SP90m GNSS Receiver

User Guide

REV B, SEP 11, 2017, PRELIMINARY

Legal Notices

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SP90m User Guide, Rev. B, September 2017.

Limited Warranty Terms and Conditions

Product Limited Warranty. Subject to the terms and conditions set forth herein, Trimble Inc. ("Trimble") warrants that for a period of 2 years from date of purchase this Spectra Precision product (the "Product") will substantially conform to our publicly available specifications for the Product and that the hardware and any storage media components of the Product will be substantially free from defects in materials and workmanship.

Product Software. Product software, whether built into hardware circuitry as firmware, provided as a standalone computer software product, embedded in flash memory, or stored on magnetic or other media, is licensed solely for use with or as an integral part of the Product and is not sold. The terms of the end user license agreement govern the use of the Product Software, including any differing limited warranty terms, exclusions and limitations, which shall control over the terms and conditions set forth in the limited Product warranty.

Warranty Remedies. If the Product fails during the warranty period for reasons covered by this limited warranty and you notify us of such failure during the warranty period, we will repair OR replace the nonconforming Product with new, equivalent to new, or reconditioned parts or Product, OR refund the Product purchase price paid by you, at our option, upon your return of the Product in accordance with our product return procedures then in effect.

Warning to Users in the United States

Federal Communication Commission Interference Statement 47 CFR Section 15, 105(b). 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.

The SP90m 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.

No Unauthorized Modifications

47 CFR Section 15.21

CAUTION: This equipment may not be modified, altered, or changed in any way without signed written permission from Trimble Inc.. Unauthorized modification may void the equipment authorization from the FCC and will void the Trimble warranty.

This device complies with FCC RF radiation exposure limits set forth for general population (uncontrolled exposure). This device must be installed to provide a separation distance of at least 30 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Warning to the Users in the Canada

This device complies with Industry Canada RF radiation exposure limits set forth for general population (uncontrolled exposure). This device must be installed to provide a separation distance of at least 30 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Attention pour les utilisateurs au Canada

Le présent appareil est conforme aux niveaux limites d'exigences d'exposition RF aux personnes définies par Industrie Canada. Cet appareil doit être installé afin d'offrir une distance de séparation d'au moins 30 cm avec l'utilisateur, et ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) il ne doit pas produire de brouillage, et (2) l'utilisateur du dispositif doit être prêt a accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

Europe

$C\epsilon$

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 sales within the European Economic Area (EEA). These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.

Notice to Our European Union Customers

For product recycling instructions and more information, please go to http://www.spectraprecision.com/eng/weee-and-rohs.

Recycling in Europe: To recycle Spectra Precision WEEE (Waste Electrical and Electronic Equipment products that run on electric 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, Spectra Precision,
declare under sole responsibility that the product:
SP90m 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,

(2) and this device must accept any interference received, including interference that may cause undesired operation.

Explanations on logos and acronyms found on the receiver sticker:

FC : Federal Communication Commission

10: Restriction of Hazardous Substances Directive

CE: Conformité européenne (European Compliance)

X: Waste Electrical and Electronic Equipment Directive

IC: Industry Canada

V: Volts

=== : Direct Current

Rechargeable Lithium-ion Batteries

This receiver uses one rechargeable Lithium-ion battery.

WARNING - Do not damage the rechargeable Lithium-ion batteries. 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 batteries if they appear to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.

• Do not expose the batteries to fire, high temperature, or direct sunlight.

• Do not immerse the batteries in water.

• Do not use or store the batteries inside a vehicle during hot weather.

• Do not drop or puncture the batteries.

• Do not open the batteries or short-circuit their contacts.

WARNING - Avoid contact with a 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 a 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 batteries only in strict accordance with the instructions. Charging or using the batteries in unauthorized equipment can cause an explosion or fire, and can result in personal injury or/and equipment damage. To prevent injury or damage:

• Do not charge a battery if it appears to be damaged or leaking.

• USE EXCLUSIVELY the dual-battery charger (P/N 53018010-SPN) or the AC/DC power supply (P/N 107000) to charge the SP90m Lithium-ion battery. See instructions in this guide. These two devices are part of the SP90m standard accessories list.

  CHARGE THE BATTERIES ONLY IN THE TEMPERATURE RANGE 0° to +40°C (32° to 104°F), at a maximum altitude of 2,000 meters (6,562 feet).

• Discontinue charging a battery that gives off extreme heat or a burning odor.

• Use the batteries only in Spectra Precision equipment that is specified to use them.

• Use the batteries only for their intended use and according to the instructions in the product documentation.

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.

CAUTION - RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.

DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS"

ATTENTION - RISQUE D'EXPLOSION SI LA BATTERIE EST REMPLACÉE PAR UNE BATTERIE DE TYPE INCORRECT.

METTRE AU REBUT LES BATTERIES USAGÉES CONFORMÉMENT AUX INSTRUCTIONS.

Receiver Use and Care

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

CAUTION - Operating or storing the receiver outside the specified temperature range can damage it. For more information, see Physical Specifications in this guide.

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

For more information, contact your Spectra Precision distributor.

Bluetooth & Wifi Radios

The radiated output power of the wireless radios is far below the FCC radio-frequency exposure limits. Nevertheless, the wireless radios shall be used in such a manner that the Spectra Precision receiver is 30 cm (11.8") or further from the human body.

The internal wireless radios operate within guidelines found in radio-frequency safety standards and recommendations, which reflect the consensus of the scientific community. Spectra precision therefore believes the internal wireless radios are safe for use by consumers.

The level of energy emitted is far less than the electromagnetic energy emitted by wireless devices such as mobile phones. However, the use of wireless radios may be restricted in some situations or environments, such as on aircraft. If you are unsure of restrictions, you are encouraged to ask for authorization before turning on the wireless radios.

COCOM Limits

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

The following limitation is implemented on the receiver: Immediate access to satellite measurements and navigation results is disabled when the receiver's velocity is computed to be greater than 1000 knots, or its altitude is computed to be above 17,000 meters (59,055 feet). The receiver continuously resets until the COCOM situation is cleared.

Technical Assistance

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

Your Comments

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

UHF Radios

Regulations and Safety. The receiver may be fitted with an internal radio as an option. It can also be connected to an external UHF radio.

Regulations regarding the use of Ultra High Frequency (UHF) radio-modems vary greatly from country to country. In some countries, the UHF kit may be used without obtaining an end-user license. Other countries require end-user licensing. For licensing information, consult your local Spectra Precision dealer.

Before operating the receiver with the UHF kit, determine if authorization or a license to operate the UHF kit is required in your country. It is the end-user's responsibility to obtain an operator's permit or license for the location or country of use.

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

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

- DO NOT operate the transmitter when someone is within 30 cm (11.8 inches) of the antenna.

- DO NOT collocate (place within 30 cm) the radio antenna with any other transmitting device.

- DO NOT operate the transmitter unless all RF connectors are secure and any open connectors are properly terminated.

- DO NOT operate the equipment near electric blasting caps or in an explosive atmosphere.

- All equipment must be properly grounded according to Spectra Precision installation instructions for safe operation.

- All equipment should be serviced only by a qualified technician.

Connecting the SP90m to an external battery using an SAE-terminated cable

The wires used should all be certified UL 758 and CSA C22.2 No. 210, or similar. Minimum wire section should be AWG 18, with insertion of a 5-A fuse in series. The fuse should be certified "UL listed" and CSA certified 3-30 A (or equivalent).

Table of Contents

Introduction to SP90m

The Spectra Precision SP90m is a powerful, highly versatile, ultra-rugged, and reliable GNSS positioning solution for a wide variety of real-time and post-processing applications. It also comes with a variety of integrated communications options, such as Bluetooth, WiFi, UHF radio, cellular modem, and two MSS L-band channels to receive Trimble RTX correction services.

The modular design of the SP90m allows for maximum flexibility on how the receiver can be used, such as base station, continuously operating reference station (CORS), RTK/RTX rover, for on-board machine integration, vessels, etc. The ultra-rugged design of the aluminum receiver housing protects the investment, especially in tough field environments.

The state-of-the-art and patented Z-Blade GNSS-centric technology uses all available GNSS signals to deliver fast and reliable real-time positions. Besides supporting all currently available and future planned GNSS satellite signals, the SP90m GNSS receiver allows the connection of two GNSS antennas for precise heading determination without the need for a secondary GNSS receiver.

First Steps

Unpacking   In its basic version, the SP90m is delivered with a transport bag, a Li-Ion battery, a dual-battery charger with battery inserts, an AC/DC power supply, a Bluetooth/WiFi antenna and accessories (see details in *System Components Overview on page 4*).

Additionally, a choice of GNSS antenna and coaxial cable should have been made, as well as that of a country-specific power cord.

When the chosen model of SP90m includes an internal radio, the power cable is different and a UHF antenna is added to the supply (see details on *page 4*).

Basic Setup   You may have the Li-Ion battery charged separately on the dual-battery charger (see *page 24*) or it can be placed in the receiver (see *page 13*) to be charged by the external DC source (AC/DC power supply) when connected as indicated below.
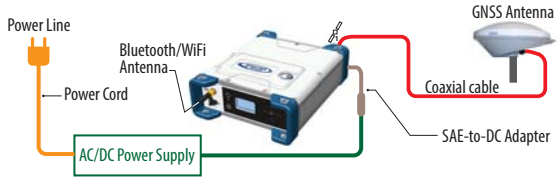
Default Configuration   The SP90m is shipped from the factory in the following configuration:

- Antenna configuration: Single antenna (GNSS input #1)
- Selected GNSS constellations and signals: All
- Elevation mask (for position and raw data): 5 degrees
- Anti-theft and startup protection: Both OFF
- Base Mode: OFF (the receiver will operate as a rover)
- Receiver with internal radio: Radio is ON
- GSM, WiFi: Both devices OFF
- Bluetooth, Ethernet: Both devices ON
- Raw data recording: OFF
- Internal GSM antenna is used
- Preset messages for raw data recording: ATOM (PVT, ATR, NAV, DAT, RNX-0, OCC)
- Distance unit used: Meters
- No corrections messages preset to be generated in base mode

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- Screen orientation: Normal
- Screen timeout: 10 minutes
- Buzzer: ON
- Automatic receiver power-on and power-off: Disabled
- ATL Recording: OFF
- Access to Web Server: Protected. The default login is "admin" and the default password is "password". These may be changed using the Security tab in the Web Server.

Customizing Receiver Operation

- If you wish to change the configuration, you need to:
  - Run the Web Server: see *Getting Started With the Web Server on page 46*.

  - Then choose your operating mode and follow the instructions to make it operational: See *Using SP90m With a Single Antenna on page 55* or *Using SP90m With Two Antennas on page 69*.

    NOTE: Web Server functions not described in this manual are covered in the on-line context-sensitive help.

- In all those applications where the *Spectra Precision Survey Pro* field software will be used, the configuration steps needed before operating the receiver in the requested mode may be taken directly from within *Survey Pro*. Typically in this case, a Bluetooth connection will be used between the data controller running *Survey Pro* and the SP90m.

Data Controller running Survey Pro

Bluetooth/WiFi Antenna

Bluetooth

GNSS Antenna

Coaxial cable

Powered from Internal Battery
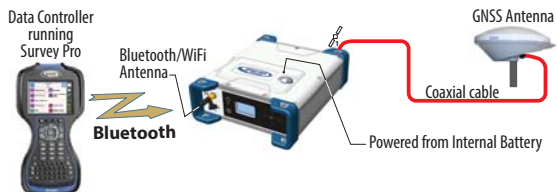
NOTE: Some configuration changes can also be made directly from the receiver's front panel. See *Receiver User Interface on page 26*.

System Components Overview

This section provides an overview of the different key items composing the SP90m.

Depending on your purchase and based on the type of survey you wish to perform, you may only have some of the listed items. Please refer to the packing list for an accurate description of the equipment that has been delivered to you.

NOTICE: Spectra Precision reserves the right to make changes to the items listed below without prior notice.

SP90m Packout Kits

Item	Part Number	Picture
SP90m, Survey, including standard accessories (see next table): • Worldwide use, without UHF radio • Worldwide use, with UHF radio • China only, without UHF radio • China only, with UHF radio • Latin America only, without UHF radio • Latin America only, with UHF radio	• SP90M-101-00 • SP90M-101-60 • SP90M-101-00-20 • SP90M-101-60-20 • SP90M-101-00-50 • SP90M-101-60-50	

Standard Accessories

The receiver you ordered was shipped with the following standard accessories. (If needed, each of these items may be

ordered separately as spare parts; Use the part numbers mentioned in the table below when ordering.)

Item	Part Number	Picture
Spectra Precision Transport Bag	206490-ASH	
Li-Ion battery,7.4 V DC, 3700 mAh	76767	
Dual Battery Charger (does not include AC/DC power supply and cable)	53018010-SPN	
AC/DC Power Supply, 65 W,19 V, 3.43 A, 100-240 V AC, Class VI (used either to power the receiver or the battery charger) (power cord not provided; see section below)	107000	
SAE-to-DC adapter cable, 0.15 m	88769-00	
OTG Cable, USB A to Mini USB B	107535	
Battery inserts for Dual Battery Charger (used for mechanical adaptation of the battery to the charger) (Qty: 2)	83664-00	
Helical SMA 2.4 Bluetooth/WiFi antenna, RH series	111403	
Tape measure, 3.60 m (12 feet)	93374	
Quick Start Guide	-	

For part numbers not including a UHF radio (SP90M-101-00, SP90M-101-00-20 and SP90M-101-00-50), the following item is added to the standard accessories.

Item	Part Number	Picture
7P Lemo-to-SAE power cable, 0.6 m	95715	

For part numbers including a UHF radio (SP90M-101-60, SP90M-101-60-20 and SP90M-101-60-50), the following items are added to the standard accessories.

Item	Part Number	Picture
Power/Data cable, 1.5 m, DB9-f to OS/7P/M to power jack	59044	
5" whip antenna (TNC) for 410-470 MHz radio	44085-60	

Country-Specific Power Cord

You should have ordered the power cord you need to power the AC/DC power supply, depending on the country where the receiver is to be used. The table below summarizes the different part numbers available for this item.

Item	Part Number	Country/Continent
Power cord, 1.8 m (6 ft) in length	105778-SPN	North America
	78656-SPN	Japan
	78653-SPN	Europe
	78654-SPN	UK
	101202-SPN	Taiwan
	102376-SPN	China
	78655-SPN	Australia

GNSS Antenna and Antenna Cables

The Spectra Precision offer in terms of GNSS antennas and coaxial cables that may be used with the SP90m is summarized in the table below.

Item	Part Number	Picture
"Spectra Precision SPGA Rover" antenna (can be used either as a rover or base antenna)	135000-00	
Coaxial, TNC/TNC, right angle, 1.6 m	58957-02-SPN	
Coaxial, TNC/TNC, right angle, 10 m	58957-10-SPN	

Pre-Installed Firmware Options

The list of pre-installed firmware options is given below. It applies to all available SP90m packout kits listed on *page 4*.

ID	Designation
N	GPS-SBAS-QZSS
G	GLONASS
O	GALILEO
B	BEIDOU
H	IRNSS
X	L1TRACKING
Y	L2TRACKING
Q	L5TRACKING
T	L6TRACKING
L	LBAND
W	20Hz
J	RTKROVER
K	RTKBASE
D	DUO
M	MODEM
U	WIFI
R	RECORD

Upgradable Firmware Options

These firmware options can be purchased separately to upgrade the receiver.

ID	Designation	Part Number
8	Fast Output (50 Hz)	113329-01
c	Embedded NTRIP Caster	113329-02
@1	Worldwide use (disables pre-installed Geofencing)	113329-03

In order to use the Trimble RTX service Center-Point RTX, a subscription is required.. The result of the purchase will be a code that you will have to type in, in the same way as you would do to activate a firmware option in the receiver using the Web Server.	Visit Trimble RTX website to purchase a subscription.

NOTE: The result of a separate purchase is a POPN (Proof Of Purchase Number) emailed to the buyer. The POPN is then entered in the receiver using the *SP Loader* software utility (see *page 88*) to activate the purchased firmware option.

Other Optional Accessories

Other accessory kits (cables, antennas, radios) may be used with the SP90m. Please contact your distributor for more information.

Equipment Description

Front Panel
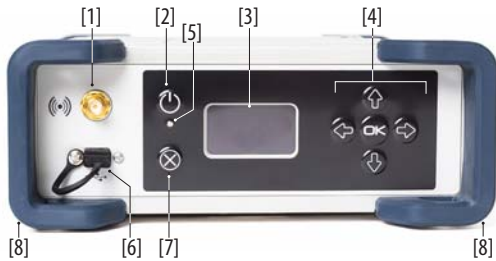
- **[1]**: External Bluetooth/WiFi antenna connector. A coaxial female connector (reverse SMA type) allowing you to connect a Bluetooth or WiFi antenna for wireless communication with a field terminal or any other device.
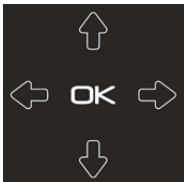- **[2]**: **Power** button.

  To turn on the receiver, press the Power button for about two seconds until the power LED **[5]** turns solid green, then release the button. The receiver will automatically complete its initialization phase before it starts operating normally.

  To turn off the receiver, press the same Power button for about two seconds. The Power LED will blink green until the receiver gets turned off.
- **[3]**: Display screen. The display consists of a 128 x 64-pixel, 1.5-inch monochrome blue-gray OLED screen.

  Used in conjunction with the direction keys, the **OK** and **Escape** keys, the display screen allows you to view and edit different pages of information. See *Receiver User Interface on page 26* for a detailed description of the information available from this screen.

  After a few seconds of keypad inactivity, screen luminosity is turned off.
- **[4]**: Keypad including four direction keys and a central **OK** key. See details on *page 26*.

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• **[5]**: Power LED. Possible states:

State		Meaning
○	Off	SP90m is off and no external power source is connected to the DC power input (but the internal battery may be present).
●	Solid green	SP90m is on (initializing or steady state), being powered from an external power source. If the internal battery is present, battery charging from the external source will take place if needed (see battery icon on General Status screen).
●	Solid green, but with 0.5-s "off" time every 2 sec	SP90m is on (initializing or steady state), being powered from the internal battery. No external power source is applied.
●	Blinking green	SP90m is running a 5-second power-off sequence following a long press on the Power button (regardless of the power source used).
●	Solid red	SP90m is off and an external power source is connected to the receiver. The internal battery may be missing or present. If it is present, that means the battery is fully charged.
●	Blinking red	SP90m is off and an external power source is connected to the receiver. An internal battery is present and being charged from the external power source.

• **[6]**: USB OTG mini connector (port U or M).

This is a five-contact connector. Depending on how it is configured, the USB port can be connected to:

1. A USB host, such as a USB key (mass storage device), using cable P/N 107535.
2. A USB device (port U), allowing USB serial communication using a standard USB cable (not provided).

This port is used typically for downloading/deleting files using *SP File Manager*, (in this case the receiver is seen as a disk) or upgrading firmware/warranty date using *SP Loader*.

The first time you connect the SP90m to a computer through a USB connection, the required driver will automatically be installed on the computer. If however the installed driver does not work, you may replace it with one of the two drivers posted on the Spectra Precision website:

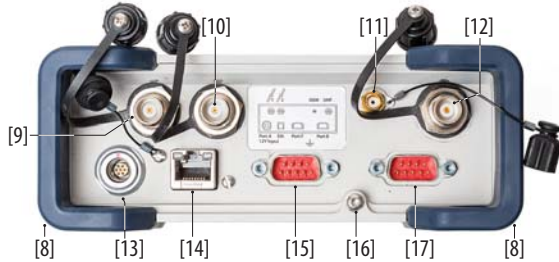USB driver for 64-bit OS: SpectraPrecisionUSBSerialSetup_x64.exe file
USB driver for 32-bit OS: SpectraPrecisionUSBSerialSetup_x86.exe file
Double-click on the downloaded file to install the driver.

- **[7]**: **Escape** button. See *Using the Front Panel Controls on page 26*.
- **[8]**: Bumpers (x2).

Rear Panel

- **[8]**: Bumpers (x2).
- **[9]**: GNSS input #1. A TNC coaxial female connector allowing you to connect the first GNSS antenna to the receiver via a coaxial cable.
- **[10]**: GNSS input #2. A TNC coaxial female connector allowing you to connect the second GNSS antenna to the receiver via a coaxial cable.
- **[11]**: External GSM antenna (optional). A coaxial female connector (SMA type) allowing you to connect an external cellular antenna.

    The SP90m having a built-in GSM antenna, no external GSM antenna is usually required. In case of adverse reception conditions however (e.g. SP90m mounted in a rack), an external antenna can advantageously be used for better reception. Run the Web Server (**Receiver**> **Network**> **Modem**> **Modem Antenna**) to choose which of the internal or external antenna should be used.

    The SP90m uses a GSM antenna when it sends or receives RTK or differential corrections via its GSM modem.

- **[12]**: UHF radio connector. A TNC coaxial female connector allowing you to connect a radio whip antenna. This connector is available only if the SP90m has been fitted with an internal radio.

    Warning! Do not confuse this coaxial connector with the GNSS inputs. Connecting a GNSS antenna to the UHF

connector might damage it if the embedded UHF transmitter is used (however the transmitter will not be transmitting until there are enough GNSS satellites tracked and used).

- **[13]**: DC Power input and serial port A (RS232). A seven-contact, female connector allowing the SP90m to be powered from either the provided AC adapter (connect the cable extension between SP90m and the end of the AC adapter output cable), or an external 9- to 36-V DC power source through cable P/N 730477 (e.g. base setup using an external radio transmitter).

- **[14]**: Ethernet connector. A 7-contact female connector (RJ45) allowing you to connect the SP90m to a local network (LAN). Through this connection, you may remotely control and monitor SP90m operation from any computer connected to the Internet. Data may also flow through this connection, in the same way as through a serial port.

- **[15]**: RS232 serial port F, a SubD, nine-contact, male connector. The PPS signal and the not operational yet CAN bus are also available on this connector.

- **[16]**: Earth terminal. A screw terminal for connecting the receiver chassis to Earth.

  Electric Isolation: All signals available on the following connectors are optically isolated from the receiver's internal circuitry and chassis ground, as well as from each other:

  - Serial ports A, B and F (including DC power output voltage on port A)
  - Ethernet port
  - USB port

- **[17]**: Switchable RS232/RS422 serial data port B (default is RS232), a SubD, nine-contact, male connector. The External Event input is also present on this connector.

SIM Card The SIM card slot is located under the battery. Open the battery compartment (see *page 13*) and then insert the SIM card as shown below. Gently push the card to the right until you hear a click.
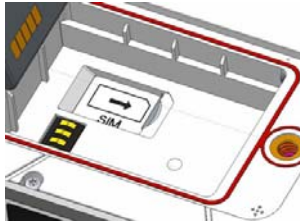
To extract the SIM card, gently push it a bit further in. This releases it from the slot. Just let go before extracting the SIM card from the battery compartment.

Battery Model & Battery Compartment

The battery used is a Lithium-Ion 7.4-V DC - 3700 mAh rechargeable battery. It is housed in a compartment accessible from above the SP90m.

The battery door can be opened by lifting and then turning the quarter-turn wing nut counter-clockwise.

The battery must first be inserted in the battery door (see picture) and then you can close and lock the battery door. The battery will smoothly connect to the receiver when closing the battery door.

The battery will automatically operate as a backup power source for the receiver if for some reason the external DC source used was removed from the DC power input.

Conversely, the battery will be charged by the external power source when needed. Indications are provided to report battery charging when this happens (see *page 9*).

NOTE: If you are using a SIM card, you must insert it before inserting the battery. (See *page 13*).

Buzzer The internal buzzer will sound whenever an error is detected. The buzzer will sound six times and then stop. The error icon will however continue to blink. To acknowledge the error notification, go back to the General Status screen (see *page 28*) and then press **OK**.

The buzzer can be deactivated permanently from the front panel screen. Go to **Display Settings**, then go down into the options until **Buzzer** is displayed. From there you can disable the buzzer. Refer to *page 36* as well.

Port Pinouts **USB Port**

On front panel, USB OTG "mini-B" connector.

5-C connector, fitted with sealing cap.

Pin	Signal Name
1	USB ID
2	GND
3	Device (D+)
4	Device (D-)
5	Host (VBus)

Power In, Serial Port A

On rear panel. A 7-C Connector.

Pin	Signal Name	Description
1	GND-A	External Power Ground
2	PWR	External Power Input (9-36 V DC)
3	TXD	Port A RS232 TXD
4	RTS	Port A RS232 RTS
5	CTS	Port A RS232 CTS
6	+Power in	
7	RXD	Port A RS232 RXD

NOTE: All signals are electrically isolated from the chassis ground and power source.

Serial Port B

On rear panel. A switchable RS232/RS422 serial port + external event input.

A 9-C connector fitted with a sealing cap.

Pin	RS232	RS422
1	NC	NC
2	RX (IN)	RX+ (IN)
3	TX (OUT)	TX– (OUT)
4	NC	NC
5	GND-B	GND-B
6	NC	NC
7	RTS (OUT)	TX+ (OUT)
8	CTS (IN)	RX– (IN)
9	EVENT	EVENT (IN)

Port B can be switched to RS232 or RS422 using the
$PASHS,MDP command. RS232 inputs/outputs are typically
± 10 Volt asymmetrical signals with respect to ground.
RS422 inputs/outputs are 0/+5 Volt symmetrical signals
(differential lines).

NOTE: All signals are electrically isolated from the chassis
ground and power source.

Serial Port F

On rear panel. A standard RS232 serial port + CAN bus +
1PPS output.

A 9-C connector fitted with a sealing cap.

Pin	Signal Name
1	CAN POWER (IN)
2	RX (IN)
3	TX (OUT)
4	CANH
5	GND-F
6	NC
7	CANL
8	NC
9	1PPS (OUT)

The 1PPS output is similar to a standard TTL output (0/+5 V):

- VOH Min= 4.5 V at IOH = + 4 mA
- VOL Max= 0.4 V at IOL= - 4 mA

NOTE: All signals are electrically isolated from the chassis
ground and power source.