

## SECTION 663

### SIGNAL PRIORITY AND PREEMPTION SYSTEMS

#### **663-1 Description.**

Furnish and install a signal priority and preemption system as shown in the Plans. The signal preemption system must recognize and respond to the priority of each user. Meet the requirements of Section 603.

#### **663-2 Materials.**

Use signal priority and preemption system equipment listed on the Department's Approved Product List (APL). Ensure that all materials furnished, assembled, fabricated or installed are new products.

Signal priority and preemption system equipment may utilize optical, GPS, and radio frequency based technologies.

**663-2.1 Functional Requirements:** Ensure that in-vehicle equipment operates without requiring any action from the vehicle operator or occupants once power is applied.

**663-2.1.1 Security:** The system must include features that secure the system and restrict its configuration and operation to authorized users and vehicles only.

**663-2.1.2 Vehicle Identification:** The system must be able to assign a unique identifier for each authorized vehicle. The system must be able to associate the identifier with vehicle information such as vehicle classification (e.g., fire, police, rescue, transit), owner/operator, and priority level.

**663-2.1.3 Configuration and Management:** The system must allow authorized local and remote users to set and read all user-programmable features and retrieve data collected by the system. The manufacturer must provide computer software required to configure, operate, and maintain the system at no additional cost to the Department.

**663-2.1.4 Logging:** The system installed in the field cabinet must store a record of events, including time, vehicle ID, class, priority level, and approaching direction for all vehicles detected. The log must operate on a first-in, first out (FIFO) principle with a minimum capacity of 5,000 events.

**663-2.1.5 Detection Range and Accuracy:** The priority and preemption system must be capable of detecting and identifying multiple authorized vehicles at various ranges up to 2,500 feet. The system must be able to determine the approaching direction of authorized vehicles. The detection range and programming of emergency (high priority) and transit signal (low priority) preemption shall be adjustable from within the traffic signal cabinet. High priority calls must override low priority calls.

The system must service preemption calls having equal priority on a first-come, first-served basis.

**663-2.2 Preemption System Cabinet Electronics:** The priority and preemption system must be compatible with NEMA TS 1, NEMA TS 2, Type 170, and Type 2070 traffic signal controllers and their respective cabinets.

The system must be able to provide calls to the controller via input file and detector rack. The system must include two channel or four channel detector card units compatible with NEMA TS 2-2003 v02.06. The system must include a shelf mount option.

The system must be able to provide emergency preemption (high priority) and transit signal (low priority) preemption calls to the controller. Detectors must include

programmable timers that allow the operator to configure detector call extension as well as limit the length of channel output calls.

Channel outputs must deliver a constant signal while emergency vehicles are detected for high priority preemption activation. Channel outputs must deliver a pulsed output for low priority preemption activation. Inputs and outputs must be optically isolated.

**663-2.2.1 Serial Interface:** Ensure that the serial ports support data rates up to 115 kbps; error detection procedures utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2). Serial interface ports may utilize RJ-45 connectors, D-sub connectors, or screw terminals.

**663-2.2.2 Network Interface:** Ensure that local area network (LAN) connections support the requirements detailed in the Institute of Electrical and Electronics Engineers (IEEE) IEEE 802.3 Standard for 10/100 Ethernet connections. Ensure that the connector complies with applicable Electronic Industries Alliance (EIA) and Telecommunications Industry Association (TIA) requirements.

**663-2.3 Optical Preemption Detectors:** Optical preemption detectors must respond to light impulses generated from a visible or infrared light source.

**663-2.4 Intersection Radio/GPS Modules:** Radio/GPS preemption systems must include radio/GPS modules that transmit a beacon signal and receive data transmitted by Radio/GPS vehicle equipment.

**663-2.5 Mechanical Specifications:** Ensure equipment is permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number.

Ensure that every conductive contact surface or pin is gold-plated or made of a noncorrosive, conductive metal. Do not use self-tapping screws on the exterior of the assembly.

All external parts must be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

Detector cards must include indicators for power and vehicle detection. Detector cards must include a test switch that can be used to manually generate detector calls that the system provides during normal operations.

**663-2.6 Electrical Specifications:** Provide equipment that operates on a nominal voltage of 120 volts alternating current ( $V_{AC}$ ). If the device requires operating voltages of less than 120  $V_{AC}$ , supply the appropriate voltage converter.

**663-2.7 Environmental Specifications:** Ensure system electronics perform all required functions during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9. Detectors and detector connections that are exposed to the elements must be weatherproof and designed for outdoor use.

### **663-3 Installation.**

Installation of materials must be in accordance with the manufacturer's instructions. Install the emergency preemption system including installation of detectors with all necessary hardware and software, mounting hardware, cabling, and all other associated electronics in cabinet necessary to create a fully functional emergency preemption system.

Ensure that status indicators remain unobstructed and visible.

**663-3.1 Field Testing:** Subject the system to field acceptance tests (FATs). Develop and submit a test plan for FATs to the Engineer for approval. The Engineer reserves the right to witness all FATs.

**663-4 Warranty.**

Ensure that the manufacturer will furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification.

Ensure that the priority and preemption system has a manufacturer's warranty covering defects for five years.

**663-5 Method of Measurement.**

The Contract unit price for each signal priority and preemption system, furnished and installed, will include furnishing, placement, and testing of all equipment and materials, and for all tools, labor, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, documentation, and incidentals necessary to complete the work.

**663-6 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 663-1-       Signal Priority and Preemption System