TECHNICAL SPECIAL PROVISION

FOR

VIDEO VEHICLE DETECTOR ASSEMBLY

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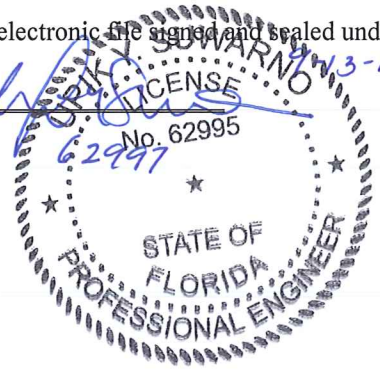

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VIDEO VEHICLE DETECTOR

660-1 Description

Install video vehicle detectors as shown in plans. The system shall be capable of providing presence vehicle detection at signalized intersections. The video detection system shall be expandable without removing or replacing existing units.

Using standard image sensor optics and in the absence of occlusion, the system shall be able to detect vehicle presence with 98% accuracy under normal conditions (days and nights), and 96% accuracy under adverse conditions (fog, rain, etc).

660-2 Materials

663-2.1 General: Use only video vehicle detectors currently listed on the Department's Approved Product List (APL). Ensure that all equipment is marked in accordance with Section 603 and the markings are visible after installation.

All items and materials furnished shall be new, current production models installed and operational in a user environment, and shall be items currently in distribution.

The system shall be capable of monitoring all vehicles on the roadway, providing video-based vehicle detection and have the capability of being programmed via a CRT display and a mouse. As a minimum, the video detection system shall consist of the following materials:

(1) Video Image Processing unit(s)
(2) Video Detection Module(s)
(3) Video Camera(s) with IR filter, enclosure, and sun shield
(4) Camera lens
(5) Camera housing
(6) Surge suppressor
(7) Sensor Bracket(s)
(8) Programming Devices and software
(9) Coaxial/Power Cable
(10) Point Discharge Dissipation Terminals
(11) Coax Line Protectors
(12) Camera Power Protectors
(13) Mounting System
(14) Detector programming device
(15) Software
(16) All other necessary equipment for operation

These devices must comply with any applicable FCC regulations. Operation and Maintenance Manuals shall be supplied with each unit. These manuals shall include the following information:

(1) General description
(2) General characteristics
(3) Installation procedure

(4) Theory of operation
(5) Schematic and logic diagram
(6) Parts list (to include part type, part number manufacturer and ratings)

The manufacturer shall provide the following technical data for all materials where applicable:

(1) Model number
(2) Power and Current requirements/consumption
(3) Temperature range
(4) Weight and Dimensions
(5) Mechanical Construction
(6) Mounting equipment necessary
(7) Operating frequency (FCC approved)
(8) Detection Range, Angle, and Pattern (horizontal and vertical)
(9) Response time and Sensitivity
(10) Software for operation of device
(11) Device capabilities as claimed by manufacturer.
(12) Any limitations, requirements, or potential hazards associated with the operation or maintenance of the device.

The manufacturer will test all video units to ensure compliance to all FCC and department specifications.

The manufacturer will be required to supply a medical statement as to the safety of the unit to the general public (example: pacemakers, etc.).

All product documentation shall be written in the English language.

660-2.2 Video Image Processor: The Video Image Processor (VIP) shall be modular by design and housed in either a self-contained stand-alone unit or fit directly into NEMA TS1 & TS2 type racks mount installation without replacing or modifying the existing VIP units. The VIP module shall be able to connect to a camera.

A video system communication board shall control from 1 to 6 VIP boards allowing for 1 to 12 image sensors.

The system shall be designed to operate reliably in the adverse environment of roadside cabinets and shall meet or exceed all NEMA TS1 and TS2, as well as ATC environmental specifications.

The VIP Video inputs shall be 75 ohms impedance with High Z option.

Ambient operating temperature shall be from -34 to +74 degrees Centigrade at 0 to 95% relative humidity non-condensing.

The system shall be powered by a self contained power supply. Power consumption shall not exceed 135 Watts.

Surge ratings shall be set forth in the NEMA TS1 and TS2 specifications.

Serial communications shall be via an RS232 serial port, modem and Ethernet communication port (RJ-45 connection). The Ethernet communications port shall meet the latest applicable IEEE Ethernet Protocol standards and shall be capable of communicating at 10/100 mbps. These ports can be used for communications to a laptop, modem or fiber modem for

upload/download detector configurations, count, turning movement, queue length data, technical events, send firmware upgrades and carryout remote setup of detectors. A standard Internet browser shall connect to Ethernet IP addressable port (RJ-45 connection) to monitor and set-up the VIP boards. RS485 on the front panel shall facilitate communications to other VIP boards.

Each VIP board shall have 4 opto-isolated open collector outputs. Twenty (20) additional outputs shall be available via the expansion port. The outputs shall be programmed for signaling the presence, the arrival or the departure of vehicles in a minimum of 24 detection zones per video image.

Each VIP board shall allow for twenty (20) digital inputs via the I/O Expansion port.

Each VIP board shall have error detection. An output contact will provide a constant call if the video signal is bad or the VIP board is not functioning properly. A user defined quality level will automatically put the VIP into a recall state in cases of severe degraded visibility (i.e., fog, blizzard, etc.). Normal detection resumes when visibility improves above the user defined quality level.

Operator selectable recall shall be available via the VIP front panel. The operator shall have the ability to assign selectable outputs for recall.

A video select button on the VIP front panel will switch between camera images of the VIP.

The VIP board shall have one (VIP3.1) or two (VIP3.2) video inputs (RS-170 NTSC or CCIR composite video) and one video out.

The VIP board shall have a reset button on the front panel to reset video detectors to "relearn", the roadway image. During "relearn", selectable recall can be enabled or disabled for immediate operation. Learning time of video detectors shall be less than 6 minutes.

External surge suppression, independent of the VIP board shall separate the VIP from the image sensor.

The VIP board shall have separate light emitting diodes (LEDs) that indicate:

Power	Red to verify power supply.
1/1 Comm	Green to indicate communications to expansion boards.
Video 1 & 2	Green to verify the presence of video input 75 ohm.
TS & RX	Green to indicate communications via the RS485 and Ethernet communication.
Out1 – Out4	Green if the corresponding detection group is active.

The VIP board shall have 2 separate buttons for Video Select:

Recall	Manually places call or selects video on detectors.
Reset	Manually reset detectors to "learn" new background.

The VIP board shall have a: a) video out female RCA style connector b) DB9 female Service port c) DB9 I/O Expansion port.

The VIP Expansion board shall have separate LEDs that indicate:

Power	Red to verify power supply.
Comm	Green to indicate communications to VIP board.
I/O1-I/O4	Green if the corresponding detection group is active.

The VIP Expansion board shall have 8 dipswitches that define which inputs and outputs are to be used.

660-2.3 Functional Capabilities: Video vehicle detector system shall provide real time detection.

Each VIP board shall be capable of processing the video signal of a minimum of four cameras. The video signal shall be analyzed in real time. It shall provide software MPEG-2 video compression at 30 frames per second.

The system shall be expandable up to 12 cameras that may be connected to different VIP units and programmed independently.

The system shall be capable of displaying detectors on the video image with associated outputs. Outputs/Inputs status will be indicated on the screen. Selectable text overlay will also include the ability to view raw video without any verbiage and/or detectors for monitoring purposes.

Each VIP board will detect within the view of the connected camera the presence of vehicles in user-defined zones. Detectors available shall be presence, count, queue length, turning movement, delay, extension, or pulse mode of either arrival or departure of vehicles. Delay and extension shall be defined between 0.1 - 99 seconds and pulse mode between 0 – 165ms in 33ms increments. Queue length detector thresholds can be programmed to generate an output when the threshold is exceeded.

The VIP board shall be programmed with a standard CCTV monitor and keypad plugged into the VIP serial port to facilitate detector programming.

The VIP board shall store up to 8 detector configurations. It shall be possible to switch between detector configurations manually or automatically by time of day or input from the traffic controller.

Via the serial port, detector configurations can be uploaded to a laptop and stored on disk.

Detectors may be linked to 24 outputs and 20 inputs using Boolean Logic features: AND, OR, NOT.

It shall be possible to make a detector directional sensitive. Options will include an omni-directional detector or a detector that only senses movement: from right to left, left to right, up to down or down to up as you look at the monitor.

To facilitate "fine tuning" of detection zones, a maximum of 10 lines and a minimum of 4 lines shall be adjustable within the confines of the detector.

All detectors and parameters can be changed without interrupting detection. For example: when one detector is modified all existing detectors continue to operate, including the one that is being modified. When the new position is confirmed, the new detector will enter a learning phase. Once the new detector is fully functional, it will take over the job of the old one. In this way, the detector is always fully operational with no interruption on any detector, even during modification. Learning phases for new detectors shall not exceed 6 minutes.

Six detectors per input may be used as count, turning movement and queue length detectors. These detectors will detect and store data at user-defined intervals of 1,2,3,4,5,6,10, 15, 30 & 60 minutes. It shall be possible for each VIP board to store up to 14226 intervals of data in non-volatile memory.

Associated software may be used with a PC to download data and export to a spreadsheet. Software will also be used to upload/download detector configurations, count, turning movement and queue length data, technical events, send software version upgrades and do remote setup of detectors.

The VIP board shall have an internal clock with daylight saving time system, which can be enabled or disabled.

The VIP board shall have a security password embedded, which may be enabled or disabled by the supervisor.

The VIP board shall monitor the 120 VAC green outputs of each movement and provide Delay Detection and Stretch Detection Program capability with Green Overrides programmable for each detection zone. Intervals shall be programmed in whole second increments from 0" to 60".

660-2.4 Video Camera: The unit shall be a high resolution (horizontal resolution 460 TV Lines), 1/3" image format CCD camera, designed for professional video detection systems to capture images of vehicles under all weather and lighting conditions. Incorporating the latest in CCD technology, the video camera shall provide detailed video without lag, image retention, or geometric distortion. The VIP board shall work with monochrome and/or color cameras as the video source for real-time vehicle detection.

The Camera must be in an enclosed assembly with the following minimum specifications:

Temperature range	-34 to +74 degrees C
Humidity	0% to 95% relative, non-condensing
Dimensions	47mm X 47mm X 83mm
Weight	200g (max)
Camera mounting slots	¼-20, top and bottom
Connectors	BNC for video out
Lens mount	CS
	Power-in/pressure screw
	Lens/4-square connector
Finish	Off-white, semi-gloss polyurethane
Construction	All metal housing
Rated input voltage	12VDC or 24VAC +/-10%@60Hz
Nominal power	10 Watts maximum
Imager	Interline transfer CCD 1/3"format
Imager spectral response	100% @ 550nm:
	30% @ 400nm and 800nm
Sync system	EIA RS-170
Active picture elements	768 H X 494 V
Horizontal resolution	580 TVL

Sensitivity (2856 K)		Usable Picture	Full Video
Scene Illumination	fc	0.012	0.08
	lx	0.12	0.8
Imager Illumination	fc	0.0015	0.01
	lx	0.015	0.1
F1.2 lens @ 75% highlight			

Signal to noise ratio	54 dB minimum 58 dB typical
AGC	18 dB
Light range (AGC on)	1,000,000:1 min. with f/1.4 to 360 auto-iris lens
Video out	1.0 volts peak-to-peak +/- 0.1 Volt @ 75 Ohms
Gray scale	At least 10 steps

660-2.5 Camera Lens: The camera lens shall be a motorized vari-focal 6.5-39mm with auto iris, including:

Image format	1/3 inch
Focal length	6X zoom (6.5-39mm)
Iris range	f 1.0 – Approx. 1200
Back focus distance	10.05mm (0.4in.) in air
Weight	500g
Size	60mm X 70mm X 89.9mm
Lens mount	CS
Iris control	DC or Video 4-pin square
Focus control	Motorized
Zoom	Motorized

660-2.6 Camera Housing: The camera assembly shall include a weatherproof housing and an integral sunshield for outdoor installation.

The weatherproof housing shall incorporate a mounting bracket to allow proper positioning of the camera. The mounting bracket shall be pre-drilled to allow attachment to standard brackets for mounting on mast arms or on Luminaire arms. Separate connectors at the back of the housing for both video and power cables shall be provided to make the camera assembly field-replaceable if service is required. A heater shall be mounted near the faceplate of the housing to minimize condensation.

The sunshield shall minimize the heating of the housing during hot weather. The sunshield shall extend beyond the ends of the weatherproof housing to minimize rain on the faceplate or body of the housing to eliminate dripping water in the line of sight of the camera.

The weatherproof housing shall be an aluminum enclosure and as a minimum, shall meet the following specifications:

Temperature range	-34 to +74 degrees C
Dimensions	449mm x 97mm x 112mm
Weight	1.4kg
Housing mounting	Three ¼-20 tapped holes

Camera mounting	Removable cradle assembly
Cable entry	Three liquid-tight fittings that will accept cable diameters of: One fitting – 2 to 7 mm Two fittings – 3 to 10 mm
Finish	Off-white semi-gloss polyurethane
Construction	Extruded aluminum housing, Aluminum rear-end cap, Aluminum front cap with glass faceplate, and aluminum cradle A sunshield shall be included
Window	3 mm thick glass, that includes a Thermostatically controlled window Heater/defogger strip
Rated input voltage	115 VAC 60 Hertz
Voltage range	108 VAC to 132 VAC
Output voltage	24 VAC 60 Hertz
Nominal power	30 Watts (Includes 20 Watts max for heater)
Enclosure protection	Waterproof and dust-tight in a NEMA-4, IP65, enclosure Type 3

660-2.7 Surge Suppressor: The video surge suppressor shall provide coaxial cable connection points to a transient suppressor for each image sensor and as a minimum shall include the following:

Peak Surge Current (8x20 us)	5KA
Technology	Hybrid, Solid State
Attenuation	0.1db @ 10Mhz
Response Time	<1 nanosecond
Protection	Line to Ground
Shield to Ground	(isolated shield modules)
Clamp Voltage	6 volts
Connectors	BNC
Impedance	75 Ohms
Temperature	-34 to +74 degrees C
Humidity	0-95% non-condensing
Dimensions	4.5" x 1.5" x 1.25"
UL Listed	UL 497B

Point Discharge Dissipation Terminal and Camera Power Protectors shall be provided for each camera. An Uninterruptible Power Source of at least 350 VA capacity shall be provided for the VIP and cameras.

660-2.8 Sensor Bracket: Camera brackets for mast arm installations shall provide adjustments for both vertical and horizontal positioning for the camera. Camera attachments shall be designed to securely fasten the camera to prevent the camera assembly from falling into the path of vehicles and/or becoming loose. Miscellaneous hardware shall be stainless steel or galvanized steel.

Camera brackets for luminaire arm installations shall provide adjustments for both vertical and horizontal positioning of the camera. Camera attachments shall be designed to securely fasten the camera to the luminaire arm. Miscellaneous hardware shall be stainless steel or galvanized steel.

660-2.9 Coaxial and Power Cable: Coaxial & Power cable (Hybrid) shall be suitable for exterior use and in direct sunlight. Power cable shall have a minimum of 5 conductors. Coaxial cable will be used for zooming and, focusing of the image sensor from the controller cabinet.

660-2.10 Programming Device: In an effort to upload/download detector configurations, count, turning movement and queue length data, technical events, send software versions upgrades and to setup detectors, the product supplier of the video detection system shall provide one (1) laptop devices with the following minimum configuration:

Central Processor (1.5GHz) with the following:
32MB Video, 14.1 XGA
USB Optical Mouse with Scroll feature
512MB Memory, 2DIMM
24X CDRW/DVD Drive
40 GB Ultra ATA Hard Drive
Internal 56K Modem
3.5" 1.44HD Floppy Drive
Windows XP Operating System (professional)
48WHr Additional Modular Battery for Dual Battery Support
Microsoft Office "Standard"

660-2.11 Software: The manufacturer software shall be provided for detection zone programming and operation. One software package shall be provided for each detection system. Software updates/revisions shall be provided to the FDOT as updated by the manufacturer at no additional charge.

All setup, controller program and diagnostic software shall be provided and run on the latest version of Windows based-operating systems. Software updates shall be provided free of charge during the warranty period.

All on-line help shall be provided as an integral part of the system software.

The operator shall be able to perform the following functions through the setup program.

(1) View a detection output from the detection unit.
(2) View a low signal from the detector unit.
(3) Program the presence timeout parameters in one minute increments from zero to thirty minutes.
(4) Provide a quick tune feature for re-tuning in an expedited fashion under ideal background condition.
(5) Select and program a new ID number for each detector unit.
(6) Program a response time for the detector unit.
(7) Program a hysterics value from a selection of low, medium, or high.
(8) Program a profile number for each detector unit.

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device the zones on a video image. Up to 24 detection zones per camera view shall be available. A separate computer shall not be required to program the detection zones.

660-3 Installation

660-3.1 General: Take all precautions necessary for the protection of all personnel and meet all requirements of OSHA regulations and FDOT Specifications Section 7-1.5 for the Occupational Safety and Health Requirements associated with this work.

Use manufacturer recommended tools and equipment to install all video detection equipment, retaining/mounting devices and software. All special installation and maintenance equipment must be provided by the vendor/manufacturer and should allow for adjustments without lane closure.

A factory certified representative from the manufacturer should be on-site during installation to supervise the installation and testing of the video equipment by maintaining agency personnel.

660-3.2 Mounting: Video detectors work in either a side-fire or overhead position. They should be mounted at a height that enables distinction between vehicles. Special instructions for mounting must be provided by the manufacturer.

Consider the location of the installed video detectors on the plans as sufficiently flexible as to allow for unanticipated field conditions at the site. The Engineer will direct any variations from the locations shown.

660-3.2 Powering: The manufacturer must provide required amplifiers for installation.

660-3.3 Calibrations and Aiming: All calibration and aiming shall be done with the device mounted in place, without interruption of traffic. Adjustments will be made according to manufacturer's recommendations.

The operator shall be able to set up, monitor lane status and retrieve data from the detector through the RS 232 serial port with any IBM compatible laptop or desktop computer. Also, the detector shall be compatible with a standard phone modem for remote data retrieval.

The sensor shall be able to hold the detection until the zone is cleared. Additionally, the sensor shall be able to tune-out stationary targets that remain within the detection zone for a minimum of 15 minutes.

The sensor shall self-tune to its detection zone with no external adjustments other than physical alignment. There will be no external tuning controls of any kind, which will require an operator.

The detector output must be directly compatible with the controller cabinet detector input.

660-4 Method of Measurement

660-4.1 General: Measurement for payment will be in accordance with the following task.

660-4.2 Furnish and Install: The Contract unit price per each for Vehicle Detector Assembly, furnished and installed, will include all equipment, materials as specified in the Contract Documents and as specified in this Section, and all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation.

660-5 Basis of Payment

Price and payment will be full compensation for all work specified in this Section. Payment will be made under:

Item No. 660-4-11 Vehicle Detector Assembly (Video) (Cabinet Equipment) – each.

Item No. 660-4-12 Vehicle Detector Assembly (Video) (Above Equipment) – each.