VIDEO DETECTION SYSTEM REQUIREMENTS

A.1 Description

The intent of the following specification is to describe the minimum requirements for providing a complete Video Detection System. Initially, the system shall be capable of providing presence vehicle detection at selected intersections. The video system shall be expandable without removing or replacing existing units.

Overview:

The purpose of the Video Image Processor is to detect the presence of vehicles over optical detection zones, which are placed on a standard video image (CCIR or EIA). Using standard image sensor optics & in the absence of occlusion, the system shall be able to detect vehicle presence with 98% accuracy under normal conditions (days & nights), and 96% accuracy under adverse conditions (fog, rain, snow).

All items & materials furnished shall be new, unused, current production models installed and operational in a user environment & shall be items currently in distribution. The detection algorithms shall have a proven record of field use at other installations for at least three (3) years of service; i.e., not including prototype field trials prior to installation. Video cameras shall be available commercially; no sole source cameras will be allowed.

VIDEO VEHICLE DETECTION SYSTEM

General

These technical specifications describe the minimum physical & functional properties of a video detection system. The system shall be capable of monitoring all licensed vehicles on the roadway, providing video detection for areas outlined in the construction drawings.

A.2 Materials

The entire video vehicle detection system shall consist of the following:

- 4 ea. - Detection Module VIP3D.2
- ViewCom/E – Remote Monitoring & Image Storage Module
- Video Camera(s) with IR Filter, Lens, Enclosure & Sunshield
- Luminaire Arm or Signal Mast Arm Sensor Bracket(s)
- Surge Suppressor
- Programming Devices and/or Software
- Coaxial/Power Cable
- All Other Necessary Equipment for Operation
- Training for Installation, Operation & Maintenance

The following equipment package has been pre-approved by this specification & is included in all applications:

- Traficon VIP3D.2 Video Image Processor
- Traficon ViewCom/E Remote Monitoring & Image Storage Module
- Aigis Outdoor Camera Housing – HS9384
- Aigis Camera Housing Sunshield – HS9384SS
- Rainbow Camera Model BL58D
- Rainbow Motorized Zoom Lens 6.5mm to 65mm Model – L10X65DC4P
- Rainbow B/W 9” Video Monitor Model – RMB92
- Pelco Extended Mast Arm Camera Mount – AB-0172-L-L
- Edco Suppressor – CX06-M
- Coaxial + 5 Conductor Wire – RG59U + STR PE/PVC 600V KG-9915P
1.0  Video Detection System

1.0  The Video Image Processor (VIP) shall be modular by design & housed in either a self-contained stand-alone unit or fit directly into NEMA TSI & TS2 type racks, as well as Type 170/2070 input files. The VIP shall be inter-changeable between a shelf or rack mount installation without replacing or modifying existing VIP units.

1.1  The system shall control from 1-6 VIP boards allowing for 1-12 image sensors.

1.2  The system shall be designed to operate reliably in the adverse environment of roadside cabinets & shall meet or exceed all NEMA TSI or TS2, as well as Type 170/2070, environmental specifications.

1.3  Ambient operating temperature shall be from -34° to 74° C at 0-95% relative humidity non-condensing.

1.4  The system shall be powered by 12-40 VDC & draw less than 2 amperes.

1.5  The system shall utilize cabinet 24 VDC for rack mount installations or external 24 VDC for stand-alone shelf installations.

1.6  Surge rating shall be set forth in the NEMA TS1 & TS2 specifications.

1.7  Serial communications shall be through an RS232 serial port. This port can be used for communications into a modem or laptop to upload/download detector configurations, count data & software upgrades. RS485 on the rear edge connector shall facilitate communications to other VIP boards.

1.8  Each VIP board shall have 4 opto-isolated open collector outputs. Twenty additional outputs shall be available via the expansion port. The VIP/3D shall have 20 presence detection zones & 4 data detection zones per camera. Data zones shall collect & store vehicle counts, volume, speed, gap time, headway, occupancy & classification. Data shall be time-stamped (6713 intervals) & stored onboard (non-volatile memory) in intervals from 1-60 minutes.

1.9  Data alarms are generated for queue, inverse direction, speed drop, no video & errors.

1.10 Must be able to provide single or double loop emulation.

1.11 Presence hold time must have parameters that range from 10-600 seconds.

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

1.13 Each VIP board shall have error detection. Outputs will be turned “ON” if the video signal is bad or the VIP board is not functioning properly. A user defined quality level will automatically put selected outputs to recall in cases of severe degraded visibility (i.e., fog, blizzard, etc.). Normal detection resumes when visibility improves above the user defined quality level.

1.14 Operator selectable recall shall be available via the VIP front panel. Holding the recall switch on for 5 seconds shall activate this function.

1.15 A video select button on the VIP front panel will switch between camera images of the VIP3D.2.

1.16 The VIP3D.2 board shall have 2 video inputs (RS-170 NTSC or CCIR composite...
The VI roadway image. During “re-learn,” 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 (LED's) that indicate:

- **Power** Red LED to verify power supply
- **I/O Comm** Red LED to indicate communications to expansion boards
- **Video 1 & 2** Red LED to verify the presence of video input 75 Ohm
- **TX & RX** Red LED to indicate communications to other VIP modules via the RS485
- **OUT1-OUT4** Green LED if the corresponding detection group is active

The VIP board shall also have 2 separate buttons for:

- **Video Select-Recall** Manually places call on detectors
- **Reset** Manually reset detectors to “learn” new background
- **Video Out** The VIP board shall also have a video out female RCA style connector
- **Service** B9 female service port & DB9 I/O Expansion port

The VIP Expansion board shall also have separate LED’s that indicate:

- **Power** Red LED to verify power supply
- **Comm** Red LED to indicate communications to VIP board
- **I/O1-I/04** Green LED if the corresponding detection group is active

The VIP Expansion board shall have 8 dip switches that define inputs & outputs used (range: 1-12 or 13-24).

**Event Log Database**

The VIP module shall have an onboard database capable of time stamping & storing 500 events. The Event Log Database can be viewed or downloaded to a selected spreadsheet. Erasure of the Event Log Database shall not alter programmed configurations. As a minimum, the VIP shall log & time stamp the following events:

- Firmware upgrade
- Loss of video signal
- Resumption of video signal
- Configuration change
- Bad video quality
- Loss of power to VIP module
- Resumption of power to VIP module
- Speed alarm
- Inverse direction
- Recall activated
**Video System Communication Module**

1.21 The communication board shall be modular by design & housed in either a self-contained stand-alone unit or fit directly into NEMA TS1 & TS2 type racks, as well as Type 170/2070 input files.

1.22 The communication board shall control from 1-6 VIP boards allowing for 1-12 image sensors.

1.23 The system shall be designed to operate reliably in the adverse environment of roadside cabinets & shall meet or exceed all NEMA TS1 & TS2, as well as Type 170/2070 environmental specifications.

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

1.25 The system shall be powered by 12-40 VDC & draw less than 2 amperes.

1.26 Serial & Ethernet (TCP/IP) communications shall be through respectively an RS232 serial port (F DB9 connector) & Ethernet port (RJ-45 connection). These ports can be used for communications to a laptop or modem to upload/download detector configurations, traffic data, technical events, send software upgrades & do remote setup of detectors. RS485 on the rear edge connector shall facilitate communications to VIP boards.

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

2.0 The communication board shall have separate light emitting diodes (LED's) that indicate:

- **Power** Red LED to verify power supply
- **LAN** Red LED to indicate data activity over Ethernet communication
- **Video Out** Video out female RCA style connector
- **Reset** Manual reset to re-initialize communications
- **Service** DB9 female service port for setup of communication board & also used for serial/dial-up communication

2.0 **Functional Capabilities**

2.1 Real Time Detection

2.2 Each VIP board shall be capable of processing the video signal of 1 or 2 cameras. The video signal shall be analyzed in real time (30 times per second for NTSC video format & 25 frames per second for pal video format).

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

2.4 The system shall be capable of displaying detectors on the video image with associated outputs. Outputs/inputs status will be indicated on the screen. Parameters will also include the ability to view raw video without any verbiage and/or detectors for surveillance purposes.

2.5 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, delay, extension or pulse mode for either arrival or departure of vehicles. Delay & extension shall be defined between 0.1-99.9 seconds & pulse mode between 0-200ms in 33ms increments if NTSC is used. Each VIP board shall also detect & collect within the view of the connected camera traffic data of passing vehicles in user-defined zones.

Collected traffic data by direction shall include:

- Volume (absolute numbers) per length class & per lane
- Average speed (km/h or mph) per length class & per lane
- Average gap time (1/10 sec) per length class & per lane
- Average headway (m or feet) per lane
- Occupancy (%) per lane
- Concentration (vehicles/km or mile) per lane
- Average length (m or fee) per lane
- Confidence level (0-10) per lane

2.6 The VIP board shall be programmed without the use of a supervisor computer. A standard CCTV monitor & keypad plugged into the VIP serial port will facilitate detector programming.

2.7 The VIP board shall store up to 4 detector configurations. It shall be possible to switch between detector configurations manually, automatically by time of day or remote input.

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

2.9 Detectors may be linked to 24 outputs & 20 inputs using Boolean Logic features: AND, OR, NOT. It will be possible to generate conditional outputs based upon inputs from a controller.

2.10 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.

2.11 All detectors & parameters can be changed without interrupting detection,

2.12 For example: when 1 detector is modified, all existing detectors continue to operate, including the 1 that is being modified. When the new position is confirmed, the new detector will enter a learning phase. Once the new detector is in function, 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.

2.13 Four (4) data detection zones per camera on a 2-camera VIP board may be used for collection of vehicle count, speed, classification, occupancy, density, headway & gap time.

Eight (8) data detection zones may be used on a single camera VIP board. These detectors will detect & store traffic data at user-defined intervals of 1, 2, 3, 5, 6, 10, 15, 30 & 60 minutes. It shall be possible for each VIP board to store up to 6713 intervals of data in non-volatile memory.

2.14 Associated software may be used with a PC to download data & export to a spreadsheet. Software will also be used to upload & download detector configurations, traffic data, technical events, send software version upgrades & do remote setup of detectors.

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

2.16 The VIP board shall provide overlaid tool tips for each individual menu & sub-menu item.

2.17 The VIP board shall have an optional password implementation. Different user-levels shall be available, each having different rights. A minimum of 10 users can be defined for each user-level.

2.18 The VIP board shall be able to delay or extend a detector zone output in combination with an input from the controller.

2.19 The VIP board shall detect wrong-way drivers & shall provide an alarm/event via communication board and/or output.

2.20 The VIP board shall provide an alarm and/or output when the user selected queue detection threshold of occupancy is exceeded for more than a user selected time threshold.

2.21 The VIP board shall distinguish 5 classes of detected vehicles based upon user selectable vehicle length thresholds.

2.22 The VIP shall be able to emulate loop emulation with user selectable loop dimensions.

**Video System Communication Module**

2.23 The Video System Communication board shall control from 1-6 VIP boards, allowing for 1-12 image sensors.

2.24 The Video System Communication board shall provide a serial or Ethernet interface & communication to provide traffic data & allow remote configuration from the Traffic Operations Center.

2.25 The LAN port shall meet IEEE 802.3 with a RJ-45 connector & meet the following specification:

- Data rates for Ethernet via LAN port: 10Mbit/s
- TCP/IP based protocol

2.26 The serial communications port shall meet EIA-232-E & meet the following specifications:

- Dial-up data rates for RS232 via Serial port: maximum 57600 bps
- Direct data rates for RS232 via Serial port: maximum 115200 bps
- Mode of operation: asynchronous, serial, 8-bit word, 1 stop bit, duplex or half-duplex
- Parity: None
- Handshake: RTS – CTS, DCD
- Configuration: DTE

2.27 The communication shall support all functions of the video detection system.

2.28 All data transmissions shall be protected by CRC (cyclic redundancy checking) or an equivalent error detection method.

2.29 The communication board shall be programmed without the use of a supervisor
computer. A standard CCTV monitor & keypad plugged into the communication serial port will facilitate board programming.

2.30 The communication shall support streaming video over Ethernet & serial communication.

2.31 Password protected remote setup (configuration upload/download, setup of detectors & detector parameters, setup of communication board parameters, firmware updates for Communication & VIP module) & monitoring of every connected VIP module shall be possible.

2.32 Dial-up shall be possible through PSTN modems.

2.33 The communication board shall log data & events provided by the VIP module(s) & transmit data & events to the Host computer.

2.34 RS485 communication to every VIP module shall be established via the Edge connector.

2.35 The communication board shall be able to store on board pre-post video sequences of alarm triggered upon traffic user defined events.

2.36 The communication board shall be able to accept PAL or NTSC video format.

2.37 A (via Ethernet) connection with a standard internet browser shall be possible to communicate with the communication board for remote setup, monitoring & real-time data of the VIP modules.

2.38 Password protection shall be provided on the communication board for remote operations.