



- 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.



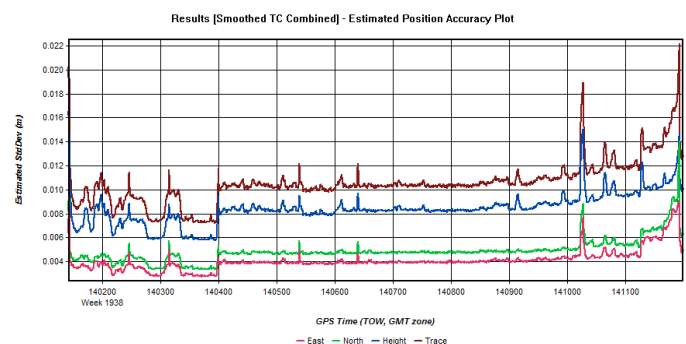
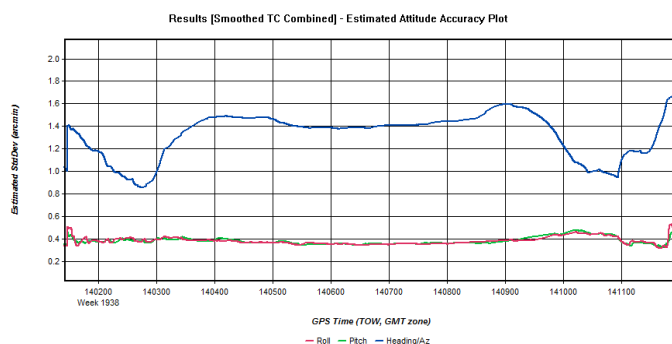
The Inertial Labs **INS-B-OEM** utilizes advanced single antenna GNSS receiver, barometer, 3-axes each of calibrated in full operational temperature range Advanced MEMS Accelerometers and Gyroscopes to provide accurate Position, Velocity, Heading, Pitch and Roll of the device under measure. **INS-B-OEM** 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, Ouster, Hesai, Livox)
- 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
- Sensor fusion algorithms with advanced extended Kalman Filter
- State-of-the-art algorithms for different dynamic motions of Vessels, Ships, Helicopters, UAV, UUV, UGV, AGV, ROV, Gimbals and Land Vehicles
- Implemented ZUPT, ZARUPT, Tunnel Guide, and GNSS tracking angle features
- Full temperature calibration of all sensing elements
- Full integration with ArduPilot platform

## 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

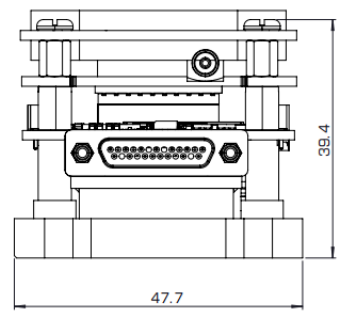
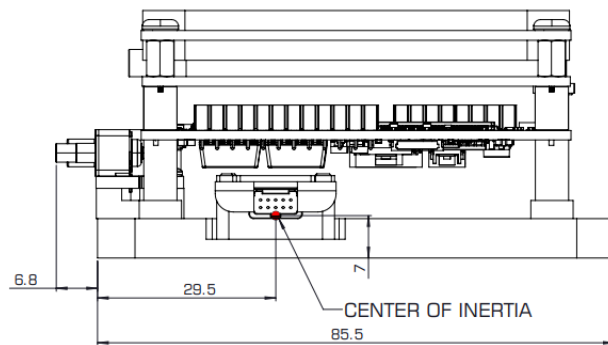
Parameter		Units	INS-B-OEM	
Inputs & Outputs	Input signals		<ul style="list-style-type: none"> <li>Marine application: DVL (Doppler Velocity Log)</li> <li>Land application: Odometer, Wheel sensor, Encoder, DMI</li> <li>Aerial application: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied)</li> <li>All: External Stand Alone Magnetic Compass (SAMC/AHRS)</li> </ul>	
	Output signals		<ul style="list-style-type: none"> <li>Positions, Heading, Pitch &amp; Roll, Velocity, Accelerations, Angular rates, Barometric data, 1PPS</li> <li>Direct AT_ITINS message with Position, Heading, Pitch &amp; Roll to COBHAM AVIATOR UAV 200</li> <li>Direct Navigation Support for Pixhawk Flight Controllers as NMEA messages</li> </ul>	
	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	
Navigation	<b>Positions, Velocity and Timestamps</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	Horizontal position accuracy (GPS L1), RMS	meters	1.5	
	Horizontal position accuracy (GPS L1/L2), RMS	meters	1.2	
	Horizontal position accuracy (SBAS), RMS <sup>(1)</sup>	meters	0.6	
	Horizontal position accuracy (DGPS), RMS	meters	0.4	
	Horizontal position accuracy (TerraStar-L) <sup>(2)</sup>	meters	0.4	
	Horizontal position accuracy (TerraStar-C PRO) <sup>(2)</sup>	meters	0.025	
	Horizontal position accuracy (TerraStar-X) <sup>(2)</sup>	meters	0.02	
	Horizontal position accuracy (post processing) <sup>(3)</sup>	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	
Orientation	<b>Heading</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	Range	deg	0 to 360	
	Static Accuracy <sup>(4)</sup>	deg	1	
	Dynamic accuracy (GNSS) <sup>(7)</sup>	deg RMS	0.1	
	Post processing accuracy <sup>(3)</sup>	deg RMS	0.03	
	<b>Pitch and Roll</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	Range: Pitch, Roll	deg	±90, ±180	
	Angular Resolution	deg	0.01	
	Static Accuracy in whole Temperature Range	deg	0.05	
	Dynamic Accuracy <sup>(7)</sup>	deg RMS	0.03	
	Post processing accuracy <sup>(3)</sup>	deg RMS	0.006	
IMU	<b>Gyroscopes</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	Measurement range	deg/sec	±450	
	Bias in-run stability (RMS, Allan Variance)	deg/hr	1	
	Angular Random Walk (ARW)	deg/√hr	0.2	
	<b>Accelerometers</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	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
	<b>Environment</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	Operating temperature	deg C	-40 to +70	
	Storage temperature	deg C	-50 to +85	
	Vibration & Shock		MIL-STD-810G	
General	<b>Electrical</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	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	
	<b>Physical</b>	<b>Units</b>	<b>INS-B-OEM</b>	
	Size	mm	85.5 x 47.7 x 39.4	
	Weight	gram	174	

<sup>(1)</sup> GPS only. <sup>(2)</sup> Requires a subscription to a TerraStar data service. <sup>(3)</sup> RMS, incremental error growth from steady state accuracy. Post-processing results using third party software. <sup>(4)</sup> calibrated in whole operational temperature range, in homogeneous magnetic environment, for latitude up to ±65 deg. <sup>(5)</sup> Dynamic accuracy may depend on type of motion.

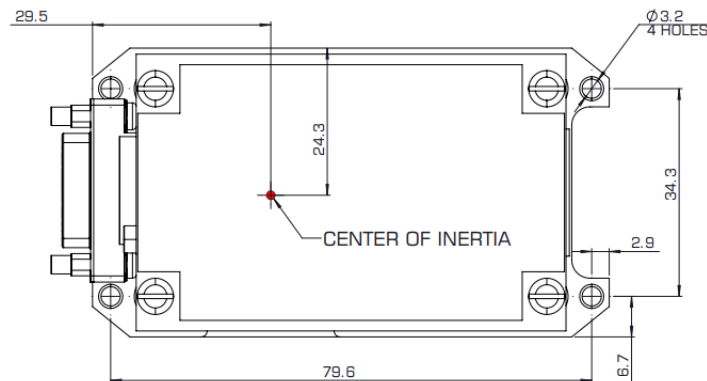
Receiver Options Available		Units	NovAtel	Septentrio	u-blox
GNSS Specifications	Model	-	OEM719	mosaic-X5	ZED-F9P
	Number of GNSS Antennas	-	Single	Single	Single
	GNSS Constellations	-	GPS L1 C/A, L1C, L2C, L2P, L5; GLONASS L1 C/A, L2 C/A, L2P, L3, L5 (OEM719); BeiDou B1I, B1C, B2I, B2a, B2b, B3I (OEM719); Galileo E1, E5 AltBOC, E5a, E5b, E6 (OEM719); QZSS L1 C/A, L1C, L1S, L2C, L5, L6 (OEM719); NavIC (IRNSS) L5; L-Band	GPS L1C/A, L1C, L1PY, L2C, L2P, L5; GLONASS L1C/A, L2C/A, L2P, L3 CDMA; BeiDou B1I, B1C, B2a, B2I, B3; Galileo E1, E5a, E5b, E5 AltBOC, E6; QZSS L1C/A, L1C, L2C, L5, L6; Navic L5; L-Band	GPS L1C/A, L2C; GLONASS L1OF, L2OF; Galileo E1B/C, E5b; BeiDou B1I, B2I; QZSS L1C/A, L2C
	GNSS Corrections	-	WAAS; EGNOS; MSAS; GAGAN; SBAS L1, L5; DGPS; RTK; TerraStar PPP, Oceanix PPP	WAAS; EGNOS; MSAS; GAGAN; SBAS L1, L5; DGPS; RTK	WAAS; EGNOS; MSAS; GAGAN; SBAS L1C/A; DGPS; RTK
	Channel Configuration <sup>(1)</sup>	-	555	448	184
	GNSS Data Rate <sup>(1)</sup>	Hz	5 / 20 / 100	100 (max)	10, 20 <sup>(2)</sup>
	RTK Corrections	-	RTCM 2, RTCM 3	RTCM 2, RTCM 3	RTCM 3
	Velocity Accuracy	m/s	0.03	0.03	0.05
	Initialization Time	s	<39 (cold start), <20 (hot start)	<45 (cold start), <20 (hot start)	<30 (cold start), <10 (hot start)
	Time Accuracy (clock drift) <sup>(3)</sup>	Nano sec	20	20	30

<sup>(1)</sup> tracks up to 60 L1/L2 satellites. <sup>(2)</sup> If tracking GPS only. <sup>(3)</sup> 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
								SMX5	V3	5
									V4	11
									VR43	22
									VR5	124
									V8	145
									V9	245
									V91	

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  $\pm 450$  deg/sec
- G950: Gyroscopes measurement range  $\pm 950$  deg/sec
- A8: Accelerometers measurement range  $\pm 8$  g  $\rightarrow$  recommended for applications with low level of operational vibrations
- A15: Accelerometers measurement range  $\pm 15$  g  $\rightarrow$  recommended for applications with medium level of operational vibrations
- A40: Accelerometers measurement range  $\pm 40$  g  $\rightarrow$  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
- P327: Hemisphere P327 single antenna GNSS receiver – **OBSELETE**
- ZF9P: u-blox ZED-F9P single antenna GNSS receiver
- SMX5: Septentrio mosaic-X5 single antenna 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 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)
- V91: GPS L1/L2/L5, GLONASS L1/L2/L3, GALILEO E1/E5/E6, BEIDOU B1/B2/B3, QZSS L1/L2/L5, NavIC L5, SBAS, RTK, GNSS measurements, GNSS positions (Single Antenna Septentrio mosaic-X5 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)