# VN-300 Dual Antenna GPS/INS

High-Performance Embedded Navigation

PRODUCT OVERVIEW

VectorNav Technologies introduces the VN-300, the world's smallest and lightest high-performance Dual Antenna GPS-Aided Inertial Navigation System (GPS/INS). Building on the architecture of the currently available VN-100 line of IMU/AHRS as well as the VN-200 line of GPS/INS, the VN-300 enables a wider range of applications through the incorporation of GPS-compass techniques. The VN-300 is ideal for applications that require a highly accurate inertial navigation solution under both static and dynamic operating conditions, especially in environments with unreliable magnetic heading and good GNSS visibility.

Incorporating the latest solid-state MEMS sensor technology, the VN-300 combines 3-axis accelerometers, gyros, magnetometers, a barometric pressure sensor, two GNSS receivers, and a low-power micro-processor into a rugged aluminum enclosure or surface mount package. The VN-300 couples measurements from the onboard GNSS receivers with measurements from the onboard inertial sensors to provide position, velocity, and attitude estimates of higher accuracies and with better dynamic performance than a standalone GPS or GNSS receiver or AHRS.
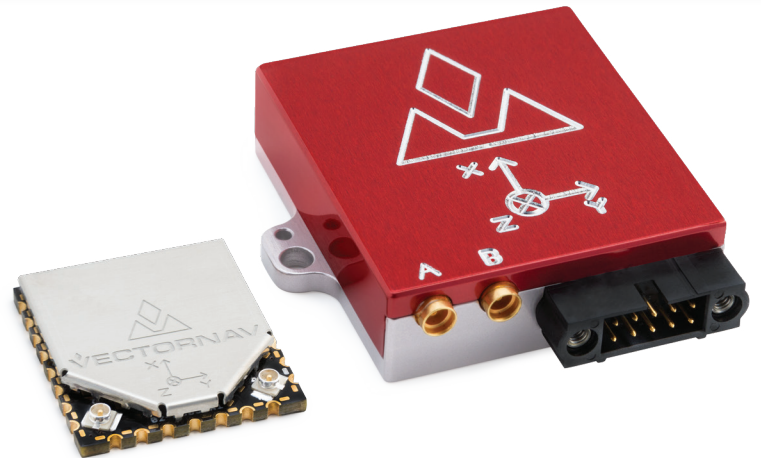
HIGHLIGHTS

➤ Coupled position, velocity, & attitude estimates
➤ Static accuracy better than 0.3° heading, 0.5° pitch & roll
➤ Dynamic accuracy better than 0.3° heading, 0.1° pitch & roll
➤ Dual 72 Channel GNSS receivers
➤ Built-in Extended Kalman Filter running at 400 Hz
➤ Automatic and seamless transition between magnetic heading (AHRS) mode (used on start-up and in GPS-denied environments), INS operation in dynamic conditions, and GPS-compass in static conditions
➤ True INS filter - no mounting orientation requirements
➤ Real-time gyro & accelerometer bias compensation
➤ Raw pseudorange, Doppler, & carrier phase outputs
➤ Individually calibrated for bias, scale factor, misalignment, and temperature over full operating range (-40°C to +85°C)
➤ Miniature self-locking MMCX connectors for GPS antennas
➤ Coning & sculling integrals (ΔV's, ΔΘ's)
➤ User configurable messages using VectorNav binary protocol
➤ Rugged aluminum package (10-pin Harwin connector)
   Dimensions: 45 x 44 x 11 mm; Weight: 30 grams
➤ Surface mount package (30-pin LGA)
   Dimensions: 24 x 22 x 3 mm; Weight: 5 grams
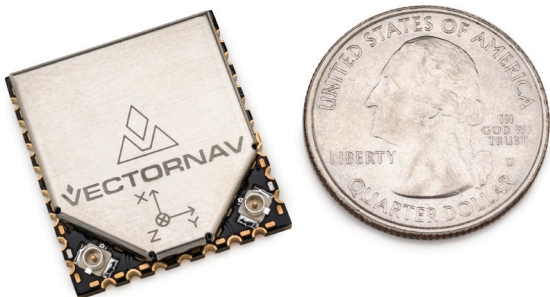
APPLICATIONS

- UAVs, UAS, Manned Aircraft, VTOL Aircraft, Aerostats
- Marine Antenna Stabilization
- Camera / Platform Stabilization
- SATCOM, SOTM, VSAT
- Ground Vehicles / Robotics
- Weapons Training / Warfare Simulation
- Heavy Machinery Monitoring
- Automated Agriculture
- Direct Surveying

DEVELOPMENT KITS

VN-300 Rugged and Surface Mount Development Kits:

- USB & Serial Adapter Cables
- Two GNSS Antennas
- Software Development Kit
- Carrying Case

DEVELOPMENT TOOLS

- **Sensor Explorer GUI**: Powerful and user-friendly GUI allows you to display sensor output as a 3D object, graph inertial data, configure sensor settings, perform data-logging, & more.
- **Software Development Kit**: Interface via C/C++, .NET & MATLAB development environments.
- **Online Library**: A large collection of inertial navigation knowledge and application notes is available on our website to help maximize VN-300 performance for your application.
- **Engineering Support**: Dedicated and responsive engineering support team with combined experience in sensing, guidance, navigation, and controls.
- **Custom Solutions Available**: Application-specific modeling & algorithm development; controls & closed-loop navigation solutions; custom form-factors & packaging; integration with other external sensors; displays, GUIs & other software packages; tailored calibrations; custom communication protocols.

TECHNICAL SPECIFICATIONS

Navigation

Horizontal Position Accuracy:	2.5 m RMS
Horizontal Position Accuracy (w/SBAS):	2.0 m RMS
Vertical Position Accuracy:	5.0 m RMS
Vertical Position Accuracy (w/Barometer):	2.5 m RMS
Velocity Accuracy:	±0.05 m/s
Dynamic Accuracy (Heading, True Inertial):	0.3 ° RMS
Dynamic Accuracy (Pitch/Roll):	0.1 ° RMS
Static Accuracy (Heading, GPS Compass)[1]:	0.3 ° RMS
Static Accuracy (Heading, Magnetic)[2]:	2.0 ° RMS
Static Accuracy (Pitch/Roll):	0.5 ° RMS
Angular Resolution:	< 0.05 °
Repeatability:	< 0.1 °
Max Output Rate (IMU Data)[3]:	400 Hz
Max Output Rate (Navigation Data):	400 Hz

Gyro

Range:	±2000 °/s
In-Run Bias Stability:	< 10 °/hr
Linearity:	< 0.1 % FS
Noise Density:	0.0035 °/s /√Hz
Bandwidth:	256 Hz
Alignment Error:	±0.05 °

Accelerometer

Range:	±16 g
In-Run Bias Stability:	<0.04 mg
Linearity:	< 0.5 % FS
Noise Density:	0.14 mg/√Hz
Bandwidth:	260 Hz
Alignment Error:	±0.05 °

Magnetometer

Range:	±2.5 Gauss
Linearity:	< 0.1 %
Noise Density:	140 µGauss/√Hz
Bandwidth:	200 Hz
Alignment Error:	±0.05 °

GNSS

Receiver Type:	72 Channels, L1, GNSS
Solution Update Rate:	5 Hz
Time-to-First-Fix (Cold/Warm Start):	26 s
Time-to-First-Fix (Hot Start):	< 1 s
Altitude Limit:	50,000 m
Velocity Limit:	500 m/s

Pressure Sensor

Range:	10 to 1200 mbar
Resolution:	0.042 mbar
Accuracy:	±1.5 mbar
Error Band:	±2.5 mbar
Bandwidth:	200 Hz

Environment

Operating Temp:	-40°C to +85°C
Storage Temp:	-40°C to +85°C

Electrical:	SMD	Rugged
Input Voltage:	3.2 V to 5.5 V	3.3 V to 14 V
Current Draw[4]:	185 mA @ 3.3 V	250 mA @ 5 V
Max Power Consumption[4]:	1.2 W	1.5 W
Digital Interface:	Serial TTL, SPI	Serial TTL, RS-232

Physical:	SMD	Rugged
Size:	24 x 22 x 3 mm	45 x 44 x 11 mm
Weight:	5 g	30 g
Connector:	30-pin LGA	10-pin Harwin
GNSS Antenna Connectors:	U.FL	MMCX

[1] With one (1) meter baseline, clear view of GNSS satellites and good multipath environment.

[2] With proper magnetic declination, suitable magnetic environment and valid hard/soft iron calibration.

[3] Contact VectorNav for higher IMU data output rates.

[4] Not including active antenna power consumption.