SP90m GNSS Receiver

Most Versatile, Rugged and Reliable GNSS receiver

VERSATILE
RUGGED
RELIABLE
DUAL GNSS

Trimble RTX

ANTI-THEFT TECHNOLOGY

Z-BLADE TECHNOLOGY INSIDE

SP90m GNSS Receiver

The Spectra Precision SP90m is a powerful, highly versatile, ultra-rugged, and reliable GNSS positioning solution for a wide variety of applications in real-time and post-processing. 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 form factor of the SP90m allows for a maximum in flexibility on how the receiver can be used, such as base station, continuously operating reference station (CORS), RTK or Trimble RTX rover, 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 positions in real-time. 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.

Key Features

- Most versatile, modular receiver design
- Ultra-rugged design
- Patented Z-Blade technology
- 480-channel ASIC
- Dual GNSS antenna inputs
- Event marker input
- PPS output
- OLED display, keyboard, and Web UI
- Internal TRx UHF radio
- 3.5G cellular modem
- Built-in Bluetooth and WiFi communication
- SMS and e-mail alerts
- Anti-theft technology
- Backup RTK
- RTK bridge
- 2 MSS L-band channels
- Trimble RTX correction services

Trimble RTX

ANTI-THEFT TECHNOLOGY

Z BLADE TECHNOLOGY INSIDE

Z-Blade Technology

Z-Blade is a GNSS-centric signal processing technology. It uses all available and future planned GNSS signals optimally and equally, without preference to any particular constellation, to deliver fast and reliable RTK positions.

Z-Blade helps SP90m achieve optimal results, even in environments where GNSS coverage is insufficient, like urban canyons, or under tree canopy. Thanks to Z-Blade technology, SP90m can still deliver high quality positions to keep you working productively.

- Get and maintain RTK solutions even if GNSS coverage is insufficient
- Achieve a rapid and reliable RTK fix, even in harsh environments like urban canyons or under tree canopy

Flexibility & Ruggedness

The SP90m offers a unique design with various mounting capabilities. It includes a wide range of built-in communication options, internal removable battery, internal memory, specific kits per application and full compatibility with various software solutions.

The weatherproof, high-impact-resistant aluminum housing ensures your investment is safe in all conditions, which is especially important for on-board machine usage or base station applications.

Adaptable to most any specific positioning usage, the SP90m is the ideal solution for people looking for a single GNSS receiver for multiple applications.

Application Packages

Base Station and Continuously Operating Reference Station

With its built-in Ethernet and WiFi capability and embedded Web Server, you can access, control and monitor SP90m from any computer or smartphone connected to the Internet. Use the capability for instant real-time, multi-data streaming over Ethernet or WiFi to build your own RTK corrections server without any additional software or equipment. If a cellular network is available, SP90m offers surveyors an efficient alternative to RTK networks (public or private) eliminating radio propagation issues.

Wireless Communication

In addition to a 3.5G internal cellular modem, SP90m accommodates a wide variety of UHF solutions (internal and external UHF modules) providing stable and reliable wireless communication between base and rover. SP90m even supports an internal transceiver with up to 2W for ultimate flexibility. It can then be used as a rover or a base without additional accessories in the field. Z-Blade long range RTK capability combined with industry-leading UHF expertise ensures maximal productivity. Trimble RTX correction services can be used through the receiver's built-in MSS L-band module for satellite delivery, or through cellular/Internet (IP) delivery.

On-board Machine Integration

Ready for system integration, SP90m is a great GNSS solution for OEM manufacturers and Value Added Resellers needing precise positioning for machine guidance/control applications, such as agriculture, construction or mining. The SP90m supports PPS output and event marker input. In addition, the dual GNSS antenna support allows users to utilize precise heading information coming from one GNSS receiver system without the need for a secondary GNSS receiver.

SP90m Technical Specifications

GNSS ENGINE

- 480 GNSS tracking channels
  - GPS L1 C/A, L1P (Y), L2P (Y), L2C, L5, L1C
  - GLONASS L1 C/A, L1P, L2 C/A, L2P, L3, L1/L2 CDMA
  - GALILEO E1, E5a, E5b
  - BeiDou B1, B2, B3 [1]
  - QZSS L1 C/A, L1 SAIF, L1C, L2C, L5
  - IRNSS L5
  - SBAS L1 C/A, L5
- Two MSS L-band tracking channels
- Two GNSS antenna inputs

FEATURES

- Patented Z-tracking to track encrypted GPS P(Y) signal
- Patented Strobe™ Correlator for reduced GNSS multipath
- Patented Z-Blade technology for optimal GNSS performance:
  - Highest quality of raw data (availability/reliability) to meet reference station applications
  - Full utilization of signals from all seven GNSS systems (GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and SBAS)
  - Enhanced GNSS-centric algorithm: fully-independent GNSS signal tracking and optimal data processing, including GPS-only, GLONASS-only or BeiDou-only solution (from Autonomous to full RTK) [2]
  - Fast and stable RTK solution
  - Fast Search engine for quick acquisition and re-acquisition of GNSS signals
- Patented SBAS ranging for using SBAS code & carrier observations and orbits in RTK processing
- Position in local datums and projections with RTCM-3 transformation data
- Support for Trimble RTX™ real-time correction services
- Support for CenterPoint® RTX Post-processing service
- Hot Standby RTK Algorithms
- Flying RTK Algorithms
- RTK base and rovers modes, post-processing mode
- Moving base
  - RTK with Static & Moving Base corrections supported
  - Multi-dynamic mode (static/moving Base and Rover functions simultaneously)
  - RTK against a moving base for relative positioning
  - Adaptive velocity filter to meet specific dynamic applications
- Heading and Roll/Pitch
  - Accurate and fast heading using dual frequency multi-GNSS algorithms
  - RTK or Trimble RTX and heading processing simultaneously
  - Heading engine with optional baseline length self-calibration
  - Adaptive velocity filter to meet specific dynamic applications
- Up to 50 Hz real-time raw data (code & carrier and position, velocity, and heading output) [3]
- Reference Inputs/Outputs: RTCM 3.2 [4], RTCM 3.1/3.0/2.3/2.1, CMR/CMR+/CMRx [5], ATOM [6]
- RTK Networks Supported: VRS, FKP, MAC
- NTRIP protocol
- Navigation Outputs: NMEA-0183, ATOM
- PPS output
- Event marker input
- UHF networking
- One-push Ashtech Trouble Log (ATL)

GNSS SENSOR PERFORMANCE

- Time to First Fix (TTFF):
  - Cold start: < 60 seconds
  - Warm Start: < 45 seconds
  - Hot Start: < 11 seconds
  - Signal re-acquisition: < 2 seconds
- Position accuracy (HRMS), SBAS: < 50 cm (1.64 ft) [7]
- Update rate: Up to 50 Hz [3]
- Latency: < 10 ms [8]
- Velocity Accuracy: 0.02 m.sec HRMS
- Maximum Operating Limits [9]:
  - Velocity: 515 m/sec
  - Altitude: 18,000 m

PRECISE POSITIONING PERFORMANCE

Real-Time Accuracy (RMS) [10, 11]

- Real-Time DGPS Position:
  - Horizontal: 25 cm (0.82 ft) + 1 ppm
  - Vertical: 50 cm (1.64 ft) + 1 ppm
- Real-Time Kinematic Position (RTK):
  - Horizontal: 8 mm (0.026 ft) + 1 ppm
  - Vertical: 15 mm (0.049 ft) + 1 ppm
- Network RTK [12]:
  - Horizontal: 8 mm (0.026 ft) + 0.5 ppm
  - Vertical: 15 mm (0.049 ft) + 0.5 ppm

Trimble RTX™ (satellite and cellular/Internet (IP)) [13, 14]

- CenterPoint® RTX
  - Horizontal (RMS): < 4 cm
  - Initialization: < 30 min. (typical)
  - Operating range (inland): Nearly worldwide
- CenterPoint RTX Fast
  - Horizontal (RMS): < 4 cm
  - Initialization: < 5 min. (typical)
  - Operating range (inland): In select regions

Heading [15, 16, 17]

- Accuracy (RMS): 0.2° per 1 m of baseline length
- Initialization time: < 10 sec typical
- Baseline length: < 100 m

Flying RTK

- 5 cm (0.165 ft) + 1 ppm (steady state) horizontal for baselines up to 1000 km

Real-Time Performance [10, 11]

- Instant-RTK® Initialization:
  - Typically 2-second initialization for baselines < 20 km
  - Up to 99.9% reliability
- RTK initialization range:
  - > 40 km

Post-Processing Accuracy (RMS) [10, 11]

- Static, Rapid Static:
  - Horizontal: 3 mm (0.009 ft) + 0.5 ppm
  - Vertical: 5 mm (0.016 ft) + 0.5 ppm
- High-Precision Static [18]:
  - Horizontal: 3 mm (0.009 ft) + 0.1 ppm
  - Vertical: 3.5 mm (0.011 ft) + 0.4 ppm
- Post-Processed Kinematic:
  - Horizontal: 8 mm (0.026 ft) + 0.5 ppm
  - Vertical: 20 mm (0.065 ft) + 1.0 ppm

Data Logging Characteristics

- Recording Interval: 0.02 [19] - 999 seconds

Memory

- 8 GB internal memory
- Memory is expandable through external USB sticks or hard drives
- Over four years of 15 sec. raw GNSS data from 14 satellites (logged to internal 8 GB Nand Flash)

Embedded Web Server

- Password-protected Web Server
- Full receiver monitoring and configuration
- FTP push function
- Embedded FTP server and NTRIP caster [20]
- NTRIP Server and instant real-time multi-data streaming over Ethernet
- DHCP or manual configuration (static IP address)
- DynDNS® technology support

USER AND I/O INTERFACE

- User Interface
  - Graphical OLED display with 6 keys and 1 LED
  - WEB UI (accessible via WiFi) for easy configuration, operation, status and data transfer
- I/O Interface:
  - 1 x USB OTG
  - Bluetooth v4.0 + EDR/LE, Bluetooth v2.1 + EDR
  - WiFi (802.11 b/g/n)
  - 3.5G quad-band GSM (850/900/1800/1900 MHz) / penta-band UMTS module (800/850/900/1900/2100 MHz)
  - 1 x Ethernet, RJ45 (Full-Duplex, auto-negotiate 10 Base-TX / 100 Base-TX)
  - 1 x Lemo, RS232 (radio connection and external power)
  - 1 x DB9, RS232 (PPS output and CAN bus)
  - 1 x DB9, RS422/232 (Event marker input)
  - 2 x TNC, GNSS antenna input
  - 1 x TNC, UHF radio antenna connector
  - 1 x SMA, GSM antenna connector
  - 1 x SMA, Bluetooth/WiFi antenna
  - PPS output
  - Event marker input
  - Galvanic Insulation (Except USB)
  - Ready for CAN bus (NMEA200 compatible)

PHYSICAL AND ELECTRICAL CHARACTERISTICS

- Size: 16.5 x 20.6 x 6.5 cm (6.5 x 8.1 x 2.6 in)
- Weight: GNSS receiver: 1.66 kg (3.66 lb) without UHF / 1.70 kg (3.75 lb) with UHF
- Battery life:
  - 4 hrs (RTK Base, GNSS On, UHF Tx On), 12.8 W average power consumption
  - 6 hrs (RTK Rover, GNSS On, UHF Rx On), 5.9 W average power consumption
- Li-ion battery, 27.8 Wh (7.4 V x 3.7 Ah). Acts as a UPS in case of a power source outage
- 9-36 V DC input (EN2282, ISO7637-2)
- External DC power limits feature

ENVIRONMENTAL CHARACTERISTICS

- Operating temperature [21]: -40° to +65°C [22] (-40° to +149°F)
- Storage temperature [23]: -40° to +95°C (-40° to +203°F)
- Humidity: Damp heat 100% humidity, +40°C (+104°F), IEC 60945:2002
- IP67 (waterproof and dustproof), IEC 60529
- Drop: 1m drop on concrete
- Shock: MIL STD 810F (fig. 516.5-10) (01/2000), Sawtooth (40g / 11ms)
- Vibration: MIL-STD 810F (fig. 514.5C-17) (01/2000)

[1] Product is designed to fully support BeiDou B3 signals as soon as the officially published signal Interface Control Documentation (ICD) becomes available.
[2] All available GNSS signals are processed equally and combined without preference to any particular constellation for optimal performance in harsh environments.
[3] 50 Hz output is available as firmware option (20 Hz output is a standard feature). At 50 Hz, a limited set of messages can be generated simultaneously through a single port.
[4] RTCM-3.2 Multiple Signal Messaging (MSM) guarantees compatibility with 3rd party for each GNSS data.
[5] A Trimble proprietary format.
[6] ATOM: Open Ashtech format.
[7] VRMS for Autonomous/SBAS positions are usually twice as high as HRMS.
[8] Heading latency is usually twice as high.
[9] As required by the U.S. Department of Commerce to comply with export licensing restrictions.
[10] Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath and satellite geometry.
[11] Performance values assume minimum of five satellites, following the procedures recommended in the user guide. High multipath areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.
[12] Network RTK PPM values are referenced to the closest physical base station.
[13] Requires L1/L2 GPS+GLONASS at a minimum.
[14] Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and L-band service availability. Trimble RTX correction services are only available on land.
[15] Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality.
[16] L1/L2 data required.
[17] Figures of pitch accuracy are twice as high.
[18] Depending on baselines, precise ephemeris and long occupations up to 24 hrs may be required to achieve the high precision static specifications.
[19] A Recording Interval of 0.05 is based on a 20 HZ output. The default changes to 0.02 if the optional 50 Hz output firmware option is installed.
[20] Embedded NTRIP Caster is available as firmware option.
[21] Function of the configuration is:
- Charging mode with internal battery at +45°C (+113°F) max.
- Discharge mode with internal battery at +60°C (+140°F)
- Without internal battery (external power supply) at +65°C (+149°F) under conditions of installation.

At very high temperature, the UHF module should not be used in transmitter mode. With the UHF transmitter on radiating 2W of RF power, the operating temperature is limited to + 55°C (+131°F).
[22] At this temperature, hand protection may be needed to safely handle the system's lower aluminum housing (as per EN60945).
[23] Without battery. Battery can be stored up to +70°C (+158°F).

NOTE: All performance values are given assuming a minimum of five satellites are used, and following the procedures recommended in the user guide. High multipath areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.

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