Inertial Labs
a VIAVI Solutions company

MADE IN USA

IRINS-DM

LOW EARTH ORBIT (LEO) AND GNSS AIDED INERTIAL NAVIGATION SYSTEM

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LOW EARTH ORBIT (LEO) AND GNSS AIDED INERTIAL NAVIGATION SYSTEM

Fully integrated solution combining an Inertial Navigation System (INS), an Attitude and Heading Reference System (AHRS), an Iridium Satellite Timing and Location (STL) service, a Low Earth Orbit (LEO) satellite signals service alternative to GNSS, and an RSR Transcoder.

Product Overview

IRINS-DM is a result of fusion of the Novatel OEM7 GNSS receiver, LEO STL-2600 receiver, Tactical-grade MEMS Inertial Measurement Unit (IMU), embedded gyro-compensated fluxgate magnetic compass, Barro-Altimeter and embedded Air Data Computer.

Optional onboard RSR transcoder converts the navigation solution into a simulated GPS (L1/L2) RF signal that can be accepted by any GNSS receiver.

The IRINS uses Inertial Labs' sensor fusion filter, state-of-the-art navigation and guidance algorithms, and battle-proven jamming and spoofing algorithms to provide precise Time, Position, Velocity and Attitude measurements in challenging GNSS-denied environments.

Features

- Assured Position, Navigation and Time (A-PNT) Solution
- LEO-Aided INS with embedded AHRS and GNSS receiver
- Low drift in GNSS and LEO denied environments
- Jamming and Spoofing mitigation
- Optionally embedded Transcoder GPS (L1/L2) RF signal output

Applications

- Medium and Long-range Unmanned Airial Vehicles (UAV)
- Loitering Munitions
- Unmanned Surface Vessels (USV)
- Manned and Unmanned Ground Vehicles (UGV)
- Navigation, Battle Management and Blue Force Tracking Systems
- Maritime Navigation and Dynamically Positioning Systems

MEMS IMU

Gyroscopes		
Measurement Range (°/s)	±2000	
Bias in-run Stability[1] (°/hr)	1	
Bias Instability[2] (°/hr, RMS)	30	
SF Accuracy[2] (ppm)	750	
Noise (ARW)[3] (°/√hr)	0.2	
Accelerometers		
Measurement Range (g)	±8	±40
Bias in-run Stability[1] (mg)	0.005	0.02
SF Accuracy[2] (ppm)	150	500
Bias instability[2] (mg, RMS)	0.5	1.2
Noise (VRW)[4] (m/s/√hr)	0.015	0.045

GNSS Receiver

NovAtel OEM719	
GNSS Constellations	GPS, GLONASS, Galileo, BeiDou, QZSS, NavIC
GNSS Bands	L1 C/A, L1C, L2C, L2P, L5, L3, L2 C/A, L2P, E1, E5a, E5b, B1I, B1C, B2I, B2a, B2b, L1S, L5
GNSS Corrections	TerraStar-L/C PRO, RTK, DGPS, SBAS, GLIDE, SPAN, GRIT
GNSS Data Rate (Hz)	20
RTK Corrections	RTCM 2, RTCM 3, CMR, CMR+
Initialization Time (s)	<34/ <20 (cold/ hot start)
Time Accuracy (ns)[5]	5

1. Allan Variance, 12-hour measurement
2. In the temperature range
3. Angular Random Walk
4. Velocity Random Walk
5. Time accuracy does not include biases due to RF or antenna delay

Performance

Attitude	
Range (Heading, Pitch, Roll) (°)	0-360, ±90, ±180
Angular resolution (°)	0.001
Heading (INS) (°)	0.15
Heading Free Inertial (°/hr)	1
LEO-Aided Heading (°)	<2
Pitch/Roll (Static) (°)	0.05
Pitch/Roll (INS) (°)	0.03
LEO-Aided Pitch/Roll (°)[6]	<0.15
Navigation	
Horizontal Position (m, RMS) (SP/SBAS/DGPS/RTK)	1 / 0.6 / 0.4 / 0.01
Vertical Position (m, RMS)	1
Velocity (m/s)	0.03
LEO-Aided Horizontal Position (m)[6]	50
LEO-Aided Velocity (m/s)[6]	0.1
Free Inertial (% DT)[6]	0.2
Jamming and Spoofing detection	Yes
STL Receiver	
Antenna Power (V)	3.3 (built in)
Tracking (dBm) [7]	-120
Clock oscillator	**MEMS OCXO**
Frequency (MHz)	10 MHz
Holdover (μs)[8]	<2
Transcoder	
RF Output Format	GPS L1, L2, P, C/A-code (at -100 to -125 dBm)
Spectral Purity (dBc) (1MHz to 13.2 GHz)	< -33 in-band (L1, ±20 MHz) < -80 out-of-band
Harmonics (dBm) (L1 1.57542 GHz)	< -150

6. Land Vehicles
7. 25 dB antenna LNA gain assumed
8. Over 8 hours with rugged OCXO
9. Circular Error Probable

Air Data Computer

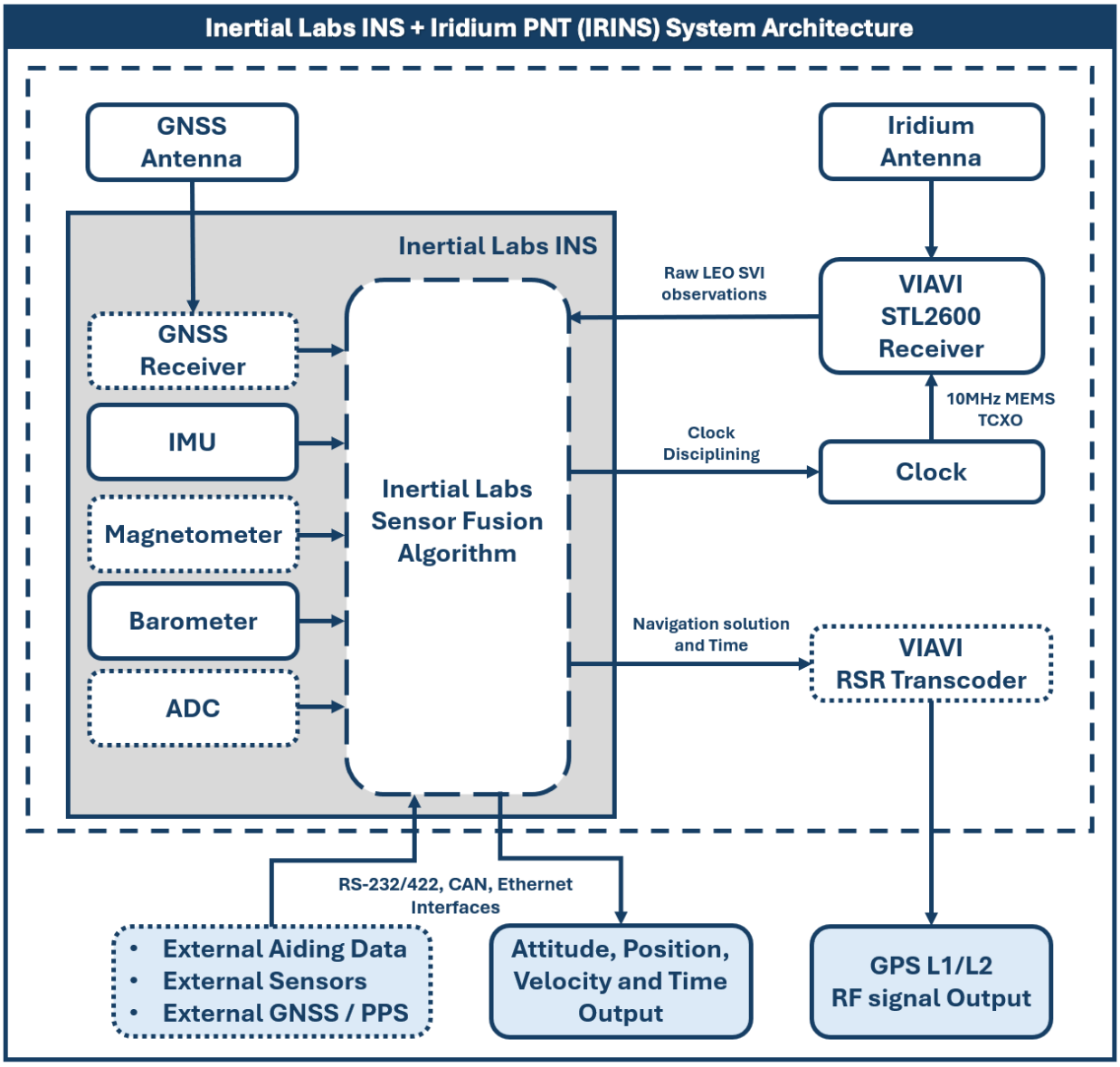
Model	2P	2PEX	2PMAX
Measurement Range (mbar)	±25	±600	±4000
Static Pressure			
Range (hPa)	300 to 1100		
Accuracy (% FSS)	±0.1		
Dynamic Pressure			
Range (hPa)	0.15 to 25	0.15 to 600	0.15 to 4000
Accuracy (% FSS)	±0.25		
Pressure Altitude			
Range (m)	-500 to 9000		
Accuracy (m)	1		
Airspeed			
Range (m/s)	5 to 64	5 to 310	5 to 800
Accuracy (m/s)	0.5		
Mach-Number			
Range (M)	0.01 to 0.2	0.01 to 0.99	0.01 to 2.5
Accuracy (M)	0.001	0.002	0.002
Static Pressure Over Total Pressure			
Range	0.97 to 1	0.63 to 1	0.2 to 1
Resolution (ppm)	1		
Air Density			
Range (kg/m3)	0.3 to 1.6		
Accuracy (kg/m3)	0.002		
Outside Air Temperature (OAT)			
Range (°C)	-40 to +85		
Resolution (°C)	0.01		

GENERAL

Environmental	
Operating Altitude (m)	up to 18000
Operating and Storage temperature (°C)	-40 to +85
Environmental Protection	IP67, MIL-STD-810G
EMI/EMC	MIL-STD-461F
Acoustic (dB)	185
MTBF (GM) (h)	100000
Electrical	
Supply Voltage (VDC)	9-36 26±10 (MIL-STD-1275)
Power Consumption (W)[1]	<10
Input power protection	MIL-STD-1275 (optional)
1 PPS Level (VDC)	3.3/ 5 / Differential
Physical[2]	
Dimensions (mm)	160.0 x 141.2 x 61.3
Weight (g)	1400
Interfacing	
Output Interface	RS-232/RS-422/CAN/ Ethernet/RF[3]
Output Data Rate (INS) (Hz)	up to 200
Output Data Format	Binary, NMEA 0183 ASCII characters
Data Inputs[4]	Aiding data External sensors External GNSS

1. Power consumption varies depending on hardware configuration. Contact Inertial Labs for details
2. Contact Inertial Labs to obtain the most recent 2D/3D files before designing any interface hardware
3. GPS RF signal output available with a transcoder configuration only
4. Refer to the ICD for the complete list of supported aiding data types and external sensors.

IRINS-DM architecture



Product Code Structure

Model	IMU	Gyro	Accel	Connector	ADC	SAMC	GNSS	LEO	Transcoder	Interface
IRINS-DM	A1	G2000	A8	C73	0P	SAMC	O719	STL2600	RSR2	.12345
			A40	C76	2P					.1245R
					2PEXT					
					2PMAX					

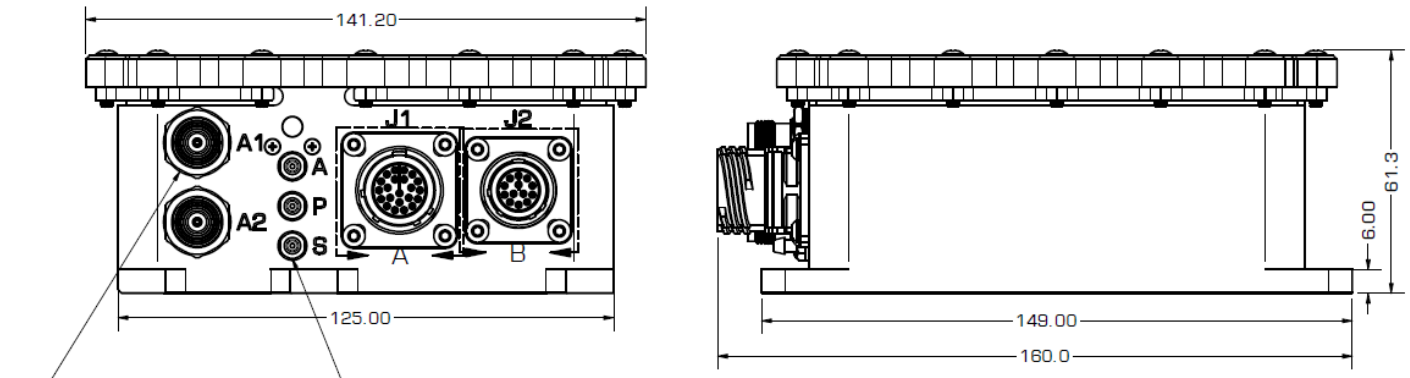
Product code details:

IRINS-DM: Inertial Navigation System
A1: Inertial Labs KERNEL-210 IMU
G2000: Gyro measurement range ±2000 deg/sec
A8: Accel measurement range ±8 g
A40: Accel measurement range ±40 g
C73: Two connectors (22-pin main; 13-pin auxiliary) with MIL-STD-1275 power protection
C76: Two connectors (22-pin main; TNC RF output) with MIL-STD-1275 power protection

0P: No ADC (Baro-altimeter only)
2P: ±25 mbar differential pressure sensor
2PEX: ±600 mbar differential pressure sensor
2PMAX: ±4 bar differential pressure sensors
SAMC: External Stand-Alone Magnetic Compass (not available with transcoder)
O719: NovAtel OEM719 GNSS Receiver (optional)
STL2600: STL-2600 STL LEO Receiver
RSR2: RSR GNSS transcoder v2.0 (optional)
.12345: RS232, RS-422, RS-485 (SAMC), CAN, Ethernet
.1245R: RS232, RS-422, CAN, Ethernet, RF (RSR2 only)

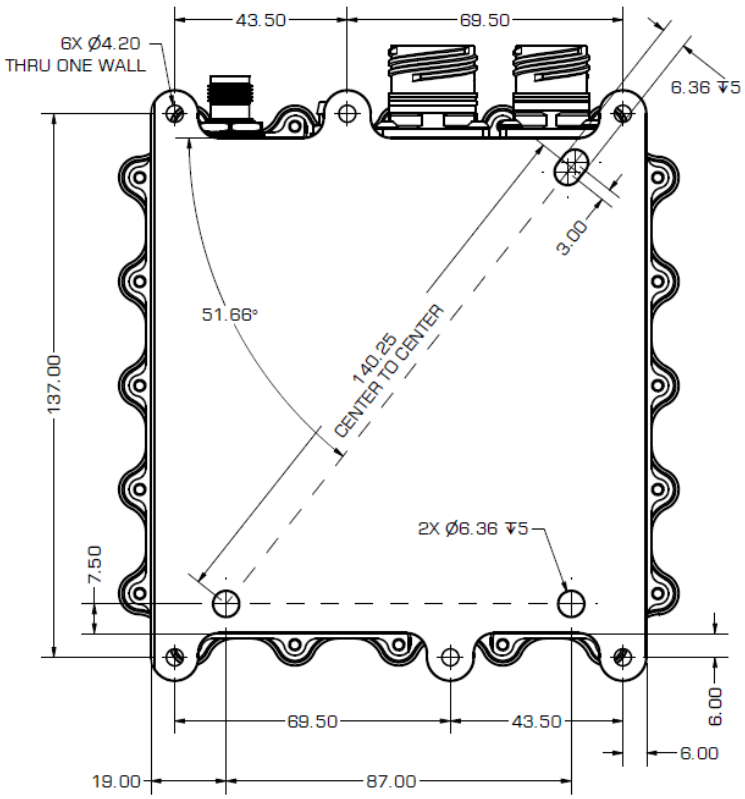
Example: IRINS-DM-A1-G2000-A40-C73-2P-SAMC-O719-STL2600-RSR2.12345

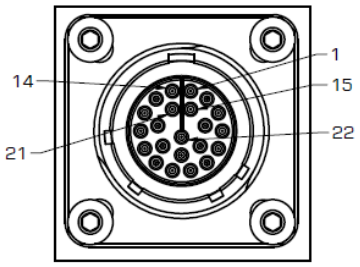
IRINS-DM Mechanical and Electrical Interface



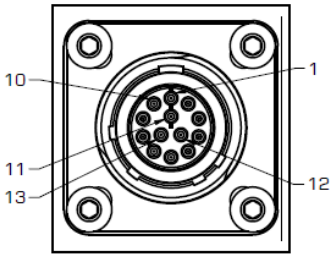
A1	GNSS ANTENNA TNC FEMALE
A2	STL ANTENNA TNC FEMALE

A	ALTIMETER (STATIC) PRESSURE
P	AIRSPEED TOTAL (DYNAMIC) PRESSURE
S	AIRSPEED (STATIC) PRESSURE





J1 PINOUT



J2 PINOUT

1	POWER INPUT
2	POWER RETURN
3	RS232-RX1
4	RS232-TX1
5	RS232-RX2
6	RS232-TX2
7	RS232-RX3
8	RS232-TX3
9	RX4/CAN1-LOW
10	TX4/CAN1-HIGH
11	COMMON GND

12	RS422-RX1+
13	RS422-RX1-
14	RS422-TX1+
15	RS422-TX1-
16	1 PPS OUT
17	MARK INPUT
18	ETHERNET TX+
19	ETHERNET TX-
20	ETHERNET RX+
21	ETHERNET RX-
22	COMMON GND

1	5V OUTPUT
2	COMMON GND
3	ENC. PHASE A
4	ENC. PHASE B
5	RS485-A
6	RS485-B
7	RESERVED
8	RESERVED
9	AUX. RS232-TX4
10	AUX. RS232-RX4
11	CAN2 HIGH
12	CAN2 LOW
13	COMMON GND

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