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Ashtech Z-12™ GPS Receiver

Full GPS Capability with Anti-spoofing Turned On



Fully upgradeable to Ashtech Real-time Z™ kinematic positioning system

The Z-Tracking™ Advantage

The *Dual-Line Digital* Z-12 GPS receiver sets the standard in performance and technology for precise surveying and navigation applications. This revolutionary GPS receiver permits uninterrupted use even when Anti-Spoofing (AS) is turned on. When AS is turned on, the Z-12 receiver automatically activates its Z - Tracking™ mode that mitigates the effects of AS. When AS is off, the Z-12 automatically reverts to P-Code mode with no glitches associated with a mode change.

The Z-12 is the result of major improvements in receiver design; RF, digital processing hardware, and substantial algorithmic improvement. Not only does it deliver unmatched performance in *Z* mode, but the performance in *P* mode is superior to earlier GPS receivers.

The technological advances represented by the Z-12 is even more dramatic under AS conditions where the patented Z-Tracking observables produce a better than 13 dB SNR advantage over *P-code-less* (cross-correlation) receivers, while maintaining the advantages of P-mode. A 13 dB SNR gain produces two great advantages:

- The ability to track rapidly varying ionosphere with full observable accuracy. This cannot be accomplished with cross correlating receivers.
- Acquisition transients settle in seconds while the competition has to wait minutes before their AS observables reach equivalent accuracy.

Both receiver modes measure: C/A carrier phase and pseudo-range, P1 and P2 carrier phase and pseudo-range, all with full (*not half*) carrier wavelengths. For most users, the performance when AS is enabled is indistinguishable from the *AS-off* performance.

Improved Surveying

Dual-frequency reception eliminates ionospheric refraction effects, so that medium-to-long baselines are measured more accurately. High-quality measurements on both L1 and L2 bands in the Z-Tracking or P-Code modes also enable significantly shorter occupations—this means increased productivity for survey crews. Centimeter-level surveying of baselines of one mile with one minute occupation times have been successfully demonstrated in Z-Tracking Mode!

Because of Ashtech's Dual-Line Digital processing capability, jam immunity is substantially improved over other single bit receivers. The receiver does not lose lock near transmitters or high voltage power lines. The result is higher productivity, robust performance and virtually no restrictions due to an encrypted satellite signal.

PNAV™ On-the-Fly Ambiguity Resolution

PNAV (*Precision Navigation*) software is a precision trajectory package that provides post-processed positions and cm-accuracy on-the-fly. This capability is especially valuable for creating robust photogrammetric flight trajectories.

Real-Time Positioning Capability

A standard Z-12 receiver can be used as a Real-time Z (RZ) base station without any additions. An RZ option to a second Z-12 receiver for rover operation and a radio data link complete the system. This produces precise, real-time cm-level position accuracies. In mobile applications, position accuracies are attained by automatically fixing integer ambiguities *on-the-fly*. In kinematic mode, a rover occupation time of only 10 seconds achieves the required position accuracies.

The rover system uses a Husky FS/2™ data collector for field operations. Depending on your application, software packages are available for seismic stakeout, topographic surveying and mine surveying. A custom backpack system, designed to accommodate GPS field surveying applications, is also available.

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Ashtech

Ashtech Z-12™ GPS Receiver Specifications

Measurement Precision[1]

C/A (>10° elevation)

Pseudo-range (raw/smooth)[2]	25cm/3.6cm
Carrier phase	0.9mm

P-Code AS Off (>10° elevation)

L1 Pseudo-range (raw/smooth)[2]	15cm/0.9cm
L1 Carrier phase	0.9mm
L2 Pseudo-range (raw/smooth)[2]	21cm/1.3cm
L2 Carrier phase	0.9mm

P-Code AS On (Z-Tracking)

L1/L2 Pseudo-range (raw/smooth)[2]	
10-30° Elevation	120cm/20cm
30-50° Elevation	25cm/6cm
>50° Elevation	10cm/3cm
L1/L2 Carrier phase	
<10° Elevation	1.4mm
Systematic Errors (Between Satellites)	
Pseudo-Range (all bands)	< 1.00cm
Carrier Phase (all bands)	< 0.01cm

1. Precision specifications are rms values for the lowest possible signal strengths as specified in ICD-GPS-200B. All values are based on observed double difference measurements.

2. The Z-12 receiver provides both raw and pseudo-range and a smoothing correction. Applying the smoothing correction to the raw pseudo-ranges yields the high accuracy pseudo-ranges.

Position Accuracy

Static, Rapid Static or Pseudo-Kinematic Survey	5 mm + 1 ppm
Real-time Differential Position	<1 m (PDOP <4)
Real-time Z Kinematic Position	
While moving (rms)	Horizontal 3cm Vertical 5cm
Static (rms)	Horizontal 1cm Vertical 1.7cm
Static occupation time	2 seconds (typ)

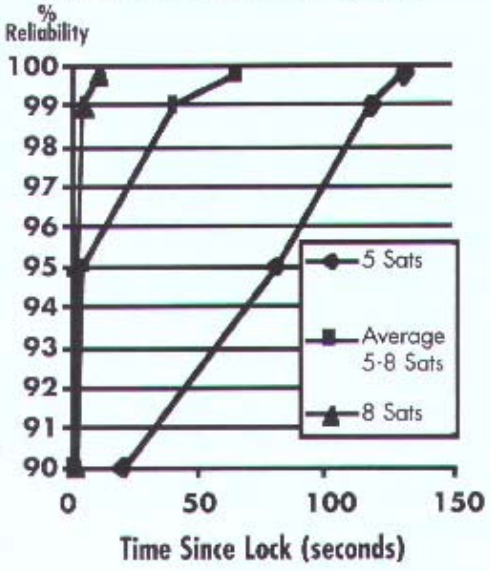
Sub-centimeter accuracy with longer occupation time.

Azimuth	0.15 - 1.5/baseline length in km

Ashtech P-code GPS receivers have been FGCC tested and are capable of performing first order surveys (report available upon request).

Carrier Phase Initialization

Carrier phase ambiguity resolution is a statistical process with a non-zero probability of error. To evaluate the performance of any system, one must look at both speed and reliability. The combination of Z-tracking and state-of-the-art algorithms give unprecedented performance in both speed and reliability. Moreover, you may select the confidence (with associated speed shown in the plot) appropriate for your application.



Environmental

Water resistance	Waterproof to 5 psi
Temperature Ranges	
Z-12 Receiver/Data Logger	
Operating	-20° to +55°C
Storage	-30° to +75°C
Antenna	
Operating	-40° to +65°C
Storage	-55° to +75°C
Humidity	100%

Physical Characteristics

Weight	
Receiver	8.5 lbs
Antenna	3.75 lbs
Dimensions	8.5"W x 3.9"H x 8"D (21.6 x 9.9 x 20.3cm)

Standard Features

- 12 Channel *All-In-View* operation
- Automatic Switching to Z-Tracking when AS is activated.
- Full wavelength carrier on L1 and L2
- 12 Watt power consumption
- 10 - 32 VDC input
- 2 Power inputs
- Audible alarm for low power
- Internal RAM data recorder
- 8-Line by 40-character display
- 4 RS-232 ports (115,200 baud max)
- Static, rapid static, kinematic, pseudo-kinematic surveys
- Waypoint navigation
- Real-time data outputs
- 1 PPS timing signal
- Cold start - 2 minutes to first data
- Warm start <30 seconds to first data
- 1 Year warranty

Standard Accessories

- Precision geodetic antenna
- 10-meter antenna cable
- External power cable
- RS-232 data cable (Z-format)
- Battery and charger
- Rotatable Tribrach adapter
- High-impact shipping case
- Receiver operating manual

Optional Features

- RZ Real-time Surveying Option
- External frequency standard input 1 to 20 MHz in 10KHz steps
- Real-time differential GPS RTCM format
- Expanded internal memory

Optional Accessories

- Choke Ring Antenna
- Backpack Kit
- Survey Tribrach
- Kinematic bipod and pole
- 10, 30 and 60-meter antenna cable Expandable to 150 meters w/line amps
- External battery
- Battery charger 110/120 VAC
- PRISM™ Software Package
- PNAV™ Software Package

Ashtech

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