450R81102

# APPLICATION FORMAT

# FOR

# CERTIFICATION OF

# LIGHT-DUTY MOTOR VEHICLES

# --1981 MODEL YEAR--

# RECOMMENDED PROCEDURES

ENVIRONMENTAL PROTECTION AGENCY
MOBILE SOURCE AIR POLLUTION CONTROL
DIVISION OF CERTIFICATION
2565 PLYMOUTH ROAD
ANN ARBOR, MICHIGAN 48105
(313) 668-4402

## Preface

The purpose of this document is to facilitate the preparation and submission of applications for certificates of conformity to the Federal regulations which govern exhaust and evaporative emissions from 1981 model year gasoline-fueled and diesel light-duty vehicles and trucks. To achieve this goal, this document: (1) specifies in detail all information, implicit in 40 CFR 86.081-21, which EPA must analyze and review to determine compliance with the pertinent regulations; (2) provides a format in which this information should be submitted to EPA; and (3) outlines a procedure for submitting this information.

The application and the related inprocess certification documents such as zero-mile books, vehicle information sheets, etc., serve three equally important functions. These are: (1) Characterization--much of the information contained in the application and subsequent documentation is for purposes of characterizing the vehicles and systems tendered for certification; (2) Vehicle selection--this information is also used as a basis for engineering analyses leading to the selection of durability-data and emission-data vehicles; and (3) Defeat device identification--the information serves as a resource for evaluating the potential for defeat devices and defeat practices associated with the proposed vehicle and systems.

TABLE OF CONTENTS

# Chapter 1

## Introduction

The 1981 application format does not differ significantly from the 1980 version. Changes in regulations, notably concerning parameter adjustments and Diesel particulates, have necessitated some minor additions to EPA's needs for information, while new developments in automotive emission control technology have influenced a few other requirements. Changes in EPA policy, such as the development of limited certification review or the transfer of data-entry responsibilities to the manufacturer, have altered the recommended formats for presenting certain kinds of information (e.g., data for deterioration factor calculations). In general, however, the 1981 application format largely duplicates the structure and content of the 1980 document.

The extensive changes made to the 1980 version, it should be recalled, were undertaken with the goal of increasing the use of automated data processing during certification review. Although the 1981 format could not be computerized without further refinements, the fundamental structure of the 1981 format is expected to be used for many years and to be the basis for future computerization efforts. Manufacturers are consequently strongly encouraged to develop their 1981 application in accordance with the format contained herein, since this will facilitate the transition to additional computerization and help expedite the review process.

Three central features of the 1981 model year format are indexing, referencing, and sequencing. (These features were developed jointly by the industry and EPA at a series of workshop and task force meetings.) Because these terms will be used throughout this document, it is appropriate that some introductory discussion of these concepts be provided here.

### 1. Indexing

"Indexing" refers to the use of codes or symbols to label each unit or element of certification information requested by the application format. Assuming that these codes are used consistently by all manufacturers, and that the structure of all applications is in accordance with the recommended format, the indexing scheme outlined in Chapter 4 will make possible the quick location of any unit of application information a certification engineer might seek.

Although application formats from model years prior to 1980 have incorporated indexing schemes, their coding methods have produced descriptors which are complicated to manipulate, interpret, and reproduce. In the 1979 model year format, for example, the code assigned to carburetor venturi diameter for four-stroke engines is VIa.C.1).b).v). The 1980 format developed an all-numeric coding scheme that should simplify the identification of, or reference to, particular sections of the application; using this coding method, carburetor venturi diameter is labelled 11.03.02.05. A short-term benefit of this scheme is simplified referencing to specific portions of the application in correspondence. In the long term, adoption of this scheme will expedite the computerized processing of certification applications.

2. Sequencing

"Sequencing" refers to the submission of blocks of certification information which, although "incomplete" relative to the entire application, are nevertheless sufficient to provide EPA with all information needed to perform one phase of certification review (e.g., the specification of durability-data vehicle requirements).

In an effort to reduce the number of revisions and their attendant paperwork, the present sequencing scheme allows the manufacturer to defer submission of certification data until the manufacturer is ready to have those data processed. Briefly stated, the sequencing scheme divides the application into seven different sections or "sequencing blocks," each of which corresponds to a particular EPA regulatory activity. The blocks are as follows:

1 Review of General Information
2. Durability-Data Vehicle Selection
3. Testing Approval
4. Mileage Accumulation Approval
5. Emission-Data Vehicle Selection
6. Information Submitted as Available or Required
7. Certification

Following an internally determined schedule, the manufacturer may "build up" a complete application by submitting these blocks over a period of weeks or months. EPA will proceed with the appropriate operation of the certification review as soon as the pertinent sequencing block is submitted in good order.

3. Referencing

Referencing seeks to reduce the size of the application by eliminating duplication and redundancy from the document. In many applications from previous model years, identical information applying to several engine families is reproduced in several different places in the application. Other data, such as descriptions of test facilities and equipment, are often repeated verbatim from one year's application to the next. "Referencing" pertains to the use of a single description to cover all instances within the application where that information may be necessary. The present format encourages manufacturers to reduce duplication by referring to the location of a unit of information's first submission whenever access to that infor-

mation is required, rather than needlessly reproducing identical data. In essence, the concept of referencing reduces paperwork by encouraging the manufacturer to submit data one time only.

Manufacturers should be wary, however, of applying the referencing concept too freely and producing an application whose every page is a bewildering network of allusions to other pages of the application. Such overuse of referencing would generate a document that, although free of repetition, could not be reviewed without large amounts of inefficient crosschecking and page-turning. Manufacturers should consequently exercise good judgment and work cooperatively with their certification teams to prevent taking the referencing concept to unproductive extremes.

In accordance with 40 CFR 86.081-21, an application for a certificate of conformity to the regulations applicable to new motor vehicles shall be made to the Administrator by the manufacturer. Such application must be made for each set of applicable standards, and clearly identify the (numerical) standards with which the therein described vehicles are intended to comply. A separate, complete application is necessary for:

1. Light-duty vehicles which are intended to comply with the 1981 model year standards applicable to new gasoline-fueled light-duty vehicles;

2. Light-duty vehicles which are intended to comply with the 1981 model year standards applicable to new Diesel light-duty vehicles;

3. Light-duty trucks which are intended to comply with the 1981 model year standards applicable to new gasoline-fueled light-duty trucks;

4. Light-duty trucks which are intended to comply with the 1981 model year standards applicable to new Diesel light-duty trucks.

Each application should clearly identify the class of vehicles (e.g., gasoline-fueled light-duty vehicles, Diesel light-duty trucks, etc.) and the standards with which the vehicles described therein are intended to comply. A separate application is required for each set of standards and each class of vehicles. In addition, the projected sales volumes in California and in the other 49 states must be specified. The regulations do not allow a certificate of conformity to be issued to cover compliance with more than one set of standards. This does not prohibit an engine family which is certified as complying with Federal standards from also containing some vehicles which are certified by the State of California for sale in that state. However, separate application must be made for those vehicles intended to be certified only to the State of California waiver standards and regulations. Vehicles intended to be certified against both the California waiver standards and the Federal standards may be included in the same engine family and application provided all vehicles qualify for being grouped together in the same engine family as described in 40 CFR 86.080-24 and Advisory Circular No. 20-B.

The application for certification is primarily a declaration of intention by a manufacturer to seek certification of new motor vehicles in conformance with 40 CFR Part 86 and includes a definitive description of all the various vehicle models and respective optional power trains to be offered

for sale by the manufacturer (ref. 40 CFR 86.081-21(b)(1)). The application represents the primary source of information regarding a manufacturer's intended product line. It is imperative that the application be as correct and up-to-date as possible.

The manufacturer is responsible for informing the Certification Division of any changes, additions, or deletions to the application which occur after the initial submission (ref. 40 CFR 86.081-21(a)).

Sections 01.00.00.00 through 08.00.00.00 of the application (using the suggested format) should contain general information relating to such things as the applicant's facility and specifications of test fuels. For the 1981 model year, the manufacturer must submit Sections 01.00.00.00 through 08.00.00.00, because MSAPC has not developed procedures to accomodate referencing of information across model years. To expedite the review process, however, one of the following statements should accompany these sections:

> "The information contained in Sections 01.00.00.00 - 08.00.00.00 is identical to the information submitted in the analogous section(s) of the [mfr. name] 1980 Model Year Application for Certification."
>
> or
>
> "The information contained in Sections 01.00.00.00 - 08.00.00.00 is identical to the information submitted in the analogous section(s) of the [mfr. name] 1980 Model Year Application for Certification, with the following exceptions."

Sections 09.00.00.00 through 15.00.00.00 of the application should contain specific information relating to the product line for a particular model year and are to be submitted annually.

Section 16.00.00.00 is the Request for Certificate in conformance with 40 CFR Part 86. It should be submitted to the Certification Division at least 30 days prior to the date certification is desired. It is a summary of the data required to substantiate that new motor vehicles comply with Federal emission standards (ref. 40 CFR 86.079-23).

The application should be submitted as soon as practicable. Each original application, as well as all subsequent revisions, should be forwarded with a letter of transmittal to:

Director
Certification Division
Mobile Source Air Pollution Control
U.S. Environmental Protection Agency
2565 Plymouth Road
Ann Arbor, Michigan 48105

When the manufacturer submits the Request for Certificate, he should also submit a duplicate copy of the application to the Mobile Source Enforcement Division. This copy should contain all revisions made up to this time but need not include sections 12.00.00.00 and 14.00.00.00. This duplicate copy should be forwarded to:

Director
Mobile Source Enforcement Division (EN-340)
U.S. Environmental Protection Agency
401 M Street S. W.
Washington, D.C. 20460

All applications should be presented on 8-1/2 inch by 11 inch paper, or a reasonable equivalent, and be bound in a looseleaf cover of the same approximate size.

In addition to the above changes, EPA instituted a new policy, effective with the 1980 model year, with regard to the processing and review of applications. Prior to the 1980 model year, EPA's certification staff had spent a considerable amount of time reviewing applications for their completeness and accuracy. This had included the preparation of detailed deficiency lists indicating specific areas in need of correction or revision. Over the years, some manufacturers have begun to rely on this procedure, thereby causing EPA to assume the responsibility of proofreading applications and calling attention to substantive, grammatical, and typographical errors.

EPA can no longer provide this service. As in the past, each manufacturer shall be responsible for the completeness, quality, and accuracy of his application. For engine families being certified under the full certification review procedures or limited certification review procedures, upon receipt of a preliminary application or application update, the certification team will conduct a preliminary review to assess its adequacy. If deficiencies are found, the general nature of the deficiencies will be explained, but a detailed list of problems will not be prepared. This procedure may be repeated when the manufacturer makes final application for certification for families undergoing full certification review or limited certification review. For engine families being certified under the voluntary abbreviated certification review procedures, EPA may similarly assess the adequacy of an application and notify the manufacturer of general deficiencies. This assessment may occur either during an audit or during review of the manufacturer's final application for certification. Thus, it is the responsibility of the manufacturer to follow the format provided and to assure that the application is ready for EPA processing at the time it is submitted.

This policy was made in an effort to reduce the number of revisions formerly needed to produce accurate applications and to substantially decrease the time spent both by EPA and the manufacturer in making such revisions.

Chapter 2

## General Instructions

To improve the efficiency of application preparation and handling, some general instructions which help explain both the application and the certification process are presented here:

### 1. Terminology

Certain terms contained in the format have unique connotations to assist manufacturers in meeting EPA's requirements for information. The following list explains the information request associated with each term.

Material - the generic type of substance used (e.g., steel, cast iron).

Composition - the precise substance used (e.g., SAE 1010 steel)

Configuration - the general layout of an item, including the approximate locations of components and, where appropriate, a labeled sketch or drawing.

Design - the precise layout and exact locations of components, including dimensioned engineering drawings.

Calibration - the set of specifications, including tolerances, unique to a particular design, version, or application of a component or component assembly capable of functionally describing its operation over its working range. (When calibration is requested, every calibration should be specified, not just a "typical" calibration.)

Parameters Sensed and/or Controlled - the engine, vehicle, or ambient conditions which are sensed and/or controlled, either mechanically or electrically, and thereby determine or bias the operation of a system or component.

Method of Operation - a narrative, qualitative description of the function of a device or system throughout its working range, including the effect of external variables.

Engine Code - a unique combination within an engine-system combination (as defined in Part 86) of displacement, carburetor (or fuel injection) calibration, choke calibration (if automatic), distributor calibration, auxiliary emission control devices, and all other items described in Section 10.00.00.00 (any code or number may be used to identify engine configurations). (Any change to an existing code after production has begun automatically creates a new code and the original and the modified codes must be identified separately.)

Car Line - A name denoting a group of vehicles within a make or car division which has a degree of commonality in construction (e.g., body, chassis). "Car line" does not consider any level of decor or opulence

and is not generally distinguished by characteristics such as roof-line or number of doors, seats, or windows except for station wagons or light-duty trucks. Station wagons and light-duty trucks are considered to be in different car lines than passenger cars.

Basic Drive Train Layout - The fundamental special relationship of engine, transmission, and axle. Examples are "front engine, transmission, rear axle," "mid-engine and transaxle," "front engine and rear-mounted transaxle," or "transaxle followed by rear-mounted engine."

Auxiliary Emission Control Device - Any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

2. Page Numbering

Each page number should include the respective section number, e.g., 02-2 (section 02.00.00.00 - page 2), 08.01.01-15 (section 08.01.01.00 - page 15), 05.01-9 (section 05.01.00.00 - page 9). The detail of the indexing system which is used in page numbering should be based upon the amount of information contained in a given section. In section 02.00.00.00, there is not a large enough volume of information to support a finer breakdown; however, in section 08.01.00.00 there may be many pages of carburetor description as well as fuel injection description so it may be appropriate to use three levels of indexing in the page number (even four may be appropriate if there are a number of carburetors to describe). It is up to the manufacturer to decide what type of detail is appropriate for his application. Some provision, such as the use of decimal numbers, should be made for adding a new page with new or supplemental data without disturbing the numbering of the other pages in a particular section, e.g., 02-2.1. Divider pages should be used between sections.

For sections that are specific to a particular engine family (e.g., 10.00.00.00, 16.00.00.00), the page numbering system should include the name of the appropriate engine family to avoid confusion in handling many pages of similar format, e.g., 10-ABC-2 (for engine family ABC).

3. Revising the Application

EPA encourages manufacturers to minimize revisions to their applications. However, it is expected that a certain number of revisions will be submitted to add or delete material or correct errata. The process of revising applications has been divided into four elements to assure that certification personnel have available to them the most recent information submitted by the manufacturer. The elements are as follows:

1. A revision index;

2. A revision cover letter;

3. The new or revised material to be inserted in the application; and

4. Marked-up copies of the pages of the application which have been revised to indicate new information, if applicable.

The revision index is a cumulative log of all revisions to the application. A suggested format is contained on page 27 of the Appendix. The purpose of the index is to establish a bookkeeping system for the application which will become essential as we move toward machine processing.

A suggested format for the revision cover letter is shown on page 1 of the Appendix.

a. Revision and Review Block

Each page of the application should include a revision block which provides space for the date of issue as well as the effective date of each revision.

| Issue Date: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Revision Date: | | | | | | | | |

When an application is submitted, each page may be reviewed in detail by a member of the EPA Certification Division. The reviewer indicates the acceptability or unacceptability of the page by checking, initialing, and dating a review block. Each page of the application, therefore, should include a review block at the bottom as follows:

PAGE IS ☐ SATISFACTORY ☐ UNSATISFACTORY

DATE __/__/__ EPA REP _____

b. Revisions Prior to Certification

Whenever a revision is made to an application, the entire page containing the revision, including the date of revision in the revision block, should be submitted along with a marked-up copy of the previously affected page to indicate the revision.

c. Revisions After Certification

After the appropriate certificate has been issued, changes which have no effect on actual hardware, such as a change in the name of a manufacturer's representative or the correction of a non-substantive typographical error, may be accomplished by a simple revision of the application as explained in section 2b. This one-step technique for changing the application is not appropriate when a revision involves a change which may have an effect on emission performance or deterioration. In such cases, the description of the proposed revision must be accompanied by a running change request. A suggested format for such a request is presented on page 23 in the Appendix. Many manufacturers in the past have followed a practice of identifying successive running changes with a number which includes the family designation and model year of the engine being affected. (For example, the number of the first running change in the 1981 model year for the ABC family might be 81-ABC-1.) This practice has proved to be quite useful and is highly recommended. Two copies of each running change should be submitted, so that the Certification Division may transmit a duplicate of every approved change to the Mobile Source Enforcement Division.

4. Confidentiality

Section 208(b) of the Clean Air Act requires the Administrator to disclose to the public all non-trade secret information, requires him to keep trade secret information confidential, and requires the person who has submitted the information claimed to be confidential to make a satisfactory showing that the information in question would divulge trade secrets, if disclosed.

The EPA General Counsel has issued a Class Determination 1-79 which sets forth EPA's policy concerning the confidentiality of business information submitted in applications for certification of light-duty motor vehicles. In accordance with the Class Determination, each manufacturer may make applicable claims of confidentiality and supply justifications in Section 02.00.00.00 of his application. If a claim of confidentiality is made, it will be treated in accordance with the Class Determination and EPA's regulations on confidentiality of business information (40 CFR Part 2 Subpart B, 41 Federal Register 36906, September 1, 1976). If a manufacturer fails to make a claim in Section 02.00.00.00, the information in the application may be made available to the public without further notice to the manufacturer.

To facilitate reproduction for release purposes, trade secrets should not be included on the same page as information which is available for public release. Pursuant to this purpose, Section 10.10.40.00 is included in the format. Section 10.10.40.00 is identical to Section 10.10.00.00, with the exception that sales information has been deleted. This section is included because product line descriptions are often requested by the public, and in past experience, sales information has been considered confidential information. If the manufacturer chooses not to request that sales information be considered confidential, Section 10.10.40.00 may be omitted. Section 10.10.40.00 need only be submitted at the time the Request for Certificate is delivered.

3. The new or revised material to be inserted in the application; and

4. Marked-up copies of the pages of the application which have been revised to indicate new information, if applicable.

The revision index is a cumulative log of all revisions to the application. A suggested format is contained on page 27 of the Appendix. The purpose of the index is to establish a bookkeeping system for the application which will become essential as we move toward machine processing.

A suggested format for the revision cover letter is shown on page 1 of the Appendix.

a. Revision and Review Block

Each page of the application should include a revision block which provides space for the date of issue as well as the effective date of each revision.

| Issue Date: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Revision Date: | | | | | | | | |

When an application is submitted, each page may be reviewed in detail by a member of the EPA Certification Division. The reviewer indicates the acceptability or unacceptability of the page by checking, initialing, and dating a review block. Each page of the application, therefore, should include a review block at the bottom as follows:

PAGE IS ☐ SATISFACTORY ☐ UNSATISFACTORY

DATE __/__/__ EPA REP _____

b. Revisions Prior to Certification

Whenever a revision is made to an application, the entire page containing the revision, including the date of revision in the revision block, should be submitted along with a marked-up copy of the previously affected page to indicate the revision.

c. Revisions After Certification

After the appropriate certificate has been issued, changes which have no effect on actual hardware, such as a change in the name of a manufacturer's representative or the correction of a non-substantive typographical error, may be accomplished by a simple revision of the application as explained in section 2b. This one-step technique for changing the application is not appropriate when a revision involves a change which may have an effect on emission performance or deterioration. In such cases, the description of the proposed revision must be accompanied by a running change request. A suggested format for such a request is presented on page 23 in the Appendix. Many manufacturers in the past have followed a practice of identifying successive running changes with a number which includes the family designation and model year of the engine being affected. (For example, the number of the first running change in the 1981 model year for the ABC family might be 81-ABC-1.) This practice has proved to be quite useful and is highly recommended. Two copies of each running change should be submitted, so that the Certification Division may transmit a duplicate of every approved change to the Mobile Source Enforcement Division.

4. Confidentiality

Section 208(b) of the Clean Air Act requires the Administrator to disclose to the public all non-trade secret information, requires him to keep trade secret information confidential, and requires the person who has submitted the information claimed to be confidential to make a satisfactory showing that the information in question would divulge trade secrets, if disclosed.

The EPA General Counsel has issued a Class Determination 1-79 which sets forth EPA's policy concerning the confidentiality of business information submitted in applications for certification of light-duty motor vehicles. In accordance with the Class Determination, each manufacturer may make applicable claims of confidentiality and supply justifications in Section 02.00.00.00 of his application. If a claim of confidentiality is made, it will be treated in accordance with the Class Determination and EPA's regulations on confidentiality of business information (40 CFR Part 2 Subpart B, 41 Federal Register 36906, September 1, 1976). If a manufacturer fails to make a claim in Section 02.00.00.00, the information in the application may be made available to the public without further notice to the manufacturer.

To facilitate reproduction for release purposes, trade secrets should not be included on the same page as information which is available for public release. Pursuant to this purpose, Section 10.10.40.00 is included in the format. Section 10.10.40.00 is identical to Section 10.10.00.00, with the exception that sales information has been deleted. This section is included because product line descriptions are often requested by the public, and in past experience, sales information has been considered confidential information. If the manufacturer chooses not to request that sales information be considered confidential, Section 10.10.40.00 may be omitted. Section 10.10.40.00 need only be submitted at the time the Request for Certificate is delivered.

5. Requesting Deviations

Unusual conditions may suggest to the applicant that a deviation from the specifications affecting such areas as test procedures, equipment, or engine maintenance is necessary. If a request for a deviation is to be made, it should be included in the letter of transmittal which accompanies the Part I application.

EPA approval of a request for a deviation will be applicable only to the model year for which the request was made. Deviations which were approved for a prior model year will not be considered in effect for the current model year without specific approval for the current model year.

6. Interchangeable Components

Devices that perform the same function, but differ in design, material, or mode of operation should be described separately. For example, if both a wax pellet and a bimetal thermostat were to be used interchangeably in production, both devices should be completely described in Section 08.00.00.00, General Technical Information, of the application.

7. Parameters and Tolerances

Information concerning engine component performance and/or dimensional parameters and associated tolerance bands must be provided in the application.

The tolerances which are applied to the various parameters will be examined closely in regard to possible effects on the test requirements which will be specified by EPA. If the tolerance bands are unusually broad relative to bands which are traditionally used by the industry, additional test vehicles may be specified to ensure that the certification vehicles will adequately represent the final production vehicles.

The Request for Certificate must include, in addition to the production parameters and tolerance bands, information which will assure EPA that all of the production vehicles will be within the limits that have been specified by the applicant. This requirement may be satisfied by either:

a. Providing the production quality control information which is requested in Section 16.04.00.00, Production Engine Parameters, in the application or

b. Making an unqualified statement in Section 16.04.00.00 to the effect that all production engines will be calibrated within the specified tolerance bands. An example of a statement which will be acceptable to EPA is presented below (ref. Advisory Circular No. 65-1).

> The application for certification identifies and describes those engines to be covered by the certificate(s) of conformity issued by EPA, and this application for certification

covers only those new engines to be produced by ____(Company Name)____ which conform, in all material respects, to the design specifications (including tolerances) which are contained herein.

8. Data Carryover

An applicant may request to use data from a previous model year (carryover data) to satisfy the 1981 model year certification requirements (ref. 40 CFR 86.080-24(f)). The request should be made in the cover letter accompanying the 1981 application. In previous model years, the manufacturer was required to submit a complete description of the vehicles (referred to as carryover vehicles), along with the test data, as a supplement to the application. For the 1981 model year, the manufacturer need initially only provide a list of the differences between the projected 1981 model year test vehicles and the proposed carryover vehicles.

It must be emphasized that the responsibility for providing a full and complete summary of changes lies solely with the manufacturer. Differences not listed in the summary and subsequently brought to light at some later stage of the certification process might seriously jeopardize a manufacturer's program.

9. Proposed Vehicle Requirements

With cover letters requesting specification of durability-data or emission-data vehicle requirements, an applicant may submit suggested or proposed durability-data or emission-data vehicle requirements to notify EPA of vehicles already ordered or built. This may reduce delays if the vehicles already procured are able to be used in certification testing.

10. Preliminary Engineering Reports

40 CFR 86.079-25(a)(10) specifies that a preliminary engineering report should be submitted to EPA within 3 working days after any malfunction diagnosis on a test vehicle. Whenever oral discussions regarding such maintenance take place between EPA and a manufacturer, a written preliminary engineering report need not be submitted as the necessary information may be obtained orally.

11. Standardized Engine Family Names

Manufacturers are strongly encouraged to adopt the standardized engine family naming system transmitted to industry on April 12, 1979. A copy of this proposal is included in Appendix pages 64-72.

12. Supplement on Preparation and Submission of Certification Data Forms

During the 1981 model year applicants for certification should take the responsibility for providing the following official Certification Division data forms (or their machine-readable equivalents):

1. Vehicle Information Data Sheet (12.01.02.00)
2. Manufacturer's Test Data Sheet (12.01.07.00)
3. Light-Duty Deterioration Factor Input Sheet (12.02.03.00)
4. Summary Sheet Input Form (16.05.00.00)

Procedures for the processing of these forms are still in the final stages of development. Rather than delay the publication of the 1981 format while these procedures are finalized, MSAPC has decided to issue all information pertinent to the preparation and submission of those forms in a special Data Forms Supplement. This supplement is scheduled for issue in mid-September.

Chapter 3

Sequencing

Unlike formats of previous model years, which have encouraged manufacturers to provide EPA with a complete application in a single submission, the present format permits industry to submit the application in sections, and thus to assemble over a period of several weeks or months, a complete application from multiple submittals. EPA does not wish to specify the quantities of data to be contained in these partial submissions--the manufacturer certainly remains free to transmit a complete application in one submission, if he so chooses--but industry will probably find it in their best interest to relate closely their submissions to the data classifications represented by EPA's "sequencing blocks."

As was explained in Chapter 1 of this document, EPA has grouped each element of application information into one of seven categories or "sequencing blocks," each of which corresponds to a particular EPA regulatory function. As soon as a manufacturer has correctly submitted all the data specified within a sequence block, EPA will proceed with the operation associated with that information.

The seven sequencing blocks are:

1) Review of General Information
2) Durability-Data Vehicle Selection
3) Testing Approval
4) Mileage Accumulation Approval
5) Emission-Data Vehicle Selection
6) Information Submitted as Available or Required
7) Certification

The sequence as listed is not strictly chronological as it is necessary to loop back in the sequence for mileage accumulation approval for emission-data vehicles, or if emission-data vehicle selection takes place at the same time as durability-data vehicle selection.

The precise data which constitute these blocks are specified by the entries in the "Sequence Block" column found in Chapter 4's Indexing System table. For example, the following excerpt from this table,

| Section of the Application | Sequence Block | Title |
|---|---|---|
| 10.01.04.02 | 2 | Exhaust valve head diameter |

indicates that exhaust valve head diameter belongs to sequence block 2 and so must be provided before durability-data vehicles can be selected. Similarly,

| | | |
|---|---|---|
| 09.01.03.05 | 5 | Accelerator pump configuration |

indicates that the accelerator pump configuration belongs to sequence block 5 and must be provided before emission-data vehicles can be selected. Manufacturers will be expected to familiarize themselves thoroughly with the Indexing System table so that the data requirements of each sequencing block are clearly understood.

## Indexing

This chapter assigns a unique eight-digit code to every element or unit of certification data contained within the application. Each code consists of four two-digit pairs, such as 10.03.02.05, with each successive pair indicating a more precise and specific level of description. Hence, in this example, the 10 refers to engine family descriptions for four-stroke cycle reciprocating engines; the 03 refers to the fuel system (one of the individual engine parameters); the 02 refers to carburetor; and the 05 refers to venturi diameter.

The table below sets forth all codes which can be used within a manufacturer's application for certification. Some of these codes, it should be noted, include two-digit pairs whose value is double zero (00, as in Carburetors--08.02.02.00). The presence of the double zero pair indicates that one available level of the indexing scheme has not been assigned by EPA. Designations at this level can and should be assigned by manufacturers, however, if distinctions at this level of precision need to be drawn. If a manufacturer needed to provide general technical descriptions of two kinds of carburetor, for example, the pertinent sections of the application could be labeled 08.02.02.01 and 08.02.02.02.

All submissions of certification data, whether of a few pages, an entire sequencing block, or a complete application, should be structured according to the indexing order outlined below. Page numbers should also reflect this order, as is specified in Chapter 2 on page numbering. It is not strictly necessary to tag information within the pages of the application with their corresponding codes, if it is always clear what kind or element of data is being presented or described.

| Section Number | Sequence Number | Title |
|---|---|---|
| 01.00.00.00 | 1 | COMMUNICATIONS |
| .01.00.00 | | Organization Chart |
| .02.00.00 | | Mailing Information |
| .01.00 | | EPA Liaison |
| .02.00 | | Certificate Information |
| .03.00 | | Telex & Telecopier Information |
| .03.00.00 | | Verbal Contacts - EPA Liaison |
| .04.00.00 | | Applicable Emission Standards |
| 02.00.00.00 | 1 | STATEMENT OF CONFIDENTIALITY |
| 03.00.00.00 | | FUELS AND LUBRICANTS |
| .01.00.00 | 3* | Tests Fuels - Specifications |
| .01.00 | | Leaded |
| .02.00 | | Unleaded |
| .03.00 | | Diesel |

* Sequence 2 if fuel type is a family determinator

| | | |
|---|---|---|
| 03.02.00.00 | 4 | Service Accumulation Fuels - Specifications |
| .01.00 | | Leaded |
| .02.00 | | Unleaded |
| .03.00 | | Diesel |
| .03.00.00 | 7 | Fuels Recommended to the Owner - Specifications |
| .01.00 | | Leaded |
| .02.00 | | Unleaded |
| .03.00 | | Diesel |
| .04.00.00 | 4 | Lubricants - Specifications |
| 04.00.00.00 | | FACILITY AND EQUIPMENT |
| .01.00.00 | | Facilities |
| .01.00 | 3 | Low Altitude |
| .02.00 | 5 | High Altitude |
| .03.00 | 5 | Secondary Laboratory |
| .04.00 | 4 | Mileage Accumulation |
| .02.00.00 | 3 | Equipment |
| 05.00.00.00 | | TEST PROCEDURES |
| .01.00.00 | 3 | Emission Testing |
| .02.00.00 | 4 | Mileage Accumulation |
| .03.00.00 | 3 | Horsepower Determination |
| .01.00 | | Frontal Area |
| .02.00 | | Road Load |
| .03.00 | | Other |
| 06.00.00.00 | | MAINTENANCE AND WARRANTY |
| .01.00.00 | | Test Vehicle Maintenance |
| .01.00 | | Scheduled Maintenance |
| .01 | 2 | Schedules |
| .02 | 4* | Procedures |
| .02.00 | 4* | Unscheduled Maintenance |
| .01 | | Diagnostic Procedures |
| .02 | | Procedure for Evaluating Driveability |
| .03 | | Blanket Approval List |
| .02.00.00 | 7 | Recommended Customer Maintenance |
| .01.00 | | Maintenance Schedules |
| .02.00 | | Differences between Certification and In-Use Vehicle Maintenance |
| .03.00 | | Maintenance Cost Estimates |
| .03.00.00 | 7 | Special Tools |
| .04.00.00 | 7 | Training Programs |
| 05.00.00 | 7 | Service Literature |
| .01.00 | | Shop Manuals |
| .02.00 | | Specification Manuals |
| .03.00 | | Owners' Manuals |
| .04.00 | | Technical Service Bulletins |
| .06.00.00 | 7 | Emission System Warranty Statement |
| 07.00.00.00 | 7 | LABEL FORMAT |
| .01.00.00 | | Sample and Location |

*Submit prior to first maintenance point (scheduled or unscheduled)

Chapter 4

## Indexing

This chapter assigns a unique eight-digit code to every element or unit of certification data contained within the application. Each code consists of four two-digit pairs, such as 10.03.02.05, with each successive pair indicating a more precise and specific level of description. Hence, in this example, the 10 refers to engine family descriptions for four-stroke cycle reciprocating engines; the 03 refers to the fuel system (one of the individual engine parameters); the 02 refers to carburetor; and the 05 refers to venturi diameter.

The table below sets forth all codes which can be used within a manufacturer's application for certification. Some of these codes, it should be noted, include two-digit pairs whose value is double zero (00, as in Carburetors--08.02.02.00). The presence of the double zero pair indicates that one available level of the indexing scheme has not been assigned by EPA. Designations at this level can and should be assigned by manufacturers, however, if distinctions at this level of precision need to be drawn. If a manufacturer needed to provide general technical descriptions of two kinds of carburetor, for example, the pertinent sections of the application could be labeled 08.02.02.01 and 08.02.02.02.

All submissions of certification data, whether of a few pages, an entire sequencing block, or a complete application, should be structured according to the indexing order outlined below. Page numbers should also reflect this order, as is specified in Chapter 2 on page numbering. It is not strictly necessary to tag information within the pages of the application with their corresponding codes, if it is always clear what kind or element of data is being presented or described.

| Section Number | Sequence Number | Title |
|---|---|---|
| 01.00.00.00 | 1 | COMMUNICATIONS |
| .01.00.00 | | Organization Chart |
| .02.00.00 | | Mailing Information |
| .01.00 | | EPA Liaison |
| .02.00 | | Certificate Information |
| .03.00 | | Telex & Telecopier Information |
| .03.00.00 | | Verbal Contacts - EPA Liaison |
| .04.00.00 | | Applicable Emission Standards |
| 02.00.00.00 | 1 | STATEMENT OF CONFIDENTIALITY |
| 03.00.00.00 | | FUELS AND LUBRICANTS |
| .01.00.00 | 3* | Tests Fuels - Specifications |
| .01.00 | | Leaded |
| .02.00 | | Unleaded |
| .03.00 | | Diesel |

* Sequence 2 if fuel type is a family determinator

| | | |
|---|---|---|
| 03.02.00.00 | 4 | Service Accumulation Fuels - Specifications |
| .01.00 | | Leaded |
| .02.00 | | Unleaded |
| .03.00 | | Diesel |
| .03.00.00 | 7 | Fuels Recommended to the Owner - Specifications |
| .01.00 | | Leaded |
| .02.00 | | Unleaded |
| .03.00 | | Diesel |
| .04.00.00 | 4 | Lubricants - Specifications |
| 04.00.00.00 | | FACILITY AND EQUIPMENT |
| .01.00.00 | | Facilities |
| .01.00 | 3 | Low Altitude |
| .02.00 | 5 | High Altitude |
| .03.00 | 5 | Secondary Laboratory |
| .04.00 | 4 | Mileage Accumulation |
| .02.00.00 | 3 | Equipment |
| 05.00.00.00 | | TEST PROCEDURES |
| .01.00.00 | 3 | Emission Testing |
| .02.00.00 | 4 | Mileage Accumulation |
| .03.00.00 | 3 | Horsepower Determination |
| .01.00 | | Frontal Area |
| .02.00 | | Road Load |
| .03.00 | | Other |
| 06.00.00.00 | | MAINTENANCE AND WARRANTY |
| .01.00.00 | | Test Vehicle Maintenance |
| .01.00 | | Scheduled Maintenance |
| .01 | 2 | Schedules |
| .02 | 4* | Procedures |
| .02.00 | 4* | Unscheduled Maintenance |
| .01 | | Diagnostic Procedures |
| .02 | | Procedure for Evaluating Driveability |
| .03 | | Blanket Approval List |
| .02.00.00 | 7 | Recommended Customer Maintenance |
| .01.00 | | Maintenance Schedules |
| .02.00 | | Differences between Certification and In-Use Vehicle Maintenance |
| .03.00 | | Maintenance Cost Estimates |
| .03.00.00 | 7 | Special Tools |
| .04.00.00 | 7 | Training Programs |
| 05.00.00 | 7 | Service Literature |
| .01.00 | | Shop Manuals |
| .02.00 | | Specification Manuals |
| .03.00 | | Owners' Manuals |
| .04.00 | | Technical Service Bulletins |
| .06.00.00 | 7 | Emission System Warranty Statement |
| 07.00.00.00 | 7 | LABEL FORMAT |
| .01.00.00 | | Sample and Location |

*Submit prior to first maintenance point (scheduled or unscheduled)

| | | |
|---|---|---|
| 07.02.00.00 | | EPA Approval |
| .03.00.00 | | Specifications & Tolerances |
| | | |
| 08.00.00.00 | | GENERAL TECHNICAL DESCRIPTION |
| .01.00.00 | 2 | Fuel Control Systems |
| .01.00 | | Carburetors |
| .02.00 | | Fuel Injection |
| .03.00 | | Closed Loop |
| .02.00.00 | 2 | Ignition Systems |
| .01.00 | | Distributor |
| .02.00 | | Spark Plugs |
| .03.00.00 | 2 | Crankcase Control System |
| .04.00.00 | | Cooling System |
| .05.00.00 | 2 | Engine |
| .01.00 | | Intake Manifolds |
| .02.00 | | Cylinder Heads |
| .03.00 | | Combustion Chambers |
| .06.00.00 | 2 | Air Inlet Systems |
| .07.00.00 | | Exhaust Systems |
| .01.00 | 2 | Exhaust Manifolds |
| .02.00 | 5 | Exhaust System Dimensions[1] (see Example 5) |
| .03.00 | 2 | Heat Riser Valves |
| .08.00.00 | 2 | Catalyst |
| .09.00.00 | 2 | EGR Systems |
| .10.00.00 | 2 | Air Injection Systems |
| .01.00 | | Pump |
| .02.00 | | Valves |
| .11.00.00 | 2 | Evaporative Emission Control Systems |
| .01.00 | | Fuel Tanks |
| .02.00 | | Fuel Caps |
| .03.00 | | Storage Devices |
| .12.00.00 | 2 | Valves and Switches |
| .01.00 | | Spark Delay |
| .02.00 | | Temperature Control |
| .13.00.00 | | General Specifications |
| .01.00 | 5 | Frontal Areas (Sequence 3 for durability-data vehicles) |
| .02.00 | 5 | Test Horsepower (Sequence 3 for durability-data vehicles) |
| .03.00 | 5 | Model Identification Charts |
| .04.00 | 2 | Family Identification Charts |
| .14.00.00 | 2 | System Warning Devices |
| .15.00.00 | 6 | Mechanisms to Assure Use of Unleaded Fuel[2] |

[1]Provide labeled drawings for each exhaust system, indicating tubing diameters, mufflers, and catalyst location(s), if applicable, and other pertinent dimensions and components such as exhaust pressure or oxygen sensor(s).

[2]If a manufacturer wishes MSAPC's judgment that his vehicles using unleaded fuel satisfy the requirements of 40 CFR 80.24, he/she should submit the information indicated by this section (see Advisory Circulars Nos. 30A, 32B, and 32B-1).

| | | |
|---|---|---|
| .01.00 | | Unleaded Fuel Labels (indicate proposed wording, locations, color, and dimensions) |
| .02.00 | | Fuel Tank Filler Inlet (design) |
| .03.00 | | Immediate Fuel Shut-off |
| .01 | | Design |
| .02 | | Method of Operation |
| .16.00.00 | 5 | Adjustable Parameters[1] |
| .01.00 | | Parameter |
| .02.00 | | Adjustable Range |
| .03.00 | | Production Tolerance of Adjustable Range |
| .04.00 | | Nominal Setting |
| .05.00 | | Method of Inhibiting Adjustment |
| .06.00 | | Justification of Adequacy of Methods of Inhibiting Adjustment |
| .17.00.00 | | Other |
| 09.00.00.00 | | EVAPORATIVE EMISSION FAMILY DESCRIPTIONS (See Chapter 5 on preparing the application for the contents of this section) |
| 10.00.00.00 | | ENGINE FAMILY DESCRIPTIONS (See Chapter 5 on preparing the application for the contents of this section) |
| 11.00.00.00 | | STARTING AND SHIFTING SCHEDULES |
| .01.00.00 | 3 | Starting |
| .02.00.00 | 3 | Shifting |

[1]The parameters which are physically capable of being adjusted should be described. For the 1981 model year, these parameters are limited to (1) idle mixture on gasoline-fueled vehicles (carbureted or fuel injected), (2) the choke valve action parameter(s) on carbureted, gasoline-fueled vehicles, and (3) any parameter on any vehicle (diesel or gasoline-fueled) which is physically capable of being adjusted, may significantly affect emissions, and was not present on certified vehicles sold under the applicant's brand name during the previous model year. The description should include the parameter's adjustable range, the production tolerance for that range, the nominal setting, and an explanation of the method proposed to inhibit adjustments, together with a discussion of how this will prevent adjustments of the parameters on in-use vehicles. Sketches should be used as necessary in order to provide clarity for the narrative explanations. It should be noted that, while this information is designated as being sequence 5, the Administrator needs this information for the purpose of making his determination of which parameters will be subject to adjustment for certification testing (86.081-21(b)(1)(ii)(C)). Therefore, manufacturers are encouraged to submit this information as early in the certification process as possible to avoid any delays in receiving the Administrator's determination.

| | | |
|---|---|---|
| 12.00.00.00 | | TEST VEHICLE INFORMATION |
| .01.00.00 | | Vehicle Book[1] |
| .01.00 | 4 | Vehicle I.D. Sheet (Cover Letter) |
| .02.00 | 4 | Vehicle Information Data Sheet (see Appendix pages 17-18)[2] |
| .03.00 | 4 | Calibrations |
| .04.00 | 4 | List of Referenced Pages |
| .05.00 | 4 | Vehicle Test Data Log Sheet(s) (See Appendix page 15) |
| .06.00 | 4 | Vehicle Maintenance Log Sheet(s) (See Appendix page 16) |
| .07.00 | 6 | Manufacturer's Test Data Sheet[2] |
| .02.00.00 | | Reports and Calculations |
| .01.00 | | Engineering Reports (see Appendix page 19) |
| .02.00 | 6 | Exhaust Emission Deterioration Factors |
| .03.00 | 6 | Light-Duty Deterioration Factor Input Sheet[2] |
| 13.00.00.00 | | EVAPORATIVE EMISSION DETERIORATION PROGRAM |
| .01.00.00 | 4 | Description of Test Program |
| .02.00.00 | 5 | Procedures |
| .01.00 | | Vehicles |
| .02.00 | | Bench Test |
| .03.00 | | Deterioration Factor Calculation |
| .03.00.00 | 7 | Data |
| .01.00 | | Vehicle Descriptions |
| .02.00 | | Vehicle Logs |
| .03.00 | | Bench Test Logs |
| .04.00 | | Deterioration Factor Calculation Summary |
| 14.00.00.00 | 6 | FORECAST OF TEST VEHICLE AVAILABILITY |
| 15.00.00.00 | | REVISIONS |
| .01.00.00 | 6 | Revision Index or Log (see Appendix page 27) |
| .02.00.00 | 6 | Revisions Prior to Certification |
| .03.00.00 | | Revisions After Certification; Certification Change Request (see Appendix page 23) |
| 16.00.00.00 | 7 | REQUEST FOR CERTIFICATE |
| .01.00.00 | | Statement of Compliance |
| .02.00.00 | | Emission Data Summary (See Appendix page 21) |
| .03.00.00 | | Certificate Information |
| .04.00.00 | | Production Engine Parameters |
| .01.00 | | Parts List (see Appendix pages 22-22A) |
| .02.00 | | Production Tolerance |
| .05.00.00 | | Summary Sheet Input Form[2] |
| 17.00.00.00 | | (Reserved for California) |

[1]The assignment of Sequence Block No. 4 to vehicle book items 12.01.01-06 pertains only to vehicle books describing durability-data vehicles. Items 12.01.01-06 in books describing emission-data vehicles belong to Sequence Block No. 6.

[2]See Item 12, pages 2-6 and 2-7, and the forthcoming Data Forms Supplement.

Chapter 5

## Preparing the Application

The use of a format which is comprised of the several sections that are listed in Chapter 3 is recommended for the application. Use of this recommended format will greatly expedite the review process. Please ensure that all required data are submitted.

In the following pages, the sixteen sections of the application are discussed. Recommendations are presented for preparing each of the sections in a manner that will ensure that the needs of EPA are met.

### 01.00.00.00 Communications

Submit an organization and personnel chart showing chain of command and structure of company and/or divisional group with certification responsibilities (liaison with EPA, vehicle testing, mileage accumulation, etc.). If the parent company is located in a foreign country, please indicate the affiliation of the U.S. representative, e.g., home office, U.S. affiliated company, or U.S. sales organization.

Specify the name(s) and address(es) of the representative(s) to whom advisory circulars and other technical information should be sent (indicate the number of copies, if more than one is required). Please indicate if you regularly receive such information through some organization (e.g., Automobile Importers of America) so that unnecessary duplicate distribution can be avoided. Indicate whether information should be mailed or picked up by courier.

Specify the corporation name and address that should appear on the certificate(s) of conformity (maximum of four lines). Indicate the name and address of the person to whom the certificate(s) should be mailed.

Indicate the Telex and telecopier type and telephone numbers and list those persons who are authorized to communicate orally with EPA and give their telephone numbers.

### 02.00.00.00 Statement of Business Confidentiality

Under Class Determination 1-79, issued by the EPA General Counsel, certain types of information submitted in applications for certification of light-duty motor vehicles may be entitled to confidential treatment. Information of the types identified under Part II of the Class Determination may be entitled to confidential treatment until the date when the vehicle model in question is released into the public market. Information described under Part III of the Class Determination may be entitled to confidential treatment beyond the date on which the vehicle is introduced into commerce.

Claims of business confidentiality may be made for data submitted in the application for certification that fall under Parts II and III of the Class Determination. Such claims should identify, by specific sections or subsections, the information in the application for certification that is subject to the claim. Confidentiality claims and substantiating information are to be included with the data for which confidential status is requested at the time of submission to EPA. For information for which confidential treatment is desired, address the following questions:

1. Which information in your 1981 application for certification do you consider to be entitled to confidential treatment until model introduction, in accordance with Part II of the Class Determination?

2. Which information in your 1981 application for certification do you consider to be entitled to continuing confidential treatment after model introduction, in accordance with Part III of the Class Determination?

3. To what extent has the information been disclosed to others, and what precautions were taken with respect to these disclosures?

4. Is the information available to the public through legitimate means?

5. Can the information be derived from a detailed engineering inspection of the motor vehicle model in question or from information already public once the model is offered for public sale?

6. Would disclosure of the information be likely to result in substantial harm to your competitive position? If so, discuss in detail what the harmful effects would be, why the effects would be substantial, and the nature of the causal relationship between disclosure and the harmful effects.

Please supply complete answers to these questions for all information claimed to be confidential. The EPA General Counsel will make a final determination on the entitlement of claimed information to confidential treatment based in part on your response.

You may claim information submitted in substantiation of your confidentiality claim to be confidential in its own right. If the information pertains to the confidentiality claim, is not otherwise possessed by EPA, and is marked, when received by EPA, as "trade secret," "proprietary," or "company confidential," it will not be disclosed by EPA without your consent unless disclosure is ordered by a Federal court. If no claim accompanies this information when it is received by EPA, it may be made available to the public without further notice to you.

03.00.00.00 Fuels and Lubricants

Submit in this section the information which is necessary to show that the fuel which will be used for exhaust and evaporative emission testing and service accumulation will meet the regulatory requirements. The data should

be in the form of the range of specifications which will be provided to the fuel vendor rather than in the form of an analysis of a particular batch of fuel. Recommended forms for comparing these specifications with the specifications in the applicable regulations are presented on pages 2 through 5 of the Appendix.

This section should also contain the specification of the fuel recommended to the ultimate purchaser.

Also submit the specifications for lubricants as outlined on pages 6-8 of the Appendix.

04.00.00.00 Facility and Equipment

Submit detailed descriptions of the test equipment, including photographs, schematic drawings, and narrative explanations, with a statement concerning the equivalency of equipment prescribed in 40 CFR Part 86. This information shall be submitted for all facilities which are used in the certification program.

Description of the facility should include:

1. Name and address of the testing facility
2. Name and title of person in charge of the facility
3. Altitude of testing facility

Description of the test equipment should include:

1. Manufacturer
2. Model number or identification
3. Number of units used in the certification program
4. Pertinent specifications
5. Flow schematics (if applicable)
6. Calibration methods and intervals
7. Scheduled maintenance procedures and intervals

The items of test equipment to be described should include:

1. Constant volume sampler
2. Analysis bench

    a. Hydrocarbon analyzer
    b. Carbon monoxide analyzer
    c. Carbon dioxide analyzer
    d. Oxides of nitrogen analyzer

3. Chassis dynamometer
4. Driver's aid
5. Computer data processing system
6. Fuel conditioning equipment (including diurnal)

7. Location of cooling fan, fan capacity, and fan type
8. Evaporative emission test equipment
    a. Evaporative emission enclosure
    b. Enclosure temperature control
    c. Analysis equipment
    d. Location of mixing fan, fan capacity, and fan type
    e. Location of enclosure sample and temperature probes
9. Particulate sampling system including the heated particulate filter
10. Particulate filter weighing system
11. Filter conditioning system
12. Filters
13. Collection efficiency results from each batch of filters

Include a description of the areas in which vehicle soak, vehicle preconditioning, vehicle testing, and evaporative emission testing are performed. Describe the location, temperature controls, humidity controls, and barometric pressure controls (if so equipped).

Describe the practices and procedures followed relative to calibration gases used for certification testing. Detail the utilization and identification of calibration gases traceability of calibration gases to referenced standards, and the origin of the referenced standards. If not covered previously, specify the span gases used for each analyzer.

Please inform EPA if a procedures manual or operational instruction guide (in English) is available for EPA review. If no such manual exists, please specify.

If a chassis dynamometer is requested to be used for mileage accumulation, the manufacturer should furnish information describing the dynamometer and associated equipment and verifying that vehicle operation on the chassis dynamometer is representative of operation on the road (ref. Advisory Circular No. 35). Such information should include a discussion of:

1. The facility (sketches or photographs showing general layout and equipment)

    a. Dynamometer identification number
    b. Controlling unit (block diagram of control circuitry)
    c. Absorber and motor (if applicable)
        i. type (waterbrake, inductor, D.C. motor absorber, etc.)
        ii. specifications (maximum torque, horsepower, and speed)
        iii. speed limiting devices (if applicable)
    d. Inertia simulation
        i. type (mechanical, electrical, etc.)
        ii. capability or range
    e. Chassis rolls
        i. number
        ii. diameter
        iii. spacing (if applicable)
    f. Method used to cool vehicles
        i. air flow (constant, proportional to vehicle speed, etc.)
        ii. approximate flow rate (cfm or cfm/mph)

g. Use of any equipment used to simulate road vibrations or conditions
h. Variables monitored
   i. variables (engine speed, manifold vacuum, output power, etc.)
   ii. recording method (if applicable)
i. Safety equipment utilized (over-speed, over-temperature, excessive vibration, vehicle movement, engine malfunction, vehicle malfunction, etc.)

2. Comparison of road and dynamometer operation

a. Route comparison
   i. vehicle used for comparison
   ii. preconditioning and warm-up of demonstration vehicle
   iii. description of test route (i.e., general terrain)
   iv. description of driving schedule (i.e., simulation of laps 2, 10, and 11 of 40 CFR Part 86 Appendix IV)
b. Data comparison[1]
   i. underhood temperatures (measured at inlet to engine compartment)
   ii. engine inlet air temperatures (at clean side of air filter)
   iii. engine oil temperatures (in sump, at drain plug, or at dipstick)
   iv. engine coolant temperatures (inlet and outlet of engine)
   v. under-chassis temperatures (longitudinal centerline of vehicle in front, center, and back)
   vi. catalyst temperatures, if applicable (skin at inlet and outlet)
   vii. exhaust manifold(s) temperature (skin at flange connection - two required for dual exhaust)
   viii. manifold vacuum
   ix. vehicle speed
   x. engine speed

[1]Continuous data plots or recordings should be made utilizing the same demonstration vehicle and the same instrumentation. The vehicle should be operated both on the road and on the dynamometer while recording the suggested data. Comparison of data would be facilitated if like data are plotted on the same graph and on the same axis for both road and dynamometer data. If the data are not on the same graph, submission on transparencies will facilitate review. Requests for approval of mileage accumulation dynamometers should be accompanied by a list of all vehicles proposed to be run on the mileage accumulation dynamometers. If approval of dynamometers has been granted in previous years, provide a list of those vehicle-engine family combinations approved for prior certification programs. Include in the list the temperature ranges, dynamometer specifications, and other pertinent data necessary to evaluate and approve a mileage accumulation dynamometer. Submission of these historical data will expedite the review process.

05.00.00.00 Test Procedures

Describe the practices and procedures followed relative to exhaust and evaporative emission testing and horsepower determination.

Include a description of the mileage accumulation route including maps, mileages, and driving schedule (i.e., stops, accelerations, cruises, decelerations, and percent of mileage at various speeds). If test vehicles are driven to the manufacturer's test facility or the EPA laboratory in Ann Arbor, mileage accumulated during such delivery is subject to the same limitations and requirements as normal mileage accumulation schedules. Therefore, the respective routes which are proposed to be followed must be specified in this section of the application, along with the approximate average and maximum speeds. Data must be submitted to substantiate that the proposed driving schedule and any other mileage accumulation is equivalent to the Durability Driving Schedule given in Appendix IV of 40 CFR Part 86 (also see MSAPC Advisory Circular No. 37)(see page 26 of the Appendix for a sample format).

Include a description of any method which may be employed to permanently record or verify the mileage accumulated on test vehicles. Describe the procedure(s) used for determining dynamometer power absorber setting(s) (both frontal area and alternative procedures) (ref. 40 CFR 86.129-80 and Advisory Circular No. 55B).

06.00.00.00 Maintenance and Warranty

Include in this section the information necessary to satisfy the requirements of 40 CFR 86.081-21. The information required includes the following:

1. A statement of the recommended maintenance and procedures that are necessary to assure that the vehicles to be covered by the certificate of conformity will conform to the regulations when in use.

2. A description of the program for training personnel to do the required maintenance.

3. A description of any special tools or equipment required for performing the maintenance. The information should include the data shown in the suggested table on page 9 in the Appendix.

Also include in this section the information which is required to satisfy the requirements of 40 CFR 86.079-25, e.g., the scheduled maintenance which is proposed to be performed on all test vehicles. Mere reference to the items of maintenance permitted in the regulations is not adequate. Give specific maintenance operations, respective mileages, and specifications, indicating which specifications (including any tolerances) will appear on the label. If the maintenance is the same as in any previous year(s), include references to the previous year(s) service manual(s). Such reference will allow EPA to judge whether the regulatory requirements will be met in regard to the maintenance being conducted in a manner which is consistent

with the service instructions and specifications which are provided by the manufacturer for use by the customer service personnel. A request must be submitted and approved in advance for any scheduled test vehicle maintenance which is not specifically permitted by the regulations. Such a request will be evaluated in terms of whether the proposed maintenance is reasonable and necessary and is likely to be performed on in-use vehicles.

If a warning device (e.g., light, buzzer) is proposed to be used as a basis for performing maintenance on items such as catalysts or EGR systems, describe the operation of the warning system as it will relate to maintenance and include in Section 08.14.00.00 applicable photographs or drawings.

This section should also include a trouble-shooting procedure for diagnosing performance problems. If desired, a reference may be made to such a procedure in a service manual which has been supplied to EPA. The submission of the trouble-shooting procedure is not specifically required in the regulations but the inclusion of the procedure will ensure that in the event unscheduled maintenance becomes necessary on a test vehicle, the maintenance will not have to be delayed until the necessary diagnostic information can be forwarded to EPA.

If poor driveability is proposed to be one of the criteria for performing unscheduled maintenance, specify the procedure which will be used for evaluating driveability. Include a trouble-shooting procedure for diagnosing driveability problems. This trouble-shooting procedure may be part of the service manual.

Submit a proposed list (blanket approval list) of those maintenance items, repairs, replacements, and/or lubrications which are proposed to be performed on durability-data vehicles without prior notice to EPA. Also submit a separate list of those maintenance items which are proposed to be performed on both durability-data and emission-data vehicles. These lists should include only exceptions or additions to the list of approved items contained in Advisory Circular No. 4A-1 to eliminate duplication.

In accordance with 40 CFR 86.079-38, copies of maintenance and use instructions which will be provided to all ultimate purchasers of vehicles shall be furnished to EPA no later than the time the Request for Certificate is submitted. If this information has not been submitted prior to submission of the Request for Certificate, please include it with the Request for Certificate. Cost information relating to these various maintenance functions should also be included (ref. Advisory Circular No. 15-A).

If any scheduled maintenance to certification vehicles proposed in this section differs from the maintenance instructions which will be given to the ultimate purchaser, these differences and the reason for the differences should be clearly identified and explained.

Section 86.078-7(b) of 40 CFR Part 86 requires that the vehicle manufacturer submit to EPA, at the time of issuance, all explanations regarding the use, repair, adjustment, maintenance, or testing of a vehicle relevant to the

control of crankcase, exhaust, or evaporative emissions issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers. If this requirement can be met by forwarding to EPA shop maintenance manuals, technical service bulletins, and vehicle owner's manuals, two copies of relevant documents will be required as soon as they are available.

Submit two copies of the emission system warranty to be provided to the ultimate purchaser.

When two copies of these items are required, one should be sent to the Certification Division in Ann Arbor, the other to the Mobile Source Enforcement Division in Washington, D.C. (see addresses given in Chapter 1).

07.00.00.00 Label Format

Submit one copy (either the actual label, a photograph, or a drawing) of each label to be used to comply with 40 CFR 86.079-35. Also include a photograph or a written description indicating the location of the label on the vehicle for each model certified.

Prior approval by EPA of the proposed engine label is not a requirement for issuance of certificates of conformity. If so requested, the Certification Division will review the label to determine if the requirements of 40 CFR 86.079-35 are met. If such an evaluation of the label is desired, a statement to this effect should be included in the letter of transmittal which accompanies the application.

08.00.00.00 General Technical Description

In this section, provide general technical descriptions regarding construction and operation of various engine parts such as carburetors, intake manifolds, and components which comprise the ignition, air inlet, cooling, and emission control systems, etc. Sketches and cross-section views should be provided as required to adequately present the necessary information.

This section should be a reference book for Sections 9.00.00.00 and 10.00.00.00. Anytime an explanation greater than a few words or a line is required in these sections, a narrative explanation should be contained in Section 08.00.00.00. Likewise, anytime the configuration of a component is requested, the drawing or schematic should be found here.

Information such as Catalyst features (Sec. 10.07.05.00), which does not differ within or among engine families, will appropriately be listed in Section 08.08.00.00 and then referenced for each family to eliminate duplication.

In order to illustrate the degree of detail needed, a number of examples are being included in the Appendix. These examples are representative of the type of sketch which should be submitted by a manufacturer.

The sketches may not, by themselves, fully explain any particular item, and the manufacturer is expected to include all pertinent narrative information necessary to amplify and explain the sketches.

Some descriptions which commonly include a sketch have not been covered by an example. The examples are only intended for general guidance, and should not be considered as all encompassing and literal requirements.

09.00.00.00 Evaporative Emission Family Descriptions

The information in this section determines how the applicant's product line is subdivided into separate evaporative emission families and provides the data which are used by EPA to select evaporative emission test vehicles. (The sample Engine Family Description form on page 10 of the Appendix provides a suitable format for this information.)

| Section Number | Sequence Number | Title |
|---|---|---|
| 09.01.00.00 | 2 | Common family parameters |
| .01.00 | 2 | Vapor storage device (e.g., canister, crankcase, air cleaner) |
| .02.00 | | Device description |
| .01 | 2 | Number of canisters |
| .02 | 2 | Design working capacity (grams absorption) |
| .03 | 2 | Housing material |
| .04 | 2 | Configuration (see Example 22) |
| .05 | 2 | Number of air cleaner storage areas |
| .06 | 2 | Design working capacity (grams absorption) |
| .07 | 2 | Housing material |
| .08 | 2 | Configuration |
| .03.00 | | Carburetor |
| .01 | 2 | Number of carburetors |
| .02 | 2 | Number of venturis per carburetor |
| .03 | 2 | Fuel reservoir system (float system) configuration (see Example 7) |
| .04 | 2 | Fuel reservoir system location relative to carburetor |
| .05 | 2 | Fuel reservoir volume |
| .06 | 2 | Vent system configuration (see Examples 7-11) |
| .07 | 2 | Accelator pump configuration |
| .04.00 | | Fuel Injection |
| .01 | 2 | Basic type (mechanical, electronic, timed, continuous) |
| .02 | 2 | Point of injection (e.g., manifold, cylinder, or throttle body) |
| .05.00 | | Fuel tank |
| .01 | 2 | Material |
| .02 | 2 | Liner configuration |
| .03 | 2 | Vapor control (baffles, configuration) |

[1]If the parameter is capable of adjustment, indicate "adjustable" at the appropriate format entry. If the parameter is adjustable and is either (1) the idle mixture on gasoline-fueled vehicles (carbureted or fuel injected), (2) the choke valve action parameter(s) on carbureted, gasoline-fueled engines, or (3) any parameter on any vehicle (Diesel or gasoline-fueled) which is physically capable of being adjusted, may significantly affect emissions, and was not present on certified vehicles sold under the applicant's brand name during the previous model year, provide the information requested in 08.16.00.00.

| | | |
|---|---|---|
| .02.00.00 | | Individual configuration parameters (fuel system) |
| .01.00 | | General fuel system |
| .01 | 2 | Configuration (see Example 21) |
| .02 | 5 | Fuel pump (electrical or mechanical) |
| .02.00 | | Fuel tank |
| .01 | 2 | Fuel tank configuration (including filler inlet, bladder or liner, baffles, fuel gauge sending unit, fuel pick-up, and vents) |
| 09.02.02.02 | 5 | Nominal tank capacity |
| .03 | 5 | Tank fuel volume (see Example 20) |
| .04 | 5 | Vapor volume at tank fuel volume |
| .05 | 5 | Pressure and vacuum relief settings and locations |
| .06 | 2 | Fuel filler cap configuration (including seal and retention mechanisms) (see Examples 23 and 24) |
| .07 | 2 | Fuel tank composition |
| .03.00 | | Carburetor |
| .01 | 5 | Carburetor spacer (heat shield) configuration and material (see Example 13) |
| .02 | 5 | Carburetor preheat or warm-up system configuration |
| .03 | 2 | Fuel reservoir vent system method of operation |
| .04 | 5 | Fuel reservoir vent system calibration |
| .05 | 5 | Carburetor purge port location (if applicable), calibration, and method of operation (e.g., purges at throttle angles of greater than $3^{o}$ through a 0.055" orifice) |
| .04.00 | | Fuel injection |
| .01 | 5 | Fuel injection purge port location (if applicable), calibration, and method of operation |
| .03.00.00 | | Individual configuration parameters (evaporative emission control systems) |
| .01.00 | 2 | Overall system configuration (see Examples 20 and 21) and method of operation |
| .02.00 | | Fuel tank vapor control system (fuel tank to storage device) |
| .01 | 2 | Configuration and method of operation including liquid-vapor separator, if applicable (include location of maximum restriction in vapor control system) |
| .02 | 2 | Parameters sensed and parameters controlled |
| .03 | 5 | Calibrations |
| .03.00 | | Carburetor vapor control system |
| .01 | 2 | Configuration and method of operation (include location of maximum restriction in vapor control system) |
| .02 | 2 | Parameters sensed and parameters controlled |
| .03 | 5 | Calibrations |
| .04.00 | | Storage device |
| .01 | 2 | Configuration (see Example 22) and method of operation |
| .02 | 2 | Storage medium composition |
| .03 | 2 | Storage medium quantity |
| .04 | 2 | Parameters sensed and parameters controlled |
| .05 | 5 | Calibration |
| .05.00 | | Purge System |
| .01 | 2 | Configuration and method of operation (include location of maximum restriction in purge lines) |
| .02 | 2 | Parameters sensed and parameters controlled |
| .03 | 5 | Calibrations |

| | | |
|---|---|---|
| 09.03.06.00 | | Auxiliary Emission Control Devices - Evaporative Emissions |
| .01 | 2 | Device configuration (see Example 34) |
| .02 | 2 | System configuration and method of operation |
| .03 | 2 | Parameters sensed and parameters controlled |
| .04 | 5 | Calibration (including hysteresis) |
| .05 | 2 | Justification |
| .07.00 | | Environmental Control Mechanisms (underhood fans) |
| .01 | 2 | Configuration and method of operation |
| .02 | 2 | Parameters sensed and parameters controlled |
| .03 | 5 | Calibrations |
| .04.00.00 | 5 | Evaporative emission family sales (see page 11 of the Appendix) |

10.00.00.00 Engine Family Descriptions - Four-Stroke Cycle Reciprocating Engines

The information submitted in this section determines how the applicant's product line is subdivided into separate engine families and provides the data which are used by EPA to select test vehicles (see page 10 of the Appendix for a sample form).

There is a great deal of redundant information submitted when a manufacturer chooses to run alternate engine families which differ by one or more engine family determinants with all other information (e.g., calibrations, sales, etc.) identical. The submission of much of this information may be eliminated by referencing the prime engine family. For example, if a manufacturer wishes to certify prime engine family A and also runs alternative engine families A-1, A-2, and A-3, each of which differ by one or more engine family determinants, the manufacturer may submit all the required information for engine family A and then submit a single page for engine families A-1, A-2, and A-3, stating that they are identical to engine family A except for the listed differences.

This concept can be enlarged to where certain sections of an engine family description may be different and benefit from the use of referencing. Discretion will have to be used, however, to insure that this procedure is used in cases where there are few enough differences to make it an effective tool. (This concept can also be used with evaporative emission families.)

| | | |
|---|---|---|
| .01.00.00 | | Common family parameters[1] |
| .01.00 | 2 | Deck height (inches) (Dimension "A")[2] |
| .02.00 | 2 | Centerline of crankshaft to centerline of camshaft (inches) (Dimension "B")[2] |
| .03.00 | 2 | Bore center-to-center (inches) (Dimension "C")[2] |

[1] If the parameter is capable of adjustment, indicate "adjustable" at the appropriate format entry. If the parameter if adjustable and is either (1) the idle mixture on gasoline-fueled vehicles (carbureted or fuel injected), (2) the choke valve action parameter(s) on carbureted, gasoline-fueled engines, or (3) any parameter on any vehicle (Diesel or gasoline-fueled) which is physically capable of being adjusted, may significantly affect emissions, and was not present on certified vehicles sold under the applicant's brand name during the previous model year, provide the information requested in 08.16.00.00.

[2] See page 24 in the Appendix for sketch showing dimensions "A," "B," and "C."

| | | |
|---|---|---|
| .04.00 | | Valve head diameters (inches) |
| .01 | 2 | Intake |
| .02 | 2 | Exhaust |
| 05.00 | 2 | Valve location |
| .06.00 | | Block configuration |
| .01 | 2 | Type of cooling (air, water) |
| .02 | 2 | Cylinder arrangement (L-6, 90° V-8, etc.) |
| 10.01.07.00 | 2 | Combustion cycle (Otto cycle, Diesel cycle, etc.) |
| .08.00 | 2 | Method of aspiration (natural, supercharged, etc.) |
| .02.00.00 | | Individual engine parameters (physical) |
| .01.00 | 2 | Displacement (expressed in cubic inches) |
| .02.00 | 2 | Bore and stroke (expressed in inches) |
| .03.00 | 2 | Number of cylinders |
| .04.00 | | Compression ratio |
| .01 | 5 | Nominal |
| .02 | 5 | Maximum |
| .03 | 5 | Minimum |
| .05.00 | 2 | Surface/Volume ratio (surface area expressed in square inches divided by volume expressed in cubic inches) |
| .06.00 | 2 | Cylinder head configuration (specify OHV, OHV/OHC, etc.) |
| .07.00 | 2 | Combustion chamber design (see Example 2) |
| .08.00 | 2 | Intake port configuration and area (expressed in square inches) at cylinder head and manifold mating surface (see Example 1) |
| .09.00 | 2 | Exhaust port configuration and area (expressed in square inches) at cylinder head and manifold mating surface (see Example 1) |
| .10.00 | 2 | Precombustion chamber design (if applicable) |
| .11.00 | | Intake valve |
| .01 | 2 | Configuration (see Example 2) |
| .02 | 2 | Material and surface treatment |
| .03 | 2 | List any special seat preparation (induction hardening, lapped, etc., and interference angle) |
| .04 | 2 | Seat angle (in cylinder head) |
| .05 | 2 | Rotator configuration (see Example 2) |
| .06 | 2 | Configuration (see Example 2) and composition of stem seal |
| .12.00 | | Exhaust valve |
| .01 | 2 | Configuration (see Example 2) |
| .02 | 2 | Material and surface treatment (include any special cooling methods e.g., sodium filled) |
| .03 | 2 | List any special seat preparation (induction hardening, lapped, etc., and interference angle) |
| .04 | 2 | Seat angle (in cylinder head) |
| .05 | 2 | Rotator configuration (see Example 2) |
| .06 | 2 | Configuration (see Example 2) and composition of stem seal |
| .13.00 | | Exhaust port liners |
| .01 | 2 | Configuration of port and port liner |
| .02 | 2 | Composition of liner |
| .03 | 2 | Insulating material and configuration |
| .14.00 | | Intake manifold |
| .01 | 2 | Configuration (including heated passages and EGR passages, if applicable) (see Example 3) |
| .02 | 2 | Material |
| .03 | 2 | Electrically heated areas and material (if different from intake manifold material) |

| | | |
|---|---|---|
| 10.02.15.00 | 2 | Exhaust manifold configuration (see Ex. 4) (including heat stoves, shields, and choke heat pickup, and internal exhaust manifold baffling, if applicable) (see Ex. 16) |
| .16.00 | 5 | Exhaust manifold material |
| .17.00 | 3 | Advertised or rated HP @ RPM[1] (include fuel rate if Diesel |
| .18.00 | 3 | Advertised or rated torque @ RPM[1] (include fuel rate if Diesel) |
| .19.00 | 2 | Exhaust system (dual or single) |
| .20.00 | 2 | General location of catalyst (e.g., in exhaust manifold, forward underfloor area, etc.) |
| .21.00 | 2 | Piston and piston ring configuration |
| .22.00 | 2 | Piston ring material |
| .23.00 | 5 | Cooling system configuration (see Example 6) |
| .24.00 | 5 | Thermostat calibration |
| .25.00 | | Electronic control devices - for each electronic control system specify the following |
| .01 | 2 | Parameters controlled (such as spark, ignition timing, air/fuel ratio, etc. and calibrations) |
| .02 | 2 | Parameters sensed (such as engine speed, manifold vacuum, engine coolant temperature, etc.) |
| .03 | 2 | General strategy of relationships between sensed and controlled parameters |
| .04 | 5 | Complete relationship between sensed and controlled parameters, i.e., give graphs and/or decision matrices to describe relationships between sensed and controlled parameters |
| .05 | 2 | Type of system (analog, digital, or hybrid) |
| .06 | 2 | List those of the following the system contains (timer, microprocessor, sequential logic) |
| .07 | 2 | Type(s) of memory used (read-only memory, random access memory, programmed logic arrays, or other memory devices - list more than one if applicable) - specify if no memory is used |
| .08 | 5 | Size of memory storage (e.g., 3012 12-bit words) |
| .09 | 2 | Functional logic flow charts of system operation (see Appendix page 20) |
| .10 | 5 | Manufacturer |
| .11 | 2 | For detonation sensors, define location and orientation.[2] |
| .03.00.00 | | Individual engine parameters (fuel system) |
| .01.00 | | General fuel system |
| .01 | 5 | Fuel pump delivery pressure (specify whether electrical or mechanical pump) (carburetor only) |
| .02 | 5 | Engine idle speed |
| .03 | 4 | Idle speed setting procedure (ref. 06.01.01.02) |
| .04 | 5 | Engine idle mixture |
| .05 | 4 | Idle mixture setting procedure (ref. 06.01.01.02) |

[1]Indicate whether net or gross, and specify method of measurement, e.g., 128 BHP @ 4000 RPM, SAE net.

[2]For example, orientation of sensors on carbureted engines may be defined relative to the X and Z planes determined by the base flange of the carburetor and to the Y plane determined by the crankshaft centerline and camshaft centerline. If the operation or sensitivity of the sensor could be affected by rotation within its fixture or mount (assuming that the position of the fixture in the XYZ space remains constant), identify the correct design configuration or alignment of sensor and mount.

| | | |
|---|---|---|
| 10.03.02.00 | | Carburetor |
| .01 | 2 | Manufacturer |
| .02 | 2 | Number of carburetors |
| .03 | 2 | Configuration (see Examples 7-12) and method of operation |
| .04 | 2 | Number of venturis per carburetor |
| .05 | 5 | Venturi diameter (nominal) |
| .06 | 2 | Fuel metering system configuration - type (e.g., fixed orifice, tapered rod, etc.) |
| .07 | 5 | Fuel metering system - calibration (e.g., 0.065-inch diameter main metering jet) (see Example 9) |
| .08 | 5 | Transient enrichment system (e.g., power valve, accelerator pump, etc.) - configuration (see Examples 10 and 11) and calibration |
| .09 | 5 | Idle stop configuration |
| .10 | 5 | Starting and warm-up enrichment system configuration[1] (see Example 12) |
| .11 | 5 | Altitude compensation system configuration and calibration |
| .12 | 5 | Hot idle compensation system configuration and calibration |
| .13 | 5 | Air-fuel flow calibration[2] |
| .03.00 | | Fuel injection |
| .01 | 2 | Manufacturer |
| .02 | 2 | System configuration and method of operation (include all controlled and sensed parameters and show the general relationship between them) |
| .03 | 5 | Calibrations including the design or nominal duration (expressed in crankshaft degrees) that Diesel fuel is injected into the combustion chamber at rated speed and load. |
| .04 | 2 | Basic type (mechanical, electronic, timed, continuous) |
| .05 | 2 | Point of injection (e.g., manifold, cylinder, or throttle body) |
| .06 | 5 | Fuel shutoff system configuration and calibration |
| .07 | 5 | Starting and warm-up enrichment system configuration[1] |
| .08 | 5 | Air-fuel flow calibration[3] |
| .09 | 5 | Altitude compensation system configuration and calibration, if applicable |
| .10 | 5 | Transient enrichment system - configuration and calibration |
| .11 | 5 | Injector configuration |
| .12 | 5 | Operating pressures |
| .13 | 5 | Injector timing calibration |
| .04.00 | | Air inlet system |
| .01 | 2 | Air cleaner configuration (see Example 15) |
| .02 | 5 | Air inlet temperature control system configuration (see Examples 14-16) and calibration |

[1]Describe method of operation, location of sensing unit (if automatic), code or number to indicate choke setting (if applicable), and calibration.
[2]Include a copy of every flow curve referenced, and if different test procedures are used for flowing different carburetors in the same engine family, include a description of each procedure used.
[3]Include a copy of every flow curve referenced.

| | | |
|---|---|---|
| 10.03.04.03 | 5 | Air filter material (e.g., paper, foam, charcoal, etc.) |
| .04.00.00 | | Individual engine parameters (ignition and camshaft) |
| .01.00 | | Ignition system |
| .01 | 2 | System configuration (see Example 17) and method of operation |
| .02 | 2 | Distributor manufacturer |
| .03 | 5 | Control parameters and calibrations[1] (include all controlled and sensed parameters and show the relationship between them) |
| .04 | 5 | Initial timing setting (degrees BTDC or ATDC @ RPM) |
| .05 | 4 | Timing adjustment procedure |
| .06 | 2 | Spark plug electrode composition and design |
| .07 | 2 | Spark plug gap |
| .08 | 5 | Spark plug vendor and identification number (e.g., RJ10Y, R43S, etc.) |
| .09 | 5 | Alternate spark plugs |
| .10 | 5 | Altitude compensation system configuration and calibration, if applicable |
| .11 | 2 | Secondary ignition wire material |
| .12 | 5 | Dwell setting, if applicable |
| .13 | 4 | Dwell adjustment procedure, if applicable |
| .14 | 2 | Glow plug configuration |
| .15 | 2 | Glow plug material |
| .16 | 5 | Glow plug heating output |
| .17 | 5 | Glow plug control parameters |
| .18 | 5 | Restrike capability description, if applicable |
| .02.00 | | Camshaft timing (crank degrees before or after TDC or BDC) |
| .01 | 2 | Intake valve opens |
| .02 | 2 | Intake valve closes |
| .03 | 2 | Intake valve duration |
| .04 | 2 | Intake valve maximum lift |
| .05 | 2 | Exhaust valve opens |
| .06 | 2 | Exhaust valve closes |
| .07 | 2 | Exhaust valve duration |
| .08 | 2 | Exhaust valve maximum lift |
| .09 | 2 | Valve overlap (degree or degree-inches) |
| .10 | 2 | Rocker arm ratio |
| .11 | 2 | Valve lifter (or actuator) type (hydraulic or mechanical) |
| .12 | 5 | Valve lash dimension |
| .13 | 2 | If variable valve timing or geometry is used, describe the system for varying valve operation and the valve operation as a function of engine speed and load |
| .05.00.00 | | Individual engine parameters (general)) |
| .01.00 | | Governor |
| .01 | 2 | Governor type (limiting, variable speed, etc.) |

[1]Include a copy of every advance curve (e.g., centrifugal, vacuum, etc.) referenced.

| | | |
|---|---|---|
| 10.05.01.02 | 2 | Signal (electronic, mechanical, flow, etc.) |
| .03 | 5 | Governed speed, RPM (with engine loaded) |
| .04 | 2 | Manufacturer |
| .05 | 2 | Configuration |
| .06 | 5 | Calibration (if applicable) |
| .02.00 | | Supercharger/Turbocharger |
| .01 | 5 | Manufacturer |
| .02 | 2 | Type (centrifugal, Roots, etc.) |
| .03 | 2 | Drive (mechanical, exhaust turbine, etc.) |
| .04 | 2 | Aneroid setting |
| .05 | 2 | Maximum manifold pressure |
| .06 | 5 | Wastegate control calibration (include parameters involved in determining wastegate valve opening and closing) |
| .07 | 2 | Configuration |
| .08 | 5 | Calibration (if applicable)[1] |
| .06.00.00 | | Individual engine parameters (emission control) |
| .01.00 | | Crankcase emission control system |
| .01 | 5 | System configuration (see Example 18) and method of operation |
| .02 | 5 | Control parameters and calibrations |
| .03 | 5 | Control valve configuration (see Example 19) and calibration |
| .02.00 | | Exhaust emission control system |
| .01 | 2 | Indicate usage of the following control systems: engine modification, mechanical fuel injection, electronic fuel injection, air injection, exhaust gas recirculation, thermal reactor, catalyst (specify type [e.g., oxidation, reduction, 3-way] and number used on each vehicle), other |
| 02 | 5 | System configuration (see Examples 35 and 36) |
| .03.00 | | Auxiliary emission control devices - Exhaust emissions |
| .01 | 2 | Device configuration (see Example 34) |
| .02 | 2 | System configuration (see Example 33) and method of operation |
| .03 | 2 | Sensed parameter(s) |
| .04 | 2 | Controlled parameter(s) |
| .05 | 2 | Calibration (including hysteresis)[2] |
| .06 | 2 | Justification[3] |
| .04.00 | | Emission control related warning system |
| .01 | 2 | System configuration |

[1] Submit a graph or performance "map" to describe operational characteristics.
[2] If the calibration consists of a curve instead of just one or two points, include a copy of each curve referenced. Show the complete relationship between the sensed and controlled parameters.
[3] Such as operation of device substantially included in FTP, vehicle safety, or engine starting (in accordance with MSAPC Advisory Circular No. 24).

| | | |
|---|---|---|
| 10.06.04.02 | 2 | Method of operation |
| .03 | 2 | Parameters sensed and parameters controlled |
| .04 | 2 | Calibration |
| .05 | 2 | Component configuration |
| .06 | 2 | Interval of operation |
| .07 | 2 | Reset procedure |
| .07.00.00 | | Description of emission control systems (the description of each exhaust emission control system, as applicable, should include but not be limited to the following) |
| .01.00 | | Engine modification features[1] |
| .02.00 | | Air injection features |
| .01 | 2 | Component configurations (diverter valve, check valve, pressure relief valve) (see Examples 26 and 27) |
| .02 | 2 | General location of injected air (exhaust port, thermal reactor, catalyst, etc.) (see Examples 25 and 28) |
| .03 | 2 | Parameters sensed and parameters controlled |
| .04 | 5 | Calibrations |
| .05 | 2 | Specific features which affect flow characteristics (nozzle angle, tip design, etc.) (see Example 28) |
| .06 | 2 | Pulley drive ratio |
| .07 | 5 | Pump flow calibration |
| .08 | 2 | Air switching features including locations, timing, and purpose |
| .09 | 2 | General method of driving air pump (e.g., constant speed, proportional to engine speed, clutching) |
| .03.00 | | Exhaust gas recirculation features |
| .01 | 2 | Component configuration (EGR valve, amplifier, modulator, delay valve) (see Examples 29 and 30) |
| .02 | 2 | Location of exhaust pick-up (crossover upstream of muffler, downstream of muffler, etc.) |
| .03 | 2 | Location of exhaust gas introduction (above throttle blade, between carburetor and intake manifold, manifold port, etc.) |
| .04 | 2 | Special features for filtering or cooling EGR |
| .05 | 2 | Special features for distribution into the inlet charge |
| .06 | 2 | Specifications of any EGR cutoff conditions (discuss the need for these cutoff conditions) |
| .07 | 2 | Parameters sensed and parameters controlled |
| .08 | 5 | Calibration |
| .09 | 5 | EGR valve flow calibration |
| .04.00 | | Thermal reactor features |
| .01 | 2 | Material |
| .02 | 2 | Lining and/or insulation (reactor and/or vehicle) |
| .03 | 2 | Cooling (if any) |
| .04 | 2 | Volume (individually and collectively, if multiple) |
| .05 | 2 | Light off method (electric ignition, glow plug, self-inducement, etc.) |

[1]The definitions of exhaust emission control systems in Section G of Advisory Circular No. 20-B indicate "that 'engine modification' is a control system used by itself"; that is, engine modification precludes the use of major add-on emission control hardware and systems (air pump, catalysts, exhaust gas recirculation, etc.) and vice-versa.

| | | |
|---|---|---|
| 10.07.04.06 | 2 | Configuration (show internal baffling) |
| .05.00 | | Catalyst features[1] |
| .01 | 2 | Catalyst supplier and address (e.g., Englehard, UOP, AC, Matthey-Bishop, etc.) |
| .02 | 2 | General type of catalyst (e.g., oxidation, reduction, three-way, etc.) |
| .03 | 2 | Number of each type of catalyst used per vehicle[2] |
| .04 | 2 | Substrate (e.g., monolithic, pelleted) - give configuration construction technique (e.g., extruded, laid-up, formed, Dravo disk, etc.), composition, supplier and address, composition of active constituents in substrate (grams or troy ounces); for monolithic substrates, give number of cells per square inch of frontal area and design tolerances, nominal cell wall thickness (e.g., in mils); for pelleted substrates, give pellet shape and dimensions, pellet bulk density, specify the use of more than one type of pellet (e.g., Rh or Pt/Pd), specify any geometrical distribution of pellets, and, if this is controlled in production, specify the mean impregnation depth (e.g., in microns) of active materials and include production tolerances |
| .05 | 2 | Washcoat - give composition of active constituents, and total active material loading (grams or troy-oz) in washcoat |
| .06 | 2 | Active material - give composition of active constituents, loading of each active material including design tolerances, total active material loading including design tolerances (grams or troy-oz) |
| .07 | 2 | Container - configuration (see Examples 31 and 32), dimensions, volume, materials used, technique of containment and restraint, method of constructing container, canner (if different from catalyst supplier), and insulation and shielding (catalyst and/or vehicle) |
| .08 | 2 | Physical description - dimensions (e.g.,length, width, height,etc.), weight (lbs), volume including design tolerances, active surface area (BET), and total active surface area including design tolerances |
| .06.00 | | Other major exhaust emission control systems |
| .01 | 2 | Component configuration(s) (see Example 33) and method of operation |
| .02 | 2 | Parameters sensed and parameters controlled |
| .08.00.00 | 2 | Projected engine family sales (see Appendix page 12) |
| .09.00.00 | 2 | Optional equipment (see Appendix page 13) |
| .10.00.00 | | Vehicle description (see Appendix page 14) |
| .01.00 | 5 | Engine code |

[1]Any combination of the listed catalyst features (excluding suppliers' addresses) is defined as a unique catalyst configuration and should be identified by a "catalyst code." Some catalyst features determine unique exhaust emission control systems and/or engine families. See MSAPC Advisory Circular No. 20-B for additional information.

[2]Each individual monolith unit or "biscuit" is considered to be a separate catalyst.

| | | |
|---|---|---|
| 10.10.02.00 | 2 | Engine family |
| .03.00 | 2 | Exhaust emission control system |
| .04.00 | 2 | Evaporative emission family |
| .05.00 | 2 | Evaporative emission control system |
| .06.00 | 5 | Evaporative emission code |
| .07.00 | 2 | Catalyst code, if applicable |
| .08.00 | 2 | Vehicle model (defined as: car line/body style/drivetrain configuration) |
| .09.00 | 2 | Car line |
| .10.00 | 2 | Body style |
| .11.00 | 2 | Transmission code[1] |
| .01 | | Class (manual, automatic, or semi-automatic) |
| .02 | | Number of forward gears |
| .03 | | Overdrive (specify either "overdrive gear ratio," "separate overdrive unit," or "not applicable"; if a separate unit is used, describe under Special Features, 10.10.11.10) |
| .04 | | Drive gear ratios (including overdrive) |
| .05 | | General description (e.g., synchronized countershaft transmission; fluid coupling; three member, six element, single phase, three stage torque converter; etc. Please use terminology recommended by SAE Recommended Practices J641b and J645b in this and subsequent subsections.) |
| .06 | | Shift calibrations (automatic transmissions only) |
| .07 | | Torque converter size (automatic transmissions only) |
| .08 | | Torque converter stall torque ratio (automatic transmissions only) |
| .09 | | Torque converter stall speed (automatic transmissions only) |
| .10 | | Special features (e.g., lockup torque converter, split torque drive, dual range transmission, variable blade reactor, etc.; provide specifications and description of operation) |
| .11 | | Lockup calibration (converter lockup transmissions only) (e.g., speed or time or parameters sensed and/or controlled or equation determining lockup condition; indicate features inhibiting lockup condition where applicable) |
| .12 | | Lockup gears (converter lockup transmissions only) (specify for which gears and under what conditions the lockup feature is employed) |
| .13 | | Blade angle shift calibration |

[1]"Transmission code" is simply a designation (e.g., 1, A, etc.) used to identify and refer to each transmission configuration or subconfiguration within the engine family which may affect exhaust emissions or fuel economy. Since each combination of the characteristics listed in Section 10.10.11.01-13 determines a unique transmission code, vehicle descriptions which cover several codes should, for clarity and economy of presentation, include a separate page or pages which itemize the characteristics of each code. The vehicle description page(s) (see Appendix page 14) may then cite the actual codes.

| | | |
|---|---|---|
| 10.10.12.00 | 5 | Curb weight |
| .13.00 | 2 | Inertia weight class |
| .14.00 | 2 | Equivalent test weight |
| .15.00 | 5 | Gross vehicle weight (less than 6000, between 6000 and 8500, or greater than 8500 pounds)(applicable to light-duty trucks only) |
| .16.00 | 5 | Frontal area[1](in square feet) |
| .17.00 | | Axle ratio[2] |
| .01 | 2 | Standard |
| .02 | 5 | Maximum optional ratio |
| .03 | 5 | Minimum optional ratio |
| .18.00 | | Tires[2] |
| .01 | 2 | Standard size and type (e.g., HR78-15) |
| .02 | 5 | Maximum size[3] and type |
| .03 | 5 | Minimum size[3] and type |
| .19.00 | | N/V ratio[2] |
| .01 | 2 | Standard |
| .02 | 5 | Maximum |
| .03 | 5 | Minimum |
| .20.00 | 2 | Basic drivetrain layout |
| .21.00 | 5 | Dynamometer power absorber setting[4] |
| .22.00 | 5 | Frontal area horsepower |
| .23.00 | 5 | A/C factor added (yes or no) |
| .24.00 | 5 | Altitude (Indicate high, low, or all if optional procedures are to be followed) |
| .25.00 | | Projected sales |
| .01 | 5 | California standards |
| .02 | 5 | 49-state standards |
| .03 | 2 | Total |
| .10.40.00 | 7 | Vehicle description - without sales data |
| .11.00.00 | 5 | Proposed test fleets (optional) |

[1]All frontal area values should be calculated according to the procedures specified in 40 CFR 86.129-79. For incomplete trucks (Ref. 40 CFR 86.079-2), specify the maximum completed curb weight and maximum completed frontal area. This value may be reported in Section 08.13.01.00 at the manufacturer's option.

[2]If vehicles equipped with air conditioning have different standard or optional axle ratios, tire sizes, or N/V ratio, indicate accordingly. (N/V ratio is defined as the quotient of engine speed in rpm divided by vehicle speed in mph measured in the highest, i.e., lowest numerical, transmission gear.)

[3]Maximum and minimum sizes are determined by the circumference. However, the nominal size (e.g., HR78-15) should be reported.

[4]Indicate if alternative dynamometer power absorption determination procedure was used and reference EPA letter of approval.

10.30.00.00 Engine Family Description - Rotary Engines

| | | |
|---|---|---|
| .31.00.00 | | Common family parameters |
| .01.00 | 2 | Major axis (inches) (Dimension "A")[1] |
| .02.00 | 2 | Minor axis (inches (Dimension "B")[1] |
| .03.00 | 2 | Eccentricity (inches) (Dimension "E")[1] |
| .04.00 | 2 | Width of rotor housing (inches) (Dimension "H")[1] |
| .05.00 | 2 | Generating radius (inches) (Dimension "R")[1] |
| .06.00 | 2 | Intake port type (side, peripheral, combination, etc.) |
| .07.00 | 2 | Exhaust port type (side, peripheral, combination, etc.) |
| .08.00 | | Housing configuration |
| .01 | 2 | Type of cooling (air, water) |
| .02 | 2 | Arrangement (number of rotor housings) |
| .03 | 2 | Number of spark plugs per rotor |
| .09.00 | | Combustion cycle |
| .10.00 | | Method of aspiration (natural, supercharged, etc.) |
| .32.00.00 | | Individual engine parameters (physical) |
| .01.00 | 2 | Displacement (inches$^2$) (if different than total chamber capacity, indicate method of measurement) |
| .02.00 | 2 | Number of rotors |
| .03.00 | | Rotor construction |
| .03.01 | 2 | Material (including coating, if applicable) |
| .02 | 2 | Configuration |
| .04.00 | | Housing construction |
| .01 | 2 | Material (including coating, if applicable) |
| .02 | 2 | Configuration |
| .05.00 | | Sealing arrangement |
| .01 | 2 | Tip seal configuration |
| .02 | 2 | Tip seal material |
| .03 | 2 | Tip seal retention |
| .04 | 2 | Side seal configuration |
| .05 | 2 | Side seal material |
| .06 | 2 | Side seal retention |
| .07 | 2 | Number of seals per rotor |
| .06.00 | | Compression ratio |
| .01 | 5 | Nominal |
| .02 | 5 | Maximum |
| .03 | 5 | Minimum |
| .07.00 | 2 | Surface/volume ratio (surface area expressed in square inches divided by volume expressed in cubic inches) |
| .08.00 | 2 | Combustion chamber design including rotor face and housing, and location of spark plugs |
| .09.00 | 2 | Precombustion chamber design (if applicable) |
| .10.00 | 2 | Intake port area (expressed in square inches) at housing and manifold mating surface |

[1] See page 25 for sketch showing dimensions "A," "B," "E," "H," and "R."

[2] If vehicles equipped with air conditioning have different standard or optional axle ratios, tire sizes, or N/V ratio, indicate accordingly. (N/V ratio is defined as the quotient of engine speed in rpm divided by vehicle speed in mph measured in the highest, i.e., lowest numerical, transmission gear.)

| | | |
|---|---|---|
| 10.32.11.00 | 2 | Intake port design at sliding surface, including location and any special port preparation |
| .12.00 | 2 | Exhaust port area (expressed in square inches) at housing and manifold mating surface |
| .13.00 | 2 | Exhaust port design at sliding surface, including location and any special port preparation |
| .14.00 | 2 | Intake manifold configuration (including heated passages and EGR passages, if applicable)(see Example 3) |
| .15.00 | 2 | Intake manifold material |
| .16.00 | 2 | Exhaust manifold configuration (see Example 4) (including heat stoves, shield, and choke heat pickup, if applicable) (see Example 16) |
| .17.00 | 2 | Exhaust manifold material |
| .18.00 | 5 | Advertised or rated HP @ RPM[1] |
| .19.00 | 5 | Advertised or rated torque @ RPM[1] |
| .20.00 | 2 | Exhaust system (dual or single) |
| .21.00 | 2 | General location of catalyst (e.g., in exhaust manifold, forward underfloor area, etc.) |
| .22.00 | 5 | Cooling system configuration (see Example 6) |
| .23.00 | 5 | Thermostat calibration |
| .24.00 | 2 | Electronic control devices - (ref. 10.02.25.09) |
| .33.00.00 | | Individual engine parameters (ref. 10.03.00.00) |
| .34.00.00 | | Individual engine parameters (ignition system) |
| .01.00 | | Ignition system (ref. 10.04.01.00) |
| .02.00 | | Port timing (eccentric shaft degrees) |
| .01 | 2 | Intake port opens |
| .02 | 2 | Intake port closes |
| .03 | 2 | Intake port duration |
| .04 | 2 | Exhaust port opens |
| .05 | 2 | Exhaust port closes |
| .06 | 2 | Exhaust port duration |
| .07 | 2 | Port overlap |
| .35.00.00 | | Individual engine parameters (general) (ref. 10.05.00.00) |
| .36.00.00 | | Individual engine parameters (emission control) (ref. 10.06.00.00) |
| .37.00.00 | | Description of emission control systems (ref. 10.07.00.00) |
| .38.00.00 | | Projected engine family sales (ref. 10.08.00.00) |
| .39.00.00 | | Optional equipment (ref. 10.09.00.00) |
| .40.00.00 | | Vehicle description (ref. 10.10.00.00) |
| .40.40.00 | | Vehicle description - without sales data (ref. 10.10.40.00) |
| .41.00.00 | | Proposed test fleets (optional) (ref. 10.11.00.00) |

10.50.00.00 Engine Family Description - Two-Stroke Cycle Reciprocating Engines

This section is reserved. In the event that a manufacturer wishes to make application for certification of a two-stroke cycle reciprocating engine, a copy of this section will be furnished upon request.

[1]Indicate whether net or gross, and specify method of measurement, e.g., 128 BHP @ 4000 RPM, SAE net.

11.00.00.00 Starting and Shifting Schedules

Provide copies of starting and shifting instructions for each family. Whenever there are different shifting instructions within the family based upon model or transmission, include these separately. If variable shift speeds are to be used, submit a pre-marked driver's aid trace (or a copy) for each shift schedule.

12.00.00.00 Vehicle Books

Authorization to begin mileage accumulation will not be granted until a vehicle book containing all of the following items applicable to the particular vehicle is received:

1. Vehicle information data sheet (see Appendix, pages 17 and 18). (Copies of the latest version of this form will be available from your certification team.)

2. Carburetor (or fuel injection) flow curve (and engineering limits for emission-data vehicles).

3. Distributor advance curve (and engineering limits for emission-data vehicles).

4. Spark control system specifications (and engineering limits for emission-data vehicles).

5. PCV valve flow curve (and engineering limits for emission-data vehicles).

6. EGR valve performance curve (and engineering limits for emission-data vehicles).

7. Air injection pump performance curve (and engineering limits for emission-data vehicles).

8. Any other emission control device performance specifications or actual calibration values, if tested (and engineering limits for emission-data vehicles). Also, if any vehicle is equipped with a thermal or a catalytic reactor and the thermal or catalytic reactor is subject to any type of production performance test, then EPA would like to see the results of these tests.

9. Zero-mile data (use pages 15 and 16 of the Appendix).

10. In order to determine compliance with 40 CRF 86.079-26(a)(7), manufacturers shall provide the system miles (system miles = CF X [odometer miles - IC], where CF = odometer correction factor and IC = initial correction) and engine operation time (in minutes) at the initiation of the preconditioning trip on the dynamometer [see 40 CFR 86. 132-78(a)(2)].

If the odometer correction factor has not been determined at the time of submission of the zero-miles book, a value of 1.0 may be used provided there is a statement that the actual correction factor has not been determined. (The correction factor must be determined prior to the test at 4,000 miles for emission-data vehicles or 5,000 miles for durability-data vehicles.) Note that the requirement to report engine operation time applies only to the zero-mile test. The zero-mile system miles and engine operation time may be recorded as a special note on the Vehicle Test Data Log Sheet (page 15 of the Appendix).

11. Name of individual responsible for assuring that the test vehicle is in all material respects the same as described.

12. All emission control system components or assemblies for which specifications have been provided in the application for certification must, when installed on test vehicles, bear identification relating to the actual performance characteristics provided in the zero-mile book.

Engine descriptive information (Section 10.00.00.00) and schematics (Section 08.00.00.00) which are identical to the vehicle being described need not be submitted, but may merely be referenced except for those items which are specifically requested on the Vehicle Information Sheet.

All computer input forms needed to enter vehicle test data into EPA's data base (and the computer outputs generated by the processing of these forms) are considered part of the Vehicle Book.

13.00.00.00 Evaporative Emission Control Deterioration Program

Submit a complete description of the method used to calculate the evaporative emission deterioration factor. Describe in detail the procedures used and the data generated.

14.00.00.00 Forecast of Test Vehicle Availability

Submit projections of test vehicle availability weekly (or less frequently if there is no change in status) covering at least the next four weeks and, if possible, as much as the next twelve weeks. Longer term projections are requested to help in long-range planning of laboratory resource requirements (ref. Advisory Circular No. 54A).

15.00.00.00 Revisions

Provide a cumulative listing of all revisions to the application for certification (see Appendix page 27 for a sample form). The description should be as brief as possible while still giving a clear description of the change.

16.00.00.00 Request for Certificate

Provide a statement of compliance with 40 CFR 86.078-5(b)(1) and (2) (ref. Advisory Circular No. 46). Also include a statement of compliance with 40 CFR 86.079-23 (this may be submitted once and referenced in the case of multiple engine families).

For each engine family/evaporative emission family combination submit:

1. The official emission test results of each emission-data vehicle (submit using recommended form on page 21 of the Appendix).

2. The vehicle or model names as you wish them to be designated on the certificate of conformity.

3. The production part numbers for each item listed on page 22 of the Appendix. At the manufacturer's option, this information may be included in an earlier sequence of the application.

4. Any production tolerances and any specific point(s) at which production pieces are checked and/or adjusted. (For example, all carburetors are flow checked and air/fuel ratio adjusted at 2 and 6 pounds per minute air flow and checked at 4 and 30 pounds per minute air flow.) Also indicate the percentage of production pieces checked and/or adjusted. Describe sampling technique, i.e., how "production" tolerances are determined and how tolerance bands are used, for example, a 100 percent check with rejection of all pieces outside of bands, a 2 percent audit of production, or a batch sampling technique. An unqualified statement as provided in Chapter 2 - Parameters and Tolerances may be submitted in lieu of the production tolerances requested above.

5. A completed Summary Sheet Input Form. (Copies of this form will be available from the certification teams. Instructions for preparation and submission will be included in the forthcoming Data Forms Supplement described on page 2-7).

17.00.00.00 (Reserved for California)

At the request of the California Air Resources Board (CARB), EPA is reserving Section 17 of this format for material uniquely required by CARB.

# APPENDIX

# Revision Cover Letter

TO: Chief, Light-Duty Vehicle Certification Branch.....

FROM: .....

RE: 1981 LDV[1] Application for Certification: Engine Family[2]_____
(Family Name or Application Section Number)

This letter transmits the latest revision(s) described on the attached revision log.[3]

The purpose of this revision (these revisions) is _____
_____.[4]

[1]Enter either LDV (Light-Duty Vehicle); LDT (Light-Duty Truck); LDDV (Light-Duty Diesel Vehicle); or LDDT (Light-Duty Diesel Truck).

[2]Enter either Engine Family, Evaporative Emission Family, or Section Number.

[3]A sample revision log is shown on Appendix page 27.

[4]State succinctly the purpose of this revision: e.g., to avert a possible dieseling condition; to reflect a change in marketing strategy; etc.

Section 03.01.00.00 - Test Fuels (Spark Ignition Engines)

Include specifications of exhaust and evaporative emission test fuel for spark ignition engines.

| Item | Federal Specifications For Leaded Test Fuel | Federal Specifications For Unleaded Test Fuel | Specifications of Fuel to be Used |
|---|---|---|---|
| Octane, Research, minimum 1/ | 98 | 93 | |
| Sensitivity, minimum | 7.5 | 7.5 | |
| Pb. (organic), gm/U.S. gal. 1/ | 1.4 minimum | 0.00 - 0.05 | |
| Distillation range | | | |
| IBP, °F 2/ | 75-95 | 75-95 | |
| 10 percent point, °F | 120-135 | 120-135 | |
| 50 percent point, °F | 200-230 | 200-230 | |
| 90 percent point, °F | 300-325 | 300-325 | |
| EP, °F (max.) | 415 | 415 | |
| Sulfur, wt. percent, max. | 0.10 | 0.10 | |
| Phosphorus, gm/U.S. gal., maximum | 0.01 | 0.005 | |
| RVP, lb. 3/ | 8.7-9.2 | 8.7-9.2 | |
| Hydrocarbon composition | | | |
| Olefins, percent, max. | 10 | 10 | |
| Aromatics, percent, max. | 35 | 35 | |
| Saturates, percent | Remainder | Remainder | |

1/ Fuels having the octane and lead specifications shown will be used by EPA for exhaust and evaporative emission testing. The octane and lead specifications do not apply to fuel used by the manufacturer for emission testing (ref. 40 CFR 86.113-79(a)).

2/ For testing at altitudes above 1,219 meters (4,000 feet), the specified range is 75 - 105.

3/ For testing which is unrelated to fuel evaporative emission control, the specified range if 8.0-9.2, For testing at altitudes above 1,219 meters (4,000 feet), the specified range is 7.9 - 9.2.

Section 03.01.03.00 - Test Fuels - Diesel

| Item | Federal Specifications | Specifications of Fuel to be Used |
|---|---|---|
| Fuel Grade | Type 2-D | _____ |
| Cetane Number | 42-50 | _____ |
| Distillation range | | |
| IBP, $^{o}$F | 340-400 | _____ |
| 10 percent point, $^{o}$F | 400-460 | _____ |
| 50 percent point, $^{o}$F | 470-540 | _____ |
| 90 percent point, $^{o}$F | 550-610 | _____ |
| EP, $^{o}$F | 580-660 | _____ |
| Gravity, $^{o}$API | 33-37 | _____ |
| Total sulfur, percent | 0.2-0.5 | _____ |
| Hydrocarbon composition | | |
| Aromatics, percent | 27 (Min.) | _____ |
| Paraffins, Naphthenes, Olefins | Remainder | _____ |
| Flash point, $^{o}$F minimum | 130 | _____ |
| Viscosity, centistokes | 2.0-3.2 | _____ |

Section 03.02.00.00 - Mileage Accumulation Fuels (Spark Ignition Engines)

| Item | Federal Specifications For Leaded Fuel | Federal Specifications For Unleaded Fuel | Specifications of Fuel to be Used |
|---|---|---|---|
| Octane, Research (range) | ____ 1/ | ____ 1/ | ____ |
| Minimum Octane (Research) Recommended | ____ 1/ | ____ 1/ | |
| Sensitivity | 7.5 1/ | 7.5 1/ | ____ |
| Pb. (organic) gm/U.S. gal. 2/ | 1.4 Minimum | | |
| Phosphorus, gm/U.S. gal. 2/ | | | ____ |
| Sulfur wt. percent | | 0.025 minimum | ____ |
| Hydrocarbon composition | | | |
| Olefins, percent, max. | | | ____ |
| Aromatics, percent, max. | | | ____ |
| Saturates, percent | | | ____ |
| RVP, lb. (range) | ____ 3/ | ____ 3/ | ____ |
| Additives 4/ (Kinds and concentration) | | | ____ |

1/ In accordance with 40 CFR 86.113-79(a)(2), the fuel used shall have an octane rating no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

2/ EPA will not approve service accumulation fuel if the specifications for such fuel call for lead- or phosphorus-sterile fuel.

3/ The Reid Vapor Pressure (RVP) of the fuel used shall be characteristic of the motor fuel during the season in which the mileage accumulation takes place.

4/ If the types or quantities of additives used are not representative of fuel commercially available from retail outlets in the United States, furnish data to support the usage of such additives.

Section 03.02.03.00 - Mileage Accumulation Fuels - Diesel

| Item | Federal Specifications | Specifications of Fuel to be Used |
|---|---|---|
| Fuel grade | Type 2-D | Type 2-D |
| Cetane number | 38-58 | _____ |
| Distillation range | | |
| 90 percent point, $^{o}F$ | 430 - 630 | _____ |
| Gravity, $^{o}API$ | 30-42 | _____ |
| Total sulphur, percent | 0.2 (Min) | _____ |
| Flash point, $^{o}F$ minimum | 130 | _____ |
| Viscosity, centistokes | 1.5-4.5 | _____ |
| Additives 1/ (kinds and concentration) | | _____ |

1/ If the types or quantities of additives used are not representative of fuel commercially available from retail outlets in the United States, furnish data to support the usage of such additives.

Section 03.04.00.00 - Lubricants - Specifications

Include specifications of each lubricant.

| Item | Factory-Fill | Recommendation to the Ultimate Purchaser | To be Used in Test Vehicles |
|---|---|---|---|
| Engine Oil | | | |
| Generic Type | | | |
| Service Designation (SF,SE,CC, etc.) | | | |
| Viscosity (e.g., SAE 10W30) | | | |
| Friction Modifier (e.g., graphite, moly., etc.) | | | |
| Drive Axle and Differential Gear Oil | | | |
| Generic Type | | | |
| Service Designation (API, GL-5, etc.) | | | |
| Viscosity (e.g., SAE 75W90) | | | |
| Friction Modifier (e.g., graphite, moly., etc.) | | | |

Section 03.04.00.00 - Lubricants - Specifications (continued)

| Item | Factory-Fill | Recommendation to the Ultimate Purchaser | To be Used in Test Vehicles |
|---|---|---|---|
| Manual Transmission Oil | | | |
| Generic Type | | | |
| Service Designation (API, GL-3, etc.) | | | |
| Viscosity (e.g., SAE 75W90) | | | |
| Friction Modifier (e.g., graphite, moly., etc.) | | | |
| Automatic Transmission Fluid | | | |
| Generic Type | | | |
| Service Designation (e.g., ATF, type F, Dexron II) | | | |
| Viscosity (e.g., 8.0 cst at 99°C and 4000 cp max at -40°C) | | | |
| Friction Modifier (e.g., graphite, moly., etc.) | | | |

Section 03.04.00.00 - Lubricants - Specifications (continued)

Describe any other differences between proposed production vehicle lubricants and proposed emission and fuel economy test vehicle lubricants for:

a) Factory-fill lubricants (including break-in additives and special parts lubrication during vehicle build)

b) Recommended replacement lubricants

Section 06.03.00.00 - Special Tools

| Special tool or equipment | Use of Tool | Was this tool used in previous model years? | Justification for use of tool 1/ |
|---|---|---|---|
| | | | |

1/ Ref. 40 CFR 86.079-25(a)(12)

Section 10.00.00.00 Engine Family Description

Family Identification_____

| Information Required | | Engine[1] Code_____ | Engine Code_____ | Engine Code_____ |
|---|---|---|---|---|
| e.g. | | | | |
| 10.01.01.00 | Deck height | | | |
| 10.01.02.00 | Centerline of crankshaft to centerline of camshaft | | | |
| 10.01.03.00 | Bore center to center | | | |

[1]If optional procedures for high-altitude certification are to be followed, indicate whether engine code is intended for sale at high altitude, low altitude, or all.

Section 09.04.00.00 Evaporative Emission Family Sales[1]

Family Identification _____

| Evaporative Emission Control Systems | Projected Sales | % of Family |
|---|---|---|
| | | |
| Family Totals | _____ | _____ |

1/ Submit a separate sheet for each family, outlining all control systems available.

Section 10.08.00.00 Engine Family Sales[1/]

Job 1 date _____ Family Identification _____
Introduction date _____

Sales by CID

| Engine Displacement | Exhaust Emission Control System | Projected Sales Hi Alt. | Projected Sales 49 States | Projected Sales Cal. | % of Family Hi Alt. | % of Family 49 State | % of Family Cal. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Sales by Test Weight and Transmission Configuration

| Transmission Configuration | Test Weight Lbs. | Projected Sales | % of Family |
|---|---|---|---|
| | | | |

Sales by Test Weight

| Test Weight | Projected Sales | % of Family | Sales Weighted Average Test Weight |
|---|---|---|---|
| | | | |

Family Totals _____ _____

[1/] Submit a separate sheet for each family, outlining all displacement - control system combinations available.

Section 10.09.00.00 - Optional Equipment [1/]

Family Identification _____

Exhaust Emission Control System _____

A. List all standard or optional equipment or proturberances which are expected to be installed on more than 33 percent of a car line [2/], within the engine system combination, including in the total factory installed, dealer installed, distributor installed, etc., options.

| Car Line | Item | Frontal Area (if included in total frontal area in Section 10.10.16.00) | Road Load Horsepower (indicate if item affects this, yes or no) | Non-Availability [3/] |
|---|---|---|---|---|

B. List all other options (regardless of projected sales) or standard equipment not described elsewhere and availability (or non-availability) which may reasonably be expected to affect emissions or fuel economy (e.g., air conditioning, power steering, power brakes, low drag brakes). Items which may reasonably be expected to affect emissions solely from a standpoint of a weight increase may be omitted from this list.

1/ Submit a separate sheet for each family.

2/ This includes items which either directly affect emissions (like optional fuel tanks) as well as other items which may significantly (in excess of 3 lbs.) affect the curb and inertia weight.

3/ Indicate any models or configurations for which these optional items are not available.

Section 10.10.00.00 Vehicle Description

Engine Family Identification _____ Displacement _____
Exhaust Emission Control System _____ Evaporative Emission Family _____
Evap. Emission Control System _____ No. and Location of Driving Wheels _____

| | | | | |
|---|---|---|---|---|
| Engine Code | | | | |
| Evaporative Emission Code | | | | |
| Vehicle Model | | | | |
| Carline | | | | |
| Body Style | | | | |
| Transmission Code[1] | | | | |
| Curb Weight | | | | |
| Inertia Weight Class | | | | |
| Equivalent Test Weight | | | | |
| Gross Vehicle Weight | | | | |
| Frontal Area | | | | |
| Axle Ratio[2/] | | | | |
| Tire Size & Type[2/] | | | | |
| N/V Ratio[2/] | | | | |
| Basic Drivetrain Layout | | | | |
| Dynamometer Power Absorber Setting | | | | |
| A/C Factor Added (yes or no) | | | | |
| Altitude (high, low, or all) | | | | |
| Projected Sales | | | | |
| California Standards | | | | |
| 49 State Standards | | | | |
| Total | | | | |

[1] See discussion on page 5-19.
[2] Sales need not be provided for each axle ratio/tire size combination; however, standard, maximum, and minimum axle ratio, tire size, and N/V values should be provided.

VEHICLE TEST DATA LOG SHEET [1]

EPA I.D. No. _____

Vehicle I.D. (if used)_____

Engine Family _____ Displacement _____ Model _____ Vehicle Serial No._____

Transmission _____ Engine Code_____ Exhaust Control System [2] _____

Evaporative Family_____ Evaporative Emission Code_____

Evaporative Control System _____ Crankcase Control System_____

| Date | Test No. | Odom. Miles | System Miles [3] | Actual Idle Speed | Ambient Temp. (°F) | Emission Results HC | CO | NOx | CO2 | Evap. | MPG | Event Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

[1] Indicate all emission measurements performed on a vehicle, including EPA tests. Also indicate whether tests are before or after tune-up, scheduled maintenance, or unscheduled maintenance, giving brief description of maintenance and additional information requested by EPA (engineering report, data, etc.). Include partial, void, and other tests.

[2] Indicate catalyst code, if applicable.

[3] Specify correction, i.e., System Miles = CFx (Odom. Miles - IC), where CF = correction factor and IC = initial correction. Use odometer reading taken after hot prep., and before cold-start LA-4.

Section 12.06.00.00 - Vehicle Maintenance Log Sheet [1/]

Evaporative Emission Family _____ Engine Code _____ Vehicle I.D. _____

Displacement _____ Inertia Weight _____ Engine Family _____

Transmission (type/code) _____ Test Weight _____ Carline _____

Horsepower (A/C factor added?) and method _____ Axle Ratio _____

| Date | Odometer Miles | System Miles | Maintenance and Authority[2/] | Report No. |
|---|---|---|---|---|

1/ Give a complete detailed description of all maintenance performed. Specify the EPA representative who gave prior approval (and date) or state the reason why prior approval was not required (regulations, etc.).

2/ All specifications checked should be reported, e.g., RPM before and after reset, ignition timing. New I.D. numbers should be retained for replaced components.

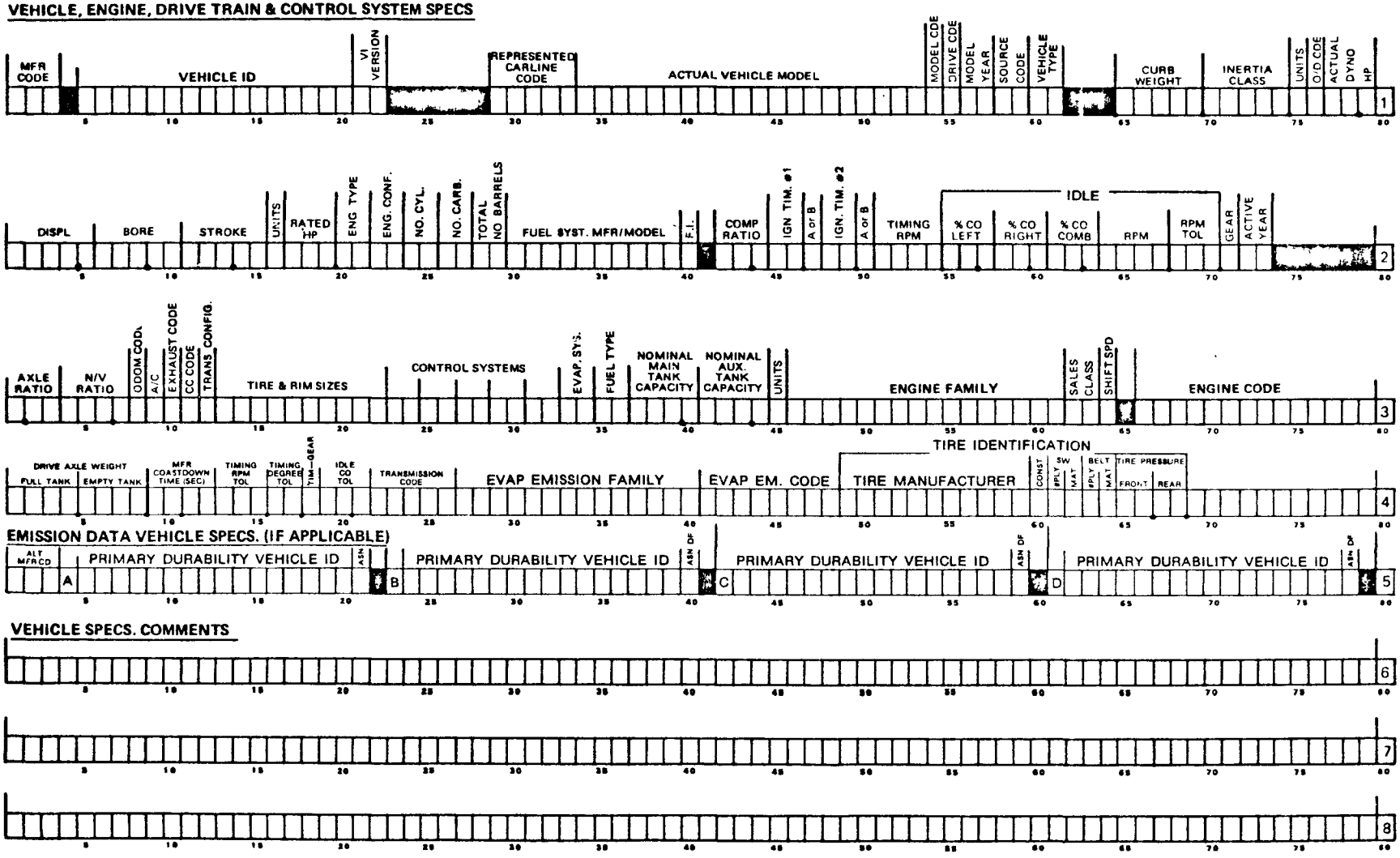
NEW__ CORRECTION__ CHANGE__ CARRYOVER__

DATA SUBMITTED BY: _____

DIVISION/BRANCH: _____

# VEHICLE INFORMATION DATA SHEET

## VEHICLE, ENGINE, DRIVE TRAIN & CONTROL SYSTEM SPECS




## EMISSION DATA VEHICLE SPECS. (IF APPLICABLE)




## VEHICLE SPECS. COMMENTS




DB-700-01 03/78

NOTE: RIGHT JUSTIFY ALL NUMERIC FIELDS; LEFT JUSTIFY ALL ALPHA NUMERIC FIELDS.

CODE EQUIVALENCE
---- ----------

CODE EQUIVALENCE
---- ----------

VI ENTRY (NOTE: KEY FIELDS ARE:
MFR CODE, VEHICLE ID,
AND VI VERSION #)

NEW
---

NO INFORMATION WAS PREVIOUSLY ENTERED FOR THIS VEHICLE.

CHANGE (R)
----------

A CHANGE APPLIED TO EXISTING INFORMATION SPECIFIED BY VERSION #. ONLY THE KEY FIELDS AND CHANGING INFORMATION SHOULD BE ENTERED.

CARRYOVER (C)

A CARRYOVER APPLIED TO EXISTING INFORMATION SPECIFIED BY VERSION #, YEAR BEING CARRIED OVER TO SPECIFIED IN ACTIVE YEAR. ENTER ONLY THE KEY FIELDS AND INFORMATION BEING CHANGED.

CORRECTION (M)
--------------

A CORRECTION CAN BE MADE TO ANY INFORMATION SPECIFIED BY VERSION #, EXCEPT KEY FIELDS. ONLY THE FIELDS TO BE CORRECTED SHOULD BE ENTERED. (MODEL YEAR CAN BE CORRECTED ONLY WHEN THERE IS NO OTHER VERSION BESIDE VERSION 0.)

CARD VI-1 & CARD TD-1
---------------------

MANF CODE (COLS 1-3)
--------------------

| | |
|---|---|
| 10 | AMC |
| 20 | CHRYSLER |
| 20 | (CHRYS) CHRYSLER |
| 20 | (CHRYS) DODGE |
| 20 | (CHRYS) PLYMOUTH |
| 30 | FORD |
| 30 | (FO MO CO) FORD |
| 30 | (FO MO CO) LINCOLN |
| 30 | (FO MO CO) MERCURY |
| 40 | GENERAL MOTORS |
| 40 | (GM) BUICK |
| 40 | (GM) CADILLAC |
| 40 | (GM) CHEVROLET |
| 40 | (GM) OLDSMOBILE |
| 40 | (GM) PONTIAC |
| 40 | (GM) GMC |
| 40 | (GM) DETROIT DIESEL |
| 50 | ABARTH |
| 60 | A C CARS |
| 64 | AICHI |
| 65 | ALBANY |
| 70 | ASTON MARTIN |
| 80 | AUTO CAR |
| 85 | AUTO SPORT |
| 90 | ALFA ROMEO |
| 95 | AM GENERAL |
| 97 | ARMBRUSTER-STAGEWAY |
| 100 | AVANTI |
| 105 | AUBURN |
| 110 | AUSTIN MORRIS (BLMC) |
| 115 | BLMC |
| 120 | BMW |
| 125 | BOLWELL |
| 130 | BRISTOL |
| 135 | BRICKLIN |
| 140 | CHECKER |
| 150 | CITROEN |
| 160 | COMMER |
| 170 | DAMCO (CORD) |
| 175 | DACIA (ARO) |
| 180 | DAF |
| 190 | DAIHATSU |
| 195 | DELOREAN |
| 200 | MERCEDES BENZ |
| 205 | DE TOMASO |
| 210 | DUAL GHIA |
| 215 | DYNA TRUCK |
| 220 | FERRARI |
| 225 | FASCINATION |
| 230 | FIAT |
| 240 | FORD OF ENGLAND |
| 245 | FORD OF GERMANY |
| 250 | HINO |
| 255 | HARLEY-DAVIDSON |
| 260 | HONDA |
| 265 | HYUNDAI |
| 270 | INC |
| 275 | INDRA |
| 280 | ISO |
| 290 | ISUZU |
| 300 | JAGUAR (BLMC) |
| 305 | JAGUAR ROVER TRIUMPH LIMITED |
| 310 | JENSEN |
| 320 | JOHN FITCH |
| 330 | JEEP (KAISER) |
| 335 | KAWASAKI |
| 340 | LANCIA |
| 350 | LOTUS |
| 355 | STEELBRO MANUFACTURING, LTD. |
| 360 | MASERATI |
| 361 | MATRA CALIFORNIA, INC |
| 363 | MG |
| 365 | MOHS |
| 370 | MORGAN |
| 380 | NISSAN |
| 385 | NORTON |
| 390 | NSU |
| 400 | OPEL |
| 405 | PANTHER |
| 410 | PEUGEOT |
| 415 | PIAGGIO-VESPA |
| 420 | PORSCHE |
| 430 | RENAULT |
| 435 | REPLICAR |
| 440 | ROLLS-ROYCE |
| 450 | ROOTES |
| 460 | ROVER (BLMC) |
| 470 | SAAB |
| 480 | SHELBY |
| 485 | SHEILEY |
| 490 | MITSUBISHI |
| 495 | SATRA |
| 500 | SIMCA |
| 510 | SKODA |
| 520 | EXCALIBUR AUTOMOBILE |
| 525 | SQUIRE |
| 530 | TRIUMPH (BLMC) |
| 535 | STUTZ |
| 540 | SUZUKI |
| 550 | TORINO |
| 560 | TOYO KOGYO |
| 570 | TOYOTA |
| 580 | VAUXHALL |
| 585 | VEHICLE TECHNOLOGY INC. |
| 590 | VOLKSWAGEN |
| 600 | VOLVO |
| 605 | WHITE |
| 610 | YENKO |
| 615 | YAMAHA |

CODE EQUIVALENCE
---- ----------

| | |
|---|---|
| 620 | TVR |
| 625 | SUPERIOR COACH |
| 630 | SUSPENSIONS INT (OMEGA) |
| 640 | AUDI |
| 650 | MUREENA MOTORS |
| 660 | FUJI HEAVY IND |
| 670 | MONTEVERDI |
| 680 | INTERMECCANICA (ITALIA) |
| 690 | LAMBORGHINI |
| 700 | MARCOS |
| 710 | ARMY |
| 720 | WINNEBAGO |
| 725 | ALLIS CHALMERS |
| 730 | CATERPILLAR |
| 740 | CUMMINS |
| 745 | DEUTZ |
| 750 | MERCULES |
| 760 | MACK |
| 770 | PERKINS |
| 780 | SCANIA-VABIS |
| 785 | SUPERFORMANCE |
| 790 | GLASSIC |
| 800 | TELEDYNE CONTINENTAL |
| 810 | CASE |
| 820 | DIAMOND REO |
| 830 | HIGHWAY PRODUCTS, INC |
| 999 | EXPERIMENTAL |

CARD VI-1
---------

VI VERSION (COL 21-22)
CHANGES, CARRYOVERS, AND CORRECTIONS
------------------------------------

ENTER EXACT VERSION NUMBER OF VI TO CHANGE, CARRYOVER, OR CORRECT.

REPRESENTED CARLINE CODE (COLS 29-33)
-------------------------------------

CONSULT CARLINE CODE LISTS FOR THE 5 DIGIT CODE

REPRESENTED MODEL CODE (COL 54)
-------------------------------

| | |
|---|---|
| 1 | SEDAN |
| 2 | TRUCK |
| 3 | VAN |
| 4 | WAGON |
| 5 | MOTORCYCLE |

DRIVE CODE (COL 55)
-------------------

| | |
|---|---|
| 1 | REAR DRIVE STR. LEFT |
| 2 | REAR DRIVE STR. RIGHT |
| 3 | FRONT DRIVE STR. LEFT |
| 4 | FRONT DRIVE STR. RIGHT |
| 5 | 4 WHEEL DRIVE STR. LEFT |
| 6 | 4 WHEEL DRIVE STR. RIGHT |

SOURCE CODE (COLS 58-59)
------------------------

| | |
|---|---|
| 01 | MANUFACTURER |
| 02 | HERTZ DETROIT |
| 03 | HERTZ L.A. |
| 04 | AVIS |
| 05 | AIRWAYS CORP L.A. |
| 06 | ALPH CORP L.A. |
| 07 | GSA L.A. |
| 08 | PO DEPT DETROIT |
| 09 | PO DEPT L.A. |
| 10 | L.A. COUNTY VEH |
| 11 | STATE OF CALIFORNIA |
| 12 | BORROWED FROM CORPS |
| 13 | AMERICAN RACEWAYS, INC |
| 14 | DEALER USED CARS |
| 15 | EPA |
| 16 | GSA |
| 17 | MILITARY |
| 18 | PRIVATE OWNER |
| 19 | MANUFACTURER FOR ECTD |
| 99 | OTHER |

VEHICLE TYPE (COLS 60-61)
-------------------------

| | |
|---|---|
| 01 | CERT EMISSION DATA |
| 02 | CERT DURABILITY |
| 03 | CERT FUEL ECONOMY |
| 04 | NON-CERT |

UNITS FOR CURB WEIGHT AND INERTIA SETTING (COL 75)
--------------------------------------------------

P - POUNDS
K - KILOGRAMS

O/D (OVERDRIVE) CODE (COL 76)
-----------------------------

1 - NO GEAR RATIO <1
2 - TOP GEAR RATIO <1
3 - ELECTRICALLY OPERATED O/D

CARD VI-2
---------

UNITS FOR DISP, BORE&STROKE (COL 16)
------------------------------------

E - CUBIC INCHES OR INCHES
M - CUBIC CENTIMETERS OR MILLIMETER

ENGINE TYPE (COLS 20-21)
------------------------

| | |
|---|---|
| 01 | OTTO SPARK |
| 02 | STRATIFIED CHARGE |
| 03 | DIESEL |
| 04 | GAS TURBINE |
| 05 | RANKINE |
| 06 | STIRLING |
| 07 | HYBRID |
| 99 | OTHER |

ENGINE CONFIGURATION (COLS 22-23)
---------------------------------

| | |
|---|---|
| 01 | IN-LINE |
| 02 | V-BLOCK |
| 03 | OPPOSED |
| 04 | ROTARY |
| 05 | ONE SHAFT |
| 06 | TWO SHAFT |
| 07 | DATTERY |
| 99 | OTHER |

FUEL INJECTION (COL 40)
-----------------------

Y - YES
N - NO

A/B (COLS 47 OR 50)
-------------------

A - AFTER
B - BEFORE

GEAR (COL 71)
-------------

N - NEUTRAL
D - DRIVE
P - PARK

CODE EQUIVALENCE
---- ----------

CARD VI-3
---------

ODOMETER CODE (COL 8)
---------------------

M - MILES
K - KM

AIR CONDITIONING INSTALLED (COL 9)
----------------------------------

Y - YES
N - NO

EXHAUST CODE (COL 10)
---------------------

| | |
|---|---|
| 1 | SINGLE LEFT REAR |
| 2 | SINGLE RIGHT REAR |
| 3 | DUAL REAR |
| 4 | SINGLE LEFT SIDE |
| 5 | SINGLE RIGHT SIDE |
| 6 | DUAL SIDES |

CRANKCASE SYSTEM CODE (COL 11)
------------------------------

| | |
|---|---|
| 1 | CLOSED |
| 9 | OTHER |

TRANSMISSION CONFIGURATION (COL 12)
-----------------------------------

(A=AUTO, M=MANUAL, L=LOCKUP/AUTO)

| | |
|---|---|
| 0 | C-4(CREEPER)(M4) |
| 1 | AUTO |
| 2 | M-3 |
| 3 | M-4 |
| 4 | M-5 |
| 5 | L-4 |
| 6 | A-3 |
| 7 | L-3 |
| 8 | A-4 |
| 9 | L-4 |

CONTROL SYSTEM TYPE (COLS 23-24),
---------------------------------

(COLS 25-26, 27-28, 29-30, 31-32)
---------------------------------

| | |
|---|---|
| 02 | ENGINE MOD |
| 03 | FUEL INJECTION |
| 05 | THERMAL REACTOR |
| 08 | EXHAUST RECYCLE |
| 10 | AIR PUMP |
| 11 | PULSATING AIR SYSTEM |
| 16 | OXIDATION CATALYST |
| 17 | REDUCTION CATALYST |
| 18 | THREE-WAY CATALYST |
| 19 | CLOSED LOOP |
| 98 | NONE |
| 99 | OTHER |

EVAP SYSTEM TYPE (COLS 33-34)
-----------------------------

| | |
|---|---|
| 01 | CRANKCASE |
| 02 | CANISTER |
| 03 | TANK |
| 04 | NONE |
| 99 | OTHER |

FUEL TYPE (COLS 35-36)
----------------------

| | |
|---|---|
| 01 | INDOLENE 30 |
| 02 | COMMERCIAL LEADED |
| 03 | LPG |
| 04 | PROPANE |
| 06 | UNLEADED (AT EPA-IND NO) |
| 07 | IND UNLEADED, 100 OCT |
| 08 | #1 FUEL OIL |
| 09 | DIESEL FUEL (AT EPA-NO.2 DIESEL) |
| 10 | NATURAL GAS |
| 11 | ALCOHOL |
| 12 | INDOLENE 10 |
| 13 | INDOLENE 20 |
| 14 | JP-4 |
| 15 | KEROSENE |
| 16 | COMMERCIAL UNLEADED |
| 17 | LEADED (AT EPA-IND 15) |

UNITS FOR TANK CAPACITY (COL 45)
--------------------------------

G - GALLONS
L - LITERS

SALES CLASS (COLS 62-63)
------------------------

FV - 49 STATE LIGHT DUTY VEH
CV - CALIF. LIGHT DUTY VEH
BV - 50 STATE LIGHT DUTY VEH
FT - 49 STATE LIGHT DUTY TRUCK
CT - CALIF. LIGHT DUTY TRUCK
BT - 50 STATE LIGHT DUTY TRUCK

SHIFT SPEED CODE (COL 64)
-------------------------

1 15 - 25 - 40
2 SPECIAL SHIFT SPDS (MAN OR S-A) SPECIFY IN COMMENTS)
3 DO NOT SHIFT MANUALLY

CARD VI-4
---------

TIMING GEAR (COL 18)
--------------------

N - NEUTRAL
D - DRIVE
P - PARK

TRANSMISSION CODE (COL 22)
--------------------------

LEFT JUSTIFY MFR TRANSMISSION CODE.

TIRE CONSTRUCTION (COL 60)
--------------------------

| | |
|---|---|
| 1 | BIAS BELTED |
| 2 | RADIAL |
| 3 | BIAS |

SIDEWALL AND BELT MATERIAL
--------------------------

(COLS 62, 64)
-------------

| | |
|---|---|
| A | ARAMID |
| F | FIBERGLASS |
| N | NYLON |
| P | POLYESTER |
| R | RAYON |
| S | STEEL |
| O | OTHER |

CARD VI-5
---------

ALTERNATE MFR CODE (COL 1)
--------------------------

ENTER ONLY IF APPLICABLE TO AT LEAST ONE DURABILITY VEHICLE.

ASSIGNED DF (COLS 21, 40, 59, 78)
---------------------------------

ENTER IF DURABILITY VEHICLE ID IS NON-APPLICABLE.

| | |
|---|---|
| 1 | GAS FUELED, OX, CAT, 4 STROKE RECIP |
| 2 | GAS FUELED, NON-CAT, 4 STROKE RECI |
| 3 | DIESEL ENGINES |
| 4 | NON-CAT ROTARY ENGINES |

Section 12.02.02.00 - Exhaust Emission Deterioration Factors[1]

Engine Family_____Durability-Data V.I.D. No._____

Interpolated Values:

4,000-Mile: HC = __.__ __ __ __ __ CO = __ __.__ __ __

NOx = __.__ __ __ __ Part.[2] __.__ __ __ __

50,000-Mile: HC = __.__ __ __ __ __ CO = __ __.__ __ __

NOx = __.__ __ __ __ Part.[2] __.__ __ __ __

Deterioration Factors:

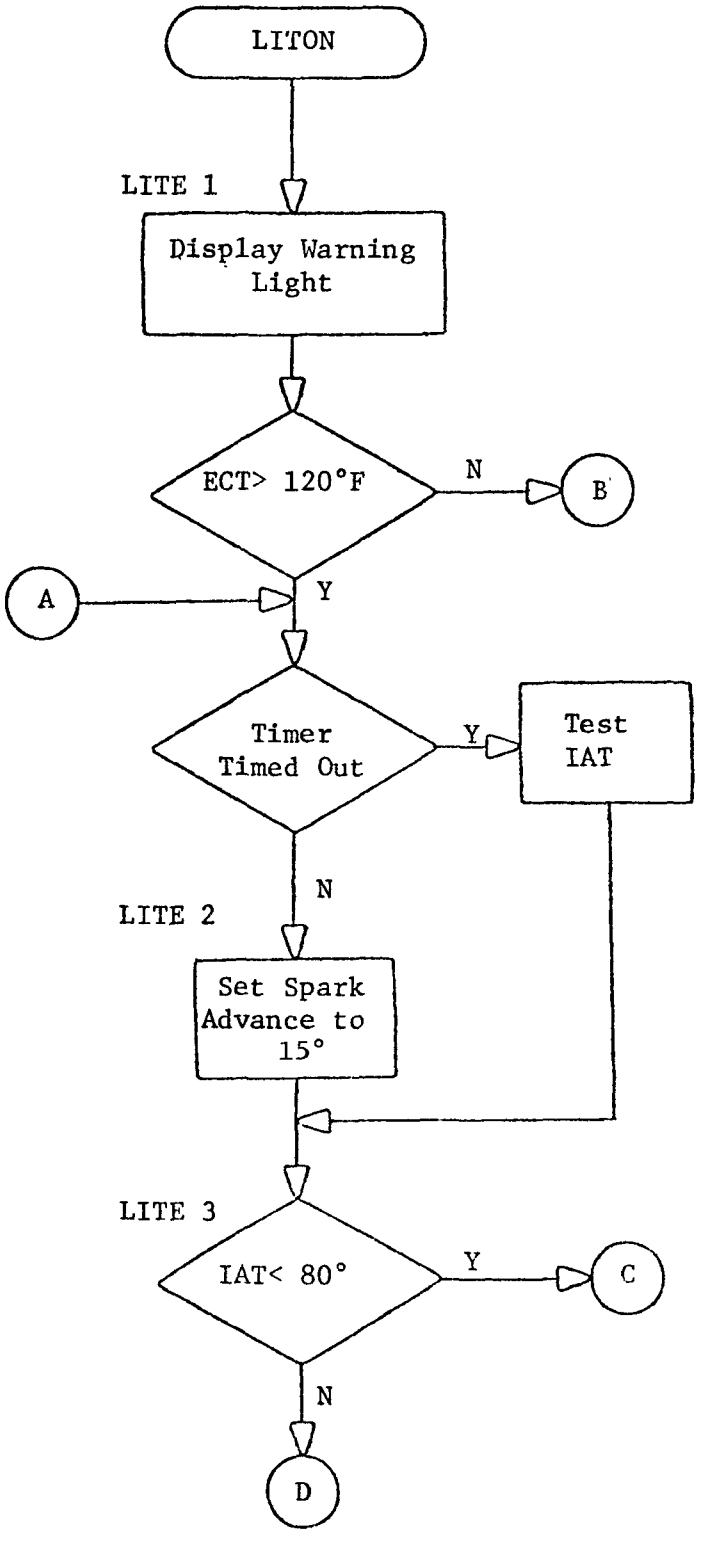
Engine-System HC Factor = __.__ __ __ Engine-System CO Factor = __.__ __ __

Engine-System NOx Factor = __.__ __ __ Engine-System Part. Factor[2] = __.__ __ __

[1]Submit a separate sheet for each engine family/exhaust emission control system combination. The data used to calculate the deterioration factors should be supplied on the "Light-Duty Deterioration Factor Input Sheet" (Section 12.02.03.00), whose preparation and submission will be described in the forthcoming Data Forms Supplement. See Item 12, pages 2-6 and 2-7.

[2]Particulate deterioration factors pertain to Diesel engines only.

Section 10.02.25.09 - Logic Flow Chart (Electronics)



Engine Family_____

Vehicle

| | | | | |
|---|---|---|---|---|
| Model | | | | |
| I.D. Number | | | | |
| Selection Criteria[1/] | | | | |
| Exhaust System | | | | |
| Engine Code | | | | |
| Evaporative Em. Family | | | | |
| Transmission (Type/Code) | | | | |
| Displacement | | | | |
| Inertia Weight Class | | | | |
| Equivalent Test Weight Category | | | | |
| Axle Ratio | | | | |
| N/V Ratio | | | | |

EPA 4000-Mile Results[2/]

| | | | | |
|---|---|---|---|---|
| Test Number | | | | |
| HC (g/mi) | | | | |
| CO (g/mi) | | | | |
| $NO_x$ (g/mi) | | | | |
| Particulates (g/mi)[3/] | | | | |
| Evap. (g/test) | | | | |

Deterioration Factors

| | | | | |
|---|---|---|---|---|
| HC | | | | |
| CO | | | | |
| $NO_x$ | | | | |
| Particulates[3/] | | | | |
| Evap. | | | | |

Certification Levels

| | | | | |
|---|---|---|---|---|
| HC (g/mi) | | | | |
| CO (g/mi) | | | | |
| $NO_x$ (g/mi) | | | | |
| Particulates (g/mi)[3/] | | | | |
| Evap (g/test) | | | | |

Estimated Emission Levels

| | | | | |
|---|---|---|---|---|
| HC (g/mi) | | | | |
| CO (g/mi) | | | | |
| $NO_x$ (g/mi) | | | | |
| Particulates (g/mi)[3/] | | | | |
| Evap. (g) | | | | |

1/ Reference the applicable section in 40 CFR 86.080-24(b).
2/ If not tested by EPA, give the EPA-determined manufacturer's test number.
3/ Diesel engines only.
4/ To be provided only for engine families whose emission-data vehicles have been selected according to the procedures outlined in EPA's May 15, 1979 guidelines on "Exhaust Emission-Data Vehicle Selection Criteria," Section II.B.1, pp. 5-7.

| Section 16.04.01.00 - Parts List | Engine Code | Engine Code | Engine Code |
|---|---|---|---|
| Fuel pump part number | | | |
| Carburetor assembly part number | | | |
| Fuel injection control unit part number | | | |
| Supercharger or Turbocharger: | | | |
| Assembly | | | |
| Turbine | | | |
| Compressor housing | | | |
| Wastegate valve | | | |
| Spark plug identification number | | | |
| Alternate spark plugs | | | |
| Distributor assembly part number | | | |
| Crankcase emission control system: component part number | | | |
| Evaporative emission canister part number | | | |
| Auxiliary emission control devices: identification (color, production code, number, etc.) of calibrated components | | | |
| Air injection system: | | | |
| Air pump part number | | | |
| Diverter valve part number | | | |
| Check valve part number | | | |
| Pressure relief valve part number | | | |
| Exhaust Gas Recirculation System: | | | |
| EGR valve | | | |
| Amplifier | | | |
| Modulator | | | |
| Delay Valve | | | |
| Catalyst assembly part number | | | |
| Other major exhaust emission and evaporative emission control systems: part numbers of calibrated component(s) | | | |

Note: In each case, both the manufacturer's part number and any vendor's part number should be included and identified. For parts labelled or identified by color-coding in addition to or instead of parts numbers, explain the color coding system used.

| Section 16.04.01.00 - Parts List | Engine Code | Engine Code | Engine Code |
|---|---|---|---|
| Major exhaust emission-related devices: part number(s) of calibrated or non-calibrated components | _____ | _____ | _____ |
| Emission control related warning system: part number(s) of calibrated components(s) | _____ | _____ | _____ |

This draft form will soon be circulated to industry for comments. The form will be finalized and distributed as soon as possible.

[1]MODEL YEAR | [2]MFR. | [3]MFR.CODE | [4]REQUEST DATE

[5]REQUEST NO. | [6]AMEND NO.* | [7]AMEND DATE*

## CERTIFICATION CHANGE REQUEST
LIGHT-DUTY VEHICLES AND TRUCKS

[8] ☐ ADDITION OF VEHICLE ☐ FIELD FIX ☐ RUNNING CHANGE

| | AMEND TRANS-ACTION CODE:* 1.Add 2 Delete 3 Change | SALES LOC CODE: 1 50 St 2 49 St 3.Calif | FUEL TYPE CODE: 1.Gas 2.Dies | VEH TYPE CODE: 1.Ven 2.Trk 3 MC | AMEND TRANS-ACTION CODE.* 1 Add 2.Delete 3.Change | SALES LOC CODE: 1 50 St 2.49 St 3.Calif | FUEL TYPE CODE. 1.Gas 2.Dies | VEH TYPE CODE: 1.Veh 2 Trk 3.MC | AMEND TRANS-ACTION CODE.* 1.Add 2 Delete 3 Change | SALES LOC CODE. 1.50 St 2.49 St 3.Calif | FUEL TYPE CODE. 1.Gas 2.Dies | VEH TYPE CODE. 1.Veh 2 Trk 3.MC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| [13]ENGINE FAMILY NAME | | | | | | | | | | | | |
| [14]DISPLACEMENTS | | | | | | | | | | | | |
| [15]EXHST CONTROL SYS** **Use codes on VI | | | | | | | | | | | | |
| [20]ENGINE CODES | | | | | | | | | | | | |
| [21]CATALYST CODES | | | | | | | | | | | | |
| [22]TRANSMISSIONS | | | | | | | | | | | | |
| [23]EVAP-EMISS FAMILY | | | | | | | | | | | | |
| [24]EVAP CONTROL SYS | | | | | | | | | | | | |
| [25]EVAP CODE | | | | | | | | | | | | |
| [26]MODELS AFFECTED | | | | | | | | | | | | |

DESCRIPTION OF CHANGE/REASON FOR CHANGE

CHANGE[27] CATEGORY CODES

REASON[28] CODES:

MFR'S TEST DATA SUBMITTED FOR:

[29]VID _____

[30]VERSION# _____ [31]TEST# _____

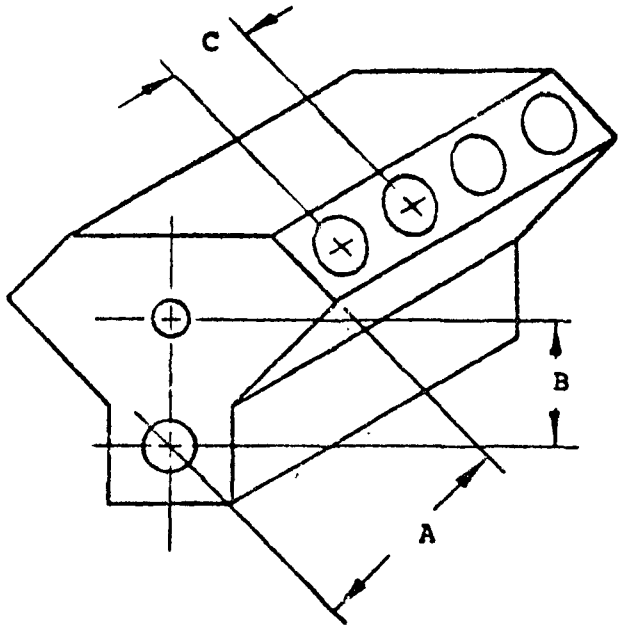
[32]HAS THIS CHANGE BEEN IMPLEMENTED CONCURRENTLY WITH THIS REQUEST TO EPA?

IF ☐ YES, *Notice is hereby given that if a change has been implemented concurrently with this request and EPA requires testing, the change must be rescinded within 5 days after receiving EPA test requirements*

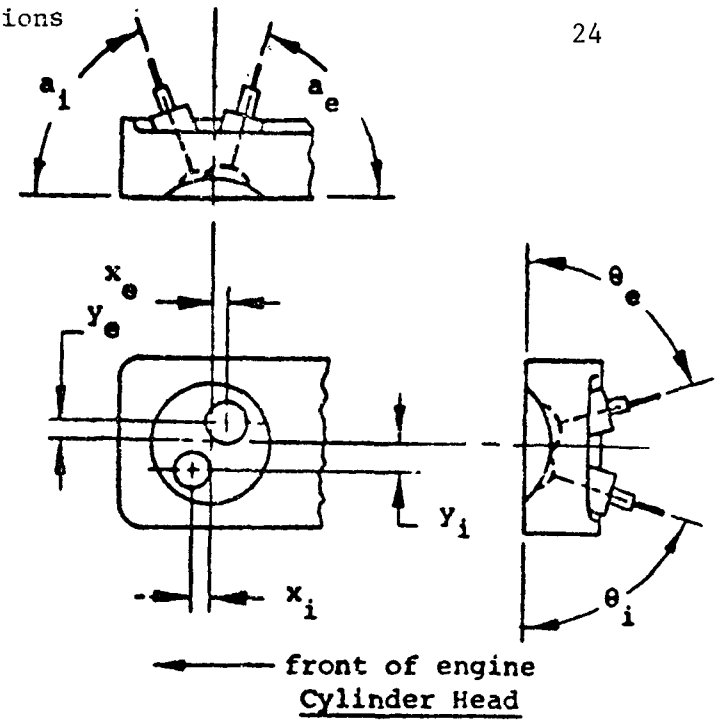
IF ☐ NO, *give proposed date of implementation:* [33]

SIGNATURES: *(As required by manufacturers. There must be at least one signature on this form.)*

NAME: _____ DATE: _____ NAME: _____ DATE: _____




Cylinder Block Dimensions "A," "B," and "C"




Valve Location Dimensions

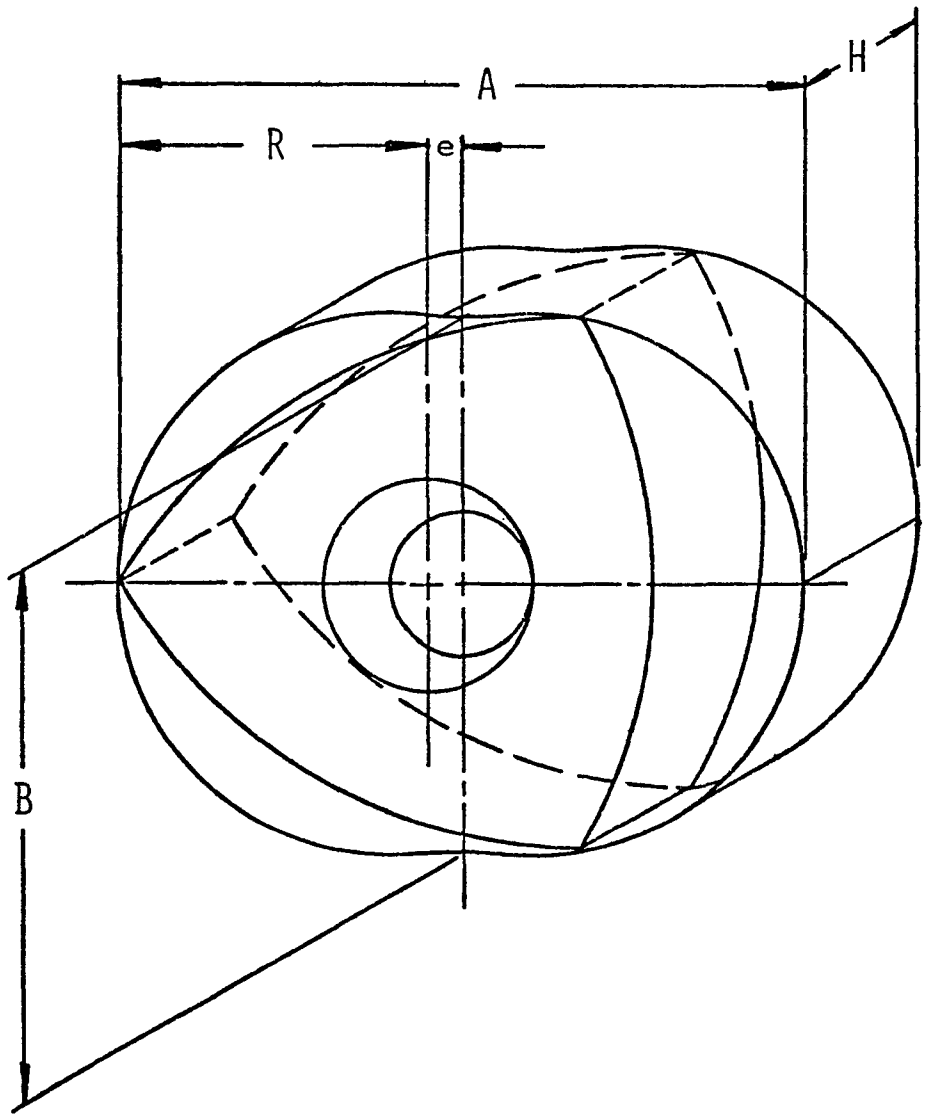
**Valve Location:**

| | | | Cylinder Number [1] | | |
|---|---|---|---|---|---|
| | | Units | #1 [2] | #2 | #3 |
| Intake Valve (Four-stroke cycle engines) | $x_i$ | inches | | | |
| | $y_i$ | inches | | | |
| | $a_i$ | degrees | | | |
| | $\theta_i$ [3] | degrees | | | |
| Exhaust Valve | $x_e$ | inches | | | |
| | $y_e$ | inches | | | |
| | $a_e$ | degrees | | | |
| | $\theta_e$ [3] | degrees | | | |

NOTE: Comparable drawings of equal detail should be supplied for other than V-block cylinder arrangements.

1 If all dimensions are the same for all cylinders, they may be specified for one cylinder and others may be indicated as "same."
2 Use additional columns as necessary.
3 For V-block engines, measure angles of left cylinder bank (when facing toward front of engine).

Section 10.31.00.00 - Engine Dimensions - Rotary Engines



Percent of Mileage Accumulation [1] at Speed

| Speed, MPH [2] | Percent |
|---|---|
| 30 | |
| 35 | |
| 40 | |
| 45 | |
| 50 | |
| 55 | |
| 60 | |
| 70 | |
| Transient | |
| | total |

| Driving Mode | Number per Cycle [1] | Per Mile [1] | Accel Rate [3] |
|---|---|---|---|
| Stops | | | |
| Normal Accelerations (from stop) | | | |
| Wide open throttle accelerations (from stop) | | | |
| Idle time (seconds) | | | |
| Light Accels (from 20 mph) | | | |

Average Speed of Cycle [1]
Total Mileage of Cycle [1]

1/ This assumes a repetitive, cyclic type of schedule. If the mileage is accumulated on a non-repetitive route, estimates obtained from a "representative" portion of route are acceptable.

2/ Include other speeds, in 5 mph increments, if applicable.

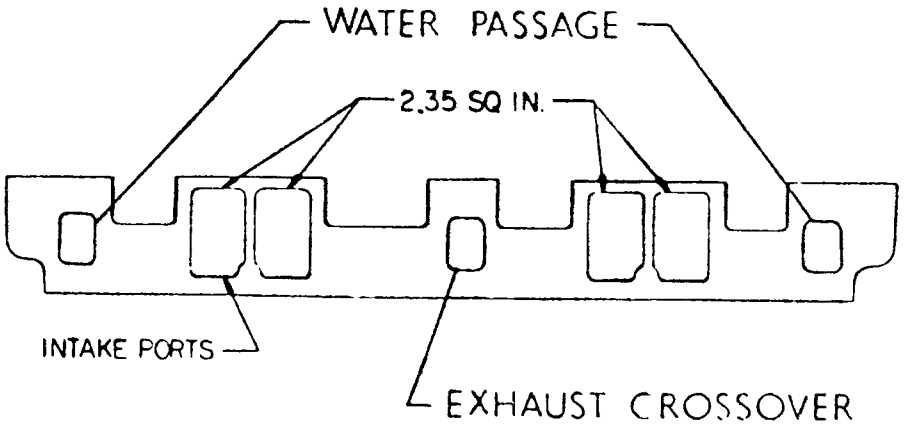
3/ If drivers are instructed to accelerate or decelerate at a prescribed rate, please specify rate.

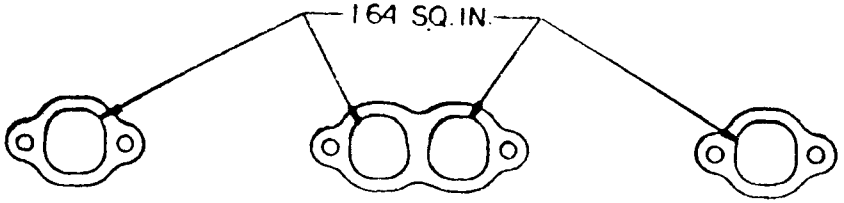
Engine Family BBK350V4FA7

| Revision # | Revision Date | Page Nos. Affected | Description of Revision |
|---|---|---|---|
| 001 | June 30, 1979 | 1 - 40 | Dropping of engine code |
| 002 | July 18, 1979 | 10.07.03.08-33 | EGR valve recalibration |
| 003 | Aug. 1, 1979 | 10.03.02.13-21 | R/C #39: Timing setting change |

[A "revision log" is to be maintained for each engine family application, evaporative emission family application, and general section(s) of the manufacturer's application. As indicated in the example above, the following information should be included: (1) the appropriate engine family name (in MY 1981 this should be the standardized EPA engine family name), evaporative emission family name, or general section number; (2) the revision number (a consecutive three digit number, starting with 001, for each engine family, evap family, or general section each year); (3) the date the revision is issued (i.e., the date of the letter transmitting the revision); (4) the page numbers affected by the revision; and (5) a terse but characterizing description of the revision. Revision logs are to be cumulative and updated at the time of each revision. An updated copy should accompany each revision submitted to EPA. For families undergoing full certification, a revision log must be supplied with each revision to the application. For families undergoing abbreviated certification review, the revision log will include all revisions made to the engine family. This log will be maintained by the manufacturer as one of the application records and submitted as part of the application. Following the submission of the ACR application, an updated revision log will be submitted with each subsequent revision.]

CYLINDER HEAD
INTAKE AND EXHAUST PORT CONFIGURATION



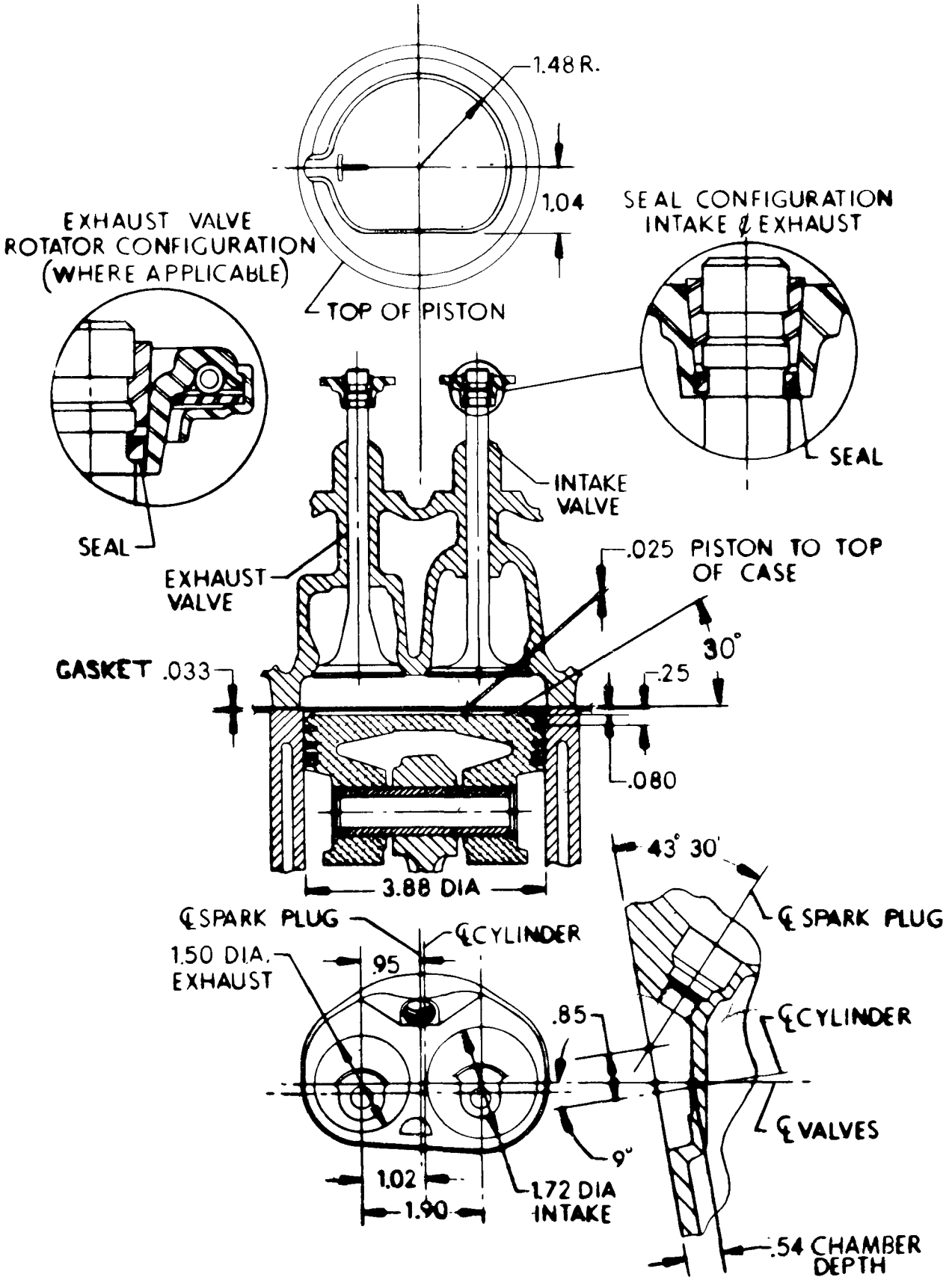



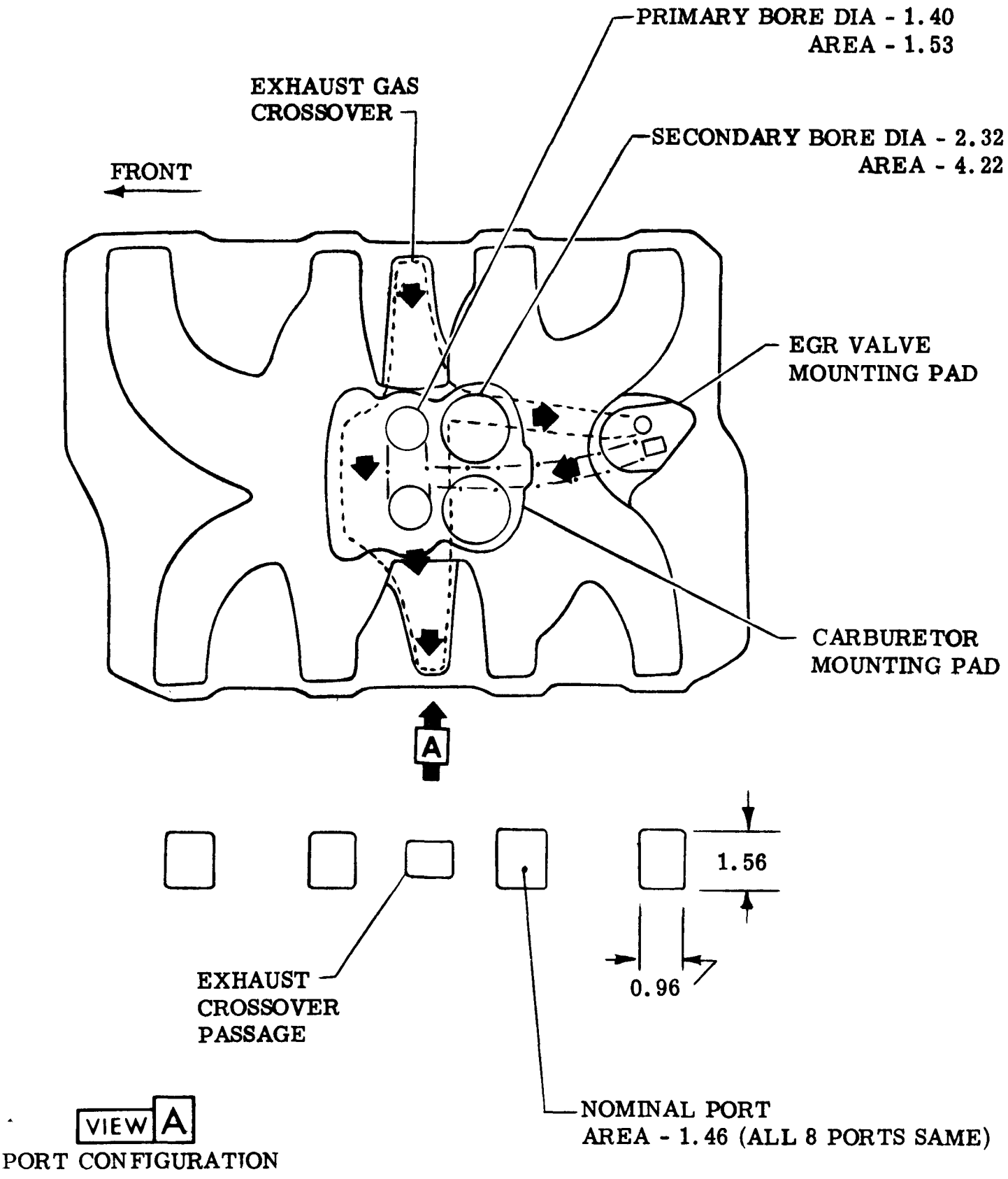

EXHAUST PORTS

EXAMPLE 1

EXAMPLE 2

COMBUSTION CHAMBER DESIGN
VALVE, VALVE STEM SEAL AND ROTATOR CONFIGURATION
PISTON AND PISTON RING CONFIGURATION

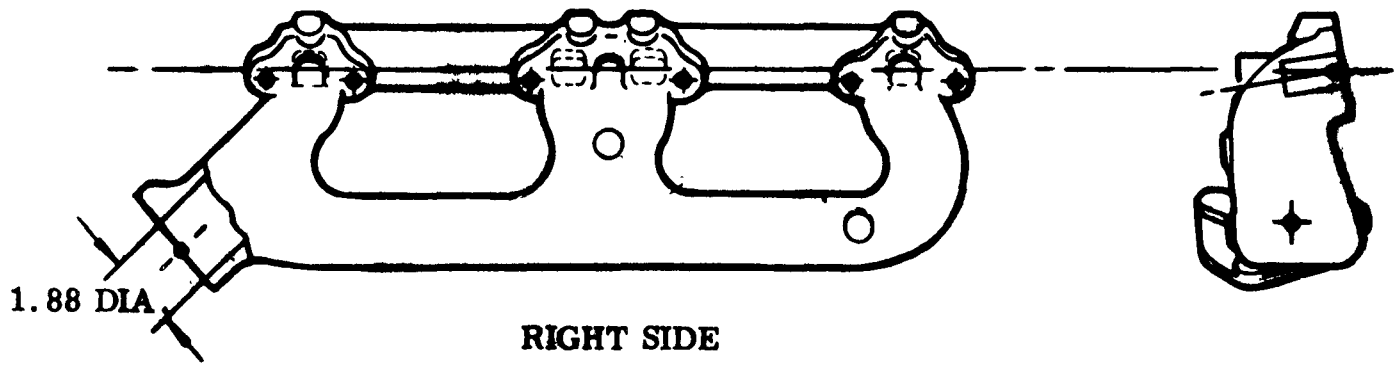





INTAKE MANIFOLD CONFIGURATION

NOTE: Dimensions in inches.

## EXHAUST MANIFOLDS

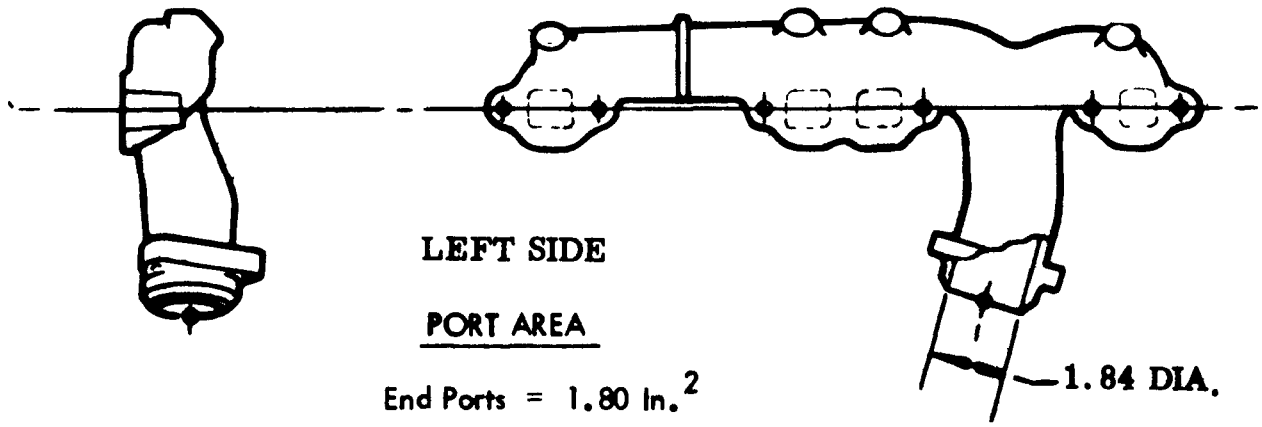



Take Down
Area = 2.77 In.$^2$

**RIGHT SIDE**

PORT AREA

End Ports = 1.80 In.$^2$
Center Ports = 1.80 In.$^2$



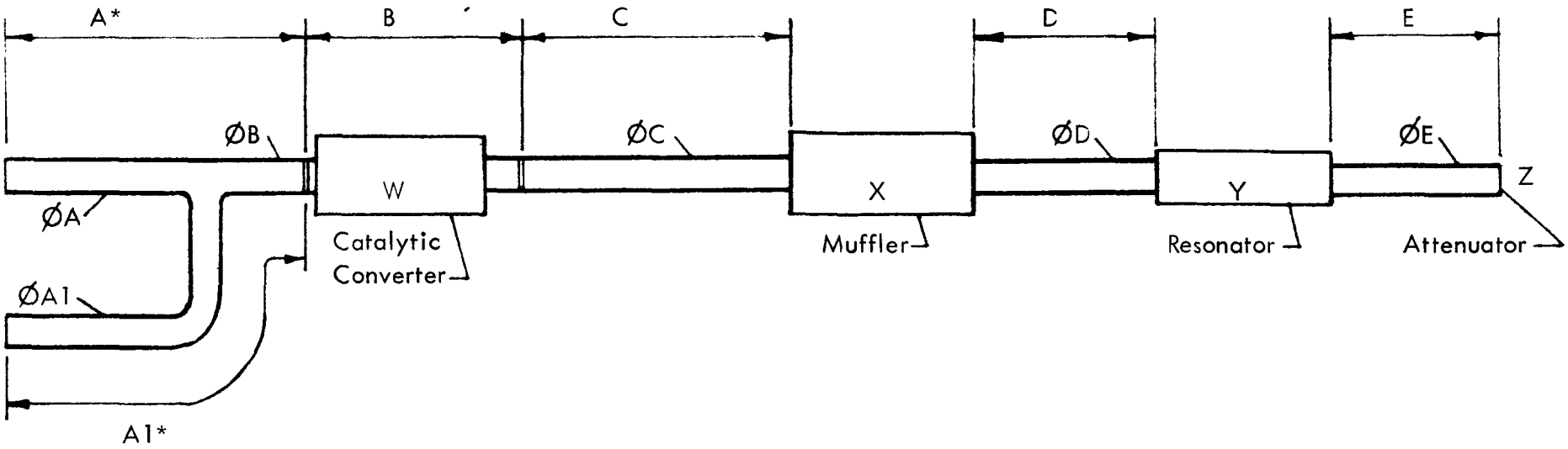

**LEFT SIDE**

PORT AREA

End Ports = 1.80 In.$^2$
Center Ports = 1.80 In.$^2$

Take Down
Area = 2.66 In.$^2$

EXHAUST SYSTEM

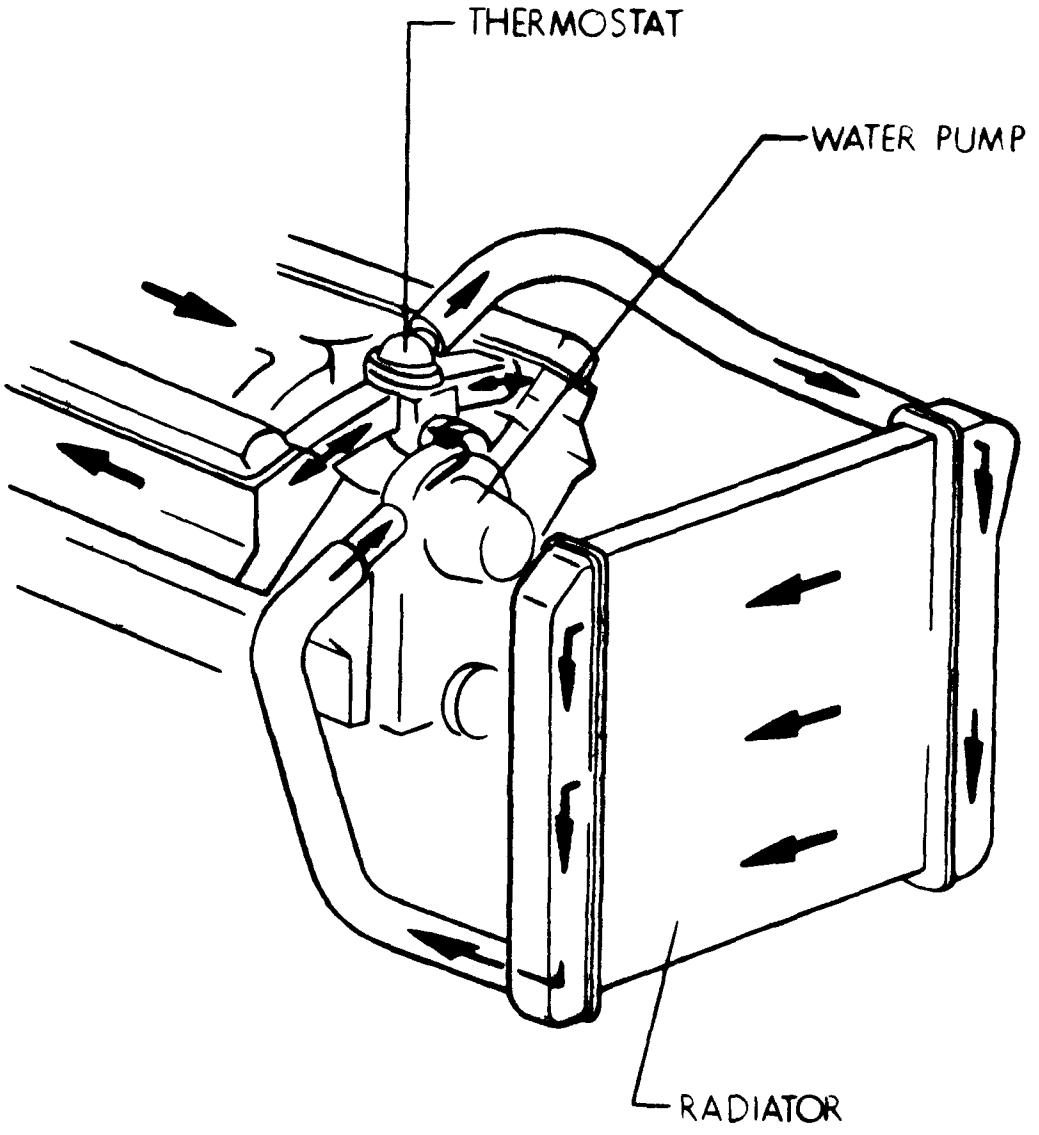



* Lengths A and A1 represent manifold outlet to converter inlet.

| CAR LINE MODEL | ENGINE | COMPONENT USAGE W | X | Y | Z | NOMINAL LENGTH A | A1 | B | C | D | E | NOMINAL DIAMETER ** ØA | ØA1 | ØB | ØC | ØD | ØE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |

** Indicate if dual-walled pipe

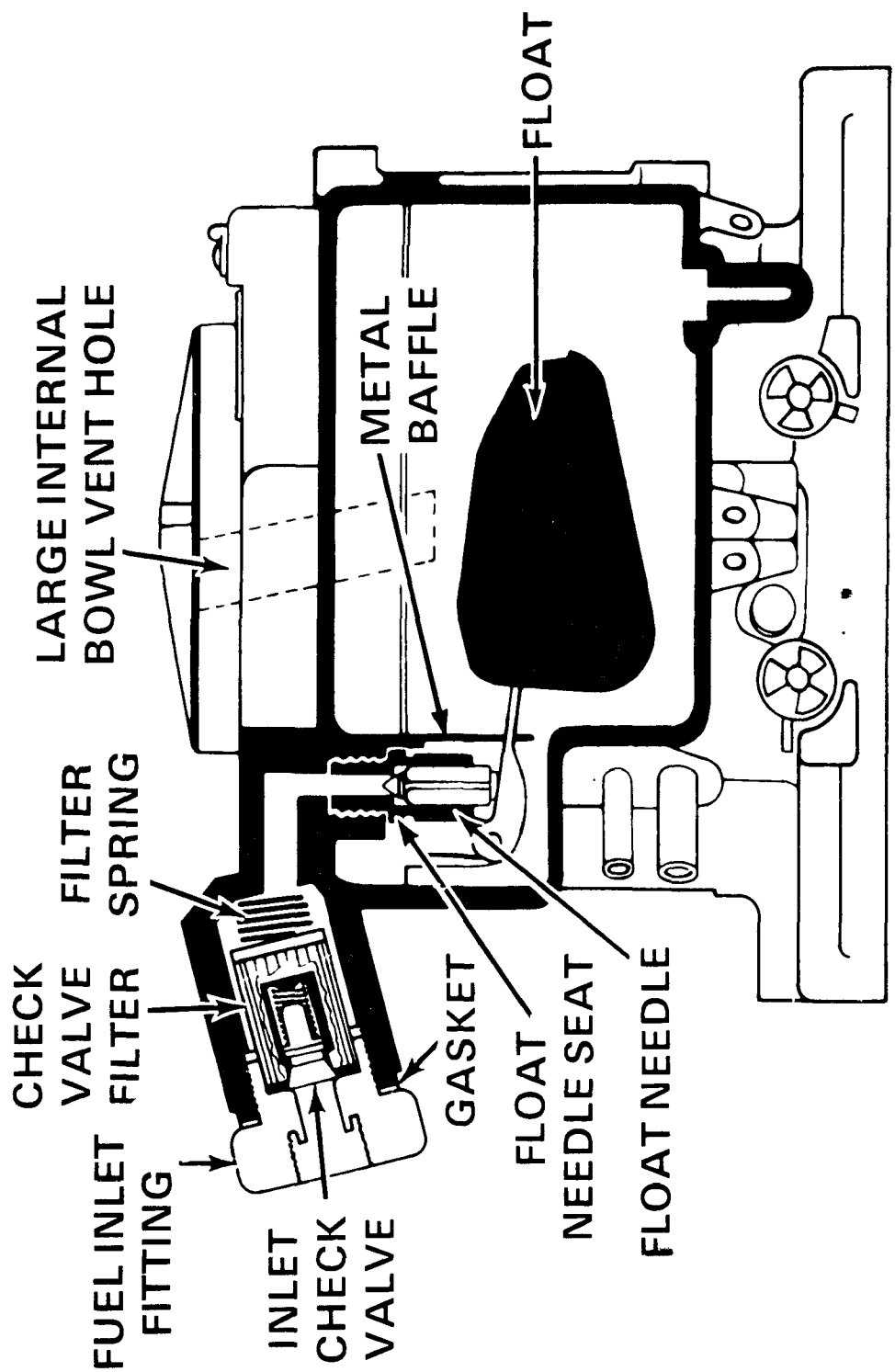
EXAMPLE 6




COOLING SYSTEM
8 CYL ENGINE

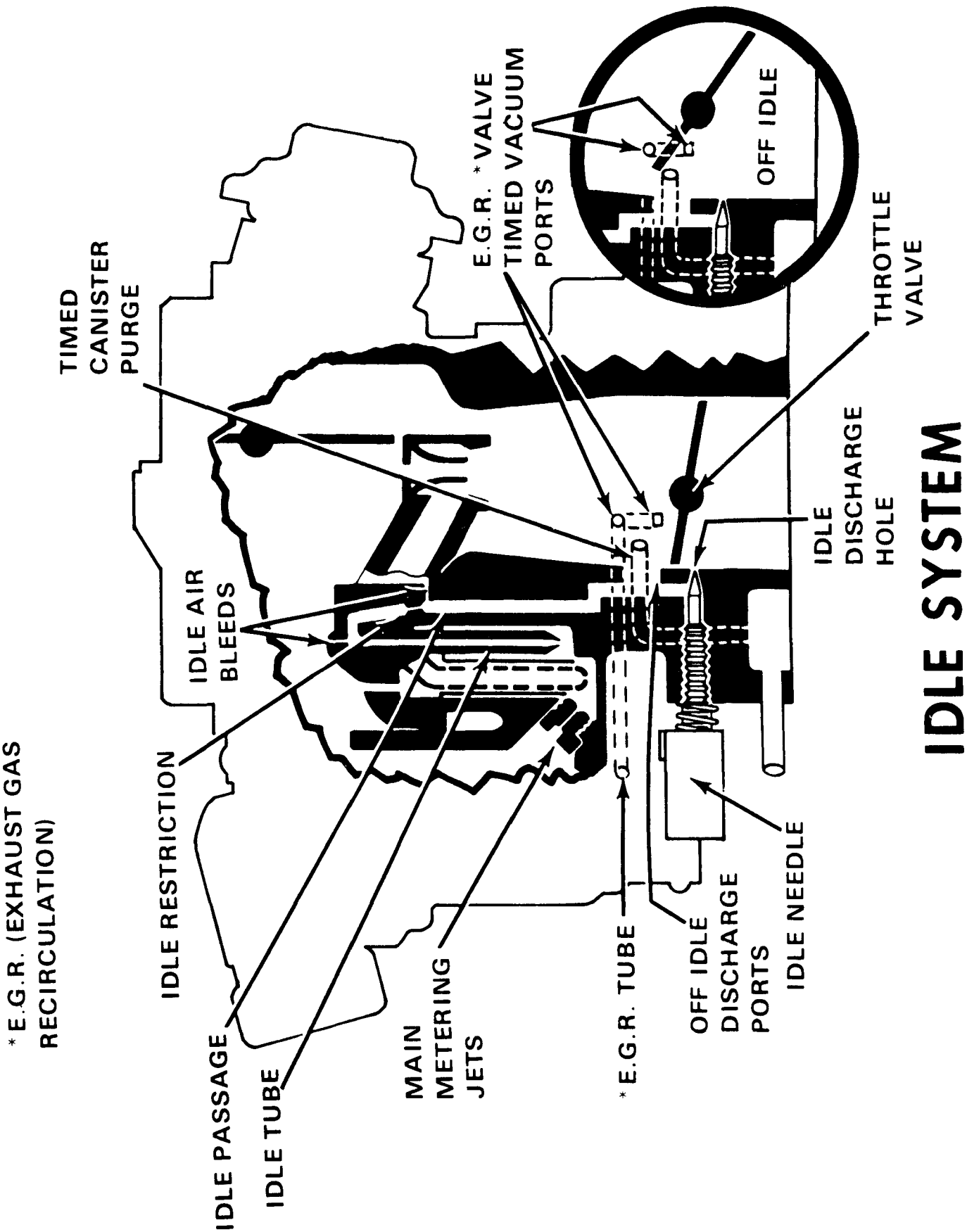
(ARROWS SHOW DIRECTION OF WATER FLOW)

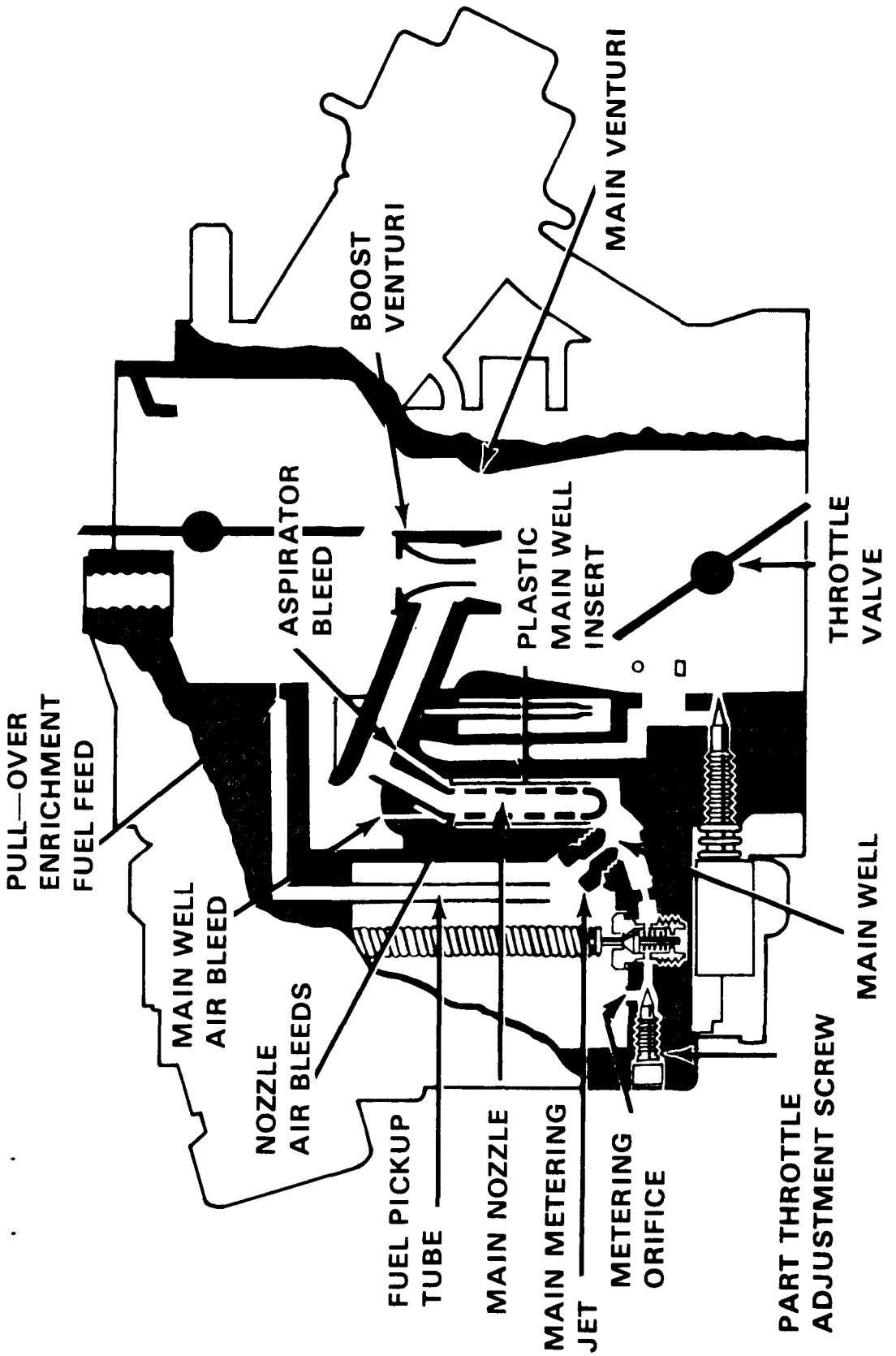
EXAMPLE 7



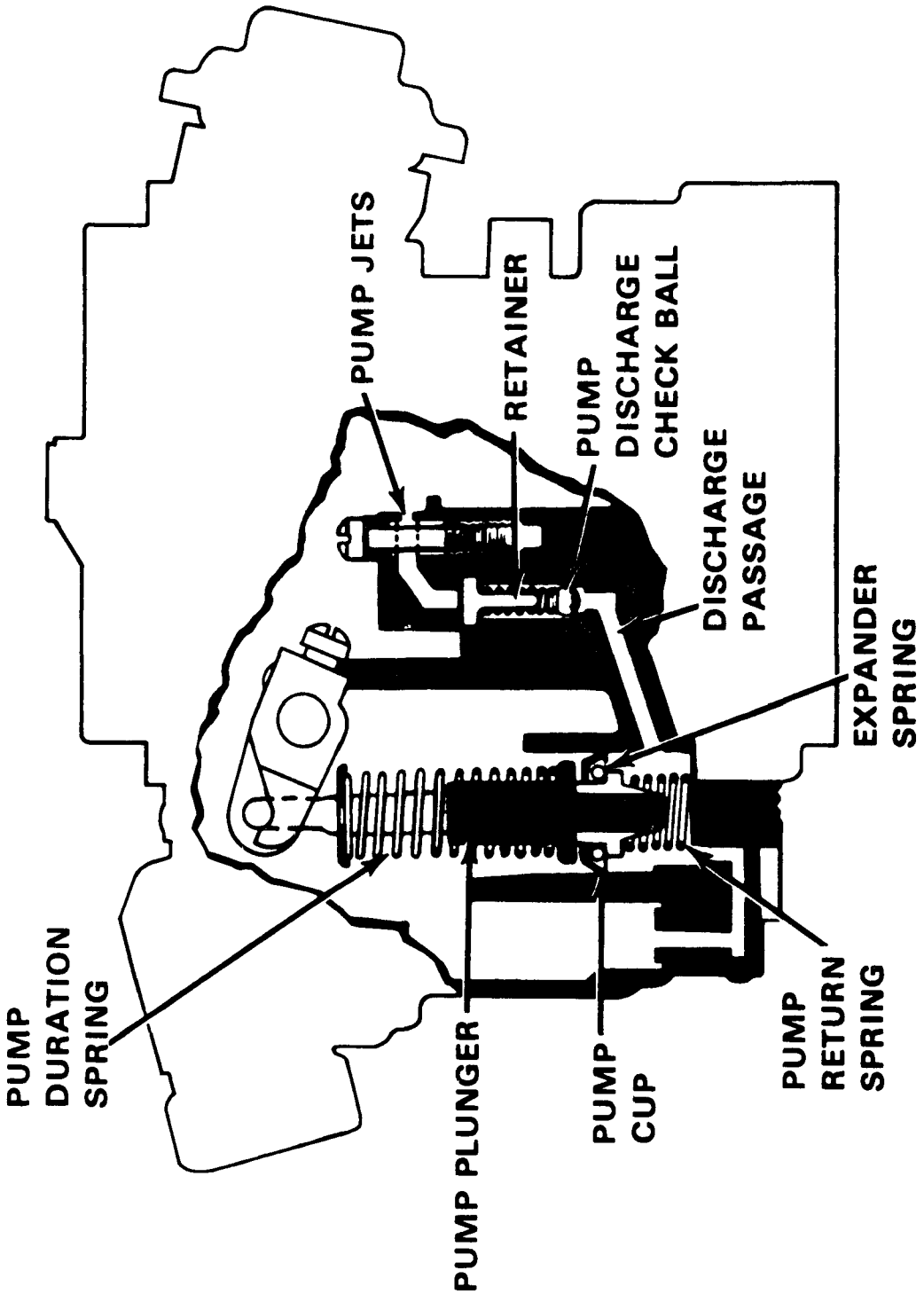

FLOAT SYSTEM

EXAMPLE 8

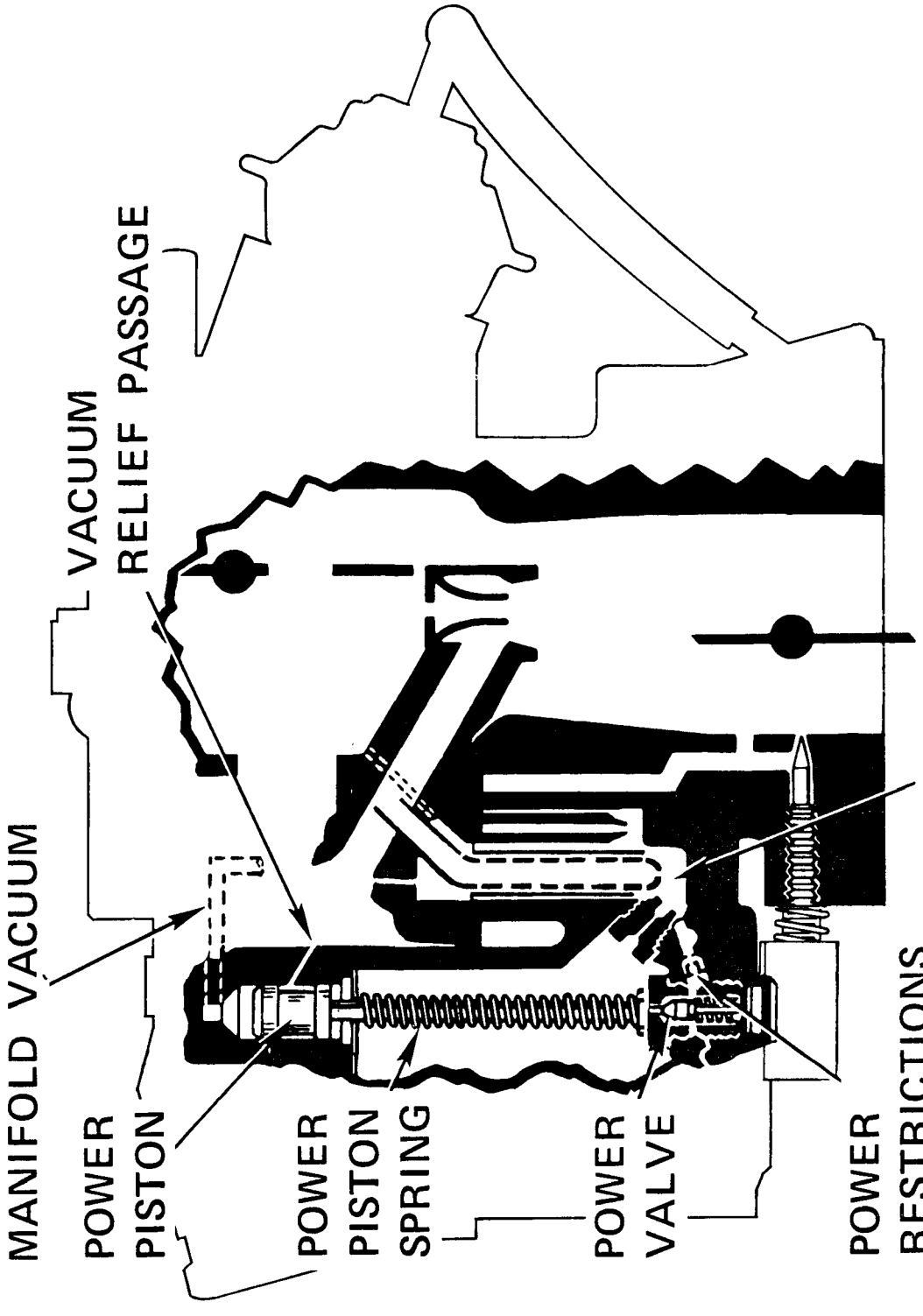

IDLE SYSTEM
*E.G.R. (EXHAUST GAS RECIRCULATION)
TIMED CANISTER PURGE
E.G.R. *VALVE TIMED VACUUM PORTS
OFF IDLE
THROTTLE VALVE
IDLE AIR BLEEDS
IDLE DISCHARGE HOLE
IDLE RESTRICTION
IDLE PASSAGE
IDLE TUBE
MAIN METERING JETS
*E.G.R. TUBE
OFF IDLE DISCHARGE PORTS
IDLE NEEDLE



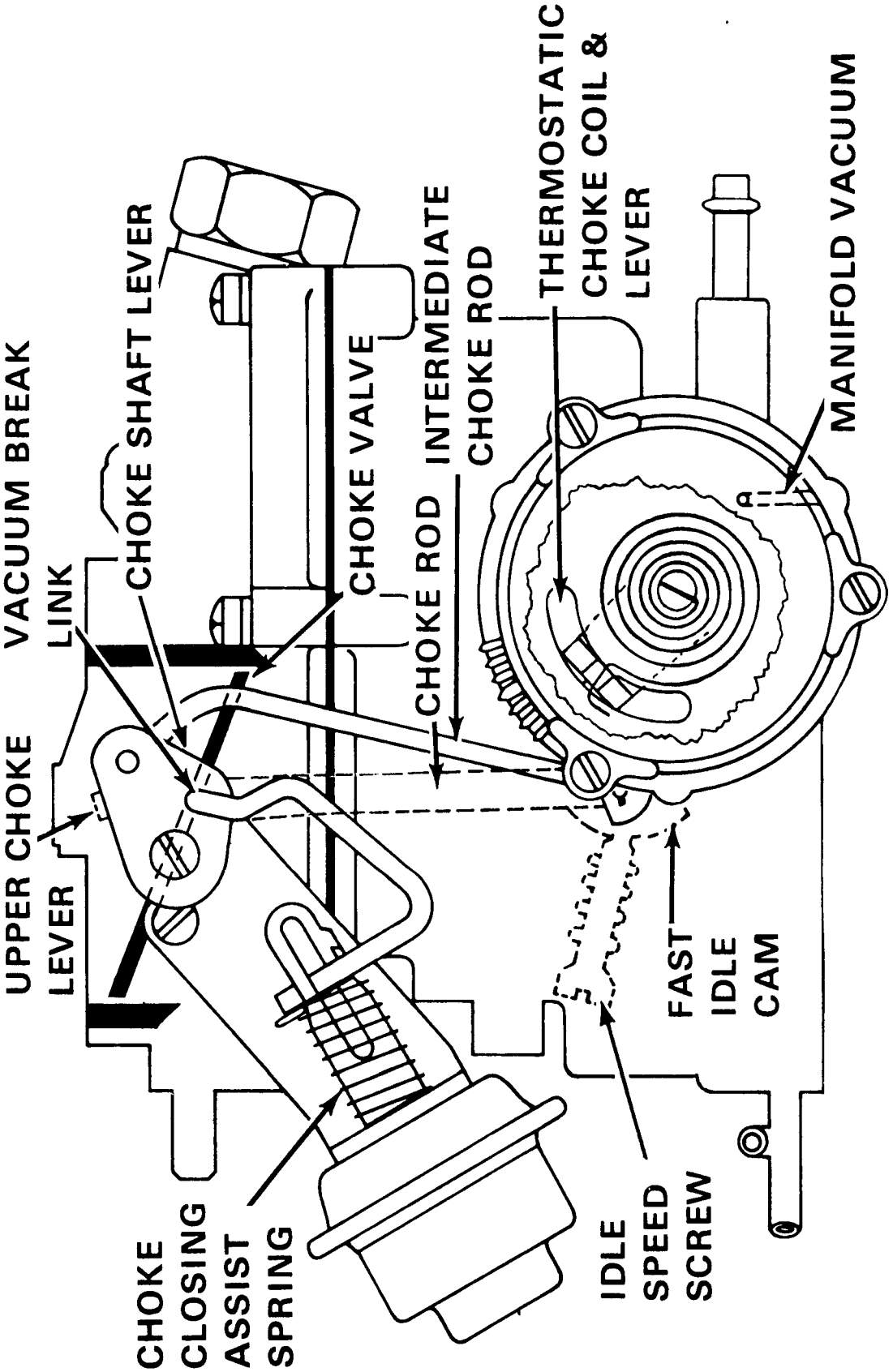

MAIN METERING SYSTEM


PUMP JETS
RETAINER
PUMP DISCHARGE CHECK BALL
DISCHARGE PASSAGE
EXPANDER SPRING
PUMP DURATION SPRING
PUMP PLUNGER
PUMP CUP
PUMP RETURN SPRING

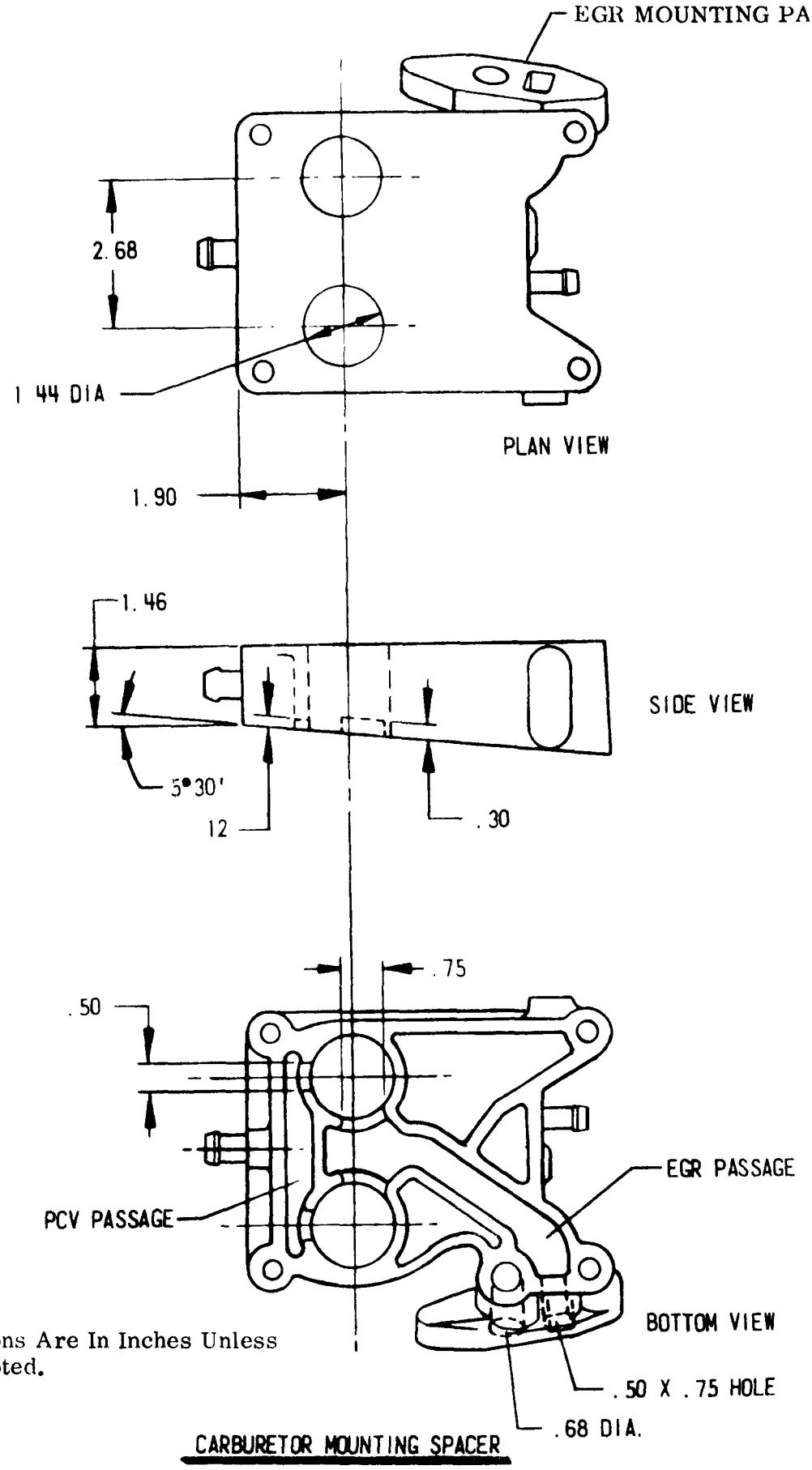
PUMP SYSTEM




POWER SYSTEM



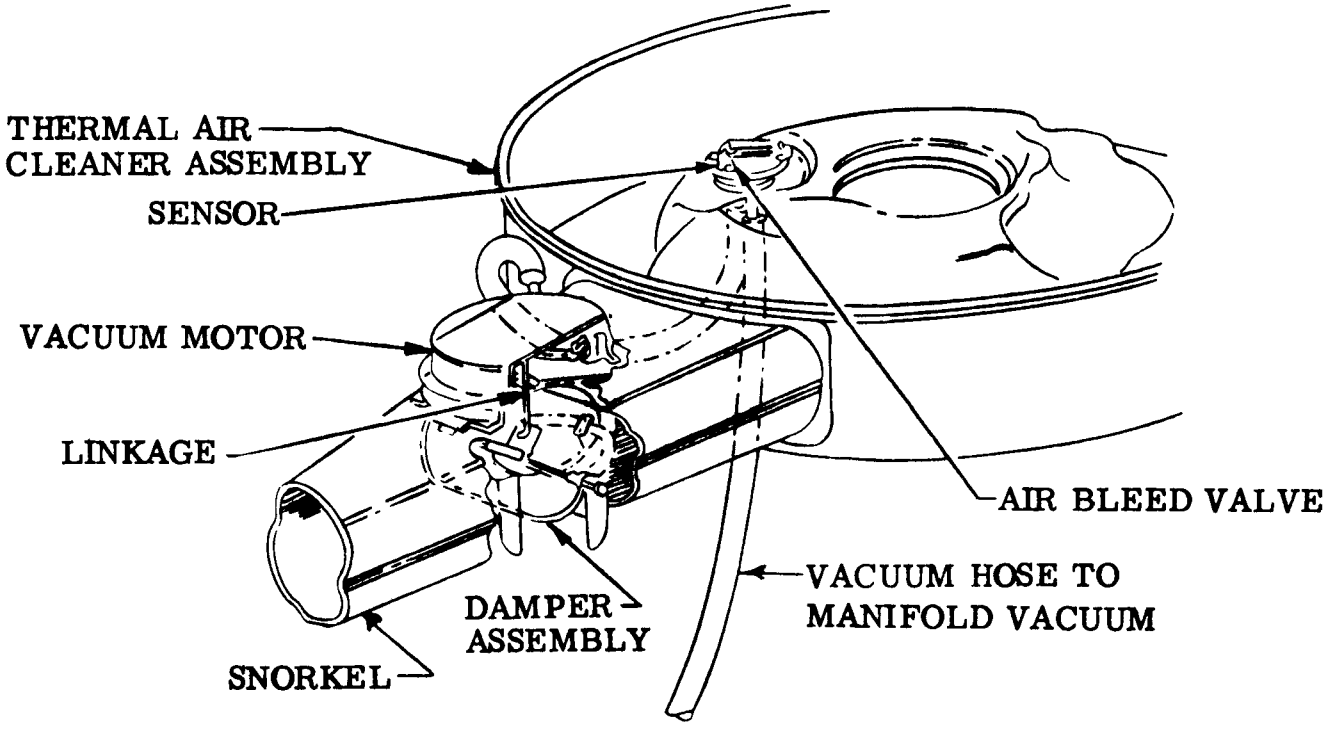

CHOKE SYSTEM

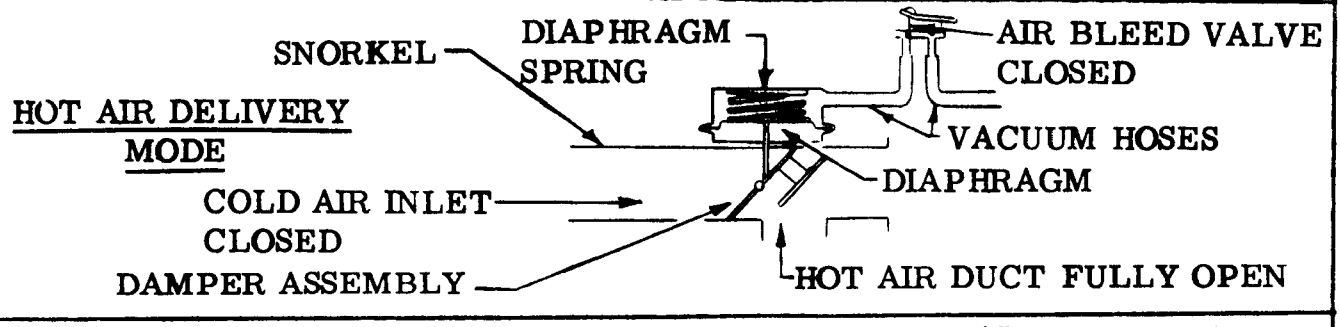


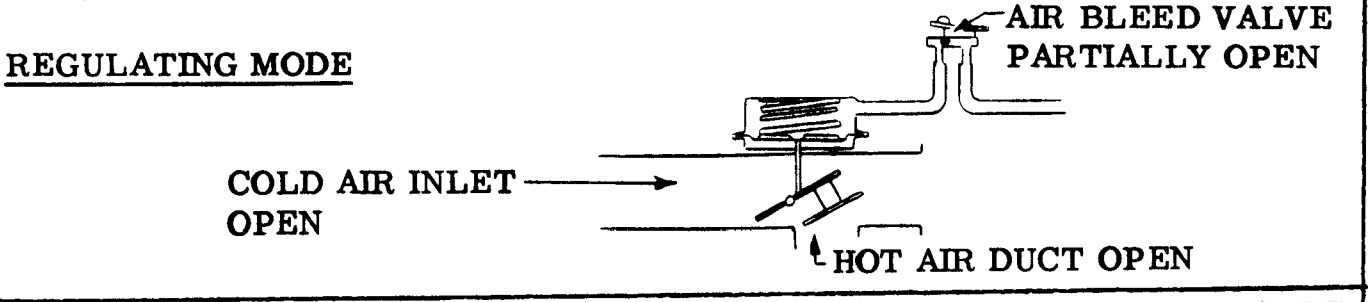

NOTE:
All Dimensions Are In Inches Unless Otherwise Noted.

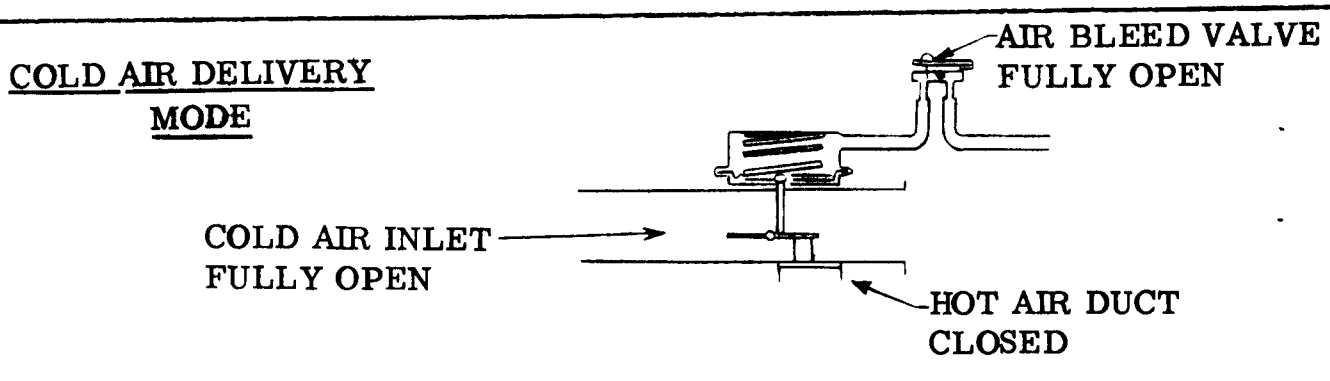
CARBURETOR MOUNTING SPACER

AIR CLEANER CONFIGURATION - TEMPERATURE CONTROL

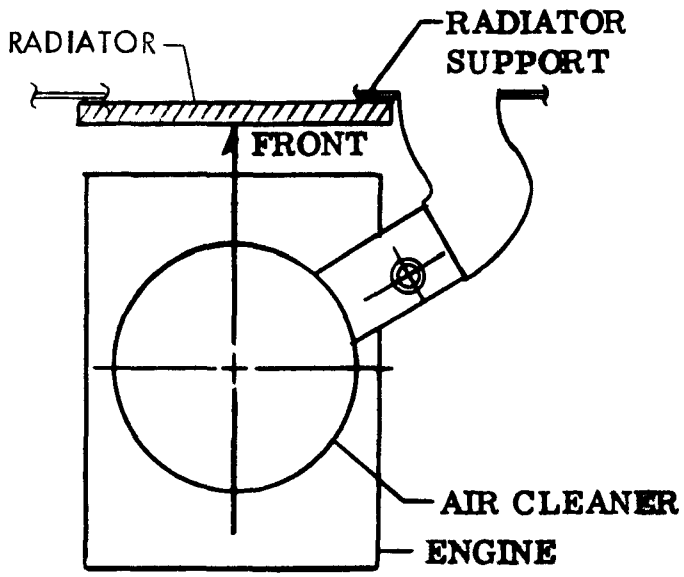


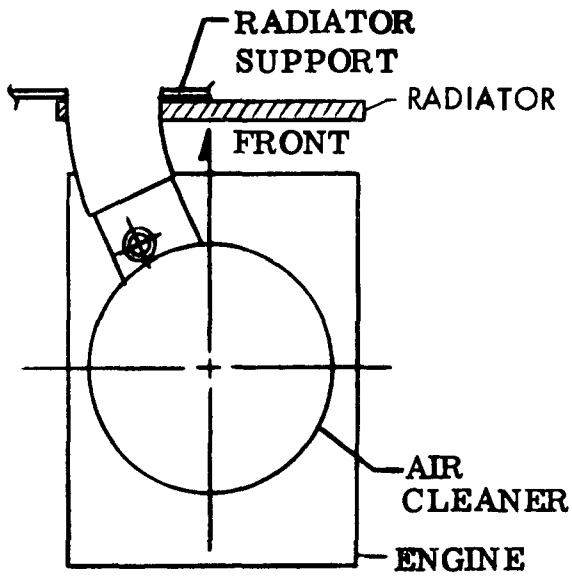



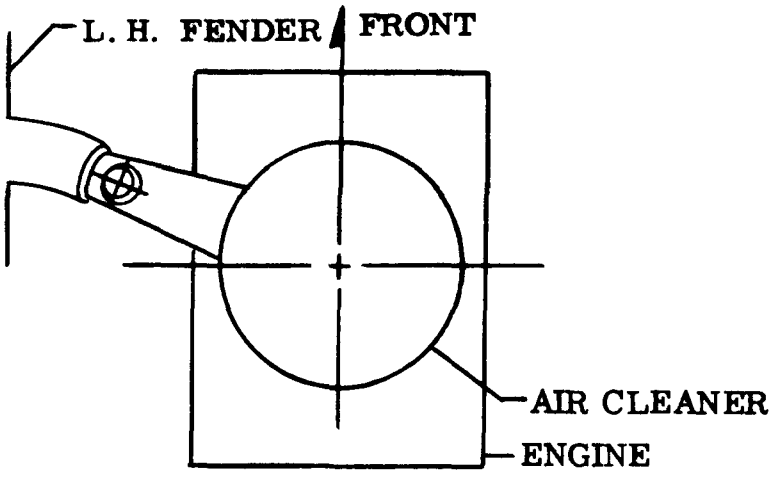



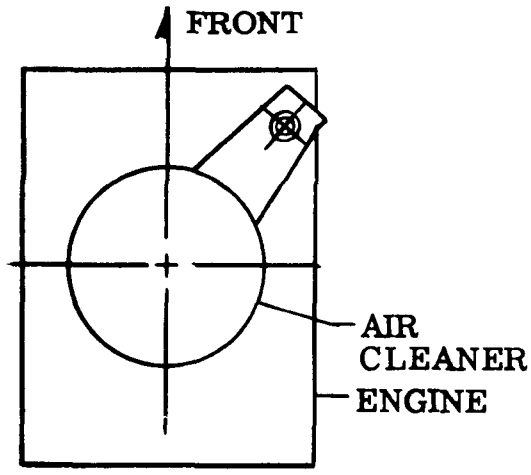



## COLD AIR INLET SYSTEM CONFIGURATION

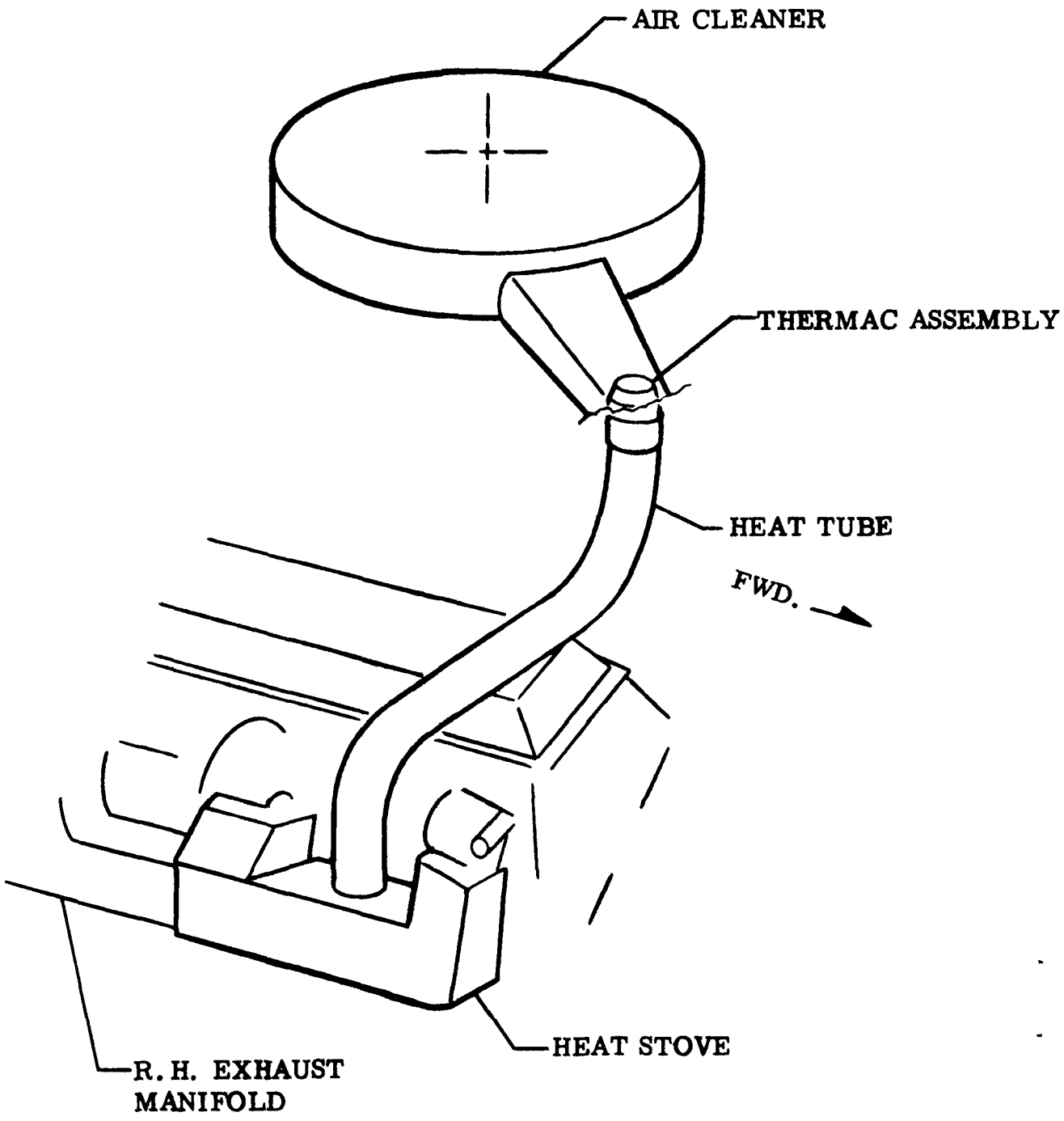


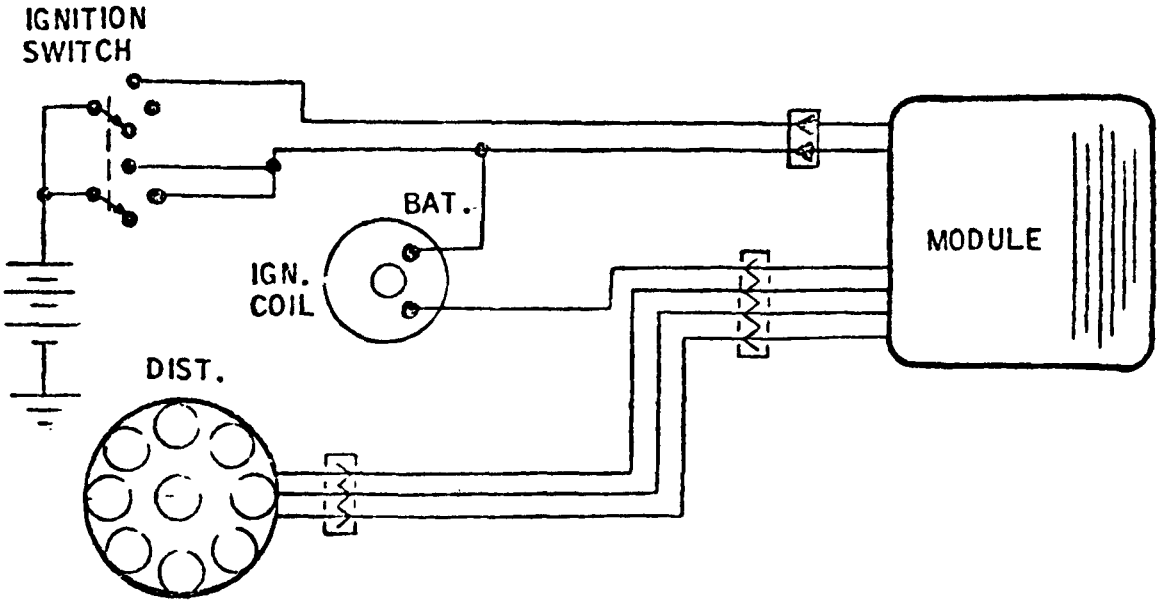



## HOT AIR INLET SYSTEM CONFIGURATION

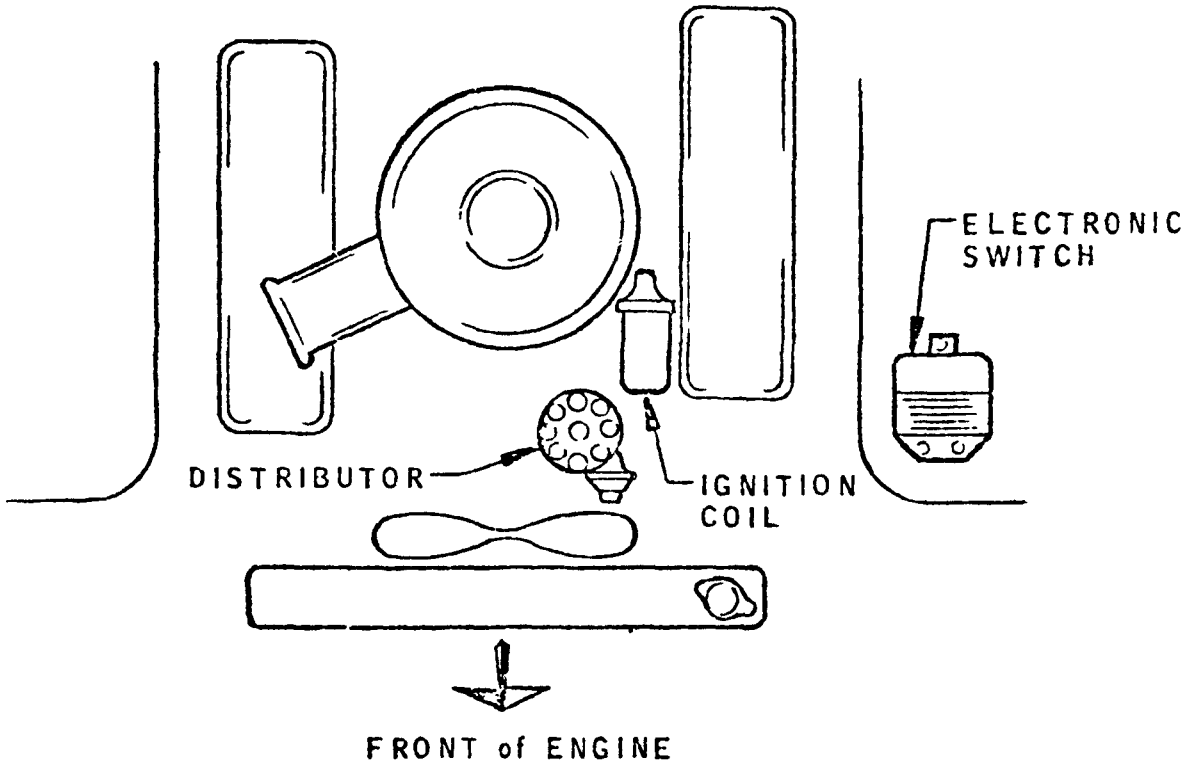


EXAMPLE 17

WIRING DIAGRAM - Breakerless- Ignition System

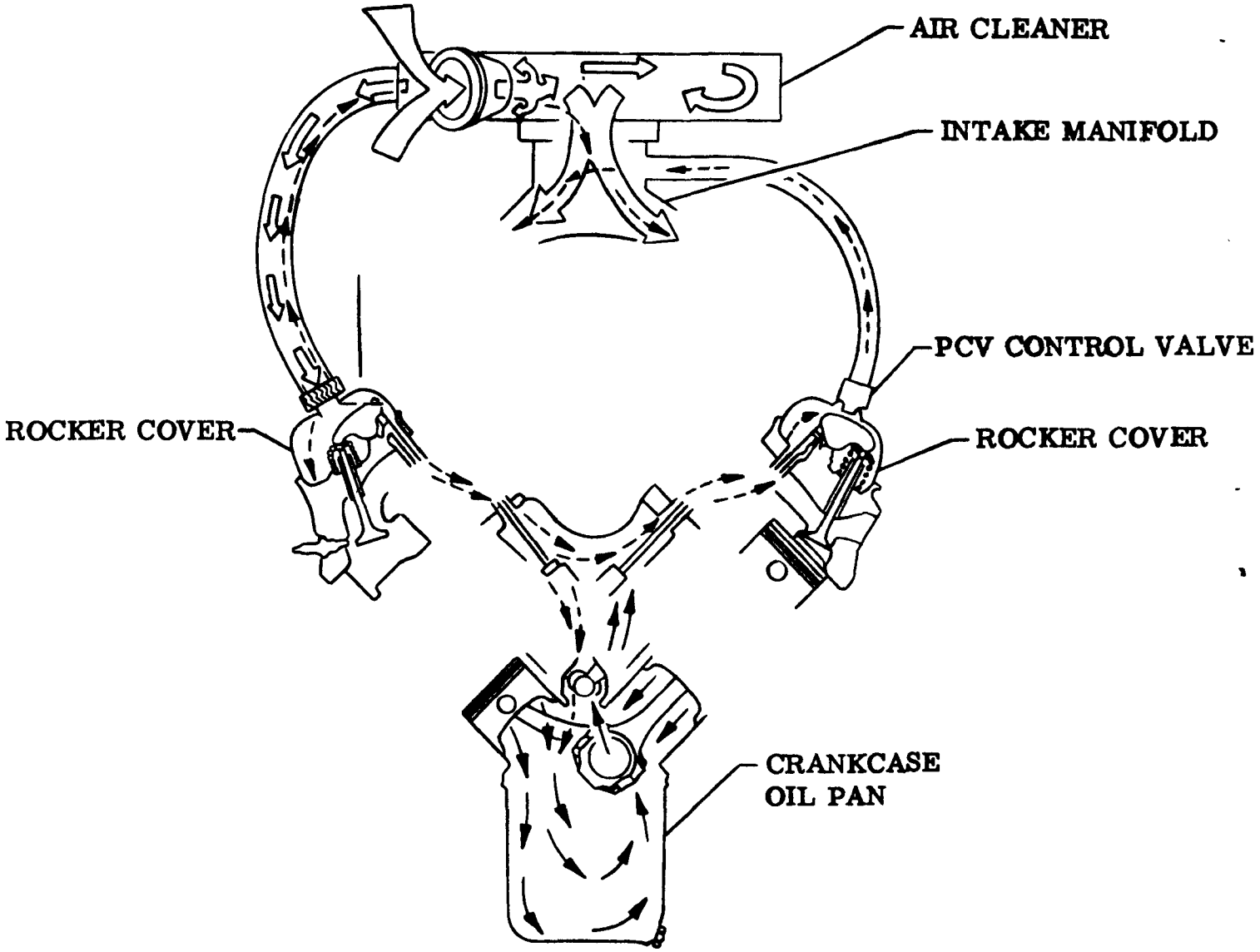



TYPICAL INSTALLATION DIAGRAM



# POSITIVE CRANKCASE VENTILATION SYSTEM SCHEMATIC

## -V8-



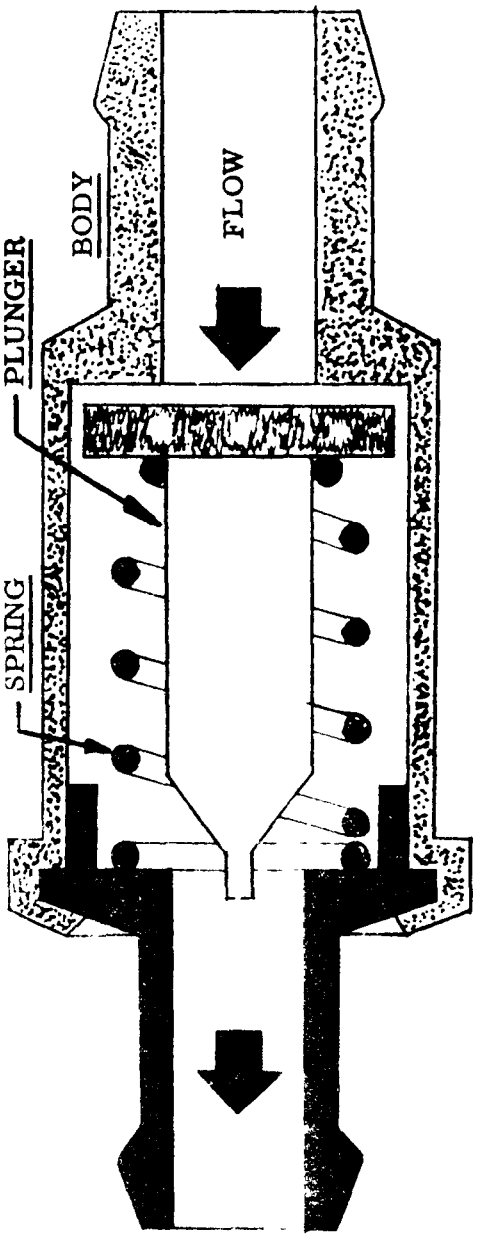

⇨ CLEAN AIR

—► VOLATILE OIL FUMES

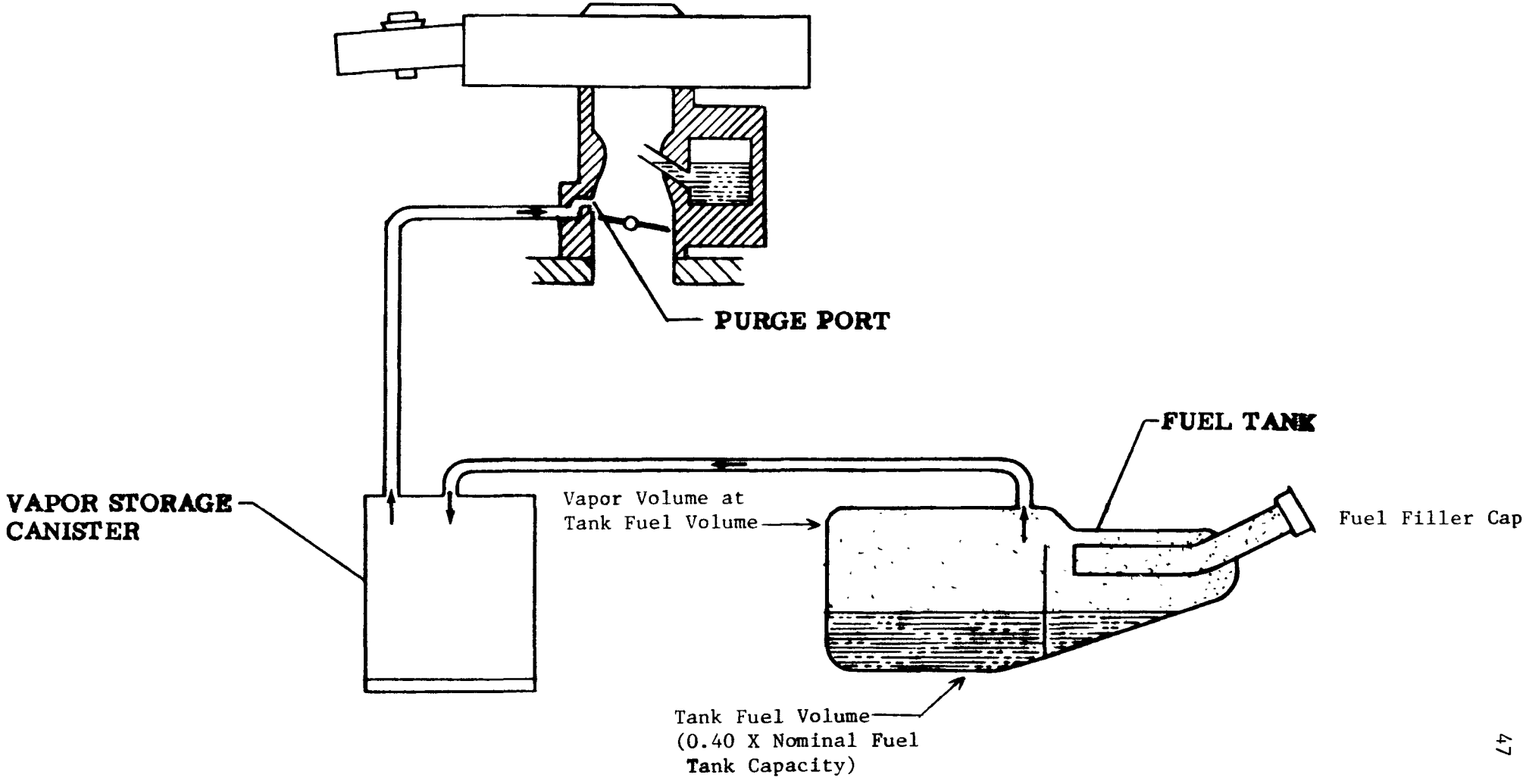
- - -► MIXTURE OF AIR AND FUMES

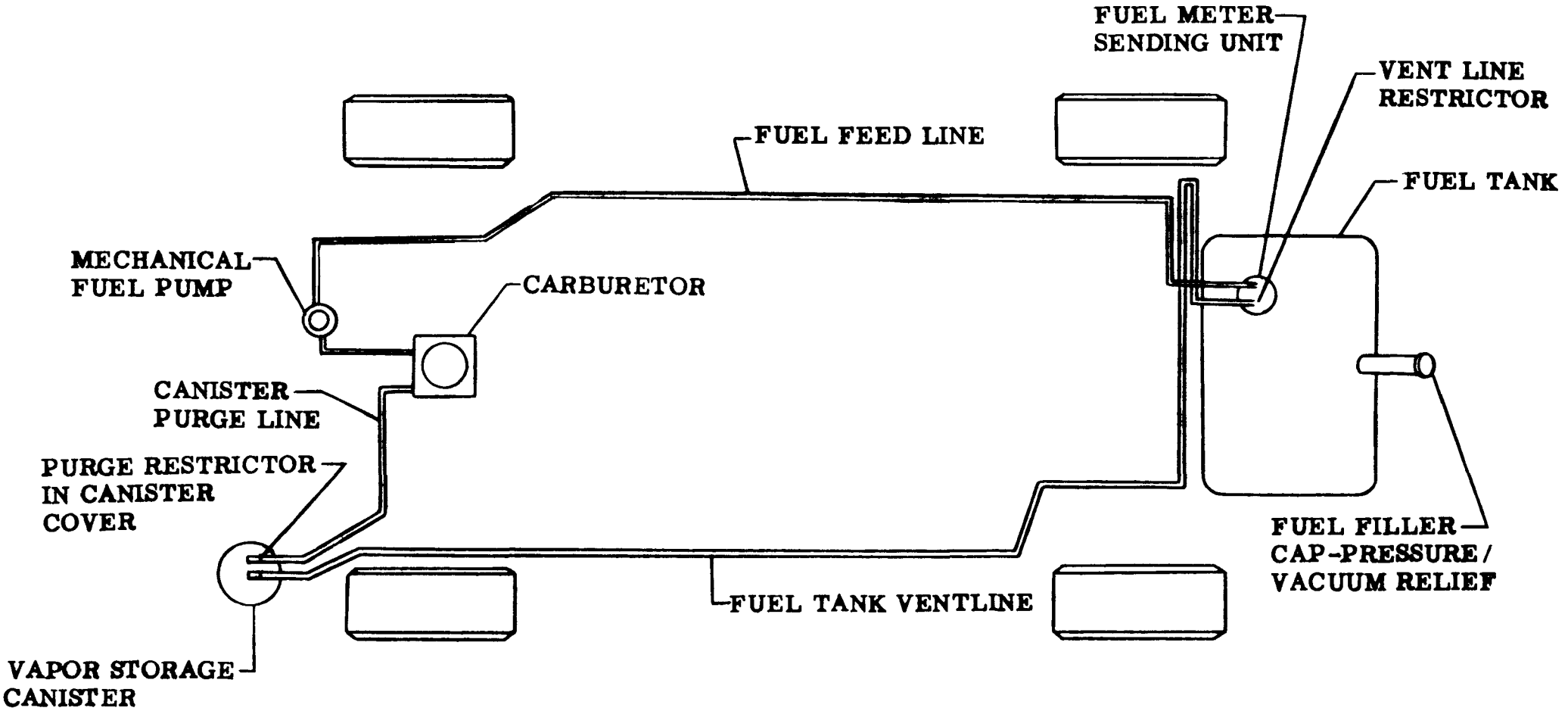
EXAMPLE 19

CRANKCASE VENTILATION SYSTEM
CONTROL VALVE



## EVAPORATIVE EMISSION CONTROL SYSTEM SCHEMATIC
## WITHOUT CARBURETOR BOWL VENT LINE



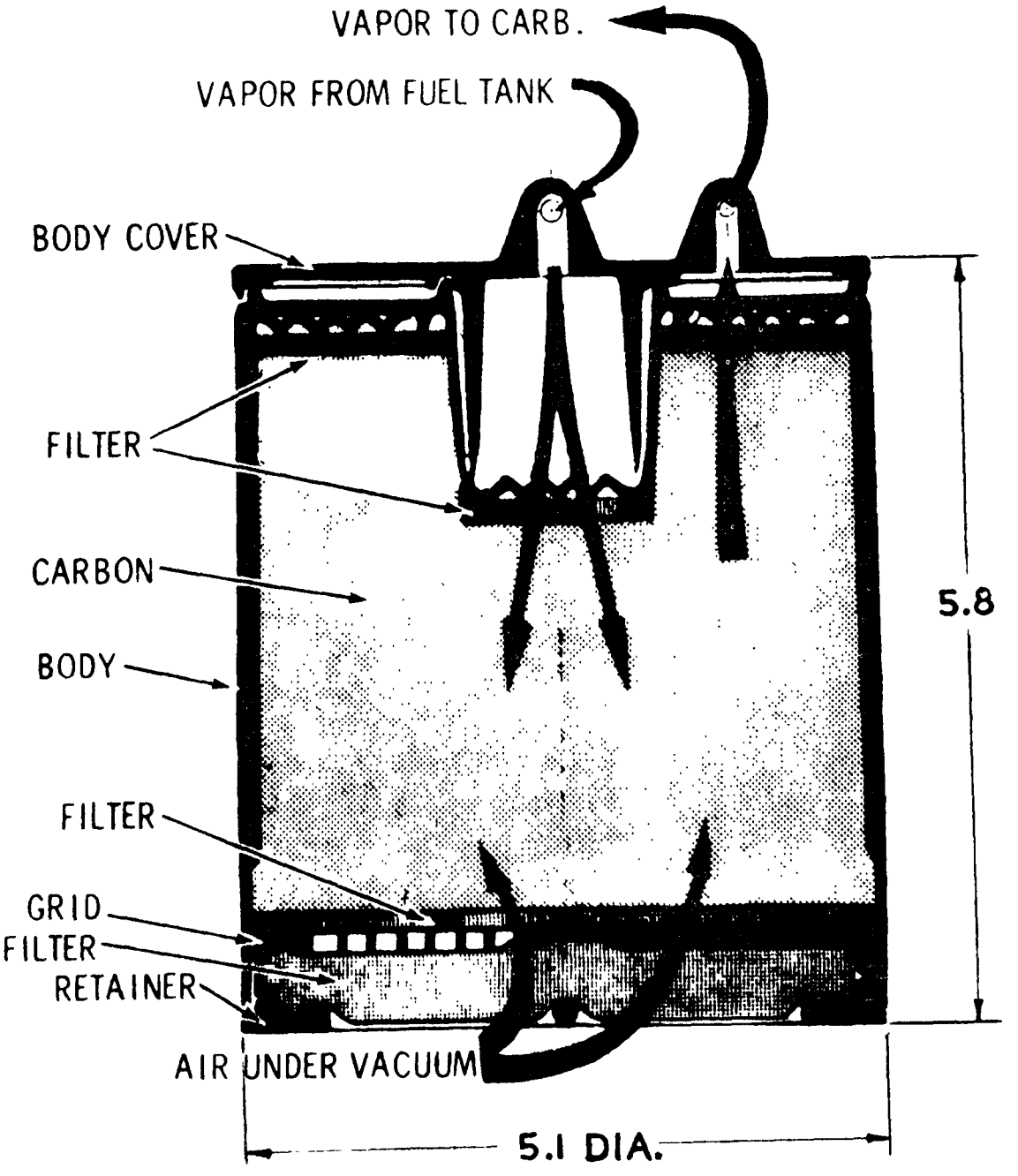



**FUEL AND EVAP SYSTEM SCHEMATIC-COMPONENT LOCATIONS**

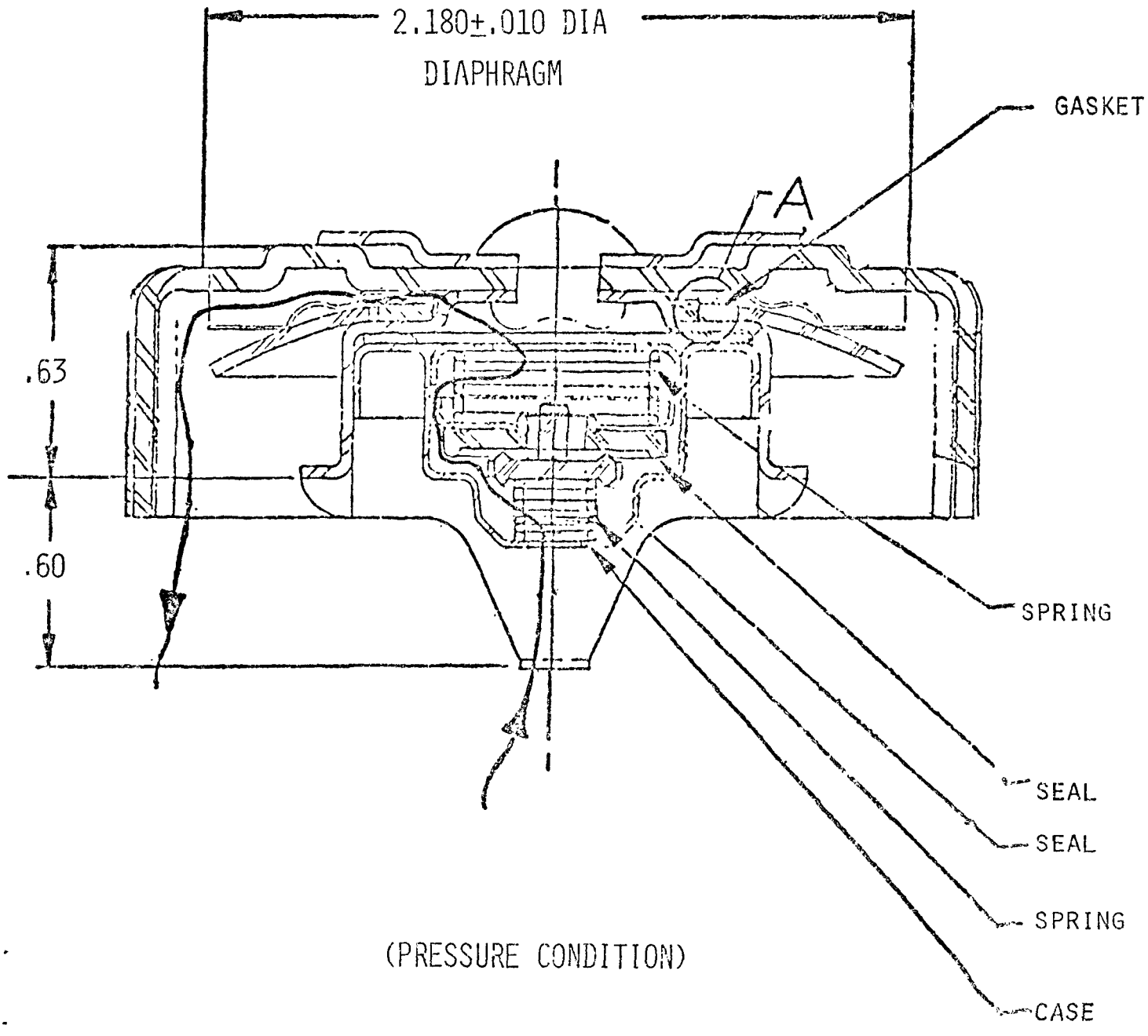
EXAMPLE 22

EVAPORATIVE EMISSION CANISTER CONFIGURATION

NOTE: All dimensions are given in inches.

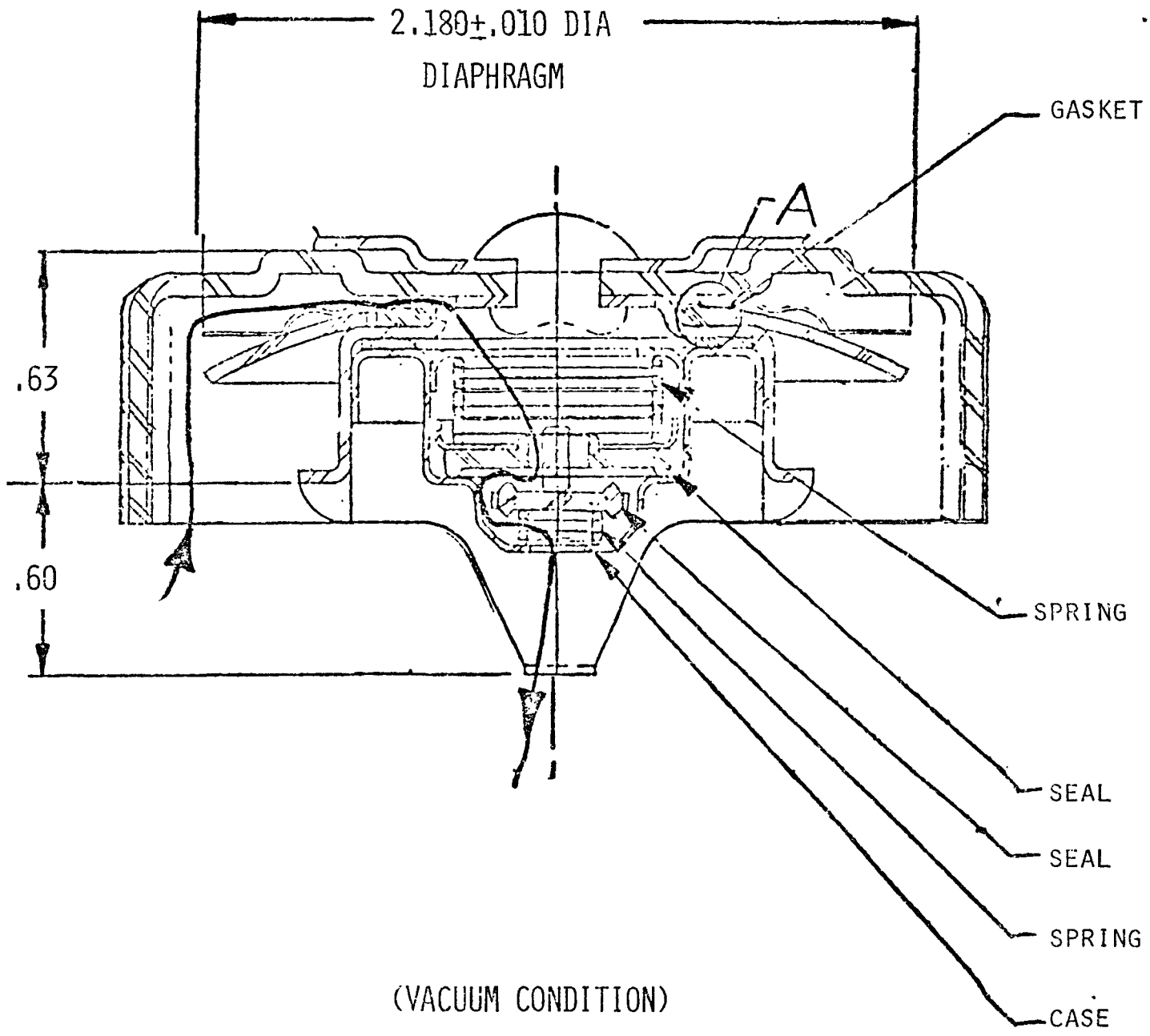


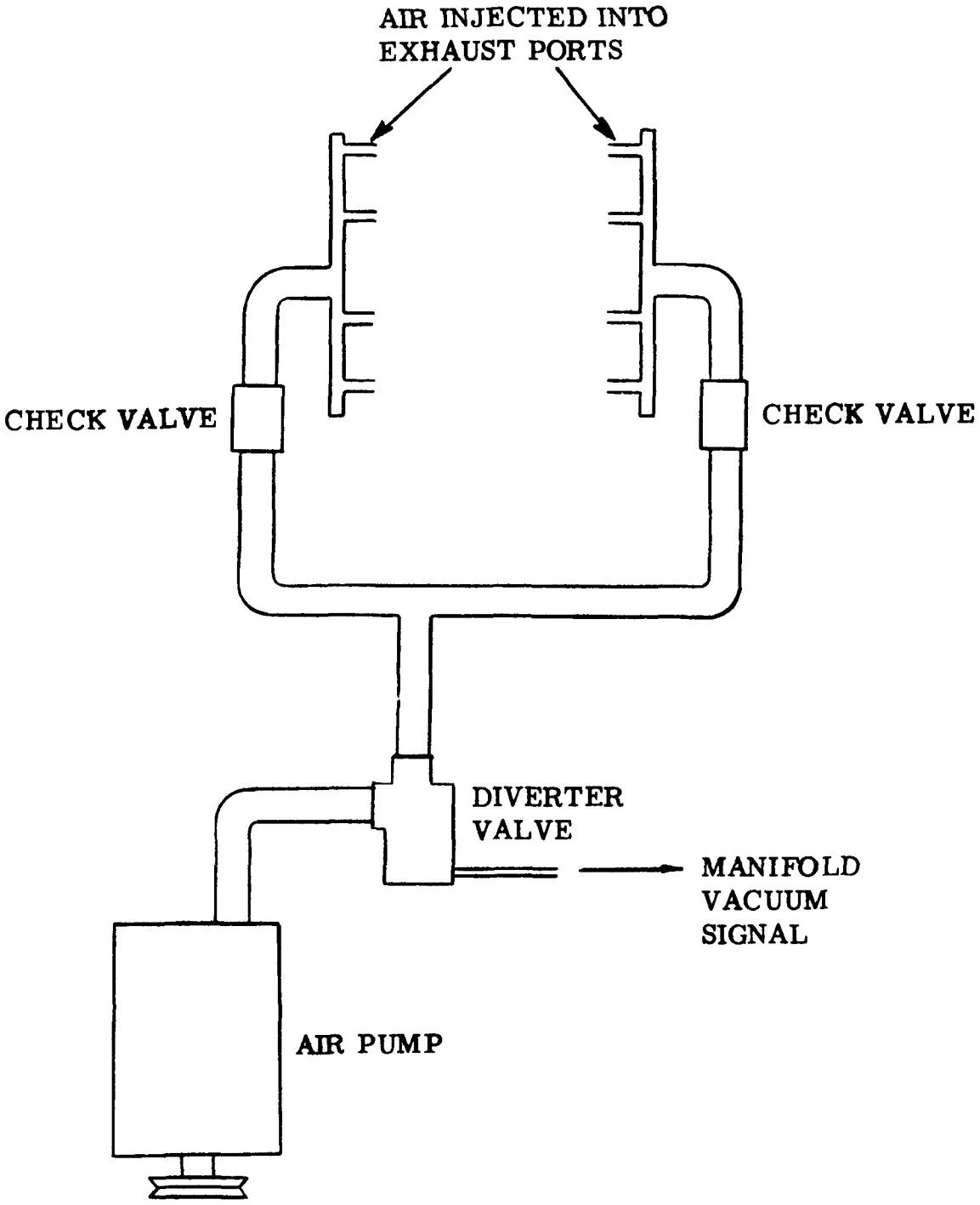
FUEL FILLER CAP




(PRESSURE CONDITION)

FUEL FILLER CAP



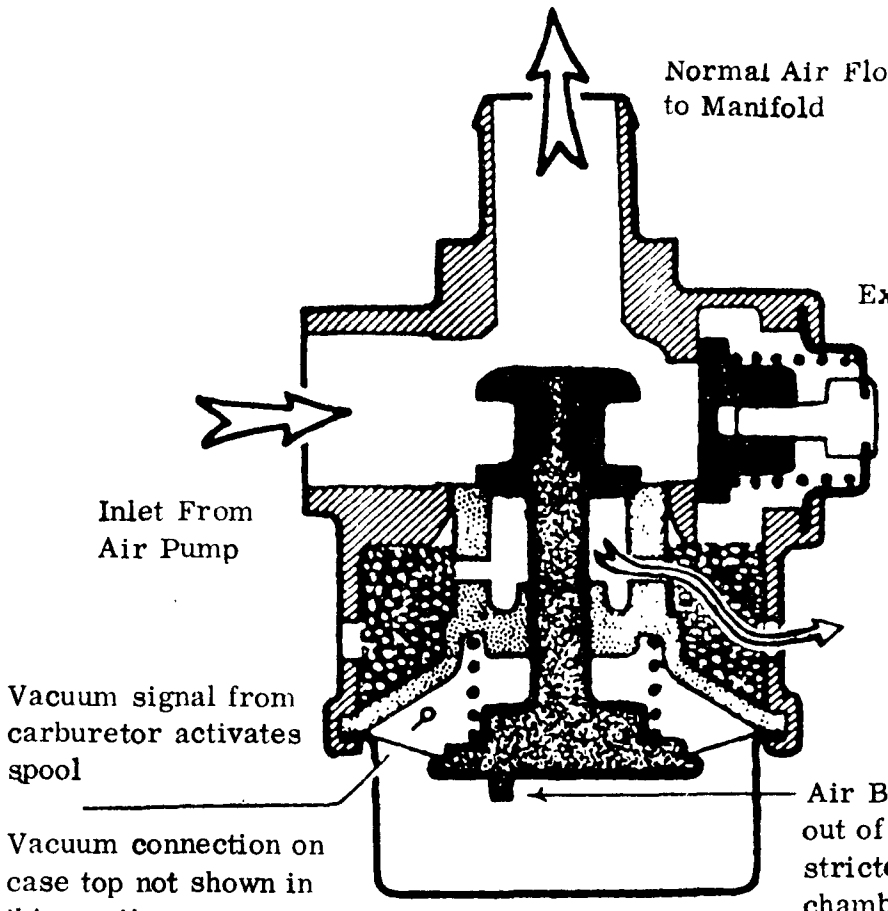



AIR SYSTEM SCHEMATIC

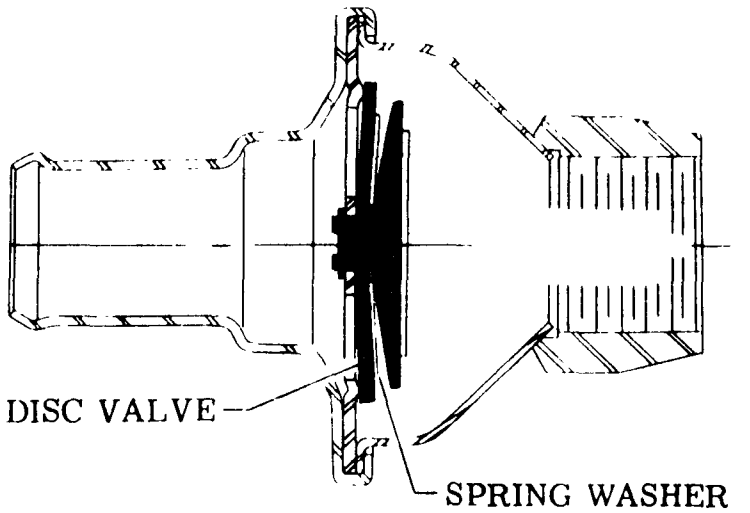
— V8 ENGINE - MANIFOLD INJECTION —

EXAMPLE 26

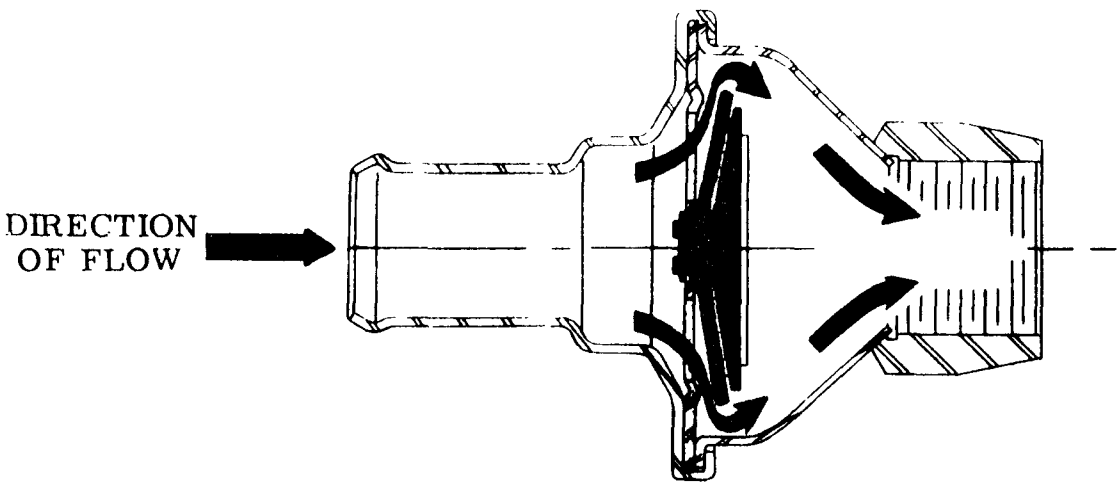
# A.I.R. DIVERTER VALVE



# A.I.R. CHECK VALVE

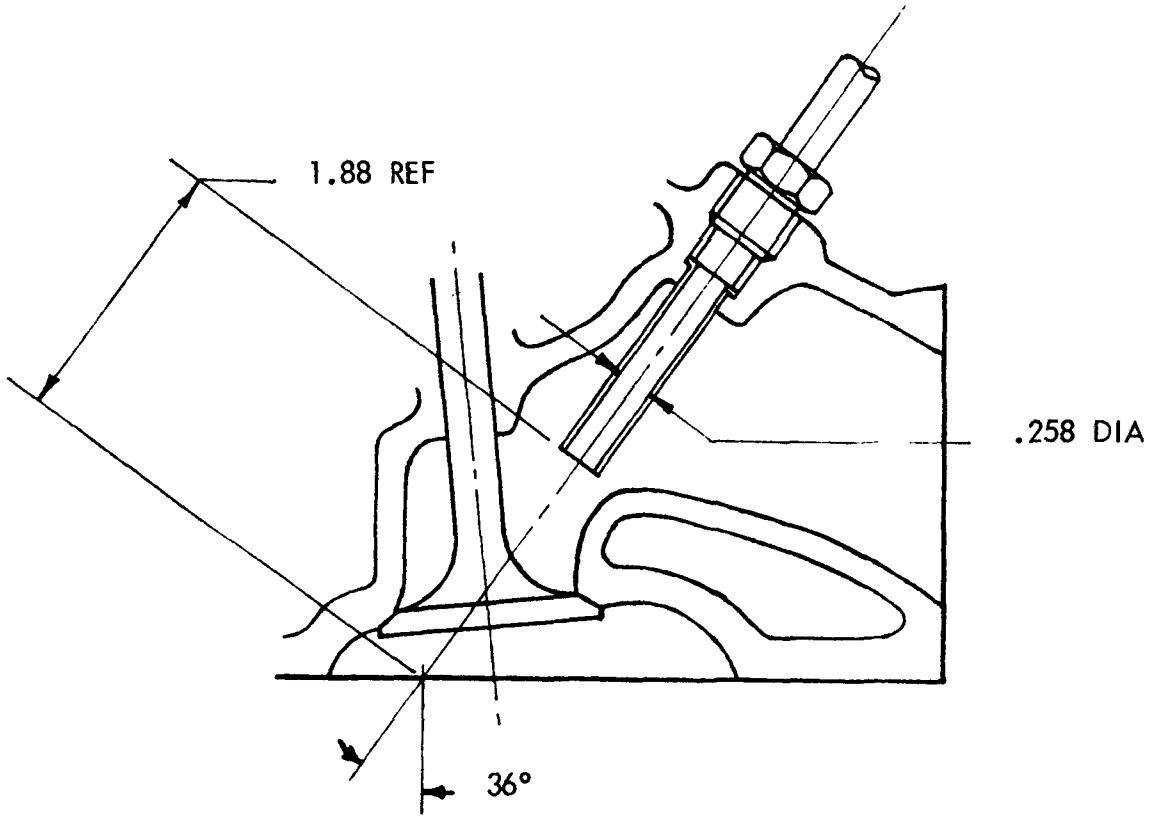



VIEW 1 (NO FLOW)

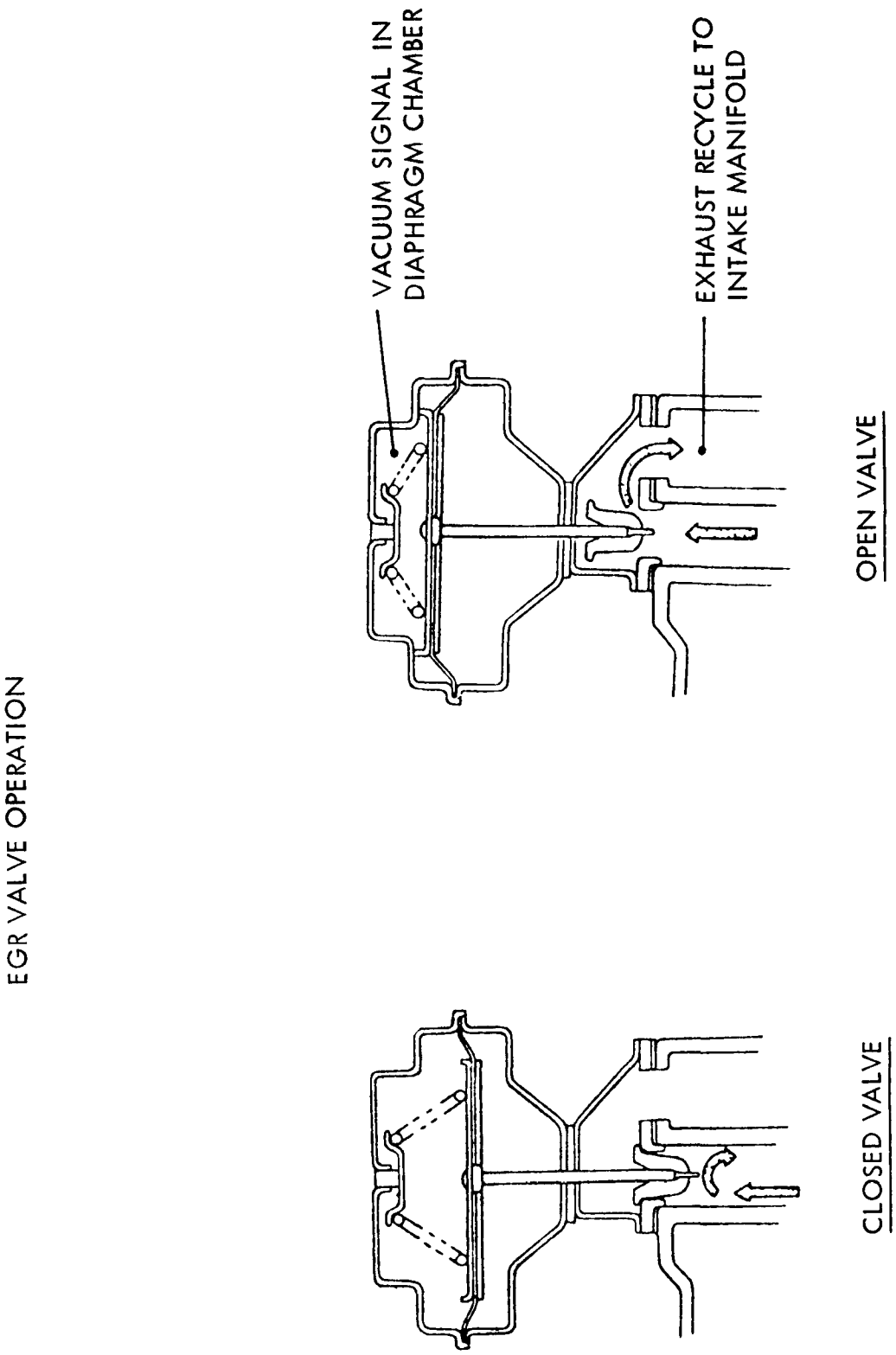



VIEW 2 (FLOW)

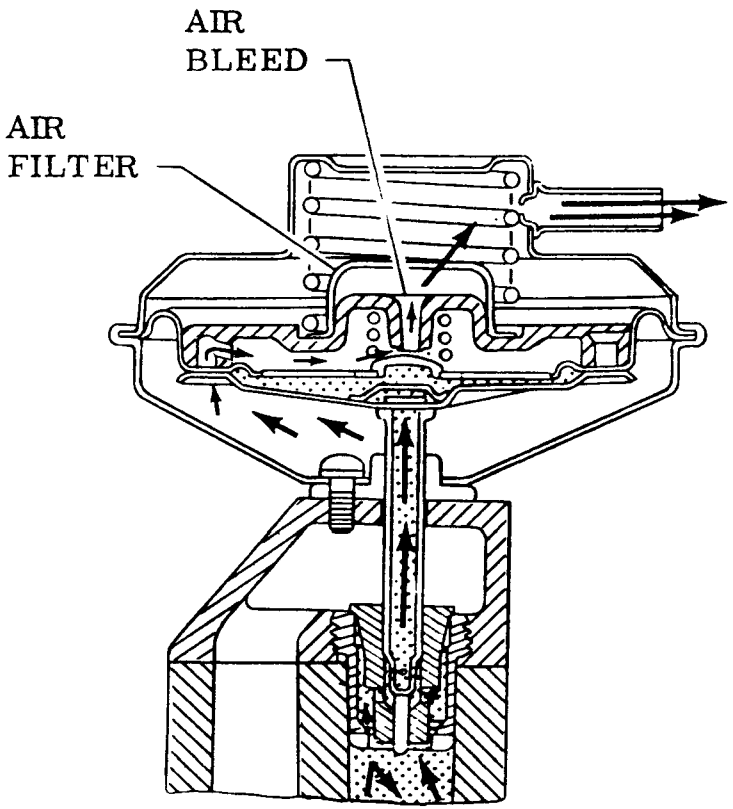
# A.I.R. INJECTION CONFIGURATION AT EXHAUST PORT




LINEAR DIMENSIONS IN INCHES.

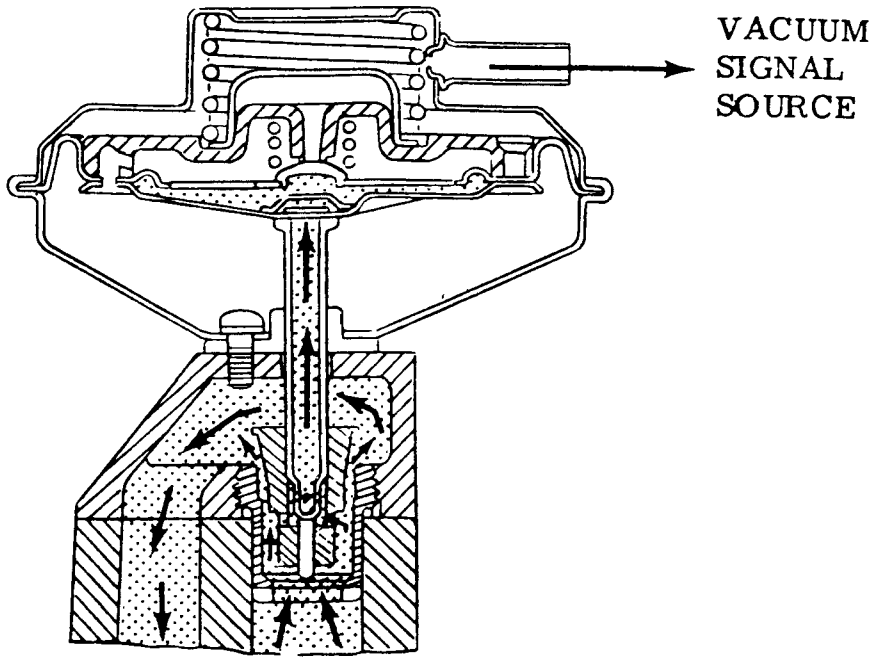

EGR VALVE OPERATION
VACUUM SIGNAL IN DIAPHRAGM CHAMBER
EXHAUST RECYCLE TO INTAKE MANIFOLD
OPEN VALVE
CLOSED VALVE

EXHAUST PRESSURE
MODULATED EGR VALVE




EXHAUST
FROM
CROSS-OVER

EXHAUST PRESSURE BELOW
CONTROL VALUE



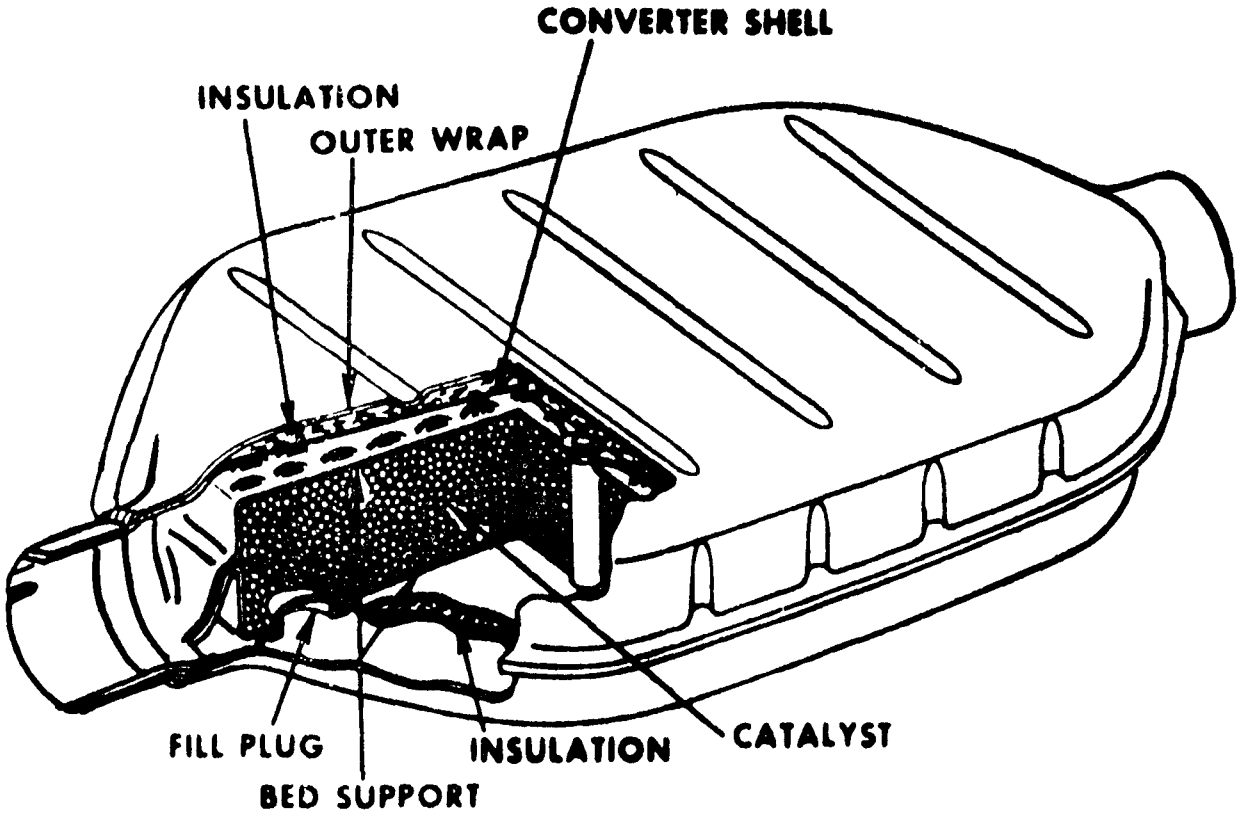

EXHAUST TO
INTAKE
MANIFOLD

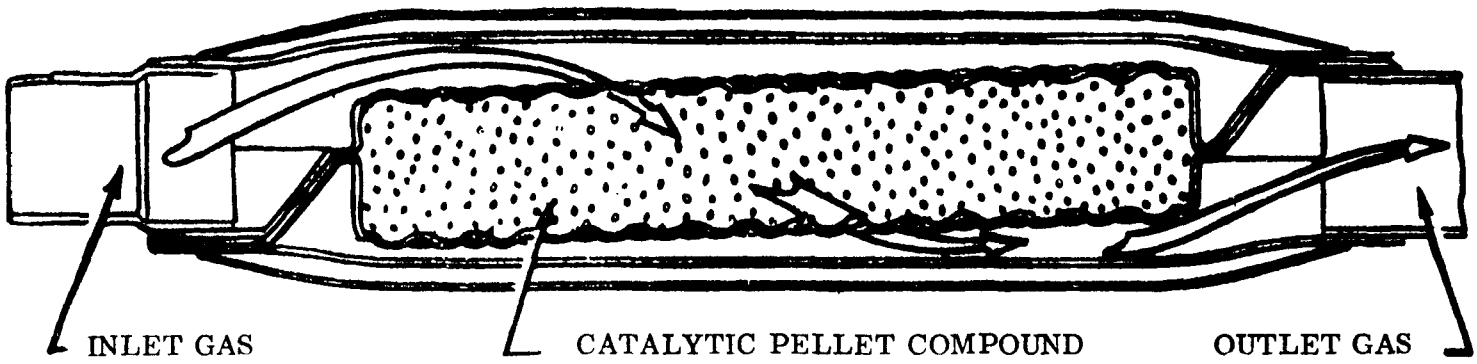
EXHAUST PRESSURE ABOVE
CONTROL VALUE

EXAMPLE 31

# UNDERFLOOR CONVERTER - FULL FLOW

## 260 CU. IN. BED VOLUME



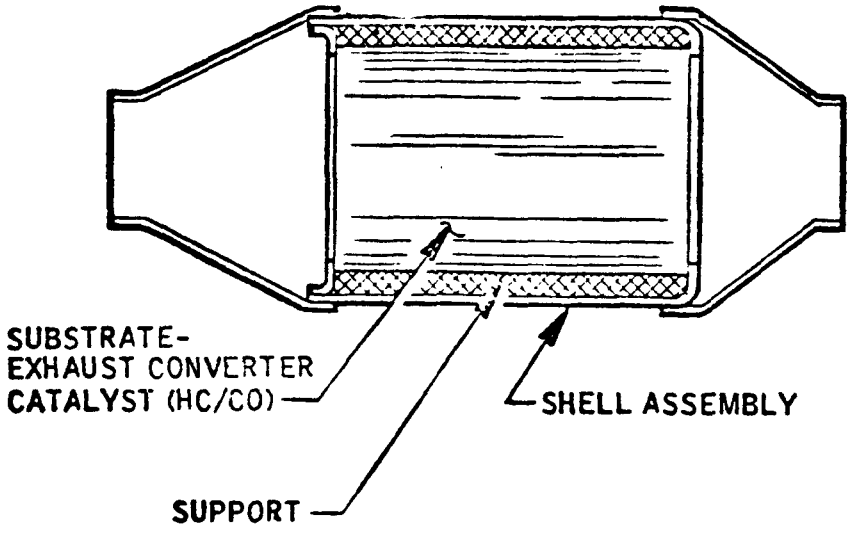




Nominal Converter Dimensions - Inches

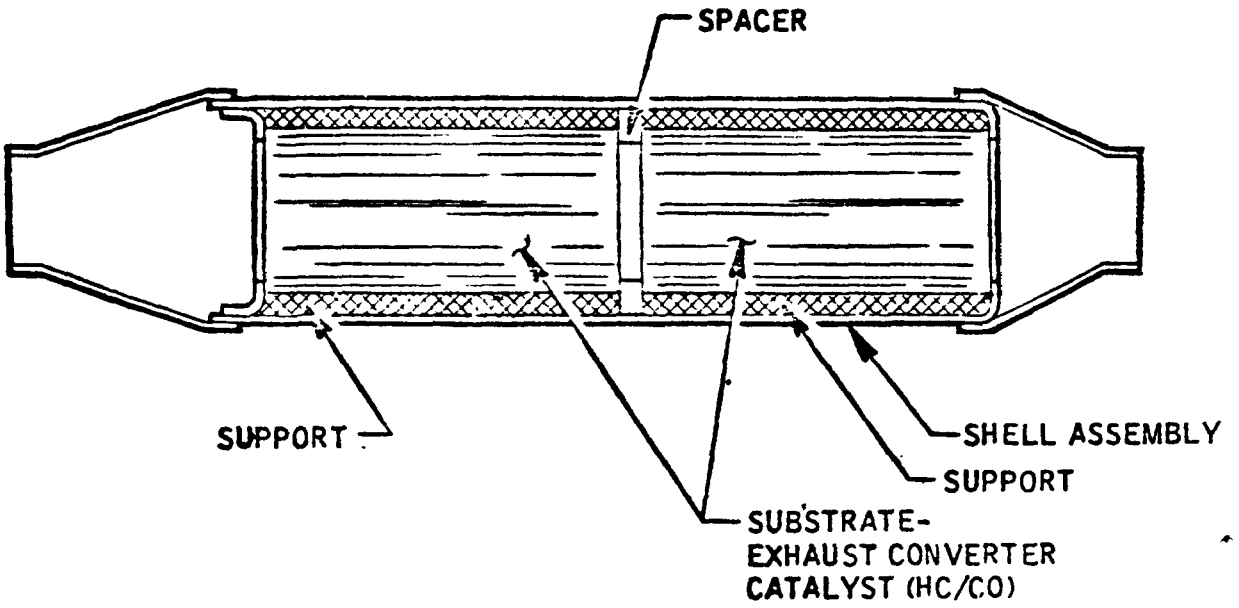
| | Converter Shell | Catalyst Bed |
|---|---|---|
| Overall Length | 18.7 | 11.8 |
| Overall Width | 12.4 | 11 |
| Overall Thickness | 3.5 | 2 |
| | Inlet Pipe | Outlet Pipe |
| Diameter | 2.5 | 2.5 |

## CATALYTIC CONVERTER ASSEMBLY

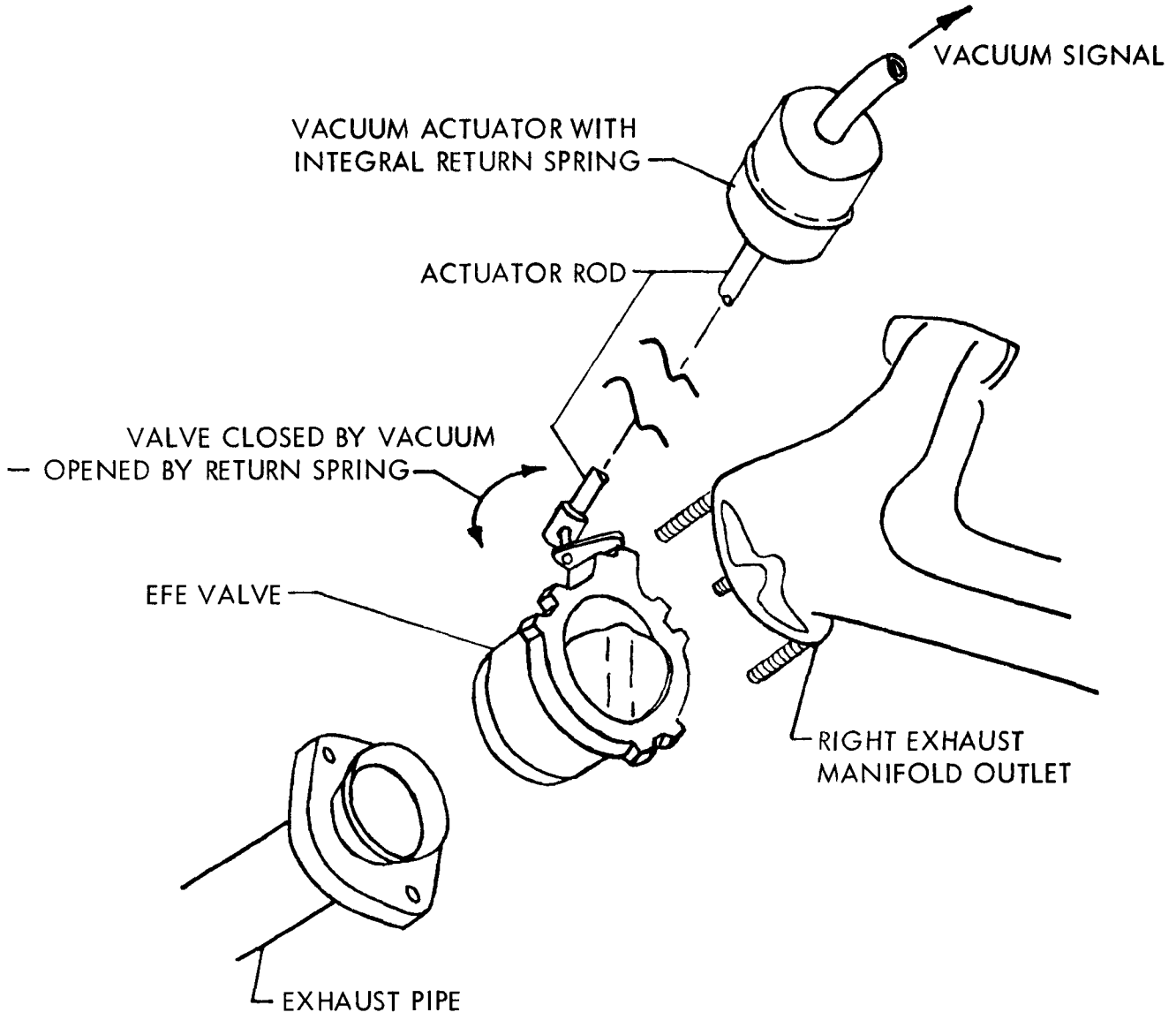
TYPICAL SINGLE SUBSTRATE CONVERTER




TYPICAL DUAL SUBSTRATE CONVERTER



## EFE VALVE CONFIGURATION



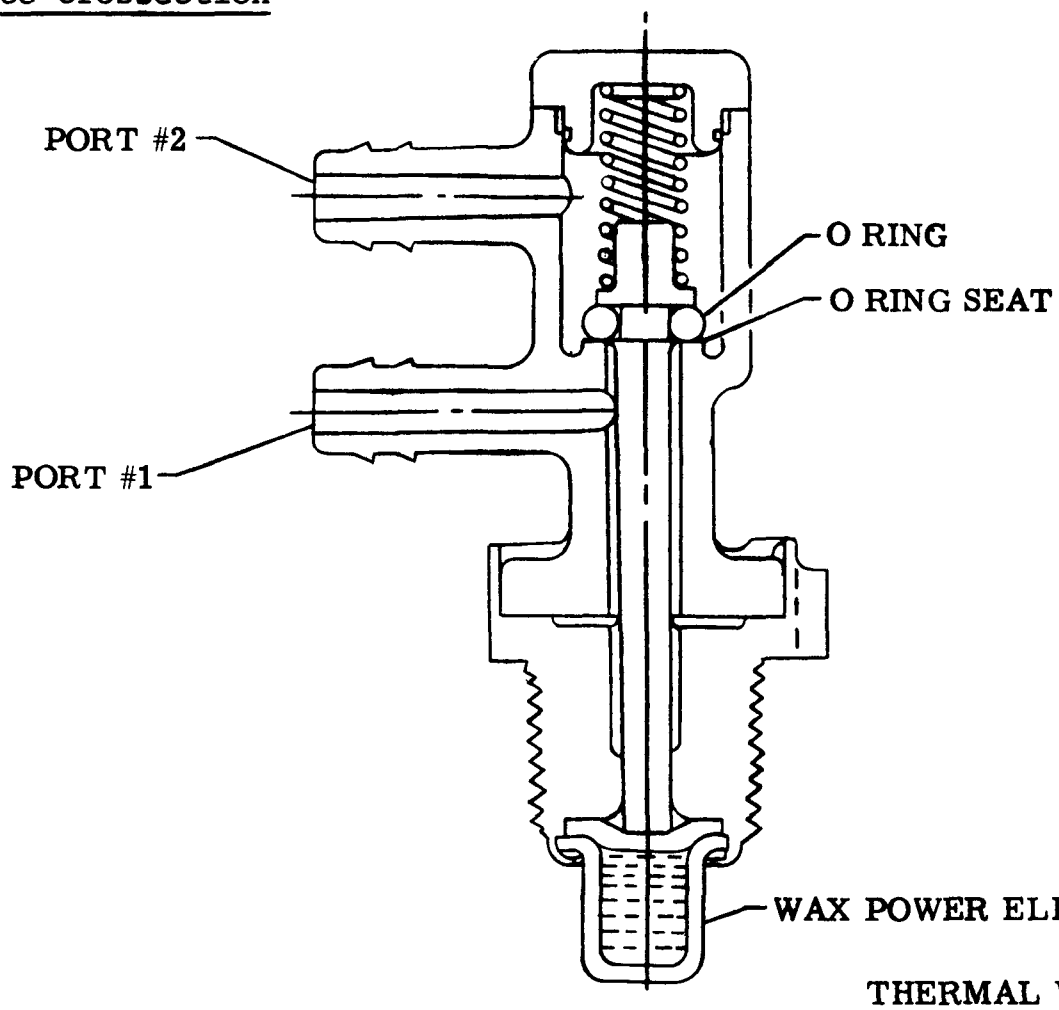
| Name | Part No. |
|---|---|
| DISTRIBUTOR SPARK ADVANCE TVS | |
| | Device Type: WAX PELLET THERMAL VACUUM SWITCH |
| Activation Value | Deactivation Value |

Comment on Operation

Below the calibration valve the O ring is seated by the spring. As the temperature of the wax power element is raised, the expanding wax forces the piston upward.

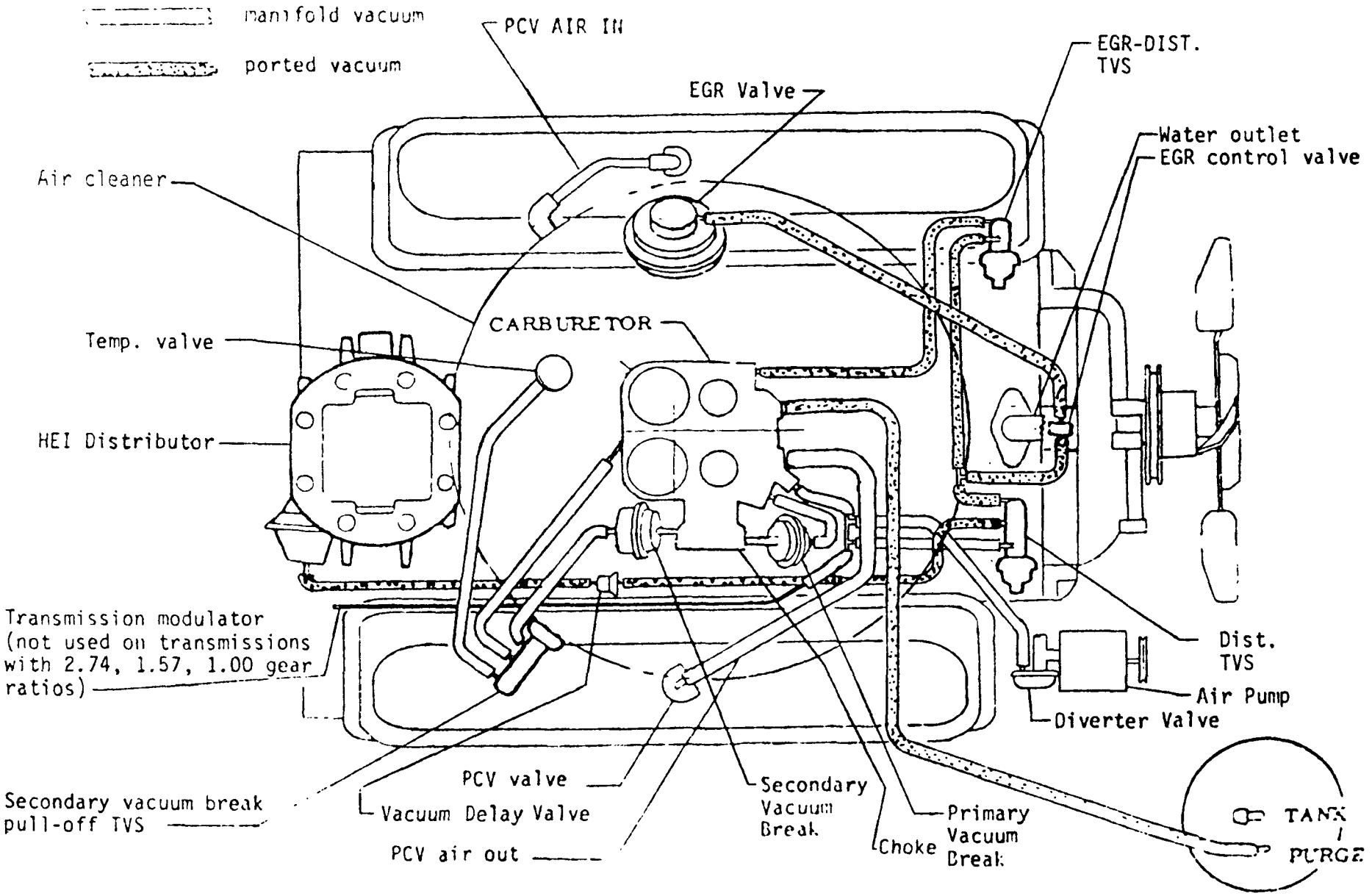
| Above Calibration Value | | | | | | | | Below Calibration Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Ports Connected | X | X | | | | | | Ports Connected | | | | | | | |
| Ports Sealed | | | | | | | | Ports Sealed | X | X | | | | | |

Device Crossection




THERMAL VACUUM SWITCH
TYPE 1

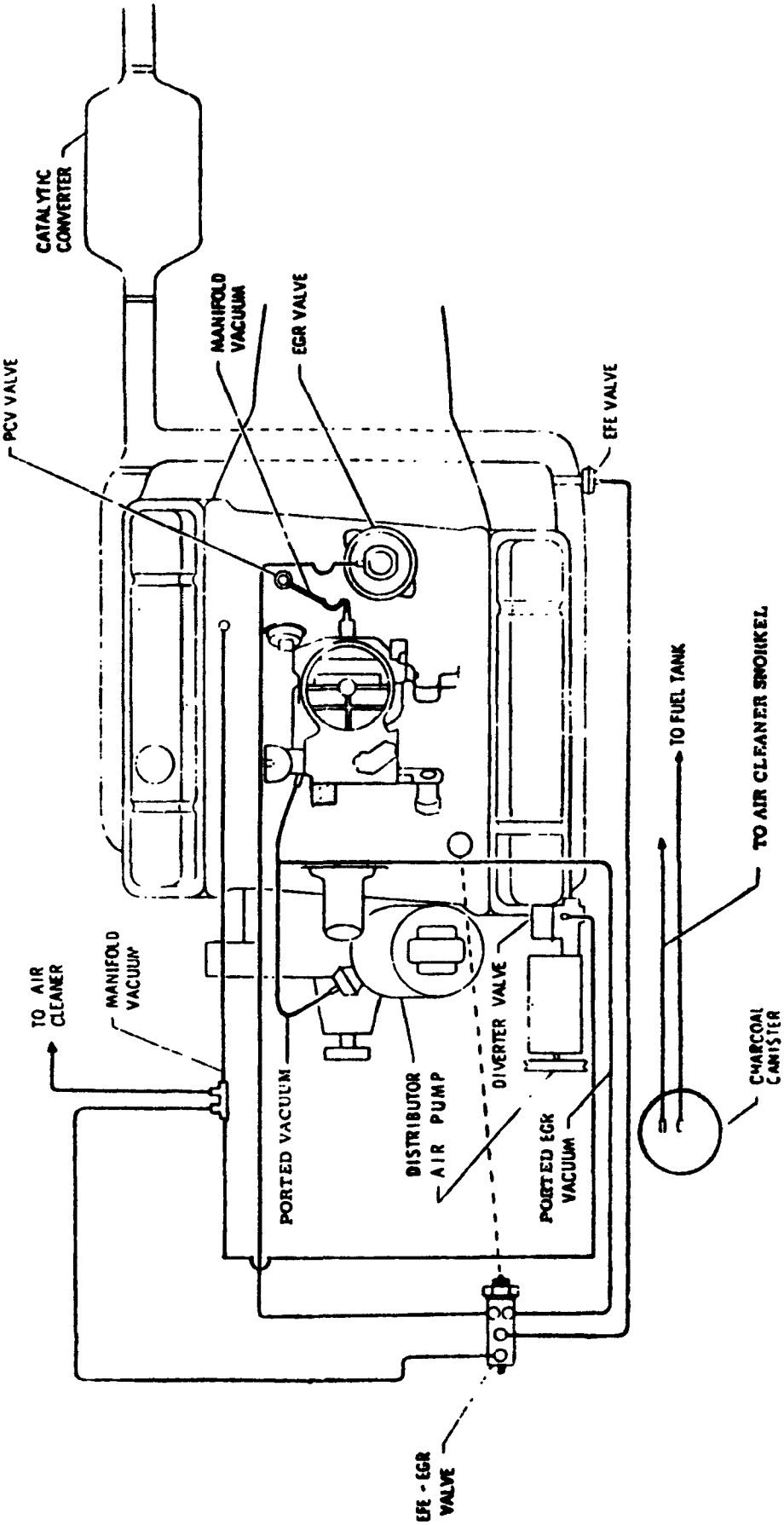
EMISSION CONTROL SCHEMATIC




Under floor oxidizing catalytic converter used but not illustrated.

**EXAMPLE 36**

EMISSION CONTROL SYSTEM SCHEMATIC



# EPA STANDARDIZED ENGINE FAMILY NAMES

## BACKGROUND

A number of recent circumstances--governmental hiring freezes, reorganization of MSAPC, increased agency emphasis on inspection and maintenance programs, increasingly stringent emission standards, new emission control technology--have resulted in a smaller number of certification engineers having to review an increasingly greater number of applications for certification. Not only has the number of engine families per team member increased, but the number of manufacturers each engineer must deal with has (in most cases) increased as well; thus each team member must spend additional time mastering the idiosyncrasies of format and terminology of the various manufacturers he/she must regulate. Even with the development of limited and abbreviated certification review to streamline the process, the capacities of the certification staff are being severely overtaxed.

Given these pressures, close cooperation between the Certification Division and industry is needed to assure and improve the timeliness of certification processing. One area where increased efficiency seems possible is the day-to-day maintenance of the data base containing descriptive and test-related data on all light-duty certification vehicles. The tasks of data entry and validation may not be as visible as the selection of test vehicles or the approval of unscheduled maintenance, but a well kept data base is essential to the accomplishment of the Division's mission: virtually every step in the processing of certification depends on the reception, storage, and retrieval of correct and correctly identified certification data.

The development and use of consistent, standardized formats and nomenclature will go far to promote this desirable level of accuracy. While more rigorous formats and terminology may be somewhat more restricting to manufacturers, they will reduce input errors, permit verification by automated error-checking routines, and encourage easy manipulation by the certification teams. The proposed system for naming engine families (ef) is a first step toward an increased (and more practicable) degree of standardization. The error-checking potentials of this coding scheme should eliminate errors of transposition (1.23 for 1.32), shifted decimals (01.23 for 1.230), and character misinterpretations (the number zero for the letter O, the number 1 for the letter I, the letter V for the letter U) whenever an engine family name must be entered or retrieved. Further, the adoption of this naming system would enable any certification engineer to glance at the name of any engine family and know at once the family's manufacturer, model year, vehicle class, displacement, fuel metering system, and catalyst type. The adoption of this system by all manufacturers, consequently, would increase the operating efficiency of the Certification Division, and might well accelerate CD's processing of applications.

## PROPOSED STANDARDIZED EF NAME

The proposed format for future ef codes was developed after examining manufacturers' coding formats, obtaining feedback from Certification personnel, and dicussing a preliminary draft of the proposal with manufac-

turers on March 21, 1979. Its design is a compromise between length and content. Although it was advantageous to make the code as short as possible, EPA sees merit in providing some basic information on the engine family (e.g., displacement). The code is to be alpha-numeric since alphabetical characters have mnemonic value and they provide for more alternatives per digit than numerical characters. The use of alphabetic characters such as I, O, and Q that are easily confused with numbers will be prohibited. The code is to include a check-sum digit (CSD) for error checking. The method of determining the CSD is discussed at the end of this paper.

The proposed ef codes are formatted as follows:

| | |
|---|---|
| first character | Model Year (see Table 1) |
| character 2 and 3 | Letter code describing manufacturer (see Table 2 for list of proposed codes) |
| character 4, 5, and 6 | Displacement in cubic inches (e.g., 350) or liters (e.g., 5.7). If more than one then larger displacement. The decimal place is the equivalent of a digit. |
| character 7 | Vehicle class (see Table 3) |
| character 8 | Numeric code describing fuel metering system (see Table 4) |
| character 9 | Letter code describing type of catalyst (see Table 5) |
| character 10 | Letter code to make the first 9 digits unique. This character makes it possible to have up to 22 families for each combination of displacement, fuel metering system, type catalyst, and certification class. |
| character 11 | Check-sum digit (CSD) |

Character 10 is provided to ensure that the ef code is unique. Any alphabetic character (except for I, O, Q, and V) can be used. Although this character does not have any inherent meaning, and so could be selected randomly, a manufacturer is free to choose a letter that can be readily associated with certain emission control technologies.

For example, suppose that two engine families are identical except that one has regular air injection whereas the other has radial-air tubes (R.A.T. air). For the former case character 10 could be A and for the latter character 10 could be R. Consequently, it would be possible to associate the A with regular air injection and R with R.A.T. air.

In the rare event that there are more than 22 engine families in a combination of displacement, vehicle class, fuel metering system, and catalyst type, it will be necessary to use both character 9 and 10 to make the code unique. In this case, character 9 would be selected with the same limitations as character 10 and without regard to catalyst type.

Examples

A 1979 GM family 910L4RU might be designated by the proposed format as:

9CV5.0V4ARX

1) 9 indicates MY 1979 (Table 1 starts with MY 1980)
2) CV indicates that the engine is built by Chevrolet (Table 2)
3) 5.0 indicates displacement in liters
4) V indicates light-duty vehicle (gasoline) (Table 3)
5) 4 indicates a 4 barrel carburetor (Table 4)
6) A indicates an oxidation catalyst (Table 5)
7) R hypothetically chosen
8) X is the CSD (see explanation on pages 67-68)

The advantage of the proposed ef code over GM's code is not obvious since GM uses a concise method to generate their ef codes. However, at a glance the proposed code does tell the displacement, manufacturer, vehicle class, fuel metering system, and type of catalyst. Someone unfamiliar with GM's engine families would have difficulty extracting this information out of GM's code. In addition, the code has a CSD and avoids the use of alphabetic characters that are confused with numbers, both of which will reduce transcription errors.

The advantage from a data processing standpoint of the proposed codes is better illustrated by showing how the following Ford engine family might be designated.

Ford's code 5.8WBV(2TT95X95)

Proposed code 9FM5.8V2GA1

1) 9 indicates MY 1979 (Table 1 starts with MY 1980)
2) FM indicates Ford Motor Company (Table 2)
3) 5.8 indicates displacement in liters
4) V indicates light-duty vehicle (gasoline; Table 3)
5) 2 indicates a 2 barrel carburetor (Table 4)
6) G indicates three-way plus other catalyst(s) (Table 5)
7) A is hypothetically chosen
8) 1 is the CSD (see explanation on pages 67-68)

As mentioned earlier, the proposed code is a compromise between length and content. Consequently, some of the new codes will be considerably longer than the existing counterparts that contain no internal information (e.g., Honda's "A" engine family). On the other hand, the Ford example shows how the new code can be shorter than the existing counterpart at the expense of some internal information (e.g., for Ford's case the information

on catalyst size was dropped in the proposed code). It should be noted that by indicating the manufacturer in the proposed code there will be no need to use 2 parameters to identify data records (the second parameter being manufacturer). Therefore, it should be easier for EPA to retrieve information pertinent to all manufacturers.

Check-Sum Digit (CSD)

A check-sum digit is used in codes as a means of checking that the characters entered are correct. For example, in university courses, the registration code for Math 321 Section 4 might be 456-321-4-5 (Math). The check-sum digit of 5 is simply the remainder obtained after the sum of all the preceding digits is divided by some arbitrary number, in this case 10 (i.e., 4 + 5 + 6 + 3 + 2 + 1 + 4 = 25, which when divided by 10 leaves a remainder of 5.) Thus a transcription error such as 466-321-4-5 would be flagged by an error-checking computer program.

Error checking with a CSD can be made more effective if different weights are applied to each digit before they are added together. For example, the value of the first digit can be multiplied by 9, the value of the second digit by 8, and so forth. This method will catch transposition errors that could be accepted by the previous method. In the example shown, if the number were entered as 456-312-4-5 (the 1 and 2 being switched), the computer would accept it since the sum is still equal to 25. The use of different weights on each digit would help prevent this type of error. The following discussion will better illustrate the weighting method proposed.

Method of Determining CSD

Step 1. Assign to each number in the ef code its actual mathematical value and assign to each letter the value specified below:

| | | |
|---|---|---|
| A = 1 | J = 1 | T = 3 |
| B = 2 | K = 2 | U = 4 |
| C = 3 | L = 3 | V = 5 |
| D = 4 | M = 4 | W = 6 |
| E = 5 | N = 5 | X = 7 |
| F = 6 | P = 7 | Y = 8 |
| G = 7 | R = 9 | Z = 9 |
| H = 8 | S = 2 | decimal pt. = 1 |

Step 2. Multiply the assigned value for each character in the ef code by the weight factor specified for it below:

| | Weight Factor |
|---|---|
| 1st | 10 |
| 2nd | 9 |
| 3rd | 8 |
| 4th | 7 |
| 5th | 6 |
| 6th | 5 |
| 7th | 4 |
| 8th | 3 |
| 9th | 2 |
| 10th | 1 |

Step 3. Add the resulting products and divide the total by 11. The remainder is the CSD. If the remainder is 10, the CSD is X.

Example 1: Determine the CSD if the first 10 characters are 9CV5.0V4AR (GM example).

| | 9 | C | V | 5 | . | 0 | V | 4 | A | R |
|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Value | 9 | 3 | 5 | 5 | 1 | 0 | 5 | 4 | 1 | 9 |
| Weighted Value | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Products | 90 | 27 | 40 | 35 | 6 | 0 | 20 | 12 | 2 | 9 |

Sum of Products = 241

Divide by 11 = 21 + 10/11
CSD = X

Therefore, ef code is 9CV5.0V4ARX.

Example 2: Determine the CSD for the Ford example 9FM5.8V2GA.

| | 9 | F | M | 5 | . | 8 | V | 2 | G | A |
|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Value | 9 | 6 | 4 | 5 | 1 | 8 | 5 | 2 | 7 | 1 |
| Weighted Value | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Products | 90 | 54 | 32 | 35 | 6 | 40 | 20 | 6 | 14 | 1 |

Sum of Products = 298

Divide by 11 = 27 + 1/11
CSD = 1

Therefore, ef code is 9FM5.8V2GA1.

TABLE 1. PROPOSED SUBCODES FOR MODEL YEAR

| Code | Year |
|---|---|
| A | 1980 |
| B | 1981 |
| C | 1982 |
| D | 1983 |
| E | 1984 |
| F | 1985 |
| G | 1986 |
| H | 1987 |
| J | 1988 |
| K | 1989 |
| L | 1990 |
| M | 1991 |
| N | 1992 |
| P | 1993 |
| R | 1994 |
| S | 1995 |
| T | 1996 |
| V | 1997 |
| W | 1998 |
| X | 1999 |
| Y | 2000 |
| 1 | 2001 |
| 2 | 2002 |
| 3 | 2003 |
| 4 | 2004 |
| 5 | 2005 |
| 6 | 2006 |
| 7 | 2007 |
| 8 | 2008 |
| 9 | 2009 |
| A | 2010 |
| B | 2011 |
| C | 2012 |

TABLE 2. PROPOSED SUBCODES FOR MANUFACTURERS

| Code | Manufacturer |
|---|---|
| AR | Alfa Romeo |
| AM | American Motors |
| AS | Aston Martin |
| AD | Audi |
| AV | Avanti |
| BM | BMW |
| BR | Bristol |
| BK | Buick (GMC) |
| CA | Cadillac |
| CK | Checker |
| CV | Chevrolet (GMC) |
| CR | Chrysler |
| EX | Excalibur Autos |
| FE | Ferrari |
| FT | Fiat |
| FM | Ford |
| FJ | Fuji |
| GC | GMC Division (GMC) |
| HN | Honda |
| HY | Hyundai |
| HC | International Harvester Company |
| SZ | Isuzu |
| JA | Jaguar |
| JR | Jaguar Rover Triumph Ltd. |
| LT | Lotus |
| MA | Maserati |
| MB | Mercedes |
| MG | MG |
| MT | Mitsubishi |
| NS | Nissan |
| LD | Oldsmobile (GMC) |
| PA | Panther |
| PE | Peugeot |
| PN | Pontiac |
| PR | Porsche |
| RE | Renault |
| RC | Replicar |
| RR | Rolls Royce |
| RV | Rover |
| SA | Saab |
| SH | Shetley |
| SR | Satra |
| SB | Steelbro |
| TK | Toyo Kogyo |
| TY | Toyota |
| TR | Triumph |
| TV | TVR |
| VW | Volkswagen |
| VV | Volvo |

TABLE 3. PROPOSED SUBCODES FOR VEHICLE CLASS

| Code | Vehicle Class |
|---|---|
| V | Light-Duty Vehicle (Gasoline) |
| T | Light-Duty Truck (Gasoline) |
| D | Light-Duty Diesel Vehicle |
| K | Light-Duty Diesel Truck |

TABLE 4. PROPOSED SUBCODES FOR FUEL METERING SYSTEM

| Code | Fuel Metering System |
|---|---|
| 0 | Multiple carburetors (e.g., four two-barrel) |
| 1 | 1 BBL |
| 2 | 2 BBL |
| 3 | 3 BBL |
| 4 | 4 BBL |
| 5 | Electronic fuel injection |
| 6 | Mechanical fuel injection |
| 9 | Other |

TABLE 5. PROPOSED SUBCODES FOR CATALYST TYPES

| Code | Catalyst Type |
|---|---|
| A | Single oxidation |
| B | More than one oxidation |
| C | Single reduction |
| D | More than one reduction |
| E | Three-way; no feedback control of fuel/air ratio |
| F | Three-way with feedback control of fuel/air ratio |
| G | Three-way plus other catalyst(s); no feedback control of fuel/air ratio |
| H | Three-way plus other catalyst(s) and feedback control of fuel/air ratio |
| J | No catalyst |
| K | Other |

U. S. GOVERNMENT PRINTING OFFICE: 1979--0-650-029/1