

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

METRIC SPECIFICATIONS FOR A CLOSED LOOP SYSTEM MAINTENANCE CONSOLE

N. J. Specification No. EBM-MC-1

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New Jersey Department of Transportation Specifications for a Microprocessor Based Closed Loop Traffic Signal System Maintenance Console.

The purpose of these specifications is to describe the minimum acceptable design and operating requirements for a microprocessor based closed loop traffic signal system maintenance console.

GENERAL - I

- 1-1 The maintenance console shall consist of a digital microprocessor unit, keyboard, monitor, temporary data storage, long term data storage equipment, printer, modem, maintenance desk, standby power system, portable data input unit, accessories and applications software.
- 1-2 The complete maintenance console shall be fully debugged and all individual units must be completely compatible.
- 1-3 The console must be capable of operation in the following environment:
 - Air temperature, 16 °C to 32 °C
 - Humidity, 20% to 80%
- 1-4 All equipment must operate with line voltage variations of 90 to 137 volts AC at 50-60 hertz. All logic level equipment must be powered by a power supply capable of operating the specified equipment.
- 1-5 All equipment provided as part of this specification shall be color coordinated. The contractor will provide for approval samples of the colors and fabrics to be used.
- 1-6 The system shall include all cabling, connectors, cards, and other ancillary equipment required for interconnection of the processors and peripheral equipment to perform the functions as required by these specifications.

DIGITAL MICROPROCESSOR UNIT - II

- 2-1 The digital microprocessor unit shall enclose the microprocessor in a tower case with three disk drives, internal expansion boards, memory, and a 220 watt power supply.
- 2-2 The digital microprocessor unit shall utilize an Intel 80486 microprocessor with an Intel 80387 math co-processor. The clock speed shall be a minimum of 66 megahertz. The

unit shall provide a minimum of 10.7 MIPS. The unit shall be manufactured by IBM, Gateway or Compaq only.

- 2-3 The digital microprocessor unit shall provide eight (8) expansion slots, one - 32 bit memory and seven - 8-/16-/32 bit EISA for adapter cards that support optional devices.
- 2-4 The unit shall include 8 megabytes of random access memory, expanded to 16 megabytes with memory expansion card.
- 2-5 The disk operating system with BASIC shall be Microsoft or IBM DOS latest version. The unit shall also be provided with the latest revision of IBM OS/2 and Windows operating environments.
- 2-6 The temporary data storage shall include as a minimum the following:
 - A. One (1) 1.2 megabyte, 130 millimeter "Floppy Disk Drive"
 - B. One (1) 1.4 megabyte, 90 millimeter "Floppy Disk Drive"
 - C. One (1) 210 megabyte Internal Hard Disk Drive
- 2-7 The unit shall utilize a video display adapter board for the Super Video Graphic Adapter video display with 1 megabyte of video memory. The graphic board shall provide a 1 024 by 786 resolution with 256 colors. The graphics monitor shall be non-interlaced, and support a non-interlaced monitor.
- 2-8 The unit shall contain one parallel port, two serial ports and a mouse port. The mouse shall be provided.
- 2-9 The unit shall contain a multi-function expansion board. The board shall provide two (2) RS-232-C serial ports for communications, configured as COM3 and COM4. The board shall also provide a 36-pin Centronics printer port, configured as LPT2.
- 2-10 The unit shall contain an Ethernet transceiver board and software to interconnect to the Operator Console when required by the current New Jersey Department of Transportation Specification No. EBM-CL-2 to which this specification applies. The board shall support Thin Ethernet wiring and equipment.

KEYBOARD - III

- 3-1 The keyboard shall be a qwerty type with 101 keys, with tactile and audio feedback.
- 3-2 The keyboard shall be detachable, with a 3 meter coiled cable for connection to digital microprocessor unit.
- 3-3 The keyboard shall contain a minimum of twelve (12) special function keys, a ten key numeric key pad, and a "print screen" key.

- 3-4 The keyboard shall be provided with overlays for all provided software and system functions.
- 3-5 LED indicators shall be provided to confirm when "number lock", "scroll lock", and "caps lock" keys are in use.

MONITOR - IV

- 4-1 The graphic intersection and system display monitor shall be a high resolution color 381 millimeter (diagonally measured) monitor. It shall provide 1 024 by 768 pixel resolution with 256 colors. The screen shall be a dark, etched screen with high contrast and reduced glare. The monitor shall have brightness and contrast controls.
- 4-2 The monitor shall be provided with a turntable that swivels 360° with a $\pm 15^\circ$ tilt.

LONG TERM DATA STORAGE - V

- 5-1 The long term data storage shall be a tape backup unit - 150 megabytes. The tape drive shall be external or internal to the microprocessor unit and have a minimum capacity of 120 megabytes. The tape drive shall be supplied with five (5) extra tapes and software to provide automatic system backups based on day and time. The tape drive may be an internal unit of the same manufacture as the microprocessor unit.

PRINTER - VI

- 6-1 The maintenance console shall include a report printer. The printer shall be an Epson LQ 2550 or approved equal and shall have a friction feed 381 millimeter platen and be capable of handling paper up to 406 millimeters wide, adjust for up to five carbons, and an automatic single sheet feeder.
- 6-2 The printer shall have high resolution 24 pin "letter quality" printing, at a rate of not less than 106 characters per second. The printer shall support bold face, strike-through, double underline, superscripts and subscripts.
- 6-3 The printer shall have eight built-in fonts, and a bar code font with a 14 by 14 dots per millimeter maximum resolution. The fonts shall be selectable in software or by a control panel located on the front of the printer.
- 6-4 The printer shall be U.L. listed and have a standard 8 bit data parallel interface with a 36-pin amphenol connector and 25-pin D connector respectively.
- 6-5 The printer will be supplied with acoustical cabinet. The cabinet shall contain a built in fan with an on-off switch. The cabinet shall be certified to reduce the sound level below 40 decibels. The acoustical chamber shall be of sufficient size to accommodate the specified printer and have a clear acrylic hood. The cabinet shall match the existing office furniture in color and style.

MODEM - VII

- 7-1 The modem shall be a external or internal 9 600 baud modem - Hayes compatible and shall provide full duplex operation using a 2 wire dial up or leased lines. The modem shall comply with part 68, FCC docket 19528.
- 7-2 The data rates shall be 300, 1 200, 2 400, 4 800 and 9 600 bits per second, and support asynchronous and synchronous communication.
- 7-3 The modulation shall be frequency shift keying (FSK) for low speed and phase shift keying (PSK) on a dibit basis for high speed.
- 7-4 Originate, manual, permanent auto answer or controlled auto answer operating modes shall be provided.
- 7-5 The modem shall have a line impedance of 600 ohms $\pm$ 10% transformer coupled and transient protected. The transmitter output level shall be 0 to -12 dBm programmable, with an external programming resistor.
- 7-6 The modem shall provide a RS-232-C and CCITT V.32 and V.22 digital interface via a DB-25S connector.
- 7-7 The carrier detect sensitivity at low speed shall be -50 dBm $\pm$ 4 dB and at high speed shall be -45 dBm $\pm$ 4 dB.
- 7-8 The modem shall provide an auto disconnect function that will disconnect the modem due to a lack of carrier for approximately 18 seconds.
- 7-9 The front panel of the modem enclosure shall contain 8 diagnostic LEDs. The indicators shall indicate modem ready, terminal ready, make busy, high speed, modem check, receive data, transmit data and test modem.
- 7-10 A power on-off switch shall be mounted on the modem along with the DB-25S connector, an 8-pin RJ45 data jack, and an RJ-11 telephone jack.

MAINTENANCE DESKS - VIII

- 8-1 The maintenance desk shall have a minimum surface area that measures 1 829 by 737 millimeters.
- 8-2 A keyboard area 610 millimeters W by 254 millimeters D shall be provided. The keyboard area shall be adjustable to extend, retract, raise, lower, or tilt the keyboard. An area of 610 millimeters W by 483 millimeters D shall be provided behind the keyboard area for the monitor.
- 8-3 The desk shall be provided with an overhead riser. The riser shall contain a bookshelf and write-on board.
- 8-4 The desk shall also provide a 660 millimeters W by 457 millimeters D printer area, with through top paper feed slots with edge protectors. Below this area shall be a stacking shelf for printouts. The stacking shelf shall be adjustable. Below the printer area shall be a shelf capable of holding a full carton of paper.

- 8-5 All cables shall pass through slots in the desk top.
- 8-6 A chair shall be provided with the desk. The chair shall be 3 way adjustable, with arm rests and have a minimum of 5 breaking casters.

STANDBY POWER SYSTEM - IX

- 9-1 A standby power system shall be provided and mounted under the desk. The system is to provide power to the maintenance console should power be disrupted for 6 milliseconds.
- 9-2 The system shall provide four (4) outlets (NEMA 5-15R) with an on-off switch.
- 9-3 Indicator lights shall indicate normal status and backup status.
- 9-4 The system shall provide a minimum of 400 volt-amperes from a dry lead-acid battery, and provide for a minimum of 10 minutes of operation of the system.
- 9-5 The system shall contain an audible alarm and an output jack for the alarm. An alarm enable/disable switch shall also be provided. The system shall provide three stage protection from voltage spikes and transients.

PORTABLE DATA INPUT UNIT - X

- 10-1 The Console shall include a portable data input unit. The portable data input unit shall consist of a digital microprocessor unit with built-in keyboard, monitor, and data storage. The portable data input unit shall also consist of a printer and applications software.
- 10-2 The complete portable data input unit shall be fully debugged and must be capable of operation in the following environment:
 - Air temperature, 5 °C to 35 °C
 - Humidity, 20% to 80%
- 10-3 The portable data input unit shall operate on 18 volts DC with an AC adapter to provide the input voltage that operates on a line voltage with variations of 100 to 140 volts AC at 50-60 hertz. The unit shall also include a Nickel Hydride battery for field operation and a spare battery.
- 10-4 The portable data input unit shall utilize an Intel 80486 micro-processor with an Intel 80387 math co-processor. The clock speed shall be 20 megahertz. The unit shall be manufactured by IBM, Gateway or Compaq only.
- 10-5 The portable data input unit shall be provided with an external or internal 2 400 baud Hayes compatible modem and a port configured to connect to both local controllers and on-street masters.

- 10-6 The unit shall include 4 megabytes of random access memory. The unit shall be provided with an operating system that shall be the latest version of Microsoft or IBM DOS. The unit shall also be provided with the latest version of IBM OS/2.
- 10-7 The data storage shall include as a minimum the following:
- A. One (1) 1.4 megabyte, 90 millimeter "Floppy Disk Drive"
 - B. One (1) 80 megabyte Minimum Internal Hard Disk Drive
- 10-8 The unit shall utilize a graphic board for the Video Graphic Adapter display (VGA or equal). The graphic board shall provide a 640 by 480 resolution with 16 gray scales. The unit shall include a mouse port, a mouse and trackpoint.
- 10-9 The unit shall include a report printer. The printer shall be an Epson or approved equal and shall have a friction feed 381 millimeter platen and be capable of handling paper up to 406 millimeters wide, adjust for up to five carbons, and an automatic single sheet loading. The printer shall have high resolution 24 pin "letter quality" printing, at a rate of not less than 106 characters per second. The printer shall support bold face, strike-through, double underline, superscripts and subscripts.
- 10-10 The unit shall include a bar code reader for the equipment inventory system. The software provided shall provide the unit with the capability of field inventory control that can return the data to the maintenance or operators console. The software provided shall allow the unit to perform all the functions of the maintenance console from a remote location or connected directly to the on-street master. The unit shall also be capable of uploading and downloading traffic and timing data directly to the on-street master or local controllers.

SOFTWARE - XI

11-1 Closed Loop System

- A. The closed loop system software shall provide for all the system capabilities required by the current New Jersey Department of Transportation Specification No. EBM-CL-1 or EBM-CL-2 as required by the contract to which this specification applies.
- B. The software shall provide setting the clocks in the on-street master and local intersection controller from the operator's real time clock. Software shall also be provided to load data to the local controllers from an ASCII file prepared by a word processor
- C. The software shall be configured for the State of New Jersey, in that all graphic and data printouts shall contain the title "New Jersey Department of Transportation, Office of ITS Engineering Closed Loop System".

- D. All graphic and data printouts for local intersection controllers will contain the State highway route designation, the intersection name, a 7 digit control number, and the municipality.
- E. All software shall be fully operational and "debugged".

11-2 Off System

The following software shall be provided:

- A. Data base management program to create, sort, retrieve, and edit data files, using simple English like commands. The program shall be DBase3 latest version or an approved equal and shall be menu driven and contain an on line context sensitive help system. The program can have data inputted immediately when a file is created or appended later. The program shall utilize an SQL file format for all data files. The files can be changed, extended and modify the applications without having to reenter data. Records, or any part of a record, can be displayed, modified and updated. The report function allows quick organization of data. Forms and formats can be created that perform calculations and totals on a field, a record or the entire database. The program shall be fully relational and handle up to one Million records per file. The data base software shall allow up to sixteen files to be opened at one time.
- B. Word processing program with spelling correction. The program shall be WordPerfect latest version and shall provide functions to write, edit, rearrange, repeat, insert, delete, search and replace; file merge; boldface, underline, super and subscript; block functions; on-line help; justification; full cursor movement; headers and footers; centering; auto backup; cut and paste; printer support and proofread documents. The program shall be capable of finding mistakes using both letter and phonetic analysis with a 100 000-word dictionary and a personal dictionary of up to 5 000 words. The program shall be capable of producing personalized mailings.
- C. Communications program to provide communication with the Department's mainframe and or microcomputers. The program shall provide functions for transferring files with or without error detection/ correction, auto-dial, auto-redial and auto-answer and transfer of files in an unattended mode.
- D. Hard disk diagnostic program to reassemble fragmented files to restore file handling speed. The program shall provide a function to sort files and directories by name, extension, date/time, or length. The program shall provide additional functions to detect failing disk sectors and move affected data to new locations on the disk. The program shall automatically backup hard disk file allocation table and place the backup in a known location on the disk. This will enable the program to recover programs and data if the disk is reformatted. The program will provide for recovery of undamaged data in the event of a hard disk crash.
- E. Memory Manager shall be provided.

ACCESSORIES - XII

- 12-1 A four way RS-232 switch shall be provided. The switch shall be composed of a wave soldered printer circuit board with sealed ceramic switches. Data flow indicators shall be provided. The switch shall provide for a data rate up to 9 600 baud and provide data line surge protection. All connectors shall be pin configured to mate with all peripheral devices utilizing a RS-232-C D 25-pin connector.
- 12-2 A contrast enhancement filter shall be provided for the monitor. The filter shall have a polarized glare screen that enhances colors on the monitor. The filters shall be attached to the monitor by Velcro fasteners.
- 12-3 A cleaning kit shall be provided. The cleaning kit shall be composed of as a minimum:
- One (1) 90 millimeter disk drive head cleaning disk
 - One (1) 130 millimeter disk drive head cleaning disk
 - One (1) 120 megabyte tape drive head cleaning cartridge
 - Printer typeface cleaner
 - Five (5) typeface cleaning sheets
 - Monitor screen cleaning fluid - 237 milliliters
 - Anti-static spray - 946 milliliters
 - Lint free cleaning wipes - 150 by 150 millimeters - 600 wipes
 - Platen cleaning solution - 59 milliliters
- 12-4 The following startup and observation period supplies shall be provided.
- Ten (10) Cartons of #20 white perforated tractor feed paper 406 mm wide.
 - Ten (10) Printer ribbons.
 - Ten (10) Boxes of 90 millimeter High Density Disks.
 - Ten (10) Boxes of 130 millimeter High Density Disks.

INSTRUCTIONS AND GUARANTEES - XIII

- 13-1 One set of complete schematics of all equipment and maintenance manual of the equipment shall be supplied with each maintenance console furnished.
- 13-2 One reproducible mylar and two prints of the schematic wiring diagram for the maintenance console shall be supplied with each console furnished. The schematic wiring diagram shall contain the following information in at least 6 millimeter lettering.
- A. Contract and bid date.
 - B. Model and Serial number of all equipment.
- 13-3 A complete set of manuals for all software shall be provided.
- 13-4 A list of all interrupts and address of all COM ports, printer ports, modems and auxiliary peripheral shall be provided.

- 13-5 No changes or substitutions in these requirements will be acceptable unless authorized in writing. Inquiries regarding this equipment shall be address set to the Manager, Office of ITS Engineering, New Jersey Department of Transportation, P.O. Box 613, 1035 Parkway Avenue, Trenton, New Jersey 08625.
- 13-6 The complete console and all equipment shall carry a one (1) year guarantee from the date of operation and acceptance against any imperfections in workmanship or materials.
- 13-7 The company shall test all equipment to be supplied in compliance with these specifications and as required by the supplementary specifications to which this specification applies.
- 13-8 The company shall furnish any and all equipment which they deem necessary for safe and reliable operation of the maintenance console.
- 13-9 Equipment furnished under this specification must be current production equipment and of recent manufacture, identical models of which are in use for no less than one year. Untried or prototype units shall not be considered for acceptance.
- 13-10 Any repairs made by a manufacturer or representative shall be documented when the equipment is repaired. This documentation shall include an explanation of the exact repairs made and identification of parts replaced by part number. All warranty and maintenance repairs must be made within one day upon receiving notice or replacement equipment must be provided.