ITEM 11680.956050 M - CONNECT EXISTING VMS TO SYSTEMS COMMUNICATIONS

DESCRIPTION:
This item will consist of providing hardware to interface an existing VMS to the Long Island Expressway system communications while maintaining the existing central communication capability.

MATERIALS:
The table titled “Existing VMS Definition Table” on plan sheet SC-1 identifies the manufacturer, model number, and type of communication interface for each existing VMS to be interfaced under this bid item. A SBC(Single Board Computer) shall be supplied which will enable this mechanism to operate. The application software for the SBC will be supplied to the contractor by others. As such, only the hardware, existing VMS protocols, and “off-the-shelf” system software for the SBC and Port Switch are to be supplied under this item.

(a) Single Board Microcomputer:

A stand- alone single board embedded microcomputer shall be provided which will control access to the existing VMS. The microcomputer will operate special software to be provided by the engineer which will provide the functionality required.

This unit shall be furnished in a housing suitable for shelf mounting with an internal power supply for operation with 110 V AC power. The two RS232 ports shall be terminated on the enclosure.

This embedded microcomputer shall meet the following requirements:

* Two RS232C ports (up to 19.2 baud rates)
* Processor 68HC11, 68332, or 68360
* RAM: 1 Meg Minimum
* 256K Flash EEPROM
* Operating temperature 0 Deg C. To 70 Deg C.
* Relative Humidity 0 - 95 % ( non condensing)
* Programmable in C or C+
* 8 TTL Level Binary Outputs/Inputs

RS232 Port 1 of the SBC shall be connected to the new system communication modem (ie:
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Twisted-Pair, Spread-Spectrum, CDPD, Fiber-Optic, as identified on the Plans for this Location) port. RS232 Port 2 will be connected to the Host Port B of the Passive RS232 Splitter device described under item (c).

(b) Software Development Kit

A software development kit shall be supplied for every ten or fraction (ie: If 11 Single Board Computers are supplied; 2 Software Development Kits would be required.) of single board computer assemblies supplied as part of this contract. The development kit shall include a C compiler, Assembler, a Board Support Package, PC Based Monitor/Debugger, Source level debugger, custom driver libraries, PC interconnection cable for Debugger/Monitor, all available documentation and manuals available from the manufacturer, a microprocessors manual (IE: Motorola or Intel), and all cables and harnesses to develop a complete working unit. This software shall be made available to the consultant who will utilize it to develop the application software required to perform the data compression functions required at each location.

(c) Passive RS232 Splitter

A passive RS232 modem splitter shall be provided which will allow two host devices to communicate with a single modem. The modem port will be assigned to the existing VMS controller’s RS232 port. Host Port A will be wired to the existing communication device at the VMS. Host Port B will be wired to Port 2 of the SBC (Single Board Computer). The device shall allow both HOST ports to receive data transmitted from the modem port simultaneously. The device will include circuitry which will allow both Host ports to transmit to the modem port simultaneously. The port device does not need to have logic to detect collisions caused by both host devices attempting to transmit simultaneously as this will be handled by the application software.

(d) Existing Modem Transmit Line Relay

A relay will be provided through which the transmit line from the Existing System Modem to Host Port A of the splitter described under item C will pass. The Normally Closed Contact of the Relay will close the circuit and allow the existing modem’s transmit to operate normally. This position will be active when the SBC computer is not connected and when the binary output from the SBC is low. When the SBC turns on this binary output, the relay will activate and break the connection of the existing modem. This will allow the SBC to have exclusive access to the VMS.

(e) Existing VMS Software Protocol and Diagnostic Program

The complete RS232 protocol utilized by the existing VMS shall be fully documented and
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provided to the engineer. This protocol description shall be utilized by a third party for the purpose of developing control software for the VMS. The protocol shall include functions which shall allow the selection of pre-programmed messages, upload/download of the sign message library, and control of all auxiliary functions. In addition, the protocol shall include functions to retrieve sign status such as current messages, failure states, etc. The protocol shall be provided without any license restrictions or non-disclosure requirements. The manufacturer shall provide a minimum of sixteen hours telephone consultation to any party designated by the engineer as a software engineer who is fully cognizant and knowledgeable in all aspects of the protocol use and application.

In addition to the protocol, a PC based software program shall be provided which fully exercises this protocol. This program shall be utilized for testing purposes.

(f) Cables and Connectors

The contractor shall supply all cables and connectors necessary to interconnect the various new and existing components identified in this specification into a working system. Pin-outs for these connectors shall be established in conjunction with the system consultant. In addition, a “by-pass” cable shall be provided which can be utilized to eliminate the RS232 splitter from the circuit, when a failure of this device is suspected.

CONSTRUCTION DETAILS:
The contractor shall prepare a shop drawing which details all components to be supplied under this bid. As a minimum, a data sheet shall be provided for each item. In addition, the submittal shall include an operations manual for the SBC and Passive RS232 splitters. The submittal shall also include a complete description of the existing VMS protocol as required under (e) of the material specifications. A schematic shall be included which details the operation of the relay circuit utilized to disconnect the transmit of the existing VMS RS232. These drawings shall also include details of the installation and pin-out of all cabling and mounting hardware to be provided.

Within one month of approval of the shop drawings, a complete assembly consisting of all of the new components included in this bid item shall be provided to the engineer. This assembly will be tested by the engineer and will be utilized for software development. This assembly will be returned to the contractor in time to install it in the VMS that it is designated for. If the engineer determines that there is specific problems with the test assembly, the contractor will be notified of the problems. Correction of the indicated problems must be achieved prior to field assembly of the unit.

Subsequent to approval of the shop drawings, all of the material shall be installed in the designated cabinet. The components shall be installed on the shelf of the designated cabinet. Velcro strips shall be utilized to stabilize all shelf mounted components which will protect them
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from moving out of position over long periods of time. Any AC power adapters required shall be connected to power in the cabinet via the AC bus.

The new equipment shall be installed in the assembly so as to minimize service disruptions to the existing VMS. Communications via the existing system interface shall not be disturbed for more than a 4 hour period. The engineer shall be notified at least one week ahead of time of the scheduled switch-over of equipment. This switch-over shall occur during off-peak periods.

Immediately after connection of the new equipment, a test shall be performed by the operating agency to verify that normal system communications is available via the existing port. If it is not, the original connections shall be restored until the source of the problem is identified.

An Operations Standalone test will be conducted that will verify that the hardware is fully operational. The engineer shall provide test software which will be utilized for this purpose.

All components to be supplied under this specification shall be warrantied for a minimum of two-years from the conclusion of the system acceptance test. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs. The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name NYSDOT as the recipient of the service. NYSDOT shall have the right to transfer this service to other private parties who may be contracted to perform overall maintenance of the facility.

METHOD OF MEASUREMENT:
This item shall be measured for payment by the actual number of CONNECT EXISTING VMS TO SYSTEMS COMMUNICATIONS assemblies installed, activated, tested, and accepted.

BASIS OF PAYMENT:
This item shall be paid for at the contract unit price each for CONNECT EXISTING VMS TO SYSTEMS COMMUNICATIONS which price shall include all equipment, material, testing, documentation, and labor detailed in the contract documents.

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

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Approval of Shop Drawings</td>
<td>10%</td>
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<table>
<thead>
<tr>
<th>Description</th>
<th>%</th>
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<tbody>
<tr>
<td>Delivery of The Assembly To the Job Site</td>
<td>50</td>
</tr>
<tr>
<td>Operational Stand-Alone Test of Assembly</td>
<td>30</td>
</tr>
<tr>
<td>System Acceptance (See System Integration)</td>
<td>10</td>
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