

# DG16 GPS Board

*The standard in advanced, high-precision  
OEM GPS technology*



## Single Board Solution

The DG16™ is a low cost, new generation, sub-meter GPS+Beacon+SBAS receiver. DG16 is the perfect single OEM board solution for high-end integration. It incorporates signals from Satellite Based Augmentation Systems (SBAS), such as WAAS, EGNOS & MSAT, and an embedded Beacon receiver to provide sub-meter differential positioning — the 2 SBAS channels can be configured as 2 additional GPS channels offering a total of 14 GPS channels.

DG16 is a 16-channel receiver with 12 GPS L1 code and carrier channels, 2 optional SBAS channels and 2 optional 300 KHz DGPS Beacon channels. DG16 can provide up to 20 Hz precise three-dimensional position and raw data for real-time guidance and navigation. DG16 also incorporates our Integrated Differential Optimization™ techniques for using multiple sources of corrections and can output SBAS ranging, ephemeris and differential corrections as well as Beacon corrections through the serial port. While DG16 offers two standard and a third optional duplex RS232 ports, it is capable of single port operation; one serial port can do it all. Also, with the [X] option installed, you can create your own messages with the User Defined Messages software (UDM).

DG16 has better signal tracking and offers enhanced Edge™ and Strobe Correlator™ technologies for multipath mitigation and better accuracy in shady environment. DG16 consumes less power than its predecessor G12™ and can be programmed for low power/sleep mode operation. It also features improved in-band and out-of-band interference rejection capabilities. For best performance, DG16 can also be configured to use a Kalman filter with user selectable dynamic modes such as walking, ship, aircraft, adaptive, etc. to match the operating conditions.

## Compatibility

DG16 is backward compatible with G12 in both hardware and software. It has the same RF connector and the same 30-pin connector location and pin-out as the G12. It also uses the same standard Ashtech serial interface; allowing for easy and smooth upgrade.

## Multipath Mitigation

Multipath is the single largest cause of differential GPS position errors. The Strobe Correlator (patent pending) is a digital signal processing technique implemented in the hardware and

software of the DG16 receiver that removes multipath errors almost entirely for reflected signals with delays of 37 m or more. This represents the best DGPS multipath mitigation available today in GPS receivers—and it is available standard with the DG16. This means improved accuracy and greater reliability.

## Evaluation Software

Evaluate™ software is available with the DG16 and provides visual displays of satellite information (e.g., SNR), receiver position and velocity as well as data logging and analysis. It also allows direct communication with the receiver. Compatible with all of our receivers, the software runs on Window® version 3.x Windows 95®/98® and Windows NT® platforms.

## Take It For a Test-Drive

The DG16 Development Kit, which includes a fully loaded DG16 and all necessary components, enables you to perform a comprehensive test-drive. It contains a DG16 GPS board, the Evaluate software, power supply, ready-made interface cables, antenna, and manuals.

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**Preliminary**

# DG16 GPS Board Specifications

## Real-Time Position Accuracy<sup>1</sup>

**Autonomous**  
3.0 m (CEP)

**Differential<sup>2</sup>**  
40.0 cm (CEP)

## Velocity Accuracy<sup>1</sup> (knots)

0.1 (95%)

## Time to First Fix<sup>1</sup>

Re-acquisition	3 sec
Hot start	11 sec
Warm start	35 sec
Cold start	90 sec

## DG16 Features Include: \*

- 16 Channels
  - 12 GPS code and carrier
  - 2 SBAS (WAAS/EGNOS/MSAS)
  - 2 differential beacon
- Standard NMEA-0183 V3.0 output
- Selectable position and raw data rates up to 20Hz
- Position latency output
- Raw data output (code and carrier)
- 1 PPS (5V TTL)
  - Precision: 200ns (stand-alone)
  - 50ns (differential)
- Edge™ and Strobe Correlator™
- Differential base and remote RTCM V2.2, message types 1,2,3,6,9,16
- 20Gs tracking capability
- Kalman filter
- Event marker
- Session programming
- User-defined messages (UDM)
- Integrated Differential Optimization™
- Low power sleep mode
- Wide array of coordinate transformation options

\* Some of these features are optional.

## Communications

- 2 bi-directional RS-232 serial ports, up to 115,000 bps
- Optional third port
- External LED drivers

## Environmental & Physical

- Operating Temp: -30°C to +70°C
- Storage Temp: -40°C to +85°C
- Power Consumption: 1.2 W (receiver)  
0.3 W (antenna)
- Input Voltage: 5 VDC ±5%  
100 mV p-p ripple
- Size: 108 mm x 57 mm
- Connector: 30 pins
- Weight: 2.3 ounces
- Vibration:
  - MILSPEC 810E / Category 10  
"Minimum Integrity Test - General"
  - Sine sweep  
8.9 Gs  
20Hz-2KHz
- Shock: ±40G Operational  
±75G Non-Operational
- Acceleration: 20 Gs
- Humidity: 95% non-condensing
- Speed (max)<sup>3</sup>: 1,000 knots
- Altitude (max)<sup>3</sup>: 60,000 feet

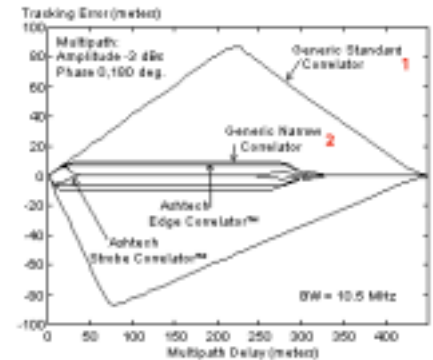
## DG16 Development Kit

The DG16 Development Kit includes a DG16 GPS receiver, GPS+Beacon antenna, power supply, cables, manuals and the Ashtech Evaluate™ and Mission Planning™ Software. The kit is loaded with all the firmware options available.

## Multipath Error Envelopes

1. Generic Standard Correlator Spacing, 1 chip
2. Generic Narrow Correlator Spacing, 0.1 chip

This figure shows the errors induced by a multipath signal half the strength of the direct signal. The horizontal axis of the plot shows the multipath



delay, this is the extra distance that the reflected signal travels compared to the direct signal. The vertical axis shows the induced range error caused by a multipath signal with the indicated delay.

From this plot you can see that typical narrow correlator performance and Edge Correlator performance is similar, while Strobe Correlator performance is much better, almost totally cancelling any multipath with a delay of more than 37 m.

<sup>1</sup> Accuracy and TTFF specs. based on preliminary tests. Tests at different locations under different conditions may produce different results.

Position accuracy specifications are for horizontal positioning. Vertical error is typically <2 times horizontal error.

<sup>2</sup> Differential positioning accuracies using a local base station over short baseline. Accuracy of differential positioning may degrade if using Beacon or SBAS.

<sup>3</sup> Higher altitudes and speeds available under validated export license.

Specifications are subject to change without notice.

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