ITEM 683.82518008 - 10/100 ETHERNET OVER TWISTED PAIR COPPER MODEM

DESCRIPTION:

This work shall consist of furnishing and installing 10/100 Ethernet over Twisted Pair Copper Modems in accordance with the contract documents and as directed by the Engineer. The Ethernet over Twisted Pair Copper Modems shall be used to transmit and receive Ethernet information over copper twisted pair wire point to point or point to multipoint on the communications network.

MATERIALS:

All materials furnished, assembled, fabricated or installed shall be new, corrosion resistant and in strict accordance with all of the details shown in the Contract Documents and in the Special Specifications.

The Ethernet over Twisted Pair Copper Modems shall be rack or shelf mounted in the same package. The unit will be a self-managed switch with 4 copper 10/100TxE Ethernet ports and two extended distance ports. The extended distance ports support Ethernet over twisted pair or coaxial cable. The self-managed switch allows for multicasting Ethernet data over the twisted pair or coaxial cable. The modem will easily and inexpensively aggregate Ethernet-enabled equipment at remote field locations back to a central or head-end location over existing copper infrastructure. A power supply shall be provided as an integral part of the rack or as an external unit.

Each Ethernet over Twisted Pair Copper Modem shall be fully compatible and interchangeable with existing equipment furnished under previous projects, which included COMNET Communication Networks “Drop-and-Repeat/Point-to-Multipoint Self-Managed switch over Copper Cable Transmission System” Model CNFE4+2CLSMS. Products shall be from the following manufacturers or an equal product as approved by the Engineer.

Manufactured by:

COMNET Communication Networks
3 Corporate Drive
Danbury, Connecticut 06810
203.796.5300

Actelis Networks
47800 Westinghouse Drive
Fremont, CA 94539
Tel: (510) 545-1045 or 866-actelis (866-228-3547)

RUGGEDCOM, INC (by Siemens)
Siemens Johnson City – SIAG Service and Support
One Internet Plaza
Johnson City, Tennessee 37604
**Functional Requirements**

The Ethernet over Twisted Pair Copper Modems shall be an environmentally hardened modem that supports two Ethernet channels over two twisted copper pairs or two coaxial cables. Point-to-Point or drop- and-Repeat/Point-to-Multipoint Ethernet transmission over existing telephone-grade copper, legacy serial, or 75 Ω coaxial cable circuits. Any standard telephone-grade twisted copper pair, legacy serial cabling, or standard 75 Ω coaxial cable may be used, for Ethernet transmission. LED status indicators shall rapidly ascertain the operating status of the modem and the link.

The Copper Ethernet Modem shall have the following features:

- Performs point-to-point or drop-and-repeat/point-to-multipoint Ethernet transmission copper transmission circuits.
- Provides functionality as drop-and-repeat self-managed switches to allow for multicasting Ethernet data on the extended distance ports.
- Provides 4-port 10/100TX Ethernet switch capability.
- Extended distance ports are switch selectable for 10 Mbps or 100 Mbps full or half duplex, on one pair or four pair in UTP mode for maximum transmission distance.
- Uses telephone-grade twisted copper pair, legacy serial cabling, or standard 75Ω coaxial cable circuits to create a point-to-point or drop-and-repeat/point-to-multipoint Ethernet-based network.
- Ethernet ports auto-negotiate for 10 or 100 Mbps.
- Extended distance ports shall have transmission distances of up to 3000 feet between drops over twisted copper (4 pair @ 10 Mbps) and 2000 feet on twisted pair (4 pairs @ 100 Mbps) or up to 5000 feet between drops over coaxial cable (RG59 @ 10Mbps).
- Extended distance ports shall have transmission distances of up to 2000 feet between drops over twisted copper (1 pair @ 10 Mbps) and 1000 feet on twisted pair (1 pair @ 100 Mbps) or up to 2000 feet between drops over coaxial cable (RG59 @ 100 Mbps).
- Designed for installation in harsh out-of-plant/ unconditioned industrial or roadside operating environments (-40°C to +75°C ambient).
- Natural convection cooling; no fans or air filters for the highest level of reliability, and zero periodic maintenance.
- 120/240 VAC power supply included and may also be operated from an external source of +12 to +27 VDC. Units that are powered from the data lines shall not be used.
- The modem shall have an optional Power-over-Ethernet (PoE) capability of up to 30 Watts per each Ethernet port, supporting IEEE802.3at.

**Mechanical Requirements**

The maximum dimensions of the rack shall be 6.1 inches (L) x 5.3 inches (W) x 2.2 inches (H).
**Environmental Requirements**

The equipment shall meet all of its specified requirements during and after being subjected to any combination of the following conditions:

- Operating temperature range of -40° C to +75° C.
- Relative humidity from 0% to 95%, non-condensing
- Fully compliant with the environmental requirements of NEMA TS-2 for Traffic Signal Control Equipment.

**CONSTRUCTION DETAILS:**

The contractor shall install the Ethernet over Twisted Pair Copper Modems in accordance with the contract documents, standard sheets, manufacturer’s instructions, and as directed by the engineer.

Prior to the installation of equipment by the Contractor’s personnel, they shall have received training from the supplier and/or manufacturer on installation, operations, testing and maintenance of all equipment. No intersection equipment shall be installed or accepted without proof of training.

The Ethernet over Twisted Pair Copper Modems will be installed in an auxiliary cabinet. The cable between the Ethernet over Twisted Pair Copper Modems and terminal board shall be as directed by the engineer.

During installation of the cable, the contractor shall take care not to damage conductors, insulation or outer covering. The method of cable installation shall not cause excessive stress on the conductors or any part of the cable. Cable grips and hangers shall be furnished and installed at vertical risers. There will be no separate payment for this work.

The contractor shall program the Ethernet over Twisted Pair Copper Modems by mapping and encoding the Ethernet settings per the manufacturer’s and Engineer’s instructions at each intersection shown in the contract documents or as directed by the Engineer. No separate payment will be made to the contractor for encoding the Ethernet over Twisted Pair Copper Modems.

**Testing Requirements**

The 10/100 Ethernet over Twisted Pair Cooper Modem shall be subjected to testing requirements described as follows:

1.1.1 **Ethernet over Twisted Pair Copper modem Performance Tests**

A Bit Error Rate Test (BERT) by sending data over the longest proposed segment of twisted pair copper at the maximum bit rate supported by the modem. To facilitate this test the contractor shall transmit data between two (2) modems under test, for a period not
less than ten (10) minutes. There shall be with no loss of (dropped) data packets.

1.1.2 Site Verification Test

All switches/jumpers shall be set to the manufactures recommendation and recorded within the SAT documentation, then both polling and a sample data packet is to be transferred, whilst being witnessed by the Engineer.

All activity and status indicators shall be monitored during the test to ensure it is a true representation.

1.1.3 Systems Acceptance Test

The satisfaction of this test completion shall be the basis for system acceptance and shall, at a minimum, exercise all functional operations of each unit of the field equipment including the communication with buses on the route. The test shall also include a thirty (30) day period of normal operations with no failure.

The Contractor shall complete any site specific tests in as few consecutive days as possible. No separate payment will be made to the contractor for the performance of the testing requirements as outlined above.

The Contractor may propose an alternate test procedure, which must be submitted at least ten (10) business days prior to the testing of any system elements for review and Engineer’s approval.

Training Requirements

At least ten (10) business days prior to the testing of any system elements, the Contractor shall submit for review and Engineer’s approval, a Training Plan covering equipment installation, maintenance, and system operation. The training shall be appropriate for varied personnel backgrounds encompassing equipment installation, maintenance, engineering and system administration. The Contractor shall address all comments to the Training Plan and resubmit for approval where necessary. Training can be scheduled only after the Engineer’s approval of the Training Plan and the receipt of any training manuals and documentation.

When installing the modems for Ethernet over copper communications, the contractor will conduct testing of the communications link for each traffic signal controllers installed, in coordination with the City of White Plains Traffic Division of Parking (914-422-1232). Two modems shall be installed in the central computer room by the contractor in coordination with White Plains staff. Traffic Signal controllers will be set up in daisy chain format (as much as possible) with some spur connections. The controller modems will be linked back to central computer room modems located at 255 Main Street (basement), White Plains, NY

Documentation

In addition to any other documentation requirements previously stated, the Contractor shall provide the following:

- All manufacturers’ documentation for equipment to be supplied under this item. This documentation shall include all operations, maintenance, software support, and protocol descriptions available from the manufacturer each system component. In addition, all documentation specifically requested in individual item specifications shall be delivered.
Written documentation of the correct hardware (settings, etc.) and software adjustable configurations for all equipment used under this item.

A site specific graphical depiction of all cable assemblies (“pin-outs”) and the actual interconnection of all system components.

**Warranty**

All equipment shall be covered by a full manufacturers warranty for a period of two (2) years from the date of the final acceptance.

**Maintenance**

The contractor will not be required to take over maintenance of each Ethernet over Twisted Pair Copper Modem after the installation. However, if within twenty-four (24) hours of completion of the work modem malfunctions, then the contractor shall respond within two (2) hours to correct the malfunction. If it is determined that the condition was not a result of the contractor’s work, the malfunction shall be reported to the governing agency. No separate payment will be made for this work.

The contractor shall be responsible for any damages to the intersection caused by their installation of Ethernet over Twisted Pair Copper Modem equipment. The contractor shall repair any damages to the intersection to the satisfaction of the engineer at no additional cost to this contract and at the contractor’s own expense. The Engineer has a period of 2 weeks after installation of the equipment to bring to the attention of the contractor any damages caused by his installation for the contractor to repair.

**METHOD OF MEASUREMENT:**

The measurement for payment shall be the number of fully tested Ethernet over Twisted Pair Copper Modems operating in accordance with the contract documents, manufacturer’s instructions, requirements of the NYSDOT representative’s and all the Engineer’s requirements.

The contractor shall not receive additional payment for the testing and client training associated with this item.

**BASIS OF PAYMENT:**

The unit price bid for each Ethernet over Twisted Pair Copper Modem shall include the cost of furnishing all labor, materials, tools, equipment, and incidentals necessary to satisfactorily complete the installation, operation and testing of the Ethernet over Twisted Pair Copper Modems.