ITEM 680.050200NA - VIDEO VEHICLE DETECTION EQUIPMENT

DESCRIPTION

This work shall consist of furnishing and installing a system that detects vehicles on a roadway by processing video images sent from a camera to an image processor with detector outputs that can be received by a 2070L series traffic signal controller within a 336S or 332 traffic signal control cabinet.

MATERIALS

1. Hardware

   1.1. This specification shall include furnishing and installing (1) one fixed position closed circuit video camera as shown on the plans or as ordered by the engineer.

   1.2. This includes any and all mounting hardware for attachment to a horizontal member such as a traffic signal mast arm or a light duty camera standoff cantilever arm, as well as the required video, power, and control cables routed back to the traffic signal control cabinet.

   1.3. This specification shall include furnishing and installing (1) one video camera image processor capable of receiving images sent from the camera, decoding them, and using the camera images to determine the need for a vehicle detection call to be placed on the respective roadway approach. This item includes all wiring and configuration of the unit to make it functional. The IP shall be modular by design and housed in a standard input file for a 336S or 332 signal control cabinet. Each IP shall occupy no more than two file slots, with four (4) separate programmable outputs. All power shall come directly from the input rack.

2. Software

   2.1. The system shall be capable of detecting vehicles in multiple lanes of traffic simultaneously. Detection zones shall be user-defined by utilizing a laptop connected directly to the image processor. The user must be able to define virtual vehicle detectors by placing lines and boxes on the video display on the laptop. Software must allow the user to re-define the parameters of the video detection at any time. Once saved, the image processor must be able to acknowledge the presence of a vehicle and send a call to the 2070L controller via the input file assignment.

   2.2. The software must also allow real time streaming video to be introduced to an Ethernet network within the traffic signal controller cabinet. The image processor must be IP (internet protocol) addressable to allow for this streaming video output. The video output will be stripped of the lines and boxes necessary to make the video detection possible, and must not interfere with the functionality of the video detection system.

3. Functionality

   3.1. Real time video detection

   3.2. Image processor must be capable of processing the images from a video camera at a speed of 30 times per second.
3.3. The system shall be capable of detecting the presence of vehicles in multiple vehicle detection zones simultaneously.

3.4. System shall be capable of stop line detection, presence detection, directional presence detection, and system sensors.

3.5. It shall be possible to set-up and view the image processor software by using a standard laptop computer and connecting via Ethernet, USB, or serial connection. No special video capture cards will be required.

3.6. All set-up parameters and settings shall be saved on the image processor card and shall be saved and automatically recovered in the event of a disconnect or a power fail.

3.7. The system shall have the ability to upload / download the set-up parameters directly to or from a laptop.

4. Vehicle Detection

4.1. The video detection system shall provide flexible detection zone placement anywhere and at any orientation within the combined field of view of the cameras. A single detector shall be able to replace multiple conventional detector loops connected in series.

4.2. Placement of detection zones shall be by means of a laptop computer operating in the Windows XP or higher operating environment, and a mouse or by using a simple keyboard and monitor. The monitor screen of a laptop computer shall show images of the detection zones superimposed on the video image of traffic. This configuration shall allow the display of detection superimposed on the video image of traffic directly on the laptop computer.

4.3. The detection zones shall be created by using the mouse or simple keyboard to draw detection zones on the laptop computer.

4.4. It shall be possible to use the mouse or other input device to edit previously defined detector configurations so as to fine-tune the detection zone placement. Once a detection configuration has been created, the computer system shall provide a graphic display of the new configuration the laptop computer.

4.5. It shall be possible to individually adjust sensitivity for each detection zone in the system.

4.6. When a vehicle is under a detection zone, the detection zone shall change in color or intensity on the laptop computer screen, thereby verifying proper operation of the detection system.

4.7. Overall performance of the video detection system shall be comparable to inductive loops. Using standard camera optics and in the absence of occlusion, the system shall be able to detect vehicle presence with 98% accuracy under normal conditions (day & night) and 96% accuracy under adverse conditions (fog, rain, snow).
5. **Environmental**

5.1. The system shall be designed to operate reliably in the adverse environment found in the typical roadside traffic controller cabinet. It shall meet the environmental requirements set forth for Type 2070L controllers. Operating temperature shall be from -31 F to +165 degrees F at 0% to 95% relative humidity, non-condensing.

6. **Electrical**

6.1. Serial communications to the modem shall be through an RS-232 serial port. This port can be used for communications to a modem, or laptop.

6.2. The Image Processor shall be equipped with a detector interface for at least 4 detector outputs. Output levels shall be compatible with the Type 2070L standards, for a standard model 336S or 332 cabinet.

6.3. The Image Processor shall be equipped with (1) one BNC composite video input.

6.4. The Image Processor shall be equipped with at least (1) one BNC composite video output.

6.5. The Image Processor shall have error detection, and shall provide a closed output in the event of camera failure or IP malfunction or loss of video due to inclement weather (fog/whiteout).

6.6. The Image Processor shall have the capability transmitting real time streaming MPEG-4 video. MPEG-4 video will be transmitted via Ethernet communications to the existing traffic signal network where it can be remotely decoded and displayed and/or stored.

6.7. The Image Processor shall have separate light emitting diodes that indicate power, video, serial communications, and detector actuations.

7. **Camera**

7.1. The video system shall use medium-resolution full color camera as the video source for real-time vehicle detection. Each camera shall provide at least 383-line resolution and at least a 510 x 492 pixel CCD sensing element that produces useable video at a scene luminance level of 0.15 lux. It shall have automatic gain, automatic iris, and absolute black reference controls. The limits of gain, iris, and sensitivity shall be adjustable to minimize blooming during nighttime hours.

7.2. The camera lens shall provide power zoom capability from .31 inches to 1.9 inches, or a fix focal length in the range from .15 inches to 2.95 inches, as specified by the manufacturer. The auto-iris capability of the lens shall operate reliably at -7 degrees F.

7.3. The camera and lens assembly shall be housed in an environmental NEMA-4 enclosure that is watertight and dust proof. The camera shall employ the use of a heater, not to consume more than 15-watts of power. Heater shall be attached to the faceplate of the enclosure to avoid ice and condensation in cold weather. The enclosure shall be light-colored and shall include a sun shield to minimize solar heating and glare.
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7.4. A video interface panel shall be mounted inside the traffic signal controller cabinet. The panel shall provide a terminal block for power connection and grounding, coaxial cable connection points, and a transient voltage suppressor for each image sensor.

7.5. The camera shall be connected to the IP in such a manner that the attenuation of the MPEG-4 video signal from the image sensor is not attenuated more than 3 db when measured at the IP. The connection between the cameras and the video interface panel shall be coaxial cable suited for outdoor installation and the cost shall be included in this item.

CONSTRUCTION DETAILS

8. Installation and Training

8.1. The manufacturer of the video detection system or their representative shall design the camera layout, placement and lens size, and shall supervise the installation and testing of the video and computer equipment. A factory certified representative from the supplier shall be on-site for a minimum of one (1) day.

8.2. Training shall be provided “As Needed” to personnel of the contracting agency and County personnel in the operation, setup, and maintenance of the video detection system. Two (2) operations manuals shall be provided for each unit installed.

8.3. The manufacturer shall provide 4 complete sets of maintenance manuals for the installed equipment. These manuals shall have complete set-up, maintenance, and troubleshooting procedures presented in an organized format.

METHOD OF MEASUREMENT

This work will be measured as the number of Video Vehicle Presence Detectors that are satisfactorily furnished and installed in accordance with the contract documents and as directed by the Engineer.

BASIS OF PAYMENT

The unit price bid to furnish and install Video Vehicle Detection Equipment shall include the cost of furnishing all labor, tools, materials, installation, hardware, software, mounting bracket, power, control and video cables, training, and technical support associated with providing fully functional and accepted Video Vehicle Presence Detectors. No payment will be made until the equipment has operated properly and satisfactorily for fifteen (15) days and the equipment is accepted.