DESCRIPTION:
This work shall consist of furnishing and installing a CDPD (Cellular Digital Packet Data) radio modem at the locations indicated elsewhere in the contract documents or as ordered by the engineer. The supplied equipment shall include all hardware required to interface the field device with the CDPD network and the existing control center link to the cellular carrier.

MATERIALS:
All material furnished, fabricated or installed shall be new, corrosion resistant and in strict accordance with these special provisions and the remaining contract documents. The CDPD modem assembly shall be supplied as a complete integrated unit including power supplies, antennas, interconnecting cables, single board microprocessor, and all incidental hardware necessary to complete a working remote communications unit.

The Contractor shall provide certification from the manufacturer that all applicable equipment to be supplied under this work item has been tested and found in compliance with the requirements of Class B digital device pursuant to Part 15 of the FCC rules.

(a) CDPD Modem

The CDPD Modem shall be suitable for shelf mounting in NEMA 3R or 4X outdoor equipment cabinets which are existing or to be installed under other contract items.

The CDPD Modem shall meet the following functional requirements:

* Comply with the CDPD standard
* Support the AT Command Set.
  * Modem IP address shall be field programmable either through dip-switches in the unit or through a notebook computer using software furnished under this bid item.
* Receive multicast transmissions.
* Store all modem configuration parameters in non-volatile memory.
* Supported Protocols: TCP/IP, UDP, SLIP and Telenet using a protocol stack internal to the modem.
* The CDPD Modem shall be suitable for shelf mounting.

The CDPD Modem shall meet the following specific requirements:

* Number of Data ports: One RS232C Port.
* Data Rate: Up to 1.2 to 19.2 kbps autos elect
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* Operation: Full and Half duplex

* RF Power Output: 3 watts

* Nominal Dimensions: 200 mm (W) x 300 mm (L) x 100 mm (H)

* Temperature (operating): -20°C to +60°C

* Temperature (storage): -40°C to +70°C

* Electrical Power: 115 ±20 VAC; current drain shall not exceed 2.5 A. (The units may operate at an AC or DC voltage lower than 115 VAC with external power supply to be supplied as part of work item)

* Indicators: LEDs for Power On and Receive Signal.

(b) Coaxial Cable Protector

A coaxial cable protector shall be installed in the cabinet between the CDPD modem and the antenna. The coaxial cable protector shall meet the following requirements:

- * Surge: 50 kA, IEC 1000-4-5m 8/20 us waveform, 500 Joules
- * Turn on voltage: 600 VDC ±20%
- * Turn on time: 2.5 ns for 2 kV/ns
- * VSWR: 1.1 to 1
- * Insertion loss: 0.1 dB over frequency range 500 MHZ to 1 Ghz
- * Temperature: operating: -30°C to +60°C storage: -40°C to +70°C
- * Material: Corrosion resistant aluminum enclosure with stainless steel hardware

(c) Antenna and Feed line

A standard cellular non ground plane mobile antenna compatible with the CDPD modem shall be used. A snub-nosed (rubber-duck) antenna shall not be acceptable. The antenna shall meet the following requirements:
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* Frequency: 825-895 MHZ
* Gain: 3 dB
* Nominal impedance: 50 ohms
* Maximum power: 200 W
* Bandwidth: 70 MHZ
* Radiator: 17-7 Stainless Steel
* Cable: RG 58U (maximum length 3 meters) or Andrew FSJ4-50 B or equivalent) for antenna cables over 3 meters (see detail on plan sheet RD-1 labeled extending antenna cables.

* Coaxial cable connectors: All coaxial cable connectors used shall be EIA compliant UG/1186U utilizing captive pin technology.

**d) Single Board Microcomputer:**

A standalone single board embedded microcomputer shall be provided which will be utilized to reduce and control the amount of wireless data transmission required to support the data device at the site. This single board microcomputer shall be installed between the port of the device requiring communications and the CDPD wireless modems serial port. The microcomputer will operate special software to be provided by the engineer which will provide the data compression functionality.

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)
* One parallel port with (minimum) 8 TTL level outputs
* Processor: 68360
* RAM: 1 Meg Minimum
* Flash EEPROM: 1 Meg Minimum
* Operating temperature -40 Deg C. To 85 Deg C.

* Relative Humidity 0 - 95 % (non condensing)

* Programmable in C or C++

As part of the single board processor, a bypass cable shall be supplied which can be utilized to
eliminate the processor from the data path. This cable shall mate with the cable utilized to attach
the data source to the single board computer and the cable utilized to connect to the CDPD modem.

The single board processor to be supplied shall be the same as other single board processors to be
provided under different bid items in this contract.

(d) Software Development Kit

A software development kit shall be supplied for every fifteen or fraction thereof of single board
computer assemblies supplied as part of this contract. (ie: If 16 Single Board Computers are
supplied, 2 Software Development Kits would be required.). 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 microprocessor manual, 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.

(e) CDPD Modem Documentation

A copy of all of the operations/maintenance manuals and schematics available from the
manufacturer for the CDPD modem and related items described in this specification shall be
supplied with each five units or fraction thereof of CDPD modems required under this contract.

Maintenance manuals shall include complete sub-component parts listing and user troubleshooting
procedures. Complete operations and protocol manuals shall also be provided with each assembly.

(f) Diagnostic Test Software

The contractor shall provide the following test software to run on a notebook computer to be used
for operational Stand-Alone test.

* Communications software in ASCII terminal emulation mode to permit the entry of AT
  COMMANDS required for modem setup and diagnostics. The software shall provide
  for the logging of its terminal communications activity to a file for later analysis or
  printout.
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If these functions can be accomplished via standard terminal utilities available in Windows 95 or Windows 3.1, this item can be deleted. However, if such software is a standard packaged item normally supplied with the modem, the software along with all relevant documentation shall be supplied.

CONSTRUCTION DETAILS:
The contractor shall prepare a shop drawing which details all components to be supplied under this bid item. As a minimum, a data sheet shall be provided for each item. In addition, the submittal shall include an operations manual for the CDPD Modem and the Single Board Microcomputer. These drawings shall also include details of the installation of all cabling and mounting hardware to be provided. Upon request, the contractor may be required to perform a field demonstration of the assembly at a particular site which would be intended to approximate the conditions under which the CDPD COMMUNICATIONS will need to operate under for the project.

Subsequent to approval of the shop drawings, all of the material shall be installed in the designated cabinet. The CDPD MODEM and Single Board Microcomputer shall be installed on the shelf of the designated cabinet. Velcro strips shall be utilized to stabilize the assembly and protect it from moving out of position over long periods of time. The AC adapter shall be connected to power in the cabinet via the AC bus.

The data cable shall be connected between the CDPD Modem and Port 1 of the SBC(Single Board Microcomputer). In addition, a second data cable shall be connected between Port 2 of the SBC to the data device located in the cabinet to which the connection shall be made.

The antenna shall be mounted as shown in the plans. The Contractor shall install the equipment in accordance with the manufacturer’s instructions and to comply with FCC requirements. The coaxial cable protector shall be mounted within the cabinet near the cable entry and connected to ground.

The engineer will provide the contractor with diagnostic software to be installed in the single board processor. This software will simply retransmit any data received and will operate in bypass mode. The software will be provided to the contractor within two months of the delivery of the first board and all required documentation to the engineer. This time will be required to develop the required software. The contractor shall account for this time when developing all schedules for the project.

The Contractor shall be responsible for registering each CDPD Modem with the CDPD service provider and obtaining and programming the IP address and multicast address for each modem. All modems shall be configured for the same multicast group. NYSDOT shall provide for the CDPD service. However, the contractor is assigned the responsibility of interfacing with the designated service provider for the purpose of establishing service. As part of this work, The Contractor shall provide to the Engineer and Cellular Service provider, at least thirty-days prior to the start of the operational stand-alone tests, the IP address for each modem and the multicast address.
After all antenna / feedline connections have been made, and before sealant has been applied to antenna connections, the contractor shall perform a “Standing Wave Ratio” (SWR) test of the antenna, feedline and coaxial cable protector, using a calibrated watt meter and reflectometer such as a Bird Truline Model 43. If a narrow band emitter is used to perform this test it shall be performed at 860 MHZ. The contractor shall keep a record of the results of each antenna feedline SWR test results and make the information available to the engineer. No VSWR of less than 1.2 to 1 shall be acceptable. Once an acceptable SWR has been achieved, all antenna connectors shall be sealed with heat shrink tubing with an epoxy sealant such as 3M brand CCT tubing.

An Operational Standalone Test shall be conducted to verify that communications has been established to the data device at the cabinet. This test shall be conducted from the Central to which the modem will be connected to and the local device. The engineer will provide the contractor with diagnostic software which shall be utilized for the operational test.

All components to be supplied under this specification shall be warranted 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 then 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 CDPD COMMUNICATIONS assemblies installed, activated, tested, and accepted.

**BASIS OF PAYMENT:**
This item shall be paid for at the contract unit price each for CDPD COMMUNICATIONS assemblies 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>
</tr>
<tr>
<td>Delivery of The Assembly To the Job Site</td>
<td>40%</td>
</tr>
<tr>
<td>Operational Stand-Alone Test of Assembly</td>
<td>40%</td>
</tr>
<tr>
<td>System Acceptance (See System Integration)</td>
<td>10%</td>
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