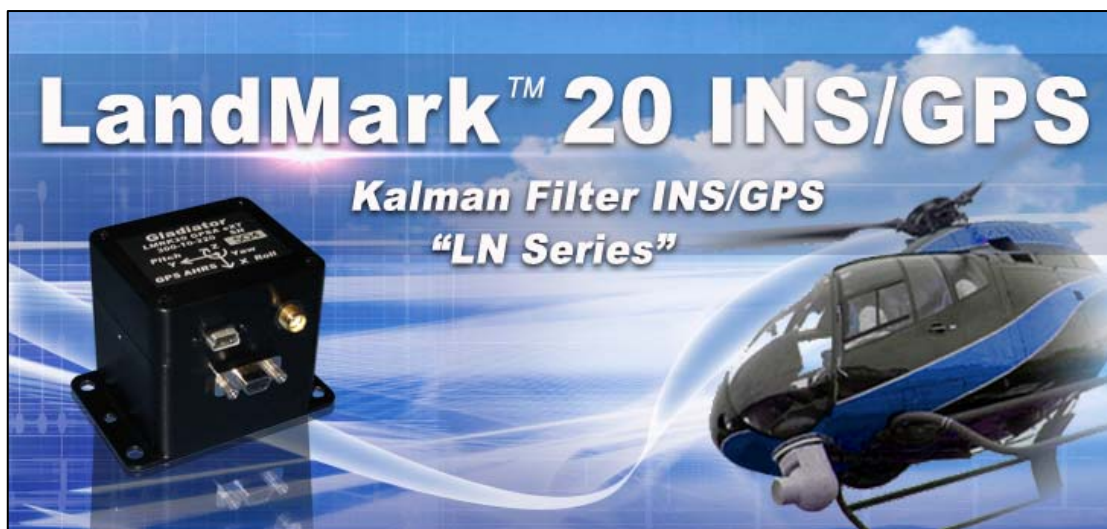


LandMark™ 20 INS/GPS "LN Series"



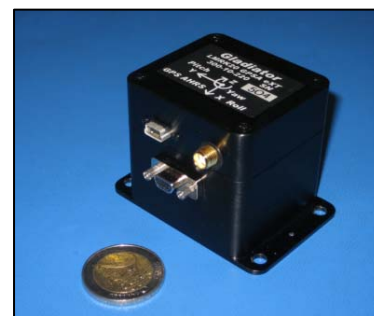
- **Small, Light Weight and Low Power MEMS GPS-Aided AHRS**
- **Rugged Environmentally Sealed Packaging & MILSPEC Connector**
- **Low Noise Gyros** $0.01^\circ/\text{sec}/\sqrt{\text{Hz}}$
- **Low Noise Accels** $0.05\text{mg}/\sqrt{\text{Hz}}$
- **In-Run Gyro Bias** $15^\circ/\text{hour } 1\sigma$
- **Heading** $\pm 0.5^\circ$ typical
- **Redundant Altitude** ± 3 meter typical
- **Fully Compensated Bias, Scale Factor, Misalignment, g-Sensitivity, Heading & Altitude**
- **GPS-Aiding of Velocity & Altitude**
- **Single RS485 Data Rate** 100Hz
- **GPS Receiver – 50 Channel & 4 Hz Position Data Update Rate**
- **GPS Accuracy** $\pm 2.5\text{m CEP}$
- **Supports WAAS, EGNOS and MSAS**
- **Low Power** < 825 mW typical
- **Low Voltage** +3.3V (single sided power)
- **Light Weight** < 150 grams
- **Small Size** $< 108\text{cm}^3/6.6\text{in}^3$

**Light Weight & Low Power
GPS-Aided AHRS**

Export Classification: Commerce ECCN7A994

The "LN Series" version of our LandMark™ 20 INS/GPS is the lowest noise version of our standard LandMark™ INS/GPS. The unit features ultra low noise gyros and accelerometers with exceptional bias in-run and bias over temperature performance with integrated GPS-Aiding in a small, light weight and low power ruggedized package. The unit provides RS485 output of delta velocity,

delta theta, heading, pitch and roll angles, altitude information, position, velocity and precision time. The inertial suite is integrated with a 50 channel C/A code GPS receiver with 4Hz position update rate. GPS aiding is included in all units for turning error correction as



well as for continued output during short-term GPS dropouts. The signature feature is the low noise inertial sensors that provide **fully compensated bias, scale factor, misalignment, g-sensitivity, heading, pitch and roll angles and redundant altitude information**. The unit employs a Kalman Filter to integrate the GPS data and GPS-Aiding in a **ruggedized environmentally sealed package** that is EMI resistant and includes a **MILSPEC connector**. This GPS-Aided AHRS is highly durable and can withstand environmental vibration, shock and EMI typically associated with commercial aircraft requirements. The LandMark™ 20 INS/GPS eXT "LN Series" is well suited for low cost flight control, navigation, image stabilization, antenna stabilization and pointing, general aviation, automotive testing as well as laboratory use.

QMS

AS9100 Rev B &
ISO 9001:2000
Cert# FM 509639



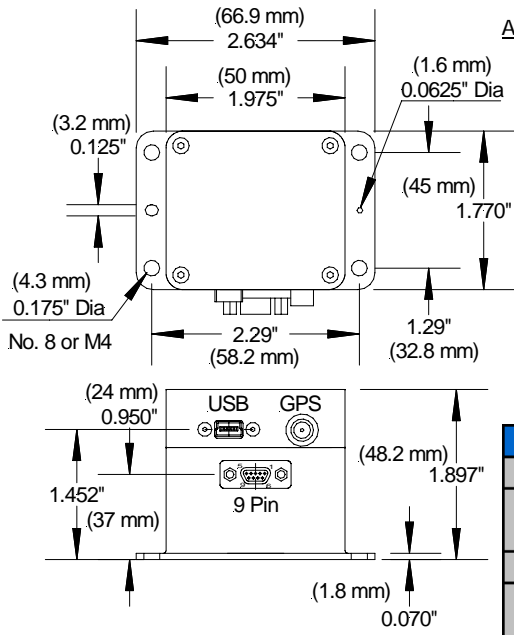
Gladiator Technologies, Inc.



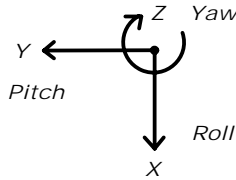
Copyright © 2010 Gladiator Technologies, Inc.

Rev. Aug1610
SN: 100

LandMark™ 20 INS/GPS "LN Series"



Axes (Top View) Right Hand Rule



LandMark™ 20 INS/GPS eXT "LN Series"

- LMRK20INSGPS-075-02-100
- LMRK20INSGPS-075-10-100
- LMRK20INSGPS-150-02-100
- LMRK20INSGPS-150-10-100
- LMRK20INSGPS-300-02-100
- LMRK20INSGPS-300-10-100

Specification

Pin No.	GPS/AHRS eXT Assignment
1	RS-485 A (+) AHRS
2	RS-485 B (-) AHRS
3	Power Ground
4	RS-485 A (+) Combined GPS/AHRS
5	+3.1V to +4.2V Input Power
6	RS-485 B (-) Combined GPS/AHRS
7	+5V Regulator Output
8	Signal Ground
9	Self Test

Outputs	Serial Sequence at 100Hz
1, 2, 3	Gyros: Roll (X), Pitch (Y), Yaw (Z)
4, 5, 6	Accelerometers: (X), (Y), (Z)
7	Temperature
8, 9, 10	Magnetometers: (X), (Y), (Z)
11, 12, 13	Angles: Roll (X), Pitch (Y), Yaw (Z)
14, 15, 16	Airspeed, Longitude, Latitude
17, 18	Time ms, Time Week
19, 20, 21	GPS: Altitude, Velocity, Heading
22	No. of SV's
23, 24, 25	IMU Status, Status, Checksum

PARAMETER	RATE AXES			ACCEL AXES	
Power Requirements					
Input Voltage	+3.1V to 4.2VDC				
Power <i>Typical (Max)</i>	825mW (1100mW)				
Inertial Performance					
Standard Full Scale Ranges	±75°/sec	±150°/sec	±300°/sec	±2 g's	±10 g's
Scale Factor Error %	≤0.1% (over temperature)				
Bias In-Run Stability 1σ	15°/hour			0.02mg	0.1mg
Bias Over Temperature (Typical)	<0.05°/sec			< 0.5mg	< 1.5mg
Resolution	0.01°/sec	0.01°/sec	0.01°/sec	0.1mg	0.5mg
Angle Random Walk (Typical)	0.01°/sec/√Hz	0.011°/sec/√Hz	0.012°/sec/√Hz	0.05mg/√Hz	0.16mg/√Hz
Alignment	1mrad typical				
G-Sensitivity	≤0.02°/sec/g typical				
INS/GPS System Performance					
GPS Accuracy	±2.5m CEP Stationary				
Heading (sole inertial)	± 0.5° typical				
Altitude (sole inertial)	± 3m typical				
Start-Up Time (Inertial)	< 1.5 sec AHRS 100 Hz Full Range				
GPS Acquisition (Cold Start)	< 30 sec				
GPS Reacquisition (Warm Start)	< 1 sec				
Update Rate (Inertial)	100 Hz (user selectable)				
Data Rate (GPS)	4 Hz Position Data typical				
Physical					
Weight	< 150 grams				
Size	U.S.:	1.770 x 1.975 x 1.882 = 6.58 in ³			
	Metric:	4.5 x 5.0 x 4.78 = 107.6 cm ³			
Operating Life	10 Years typical				
Environments					
Operating Temperature	-40°C to +85°C				
Storage Temperature	-55°C to +100°C				
Vibration Operating	6gRMS (20Hz to 2KHz ~ 10g accelerometers)				
Shock	500g's ½ sine 30 msec powered, any axis				

Specification subject to change without notice



Gladiator Technologies, Inc.



Copyright © 2010 Gladiator Technologies, Inc.

Gladiator Technologies, Inc.

8022 Bracken Place SE
 Snoqualmie, WA 98065 USA
 Tel: 425.396.0829 Fax: 425.396.1129
 Email: sales@gladiatortechnologies.com
 Web: www.gladiatortechnologies.com

Rev. Aug1610
 SN: 100

LandMark™ 20 INS/GPS “LN Series” Feature Guide

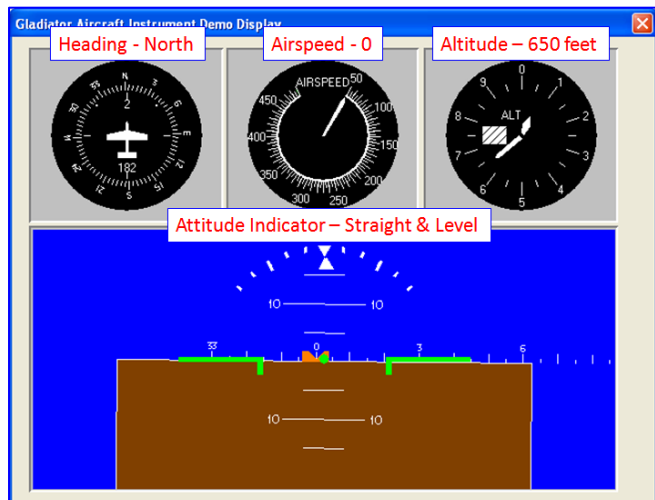
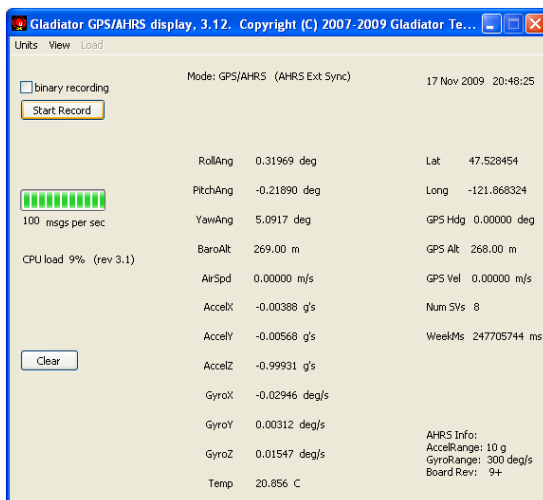
INS/GPS eXT “LN Series” Feature Guide	-3XX GPS-Aiding with Velocity Correction, Mags. & Barometric Pressure
Inertial	
Magnetic Heading	✓
Pitch, Roll & Yaw Angles - X, Y & Z	✓
Raw Inertial Data Accels - X, Y & Z	✓
Raw Inertial Data Gyros - X, Y & Z	✓
Redundant Altitude (Barometric Pressure)	✓
Temperature	✓
Barometric Pressure	✓
Raw Inertial Data Accels - X, Y & Z	✓
Raw Inertial Data Gyros - X, Y & Z	✓
Raw Magnetometer Data - X, Y & Z	✓
External Sync	✓
In-Field Calibration AHRs Capable	✓
Unit of Measure Selection	✓
Real-Time Display Software (in DEMO KIT)	✓
GPS	
Latitude	✓
Longitude	✓
GPS Altimeter	✓
GPS Velocity	✓
GPS Heading	✓
Number of Satellites	✓
GPS Week millisecond time (ms)	✓
GPS Week Number	✓
EGNOS, WAAS, MSAS Capable	✓
Kalman Filter CCA	
Single Synchronized (Time Correlated) Output	✓
GPS Turning Error Correction	✓
Turning Error Correction with Short-Term GPS Loss	✓
GPS Velocity Correction	✓
Accelerometer Velocity Correction	✓
Heading Aiding	✓
Barometric Aiding	✓

Description	Format	Source	LSB Weight
Start of message	U8	Fixed: 0x51	N/A
Message counter	U8	Mod 256 counter	N/A
Gyro - X axis	I16	AHRs	0.01 deg/sec
Gyro - Y axis	I16	AHRs	0.01 deg/sec
Gyro - Z axis	I16	AHRs	0.01 deg/sec
Accel - X axis	I16	AHRs	See note 6.
Accel - Y axis	I16	AHRs	See note 6.
Accel - Z axis	I16	AHRs	See note 6.
Temp - X axis	I16	AHRs	0.01 deg C
Roll Angle	I16	AHRs	0.01 deg
Pitch Angle	I16	AHRs	0.01 deg
Yaw Angle	U16	AHRs corrected with GPS	0.01 deg
Air Speed *	I16	AHRs - *Factory Option	meters/sec
Latitude	I32	POSLH - Latitude	1e-7 degrees
Longitude	I32	POSLH - Longitude	1e-7 degrees
TimeMs	U32	SOL - ms since start of week	1
TimeWeek	U16	SOL - week number	1
Baro Altitude	I16	AHRs corrected with GPS	meters
Altitude	I16	POSLH - height above mean sea level (MSL)	meters
Velocity	U16	VELNED 3-D velocity blended with AHRs accels	meters/sec
Heading	U16	VELNED - 2D heading	0.01 deg
No. of SVs	U8	SOL - Number of SVs	1
AHRs status	U8	AHRs: See note 4.	n/a
Status	U8	See note 5.	n/a
Checksum	U8	See note 1.	n/a
Total size (bytes)	50		
Output Rate	100Hz		

* Factory Option - Requires special configuration & pitot tube of 1.45 differential pressure analog input 0-5V

Messaging Protocol Notes:

- The checksum byte is the two's complement of the sum of all bytes in the message excluding the checksum byte.
- All 16-bit data are transferred in little-endian format (LSB first).
- Total transport time per message packet is 4.4ms:
 $Full: (46 \text{ bytes} * 11 \text{ bits/byte}) / 115200 \text{ bps} = 4.4 \text{ ms}$
- Status byte format: The status byte contains 5 error bits and 3 status bits (see User Guide).



Gladiator Technologies, Inc.



Copyright © 2010 Gladiator Technologies, Inc.

Gladiator Technologies, Inc.

8022 Bracken Place SE
 Snoqualmie, WA 98065 USA
 Tel: 425.396.0829 Fax: 425.396.1129
 Email: sales@gladiatortechnologies.com
 Web: www.gladiatortechnologies.com

Rev. Aug1610
 SN: 100