Louisiana
Department of Transportation
and
Development

Traffic Control Standard
Number 44

Video Detection System

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GENERAL

This specification sets forth the minimum requirements for a complete Video Detection System (VDS) that will monitor vehicles on a roadway via processing of video images and provide detector outputs to a traffic controller or similar device.

A single intersection video detection system should include the following components:

- Color Camera
- Bus Interface Unit (BIU)
- Processor
- Camera Interface Panel
- One (1) Video Monitor (7-10 inch screen size)
- One (1) Mouse or a Handheld Programming Device, if required
- Connectors
- Communication Cable
- Camera Mounting Hardware

SOFTWARE

The system software shall be able to detect either approaching or departing vehicles in multiple traffic lanes. Each video processor module card shall be capable of a minimum of sixty-four (64) detector outputs and each processor input shall be capable of a minimum of twenty (20) detection zones. Each zone and output shall be user-definable through interactive graphics by placing lines and/or boxes in an image on a video monitor or personal computer. The user shall be able to redefine previously defined detection zones.

Software updates shall be provided for the life of the product at no additional cost to the Department.

CAMERA AND ENVIRONMENTAL ENCLOSURE

The video detection camera shall be completely compatible with the video detection processor and such compatibility shall be certified by the manufacturer to ensure proper system operation.

The detection system shall produce accurate detector outputs under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 0.009 to 930 foot-candles (0.1 lux to 10,000 lux). The camera shall compensate for changing of lighting by using an electronic shutter and/or auto-iris lens.

Images shall be produced with a Charge Coupled Device (CCD) sensing element with horizontal resolution of at least 470 lines and vertical resolution of at least 400 lines. Images shall be output as a video signal conforming to RS 170A or CCIR.

The camera and lens assembly shall be housed in an environmental enclosure that meets or exceeds the latest NEMA-4 (National Electrical Manufacturers Association) specifications and the following requirements:
- Enclosure shall be metallic, light-colored and must include a sun shield to minimize solar heating. The front edge of the sunshield shall protrude beyond the front edge of the environmental enclosure and shall include a provision to divert water flow to the sides of the sunshield. The amount of overhang of the sunshield shall be adjustable to block the view of the horizon and prevent direct sunlight from entering the lens. Any plastics used in the enclosure shall include ultra violet inhibitors.

- Enclosure shall allow the camera to operate satisfactorily over an ambient temperature range from -30°F to +140°F while exposed to precipitation as well as direct sunlight. Enclosure design shall prevent the formation of ice and condensation on the lens.

- Enclosure shall allow the camera horizon to be rotated in the field during installation.

- Enclosure shall include a provision for connection of power and video signal cables. The input power to the environmental enclosure shall be nominally 120 VAC60 Hz.

- The design of the enclosure shall not interfere with the operation of the camera electronics and video signal.

Image sensor(s) shall meet FCC class B requirements for electromagnetic interference emissions when operating in the environmental enclosure with power and video signal cables connected.

Video output of the cameras and all video connections for the cameras to the video interface panel shall be isolated from earth ground. Connections for both video and power shall be made to the processor using waterproof, quick disconnect connectors.

**VIDEO DETECTION SYSTEM CABINET COMPONENTS**

The video detection system components listed below shall be housed in the signal cabinet:

- Bus Interface Unit (BIU)
- Camera Interface Panel
- All associated equipment required to setup and operate in a field environment including
  - One (1) Video Monitor (7-10 inch screen size)
  - One (1) Mouse or Handheld Programming Device, if required to connect up to four (4) cameras.

**Camera Interface Panel**

Panel shall have a maximum size of 12” x 11” x 3.5” thick in order to be able to mount to unistrut inside the signal cabinet. See Figure 1. Any required connector cables shall be included.

**Processor Component**

The processor shall convert the video image provided by the camera, generate vehicle detection for defined zones and collect vehicular data as specified herein.
The processor shall have a modular electrical design and shall be powered by 89-135 VAC, 60 Hz single-phase. Power to the VDS shall be from the transient protected side of the AC power distribution system in the signal cabinet in which the VDS is installed.

The processor may be housed either in the cabinet or inside the detection cameras on the outside of the cabinet. If the processor is housed in the signal cabinet, then the system shall be powered by 12-24 VDC and draw less than 2 amperes and shall fit directly into NEMA TS1 and TS2 type detector racks, or other specially supplied racks that are supplied if necessary. The video output from the processor shall be in color with active detection zones overlaid on full motion video.

The processor shall be capable of a minimum of sixty-four (64) outputs with the BIU assignment being hardware selectable. Detection input shall be via a Synchronous Data Link Control (SDLC) interface connection to the signal controller front panel. The field communications wiring between each camera and the signal cabinet shall meet VDS factory requirements.

The processor shall meet the environmental requirements set forth by the latest NEMA TSI and TS2 standards. Operating temperature shall be from -25°F to +160°F at 0% to 95% relative humidity, non-condensing.

The processor software and/or the supervisor software shall include diagnostic software to allow testing the video detection system functions. This shall include the capability to set and clear individual detector outputs and display the status of inputs to enable setup and troubleshooting in the field.

**OTHER HARDWARE AND CABLE**

**Mounting Bracket**

The mounting bracket(s) shall allow for vertical or horizontal mounting and be compatible with the video detection system to ensure proper system operation. The mounting bracket shall be durable construction for up to 40 lb. loads and include three stainless steel mounting straps (30” in length) for attachment to mast arm.

Typical usage of a horizontal mounting bracket includes aiming video detection camera obliquely away from mast arm or luminaire mount.

Typical usage of a vertical mounting bracket includes aiming video detection camera from one side of vertical pole, such as a wood pole or below another device on a metal/concrete pole.

**Camera Cabling**

Cabling shall be compatible with the video detection system to ensure proper system operation. The cable shall be durable and designed to accommodate the water-resistant requirements and low pulling tension necessary for conduit applications.

A pigtail with factory-made connector on the back of the video detection camera is required. Only one (1) splice is allowed between the camera and signal cabinet. Splicing is allowed only at a factory-provided water-proof metal connection box mounted on the camera bracket or inside the pole base.
Connection box shall have a drain hole.

**FUNCTIONAL CAPABILITIES**

**Processor**

The processor shall provide real-time vehicle detection and be capable of simultaneously processing information from various video sources, including CCTV video image sensors and video tape players. The video sources may be, but are not required to be, synchronized or line-locked.

The system shall be capable of providing sixty-four (64) or more detector outputs from up to eight (8) camera/video processors. The processor should provide compressed color video through a DB-9 RS-232 or an Ethernet port data stream with active detection zones overlaid.

Detection zones shall be provided that are sensitive to the direction of vehicle travel. The direction to be detected by each detection zone shall be user programmable. The processor shall compensate for minor camera movement up to 2% of the field of view at 400 ft. without falsely detecting vehicles. The camera movement shall be measured on the unprocessed video input to the processor. The camera shall operate while directly connected to the processor. Once the detector configuration has been downloaded or saved into the processor, the video detection system shall operate whether the monitoring equipment (monitor and/or laptop) is disconnected or on-line.

The processor shall be capable of providing the following detection zones -- count, presence, directional presence, speed, stopped vehicles, and queue types of detection zones. The Windows software shall be able to display the traffic parameters on the screen of a monitor on a per vehicle basis for each detection station by lane. It shall also be able to view and sort the stored data for selected time intervals. When the monitoring equipment is directly connected to the processor, it shall be possible to view vehicle detections in real-time as they occur on the field setup computer's color display or the video monitor.

**Vehicle Detection**

The video detection system shall provide flexible detection zone placement anywhere within the combined field of view of the image sensors. Presence detector configurations shall be lines or boxes placed either across or in-line with lanes of traffic. A single detector shall be able to replace one or more conventional detector loops. Detection zones shall be able to be fully overlapped and have the capability of implementing "AND" and "OR" logical functions including presence, extension and delay timing. These logical functions may be excluded if provisions are made to bring each detector separately into the controller and the controller can provide these functions.

**Detection Programming**

Placement of detection zones shall be by means of a graphical interface using the video image of the roadway. The monitor shall show images of the detection zones superimposed on the video image of traffic while the VDS processor is running.

The detection zones shall be created by using the mouse or handheld programming device to draw detection zones on the monitor. The detection zones shall be capable of being sized, shaped and overlapped to provide optimal road coverage and detection. It shall be possible to save the detector
configurations on disk to download detector configurations to the processor and to retrieve the detector configuration that is currently running in the processor.

The mouse or handheld programming device shall be used to edit previously defined detector configurations so as to fine-tune the detection zone placement size and shape. Once a detection configuration has been created, the system shall provide a graphic display of the new configuration on its monitor. While this fine-tuning is being done, the detection shall continue to operate from the currently called-for detector configuration.

When a vehicle occupies a detection zone, the detection zone on the live video shall indicate the presence of a vehicle, thereby verifying proper operation of the detection system. With the absence of video, the card shall have an LED that will indicate proper operation of the detection zones.

TECHNICAL SUPPORT AND SUPPLY

Contractor shall be either or both:

- The manufacturer of the Synchronous Data Link Control (SDLC) device that has developed and will fully support the firmware/embedded code for the device
- The manufacturer of the Video Detection System Processor(s)

Contractor shall maintain an ongoing program of technical support for the video detection system. Direct technical support personnel shall be available to come to installation sites at no additional cost to the Department.

Contractor must provide twenty-four (24) hours a day, seven (7) days a week technical support personnel that will be on call and can be on site at any designated state signal location within twelve (12) hours of notification. Support personnel must be a direct employee of the Contractor. Contact information shall be provided to the State Traffic Signal Engineer. Contractor must immediately notify the State Traffic Signal Engineer of any contact information changes.

An adequate inventory of parts to support maintenance and repair of the video detection system shall be maintained by the Contractor and readily available for delivery within forty-eight (48) hours of order.

WARRANTY

All materials, workmanship and labor furnished shall be covered by Supplier(s)/Manufacturer(s) guarantee and/or warranty for a minimum period of twenty-four (24) months after delivery. Coverage shall include, but is not limited to, all expenses connected with the return and/or replacement of any material deem necessary by the State.

TRAINING

At no additional cost to the Department, Contractor shall provide DOTD personnel, as designated by the State Traffic Signal Engineer, with both formal and informal “hands-on” training courses, inclusive of all course materials.
Each formal training course shall take place at the Traffic Services facility in Baton Rouge, LA and consist of sixteen (16) hours of instruction over a two (2) day period. Classroom instruction shall not exceed eight (8) hours per day, number of formal courses shall not exceed two (2) courses per year. Contractor shall supply copies of course materials that will be retained by each attendee. Training shall include but not limited to detection system function, hands-on detections zone set up, trouble shooting and communication set up from field devices to computers.

Each informal “hands-on” shall take place at LADOTD District Offices located throughout the State and shall consist of a one (1) eight (8) hour on-site field visit per District. Contractor shall provide up to nine (9) field visits to the Department on an annual basis. Hands-on training shall be informal and tailored to the field technician’s needs for each District.

Contractor shall coordinate the annual training schedule with the State Traffic Signal Engineer.
FIGURE 1

(Picture to show maximum panel size only)