

## LandMark™ 40 INS/GPS



- **Small, Light Weight and Low Power MEMS GPS-Aided INS**
- **Precision Position Data Provided in the Case of Short-Term GPS Loss**
- **GPS-Aiding of Velocity & Altitude**
- **Low Noise Gyros**  $0.002^\circ/\text{sec}/\sqrt{\text{Hz}}$
- **Low Noise Accels**  $0.03\text{mg}/\sqrt{\text{Hz}}$
- **In-Run Gyro Bias**  $10^\circ/\text{hour } 1\sigma$
- **Heading**  $\pm 0.5^\circ$  stationary
- **Redundant Altitude**  $\pm 3$  meter  $1\sigma$
- **Fully Compensated Bias, Scale Factor, Misalignment, g-Sensitivity, Heading & Altitude**
- **RS485 Data Rate** 100Hz
- **GPS Receiver – 50 Channel & 5 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**  $+3.1\text{V}$  to  $+5.5\text{V}$
- **Light Weight**  $< 160$  grams
- **Small Size**  $< 108\text{cm}^3/6.6\text{in}^3$

The LandMark™ 40 INS/GPS offers break-through performance with ultra low noise MEMS gyros and accelerometers enabling precise position information even in the case of short-term GPS outage. The INS is integrated with GPS-Aiding in a small, light weight and low power ruggedized package. The unit provides RS485 output of position, velocity and precision time, altitude and delta velocity, delta theta, heading, pitch and roll angles. The inertial suite is integrated with a 50 channel C/A code GPS receiver with 5Hz position update rate. Turning error correction and acceleration algorithms in the firmware are standard as is a quick initialization routine for fast starts. The signature feature is the continued precise Kalman Filter INS position data provided even in the case of short-term loss of GPS. The high performance and low noise inertial sensors provide **fully compensated bias, scale factor, misalignment, g-sensitivity, heading, pitch and roll angles and redundant altitude** information in addition to position, velocity and time data. The unit is in a **ruggedized environmentally sealed package** that is EMI resistant and includes a **MILSPEC connector**. This GPS-Aided INS is highly durable and can withstand environmental vibration, shock and EMI typically associated with commercial aircraft and motorsports requirements. The LandMark™ 40 INS/GPS is well suited for low cost flight control, navigation, image stabilization, antenna stabilization and pointing, general aviation, automotive testing as well as laboratory use.



**Small, High Performance  
GPS-Aided MEMS INS**

Export Classification: Commerce ECCN7A994



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# LandMark™ 40 INS/GPS Feature Guide

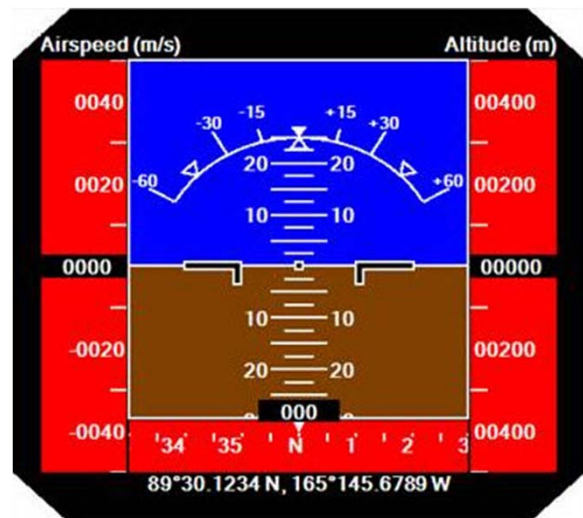
<b>LandMark™ 40 INS/GPS Feature Guide</b>	<b>-1XX GPS-Aiding with Velocity Correction, Mags. &amp; Barometric Pressure</b>
<b>Inertial</b>	
Magnetic Heading	✓
Pitch, Roll & Yaw Angles - X, Y & Z	✓
Inertial Data Velocities - X, Y & Z	✓
Inertial Data Gyros - X, Y & Z	✓
Redundant Altitude (Barometric Pressure)	✓
Temperature	✓
Barometric Pressure	✓
External Sync	✓
In-Field Calibration AHRS Capable	✓
Unit of Measure Selection	✓
Real-Time Display Software (in DEMO KIT)	✓
<b>GPS</b>	
Latitude	✓
Longitude	✓
GPS Altimeter	✓
GPS Velocity	✓
GPS Heading	✓
Number of Satellites	✓
GPS Week millisecond time (ms)	✓
GPS Week Number	✓
EGNOS, WAAS, MSAS Capable	✓
<b>Kalman Filter</b>	
Single Synchronized (Time Correlated) Output	✓
GPS Turning Error Correction	✓
Turning Error Correction with Short-Term GPS Loss	✓
Velocity Correction with Short-Term GPS Loss	✓
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
Velocity - X axis	I16	AHRS	0.01 m/s
Velocity - Y axis	I16	AHRS	0.01 m/s
Velocity - Z axis	I16	AHRS	0.01 m/s
Temp - Sensors	I16	AHRS	0.01 ° 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	0.01 m/s
Latitude	I32	POSLLH - Latitude	1e-7 degrees
Longitude	I32	POSLLH - 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	POSLLH - height above mean sea level (MSL)	meters
Velocity	U16	VELNED 3-D velocity blended with AHRS accels	0.01 m/s
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
<b>Total size (bytes)</b>	<b>50</b>		
<b>Output Rate</b>	<b>100Hz</b>		

\* 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 4.8ms:  
Full: (50 bytes \* 11 bits/byte) / 115200 bps = 4.8ms
- Status byte format: The status byte contains 5 error bits and 3 status bits (see User Guide).



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8022 Bracken Place SE  
Snoqualmie, WA 98065 USA  
Tel: 425.396.0829 Fax: 425.396.1129  
Email: [sales@gladiatortechnologies.com](mailto:sales@gladiatortechnologies.com)  
Web: [www.gladiatortechnologies.com](http://www.gladiatortechnologies.com)

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