

## Introduction

The GRX1 receiver is a multi-frequency, GPS+ receiver built to be the most advanced and compact receiver for the surveying market. The receiver is a multi-function, multi-purpose receiver intended for precision markets.

Precision markets means markets for equipment, subsystems, components and software for surveying, construction, commercial mapping, civil engineering, precision agriculture and land-based construction and agriculture machine control, photogrammetry mapping, hydrographic and any use reasonably related to the foregoing.

The GRX1 can receive and processes multiple signal types ( including the latest GPS L1, L2, C/A, L2C GLONASS L1, L2, C/A signals ) improving the accuracy and reliability of the survey points and positions, especially under difficult jobsite conditions. The multifrequency and GPS+ features of the receiver combine to provide a positioning system accurate for any survey. Several other features, including multipath mitigation, provide under-canopy and low signal strength reception. The receiver provides the functionality, accuracy, availability, and integrity needed for fast and easy data collection.

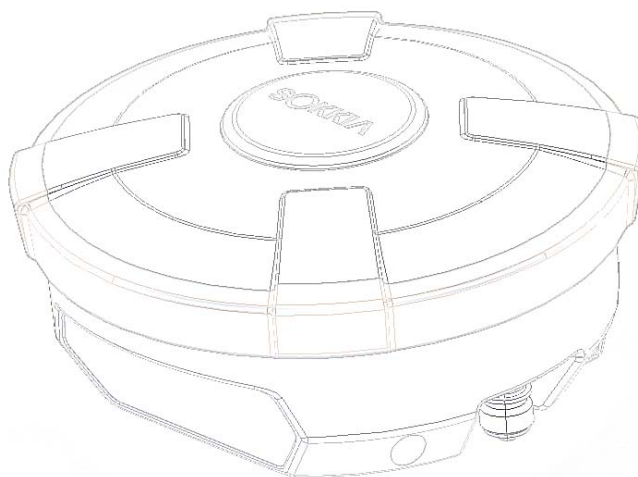


Figure 1-1. GRX1 Receiver

## Principles of Operation

Surveying with the right GPS receiver can provide users accurate and precise positioning, a requirement for any surveying project. This section gives an overview of existing and proposed Global Navigation Satellite Systems ( GNSS ) and receiver functions so that basic operating principles can be applied.

## GNSS Overview

Currently, the following two global navigation satellite systems ( GNSS ) offer line-of-site radio navigation and positioning, velocity, and time services on a global, all-weather scale to any user equipped with a GNSS tracking receiver on or near the Earth's surface:

- GPS - the Global Positioning System maintained and operated by the United States Department of Defense. For information on the status of this system, visit the US Naval Observatory website ( <http://tycho.usno.navy.mil/> ) or the US Coast Guard website ( <http://www.navcen.uscg.gov/> ).
- GLONASS - the Global Navigation Satellite System maintained and operated by the Russian Federation Ministry of Defense. For information on the status of this system, visit the Coordinational Scientific Information Center website ( <http://www.glonass-ianc.rsa.ru/> ).

Despite numerous technical differences in the implementation of these systems, satellite positioning systems have three essential components:

- Space - GPS and GLONASS satellites orbit approximately 12,000 nautical miles above Earth and are equipped with a clock and radio. These satellites broadcast ranging signals and various digital information ( ephemerides, almanacs, time and frequency corrections, and so forth ).
- Control - Ground stations located around the Earth that monitor the satellites and upload data, including clock corrections and new ephemerides ( satellite positions as a function of time ), to ensure the satellites transmit data properly.
- User - The community and military that use GNSS receivers to calculate positions.

## Calculating Absolute Positions

When calculating an absolute position, a stationary or moving receiver determines its three-dimensional position with respect to the origin of an Earth-Center Earth-Fixed coordinate system. To calculate this position, the receiver measures the distance ( called pseudo-ranges ) between it and at least four satellites.

The measured pseudo-ranges are corrected for clock differences ( receiver and satellites ) and signal propagation delays due to atmospheric effects. The positions of the satellites are computed from the ephemeris data transmitted to the receiver in navigation messages. When using a single satellite system, the minimum number of satellites needed to compute a position is four. In a mixed satellite scenario ( GPS, GLONASS ), the receiver must lock onto five or more satellites to account for the different time scales used in these systems and to obtain an absolute position.

## Calculating Differential Positions

DGPS, or Differential GPS, is a relative positioning technique where the measurements from two or more remote receivers are combined and processed using sophisticated algorithms to calculate the receivers' relative coordinates with high accuracy. DGPS accommodates various implementation techniques that can be classified according to the following criteria:

- The type of GNSS measurements used, either code-phase differential measurements or carrier-phase differential measurements
- If real-time or post-mission results required. Real-time applications can be further divided according to the source of differential data and communication link used.

With DGPS in its most traditional approach, one receiver is placed at a known, surveyed location and is referred to as the reference receiver or base station. Another receiver is placed at an unknown location and is referred to as the remote receiver or rover. The reference station collects the code-phase and carrier-phase measurements from each GNSS satellite in view.

- For real-time applications, these measurements and the reference station coordinates are then built up to the industry standard RTCM - or various proprietary standards established for transmitting differential data - and broadcast to the remote receiver ( s ) using a data communication link. The remote receiver applies the transmitted measurement information to its observed measurements of the same satellites.
- For post-mission applications, the simultaneous measurements from reference and rover stations are normally re-corded to the receiver's internal memory ( not sent over communication link ). Later, the data are downloaded to computer, combined, and processed. Using this technique, the spatially correlated errors - such as satellite orbital errors, ionospheric errors, and tropospheric errors - can be significantly reduced, thus improving the position solution accuracy.

A number of differential positioning implementations exist, including post-processing surveying, real-time kinematic surveying, maritime radio beacons, geostationary satellites ( as with the OmniSTAR service ), and satellite based augmentation systems ( WAAS, EGNOS, MSAS ).

The real-time kinematic (RTK) method is the most precise method of real-time surveying. RTK requires at least two receivers collecting navigation data and communication data link between the receivers. One of the receivers is usually at a known location ( Base ) and the other is at an unknown location ( Rover ). The Base receiver collects carrier phase measurements, generates RTK corrections, and sends this data to the Rover receiver. The Rover processes this transmitted data with its own carrier phase observations to compute its relative position with high accuracy, achieving an RTK accuracy of up to 1.0 cm horizontal and 2.0 cm vertical.

## Essential Components for Quality Surveying

Achieving quality position results requires the following elements:

- Accuracy - The accuracy of a position primarily depends upon the satellite geometry ( Geometric Dilution of Precision, or GDOP ) and the measurement (ranging) errors.
  - Differential positioning ( DGPS and RTK ) strongly mitigates atmospheric and orbital errors, and counteracts Selective Availability ( SA ) signals the US Department of Defense transmits with GPS signals.
  - The more satellites in view, the stronger the signal, the lower the DOP number, the higher positioning accuracy.
- Availability - The availability of satellites affects the calculation of valid positions. The more visible satellites available, the more valid and accurate the position. Natural and man-made objects can block, interrupt, and distort signals, lowering the number of available satellites and adversely affecting signal reception.
- Integrity - Fault tolerance allows a position to have greater integrity, increasing accuracy. Several factors combine to provide fault tolerance, including:
  - Receiver Autonomous Integrity Monitoring ( RAIM ) detects faulty GNSS satellites and removes them from the position calculation.
  - Five or more visible satellites for only GPS or only GLONASS; six or more satellites for mixed scenario
  - Satellite Based Augmentation Systems ( WAAS, EGNOS, and so on ) creates and transmit, along with DGPS corrections, data integrity information ( for example, satellite health warnings ).
  - Current ephemerides and almanacs.

## Conclusion

This overview simply outlines the basics of satellite positioning. For more detailed information, visit the [Sokkia Topcon](#) website.

## Receiver Overview

When power is turned on and the receiver self-test completes, the receiver's 72 channels initialize and begin tracking visible satellites. Each of the receiver's channels can be used to track any one of the GPS or GALILEO signals. The number of channels available allows the receiver to track all visible global positioning satellites at any time and location.

An internal GPS+ antenna equipped with a low noise amplifier ( LNA ) and the receiver's radio frequency ( RF ) device are connected with a co-axial cable. The wide-band signal received is down-converted, filtered, digitized, and assigned to different channels. The receiver processor controls the process of signal tracking.

Once the signal is locked in the channel, it is demodulated and necessary signal parameters ( carrier and code phases ) are measured. Also, broadcast navigation data are retrieved from the navigation frame.

After the receiver locks on to four or more satellites, its absolute position in WGS-84 and the time offset between the receiver clock and GPS time are computed. This information and the measurement data can be stored in the optional SD card and downloaded later onto a computer, then processed using a post-processing software package. When the receiver operates in RTK mode, raw data measurements can also be recorded into the receiver's internal memory. This allows the operator to double check real-time results obtained in the field.

Depending on your options, capabilities of the receiver include:

- Satellite based augmentation systems ( WAAS, EGNOS, and so forth ).
- Adjustable phase locked loop ( PLL ) and delay lock loop ( DLL ) parameters
- Dual- or multi-frequency modes, including static, kinematic, real-time kinematic ( RTK ), and differential GPS ( DGPS ) survey modes ( DGPS modes include static, kinematic, and RTK )
- Auto data logging
- Setting different mask angles
- Setting different survey parameters
- Static or dynamic modes

## **Getting Acquainted**

The GRX1 is a 72-channel GPS receiver, which includes the following:

- External, detachable batteries
- One data ports
- Interface for controlling and viewing data logging
- External memory card slot
- Internal radio modem
- Bluetooth wireless technology module
- Optional GSM/GPRS module
- Optional CDMA module ( only with the Digital UHF radio modem )

## Batteries

The GRX1 receiver comes equipped with one detachable, re-chargeable batteries ( Figure 1-2 ) for powering the receiver.

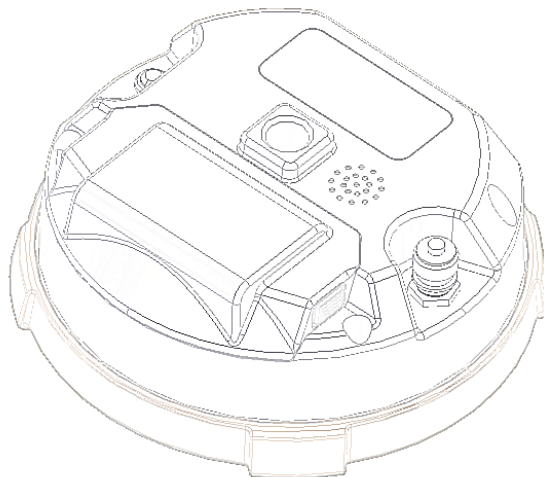


Figure 1-2. GRX1 Batteries

Please use CDC68 as battery charging cradle.

It takes approximately four **hours** to completely charge one battery, and **eight** hours to charge two batteries. ( In BDC58 use )

## GRX1 Receiver

The GRX1 receiver's advanced design reduces the number of cables required for operation, allowing for more reliable and efficient surveying. The casing allocates space for one removable, rechargeable batteries, SD and SIM card slots, a Bluetooth wireless technology module and a radio modem communications board.

The GRX1 comes in one of the following configurations:

- with an FH915 Plus TX/RX/RP radio modem and a GSM/GPRS module
- with a 1W Digital UHF TX/RX radio modem, depending on the country
- with a Digital UHF radio modem and a GSM/GPRS module
- with a Digital UHF TX/RX radio modem and a CDMA module

Other features include one data ports, a power port, and a MINTER for viewing status and controlling data input/output.

## MINTER

The MINTER is the receiver's minimum interface used to display and control data input and

output ( Figure 1-5 ).

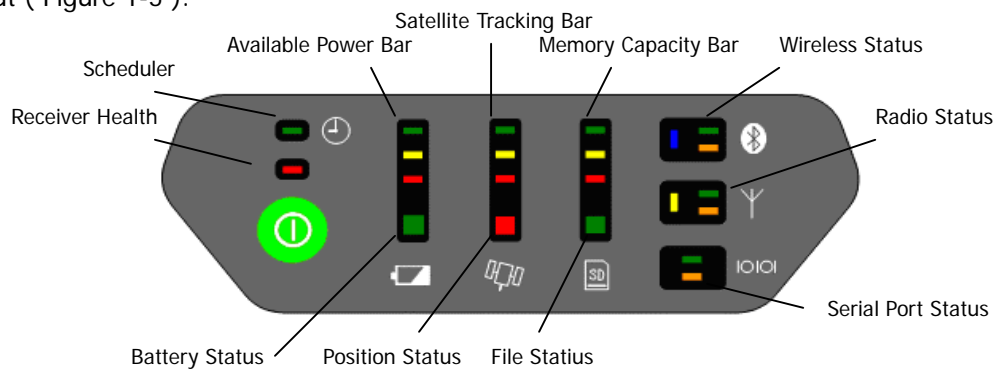


Figure 1-5. GRX1 MINTER

**Available Power Bar** indicates battery remaining or voltage.

- Green - indicate greater than 50%.
- Yellow - indicate greater than 25%.
- Red - indicate greater than 10%.
- Red blink - indicate less than 10%.

**Battery Status LEDs** indicates an available battery and the usage condition.

- Green - only battery is available.
- Red - only external power is available.
- Umber - battery and external power are available.

**Satellite Tracking Bar** indicate number of satellites tracked.

- Green - indicate greater than 8 satellites.
- Yellow - indicate 6 or 7 satellites.
- Red - indicate 4 or 5 satellites.
- Red blink - indicate 3, 2, 1 or 0 satellites.

**Position Status LEDs** indicate current type position computed.

- Green - Integer RTK or Fixed RTK.
- Umber - DGPS or Float RTK.
- Red - Single

**Memory Capacity Bar** indicate a percentage of available space in the memory.

- Green - indicate greater than 50%.
- Yellow - indicate greater than 25%.
- Red - indicate greater than 10%.
- Red blink - indicate greater than 0%.

**File Status LEDs** indicate status of current file.

- Green - file is opened.
- Umber blink - writing are done on the file.
- ( light out ) - file is not opened or there is no memory card in slot.

**Wireless Status LEDs** indicate status of the internal Blue-tooth module.

- Blue - internal Bluetooth connection has been established.
- Blue blink - internal Bluetooth connection has not been made, as long as the module has power.
- Blue dark - internal Bluetooth is not being powered.
- Green flash - data is transmitted from the Bluetooth port.
- Orange flash - data is received from the Bluetooth port.

**Radio Status LEDs** indicate status of the internal UHF radio and GSM module.

- Yellow - internal radio is being powered.
- Yellow dark - internal radio is not being powered.
- Green flash - data is transmitted from the internal radio port.
- Orange flash - data is received from the internal radio port.

**Serial Port Status LEDs** indicates status of the serial port.

- Green flash - data is transmitted from the serial port.
- Orange flash - data is received from the serial port.

**The power button** turns the receiver on, off and receiver setting.

The power button is used to turn the unit on or off, format or erase the internal memory, or perform a factory reset. The number of seconds that you press the power button determines how the receiver will behave. At each time interval, the receiver issues voice messages or sounds to guide you through the process.

Action	Number of seconds	Description
Turn on	1	Press the button for 1 second and release to turn on the receiver. The battery life gauge indicates the progress of the startup sequence. After startup (approximately 20 seconds), the battery life gauge indicators will turn off for a short period, and you will hear the "Receiver Ready" message or sound that indicates that the system is operational. Note: It is normal for the receiver health indicator LEDs to illuminate during startup.
Turn off	3	Press the button for 3 seconds and/or until you hear the "Power Off" message or sound, and the top three battery life gauge LEDs illuminate.



Factory reset	10	<p>With the receiver on, press the button for 10 seconds until you hear the "Factory Reset" message or sound and the top three LEDs on the battery life, satellite tracking, and memory gauges illuminate.</p> <p>Release the button to reset all stored parameters on the receiver to their default values.</p> <p>Note: This action is irreversible.</p>
Erase memory	20	<p>With the receiver on, press the button for 20 seconds until you hear the "Delete Files" message or sound and the top three LEDs on the memory gauge illuminate.</p> <p>Release the button to delete all the files from the memory.</p> <p>Note: This action is irreversible.</p> <p>If you are unsure about whether you want to delete all the files, hold the button longer than 25 seconds, so that the receiver simply returns to normal operation.</p> <p>To delete individual files from the memory, use a data collector or SOKKIA TOPCON software on your PC.</p>
Disregard	25	<p>When you hold the button longer than 25 seconds and you hear the "Continue Operation" message or sound, no action will be taken, and the receiver will return to normal operation.</p> <p>The receiver will not turn off, the data files will not be erased, and the settings will not revert to factory settings.</p>

## Data and Power Ports

The GRX1 has the following three ports (Figure 1-6):

- Serial - rimmed in **blue**; used for communication between the receiver and an external device. The body of the connector on the corresponding cable is **blue**.
- Power - rimmed in **red**; used to connect the receiver to an external power source. The body of the connector on the corresponding cable is **red**.

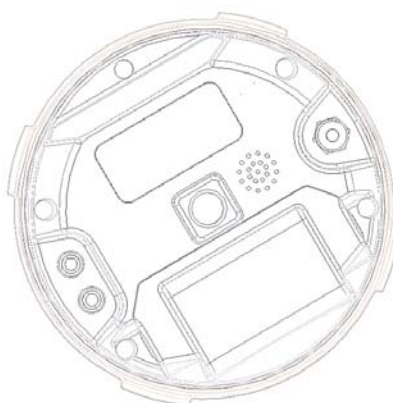


Figure 1-6. GRX1 Ports

## External Radio Antenna Connector

The UHF and SS antennas connect to the external antenna connector under the GRX1 housing ( Figure 1-7 ). Both modem antenna types include support for a GSM modem.

The modem antenna depends on the type of modem in-stalled in the receiver:

- UHF: Uses a BNC RF connection and comes in three versions: 410-440MHz ( p/n 30-070003-01 ) and 440-470MHz ( p/n 30-050503-01 ).
- Spread Spectrum: Uses a reverse polarity TNC RF connection and comes in one version: ( p/n 30-030012-01 ).



Figure 1-7. Modem Antennas

## Connector

The bottom connector ( Figure 1-8 ) connects the receiver to either a standard 5/8"thread pole/adaptor or the quick disconnect ( see "The quick disconnect adapter" on page 1-22 for details ).

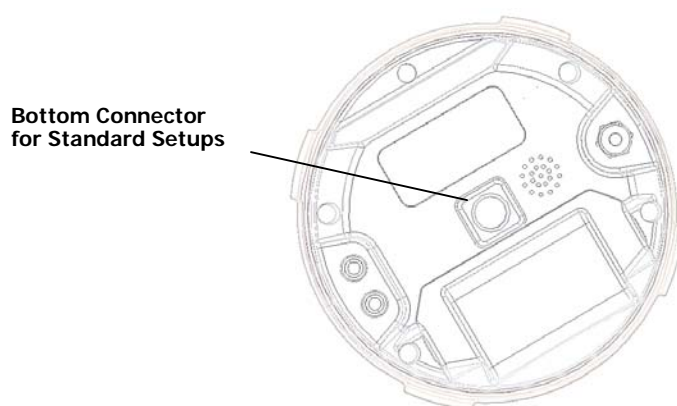


Figure 1-8. GRX1 Quick Connector

## SD/MMC and SIM Card Slots

The SD and SIM card slots reside under the batteries near the base of the dome.

**The SD card slot** is located to the left of the MINTER inside the battery pocket ( Figure 1-9 ) and connects an optional SD card to the receiver board to provide memory. Once installed, the SD card usually remains inside the receiver. The data that resides on the SD card can be accessed via the serial port, or Bluetooth wireless technology. A secure digital card can be purchased at a local computer supply store.

**The SIM card slot** is located to the inside the battery pocket and allows a standard SIM card to be installed in the receiver. Once installed, the SIM card provides a unique identification for the receiver's GSM module and enables the receiver's GSM functionality based on the subscribed services ( the receiver board accesses the GSM module which accesses the SIM card ). The SIM card usually remains inside the receiver. The GSM module with the SIM card installed can be accessed via **Modem-TPS** for configuration purposes. A SIM card can be purchased from a local cellular provider.

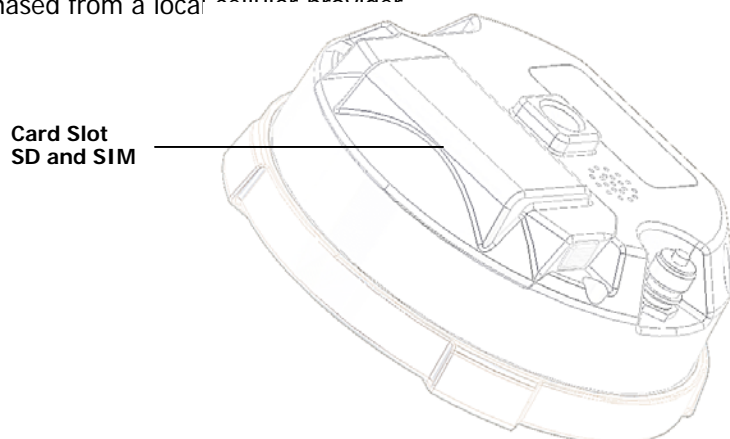
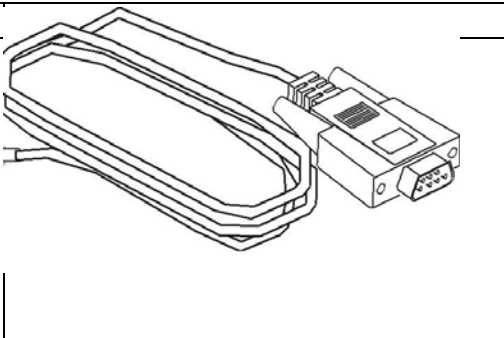


Figure 1-9. GRX1 Card Slot Example

## Cables

The GRX1 package includes standard communication cables for configuring the receiver. Table 1-3 lists the cables included in the GRX1 package.

Table 1 -3. GRX1 Package Cables

Cable Description	
<p><b>Serial Cable</b> Connects the receiver to an external device ( controller or computer ) data transfer and receiver configuration. Body of connector back. p/n xx-xxxxxx-xx</p>	

## Other Accessories

- **Battery** ( BDC58 ) Li-ion Battery [ 4300mAh,7.2V DC ].
- **Power system - without Power Cable** ( CDC68 ) Battery BDC58 [ about 150min ] × 2、AC100V [ without AC power cable、CDC68-11 include ]
- **Power Cable** ( EDC113/A/B/C/D/E ) CDC68 to AC consent. It is chosen by every country.
- **Quick release** ( 086-0-0001 )
- **Measuring Tape** ( 405-0-0013 ) 3.7m HI ( Calibrated )
- **SD Card** FAT16、2GB industrial
- **CD-ROM** include Manual PDF and Config Tool
- **Carrying Case**

For more details on the accessories and package options available for the GRX1, contact the local Sokkia Topcon dealer.

## Optional Accessories

Sokkia Topcon offers a wide variety of accessories especially designed to extend job reliability and efficiency. For more details on the optional accessories available for GRX1, contact the local Sokkia Topcon dealer.

- **Interface Cable** ( \*\*\*\*\* ) For SHC250/SHC2500, Cross connection, D-sub 9pin
- **Interface Cable** ( \*\*\*\*\* ) For Computer, Cross connection, D-sub9pin
- **Tribrach and Tribrach adapter** ( WOA )
- **Tribrach** ( WA100A ) w/Optical Plummet
- **Tribrach adapter** (555501 )
- **Tribrach adapter, Rotating Center** ( 501-0-0011 )
- **Tribrach adapter** ( 51861 ) Model S2
- **Tripod** ( PWF1 )
- **Tripod** ( 30-050505-01 ) 2m Fixed Height Tripod
- **AC Adaptor** ( EDC117 )
- **Interface Cable** ( BDC118 )
- **External Battery Box** ( \*\*\*\*\* ) Output DC5V, 7.2V, 12V
- **Power Cable** ( \*\*\*\*\* )
- **Bibod** ( GP-SP) RTK-GPS, Steel
- **RTK-GPS Pole** ( GP-SP1 ) RTK-GPS, 2m, connection, steel
- **Slide Pole** ( AP61 ) 2m, Caing Case
- **2M Pole** ( 22-050908-01 ) 2m pole Fixed Hieght
- **Pole Stand** ( AP71) with plastic case
- **Range Pole Level** ( AP61L2 ) with reflective mirror, bubble tube detection range 10'
- **Controller Pole Cramp** ( 700264901 ) SECO Co., Product
- **Controller** ( SHC250 ) with Battery, Power System, Cable
- **Controller** ( SHC2500 )

## Option Authorization File (OAF)

Sokkia Topcon issues an Option Authorization File ( OAF ) to enable the specific options that customers purchase. An Option Authorization File allows customers to customize and configure the receiver according to particular needs, thus only purchasing those options needed.

Typically, all receivers ship with a temporary OAF that allows it to be used for a predetermined period of time. When the receiver is purchased, a new OAF permanently activates purchased options. Receiver options remain intact when clearing the NVRAM or resetting the receiver.

The OAF enables the following kinds of functions. For a complete list of available options and details, visit the Sokkia Topcon website or consult a Sokkia Topcon dealer.

- Type of signal ( standard L1; optional L2, L5 GPS, GLONASS )
- Update rate standard 1Hz ( optional 5, 10, or 20Hz )
- RTK at 1Hz, 5Hz, 10Hz, and 20Hz
- RTCM/CMRInput/Output
- Advanced multipath reduction
- Wide Area Augmentation System ( WAAS )
- Receiver Autonomous Integrity Monitoring ( RAIM )

## Pre-survey Preparation

Before beginning to survey with the GRX1 receiver, the following software needs to be installed and configurations need to be applied:

- Install receiver configuration software See "Installing Sokkia Topcon Software" on page 2-2.
- Optional: install SD card and/or SIM card See "Installing the Optional SD and SIM Cards" on page 2-7.
- Charge the batteries See "Charging the Batteries" on page 2-9.
- Enable power source settings ( either attached or external ) See "Power Management" on page 2-11 and "Power-ing the Receiver" on page 2-14.
- Configure the Bluetooth wireless technology module See "Bluetooth Module Configuration" on page 2-23.
- Collect almanacs and ephemerides ( after first-time configuration activities as described in Chapter 3 ) See "Collecting Almanacs and Ephemerides" on page 2-26.

This chapter also discusses connecting batteries to the receiver, connecting the receiver and a computer, and powering the receiver using different sources.

## Installing Sokkia Topcon Software

The Sokkia Topcon GPS+ CD includes the following software programs used for configuring and maintaining the receiver. This software is also available on the Sokkia Topcon website to registered users.

- PC-CDU Lite ver. 2.1.15 or newer
- Modem-TPS ver. 2.2p2 or newer
- BTCONF ver. 1.3 or newer
- FLoader ver 1.0.07 or newer

If installing the program ( s ) from the GPS+ CD, insert the CD into the computer's CD-ROM drive.

If downloading the program ( s ) from the website, extract the program's files into a folder on the hard drive.

The following sections describe installing this software, and other sections throughout the manual describe using this software with the receiver.

## Installing PC-CDU

**PC-CDU** is a comprehensive Windows software product designed for controlling GPS+ receivers developed by Sokkia Topcon. **PC-CDU** uses the GPS Receiver Interface Language ( GRIL ) to configure various receiver settings and diagnose receiver performance.

The PC-CDU software exists in two versions: a full-functionality version called PC-CDU MS and a reduced-functionality version called PC-CDU Lite. PC-CDU Lite is available for free on the Sokkia Topcon website ( [www.sokkia.co.jp](http://www.sokkia.co.jp) ) or the GPS+ CD.

Computer requirements for PC-CDU are: Windows98 or newer and an RS-232C or Bluetooth capable. Use PC-CDU version 2.1.15 or newer to correctly configure the receiver.



Refer to the **PC-CDU** Reference Manual for full details on installing and using **PC-CDU**.

To Install **PC-CDU**:

1. Create a **PC-CDU** folder on the hard drive, and place the compressed **PC-CDU** zip file ( retrieved from either the website or the GPS+ CD ) in this folder.
2. Navigate to the PC-CDU folder, and double-click the PC-CDU\_MS zip file.
3. Extract the **PCCDU.EXE** and associated \*.dll file to the **PC-CDU** folder ( Figure 2-1 ).
4. Optionally, create a shortcut on the computer's desktop for quick access to **PC-CDU** ( Figure 2-1 ).

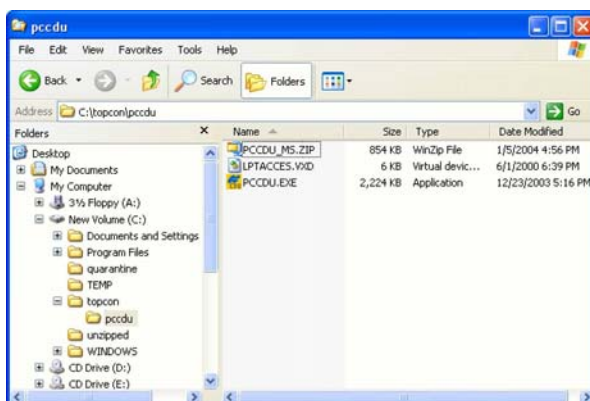


Figure 2-1. Extract Program and Create Shortcut

To uninstall **PC-CDU**, navigate to the location of the \*.exe file. Select the file, and press Delete.

## Installing Modem-TPS

**Modem-TPS** is a configuration program for the radio modem board inside the receiver.



**Modem-TPS** is available from the Sokkia Topcon website ( [www.sokkia.co.jp](http://www.sokkia.co.jp) ) or on the GPS+ CD.

Computer requirements for **Modem-TPS** are: Windows98 or newer and an RS-232C port or Bluetooth wireless technology. Use **Modem-TPS** version 2.2p2 or newer to correctly configure the receiver.

To install **Modem-TPS**:

1. Navigate to the location of the **Modem-TPS** program, and double-click the Setup.exe icon.
2. Keep the default installation location or select a new location. Click Finish ( Figure 2-2 ).

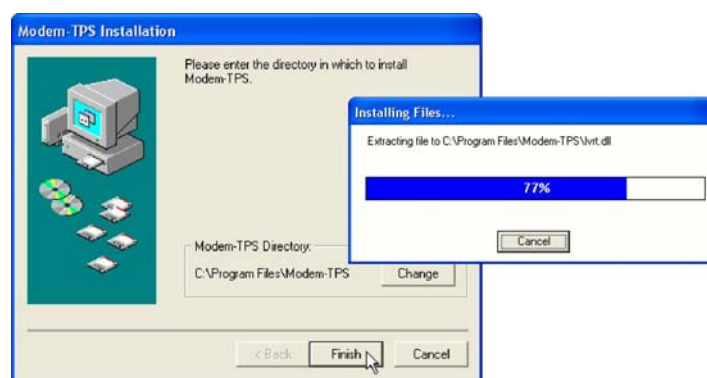


Figure 2-2. Select **Modem-TPS** Installation Location and Install

3. Click OK to complete the installation ( Figure 2-3 ).
4. Optionally, create a shortcut on the computer's desktop for quick access to **Modem-TPS** ( Figure 2-3 )

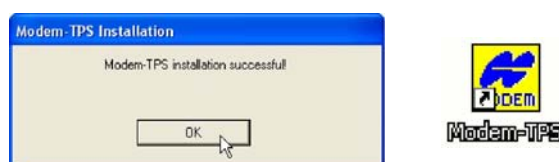


Figure 2-3. Installation Complete and Shortcut

To uninstall **Modem-TPS**, use the Start menu on the computer:

1. Click Start Programs **Modem-TPS UninstallModem-TPS**, and click Yes at the prompt.
2. Click OK when the uninstall completes.

## Installing **BTCONF**

**BTCONF** is a configuration program for the Bluetooth wireless technology module inside the receiver. **BTCONF** is available from the Sokkia Topcon website ( [www.sokkia.co.jp](http://www.sokkia.co.jp) ) or on the GPS+ CD.

Computer requirements for **BTCONF** are: Windows98 or newer and an RS-232C port or

Bluetooth wireless technology. Use **BTCONF** version 1.3 or newer to correctly configure the receiver.

To install **BTCONF**:

1. Create a **BTCONF** folder on the hard drive, and place the compressed **BTCONF** zip file (retrieved from either the website or the GPS+ CD) in this folder.
2. Navigate to the **BTCONF** folder, and double-click the **BTCONF** zip file.
3. Extract the **btconf.exe** to the **BTCONF** folder.
4. Create a shortcut on the computer's desktop for quick access to **BTCONF** (Figure 2-4).

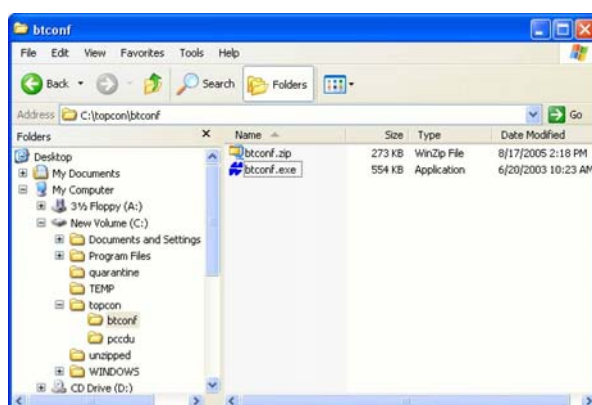


Figure 2-4. Extract Program and Create Shortcut

To uninstall **BTCONF**, navigate to the location of the \*.exe file. Select the file, and press Delete.

Each time **BTCONF** runs and configures the Bluetooth module, **BTCONF** saves the settings in a file ( **btconf.ini** ). **BTCONF** automatically updates the file each time changes are made to the Bluetooth module's settings.



To maintain unique Bluetooth module settings for different purposes, keep copies of **BTCONF** in separate folders.

## Installing **FLoader**

**FLoader** is a firmware loading program for the power board, GPS module, and modem board inside the receiver. **FLoader** is available from the Sokkia Topcon website ( [www.sokkia.co.jp](http://www.sokkia.co.jp) ) or on the GPS+ CD.

Computer requirements for **FLoader** are: Windows98 or newer and an RS-232C port or Bluetooth wireless technology. Use **FLoader** version 1.0.07 or newer to correctly configure the receiver.

To install **FLoader**:

1. Create an **FLoader** folder on the hard drive and place the compressed **FLoader** zip file (retrieved from either the website or the GPS+ CD) in this folder.
2. Navigate to the **FLoader** folder, and double-click the zip file.
3. Extract the **FLoader.exe** file to the **FLoader** folder (Figure 2-5).
4. Optionally, create a shortcut on the computer's desk-top for quick access to **FLoader** (Figure 2-5).

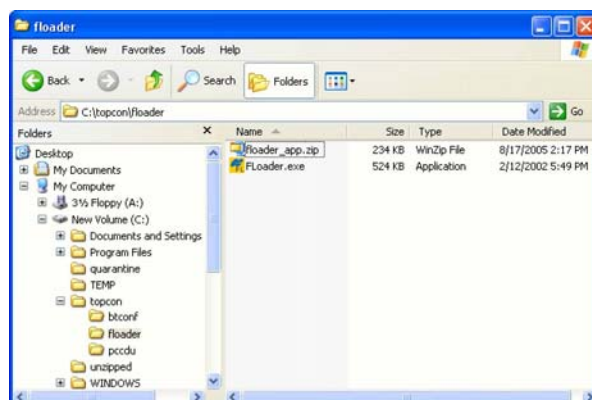


Figure 2-5. Extract Program and Create Shortcut

To uninstall **FLoader**, navigate to the location of the \*.exe file, select the file, and press Delete

## Installing the Optional SD and SIM Cards

Behind each detachable battery is a slot for the optional SD card or the optional SIM card. The SD card provides memory space in which to save logged data; the SIM card provides telephony communication for data transfer between two GSM-capable receivers. The SD card can be purchased at a local computer store; the SIM card can be purchased at a local cellular phone supply store. The receiver currently supports an SD card with up to 2GB ( FAT16 format ) capacity.

Once installed, the card ( s ) generally remains installed. The card can then be accessed via the receiver board using a data port or Bluetooth wireless technology.

**To install the SD card** ( Figure 2-6 ):

1. Ensure the receiver is turned off.
2. Remove the battery.
3. Carefully insert the SD card, label side down, into the SD card slot located at the top of the battery pocket.

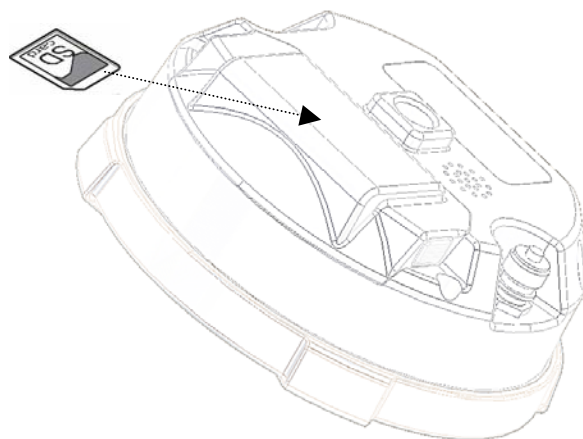


Figure 2-6. Install SD Card



Do not remove the card if the receiver is powered on. Damage to data may result from improper removal of the card.

Once the receiver is turned on, the receiver board will detect the SD card, and it will be ready to use as needed.

**To install the SIM card** ( Figure 2-7 ):

The SIM card must support Circuit Switched Data to communicate directly between receivers. The SIM card must have GPRS or EDGE support to communicate with a GPS Network IP address.



For direct communication between Base and Rover receivers, you must install a SIM card with a Circuit Switch Data plan and have subscriptions to the same service provider for proper data communication.

1. Ensure the receiver is turned off.
2. Remove the battery.
3. If needed, snap the SIM card into its holder.
4. Carefully insert the holder, label side down, into the SIM card slot located at the top of the battery pocket.

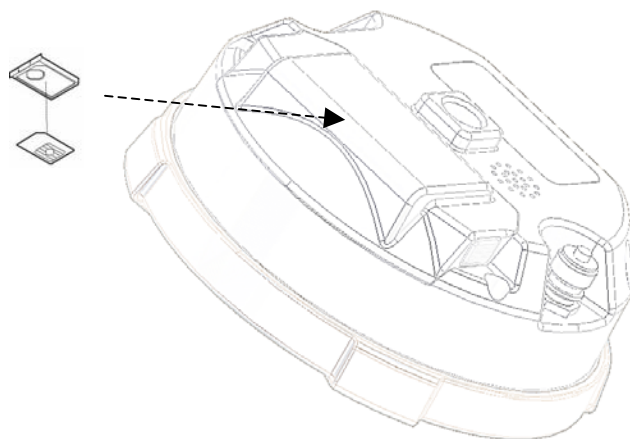


Figure 2-7. Install SIM Card

Once the receiver is turned on, the receiver board will detect the SIM card, and it will be ready to use as needed.

## Charging the Batteries

To charge the battery, use the included charger. It takes approximately two hours to completely charge one battery, and **four** hours to charge two batteries.



The batteries are shipped from the factory without power. Fully charge the batteries before surveying.

---

The Li-Ion batteries used in the battery packs should run at no less than 80% capacity after 500 charging cycles. These batteries do not need to be drained before recharging.

## Power Management

This chapter describes how to power your receiver. Before using the receiver for the first time, ensure that you have followed the setup instructions.

## Powering the Receiver

The receiver's power button is used to switch the receiver on or off. However, the receiver will

also automatically turn on if it detects activity on COM1. If you turn off the receiver while it is logging data to the memory, it will save and close any open files before turning off. The receiver does not support the use of schedules.

As an alternative to using the internal battery ( for example, if the internal battery is discharged ), the receiver can also be powered using an external battery, following the recommendations in this section.



If the external power input exceeds 18 VDC, it may damage the receiver.

---

When the external battery is discharged, the receiver will automatically switch to using the internal battery. If the internal battery does not have sufficient charge ( or is not present ), the receiver will turn off.

The receiver draws a small amount of power from the batteries while the receiver is off. During long term storage, you should remove the battery.

If the internal battery and any external power input voltage are below minimum operating parameters ( in other words, if the main battery is depleted, or external power is removed or insufficient ), the receiver will initiate a power-down sequence. It will turn off and become inactive. If this happens, you will not be able to turn the receiver on until you restore sufficient power.

To return to normal operation, insert a charged battery or connect a valid external power input to the receiver. When sufficient power is restored, the receiver will turn on if the power button is pressed.



The receiver may also become inactive if the external power input is greater than the power specified as acceptable for the receiver.

---

## Using the Detachable Batteries

The receiver uses one rechargeable lithium-ion battery. It also contains an internal backup battery, which maintains internal RTC. The backup battery is automatically charged from the main battery.

The battery is capable of running for more than 8 hours on a single charge. ( static observation )

The battery compartment door provides access to the main battery. The receiver can also be powered using an external power source.

## Remove or insert the battery

To remove the battery:

1. Please turn bottom to the top in GRX1.
2. Push battery knob of both sides, and please lift battery cover. It becomes easy to lift a battery cover when push the center of a battery cover lightly.
3. Please slide with battery sideways, and please separate battery from connector.
4. Please lift up battery.

# Regulatory Information

The following sections provide information on this product's compliance with government regulations for use.

## UHF Radio Usage

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### \*NOTICE\*

Using a UHF radio requires a license. Operating a UHF radio without a license may result in fines or other penalties. Be sure you comply with all local laws before operating a UHF radio. Contact your local authorities (such as, the FCC in the United States) for details.

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Surveying in RTK mode has made UHF the most popular choice for communications between Base and Rover receivers. Know the strengths and weaknesses of this technology to get the best use out of your receiver. The quality and strength of the UHF signals translates into range for UHF communications.

1. The system's range will greatly depend on the local conditions. Topography, local communications and even meteorological conditions play a major role in the possible range of RTK communications. If needed, use a scanner to find clear channels.
2. The system's range will increase by adjusting the Base station's antenna using the following methods.
  - Ensure the Base radio has a fully charged battery.
  - Use directional antennas and/or repeaters to increase your system's range. Directional antennas concentrate the signal power within a more narrow direction, significantly increasing the range of your system.
  - Check the TPS accessory line for items to raise the Base radio.



## FCC Compliance

This device complies with Part 15 of the 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.

This equipment has been tested and found to comply with the limits for a digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, There is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television equipment 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.
- Move the equipment away from the receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.
- Consult the dealer or an experienced radio/television technician for additional suggestions.

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### \*CAUTION\*

Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.

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### FCC RF Radiation Exposure Statement

To comply with FCC/IC RF exposure compliance requirements a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

**Federal Communication Commission  
Declaration of Conformity (DoC) Statement**



Model No: GRX1

Trade Name	Topcon
Responsible Party	Topcon Positioning Systems, Inc.
Address	7400 National Drive, Livermore, CA 94551
Telephone No	+925-245-8300

## Canadian Emission Labeling Requirements

- 1.Operation is subject to the following two conditions. (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
- 2.To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than that permitted for successful communication.
- 3.This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte conform a la norme NMB-003 du Canada.

### IC RF Radiation Exposure Statement

This installer of this device must ensure that the antenna is located or pointed such that it dose not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website at [www.hc-sc.gc.ca/rpb](http://www.hc-sc.gc.ca/rpb).

### IC Additional statement with Detachable Antennas

This device has been designed to operate with the antennas listed below, and having a maximum gain of 2.4dB. Antennas not included in this or having a gain greater than 2.4 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

- GRX1/U 2.4dBi whip antenna Manufacture/Type  
410-440MHz ANTENEX/G420BN  
440-470MHz CENTURION/EVR450
- GRX1/FH 2.4dBi whip antenna Manufacture/Type  
CENTURION/EVR450

## Community of Europe Compliance

The product described in this manual is in compliance with the R&TTE and EMC directives from the European Community.

### **European Community Declaration of Conformity with R&TTE Directive 1999/5/EC**










The following standards were applied: (R&TTE Directive 1999/5/EEC)









- EN 301 489-1 V1.8.1 (2008-04)
- EN 301 489-5 V1.3.1 (2002-08)
- EN 301 489-17 V1.3.2 (2008-04)
- EN 300 328 V1.7.1 (2006-10)
- EN 300 113-2 v1.4.1 (2007-07)
- EN 62311:2008
- EN 60950-1:2001 + A11:2004

The following CE mark is affixed to the device:



### Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC

 Český [Czech]	<i>(Topcon Positioning Systems, Inc.)</i> tímto prohlašuje, že tento <i>(GRX1)</i> je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
 Dansk [Danish]	Undertegnede <i>(Topcon Positioning Systems, Inc.)</i> erklærer herved, at følgende udstyr <i>(GRX1)</i> overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
 Deutsch [German]	Hiermit erkläre <i>(Topcon Positioning Systems, Inc.)</i> dass sich das Gerät <i>(GRX1)</i> in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
 Eesti [Estonian]	Käesolevaga kinnitab <i>(Topcon Positioning Systems, Inc.)</i> seadme <i>(GRX1)</i> vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
 English	Hereby, <i>(Topcon Positioning Systems, Inc.)</i> declares that this <i>(GRX1)</i> is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
 Español [Spanish]	Por medio de la presente <i>(Topcon Positioning Systems, Inc.)</i> declara que el <i>(GRX1)</i> cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
 Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ <i>(Topcon Positioning Systems, Inc.)</i> ΔΗΛΩΝΕΙ ΟΤΙ <i>(GRX1)</i> ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
 Français [French]	Par la présente <i>(Topcon Positioning Systems, Inc.)</i> déclare que l'appareil <i>(GRX1)</i> est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
 Italiano [Italian]	Con la presente <i>(Topcon Positioning Systems, Inc.)</i> dichiara che questo <i>(GRX1)</i> è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski	Ar šo <i>(Topcon Positionina Svstems, Inc.)</i> deklarē.

[Latvian]	ka ( <i>GRX1</i> ) atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo ( <i>Topcon Positioning Systems, Inc.</i> ) deklaruoja, kad šis ( <i>GRX1</i> ) atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
 Nederlands [Dutch]	Hierbij verklaart ( <i>Topcon Positioning Systems, Inc.</i> ) dat het toestel ( <i>GRX1</i> ) in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
 Malti [Maltese]	Hawnhekk, ( <i>Topcon Positioning Systems, Inc.</i> ) , jiddikjara li dan ( <i>GRX1</i> ) jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn rilevanti li hemm fid-Dirrettiva 1999/5/EC.
 Magyar [Hungarian]	Alulírott, ( <i>Topcon Positioning Systems, Inc.</i> ) nyilatkozom, hogy a ( <i>GRX1</i> ) megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
 Polski [Polish]	Niniejszym, ( <i>Topcon Positioning Systems, Inc.</i> ) , deklaruje, że ( <i>GRX1</i> ) spełnia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.
 Português [Portuguese]	( <i>Topcon Positioning Systems, Inc.</i> ) declara que este ( <i>GRX1</i> ) está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
 Slovensko [Slovenian]	( <i>Topcon Positioning Systems, Inc.</i> ) izjavlja, da je ta ( <i>GRX1</i> ) v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	( <i>Topcon Positioning Systems, Inc.</i> ) týmto vyhlasuje, že ( <i>GRX1</i> ) spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
 Suomi [Finnish]	( <i>Topcon Positioning Systems, Inc.</i> ) vakuuttaa täten että ( <i>GRX1</i> ) tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
 Svenska [Swedish]	Härmed intygar ( <i>Topcon Positioning Systems, Inc.</i> ) att denna ( <i>GRX1</i> ) står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

## WEEE Directive

Following information is for EU-member states only:

The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product or consult.