

STATE

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Sheet 1 of 6

SPECIAL PROVISION

REGARDING

VIDEO DETECTION FOR TRAFFIC SIGNALS

This specification establishes the minimum requirements for a system that detects vehicles on a roadway by video image processing.

1.0 FUNCTIONAL CAPABILITIES

Generally, the system shall include video cameras, image processing units, and all appurtenances as recommended by the manufacturer for proper operation. A manufacturer may meet the functional aspects of this specification by integrating the optics, image processing hardware, and a general purpose CPU in one sealed enclosure.

1.1 AVAILABLE SYSTEM CONFIGURATION

The proposed video vehicle detection system shall be available in various configurations to allow maximum deployment flexibility. Each configuration shall have identical user interface for system setup and configuration. The communications protocol to each configuration shall be identical and shall be hardware platform independent.

Wired camera systems shall be able to transmit NTSC or PAL video signals, with minimal degradation, up to 1000 feet under ideal conditions.

Wireless camera systems shall be able to transmit NTSC or PAL video signals, with minimal degradation, up to 500 feet under normal conditions, and up to 900 feet under ideal electromagnetic interference conditions.

1.2 SYSTEM INTERFACES

VIDEO INPUT: Each video input shall accept RS170 (NTSC) or CCIR (PAL) signals from an external video source (camera sensor or VCR). The interface connector shall be located on the video processing unit.

VIDEO LOCK LED: A LED indicator shall be provided to indicate the presence of the video signal. The LED shall illuminate upon valid video synchronization and turn off when the presence of a valid video signal is removed

**VIDEO OUTPUT:** One video output shall be provided. The video output shall be RS170 or CCIR compliant and shall pass through the input video signal.

**SERIAL COMMUNICATIONS:** A serial communications port shall be provided. The serial port shall be compliant with RS232. The serial communications interface shall allow the user to remotely configure the system and/or to extract calculated vehicle/roadway information. The interface protocol shall be documented and interface software shall be provided. The interface protocol shall support multi-drop or point-to-multipoint communications. Each video vehicle detection system shall have the capability to be addressable.

**DETECTION LEDS:** LED's shall be provided on the front panel. The LED's shall illuminate when a contact closure output occurs.

### **1.3 GENERAL SYSTEM FUNCTIONS**

Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device or via a laptop computer.

The video detection processing unit (VDPU) shall store a minimum of two different detection zone patterns.

The VDPU shall detect vehicles in real time as they travel across each detection zone.

The VDPU shall have an RS232 port for communications with an external computer. The VDPU RS232 port shall be multi-drop capable.

The VDPU shall accept new detection patterns from an external computer through the RS-232 port when the external computer uses the correct communications protocol for downloading detection patterns. A WINDOWS™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDPU shall send its detection patterns to an external computer through the RS-232 port when requested when the external computer uses the correct communications protocol for uploading detection patterns.

The VDPU shall default to a safe condition, such as a constant call on each active detection channel, in the event of unacceptable interference with the video signal.

The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

## 2.0 VEHICLE DETECTION

### 2.1 DETECTION ZONES

A minimum of 128 detection zones (a minimum of 24 detection zones per camera) shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

The VDPU's memory shall be non-volatile to prevent data loss during power outages.

The selection of the detection zone pattern for current use shall be available.

The VDPU shall provide dynamic zone reconfiguration (DZR). DZR enables normal operation of existing detection zones when one zone is being added or modified during the setup process. The vehicle detection equipment shall output a constant call on any detector channel corresponding to a zone being modified.

Detection zones shall be directional to reduce false detections from objects traveling in directions other than the desired direction of travel in the detection area.

The VDPU shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDPU shall output a constant call during the background learning period.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs.

A minimum of six detection zones per camera view shall have the capability to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in at least the periods of 1, 5, 15, 30 or 60 minutes.

### **3.0 VEHICLE DETECTION HARDWARE**

The VDPU hardware shall be powered by 120 VAC 60 HZ single-phase power. Surge ratings shall be as set forth in NEMA specifications. Power consumption shall not exceed 135 watts.

#### **3.1 DETECTION OUTPUTS**

The VDPU shall include ports for transmitting TS1 and TS2 detections to a traffic controller. The TS1 contact closure port shall be a 37-pin "D" connector. The TS2 port shall be a 15-pin "D" connector.

#### **3.2 VIDEO INPUTS**

The VDPU shall be able to accept a minimum of four video input connections suitable for RS170 video inputs. Each video input shall include a switch selectable 75-ohm or higher impedance termination to allow camera video to be routed to other devices, as well as input to the VDPU for vehicle detection. The video inputs to the VDPU shall include transient voltage suppression and isolation. Amplification that shall assure the 1-volt peak to peak video signal integrity is maintained despite video cabling losses and externally induced transients shall be provided. The amplifier shall have a minimum common mode rejection at 60 hz or 90 db.

#### **3.3 VIDEO OUTPUTS**

The VDPU shall be able to provide a minimum of one video output connection.

#### **3.4 MECHANICAL**

The VDPU shall operate satisfactorily in a temperature range from -34 °C TO +60 °C and a humidity range from 0%RH TO 95%RH, non-condensing as set forth in NEMA specifications.

The VDPU enclosure shall include provisions to be bonded to a good earth ground.

The VDPU shall include an RS232 port for serial communications with a remote computer.

This port shall be a 9-pin "D" subminiature connector on the front of the VDPU.

The VDPU shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS232 port and without modifying the VDPU hardware.

#### 4.0 CAMERA

The video cameras used for traffic detection shall be furnished by the VDPU supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles 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 0.1 lux to 10,000 lux.

The camera shall use a CCD sensing element and shall output monochrome or color video with resolution of not less than 380 lines horizontal.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

The camera shall be powered by 120-240 VAC.

The camera enclosure shall be equipped with separate, weather-tight connections for power and setup video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole using a lens adjustment module (LAM) supplied by the VDPU supplier. Video and power shall not be connected within the same connector.

The video signal output by the camera shall be black and white or color in RS170 or CCIR format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

#### 5.0 INSTALLATION

**CAMERAS** - The coaxial cable to be used between the camera and the VDPU in the traffic cabinet shall be Belden 8281 or a 75 ohm, precision video cable with 20 gauge solid bare copper conductor (9.9 ohms/m), solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering.

The signal attenuation shall not exceed 0.78 db per 100 feet at 10 mhz. Nominal outside diameter is 0.304 inches. The coax cable shall be a continuous unbroken run from the camera to the VDPU. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm connectors shall be used at both the camera and cabinet ends. The coaxial cable, connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions shall be followed to ensure proper connection.

## **6.0 WARRANTY**

The supplier shall provide a two-year warranty on the video detection system.

During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

During the warranty period, updates of all software shall be available from the supplier without charge.

## **7.0 MAINTENANCE, SUPPORT, AND TRAINING**

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on site technical support services.

Installation and training support shall be provided by a factory-authorized representative and shall be a minimum IMSA-level II certified signal technician.

## **8.0 COMPENSATION**

Vehicle Detection (Video) shall be measured and paid for per camera furnished and installed, and shall be full compensation for each camera and the associated VDPU, cable, appurtenances, training, warranty, and support as outlined herein.

Payment will be made under item 730-13.02, Vehicle Detection (Video), per each.