STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION
TRENTON, NEW JERSEY 08625

METRIC SPECIFICATIONS FOR VIDEO DETECTORS

N.J. Specification No. EBM-VIDEO Effective Date: July 1, 2001

New Jersey Department of Transportation Specifications for a non-intrusive Video detection system that provides measures of traffic flow including volume, occupancy, and speed. In addition, the processor can provide simulated contact closures that emulate standard loop detector amplifier outputs.

The purpose of these specifications is to describe minimum acceptable design and operating requirements for the Video Detection System.

GENERAL - I

This section defines a complete Video Imaging Detector (VID) system that is comprised of an Automatic Control Unit (ACU), a CCTV Camera, Digitizing Boards, and a Configuration and Diagnostic Computer. The system shall be fully operational and provide accurate, real-time detector measures to a remote monitoring station for analysis.

1-1 Basic Design

The camera shall be as defined in EBM-CCTV-COLOR. This is a high resolution color camera mounted on a PT (Pan/Tilt) housing. The video shall feed into the Automatic Control Unit, via baseband coaxial cable. The ACU is housed in the field cabinet specified in EBM-FTC-3. The detector data and the video image (Output from ACU) is returned to the remote monitor station for display. The system shall also include a portable Configuration and Diagnostic computer to run configuration programs and to provide diagnostic capability at the camera site. Software shall be provided to run both computers.

1-2 Performance Requirements

The overall performance of the video detection system shall be comparable to that of inductive loop detectors. The system shall be able to detect vehicle presence with 98% accuracy under normal day and night conditions, and 96% accuracy under inclement weather (fog, rain, and snow) conditions.

AUTOMATIC CONTROL UNIT - II

2-1 Functional Requirements

The ACU shall process data from up to two video sources simultaneously. The video shall be digitized and analyzed at a minimum rate of 30 times per second. In addition, a video output shall be provided which will be the composite of the video input sources with the pseudo detection zones superimposed.

A. Detector Types

The ACU shall be able to emulate the following detector types:

1. Stop-line detectors
2. Presence detectors
3. Speed trap detectors
4. Vehicle classification detectors.

B. The ACU shall be able to emulate at least 48 detection zones

C. Normal Operation

In normal operation, the ACU shall operate as a stand-alone unit, calculate traffic parameters in real-time, and store the parameters in non-volatile memory. The ACU shall operate without any computer attached to it. In addition, the ACU shall provide contact closures which emulate standard loop detector amplifiers, for the pseudo detectors defined on the video processor.

2-2 Local Data Storage

The ACU shall retain detector data in non-volatile, Zero powered RAM or EEPROM, which shall be available for data transfer to a central computer over an RS232 connection. There shall be a minimum of 4 megabytes of memory available for data storage. When the entire storage memory is full, the ACU shall continue to store current data by writing over the oldest information.

A. Data Characteristics

For each time interval and detector channel, the following data characteristics shall be retained in memory:

1. Count of vehicles during the time interval
2. Occupancy (percent)
3. Classification (one of three categories by length)
4. Average Speed (kilometers per hour)

B. Time Interval

The time interval duration used for data storage shall be user-selectable and shall include 30 seconds, 1 minute, 5 minutes, 10 minutes, 15 minutes, 30 minutes, and 60 minutes.

C. Data Retrieval

Data shall be retrievable from the ACU via an RS232 communications port. The Supplier shall provide documentation detailing the protocol utilized to access this information. The protocol shall not be proprietary and can be utilized by any NJDOT system integrator to interface to the equipment. The software manuals shall include data scope outputs illustrating the various commands and return messages.

2-3 ACU Hardware

The ACU shall be rack mountable in a 483 millimeter EIA enclosure and shall be small enough to fit into the cabinet assembly specified in EBM-FTC-3.

A. ACU Size

The nominal outside dimensions, excluding connectors, shall be approximately 140 by 438 by 257 millimeters.

B. Environmental Requirements

The ACU shall meet the environmental requirements defined by the NEMA TS1 and TS2 specifications. Operating temperatures shall be from -30 °C to +74 °C at 0% to 95% relative humidity, non-condensing.

C. ACU Electrical

1. Power Supply

The ACU shall be powered by 95 - 135 volts AC, 60 hertz, single phase and draw less than 2 amps. Additional surge suppression equipment, above defined for the cabinet, shall be supplied, if recommended by the manufacturer.

2. Serial Port

The ACU shall have an RS-232 / RS-422 serial port. This port shall support transferring data stored in the non-volatile memory, as well as enabling the programming of the detection zones from a remote site.

3. NEMA Detector Interface

The ACU shall have a NEMA TS1 detector interface for 32 detector outputs. Output levels shall be compatible with those required by the C1

interface of a 170E. These contact closures shall be available on a 37 pin output port which is terminated on an interface block mounted on the side of the cabinet. The C1 harness of the 170E assigned to the ACU shall also be terminated on this block.

4. Video Input

The ACU shall have two RS-170 (NTSC) composite video inputs. The ACU shall be able to process both video input signals simultaneously. The ACU front panel shall have two BNC connectors reserved to input the baseband video signals.

D. Video Cable and Connectors

The CCTV assembly shall be connected to the ACU with coaxial video cable. This cable shall be 75 ohm with 20 gauge solid bare copper connector, solid polyethylene insulating dielectric, 96% (minimum) tinned copper double braided shield, and black polyethylene outer covering. Nominal outside diameter shall be 8 millimeters. Connectors shall be compatible with the CCTV assembly and the ACU.

DIGITIZING BOARD - III

Two digitizer boards shall be supplied. One shall be installed at the remote computer site; the other shall be installed in the Configuration and Diagnostic portable computer. The boards shall permit the viewing of real-time vehicle detectors overlaying the live roadway video feed.

CONFIGURATION AND DIAGNOSTIC COMPUTER - IV

The Configuration Diagnostic Computer (CDC) shall be a properly configured, portable supervisor computer, with an integrated VGA monitor and digitizer board. The computer shall be manufactured by either IBM, Gateway or Compaq. This computer shall be equipped with an Intel 80486 processor; MS-DOS 6.0; Microsoft Windows 3.1, an integral VGA color monitor, a mouse, 4 megabyte RAM, 90 millimeter floppy disk drive, and a 120 megabyte hard disk drive. If additional hardware is required to support the ACU, the processor shall be upgraded accordingly.

VIDEO IMAGING DETECTION SOFTWARE - V

The video imaging software shall run in the supervisor computers and shall perform several key functions as subsequently defined.

5-1 Detector Placement

The VID software shall support the definition of detectors at any location within the field of view of the camera. Placement of detectors shall be via software operating in the Windows 3.1 environment. The primary operator interface shall be a mouse. The

supervisor computers (Remote and Local) shall be capable of displaying the video image and the detector status.

5-2 Detector Database Management

The VID software shall support the editing, revising, deleting, and adding new detectors, as well as saving the detector configuration file.

5-3 ACU Interface

The VID software shall provide the direct interface with the ACU and support downloading and uploading of all relevant control parameters. These parameters shall include the sensitivity, persistence, pixel adjustments, and shadow compensation for each detector zone.

INSTALLATION AND TRAINING - VI

6-1 Supervised Installation

The Supplier of the video detection system shall supervise the installation and testing of the video and computer equipment. A factory certified representative shall be on-site to configure the CCTV camera, to prepare the detector configuration file, and to verify the optimum operation of VID software as installed in the computers. This person shall be on site in New Jersey until the initial installation is accepted by the engineer. This period of time shall not be less than 8 hours.

6-2 Training

The Supplier shall conduct two formal training programs for up to twenty personnel. One program shall be directed to engineering personnel and shall emphasize theory and operations; the other program shall be directed to maintenance personnel and shall emphasize operations and maintenance.

Both training program shall have a classroom and an on-site component. The engineer/operator training shall be at least 16 hours. The maintenance training shall be at least 24 hours. Both courses shall provide training in the theory, operation, setup, and maintenance of the video detection system. Training shall be conducted in New Jersey at a location designated by the Engineer. Neither training program shall be scheduled until the video detection system has been installed and operational for at least two weeks.

INSTRUCTIONS AND GUARANTEES - VII

7-1 One set of complete schematics and maintenance manual of the equipment shall be supplied with each assembly furnished. Maintenance manuals shall include complete sub-component parts listing.

7-2 No changes or substitutions in these requirements will be acceptable unless authorized in writing. Inquiries regarding this specification shall be addressed to the Manager, Office of ITS Engineering, New Jersey Department of Transportation, P.O. Box 613, 1035 Parkway Avenue, Trenton, New Jersey 08625.

7-3 The complete control and auxiliary equipment shall carry a two-year guarantee from the date of acceptance against any imperfections in workmanship or materials.

7-4 The Supplier agrees upon the request of the Manager, Office of ITS Engineering to deliver to the Office, a sample of the equipment to be supplied in compliance with these specifications for inspection and test before acceptance. After completion of the test, the sample shall be returned.

7-5 The Supplier shall furnish any and all equipment which they deem necessary for safe and reliable field operation of the control equipment.

7-6 All equipment furnished under this specification must be current production equipment and of recent manufacturer, similar models of which are in field operation in not less than three locations in the United States or Canada. Untried or prototype units shall not be considered for acceptance.

7-7 All major components shall be identified with a metal plate containing the serial number with a bar code identification.

7-8 Any repairs made by a manufacturer or representative shall be documented and returned with units when warranty repaired. This documentation shall include an explanation of the exact repairs made and identification of parts replaced by part number and circuit number. All warranty repairs must be made within thirty days upon receiving equipment.