![Hemisphere® logo]

SCALABLE ALL-IN-ONE GNSS RECEIVER
SOLUTION

![atlas®]

The A222 GNSS Smart Antenna is an affordable, portable solution with professional-level accuracy for agricultural, marine, GIS, mapping, and other applications.

Focus on the job-at-hand with fast start-up and reacquisition times, 60 cm accuracy, and an easy-to-see LED status indicator for power, GNSS, and DGNSS. The durable enclosure houses both antenna and receiver. It can be powered through various sources, making the A222 smart antenna ideal for a variety of applications. Dual-Serial, CAN, and pulse output options make this DGNSS receiver compatible with almost any interface.

A222 is supported by Hemisphere's easy-to-use Atlas Portal (www.atlasgnss.com), which empowers you to update firmware and enable functionality, including Atlas subscriptions for accuracies from meter to sub-decimeter levels.

Key Features

- Atlas® L-band corrections
- Exclusive Atlas Basic option available when other differential signals are not practical
- Scalable accuracy within a single product for different use cases
- Durable enclosure is proven to withstand the most aggressive environments
- Compact, low-profile design with fixed or magnetic mounting options are ideal for portable and dynamic applications

GNSS Receiver Specifications

Receiver Type:	Scalable dual-frequency, multi-GNSS RTK
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C
	GLONASS G1/G2/P1/P2
	BeiDou B1
	Galileo E1BC
	Atlas
Channels:	332
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional (with subscription)

Timing (1 PPS)

Accuracy:	20 ns
Cold Start:	< 60 s typical (no almanac, ephemeris, position, or RTC)
Warm Start:	< 30 s typical (almanac and RTC)
Hot Start:	< 10 s typical (almanac, ephemeris, position, and RTC)
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas: [1,3]	0.08 m	0.16 m
RTK: [1,2]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

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

Communications

Ports:	2 full-duplex RS-232, CAN [4]
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary, RTCM v2.3 (DGPS), RTCM v3 (RTK)
Data I/O Protocol:	NMEA 0183, NMEA 2000, Hemisphere GNSS binary
Timing Output:	1 PPS, CMOS, active low, falling edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	7-32 VDC with reverse polarity operation
Power Consumption:	4.1 W nominal (L1/L2 GPS/GLONASS; L-band)
Current Consumption:	0.35 A nominal (L1/L2 GPS/GLONASS; L-band)
Power Isolation:	No
Reverse Polarity Protection:	Yes
Antenna Voltage:	Internal Antenna

Environmental

Operating Temperature:	-40°C to +70°C (-40°F to +158°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing
Mechanical Shock:	EP455 Section 5.41.1 Operational
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (ISO 14982 Emissions and Immunity), FCC Part 15, Subpart B, CISPR 22
Enclosure:	IP67

Mechanical

Dimensions:	15.8 L x 15.8 W x 7.9 H (cm) 6.2 L x 6.2 W x 3.2 H (in)
Weight:	< 1.05 kg (< 2.53 lbs)
Status Indications (LED):	Power, GNSS Lock
Power/Data Connector:	12-pin male (metal)
Antenna Mounting:	1-14 UNS-2A female adapter, 5/8-11 UNC 2B adapter, flat mount available

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends also on baseline length
3. Requires a subscription from Hemisphere GNSS 4 Requires software upgrade

GNSS SMART ANTENNA
FOR **MACHINE**
CONTROL SYSTEMS

atlas®

The A326 is an all-new multi-GNSS, multi-frequency smart antenna. Showcasing fast start-up and reacquisition times, and an easy-to-see status indicator for power, GNSS, and Bluetooth. The durable enclosure houses the high precision antenna element and GNSS receiver. Resulting in the A326 smart antenna being ideal for a variety of applications. The available multiple communication ports, such as Bluetooth, Wi-Fi, dual-Serial, and CAN options make the A326 compatible with almost any interface. The easy-to-use WebUI allows the user to wirelessly monitor and configure the A326 with any Wi-Fi capable device, making the A326 one of the most versatile GNSS smart antennas in the world.

Athena™ RTK

The A326 GNSS Smart Antenna uses Hemisphere GNSS' next-generation Athena RTK engine. Athena offers world class performance in the areas of initialization time, robustness in very difficult operating environments, superior performance over long RTK baselines, and exceptional reliability in scintillation conditions.

Atlas® GNSS Global Corrections

A326 is Atlas ready, and capable of receiving corrections from Hemisphere's Atlas Global Correction Service.

A326 is supported by our easy-to-use Atlas Portal (www.atlasgnss.com), which empowers you to update firmware and enable functionality, including Atlas subscriptions for accuracies from meter to sub decimeter levels.

Key Features

- Atlas GNSS Global Correction Service
- Athena RTK engine
- Powerful WebUI accessed via Wi-Fi
- Internal memory for data logging, download, and upload
- Durable enclosure is proven to withstand aggressive environments

GNSS Receiver Specifications

Receiver Type:	GNSS Position RTK Receiver
Signals Received:	GPS, GLONASS, Galileo, BeiDou, QZSS
Channels:	572 / 488
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional (with subscription)
Timing (1 PPS)	
Accuracy:	20 ns
Cold Start:	< 60 s typical (no almanac, ephemeris, position, or RTC)
Warm Start:	< 30 s typical (almanac and RTC)
Hot Start:	< 10 s typical (almanac, ephemeris, position, and RTC)
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas: [1,3]	0.08 m	0.16 m
RTK: [1,2]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

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

Communications

Ports:	2 full-duplex RS-232, CAN
Interface Level:	Atlas GNSS (WebUI)
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, NMEA 2000, Hemisphere GNSS binary, Bluetooth 2.0 (Class 2), Wi-Fi
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	7-32 VDC
Power Consumption:	4.5 W nominal (L1/L2 GPS/GLONASS/ BeiDou, L-band)
Current Consumption:	0.38 A nominal (L1/L2 GPS/GLONASS/ BeiDou, L-band)
Power Isolation:	No
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-40°C to +70°C (-40°F to +158°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing
Mechanical Shock:	50G, 11ms half sine pulse (MIL-STD-810G w/Change 1 Method 516.7 Procedure 1)
Vibration:	7.7Grms (MIL-STD-810G w/Change 1 Method 514.7 Category 24)
EMC:	CE (ISO14982/EN13309/ISO13766/ IEC60945), Radio Equipment Directive 2014/53/EU, E-Mark, RCM
Enclosure:	IP67

Mechanical

Dimensions:	15.8 L x 15.8 W x 7.9 H (cm) 6.2 L x 6.2 W x 3.2 H (in)
Weight:	< 1.15 kg (< 2.53 lbs)
Status Indications (LED):	Power, GNSS Status, Bluetooth, Wi-Fi
Power/Data Connector:	12-pin male
Antenna Mounting:	1-14 UNS-2A female adapter, 5/8-11 UNC 2B adapter, flat mount available

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends also on baseline length
3. Requires a subscription from Hemisphere GNSS
4. With L5 option 5 With B3 option
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Hemisphere®

MULTI-FREQUENCY, MULTI-GNSS SMART ANTENNA

AtlasLink is a multi-GNSS, multi-frequency smart antenna preconfigured to receive corrections from Hemisphere's Atlas global corrections service. AtlasLink paired with Atlas provides you with the easiest way to receive Atlas corrections via the industry's most powerful multi-purpose GNSS smart antenna, either directly from AtlasLink or into your existing receiver.

Over are the days of being tied to a single corrections provider who requires you to purchase their corrections, which can only be received by their device. If you use Atlas corrections data on equipment that doesn't have the ability to receive L-band signals, or you would like to use Atlas corrections on systems that currently receive L-band corrections from another source, you now have the freedom to do so. AtlasLink, in SmartLink™ or BaseLink® mode, enables you to use Atlas corrections on any receiver from any vendor that supports industry-standard correction formats.

AtlasLink is supported by our easy-to-use Atlas Portal (www.atlasgnss.com), which empowers you to update firmware and enable functionality, including Atlas subscriptions for accuracies from meter to sub-decimeter levels.

Key Features

- Atlas® L-band corrections
- Athena™ RTK engine
- Powerful WebUI accessed via Wi-Fi
- Internal memory for data logging, download, and upload
- Environment-proven enclosure for the most aggressive user scenarios

GNSS Receiver Specifications

Receiver Type:	Multi-frequency, Multi-GNSS RTK
Signals Received:	GPS, GLONASS, BeiDou, and Atlas
Channels:	572 / 488
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional (with subscription)

Timing (1 PPS)

Accuracy:	20 ns
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1,3]	0.04 m	0.08 m
Atlas H30: [1,3]	0.15 m	0.3 m
Atlas Basic: [1,3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5 kHz
Satellite Selection:	Manual or Automatic
Reacquisition Time:	15 sec (typical)

Communications

Ports:	2x full-duplex RS-232, 1x CAN
Interface Level:	Atlas GNSS (WebUI)
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[4], CMR+[4]
Data I/O Protocol:	NMEA 0183, NMEA 2000, Hemisphere GNSS binary, Bluetooth 2.0 (Class 2), Wi-Fi
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	7-32 VDC
Power Consumption:	3.4W nominal All Signals + L-band
Current Consumption:	0.28 A nominal All Signals + L-band
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-40°C to +70°C (-40°F to +158°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing
Mechanical Shock:	EP455 Section 5.41.1
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (ISO 14982 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22
Enclosure:	IP67

Mechanical

Dimensions:	15.8 L x 15.8 W x 7.9 H (cm) 6.2 L x 6.2 W x 3.2 H (in)
Weight:	1.05 kg (2.53 lbs)
Status Indications (LED):	Power, RTK/Atlas Float, RTK/Atlas Fixed
Power/Data Connector:	12-pin male (metal)
Antenna Mounting:	1-14 female with 5/8-11 adapter, and flat mount

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1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends also on baseline length
3. Requires a subscription from Hemisphere GNSS
4. CMR and CMR+ do not cover proprietary messages outside of the typical standard
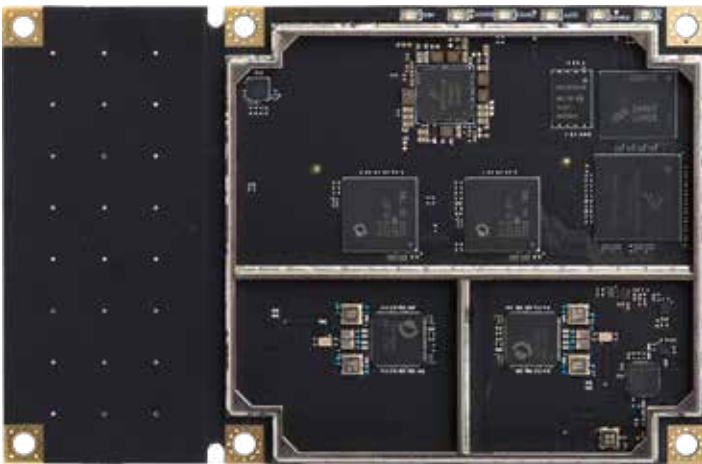

Hemisphere GNSS

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NEXT GENERATION, HIGH-PERFORMANCE GNSS POSITION AND **HEADING MODULE**

The Crescent Vector H220 GNSS OEM board is the next generation, single-frequency, high-performance GNSS heading, positioning, and attitude module available from Hemisphere GNSS.

The H220 provides integrators with an opportunity for developing sophisticated marine, navigation, and land applications in challenging dynamic environments. The H220 uses Hemisphere's advancements in Vector technology, advanced multipath mitigation techniques, and Hemisphere's patented Multifunction Application.

H220 is capable of providing heading of 0.04° with a 5 meter antenna baseline and either RTK or SBAS positioning depending on your location requirements. With Atlas corrections, the H220 can obtain instant sub-meter accuracy worldwide.

Integrate the robust H220 GNSS OEM board into your applications to experience exceptional heading, positioning, and attitude performance. Diversity and cost savings make it an ideal part of your solution for system integrators.

Key Features

- Extremely accurate heading with short baselines
- Single Frequency GPS/GLONASS/BeiDou/Galileo QZSS RTK capable
- Integrated L-band for Atlas® corrections
- Excellent coasting performance
- 10 cm RMS heave accuracy with RTK
- Strong multipath mitigation and interference rejection
- New multi-axis gyro and tilt sensor for reliable coverage during short GNSS outages

GNSS Receiver Specifications

Receiver Type:	Single Frequency GPS, GLONASS, BeiDou, Galileo, QZSS4, and Atlas
Signals Received:	GPS L1CA/L1P GLONASS G1, P1 BeiDou B1 GALILEO E1BC QZSS L1CA4 Atlas
Channels:	424
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	10 Hz standard, 1 Hz, 20 Hz or 50 Hz[5] optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (Hot Start)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	10 mm + 1 ppm	20 mm + 2 ppm
Heading (RMS):	0.30˚ @ 0.5 m antenna separation	
	0.15˚ @ 1.0 m antenna separation	
	0.08˚ @ 2.0 m antenna separation	
	0.04˚ @ 5.0 m antenna separation	
Pitch/Roll (RMS):	1°	
Heave (RMS): [1]	30 cm (DGPS), 10 cm (RTK)	

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Based on a 40 second time constant
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	4 x full-duplex 3.3V CMOS (3 x main serial ports, 1 x differential-only port) 1 x USB Host 1 x USB Device
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary [3]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	2.1 W nominal GPS (L1) and GLONASS (L1)
Current Consumption:	0.64 A nominal GPS (L1) and GLONASS (L1)
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22

Mechanical

Dimensions:	109 L x 71 W x 5 H (mm) 4.3 L x 2.8 W x 0.2 H (in)
Weight:	50 g (1.77 oz)
Status Indications (LED):	Power, Primary and Secondary GNSS lock, Differential lock, DGNSS position, Heading
Power/Data Connector:	34-pin male header 2 mm pitch
Antenna Connectors:	MCX, female, straight

Aiding Devices

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Gyro:	Provides smooth and fast heading reacquisition. During loss of GNSS signals heading stability is degraded by < 1° per minute for up to 3 minutes. [2]
Tilt Sensors:	Provide pitch and roll data and assist in fast startup and reacquisition of heading solution.

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Hemisphere®

ADVANCED HEADING AND RTK POSITIONING

atlas®
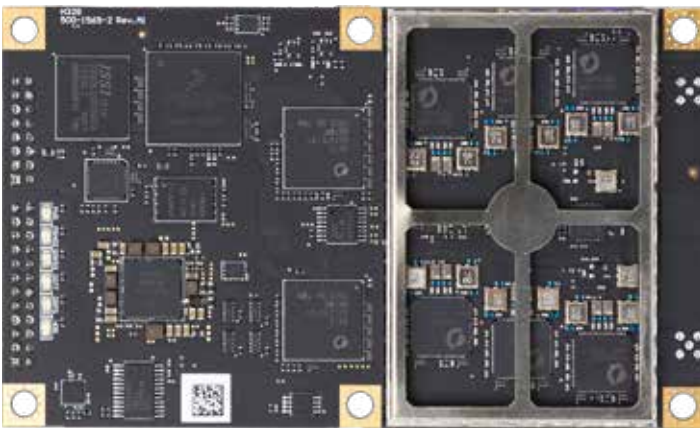
Develop sophisticated machine control and navigation solutions in a complex world full of dynamic environments. The Vector H328 is our most advanced GNSS heading and positioning board.

The Vector H328 uses dual antenna ports to create a series of additional capabilities to Eclipse Vector technology including fast, high-accuracy heading over short baselines, RTK positioning, onboard Atlas L-band, RTK-enabled heave, low-power consumption, and precise timing.

Scalable Solutions

With the Vector H328, positioning is scalable and field upgradeable with all Hemisphere software and service options. Use the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency multi-constellation GNSS signals. High-accuracy L-band positioning from meter to sub-decimeter levels are available via Atlas correction service.

Ease of Migration

Leverage the industry standard form factor for easy upgradeability from other manufacturers' modules.

Key Features

- Extremely accurate heading with long baselines
- Multi-frequency position, dual-frequency heading supporting GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and L-band
- Atlas® L-band capable to 4 cm RMS
- Athena™ GNSS engine providing best-in-class RTK performance
- Excellent coasting performance
- 5 cm RMS RTK-enabled heave accuracy
- Strong multipath mitigation and interference rejection
- New multi-axis gyro and tilt sensor for reliable coverage during short GNSS outages

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2, P1/P2 BeiDou B1/B2/B3 GALILEO E1BC/E5a/E5b QZSS L1CA/L2C/L5/L1C Atlas
Channels:	1059
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 1 Hz or 20 Hz optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (Hot Start)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1, 3]	0.04 m	0.08 m
Atlas H30: [1, 3]	0.15 m	0.3 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

Heading (RMS):	0.16° rms @ 0.5 m antenna separation
	0.08° rms @ 1.0 m antenna separation
	0.04° rms @ 2.0 m antenna separation
	0.02° rms @ 5.0 m antenna separation
Pitch/Roll (RMS):	1°
Heave (RMS): [1]	30 cm rms (DGNSS) , 5 cm rms (RTK)

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, SBAS coverage, satellite geometry, and ionospheric activity
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	3 x full-duplex (1 x 3.3V CMOS, 1 x 3.3V CMOS with flow control, 1 x RS-232 with flow control) 1 x USB Device 1 x Ethernet 10/100Mbps 2 x CAN (NMEA2000, ISO 11783) 1 x SPI
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary [5]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ,10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	2.0 W nominal GPS (L1) 2.7 W nominal GPS (L1/L2) and GLONASS (G1/G2) 3.8 W nominal All Signals + L-band
Current Consumption:	0.61 A nominal GPS (L1) 0.82 A nominal GPS (L1/L2) 1.15 A nominal All Signals + L-band
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22

Mechanical

Dimensions:	100 L x 60 W x 10 H (mm) 3.9 L x 2.4 W x 0.4 (in)
Weight:	44 g (1.56 oz)
Status Indications (LED):	Power, Primary and Secondary GNSS lock, Differential lock, DGNSS position, Heading
Power/Data Connector:	24-pin male header 2 mm pitch 16-pin male header 2 mm pitch
Antenna Connectors:	MMCX, female, straight

Aiding Devices

Gyro:	Provides smooth and fast heading reacquisition. During loss of GNSS signals heading stability is degraded by < 1° per minute for up to 3 minutes.
Tilt Sensors:	Provide pitch, roll data and assist in fast start-up and reacquisition of heading solution

Hemisphere®

MULTI-CONSTELLATION, SINGLE-FREQUENCY

Key Features

- Extremely affordable single frequency, multi constellation solution with up to 20 Hz update rate

- GPS, GLONASS, BeiDou, Galileo, and QZSS-ready

- Fast start-up and reacquisition times allow you to get right to work

- High-precision, differential positioning accuracy of 60 cm, 95% of the time

- Exclusive e-Dif® option where other differential signals are not practical

- COAST and SureTrack maintain sub-meter DGNSS positioning for 40 minutes after correction loss

- Small form and low-power consumption design is ideal for easy integration

Hemisphere GNSS' Crescent P206 and P207 OEM modules use GPS, GLONASS, and BeiDou, and are Galileo and QZSS ready. Track more signals for unparalleled positioning performance even in challenging environments. Leverage the compact size and easy integration in your design. The 34-pin P206 module is a drop-in upgrade for many Hemisphere products. P207 is a drop in upgrade for existing Crescent designs using standard 20 pin modules from other manufacturers.

DGPS and SBAS with patented COAST™ software enables Hemisphere receivers to use previous DGPS and SBAS correction data during times of interference, signal blockage and weak signal. The receiver will coast and continue to maintain sub-meter positioning for up to 40 minutes without any DGPS signal. When your corrections are only for one GNSS constellation, for example GPS using SBAS, Hemisphere's patented SureTrack™ goes to work to model all other satellites, helping maintain an accurate solution in challenging environments.

GNSS Receiver Specifications

Receiver Type:	GNSS single-frequency RTK with carrier phase
Signals Received:	GPS, GLONASS, BeiDou, GALILEO [1], and QZSS [1]
Channels:	103
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	1 Hz standard, 10 or 20 Hz optional

Timing (1 PPS)

Accuracy:	20 ns
Cold Start:	< 60 s typical (all unknown)
Warm Start:	< 30 s typical (no ephemeris)
Hot Start:	< 10 s typical (all known)
HeadStart: [5]	Removable, auto-recharging onboard clock battery
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [3]	1.2 m	2.5 m
SBAS: [3]	0.3 m	0.6 m
RTK: [2]	10 mm + 1 ppm	20 mm + 2 ppm

Communications

Ports:	4x full-duplex 3.3 V CMOS (3 main serial ports 1x differential-only port) 1x USB Host [6] 1x USB Device
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[8], CMR+[8]
Data I/O Protocol:	NMEA 0183, Crescent binary [7]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	1.2 W nominal L1 GPS 1.4 W nominal single frequency GPS + GLONASS + BeiDou
Current Consumption:	0.30 A nominal GPS (L1) 370 mA nominal L1 GPS 420 mA nominal single frequency GPS + GLONASS + BeiDou
Antenna Voltage:	15 VDC maximum Antenna Short Circuit
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB
Antenna Input Impedance:	50 Ω

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)

Mechanical

Dimensions:	7.25 L x 4.1 W x 1.1 H (cm) 2.85 L x 1.61 W x 0.43 H (in)
Weight:	.105 kg (3.70 oz.)
Status Indications (LED):	Power, Primary and Secondary GPS lock, Differential lock, DGPS position, Heading, RTK lock, Atlas L-band lock
Power/Data Connector:	
P206:	34-pin male header 0.05" pitch
P207:	20-pin male header 0.05" pitch
Antenna Connectors:	MCX, female, straight

1. Firmware update required
2. Depends on multipath environment, number of satellites in view, satellite geometry baseline length (up to 10 km) and ionospheric activity
3. Depends on multipath environment, number of satellites in view, satellite geometry and ionospheric activity
4. Cold start means no approx. position, no approx. time, no almanac, no ephemeris - Warm starts require an approx. position, approx. time, and almanac - Hot starts require an approx. position, approx. time, and valid ephemeris
5. Maintains time while receiver is powered off, reducing cold start occurrences
6. P206 Only
7. Hemisphere GNSS proprietary
8. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Hemisphere®

MULTI-FREQUENCY, MULTI-GNSS RTK & ATLAS®

atlas®

Track More Signals for the Most Robust Low-Power, Multi-Frequency, Multi-GNSS Solution

Track more signals for unparalleled positioning performance with Hemisphere GNSS' new Eclipse P326 and P327 OEM modules. The latest technology platform enables simultaneous tracking of all satellite signals including GPS, GLONASS, BeiDou, Galileo, and L-band (QZSS ready) making it the most robust and reliable solution. The updated power management system efficiently governs the processor, memory, and ASIC making it ideal for multiple integration applications including handheld and battery- powered devices.

Experience Unparalleled Accuracy and Reliability with Advanced Technology Features

The P326 and P327 are the most accurate and reliable OEM modules with two new advanced technology features; aRTK™ and Tracer™. Hemisphere's aRTK technology, powered by Atlas, allows the P326 and P327 to operate with RTK accuracies when RTK corrections fail. Tracer utilizes specialized algorithms to sustain positioning in the absence of corrections data.

Scalable Solutions

With the Eclipse P326 and P327, positioning is scalable and field upgradeable with all Hemisphere software and service options. Use the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency, multi-constellation GNSS signals. High-accuracy L-band positioning from meter to sub-decimeter levels available via Atlas correction service.

Ease of Migration

Leverage the compact size and easy integration in your design. The 34-pin P326 module is a drop-in upgrade for many Hemisphere products. P327 is a drop-in upgrade for existing designs using standard 20-pin modules from other manufacturers.

Key Features

- Multi-Frequency GPS, GLONASS, BeiDou, Galileo and QZSS-ready
- Long-range RTK baselines up to 50 km with fast acquisition times
- Compatible with many RTK sources including Hemisphere GNSS' ROX format, RTCM, CMR, CMR+
- Mechanically and electrically (pin-for- pin) compatible with many Hemisphere and other manufacturers' modules
- Atlas® L-band capable to 4 cm RMS
- Athena™ GNSS engine providing best-in- class RTK performance

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5
	GLONASS G1/G2, P1/P2
	BeiDou,B1/B2 (B3 separate variant without L5)
	GALILEO E1BC/E5a/E5b
	QZSS L1CA/L2C/L5/L1C
	Atlas
Channels:	
P326/P327 (L5):	572
P326/P327 (B3):	488
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	1 Hz standard, 10 Hz, 20 Hz, or 50Hz optional (with activation)
Timing (1 PPS)	
Accuracy:	20 ns
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1, 3]	0.04 m	0.08 m
Atlas H30: [1, 3]	0.15 m	0.3 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, SBAS coverage, satellite geometry, and ionospheric activity
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	4x full-duplex 3.3V CMOS (3 x main serial ports, 1 x differential-only port)
	1x USB Host
	1x USB Device
	2x CAN
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary [3]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	1.0 W nominal GPS (L1)
	1.6 W nominal GPS (L1/L2) and GLONASS (G1/G2)
	2.3 W nominal All Signals + L-Band
Current Consumption:	0.30 A nominal GPS (L1)
	0.48 A nominal GPS (L1/L2) and GLONASS (G1/G2)
	0.70 A nominal All Signals + L-Band
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity)
	FCC Part 15, Subpart B
	CISPR 22

Mechanical

Dimensions:	
P326:	71 L x 41 W x 10.1 H (mm)
	2.8 L x 1.6 W x 0.4 H (in)
P327:	72 L x 41 W x 10.1 H (mm)
	2.8 L x 1.6 W x 0.4 H (in)
Weight:	22 g (0.79 oz)
Status Indications (LED):	Power, GNSS lock, Differential lock, DGNSS position
Power/Data Connector:	
P326:	34-pin male header, 0.05'' (1.27 mm) pitch
P327:	20-pin male header, 0.08'' (2 mm) pitch
Antenna Connectors:	MCX, female, straight

Hemisphere®

MULTI-FREQUENCY, MULTI-GNSS RTK & ATLAS®

atlas®

Key Features

- Multi-Frequency GPS, GLONASS, BeiDou, Galileo, and QZSS

- Long-range RTK baselines up to 50 km with fast acquisition times

- Compatible with many RTK sources including Hemisphere GNSS' ROX format, RTCM, CMR, CMR+

- Mechanically and electrically (pin-for-pin) compatible with many other manufacturers' modules

- Atlas® L-band capable to 4 cm RMS

- Athena™ GNSS engine providing best-in- class RTK performance

- Serial, USB, Ethernet and CAN connectivity for ease of use and integration

Track More Signals for the Most Robust Low-Power Multi-Frequency, Multi-GNSS Solution

Track more signals for unparalleled positioning performance with Hemisphere GNSS' new Eclipse P328 OEM board. The latest technology platform enables simultaneous tracking of all satellite signals including GPS, GLONASS, BeiDou, Galileo, QZSS, and L-band making it the most robust and reliable solution for machine control. The power management system efficiently governs the processor, memory, and ASIC making it ideal for multiple integration applications.

Experience Unparalleled Accuracy and Reliability with Advanced Technology Features

The P328 is the most accurate and reliable OEM module with two new advanced technology features; aRTK™ and Tracer™. Hemisphere's all-new aRTK technology, powered by Atlas, allows the P328 to operate with RTK accuracies when RTK corrections fail. Tracer utilizes specialized algorithms to sustain positioning in the absence of correction data.

Scalable Solutions

With the Eclipse P328, positioning is scalable and field upgradeable with all Hemisphere software and service options. Utilize the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency, multi-constellation GNSS signals. High- accuracy L-band positioning from meter to sub-decimeter levels available via Atlas GNSS correction service.

Ease of Migration

Leverage the industry standard form factor for easy upgradeability from other manufacturers' modules.

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5
	GLONASS G1/G2, P1/P2
	BeiDou B1/B2/B3
	GALILEO E1BC/E5a/E5b
	QZSS L1CA/L2C/L5/L1C
	Atlas
Channels:	600
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	1 Hz standard, 10 Hz, 20 Hz or 50Hz optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)

Antenna Input

Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1, 3]	0.04 m	0.08 m
Atlas H30: [1, 3]	0.15 m	0.3 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Based on a 40 second time constant
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	3 x full-duplex (1 x 3.3V CMOS, 1 x 3.3V CMOS with flow control, 1 x RS-232 with flow control)
	1 x USB Device
	1 x Ethernet 10/100Mbps
	2 x CAN (NMEA2000, ISO 11783)
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary [3]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	1.1 W GPS (L1)
	1.8 W GPS (L1/L2) and GLONASS (G1/G2)
	2.9 W All Signals + L-band
Current Consumption:	0.33 A nominal GPS (L1)
	0.55 A nominal GPS (L1/L2) and GLONASS (G1/G2)
	0.88 A nominal All Signals + L-band
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity)
	FCC Part 15, Subpart B
	CISPR 22

Mechanical

Dimensions:	100 L x 60 W x 10 H (mm)
	3.9 L x 2.4 W x 0.4 (in)
Weight:	44 g (1.56 oz)
Status Indications (LED):	Power, GNSS lock, Differential lock, DGNSS position
Power/Data Connector:	24 pin male header 2 mm pitch
	16 pin male header 2 mm pitch
Antenna Connectors:	MMCX, female, straight

Hemisphere®

MULTI-FREQUENCY, MULTI-GNSS RTK & ATLAS®

atlas®

Key Features

- Multi-Frequency GPS, GLONASS, BeiDou, Galileo, and QZSS

- Long-range RTK baselines up to 50 km with fast acquisition times

- Compatible with many RTK sources including Hemisphere GNSS' ROX format, RTCM, CMR, CMR+

- Mechanically and electrically (pin-for-pin) compatible with many other manufacturers' modules

- Atlas® L-band capable to 4 cm RMS

- Athena™ GNSS engine providing best-in-class RTK performance

- Serial, USB host (Phantom 34 only), USB device, and CAN connectivity for ease of use and integration

Track More Signals for the Most Robust Low-Power Multi-Frequency, Multi-GNSS Solution

Track more signals for unparalleled positioning performance with Hemisphere GNSS' new Phantom 20 and 34 OEM boards. The latest technology platform enables simultaneous tracking of all satellite signals including GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS and L-band making it the most robust and reliable solution for GIS, agriculture, and machine control. The power management system efficiently governs the processor, memory, and ASIC making it ideal for multiple integration applications.

Experience Unparalleled Accuracy and Reliability with Advanced Technology Features

The Phantom 20 and 34 are the most accurate and reliable OEM modules with two advanced technology features; aRTK™ and Tracer™. Hemisphere's aRTK technology, powered by Atlas, allows the Phantom 20 and 34 to operate with RTK accuracies when RTK corrections fail. Tracer uses specialized algorithms to sustain positioning in the absence of correction data.

Scalable Solutions

With the Phantom 20 and 34, positioning is scalable and field upgradeable with all Hemisphere software and service options. Use the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency, multi-constellation GNSS signals. High- accuracy L-band positioning from meter to sub-decimeter levels available via Atlas GNSS correction service.

Ease of Migration

Leverage the industry standard form factor for easy upgradeability from other manufacturers' modules.

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B10C/B2A/B2B/ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ALTBOC QZSS L1CA/L2C/L5/L1C/LEX IRNSS L5 Atlas
Channels:	800+
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	1 Hz standard, 10 Hz, 20 Hz or 50Hz optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1,3]	0.04 m	0.08 m
Atlas H30: [1,3]	0.15 m	0.3 m
Atlas Basic: [1,3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, SBAS coverage, satellite geometry, and ionospheric activity
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	4 x full-duplex 3.3V CMOS (3 x main Serial ports, 1x differential port) 1 x USB Host (Phantom 34 only) 1 x USB Device 2 x CAN (NMEA2000, ISO 11783)
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary [3]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ,10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	< 1.8 W all signals + L-Band
Current Consumption:	545 mA
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22

Mechanical

|	
Dimensions:	
Phantom 20:	72 L x 41 W x 10 H (mm) 2.8 L x 1.6 W x 0.4 H (in)
Phantom 34:	71 L x 41 W x 10 H (mm) 2.8 L x 1.6 W x 0.4 H (in)
Weight:	22 g (0.79 oz)
Status Indications (LED):	Power, GNSS lock, Differential lock, DGNSS position
Power/Data Connector:	
Phantom 20:	20-pin male header, 0.08" (2 mm) pitch
Phantom 34:	34-pin male header, 0.05" (1.27 mm) pitch
Antenna Connectors:	MMCX, female, straight

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MULTI-FREQUENCY, MULTI-GNSS RTK & ATLAS®
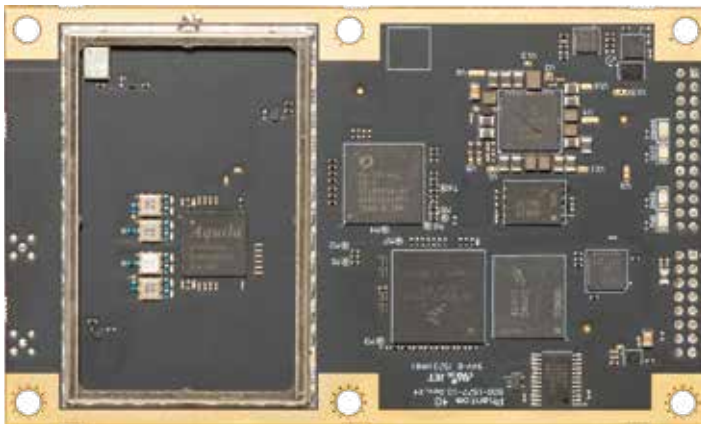
atlas®

Key Features

- Multi-Frequency GPS, GLONASS, BeiDou, Galileo, and QZSS
- Long-range RTK baselines up to 50 km with fast acquisition times
- Compatible with many RTK sources including Hemisphere GNSS' ROX format, RTCM, CMR, CMR+
- Mechanically and electrically (pin-for-pin) compatible with many other manufacturers' modules
- Atlas® L-band capable to 4 cm RMS
- Athena™ GNSS engine providing best-in-class RTK performance
- Serial, USB, Ethernet and CAN connectivity for ease of use and integration

Track More Signals for the Most Robust Low-Power Multi-Frequency, Multi-GNSS Solution

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Experience Unparalleled Accuracy and Reliability with Advanced Technology Features

The Phantom 40 is the most accurate and reliable OEM module with two advanced technology features; aRTK™ and Tracer™. Hemisphere's aRTK technology, powered by Atlas, allows the Phantom 40 to operate with RTK accuracies when RTK corrections fail. Tracer uses specialized algorithms to sustain positioning in the absence of correction data.

Scalable Solutions

With the Phantom 40, positioning is scalable and field upgradeable with all Hemisphere software and service options. Use the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency, multi-constellation GNSS signals. High- accuracy L-band positioning from meter to sub-decimeter levels available via Atlas GNSS correction service.

Ease of Migration

Leverage the industry standard form factor for easy upgradeability from other manufacturers' modules.

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B10C/B2A/B2B/ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ALTBOC QZSS L1CA/L2C/L5/L1C/LEX IRNSS L5 Atlas
Channels:	800+
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	1 Hz standard, 10 Hz, 20 Hz or 50Hz optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1, 3]	0.04 m	0.08 m
Atlas H30: [1, 3]	0.15 m	0.3 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, SBAS coverage, satellite geometry, and ionospheric activity
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	3 x full-duplex (1 x 3.3V CMOS, 1 x 3.3V CMOS with flow control, 1 x RS-232 with flow control) 1 x USB Host/Device 1 x Ethernet 10/100Mbps 2 x CAN (NMEA2000, ISO 11783)
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary [3]
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ,10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	< 1.8 W all signals + L-Band
Current Consumption:	545 mA
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22

Mechanical

Dimensions:	100 L x 60 W x 10 H (mm) 3.9 L x 2.4 W x 0.4 (in)
Weight:	44 g (1.56 oz)
Status Indications (LED):	Power, GNSS lock, Differential lock, DGNSS position
Power/Data Connector:	24-pin male header 2 mm pitch 16-pin male header 2 mm pitch
Antenna Connectors:	MMCX, female, straight

Hemisphere®

Hemisphere®

MULTI-GNSS RTK, HIGH-ACCURACY RECEIVER

atlas®

The R330 GNSS receiver is a full solution product in a compact enclosure. The R330 use the Hemisphere GNSS' Eclipse™ platform and our latest GNSS patented technology. The R330 provides accurate positioning using several differential correction methods such as Athena™ RTK, Atlas® L-band corrections (Atlas Basic, H30, H10), Beacon, and SBAS. Our patented Multifunction Application (MFA) firmware allows the R330 to smoothly transition between DGNSS systems.

The R330 GNSS receiver works well in any marine or land application where positioning accuracy is required. The base unit is configured as single frequency, 10 Hz, SBAS, and raw data. The unit can be optionally subscribed to multi-freqeuncy, multi-GNSS, 20 Hz, RTK, Atlas (Atlas Basic, H30, or H10), and Beacon. Compatible GNSS antennas for the R330 are A21, A25, A31, A42, A43, A45 and A52.

The R330 GNSS receiver works with two new advanced technology features; aRTK™ and Tracer™. Hemisphere's aRTK technology, powered by Atlas, allows the R330 to operate with RTK accuracies when RTK corrections fail. Tracer uses specialized algorithms to sustain positioning in the absence of corrections data.

Key Features

- Atlas® L-band capable to 4 cm RMS
- Athena™ GNSS engine providing best-in- class RTK performance
- Fast update rate of up to 20 Hz
- Status LEDs and menu system make R330 easy to monitor and configure
- USB flash drive for data logging

GNSS Receiver Specifications

Receiver Type:	Multi-Freqeuncy GPS, GLONASS, BeiDou, Galileo, and Atlas
Signals Received:	GPS, GLONASS, BeiDou, Galileo, and Atlas
Channels:	227
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1 PPS) Accuracy:	20 ns
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [2]	0.3 m	0.6 m
Atlas H10: [3,5]	0.04 m	0.08 m
Atlas H30: [3,5]	0.15 m	0.30 m
Atlas Basic: [3,5]	0.50 m	1.0 m
RTK: [4]	8 mm + 1 ppm	15 mm + 2 ppm

Beacon Receiver Specifications

Channels:	2-channel parallel tracking
Frequency Range:	283.5 to 325.0 kHz
Operating Modes:	Manual, Automatic, and Database
Compliance:	IEC 61108-4 beacon standard

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5 kHz
Satellite Selection:	Manual or Automatic
Reacquisition Time:	15 sec (typical)

Communications

Ports:	2 x full-duplex (RS-232)
	1 x USB Host
	1 x USB Device
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[6], CMR+[6]
Data I/O Protocol:	NMEA 0183, Hemisphere GNSS binary [5]
Timing Output:	1 PPS (CMOS, active high, rising edge sync, 10 kΩ,10 pF load)
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ

Power

Input Voltage:	8-36 VDC
Power Consumption:	2.8W nominal All Signals + L-band
Current Consumption:	0.24 A nominal All Signals + L-band
Reverse Polarity Protection:	Yes
Antenna Voltage Output:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-30°C to + 70°C (-22°F to + 158°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing
Mechanical Shock:	EP455 Section 5.41.1 Operational
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR22

Mechanical

Dimensions:	17.8 L x 12.0 W x 4.6 H (cm)
	7.0 L x 4.7 W x 1.8 H (in)
Display:	LED
Weight:	0.65 kg (1.42 lbs)
Status Indications (LED):	Power, GNSS lock, Differential lock
Power Switch:	Soft Switch
Power Connector:	2-pin metal ODU
Data Connector:	2 x DB9 (female)
	2 x USB-A
Antenna Connector:	TNC (female), straight

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, SBAS 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

Hemisphere®

WORLD'S MOST POPULAR DGPS BEACON MODULE

Provide a reliable source of differential corrections with the SBX-4 radiobeacon board that augments a separate GPS receiver with free accuracy-improving correction data from networks of beacon stations located throughout the world.

With dual-channel architecture to ensure the best station is always being decoded, the SBX-4 delivers high performance reception and a wide range of functionality including the capability to be tuned to signal strength or station distance.

The SBX-4 outputs the industry standard RTCM SC-104 format accepted by differential-ready GPS receivers and can also be configured and monitored with NMEA 0183 protocol.

Key Features

- Certified IEC 61108-4 compliant
- Dual-channel design allows strongest signal or closest station tracking
- Dual serial ports accommodate separate RTCM and NMEA communications
- Patented ceramic filter blocks out-of-band signals, optimizing reception
- Low power consumption extends battery life
- Power and signal lock LEDs permit visual verification of receiver status
- Reverse-compatibility ensures operation in existing SBX–2 and SBX–3 integrations
- Boot loader provides firmware upgrade reliability

Operating Specifications

Channels:	2-channel parallel tracking
Frequency Range:	283.5 to 325.0 kHz
Channel Spacing:	500 Hz
MSK Bit Rates:	50, 100, and 200 bps
Operating Modes:	Manual, automatic and database
Cold Start Time:	< 1 minute typical
Reacquisition Time:	< 2 seconds typical
Demodulation:	Minimum shift keying (MSK)
Sensitivity:	2.5 µV/m for 6 dB SNR @ 200 bps
Out-of-Band Rejection:	60 dB < 204 kHz and > 404 kHz
Spurious Response:	< -55 dB (0.1 MHz to 1.6 MHz)
Ripple (In-band):	3 dB
Dynamic Range:	100 dB
Frequency Offset:	± 8 Hz (~ 27 ppm)
Adjacent Channel Rejection:	61 dB ± 1 dB @ fo ± 400 Hz
Antenna Input Impedance:	50 Ω

Communications

Ports:	2x full-duplex
Interface Level:	HCMOS, tracks input voltage
Baud Rates:	4800, 9600, 19200, 38400, and 57600
Correction I/O Protocol:	RTCM SC-104, NMEA 0183

Environmental

Operating Temperature:	-30°C to +70°C (-22°F to +158°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing
EMC:	EN50081-4-2 ESD

Power

Input Voltage:	3.3 to 5.5 VDC
Power Consumption:	< 0.25 W @ 3.3 VDC (no antenna)
Current Consumption:	< 70 mA @ 3.3 VDC (no antenna)
Antenna Voltage:	5 VDC applied externally

Mechanical

Dimensions:	7.6 L x 5.1 W x 1.4 H (cm)
	3.0 L x 2.0 W x 0.54 H (in)
Weight:	30 g (1.1 oz)
Connector (J1):	1x 4 pin header, 0.1" spacing
Connector (J2):	2x 12 pin header, 0.1" spacing

Patented Front-End Filter Response

The front-end filter in the SBX-4 passes beacon frequencies at a consistent strength while blocking out-of band signals. The result is low-noise, high performance beacon reception. The following figure illustrates the frequency response of this filter.
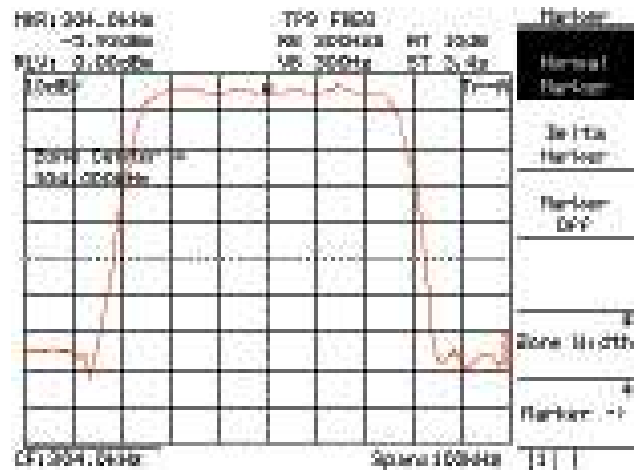
Proprietary Commands

- Select operating mode
- Query receiver performance and operating status
- Specify communication baud rate up to 57600 bps
- Reset receiver from operation to simulate a cold start
- Tabulate and output results of frequency scan

Pin-Out
J200 Connector:

Pin(s):	Signal
1, 3:	Analog ground
2:	Antenna input
4:	Antenna power output

J300 Connector:

Pin(s):	Signal
1, 2:	Antenna power input
3, 4:	Power supply input
14:	TXD0, output
15:	TXD1, output
16:	Lock indicator (active high)
17:	RXD0, input
18:	RXD1, input
19:	External reset input (active low)
21, 22, 23, 24:	Digital ground

Hemisphere®

Hemisphere®

GENERAL NAVIGATION
HEADING AND
POSITIONING COMPASS

Experience superior navigation from the accurate heading and positioning performance available with the Vector™ V102 GPS compass. The Vector V102 uses SBAS for differential GPS positioning allowing Hemisphere GNSS to provide a highly effective heading and position based smart antenna that out rank any fluxgate compasses.

The rugged low profile enclosure combined with Hemisphere GNSS' Crescent® Vector OEM technology gives portability and simple installation. The compass - measuring less than half-meter length - mounts easily to a flat surface or pole. The stability and maintenance- free design of the Vector V102 provides simple integration into autopilots, chart plotters, and AIS systems.

Key Features

- Provides heading, positioning, heave, roll, and pitch
- Excellent in-band and out-of-band interference rejection
- 0.75 degree heading accuracy in an amazingly small form factor
- Differential positioning accuracy of 1.0 m, 95% of the time
- Integrated gyro and tilt sensors help deliver fast start-up times and provide heading updates during temporary loss of satellites
- Accurate heading up to 3 minutes during GNSS outages

GPS Receiver Specifications

Receiver Type:	Vector GPS L1 Compass
Signals Received:	GPS
Channels:	Two 12-channel, parallel tracking (Two 10-channel when tracking SBAS)
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Rate of Turn:	90°/s maximum
Compass Safe Distance:	30 cm [4]
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)
Differential Options:	SBAS

Accuracy

Position:	RMS (67%)
Autonomous, no SA: [1]	1.2 m
SBAS: [2]	0.5 m
Heading (RMS):	0.75°
Pitch/Roll (RMS):	1.5°
Heave (RMS):	30 cm [3]

Communications

Ports:	2 full-duplex RS232
Baud Rates:	4800 - 115200
Correction I/O Protocol:	RTCM SC-104
Data I/O Protocol:	NMEA 0183, NMEA 2000, Hemisphere Crescent binary [5]

Power

Input Voltage:	6 to 36 VDC
Power Consumption:	3.0 W nominal (GPS L1)
Current Consumption:	0.25 A nominal (GPS L1)
Power Isolation:	Isolated to enclosure
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-30°C to + 70°C (-22°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Mechanical Shock:	EP455 Section 5.14.1
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B, CISPR22

Mechanical

Dimensions:	41.7 L x 15.8 W x 6.9 H (cm) 16.4 L x 6.2 W x 2.7 H (in)
Weight:	1.5 kg (3.3 lbs.)
Status Indications (LED):	Power, GNSS Lock, Heading
Power/Data Connector:	12-pin, Female, IP67

Aiding Devices

Gyro:	Provides smooth heading, fast heading reacquisition and reliable 1° per minute heading for periods up to 3 minutes when loss of GPS has occurred
Tilt Sensors:	Provide pitch and roll data and assist in fast start-up and reacquisition of heading solution

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. Based on a 40 second time constant
4. This is the minimum safe distance measured when the product is placed in the vicinity of the steering magnetic compass. The ISO 694 defines "vicinity" relative to the compass as within 5 m (16.4 ft) separation
5. Hemisphere GNSS proprietary

Hemisphere®

COMPACT GPS POSITIONING AND
HEADING SMART ANTENNA

Vector™ V104 GPS Smart Antenna offers superior navigation including accurate positioning and heading performance. V104 uses SBAS (WAAS, EGNOS, MSAS, etc.) for differential GPS position allowing Hemisphere GNSS to provide a low cost and highly effective positioning and heading based smart antenna.

The rugged and low-profile enclosure combines Hemisphere GNSS' Crescent® Vector technology and two multi-path resistant antennas for accuracy, portability and simple installation. The smart antenna, measuring approximately 25 cm in length, mounts easily to a flat surface or pole. The stability and maintenance-free design of V104 provides traditional GPS position and heading at a low cost, replacing the combination of low-accuracy GPS and fluxgate compass.

Key Features

- Provides position, heading, pitch, roll, and heave
- Excellent in-band and out-of-band interference rejection
- 2° (RMS) heading accuracy in an amazingly small form factor
- Integrated gyro and tilt sensors deliver fast start up times and provide heading updates during temporary loss of GPS and satellites
- Differential position accuracy of 1m, 95% of the time
- Accurate heading for up to 3 minutes during GNSS outages
- Offered as a Serial or NMEA 2000 version

GPS Receiver Specifications

Receiver Type:	Vector GPS L1 Compass
Signals Received:	GPS
Channels:	48
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Rate of Turn:	90°/s maximum
Compass Safe Distance:	30 cm [4]
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Position:	**RMS (67%)**
Autonomous, no SA: [1]	1.5 m
SBAS: [2]	0.5 m
Heading (RMS):	2°
Pitch/Roll (RMS):	2°
Heave (RMS):	30 cm [3]

Communications

Ports:	2 full-duplex RS232 6 or 1 NMEA 2000 [7]
Baud Rates:	4800 - 115200
Correction I/O Protocol:	RTCM SC-104
Data I/O Protocol:	NMEA 0183 [6], NMEA 2000 [7], Hemisphere Crescent binary [5]

Power

Input Voltage:	8-36 VDC
Power Consumption:	~ 2.0 W nominal
Current Consumption:	0.16 A @ 12 VDC
Power Isolation:	Isolated to enclosure
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-30°C to + 70°C (-22°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	100% non-condensing
Mechanical Shock:	IEC 60945
Vibration:	IEC 60945
EMC:	CE (IEC 60945 Emissions and Immunity), FCC Part 15 Subpart B, CISPR22
IP Rating:	IP69
Enclosure:	UV resistant, white plastic, Geloy CR7520 (ASA)

Mechanical

Dimensions:	
Not including mount:	25.9 L x 12.9 W x 4.5 H (cm) 10.2 L x 5.1 W x 1.8 H (in)
Including mount:	25.9 L x 12.9 W x 12.8 H (cm) 10.2 L x 5.1 W x 5.0 H (in)
Weight:	
Not including mount:	0.4 kg (0.9 lb)
Including mount:	0.5 kg (1.1 lb)
Power/Data Connector:	8-pin Male for Serial or 5 Pin Male NMEA 2000 Micro connector

Aiding Devices

Gyro:	Provides smooth heading, fast heading reacquisition and reliable 2° per minute heading for periods up to 3 minutes when loss of GPS has occurred
Tilt Sensors:	Provide pitch and roll data, assist in fast start-up and reacquisition of heading solution

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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, SBAS coverage and satellite geometry
3. Based on a 40-second time constant
4. This is the minimum safe distance measured when the product is placed in the vicinity of the steering magnetic compass. The ISO 694 defines "vicinity" relative to the compass as within 5 m (16.4 ft) separation
5. Hemisphere GNSS proprietary
6. Serial model only
7. NMEA 2000 model only

Hemisphere®

PROFESSIONAL GNSS
HEADING & POSITIONING
SMART ANTENNA

atlas®

The Vector™ V123/133 is Hemisphere GNSS' all-in-one single-frequency, multi-GNSS smart antenna which provides Atlas decimeter-level position and precise heading. This rugged design is sealed for the harshest environments and is a great solution for professional marine and other challenging applications.

The all-in-one V123/133 combines simple installation with consistent and precise heading accuracy and decimeter positioning.

Key Features

- Simple all-in-one single-frequency, multi-GNSS heading solution

- Single-frequency GPS/GLONASS/ BeiDou/Galileo QZSS

- Atlas® L-band and beacon (V133) capable

- Integrated gyroscope provides smooth, fast heading reacquisition

- Reliable < 1° per minute heading for periods up to 3 minutes when loss of GNSS has occurred

- Fully rugged solution for the harshest environments

GNSS Receiver Specifications

Receiver Type:	Vector GNSS Receiver
Signals Received:	GPS, GLONASS, BeiDou, Galileo, QZSS [7], and Atlas [6]
Channels:	424
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	20 Hz standard, 50 Hz optional
Timing (1 PPS) Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Compass Safe Distance:	50 cm [4]
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)
Differential Options:	SBAS, Atlas (L-band)

Accuracy

Position:	RMS (67%)
Autonomous, no SA: [1]	1.2 m
SBAS: [2]	0.3 m
Atlas (L-Band): [6]	0.3 m
Heading (RMS):	0.3°
Pitch/Roll (RMS):	1°
Heave (RMS):	30 cm (DGPS) [3], 10 cm (Atlas) [6]

Beacon Receiver Specifications

Channels:	2-channel, parallel tracking [8]
Frequency Range:	283.5 to 325 kHz [8]
Operating Modes:	Manual, Automatic, and Database [8]
Compliance:	IEC 61108-4 beacon standard [8]

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5 kHz
Satellite Selection:	Manual or Automatic
Reacquisition Time:	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. Based on a 40-second time constant
4. This is the minimum safe distance measured when the product is placed in the vicinity of the steering magnetic compass. The ISO 694 defines "vicinity" relative to the compass as within 5 m (16.4 ft) separation
5. Hemisphere GNSS proprietary
6. Requires a Hemisphere GNSS subscription
7. With future firmware upgrade and activation
8. V133 only

Communications

Ports:	1x RS232, 1x RS422, 1x half-duplex RS422(TX), NMEA2000
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Atlas, Hemisphere GNSS proprietary, RTCM v2.3 (DGPS)
Data I/O Protocol:	NMEA 0183, NMEA 2000, Hemisphere GNSS binary
Timing Output:	1 PPS (active high, rising edge sync, 10 kΩ, 10 pF load)
Event Marker Input:	Active low, falling edge sync, 10 kΩ, 10 pF load
Heading Warning I/O:	Open relay system indicates invalid heading

Power

Input Voltage:	9 - 36 VDC with reverse polarity operation
Power Consumption:	(multi-GNSS, typical continuous draw @ 12V)

	SBAS	Beacon	Atlas
V123	3.9 W	-	4.3 W
V133	-	4.2 W	4.36 W

Current Consumption:	(multi-GNSS, typical continuous draw @ 12V)

	SBAS	Beacon	Atlas
V123	0.33 A	-	0.36 A
V133	-	0.35 A	0.38 A

Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-40°C to + 70°C (-40°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Vibration:	IEC60945 Section 8.7
EMC:	IEC60945 FCC part 15 Subpart B, CISPR32
IMO Wheelmark Certification:	MED/4.41 Transmitting Heading Device THD (GNSS Method)
Enclosure:	IP66/IP69

Mechanical

Dimensions:	66.5 L x 20.8 W x 14.6 H (cm) 26.2 L x 8.2 W x 5.8 H (in)
Weight:	
V123	2.1 kg (4.6 lb)
V133	2.4 kg (5.4 lb)
Status Indications (LED):	Power
Power/Data Connector:	18-pin environmentally sealed

Aiding Devices

Gyro:	Integrated gyroscope provides smooth heading, fast heading reacquisition and reliable < 1° per minute heading for periods up to 3 minutes when loss of GNSS has occurred
Tilt Sensors:	Provide pitch, roll data and assist in fast start-up and reacquisition of heading solution

◐Hemisphere®

Hemisphere®

GENERAL NAVIGATION
HEADING AND
POSITIONING COMPASS

atlas®

Experience superior navigation from the accurate heading and positioning performance available with the Vector™ V200 GNSS compass. The multi-GNSS Vector V200 supports GPS, GLONASS, BeiDou, Galileo, and QZSS and offers an amazing world-wide 30 cm (RMS) accuracy via Hemisphere's Atlas GNSS global correction service.

The Vector V200 offers an incredible combination of simple installation, small form factor, and amazing performance. The compass - measuring only 35 cm in length - mounts easily to a flat surface or pole. The stability and maintenance-free design of the Vector V200 provides simple integration into autopilots, chart plotters, and AIS systems.

Key Features

- L1 GPS, GLONASS, Galileo, BeiDou, QZSS

- 30 cm RMS world-wide positioning accuracy with Atlas corrections

- 0.75 degree heading accuracy in an amazingly small form factor

- Excellent in-band and out-of-band interference rejection

- Integrated gyro and tilt sensors help deliver fast start-up times and provide heading updates during temporary loss of satellites

- Provides heading, positioning, heave, roll, and pitch

GNSS Sensor Specifications

Receiver Type:	Vector GNSS L1 Receiver
Signals Received:	GPS, GLONASS, BeiDou, Galileo, QZSS [7], and Atlas
Channels:	424
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1 PPS) Accuracy:	20 ns [6]
Rate of Turn:	100°/s maximum
Compass Safe Distance:	50 cm [4]
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)
Differential Options:	SBAS, Atlas (L-band)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	
SBAS: [2]	0.3 m	
Atlas: [6]	-	0.3 m
Heading (RMS):	1.5°	0.75°
Pitch/Roll (RMS):	1°	
Heave (RMS):	30 cm (DGPS) [3]	30 cm (Atlas)

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5 kHz
Satellite Selection:	Manual or Automatic
Reacquisition Time:	15 sec (typical)

Communications

Ports:	
5-pin:	NMEA2000
12-pin:	RS-232 (2 Tx, 2 Rx), RS-422 (1 Tx), 1 PPS or RS-422 (2 Tx, 1 Rx), 1 PPS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	RTCM SC-104
Data I/O Protocol:	
5-pin:	NMEA 2000
12-pin:	NMEA 0183, Crescent binary [5]
Timing Output:	1 PPS (CMOS, rising edge sync [6])

Power

Input Voltage:	6 to 36 VDC
Power Consumption:	(multi-GNSS, typical continuous draw @ 12V)
SBAS:	3.2 W
Atlas:	3.6 W
Power Isolation:	Isolated to enclosure
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-40°C to + 70°C (-40°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Enclosure:	ISO 60529:2013 for IPx6/IPx7/IPx9
Vibration:	IEC 60945:2002 Section 8.7 Vibration
EMC:	IEC60945:2002
	EN 301 489-1 V2.1.1
	EN 301 489-5 V2.1.1
	EN 301 489-19 V2.1.0
	EN 303 413 V1.1.1

Mechanical

Dimensions:	
No Mount:	34.8 L x 15.8 W x 7.5 H (cm)
LP Flat Mount:	34.8 L x 15.8 W x 7.6 H (cm)
HP Flat Mount:	34.8 L x 15.8 W x 10.7 H (cm)
Pole Mount:	34.8 L x 15.8 W x 16.8 H (cm)
Weight:	
Not including Mount:	0.75 kg (1.7 lb)
Including Mount:	0.94 kg (2.1 lb)
Power/Data Connector:	5-pin or 12-pin

Aiding Devices

Gyro:	Provides smooth heading, fast heading reacquisition and reliable 1° per minute heading for periods up to 3 minutes when loss of GPS has occurred [4]
Tilt Sensors:	Provide pitch and roll data and assist in fast start-up and reacquisition of heading solution

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. Based on a 40 second time constant
4. This is the minimum safe distance measured when the product is placed in the vicinity of the steering magnetic compass. The ISO 694 defines "vicinity" relative to the compass as within 5 m (16.4 ft) separation
5. Hemisphere GNSS proprietary
6. V200s only
7. With future firmware upgrade and activation

Hemisphere GNSS

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ALL-IN-ONE PROFESSIONAL POSITIONING AND HEADING RECEIVER

atlas®

Vector™ V320 is the first all-in-one multi-frequency, multi-constellation GNSS smart antenna, which provides RTK level position and precise heading. Using Hemisphere's patented Eclipse™ Vector GNSS technology, V320 is a strong addition to our V family. The rugged IP69 design housing is sealed for the harshest environments. It incorporates fixed and pole mounting capability for both marine and land applications. The Vector V320 is series are suitable for both dynamic positioning and professional marine survey. The V320 provides a great solution for machine control and other challenging applications.

The all-in-one V320 smart antenna can be installed in various environments. With a set separation, the V320 provides consistent and reliable position and heading accuracy. The Vector V320 can use Atlas L-band and SBAS (WAAS, EGNOS, MSAS, etc.) for differential GNSS position.

Key Features

- Simple all-in-one RTK-capable heading solution
- Athena™ and Atlas® capable
- Multi frequency GPS/GLONASS/BeiDou RTK capable
- Maintain position and heading lock when more of the sky is blocked
- Accurate heading with a precise baseline
- Integrated gyro and tilt sensors deliver fast start up times and provide heading updates during temporary loss of satellites

GNSS Receiver Specifications

Receiver Type:	Vector GNSS RTK Receiver
Signals Received:	GPS, GLONASS, BeiDou, and Atlas
Channels:	502
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1 PPS)	
Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Compass Safe Distance:	30 cm (with enclosure)
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Position:	RMS (67%)	2DRMS (95%)
Single Point: [1]	1.2 m	2.5 m
SBAS: [2]	0.3 m	0.6 m
Atlas (L-Band): [6]	0.08 m	0.16 m
RTK: [1, 3]	10 mm + 1 ppm	20 mm + 2 ppm
Heading (RMS):	0.2°	
Pitch/Roll (RMS):	1°	
Heave (RMS):	30 cm (DGPS) [5], 10 cm (RTK) [2, 4]	

L-Band Receiver Specifications

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

Communications

Ports:	1 full-duplex RS-232; 1 full-duplex RS-422 and 1 half-duplex RS-422 (Tx only)
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[7], CMR+[7]
Data I/O Protocol:	NMEA 0183, NMEA 2000, Crescent binary [5]
Timing Output:	1 PPS (active high, rising edge sync, 10 kΩ, 10 pF load)
Heading Warning I/O:	Open relay system indicates invalid heading

Power

Input Voltage:	8 - 36 VDC
Power Consumption:	6.10 W nominal (GPS L1/L2)
	7.25 W nominal (GPS L1/L2 + GLONASS L1/L2)
	8.50 W nominal (GPS L1/L2 + GLONASS L1/L2 + BeiDou B1/B2)
	9.50 W nominal (GPS L1/L2 + GLONASS L1/L2 + BeiDou B1/B2 + L-band)
Power Isolation:	Yes
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-30°C to + 70°C (-22°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Mechanical Shock:	EP455 Section 5.14.1
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR22
Enclosure:	IP69

Mechanical

Dimensions:	66.3 L x 20.9 W x 14.6 H (cm)
	26.1 L x 8.3 W x 5.8 H (in)
Weight:	2.1 kg (4.6 lb)
Status Indications (LED):	Power
Power/Data Connector:	18-pin environmentally sealed

Aiding Devices

Gyro:	Provides heading smoothing with GNSS. Drift rate is 1° per minute in heading for periods up to 3 minute when loss of GNSS has occurred [3]
Tilt Sensors:	Provide pitch and roll data and assist in fast start-up and reacquisition of heading solution

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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. Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for differential services), and ionospheric activity.
4. Based on a 40 second time constant
5. Hemisphere GNSS proprietary
6. Requires a Hemisphere GNSS subscription
7. CMR and CMR+ do not cover proprietary messages outside of the typical standard

◑Hemisphere®

MULTI-FREQUENCY, MULTI-GNSS VECTOR COMPASS

atlas®

The Vector V500 is Hemisphere GNSS' all-in-one multi-frequency, multi-GNSS smart antenna which provides RTK-level position and precise heading. This rugged design is sealed for the harshest environments and is a great solution for professional marine and other challenging applications.

The all-in-one V500 combines simple installation with consistent and precise heading accuracy and RTK positioning.

Key Features

- Simple all-in-one RTK-capable
- Multi-frequency GPS/GLONASS/BeiDou/Galileo/QZSS/IRNSS
- Athena™ RTK and Atlas® L-band capable
- Supports Ethernet, CAN, Serial, Bluetooth, and Wi-Fi
- Powerful WebUI accessed via Wi-Fi
- Fully rugged solution for the harshest environments

GNSS Receiver Specifications

Receiver Type:	Vector GNSS RTK Receiver
Signals Received:	GPS, GLONASS, BeiDou, Galileo, QZSS [7], IRNSS [7], and Atlas
Channels:	1059
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1 PPS) Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)
Differential Options:	SBAS, Atlas (L-band), RTK

Accuracy

Position:	RMS (67%)	2DRMS (95%)
Single Point: [1]	2.4 m	-
SBAS: [2]	0.6 m	-
Atlas H10: [6]	0.08 m	0.16 m
Atlas H30: [6]	0.3 m	-
Atlas Basic: [6]	0.5 m	-
RTK: [1, 3]	8 mm + 1 ppm	15 mm + 2 ppm

Heading (RMS):	0.27°
Pitch/Roll (RMS):	1°
Heave (RMS):	30 cm (DGPS) [1], 10 cm (Atlas) [1, 6], 5 cm (RTK) [1, 6]

L-Band Receiver Specifications

Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5 kHz
Satellite Selection:	Manual or Automatic
Reacquisition Time:	15 sec (typical)

Communications

Ports:	1x full-duplex RS-232/RS-422, 1x RS232, 2x CAN, 1x Ethernet
Baud Rates:	4800 - 115200
Radio Interfaces:	Bluetooth 2.0 (Class 2), Wi-Fi 2.4 GHz
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[8], CMR+[8]
Data I/O Protocol:	NMEA 0183, Hemisphere GNSS binary
Timing Output:	1 PPS (CMOS, rising edge sync)
Event Marker Input:	Open drain, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage:	9 - 32 VDC
Power Consumption:	7.5 W maximum
Current Consumption:	1.8 A maximum
Power Isolation:	No
Reverse Polarity Protection:	Yes

Environmental

Operating Temperature:	-40°C to + 70°C (-40°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Enclosure:	ISO 60529:2013 for IPx6/IPx7/IPx9
Vibration:	IEC 60945:2002 Section 8.7 Vibration
EMC:	IEC60945:2002 EN 301 489-1 V2.1.1 EN 301 489-5 V2.1.1 EN 301 489-19 V2.1.0 EN 303 413 V1.1.1

Mechanical

Dimensions:	68.6 L x 22.0 W x 12.3 H (cm) 27.0 L x 8.7 W x 4.8 H (in)
Weight:	3.7 kg (8.2 lb)
Status Indications (LED):	Power, GNSS Lock, Heading
Power/Data Connector:	22-pin environmentally sealed

Aiding Devices

Gyro:	Provides smooth heading, fast heading reacquisition and reliable < 1° per min heading for periods up to 3 min. when loss of GPS has occurred [4]
Tilt Sensors:	Provide pitch, roll data and assist in fast start-up and reacquisition of heading solution

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. Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for differential services), and ionospheric activity
4. Based on a 40 second time constant
5. Hemisphere GNSS proprietary
6. Requires a Hemisphere GNSS subscription
7. With future firmware upgrade and activation
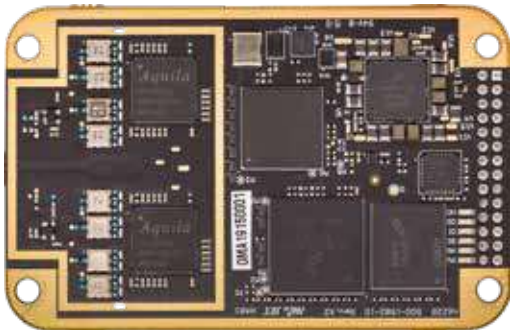8. CMR and CMR+ do not cover proprietary messages outside of the typical standard

◗Hemisphere®

Hemisphere®

ADVANCED HEADING AND RTK POSITIONING

atlas®

Develop sophisticated machine control and navigation solutions in a complex world full of dynamic environments. The Vega 28 is one of our most advanced GNSS heading and positioning boards.

The Vega 28 uses dual antenna ports to create a series of additional capabilities including fast, high-accuracy heading over short baselines, RTK positioning, onboard Atlas L-band, RTK-enabled heave, low-power consumption, and precise timing.

Scalable Solutions

With the Vega 28, positioning is scalable and field upgradeable with all Hemisphere software and service options. Utilize the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency multi-constellation GNSS signals. High-accuracy L-band positioning from meter to sub-decimeter levels available via Atlas correction service.

Ease of Migration

Leverage the industry standard form factor for easy upgradeability from other manufacturers' modules.

Key Features

- Extremely accurate heading with long baselines
- Multi-frequency position, dual-frequency heading supporting GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and L-band
- Atlas® L-band capable to 4 cm RMS
- Athena™ GNSS engine providing best-in-class RTK performance
- Excellent coasting performance
- 5 cm RMS RTK-enabled heave accuracy
- Strong multipath mitigation and interference rejection
- New multi-axis gyro and tilt sensor for reliable coverage during short GNSS outages

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B10C/B2A/B2B/ ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ ALTBOC QZSS L1CA/L2C/L5/L1C/LEX IRNSS L5 Atlas
Channels:	1,100+
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 1 Hz or 20 Hz optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (Hot Start)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1, 3]	0.04 m	0.08 m
Atlas H30: [1, 3]	0.15 m	0.3 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

Heading (RMS):	0.16° rms @ 0.5 m antenna separation 0.08° rms @ 1.0 m antenna separation 0.04° rms @ 2.0 m antenna separation 0.02° rms @ 5.0 m antenna separation
Pitch/Roll (RMS):	0.5°
Heave (RMS): [1]	30 cm rms (DGNSS) , 5 cm rms (RTK)

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, SBAS coverage, satellite geometry, and ionospheric activity
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	2 x full-duplex (1 x 3.3V CMOS, 1 x 3.3V CMOS with flow control) 1 x USB Host/Device 1 x Ethernet 10/100Mbps 2 x CAN (NMEA2000, ISO 11783)
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ,10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	< 2.5 W all signals + L-band
Current Consumption:	757 mA all signals + L-band
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22

Mechanical

Dimensions:	71 L x 45 W x 10 H (mm) 2.8 L x 1.8 W x 0.4 (in)
Weight:	24 g (0.85 oz)
Status Indications (LED):	Power, Primary and Secondary GNSS lock, Differential lock, DGNSS position, Heading
Power/Data Connector:	2 x 14-pin male header
Antenna Connectors:	MMCX, female, straight

Aiding Devices

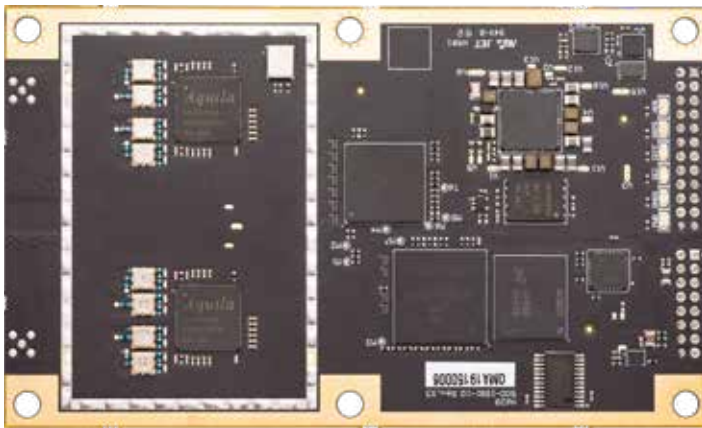|	
Gyro:	Provides smooth and fast heading reacquisition. During loss of GNSS signals heading stability is degraded by < 1° per minute for up to 3 minutes.
Tilt Sensors:	Provide pitch, roll data and assist in fast start-up and reacquisition of heading solution

Hemisphere®

ADVANCED HEADING AND RTK POSITIONING

atlas®

Develop sophisticated machine control and navigation solutions in a world full of complex dynamic environments. The Vega 40 is one of our most advanced GNSS heading and positioning boards.

The Vega 40 uses dual antenna ports to create a series of additional capabilities; including fast, high-accuracy heading over short baselines, RTK positioning, onboard Atlas L-band, RTK-enabled heave, low-power consumption, and precise timing.

Scalable Solutions

With the Vega 40, positioning is scalable and field upgradeable with all Hemisphere software and service options. Use the same centimeter-level accuracy in either single frequency mode, or employ the full performance and fast RTK initialization times over long distances with multi-frequency multi-constellation GNSS signals. High-accuracy L-band positioning from meter to sub-decimeter levels available via Atlas correction service.

Ease of Migration

Leverage the industry standard form factor for easy upgradeability from other manufacturers' modules.

Key Features

- Extremely accurate heading with long baselines
- Multi-frequency position, dual-frequency heading supporting GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and L-band
- Atlas® L-band capable to 4 cm RMS
- Athena™ GNSS engine providing best-in-class RTK performance
- Excellent coasting performance
- 5 cm RMS RTK-enabled heave accuracy
- Strong multipath mitigation and interference rejection
- New multi-axis gyro and tilt sensor for reliable coverage during short GNSS outages

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS and Atlas
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B10C/B2A/B2B/ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ALTBOC QZSS L1CA/L2C/L5/L1C/LEX IRNSS L5 Atlas
Channels:	1,100+
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 1 Hz or 20 Hz optional (with activation)

Timing (1 PPS)

Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Cold Start:	60 s typical (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (Hot Start)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: [1]	1.2 m	2.5 m
SBAS: [1]	0.3 m	0.6 m
Atlas H10: [1, 3]	0.04 m	0.08 m
Atlas H30: [1, 3]	0.15 m	0.3 m
Atlas Basic: [1, 3]	0.50 m	1.0 m
RTK: [1]	8 mm + 1 ppm	15 mm + 2 ppm

Heading (RMS):	0.16° rms @ 0.5 m antenna separation 0.08° rms @ 1.0 m antenna separation 0.04° rms @ 2.0 m antenna separation 0.02° rms @ 5.0 m antenna separation
Pitch/Roll (RMS):	0.5°
Heave (RMS): [1]	30 cm rms (DGNSS) , 5 cm rms (RTK)

L-Band Receiver Specifications

Receiver Type:	Single Channel
Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, SBAS coverage, satellite geometry, and ionospheric activity
3. Hemisphere GNSS proprietary
4. With future firmware upgrade and activation
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	3 x full-duplex (1 x 3.3V CMOS, 1 x 3.3V CMOS with flow control, 1 x RS-232 with flow control) 1 x USB Host/Device 1 x Ethernet 10/100Mbps 2 x CAN (NMEA2000, ISO 11783) 1 x SPI
Interface Level:	3.3V CMOS
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[5], CMR+[5]
Data I/O Protocol:	NMEA 0183, Crescent binary
Timing Output:	1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input:	CMOS, active low, falling edge sync, 10 kΩ,10 pF load

Power

Input Voltage:	3.3 VDC +/- 5%
Power Consumption:	< 2.5 W all signals + L-band
Current Consumption:	757 mA all signals + L-band
Antenna Voltage:	5 VDC maximum
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-40°C to +85°C (-40°F to +185°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing (when in an enclosure)
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized)
Vibration:	EP455 Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22

Mechanical

Dimensions:	100 L x 60 W x 10 H (mm) 3.9 L x 2.4 W x 0.4 (in)
Weight:	44 g (1.56 oz)
Status Indications (LED):	Power, Primary and Secondary GNSS lock, Differential lock, DGNSS position, Heading
Power/Data Connector:	24-pin male header 2 mm pitch 16-pin male header 2 mm pitch
Antenna Connectors:	MMCX, female, straight

Aiding Devices

Gyro:	Provides smooth and fast heading reacquisition. During loss of GNSS signals heading stability is degraded by < 1° per minute for up to 3 minutes.
Tilt Sensors:	Provide pitch, roll data and assist in fast start-up and reacquisition of heading solution

Hemisphere®

HIGH-PRECISION POSITIONING & HEADING RECEIVER

The Vector VS1000 is Hemisphere GNSS' premiere multi-GNSS, multi-frequency receiver designed specifically for the professional marine market. Providing precise heading, Athena RTK positioning, and full Atlas capability, its rugged design is compliant to 60529:2013 IP67 and IEC 60945:2002 8.7 standards.

The VS1000 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 worldwide L-band corrections.

Key Features

- Athena™ RTK and Atlas® L-band capable
- Extremely accurate heading (to 0.01° RMS)
- Multi-frequency GPS/GLONASS/BeiDou/Galileo
- Purpose-built for the most challenging environments
- Supports Ethernet, CAN, Serial, USB, Bluetooth, and Wi-Fi
- Powerful WebUI accessed via Wi-Fi plus a 128x64 display and 10 multi-color LEDs

GNSS Receiver Specifications

Receiver Type:	Vector GNSS RTK Receiver
Signals Received:	GPS, GLONASS, BeiDou, Galileo, & Atlas [3]
Channels:	1059
GPS Sensitivity:	-142 dBm
SBAS Tracking:	2-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1PPS) Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)
Differential Options:	SBAS, Atlas (L-band), RTK

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Single Point: [1]	2.4 m	
SBAS: [2]	0.6 m	
Atlas H10: [6]	0.08 m	0.16 m
Atlas H30: [6]	0.3 m	
Atlas Basic: [6]	0.5 m	
RTK: [1, 3]	8 mm + 1 ppm	15 mm + 2 ppm

Heading (RMS):	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
Pitch/Roll (RMS):	1°
Heave (RMS):	30 cm (DGPS) [1], 10 cm (Atlas) [1, 6], 5 cm (RTK) [1, 6]

L-Band Receiver Specifications

Channels:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5 kHz
Satellite Selection:	Manual or Automatic
Reacquisition Time:	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. Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for differential services), and ionospheric activity
4. Based on a 40 second time constant
5. Hemisphere GNSS proprietary
6. Requires a Hemisphere GNSS subscription
7. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports:	1x CAN, 1x Ethernet, 1x USB, 1x 12-pin multi-purpose (RS232, RS422, CAN, 1PPS, Event Marker)
Baud Rates:	4800 - 115200
Radio Interfaces:	Bluetooth 2.0 (Class 2), Wi-Fi 2.4 GHz
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[7], CMR+[7]
Data I/O Protocol:	NMEA 0183, Hemisphere GNSS binary
Timing Output:	1PPS (CMOS, rising edge sync)
Event Marker Input:	Open drain, falling edge sync, 10 kΩ, 10 pF load

Environmental

Operating Temperature:	-40°C to +70°C (-40°F to +158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Enclosure:	ISO 60529:2013 for IPx6/IPx7
Vibration:	IEC 60945:2002 Section 8.7 Vibration
EMC:	IEC 60945:2002, EN 301 489-1 V2.1.1, EN 301 489-5 V2.1.1, EN 301 489-19 V2.1.0, EN 303 413 V1.1.1

Mechanical

Dimensions:	
No Plate:	23.2 L x 16.5 W x 7.9 H (cm) 9.1 L x 6.5 W x 3.1 H (in)
With Plate:	23.2 L x 21.4 W x 8.3 H (cm) 9.1 L x 8.4 W x 3.3 H (in)
Display:	128 x 64 Resolution
Weight:	1.7 kg (3.8 lb)
Status Indications (LED):	Power, Primary Antenna, Secondary Antenna, Heading, Quality, Atlas, Bluetooth, Wi-Fi, CAN, Ethernet
Power/Data Connector:	M12 CAN/Power, 12-pin multi-purpose, RJ45, USB
Antenna Connectors:	BT/Wi-Fi

Aiding Devices

Gyro:	Provides fast reacquisition and reliable heading for short periods when loss of GNSS has occurred
Tilt Sensors:	Provide pitch, roll data and assist in fast start-up and reacquisition of heading solution

Hemisphere®

PROFESSIONAL POSITIONING AND
HEADING RECEIVER

atlas®

Experience the Vector™ VS330 with our powerful Athena GNSS core engine technology. The Vector VS330 supports precise marine, dynamic positioning, and land applications that require RTK positioning and precise heading performance.

The Vector VS330 use all of the innovations in Hemisphere GNSS' Eclipse™ Vector technology. Our optimized Eclipse Vector technology brings a series of new features to the Vector VS330 including heave, pitch, and roll output, and more robust positioning and heading performance.

The Vector VS330 receiver, with its display and user interface, can be conveniently installed near the operator. The two antennas are mounted separately with a user-determined separation to meet the desired heading accuracy. The fully-subscribed Vector VS330 uses Atlas L-band, Beacon, and SBAS for differential positioning. Our firmware allows the VS330 to transition smoothly between DGNSS systems.

Key Features

- Athena™ RTK, Atlas® L-band, Beacon and SBAS capable
- Extremely accurate heading with baselines up 50 m
- Multi-frequency GPS/GLONASS/BeiDou RTK capable
- Automatic antenna baseline survey
- Maintain heading and position lock when more of the sky is blocked
- Runs Athena core GNSS engine offering improved initialization times, robustness in difficult environments, performance over long baselines and under scintillation
- Integrated gyro and tilt sensors help deliver fast start-up times and provide heading updates during temporary loss of satellites

GNSS Receiver Specifications

Receiver Type:	Vector GNSS L1/L2 RTK Receiver
Signals Received:	GPS, GLONASS, BeiDou, and Atlas
Channels:	502
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1 PPS) Accuracy:	20 ns
Rate of Turn:	100°/s maximum
Compass Safe Distance:	30 cm (with enclosure) [5]
Cold Start:	60 s (no almanac or RTC)
Warm Start:	30 s typical (almanac and RTC)
Hot Start:	10 s typical (almanac, RTC and position)
Heading Fix:	10 s typical (valid position)
Antenna Input Impedance:	50 Ω
Maximum Speed:	1,850 mph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)
Differential Options:	SBAS, Beacon, External RTCM, Atlas L-band and Athena RTK

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Single Point: [1]	2.4 m	
SBAS: [2]	0.6 m	
Atlas H10: [6]	0.08 m	0.16 m
Atlas H30: [6]	0.3 m	
Atlas Basic: [6]	0.5 m	
RTK: [1, 3]	10 mm + 1 ppm	20 mm + 2 ppm

Heading (RMS):	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
Pitch/Roll (RMS):	1°
Heave (RMS):	30 cm (DGPS) [5], 10 cm (RTK) [1, 3]

Beacon Receiver Specifications

Channels:	2-channel, parallel tracking
Frequency Range:	283.5 to 325 kHz
Operating Modes:	Manual, Automatic, and Database
Compliance:	5 kHz

L-Band Receiver Specifications

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

Communications

Ports:	2 full-duplex RS232, 1 half-duplex RS422 port
	1 USB-A
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR[7], CMR+[7]
Data I/O Protocol:	NMEA 0183, Hemisphere GNSS binary [6]
Timing Output:	1 PPS (active high, rising edge sync, 10 kΩ, 10 pF load)

Power

Input Voltage:	8-36 VDC
Power Consumption:	5.3 W nominal (GPS L1/L2 + GLONASS L1/L2)
	7 W nominal (GPS L1/L2 + GLONASS L1/L2 + BeiDou B1/B2 + L-band)
Current Consumption:	0.44 A nominal (GPS L1/L2 + GLONASS L1/L2)
	0.51 A nominal (GPS L1/L2 + GLONASS L1/L2 + BeiDou B1/B2 + L-band)
Power Isolation:	500 V
Reverse Polarity Protection:	Yes
Antenna Voltage:	5 VDC maximum 60mA
Antenna Short Circuit Protection:	Yes
Antenna Gain Input Range:	10 to 40 dB

Environmental

Operating Temperature:	-30°C to + 70°C (-22°F to + 158°F)
Storage Temperature:	-40°C to + 85°C (-40°F to + 185°F)
Humidity:	95% non-condensing
Mechanical Shock:	EP455 Section 5.14.1 Operational (when mounted in an enclosure with screw mounting holes utilized) EP455
Vibration:	Section 5.15.1 Random
EMC:	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B CISPR22
Enclosure:	IP66 (IEC 60529)

Mechanical

Dimensions:	20.2 L x 12.0 W x 7.5 H (cm)
	8.0 L x 4.7 W x 3.0 H (in)
Weight:	1.1 kg (2.5 lbs.)
Status Indications (LED):	Power, Primary and Secondary GPS lock, Differential lock, DGPS position, Heading, RTK lock, L-band DGNSS lock
Power Switch:	Front panel soft switch
Power/Data Power Connector:	9-pin ODU metal circular
Power Connector:	2-pin ODU metal circular
Data Connector:	DB9 (sealed)
Antenna Connectors:	2 TNC (female)

Aiding Devices

Gyro:	Provides heading smoothing with GNSS. Drift rate is 1° per minute in heading for periods up to 3 minute when loss of GNSS has occurred [4]
Tilt Sensors:	Provide pitch, roll data, assist in fast start-up and heading reacquisition

1. Depends on multipath environment, number of satellites in view, satellite geometry, no SA, and ionospheric activity.
2. Requires a subscription
3. Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for differential services), and ionospheric activity.
4. Based on a 40 second time constant
5. This is the minimum safe distance measured when the product is placed in the vicinity of the steering magnetic compass. The ISO 694 defines "vicinity" relative to the compass as within 5 m (16.4 ft) separation.
6. Hemisphere GNSS proprietary
7. CMR and CMR+ do not cover proprietary messages outside of the typical standard

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