2. From the main menu, select *Install individual software packages*.
3. Select *Install GPS Configurator vX.XX*.
4. Follow the on-screen instructions.

### Configuring the Trimble R7 GPS receiver using the GPS Configurator software

1. Connect Port 1 or 2 on the receiver to a serial (COM) port on the computer and then apply power.
2. To start the GPS Configurator software, click  and then select *Programs / Trimble / GPS Configurator / GPS Configurator*.
3. In the *Device Type* dialog, select *Trimble R7 GPS receiver*.  
The software automatically establishes a connection with the receiver.
4. Make appropriate selections for your required receiver settings.  
For more information, refer to the *GPS Configurator Help*.
5. Click **Apply**.

The settings in the GPS Configurator software are applied to the receiver.

## The WinFlash utility

The WinFlash utility communicates with Trimble products to perform various functions including:

- installing software, firmware, and option upgrades
- running diagnostics (for example, retrieving configuration information)
- configuring radios

For more information, online help is also available when using the WinFlash utility.

**Note** – *The WinFlash utility runs on Microsoft Windows 95, 98, 2000, Me, XP, or Windows NT® operating systems.*



## Installing the WinFlash utility

Install the WinFlash utility from the *receiver* CD:

1. Insert the disk into the CD drive on your computer.
2. From the main menu, select *Install individual software packages*.
3. Select *Install WinFlash vX.XX with Trimble R7 GPS receiver drivers and firmware* and then follow the on-screen instructions.

Alternatively, install the WinFlash utility from the Trimble website.

## Upgrading firmware

Your Trimble R7 GPS receiver is supplied with the latest version of receiver firmware installed. If a later version becomes available, upgrade the firmware installed on your receiver.

The WinFlash utility guides you through the firmware upgrade process, as described below. For more information, refer to the *WinFlash Help*.

To upgrade the Trimble R7 GPS receiver firmware:

1. Start the WinFlash utility. The *Device Configuration* screen appears.
2. From the *Device type* list, select Trimble R7 GPS receiver.
3. From the *PC serial port* field, select the serial (COM) port on the computer that the receiver is connected to.
4. Click **Next**.

The *Operation Selection* screen appears. The *Operations* list shows all of the supported operations for the selected device. A description of the selected operation is shown in the *Description* field.

5. Select *GPS software upgrade* and then click **Next**.

The *GPS Software Selection* dialog appears. This screen prompts you to select the software that you want to install on the Trimble R7 GPS receiver.

6. Select the latest version from the *Available Software* list and then click **Next**.

The *Settings Review* dialog appears. This screen prompts you to connect the receiver, suggests a connection method and then lists the receiver configuration and selected operation.

7. If all is correct, click **Finish**.

Based on your selections, the *Software Upgrade* window appears and shows the status of the operation (for example, **Establishing communication with the Trimble R7 GPS receiver. Please wait.**)

8. Click **OK**.

The *Software Upgrade* window appears again and states that the operation was completed successfully.

9. Click **Menu** to select another operation, or click **Exit** to quit WinFlash.
10. If you click **Exit**, another screen appears asking you to confirm that you want to quit. Click **OK**.

### Adding frequencies for the 450 MHz internal radio

If your receiver has the optional internal radio installed, you can use the WinFlash utility to add receiving frequencies to the default list:

1. Start the WinFlash utility. The *Device Configuration* dialog appears.
2. From the *Device type* list, select Trimble R7 GPS receiver.
3. From the *PC serial port* field, select the serial (COM) port on the computer that the receiver is connected to.
4. Click **Next**.

The *Operation Selection* screen appears. The *Operations* list shows all of the supported operations for the selected device. A description of the selected operation is shown in the *Description* field.

5. Select Configure Radio and then click **Next**.

The *Frequency Selection* dialog appears:

**Frequency Selection**

You have connected to a Trimble R7 Internal

Frequency Band: 410.0 - 430.0 MHz

Wireless Format

Current Channel: 1 - 419.550 MHz

Wireless Mode: TRIMTALK 450S at 9600 bps

Note: Wireless mode must be common among all radios in your network.

Channel Frequency

Specify Frequency: 419.5500 MHz

Add

Selected Frequencies:

Channel	Frequency
1	419.5500
2	420.0000
3	430.0000

Remove

Remove All

Move Up

Move Down

OK

Cancel

Radio Info...

Save...

Print

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

**Note** – The frequencies that you program must conform to the channel spacing and minimum tuning requirements for the radio. To view this information, click **Radio Info**. You may select either 12.5 or 25 kHz channel spacing. All radios in your network must use the same channel spacing.

9. When you have configured all the frequencies you require, click **OK**. The WinFlash utility updates the receiver radio frequencies and then restarts the receiver.

### Configuring the radio network using the Trimble Survey Controller software

1. Connect the data/power cable to the controller and the receiver and then turn on the controller. The receiver starts automatically.
2. From the main menu on the controller, select *Configuration*.
3. In the dialog that appears, select *Survey styles* and then select *RTK* from the *Type* field.
4. Select *Rover radio* and then select *Trimble Internal* from the *Type* field.
5. Tap the **Connect** softkey.
6. Once connected, enter the number of the network set on your base radio in the *Network number* field.

**Note** – The *Base Radio Mode* field is not used here.

7. To complete the configuration, tap the **Enter** softkey.

### Configuring the radio network using the WinFlash utility

1. Connect the data/power cable to Port 1 on the receiver.
2. Connect the female DE-9 connector on the other end of the data/power cable to a serial (COM) port on the computer.
3. Start the WinFlash utility. The *Device Configuration* dialog appears.
4. From the *Device type* list, select *Trimble R7 GPS receiver*.
5. From the *PC serial port* field, select the serial port on the computer that the receiver is connected to and then click **Next**.
6. From the *Operation selection* dialog, select *Configure radio* and then click **Next**.
7. Confirm that your current settings are correct and click **Finish**. The *Configure 900MHz radio* dialog appears.

8. In the *Network number* field, select the same network that is set on your base radio.
9. In the *Country setting* field, select one of the following (according to how your base radio was shipped):
  - Your country (if available). This sets the radio to the a specific frequency range being transmitted by the base radio.
  - A single frequency. This limits the frequencies used to those authorized in your particular country.
10. Click **OK**.

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

# Specifications

**In this chapter:**

- Physical specifications
- Positioning specifications
- Technical specifications

This chapter lists the specifications of the Trimble R7 GPS receiver.

## Physical specifications

The temperature rating of the receiver applies only when all doors on the receiver are closed.

Feature	Specification
Size	13.5 cm W x 8.5 cm H x 24 cm L (5.3 in. W x 3.4 in. H x 9.5 in. L)
Weight (with 2 batteries inserted)	1.4 kg (3.0 lb)
Battery life (at 20 °C)	RTK with internal radio: 3.5 hours No internal radio: 5 hours
Power input	11–28 V DC
Operating temperature	–40 °C to +65 °C (–40 °F to +149 °F) <sup>a</sup>
Storage temperature	–40 °C to +80 °C (–40 °F to +176 °F)
Humidity	100% condensing, unit fully sealed
Casing	Dust-proof, shock- and vibration-resistant

<sup>a</sup>The USB port operates only when the temperature is above 0 °C (32 °F). The internal batteries charge only when the temperature is in the range 0 °C to 40 °C (32 °F to 104 °F)

## Positioning specifications

Positioning	Mode	Horizontal Accuracy (RMS)	Vertical Accuracy (RMS)
RTK (OTF)	Synchronized	1 cm + 1 ppm (× baseline length)	2 cm + 1 ppm (× baseline length)
	Low Latency	2 cm + 2 ppm (× baseline length) <sup>a</sup>	3 cm + 2 ppm (× baseline length) <sup>a</sup>
L1 C/A Code Phase	Synchronized/ Low Latency	.25 m + 1 ppm RMS	.50 m + 1 ppm RMS
Static/ FastStatic	N/A	5 mm + 0.5 ppm (× baseline length)	5 mm + 1 ppm (× baseline length)
WAAS	N/A	Less than 5 m <sup>b</sup>	Less than 5 m <sup>b</sup>

<sup>a</sup>Depends on radio link latency.

<sup>b</sup>3D RMS values depend on WAAS system performance.

## Technical specifications

Feature	Specification
Tracking	24 Channels L1 C/A Code, L2C, L1/L2 Full Cycle Carrier, WAAS/EGNOS support Fully operational during P-code encryption WAAS satellite tracking
Signal processing	Maxwell™ V architecture Very low-noise C/A code processing Multipath suppression
Start-up	Cold start: < 60 seconds from power on Warm start: < 30 seconds with recent ephemeris
Initialization	Automatic while moving or static
Minimum initialization time	10 sec + 0.5 × baseline length (km)
Communications	Three RS-232 serial ports (Port 1, Port 2, and Port 3) Baud rates up to 115,200 bps RTS/CTS flow control negotiation supported on Port 3 only One USB port (download only)
Configuration	Via user-definable application files or GPS Configurator
Output formats	NMEA-0183: AVR; GGA; GSA; GST; GSV; PTNL,GGK; PTNL,GGK_SYNC; HDT; PTNL,PJK; PTNL,PJT; ROT PTNL,VGK; VHD; VTG; ZDA GSOF (Trimble Binary Streamed Output) 1PPS RT17





# Default Settings

## In this chapter:

- [Default settings](#)
- [Resetting to factory defaults](#)
- [Examples](#)

All Trimble R7 GPS receiver settings are stored in application files. The default application file, `Default.cfg`, is stored permanently in the receiver, and contains the factory default settings for the Trimble R7 GPS receiver. Whenever the receiver is reset to its factory defaults, the current settings (stored in the current application file, `current.cfg`) are reset to the values in the default application file.

You cannot modify the default application file. However, if there is a power up application file (`Power_up.cfg`) in the receiver, the settings in this file can be applied immediately after the default application file, overriding the factory defaults.

For more information, see [Application files](#), page 38.

## Default settings

These settings are defined in the default application file.

Function		Factory Default
SV Enable		All SVs enabled
General Controls:	Elevation mask	13°
	PDOP mask	7
	RTK positioning mode	Low Latency
	Motion	Kinematic
Power Output 3		Disabled
1PPS time tags		Off
ASCII time tags		Off
Serial Port 1:	Baud rate	38400
	Format	8-None-1
	Flow control	None
Serial Port 2:	Baud rate	38400
	Format	8-None-1
Serial Port 3:	Baud rate	38400
	Format	8-None-1
	Flow control	None
Input Setup:	Station	Any
NMEA/ASCII (all messages)		All Ports Off
Streamed output		All Types Off Offset = 00
RT17/Binary		All Ports Off
CMR output		[Static] CMR: cref ID 0000
RTCM output		RTCM: Type 1 ID 0000
Reference position:	Latitude	0°
	Longitude	0°
	Altitude	0.00 m HAE
Antenna:	Type	Unknown external
	Height (true vertical)	0.00 m
	Group	All
	Measurement method	Bottom of antenna mount
Logging rate		15 sec
Position rate		5 min
Measurement rate		10 Hz

## Resetting to factory defaults

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

- On the receiver, press and hold down **[P]** for 15 seconds.
- In the GPS Configurator software, select *Connect to Receiver* and then click **Reset receiver** in the *General* tab.

## Examples

The following examples show how the Trimble R7 GPS receiver uses the default settings and special application files in various situations.

### Default behavior

The factory defaults are applied whenever you start the receiver. If a power up file is present in the receiver, its settings are applied immediately after the default settings, so you can use a power up file to define your own set of defaults.

When you turn the receiver on and ...	then logging settings are ...	and logging ...
it is the first time that the receiver has been used	the factory defaults	does not begin automatically
you have reset the receiver to its factory defaults	the factory defaults, or those in the power up file <sup>a</sup>	does not begin automatically
you have performed a full reset	the factory defaults, because resetting deletes any power up file	does not begin automatically

<sup>a</sup>A factory default setting is used only if the setting is not defined in the power up file.

### Power up settings

When you turn the receiver off, any changes that you have made to logging settings are lost and these settings are returned to the factory defaults. Other settings remain as defined in the current file. The next time you turn on the receiver, the receiver checks for a power up file and, if one is present, applies the settings in this file.

When you use <b>[P]</b> to turn the receiver off then on again and ...	then logging settings are ...	and all other settings are ...
you changed the receiver settings by applying an application file	the factory defaults	the last settings used

When you use <b>[P]</b> to turn the receiver off then on again and ...	then logging settings are ...	and all other settings are ...
you changed the receiver settings using configuration software	the factory defaults	the last settings used
there is a power up application file in the receiver	the factory defaults, or those in the power up file <sup>a</sup>	the last settings used, or those in the power up file <sup>a</sup>

<sup>a</sup>A factory default setting is used only if the setting is not defined in the power up file.

## Logging after power loss

If the Trimble R7 GPS receiver loses power unexpectedly, when power is restored the receiver tries to return to the state it was in immediately before the power loss. The receiver does not reset itself to defaults or apply any power up settings. If the receiver was logging when power was lost unexpectedly, it resumes logging when power is restored.

However, when you turn off the receiver using **[P]**, the receiver behaves as if you pressed **[D]** to stop logging before you pressed **[P]**. In this case, when power is restored normally, logging does not begin until you start it manually.

When the receiver is logging data and then loses power ...	then when power is restored, data logging ...	and logging settings are ...	and all other settings are ...
unexpectedly	resumes automatically	the last settings used	the last settings used
when you press <b>[P]</b>	does not resume	the factory defaults	the last settings used

## Disabling logging

To disable logging, you can set the receiver's data logging and position logging rates to Off. However, if you press **[D]** while logging is disabled, the receiver will still log data, using the default logging settings.

When you have disabled logging ...	then if you press <b>[D]</b> to start logging, logging settings are ...
using the Trimble Survey Controller or GPS Configurator software	the factory defaults
in the power up application file	the factory defaults

## Application files

You can use application files to change the settings in the receiver. Sending an application file to the receiver does not necessarily apply the file's settings; you can apply a file's settings at any time after sending it to the receiver. You can also define timed application files. A timed application file contains receiver settings, but also includes a date and time when it is automatically activated.

If there is a timed application file on the Trimble R7 GPS receiver, the receiver automatically applies the file's settings and begins logging (if logging settings are included in the file) at the specified time. If the receiver is in Sleep mode, it wakes up five minutes before the start time of the timed application file, and then begins logging, if required, at the specified start time.

<b>When you send an application file to the receiver and ...</b>		<b>then the receiver settings are changed ...</b>
you apply the file's settings immediately		as soon as you send the file to the receiver
you apply the file later		as soon as you apply the file
it is a timed application file		at the specified activation time



## Cables and Connectors

### In this chapter:

- Port 1, 2, and 3 connectors
- Power/serial data cable
- Event marker/1PPS cable
- GPS antennas and cables

This chapter provides pinout information for the Trimble R7 GPS receiver standard and optional cables. This information can be used to build special cables for connecting the receiver to devices and instruments not supported by the standard and optional cables.

## Port 1, 2, and 3 connectors

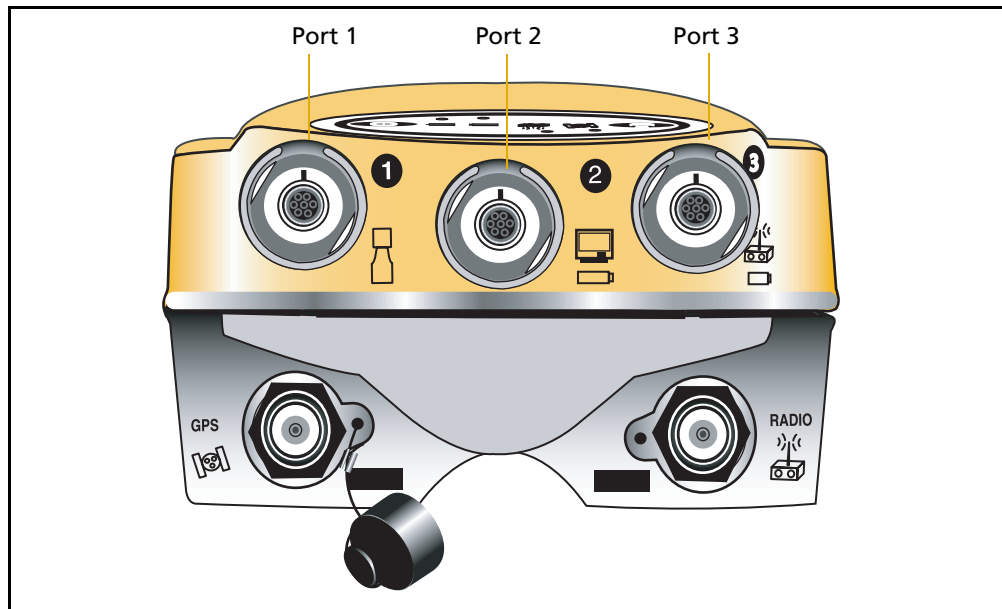


Figure 10.1 Trimble R7 GPS receiver serial ports

Figure 10.2 gives pinout requirements for the connector labeled Port 1. The pin locations for the Port 2 and Port 3 connectors are identical.

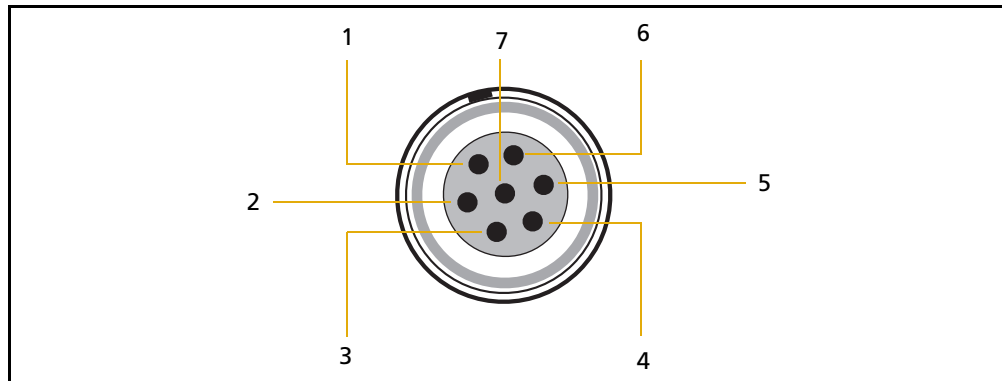


Figure 10.2 Pinout connectors for all ports

Table 10.1 Trimble R7 GPS receiver port pinout functions

Pin	Pinout function		
	Port 1 (TSCe controller, event, or computer)	Port 2 (Power in, computer, PPS, or event)	Port 3 (External radio or power in)
1	Signal GND	Signal GND	Signal GND
2	GND	GND	GND
3	TX data out (TXD1)	TX data out (TXD2)	TX data out (TXD3)
4	RTS1	1PPS	RTS3
5	CTS1/Event 2	Event 1	CTS3



Table 10.1 Trimble R7 GPS receiver port pinout functions (Continued)

Pin		Pinout function		
		Port 1 (TSCe controller, event, or computer)	Port 2 (Power in, computer, PPS, or event)	Port 3 (External radio or power in)
6	Power Out (+)		Power In (+)	Power In/Out (+)
7	Serial data in (RXD1)		Serial data in (RXD2)	Serial data in (RXD3)

## Power/serial data cable

The power/serial data cable (P/N 32345) is supplied with the Trimble R7 GPS receiver.

Table 10.2 Power/serial data cable pinouts

Lemo 0-shell connector 7 Pin		Direction	DE9-F connector 7 Conductors			Power lead 2 Conductors	
Pin	Function		Pin	Color	Function	Color	Function
1	Signal ground	↔	5	Brown	Signal ground		
2	GND	→				Black	V-OUT
3	TXD	→	2	Orange	TXD		
4	RTS/TXD	→	8	Blue	RTS		
5	CTS/RXD	←	7	Green	CTS		
6	PWR	←				Red	Power IN (+)
7	RXD	←	3	Yellow	TXD		

**Note** – Table 10.2 assumes that the cable is attached to the connector labeled Port 1 or Port 3.

## Event marker/1PPS cable

The event marker/1PPS cable shown in Figure 10.3 provides a breakout box with two BNC (female) connectors for 1PPS input and event marker output.

Connect a device that accepts 1PPS output pulses to the BNC connector labeled 1PPS on the breakout box. Connect a device that outputs event marker pulses to the Trimble R7 GPS receiver, such as a photogrammetric camera, to the BNC connector labeled Event Marker on the breakout box.

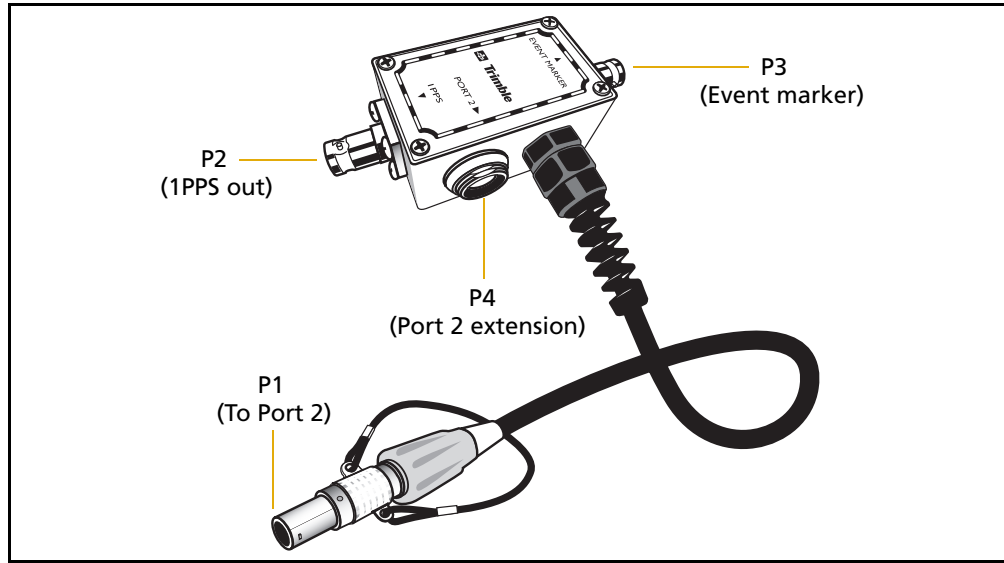


Figure 10.3 Event marker/1PPS cable

In addition, the breakout box includes a Lemo 7-pin connector to extend serial communications and/or power on Port 2. Because the BNC connectors are used to service the event marker and 1PPS features, pins 4 (1PPS) and 5 (Event Marker) are inactive on the Lemo connector.

For Port 2 pinouts, see [Port 1, 2, and 3 connectors, page 66](#). For more information on 1PPS input and event marker output, see [Chapter 11, Event Marker Input and 1PPS Output](#).

[Table 10.3](#) gives pinout information for the event marker/1PPS cable, which is supplied with the Trimble R7 GPS receiver. The event marker/1PPS cable is only used with the Trimble R7 GPS receiver connectors labeled Port 1 (for event marker output) and Port 2.

Table 10.3 Event marker/1PPS cable pinouts

P1: Lemo 7-Pin Port 2 Trimble R7 GPS receiver		Direction	P2: BNC-F connector (1PPS)	P3: BNC-F connector (Event marker)	P4: Lemo 7s Port 2 extension	
Pin	Trimble R7 GPS receiver function		Pin	Pin	Pin	Function
1	Signal ground	←			1	Signal ground
2	GND	→	GND	GND	2	GND
3	Serial data out (TXD2)	←			3	Serial data in (TXD2)
4	1PPS	←	Center pin		4	No Connect
5	Event Marker	↔		Center pin	5	No Connect

Table 10.3 Event marker/1PPS cable pinouts (Continued)

P1: Lemo 7-Pin Port 2 Trimble R7 GPS receiver		Direction	P2: BNC-F connector (1PPS)	P3: BNC-F connector (Event marker)	P4: Lemo 7s Port 2 extension	
Pin	Trimble R7 GPS receiver function		Pin	Pin	Pin	Function
6	Power IN (+)	→			6	Power IN (+)
7	Serial data in (RXD2)	←			7	Serial data out (RXD2)

## GPS antennas and cables

The antenna that a receiver uses to collect satellite signals is sometimes called a GPS antenna to distinguish it from a radio antenna. Radio antennas are used for communication between receivers and external networks or systems.

**Note** – Older models of antennas, such as Choke Ring or Micro-Centered L1/L2, have different power requirements. The Trimble R7 GPS receiver can adjust the antenna power output when you designate the appropriate antenna in the GPS Configurator software. For more information, see [Antennas, page 25](#).

Connect the receiver to its GPS antenna using the yellow TNC connector. Use a coaxial cable with a right-angle TNC plug at the antenna end.

If the antenna cable length is ...	use ...
up to 15 meters (45 feet)	RG-58 cable
up to 30 meters (100 feet)	RG-214 cable
over 30 meters (100 feet)	one of the following: <ul style="list-style-type: none"> <li>• in-line amplifier</li> <li>• semi-rigid coaxial cable</li> <li>• a low-loss cable assembly</li> </ul>



## Event Marker Input and 1PPS Output

### In this chapter:

- Event marker input
- 1PPS output

The Trimble R7 GPS receiver can accept event marker input on Port 1 and port 2, and can generate 1PPS output on Port 2.

## Event marker input

Use event marker input to log a precise GPS time tag whenever an externally generated pulse is received, such as one generated at the time of the shutter closing from a photogrammetric camera.

The event is triggered when the source pulse voltage transitions between 1.0 V DC and 2.0 V DC in less than 100 nsec. Trimble recommends that you use TTL level inputs. You can configure the receiver to recognize either a positive (rising) or negative (falling) voltage as the leading edge of a pulse. The accuracy of the associated time tag recorded for an event is determined by the GPS accuracy (typically less than 1  $\mu$ sec.).

The Trimble R7 GPS receiver records each event in the current data file. This record includes the port on which the event was received.


### Enabling and configuring event marker input

To enable or configure the event marker input function, you need the GPS Configurator software.

#### In real time

You can use the GPS Configurator software to configure a Trimble GPS receiver connected to your office computer. For more information, see [The GPS Configurator software, page 50](#), or refer to the *GPS Configurator Help*.

To enable event marker input:

1. Connect the computer to the Trimble R7 GPS receiver.
2. Press **[P]** to turn on the receiver.
3. To start the GPS Configurator software, click  and then select *Programs / Trimble / GPS Configurator / GPS Configurator*. The *GPS Configurator* dialog appears and the software automatically connects to the Trimble R7 GPS receiver.
4. In the *General* tab, select the *Event marker* check box.
5. Select the appropriate option, Positive slope or Negative slope, depending on the type of pulse the external device uses.
6. Click **Apply**.

The GPS Configurator software sends the new configuration information to the receiver, and the receiver starts to accept event marker input.

7. Click **OK** to exit the GPS Configurator software.

The software disconnects from the receiver.

## 1PPS output

The Trimble R7 GPS receiver can output a one pulse per second (1PPS) time strobe with an associated ASCII time tag output. The pulse is output through port 2 of the receiver using the event marker/1PPS cable.

### 1PPS pulse definition

The leading edge of the pulse coincides with the beginning of each UTC second, as shown in [Figure 11.1](#). The pulse is driven by an RS-422 driver between nominal levels of 0 V and 4 V. The leading edge is positive, rising from 0 V to 4 V.

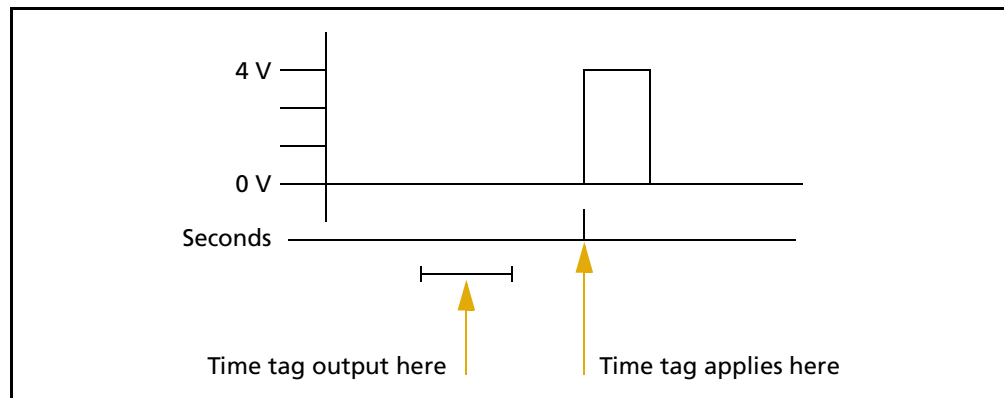


Figure 11.1 Time tag relation to 1PPS wave form

The pulse is approximately 8  $\mu\text{sec}$  wide, with rise and fall times of about 100 nsec. Resolution is approximately 40 nsec, but several external factors limit accuracy to approximately  $\pm 1 \mu\text{sec}$ :

- Position errors, especially with user-entered reference. Each meter of error can result in 3 nsec of error in the 1PPS pulse.
- Antenna cable length. Each meter of cable adds a delay of about 2 nsec to satellite signals, and a corresponding delay in the 1PPS pulse.

### ASCII time tag definition

Each time tag is output about 0.5 second before the corresponding pulse, as shown in [Figure 11.1](#). Time tags are in ASCII format on a user-selected serial port. The format of a time tag is:

UTC yy.mm.dd hh:mm:ss ab

Where:

- *UTC* is fixed text.
- *yy.mm.dd* is the year, month, and date.
- *hh:mm:ss* is the hour (on a 24-hour clock), minute, and second. The time is in UTC, not GPS time.

- $a$  is the position-fix type:
  - 1 = 2D Position Fix for E,N only
  - 2 = 3D Position Fix
  - 3 = Single SV Clock-only fix
  - 4 = Automatic Mode
  - 5 = Reference Station Position
  - 6 = Two-Dimensional with Fixed Clock
  - 7 = Overdetermined solution for Clock-only
- $b$  is the number of satellites being tracked: 1 to 9, “:” (for 10), “;” (for 11), or “<” (for 12).
- Each time tag is terminated by a *carriage return, line feed* sequence.


A typical printout looks like this:

```
UTC 93.12.21 20:21:16 56
UTC 93.12.21 20:21:17 56
UTC 93.12.21 20:21:18 56
```

If the fields “ $a$ ” and “ $b$ ” appear as “??”, the time is based on the receiver clock because the receiver is not tracking satellites. The receiver clock is less accurate than time readings extracted from satellite signals.

## Enabling and configuring 1PPS output in real time

To enable or configure the 1PPS output function, you need the GPS Configurator software. You can use the GPS Configurator software to configure a Trimble GPS receiver connected to your office computer. For more information, see [The GPS Configurator software, page 50](#), or refer to the *GPS Configurator Help*.

1. Connect the computer to the Trimble R7 GPS receiver.
2. Turn on the receiver.
3. To start the GPS Configurator software, click  and then select *Programs / Trimble / GPS Configurator / GPS Configurator*. The *GPS Configurator* dialog appears and the software automatically connects to the receiver.
4. Select the *Serial outputs* tab.
5. Select the *1PPS (Port 2 only)* check box.
6. If you want ASCII time tags enabled, select the check box and choose an output port.
7. Click **Apply**.

The GPS Configurator software sends the new configuration information to the receiver, and the receiver starts to generate 1PPS output on Port 2.

8. Click **OK** to exit the GPS Configurator software.

The software disconnects from the receiver.



# TRIMBLE R6 GPS R8 GNSS RECEIVERS

## In this section:

- Chapter 12, Overview
- Chapter 13, Setting up the Receiver
- Chapter 14, General Operation
- Chapter 15, Configuration
- Chapter 16, Software Utilities
- Chapter 17, Specifications
- Chapter 18, Default Settings
- Chapter 19, Cables and Connectors



## Overview

### In this chapter:

- [Features](#)
- [Use and care](#)
- [COCOM limits](#)

This chapter introduces the Trimble® R6 GPS and R8 GNSS receivers, which are designed for GPS surveying applications.

The Trimble R6 GPS and R8 GNSS receivers are referred to in this section of the User Guide as “the receiver”.

Where details refer to only one of the receiver models, this is clearly identified.

The receiver incorporates a GPS antenna, receiver, internal radio with a transmit option or an internal GSM module, and a battery in a rugged light-weight unit that is ideally suited as an all-on-the-pole RTK rover. Three LEDs allow you to monitor the satellite tracking, radio reception, data logging status, and power. Bluetooth® wireless technology provides cable-free communications between receiver and controller.

The Trimble R6 GPS receiver provides 72 total channels containing: GPS L1 C/A Code, L1/L2 Full Cycle Carrier and (Optional) GLONASS L1 C/A Code, L1 P Code, L2 P Code, and L1/L2 Full Cycle Carrier satellite tracking and supports logging of raw GPS observables to the handheld controller for postprocessed applications.

The Trimble R8 GNSS receiver provides 72 total channels containing GPS L1 C/A Code, L2C, L1/L2/L5 Full Cycle Carrier, GLONASS L1 C/A Code, L1 P Code, L2 P Code, and L1/L2 Full Cycle Carrier satellite tracking and supports logging of raw GPS observables to the handheld controller for postprocessed applications.

The receiver does not postprocess raw GLONASS observables.

The receiver is available as a standalone rover, base station, or as part of the GPS Total Station® system, offering maximum versatility in the system configuration to meet your specific requirements.

## Features

The receiver provides the following features:

- Trimble R-track technology, which allows the receivers to track the following:
  - GLONASS (Trimble R6 GPS and Trimble R8 GNSS receivers)
  - L2C and L5 (Trimble R8 GNSS receiver)
- Centimeter-accuracy, real-time positioning with RTK/OTF data, up to 10 Hz position updates
- Submeter-accuracy, real-time positioning using pseudorange corrections
- Adaptive dual-frequency RTK engine
- SBAS WAAS/EGNOS support
- Automatic OTF (on-the-fly) initialization while moving
- Single Lithium-ion rechargeable battery
- Cable-free Bluetooth communications with the Trimble Attachable Control Unit (ACU), TSC2™, TSCe™, or TCU controller with BlueCap® module
- Two RS-232 serial ports for:
  - NMEA output
  - RTCM SC-104 input and output
  - Trimble Format (CMR™ & CMR+™) input and output
- One TNC radio antenna connector
- 11 MB internal memory for data storage
- Internal 450 MHz radio with a transmit option or GSM module

## Use and care

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




---

**WARNING** – Operating or storing the receiver outside the specified temperature range can damage it. For more information, see [Chapter 17, 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 electronics from functioning correctly. Avoid using the receiver within 400 meters of powerful radar, television, or other transmitters. Low-power transmitters such as those used in cellphones and two-way radios normally do not interfere with receiver operations.

For more information, contact your local Trimble distributor.

## COCOM limits

The U.S. Department of Commerce requires that all exportable GPS products contain performance limitations so that they cannot be used in a manner that could threaten the security of the United States. The following limitations are implemented on the Trimble R6 GPS and R8 GNSS receivers.

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. The receiver continuously resets until the COCOM situation is cleared.



## Setting up the Receiver

### In this chapter:

- [Parts of the receiver](#)
- [Setup guidelines](#)
- [Pole-mounted setup](#)
- [Other system components](#)

This chapter provides general information on setup, connection, and cabling for the Trimble R6 GPS and R8 GNSS receivers (“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.

### Front panel

Figure 13.1 shows a front view of the Trimble R8 GNSS receiver. The front panel on the Trimble R6 GPS receiver is identical. The panel contains the three indicator light emitting diodes (LEDs), and the power button.



Figure 13.1 Trimble R8 GNSS receiver front panel

The power button controls the receiver's power on or off functions.

The indicator LEDs show the status of power, satellite tracking, and radio reception. For more information, see [LED behavior](#), page 90.

### Lower housing

Figure 13.2 shows the lower housing of the Trimble R8 GNSS receiver. The lower housing on the Trimble R6 GPS receiver is identical. The lower housing contains the two serial ports, one TNC radio antenna or GSM antenna connector (depending on the internal communication module ordered), the removable battery compartment and the 5/8-11 threaded insert.



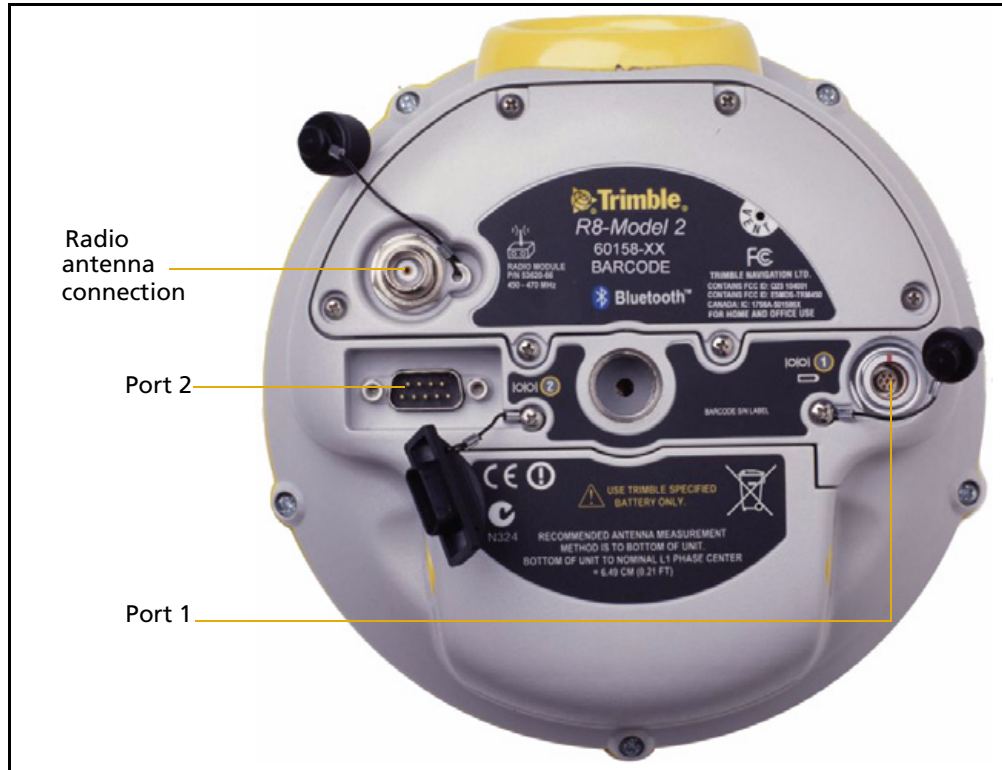


Figure 13.2 Trimble R8 GNSS receiver lower housing

Each port or connector on the receiver is marked with an icon to indicate its main function as shown below.

Icon	Name	Connections
	Port 1	Device, computer, external radio, power in
	Port 2	Device, computer, external radio
	RADIO	Radio communications antenna

Port 1 is a 7-pin 0-shell Lemo connector that supports RS-232 comms and external power input. Port 1 has no power outputs.

Port 2 is a DB-9 male connector that allows for full 9-pin RS-232 comms. Port 2 does not support power in or out. For more information, see [Chapter 18, Default Settings](#) and [Chapter 19, Cables and Connectors](#).

The TNC connector is for connecting a radio antenna to the receiver internal radio. A whip “rubber duck” antenna is supplied with the system for units with internal UHF radios. This connector is not used if you are using an external UHF radio or GSM.

## External UHF or GSM antenna

Depending on which module you have purchased, use this TNC connection for an external antenna to enhance the UHF or GSM.

The UHF antenna is approximately 16.5 cm (6.5 inches) long, and round. The GSM antenna is approximately 16.5 cm (6.5 inches), and flatter than the UHF antenna. Make sure that you use the correct antenna or the signal will be degraded.

For more information on connecting the receiver, see the following sections in this chapter.

## Setup guidelines

Consider the following guidelines when setting up the receiver.



---

**CAUTION** – To satisfy the RF Exposure requirements of the FCC, you must maintain a minimum separation distance of 20 cm (approximately 8 in.) between yourself and the radiating GSM antenna for this device.

For mobile operation, the maximum gain of the GSM antenna must not exceed 0 dBi.

---

## Environmental conditions

Although the receiver has a waterproof housing, take reasonable care to protect the unit. Avoid exposure to extreme environmental conditions, including:

- Water
- Heat greater than 65 °C (149 °F)
- Cold less than –40 °C (–40 °F)
- 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](#) on [page iii](#) at the front of this manual.

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

- When plugging in a Lemo cable, make sure that the red dots on the receiver port and the cable connector line up. **Do not** use force to plug cables in, as this may damage the connector pins.
- 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, align the cable connector with the receiver receptacle and then thread the cable connector 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 and compartment as a unit upward into the receiver until the battery compartment latches are locked into position.

## Pole-mounted setup

[Figure 13.3 on page 86](#) shows the pole-mounted setup for the receiver. To mount the receiver on a range pole:

1. Thread the unit onto the range pole.
2. Attach the controller bracket to the pole.
3. Insert the controller into the bracket.

**Note** – When using a Trimble ACU, a TSCe controller with BlueCap module, or a TSC2 controller, no cabling is required, as shown in [Figure 13.3](#).

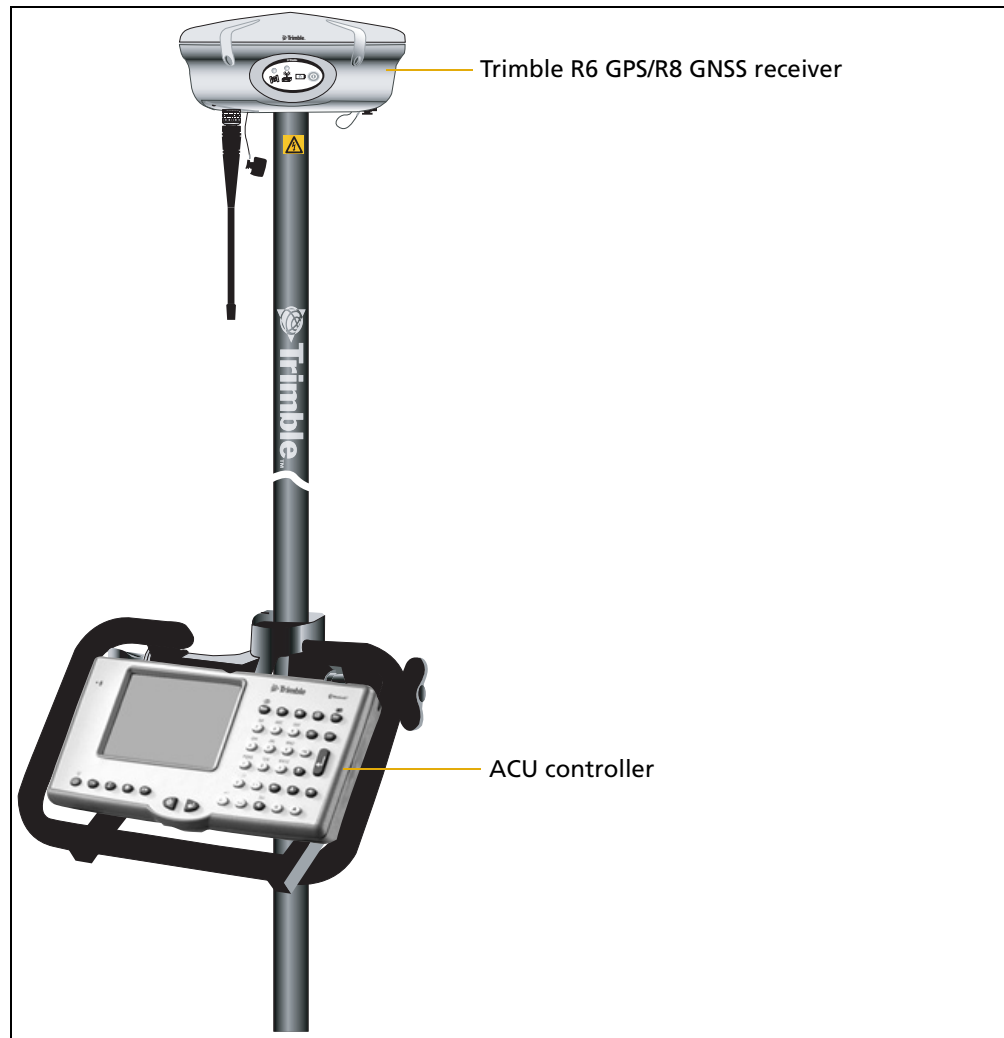


Figure 13.3 Receiver pole-mounted setup

## Other system components

This section describes optional components that you can use with the receiver.

### Radios

Radios are the most common data link for Real-Time Kinematic (RTK) surveying. The receiver is available with an optional internal radio in the 450 MHz UHF band, or with an internal GSM module. You can also connect an external radio to either receiver port, whether or not the internal radio is installed.

The receiver supports the following Trimble base radios with the internal 450 MHz radio:

- TRIMMARK™ 3
- TRIMMARK IIe
- TRIMTALK™ 450S
- Receiver internal 450 transmitter
- HPB450 radio-modem

### Internal GSM setup

You can configure the receiver optional internal GSM Module using the Trimble Survey Controller™ software. For more information, refer to the *Trimble Survey Controller User Guide*.

### Internal radio setup

To configure the receiver optional internal radio, use one of the following:

- The GPS Configurator software
- The WinFlash utility
- The Trimble Survey Controller software

For more information, refer to the *GPS Configurator Help*, the *WinFlash Help*, or the *Trimble Survey Controller User Guide*.

By default, the internal radio has only a few “test” frequencies installed at the factory. If you purchased the transmit option, the broadcast frequencies must be programmed at the factory. You can program the receive frequencies using the WinFlash utility. For more information, see [The WinFlash Utility, page 105](#).

**Note** – *A Frequency Configuration sheet accompanies every receiver order that contains the transmit option.*

### Cellular modems and external radios

For a data communications link, you can use an internal or external radio, or an internal or external cellular modem.

To connect an external cellular modem to the receiver, you need the following:

- A Trimble R6 GPS/R8 GNSS receivers.
- A cellular modem, or a cellphone that can transmit and receive data.
- Serial (cellphone to DB9) cable (supplied with the cellular modem or phone).

**Note** – *For more information, refer to the document *Using Cellular and CDPD Modems for RTK*, which is available from the Trimble website.*

- Port 2 of the receiver supports full RS-232 protocol, and should function properly with most cellular phone cables. Some cellular units may require custom cabling.

Alternatively, the receiver also supports a cable-free Bluetooth connection with Bluetooth-enabled cell phones.

For more information on using an external cellular modem as a data link, refer to the *Trimble Survey Controller User Guide*.

To connect an external radio modem to a receiver, you need the following:

- A Trimble R6 GPS/R8 GNSS receiver.
- An external radio capable of receiving and decoding Trimble data packets.
- Serial cable for either Port 1 or Port 2 of the receiver, as supplied by the radio manufacturer.
- Radio mount for the range pole.

## General Operation

### In this chapter:

- Button functions
- LED behavior
- Starting and stopping the receiver
- Logging data
- Resetting to defaults
- Batteries and power

All the controls that you need for general operation of the receiver are located on the front panel.

For more information about other receiver panels, see [Parts of the receiver](#), page 82.

## Front panel controls

Figure 14.1 shows the receiver front panel controls for the power on/off functions, or receiver reset. The LEDs provide power, radio, data logging, and SV tracking status information.

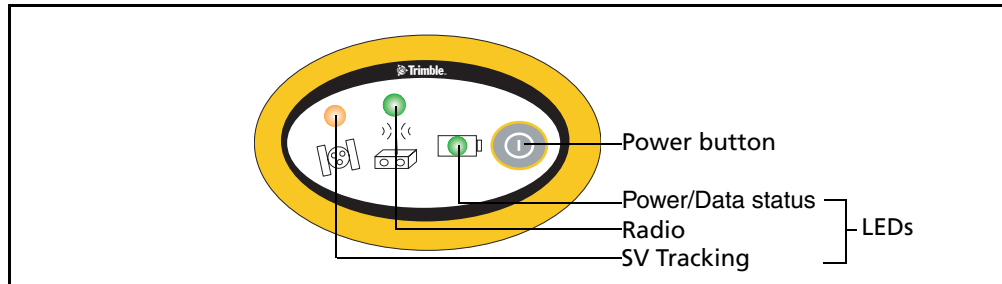


Figure 14.1 Receiver front panel controls and LEDs

## Button functions

The receiver has only one button, the Power button, represented in this manual by  $\text{P}$ . Use  $\text{P}$  to turn on or turn off the receiver, and to perform other functions, as described below.

Table 14.1 Power button functions

To ...	Power button
turn on the receiver	Press
turn off the receiver	Hold for 2 seconds
delete the ephemeris file	Hold for 15 seconds
reset the receiver to factory defaults	Hold for 15 seconds
delete application files	Hold for 30 seconds

**Note** – The term “press” means to press the button and release it immediately. The term “hold” means to press the button and hold it down for the given time.

## LED behavior

The three LEDs on the front panel of the receiver indicate various operating conditions. Generally, a lit or slowly flashing LED indicates normal operation, a LED that is flashing quickly indicates a condition that may require attention, and an unlit LED indicates that no operation is occurring. The following table defines each possible LED state.

The term ...	means that the LED ...
Slow flash	alternates on/off for 500 milliseconds.
Fast flash	alternates rapidly on/off for 100 milliseconds



The term ...	means that the LED ...
On	is lit steady
Off	is unlit

## LED flash patterns

The following table details the possible flash patterns to indicate various states of receiver operation.

Receiver mode	Power LED Green	Radio LED Green	Satellite LED Amber
Receiver OFF	OFF	OFF	OFF
Receiver ON:			
Healthy power	ON	N/A	N/A
Low power	Fast flash	N/A	N/A
Tracking <4 SVs	ON	N/A	Fast flash
Tracking >4 SVs	ON	N/A	Slow flash
Logging data internally	Flashes off every 3 seconds	N/A	N/A
Transmitting internally	N/A	Flashes off when transmitting	N/A
Receiving valid data packets	ON	Slow flash	N/A
No data packets	ON	OFF	N/A
Receiver in Monitor	ON	Slow flash	ON

**Note** – If a column shows “N/A”, that specific LED may or may not be on, but it is not relevant to that particular mode.

## Starting and stopping the receiver

To turn on the receiver, press **[P]**.

To turn off the receiver, hold down **[P]** for two seconds.

## Logging data

You can log data internally or to a Trimble controller.

### Logging internally

The receiver logs GPS data internally on 11 MB of internal memory.

You can then use the Trimble Data Transfer utility to transfer logged data files to the office computer. The transferred files are in Trimble DAT (.dat) format.

**Note** – If you use the Data Transfer utility to download the internally-logged files, you lose any collected GLONASS data. Consider this if you plan to use the Trimble Geomatics Office software to process the \*.dat files because that software does not process GLONASS data.

If you have the Trimble Business Center software, the \*.T01 file that is stored on the receiver can be directly downloaded. The \*.T01 files will contain any collected GLONASS data because the Trimble Business Center software can process GLONASS data, if you have purchased that option.



**WARNING** – The receiver allows for a maximum of 200 files on the internal memory. The filenames must be in 8.3 format, otherwise, files copied to the internal memory may cause data corruption or loss of data when logging.

Data is logged using the current logging settings configured in the receiver. Data files logged internally are named automatically.

To begin internal logging, you must use a Trimble controller, or the GPS Configurator software. The receiver does not have an internal clock, so you can only conduct timed survey sessions if the receiver has a continuous power supply.

When the internal memory is full, the receiver stops logging data, and the Logging/Memory LED turns off. Existing data files are not overwritten. You can use the Auto-delete option to override this action and automatically delete the oldest files when the receiver memory is full. However, you should use this option with caution because it can lead to data loss.

Approximate storage requirements for different logging rates are shown below. The values shown are for a one-hour logging session with six satellites visible.

Logging rate	Memory required
10 Hz	2,588 KB
1 Hz	335 KB
5 seconds	87 KB
15 seconds	37 KB

### Logging to a Trimble controller

When the receiver is connected to a Trimble controller, you can log GPS data from the receiver to the controller, or to a PC card inserted in the controller. When you use a Trimble controller, you do not use the receiver's controls. Instead, you use the controller functions to set logging options, specify filenames, and control when logging occurs.

Data is stored in job files, which can be transferred to your office computer using the Trimble Data Transfer utility.

For more information on logging data from a receiver using a Trimble controller, refer to the user guide for your particular controller.

## Resetting to defaults

To reset the receiver to its factory default settings, hold down **[P]** for at least 15 seconds.

For more information, see [Default settings, page 116](#).

## 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.

The receiver can be powered by its internal battery or by an external power source connected to Port 1. Typically, one internal 2.4 ampere-hour battery provides approximately 5.3 hours of operation during an RTK survey using the internal radio in rover mode and approximately 3.5 hours of operation as an RTK base (this varies according to temperature and wireless data rate).

If an external power source is connected to Port 1, 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.



**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.

The receiver is supplied with two rechargeable Lithium-ion batteries, and a dual battery charger. The two batteries charge sequentially and take approximately four hours each to fully charge.

## Battery charging and storage

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 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 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.

### 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.

To protect the battery from deep discharge (5 V or less), the receiver is designed to switch batteries or cease drawing power when the battery pack discharges to 5.9 V.

A battery that has reached the deep discharge level cannot be recharged and must be replaced. The following recommendations provide optimal performance and extend the life of your batteries:

- 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.

### Power output

The receiver does not supply power from either of its two ports.

## Firmware

A receiver's *firmware* is the program inside the receiver that controls receiver operations and hardware. You can upgrade the firmware for the receiver using the WinFlash utility provided on the receiver CD.

For more information, see [The WinFlash Utility, page 105](#).



---

**WARNING** – Upgrading the firmware deletes all application files on the receiver.

---



# Configuration

## In this chapter:

- [Configuring the receiver in real time](#)
- [Configuring the receiver using application files](#)
- [Application files](#)

The Trimble R6 GPS and R8 GNSS receivers have no controls to change settings. To configure the receiver, use external software such as GPS Configurator, WinFlash, or Trimble Survey Controller.

There are two ways to configure the receiver. You can:

- configure the receiver in real time
- apply the settings in an application file

This chapter provides a brief overview of each of these methods and describes the contents and use of application files.

## Configuring the receiver in real time

GPS Configurator and Trimble Survey Controller software support real-time configuration of the receiver.

When you configure the receiver in real time, you use one of these software applications to specify which settings you want to change. When you apply the changes, the receiver settings change immediately.

Any changes that you apply to the receiver are reflected in the current application file, which is always present in the receiver. The current application file always records the most recent configuration, so if you apply further changes (either in real time or using an application file) the current file is updated and there is no record of the changes that you applied originally.

For more information on configuring the receiver in real time, see [Chapter 16, Software Utilities](#).

## Configuring the receiver using application files

An application file contains information for configuring a receiver. To configure a receiver using an application file, you need to create the application file, transfer it to the receiver and then apply the file's settings. The GPS Configurator software does this automatically when you work with configuration files.

For more information on applying application files, see [Chapter 16, Software Utilities](#).

## Application files

An application file is organized into records. Each record stores configuration information for a particular area of receiver operation. Application files can include the following records:

- File Storage
- General Controls
- Serial Port Baud/Format
- Reference Position
- Logging Rate
- SV Enable/Disable
- Output Message
- Antenna
- Device Control
- Static/Kinematic
- Input Message



An application file does not have to contain all of these records. When you apply an application file, any option that is not included in the records in the file remains at its current setting. For example, if you apply an application file that only specifies the elevation mask to use, all other settings remain as they were before the application file was applied.

You can store up to twenty different application files in the receiver. You can apply an application file's settings at the time it is transferred to the receiver, or at any time afterwards.

## Special application files

The receiver has three special application files, which control important aspects of the receiver's configuration.

### Default application file

The default application file (Default.cfg) contains the original receiver configuration, and cannot be changed. This file configures the receiver after it is reset. You can reset the receiver by holding down **[P]** for at least 15 seconds, or by using the reset option in the GPS Configurator software.

For more information, see [Default settings, page 116](#).

Although you cannot change or delete the default application file, you can use a power up application file to override any or all of the default settings.

### Current application file

The current application file (Current.cfg) reflects the current receiver configuration. Whenever you change the receiver's configuration, either in real time or by applying an application file, the current file changes to match the new configuration.

You cannot delete the current file or change it directly, but every change to the receiver's current configuration is applied to the current file as well.

When you switch off the receiver then turn it on again, all the settings from the current application file are applied, so you do not lose any changes that you have made. The only exceptions are the following logging parameters:

- Logging rate
- Position rate
- Elevation mask

These parameters are always reset to the factory default values whenever the receiver is switched off.

## Power up application file

The power up application file (Power\_up.cfg) is used to set the receiver to a specific configuration any time the unit is powered up.

In this file, you can specify that the receiver is reset to defaults before the power up settings are applied. This ensures that restarting the receiver always resets it to factory defaults prior to applying the power up application file.

Alternatively, you can specify that the power up settings are applied immediately after the current application file's settings have been applied. Restarting the receiver results in a configuration that uses your default settings for the options you define in the power up file, but the current settings for all other options.

By default, there is no power\_up application file on the receiver. To use a power up application file, you must create and save a power\_up application file in the GPS Configurator software. If you save this file to disk, the file is called power\_up.cfg. The extension .cfg is used, by convention, to identify application files on the office computer. When you transfer this file to the receiver, the file is saved on the receiver as power\_up, and becomes the new power up file.

The power up file is the only special application file that you can overwrite or delete from the receiver.

## Applying application files

An application file's settings do not affect the receiver's configuration until you **apply** the application file. You can do this at the same time that you save the file.

Alternatively, you can save the file on the computer or in the receiver, then open it later and apply its settings.

## Storing application files

You can store application files that you create in the GPS Configurator software on the receiver and on the computer. For example, each file can represent a different user sharing the same receiver, or a particular mode of operation or survey style. Saving application files on your computer as well as in your receiver is optional, but it is useful because:

- it gives you a permanent copy of the settings you have sent to a receiver, for audit or your own reference.
- you can use the same file to configure multiple receivers identically.
- you can use an existing application file as a template to create other application files with similar settings.

## Naming application files

The application filename in the office computer and in the receiver are always the same. This makes it easier to recognize and keep track of your application files.

When you change the name of the application file in the receiver, this changes the application filename on your computer. When you transfer an application file from the receiver and save it to the computer, the system renames the file to match the internal receiver file. However, if you use Windows Explorer, for example, to change the .cfg filename on the computer, this **does not** change the internal receiver filename. This means that the GPS receiver does not recognize the change to the filename on the computer.



## Software Utilities

### In this chapter:

- [The GPS Configurator software](#)
- [The WinFlash Utility](#)

This chapter provides information on the software utilities that you can use with the Trimble R6 GPS and R8 GNSS receivers.

## The GPS Configurator software

GPS Configurator is office software that configures selected Trimble GPS or GNSS receivers.

GPS Configurator software enables you to:


- edit and save configuration files to the receiver and the computer
- check current receiver settings and operation
- configure receiver settings with your office computer

### Installing the GPS Configurator software

A copy of GPS Configurator software is included on the receiver CD.

1. Insert the CD into the CD drive on your computer.
2. From the main menu, select *Install individual software packages*.
3. Select *Install GPS Configurator vX.XX*.
4. Follow the onscreen instructions.

### Configuring the receiver using GPS Configurator software

1. Connect Port 1 or 2 on the receiver to a serial (COM) port on the computer and apply power.
2. To start GPS Configurator, click  and then select *Programs / Trimble / GPS Configurator / GPS Configurator*.
3. In the *Device Type* dialog, select *Trimble R8/R6*.  
The software automatically establishes a connection with the receiver.
4. Make appropriate selections for your required receiver settings.  
For more information, refer to the *GPS Configurator Help*.
5. Click **Apply**.

The settings in GPS Configurator software are applied to the receiver.

## The WinFlash Utility

The WinFlash utility communicates with Trimble products to perform various functions including:

- installing software, firmware, and option upgrades
- running diagnostics ( for example, retrieving configuration information)
- configuring radios

For more information, online help is also available when using the WinFlash utility.

**Note** – *The WinFlash utility runs on Microsoft® Windows® 95, 98, Windows NT®, 2000, Me, or XP operating systems.*

### Installing the WinFlash utility

1. Insert the receiver CD into the CD drive on the computer.
2. From the main menu, select *Install individual software packages*.
3. Select *Install WinFlash vX.XX for R/5000/NetR5 receivers* and then follow the on-screen instructions.

Alternatively, install the WinFlash utility from the Trimble website

### Upgrading firmware

Your receiver is supplied with the latest version of receiver firmware installed. If a later version becomes available, upgrade the firmware installed on your receiver.

The WinFlash utility guides you through the firmware upgrade process. The steps required are described below. For more information, refer to the *WinFlash Help*.

To upgrade the receiver firmware:

1. Start the WinFlash utility. The *Device Configuration* screen appears.
2. From the *Device type* list, select *Trimble R8/R6*.
3. From the *PC serial port* field, select the serial (COM) port on the computer that the receiver is connected to.

4. Click **Next**.

The *Operation Selection* screen appears. The *Operations* list shows all of the supported operations for the selected device. A description of the selected operation is shown in the *Description* field.

5. Select GPS software upgrade and click **Next**.

The *GPS Software Selection* window appears. This screen prompts you to select the software that you want to install on the receiver.

6. Select the latest version from the *Available Software* list and then click **Next**.

The *Settings Review* window appears. This screen prompts you to connect the receiver, suggests a connection method and then lists the receiver configuration and selected operation.

7. If all is correct, click **Finish**.

Based on your selections, the *Software Upgrade* window appears and shows the status of the operation (for example, **Establishing communication with the Trimble R8 GNSS. Please wait ...**)

8. Click **OK**.

The *Software Upgrade* window appears again and states that the operation was completed successfully.

9. Click **Menu** to select another operation, or click **Exit** to quit WinFlash.

10. If you click **Exit**, another screen appears asking you to confirm that you want to quit. Click **OK**.

### Adding frequencies for the 450 MHz internal radio

If your receiver has the optional internal radio installed, you can use the WinFlash utility to add receiving frequencies to the default list. If you purchased the transmit option, the broadcast frequencies must be programmed at the factory.

1. Start the WinFlash utility. The *Device Configuration* screen appears.
2. From the *Device type* list, select *Trimble R8/R6*.
3. From the *PC serial port* field, select the serial (COM) port on the computer that the receiver is connected to.
4. Click **Next**.

The *Operation Selection* screen appears. The *Operations* list shows all of the supported operations for the selected device. A description of the selected operation is shown in the *Description* field.

5. Select *Configure Radio* and then click **Next**.



The *Frequency Selection* dialog appears:

**Frequency Selection**

You have connected to a Trimble R8 Internal

Frequency Band: 410.0 - 430.0 MHz

Wireless Format

Current Channel: 1 - 419.550 MHz

Wireless Mode: TRIMTALK 450S at 9600 bps

Note: Wireless mode must be common among all radios in your network.

Channel Frequency

Specify Frequency:

419.5500 MHz

Add

Selected Frequencies:

Channel	Frequency
1	419.5500
2	420.0000
3	430.0000

Remove

Remove All

Move Up

Move Down

OK

Cancel

Radio Info...

Save...

Print

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

**Note** – The frequencies that you program must conform to the channel spacing and minimum tuning requirements for the radio. To view this information, click **Radio Info**. You may select either 12.5 or 25 kHz channel spacing. All radios in your network must use the same channel spacing.

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

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

**Note** – You can only configure receive frequencies. The FCC approved transmit frequencies must be specified and configured by Trimble.

## Configuring the internal transceiver

Use the WinFlash *Internal Transceiver Configuration* dialog to configure the internal transceiver.



**Tip** – To view a list of all radio information, including the current configuration, click **Radio Info**.

1. Select the *Current Channel*, which determines the radio operating frequency.
2. Select the *Wireless Mode*, which determines the over-the-air communications parameters. The following example shows a rover setup:

**Internal Transceiver Configuration**

You have connected to a Trimble R8 Internal Radio

Wireless Format:

Current Channel: Ch. 1 - 461.0250 MHz

Wireless Mode: TRIMTALK 450S at 4800 bps

Note: Wireless mode must be common among all radios in your network.

Radio Settings:

Mode: Rover

Channel Frequency:

Specify Frequency: 461.02500 MHz

Add

Selected Frequencies:

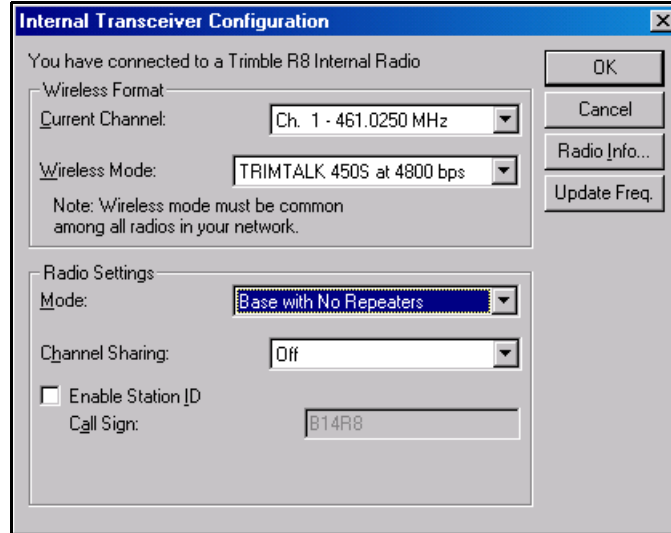
Channel	Frequency
1	461.02500
2	461.07500
3	461.10000
4	462.12500
5	462.37500
6	462.40000
7	464.50000
8	464.55000
9	464.60000
10	464.62500

Remove, Remove All, Move Up, Move Down

To reduce battery consumption on your base receiver, set the wireless mode as high as possible. For example, 9600 bits per second (bps) consumes half the power of 4800 bps for the same data format and time of operation.

**Note** – All radios in the network must be configured with the same wireless setting.

3. Select the appropriate operating mode, depending on how you intend to use the receiver, for example, *Base with No Repeaters*:



4. Select one of the following channel sharing configurations (base modes only; not available for rover):
  - Off. The carrier detect mode is off. The unit will ignore other transmissions on your frequency and continue to transmit data.
 

*Note – It may be illegal in your country of use to set channel sharing to Off. You may be subject to penalties or fines based upon the specific licensing requirements for your country of use. Please consult your radio license documentation or licensing agency for operational guidelines.*
  - Avoid Weak Signals. The carrier detect mode is on. The radio will cease transmitting if it detects another radio transmission on its frequency. It will resume transmission when the channel is free of radio traffic.
  - Avoid Strong Signals. The carrier detect mode is on, but the radio will stop transmitting only when there is a strong signal present (receive level greater than 90 dBm).
5. If you are operating in Base mode, select the *Enable Station ID* check box and then enter your call sign in the *Call Sign* field. This FCC requirement is for U.S. licensed users. It sets your radio to transmit your call sign in Morse code every 15 minutes.
6. To update the configuration, click **OK**.

In the *Status* dialog that appears, select an option to return to the main menu or to exit the WinFlash utility.



**Tip** – You can print or save the radio configuration information for future reference. If required, you can fax or e-mail the file to Trimble Support to aid in troubleshooting radio problems.

### Updating the frequency list

You can program the internal transceiver modem with a list of up to 20 frequencies, which are stored in non-volatile memory. This list is pre-configured based on the frequencies that you requested when you ordered the unit. Government regulations stipulate that only manufacturers or authorized dealers can create this frequency list and that all frequencies programmed into a unit must comply with the host country regulations. If you need to add, delete, or replace frequencies, contact your Trimble dealer, and provide the radio modem serial number and an updated list of the frequencies you require. Once you receive the frequency file, you can upgrade the radio using the WinFlash utility.

# Specifications

**In this chapter:**

- Physical specifications
- Positioning specifications
- Technical specifications

This chapter details the specifications of the Trimble R6 GPS and R8 GNSS receivers (“the receiver”). Where specifications apply to only one receiver model, this is clearly indicated.

## Physical specifications

Feature	Specification
Size	19.0 cm (7.5") wide x 11.2 cm (4.4") deep including connectors
Weight: with internal battery and radio	1.35 kg (2.97 lbs)
Operating times on internal battery	450 MHz receive/transmit: 3.5 hours (varies with temperature and wireless data rate) GSM: 3.8 hours (varies with temperature)
Battery life (at 20 °C)	Approximately 5.3 hours for one 2.4 ah Lithium-ion battery
External Power input	11–28 V DC
Operating temperature <sup>a</sup>	–40 °C to +65 °C (–40 °F to +149 °F)
Storage temperature	–40 °C to +75 °C (–40 °F to +167 °F)
Humidity	100% condensing, unit fully sealed
Casing	Dust-proof, shock- and vibration-resistant

<sup>a</sup>Receiver will operate normally to –40 °C. Bluetooth module, GSM module, and internal batteries are rated to –20 °C.

## Positioning specifications

Positioning	Mode	Horizontal accuracy (RMS)	Vertical accuracy (RMS)
RTK (OTF)	Synchronized	1 cm + 1 ppm (× baseline length)	2 cm + 1 ppm (× baseline length)
	Low Latency	2 cm + 2 ppm (× baseline length) <sup>a</sup>	3 cm + 2 ppm (× baseline length) <sup>a</sup>
L1 C/A Code Phase	Synchronized/ Low Latency	.25m + 1ppm RMS	.50m + 1ppm RMS
Static/ FastStatic	N/A	5 mm + 0.5 ppm (× baseline length)	5 mm + 1 ppm (× baseline length)
WAAS	N/A	Less than 5 m <sup>b</sup>	Less than 5 m <sup>b</sup>

<sup>a</sup>Depends on radio link latency.

<sup>b</sup>3D RMS values depend on WAAS system performance.

## Technical specifications

Feature	Specification
Tracking: Trimble R8 GNSS receiver	72 Channels GPS L1 C/A Code, L2C, L1/L2/L5 Full Cycle Carrier, GLONASS L1 C/A Code, L1 P Code, L2 P Code, L1/L2 Full Cycle Carrier, SBAS WAAS/EGNOS support Fully operational during P-code encryption
Tracking: Trimble R6 GPS receiver	72 Channels GPS L1 C/A Code, L1/L2 Full Cycle Carrier, (Optional) GLONASS L1 C/A Code, L1 P Code, L2 P Code, L1/L2 Full Cycle Carrier, SBAS WAAS/EGNOS support Fully operational during P-code encryption
Signal processing	Advanced Trimble Maxwell™ Custom Survey GNSS chip Very low-noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth Multipath suppression
Start-up	Cold start: < 60 seconds from power on Warm start: < 30 seconds with recent ephemeris
Initialization	Automatic while moving or static
Minimum initialization time	10 sec + 0.5 × baseline length (km)
Communications	Two RS-232 serial ports (Port 1, Port 2,) Port 1: Baud Rates up to 115,200 bps Port 2: Baud Rates up to 115,200 bps RTS/CTS flow control negotiation supported on port 2 only Bluetooth communications with Trimble ACU or TSCe with BlueCap module
Transmit radio	Transmit power: 0.5 watts Wireless data rate: 4800, 8000, 9600, 16000, and 19200 Frequency bands: 410-430MHz, 430-450MHz, 450-470MHz Channel Spacing: 12.5kHz and 25kHz Number of channels: Total of 20 factory pre-programmed transmit frequencies or user configured receive frequencies RF modulation format: Gaussian Minimum Shift Keying (GMSK) at 4800, 8000, 9600, 16000, and 19200 bps Range: Optimal 10 km (line of sight); Typical: 3–5 km (varies with terrain and operational conditions) Battery life: Up to 3.5 hours (varies with temperature and wireless data rate)
GSM module	Certification: Class B Part 15, 22, 24 FCC certification: 850/1900 Class 10 GSM module CE Mark approval C-tick approval GSM: type approvals are country specific. For more information, contact your Trimble representative.
Bluetooth	Type approvals are country specific. For more information, contact your Trimble representative.

Feature	Specification
Configuration	Through user-definable application files or GPS Configurator
Output formats	NMEA-0183: AVR; GGA; GSA; GST; GSV; PTNL,GGK; PTNL,GGK_SYNC; HDT; PTNL,PJK; PTNL,PJT; RMC, ROT; PTNL,VGK; VHD; VTG; ZDA GSOF (Trimble Binary Streamed Output) RT17



## Default Settings

### In this chapter:

- [Default settings](#)
- [Resetting to factory defaults](#)

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

You cannot modify the default application file. However, if there is a power up application file (Power\_up) in the receiver, the settings in this file can be applied immediately after the default application file, overriding the factory defaults.

For more information, see [Application files](#), page 98.

## Default settings

These settings are defined in the default application file.

Table 18.1 Default settings

Function		Factory default
SV Enable		All SVs enabled
General Controls:	Elevation mask	13°
	PDOP mask	7
	RTK positioning mode	Low Latency
	Motion	Kinematic
Serial Port 1:	Baud rate	115,200
	Format	8-None-1
	Flow control	None
Serial Port 2:	Baud rate	115,200
	Format	8-None-1
	Flow control	None
Input Setup:	Station	Any
NMEA/ASCII (all supported messages)		All ports Off
Streamed output		All Types Off Offset = 00
RT17/Binary		All ports Off
Reference position:	Latitude	0°
	Longitude	0°
	Altitude	0.00 m HAE
Antenna:	Type	Trimble R6 Internal /Trimble R8 Model 2
	Height (true vertical)	0.00 m
	Group	All
	Measurement method	Bottom of mount

## Resetting to factory defaults

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

- On the receiver, press and hold down **[P]** for 15 seconds.
- In the GPS Configurator software, select *Connect to Receiver* and then click **Reset receiver** in the *General* tab.

## Default behavior

The factory defaults specified above are applied whenever you start the receiver. If a power up file is present in the receiver, its settings are applied immediately after the default settings, so you can use a power up file to define your own set of defaults.

When you turn the receiver on and ...	then logging settings are ...	and logging ...
it is the first time that the receiver has been used	the factory defaults	does not begin automatically
you have reset the receiver to its factory defaults	the factory defaults, or those in the power up file <sup>a</sup>	does not begin automatically
you have performed a full reset	the factory defaults, because resetting deletes any power up file	does not begin automatically

<sup>a</sup>A factory default setting is used only if the setting is not defined in the power up file.

## Power up settings

When you turn off the receiver, any changes that you have made to logging settings are lost and these settings are returned to the factory defaults. Other settings remain as defined in the current file. The next time you turn on the receiver, the receiver checks for a power up file and, if one is present, applies the settings in this file.

When you use <b>P</b> to turn off and then turn on the receiver and ...	then logging settings are ...	and all other settings are ...
you changed the receiver settings by applying an application file	the factory defaults	the last settings used
you changed the receiver settings using configuration software	the factory defaults	the last settings used
there is a power up application file in the receiver	the factory defaults, or those in the power up file <sup>a</sup>	the last settings used, or those in the power up file

<sup>a</sup>A factory default setting is used only if the setting is not defined in the power up file.



## Cables and Connectors

### In this chapter:

- [Port 1 and 2 connectors](#)
- [Power/serial data cables](#)

This chapter provides pinout information for the 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

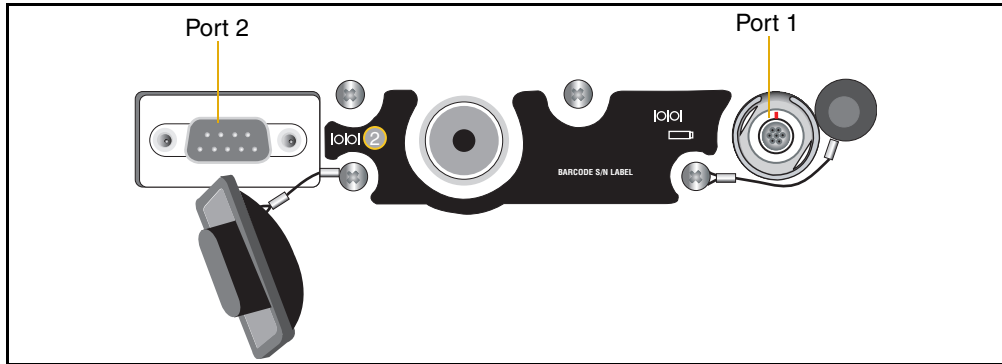


Figure 19.1 Receiver serial ports

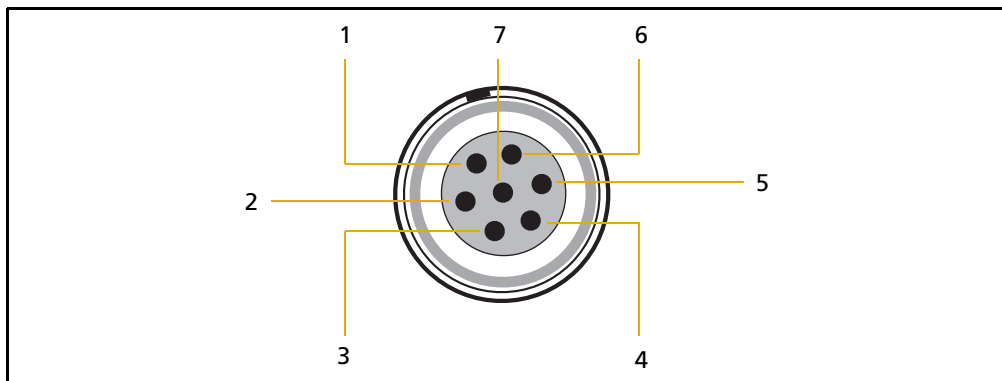


Figure 19.2 Port 1 connector pinouts

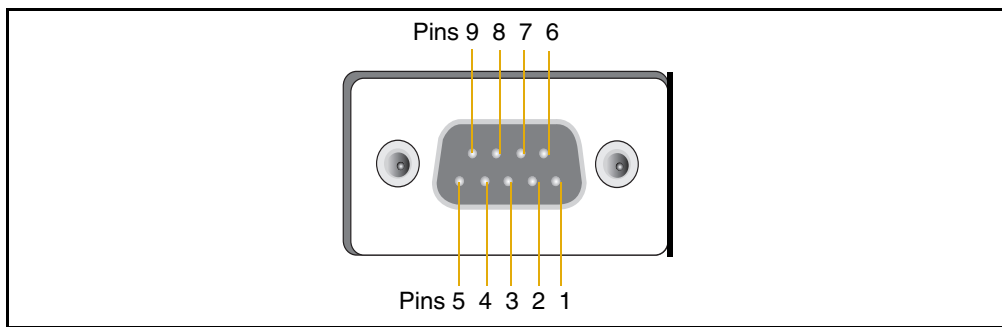


Figure 19.3 Port 2 connector pinouts

Pin	Pinout function	
	Port 1 – 7-pin Lemo	Port 2 – DB-9
1	Signal ground	DCD
2	- Power ground	RXD
3	TXD	TXD
4	N/C	DTR
5	N/C	Signal ground
6	+ Power in	DSR

Pin	Pinout function	
	Port 1 – 7-pin Lemo	Port 2 – DB-9
7	TRXD	RTS
8	N/A	CTS
9	N/A	Ring indicator

## Power/serial data cables

The data-I/O cable, (P/N 18532) is supplied with the receiver.

Table 19.1 Data-I/O cable pinouts

DB-9 Female 9-pin		DB-9 Female 9-pin	
Pin	Function	Pin	Function
1-6	DCD5_232	4	DTR5_232
2	RX5_232	3	TX5_232
3	TX5_232	2	RX5_232
4	DTR5_232	1-6	DCD5_232
5	GND	5	GND
7	RTS5_232	8	CTS5_232
8	CTS5_232	7	RTS5_232
9	no connection RI5_232	9	

**Note** – Table 19.1 assumes that the cable is attached to the connector labeled Port 2.

This data cable may be used for firmware upgrades and other computer functions with the receiver. Power must be supplied to the receiver through Port 1, or from the internal battery.

**Note** – This pinout information also applies to the power/serial data cable (P/N 32345), which is optional for use with the receiver. This cable can be used for firmware upgrades through Port 1, while also supplying external power.



**CAUTION** – Cable (P/N 53107) supports the connection between the receiver and the Multi Battery Adaptor. The cable carries power only and **must not** be used in any other manner. Damage to equipment can occur if this cable is not used in conjunction with the receiver and the Multi Battery Adaptor.

*Note* – Table 19.2 assumes that the cable is attached to the connector labeled Port 1.

Table 19.2 Power/serial data cable pinouts

Lemo 0-shell connector 7-Pin		Direction	DE9-F connector 7 Cond			Power lead 2 Cond	
Pin	Function		Pin	Color	Function	Color	Function
1	GND	↔	5	Brown	Signal ground		
2	GND	→				Black	V-OUT
3	TX3_232	→	2	Orange	TXD		
4	RTS/TXD	→	8	Blue	RTS		
5	CTS/RXD	←	7	Green	CTS		
6	PWR_IN	←				Red	Power IN (+)
7	RX3_232	←	3	Yellow	TXD		



# APPENDIXES: TRIMBLE R6/R7 GPS RECEIVERS TRIMBLE R8 GNSS RECEIVER

## In this section:

- Appendix A, NMEA-0183 Output
- Appendix B, RTCM Output
- Appendix C, Troubleshooting



## NMEA-0183 Output

### In this appendix:

- [NMEA-0183 Outputs](#)
- [Common Message Elements](#)
- [NMEA Messages](#)

This appendix describes the formats of the subset of NMEA-0183 messages that are available for output by the Trimble R6/R7 GPS receivers and the Trimble R8 GNSS receiver. For a copy of the NMEA-0183 Standard, go to the National Marine Electronics Association website at [www.nmea.org](http://www.nmea.org).

## NMEA-0183 Outputs

When NMEA-0183 output is enabled, a subset of NMEA-0183 messages can be output to external instruments and equipment connected to the Trimble receiver serial ports. These NMEA-0183 messages let external devices use selected data collected or computed by the receiver.

All messages conform to the NMEA-0183 version 3.01 format. All begin with \$ and end with a carriage return and a line feed. Data fields follow comma (,) delimiters and are variable in length. Null fields still follow comma (,) delimiters but contain no information.

An asterisk (\*) delimiter and checksum value follow the last field of data contained in an NMEA-0183 message. The checksum is the 8-bit exclusive *OR* of all characters in the message, including the commas between fields, but not including the \$ and asterisk delimiters. The hexadecimal result is converted to two ASCII characters (0–9, A–F). The most significant character appears first.

The following table summarizes the set of NMEA messages supported by the receiver, and shows the page where detailed information about each message can be found.

Message	Function	Page
AVR	Time, yaw, tilt, range, mode, PDOP, and number of SVs for Moving Baseline RTK	128
GGA	Time, position, and fix related data	128
GSA	GNSS DOP and active satellites	129
GST	Position error statistics	130
GSV	Number of SVs in view, PRN, elevation, azimuth, and SNR	130
HDT	Heading from True North	131
PTNL,GGK	Time, position, position type and DOP values	131
PTNL,GGK_SYNC	Time, synchronized position, position type and DOP values	132
PTNL,PJK	Local coordinate position output	133
PTNL,PJT	Projection type	133
PTNL,VGK	Time, locator vector, type and DOP values	134
PTNL,VHD	Heading Information	134
RMC	Position, Velocity, and Time	135
ROT	Rate of turn	135
VTG	Actual track made good and speed over ground	136
ZDA	UTC day, month, and year, and local time zone offset	136

To enable or disable the output of individual NMEA messages, do one of the following:

- Create an application file in the GPS Configurator software that contains NMEA output settings and then send the file to the receiver.
- Add NMEA outputs in the *Serial outputs* tab of the GPS Configurator software and then apply the settings.

## Common Message Elements

Each message contains:

- A message ID consisting of *\$GP* followed by the message type. For example, the message ID of the GGA message is *\$GPGGA*.
- A comma
- A number of fields, depending on the message type, separated by commas
- An asterisk
- A checksum value

Below is an example of a simple message with a message ID (*\$GPGGA*), followed by 13 fields and a checksum value:

```
$GPGGA,172814.0,3723.46587704,N,12202.26957864,W,2,6,1.2,18.893,M,-
25.669,M,2.0,0031*4F
```

### Message values

The following values can be found in NMEA messages that the receiver generates.

#### Latitude and longitude

Latitude is represented as *ddmm.mmmm* and longitude is represented as *dddmm.mmmm*, where:

- *dd* or *ddd* is degrees
- *mm.mmmm* is minutes and decimal fractions of minutes

#### Direction

Direction (north, south, east, or west) is represented by a single character: *N*, *S*, *E*, or *W*.

#### Time

Time values are presented in Universal Time Coordinated (UTC) and are represented as *hhmmss.cc*, where:

- *hh* is hours, from 00 to 23
- *mm* is minutes
- *ss* is seconds
- *cc* is hundredths of seconds

## NMEA Messages

When NMEA-0183 output is enabled, the following messages can be generated.

### AVR Time, Yaw, Tilt, Range for Moving Baseline RTK

The AVR message string is shown below, and [Table A.1](#) describes the message fields.

```
$PTNL,AVR,181059.6,+149.4688,Yaw,+0.0134,Tilt,,,60.191,3,2.5,6*00
```

Table A.1 AVR message fields

Field	Meaning
1	UTC of vector fix
2	Yaw angle in degrees
3	Yaw
4	Tilt angle in degrees
5	Tilt
6	Reserved
7	Reserved
8	Range in meters
9	Quality indicator: 0: Fix not available or invalid 1: Autonomous GPS fix 2: Differential carrier phase solution RTK (Float) 3: Differential carrier phase solution RTK (Fix) 4: Differential code-based solution, DGPS
10	PDOP
11	Number of satellites used in solution

### GGA Time, Position, and Fix Related Data

An example of the GGA message string is shown below. [Table A.2](#) describes the message fields.

```
$GPGGA,172814.0,3723.46587704,N,12202.26957864,W,  
2,6,1.2,18.893,M,-25.669,M,2.0,0031*4F
```

Table A.2 GGA message fields

Field	Meaning
1	UTC of position fix
2	Latitude
3	Direction of latitude: N: North S: South
4	Longitude

Table A.2 GGA message fields (continued)

Field	Meaning
5	Direction of longitude: E: East W: West
6	GPS Quality indicator: 0: Fix not valid 1: GPS fix 2: Differential GPS fix 4: Real Time Kinematic, fixed integers 5: Real Time Kinematic, float integers
7	Number of SVs in use, range from 00 to 12
8	HDOP
9	Orthometric height (MSL reference)
10	M: unit of measure for height is meters
11	Geoid separation
12	M: geoid separation is measured in meters
13	Age of differential GPS data record, Type 1 or Type 9. Null field when DGPS is not used.
14	Reference station ID, ranging from 0000 to 1023. A null field when any reference station ID is selected and no corrections are received.

## GSA GNSS DOP and active satellites

An example of the GSA message string is shown below. [Table A.3](#) describes the message fields.

```
$GPGSA,<1>,<2>,<3>,<3>,,,,,<3>,<3>,<3>,<4>,<5>,<6>*<7><CR><LF>
```

Table A.3 GSA message fields

Field	Meaning
1	Mode 1, M = manual, A = automatic
2	Mode 2, Fix type, 1 = not available, 2 = 2D, 3 = 3D
3	PRN number, 01 to 32, of satellite used in solution, up to 12 transmitted
4	PDOP-Position dilution of precision, 0.5 to 99.9
5	HDOP-Horizontal dilution of precision, 0.5 to 99.9
6	VDOP-Vertical dilution of precision, 0.5 to 99.9
7	Checksum

## GST Position Error Statistics

An example of the GST message string is shown below. [Table A.4](#) describes the message fields.

```
$GPGST,172814.0,0.006,0.023,0.020,273.6,
0.023,0.020,0.031*6A
```

Table A.4 GST message fields

Field	Meaning
1	UTC of position fix
2	RMS value of the pseudorange residuals (includes carrier phase residuals during periods of RTK(float) and RTK(fixed) processing)
3	Error ellipse semi-major axis 1 sigma error, in meters
4	Error ellipse semi-minor axis 1 sigma error, in meters
5	Error ellipse orientation, degrees from true north
6	Latitude 1 sigma error, in meters
7	Longitude 1 sigma error, in meters
8	Height 1 sigma error, in meters

## GSV Satellite Information

The GSV message string identifies the number of SVs in view, the PRN numbers, elevations, azimuths, and SNR values. An example of the GSV message string is shown below. [Table A.5](#) describes the message fields.

```
$GPGSV,4,1,13,02,02,213,,03,-3,000,,
11,00,121,,14,13,172,05*67
```

Table A.5 GSV message fields

Field	Meaning
1	Total number of messages of this type in this cycle
2	Message number
3	Total number of SVs visible
4	SV PRN number
5	Elevation, in degrees, 90° maximum
6	Azimuth, degrees from True North, 000° to 359°
7	SNR, 00–99 dB (null when not tracking)
8–11	Information about second SV, same format as fields 4–7
12–15	Information about third SV, same format as fields 4–7
16–19	Information about fourth SV, same format as fields 4–7



## HDT Heading from True North

The HDT string is shown below, and [Table A.6](#) describes the message fields.

```
$GPHDT,123.456,T*00
```

Table A.6 Heading from true north fields

Field	Meaning
1	Heading in degrees
2	T: Indicates heading relative to True North

## PTNL,GGK Time, Position, Position Type, DOP

An example of the PTNL,GGK message string is shown below. [Table A.7](#) describes the message fields.

```
$PTNL,GGK,172814.00,071296,  
3723.46587704,N,12202.26957864,W,  
3,06,1.7,EHT-6.777,M*48
```

Table A.7 PTNL,GGK message fields

Field	Meaning
1	UTC of position fix
2	Date
3	Latitude
4	Direction of latitude:
5	Longitude
6	Direction of Longitude:
7	GPS Quality indicator:
	Differential, code phase only solution (DGPS)
8	Number of satellites in fix
9	DOP of fix
10	Ellipsoidal height of fix
11	M: ellipsoidal height is measured in meters

**Note** – The PTNL,GGK message is longer than the NMEA-0183 standard of 80 characters.

## PTNL,GGK\_SYNC

### Time, Synchronized Position, Position Type, DOP

The PTNL,GGK\_SYNC message has the same format as the PTNL,GGK message, but outputs Synchronized 1 Hz positions even in Low Latency mode. An example of the PTNL,GGK\_SYNC message string is shown below. [Table A.8](#) describes the message fields.

```
$PTNL,GGK_SYNC,172814.00,071296,
3723.46587704,N,12202.26957864,W,
3,06,1.7,EHT-6.777,M*48
```

Table A.8 PTNL,GGK\_SYNC message fields

Field	Meaning
1	UTC of position fix
2	Date
3	Latitude
4	Direction of latitude:
5	Longitude
6	Direction of Longitude:
7	GPS Quality indicator: 0: Fix not available or invalid 1: Autonomous GPS fix 2: Differential, floating carrier phase integer-based solution, RTK(float) 3: Differential, fixed carrier phase integer-based solution, RTK(fixed) 4: Differential, code phase only solution (DGPS)
8	Number of satellites in fix
9	DOP of fix
10	Ellipsoidal height of fix
11	M: ellipsoidal height is measured in meters

**Note** – The PTNL,GGK\_SYNC message is longer than the NMEA-0183 standard of 80 characters.

## PTNL,PJK Local Coordinate Position Output

An example of the PTNL,PJK message string is shown below. [Table A.9](#) describes the message fields.

```
$PTNL,PJK,010717.00,081796,  
+732646.511,N,+1731051.091,E,  
1,05,2.7,EHT-28.345,M*7C
```

Table A.9 PTNL,PJK message fields

Field	Meaning
1	UTC of position fix
2	Date
3	Northing, in meters
4	Direction of Northing will always be N (North)
5	Easting, in meters
6	Direction of Easting will always be E (East)
7	GPS Quality indicator:
8	Number of satellites in fix
9	DOP of fix
10	Ellipsoidal height of fix
11	

*Note* – The PTNL,PJK message is longer than the NMEA-0183 standard of 80 characters.

## PTNL,PJT Projection Type

An example of the PTNL,PJT message string is shown below. [Table A.10](#) describes the message fields.

```
$PTNL,PJT,NAD83(Conus),California Zone 4 0404,*51
```

Table A.10 PTNL,PJT message fields

Field	Meaning
1	Coordinate system name (can include multiple words)
2	Projection name (can include multiple coordinates)

## PTNL,VGK

### Vector Information

An example of the PTNL,VGK message string is shown below. [Table A.11](#) describes the message fields.

```
$PTNL,VGK,160159.00,010997,-0000.161,
00009.985,-0000.002,3,07,1,4,M*0B
```

Table A.11 PTNL,VGK message fields

Field	Meaning
1	UTC of vector in hhmmss.ss format
2	Date in mmddyy format
3	East component of vector, in meters
4	North component of vector, in meters
5	Up component of vector, in meters
6	GPS quality indicator:
7	Number of satellites if fix solution
8	DOP of fix
9	Vector components are in meters

## PTNL,VHD

### Heading Information

An example of the PTNL,VHD message string is shown below. [Table A.12](#) describes the message fields.

```
$PTNL,VHD,030556.00,093098,187.718,
-22.138,-76.929,-5.015,0.033,0.006,
3,07,2.4,M*22
```

Table A.12 PTNL,VHD message fields

Field	Meaning
1	UTC of position, in <i>hhmmss.ss,ddmmyy</i> format
2	Date in mmddyy format
3	Azimuth
4	$\Delta$ Azimuth/ $\Delta$ Time
5	Vertical Angle
6	$\Delta$ Vertical/ $\Delta$ Time
7	Range
8	$\Delta$ Range/ $\Delta$ Time

Table A.12 PTNL,VHD message fields (continued)

Field	Meaning
9	Quality indicator:
10	Number of satellites used in solution
11	PDOP

## RMC Position, Velocity, and Time

The RMC string is shown below, and [Table A.13](#) describes the message fields.

```
$GPRMC,123519,A,4807.038,N,01131.000,E,022.4,084.4,230394,003.1,W*6A
```

Table A.13 GPRMC message fields

Field	Meaning
1	UTC of position fix
2	Status A=active or V=void
3	Latitude
4	Longitude
5	Speed over the ground in knots
6	Track angle in degrees (True)
7	Date
8	Magnetic variation
9	The checksum data, always begins with *

## ROT Rate of Turn

The ROT string is shown below, and [Table A.14](#) describes the message fields.

```
$GPROT,35.6,A*4E
```

Table A.14 ROT message fields

Field	Meaning
1	Rate of turn, degrees/minutes, "-" indicates bow turns to port
2	A: Valid data V: Invalid data

## VTG Actual Track Made Good Over and Speed Over Ground

An example of the VTG message string is shown below. [Table A.15](#) describes the message fields.

```
$GPVTG,,T,,M,0.00,N,0.00,K*4E
```

Table A.15 VTG message fields

Field	Meaning
1	Track made good (degrees true)
2	
3	Track made good (degrees magnetic)
4	
5	Speed, in knots
6	
7	Speed over ground in kilometers/hour (kph)
8	

## ZDA UTC Day, Month, And Year, and Local Time Zone Offset

An example of the ZDA message string is shown below. [Table A.16](#) describes the message fields.

```
$GPZDA,172809,12,07,1996,00,00*45
```

Table A.16 ZDA message fields

Field	Meaning
1	UTC
2	Day, ranging between 01 and 31
3	Month, ranging between 01 and 12
4	Year
5	Local time zone offset from GMT, ranging from 00 to $\pm 13$ hours
6	Local time zone offset from GMT, ranging from 00 to 59 minutes

Fields 5 and 6 together yield the total offset. For example, if field 5 is  $-5$  and field 6 is  $+15$ , local time is 5 hours and 15 minutes earlier than GMT.

## RTCM Output

**In this appendix:**

- Generated messages
- Message scheduling

## Generated messages

Table B.1 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.

Table B.1 RTCM output

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

Table B.2 describes the frequency at which messages are generated when they are enabled in a base receiver.

Table B.2 Message scheduling

Type	Frequency
1	Every second
3	The 10th second after the first measurement, then every 10 seconds after that
9-3	Every second
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



# Troubleshooting

**In this appendix:**

- LED conditions
- Receiver issues

## LED conditions

An LED that is flashing quickly indicates a condition that may require attention, and an unlit LED indicates that no operation is occurring. The following table describes some LED conditions, possible causes, and how to solve them.

Condition	Possible cause	Solution
The SV Tracking LED is lit solidly and the Logging/Memory LED is flashing slowly.	The receiver is in Monitor mode, ready for new firmware to be loaded or new options to be added.	Turn off or turn on the receiver. Load the latest version of the firmware, which you can download from <a href="http://www.trimble.com/support">www.trimble.com/support</a>
The SV Tracking LED is not flashing.	The receiver is tracking fewer than four satellites. The radio antenna cable and GPS antenna cable are mixed up.	Wait until the SV Tracking LED is flashing slowly. Make sure that the GPS antenna cable (with the yellow over-mould) is connected between the yellow TNC connector marked GPS and the GPS antenna.

## 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 turn on.	External power too low.	Check the charge on the external battery, and check the fuse if applicable. Replace the battery if necessary.
	Internal power too low.	Check the charge on the internal batteries and replace if necessary. Ensure battery contacts are clean.
	External power not properly connected.	Check that the 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.	Insufficient internal memory.	Delete old files using the GPS Configurator or Trimble Survey Controller software, or by holding down <b>[P]</b> for 30 seconds.
	The receiver is tracking fewer than four satellites.	Wait until the SV Tracking LED is flashing slowly.
The receiver is not responding.	Receiver needs soft reset.	Power down the receiver and power back up.
	Receiver needs full reset.	Hold down <b>[P]</b> for 30 seconds. If you want to retain data files, remove the CompactFlash card first.
Reference receiver is not broadcasting.	Port settings between reference receiver and radio are incorrect.	Using the Trimble Survey Controller software, connect to the reference radio through the receiver. If no connection is made, connect directly to the radio and change the port settings. Try to connect through the receiver again to ensure that they are communicating.
	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.

Issue	Possible cause	Solution
Roving receiver is not receiving radio.	Reference receiver is not broadcasting.	See above.
	Incorrect over air baud rates between reference and rover.	Connect to the roving receiver's radio and check to ensure it has the same setting as the reference receiver.
	Incorrect port settings between roving external radio and receiver.	If the radio is receiving data (the Logging/Memory LED is flashing) and the receiver is not getting radio communications, use Trimble Survey Controller to check that the port settings are correct.
	The cellular modem does not have hardware flow control enabled.	Disable flow control on the modem. Use a special cable. For more information, refer to the document <i>Using Cellular and CDPD Modems for RTK</i> , which is available from the Trimble website.

# Index

## Symbols

- Ⓛ 10, 28
- Ⓧ 10, 28, 90
- \$ (NMEA start of message delimiter) 126
- \* (NMEA checksum delimiter) 127
- , (NMEA field delimiter) 126
- .cfg files 38–41, 47, 98–101
- .dat files 45–47
- .elf files 36, 47, 95
- .eph files 47
- .T01 files 45, 46, 47

## Numerics

- 1PPS output
  - default settings 60
  - pulse definition 73
  - time tag definition 73
- Trimble R7 GPS receiver 6, 57, 73

## A

- accuracy
  - centimeter-level 6, 78
  - submeter-level 6, 78
- Actual Track Made Good Over and Speed Over
  - Ground message 136
- adding frequencies for internal radio 52, 106
- ANT port 13
- antenna information, default 60, 116
- Antenna record, in application file 38, 98
- antennas
  - electrical interference 14, 84
  - mounting 14, 84
  - RPA 20
  - rubber duck 16, 20
  - using with the Trimble R7 GPS receiver 69
  - whip 16, 20
  - Zephyr 17
  - Zephyr Geodetic 17
- application files
  - applying 41, 100
  - configuring the receiver with 98

- Current (Current.cfg) 39, 59, 99, 115
- Default (Default.cfg) 39, 59, 99, 115
- deleting 28, 90
- deleting by formatting CompactFlash card 32
- maximum number 39, 99
- naming 42, 101
- overview 38, 98
- power up (Power\_up.cfg) 40, 59, 100, 115
- records 38, 98
- storage of 41
- storing 41, 100
- timed 29, 40, 63
- applying application files 41, 100
- ASCII
  - output, default settings 60, 116
  - time tags, default 60
  - time tags, definition 73
- Australia
  - notices to users ii

## B

- backpack setup 20
- base station *See* reference station
- baseline, moving 126
- batteries
  - camcorder 23
  - charging in reference and rover receiver at the same time 34
  - charging while in Trimble R7 GPS receiver 33
  - charging with TSCe batteries 35
  - minimum power to charge 33
  - operating time 33, 56, 112
  - standby 30
- battery
  - compartments 11, 13, 84
  - inserting in the Trimble R6/R8 receiver 85
  - LEDs 30
- baud rate
  - default 60, 116
  - maximum 57, 113
- binary output, default settings 60, 116
- blue RPA cable 13
- blue TNC port 13

Bluetooth wireless technology 78, 88  
 bottom panel 13, 84  
 bracket  
   insert 18  
   receiver 18  
   RPA 17  
 breakout box, on event marker/1PPS cable 68  
 buttons 10, 28, 82, 90

## C

cables  
   coaxial 69  
   data/power 44, 67, 121  
   event marker/1PPS 67  
   GPS antenna 13, 73  
   RPA 13  
 camcorder batteries 23  
 catch  
   for battery compartment 11  
   for CompactFlash/USB door 10, 82  
 cellphones 24, 87  
 cellular modems 24, 87, 144  
 centimeter-level accuracy 6, 78  
 charging  
   internal batteries 33  
   minimum time required 33  
   Trimble R7 GPS receiver and TSCe controller  
     batteries 35  
 CMR  
   input 6, 78  
   output 6, 78  
   output, default settings 60  
 coaxial cable, for connecting to GPS antenna 69  
 COCOM limits 7, 79  
 cold start, time required 57, 113  
 color-coded TNC ports 13  
 CompactFlash card  
   formatting 28, 32  
   full 31  
   logging data to 30  
   transferring files from 46  
   Type I 25  
   upgrading receiver firmware from 36, 95  
 CompactFlash port 13, 84  
 CompactFlash/USB door 13, 84  
 CompactFlash/USB door catch 10, 82  
 configuring  
   event marker input in real time 72  
   MS Series parameters 128

  receiver in real time 38, 98  
   receiver using application files 98  
 connecting to computer for data transfer 44  
 current application file 39, 59, 99, 115  
 current receiver configuration 99  
 current settings 115  
 Current.cfg *See* current application file

## D

DAT files 45, 46  
 data  
   logging internally 30  
   logging to Trimble Survey Controller 31, 92  
   transferring from the receiver 43  
 Data button 10, 28  
 data files  
   deleting by formatting CompactFlash card 32  
   transferring 45  
   transferring from CompactFlash card 46  
   Trimble R7 GPS receiver 46, 47  
 Data LED *See* Logging/Memory LED  
 data link, using a cellular modem 24, 87  
 data outputs, NMEA 128  
 data storage cards *See* CompactFlash cards  
 data transfer  
   transferring files 43–47  
   with serial connection 44  
   with USB connection 45  
 Data Transfer utility  
   deleting files on receiver with 47  
   transferring files with 45  
 data/power cable pinouts 67, 121  
 default application file 39, 59, 99, 115  
 default settings  
   1PPS time tags 60  
   antenna 60, 116  
   ASCII output 60, 116  
   ASCII time tags 60  
   baud rate 60, 116  
   binary output 60, 116  
   changing 100  
   CMR output 60  
   elevation mask 60, 116  
   factory 61  
   logging rate 60  
   measurement rate 60  
   motion 60, 116  
   NMEA output 60, 116  
   overriding 99  
   Port 3 power output 60



- position logging rate 60
  - reference position 60, 116
  - reference station 60, 116
  - resetting 93
  - RT17 output 60, 116
  - RTCM output 60
  - serial format 60, 116
  - SNR mask 60
  - streamed output 60, 116
  - SV enabling 60, 116
  - Trimble R6/R8 receiver 115
  - Trimble R7 receiver 59
  - Default.cfg *See* default application file
  - deleting files
    - application files 28, 90
    - by formatting CompactFlash card 32
    - ephemeris file 28, 90
    - in the receiver 47
  - delimiters, NMEA
    - checksum 127
    - field separator 127
    - start of message 126
  - Device Control record, in application file 38, 98
  - diameter, of pole 18
  - dimensions
    - Trimble R6/R8 receiver 112
    - Trimble R7 receiver 56
  - direction, NMEA field format 127
  - disabling flow control 144
  - dual event marker input 6, 71
  - dual-frequency RTK engine 6, 78
- E**
- electrical interference 14, 84
  - electronic interference 78
  - elevation mask
    - default 60, 116
  - enabling
    - event marker input in real time 72
    - power output on Port 3 36, 94
  - enhanced RTK *See* extended RTK
  - environmental factors
    - when setting up the receiver 14, 84
  - ephemeris file
    - deleting 28, 90
    - supported file type 47
  - eRTK Range Pole antenna *See* RPA
  - Europe
    - notices to users ii
  - European Council Directive 89/336/EEC ii
  - event marker input
    - configuring in real time 72
    - feature 6
  - Event Marker LED *See* Radio LED
  - event marker/1PPS
    - cable 67
    - cable pinouts 68
  - examples, of default behavior 61
  - extended RTK 6
  - external power
    - minimum required to charge internal batteries 33
    - output on Port 1 36
- F**
- factory defaults
    - resetting to 28, 61, 90, 116
    - Trimble R6/R8 receiver 115–117
    - Trimble R7 receiver 59–63
  - FastStatic surveying, specifications 56, 112
  - features
    - 1PPS output 6
    - automatic OTF (on-the-fly) initialization 6, 78
    - centimeter accuracy 6, 78
    - charging batteries internally 6
    - CMR input and output 6, 78
    - CompactFlash card 6
    - extended RTK 6
    - OTF data 6, 78
    - real-time positioning 6, 78
    - RS-232 ports 6
    - RTCM SC-104 input and output 6, 78
    - RTK data 6, 78
    - submeter accuracy 6, 78
    - Trimble R6/R8 receiver 78
    - USB port 6
    - WAAS capability 6, 78
  - file size 45
  - File Storage record, in application file 38, 98
  - file types
    - .cfg 47
    - .dat 46
    - .elf 47
    - .eph 47
    - .T01 46
    - application (.cfg) 47
    - DAT 45
    - data (.dat) 46
    - data files 46
    - ephemeris (.eph) 47

- job 31, 92
- raw observations (.T01) 47
- receiver firmware (.elf) 47
- supported 47
- files
  - deleting 47
  - transferring from CompactFlash card 46
- firmware
  - (.elf) files 47
  - upgrading 36, 51, 95, 105
- flashing LED 29, 90
- flow control
  - default setting 60, 116
  - disabling on cellular modem 24, 87, 144
  - Trimble R6/R8 receiver 113
  - Trimble R7 receiver 57
- formatting a CompactFlash card 25, 28, 32
- frequencies, for internal radio 52, 106
- front panel 10, 82
- full memory 31
- full reset 143

## G

- General Controls record, in application file 38, 98
- GGA message, time, position, and fix related data 128
- GPS antenna cable 13
- GPS antenna port 6, 13, 78
- GPS Configurator software
  - configuring event marker input 72
  - configuring Trimble R6/R8 receiver 50, 104
  - deleting files on receiver with 47
  - installing 50, 104
  - Trimble R6/R8 receiver 87, 97, 104
  - Trimble R7 receiver 31, 50
- GPS LED *See* SV Tracking LED
- green LEDs 30
- GSA message 129
- GSOFF output 57
- GST message 130
- GSV message 130
- guidelines for setting up receiver 14, 85

## H

- Heading Information message 134

## I

- icons, on top panel 12, 83
- indicator LEDs 10, 29, 82, 90
- initialization
  - minimum time required 57, 113
  - on-the-fly 6, 78
  - specifications 57, 113
- input
  - CMR 6, 78
  - event marker 6, 71
  - RTCM 6, 78
- Input Message record, in application file 38, 98
- insert, for receiver bracket 18
- installing
  - GPS Configurator software 50, 104
  - WinFlash utility 51, 105
- interference
  - electrical 14, 84
  - electronic 78
- internal batteries
  - charging 6
  - charging while in Trimble R7 GPS receiver 33
  - charging with TSCe batteries 35
  - minimum power to charge 33
  - operating time 33, 56, 112
  - standby 30
- internal radio
  - adding frequencies 52, 106
  - Trimble R6/R8 receiver 87
  - Trimble R7 receiver 22
- internal transmitter, Trimble R6/R8 receiver 22

## J

- job files 31, 92

## L

- L2C GPS signal
- latency
  - Trimble R6/R8 receiver 112
  - Trimble R7 receiver 56
- latitude, NMEA field format 127
- LEDs
  - Battery 1 30
  - Battery 2 30
  - flashing 29, 90
  - Logging/Memory 29
  - Radio 30
  - SV Tracking 29

- Trimble R6/R8 receiver 82, 90
- Trimble R7 receiver 10, 29
- Lemo cables, plugging in 14, 85
- limits, imposed by COCOM 7, 79
- Lithium-ion battery
  - charging 34
  - disposing of 34
  - safety warning 32
  - voltage 36
- Local Coordinate Position Output message 133
- logging
  - internally 30
  - scheduling 40
  - starting 28
  - stopping 28
  - to Trimble Survey Controller software 31, 92
- Logging button *See* Data button
- Logging Rate record, in application file 38, 98
- logging rate, default 60
- Logging/Memory LED 29
- longitude, NMEA field format 127
- Low Latency RTK mode, specifications 56, 112

## M

- maximum
  - baud rate 57, 113
  - number of application files 39, 99
- Maxwell architecture 57, 113
- measurement rate, default 60
- Memory LED *See* Logging/Memory LED
- memory, full 31, 143
- message ID, in NMEA messages 127
- mobile phones 24, 87
- Monitor mode 29, 36, 95, 142
- motion, default settings 60, 116
- mounting antenna, avoiding electrical interference 14, 84

## N

- naming application files 42, 101
- New Zealand
  - notices to users ii
- NMEA
  - output 6, 78, 125–136
  - output, default settings 60, 116
- NMEA messages
  - common elements 126
  - common message elements 127

- delimiters 127
- enabling and disabling 126
- GGA 128
- GSA 129
- GST 130
- GSV 130
- ID 127
- PTNL,GGK 131
- PTNL,GGK\_SYNC 132
- PTNL,PJK 133
- PTNL,PJT 133
- PTNL,VGK 134
- PTNL,VHD 134
- summary 126
- values 127
- VTG 136
- ZDA 136
- notices to users
  - Australia and New Zealand ii
  - Europe ii

## O

- One Pulse per Second output *See* 1PPS output
- on-the-fly (OTF) initialization 6, 78
- operating controls 82
- operating temperature iv, 13, 56, 112
- OTF initialization *See* on-the-fly initialization
- output formats
  - 1PPS 6, 57, 71
  - CMR 6, 78
  - GSOFF 57
  - NMEA 6, 78, 125
  - RT17 57, 60, 114, 116
  - RTCM 6, 78
  - Trimble R6/R8 receiver 114
  - Trimble R7 receiver 57
- Output Message record, in application file 38, 98
- overriding default settings 99

## P

- parts of the receiver 10–13
- physical specifications 56, 112
- pinout information
  - Trimble R6/R8 receiver 119
  - Trimble R7 receiver 65
- pinouts
  - data/power cable 67, 121
  - event marker/1PPS cable 68

- serial ports 66, 120
  - pole diameter 18
  - pole-mounted setup
    - pole diameter 18
    - Trimble R6/R8 receiver 85
    - Trimble R7 receiver 16
  - Port 1
    - default baud rate 60, 116
    - default serial format 60, 116
    - event marker input 71
    - flow control 60, 116
    - icon 12, 83
    - pinout diagram 66, 120
    - pinout functions 66
    - power output 36, 94
  - Port 2
    - 1PPS output 71
    - default baud rate 60, 116
    - default serial format 60, 116
    - event marker input 71
    - icon 12, 83
    - pinout diagram 66, 120
    - pinout functions 66
  - Port 3
    - default baud rate 60
    - default power output 60
    - default serial format 60
    - flow control 60, 116
    - icon 12
    - pinout functions 66
    - power output 36, 94
  - port settings, checking 144
  - ports
    - Trimble R7 receiver pinout diagram 66
    - Trimble R8 R6/R8 receiver pinout diagram 120
  - Position Error Statistics message 130
  - position logging rate, default 60
  - positioning specifications 56, 112
  - postprocessed setup 15
  - power
    - external 36
    - minimum to charge batteries 33
  - Power button 10, 28, 90
  - power cable, pinouts 67, 121
  - Power LEDs *See* Battery LEDs
  - power output
    - automatically enabling on Port 3 36
    - enabling on Port 3 36, 94
    - on Port 1 36, 94
  - power supply 33, 93
  - power up application file 40
    - overriding factory defaults with 59, 115
    - Trimble R6/R8 receiver 100
    - Trimble R7 GPS receiver 40
  - power/data ports 11
  - Power\_Up.cfg *See* power up application file 59
  - powering down the receiver 28, 90
  - powering up the receiver 28, 30, 90, 91
  - problems, troubleshooting 141–142
  - Projection Type message 133
  - PTNL,GGK message 131
  - PTNL,GGK message, Time, Position, Position Type, DOP 131
  - PTNL,GGK\_SYNC message 132
  - PTNL,PJK message 133
  - PTNL,PJT message 133
  - PTNL,VGK message 134
  - PTNL,VHD message 134
  - pulse, for 1PPS output 73
- ## Q
- quick format 25, 31
- ## R
- radio antenna port 6, 13, 78
  - Radio LED 30
  - radio noise emissions
    - Canada ii
  - RADIO port
    - icon 12, 83
    - Trimble R7 GPS receiver 13
  - radios
    - internal 22, 87
    - Trimble R6/R8 receiver 86
    - TRIMMARK 3 22, 87
    - TRIMMARK IIe 22, 87
    - TRIMTALK 450S 22, 87
  - Range Pole antenna *See* RPA
  - raw observations 47
  - real time, configuring receiver in 38, 98
  - rear panel 11, 82
  - receiver
    - bracket 18
    - catch lock 11, 82
    - changing default settings 100
    - configuring 97
    - connecting to devices 119
    - current configuration 99

- data files 46
  - firmware files 47
  - resetting 99
  - receiver setup 9–26, 81–88
  - red LED 29
  - Reference Position record, in application file 38, 98
  - reference position, default 60, 116
  - reference receiver, charging batteries 34
  - reference station, default settings 60, 116
  - reformatting CompactFlash card 32
  - registration 1
  - release notes 1
  - reset
    - full 143
    - soft 143
    - to factory defaults 28, 61, 90, 116
    - Trimble R6/R8 receiver 99
  - rover, charging batteries 34
  - RPA 20
  - RPA bracket 17
  - RS-232 ports 6
  - RT17 output
    - default settings 60, 116
    - Trimble R6/R8 receiver 114
    - Trimble R7 receiver 57
  - RTCM input 6, 78
  - RTCM output
    - default settings 60
    - Trimble R6/R8 receiver 78
    - Trimble R7 receiver 6
  - RTK engine 6, 78
  - RTK/OTF data 6, 78
  - R-track *See* Trimble R-track technology
  - rubber duck antenna 16, 20
- S**
- Satellite Information message 130
  - Satellite LED *See* SV Tracking LED
  - scheduling logging sessions 40
  - security limits 79
  - serial format, default setting 60, 116
  - Serial Port Baud/Format record, in application file 38, 98
  - serial ports
    - pinouts 66, 120
    - Trimble R7 receiver 5, 6, 11
  - setup
    - backpack 20
    - guidelines 14, 84
    - pole-mounted 16, 85
    - postprocessed survey 15
    - Trimble R6/R8 receiver 81–88
    - Trimble R7 receiver 9–26
  - signal processing 57, 113
  - size
    - Trimble R6/R8 receiver 112
    - Trimble R7 receiver 56
  - Sleep mode 29, 41, 63
  - SNR mask, default setting 60
  - soft reset 143
  - special application files 39
  - specifications
    - physical 56, 112
    - positioning 56, 112
    - technical 57, 113
    - Trimble R6/R8 receiver 111–114
    - Trimble R7 receiver 55–57
  - standby, battery 30
  - starting logging manually 28
  - start-up specifications 57, 113
  - Static surveying specifications 56, 112
  - Static/Kinematic record, in application file 38, 98
  - stopping logging manually 28
  - storage temperature iv, 13, 56, 112
  - storing application files 41, 100
  - streamed output, default settings 60, 116
  - submeter-level accuracy 6, 78
  - supported file types 47
  - Survey Controller software *See* Trimble Survey Controller software
  - SV Enable/Disable record, in application file 38, 98
  - SV enabling, default settings 60, 116
  - SV Tracking LED 29
  - switching the receiver on and off 28, 30, 90, 91
  - Synchronized RTK mode, specifications 56, 112
- T**
- T01 files 46
  - technical specifications 57, 113
  - temperature
    - operating range iv, 13, 56, 112
    - storage range iv, 13, 56, 112
  - time tag definition 73
  - time values in NMEA messages 127
  - Time, Position, and Fix Related Data message 128
  - Time, Position, and Fix Related Data, GGA message 128
  - Time, Position, Position Type, DOP message 131
  - Time, Synchronized Position, Position Type, DOP message 132

- Timed Activation record, in application file 39
  - timed application file 40
  - timed application files 29, 40, 63
  - TNC connector 6, 69, 78
  - TNC ports 6, 78
  - top panel 11
  - tracking specifications 57, 113
  - transceiver *See* Trimble R6/R8 internal transmitter
  - transferring
    - data files from CompactFlash card 46
    - data files from the receiver 43
  - Trimble Binary Streamed Output *See* GSOF output
  - Trimble Format (CMR) *See* CMR format
  - Trimble R6/R8 receiver
    - buttons 90
    - factory default settings 115
    - inserting the internal battery 85
    - internal radio 87
    - LEDs 90
    - maximum number of application files 99
    - output formats 114
    - parts of the receiver 82–84
    - pole-mounted setup 85
    - resetting to factory defaults 90, 116
    - setup 81–88
    - specifications 111–114
    - turning on and off 90, 91
    - upgrading firmware 95, 105
    - use and care 78
  - Trimble R6/R8 receiver internal transmitter 22
  - Trimble R7 receiver
    - backpack setup 20
    - buttons 28
    - factory default settings 59
    - features 6
    - internal radio 22
    - LEDs 29
    - maximum number of application files 39
    - output formats 57
    - parts of the receiver 10–13
    - pole-mounted setup 16
    - postprocessed setup 15
    - resetting to factory defaults 28, 61
    - setup 9–26
    - specifications 55–57
    - turning on and off 28, 30
    - upgrading firmware 36, 51
    - use and care 6
  - Trimble R-track technology 6
  - Trimble Survey Controller software
    - automatically enabling power output 36
    - configuring the internal radio with 87
    - configuring the receiver with 97
    - logging data to 31
  - Trimble web site 1, 24, 87
  - TRIMMARK 3 radio 22, 87
  - TRIMMARK IIe radio 22, 87
  - TRIMTALK radio 22, 87
  - troubleshooting 141–142
  - TSCe controller
    - deleting files on receiver with 47
    - power supply 35
  - turning the receiver on and off 28, 30, 90, 91
  - Type I CompactFlash cards 6, 25
  - types of files supported 47
- ## U
- U.S. Department of Commerce 7, 79
  - Universal Time Coordinated (UTC) *See* UTC
  - upgrading receiver firmware 36, 51, 95, 105
  - USB cable, connecting for data transfer 45
  - USB port 5, 6, 13, 57, 84
  - use and care of Trimble R6/R8 receiver 78
  - use and care of Trimble R7 GPS receiver 6
  - UTC Day, Month, and Year, and Local Time Zone
    - Offset message 136
  - UTC, NMEA time values 127
- ## V
- Vector Information message 134
  - voltage
    - minimum required to charge internal
      - batteries 33
      - of internal batteries 36
  - VTG message 136
- ## W
- WAAS
    - specifications 56, 112
    - Trimble R6/R8 receiver 78
    - Trimble R7 GPS receiver 6
  - waking up, from Sleep mode 41
  - warm start, time required 57, 113
  - website 1
  - weight
    - Trimble R6/R8 receiver 112
    - Trimble R7 GPS receiver 56
  - whip antenna 16

## WinFlash utility

installing 51, 105

Trimble R6/R8 receiver 50, 87, 105

upgrading receiver firmware with 51, 105

**Z**

ZDA message 136

Zephyr antenna 17

**Y**

yellow GPS antenna cable 13

yellow LEDs 29, 30

yellow TNC port 13









#### **NORTH AMERICA**

Trimble Engineering &  
Construction Group  
5475 Kellenburger Road  
Dayton, Ohio 45424-1099 • USA  
800-538-7800 (Toll Free)  
+1-937-245-5154 Phone  
+1-937-233-9441 Fax

#### **EUROPE**

Trimble GmbH  
Am Prime Parc 11  
65479 Raunheim • GERMANY  
+49-6142-2100-0 Phone  
+49-6142-2100-550 Fax

#### **ASIA-PACIFIC**

Trimble Navigation  
Singapore Pty Limited  
80 Marine Parade Road  
#22-06, Parkway Parade  
Singapore 449269 • SINGAPORE  
+65-6348-2212 Phone  
+65-6348-2232 Fax



[www.trimble.com](http://www.trimble.com)