Inertial Labs
Attitude is Everything

- 0.5 cm Position accuracy (PPK)
- 0.03 deg Heading accuracy (PPK)
- 0.006 deg Pitch & Roll accuracy (PPK)
- Ideal solution for accurate point clouds
- Real time (RTK) & Post Processing (PPK)
- Small Size, light weight
- Affordable price
- Compatible with LIDAR, Optical camera
- Applications: flight control, remote sensing

OEM Version Of GPS-Aided Inertial Navigation System

"INS-B-OEM"

The **Inertial Labs GPS-Aided Inertial Navigation System (INS-B-OEM)** is OEM version of new generation, fully-integrated, combined GPS, GLONASS, GALILEO and BEIDOU GNSS and high-performance strapdown system, that determines position, velocity and absolute orientation (Heading, Pitch and Roll) for any device on which it is mounted. Horizontal and Vertical Position, Velocity and Orientation are determined with high accuracy for both motionless and dynamic applications.

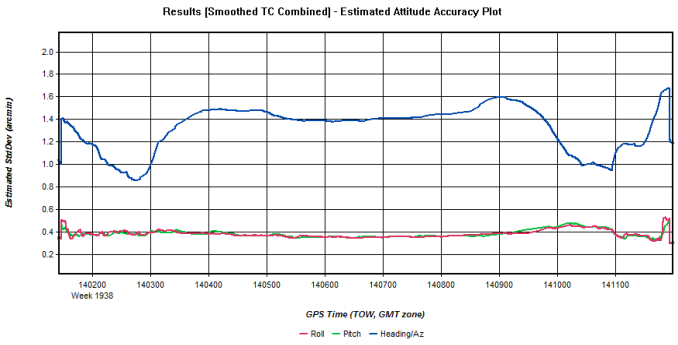
The Inertial Labs **INS-B-OEM** utilizes advanced single antenna GNSS receiver, barometer, 3-axes each of calibrated in full operational temperature range Advanced MEMS Accelerometers and Gyroscopes to provide accurate Position, Velocity, Heading, Pitch and Roll of the device under measure. **INS-B-OEM** contains Inertial Labs new on-board sensors fusion filter, state of the art navigation and guidance algorithms and calibration software.

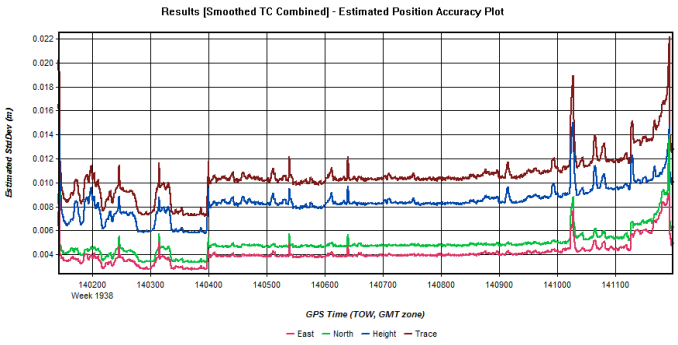
KEY FEATURES, BENEFITS & FUNCTIONALITY

- Commercially exportable GPS-Aided Inertial Navigation System
- Small size & light weight: 85.5 x 47.7 x 39.4 mm size and 174 gram weight
- High precision IMU (1 deg/hr gyroscopes and 5 micro g accelerometers Bias in-run stability)
- GPS, GLONASS, GALILEO, BEIDOU, SBAS, DGPS, RTK supported signals
- Compatibility with LiDARs (Velodyne, RIEGL, FARO)
- Trigger for optical camera
- Up to 2000 Hz IMU; 200 Hz INS and 20 Hz GNSS data rate
- GNSS measurements and IMU raw data for post processing
- Advanced, extendable, embedded Kalman Filter based sensor fusion algorithms
- State-of-the-art algorithms for different dynamic motions of Vessels, Ships, Helicopters, UAV, UUV, UGV, AGV, ROV, Gimbals and Land Vehicles
- Implemented ZUPT, GNSS tracking angle features
- Full temperature calibration of all sensing elements

INS-B-OEM performance

Outage duration	Positioning mode	Position accuracy (meters, RMS)		Velocity accuracy (meters/sec, RMS)		Attitude accuracy (degree, RMS)	
		Horizontal	Vertical	Horizontal	Vertical	Pitch, Roll	Heading
0 sec	RTK	0.01 + 1ppm	0.02 + 1ppm	0.02	0.01	0.015	0.08
	SP	1.2	1.0	0.03	0.02	0.08	0.1
	PP	0.005	0.01	0.02	0.01	0.006	0.03
60 sec	RTK	7	2	0.3	0.1	0.05	0.15
	SP	8	3	0.3	0.1	0.1	0.5
	PP	0.3	0.2	0.03	0.05	0.01	0.1



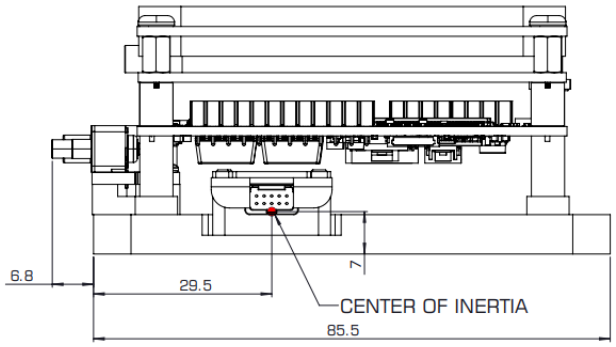


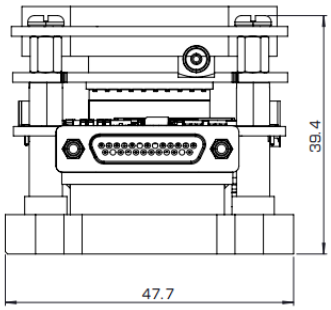
INS-B-OEM Specifications

	Parameter	Units	INS-B-OEM	
Inputs & Outputs	Input signals		• Marine application: DVL (Doppler Velocity Log) • Land application: Odometer, Wheel sensor, Encoder, DMI • Aerial application: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied) • All: External Stand Alone Magnetic Compass (SAMC/AHRS)	
	Output signals		• Positions, Heading, Pitch & Roll, Velocity, Accelerations, Angular rates, Barometric data, 1PPS • Direct AT_ITINS message with Position, Heading, Pitch & Roll to COBHAM AVIATOR UAV 200 • Direct Navigation Support for Pixhawk Flight Controllers as NMEA messages	
	Main feature		Ideal solution for flight control and remote sensing (mapping, survey and inspection with LiDAR, Optical Camera)	
	Update rate (INS data)	Hz	1 … 200 (user settable)	
	Update rate (IMU data)	Hz	1 … 2000 (user settable)	
	Start-up time	sec	<1	
	Positions, Velocity and Timestamps	Units	INS-B-OEM	
Navigation	Horizontal position accuracy (GPS L1), RMS	meters	1.5	
	Horizontal position accuracy (GPS L1/L2), RMS	meters	1.2	
	Horizontal position accuracy (SBAS), RMS [1]	meters	0.6	
	Horizontal position accuracy (DGPS), RMS	meters	0.4	
	Horizontal position accuracy (TerraStar-L) [2]	meters	0.4	
	Horizontal position accuracy (TerraStar-C PRO) [2]	meters	0.025	
	Horizontal position accuracy (TerraStar-X) [2]	meters	0.02	
	Horizontal position accuracy (post processing) [3]	meters	<0.005	
	Horizontal position accuracy (RTK), RMS	meters	0.01 + 1 ppm	
	Vertical position accuracy, RMS	meters	<1	
	Velocity accuracy, RMS	meters/sec	0.03	
	PPS timestamps accuracy	nano sec	20	
	Heading	Units	INS-B-OEM	
Orientation	Range	deg	0 to 360	
	Static Accuracy [4]	deg	1	
	Dynamic accuracy (GNSS) [7]	deg RMS	0.1	
	Post processing accuracy [3]	deg RMS	0.03	
	Pitch and Roll	Units	INS-B-OEM	
	Range: Pitch, Roll	deg	±90, ±180	
	Angular Resolution	deg	0.01	
	Static Accuracy in whole Temperature Range	deg	0.05	
	Dynamic Accuracy [7]	deg RMS	0.03	
	Post processing accuracy [3]	deg RMS	0.006	
	GNSS receiver	Units	INS-B-OEM	
GNSS	Number of GNSS Antennas		Single	
	Supported GNSS signals & corrections (optional)		GPS L1 C/A, L1C, L2C, L2P, L5; GLONASS L1 C/A, L2 C/A, L2P, L3, L5; BeiDou B1I, B1C, B2I, B2a, B3I; Galileo E1, E5 AltBOC, E5a, E5b, E6; NavIC (IRNSS) L5; SBAS L1, L5; QZSS L1 C/A, L1C, L2C, L5, L6; L-Band up to 5 channels; DGPS; RTK	
	Channel configuration [5]		555 Channels (Novatel GNSS receiver) 120 Channels (Hemisphere GNSS receiver)	
	GNSS Positions data rate [6]	Hz	Up to 100	
	GNSS Measurements (raw) data rate	Hz	Up to 100	
	Velocity accuracy, RMS	meters/sec	<0.03	
	Initialization time	Sec	39 (cold start), 20 (hot start)	
	Time accuracy (clock drift) [8]	nano sec	20	
	Gyroscopes	Units	INS-B-OEM	
IMU	Measurement range	deg/sec	±450	
	Bias in-run stability (RMS, Allan Variance)	deg/hr	1	
	Angular Random Walk (ARW)	deg/√hr	0.2	
	Accelerometers	Units	INS-B-OEM	
	Measurement range	g	±8	±15
	Bias in-run stability (RMS, Allan Variance)	mg	0.005	0.02
	Velocity Random Walk (VRW)	m/sec/√hr	0.015	0.035
	Environment	Units	INS-B-OEM	
General	Operating temperature	deg C	-40 to +70	
	Storage temperature	deg C	-50 to +85	
	Vibration & Shock		MIL-STD-810G	
	MTBF	hours	100,000	
	Electrical	Units	INS-B-OEM	
	Supply voltage	V DC	9 - 36	
	Power consumption	Watts	2.5 (3.5 with data logger)	
	Output Interface (options)	-	RS-232/RS-422/CAN/Ethernet	
	Output data format	-	Binary, NMEA 0183 ASCII characters	
	Physical	Units	INS-B-OEM	
	Size	mm	85.5 x 47.7 x 39.4	
	Weight	gram	174	

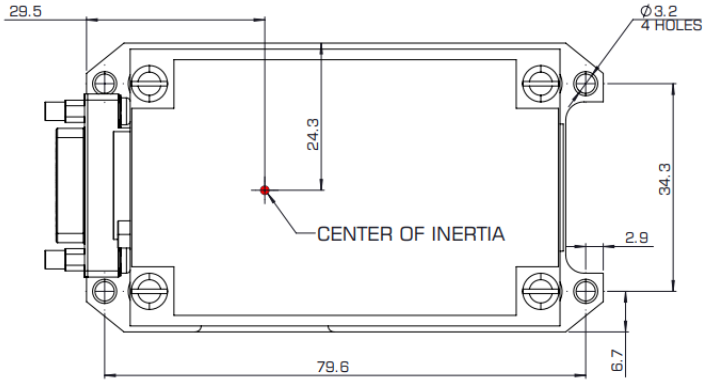
[1] GPS only; [2] Requires a subscription to a TerraStar data service; [3] RMS, incremental error growth from steady state accuracy. Post-processing results using third party software. ; [4] calibrated in whole operational temperature range, in homogeneous magnetic environment, for latitude up to ±65 deg; [5] tracks up to 60 L1/L2 satellites; [6] 50 Hz while tracking up to 20 satellites. 20 Hz position update rate for Basic model of INS ; [7] dynamic accuracy may depend on type of motion ; [8] time accuracy does not include biases due to RF or antenna delay

INS-B-OEM mechanical interface drawing (standard configuration)





Device side: 25-pin connector
MDSM-25PE-Z10-VR17



Notes:
1. All dimensions are in millimeters.
2. All dimensions within this drawing are subject to change without notice.
3. Weight and size are PN dependent. Customers should obtain the most recent 2D/3D files before designing any interface hardware.
4. Please contact Inertial Labs, Inc. if you need the INS unit to be delivered in a custom configuration with customized connector and output data.

Product Code Structure:

Model	Gyroscope	Accel	Calibration	Connector	Encoder support	Stand Alone Magnetic Compass	Data Logger	GNSS receiver	Version	Interface
INS-B-OEM	G450	A8	TGA	C4	E (option)	SAMC	S64	O719	V0	1
	G950	A15	TMGA (Optional)	C6				P327	V1	2
		A40		C8				ZF9P	V2	4
									V3	5
									V4	11
									VR43	22
									VR5	124
									V8	145
									V9	245

Example: INS-B-OEM-G450-A15-TGA-C6-O719-V0.1

Product code details:

- INS-B-OEM: Basic Model of GPS-Aided Inertial Navigation System
- G450: Gyroscopes measurement range = ±450 deg/sec
- G950: Gyroscopes measurement range = ±950 deg/sec
- A8: Accelerometers measurement range = ±8 g –> recommended for applications with low level of operational vibrations
- A15: Accelerometers measurement range ±15 g –> recommended for applications with medium level of operational vibrations
- A40: Accelerometers measurement range ±40 g –> recommended for high dynamic applications or/and with high level of operational vibration
- TGA: Gyroscopes and Accelerometers
- TMGA: Magnetometers, Gyroscopes and Accelerometers
- C4: Aluminum Base Plate - 26 pin header and ribbon cable (20021121-00026T4LF by Amphenol) (with available interfaces of: RS-232, RS-422, Ethernet and CAN)
- C6: Aluminum Base Plate - 14 pin screw-lock connector (M80-5401442 by Harwin) (with available interface of: RS-232 and CAN, RS-422 and CAN, or Ethernet and CAN)
- C8: Aluminum Base Plate - 25-pin micro D-SUB connector with screw lock (MDSM-25PE-Z10-VR17 by ITT Cannon) (with available interfaces of: RS-232, RS-422, Ethernet and CAN)
- E: encoder support
- SAMC: Supports external Stand-Alone Magnetic Compass (optional; only supports interfaces .124)
- S64: 64GB embedded Data Logger (optional)
- O719: Novatel OEM719 single antenna GNSS receiver (INS-B and INS-P only)
- P327: Hemisphere P327 single antenna GNSS receiver (INS-B and INS-P only) – OBSOLETE
- ZF9P: Single UBlox ZED-F9P GNSS Receiver
- V0: GPS L1, SBAS, DGPS, 20 Hz positions (NovAtel Single Antenna GNSS Receiver only)
- V1: GPS L1, SBAS, DGPS, 50 Hz positions (NovAtel Single Antenna GNSS Receiver only)
- V2: GPS L1, GLONASS, SBAS, DGPS, 20 Hz positions (NovAtel Single Antenna GNSS Receiver only)
- V3: GPS L1/L2, SBAS, DGPS, 20 Hz positions (NovAtel Single Antenna GNSS Receiver only)
- V4: GPS L1/L2, GLONASS L1/L2, SBAS, DGPS, 20 Hz positions (NovAtel Single Antenna GNSS Receiver only)
- VR43: GPS L1/L2, GLONASS L1/L2, SBAS, DGPS, 20 Hz positions, 20 Hz measurements (NovAtel Single Antenna GNSS Receiver only)
- VR5: GPS L1/L2, GLONASS L1/L2, SBAS, DGPS, RTK, 20 Hz positions, 20 Hz measurements (NovAtel Single Antenna GNSS Receiver only)
- V8: GPS L1/L2/L5; GLONASS L1/L2; BeiDou B1/B2/B3; GALILEO E1/E5; SBAS; DGPS; 20 Hz measurements; 20 Hz positions RTK (NovAtel Single Antenna GNSS Receiver only)
- V9: GPS L1/L2, GLONASS L1/L2, BEIDOU B1/B2, GALILEO E1/E5, QZSS L1/L5, DGPS, RTK, GNSS measurements, GNSS positions (Single Antenna GNSS Receiver only)
- VX.1: RS-232 interface
- VX.2: RS-422 interface
- VX.4: CAN interface
- VX.5: Ethernet interface
- VX.11: two RS-232 interfaces (only available for C4 and C8 connectors)
- VX.22: two RS-422 interfaces (only available for C4 and C8 connectors)
- VX.124: RS-232, RS-422 and CAN interfaces (only available for C4 and C8 connectors)
- VX.145: RS-232, CAN and Ethernet interface (with optional Encoder support) (only available for C4 and C8 connectors)
- VX.245: RS-422, CAN and Ethernet interface (without Encoder support) (only available for C4 and C8 connectors)