

Trimble BD940-INS

Triple frequency receiver with integrated inertial navigation system and MSS band demodulator

GNSS and inertial tight integration

Taking advantage of the expertise from Trimble expertise in both GNSS and inertial technology, the Trimble® BD940-INS module has been designed for applications that require continuous centimeter-level accuracy in a compact package. By integrating inertial sensors on the same module, it delivers robust, high-accuracy positioning in all environments. The GNSS components are fully shielded, ensuring that high-quality signals are protected from sources of EMI on the host platform.

Multi constellation GNSS

The Trimble BD940-INS supports triple-frequency operation for the GPS and GLONASS constellations, as well as dual-frequency support for BeiDou and Galileo. As the number of satellites in these constellations increases, the BD940-INS is ready to take advantage of additional signals, delivering the fastest and most reliable RTK initializations for 1–2 centimeter positioning. For applications that do not require centimeter-level accuracy, the integrated GNSS inertial engine provides high-accuracy GNSS and DGNSS positioning in challenging environments such as urban canyons. The module is available in different configurations, allowing you to choose the receiver that best fits your application and budget. All features are password-upgradeable, enabling functionality to be expanded as requirements change. With the option to use Trimble OmniSTAR® or Trimble RTX® correction service, the BD940-INS delivers performance levels down to centimeter accuracy without the need for a base station.

High performance integrated inertial sensors

The Trimble BD940-INS integrates the latest precision inertial sensors in a compact package. With the BD940-INS, you are buying a robust navigation solution, not just a GNSS receiver.

Trimble ProPoint engine

The Trimble BD940-INS is now available with the Trimble ProPoint® engine. For optimal performance in GNSS-degraded conditions, the ProPoint engine delivers premium accuracy, availability, and integrity for your application.

Key benefits

- Trimble Maxwell™ 7 Technology
- Trimble ProPoint positioning engine (optional)
- Onboard high-accuracy inertial sensor package integrated with GNSS for precise position and orientation
- 336 channels for multi-constellation GNSS support
- Trimble RTX and OmniSTAR support
- EMI-shielded module
- Compact design for mobile applications
- Flexible RS232, USB, and Ethernet interfacing
- Centimeter-level position accuracy
- Advanced RF spectrum monitoring



Trimble BD940-INS Module

Flexible interfacing

The Trimble BD940-INS was designed for easy integration and rugged dependability. Customers benefit from the Ethernet connectivity available on the board, allowing high-speed data transfer and configuration via standard web browsers. USB and RS-232 are also supported. Like other Trimble embedded technologies, easy-to-use software commands simplify integration and reduce development times. An intuitive 3D interactive graphical web page allows easy input of lever arms, and dynamic graphic models for various vehicle types can also be selected.

Technical specifications¹

- Trimble Maxwell 7 technology
- Trimble ProPoint GNSS technology (optional)
- On-board Advanced MEMS inertial sensors
- 336 Channels:
 - GPS: L1 C/A, L2E, L2C, L5
 - BeiDou: B1, B2
 - GLONASS: L1 C/A, L2 C/A, L3 CDMA¹²
 - Galileo: E1, E5A, E5B, E5AltBOC
 - IRNSS: L5
 - QZSS: L1 C/A, L1 SAIF, L2C, L5
 - SBAS: L1 C/A, L5
 - MSS L-Band: OmniSTAR, Trimble RTX
- Vector Antenna based on second 336 Channel Maxwell 7 chip:
 - GPS: L1 C/A, L2E, L2C, L5
 - BeiDou: B1, B2
 - GLONASS: L1 C/A, L2 C/A, L3 CDMA¹²
 - Galileo: E1, E5A, E5B, E5AltBOC
 - IRNSS: L5
 - QZSS: L1 C/A, L1 SAIF, L1C, L2C, L5
- High precision multiple correlator for GNSS pseudorange measurements
- Trimble Everest™ Plus multipath mitigation
- Supports Trimble CenterPoint® RTX, Trimble FieldPoint RTX (only with ProPoint Engine) and Trimble RangePoint® RTX (only with ProPoint Engine)
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation, and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Proven Trimble low elevation tracking technology
- Reference outputs/inputs:
 - CMR, CMR⁺, sCMRx, RTCM 2.1, 2.2, 2.3, 3.0, 3.1¹², 3,2
- Navigation Outputs:
 - ASCII: NMEA-0183 GSV, AVR, RMC, HDT, VGK, VHD, ROT, GGK, GGA, GSA, ZDA, VTG, GST, PJT,PJK, BPQ, GLL, GRS, GBS and Binary: Trimble GSOF, NMEA2000
- 1 Pulse Per Second Output
- Event Marker Input Support
- Supports Fault Detection & Exclusion (FDE), Receiver Autonomous Integrity Monitoring (RAIM)

Key features include:

- High update rate position and orientation solutions
- Continuous positioning in GNSS denied environments
- Lever arm calculation from antenna to navigation point of interest
- Robust Moving Baseline RTK for precision landing on moving platforms
- Single antenna heading not influenced by magnetic field variations

Communication

- 1 USB 2.0 Device port
- 1 LAN Ethernet port:
 - Supports links to 10BaseT/100BaseT auto-negotiate networks
 - All functions are performed through a single IP address simultaneously—including web GUI access and raw data streaming
 - Network Protocols supported:
 - HTTP (web GUI)
 - NTP Server
 - NMEA, GSOF, CMR over TCP/IP or UDP
 - NTripCaster, NTripServer, NTripClient
 - mDNS/uPnP Service discovery
 - Dynamic DNS
 - eMail alerts
 - Network link to Google™ Earth
 - Support for external modems via PPP
 - RDNIS Support
- 2 x RS232 ports:
 - Baud rates up to 230,400
- Control Software:
 - HTML web browser, Internet Explorer®, Firefox®, Safari®, Opera®, Google Chrome™

Physical and electrical characteristics

Size	60 mm × 67 mm × 15 mm
Power	5.5 VDC to 30VDC
	Typical 2.0 W (L1/L2 GPS + L1/L2 GLONASS)
Weight	60 gr
Connectors	
I/O	44-pin header
GNSS Antenna	MMCX receptacle
Antenna LNA Power Input	
Input voltage	3.3 VDC to 5 VDC
Maximum current	400 mA
Minimum required LNA Gain	32.0 dB

Trimble BD940-INS Module

Performance specifications

Time to First Fix (TTFF)⁶

Cold Start⁷ <45 seconds

Warm Start⁸ <30 seconds

Signal Re-acquisition <2 seconds

Velocity Accuracy^{2,3}

Horizontal 0.007 m/sec

Vertical 0.020 m/sec

Maximum acceleration GNSS tracking ±11 g

Inertial Sensors

Maximum acceleration ±6 g

Maximum angular rate ±125 deg/sec

Maximum Operating Limits⁹

Velocity 600 m/sec

Altitude 18,000 m

RTK initialization time² typically <8 seconds

RTK initialization reliability² <99.9 %

Position Latency⁴ <20 ms

Maximum Position/Attitude Update Rate. 100 Hz

Environmental characteristics¹⁰

Temperature

Operating -40 °C to +75 °C

Storage -55 °C to +85 °C

Vibration MIL810F, tailored

Random 6.2 gRMS operating

Random 8 gRMS survival

Mechanical shock MIL810D

±40 g 10ms operating ±75 g 6ms survival

Operating Humidity 5% to 95% R.H.

non-condensing, at +60 °C

Ordering information

Module Part Number X12078-XX

Module Trimble BD940-INS GNSS available in a variety of configurations from L1 SBAS upwards

Evaluation Kit Includes interface board, power supply

- 1 Trimble BD940-INS is available in a variety of software configurations. Specifications shown reflect full capability.
- 2 May be affected by atmospheric conditions, signal multipath, and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.
- 3 1 sigma level, when using Trimble Zephyr™ 2/3 antennas, add 1 ppm for RTK position accuracies. Heading accuracy is after dynamic alignment and during motion. Performance may be reduced with long stationary or hovering periods.
- 4 At maximum output rate.
- 5 GPS only and depends on SBAS System performance. FAA WAAS accuracy specifications are <5 m 3DRMS.
- 6 Typical observed values.
- 7 No previous satellite (ephemerides / almanac) or position (approximate position or time) information.
- 8 Ephemerides and last used position known.
- 9 As required by the U.S. Department of Commerce to comply with export licensing restrictions.
- 10 Dependent on appropriate mounting/enclosure design.
- 11 Input only network correction.
- 12 There is no public GLONASS L3 CDMA. The current capability in the receivers is based on publicly available information. As such, Trimble cannot guarantee that these receivers will be fully compatible.
- 13 Detailed specifications are available at oemgnss.trimble.com
- 14 Also available in configurations with RTK accuracies limited to 10 and 30 centimeters.

Specifications subject to change without notice.

Positioning specifications^{2, 3, 14}

	Autonomous	SBAS	DGNSS	RTK	INS-Autonomous	INS-SBAS	INS-DGNSS	INS-RTK
No GNSS Outages								
Position (m)	1.00 (H) 1.50 (V)	0.50 (H) 0.85 (V)	0.25 (H) 0.50 (V)	0.008 (H) 0.015 (V)	1.00 (H) 1.50 (V)	0.50 (H) 0.85 (V)	0.40 (H) 0.60 (V)	0.05 (H) 0.03 (V)
Roll/Pitch (deg)	N/A	N/A	N/A	N/A	0.10	0.10	0.10	0.10
Heading (deg) on 2 m Baseline	N/A	N/A	N/A	N/A	0.50	0.50	0.50	0.09
10 second GNSS Outages								
Position (m)	N/A	N/A	N/A	N/A	1.50 (H) 1.80 (V)	1.20 (H) 1.20 (V)	1.00 (H) 1.00 (V)	0.30 (H) 0.20 (V)
Roll/Pitch (deg)	N/A	N/A	N/A	N/A	0.10	0.10	0.10	0.10
Heading (deg) on 2 m Baseline	N/A	N/A	N/A	N/A	0.50	0.50	0.50	0.50

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