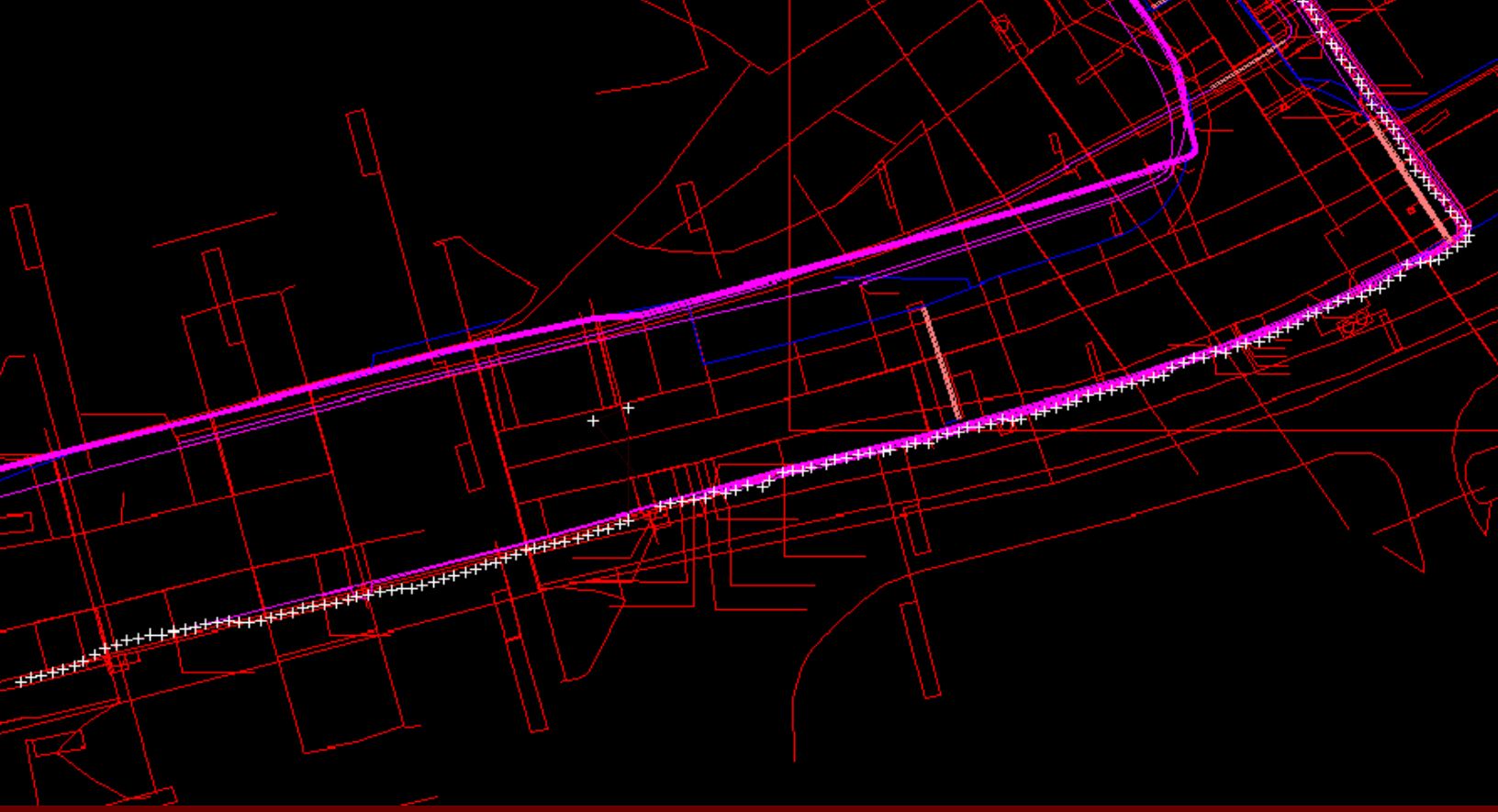

Underground Utility 3-D Survey

Datasheet

Spar 300
Spar 300 RL1G1

Version 1.1

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Spar Receiver Hardware

Item	Parameter
Construction	High impact thermoplastic (ABS) injection molded housing 32-mm (1.25”) diameter carbon fiber reinforced pole separating two sensors Brass inserts hold two quick-release stainless steel spuds
Weight	1.4 kg (3.1 lb)
Dimensions	61 cm X 11 cm (24” X 4.5”)
Antennas	Two 3-axis orthogonal loop magnetic antennas, 500:1 secondary loop ratio (total of 6 antennas)
Battery	Samsung SB-L320 4,000mAh camcorder battery, replaceable. 5 hour life with Ashtech MB100 RTK-GPS, or 10 hours without the RTK board
Host Interface	RS-232 or Bluetooth, fixed baud rate: 115,200 bits per second
Other I/O	USB device for Spar software updates, option upgrades, and RTK trouble ticket generation (internal USB hub)
Approvals	CE: ❖ Radiated Emissions: EN61000-6-4 ❖ Electrostatic Discharge: EN61000-4-2 ❖ Radiated RF Immunity, EN 61000-4-3 ❖ Power Frequency Magnetic Field Immunity: EN61000-4-8 FCC Part 15, Class A digital device, unintentional radiator
Fully qualified Class 1 Bluetooth 2.1/2.0/1.2/1.1 module	❖ USA FCC CFR47 Part 15 C, ¶15.247, FCC ID: T9J-R41-1 ❖ EUROPE EN 300 328-1, EN 300 328-2 2.4GHz ❖ CANADA IC RSS-210 low power comm. Device, IC Canada ID: 6514A-RN411 ❖ Bluetooth LISTED B013180
Other	RoHS compliant
Standard Accessories	❖ USB data cable ❖ Two Li-Ion 4Ah batteries ❖ 100/120/200/240 VAC mains charger ❖ Soft carry bag
Optional Accessories	❖ Vivax-Metrotech 10W Transmitter Loc-10Tx, with special low 32 Hz frequency ❖ Ashtech MB-100 RTK-GPS/GLONASS Board ❖ External professional GNSS antenna (L1 frequency) ❖ 982 Hz high power sonde for geospatial positioning of ducts and pipes ❖ Carbon fiber range pole with brackets for Spar, Tablet, and GNSS antenna ❖ Mounting brackets and quick-release clamps ❖ 30-minute quick charger with AC/12VDC input
Software	❖ FieldSens View ❖ Trimble Access™ (available from Trimble)

Spar Measurement Features

Item	Parameter
Configurations	❖ One or Two Spar mode ❖ Sonde or Line geospatial mapping ❖ GNSS: Internal (Ashtech MB100 RTK board), External, or None ❖ Spar height above ground ❖ GNSS antenna offset to spar center ❖ Units of measure (feet/meter) ❖ Language
Operating Frequencies	22, 32, 50, 60, 64, 80, 98, 100, 120, 128, 491, 512, 640, 577, 815, 982, 1024 1520, 8192, 8440, 9820 Hz
Pinpointing Performance (with undistorted signal source)	***Single Spar*** Geospatial position pinpointing accuracy: ❖ Up to 9ft (3m) – 5% of radial distance to targeted utility or sonde[1] Current measurement accuracy: ❖ Up to 9ft (3m) – 5% of actual current ***Dual Spar*** Geospatial position pinpointing accuracy: ❖ Up to 50ft (15m) – 5% of radial distance to targeted utility or sonde[1] Current measurement accuracy: ❖ Up to 50ft (15m) – 5% of actual current
Geospatial Information	❖ FieldSens View software automatically merges measured offsets to the utility line or sonde transmitter with the geospatial position of the GNSS subsystem. ❖ Geospatial solution data logging is always active. All results (depth, offset, range, yaw, and AC current are stored in the selected folder, based on: ➢ User selected update on time interval (200 msec to 10 sec), distance step (centimeters to meters), or manual command. ➢ User selected tolerance mask for both horizontal and vertical expected error. Locate confidence can be merged with the GNSS RMS error. Points will only be logged if the aggregate error is less than the specified values. ❖ All raw field and body orientation data is logged: enables playback offline with different settings (averaging, logging interval, tolerances)

Locating Information (descriptions may refer to optional software components)	❖ Signal strength: screen-based spatial locating tiles the map view with color representing signal strength. Permits a rapid acquisition of the utility target to begin model-based location. ❖ Compass: line direction indicator for both upper and lower 3-axis sensors ❖ Internal battery condition ❖ Operating frequency
Transmitter Compatibility	Any standard locating transmitter is supported at the above stated frequencies. No special modulation method is required. No line transmitter is required when tracking sondes.

1. Using the SONDH982 sonde transmitter, a high power, current stabilized 982 Hz sonde accessory.

Spar Receiver Sensitivity[1] (at 1 meter, or 3.2 feet)

Item	Locate[2]	3-D Geospatial Solution[3]
50/60 Hz Power	5 mA	50 mA
491, 512, 640 Hz	500 µA	5 mA
8192, 8440, 9820 Hz	25 µA	250 µA

1. Sensitivity is dependent on field conditions, primarily interference sources. Spar results are always presented with expected RMS accuracy, which will take into account all on-site field conditions.
2. Sensitivity at which spatial locating can distinguish a doubling of signal level.
3. 3-D Geospatial solution sensitivity is the level at which a 5% accurate solution is attainable in typical field conditions.

Spar Environmental Specifications

Item	Parameter
Temperature Range	Operating: -4ºF to 122ºF (-20ºC to 50ºC) Storage : -40ºF to 140ºF (-40ºC to 60ºC)
Weather	IP54 and NEMA 4
Shipping Weight	4 kg
Shipping Dimension	72 X 15 X 20 cm (28 X 6 X 8 inches)
Humidity	95% non-condensing
Shock	MIL-STD 810F, Fig. 516.5-10 (40g, 11ms, saw-tooth)
Vibration	MIL-STD 810F, Fig. 514.5C-17

Spar Warranty

Item	Parameter
Warranty	12 months

Ashtech MB100 GNSS Board (Optional Component)

Item	Parameter
GNSS Characteristics	❖ 45 channels: ➢ GPS and GLONASS L1 C/A, ➢ SBAS (WAAS / EGNOS / MSAS), ❖ Fully independent code and phase measurements ❖ Advanced multi-path mitigation ❖ Ashtech BLADE technology for optimal performance
Features	❖ 5 Hz simultaneous RTK-GPS, GLONASS, SBAS (L1 frequency) ❖ RTK base and rover modes, supports dual-spar moving baseline ❖ Easy-to-use trouble ticket (ATL)
RTK Base	❖ RTCM-2.3 & RTCM-3.1 ❖ CMR & CMR+ ❖ DBEN & ATOM (Ashtech format) ❖ Moving base operation
RTK Rover	❖ RTCM-2.3 & RTCM-3.1 ❖ CMR & CMR+ ❖ DBEN, LRK & ATOM (Ashtech formats) ❖ Networks: VRS, FKP, MAC ❖ NMEA0183 message output ❖ RTK with moving base operation
RTK Initialization	Range ❖ Up to 10 km typical Time To First Fix (TTFF) [1] ❖ Re-acquisition: 3 sec ❖ Hot start: 11 sec ❖ Warm start: 35 sec ❖ Cold start: 45 sec (after Spar 300 power is applied)
Accuracy	SBAS ❖ < 50 cm typical Horizontal DGPS ❖ < 30 cm + 1 ppm typical Horizontal [2,3] Flying RTK ❖ 5 cm + 1 ppm typical Horizontal for baselines < 50 km [2,3] RTK ❖ Horizontal: 1 cm + 1 ppm [2,3]

- Vertical: 2 cm + 1 ppm [2,3]

1. Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality. Position accuracy specifications are for horizontal positioning. Vertical error is typically < 2X horizontal error.
2. Performance values assume minimum of five satellites, following the procedures recommended in the product manual. High multi-path areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.
3. Steady state value for baselines < 50 km after sufficient convergence time.

Overall Geospatial Positioning Accuracy

Item	Parameter
For spar versions with internal Ashtech GNSS Boar	Total accuracy is derived by taking the square root of the sum-of-squares of the GNSS accuracy and the Locating accuracy. This is done on every measurement result automatically, and presented as the effective tolerance of the 3-D utility position.
L1 DGPS	30-cm with differential corrections, 50-cm with WAAS
L1 RTK-GPS+GLONASS	10-cm typical, 1-cm after fix

Specifications are preliminary and subject to change without notice.