



# GNSS RECEIVER FOR MACHINE CONTROL SYSTEMS



The Vector VR1000 is Hemisphere GNSS' premiere multi-GNSS, multi-frequency position and heading receiver designed specifically for the machine control market. Providing precise heading, Athena RTK positioning, and full Atlas capability, its rugged design is compliant to IP69K, MIL-STD-810G, and IEC 60068-2 standards.

The VR1000 supports antenna separations up to 10 meters, offering heading accuracy to 0.01 degrees RMS in addition to RTK position accuracy and full support for Hemisphere GNSS' Atlas Global Correction Service.

## Key Features

- Athena™ RTK Engine
- Extremely accurate heading with baselines up to 10m
- Multi-frequency GPS/GLONASS/BeiDou/Galileo/QZSS/IRNSS
- Atlas® Global Correction Service
- Integrated Ethernet, CAN, internal 400MHz radio, Serial, Bluetooth, and Wi-Fi
- Powerful WebUI accessed via Wi-Fi plus 12 multi-color LEDs
- Integrated IMU delivers fast start-up times and maintains heading during temporary GNSS outage
- Fully rugged IP69K, and MIL-STD-810G compliant solution for the harshest environments

## GNSS Receiver Specifications

<b>Receiver Type:</b>	GNSS Position & Heading RTK Receiver
<b>Signals Received:</b>	GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and Atlas
<b>Channels:</b>	1059
<b>GPS Sensitivity:</b>	-142 dBm
<b>SBAS Tracking:</b>	3-channel, parallel tracking
<b>Update Rate:</b>	10 Hz standard, 20 Hz optional
<b>Timing (1 PPS)</b>	
<b>Accuracy:</b>	20 ns
<b>Rate of Turn:</b>	100°/s maximum
<b>Cold Start:</b>	40 s (no almanac or RTC)
<b>Warm Start:</b>	20 s typical (almanac and RTC)
<b>Hot Start:</b>	5 s typical (almanac, RTC and position)
<b>Heading Fix:</b>	10 s typical (Hot Start)
<b>Antenna Input Impedance:</b>	50 Ω
<b>Maximum Speed:</b>	1,850 mph (999 kts)
<b>Maximum Altitude:</b>	18,288 m (60,000 ft)
<b>Differential Options:</b>	SBAS, Atlas (L-band), RTK

## Accuracy

<b>Positioning:</b>	<b>RMS (67%)</b>	<b>2DRMS (95%)</b>
<b>Autonomous, no SA:</b> <sup>2</sup>	1.2 m	2.5 m
<b>SBAS:</b> <sup>2</sup>	0.25 m	0.5 m
<b>Atlas:</b> <sup>2,3</sup>	0.04 m	0.08 m
<b>RTK:</b> <sup>1</sup>	10 mm + 1 ppm	20 mm + 2 ppm
<b>Heading (RMS):</b>	< 0.2° @ 0.5 m antenna separation < 0.1° @ 1.0 m antenna separation < 0.05° @ 2.0 m antenna separation < 0.02° @ 5.0 m antenna separation < 0.01° @ 10.0 m antenna separation	
<b>Pitch/Roll (RMS):</b>	1°	
<b>Heave (RMS):</b>	30 cm (DGPS) <sup>3</sup> , 10 cm (RTK) <sup>3</sup>	

## L-Band Receiver Specifications

<b>Receiver Type:</b>	Single Channel
<b>Channels:</b>	1530 to 1560 MHz
<b>Sensitivity:</b>	-130 dBm
<b>Channel Spacing:</b>	5 kHz
<b>Satellite Selection:</b>	Manual or Automatic
<b>Reacquisition</b>	
<b>Time:</b>	15 sec (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, no SA, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, WAAS coverage and satellite geometry
3. Requires a subscription
4. Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for differential services), and ionospheric activity
5. Hemisphere GNSS proprietary
6. CMR and CMR+ do not cover proprietary messages outside of the typical standard



## Communications

<b>Ports:</b>	1x full-duplex RS-232/RS-422, 1x full-duplex RS232, 2x CAN, 1x Ethernet
<b>Baud Rates:</b>	4800 - 115200
<b>Radio Interfaces:</b>	Bluetooth 2.0 (Class 2), Wi-Fi 2.4 GHz, UHF (400 MHz)
<b>Correction I/O Protocol:</b>	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR <sup>6</sup> , CMR+ <sup>6</sup>
<b>Data I/O Protocol:</b>	NMEA 0183, Hemisphere GNSS binary
<b>Timing Output:</b>	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
<b>Event Marker Input:</b>	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load
<b>Power Input Voltage:</b>	9-36 VDC
<b>Power Consumption:</b>	10.8W Maximum (All signals and L-band)
<b>Current Consumption:</b>	1.2A Maximum
<b>Power Isolation:</b>	No
<b>Reverse Polarity Protection:</b>	Yes

## Environmental

<b>Operating Temperature:</b>	-40°C to +70°C (-40°F to +158°F)
<b>Storage Temperature:</b>	-40°C to +85°C (-40°F to +185°F)
<b>Humidity:</b>	95% non-condensing
<b>Mechanical Shock:</b>	50G, 11ms half sine pulse (MIL-STD-810G w/ Change 1 Method 516.7 Procedure 1)
<b>Vibration:</b>	7.7Grms (MIL-STD-810G w/Change 1 Method 514.7 Category 24)
<b>EMC:</b>	CE (ISO14982/EN13309/ISO13766/IEC60945), Radio Equipment Directive 2014/53/EU, E-Mark, RCM
<b>Enclosure:</b>	IP69K

## Mechanical

<b>Dimensions:</b>	
<b>No Plate:</b>	23.2 L x 16.5 W x 7.9 H (cm) 9.1 L x 6.5 W x 3.1 H (in)
<b>With Plate:</b>	23.2 L x 21.4 W x 8.3 H (cm) 9.1 L x 8.4 W x 3.3 H (in)
<b>Status Indications (LED):</b>	Power, Primary Antenna, Secondary Antenna, Heading, Quality, Atlas, Bluetooth, Wi-Fi, CAN1, CAN2, Ethernet, Radio

## Power/Data

<b>Connector:</b>	23-pin multi-purpose
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## Aiding Devices

<b>Gyro:</b>	Provides smooth heading, fast heading reacquisition and reliable < 0.5° per min heading for periods up to 3 min. when loss of GNSS has occurred <sup>4</sup>
<b>Tilt Sensors:</b>	Provide pitch/roll data and assist in fast start-up and reacquisition of heading solution

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