DG14 Receiver

Advanced, High-Precision GPS Technology for Highly Demanding Applications

Key Features

- GPS+Beacon+SBAS receiver
- State-of-the-art multipath mitigation
- Moving base operation
- Heading plus pitch or roll against another device
- User Defined Messages

The DG14™ from Ashtech is a cost-effective, sub-meter GPS+Beacon+SBAS receiver. It incorporates signals from Satellite Based Augmentation Systems (SBAS), such as WAAS, EGNOS & MSAS, or an embedded beacon receiver to provide sub-meter differential positioning.

The DG14 comes standard as a 14-channel receiver with 12 GPS L1 code and carrier channels and two SBAS channels. Two additional DGPS beacon channels are available as an optional feature. The two SBAS channels can be configured as two additional GPS channels offering a total of 14 GPS channels. DG14 can provide up to 20-Hz precise three-dimensional position and raw data for real-time guidance and navigation. DG14 can output SBAS ranging, ephemeris and differential corrections through the serial port. While DG14 offers three standard RS232 ports, it is capable of single port operation. In addition, DG14 comes standard with User Defined Messages (UDM) software, a feature that enables the user to create custom messages.

DG14 incorporates Receiver Autonomous Integrity Monitoring (RAIM) that allows the receiver to detect and correct errors in the satellite signals. In addition, the DG14 features Horizontal Protection Level (HPL) output for aviation applications such as Automatic Dependent Surveillance Broadcast (ADS-B) stations. It also features improved in-band and out-of-band interference rejection capabilities. For best performance, DG14 can be configured to use a Kalman filter with adaptive dynamic mode or user can select dynamic modes such as walking, ship, aircraft, etc. to match the operating conditions.

RTK Engine

The DG14 receiver now supports RTK positioning with reliable decimeter to centimeter accuracy. The DG14 supports moving base operation and heading plus pitch or roll computation with auto-calibration for easy initialization. For best results, the DG14 rover can be configured to use SBAS signals in addition to GPS for RTK positioning with RTCM 3.0-compatible base station.

WADGPS Processing with (M) Option

The DG14 WADGPS algorithm has been developed by Ashtech to provide a position solution using corrections coming from a network of up to 24 base stations. The DG14 WADGPS algorithm has been extensively tested in operational conditions in various environments: North-Sea, Equatorial region and Southern Hemisphere, and has shown excellent results over medium-spaced (1500 km) network, even during ionospherically active days.

Integrated Differential Optimization (IDO)

With the IDO, you can choose either a single or multiple sources of corrections from up to seven sources/channels of corrections (serial port, SBAS, and beacon). Sources are selected in order of preference through a Primary-Secondary scenario mode or combined using a Multi-Base processing, automatically or manually.

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 DG14 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 DG14.

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DB14 Technical Specifications

Real-Time Position Acuracy[1] Autonomous

- CEP: 3.0 m (9.843 ft)
- 95%: 5.0 m (16.4 ft)

Differential[2]

- Local Base Station
  - CEP: 40 cm (1.31 ft)
  - 95%: 90 cm (2.95 ft)
- Beacon
  - CEP: 70 cm (2.30 ft)
  - 95%: 1.6 m (5.25 ft)
- SBAS
  - CEP: 1.0 m (3.28 ft)
  - 95%: 3.0 m (9.84 ft)
- RTK
  - Fixed RTK (kinematic)
  - sigma: 1 cm + 1 ppm[3,4]
- Flying RTK (kinematic)
  - CEP: 5 cm + 1 ppm[3,5]
  - CEP: 20 cm + 1 ppm[3,6]
- Heading, Pitch/Roll
  - Heading (sigma): 0.2 deg/baseline (m)[3,7]
  - Pitch/Roll (sigma): 0.4 deg/baseline (m)[3,7]

Velocity Accuracy[1] (knots)

- 0.1 (95%)

Time To First Fix[1]

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

Features

- 14 Channels
  - 12 GPS code and carrier
  - 2 SBAS (WAAS/ENGOS/MAS)
- Standard NMEA-0183 V3.0 output
- Selectable position and raw data ratas up to 20 Hz (maximum 10 Hz with RTK
- Position latency output: 20-40 ms
- Raw data output (code and carrier)
- 1 PPS (5V TTL)
  Precision: 200 ns (stand-alone
  50 ns (differential)
- Edge and Strobe Correlator
- Differential base RTCM V2.3,
  message types 1,2,3,6,9,16,18,19,22
- Differential rover RTCM V2.3 message types 1,2,3,6,9,16,18,19,22. RTCM V3.0 message types 1001-1006
- 20 G tracking capability
- Kalman filter
- Event market
- Session prgramming
- Integrated Differential Optimization™
- Low-power sleep mode
- Wide array of coordinate transformation options
- 3 bi-directional RS-232 serial ports, up to 115,000 bps
- External LED drivers
- Multi-base Differental with WADGPS (optional)
- Receiver Autonomous Integrity Monitoring (RAIM)
- User-defined Messages (UDM)
- On-board 2-Channel Beacon Receiver (optional)
- Horizontal Protection Level (HPL) Output
- Speed (max)[2]: 514 m/sec (1,000 knots)
- Attitude (max)[2]: 18287 n (60,000 feet)

RTK Base

- RTCM-2.3 & Types 3, 22, 18, 19
- 5 Hz update rate
- Moving base operation

RTK Rover

- Up to 10 Hz Fast RTK
- Compatible with RTCM, 2.3, RTCM-3.0, DBEN (proprietary)
- 5 Hz Synchronized RTK
- Heading and pitch or roll determination with auto-calibration
- Moving base operation
- Compatible with RTCM 2.3, RTCM-3.0, DBEN (proprietary)

Physical Characteristics

- Size: 108 mm x 57 mm
  (4.25 in x 2.25 in)
- Weight: 65.35 gr (2.3 ounces)
- Connector: DB-25

Power Characteristics

- Power input:+3.3V DC±10% power input
- Power consumption:
  - 1.2 W (GPS only)
  - 1.6 W (GPS + Beacon) 0.3 W (antenna)
- Input Voltage: 5 VDC ± 100 mV p-p ripple

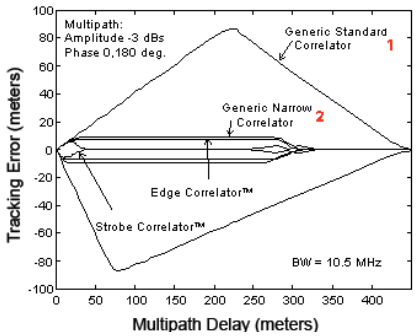
Environmental Characteristics

- Operating temperature: -30° to +60°C
  (-22° to +140°F)
- Storage temperature: -40° to +85°C
  (-40° to +185°F)
- Shock:
  ±40 G operational
  ±75 G Non-operational
- Vibration:
  MILS PEC 810E/Category 10
  "Minimum Integrity Test - General"
- Humidity: 95% non-condensing
- Acceleration: 20 G

Edge and Strobe Correlator

- Generic Standard Correlator Spacing, 1 chip
- Generic Narrow Correlator Spacing, 0.1 chip

This figure show the errors induced by a multipath signal half the strength of the direct signal.



The horizontal axis of the plot show the multipth 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.

[1]Accuracy and TTFF specifications based on tests conducted in Santa Clara and Moscow. Tests at different locations under different conditions may produce different results. Beacon tests based on 40 km baseline. Position accuracy may degrade with longer baselines.

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

[2]Options for altitude and/or velocity limits removed are available with proper authorization.

[3]Values correspond to open sky conditions. Performance may degrade with limited visibility, multipath, and high ionosphere activity.

[4]For baseline lengths <10 km.

[5]Steady state value for baselines <50 km after sufficient convergence time.

[6]Typical value after 3 minutes of convergence for baselines <50 km

[7]Typical value for properly installed antenna on vehicle body.

Other Configurations

DG14 Receiver are also available in a compact rugged sensor housing.

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