

# Ashtech Z-12™

## GPS Receiver

### Full GPS Capability with Anti-Spoofing Turned On

Ashtech's "Dual-Line Digital" Z-12 GPS Receiver sets the standard in GPS receiver performance and technology for precise surveying and navigation applications. This revolutionary new GPS receiver permits uninterrupted use even when Anti-Spoofing (AS) is turned on. When Anti-spoofing is turned on, the Z-12 receiver automatically activates its Z-Tracking™ mode which mitigates the effects of AS. When AS is off, the Z-12 automatically reverts to P-Code mode.

The Z-12 is a new receiver. It is the result of major improvements in all areas of receiver design; RF, digital processing hardware, and substantial algorithmic improvement. As a result, not only does the receiver deliver unmatched performance in "Z" mode, but the performance in "P" mode is world-class (substantially improved over the performance of the pioneering Ashtech P-12).

The technological advance represented by this receiver is even more dramatic under Anti-Spoofing (A/S) conditions where the patented Z mode observables enjoy an over 13 dB SNR advantage over their "P-codeless" (cross-correlation) competitors while maintaining the P-mode's freedom from receiver-caused systematic errors. Indeed, the receiver measures the same things in both modes: C/A carrier phase and pseudo-range, P1 carrier phase and pseudo-range, P2 carrier phase and pseudo-range, all with full (not 1/2) carrier wavelengths. There are no "glitches" associated with a mode change, no changes in the already negligible systematic errors. For the overwhelming majority of users, the performance of the receiver when A/S is enabled is indistinguishable from the "A/S off" performance.

The Ashtech receiver's patented Z technique is the only available technology that offers an over 13 dB improvement in SNR over cross-correlating receivers along with full wavelength carrier phases on both P-code bands when A/S is enabled.

### Mile-a-Minute Surveying

Dual-frequency reception eliminates ionospheric refraction effects, which means medium-to-longer baselines can be measured more accurately. High-quality measurements on both the L1 and L2 bands in the Z-Tracking, mode or the P-Code mode also enable significantly shorter station occupation time - this translates into increased productivity for high-precision survey crews. Centimetre-level surveying of baselines of one mile using one minute station occupation times has been successfully demonstrated in [Z-Tracking Mode!](#)



### Seconds vs. Minutes

A 13 dB SNR advantage means a factor of 20 less in integration time for the same observable RMS. Based on actual measurements on real satellites, we need to integrate for 10 seconds to the cross correlation competition's 5 minutes. There are two great advantages to having shorter correlation times for the same SNR:

- 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 A/S observables reach equivalent accuracy.

The ability to derive any useful information at low elevations is critically tied to SNR. When faced with low SNR, the user has a terrible choice: either integrate for such a long time that there is essentially no data at low elevations, or accept huge errors. For all non-classified--"A/S on" solutions, the SNR falls off with elevation angle as the square of normal code SNR. That is, if the P mode SNR drops (with elevation angle) by a factor of 4, all civilian A/S techniques yield a drop in the SNR of a factor of 16.

### Better Jam Immunity

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

Ashtech's newest application software package is called PNAV (for Precision Navigation). This software, combined with dual-frequency data from Z-12 receivers provides a powerful new capability in GPS. PNAV is a precision trajectory package providing post-processed positions and can provide centimetre level accuracy on-the-fly. This capability is especially valuable for creation of robust photogrammetric flight trajectories.

A PNAV survey version which produces vectors for network adjustments is a standard feature of the PRISM II™ software package.



# Z-12 TECHNICAL SPECIFICATIONS

## Measurement Precision

### C/A(>25°)

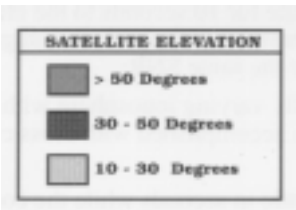
Carrier phase (1 sec)	(25 Hz)	0.15 cm
Pseudo-range (5 sec)	(10 sec)	20.00 cm
		3.60 cm

### P-Code A/S Off (>25°)

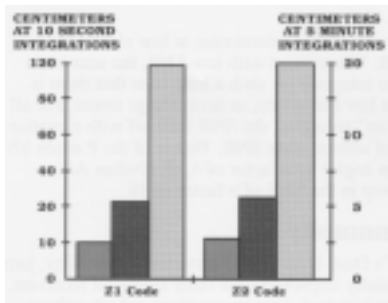
L1 Carrier phase (5 min)	(10 sec)	0.10 cm
L1 Pseudo-range (5 min)	(10 sec)	5.00 cm
	(5 min)	0.90 cm
L2 Carrier phase (5 min)	(10 sec)	0.10 cm
	(5 min)	0.02 cm
L2 Pseudo-range (5 min)	(10 sec)	7.00 cm
	(5 min)	1.30 cm

Real-Time Differential Position (PDOP<4) <1 m  
 Static, Rapid Static or Pseudo-Kinematic Survey 5 mm + 1 ppm

### P-Code A/S On (Z-Tracking)



OBSERVABLE RMS IN CENTIMETERS FOR THE Z-12



### Systematic Errors (Between Satellites)

Pseudo-Range (all bands)	<1.00 cm
Carrier Phase (all bands)	<0.01 cm

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

Z- 12, Z-Tracking, PNAV and PRISM II are trademarks of Ashtech Inc.

Specifications are subject to change without notice

## Environmental

Waterproof to 5 psi

### Temperature Ranges

Receiver/Data Logger	Operating: -20° to +55°C
	Storage: -30° to +75°C
Antenna	Operating: -40° to +65°C
	Storage: -55° to +75°C

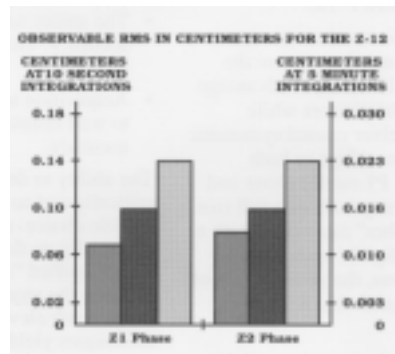
### Humidity

Weight	100%
Receiver	4.0 kg
Antenna	1.7 kg

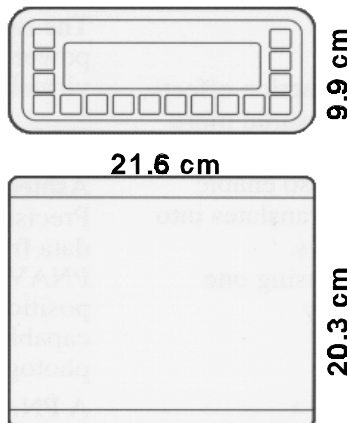
Speed (Max) Does not exceed 1,000 nautical miles-per-hour

Altitude (Max) Does not exceed 60,000 Ft.

OBSERVABLE RMS IN CENTIMETERS FOR THE Z-12



## Dimensions



## Standard Features

- 12 Channel "All-In-View" operation
- Automatic Switching to Z-Tracking when A/S is activated.
- Full wavelength carrier on L 1 and L2
- 21 Watt power consumption (typical)
- 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

## Standard Accessories

- Precision geodetic antenna
- 10-metre antenna cable
- External power cable
- RS-232 data cable (Z-format)
- Battery and charger
- Rotatable Tribrach adapter
- High-impact shipping case
- Receiver operating manual (Shipping weight of standard Z-12 package is 48 pounds)

## Optional Features

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

## Optional Accessories

- 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 II™ Software Package
- PNAV Software Package

\*Display off/with LNA.

## For Rental Information:

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