

**11 CSR 50-2.407 Documentation, Logistics and  
Warranty Requirements**

(1) General.

(A) The following items shall be included with each instrument submitted for certification or delivered to stations:

1. Instruction manual, securely held in a binder (or other suitable container) made of a material that is resistant to most petroleum based products used in the garage environment;
2. An easily understood explanation of warranty provisions (including limitations and restrictions) and a listing of components covered and not covered, signed by a company representative and the purchaser, contained in the instruction manual;
3. Several extra particulate filter elements;
4. Special adjustment tools to include all apparatus for gas calibration (internal/integral), and a probe tip cap if it is needed for conducting a leak check; and
5. Attached placard denoting operating procedures, gas checking/calibrating steps, maintenance items and local service contact with phone number and address.

(2) Instruction Manual.

(A) The instruction manual accompanying each analyzer shall contain the following minimum information:

1. Background information describing how emissions are formed during the combustion process, the general types of controls that are used on vehicles and what negative health impacts can result from vehicle emissions;
2. Functional diagrams (mechanical and electrical);
3. Accessories and options (included and/or available);
4. Model number and identification markings and locations;
5. Maintenance procedures and frequencies recommended by the manufacturer (the services that should be performed only by the manufacturer shall be clearly identified);
6. Gas calibration/leak check procedures;

7. Brief description of the inspection/test procedures with a subject index;

8. Brief description of emission analyzer operating principles;

9. A listing and an easily understood explanation of warranty provisions (including the extended warranty), signed by a company representative and the purchaser, contained in the instruction manual. Information provided shall include a listing of warranty repair stations by name, address and phone number; and

10. Name, address and phone number of the manufacturer's representative in charge of sales and service personnel for the company in Missouri. In addition, information shall provided indicating the name, address and phone number for the company's vice president of service (or equivalent) who reports directly to the chief executive officer. The names of these representatives shall be verified, or updated as needed, every time a service technician visits a station.

(3) Instrument Warranty.

(A) Scope of Warranty.

1. The cost of the analyzer shall include a two (2)-year transferable warranty covering parts and labor; an optional extension to this warranty shall be made available to all purchasers. The warranty shall cover all items which are located inside the secured area(s) of the analyzer. The manufacturer shall provide instructions to the purchaser describing the procedures needed to repair, replace or adjust components which are not covered by the warranty and can be accessed without compromising the security of the analyzer. The manufacturer shall provide the purchaser with the information necessary to properly select replacement parts not covered by the warranty to prevent degradation of analyzer performance. In addition, an adequate number of qualified repair technicians shall be retained by the manufacturer to perform repairs on analyzers.

2. Preventive maintenance shall not be required by the State Highway Patrol (SHP). However, if the manufacturer feels that preventive maintenance is required or feels that it will reduce the warranty costs, it shall be included in the price of the analyzer. The terms and conditions of the warranty shall not be contingent on the purchase of any additional warranties or entering into a service agreement or maintenance agreement.

(B) Warranty Provisions. Warranty provisions protecting the interested of the buyer shall include:

1. Location, phone number and address of the repair centers throughout the state. These shall be of an adequate number and so located to efficiently and timely meet statewide service needs. The response time established by the manufacturer may be long for a lower analyzer purchase price or short if the analyzer price is higher. All response time and cost provisions shall be clearly indicated in the warranty provisions;

2. Name of the manufacturer's representative closest to each franchised service center (if not a factory service center);

3. Coverage of at least all of the inspection/maintenance (I/M) hardware and software contained inside the tamper-resistant cabinet. A description of specific parts and labor covered by the provisions of the warranty shall be permanently provided to the purchaser. In addition, the warranty shall itemize the parts and labor which are not covered by the warranty. To ensure that purchasers are properly notified regarding the cost and provisions of the warranty, the Missouri Analyzer System (MAS) shall not be delivered until a copy of the warranty has been signed by the purchaser and a company representative. Service response time and loaner provisions shall be initialed by the purchaser. A copy of the warranty shall be provided to the purchaser, a copy forwarded to the state and a copy filed by the company;

4. The analyzer owner shall be provided a cost estimate prior to the performance of any service or maintenance unless the work will be covered by the warranty. Regardless of whether or not the work is covered by the warranty, the owner shall be provided a detailed description of the work performed when the job is completed. In addition, the description of the work performed, the owner shall include a toll free telephone number for the owner of the analyzer to call if s/he wants to complain about the work performed, the courtesy or competency of the manufacturer's technician or any other aspect of the warranty;

5. Manufacturers shall provide stations with loaner instruments if they are unable to repair analyzer within the specified time indicated in the warranty. Loaner instruments shall be gas-calibrated and provided with new filters, printers shall be full of paper and the latest version of I/M testing software shall be installed. The manufacturer's technician shall set up the loaned MAS, install all necessary access codes, a

fresh floppy disk and any other tasks necessary to allow the station to immediately begin work. The manufacturer's technician shall mail any floppy disks removed as a result of repairs, to the Department of Natural Resources, to the attention of the I/M Unit. The technician shall transfer the station copies of certificates stored in the analyzer cabinet to the loaner. Care shall be taken by the technician to maintain the sequence of the certificates and to keep them in good condition; and

6. All software updates must be approved by the state.

(4) Replacement Parts. The instrument manufacturer shall maintain an adequate supply of replacement parts and accessories to fulfill the service requirements of the instrument warranty/extended warranty. The manufacturer, upon delivery, shall supply the purchaser with four (4) sets of filters, twenty-five hundred (2500) sheets of fan-fold paper, two (2) extra printer ribbons and one (1) extra set of gas cylinders (if required for calibration). Replacement components for MAS-certified analyzers must be approved by the manufacturer. All analyzer components must function properly before conducting official state inspections.

(5) Service Centers. The instrument manufacturer shall provide or contract for instrument service/warranty repair stations within each region where analyzers are marketed. Shipping units by common carrier after repair or service is accomplished should only be done in cases where remanufacturing is required or where solving a problem requires research beyond the capabilities of field service personnel.

(6) Workmanship. Each manufacturer or his/her agent shall guarantee the repairs made for a period of ninety (90) days.

(7) Parts Removed. All parts removed from an instrument to accomplish repairs will be accounted for and given to the instrument owner when the instrument is returned to service except for parts covered under warranty. Parts which can be rebuilt and returned to service shall be listed on the completed work order.

(8) Noncompliance With Any Portion of the MAS Specifications.

(A) The term of the MAS certificate issued by the state shall begin on the date of issuance and terminate on the implementation date of each annual software update specified by the state, or two (2) years, whichever comes first. To renew the MAS certificate, each analyzer manufacturer shall demonstrate

that the software update meets the state's specifications and has been installed in all applicable MAS unit analyzers to the state's satisfaction. Manufacturers must also correct any other problems identified by the state prior to having their certificates renewed. These terms and conditions are in addition to those specified in a conditional certificate and/or terms specified in other parts of the MAS specifications.

(B) Manufacturers' MAS certificates will not be renewed, or may be conditionally revoked, if the state determines that an analyzer does not fully comply with all portions of the analyzer specifications and/or any of the following conditions exist:

1. Software updates are not performed within the time frame specified by the state or do not meet the requirements specified by the state; or

2. Analyzers in the field are found to be in violation of the MAS specifications and the manufacturer is unwilling to resolve the matter either in the time frame requested by the state or in a way that is satisfactory to the state.

(C) Revocation of the manufacturer's certificates may be limited to future sales of analyzers. However, existing analyzers which do not conform to analyzer and update specifications will be locked out until they are brought into compliance. If problems identified are not corrected within the time specified by the state, a certificate may be permanently revoked. If a certificate is conditionally or permanently revoked, the state will notify all licensed stations and representatives of the repair industry that new stations purchasing affected analyzers will no longer be licensed.

Appendix A: Microcomputer Specifications

(1) General Requirements.

(A) Acceptance.

1. All equipment and software submitted for certification must be the full and current configuration proposed for sale. PARTIAL, DATED OR INCOMPLETE MODELS ARE NOT ACCEPTABLE.

2. Acceptance of the microcomputer portion of the MAS will be dependent upon the satisfactory performance of the full proposed configuration meeting all the requirements of this specification.

3. The proposed hardware configuration must be fully supported by all software and/or operating systems listed in the acceptance requirements or elsewhere in these specifications. Performance tests to prove compatibility will be required. The vendor will bear all shipping and equipment preparation charges for the certification testing.

(2) Minimum Required Configuration.

(A) Operation System.

1. Each unit must be supplied with Microsoft DOS version 3.3 (or more current version).

(B) Processor.

1. The microprocessor must be fully compatible with either the Intel 80286 or 80386 microprocessors. The system must operate with a Norton performance index of at least 4.0.

(C) RAM Memory.

1. The system must contain at least one megabyte (1 Mb) of user available RAM.

(D) BIOS,

1. The system must include a ROM BIOS (Basic Input/Output System) which provides a self-diagnostic routine to check the performance of critical PC components (including, at a minimum, the processor, firmware, ROM, hard disk, keyboard, clock, setup RAM and memory) upon power up and which enables full use of MS-DOS 3.3. This BIOS must fully support all supplied

components (except the secured floppy disk) and all normally supported IBM PC-AT and MCA (or an alternative approved by the state) components.

(E) Video.

1. The display must be at least twelve inches (12") in diagonal measure and may be either color or monochrome. The display must be driven by a color graphics interface fully compatible with the IBM VGA color graphics adapter. This interface must be able to run in the IBM EGA, CGA and monochrome modes.

2. The software shall automatically blank the screen if no keyboard entry is made for at least every thirty (30) minutes or the manufacturer may display a reduced intensity message which blanks after one (1) hour or display a full-intensity single-line message that periodically (every thirty (30) minutes) moves to a new location on the screen. The display shall return when the operator strikes any key. Alternative proposals to protect the monitor may be proposed to the state for evaluation.

(F) Floppy Disk.

1. Each analyzer must be equipped with one standard 1.44 Mb, 3.5 inch, IBM compatible floppy disk drive, accessible only to state authorized representatives. The analyzers shall be capable of reading, writing and formatting the high density 3.5 inch diskettes used in the state's IBM PS-2 microcomputers directly without the need for any conversion. If there are any major brands of floppy disks which are incompatible with a manufacturer's analyzer, the manufacturer must state so at the time the analyzer is submitted for certification. The state may require test data to support the manufacturer's claims. The secured floppy disk shall be designated the A drive.

(G) Hard Disk.

1. Each unit must come with at least forty megabytes (40 Mb) of usable hard disk storage. The vendor may use up to ten megabytes (10 Mb) for its propriety programs )or more upon petitioning the state if a mutually beneficial software application is being proposed), leaving thirty megabyte (30 Mb) off usable storage for the state. The hard disk is to be self parking (where applicable), shock mounted and able to operate reliably in the expected hostile garage environment. The hard disk must also include a state-approved method to limit logical access to state data and programs. The hard disk containing the

state programs and files shall be designated the "C" drive.

(H) I/O Ports.

1. The unit must include at least two (2) MS-DOS/IBM PC standard compatible parallel printer ports and one (1) baud rate programmable (300 to 19.2K) IBM PC compatible serial port with a male DB-25 (25 pin) connector. The parallel ports can be connected to the printers, but the serial port must be available. There must also be a serial port or state-approved equivalent for the bar code reader. All ports must be clearly labeled and easily accessible only by state-authorized representatives.

(I) Keyboard.

1. The MAS keyboard must be fully interfaced with the microcomputer and have all of the necessary normal, numeric, cursor, control, shift, alternate and function keys needed to operate a standard IBM PC-AT compatible microcomputer, preferably a full one hundred one (101) keys should be provided.

(J) Modem.

1. The analyzer shall be equipped to transfer vehicle test records to the state via an IBM PC compatible internal (that is, located inside the cabinet) modem and connection to a telephone line. This modem is to be attached to a telephone line installed in the facility. Upon contact, the MAS is to verify authorization for access via password and then either send or receive files as commanded by the state computer initiating the contact.

2. A telephone line, separated from the power cord, shall be provided for the modem. The telephone line shall be enclosed in as protective cable meeting state and UL approval. Alternative methods to protect the telephone line may be submitted to the state for approval.

3. The manufacturer shall include provisions to ensure that the power necessary to activate the modem at the appropriate time is available.

4. Standby power shall be provided to the modem when the main power switch to the analyzer is turned to the on position, to allow the automatic answer feature of the modem to operate.

5. The modem must be equipped with MNP level-5 error correction. A complete communications package is available from



at least one (1) private supplier. However, manufacturers may develop their own communications package based on Omen Technology's ZModem as long as the appropriate response occurs when the state sends one (1) of the designated commands and as long as the communications system is adequately protected. For command sets and modem protocol information, refer to the MAS Modem Protocol document dated June 1990. This information is restricted to state-authorized persons on a need-to-know basis.

6. The manufacturer must provide all necessary software and protocol for modem file transfers. Omen Technology's Zmodem shall be used for file transfer. Specifications for this protocol are in the public domain.

7. The modem shall emulate a VT100 terminal and shall meet the following specifications:

- A. Operating Characteristics.
  - I. Operating Modes.  
Automatic or manual originate.  
Automatic or manual answer;
- B. Data Format.
  - I. Binary, serial, asynchronous or synchronous;
- C. Terminal-To-Modem Data Rate.
  - I. CCITT V.22bis asynchronous 2532 to 2424 bps.
  - II. Bell 212 asynchronous 1170 to 1212 bps.
  - III. Bell 103 asynchronous 0 to 300 bps;
- D. Modulation.
  - I. 2400 Quadrature amplitude modulation (16-level PSK).
  - II. 212 Quadrature amplitude modulation (4-level PSK).
  - III. 103 Binary, phase coherent, frequency shift keying;

E. Transmit Frequencies.

I. Manufacturers will be responsible to demonstrate full system compatibility as well as diskette, port and modem transfer of files to the state. The following table lists the transmit frequencies:

ANSWER	ORIGINATE
2400 Hz $\pm$ 2 Hz	1200 Hz $\pm$ 2 Hz
2225 Hz $\pm$ 7 Hz(MARK)	1270 Hz $\pm$ 7 Hz(MARK)
2025 Hz $\pm$ 7 Hz(SPACE)	1070 Hz $\pm$ 7 Hz(SPACE)

F. Transmit Level.

- I. PSTN: -10 dBm  $\pm$  2 dBm: -12 dBm  $\pm$  2 dBm.
- II. Leased line: 0 dBm  $\pm$  2 dBm;

G. Receive level.

- I. PSTN: -10 dBm to -45 dBm.
- II. Leased line: 0 dBm to -35 dBm;

H. Receiver Sensitivity.

- I. OFF: -48 dBm;
- II. ON: -43 dBm.
- III. Hysteresis: 2 dBm;

I. Terminal Interface.

- I. Compatible with EIA RS-232; and

J. Environmental Requirements.

- I. Temperature:  
Operating: 0 to 50 degrees C (32° to 122°F)
- II. Humidity: 5 to 90% without condensation.

(K) Data Compression Software.

1. Data files will be compressed using PKWARE PKZIP program.

2. Each MAS manufacturer will receive from the state a copy of PKWARE's PKZIP program for use in the MAS units. This software is under license from PKWARE to the State of Missouri and is for use in Missouri MAS units only.

3. The programs are distributed in a self-extracting

file "PKZ101.EXE" which will create all the required programs and the software manual when it is executed.

4. Each time the MAS unit goes into communications mode, the MAS should use PKZIP to compress the MAS.DAT, CAL.DAT and AUDIT.DAT files. These files will become MAS.ZIP, CAL.ZIP and AUDIT.ZIP respectively. It is the ".ZIP" files that will be transferred to the state via the modem and the FSEND command. After a successful transfer and the receipt, by the MAS, of the VERIFIED command, the respective ".ZIP" file shall be deleted and the respective ".DAT" file shall be archived, as indicated elsewhere in the specification.

5. Included with PKZIP program is the complete manual for use of the ZIP programs. The user should make note of the "-a" switch in using PKZIP to append only new data to the ".ZIP" file from day-to-day between MAS data collections.

(L) Expansion.

1. The state is interested in insuring that the MAS will have expansion capability to add functions beyond those defined in this specification. For example, the MAS unit may need to be updated to provide for additional support for diagnostic and repair capability which might include on-line maintenance manuals using new technology such as CD-ROM or optical disk storage devices.

2. Two (2) full-sized PC-AT expansion slots must be available in the MAS unit after the manufacturer has installed all features and adapters required to meet current specifications. These slots cannot be used by the manufacturers for additional options unless approved by the state and the use complies with and satisfies a state intended use for these expansion slots. It should be stressed that analyzers submitted for certification shall be equipped with fully functional noncontact bar code scanners capable of reading bar coded labels meeting SAE J1877 and J1892 as indicated in Section 1.14.

(M) Printer.

1. The MAS unit is to use an impact printer if it is to print vehicle inspection reports (VIR). The printer shall be equipped with at least a nine (9) pin print head and be capable of printing in either draft (9 x 9 dot matrix) or in near-letter-quality mode (18 x 18 dot matrix) selectable by the operator. The printer shall be capable of printing either pica (ten (10) characters per inch) or elite (twelve (12) characters per inch). The printer shall be capable of printing one hundred twenty (120)

characters per second in draft-pica pitch. Continuous (eight and one-half by eleven inch (8 1/2" x 11") finished) fan-fold, pin-fed paper is to be used. The VIR printer must be able to copy graphic output from CRT displays.

2. There shall be unlimited access to the test report printer so that paper can be easily replaced, printer jams can be cleared and ribbons can be replaced.

3. A second, separate impact printer shall be supplied which is dedicated to the task of filling in designated information on state certificates which were previously filled in by hand. Continuous, fan-fold, preprinted paper will be used. The center of the first printed line will begin at one inch (1") below the top of the page. Because of the limited amount of space between the top of the certificate and first printed line, the top of the certificate may need to be used to align the certificate prior to printing. Only authorized station personnel shall be allowed access to the certificate printer.

4. The print font used for the first line (on the eight and one-half by eleven inch (8 1/2" x 11") portion of the certificate) shall be OCR-A as specified by ANSI X3.111-1986 using 7 x 9 dot matrix and shall meet the optical character recognition guidelines for OCR print quality specified in ANSI X3.99-1983. Key portions of the specifications are listed as follows:

#### SPECIFICATIONS

Nominal character width:	0.055"
Nominal character height:	0.094"
Section 4.1.1 Dot Size:	0.012"))0.020"
Section 4.4.2 Character Spacing:	0.090"))0.110"
Section 4.4.3 Minimum Character Separation:	0.014"

5. The certificate printer shall utilize a high carbon ribbon (OCR ribbon), or other ribbon which meets the character recognition guidelines with state approval. The pitch for the OCR characters shall be ten (10) characters per inch. Some inexpensive printers may need to be programmed to print the OCR font unidirectionally in order to meet the ANSI specifications over sustained periods of time.

6. The remainder of the information printed on the certificate shall use pica font, IBM-8 character set (or comparable character set approved by the state), twelve (12) point, ten (10) characters per inch, six (6) lines per inch, eighty (80) characters per line. This is intended to ensure uniformity between manufacturers for style, size and number of characters per inch. If during the certification process the state finds that font styles vary between analyzers, OCR-A may be required to be used throughout the certificate.

7. The certificate will be a two-(2) part, two (2)-copy document. However, the printer must be able to print through a three (3)-copy certificate in the event the certificate is changed at a later date. The finished dimensions of the certificate itself will be eight and one-half inches by eleven inches (8 1/2" X 11"). Certificates will be in lots of twenty-five (25) and will be folded at every certificate. There will be no leader or trailer other than one inch (1") from the top edge of the page to the midline of the first printed line on each page of the certificate. To print the last certificate of each lot may required the Paper Out Sensor to be deactivated.

8. It is expected that the inspector mechanics will be required to give the original copy of the certificate to the motorist and insert the carbon copy of the certificate into the analyzer's used certificate drop box. The used certificate drop box shall be of the approximate size of the certificate and shall be designed to keep the certificates in sequential order. The certificate drop box need not be a secured area, but shall prevent certificates from being spilled out when access is gained.

9. The secured space designed to store unused certificates shall measure nine and one-half inches (9 1/2") deep X eleven inches (11") wide X ten inches (10") tall. Initially the certificate will consist of two (2) copies that will be torn away from a perforation on the bottom of the form. It is not expected that the overall size of the certificate will change. The top copy of the certificate may be printed on up to twenty-four (24) pound paper, and carbonless copies on up to fifteen (15) pound paper.

10. The area containing the certificates shall be located so that proper tension is maintained on the certificates as they are fed up through the printer.

11. The certificate printer shall print near letter quality (NLQ) characters. Minimum print speed for NLQ characters must be thirty (30) characters per second (CPS) while printing

full lines of eighty (80) columns utilizing the IBM-8 character set at ten (10) CPI horizontal and six (6) LPI vertical. This printer must have a top of form advance which will accept variable length forms. The printer must also allow removal of certificates without having to advance or realign the printer between forms. The printed characters used must be such that the number 0 is printed differently than the letter O.

12. Both printers are to be hardware and software compatible with the IBM PC. A standard IBM/Centronics interface with parallel cable is to be used for each. Likewise each shall fully conform to the setup, codes and operation of one of the major printer makes. Both printers must be able to print the full IBM standard PC character set, standards IBM VGA compatible graphics, and bar codes compatible with the AAIAG B-1 and B-2 standards.

13. Both printers must be designed for the garage environment and must not be susceptible to overheating or other extended usage related problems. The printers shall be capable of printing continuously for at least twenty-five (25) full pages of text without stopping due to overheating. The printers shall be an automatic thermal shutoff feature or the analyzer software shall display a message to the operator when, and only when, more than the recommended number of pages are to be printed all at once.

(N) Acceptance Test.

1. A demonstration test will be required prior to certification to assure that all items offered meet the specified requirements.

2. This test will be conducted at a site specified by the state. The vendor is required to provide and set up the entire configuration proposed in his/her response to this specification. The state will provide test software to be run and expansion boards and/or peripheral hardware items to be installed during the test if necessary (except where noted in the specifications). Lists of the users standard hardware and software are attached.

(O) Compatibility.

1. Computers offered must be able to reliably read and write floppy disks for use with IBM PS-2 1.44Mb 3.5" diskettes using 3.3 and later versions of IBM PC-DOS operating systems. All 1.44Mb diskette drives must be fully functionally compatible with those provided as standard from the factory in IBM computers. Systems must be able to interchange/use software

and data files with existing state-owned IBM microcomputers without requiring software or hardware reconfiguration.

2. Systems must be capable of producing graphic output on CRT displays and dot matrix printers. Graphics requirements include, but are not limited to, the ability to display graphic output from applications like Lotus 1-2-3, Gem, Decision Resources and applications developed by the users written in MS QUICK BASIC, MS BASIC and/or GWBASIC. Use of PrtSc key must cause text displayed on CRT to print on printer. The graphics interface must fully support MS BASIC as is normally provided with PC-DOS.

3. Systems must be capable of communicating with state personal and mainframe computers. State PCs will use modems supporting MNP Level 5 model level protocol, and communications software supporting the ZMODEM protocol to poll the MAS units. The MAS units are expected to operate without manual intervention to automatically answer, verify password, unload and download files with the contacting computer. Modem speed is to self-adjust to calling computer and available line conditions. All system components (hardware and software) must be compatible.

(3) Documentation (to be provided only to the state).

(A) Hardware.

1. For the microcomputer portion of each MAS system delivered, the vendor must provide complete technical/operational manuals covering installation and operation.

(B) Software.

1. All prepackaged applications software deliveries (including, but not limited to, Operating Systems and BASIC if offered) must include manuals that fully explain all installation and operating procedures. All such software deliveries must include warranty, a licensing agreement and (except for operating systems) a means for registration that provides for future updates. All software deliveries must include the version or release number. All software deliveries must include a list of the computers the software is guaranteed to run on.

(C) Manuals.

1. All manuals must be commercially printed and must show title, manufacturer's name and address and copyright date.

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(D) Files.

1. All MS-DOS files must include a full record layout. This layout must identify file name, security and each field. For each field the delimiters, contents, definition and editing rules are to be provided in the form of a data dictionary.

(4) Standard Hardware.

(A) During an acceptance test to prove compatibility, the proposed computer will be tested for compatibility with either the IBM MCA or IBM AT type systems. MCA compatible units will be tested for configuration and software. AT compatible units will be required to function when items selected from the following list are installed. Modification to the proposed computer will not be allowed, except for changing of dip switches as needed to identify memory installed or to identify I/O ports, etc:

1. Display Adapters and Monitors Everex VGA, Paradise VGA and Video-7 Vega VGA with NEC Multisync Plus;

2. Expansion Cards INTEL Above Board with minimum memory and maximum memory;

3. Math Co-processor. The system must be able to accept and use a compatible math Co-Processor;

4. Hard disk Expansion. The system must include a hard disk interface which will fully support a second internal disk drive of the same type as the original type drive or a functional equivalent approved by the state which does not compromise tamper-resistance;

5. Tape Back-up. Mountain Tape Back-up and Irwin Tape Back-up;

6. Additional Storage. Functional equivalent may be submitted to the state for approval.

A. 3.5" 1.44Mb Floppy Disk Drive.

B. 10 Meg 10 X 10 Bernoulli Box (Boot and non-boot).



- C. 10 Meg 20 X 20 Bernoulli Box (Boot and non-boot).
- D. IBM Optical disk drive;

7. Mouse. Functional equivalence may be submitted to the state for approval.

- A. Microsoft Serial Mouse.
- B. Microsoft Bus Mouse; and

8. Communications

- A. Hayes internal Modem 2400B.
- B. Multi-tech External Modem 2400B.

(5) Standard Software.

(A) During an acceptance test to prove compatibility, the proposed computer will be required to run the latest release of software selected from the following list. The proposed system may also be required to run user programs using earlier releases of software listed.

(B) Modification to the proposed computer will not be allowed.

(C) Modification to the standard software packages beyond normal installation procedures will not be allowed.

(D) Software packages.

- 1. Spreadsheet  
Lotus Development Corp: Lotus 1-2-3 Rel 2 and 2.2
- 2. Word Processing  
Satellite Software International: WordPerfect  
Microsoft: Word
- 3. Data Base Managers  
  
Ashton-Tate: dBase III Plus  
Borland: Reflex  
Ansa Software: Paradox
- 4. Graphics  
  
Digital Research: Gem Draw, Gem Graph, Gem Collection  
Intl. Microcomputer Software Inc.: PC Paintbrush

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5. Operating Systems  
Microsoft: MS DOS 3.3 or later
6. Utilities  
Peter Norton: Advanced Norton Utilities
7. Communications  
OMEN Technology: ZMODEM
8. User Software  
Microsoft: MS BASIC & Programs, QUICK BASIC  
Borland: Turbo Pascal

## Appendix B: Bar Code Readers

The bar code reader will be used to load emission control system information from application manuals and from the permanent bar code labels placed on the vehicle by the manufacturer. The supplied bar code reader must come with at least a twenty foot (20') long self coiling cord and be able to read bar codes placed on the door frames, under the hoods and through windshields. Manufacturers will be expected to include any software necessary to utilize the data gathered from the labels. To provide ample flexibility to permit use in this environment, the following or state-approved specifications are required. The analyzer shall be equipped with an RS232C connector for the bar code scanner. The state may consider alternative designs.

(1) Bar-coded Vehicle Identification Number Label. Reference: SAE J1877.

(A) Definitions (Reference AIAG B-2 specification))Appendix A).

1. Vehicle Identification Number (VIN)

A. The VIN is a standardized series of letters and single-digit numbers that is assigned to a motor vehicle for identification purposes as required by Federal Motor Vehicle Safety Standard (FMVSS) 115 and Federal Motor Vehicle Safety regulation (FMVSR) 567 and recommended under SAE J272 and J273.

2. Label

A. The surface containing the information in bar-coded and corresponding human-readable (printed) formats.

3. Bar-code Reader.

A. A device for machine reading of bar codes which typically consists of a scanner, decoder and data communications device.

(B) VIN Label Description (Reference AIAG B-2))Appendix A).

1. Vehicle Identification Number.

A. The VIN bar code consists of the seventeen (17)-character vehicle identification number preceded by the data identifier I. The bar code also contains start and stop characters.

2. Label Title.

A. The bar code contains a title, VIN, unless it is part of the federal certification label as required pursuant to FMVSR 567 or if it is part of the VIN label located on the upper left side of the dash panel as allowed pursuant to FMVSS 115.

3. Human-readable Character Suppression.

A. The bar code characters for start, stop and the data identifier are suppressed from the human-readable printing.

4. Human-readable Character Height.

A. The minimum height of the human-readable characters is 2.38 mm (0.094 inches). This requirement is not intended to supersede government requirements. For example, FMVSR 567 dictates the minimum height of the characters when the VIN is placed on the certification label.

5. Horizontal or Vertical Printing.

A. The symbols may be printed horizontally or vertically. When the bar codes are printed horizontally, the human-readable data are printed directly above or below the bar codes and centered. When bar codes are printed vertically, the human-readable data should be printed vertically and centered to the left or right of the bar code.

(C) General Symbology Specifications.

1. Code 39 Symbology.

A. The VIN bar code conforms to *Bar Code Symbology for 3 of 9 Bar Codes* published by the Automotive Industry Action Group (AIAG B-1). All aspects of the bar-code symbology codes follows this specification except as described in the following sections.

2. Code Density and Dimensions (Reference AIAG B-2))Appendix A).

A. The average width of the narrow element is within the range of 0.19 mm (0.0075 inches) and 0.317 mm (0.0125 inches). The ratio is three to one (3:1) with an allowable range

of 2.8 to 3.2. The minimum bar height is 9.5 mm (0.375 inches) or fifteen percent (15%) of the bar code length.

(D) Scanning Devices (Reference AIAG B-2))Appendix A).

1. Scanning devices shall use a light source at B633 nanometer range or in the visible red light spectral band range.

(2) VEC Label Description. Reference: SAE J1892.

(A) Definitions.

1. Vehicle Emission Configuration (VEC).

A. The VEC label identifies selected emission controls on a vehicle as well as partially identifies the engine family designation.

2. Engine Displacement.

A. The engine displacement signifies the engine size as expressed in liters. Two characters on the VEC label indicate the engine displacement: the decimal point is deleted.

3. Engine Family Designation.

A. An EPA-standardized system, as of January 1, 1988, for identifying each vehicle manufacturer's engine model for the purpose of new-vehicle emissions certification. The engine family designation is normally twelve (12) characters long for light-duty vehicles and eleven (11) characters long for heavy-duty engines. Only a specified five (5) of the twelve (12) or eleven (11) characters, respectively, are coded in the VEC.

4. Emission Control System (ECS) Combination Code.

A. A coded letter or single-digit number in the VEC that designates the combination of selected major emission controls that are installed on the vehicle by the vehicle manufacturer. The frequency of engine ignition is included in this code combination.

5. Label (Reference AIAG B-7))Appendix A).

A. The surface containing the VEC information in bar-coded and human-readable formats.

6. Bar-code Reader (Reference AIAG B-7))Appendix A).

A. A device for machine reading of bar codes which typically consists of a scanner, decoder and data communications device.

(B) VEC Label Descriptions.

1. Vehicle Emission Configuration Label Content.

A. The VEC bar code consists of eight (8) characters preceded by the data identifier 3T. The eight (8) characters are defined here. The bar code also contains a start and stop character. The label also contains a title, VEC, unless the bar code is part of the Vehicle Emission Control information Label.

2. Engine Displacement.

A. The VEC label first contains two (2) characters for engine displacement specified in liters.

B. For engine displacements less than ten (10) liters, the displacement is expressed to the nearest one-tenth (.1) of a liter and then multiplied by ten (10) on the VEC label. For displacements ten (10) liters and over (rare), the displacement is expressed to the nearest liter. (This procedure allows the elimination of the decimal point from the VEC label.)

Label Character No.	Designation
1,2	Engine displacement in liters (Example: 11 = 1.1 liters or 11 liters, in rare cases)

C. Partial Engine Family Designation))Light-duty Vehicles/Trucks.

(I) The VEC label contains the following five (5) characters of the EPA twelve (12)-character engine family designations. (The alphabetical and numerical coding requirements for the engine family designation conforms to the EPA recommendations for standardizing engine family names.)

Label Character No.	EPA Designation
3	Vehicle and fuel type
4	Fuel metering type
5	Catalyst type
6,7	Engine family suffix for unique identification) manufacturer selected

(C) VEC Labels, Light-duty Vehicles Label Character Definitions.

Label Character No.	Designation
1,2	Engine displacement in liters. (Decimal ignored.) MAS shall check characters for agreement with engine displacement code on VIN label.
3	Vehicle and fuel type. V = Light-duty vehicle (gasoline) T = Light-duty truck (gasoline) D = Light-duty vehicle (diesel) K = Light-duty truck (diesel) W = Light-duty vehicle (gasoline) Calif. Stds. GM ONLY
4	Fuel Metering type. 0 = Multiple carburetors 1 = 1-barrel carburetor 2 = 2-barrel carburetor 3 = 3-barrel carburetor 4 = 4-barrel

carburetor  
5 = Electronic Fuel Injection  
5 = Throttle Body  
Injection  
GM ONLY  
6 = Mechanical  
Fuel  
Injection  
7 - Multiport  
Fuel  
Injection  
GM ONLY  
8 = Port Fuel  
Injection  
GM ONLY  
9 = Port Fuel  
Injection  
Turbo  
GM ONLY  
9 = Other

5

Catalyst type.  
A = Single  
oxidation  
B = More than one  
oxidation  
C = Single  
reduction  
D = More than one  
reduction  
E = Three-way without  
feedback  
F = Three-way with  
feedback  
G = Three-way  
plus other  
catalyst  
without  
feedback  
H = Three-way  
plus other  
catalyst with  
feedback  
J = No catalyst  
K = Other



L = Three-way  
catalyst with  
feedback  
GM ONLY

6,7

Engine family suffix for unique identification. MAS shall read for engine family identification, but not define.

8

ECS Component Combination.

NOTE: Following codes A))D for engines with ignition frequency of one event per two engine revolutions (for MAS measurement of RPM).

A = No Air Inj.,  
No EGR

B = Air Inj.,  
No EGR

C = No Air Inj.,  
EGR

D = Air Inj.,  
EGR

NOTE: Following codes S))V for engines with ignition frequency of one event per engine revolution (for MAS measurement of RPM).

S = No Air Inj.,  
No EGR

T = Air Inj.,  
No EGR

U = No Air Inj.,  
EGR

V = Air Inj.,  
EGR

(D) Partial Engine Family Designation))Heavy-duty Engines.

1. The VEC label contains the following five (5) characters: a two (2)-digit non-EPA-specified identifier for heavy-duty engines and three (3) characters of the EPA eleven (11)-character engine family designation. (The alphabetical and numerical coding requirements for the engine family designation is to conform to the EPA recommendations for standardizing engine family names.) Label character numbers three (3) and four (4)

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represent the two (2)-digit non-EPA-specified identifier and is specified as 80 for gasoline engines and 90 for diesel engines.

Label Character No.	EPA Designation
3,4	Heavy-duty Engine Identifier
5	Engine Type
6	Emission Control System Type
7	Uniqueness Digit))Manufacturer Selected

(E) VEC Lables, Heavy-Duty Vehicles Label Character Definitions.

Label Character No.	EPA Designation
1,2	Engine displacement in liters. (Decimal ignored.) MAS should check characters for agreement with engine displacement code on VIN label.
3,4	Heavy-duty Engine Identifier. 80 = Gasoline 90 = Diesel
5	Engine Type.  A = Spark Ignition Carbureted B = Spark Ignition Fuel Injected C = Spark Ignition Turbocharged D = Compression Ignition, Naturally Aspirated E = Compression Ignition, Turbocharged F = Compression Ignition, Turbocharged, Intercooled or Aftercooled Z = Other
6	Emission Control System Type. A = Engine Modifications B = Air Injection C = EGR D = Oxidation Catalyst E = Reduction Catalyst F = Three-way Catalyst G = Air Injection plus EGR H = Air Injection plus Oxidation Catalyst J = Air Injection plus Reduction Catalyst

K = Air Injection plus Three-way Catalyst  
 L = EGR plus Oxidation Catalyst  
 M = EGR plus Reduction Catalyst  
 N = EGR plus Three-way Catalyst  
 P = Smoke Puff Limiter  
 R = Air Injection, EGR, Oxidation Catalyst  
 S = Air Injection, EGR, Reduction Catalyst  
 T = Air Injection, EGR, Three-way Catalyst  
 Z = Other

7 Engine family suffix for unique identification. MAS should read for engine family identification, but not define.

8 ECS Component Combination.  
 NOTE: Following codes A))D for engines with ignition frequency of one event per two engine revolutions (for MAS measurement of RPM).  
 A = No Air Inj., No EGR  
 B = Air Inj., No EGR  
 C = No Air Inj., EGR  
 D = Air Inj., EGR  
 NOTE: Following codes S))V for engines with ignition frequency of one event per engine revolution (for MAS measurement of RPM).  
 S = No Air Inj., No EGR  
 T = Air Inj., No EGR  
 U = No Air Inj., EGR  
 V = Air Inj., EGR

(F) The eighth character on the VEC label is the code for the ECS combination and the engine ignition frequency for vehicle inspection programs. The engine ignition frequency is specified because some engine designs have twice the ignition frequency of other designs. Label codes A through R describes the ECS component combination for vehicles with an ignition frequency of one (1) event per two (2) engine revolutions. Label codes S

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through nine (9) describes the ECS component combinations for vehicles with an ignition frequency of one (1) event per engine revolution.

(G) Human-readable Character Suppression (Reference AIAG B-7))Appendix A).

1. The bar code characters for start, stop and the data identifier shall be suppressed from the human-readable printing.

(H) Human-readable Character Height (Reference AIAG B-7))Appendix A).

1. The minimum height of the human-readable characters is 2.38 mm (0.094 inches).

(I) Horizontal or Vertical Printing (Reference AIAG B-7))Appendix A).

1. The symbols may be printed horizontally or vertically. When the bar codes are printed horizontally, the human-readable data is printed directly above or below and centered. When bar codes are printed vertically, the human-readable data are printed vertically and centered to the left or right of the bar code.

(J) Title.

1. This label contains the title of VEC unless the bar code is part of the Vehicle Emission Control information Label.

(3) General Symbology Specifications.

(A) Code 39 Symbology.

1. The VEC bar code conforms to *Bar Code Symbology for 3 of 9 Bar Codes* published by the Automotive Industry Action Group (AIAG B-1). All aspects of the bar-code symbology codes follows this specification except as described in the following sections.

2. Code Density and Dimensions (Reference AIAG B-7))Appendix A).

3. The average width of the narrow element is within the range of 0.19 mm (0.0075 inches) and 0.317 mm (0.0125 inches). The ratio is three to one (3:1) with an allowable range

of 2.8 to 3.2. The minimum bar height is 9.5 mm (0.375 inches) or fifteen percent (15%) of bar code length.

(4) Scanning Devices (Reference AIAG B-7))Appendix A).

(A) Scanning devices shall use a light source at B633 nanometer range or in the visible red light spectral band range.

Appendix C: Emission Standard Table

(1) The emission inspection standards for all vehicle types except type H.

(A) Passenger cars and light duty trucks.

Model Year of Vehicle	CO(%)	HC (ppm)
1971	7.0	700
1972	7.0	700
1973	7.0	700
1974	7.0	700
1975	6.0	600
1976	6.0	600
1977	6.0	600
1978	6.0	600
1979	6.0	600
1980	3.0	300
1981 and later	1.2	220

(2) The emission inspection standards for vehicle type H only.

(A) Specially-made vehicles.

Model Year of Vehicle	CO(%)	HC (ppm)
1971	7.0	700
1972	7.0	700
1973	7.0	700
1974	7.0	700
1975	6.0	600
1976	6.0	600
1977	6.0	600
1978	6.0	600
1979	6.0	600
1980 and later	5.0	500

