ITEM 11683.9117 M - SPEED MEASURING RADAR DETECTOR
ITEM 11683.9118 M - RADAR DETECTOR POWER SUPPLY

**DESCRIPTION:** This work shall consist of furnishing and installing Speed Measuring Radar Detectors, including input file cards and power supplies for the Speed Measuring Radar Detectors, in accordance with the contract documents and as directed by the Engineer. The Speed Measuring Radar input file cards shall provide outputs to a type 170E controller in order to emulate loops in a trap configuration. Each input file card shall be capable of emulating at least one trap configuration and shall take up no more than one slot in the input file. The input file and 170E controller shall be furnished under other bid items.

**MATERIALS:** The Contractor shall provide all the necessary equipment required to satisfactorily complete the work. All materials furnished, assembled, fabricated or installed shall be new, corrosion resistant and in strict accordance with all the details shown in the contract documents and in this special specification.

**Speed Measuring Radar Detector**

**Functional Requirements:** The units shall be designed for mounting in a side fired position along the shoulder of the roadway either on a pole, sign bridge or overpass facing. The material of the structure to which it is mounted shall not affect its operation.

The unit shall not require the programming of either average vehicle length or average speed in order to meet the requirements specified herein.

**Specific Requirements**

**Detection Requirements**

- **Accuracy:** The equipment shall meet the following accuracy requirements:
  - Speed: ± 10%.
  - Volume: ± 5%.
  - Occupancy: ± 5%.

- **Consistency:** The above criteria shall be met for at least 90% of samples collected and without the need for any reprogramming as the mix of vehicle lengths change.

- **Detection zone:** As a minimum, eight travel lanes of roadway, including vehicles traveling in opposite directions, over a maximum range of 60 m when the unit is mounted at a height of 4 to 10 m at a distance of 3 to 15 m from the edge of the closest travel lane. The shoulder is not considered to be a travel lane. The accuracy requirements shall be met for all vehicles in the detection zone. The detection zone configuration shall be stored in the Speed Measuring Radar Detector in non-volatile memory. The Contractor shall provide configuration software suitable for running on a notebook computer.

**Electrical**

- **Power Requirements:** 7.5 W (28 VDC).
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- **Data Interface:** Data shall be transmitted in a serial format through an RS-232C or RS-485 interface as specified in the contract documents. The type of interface shall be user selectable.

- **Transient Protection:** Meets requirements of Section 2.1.6 “Transients, Power Service” of NEMA Standard TS-1.

**Mechanical**

- **Mounting:** All of the electronics shall be housed in a weatherproof enclosure suitable for mounting on either a pole or other structure fabricated out of aluminum, steel, concrete, stone or wood. The unit shall be adjustable to provide the required coverage.

- **Termination:** The power and data cables shall be terminated in a method approved by the Engineer so as to preserve the weatherproof integrity of the unit.

- **Weight:** 2.5 kg maximum (including any external junction box).

- **Dimensions:** 320 mm (H) x 230 mm (W) x 76 mm (D).

**Environmental**

- **Operating Temp:** -40°C to 75°C.

- **Storage Temp:** -40°C to 75°C.

**Radar Detector Power Supply**

**Functional Requirements:** The Radar Detector Power Supply shall be a stand-alone unit suitable for shelf mounting inside the designated field cabinet. The power supply shall provide the power required for the operation of the Speed Measuring Radar Detectors.

**Specific Requirements**

**Electrical**

- **Output Voltage:** 28 VDC ± 1 VDC. The output voltage shall be limited to 29 VDC.

- **Current:** ≥ 500 mA (over temperature range -20°C to 70°C).

- **Regulation (line):** ≤ 0.2%.

- **Ripple:** ≤ 50 mV peak to peak.

**Mechanical**

- **Dimensions:** 250 mm (L) x 150 mm (W) x 100 mm (H) (maximum).

- **Weight:** 3 kg (maximum).

**Environmental**

- **Operating Temp:** -20°C to 70°C.

- **Storage Temp:** -40°C to 85°C.
CONSTRUCTION DETAILS: The Contractor shall install the Speed Measuring Radar Detectors at the locations shown on the plans in accordance with the manufacturer’s recommendations. The units shall be oriented such that speed can be measured for all travel lanes at each location shown and the serial interface shall be set for either RS-232C or RS-485 operation as indicated in the plans.

The Contractor shall connect all data cables, described under other items, to the detector and to the Input/Communications Panel within the Field Cabinet described under another item. The Contractor shall install a power supply in the designated cabinet and connect all power cables, described under other items, required to make the Speed Measuring Radar power supply operational and make any adjustment to the power supply voltage such that the voltage measured at the input to each Speed Measuring Radar Detector measures 28 VDC (±1 VDC) with all detectors reporting to the power supply powered on.

Documentation: The Contractor shall furnish the following documentation:

Manuals: The Contractor shall furnish ten (10) sets of maintenance and operations manuals. The maintenance manuals shall contain maintenance and trouble shooting charts and procedures to permit fault isolation to the lowest replaceable unit level. The Contractor shall assemble the individual manuals and trouble shooting and fault isolation procedures into loose-leaf binder(s). The equipment manuals shall as a minimum contain the following:

a. Complete schematic diagrams.

b. Complete installation and operation procedures.

c. Complete performance specifications (functional, electrical, mechanical and environmental) of the unit.

d. Complete list of replaceable parts including names of vendors for parts not identified by universal part numbers such as JEDEC/ RETMA or EIA

e. Complete maintenance and troubleshooting procedures.

The Contractor shall submit to the Engineer six (6) copies of review manuals for approval prior to the final submission. The review copies shall be submitted prior to the start of the system acceptance test. The final copy shall be submitted within 30 calendar days of receipt of review comments from the Engineer. Any changes resulting from the testing of the units shall be incorporated into the final submission.

Training

Installer Training: All of the personnel involved in the installation, operation and testing of the equipment shall have received training is such tasks prior to installation of the equipment. The proof of training shall be submitted to the Engineer a minimum of ten working days prior to the start of the first installation. The Contractor shall not install the speed measuring radars until the personnel have been approved by the Engineer.

Maintenance and Operations Training: Training in the set-up, calibration and use of the test software shall be provided in accordance with the special notes.

Testing: In addition to the testing described in the Special Notes, the Speed Measuring Radar Detector shall be subjected to the following testing:

Design Demonstration Tests: The Contractor shall conduct Design Demonstration Tests of the Speed Measuring Radar Detector at either the manufacturer’s test site or, with the Engineer’s permission, an
installation site. The site shall provide for the detection of vehicles of various lengths across up to eight lanes of traffic at distances up to 60 meters. The Contractor shall provide all test equipment. As a minimum, the test shall demonstrate the following:

a. Detection of vehicles to the accuracy and consistency requirements specified in this special specification for each lane of traffic including those in opposite directions without the need to reprogram as the mix of vehicle lengths change. The upstream and downstream emulated pulses shall be measured and shall be within 5% of each other.

b. Accuracy of the spacing between the two pulses with the speed of the vehicle passing through the detection zone measured with a radar or lidar gun (e.g. Laser Technology LTI Marksman).

c. Configuration of the unit and storage in non-volatile memory of the configuration parameters.

d. A test car of known length shall be driven through the detection zone and its calculated presence based on the known vehicle length and speed shall be compared to the measured results. This measurement shall be repeated a total of twenty times with a minimum of twice in each detection zone.

For a. and b., a minimum of 150 measurements shall be made.

Operational Stand-Alone Test: After installation of the detectors and their associated power supplies and prior to integration of the equipment into the system, the Contractor shall perform an operational stand-alone test in the field for each of the units. The test shall demonstrate as a minimum the ability of the detector to measure speed, volume and occupancy. The Contractor shall verify the accuracy of the speed measured by the Speed Measuring Radar Detector using an independent means (e.g., radar or lidar gun) to measure the speed of the passing traffic. Test software furnished by the Contractor shall be used to emulate the Type 170E controller. The test software shall run on the notebook computer furnished as part of the System Support Equipment. As part of this test, the DC voltage at each Speed Measuring Radar Detector shall be measured and recorded. The voltage shall be 27-29 VDC.

If the standalone test fails, the equipment shall be repaired and the test shall be rerun for that site. If a component has been modified as a result of a failure, that component shall be replaced in all like units and the test shall be rerun for each unit.

METHOD OF MEASUREMENT: This work will be measured for payment as each unit of the type specified in the contract documents satisfactorily installed.

BASIS OF PAYMENT: The unit price bid for each item shall include the cost of furnishing all labor, test software, materials, and equipment necessary to satisfactorily complete the work.

Progress payment for each item will be made as follows:

- Fifty percent of the bid price for each item will be paid when the Speed Measuring Radar Detector and power supply are installed and have passed the operational stand-alone test.
- Twenty percent of the bid price for each item will be paid upon successful completion of the Detector Processing Group Local Site Verification Test.
- Twenty percent of the bid price for each item will be paid upon successful completion of the Detector Processing Group Remote Site Verification Test.
- Ten percent of the bid price will be paid upon system acceptance.