ITEM 11680.956032 M - REMOTE MINIHUB ELECTRONICS AND INTEGRATION

DESCRIPTION:
This work consists of furnishing and installing a REMOTE MINIHUB ELECTRONICS assembly that shall function as a communications and processing hub for the Woodhaven Blvd ITS. This equipment shall be installed in a 483 mm (19") rack mount cabinet included with other work. This item includes all integration work necessary to make the assembly fully operational as subsequently described.

MATERIALS:
The material shall contain all of the components described in the subsequent material specifications. A block diagram of the complete assembly is included on Sheet ITS-13 of the plans. These components are to be housed in a pole mounted rack mount cabinet to be supplied under another pay item. The contractor retains full responsibility to select components that will fit into the designated cabinet assembly.

All necessary incidental components, cables, and hardware, shall be supplied to accomplish a fully operational communications Hub. All equipment and components parts furnished shall be new, be of the latest design, and manufacture. All parts shall be of high quality workmanship, and no part or attachment shall be substituted or applied contrary to the manufacturer's recommendations and standard practices. The design life of all components, operating 24 hours per day shall be ten (10) years minimum. The REMOTE MINIHUB ELECTRONICS communications assembly shall consist of the following major components:

(a) MODEL 2070 ATC CONTROLLER

The Contractor shall furnish and install a Model 2070 ATC microprocessor controller with six (6) RS232 serial communications ports, which shall fully comply with the latest applicable CalTrans Transportation Electrical Specification and ANSI/IEEE standard 1014-1987 standards in place at the time of contract letting. The Contractor shall supply the Model 2070 controller with the following memory specifications:

* 4 MBytes DRAM, 32 bit Data Path from 360
* 2 Mbytes of Flash PROM, 16 bit Data Path
* 256 Kbytes of SRAM, 16 bit Data Path

The supplier shall submit documentation with the shop drawing submittal that the proposed unit is on the CALTRANS QPL (Qualified Products List). The unit shall be delivered with an OS/9 run-time license and a custom driver library for all devices utilized in the 2070.

(b) ISDN Transmitter

The remote transmitter shall encode one color NTSC video image and at least 2 full duplex RS232 data port signals over one ISDN communications line. This unit shall be a self contained rack mounted package that operates from standard 110 VAC 60 Hz electrical power. The ISDN transmitter, when utilized with the control/receiver driver to be utilized at the location, shall be capable of at least 6 programmable preset Pan Tilt and Zoom settings that can be accessed from the matching receiver to be located at the central. The ISDN transmitter shall also be capable of dialing 6 programmable preset telephone numbers that can be activated from a contact closure input to the ISDN transmitter. The remote transmitter shall be fully compatible with the ISDN receiver as detailed and paid for in the CENTRAL ITS EQUIPMENT specifications and shall also meet the following minimum requirements:
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* Image update rates of 2 fields per second minimum.
* Transmission rates up to 115.2 kbps
* Accept NTSC video at 1 volt peak to peak on 75 ohm BNC termination inputs.
* 640 (h) X 480 (v) resolution
* Data inputs two (2) RS232C multiplexed on same phone line capable of data rates of 300 to 9600 bits/sec minimum.
* Temperature range of 0 Deg. C. To + 50 Deg C. 0 - 95 % non condensing humidity conditions.

The ISDN multiplexer shall include documentation which shall include a complete description of the central control port protocol utilized to command and configure the electronics. In addition, all available PC based diagnostic software shall be provided which supports the assembly.

(c) ISDN Terminal Adaptor

The ISDN terminal adaptor shall be compatible with the ISDN transmitter and receivers chosen by the contractor and shall also be compatible with local Bell Atlantic ISDN service. The ISDN terminal adaptor shall be capable of transmitting video and data through the local ISDN communications network at 128 kbits/sec

(d) Telephone Service

The contractor shall be responsible for ordering one (1) ISDN telephone line and one (1) standard telephone service line for connection to the Remote MINIHUB and also to the JTOC(Four lines in total). The contractor shall be responsible for the proper provisioning of these lines to provide reliable service for the hardware provided in subheading b, e and I of this specification. The contractor shall be responsible for the cost of the installation of both types of telephone service to be provided and shall also be responsible for the cost of the monthly service charges until the ITS System Acceptance milestone has been reached.

(e) Telco Demarcation cabinet

The Contractor shall furnish and install a TECO Demarcation Cabinet attached to each equipment Cabinet at the locations designated in the Contract Documents or as directed by the Engineer. The dimensions and exact placement of the TECO Demarcation Cabinet on the equipment cabinet are outlined in the plan set. The TECO Demarcation Cabinets will be used by Bell Atlantic to terminate leased telephone lines that will be used for the transmission of data and video between the field and the JTOC. Bell Atlantic will terminate the telephone lines on a demarcation block that they will be installed in the "TECO Demarcation Cabinet". The TECO demarcation cabinet shall be furnished complete with all internal components and mounting hardware as described in this specification. The cabinet shall meet the following requirements:

* NEMA 4X rated outdoor enclosure
* Material: 2 mm minimum thickness 5052-H32 sheet aluminum.
* Finish: All surfaces shall be clean, free of holes or blemished, without burrs, contain a smooth
natural finish and with exterior corners rounded. The cabinets shall be unpainted.

* Door: Single full size door located on the front of the cabinet. The door shall be hinged on the right side.

* Stainless Steel door clamp assembly

* Locking: Provision for padlocking the cabinet when the door is closed shall be provided.

* Back panel: 19mm thick plywood 635 mm (H) x 406 mm (W)

* Ground bus: A solid copper grounding bus shall be permanently mounted to the inside surface of the cabinet wall. The point of contact between the ground bus bar and the cabinet wall shall have less than 1 ohm resistance. The copper ground bus shall have a minimum of twenty (20) connector points, each capable of securing at least one #8 conductor. A #8 stranded wire shall be installed between this copper ground buss and the ground rod assembly in the equipment cabinet.

* Grounding: The cabinet shall be grounded in accordance with Section 680-3.12 of the Standard Specification. The ground rod will be installed as part of the located field cabinet installed under another item.

(f) Antenna

A high gain omnidirectional antenna shall be mounted on the top of the 18.3 M camera pole as detailed in the plan set. This spread spectrum radio antenna shall meet the following requirements:

* Antenna type: Collinear/Fiberglass/Radome
* Gain: 9 db over dipole
* Pattern: Omnidirectional
* Frequency range: 902 to 928 MHZ.
* Impedance: 50 ohms nominal
* Wind Velocity: 100 mph
* Mounting: All hardware and clamps required for mounting on pole as indicated in plan details
* Connector: "N-Type" female

(g) Antenna Feed-line and Connectors

* The antenna feed-lines shall be low loss, nominal 50 ohm, weather resistant 7/8 hard line such as Andrew LDF5-50A or equivalent. Short flexible jumper cables made of Andrew FSJ4-50B Heliax or equivalent shall be utilized to connect the antenna to the 7/8 hard line and inside the equipment cabinet. Braided coax such as RG8U shall not be acceptable.
All coaxial cable connectors shall be EIA compliant UG1168 Utilizing captive pin technology.

(h) C1S connector for 2070 ATC controller

The contractor shall install a C1S connector, to connect the 2070 ATC controller with the ISDN transmitter. The C1S connector shall be an AMP connector block with T-Handle Part No.201692-4, or equivalent. It shall be supplied with a Pin Hood (AMP No. 202119-2 or equal), a 45 Deg. Outlet shield with cable clasp (AMP No. 202110-1 or equal), guide pins (AMP No.202173-5 or equal) and guide sockets (AMP No. 204099-2 or equal). The guide pins shall be installed in connector holes B & C, The guide sockets installed in connector holes A & D.

(i) Hardened Dial-Up Modem

One 56KB external modem and RS232 cable for connection of the modem to the 2070 RS232 port (COM5) assigned to the modem. The modem shall be Hayes Compatible, V.34 ,and V.32 compliant. The modem shall support the following modes of operations:

- 7 data bits with any parity type + 1 or 2 stop bits
- 8 data bits with  No parity + 1 or 2 stop bits
- Full or half duplex
- Automatic and manual call originate
- Automatic and manual call answer
- Allows storage of 2 user profiles & four 36-digit dial strings.

The modem shall be hardened for use in the external environment that the remote processing cabinet will be subjected to. The modem shall be connected to one of the ports on the remote processor.

(j) Heater Assembly

The cabinet shall be equipped with a heavy duty heater. The heavy duty radiant heater shall provide a minimum of 1,000 BTU per hour. The heater shall be equipped with a thermostat which will activate the heater whenever cabinet temperature falls below 40 degrees F. The heater will turn-off at 45 degrees F. The thermostat shall include adjustments for temperature. A contact closure shall be available and wired to a 2070 C1 input whenever the heater is on.

CONSTRUCTION DETAILS:

Prior to submittal of the shop drawing, the contractor shall conduct a site survey which shall identify any problems and/or pinpoint setup procedures for the spread-spectrum radio system. The results of this survey shall be documented in the shop drawing along with all procedures to be followed to mitigate any noted difficulties. The contractor shall have full responsibility of providing all components which are necessary to achieve a fully operational radio system capable of bi-directional data transmission.
A shop drawing submittal shall be prepared which will include copies of descriptive and operations manuals for every component to be included in the cabinet. Particular care shall be given to the interconnection of all of the components and the cabling.

In addition, the submittal shall include a complete plan for the cabinet including all interconnections and physical placement of all of the required major and incidental components. The plans include a sample drawing illustrating such an arrangement. The submittal shall also include a complete operations and users guide for all complex electronic components such as the modems and ISDN multiplexers. These drawings shall include specific details of the installation of all of the material listed in this specification including cable lengths, connector types, gender and connector pin outs. When the assembly is integrated, all cables shall be labeled utilizing marking tags. The shop drawing submittal must be approved by the engineer prior to any testing or installation of the completed Remote MiniHub.

The contractor shall have the responsibility to select components for the minihub assembly that will fit in the cabinet to which it is intended for. If the space requirements for the proposed components exceed the capacity of the cabinet, the submittal will not be approved by the engineer.

Subsequent to approval of the shop drawings, a factory test/demonstration shall be conducted. The factory test shall be held to test all aspects of the “Remote MINIHUB ASSEMBLY” and it’s components. Prior to the factory test, all components to be installed in the cabinet which are to be procured under other bid items, (IE: "CAMERA ASSEMBLY " ), shall be installed in the cabinet. The engineer shall be provided with a test procedure for review and approval at least two weeks prior to the scheduling of the test. If the test will be conducted more then 160 km from the project site, the contractor shall be responsible for all travel costs for up to three personnel representing the engineer. The test will demonstrate that the cabinet has been constructed in accordance with the specifications and approved shop drawings and shall simulate operation of all required functions. A component test shall be conducted for each assembly which shall verify that all aspects of the specifications are complied with. Certified test results of identical components shall be considered in lieu of testing specifically conducted for the factory test.

Upon completion of the factory test, the contractor shall install the Remote minihub at the location designated in the plans and shall connect it to power and the telephone utility. A two pair # 19 AWG stranded, insulated wire cable shall be installed for the ISDN line and 1 twisted pair for the standard telephone line shall be installed which shall connect the active pairs on the Bell Atlantic cable TECO Demarcation block with the ISDN terminal adaptor unit. The standard dial-up line shall be terminated on a lightning suppression block prior to connection to the modem. This connection shall be accomplished by installing a 25 mm (1 inch) diameter insulated close nipple through both cabinets.

The contractor shall install the central spread spectrum transceiver components including the antenna. The antenna shall be mounted on the structure as indicated in the plan set. The antenna lead-in shall be installed, tested, and connected to the transceiver as directed and paid for in the Spread Spectrum Radio Assembly specification. Utilizing a portable computer connected to the RS232 port of the Spread Spectrum Radio Transceiver at the MiniHUB location ,the contractor shall program the spread-spectrum radio to operate as a master and shall acquire communications to both the radar detectors and VMS on separate channels.

The contractor shall furnish and install a cable connecting the C1S connector on the 2070 ATC controller
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with the various discrete alarms in the panel including heater, door alarm of the cabinet, and the remote dial select of the ISDN transmitter.

The contractor shall furnish and install three RS232 connectors to shielded cables for connection to the 2070 ATC controller. These cables shall be installed as follows:

* Port 3 Connected to the VIDS Processor
* Port 4 Connected to Spread Spectrum Radio Transceiver
* Port 5 Connected to the Dial-up modem

A standalone Operations Test shall be conducted once the assembly is installed and telephone service has been established. The test shall verify the following:

- Operation of CCTV Assembly
- Operation of VIDS Assembly
- Operation of Radar Assembly of Spread-Spectrum Link
- Remote Operation of VMS over Spread-Spectrum Link (Via PC Software)
- Operation of 2070 Control/Monitor Signals (Heater, Preset, Etc)
- Operation of Presets and Remote Dialing Over ISDN
- Operation of Both Standard and ISDN Telephone Lines

At the successful conclusion of these tests, the "Operational Stand-Alone Test of Assembly" benchmark is achieved.

The engineer reserves the right to inspect and/or factory test any completed cabinet assemblies prior to delivery of the material to the project site. Any deviations from these specifications that are identified during such testing shall be corrected prior to shipment of the assembly to the project site.

METHOD OF MEASUREMENT:
This item will be measured for payment on a lump sum basis.

BASIS OF PAYMENT:
The Lump sum price bid for "REMOTE MINIHUB ELECTRONICS AND INTEGRATION" shall include the cost of all equipment, material, testing, telephone line costs, documentation, support during the observation period, and labor detailed in the contract documents.

Progress payments will be made in the following percentages of the bid price for the lump sum item after each milestone is reached.

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<tr>
<td>Approval of Shop Drawings</td>
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<td>Successful Factory Test</td>
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<td>Successful Operational Stand-Alone Test</td>
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<tr>
<td>System Acceptance of ITS</td>
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