

ProBeacon

Marine Radiobeacon MSK Receiver

Key features and benefits

- High noise immunity
- Rapid signal acquisition
- Automatic and manual modes
- FFT signal analysis

Differential GPS correction data broadcast from marine radiobeacons provides GPS users with the improved accuracy of DGPS without setting up and maintaining a reference station. Depending on the DGPS receiver being used in conjunction with the ProBeacon™, the combination can provide position and navigation accuracies of less than a meter to land surveyors, dredge operators, resource management agencies, crop dusters, and many others operating on land, offshore or in the air. Anyone within the range of a radiobeacon, whose application requires real-time positions, time, or velocity can benefit from this form of DGPS.

RTCM and IALA complaint

The International Association of Lighthouse Authorities (IALA), the U.S. Coast Guard and the Radio Technical Commission for Maritime Services (RTCM) have developed standards for the broadcast of DGPS correction data for public access.

All digital design

Obtaining the highest levels of DGPS performance requires a superior MSK receiver. Trimble's ProBeacon is an all-digital design, proven in independent testing to have the best overall performance, even under conditions



Differential GPS using MSK radiobeacon broadcasts.

of low signal strength and/or high noise levels. This all-digital design facilitates rapid signal acquisition and superior tracking capabilities. In addition, the ProBeacon signal processing is based upon a proprietary (patented) "noise cancellation" technique utilizing multiple channels to further improve data reception by rejecting the "impulsive" type of noise commonly found in this frequency band.

The ProBeacon also utilizes advanced logic, working in conjunction with the DGPS receiver to select the most appropriate beacon. The ProBeacon constantly monitors Message Error Ratio,

switching to a different beacon if the signal degrades. By utilizing the broadcast beacon almanacs and receiving the position data from the DGPS receiver, the ProBeacon switches to the nearest beacon to maintain the highest accuracy possible.

H-field loop antenna

These features, combined with an advanced, high sensitivity H-field antenna, ensure that the DGPS user realizes the best performance under all conditions.

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DESCRIPTION

Differential GPS (DGPS) is the most accurate long range form of GPS for surveying, positioning and navigation. GPS receivers that are differential capable use the correction data to counter the effects of Selective Availability, errors induced by the ionosphere and troposphere and other correlated errors that degrade the GPS solution. The ProBeacon is designed to provide this correction data in the RTCM SC-104 standard format to any compatible DGPS receiver, using standard RS-232 and RS-422 serial connections. Accuracy will depend on the type of DGPS receiver utilized. Trimble offers several GPS receivers with DGPS capability designed to meet all types of application requirements.

PERFORMANCE CHARACTERISTICS

General

Frequency range	283.5 kHz to 325.0 kHz
Channel spacing	500 Hz
MSK modulation	25, 50, 100 & 200 bits/second
Signal strength	10 μ V/meter minimum
Dynamic range	100 dB
Channel selectivity	60 dB @ 500 Hz offset
Frequency offset	10 ppm maximum (200 bits/second) 40 ppm maximum (100, 50 & 25 bits/second)
3rd order intercept	+15 dBm @ RF input (min. AGC setting)

PHYSICAL CHARACTERISTICS

Receiver

Size	5.6 W x 2.7 H x 7.5 D (14.2 cm x 6.9 cm x 19.0 cm)
Weight	2.5 lbs. (1.1 kg)
Power consumption	3.5 watts
Voltage	10 to 32 volts DC
Operating temperature	-20°C to +60°C
Humidity	95% non-condensing

Antenna

Dimensions	5.8 D x 4.5 H (14.7 cm x 11.4 cm)
Weight	1.4 lbs. (0.63 kg)
Operating temp	-30°C to +65°C
Humidity	100% - fully sealed
Cable length	50 ft. (15 meters)

FEATURES

Automatic

The ProBeacon serves as a stand-alone receiver of DGPS correction data. Once on, it automatically selects and tracks the best differential beacon in your area. If you lose reception of a differential beacon, the ProBeacon automatically switches to another beacon for continuous DGPS coverage.

Manual

Manual mode allows the operator to select a specific beacon, to pre-program a list of preferred beacons, and to request signal levels, SNR data, PLL offsets, RTCM message errors, and tracking history.

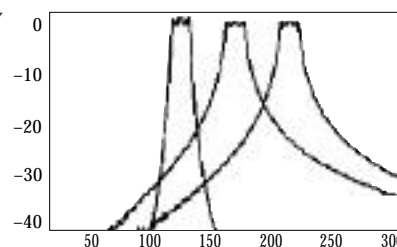
Fast acquisition

The ProBeacon uses a proprietary spectral search algorithm which enables exceptionally fast identification and acquisition of differential beacons under all operating conditions.

Jamming immunity

Only a subset of all marine radiobeacons will be differential beacons. The ProBeacon is able to track a weaker differential beacon signal in the presence of multiple jamming signals from nearby standard radiobeacons.

Normalized Frequency



Integrity monitoring

The ProBeacon continuously monitors the integrity of incoming RTCM messages. If it observes parity errors, the ProBeacon will automatically switch to an adjacent beacon to ensure RTCM data integrity.

Noise immunity

Using advanced digital signal processing, the ProBeacon reliably tracks even in the presence of heavy atmospheric noise (e.g. lightning). Using algorithms based on a proprietary (patented) noise cancellation technique, the ProBeacon realizes improved performance in the presence of impulsive noise. As shown in the above figure, the signal channel plus two additional channels are monitored by the MSK receiver. These two noise-only, or pilot, channels facilitate noise reduction as the output from all the channels is highly correlated. Reduction in noise in the signal channel improves the performance of the ProBeacon in all operating environments.

Almanac monitoring

Each differential beacon broadcasts an almanac message with the identity (frequency, data rate, etc.) for adjacent differential beacons. The ProBeacon uses this message to accelerate the switch between beacons. This minimizes the interruption in DGPS data when you lose reception of a beacon.

Dual serial ports

The ProBeacon offers two bi-directional serial ports and multiple baud rates (1200, 2400, 4800, 9600). Both RS-232 and RS-422 are supported. One port supports modem operation, allowing remote control of the ProBeacon

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