

Specifications for SIX (6) GNSS Network Rover Systems

The Alabama Department of Transportation is requesting bids for a quantity of **FIVE (5)** GNSS Network Rover Systems with built-in SATEL UHF Radio Receiver better than or equal to the Leica GS14 Profesional GNSS Receiver and **ONE (1)** GNSS Network Rover System with built-in SATEL UHF Radio Receiver and Transmitter better than or equal to the Leica GS15 Performance, GPS L1/L2, RTK GNSS Receiver providing position corrections a minimum range of 2 miles. The system must allow for a direct download of binary raw and RTK data into the Department existing post processing software.

Each system will require all necessary setup equipment for static observations (tripod, tribrach, carrier, controller bracket, height measuring device, etc...) and a controller better than or equal to the Leica Viva CS15. The following technical requirements or equal must be met in order to meet the functional requirements of the DOT.

Real Time GPS System Rover Requirements

General

- a) The system shall have the capability to perform Real Time Kinematics (RTK) surveys.
- b) The system shall consist of two primary components: antenna/receiver/radio modem and controller/wireless data modem.
- c) The system shall be configured for an "All on the Pole" setup. The system shall be wireless and transmit data from the receiver to controller display unit (CDU) via Bluetooth technology.
- d) The system shall weigh no more than 6.5 lbs. when assembled all on the pole including batteries and the 2 meter pole.
- e) The system shall be configured either as reference or rover unit, for real time or static data collection operation.
- f) The system shall support both UHF radio modem and wireless data modems for RTK data transmission.
- g) The system shall be capable of performing RTK while simultaneously recording both field coordinates, raw GPS measurements and codes/attributes without the need to purchase onboard memory.
- h) The user shall be able to perform Static, Rapid Static, Stop-and-Go, Kinematics and Kinematics On-The-Fly surveys in Real Time Mode.
- i) RTK Initialization to resolve ambiguities shall include 'On-The-Fly' (OTF), 'Static on Unknown Point' and 'Static on Known Point' scenarios.
- j) The CDU shall be capable of utilizing a dual-processing task to permanently check the real time carrier phase ambiguity values.
- k) Reliability of OTF initialization must be better than 99.99%.
- l) The CDU shall indicate to the user the ambiguity resolution status at all times.
- m) The CDU shall provide information, such as satellite tracking status, battery status and memory capacity, of both the roving unit and the base unit when the user is operating the rover unit.
- n) The system shall provide stakeout features with different orientations. See section 'Real Time Stake-Out'
- o) The system must come standard with the following software capabilities: Data management, full COGO, line and arc staking, point and road staking, and cross section surveying.
- p) The system must have the capability of receiving and processing a GPS NETWORK correction from the existing ALDOT reference station network.

Field Operations

- a) The system shall automatically begin tracking satellites and initialize integer ambiguities when powered on without user interaction.
- b) It shall display the following information:
 - Number of satellites tracked verses number of satellites available
 - Number of satellites for which integers are resolved
 - An indicator of the accuracy of the currently computed coordinates

Real Time Stake-Out

- a) In real time stake-out the system shall allow the user to easily orientate themselves to True North, Grid North, the Sun, a line, the last survey point or to any user-selected point stored in the system database.
- b) The system shall allow the user to stake-out from a job (geodetic or Cartesian or grid) or from an ASCII file (in any order of Point ID, Northing, Easting and Height).
- c) The stakeout screen shall be able to guide the user to a point by graphics or text. Both the graphical guidance and the textual guidance information shall be displayed on the same screen.
- d) The system shall allow the user to choose between an orthogonal or polar display to assist in guidance to a point.
- e) The system shall provide a graphical display that scales automatically as the user approaches the stakeout point. The target shall appear as a bulls-eye on the graphical screen.
- f) The system shall alert the user when the user is approaching the target. This should be in the form of graphical display and/or audible alarm. The system must allow the user to set a user-definable distance between the user position and the target in order to activate the audible alarm. When the user is within the radius of the defined distance, an audible alarm shall alert the user.
- g) The real time system shall have the ability to compare the surveyed point with the point to be staked.
- h) The system shall allow the user to stakeout points, grids or lines.
- i) Each receiver must efficiently display current station and offset of unit based on a stored 2-D alignment.
- j) Must accept 2-D alignment file created with Terramodel 10.51

Items that must be included with each rover system

- A. Rigid shock resistant carrying case(s) to hold receiver, controller, and static setup items including tribrach, carrier, measurement device, etc...
- B. Two meter fixed height composite GNSS pole with quick connect and Heads Up Bubble
- C. Data Collector Mounting bracket for Pole
- D. Carry Bag for Pole and Pole Accessories
- E. An adequate supply of LI-Ion or NiMh batteries to operate all provided electronic equipment 24 continuous hours without charge
- F. AC/DC dual battery chargers

The following specification describes the minimum technical and performance requirements for **FIVE (5)** GNSS Network Rover Systems with built-in UHF Radio Receiver

Supported GNSS Systems
GPS L2
GLONASS
Galileo
RTK performance
DGPS / RTCM
RTK unlimited
Network RTK
Position update & data recording
5 Hz positioning
20 Hz positioning
Raw data logging
RINEX logging
NMEA out
Additional features
RTK Reference Station functionality
GSM
UHF Radio

 GNSS Performance	GNSS technology	Leica patented SmartTrack technology: • Advanced measurement engine • Jamming resistant measurements • High precision pulse aperture multipath correlator for pseudorange measurements • Excellent low elevation tracking • Very low noise GNSS carrier phase measurements with <0.5 mm precision • Minimum acquisition time
	No. of channels	120 channels (240 channels) ⁴
	Max. simultaneous tracked satellites	Up to 60 Satellites simultaneously on two frequencies
	Satellite signals tracking	• GPS: L1, L2, L2C • GLONASS: L1, L2 • Galileo • Compass ¹ • SBAS: WAAS, EGNOS, GAGAN, MSAS, QZSS
	Reacquisition time	< 1 sec
	Measurement Performance & Accuracy	Accuracy (rms) Code differential with DGPS / RTCM²
	DGPS / RTCM	Typically 25 cm (rms)
	Accuracy (rms) with Real-Time (RTK)³	
	Standard of compliance	Compliance with ISO17123-B
	Rapid static (phase)	Horizontal: 5 mm + 0.5 ppm (rms) Vertical: 10 mm + 0.5 ppm (rms)
	Static mode after initialization	Horizontal: 10 mm + 1 ppm (rms) Vertical: 20 mm + 1 ppm (rms)
	Kinematic (phase)	Horizontal: 10 mm + 1 ppm (rms) Vertical: 20 mm + 1 ppm (rms)
	Moving mode after initialization	Horizontal: 10 mm + 1 ppm (rms) Vertical: 20 mm + 1 ppm (rms)
	Accuracy (rms) with Post Processing²	
	Static (phase) with long observations	Horizontal: 3 mm + 0.1 ppm (rms) Vertical: 3.5 mm + 0.4 ppm (rms)
	Static and rapid static (phase)	Horizontal: 5 mm + 0.5 ppm (rms) Vertical: 10 mm + 0.5 ppm (rms)
	Kinematic (phase)	Horizontal: 10 mm + 1 ppm (rms) Vertical: 20 mm + 1 ppm (rms)
	On the Fly (OTF) Initialization	
	RTK technology	Leica SmartCheck technology
	Reliability	Better than 99.99% ²
	Time for initialization	Typically 4 sec ¹
OTF range	up to 70 km ¹	
Network RTK		
Supported RTK network solutions	VRS, FKP, IMX	
Supported RTK network standards	MAC (Master Auxiliary Concept) approved by RTCM SC 104	

¹ The Compass signal is not finalized, although, test signals have been tracked in a test environment. As changes in the signal structure may still occur, Leica Geosystems cannot guarantee full Compass compatibility.

² Measurement precision, accuracy and reliability are dependent upon various factors including number of satellites, geometry, obstructions, observation time, ephemeris accuracy, ionospheric conditions, multipath etc. Figures quoted assume normal to favorable conditions. Times required are dependent upon various factors including number of satellites, geometry, ionospheric conditions, multipath etc. GPS and GLONASS can increase performance and accuracy by up to 30% relative to GPS only.

³ Might vary due to atmospheric conditions, signal multipath, obstructions, signal geometry and number of tracked signals.

⁴ Upgrade possibility to 240 channels including GPS L5.

Hardware

Weight & Dimensions	
Weight (GS14)	0.93 kg
Weight	2.90 kg standard RTK rover including controller, batteries, pole and bracket
Dimension (GS14) (diameter x height)	190 mm x 90 mm
Environmental specifications	
Temperature, operating	-40° C to +65° C, compliance with ISO9022-10-08, ISO9022-11-special, MIL STD 810F - 502.4-II, MIL STD 810F - 501.4-II
Temperature, storage	-40° C to +80° C, compliance with ISO9022-10-08, ISO9022-11-special, MIL STD 810F - 502.4-II, MIL STD 810F - 501.4-II
Humidity	100%, compliance with ISO9022-13-06, ISO9022-12-04 and MIL STD 810F - 507.4-I
Proof against: water, sand and dust	IP68 according IEC60529 and MIL STD 810F - 506.4-I, MIL STD 810F - 510.4-I and MIL STD 810F - 512.4-I Protected against blowing rain and dust Protected against temporary submersion into water (max. depth 1.4 m)
Vibration	Withstands strong vibration during operating, compliance with ISO9022-36-08 and MIL STD 810F - 514.5-Cat.24
Drops	Withstands 1.0 m drop onto hard surfaces
Functional shock	40 g / 15 to 23 msec, compliance with MIL STD 810F - 516.5-I No loss of lock to satellite signal when used on a pole set-up and submitted to pole bumps up to 100 mm
Topple over	Withstands topple over from a 2 m survey pole onto hard surfaces
Power & Electrical	
Supply voltage	Nominal 12 V DC Range 10.5 - 28 V DC
Power consumption	Typically: 2.0 W, 270 mA
Internal power supply	Recharge & removable Li-Ion battery, 2.6Ah / 7.4 V, 1 battery fit into receiver
Internal power supply, operation time	<ul style="list-style-type: none"> • 10.00 h static observations¹ • 7.00 h receiving RTK data with internal UHF radio¹ • 6.00 h receiving RTK data with internal GSM¹
External power supply	Rechargeable external NiMH battery 9 Ah / 12 V
Certifications	Compliance to: FCC, CE, PTCRB Local approvals (as IC Canada, C-Tick Australia, Japan, China)

Memory & Data Recording

Memory	
Memory medium	Removable microSD Card: 1 GB
Data capacity	1 GB is typically sufficient for about GPS & GLONASS (8+4 satellites) 260 days raw data logging at 15 s rate
Data recording	
Type of data	Onboard recording of: <ul style="list-style-type: none"> • Leica GNSS raw data • RINEX data

User Interface

Buttons	<ul style="list-style-type: none"> • ON / OFF button • Function button
Button functionality	Function button: <ul style="list-style-type: none"> • Easy switch between Rover / Base mode • Easy "Here" positioning functionality
Led status indicator	Bluetooth®, position, RTK Rover status, RTK Base status, data logging, internal power status, external power status
Additional user interface	Additional web interface functionality provides full status indicator and configuration options

Communications

Communication ports	1 x USB / RS232 Lemo 1 x Bluetooth® port, Bluetooth® v2.00+ EDR, class 2
Built-in data links	
Radio modem	<ul style="list-style-type: none"> • Fully integrated, fully sealed receive only radios • SATEL, Pacific Crest and TrimTalk support • 400 - 470 MHz bandwidth
UHF antenna options	• External UHF antenna connector (Type QN)
GSM / GPRS phone modem	<ul style="list-style-type: none"> • Fully integrated, fully sealed phone modem • User exchangeable SIM card • Quad-Band GSM / GPRS: 850 / 900 / 1800 / 1900 MHz
GSM / antenna	• Integrated GSM antenna
External data links	
Radio modems	Support of any suitable UHF / VHF radio
GSM / UMTS / CDMA phone modems	Support of any suitable GSM / GPRS / UMTS / CDMA modem
Landline phone modems	Support of any suitable Landline phone modem
Communication protocols	
Real-Time data formats for data transmission and reception	Leica proprietary formats (Leica, Leica 4G) CMR, CMR+
Real-Time data formats according RTCM standard for data transmission and reception	RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1
NMEA output	NMEA 0183 V 4.00 and Leica proprietary

¹ Might vary with temperatures, age of battery, transmit power of data link device.

The following specification describes the minimum technical and performance requirements for **ONE (1)** GNSS Network Rover Systems with built-in UHF Radio Receiver and Transmitter

Supported GNSS Systems
GPS L2
GLONASS
RTK performance
DGPS / RTCM
RTK up to 5 km
RTK unlimited
Network RTK
Position update & data recording
5 Hz positioning
20 Hz positioning
Raw data logging
Additional features
RTK Reference Station functionality

 GNSS Performance	GNSS technology	Leica patented SmartTrack technology: <ul style="list-style-type: none"> • Advanced measurement engine • Jamming resistant measurements • High precision pulse aperture multipath correlator for pseudorange measurements • Excellent low elevation tracking • Very low noise GNSS carrier phase measurements with <0.5 mm precision • Minimum acquisition time
	No. of channels	120 channels
	Max. simultaneous tracked satellites	Up to 60 Satellites simultaneously on two frequencies
	Satellite signals tracking	<ul style="list-style-type: none"> • GPS: L1, L2, L2C, L5 • GLONASS: L1, L2 • Galileo (Test): GIOVE-A, GIOVE-B • Galileo: E1, E5a, E5b, Alt-BOC • Compass¹ • SBAS: WAAS, EGNOS, GAGAN, MSAS, QZSS
	GNSS measurements	Fully independent code and phase measurements of all frequencies <ul style="list-style-type: none"> • GPS: carrier phase full wave length, Code (C/A, P, C Code) • GLONASS: carrier phase full wave length, Code (C/A, P narrow Code) • Galileo: carrier phase full wave length, Code
	Reacquisition time	< 1 sec
 Measurement Performance & Accuracy	Accuracy (rms) Code differential with DGPS / RTCM ²	
	DGPS / RTCM	Typically 25 cm (rms)
	Accuracy (rms) with Real-Time (RTK) ²	
	Standard of compliance	Compliance with ISO17123-8
	Rapid static (phase)	Horizontal: 5 mm + 0.5 ppm (rms)
	Static mode after initialization	Vertical: 10 mm + 0.5 ppm (rms)
	Kinematic (phase)	Horizontal: 10 mm + 1 ppm (rms)
	Moving mode after initialization	Vertical: 20 mm + 1 ppm (rms)
	Accuracy (rms) with Post Processor ²	
	Static (phase) with long observations	Horizontal: 3 mm + 0.1 ppm (rms)
		Vertical: 3.5 mm + 0.4 ppm (rms)
	Static and rapid static (phase)	Horizontal: 5 mm + 0.5 ppm (rms)
		Vertical: 10 mm + 0.5 ppm (rms)
	Kinematic (phase)	Horizontal: 10 mm + 1 ppm (rms)
		Vertical: 20 mm + 1 ppm (rms)
	On the Fly (OTF) Initialization	
RTK technology	Leica SmartCheck technology	
Reliability of OTF Initialization	Better than 99.99% ³	
Time for initialization	Typically 4 sec ³	
OTF range	up to 70 km ³	
Network RTK		
Supported RTK network solutions	VRS, FKP, IMAX	
Supported RTK network standards	MAC (Master Auxiliary Concept) approved by RTCM SC 104	

¹ The Compass signal is not finalized, although, test signals have been tracked in a test environment. As changes in the signal structure may still occur, Leica Geosystems cannot guarantee full Compass compatibility.

² Measurement precision, accuracy and reliability are dependent upon various factors including number of satellites, geometry, obstructions, observation time, ephemeris accuracy, ionospheric conditions, multipath etc. Figures quoted assume normal to favorable conditions. Times required are dependent upon various factors including number of satellites, geometry, ionospheric conditions, multipath etc. GPS and GLONASS can increase performance and accuracy by up to 30% relative to GPS only. A full Galileo and GPS L5 constellation will further increase measurement performance and accuracy.

³ Might vary due to atmospheric conditions, signal multipath, obstructions, signal geometry and number of tracked signals.

⁴ Might vary with temperatures, age of battery, transmit power of data link device.

Hardware



Physical & Dimensions	
Weight (GS15)	1.34 kg
Weight	3.30 kg standard RTK rover including slot RTK device, controller, batteries, pole and bracket
Dimension (GS15) (diameter) x height	196 mm x 198 mm
Environmental Specifications	
Temperature, operating	-40° C to +65° C, compliance with ISO9022-10-06, ISO9022-11-special, MIL STD 810F - 502.4-II, MIL STD 810F - 501.4-II
Temperature, storage	-40° C to +80° C, compliance with ISO9022-10-06, ISO9022-11-special, MIL STD 810F - 502.4-II, MIL STD 810F - 501.4-II
Humidity	100%, compliance with ISO9022-13-06, ISO9022-12-04 and MIL STD 810F - 507.4-I
Proof against: water, sand and dust	IP67 according IEC60529 and MIL STD 810F - 506.4-I, MIL STD 810F - 510.4-I and MIL STD 810F - 512.4-I Protected against blowing rain and dust Protected against temporary submersion into water (max. depth 1 m)
Vibration	Withstands strong vibration during operating, compliance with ISO9022-36-06 and MIL STD 810F - 514.5-Cat.24
Drops	Withstands 1.0 m drop onto hard surfaces
Functional shock	40 g / 15 to 23 msec, compliance with MIL STD 810F - 516.5-1 No loss of lock to satellite signal when used on a pole set-up and submitted to pole bumps up to 150 mm
Topple over	Withstands topple over from a 2 m survey pole onto hard surfaces
Power & Electrical	
Supply voltage	Nominal 12 V DC Range 10.5 - 28 V DC
Power consumption	Typically: 3.2 W, 270 mA
Internal power supply	Recharge & removable Li-Ion battery, 2.6 Ah / 7.4 V, 2 batteries fit into receiver
Internal power supply, operation time	<ul style="list-style-type: none"> • 10.00 h receiving RTK data with standard radio* • 9.00 h transmitting RTK data with standard radio* • 7.50 h RTK via GSM/GPRS connection* using 2 internal batteries
External power supply	Rechargeable external NiMH battery 9 Ah / 12 V
Certifications	Compliance to: FCC, CE Local approvals (as IC Canada, C-Tick, Australia, Japan, China)

Memory & Data Recording



Memory	
Memory medium	Removable SD Card: 1 GB
Data capacity	1 GB is typically sufficient for about GPS & GLONASS (8+4 satellites) 280 days raw data logging at 15 s rate
Data recording	
Type of data	Onboard recording of: <ul style="list-style-type: none"> • Leica GNSS raw data • RINEX data
Recording rate	Up to 20 Hz

User Interface



Buttons	<ul style="list-style-type: none"> • ON / OFF button • Function button
Button functionality	Function button: <ul style="list-style-type: none"> • Easy switch between Rover / Base mode • Easy "Here" positioning functionality
LED status indicator	Bluetooth®, position, RTK status, data logging, detailed power status
Additional user interface	Additional web interface functionality provides full status indicator and configuration options

Communications



Communication ports	1 x serial RS232 Lemo 1 x USB / RS232 Lemo 1 x UART serial & USB (for removable internal RTK devices) 1 x Bluetooth® port, Bluetooth® v2.00+ EDR, class 2
No. of simultaneous data links	<ul style="list-style-type: none"> • Up to 3 data links can be attached and used simultaneously • 2 real-time output interfaces via independent ports, providing identical or different RTK/RTCM formats
Built-in data links	
Radio modems	<ul style="list-style-type: none"> • Fully integrated, fully sealed receive / transmit radios • User exchangeable device • SATEL, Pacific Crest and others • 390 - 470 MHz bandwidth • Transmit power: 0.5 - 1.0 W
Radio modems	<ul style="list-style-type: none"> • Fully integrated, fully sealed receive / transmit radios • User exchangeable device • SATEL, Pacific Crest and others • 390 - 470 MHz bandwidth • Transmit power: 0.5 - 1.0 W
UHF antenna options	<ul style="list-style-type: none"> • Fully integrated UHF antenna • External UHF antenna connector (Type QN)
3G GSM / UMTS(HSDPA) phone modem	<ul style="list-style-type: none"> • Fully integrated, fully sealed phone modem • User exchangeable device • User exchangeable SIM card • Tri-Band UMTS / HSDPA: 850 / 1900 / 2100 MHz • Quad-Band GSM / GPRS: 850 / 900 / 1800 / 1900 MHz
CDMA phone modem	<ul style="list-style-type: none"> • Fully integrated, fully sealed CDMA phone modem • User exchangeable device • Dual-Band CDMA 1XRTT (800 / 1900 MHz)
GSM / UMTS / CDMA antenna options	<ul style="list-style-type: none"> • Integrated GSM / UMTS / CDMA antenna • External GSM / UMTS / CDMA antenna connector (Type QN)
External data links	
Radio modems	Support of any suitable UHF / VHF radio
GSM / UMTS / CDMA phone modems	Support of any suitable GSM / GPRS / UMTS / CDMA modem
Landline phone modems	Support of any suitable Landline phone modem
Communication protocols	
Real-Time data formats for data transmission and reception	Leica proprietary formats (Leica, Leica 4G) CMR, CMR+
Real-Time data formats according RTCM standard for data transmission and reception	RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1
NMEA output	NMEA 0183 V 4.00 and Leica proprietary

The following specification describes the minimum technical and performance requirements for **SIX (6)** GNSS Network Controllers

General			
Operating system	Windows CE 6.0		•
Processor	Freescale iMX31 533MHz ARM Core		•
Dimensions (L x W x D)	CS15: 245 x 125 x 45 mm CS10: 200 x 102 x 45 mm		•
Weight ¹			710 g
Memory, Ports & Communication			
System memory	512 MB DDR SDRAM		•
Flash storage memory	1 GB (nonvolatile NAND Flash)		•
Interfaces	SD card slot (SDIO) CF Type I / II card slot 5-pin custom connector (USB)		• • •
Communication modules	Lemo module: Lemo (USB and serial), USB A host, 7-pin connector, power RS232 module: RS232, USB A host, USB mini AB, DTG, 7-pin connector, power		•
Integrated wireless connectivity	Bluetooth® 2.0 Class 2 Wireless LAN 802.11b/g (option) Integrated 2.4 GHz FHSS total station radio with fully integrated internal antenna (option)		•
Interface			
Display	640 x 480 pixel (VGA) color TFT with LED backlight and touch screen		
Keypad	Rubber, tactile keypad, fully illuminated		landscape
	No. of keys		65 keys, QWERTY including 12 function keys
	QWERTY		65
	Numeric		•
Audio	Integrated sealed speaker and microphone Bluetooth® audio headset support		•
Camera	Integrated 2MP fixed focus camera		•
Function keys			•
Power Management			
Power	Nominal 12 V DC Range 10.5 - 28 V DC		•
Battery	GEB212 (7.4V / 2600 mAh Li-Ion rechargeable), removable		•
Battery life ²	10 hours		•
Battery charging	2 hours		•
Environmental Specifications			
Temperature	Operation: -30 to 60° C Storage: -40 to 80° C		•
Dust and Water	IP67 (IEC 60529)		•
Humidity	100% condensing (MIL-STD-810E, Method 507.4-1)		•
Drop ³	1.2 m		•
Vibration	MIL-STD-810E, Method 514.5-Cat24		•
Software			
Application Software	Viva Controller runs Leica SmartWorx Viva and SmartWorx Viva LT. In addition, a number of regional solutions are available. For more information on the field software that's best for you, contact your local Leica authorized distribution partner.		•
Standard Software	Internet Explorer Mobile, File Explorer, Word Mobile, Microsoft Windows Media™ Player, Camera Software, Online Help		•
Accessories			
	100 - 240 V AC power supply for all regions		•
	Stylus		•
	2 x anti-glare display foils		•
	Documentation CD		•
	Docking station		○
	12 V DC vehicle charger		○
	Additional cables		○
	Hand strap		○
	Pole holder set		○
	Soft bag		○

¹ without battery 110g

² room temperature, depending on use of embedded devices

³ onto plywood over concrete

• = St.

○ = Op.

Training

Technical support must be available within the State of Alabama. One day of on site training is to be performed by a factory trained representative.

The typical training course for the GPS Satellite Surveying System consists of a 3-day on-site session. The course is designed specifically for the needs of the user of the system. Hands-on exercises are used to illustrate the data acquisition, processing, and interpretation of the result. Course topics should include:

- Explanation of the GPS satellite system
- Geodetic background required for surveying with GPS
- Applications of GPS surveying
- Planning the GPS survey
- GPS survey design
- Set-up and operation of the field equipment
- Acquisition and processing of GPS data:
 - Static
 - Rapid Static
 - Kinematics
 - Kinematics-On-Fly
 - Real Time
- Inspection and interpretation of the result
- Troubleshooting the survey
- Adjustment of the survey data
- Transformation of the GPS survey results into the user's datum
 - State Plane Coordinates
 - Local Grid Coordinate Systems
- Transferring the GPS result into other survey systems
- Care of the equipment

A specific course outline will be developed with the ALDOT, and be provided prior to the beginning of the course.

Documentation

The GPS system shall be accompanied by complete technical and reference documentation. The documentation may be in either hard copy or electronic format. Documents should include all available:

- GPS Book, System Overview and Applications
- GPS Equipment User Manual
- Technical Reference Manual for the System Hardware
- Operating Manual for the System Software
- Guidelines to Static and Rapid Static GPS Surveys
- Guidelines to Static and Kinematics GPS Surveys
- Operating Manual for Real Time Kinematics GPS Surveys

Warranty

The manufacturer shall provide a 1 year warranty on the GPS Satellite Surveying System and either replace or repair any parts of its products which are or have become ascertainably defective or unserviceable due to poor materials, faulty design, of deficient manufacture. The software warranty shall be limited to the replacement of defective media (diskettes or CD).

Support

For warranty repair and support issues after the sale. The dealer shall be able to provide warranty repair services at the dealer service shop thus preventing the need to ship equipment back to the manufacturer for repair. Support services shall also be available from the manufacturer via a toll free support number and a web-based subscription support forum that is renewable on a yearly contract.

Dealer

- Ability to provide 100% repair, calibration, and instrument update to all system components.
- Ability to provide factory-trained repair techniques.
- Calibration N.B.S. traceable.
- Ability to provide training in instrument operation and application of software.

General System requirement

All equipment furnished shall be of the latest model(s) available in current production. Used, demonstrator or discontinued models shall not be accepted. Any variations from these specifications shall be so indicated on the bid or by separate attachment.

All equipment furnished must be with full manufacturer's support. Services shall apply to all components provided and shall include packaging and shipment, maintenance and repair, support and state requested enhancements. Loaner equipment must be available for use in the event of malfunctions during the warranty period with lease equipment available thereafter.

A full two-year unconditional labor and parts warrants shall be provided the GPS rover and base with a 90-day warranty on all batteries. Loaner equipment is to be provided in the event of a malfunction, should the units be out of service for more than three (3) working days during the warranty period. Thereafter, rental equipment shall be available. Should the warranty exceed two years, then the standard warranty shall be in effect.

A toll-free telephone number shall be provided for operational and technical problems.

An on-site training session for no less than two operators, for a minimum of 12 clock hours of instruction in the use of the system and software will be required with scheduling and format of the session(s) to be at ALDOT's discretion.

All cables, connectors, manual, latest literature, specifications, and other ordinary peripheral hardware and accessories necessary for proper operation shall be furnished.

The vendor shall deliver in person the fully tested, debugged, setup and prepared hardware at a site designated. Base unit and all accessories must be furnished with all of the necessary mounting hardware, battery, battery charger, and a rigid carrying case.

Terms and conditions for award

Any GPS system that deviates from the specifications must list the deviation. This in no way removes the requirement to meet the specification. The successful vendor shall be notified in writing of the tentative award. ALDOT testing of the tentatively awarded GPS system will assure compatibility with ALDOT's equipment. The GPS system shall meet ALDOT's standards for performance and have the capability of satisfying ALDOT's need. ALDOT will be the final authority on deciding if the GPS system meets the contract requirements. Testing will be accomplished over a forty-five (45) calendar day period.

By the end of the forty-five (45) day test period, ALDOT will:

1. Formally award and approve payment for the GPS system upon receipt of the vendor's invoice; or
2. Notify the vendor in writing that the GPS system is unacceptable and for what reason. The Department will also immediately return GPS system to the vendor freight collect.