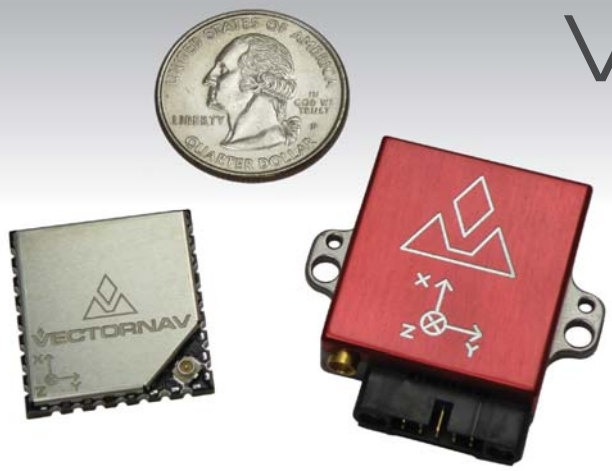
VECTORNAV
Embedded Navigation Solutions

GPS-AIDED
INERTIAL NAVIGATION SYSTEM

VN-200 GPS/INS

High-Performance Embedded Navigation



The VN-200 is the world's smallest & lightest, high-performance GPS-Aided Inertial Navigation System (GPS/INS). Combining an advanced GPS module with the latest in MEMS inertial & pressure sensor technology, the patented VN-200 provides unprecedented opportunities for embedded navigation in a footprint no larger than a postage stamp.

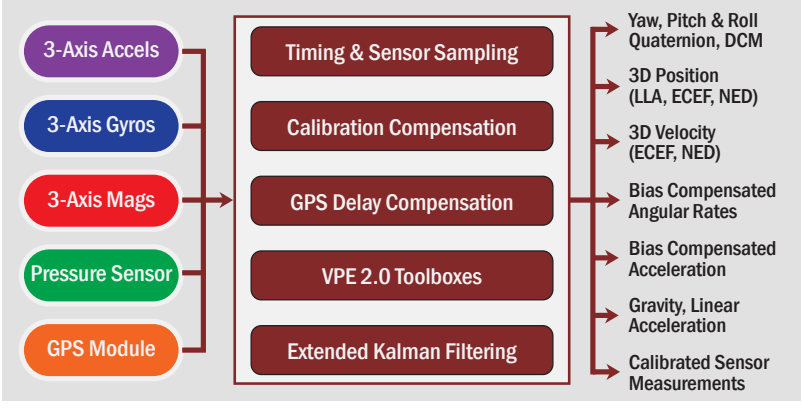
PRODUCT OVERVIEW

- On-board Extended Kalman filter running at 400 Hz, IMU data available at 1 kHz
- Continuous attitude solution over the complete 360° range of motion
- Coupled position, velocity & attitude estimates
- Dynamic accuracy better than 0.3° in heading, 0.1° in pitch/roll
- On-board pressure sensor & u-blox GPS receiver
- Compatible with external GPS, pressure or magnetic measurements
- Individually calibrated for bias, scale factor, misalignment, & gyro g-sensitivity
- Available with standard (at +25°C) or full temperature compensation (-40°C to +85°C)
- Miniature, self-locking U.FL & MMCX connectors for GPS antenna
- Coning & sculling integrals (ΔV's, Δθ's)
- User configurable messages using simple VectorNav binary protocol
- Serial TTL, SPI & USB communication interfaces
- Surface mount package (30-pin LGA)
  Dimensions: 24 x 22 x 3 mm; Weight: 4 grams
- Rugged package (10-pin Harwin connector)
  Dimensions: 36 x 33 x 9.5 mm; Weight: 16 grams

VECTOR PROCESSING ENGINE (VPE)

- On-board Extended Kalman filter
- Automatic filter initialization & dynamic alignment
- GPS delay compensation
- Real-time sensor bias drift compensation
- All inertial data synchronized to GPS time
- Automatic transitioning between AHRS and INS Modes
- On-board World Magnetic & Gravity Reference Models
- VPE Toolboxes
  - Advanced disturbance rejection
  - Adaptive signal filtering
  - Dynamic filter tuning
  - On-board Hard & Soft Iron compensation

VN-200 SIMPLIFIED BLOCK DIAGRAM



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, Magnetic)[1]:	2.0 ° RMS
Static Accuracy (Pitch/Roll):	0.5 ° RMS
Angular Resolution:	< 0.05 °
Repeatability:	< 0.1 °
Max Output Rate (IMU Data)[2]:	1 kHz
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 °

GPS

Receiver Type:	50 Channels, L1 GPS C/A Code
Solution Update Rate:	5 Hz
Time-to-First-Fix (Cold/Warm Start):	36 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 17 V
Current Draw[3]:	105 mA @ 3.3 V	80 mA @ 5 V
Max Power Consumption[3]:	445 mW	500 mW
Digital Interface:	Serial TTL, SPI	Serial TTL, RS-232

Physical:	SMD	Rugged
Size:	24 x 22 x 3 mm	36 x 33 x 9.5 mm
Weight:	4 g	16 g
Connector:	30-pin LGA	10-pin Harwin
GPS Antenna Connector:	U.FL	MMCX

[1] With proper magnetic declination, suitable magnetic environment and valid hard/soft iron calibration.
[2] Default 800 Hz.
[3] Not including active antenna power consumption.

DEVELOPMENT KITS

VN-200 Development Board

- Pre-Soldered VN-200 Surface Mount Part with USB & RS-232 Interfaces
- 30-Pin Header
- SMA Connector for GPS Antenna
- Software Development Kit

VN-200 Rugged Development Kit

- USB & Serial Adapter Cables
- GPS Antenna
- Cable Connection Tool
- Carrying Case
- Software Development Kit

APPLICATIONS

- UAVs, UAS, Manned Aircraft
- Camera/Platform Stabilization
- Marine Antenna Stabilization
- Gimbaled Payloads
- SATCOM, SOTM, VSAT
- Ground Vehicles/Robotics
- Smart Weapons
- Motorsports




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-200 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.

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