

# Trimble R9s

## GNSS RECEIVER

### Scalable GNSS Modularity

The Trimble® R9s receiver is a GNSS receiver designed to provide Survey professionals with maximum features and flexibility. The Trimble technologies provided in the Trimble R9s receiver are a unique and comprehensive combination.

Trimble CenterPoint™ RTX, Trimble xFill™ and Trimble 360 technologies are integrated into this receiver system to provide Surveyors with an outstanding option for their modular requirements.

### Options and Upgrades

The Trimble R9s receiver platform allows you to purchase the options you want, when you want them. Whether you just need a simple receiver for post processing, a base receiver for transmitting RTK corrections, rover for mobile positioning, or a full base and rover capability, the Trimble R9s is scalable to meet your needs. You can also upgrade at anytime which means your technology investment can grow as your needs do.

### Trimble CenterPoint RTX

Trimble CenterPoint RTX delivers RTK level precision anywhere in the world without the use of a local base station or Trimble VRS Now™ correction service. Survey using satellite delivered, CenterPoint RTX corrections in areas where terrestrial based corrections are not available. When surveying over a great distance in a remote area, such as a pipeline or utility right of way, CenterPoint RTX eliminates the need to continuously move a base station or maintain connection to cell coverage.

### Trimble xFill

Leveraging a worldwide network of Trimble GNSS reference stations and satellite datalinks, Trimble xFill seamlessly fills in for gaps in your RTK or VRS connection stream. In combination with a CenterPoint RTX subscription, survey level precisions are maintained beyond five minutes.

### Trimble 360 Receiver

Powerful Trimble 360 receiver technology in the Trimble R9s receiver supports signals from all existing and planned GNSS constellations and augmentation systems. With two integrated Trimble Maxwell™ 6 chips, the Trimble R9s offers an unparalleled 440 GNSS channels. Trimble delivers business confidence with a sound GNSS investment for today and long into the future.

### Smart for Many Applications

The Trimble R9s receiver's compact form factor, low power consumption and powerful feature set make for an ideal combination supporting a wide range of high-accuracy positioning applications, including:

- ▶ RTK and RTX rover
- ▶ Mobile field base station
- ▶ Post Processed data collection

The familiar Trimble web user interface provides full receiver status, configuration, data access, as well as a variety of security levels and access controls.

For simple hands-on configuration, the Trimble R9s receiver offers a seven-button, two line display and status information so that performing in-field configuration is practically effortless. Best of all, no handhelds are required to get datalogging started.

The Trimble R9s is available with an internal radio or with no radio. The radio model includes an internal UHF radio for transmitting and receiving RTK corrections. The no radio model can use a high power external radio for transmitting RTK corrections.

The Trimble R9s integrated lithium-ion battery can provide up to 15 hours of continuous power, easily spanning one days work. With stringent environmental specifications, the Trimble R9s is fully rugged to IP67 for dust and water and meets MIL-STD-810F standards for shock, vibration, humidity and temperature, to keep working even in harsh conditions.

## Key Features

- ▶ Advanced satellite tracking with Trimble 360 receiver technology
- ▶ Convenient front panel display and configuration
- ▶ Bluetooth®, Ethernet, serial and USB support
- ▶ Data logging internally and to external drive
- ▶ Multiple data file formats
- ▶ Trimble CenterPoint RTX provides RTK level precision anywhere without the need for a base station or VRS network
- ▶ Trimble xFill technology provides seamless RTK coverage during connection outages



# Trimble R9s GNSS RECEIVER

## SATELLITE TRACKING

- Two advanced Trimble Maxwell 6 GNSS chipsets for a total of 440 channels
- Trimble EVEREST™ multipath signal rejection
- Trimble 360 receiver technology
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Signal-to-noise ratios reported in dB-Hz
- Proven Trimble low elevation tracking technology
- Satellite signals tracked simultaneously:
  - GPS: L1 C/A, L2C, L2E (Trimble method for tracking unencrypted L2P), L5
  - GLONASS: L1 C/A and unencrypted P code, L2 C/A and unencrypted P code, L3 CDMA
  - Galileo: L1 CBOC, E5A, E5B, and E5AltBOC
  - Beidou (COMPASS): B1, B2, B3<sup>2</sup>
- CenterPoint RTX
- QZSS, WAAS, EGNOS, GAGAN, MSAS
- Positioning Rates: 1 Hz, 2 Hz, 5 Hz, 10 Hz, and 20 Hz

## POSITIONING PERFORMANCE<sup>3</sup>

### Code Differential GNSS Positioning

Horizontal	0.25 m + 1 ppm RMS
Vertical	0.50 m + 1 ppm RMS
SBAS differential positioning accuracy <sup>4</sup>	typically <5 m 3DRMS

### Static GNSS surveying

High Accuracy Static	
Horizontal	3 mm + 0.1 ppm RMS
Vertical	3.5 mm + 0.4 ppm RMS
Static and Fast Static	
Horizontal	3 mm + 0.5 ppm RMS
Vertical	5 mm + 0.5 ppm RMS

### Real Time Kinematic surveying

Single Baseline <30 km	
Horizontal	8 mm + 1 ppm RMS
Vertical	15 mm + 1 ppm RMS
Network RTK <sup>5</sup>	
Horizontal	8 mm + 0.5 ppm RMS
Vertical	15 mm + 0.5 ppm RMS
RTK start-up time for specified precisions <sup>6</sup>	
Trimble CenterPoint RTX	2 to 8 seconds
Horizontal	
Vertical	4 cm
Vertical	9 cm
RTX convergence time <sup>7</sup>	
	<5 minutes (select regions)
	<30 minutes (worldwide)
RTX QuickStart convergence time <sup>7</sup>	
	<5 minutes (worldwide)
Trimble xFill <sup>8</sup>	
Horizontal	RTK <sup>9</sup> + 10 mm/minute RMS
Vertical	RTK <sup>9</sup> + 20 mm/minute RMS

1 There is no public GLONASS L3 CDMA ICD. The current capability in the receivers is based on publicly available information. As such, Trimble cannot guarantee that these receivers will be fully compatible with a future generation of GLONASS satellites or signals.

2 Current BeiDou capability is based on publicly available information. The hardware of this product is designed for BeiDou B3 compatibility (trial version) and its firmware will be enhanced, where possible, to fully support such new signals as soon as the officially published signal interface control documentation (ICD) becomes available. As such, Trimble cannot guarantee full compatibility with future generations of BeiDou satellites or signals.

3 Accuracy and reliability may be subject to anomalies due to multipath, obstructions, satellite geometry, and atmospheric conditions. The specifications stated recommend the use of stable mounts in an open sky view, EMI and multipath clean environment, optimal GNSS constellation configurations, along with the use of survey practices that are generally accepted for performing the highest-order surveys for the applicable application including occupation times appropriate for baseline length. Baselines longer than 30 km require precise ephemeris and occupations up to 24 hours may be required to achieve the high accuracy static specification.

4 Depends on WAAS/EGNOS system performance.

5 Network RTK PPM values are referenced to the closest physical base station.

6 May be affected by atmospheric conditions, signal multipath, obstructions and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.

7 Receiver convergence time varies based on GNSS constellation health, level of multipath, and proximity to obstructions such as large trees and buildings. Convergence times decrease significantly when using a "RTX Quickstart" on a previously surveyed point or a known survey control point.

8 Precisions are dependent on GNSS satellite availability, xFill positioning without a RTX subscription ends after 5 minutes of radio downtime. xFill positioning with a RTX subscription will continue beyond 5 minutes providing RTX has converged, with typical precisions not exceeding 6 cm horiz, 14 cm vert. xFill is not available in all regions, check with your local sales representative for more information.

9 RTX refers to the last reported precision before the correction source was lost and xFill started.

10 The internal battery will operate from -10° C to +55° C. The internal battery charger will operate from 0° C to +45° C. All temperatures listed are ambient.

11 Bluetooth type approvals are country specific. Contact your Trimble distribution partner for more information.

## HARDWARE

### Physical

Keyboard and display	Vacuum fluorescent display 16 characters by 2 rows. Dimmable. On/Off key for one-button startup
Dimensions (L x W x D)	24 cm x 12 cm x 5 cm
Weight	1.65 kg receiver with internal battery and radio 1.55 kg receiver with internal battery and no radio

## ENVIRONMENTAL

Operating <sup>10</sup>	-40 °C to +65 °C
Storage	-40 °C to +80 °C
Humidity	MIL-STD 810F, Method 5074
Waterproof	IP67 for submersion to depth of 1 m, dustproof
Pole drop	Designed to survive a 1 m pole drop onto a hard surface

## ELECTRICAL

Internal	Integrated internal battery 7.2 V, 7800 mA-hr, Lithium-ion
External	Power input on 7-pin 0-shell Lemo connector is optimized for lead acid batteries with a cut-off threshold of 11.5 V Power input on the 26-pin D-sub connector is optimized for Trimble Lithium-ion battery input with a cut-off threshold of 10.5 V
Power consumption	6.0 W in rover mode with internal receive radio 8.0 W in base mode with internal transmit radio

### Operation Time on Internal Battery

Rover	13 hours; varies with temperature
Base station	
450 MHz systems	Approximately 11 hours; varies with temperature <sup>10</sup>

## INPUT/OUTPUT FORMATS

- Correction Formats:
  - CMR, CMR+, CMRx, RTCM 2.1, RTCM 2.2, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2
- Observables:
  - RT17, RT27, RTCM 3.x
- Position/Status I/O:
  - NMEA-0183 v2.30, GSOF

## COMMUNICATION AND DATA STORAGE

Lemo (Serial)	7-pin 0S Lemo, Serial 1, 3-wire RS-232
Modem 1 (Serial)	26-pin D-sub, Serial 2, Full 9-wire RS232, using adaptor cable
Modem 2 (Serial)	26-pin D-sub, Serial 3, 3 wire RS-232, using adaptor cable
Ethernet	Through a multi-port adaptor
Bluetooth wireless technology <sup>11</sup>	Fully-integrated, fully-sealed 2.4 GHz Bluetooth module
Integrated radios (optional)	Fully-integrated, fully-sealed internal 450 MHz (UHF) 1x/Rx
External GSM/GPRS, cell phone support	For Internet-based correction streams
Receiver position update rate	1 Hz, 2 Hz, 5 Hz, 10 Hz, and 20 Hz positioning
Correction data input/output	CMR™, CMR+™, CMRx, RTCM v 2.x & 3.x
Data outputs	NMEA, GSOF
Capacity	52 MB
External Storage	USB flash drive or external hard drive

## CERTIFICATIONS

IEC 60950-1 (Electrical Safety);  
 FCC OET Bulletin 65 (RF Exposure Safety); FCC Part 15.105 (Class B), Part 15.247, Part 90; PTCRB (AT&T); Bluetooth SIG; IC ES-003 (Class B); Radio Equipment Directive 2014/53/EU, RoHS, WEEE; Australia & New Zealand RCM; Japan Radio and Telecom MIC



Specifications subject to change without notice.

Contact your local Trimble Authorised Distribution Partner for more information

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