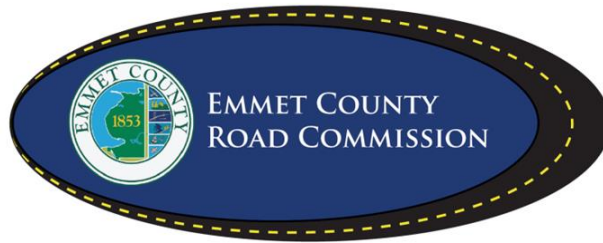


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MULTI-CONSTELLATION GNSS RTK SURVEY SYSTEM

INVITATION TO BID

General Clauses & Conditions

January 13, 2021

Sealed bids will be received by the Emmet County Road Commission at their offices located at 2265 E. Hathaway Road, Harbor Springs, MI, until 9:25 a.m., Tuesday, February 16, 2021, at which time they will be opened and read aloud for a Multi-Constellation GNSS RTK Survey System.

The equipment furnished under these specifications shall be the latest improved model in current production to commercial trade and shall be of quality workmanship and material. The bidder represents that all equipment offered under these specifications shall be new. USED, SHOPWORN, DEMONSTRATOR, PROTOTYPE, OR DISCONTINUED MODELS ARE NOT ACCEPTABLE.

Bidders are requested to submit with their bid the latest print literature and detailed specifications of the equipment offered.

All parts not specifically mentioned which are necessary for the unit to be complete and ready for operation or which are normally furnished as standard equipment, shall be furnished by the successful bidder. All parts shall conform in strength, quality, and workmanship to the accepted standard of the industry.

Any variation from these specifications must be included on the Bid or on a separate attachment to the Bid. This sheet shall be labeled as such.

Specifications –Functional Requirements

Hardware

General Description

This bid is for a Topcon VR Base/Rover kit UHF 440-470MHz - kit # 1028516-01 or equivalent.

- This high-precision GNSS measurement system must have the following items:
 - Integrated GNSS receiver, antenna, and wireless communications.
 - 226 Universal channel GNSS receiver that features GPS, GLONASS, GALILEO, BEIDOU, QZSS and SBAS tracking.
 - Receivers must fully integrate with and support our existing Magnet Field software from Topcon including TILT functionality.
 - Receiver kit hard-case, capable of housing two GNSS receivers, data collector and accessories.

Integrated Receiver

- GNSS receiver, antenna, integrated UHF radio, internal memory and *Bluetooth*[®] wireless technology must be integrated into a single unit that can be mounted on top of a standard tripod, adjustable range pole or fixed height pole.
- GNSS receiver shall have the option for integrated UHF radio with additional wireless options for LTE (4G) cell modules.
- GNSS receiver shall feature an integrated 9-axis Inertial Measurement Unit (IMU) that can compensate mis-leveled field measurements up to 15 degrees.
- GNSS receiver shall feature an L-Band correction service to provide continuous coverage during RTK base station or network outages.
- GNSS receiver shall support a baseline length of up to 50km, depending on atmospheric and multipath conditions.
- GNSS receiver shall support an initialize time from 1 second depending on the baseline length (D) and multipath conditions
- GNSS receiver shall support 1 Hz standard: 10, 20 Hz optional output intervals for CMR/RTCM
- GNSS receiver shall support an elevation of 0 to 90 degrees (independent of data logging)
- GNSS receiver shall support a solution mode of delay (synchronization) or extrapolation (not synchronized)
- GNSS receiver shall support the following ‘real-time’ accuracies:
 - RTK: H: 3mm + 0.8ppm; V 5mm + 1.0ppm
 - DGPS (RTCM): H <0.25m V <0.50m
 - GNSS receiver shall support the following ‘static’ accuracies:
 - H: 3mm + 0.4ppm (x baseline length); V: 5mm + 0.5ppm (x baseline length)
 - GNSS receiver shall support the following ‘standalone’ accuracies:
 - H: 1.2m V: 1.8m

- GNSS receiver shall support the following 'DGPS' (SBAS) accuracies:
 - H: <1.0m V: 1.5m
 - GNSS receiver shall support the following start times to acquisition:
 - Cold Start <40sec
 - Warm Start <20sec
 - Reacquisition <1sec
 - GNSS receiver shall feature a Time to First Fix (TTFF) of <20 sec after startup procedure is completed.
- GNSS receiver shall support the following frequencies on 226 universal channels:
 - GPS L1 C/A, L1C, L1P(Y), L2P(Y) L2C, L5
 - GLONASS L1 C/A, L1P, L2C/A, L2P, L3C
 - GALILEO E1, E5a, E5b, E5AltBOC
 - BEIDOU B1, B2
 - QZSS L1 C/A, L1C, L2C, L5
 - IRNSS: SPS-L5
 - SBAS (WAAS/EGNOS/MSAS)
 - L-band: 1525-1560 MHz
- GNSS receiver must use a shock and vibration mitigation technique to stabilize GNSS timing signals.
- The integrated receiver must include an integrated GNSS survey-grade antenna.
- GNSS receiver shall feature a 7 LED display that indicates battery life, remaining memory, satellite usage, occupation timer, indications when data is being recorded and notification of COM port and *Bluetooth* link activity.
- The occupation timer must provide the user with an indication as to when enough data has been collected for a particular length of baseline.
- GNSS receiver must have a power button that allows the user to turn the receiver on or off, reset the receiver to its factory defaults and erase memory.
- GNSS receiver shall give audible notification of the following events:
 - GNSS receiver turned on and has successfully completed the boot/self-test cycle
 - GNSS receiver's power button has been held long enough to power off the receiver
 - GNSS receiver is powering off
 - GNSS receiver's power button has been held long enough to initiate a hard reset (factory default reset) of the receiver
 - GNSS receiver's power button has been held long enough to initiate the erasing of the files on the internal memory card
 - GNSS receiver's power button has been held too long for any action to take place, and releasing the button will do nothing

- GNSS receiver's memory is full and the current configuration is to write to the memory
- GNSS receiver should automatically open a file and begin recording data after being powered on.
- GNSS receiver shall be capable of output of raw GNSS measurements for post-processing to the internal memory card or an external device such as a PC.
- GNSS receiver shall effectively track satellites at a 10-degree elevation mask.
- GNSS receiver shall have one (1) power input port, one (1) RS-232 serial data port, one (1) USB port, one (1) external GNSS antenna port, one (1) external radio antenna port
- GNSS receiver shall feature a ODU-5 power connector
- GNSS receiver shall be capable of being operated from a PC using commercially available serial communication software.
- GNSS receiver shall incorporate *Bluetooth* technology for wireless communication with a data collector.
- GNSS receiver shall have the capability to turn off the internal *Bluetooth* enabled devices if not in use.
- GNSS receiver shall have the capability to rename the internal *Bluetooth* browsing name.
- GNSS receiver shall have the capability to operate without the use of any cable(s) when operating in any application including RTK, static and kinematic post-processing data collection.
- GNSS receiver shall be capable of being powered from a 9V to 27V (< 2.5Amps) DC power source.
- GNSS receiver shall accept multiple user-defined scheduled events to operate at specified times without requiring the user to manually power up the unit.
- GNSS receiver shall support a MINTER logging interface whereby static files can be started and stopped with the push of a button, without powering down the receiver.
- The MINTER user interface can be customized via mobile or desktop utility software.
- The integrated GNSS receiver must weigh less than 1.061 kg (2.34 lbs.).
- The integrated GNSS receiver's size should not exceed (mm) 149(w) X 149(l) X 94.6(h).
- GNSS receiver must be waterproof, fully sealed and submersible.
- GNSS receiver must be resistant to 100% condensing humidity.
- GNSS receiver must be completely protected against dust and water ingress (IP67)
- GNSS receiver must be RoHS compliant.
- GNSS receiver must be composed of magnesium alloy housing.
- GNSS receiver must operate in a temperature range of -40° to +65° C using external power source.
- GNSS receiver must operate in a temperature range of -20° to +50° C using battery power (non-charging).
- GNSS receiver must feature a storage temperature of -40° to +85° C

- The internal batteries must provide power to the receiver during RTK and static operations.
- The internal batteries must be able to power the integrated GNSS receiver for at least 5 hours of operation.

- **Integrated UHF Radio**

- Integrated UHF radio will operate at a frequency range of 425-470 MHz.
- Integrated UHF radio will support 6.25 KHz, 12.5 KHz and 25 KHz channel spacings.
- Integrated UHF radio will support transmitter carrier powers of 100, 200, 500 and 1000 mW, user selectable
- Integrated UHF radio will support a dynamic range of -110 to -10 dBm
- Integrated UHF radio will support a serial data rate of 115200bps
- Integrated UHF radio will support modulation techniques of GMSK and 4FSK.
- Integrated UHF radio will support a receiver sensitivity as follows:
 - GMSK: -115 dBm at 10⁻⁵ BER and 12.5 KHz spacing
 - 4FSK: -106 dBm at 10⁻⁵ BER and 12.5 KHz spacing
- Integrated UHF radio will support an antenna connector type BNC
- Integrated UHF radio will support a data interface baud rate of 115200 bps.
- Integrated UHF radio will support user selectable Forward Error Correction (on/off).
- Integrated UHF radio will support Scrambling (on/off).
- Integrated UHF radio will support a 'time division duplex' communication mode.
- Integrated UHF radio will operate as a transmitter, receiver or repeater.
- Integrated UHF radio will support the following protocols:
 - TPS
 - PDL
 - Trimble
 - Satel 3AS

- **Integrated Bluetooth**

- Integrated unit will feature a range of up to 50 m (indoor); up to 1000 m (outdoor)
- Integrated unit will feature a Class 1 unit.
- Integrated unit will feature SPP and Long Link™ profiles
- Integrated unit will feature North America and Europe frequency country codes