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**CERTIFICATION AND FUEL ECONOMY
INFORMATION SYSTEM (CFEIS)
MANUFACTURERS' USER GUIDE (CMUG)**

**United States Environmental Protection Agency
Office of Mobile Sources
Vehicle Programs and Compliance Division
National Vehicle and Fuel Emissions Laboratory
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Ann Arbor, MI 48105**

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1.0 INTRODUCTION

The Certification and Fuel Economy Information System (CFEIS) is Environmental Protection Agency's (EPA) Relational Database Management System (RDBMS) for processing vehicle emission and fuel economy information. This information, gathered from automobile manufacturers, testing laboratories, and EPA analysts, is used to determine if a particular car or truck is in compliance with federal regulations so EPA can certify it for sale in the United States. CFEIS also provides information for reports to other federal agencies, state and local governments, and public inquiries under the Freedom of Information Act (FOIA).

1.1 About CFEIS

CFEIS resides on a Sun UNIX database server that can be accessed over the EPA's National Vehicle and Fuel Emissions Laboratory (NVFEL) Ethernet network from UNIX workstations and other computers running X Window software. CFEIS is a *host-based* system (i.e., a server/workstation setup), meaning that all processing of CFEIS data occurs on the server, with each client workstation handling presentation functions. CFEIS runs under version 7.2.2 of Oracle, a multi-user RDBMS.

1.1.1 CFEIS Databases

For security and efficiency, CFEIS comprises several databases. All data submitted to CFEIS first resides in a submission database. This serves as a holding area for data waiting to be processed, as well as a record of all data exactly as they were submitted. Data from the submission database is checked before processing, and if errors are found, an error report is sent to the user who submitted the data. If the data pass this edit check, they are placed into the production database. This is the database of record, against which searches can be conducted and reports generated.

CFEIS also maintains an output database, which holds reports generated by the system or requested by users. This database also serves as an archive of reports as they were sent to the user, should there be a need to recreate a report after the data on which it was based has been changed.

1.1.2 CFEIS Subsystems

For the purposes of manufacturers' data submission, CFEIS is organized into nine subsystems, each of which is responsible for processing or reporting particular certification and fuel economy information.

These subsystems are as follows:

- **Car Line (CL).** Allows for the receipt, validation, and update of Car Line information from manufacturers. This information is entered by the manufacturer and is used to identify those Car Lines to be included in emission certification, fuel economy label, and Corporate Average Fuel Economy (CAFE) calculations.
- **Engine System Information (ESI).** Allows for the receipt, validation, update, and reporting of ESI received from manufacturers applicable to emission certification and fuel economy labeling. This information is grouped by family and is used to identify the applicable standards that those families must meet.
- **Evaporative System Information (EvSI).** Allows for the receipt, validation, update, and reporting of EvSI received from manufacturers applicable to emission certification and fuel economy labeling. This information is grouped by family and is used to identify the applicable standards that those families must meet.
- **Vehicle Information (VI).** Allows for the receipt, validation, update, and reporting of VI. Additionally, it provides descriptive information for fuel economy and certification test vehicles. VI data submission should also be prepared when fuel economy data vehicle packages are assembled, when vehicles (and their data) are submitted for carry over/carry across, or when vehicles are built or re-configured for running change/field fix testing. The VI submission cannot be processed until the ESI, EvSI, and Car Line data are accepted.
- **Shift Schedule (SH).** Allows for the receipt, validation, update, and reporting of Shift Schedule information received from the manufacturers. Additionally, it provides the capability for a vehicle manufacturer to enter unique transmission shift schedules that are used to produce video driving traces for vehicle emission and fuel economy tests performed at NVFEL. The manufacturer submits Shift Schedule data into the Shift Schedule database.
- **EPA/Manufacturer Test Data (MTDS).** Allows for the receipt, validation, update, and reporting of EPA and manufacturer test data applicable to emission certification and fuel economy labeling. The manufacturer performs and submits the results of emission and fuel economy tests into the EPA database. The test data cannot be processed until the ESI, EvSI, and VI data have been accepted.
- **Summary Sheet (SS).** Allows for the receipt, validation, update, and reporting of Summary Sheet information received from the manufacturers. It provides the means

for accepting the manufacturer's vehicle summary information by (engine family/ test group) / (evaporative family/refueling family) combination. The Summary Sheet submission includes a concise description of all test vehicles, test results, and procedures used to support the issuance of each Certificate of Conformity, together with a list of all Car Lines covered by the particular certificate. The data cannot be processed until the ESI, EvSI, Car Line, VI, and MTDS data have been processed.

- **General Label (GL).** Allows for the receipt, validation, update, and reporting of General Label information received from the manufacturers. This processing includes the verification of the manufacturer submitted self-approved fuel economy calculations. The data cannot be processed until the ESI, Car Line, VI, and MTDS data have been accepted.
- **Corporate Average Fuel Economy (CAFE).** Allows for the receipt, validation, update, and reporting of CAFE Information. It uses reported or generated manufacturer test data and the actual sales volume to produce manufacturers CAFE by compliance category. The data cannot be processed until the ESI, Car Line, VI, and MTDS data have been accepted.

1.2 Purpose

This guide gives manufacturers the information they need to exchange data with CFEIS. It introduces the procedures for physically submitting data to NVFEL and briefly explains the sequence of data submission that is important across the various subsystems.

1.3 References

This subsection identifies documents applicable to or referenced by this guide.

Government Documents

- *Draft Certification Division Application Software Development Guidelines*, EPA, May 1994.
- *Hardware and Software Standards*, EPA, December, 30, 1994.
- *Draft Standard for Data Element Naming Conventions*, EPA, August 28, 1992.
- *Draft Standard for Data Element Attribution*, EPA, August 28, 1992.

- *Draft Standard for the Formulation of Data Definitions*, EPA, September 15, 1992.
- *EPA Information Security Manual*.
- *EPA Common User Interface Standards*.
- *EPA Systems Development Center User Support Operations and Procedures Manual*.
- *EPA Systems Development Center Information Systems Engineering Methodology (ISEM)*.
- OMB Circular A-130, *Management of Federal Information Resources*.
- Title II of the Clean Air Act (CAA).
- Energy Policy and Conservation Act (EPCA).
- Motor Vehicle Information and Costs Savings Act (MVICSA).
- 40 CFR Part 86, Certification Compliance Program.
- 40 CFR Part 600, Fuel Economy Compliance Program.
- Advisory Circulars.
- *Dear Manufacturer Guidance Letters*.
- *Information Security Plan for Development and Maintenance of CFEIS* (SDC-0055-078-RA-4007, dated November 18, 1995).
- *EPA Security Manual*.
- *EPA Personal Security Computer Manual*.
- *Specific VPCD Information Security Guidance*.

Systems Development Center (SDC) Documents

- *The Certification and Fuel Economy Information System (CFEIS) Database Conversion Plan*. SDC document no. SDC-0055-078-AG-4003.

- *The Certification and Fuel Economy Information System (CFEIS) Requirements Specification.* SDC document no. SDC-0055-078-WB-5011.
- *The Certification and Fuel Economy Information System (CFEIS) Logical Design* working papers. SDC document no. SDC-0055-078-WB-4015, W0 through W14.
- *SDC Systems Engineering Environment (SEE)*, containing:
 - SDC Guidelines for the Change Control Board. SDC document no. SDC-0055-028-SS-20052 (January 8, 1993)
 - SDC Procedure 1 - Product Development Process. SDC document No. SDC-0055-028-2054 (June 15, 1993)
 - SDC Procedure 1 - Product Development Process Briefing. SDC document no. SDC-0055-028-2055 (April, 1994)
 - SDC Standard - Application Development Process Environment (ADPE) Elements. SDC document no. SDC-0055-028-SS-3004 (March 1, 1994)
 - *SDC ADTE Plan* - Plan for the EPA Systems Development Center Application Development Technology Environment Plan. SDC document no. SDC-0055-028-3006A (May 13, 1994)
 - *SDC Telecommunications Services Request (TSR) Process Briefing.* SDC document no. SDC-0055-028-TB (January, 1994)
 - *SDC Document Style Guide* (Second Edition). SDC document no. SDC-0055-028-PK-4027 (July 15, 1995)
- *Certification and Fuel Economy Information System (CFEIS) Input Data Record Layouts.*

1.4 Organization

This document consists of the following:

- **Section 1.0. Introduction**, explains the guide's purpose and organization.

- **Section 2.0. System Description**, gives an overview of the system, the configuration and operation of the parts of the system that manufacturers access, the logical parts of the system as they relate to processing manufacturer-submitted data, and a high-level discussion of the internal structure of a submission file.
- **Sections 3.0 through 11.0**, explains how to format data submissions for each subsystem and what validations or calculations the system performs on the data submitted.
- **Section 12.0. Reports**, describes what reports CFEIS generates from the data submissions.
- **Section 13.0. Errors**, discusses the errors that the user can expect to receive as a result of submitting data. Such errors fall into two groups: (1) errors that the user caused (that is, user-induced errors) and (2) system or database errors (errors generated independently from the content of a user's data submission).
- **Appendices** contain Acronyms and Abbreviations (Appendix A), Error Messages (Appendix B), Reports (Appendix C), Input Data Record Layouts (Appendix D), Input Forms (Appendix E), and EPA Standardized Engine and Evaporative Family Names (Appendix F).

2.0 SYSTEM DESCRIPTION

2.1 System Overview

CFEIS is installed at the Vehicle Programs and Compliance Division (VPCD) located at NVFEL in Ann Arbor, Michigan. The system employs a workstation/server architecture in a Local Area Network (LAN) environment using version 7.2.2 of the Oracle RDBMS.

Like its mainframe predecessor, CFEIS uses batch processing. This means that CFEIS periodically processes the data left in users' mailboxes, or placed in the submission database by EPA analysts. Transaction reports and other report requests are also processed in this periodic fashion. CFEIS picks up submissions and drops off reports every 2 hours.

As shown in Exhibit 2-1, the system accepts the information that constitutes the manufacturer's application for a Certificate of Conformity for vehicle emissions. It also accepts the information required to perform the calculations for the fuel economy label and CAFE. CFEIS generates the Certificate of Conformity and calculation results that verify the fuel economy calculations performed by the manufacturer.

The system periodically transmits Shift Schedule information to the Testing Services Division's (TSD) Laboratory Network System (LNS), which performs the confirmatory tests. LNS, in turn, transmits the confirmatory test results to CFEIS. Once in the system, the confirmatory test results are reviewed by the certification analyst responsible for issuing the Certificate of Conformity.

CFEIS generates standard reports that VPCD must provide to external entities (that is, an organizational unit outside of EPA). The external entities and the reports they receive are as follows:

- *CAFE Report*, Department of Transportation.
- *Fuel Economy Guide*, Department of Energy.
- *Gas Guzzler Tax Report*, Internal Revenue Service.
- *Annual Certification Test Results Report*, public distribution.
- *General Label Test Car Lists*, public distribution.
- Freedom of Information Act (FOIA) responses to public inquiries.
- Ad hoc queries meeting a variety of internal and external requests.

In addition to the reports listed above, CFEIS generates processing reports that provide feedback to manufacturers about their data submissions. The system generates one or more reports in response to every type of submission processed.

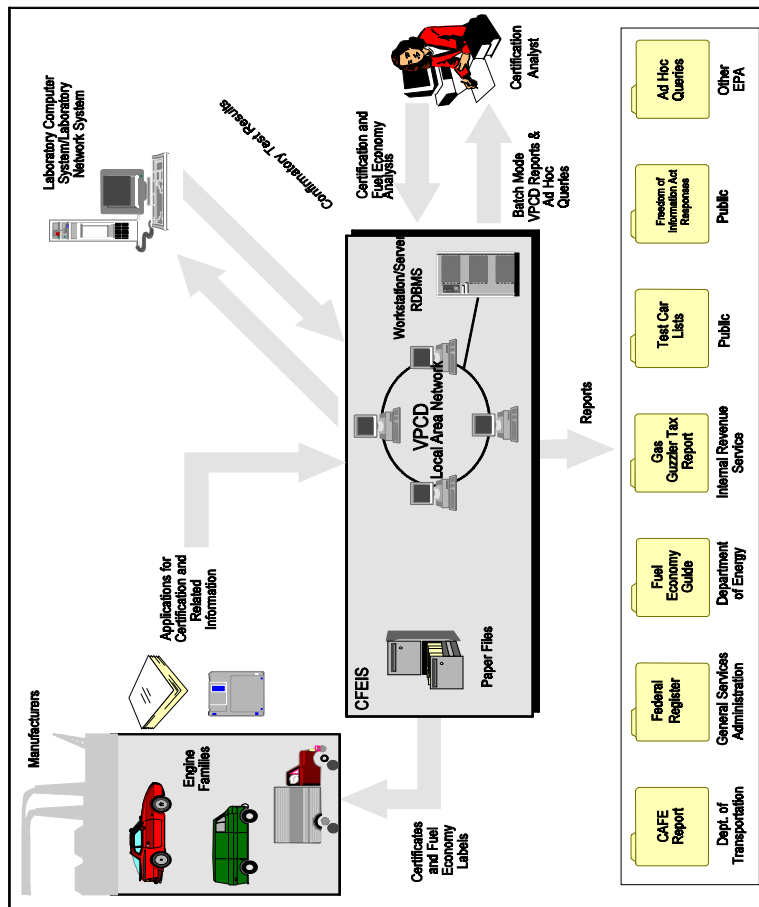


Exhibit 2-1. CFEIS Operations

2.2 Personnel Interaction

A number of different types of users and operators interact with CFEIS. The first and most important is the manufacturer. CFEIS facilitates the processing of information submitted by the manufacturer for the Certificate of Conformity and fuel economy calculations. CFEIS accepts all of the manufacturer's submissions and checks the information for consistency and accuracy. The system then generates the Certificate of Conformity and the results of the fuel economy calculations. The manufacturer receives both products.

Two types of VPCD personnel interact with CFEIS. The first is the certification analyst, who interacts with the manufacturer and reviews the manufacturer's submissions. CFEIS automates much of the edit checking that must be performed on manufacturer submissions. The certification analyst monitors the submission acceptance process and reviews final submission information to determine if the manufacturer's application for certification can be accepted. If a manufacturer's test results must be verified, the certification analyst schedules a confirmatory test with TSD.

VPCD's Automated Data Processing (ADP) analyst also interacts with CFEIS. The ADP analyst maintains CFEIS and monitors technical system operations to ensure that the system functions properly. Among the ADP analyst's duties are database administration, maintenance of the business process and data models, maintenance and development of software to support functionality outside the scope of CFEIS, resolution of manufacturer and EPA user problems, and incorporation of new regulations into future versions of CFEIS.

2.3 System Configuration and Operation

CFEIS consists of a database server, workstations, and an electronic interface used by manufacturers at remote sites for submitting and storing data and for processing reports. The RDBMS stores and retrieves CFEIS data. The ADP analysts use CFEIS to perform their technical functions.

CFEIS gives each manufacturer access to a single UNIX workstation connected to the CFEIS LAN. A modem and a UNIX File Transfer Protocol (FTP) enable the manufacturer to both send submission files to and receive report files from the CFEIS server through the workstation's data storage disk. The CFEIS server periodically (that is, every 2 hours) reads the data from the workstation's hard disk into its own mass storage. The workstation is capable of maintaining up to six concurrent dial-in sessions. Appendix D, Input Data Record Layouts, contains instructions for formatting the electronic files used for submissions.

Manufacturers are assured of having a secure repository within CFEIS for their data submissions and the reports requested or generated by the system. The CFEIS workstation is configured with a 5-megabyte UNIX partition for each manufacturer, and no manufacturer can access or view the files in another manufacturer's partition. Regardless of the data submission's source (magnetic diskette, paper forms from the NVFEL, or electronic data transfer), the system identifies the manufacturer who originated the file and stores the file in that manufacturer's partition. Exhibit 2-2, illustrates disk partitioning on the workstation.

The system transfers data from the manufacturer's workstation to the CFEIS server for processing. The system identifies the manufacturer making the submission and places a copy of the Submission Summary Report in the manufacturer's partition. The system also places an identical copy of each Submission Summary Report in an archive partition. The archive partition is not accessible to manufacturers, but EPA-designated system users may retrieve the Submission Summary Reports that are generated. The system retains the archived Submission Summary Reports online for at least 60 days.

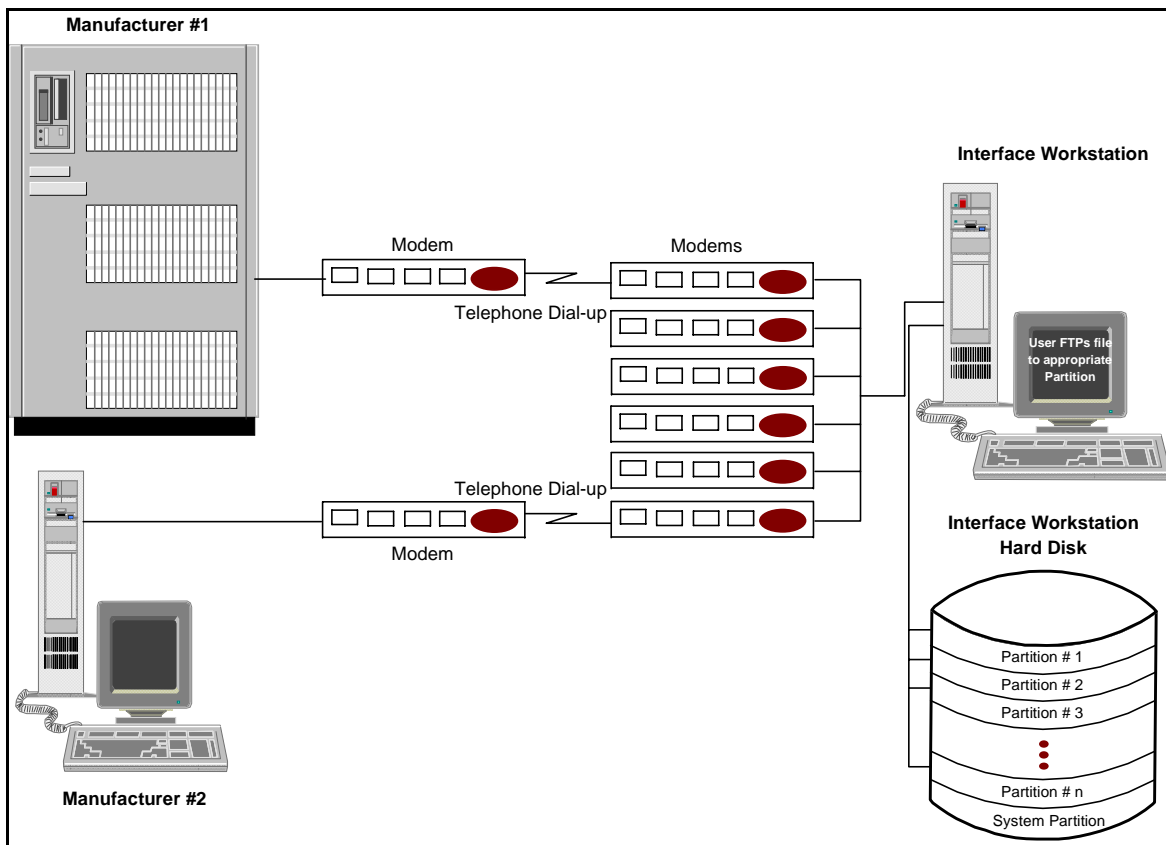


Exhibit 2-2. Electronic File Transfer

After the 60-day online period, they are copied to archive tapes. The system automatically moves the Submission Summary Report to the manufacturer's workstation partition after processing has been completed. All EPA users interact with the CFEIS server, while all manufacturers interact only with the workstations. Exhibit 2-3 illustrates CFEIS processing of manufacturer data.

The manufacturers are responsible for managing, cleaning up, and removing the Submission Summary Reports in their partitions on the workstation.

EPA computer operations accepts manufacturers' data submissions in ASCII format copied onto 3.5-inch magnetic diskettes.

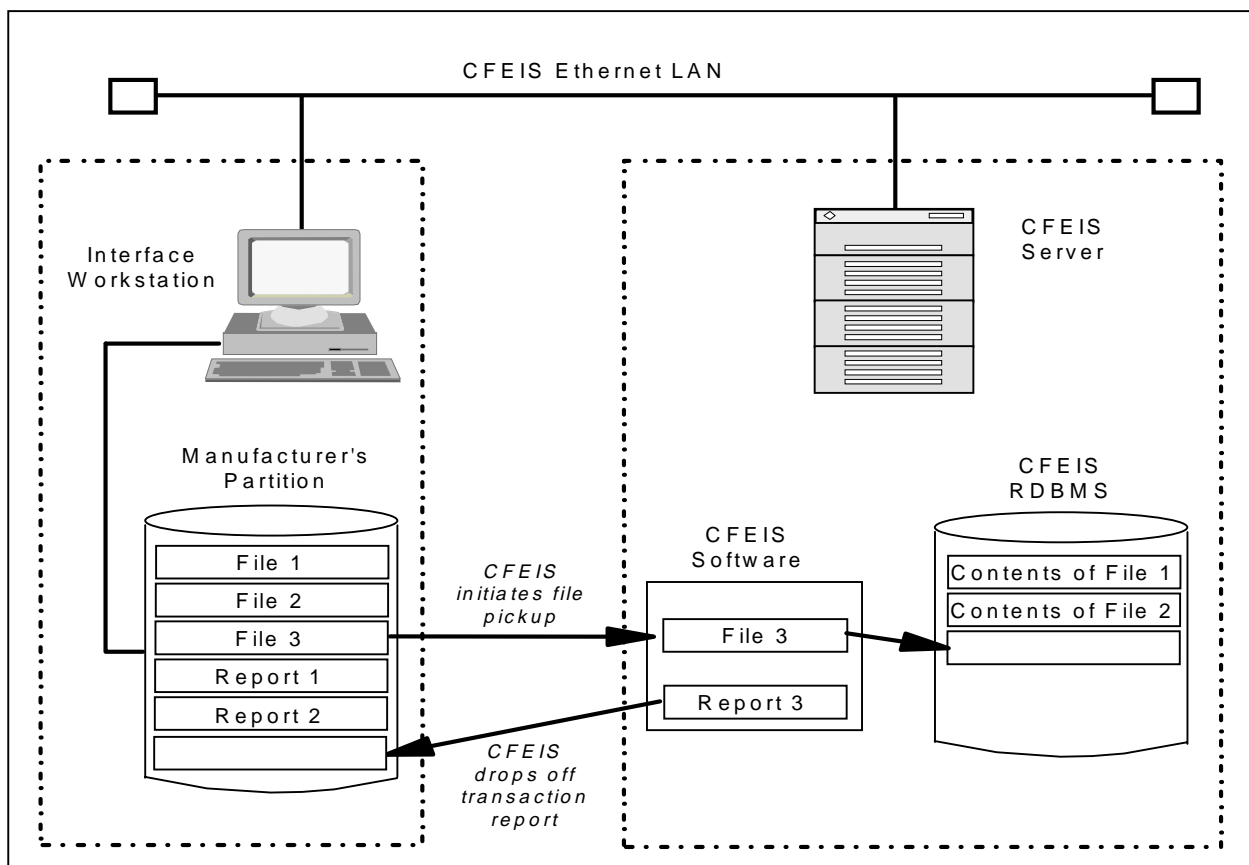


Exhibit 2-3. Processing by the CFEIS Server

The submission data are represented as flat-file ASCII formats corresponding to those defined in Appendix D, Input Data Record Layouts.

Manufacturers may submit data on paper forms. Appendix E, Input Forms, contains the paper forms used for paper submission. To enter the data from the paper forms into CFEIS, the flat-file ASCII formats are prepared using a data input software package. The system processes the flat file just as if it had been delivered to NVFEL on a diskette or through a telecommunications link. Reports for the data submitted on diskette or paper forms will be generated in hard copy printouts.

2.4 Input Data Structure

Submissions to CFEIS are for one subsystem and one manufacturer. Each submission contains one or more transactions. A transaction is a type of action that CFEIS performs on the data submitted (for example, *Add, Modify, Delete, Report*, etc). A transaction contains one or more input records followed by a *ZZ* record. The *ZZ* record indicates to CFEIS that the transaction has ended.

Each subsystem has different allowable transaction types. The transaction type is generally determined by the process code for the first input record of the transaction. Some record types do not have process codes. In that case, the transaction type is determined by the presence or absence of other record types within the transaction. The scope of a process code can be limited to a subset of the fields in a single input record; however, within a transaction different combinations of process codes are allowed.

When submitting data to CFEIS, you should do the following:

- Organize your data by *CFEIS subsystem*.
- Verify *subsystem* data dependency
- Organize subsystem data by *valid transaction type (Add, Modify, Delete, etc.)*.
- Find the correct *input record type* (within each subsystem) in Appendix D or E for each of your data entries.
- Verify *input record dependencies*.

Some input records are independent while others require one or more specified input records in the same submission to make the record complete. Sections 3.0 through 11.0 each contain a table listing these dependencies. Ensure that your submission

includes the additional input record(s) for each dependent record. Exhibit 2-4 summarizes the transaction types for each subsystem.

Transaction Process Code	CFEIS Subsystem								
	CL	ESI	EvSI	VI	SH	MTDS	SS	GL	CAFE
<i>Add (A or blank)</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Modify (M)</i>	✓	✓	✓	✓		✓	✓		
<i>Replace (R)</i>		✓	✓		✓	✓	✓	✓	✓
<i>Delete (D)</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Change (N)</i>				✓			✓		
<i>Report (P)</i>		✓	✓	✓	✓	✓	✓		
<i>Summary Report (Y)</i>							✓		
<i>Cancel (F)</i>		✓	✓						
<i>Carry Over (C)</i>				✓		✓			
<i>Carry Across (X)</i>						✓			
<i>Re-activate (G)</i>		✓	✓						
<i>Re-process (S)</i>					✓	✓		✓	✓

Exhibit 2-4. Transaction Type Summary

When entering your data you should do the following:

- Observe the data input rules discussed in Sections 3 through 11, *Input Notes*.
- Observe the Valid Range/Entry Criteria for each data field as shown in Appendix D, or the Entry Field Description for each field in Appendix E.
- Ensure that all required field entries are correct and complete. Appendix D shows the required and optional fields for each transaction type and input record.
- End each transaction with a ZZ record.

2.4.1 Data Entry

Data may be entered into CFEIS from magnetic diskette, paper forms, or electronic data transfer (FTP). If you want to enter your data on paper forms, you will find the input forms you need in Appendix E. On the back of the form are the valid range/entry criteria to help you determine what values to put into each block.

If you want to enter your data on magnetic diskettes or through electronic data transfer, use the input data record layouts found in Appendix D. The input data record layouts give the field names, transaction types; indicate whether the field is allowable, required, or optional; and show the position, length, data type, and valid range/entry criteria for each record type allowable for each subsystem. Since CFEIS processes the input data record layouts by subsystem, record type, and column position, make sure to include only the submission record types for one subsystem using the proper column position for the field placement.

2.4.1.1 Field Justification

Alphanumeric fields should be left justified. Numeric fields may be left or right justified. It is recommended that right justification be used.

2.4.2 Input Data Formats

When you input your data, either on paper forms or electronically, use the following formats (see also Appendix D):

A	=	Alphanumeric character.
R	=	Real number (with precision defined as n.n under the element <i>Length</i>).
I	=	Integer number.
D	=	Date (in the format of MMDDYYYY).

2.4.3 Decimals in Input Data

If you are entering data that contain decimals, you must include the decimal point. The system will **not** put it in for you.

2.4.4 Input Data File Names

Exhibit 2-5 shows the names of the files that the manufacturers drop off in CFEIS and the names of the Submission Status Report files that the system sends back to the manufacturers. The input data record layouts in Appendix D show the required fields in each transaction, the starting position of the field in the input record, the length and type of the fields, and so on.

Input File Name	Output File Name	File Content
carline.in	carline.out	Car Line
esi.in	esi.out	ESI
evsi.in	evsi.out	EvSI
vi.in	vi.out	Vehicle Information
shift.in	shift.out	Shift Schedule
mtds.in	mtds.out	Manufacturer Test Data
summary.in	summary.out	Summary Sheet Data
gl.in	gl.out	General Label Fuel Economy
cafe.in	cafe.out	Corporate Average Fuel Economy

Exhibit 2-5. CFEIS Mail Box Files

2.4.5 Input Notes and Calculations

Each subsystem has validations that are performed and for some subsystems CFEIS computes values from the input data submitted. The following subsections describe the rules you must follow to ensure successful validation of the data submitted. We have called those rules Input Notes. In addition, if CFEIS makes calculations on the data you submit, we give you the equations that CFEIS uses to perform those calculations.

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3.0 CAR LINE (CL)

3.1 Car Line Input/Output File Names

Input file name: carline.in
Output file name: carline.out

3.2 Car Line Transaction Process Codes

Process code explanations are as follows:

blank, A (Add) Use this code to enter new data into the Car Line database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Car Line Input Notes Subsection 3.3.**

M (Modify) Use this code to modify existing data in the Car Line database. For *Modify* process codes, optional fields containing non-blank input data replace existing data in the database. CFEIS leaves existing data in the database unchanged if the input value is blank. To blank out a numeric field, enter an * in any column of the field. To blank out a text field, enter an * in every column of the field. If the asterisks do not fill the entire field, they will become part of the text. CFEIS generates an exception condition if the database does not contain the data to be modified. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Car Line Input Notes Subsection 3.3.**

D (Delete) Use this code to delete existing data in the Car Line database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Car Line Input Notes Subsection 3.3.**

3.3 Car Line Input Notes

3.3.1 Add and Modify Transactions

The rules are as follows:

- Specify passenger and luggage volumes for at least one body style on a C2 record if the vehicle is a **passenger car** and not a **2-seater**.
- When you create a new Car Line, use an *Add* process code on the C1 record with a new Car Line code.
- The sum of the average passenger and luggage volumes that you enter for a Car Line must be within the tolerances specified for the Class code (see Exhibit 3-1).

Class Code	Sum of Averages	
	Minimum	Maximum
2	≥1	<85
3	85	<100
4	100	<110
5	110	<120
6	120	200
7	1	<130
8	130	<160
9	160	200

Exhibit 3-1. Sum of Averages per Class Code

- When you enter passenger and luggage volumes for the following:
 - 2-door.
 - 4-door.
 - Hatchback vehicles.

the values must be within 20 percent of the average volume specified.

- Vehicle Information, Summary Sheet, General Label, and CAFE may need to be re-processed if Car Line data are modified.

3.3.2 Delete Transactions

The CFEIS will not allow you to delete a Car Line that you have used in a General Label index, Vehicle Configuration, or Summary Sheet.

3.3.3 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 3-2 shows the Input record dependencies for the Car Line subsystem.

Car Line

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
C1	None	A,M,D ¹	Car Line
C2	None	Implied M	Car Line
CS	C1	A,D	Car Line State Restrictions
ZZ		All Transactions	

Exhibit 3-2. Car Line Input Record Dependencies

¹ Transactions Legend:

A= Add M= Modify D= Delete ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

3.4 Conversion of MTS CFEIS Car Line and Manufacturer Codes

CFEIS uses different Car Line and Manufacturer codes than the Michigan Terminal System (MTS)CFEIS did. In MTS CFEIS, a Car Line was defined by a 3-digit Car Line Manufacturer code and a 2-digit Car Line code. A Car Line Manufacturer code less than or

equal to 500 indicated a car manufacturer, and a code greater than 500 indicated a truck manufacturer.

In CFEIS, the 3-digit Car Line Manufacturer code has been replaced by a 2-digit Division code. Each Car Line manufacturer is assigned a Division code based on the alphabetically ordered Car Line manufacturer names for a specific VI manufacturer. For example, Chrysler's Car Line Manufacturer codes convert as shown in Exhibit 3-3.

Car Line Manufacturer Name	Car Line Manufacturer Code	Division Code
Chrysler	130	1
Chrysler	620	1
Dodge	160	2
Dodge	650	2
Eagle	161	3
Eagle	651	3
Imperial	214	4
Jeep	850	5
Jeep	652	5
Plymouth	320	6
Plymouth	910	6
.		
.		
.		

Exhibit 3-3. Sample Car Line Code Conversion

The distinction between car and truck manufacturers is no longer relevant at the division level in CFEIS. Instead, the car/truck division is made for each Car Line using the Class code. Each Class code is identified as either a car or truck. As a result, the Car Line code is not always unique within a division. Therefore, if the Car Line Manufacturer code is greater than 500, then 100 is added to the MTS Car Line code for the translation to CFEIS. For example, Car Line code 95 is a Q-Car for Car Line Manufacturer 130 and the same Car Line code 95 is a Caravan 4WD for Car Line Manufacturer 620. Both Car Line Manufacturers 130 and 620

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become Division Code 1 in CFEIS. Therefore, Car Line code 95 for Car Line Manufacturer 620 (that is, Caravan 4WD) translates to Car Line code 195 in CFEIS.

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4.0 ENGINE SYSTEMS INFORMATION (ESI)

4.1 ESI Input/Output File Names

Input file name: esi.in
Output file name: esi.out

4.2 ESI Transaction Process Codes

Process code explanations are as follows:

- blank, A (Add)*** Use this code to enter new data into the ESI database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also ESI Input Notes Subsection 4.3.**
- M (Modify)*** Use this code to modify existing data in the ESI database. For *Modify* process codes, optional fields containing non-blank input data replace existing data in the database. CFEIS leaves existing data in the database unchanged if the input value is blank. To blank out a numeric field, enter an * in any column of the field. To blank out a text field, enter an * in every column of the field. If the asterisks do not fill the entire field, they will become part of the text. CFEIS generates an exception condition if the database does not contain the data to be modified. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also ESI Input Notes Subsection 4.3.**
- D (Delete)*** Use this code to delete existing data in the ESI database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also ESI Input Notes Subsection 4.3.**
- R (Replace)*** Use this code to replace with input data all existing data in the ESI database. *Replace* can be considered equivalent to a *Delete* transaction followed by an *Add* transaction. Unlike the *Modify*

process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also ESI Input Notes Subsection 4.3.**

F (*Cancel*) A *Cancel* process code is used to cancel an Engine subsystem. Canceling an ESI subsystem preserves existing information in the CFEIS database while indicating that it will not be used. **See also ESI Line Input Notes Subsection 4.3.**

G (*Re-activate*) A *Re-activate* process code is used to re-activate an Engine subsystem that was previously canceled.

P (*Report*) A *Report* process code is used to generate an Engine Family/ Test Group report for a given manufacturer.

4.3 ESI Input Notes

4.3.1 Add Transactions

The rules are as follows:

- In the ESI database, a transaction must begin with and include **only one** E1 or E2 input record. This means that operations can be performed for a single Engine system or Engine subsystem in a transaction. If you are adding an E1 or E2 input record **only** to provide key field data for other input records in the transaction, you must include a *Modify M* process code in the E1 or E2 record.
- If you do not specify the following:
 - Emission standard.
 - Phase-in-percentage.
 - Additive DF.
 - Multiplicative DF.

when you add an EG record, CFEIS will look up and apply a corresponding emission standard based on model year, tier, useful life, Cert/In-Use code, LVW range, ALVW range, ignition type, emission name, sales area, GVW category, and fuel type. If the database does not contain a corresponding emission standard, it assigns 0 to the additive DF, 1 to the multiplicative DF, and 0 to the phase-in percentage.

- If you enter a value less than 0 for additive DF, CFEIS will use value 0 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- If you enter a value less than 1 for multiplicative DF, CFEIS will use value 1 for calculation of certification level. However, the entered value is retained in the CFEIS database.

4.3.2 *Modify and Replace Transactions*

The rules are as follows:

- You cannot modify or replace ESI data if there is a VI record against it. ESI subsystems may be added even if a VI exists for an engine system.
- When modifying or replacing an E2 record, you must include a non-blank value for DF type if you have never entered the DF type for the Engine subsystem that you are modifying.
- If you do not specify the following:
 - Emission standard.
 - Phase-in-percentage.
 - Additive DF.
 - Multiplicative DF.

when you replace an EG record, CFEIS will look up and apply a corresponding emission standard based on model year, tier, useful life, Cert/In-Use code, LVW range, ALVW range, ignition type, emission name, sales area, GVW category, and fuel type. If the database does not contain a corresponding emission standard, it assigns 0 to the additive DF, 1 to the multiplicative DF, and 0 to the phase-in percentage.

- If you enter a value less than 0 for additive DF, CFEIS will use value 0 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- If you enter a value less than 1 for multiplicative DF, CFEIS will use value 1 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- To replace the following:
 - Combustion cycle.
 - Ignition type.
 - Fuel system.
 - Valves per cylinder.
 - Turbocharger supercharger.
 - Catalyst.
 - Trap.
 - California OBD.
 - Federal OBD.
 - Production code.

| the pre-conversion codes must match the values associated with the existing Engine
| Family/Test Group.

- | • A *Replace* process code on an E1 input record replaces an Engine system, **not** an Engine
| Family/Test Group.
- Vehicle Information, Summary Sheet, General Label, and CAFE may need to be re-processed if ESI data are modified or replaced.

4.3.3 *Delete Transactions*

The rules are as follows:

- You may delete a subsystem without deleting the associated system.
- You cannot delete ESI data if you have used the data in a Summary Sheet **and** that Summary Sheet is locked.
- You cannot delete a subsystem if the Engine system containing the subsystem is used by a vehicle configuration **and** the vehicle configuration references a sales area that corresponds to the subsystem.
- The *Delete* process code on the E1 input record deletes an Engine system and all its associated Engine subsystems. You cannot perform any *Delete* operations on an Engine system until CFEIS is no longer using any of the associated subsystems. If the last Engine system that you are deleting is also the last one for that family, the Engine Family/Test Group will be deleted.
- You cannot delete subsystem numbers unless they are the highest numbered subsystem in the Engine system.

4.3.4 *Cancel Transactions*

You cannot cancel a subsystem more than three times.

4.3.5 **E2 and ES Input Records**

Exhibits 4-1 through 4-7 give the codes to be entered on the E2 and ES input records for sales area, vehicle class, and exhaust emission standards.

For California sales areas, note that EPA uses the federal definition of LVW and ALVW and EPA's definition is not necessarily the same as California's. For example, California has used two different definitions of LVW: one for 1994 and another for later model years. For 1994, California's definition of LVW is the same as the federal definition of **LVW**. For later model years; however, California's definition is the same as the federal definition of **ALVW**. The following exhibits, including those for California, use the **federal** definitions.

| Engine Family/Test Group Names

| EPA standardized Engine Family/Test Group names are described in detail in Appendix F of this document.

| **Engine Family/Test Group Related Information**

Sales Area Codes	
Codes	Sales Area
CA	California + Section 177 States (includes California Tier 1, TLEV, LEV, ULEV, ZEV vehicles)
FA	Federal All Altitude (Tier 1)
NL	NLEV - All States Trading Region (TLEV, LEV, ULEV, ZEV)
NE	NLEV - Northeast Trading Region (TLEV, LEV, ULEV, ZEV in 1999; TLEV Only in 2000. Obsolete in 2001.)
CF	Federal Clean Fueled Fleet Areas (LEV, ULEV, ILEV, ZEV)
CF	Clean Fuel Vehicle Tier 1 (Obsolete)
If Certified to Same Standards:	
CE	CA + NE
CL	CA + NL
NF	CA + NL + CF

Exhibit 4-1. Sales Area Codes (Federal and California)

Vehicle Class Codes: 1998 and Later					
Code	Fuel	Description			Tier 1
		GVWR	ALVW	LVW	
V	Any	LDV or CARB's PC			LDV
T1		0-6000	Any	0-3750	LDT1
T2				3751-5750	LDT2
T3		>6000	3751-5750	0-3750	LDT3
T4					≥5751
T5			3751-5750	≥3751	LDT3
T6					≥5751
VT		LDV and LDT1 (or CARB's PC and LDT1)			LVT

Exhibit 4-2. Light-Duty Vehicle Class Codes (Federal and California)

Vehicle Class Codes: 1995, 1996 and 1997						
Code	Fuel	GVWR	Description		Tier 1	Tier 0
			ALVW	LVW		
V	Any	LDV or CARB's PC			LDV	LDV
1		0-6000	Any	0-3750	LDT1	N/A
2				3751-5750	LDT2	
3		>6000	3751-5750	0-3750	LDT3	
4					≥5751	
5			3751-5750	≥3751	LDT3	
6					≥5751	
7		N/A	N/A	0-3750	N/A	LDT-A-NOx 1.2
8				≥3751		LDT-B-NOx 1.7

Exhibit 4-3. Light-Duty Vehicle Class Codes (Federal and California)
For Model Years 1995, 1996 and 1997 Only

HC/CO/NO _x	In use	PM	Cold CO	Standards Code
Tier 0	Tier 0	Tier 0	Y	01
			N	02
		Tier 1	Y	03
			N	04
Tier 1	Tier 0	Tier 0	Y	05
			N	06
		Tier 1	Y	07
			N	08
	Tier II	Tier 0	Y	09
			N	10
		Tier 1	Y	11
			N	12
	Tier 1F	Tier 0	Y	13
			N	14
		Tier 1	Y	15
			N	16
TLEV	TLEV	TLEV	Y	17
			N	18
TLEV + ILEV	TLEV + ILEV	TLEV + ILEV	Y	19
			N	20
LEV	LEV	LEV	Y	21
			N	22
LEV + ILEV	LEV + ILEV	LEV + ILEV	Y	23
			N	24
ULEV	ULEV	ULEV	Y	25
			N	26
ULEV + ILEV	ULEV + ILEV	ULEV + ILEV	Y	27
			N	28
ZEV	ZEV	ZEV	N	30
ZEV + ILEV	ZEV + ILEV	ZEV + ILEV	N	32

Exhibit 4-4. Codes for Exhaust Emission Standards (Federal and National)

Code	Description
C0	Tier 0
C1	Tier1
CT	TLEV
CL	LEV
CU	ULEV
CZ	ZEV (Electric)
CS	SLEV

Exhibit 4-5. Exhaust Emission Standards Codes (California)

Codes for Exhaust Emission Standards: 1998 LEV Standards

| To determine emission standards from the Engine Family/Test Group name, you must determine the ALVW and LVW for the vehicle class, combustion cycle, fuel, and standards. For Clean Fuel vehicles, the definition of test weight in 40 CFR, Part 86.101-94, is identical to the definition of ALVW.

4.3.6 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 4-8 shows the Input record dependencies for the ESI subsystem.

Engine System Information

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
E1	None	A,M,R,D,P,F,G ¹	Engine Family/Test Group Engine System
EE	E1	A,D	Engine System Emission Component
EC	E1	A,M,R	Engine System
ZZ		All Transactions	
E2	None	A,M,R,D,P,F,G	Engine Subsystem
ES	E2	A,M,R,D	Engine Subsystem Fuel
EG	ES	A,M,R,D	Engine Subsystem Standard EG Standard Cross Reference
ET	E2	A,M,R	Engine Subsystem
ZZ		All Transactions	

Exhibit 4-6. ESI Input Record Dependencies

¹Transactions Legend:

A= Add M= Modify R= Replace D= Delete P= Report
 F= Cancel G= Re-activate ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

NOTE: Either an E1 or an E2 must be included in a transaction; however, both cannot be included in the same transaction.

5.0 EVAPORATIVE/REFUELING SYSTEMS INFORMATION (EvSI)

5.1 EvSI Input/Output File Names

Input file name: evsi.in
Output file name: evsi.out

5.2 EvSI Transaction Process Codes

Process code explanations are as follows:

blank, A (Add) Use this code to enter new data into the EvSI database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also EvSI Input Notes Subsection 5.3.**

M (Modify) Use this code to modify existing data in the EvSI database. For *Modify* process codes, optional fields containing non-blank input data replace existing data in the database. CFEIS leaves existing data in the database unchanged if the input value is blank. To blank out a numeric field, enter an * in any column of the field. To blank out a text field, enter an * in every column of the field. If the asterisks do not fill the entire field, they will become part of the text. CFEIS generates an exception condition if the database does not contain the data to be modified. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also EvSI Input Notes Subsection 5.3.**

D (Delete) Use this code to delete existing data in the EvSI database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also EvSI Input Notes Subsection 5.3.**

R (Replace) Use this code to replace with input data all existing data in the EvSI database. *Replace* can be considered equivalent to a *Delete* transaction followed by an *Add* transaction. Unlike the *Modify*

process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also EvSI Input Notes Subsection 5.3.**

F (*Cancel*) Use this code to cancel an EvSI subsystem. Canceling an EvSI subsystem preserves existing information in the database while indicating that it will not be used. **See also EvSI Input Notes Subsection 5.3.**

G (*Re-activate*) Use this code to re-activate an EvSI subsystem that you previously canceled.

P (*Report*) Use this code to generate an Evaporative Family Report for a given manufacturer.

5.3 EvSI Input Notes

5.3.1 Add Transactions

The rules are as follows:

- In the EvSI database, a transaction must begin with and include **only one** P1 or P2 input record. This means that operations can be performed for a single Evaporative system or Evaporative subsystem in a transaction. If you are adding a P1 or P2 input record **only** to provide key field data for other input records in the transaction, you must include a *Modify M* process code in the P1 or P2 record.
- If you do not specify the following:
 - Emission standard.
 - Phase-in-percentage.
 - Additive DF.
 - Multiplicative DF.

when you add an EG record, CFEIS will look up and apply a corresponding emission standard based on model year, tier, useful life, Cert/In-Use code, LVW range, ALVW range, ignition type, emission name, sales area, GVW category, and fuel type. If the database does not contain a corresponding emission standard, it assigns 0 to the additive DF, 1 to the multiplicative DF, and 0 to the phase-in percentage.

- If you enter a value less than 0 for additive DF, CFEIS will use the value 0 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- If you enter a value less than 1 for multiplicative DF, CFEIS will use the value 1 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- | • When you add an Evaporative system on a P1 record, also include a vapor storage system and combustion cycle.

5.3.2 *Modify or Replace Transactions*

The rules are as follows:

- You cannot modify or replace EvSI data if you have used the data in a Summary Sheet **and** that Summary Sheet is locked.
- When affecting a change to the fuel material, you should use the 'A', 'R', or 'D' process code for the PM input record, which would be contained within a P1 *Modify* transaction. Use multiple PM input records to append more than 72 characters of new text.
- | • When modifying or replacing a P2 record, you must include a non-blank value for DF type if you have never entered the DF type for the Evaporative subsystem that you are modifying or replacing. No fuel material validation checks are performed to the text field; however, the fuel material field should indicate the type of material: plastic, metal or combined.
- If you do not specify the following:
 - Emission standard.
 - Phase-in-percentage.

- Additive DF.
- Multiplicative DF.

when you replace an EG record, CFEIS will look up and apply a corresponding emission standard based on model year, tier, useful life, Cert/In-Use code, LVW range, ALVW range, ignition type, emission name, sales area, GVW category, and fuel type. If the database does not contain a corresponding emission standard, it assigns 0 to the additive DF, 1 to the multiplicative DF, and 0 to the phase-in percentage.

- If you enter a value less than 0 for additive DF, CFEIS will use the value 0 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- If you enter a value less than 1 for multiplicative DF, CFEIS will use the value 1 for calculation of certification level. However, the entered value is retained in the CFEIS database.
- You cannot *Add, Modify, or Delete* canister configurations on a *Replace* transaction.
- Vehicle Information, MTDS, and Summary Sheet may need to be re-processed if EvSI data have been modified or replaced.

5.3.3 *Delete Transactions*

The rules are as follows:

- You may *delete* a subsystem without deleting the associated system.
- You cannot *delete* EvSI data if you have used the data in a Summary Sheet **and** that Summary Sheet is locked.
- You cannot *delete* a subsystem if the Evaporative Family system containing the subsystem is used by a vehicle configuration **and** the vehicle configuration references a sales area that corresponds to the subsystem.
- The *Delete* process code on the P1 input record deletes an Evaporative Family system and all its associated Evaporative Family subsystems. You cannot make any deletes on an Evaporative Family system until CFEIS is no longer using any of the associated subsystems. If the Evaporative Family system that you are deleting is the last one for the family, CFEIS will delete the entire family.

5.3.4 Cancel Transactions

You cannot cancel a subsystem more than three times.

5.3.5 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 5-1 shows the Input record dependencies for the EvSI subsystem.

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

NOTE: Either a P1 or a P2 must be included in a transaction; however, both cannot be included in the same transaction.

Evaporative Family Names

EPA standardized evaporative family names are described in detail in Appendix F of this document.

Evaporative System Information

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
P1	None	A,M,R,D,P,F,G ¹	Evaporative Family Evaporative Family System
PF	P1	A,M,D	Evaporative Family
PM	P1	A,M,D	Evaporative Family System
PE	P1	A,D	Evaporative System Emission Component
PC	P1	A,M,R	Evaporative Family Subsystem
ZZ		All Transactions	
P2	None	A,M,R,D,P,F,G	Evaporative Family Subsystem
PS	P2	A,M,R,D	Evaporative Family Subsystem Fuel
PT	P2	A,M,R	Evaporative Family Subsystem
PG	PS	A,M,R,D	Evaporative Family Subsystem Standard PG Standard Cross Reference
ZZ		All Transactions	

Exhibit 5-1. EvSI Input Record Dependencies

¹Transactions Legend:

A= Add M= Modify R= Replace D= Delete P= Report
 F= Cancel G= Re-activate ZZ= Termination

6.0 VEHICLE INFORMATION (VI)

6.1 VI Input/Output File Names

Input file name: vi.in

Output file name: vi.out

6.2 VI Transaction Process Codes

Process code explanations are as follows:

blank, A (Add) Use this code to enter new data into the VI database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also VI Input Notes Subsection 6.3.**

M (Modify) Use this code to modify existing data in the VI database. For *Modify* process codes, optional fields containing non-blank input data replace existing data in the database. CFEIS leaves existing data in the database unchanged if the input value is blank. To blank out a numeric field, enter an * in any column of the field. To blank out a text field, enter an * in every column of the field. If the asterisks do not fill the entire field, they will become part of the text. CFEIS generates an exception condition if the database does not contain the data to be modified. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also VI Input Notes Subsection 6.3.**

D (Delete) Use this code to delete existing data in the VI database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Car Line Input Notes Subsection 6.3.**

N (Change) Use this code to duplicate and create a new instance of a configuration using existing configuration data. The *Change/*
 | **(CarryAcross)**

CarryAcross transaction is similar to *Add*, except that for *Change* or *CarryAcross* CFEIS creates a new record with a configuration number equal to the next available unused configuration number. If there is test data for the configuration being changed or carried across, the test data will be carried across to the new configuration. **See also VI Input Notes Subsection 6.3.**

C (*Carry Over*) Use this code to carry over the specification data for a particular vehicle configuration from one year to another year. Vehicle configurations can be carried forward as well as back. All the tests for the configuration will be automatically carried over to the new model year. **See also VI Input Notes Subsection 6.3.**

P (*Report*) Use this code to generate a VI report for a given manufacturer.

6.3 VI Input Notes

6.3.1 *Add, Modify, Change and CarryAcross* Transactions

The rules are as follows:

- On an *Add* transaction, specify at least the following:
 - One fuel system using a VF record.
 - The Engine system.
- The CFEIS database must contain a DF type for each **Engine** subsystem that you identify for the vehicle.
- The CFEIS database must contain a DF type for each **Evaporative** subsystem that you identify for the vehicle.
- If the engine type is 03 **and** the fuel type is 09 **and** the vehicle is not equipped with any add-on exhaust control systems, use a value of 002 for the emission control system.
- When specifying the manufacturer coastdown time, also specify the following:
 - Tire manufacturer.
 - Tire construction code.

- Recommended in-use front tire pressure.
- Recommended in-use rear tire pressure.
- Tire pressure units.
- Specify 099 (Other) for the exhaust control system for a vehicle with the ESI exhaust emission-related component codes of 01 (Combustion Chamber/Non-Conventional Valve Train), 60 (Detonation Sensor), 61 (Electronic Controls - Analog), 62 (Electronic Controls - Digital), or 99 (Other).
- For engine type use only Otto Spark 01, Stratified Charge 02, or Diesel 03 for the Engine Type code.
- If you specify Ignition Timing #1, you must also specify the following:
 - Ignition timing before/after code.
 - Ignition timing RPM tolerance.
 - Ignition timing degree tolerance.
 - Ignition timing RPM.
 - Ignition timing gear code.
- If you specify idle RPM, you must also specify the following:
 - Idle RPM tolerance.
 - Idle gear code.

| **6.3.2 Add or Change or CarryAcross Transactions**

The rules are as follows:

- If you are submitting a VP record that specifies an EvSI system, you must also specify the following:

- Canister type.
- Bed volume per canister.
- Working capacity per canister.
- Total number of canisters of that type on the vehicle.

6.3.3 *Modify Transactions*

The rules are as follows:

- Specify an existing vehicle-configuration number for the following:
 - Manufacturer code.
 - Vehicle identification.
 - Model year.
- If the Engine or EvSI subsystem DF Type code is 1, 2, 3, 4, 5, or 6 **and** the vehicle is a durability vehicle, you cannot correct the Sales Area code.
- You cannot change the following:
 - Design gross vehicle weight.
 - Design curb weight.
 - Design equivalent test weight.
 - Manufacturer ETW units code.
 - Ignition timing #1.
 - Ignition timing #1 before/after code.
 - Ignition timing RPM.
 - Ignition timing RPM tolerance.

- Ignition timing degree tolerance measure.
- Transmission-configuration code.
- Odometer correction sign indicator code.
- Odometer initial correct measure.
- Odometer correction factor measure.
- Idle RPM measure.
- Idle RPM tolerance measure.
- Idle gear code.
- You cannot submit a VT record with a *Modify* process code if you have conducted a test on the vehicle configuration for the test procedure and vehicle fuel type identified by the VT record that you are submitting.
- MTDS, Summary Sheet, General Label, and CAFE may need to be re-processed if VI data are modified.

6.3.4 Delete Transactions

- You cannot do the following:
 - Remove the last fuel system for a vehicle.
 - Delete a vehicle configuration if the system number for the Engine Family specified in the VI data has been certified.
 - Delete a vehicle configuration if the system number for the Evaporative Family specified in the VI data has been certified.
 - Delete a vehicle configuration if the CFEIS database contains tests associated with the vehicle configuration.
 - Delete a vehicle configuration if the data have been carried over to another model year.

6.3.5 Carry Over Transactions

- You cannot do the following:
 - Carry over a durability vehicle to a non-durability vehicle.
 - Carry over a non-durability vehicle to a durability vehicle.

6.3.6 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 6-1 shows the Input record dependencies for the VI subsystem.

Vehicle Information

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
V1	None	A,M,D,N,P,C ¹	Vehicle Configuration
V2	V1	A,M,N	Vehicle Configuration
V3	V1	A,M,N,C	Vehicle Configuration
V4	V1	A,M,N,C	Vehicle Configuration
V5	V1	A,M,N	Vehicle Configuration
VP	V1	A,M,D	Vehicle Evaporative System
VF	V1	A,M,D	Vehicle Fuel System
VT	V1	A,M,D	Test Procedure Fuel
VC	V1	A,M,N,C	Vehicle Configuration
ZZ		All Transactions	

Exhibit 6-1. VI Input Record Dependencies

¹Transactions Legend:

A= Add M= Modify D= Delete P= Report
 N= Change C= Carry Over ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

NOTE: An add transaction must have at least one V1, one V3, and one VF record.

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7.0 SHIFT SCHEDULE (SH)

7.1 Shift Schedule Input/Output File Names

Input file name: shift.in

Output file name: shift.out

7.2 Shift Schedule Transaction Process Codes

Process code explanations are as follows:

blank, A (Add) Use this code to enter new data into the Shift Schedule database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Shift Schedule Input Notes Subsection 7.3.**

M (Modify) Use this code to modify existing data in the Shift Schedule database. For *Modify* process codes, optional fields containing non-blank input data replace existing data in the database. CFEIS leaves existing data in the database unchanged if the input value is blank. To blank out a numeric field, enter an * in any column of the field. To blank out a text field, enter an * in every column of the field. If the asterisks do not fill the entire field, they will become part of the text. CFEIS generates an exception condition if the database does not contain the data to be modified. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Shift Schedule Input Notes Subsection 7.3.**

D (Delete) Use this code to delete existing data in the Shift Schedule database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Shift Schedule Input Notes Subsection 7.3.**

- R (Replace)** Use this code to replace with input data all existing data in the Shift Schedule database. *Replace* can be considered equivalent to a *Delete* transaction followed by an *Add* transaction. Unlike the *Modify* process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Shift Schedule Input Notes Subsection 7.3.**
- N (Change)** Use this code to create a new Shift Schedule by modifying a copy of a standard EPA Shift Schedule or an existing manufacturer Shift Schedule. **See also Shift Schedule Input Notes Subsection 7.3.**
- P (Report)** Use this code to generate a Shift Schedule Family report for a given manufacturer.
- Y (Summary Report)** Use this code to generate a report of all Shift Schedules submitted by one vehicle manufacturer.

7.3 Shift Schedule Input Notes

The rules are as follows:

- You **must** provide an S1 record type for **all** Shift Schedule transactions regardless of the process code.
- Only one S1 record type may exist per transaction.

7.3.1 Add, Replace, and Change Transactions

The rules are as follows:

- Specify **only one** record for each of the following record types:
 - S2.
 - S3.

- S4.
- S7.
- Specify **at least one** S8 record type.
- On the S3 and S4 records, specify declutch speeds for each consecutive gear as follows:
 - Gear1_2.
 - Gear2_3.
 - Gear3_4.
 - Gear4_5.
 - Gear5_6.
- If you specify declutch speeds for cruise, also specify declutch speeds for non-cruise.
- If you specify declutch speeds for non-cruise, also specify declutch speeds for cruise.

7.3.2 *Add and Replace Transactions*

You must provide shift points using SP records for *Add* and *Replace* transactions.

7.3.3 *Modify and Change Transactions*

On SP records, *Modify* and *Change* process codes for Shift Schedule transactions cause the shift points to merge with the shift points already in the CFEIS database.

7.3.4 *Add and Change Transactions*

The *Add* and *Change* process codes for Shift Schedule transactions cause CFEIS to assign a new shift schedule number to the Shift Schedule.

7.3.5 *Modify, Delete, and Replace Transactions*

You cannot *Modify*, *Delete*, or *Replace* Shift Schedule data if the Shift Schedule has been used in a test.

7.3.6 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 7-1 shows the Input record dependencies for the Shift Schedule subsystem.

Shift Schedule

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
S1	None	A,M,R,D,N,P,Y ¹	Shift Schedule
S2	S1	A,M,R,N	Shift Schedule (Data Originator)
S3	S1	A,M,R,N	
S4	S1	A,M,R,N	
S5	S1	R	
S6	S1	R	
S7	S1	A,M,R,N	Drive Schedule
S8	S1	A,M,R,N	Shift Schedule Model Year
SP	S1	A,M,R,N	Shift Point
SC	S1	A,M,R,N	Shift Schedule
ZZ		All Transactions	

Exhibit 7-1. Shift Schedule Input Record Dependencies

¹Transactions Legend:

A= Add M= Modify R= Replace D= Delete P= Report
 N= Change Y= Summary Report ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

8.0 EPA/MANUFACTURER TEST DATA (MTDS)

8.1 MTDS Input/Output File Names

Input file name: mtds.in
Output file name: mtds.out
Output file name: mtds.epa (EPA confirmatory tests)

8.2 MTDS Transaction Process Codes

Process code explanations are as follows:

blank, A (Add) Use this code to enter new data into the MTDS database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also MTDS Input Notes Subsection 8.3.**

M (Modify) Use this code to modify existing data in the MTDS database. For *Modify* process codes, optional fields containing non-blank input data replace existing data in the database. CFEIS leaves existing data in the database unchanged if the input value is blank. To blank out a numeric field, enter an * in any column of the field. To blank out a text field, enter an * in every column of the field. If the asterisks do not fill the entire field, they will become part of the text. CFEIS generates an exception condition if the database does not contain the data to be modified. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also MTDS Input Notes Subsection 8.3.**

D (Delete) Use this code to delete existing data in the MTDS database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. See also MTDS Input Notes Subsection 8.3.

R (<i>Replace</i>)	Use this code to replace with input data all existing data in the MTDS database. <i>Replace</i> can be considered equivalent to a <i>Delete</i> transaction followed by an <i>Add</i> transaction. Unlike the <i>Modify</i> process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. See also MTDS Input Notes Subsection 8.3.
C (<i>Carry Over</i>)	Use this code only to carry over those test data that did not get carried over during the vehicle configuration carry over process. CFEIS generates a new set of model-year-dependent data for the carried over data. See also MTDS Input Notes Subsection 8.3.
X (<i>Carry Across</i>)	Use this code to carry across test results to a different vehicle configuration. CFEIS generates a new set of configuration-dependent data for the carried across data. See also MTDS Input Notes Subsection 8.3.
S (<i>Re-process</i>)	Use this code to re-capture any corrected/updated data in related subsystems and re-calculate affected results (Cert Level, Pass/Fail, etc.) for the specified configuration and the model year.
P (<i>Report</i>)	Use this code to generate an MTDS report for a given manufacturer.

8.3 MTDS Input Notes

The rules are as follows:

- CFEIS generates a unique test number for each new MTDS submission.
- EPA test numbers are generated outside of CFEIS and submitted by TSD.
- During the processing of EPA test data into CFEIS, the input is placed into a file named *mtdstsd.in* under the manufacturer's subdirectory. This file is appended to the *mtds.in* at the time CFEIS processing occurs at the even hour. The file, *mtdstsd.in*

| should not be altered or removed by the manufacturer. The EPA test results are placed in
| the manufacturer's *mtds.out* file, along with manufacturer test results, if any.

- CFEIS assigns a test number with a value of 1XXXXXX (X = 0-9) for a manufacturer test.
- Manufacturers **must** use a **valid Vehicle ID** for the Manufacturer code that you specify.
- Only EPA may enter a reason for confirmation, and it may only be entered for a confirmatory test.

8.3.1 *Add Transactions*

The rules are as follows:

- If the fuel type is diesel, you cannot specify the following:
 - Batch ID.
 - Container ID.
 - Fuel calibration number.
- If the fuel type is diesel, you do not need to specify a Test Lab Site code.
- For EvSI tests, you do not need to specify the following:
 - Dyno site.
 - Test analyzer site.
 - Test Lab Site code.
- For cold CO, light truck idle CO, or short tests, you do not need to specify the following:
 - Test Group code.
 - Average code
- A Fuel Batch calibration (T4 record) may only be entered on an add transaction for a city or highway test, where the VI fuel type is not diesel.

8.3.2 *Modify and Replace Transactions*

The rules are as follows:

- You must specify a test number that already exists in the MTDS database.
- You cannot change the values for the Manufacturer code and vehicle ID.
- You cannot change the values for model year or configuration number if the test has been carried over or carried across to another vehicle configuration.
- You may change the model year or configuration number to values present in the VI database, if the test data have not been carried over or carried across to another vehicle configuration.
- You cannot modify or replace test data that have been used to support a Certificate of Conformity for the specified EvSI or Engine system (diesel-fueled vehicles).
- You may modify test data (other than dispositions) **only** if the value for certification disposition or fuel economy disposition is one of the codes representing the following:
 - No disposition.
 - Undefined because of error.

If some other value for certification disposition or fuel economy disposition has been stored in the database, you can modify data **only** if your input contains certification disposition or fuel economy disposition codes that remove existing dispositions.

- You may not modify any EPA test data except the Fuel Economy Disposition code.
- If a test has been carried over or carried across, you may modify **only** the following fields:
 - Test purpose.
 - Certification disposition.
 - Fuel economy disposition.

- If you submit a correction for a specified configuration and model year **and** the Engine or EvSI Family system has not been certified, CFEIS re-calculates all configuration model-year data.
- Summary Sheet, General Label, and CAFE may need to be re-processed if MTDS data are modified, replaced, or re-processed.
- Measured fuel property data for a Fuel Batch ID/Calibration Number need only be entered once as a part of the first test's input.
- Measured fuel property data for a Fuel Batch ID/Calibration Number may only be modified on a *Modify* transaction for a city or highway test, where the VI Fuel Type is not diesel and the test being modified references the fuel batch.
- Measured fuel property data for a Fuel Batch ID/Calibration Number may only be modified if none of the tests that reference the fuel batch support a locked certificate.
- If a measured fuel property data for a Fuel Batch ID/Calibration Number are modified, the fuel economy results for all tests that reference the fuel batch are re-calculated and the disposition codes are re-assigned accordingly (CFEIS Release 2.0 and later).

8.3.3 *Delete Transactions*

The rules are as follows:

- You cannot delete test data used to support a locked Certificate of Conformity.
- You may delete configuration model-year-dependent test results (for example, rounded emission results, certification levels, etc.) **only** if they are associated with the following:
 - Test number.
 - Configuration number.
 - Vehicle ID.
 - Model year.

that you specify when you delete test data. If your deletion removes the last occurrence of configuration model-year-dependent results for the test number that you specify, CFEIS deletes the test number and all test data associated with it.

- A Fuel Batch cannot be deleted from the system once entered.

8.3.4 *Carry Over or Carry Across Transactions*

The rules are as follows:

- You cannot *Modify* Manufacturer code and configuration number when you are carrying over test data.
- You cannot *Modify* Manufacturer code and Vehicle ID when you are carrying across test data.
- You cannot *Carry Over* or *Carry Across* test data until the technical disposition for a test has been assigned.
- When you carry over test data, specify a new value for model year.
- When you *Carry Over* or *Carry Across* test data, CFEIS generates a new instance of the configuration model-year-dependent test results and updates the CFEIS database with the results. Configuration model-year-dependent results include the following:
 - Rounded emission results.
 - Deterioration factors.
 - Certification levels.
 - Emission standards used for the test.
 - Emission level pass/fail.
 - Test level pass/fail.
 - Test fuel economy.

- When you *Carry Across* test data, specify a new configuration number (required) and model year (optional).

8.3.5 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 8-1 shows the Input record dependencies for the MTDS subsystem.

EPA/Manufacturer Test Data System (MTDS)

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
T1	None	A,M,R,D,P,C,X,S ¹	Test
T2	T1	A,M,R	Test Fuel Batch
T3	T1	A,M,R	Test
T4	T1	A,M,R	Fuel Batch
TR	T1	A,M,R	Unrounded Emission Results
TC	T1	A,M,R	Test
ZZ		All Transactions	

Exhibit 8-1. MTDS Input Record Dependencies

¹Transactions Legend:

A= Add M= Modify R= Replace D= Delete P= Report
 C= Carry Over X= Carry Across S= Re-process ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

8.4 System-Generated Calculations

CFEIS takes unrounded test results received from either a manufacturer or TSD, and rounds them to meet the minimum precision specified in the Code of Federal Regulations (CFR). CFEIS rounds test results according to the following rounding criteria:

- When the digit following the digit in the rounding position is less than 5, CFEIS truncates the digits following the digit in the rounding position.
- When the digit following the digit in the rounding position is greater than 5, CFEIS truncates the digits following the digit in the rounding position and adds 1 to the digit in the rounding position.
- When the digit following the digit in the rounding position is 5 and there are no trailing digits (or only zeroes), CFEIS truncates the digits following the digit in the rounding position and adds 1 to the rounding digit if it is odd. If any trailing digits exist beyond the 5 following the rounding digit, CFEIS truncates the digits following the digit in the rounding position and adds 1 to the rounding digit.

CFEIS determines certification levels. These certification levels are the adjusted exhaust/evaporative emission test results after deterioration factors and rounding methods have been applied. CFEIS compares the adjusted emission values against the standard to determine vehicle compliance.

CFEIS determines emission level pass/fail. Pass/fail determinations are made by comparing the adjusted emission values (certification levels) to the emission standards. A passing emission value is less than or equal to the emission standard. These standards are set forth by the Clean Air Act and stated in the CFR.

| CFEIS determines sales area pass/fail. If you are requesting certification of an Engine/
| Evaporative family that is to be sold across sales areas, (that is, CA - California, FA - federal all-altitude, NL - national LEV, CF - Clean Fuel vehicle, CT - Clean Fuel vehicle/ Tier 1), submit test data for each sales area. CFEIS determines vehicle compliance based on a comparison to the standard values applicable for each individual sales area.

CFEIS assigns a Certification Disposition code to vehicle tests that are either performed by the manufacturer or EPA. The Certification Disposition code identifies how a test is used in the certification process. CFEIS disallows assignment of a Certification Disposition code other than the codes for Undefined Because of Error or No Disposition until the Technical Disposition code has been assigned.

CFEIS assigns a Fuel Economy Disposition code to vehicle tests performed by the manufacturer or EPA. The Fuel Economy Disposition code is used to indicate how a test is used in the fuel economy process. CFEIS disallows assignment of a Fuel Economy Disposition code until the Certification Disposition code has been assigned.

CFEIS internally stores and retrieves 2-digit disposition codes. You indicate these codes through the use of 1-digit user codes, and CFEIS recognizes these 1-digit codes as representing the corresponding 2-digit codes on the basis of the input records employed and the position of the 1-digit codes within the input records.

CFEIS performs fuel economy calculations based on constant fuel (diesel only), measured fuel, or methanol flexible-fuel, natural gas fuel, or California Phase 2 fuel properties. There are no fuel calculations for ethanol, hydrogen, or LPG. The results of these calculations are compared to manufacturer reported fuel economy values for accuracy. These calculations are performed in accordance with the provisions defined in the CFR. Specifically, the following formulas, as stated in Part 600, Subpart F, §600.113-93 of the July 1, 1994, edition of the 40 CFR, are identified for these calculations. The mathematical notation in the equations below has been revised to make it consistent with the notation most commonly used in Federal regulations.

8.4.1 Unrounded Unadjusted Fuel Economy/Measured Fuel Properties

This equation is used to perform fuel economy calculations for 1988 and later model year vehicles.

$$UUE_{mfp} = [51740000.0 \times CWF \times SG] / [((CWF \times HC) + (0.429 \times CO) + (0.273 \times CO_2)) \times ((0.6 \times SG \times NHV) + 5471)]$$

where:

- UUE_{mfp} = Unrounded unadjusted fuel economy using measured fuel properties.
- CWF = Test fuel carbon weight fraction.
- SG = Test fuel specific gravity.
- NHV = Test fuel net heating value.
- HC = Hydrocarbons in grams per mile.

CO = Carbon monoxide in grams per mile.

CO₂ = Carbon dioxide in grams per mile.

8.4.2 Unrounded Unadjusted Fuel Economy/Methanol Flexible-Fueled Vehicles

$$UUF_{E_{mffv}} = \frac{[3781.8 \times CWF \times SG]}{[(CWF_{EXHC} \times HC) + (0.429 \times CO) + (0.273 \times CO_2) + (0.375 \times CH_3OH) + (0.400 \times HCHO)]}$$

where:

UUF_{E_{mffv}} = Unrounded unadjusted fuel economy for vehicles tested on methanol test fuel.

CWF = Test fuel carbon weight fraction.

SG = Test fuel specific gravity.

CWF_{EXHC} = Carbon weight fraction of exhaust hydrocarbons.

HC = Hydrocarbons in grams per mile.

CO = Carbon monoxide in grams per mile.

CO₂ = Carbon dioxide in grams per mile.

CH₃OH = Methanol in grams per mile.

HCHO = Formaldehyde in grams per mile.

8.4.2.5 Unrounded Unadjusted Fuel Economy Equation for Ethanol Flexible-Fueled Vehicles:

$$UUF_{E_{effv}} = \frac{[3781.8 \times CWF_{blend} \times SG_{blend}]}{[(CWF_{EXHC} \times HC) + (0.429 \times CO) + (0.273 \times CO_2) + (0.375 \times CH_3OH) + (0.400 \times HCHO) + (0.521 \times C_2H_5OH) + (0.545 \times C_2H_4O)]}$$

where:

UUF_{E_{effv}} = Unrounded unadjusted fuel economy for vehicles tested on ethanol test fuel.

CWF = Carbon weight fraction of the fuel.

SG = Specific gravity of the fuel.

CWF_{EXHC} = Is assumed to be equal to CWF_{blend}.

and emissions are expressed in grams/mile.

8.4.3 Unrounded System Miles or Kilometers

(1) If

Odometer Correction Sign = +

then

USYSMI/KM = (Odometer x Factor) + Initial

(2) If

Odometer Correction Sign = -

then

USYSMI/KM = (Odometer - Initial) x Factor

where:

USYSMI/KM = Unrounded system miles or kilometers.

Odometer = Test odometer reading, rounded to the nearest whole number.

Initial = Initial odometer reading (reported with VI).

Factor = Correction factor (reported with VI).

NOTE: The odometer correction sign is reported with VI.

8.4.4 Conversion of System Kilometers to System Miles

This equation is used if the odometer reading is reported in kilometers.

$$\text{SYSMI} = \text{USYSMI} / (\text{KM} \times 0.62137119)$$

where:

$$\text{SYSMI} = \text{System miles.}$$

$$\text{USYSMI} = \text{Unrounded system miles.}$$

$$\text{KM} = \text{Kilometers.}$$

NOTE: The result is rounded to the nearest whole number.

8.4.5 Unrounded Mileage-Adjusted Fuel Economy

| **NOTE:** The adjustment takes place only if the system miles is greater than 6200.

$$\text{UMAFE} = \text{FE} / [(0.00000525 \times \text{SYSMI}) + 0.979]$$

where:

$$\text{UMAFE} = \text{Unrounded mileage-adjusted fuel economy.}$$

$$\text{FE} = \text{Unadjusted fuel economy rounded to one decimal place.}$$

$$\text{SYSMI} = \text{System miles.}$$

8.4.6 Fuel Economy Calculations for Vehicles Tested on California Phase 2 Gasoline

CFEIS calculates fuel economy values for vehicles tested on California Phase 2 gasoline.

These calculations are performed in accordance with the procedures set forth in the Dear Manufacturer letter CD-95-09, *MPG Calculations for Certification Vehicles Tested on California Phase 2 Gasoline*.

$$(1) \quad \text{UUF}_{\text{corr}} = \frac{[\text{CWF}_{\text{blend}} \times \text{SG}_{\text{blend}} \times 51740000]}{[(1.03 \times \text{CWF}_{\text{exHC}} \times \text{HC}) + (.429 \times \text{CO}) + (.273 \times \text{CO}_2)] \times [(0.6 \times \text{SG}_{\text{blend}} \times \text{NHV}_{\text{blend}}) + 5471]}$$

where:

UUF_{corr} = Corrected unrounded unadjusted fuel economy for vehicles fueled using CARB Phase 2 gasoline. This is the official EPA mpg value for certification vehicles tested on CARB Phase 2 gasoline. Data indicate that this mpg value is partially corrected for the differences in fuel properties between Phase 2 test fuel and 1975 EPA test fuel.

$\text{CWF}_{\text{blend}}$ = Carbon weight fraction of the fuel.

SG_{blend} = Specific gravity of the fuel.

CWF_{exHC} = Carbon weight fraction of exhaust hydrocarbons.

$\text{NHV}_{\text{blend}}$ = Net heating value of the fuel.

HC = Hydrocarbons in grams per mile.

CO = Carbon monoxide in grams per mile.

CO_2 = Carbon dioxide in grams per mile.

$$(2) \quad \text{UUF}_{\text{uncorr}} = \frac{[\text{CWF}_{\text{blend}} \times \text{SG}_{\text{blend}} \times 3781.8]}{[(1.03 \times \text{CWF}_{\text{exHC}} \times \text{HC}) + (.429 \times \text{CO}) + (.273 \times \text{CO}_2)]}$$

where:

| $\text{UUF}_{\text{uncorr}}$ = Uncorrected unrounded unadjusted fuel economy for vehicles fueled using CARB Phase 2 gasoline. This is the uncorrected (volumetric) mpg value for certification vehicles tested on CARB Phase 2 gasoline.

CFW_{blend}	=	Carbon weight fraction of the fuel.
Sg_{blend}	=	Specific gravity of the fuel.
CWF_{exHC}	=	Carbon weight fraction of exhaust hydrocarbons.
NHV_{blend}	=	Net heating value of the fuel.
HC	=	Hydrocarbons in grams per mile.
CO	=	Carbon monoxide in grams per mile.
CO ₂	=	Carbon dioxide in grams per mile.

8.4.7 Fuel Economy Calculations for Vehicles Tested Using Natural Gas Fuel

CFEIS calculates fuel economy values for vehicles tested using natural gas fuel as specified in the 40 CFR Parts 80, 85, 86, 88, and 600, *Standards for Emissions From Natural Gas-Fueled, and Liquefied Petroleum Gas-Fueled Motor Vehicles and Motor Vehicle Engines, and Certification Procedures for Aftermarket Conversions; Final Rule.*

$$UUE_{NG} = \frac{[CWF_{HC/NG} \times D_{NG} \times 121.5]}{[(0.749 \times CH_4) + (CWF_{NMHC} \times NMHC) + (0.429 \times CO) + (0.273 \times (CO_2 - CO_{2NG}))]}$$

where:

UUE_{NG}	=	Miles per equivalent gallon of natural gas
$CWF_{HC/NG}$	=	Carbon weight fraction based on the hydrocarbon constituents in the natural gas fuel.
D_{NG}	=	Density of the natural gas fuel [grams per foot ³ at 680F (200C) and 760 mm Hg (101.3 kPa)]
CH ₄	=	Weighted mass exhaust emissions in grams per mile for methane.

- NMHC = Weighted mass exhaust emissions in grams per mile for nonmethane hydrocarbons.
- CO = Weighted mass exhaust emissions in grams per mile for carbon monoxide.
- CO₂ = Weighted mass exhaust emissions in grams per mile for carbon dioxide.
- CWF_{NMHC} = Carbon weight fraction of the non-methane HC constituents of the fuel as determined from the speciated fuel composition.
- CO_{2NG} = Grams of carbon dioxide in the natural gas fuel consumed per mile of travel, equal to $FC_{NG} \times D_{NG} \times WF_{CO_2}$

where:

$$FC_{NG} = \text{Cubic feet of natural gas consumed per mile.}$$

$$= \frac{[(0.749 \times CH_4) + (CWF_{NMHC} \times NMHC) + (0.429 \times CO) + (0.273 \times CO_2)]}{[CWF_{NG} \times D_{NG}]}$$

where:

$$CWF_{NG} = \text{Carbon weight fraction of the natural gas fuel.}$$

$$WF_{CO_2} = \text{Weight fraction carbon dioxide of the natural gas fuel calculated using mole fractions and molecular weights of the natural gas fuel constituents.}$$

8.4.8 Fuel Economy Calculations for Vehicles Tested Using Diesel Fuel

$$UUE_{FD} = 2778 / [(0.866 \times HC) + (0.429 \times CO) + (0.273 \times CO_2)]$$

where:

UUFED	=	Uncorrected unrounded unadjusted fuel economy for vehicles fueled using diesel fuel.
HC	=	Weighted mass exhaust emissions in grams per mile for hydrocarbons.
CO	=	Weighted mass exhaust emissions in grams per mile for carbon monoxide.
CO ₂	=	Weighted mass exhaust emissions in grams per mile for carbon dioxide.

8.4.9 Test Type/Test Purpose

CFEIS associates Test Purpose/Test Type codes with definition strings as shown in Exhibit 8-2.

Test Type/Test Purpose Code	Definition String
01	Emission data
02	Durability
04	Surveillance
05	Experimental
06	Sulfate
07	Particulates
08	Manufacturers' development
11	Correlation
21	Experimental (TSD)
22	Recall
23	Emission factor
24	In-use feasibility
25	Fuel tampering
26	Independent commercial importer
30	TSD other
31	Fuel economy data
32	Analytical fuel economy data
33	Certification or fuel economy for other years (carry over)
45	Methanol

Exhibit 8-2. Test Type/Test Purpose Codes

8.4.10 Test Procedure Codes

CFEIS associates Test Procedure codes with definition strings, as shown in two parts in Exhibit 8-3.

Test Procedure Code	Definition String
02	CVS 75 - & Later (EPA city test w/o canister loading)
03	HWFE (Highway test)
10	Idle CO
11	Cold CO
13	Constant temperature evaporative (2-hr evap)
15	Spitback test
21	Federal Fuel 2-day Exhaust (C ₄ H ₁₀ can load)
23	Federal Fuel 2-day Evap Test (C ₄ H ₁₀ can load)
24	Federal Fuel Refueling Test (ORVR) (C ₄ H ₁₀ canister loading)
25	California Fuel 2-day Exhaust (C ₄ H ₁₀ can load)
27	California Fuel 2-day Evap Test (C ₄ H ₁₀ can load)
28	California Fuel Refueling Test (ORVR) (C ₄ H ₁₀ canister loading)
31	Federal Fuel 3-day Exhaust (C ₄ H ₁₀ can load)
34	Federal Fuel 3-day Evap Test (C ₄ H ₁₀ can load)
35	California Fuel 3-day Exhaust (C ₄ H ₁₀ can load)
38	California Fuel 3-day Evap Test (C ₄ H ₁₀ can load)
41	Federal Fuel 2-day Exhaust (heat fuel tank to load canister)
43	Federal Fuel 2-day Evaporative Test (heat fuel tank to load canister)
44	Federal Fuel Refueling Test (ORVR)
45	California Fuel 2-day Exhaust (heat fuel tank to load canister)
47	California Fuel 2-day Evaporative Test (heat fuel tank to load canister)
51	California Fuel 50°F Exhaust Test

Exhibit 8-3. Test Procedures Codes

Test Procedure Code	Definition String
52	Federal Fuel 50°F Exhaust Test
71	CST - Idle Test (EPA Only)
72	CST - 2-speed Idle Test
73	CST - Loaded Test (EPA Only)
74	CST - Preconditioned Idle Test (EPA Only)
76	CST - Preconditioned 2-speed Idle Test (EPA Only)

Exhibit 8-3. Test Procedure Codes (Continued)

8.4.11 Valid Combinations of Test Type/Test Purpose and Test Procedure Codes

Exhibit 8-4, as shown in two parts, are combinations of Test Procedure codes with Test Type/Test Purpose codes, where the presence of an X indicates that the combination is valid.

Test Procedure Code	Definition String	Test Type/Test Purpose Code					
		01	02	08	31	32	33
02	CVS 75 & Later (EPA city test w/o canister loading)	X	X	X	X	X	X
03	HWFE (Highway test)	X		X	X	X	X
10	Idle CO	X	X	X	X		X
11	Cold CO	X	X	X	X		X
13	Constant temperature evaporative (2-hr evap)	X	X	X	X		X
15	Spitback test	X	X	X	X		X
21	Federal Fuel 2-day Exhaust (C ₄ H ₁₀ can load)	X	X	X	X		X
23	Federal Fuel 2-day Evap Test (C ₄ H ₁₀ can load)	X	X	X	X		X
24	Federal Fuel Refueling Test (ORVR) (C ₄ H ₁₀ canister loading)	X	X	X	X		X
25	California Fuel 2-day Exhaust (C ₄ H ₁₀ can load)	X	X	X	X		X
27	California Fuel 2-day Evap Test (C ₄ H ₁₀ can load)	X	X	X	X		X
28	California Fuel Refueling Test (ORVR) (C ₄ H ₁₀ canister loading)	X	X	X	X		X
31	Federal Fuel 3-day exhaust (C ₄ H ₁₀ can load)	X	X	X	X		X
34	Federal Fuel 3-day Evap Test (C ₄ H ₁₀ can load)	X	X	X	X		X

Exhibit 8-4. Valid Combinations of Test Procedure Codes and Test Type/Test Purpose Codes

Test Procedure Code	Definition String	Test Type/Test Purpose Code					
		01	02	08	31	32	33
35	California Fuel 3-day Exhaust (C ₄ H ₁₀ can load)	X	X	X	X		X
38	California Fuel 3-day Evap Test (C ₄ H ₁₀ can load)	X	X	X	X		X
41	Federal Fuel 2-day Exhaust (heat fuel tank to load canister)	X	X	X	X		X
43	Federal Fuel 2-day Evaporative Test (heat fuel tank to load canister)	X	X	X	X		X
44	Federal Fuel Refueling Test (ORVR) (heat fuel tank to load canister)	X	X	X	X		X
45	California Fuel 2-day Exhaust (heat fuel tank to load canister)	X	X	X	X		X
47	California Fuel 2-day Evaporative Test (heat fuel tank to load canister)	X	X	X	X		X
51	California Fuel 50°F Exhaust Test			X			X
52	Federal Fuel 50°F Exhaust Test			X			X
71	CST - Idle Test (EPA Only)	X	X	X	X		X
72	CST - 2-speed Idle Test	X	X	X	X		X
73	CST - Loaded Test (EPA Only)	X	X	X	X		X
74	CST - Preconditioned Idle Test (EPA Only)	X	X	X	X		X
76	CST - Preconditioned 2-speed Idle Test (EPA Only)	X	X	X	X		X

Exhibit 8-4. Valid Combinations of Test Procedure Codes and Test Type/Test Purpose Codes (Continued)

9.0 SUMMARY SHEET (SS)

9.1 Summary Sheet Input/Output File Names

Input file name: summary.in
Output file name: summary.out

9.2 Summary Sheet Transaction Process Codes

Process code explanations are as follows:

- blank, A (Add)** Use this code to enter new data into the Summary Sheet database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Summary Sheet Input Notes Subsection 9.3.**
- D (Delete)** Use this code to delete existing data in the Summary Sheet database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Summary Sheet Input Notes Subsection 9.3.**
- R (Replace)** Use this code to replace with input data all existing data in the Summary Sheet database. *Replace* can be considered equivalent to a *Delete* transaction followed by an *Add* transaction. Unlike the *Modify* process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also Summary Sheet Input Notes Subsection 9.3.**
- S (Re-process)** Use this code to re-capture any corrected/updated data in other subsystems. **See also Summary Sheet Input Notes Subsection 9.3.**
- P (Report)** Use this code to generate a report for a Summary Sheet index.

9.3 Summary Sheet Input Notes

9.3.1 For All Transactions

| For all transactions **except** *Delete*, CFEIS produces a report showing out-of-range data for the car lines, Engine system, Evaporative system, tests, and vehicles associated with the Summary Sheet information provided in the transaction. No Certificate of Conformity can be generated by the VPCD ADP Analysts as long as out-of-range data are associated with the Summary Sheet. Correct the out-of-range data by creating submissions in the subsystem where the error occurred (for example, Car Line, ESI, EvSI, VI, or MTDS).

9.3.2 Add Transactions

When you input an *Add* process code, CFEIS generates a new Summary Sheet index number.

9.3.3 Add and Replace Transactions

Specify at least one X1, X2, and XT record in the transaction.

9.3.4 Re-process, Delete, and Report Transactions

Specify at least one X1 record in the transaction.

9.3.5 Replace, Re-process, and Delete Transactions

You cannot change the Summary Sheet information if you have a Certificate of Conformity for that Summary Sheet **and** the Certificate of Conformity is locked.

9.3.6 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 9-1 shows the Input record dependencies for the Summary Sheet subsystem.

Summary Sheet

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
X1	None	A,R,D,P,S ¹	Summary
X2	X1	A,R	Summary
XC	X1	A,R	Summary
XT	X1	A,R	Summary
ZZ		All Transactions	

Exhibit 9-1. Summary Sheet Input Record Dependencies

¹Transactions Legend:

A= Add R= Replace D= Delete P= Report
 S= Re-process ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

NOTE: Add and Replace must contain one X1 and at least one X2 and one XT record.

10.0 GENERAL LABEL

10.1 General Label Input/Output File Names

Input file name: gl.in
Output file name: gl.out

10.2 General Label Transaction Process Codes

Process code explanations are as follows:

- blank, A (Add)*** Use this code to enter new data into the General Label database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also General Label Input Notes Subsection 10.3.**
- D (Delete)*** Use this code to delete existing data in the General Label database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also General Label Input Notes Subsection 10.3.**
- R (Replace)*** Use this code to replace with input data all existing data in the General Label database. *Replace* can be considered equivalent to a *Delete* transaction followed by an *Add* transaction. Unlike the *Modify* process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also General Label Input Notes Subsection 10.3.**
- S (Re-process)*** Use this code to re-compute or re-evaluate any corrected/ updated General Label data and to record re-computed or re-evaluated results. **See also General Label Input Notes Subsection 10.3.**

10.3 General Label Input Notes

The rules are as follows:

- Use a Manufacturer code and Index number that when concatenated together represent a unique Basic Engine Index within a model year.
- If you specify lock-up RPM data, you must also specify lock-up range numbers.
- If you are spanning multiple input records for a group of city or highway tests, you must specify an averaging group indicator.
- You cannot re-process fuel economy data after their release date has passed (that is, the date on which the label information can be released to the public).

10.3.1 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 10-1 shows the Input record dependencies for the General Label subsystem.

General Label

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
G1	None	A,R,D,S ¹	General Label Basic Engine
G2	G1	A,R	General Label Base Level
GM	G2	A,R	General Label Model Type General Label Submodel Type
GF	G2	A,R	General Label Configuration General Label Subconfiguration General Label Configuration Xref
GR	GF	A,R	General Label Gear Ratios
GL	GF	A,R	General Label Lockup RPM
GT	GF	A,R	General Label Test Group
GC	G1	A,R	General Label Basic Engine
ZZ		All Transactions	

Exhibit 10-1. General Label Input Record Dependencies

¹Transactions Legend:

A= Add R= Replace D= Delete S= Re-process

ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column shows the kind of transactions that you can submit. Your input record data will be stored in the respective CFEIS table.

10.4 System-Generated Calculations

CFEIS performs fuel economy calculations based on a manufacturer's General Label data submission. The General Label calculations are performed in accordance with the provisions defined in the CFR. Specifically, the following formulas (as stated in Part 600, Subpart F, §600.207-86, §600.208-77, §600.209-85, and §600.513-81 of the July 1, 1994, edition of the 40 CFR) are identified for these calculations.

10.4.1 Multiple tests on one test vehicle within one subconfiguration

$$FEV_{city/hwy} = n / \sum_{i=1}^n (1.0 \text{ DO} / FET_i)$$

where:

$FEV_{city/hwy}$ = City or highway fuel economy for this vehicle.

DO = Double precision.

FET_i = Fuel economy of test i which has been ASTM rounded to 1 decimal place.

City test are used for FEV_{city} calculation and highway tests are used for FEV_{hwy} .

10.4.2 Subconfiguration-level MPG/City or Highway

$$FES_{city/hwy} = \text{ASTM}(4) [n / \sum_{i=1}^n (1.0 \text{ DO} / FEV_i)]$$

where:

ASTM(4) = round to 4 decimal places in accordance with the “Rounding-Off Method” specified in ASTM E 29-67.

Throughout this document, ASTM(i) indicates ASTM rounding to i-th decimal places.

$FES_{city/hwy}$ = City or highway fuel economy for this subconfiguration.

DO = Double precision.

FEV_i = City or highway fuel economy for vehicle i (from section 10.4.1) within this subconfiguration.

10.4.3 Configuration-level MPG/City or Highway

$$FEC_{city/hwy} = \text{ASTM}(4) [1.0 \text{ DO} / \sum_{i=1}^n (SF_i / FES_i)]$$

where:

$FEC_{city/hwy}$ = City or highway fuel economy for this configuration.

DO	=	Double precision.
SF_i	=	ASTM(4)[Sales _i / Total Sales]
Sales _i	=	Sales for tested subconfiguration i within this configuration.
Total Sales	=	Total tested subconfiguration sales within this configuration.
FES _i	=	City or highway fuel economy for subconfiguration i (from section 10.4.2) within this configuration.

10.4.4 Configuration-level MPG/Combined

$$FEC_{comb} = ASTM(4)[1.0 DO / (0.55 DO / FEC_{city} + 0.45 DO / FEC_{hwy})]$$

where:

FEC_{comb}	=	Combined fuel economy for this configuration.
DO	=	Double precision.
FEC_{city}	=	City fuel economy for this configuration from section 10.4.3.
FEC_{hwy}	=	Highway fuel economy for this configuration from section 10.4.3.

10.4.5 Base-level MPG/City, Highway, or Combined

$$FEB = ASTM(4)[1.0 DO / \sum_{i=1}^n (SF_i / FEC_i)]$$

where:

FEB	=	City, highway or combined fuel economy for this base level.
-----	---	---

DO	=	Double precision.
SF_i	=	ASTM(4)[Sales _i / Sales _{total}]
Sales _i	=	Sales for tested configuration i within this base-level.
Sales _{total}	=	Total tested configuration sales within this base level.
FEC _i	=	City, highway or combined fuel economy for configuration i (from section 10.4.3 or 10.4.4) within this base-level.

10.4.6 Model-level MPG/City, Highway, or Combined

$$FEM = ASTM(4)[1.0 DO / \sum_{i=1}^n (SF_i / FEB_i)]$$

where:

FEM	=	City, highway or combined fuel economy for this model type.
DO	=	Double precision.
SF_i	=	ASTM(4)[Sales _i / Sales _{total}]
Sales _i	=	Sales for base-level i within this model type.
Sales _{total}	=	Model type sales.
FEB _i	=	City, highway or combined fuel economy for base-level i (from section 10.4.5) within this model type.

10.4.7 Estimated Model Type MPG/City

$$FEE_{city} = ASTM(0)[FEM(0.9 DO)]$$

where:

FEE_{city} = Estimated city fuel economy for this model type.

FEM = City fuel economy for this model type (from section 10.4.6).

DO = Double precision.

10.4.8 Estimated Model Type MPG/Highway

FEE_{hwy} = $ASTM(0)[FEM(0.78 DO)]$

where:

FEE_{hwy} = Estimated highway fuel economy for this model type

FEM = Highway fuel economy for this model type (from section 10.4.6).

DO = Double precision

10.4.9 Estimated Model Type MPG/Combined

FEE_{comb} = $ASTM(0)[1.0 DO / (0.55 DO / FEM_{city}(0.9 DO) + 0.45 DO / FEM_{hwy}(0.78 DO))]$

where:

FEE_{comb} = Estimated combined fuel economy for this model type.

DO = Double precision.

FEM_{city} = City fuel economy for this model type (from section 10.4.6).

FEM_{hwy} = Highway fuel economy for this model type (from section 10.4.6).

10.4.10 Annual Fuel Cost

$$AFC = ASTM(0)[FUCOST(15000 (FEE_{inv}))]$$

where:

AFC = Annual fuel cost for this model type.

FUCOST = Dollars per gallon (fuel cost).

FEE_{inv} = $ASTM(4)[1.0 DO / FEE_{comb}]$

DO = Double precision.

FEE_{comb} = Estimated combined fuel economy of a given model type (from section 10.4.9), or as submitted by manufacturer on Gen. Label record type "GM".

10.4.11 Averaging/Weighting of tests

$$FEA = ASTM(1)[\sum_{i=1}^n (FET_i (WT_i))]$$

where:

FEA = Average city or highway fuel economy for this group.

FET_i = Fuel economy for test i (if a single test on a vehicle configuration) or harmonically averaged fuel economy for vehicle configuration i within the averaging group. City or highway values are used as applicable.

$$\sum_{i=1}^n WT_i = 1.$$

NOTE: If multiple test data exist on a single test vehicle configuration, the harmonic average of fuel economy values is first calculated for each vehicle configuration before weighted averaging takes place.

10.4.12 Fuel Economy Range/City or Highway

$$FER_{\text{low-end}} = 85(\text{FEE}) / 100$$

$$FER_{\text{high-end}} = (115(\text{FEE}) + 99) / 100$$

where:

$$FER_{\text{low-end}} = \text{Fuel economy range minimum value.}$$

$$FER_{\text{high-end}} = \text{Fuel economy range maximum value.}$$

$$\text{FEE} = \text{Adjusted city/highway fuel economy for this model type (from section 10.4.7 or 10.4.8).}$$

NOTE: $FER_{\text{low-end}}$ and $FER_{\text{high-end}}$ are both truncated to whole numbers.

10.4.13 Adjusted MPG Calculation for Gas Guzzler

$$FE_{\text{adj}} = \text{ASTM}(1) [FEM_{\text{comb}} [(0.55a + 0.45c + 0.5556a + 0.4487) / (0.55a + 0.45)] + Iw_g]$$

where:

$$FE_{\text{adj}} = \text{Adjusted fuel economy to be used for gas guzzler assessment.}$$

$$FEM_{\text{comb}} = \text{Combined fuel economy for this model type (from section 10.4.6).}$$

$$a = \text{ASTM}(4) [FEM_{\text{hwy}} / FEM_{\text{city}}]$$

$$FEM_{\text{hwy}} = \text{Highway fuel economy for this model type (from section 10.4.6).}$$

$$FEM_{\text{city}} = \text{City fuel economy for this model type (from section 10.4.6).}$$

$$c = 2.501 \times 10^{-2} \text{ for model year 1980.}$$

- = 2.184×10^{-2} for model year 1981.
- = 9.260×10^{-3} for model year 1982.
- = 1.435×10^{-2} for model year 1983.
- = 1.420×10^{-2} for model year 1984.
- = 1.490×10^{-2} for model year 1985.
- = 1.300×10^{-3} for model year 1986 and later model years.

$$Iw_g = 0.0092917(SF_{3IWCg})(FE_{3IWCg}) - 0.0035123(SF_{4ETWG})(FE_{4IWCg}).$$

Any calculated value of Iw_g less than zero shall be set to equal to zero.

$$SF_{3IWCg} = ASTM(4)[\text{sales at 3000 lb IWT} / \text{total model type sales}].$$

$$SF_{4ETWG} = ASTM(4)[\text{sales at 4000 lb ETW} / \text{total model type sales}].$$

$$FE_{3IWCg} = \text{FEB (base-level combined fuel economy) at 3000 IWT (from section 10.4.5).}$$

$$FE_{4IWCg} = \text{FEB (base-level combined fuel economy) at 4000 IWT (from section 10.4.5).}$$

NOTE: Gas Guzzler calculation applies to passenger cars only.

11.0 CORPORATE AVERAGE FUEL ECONOMY (CAFE)

11.1 CAFE Input/Output File Names

Input file name: cafe.in
Output file name: cafe.out

11.2 CAFE Transaction Process Codes

Process code explanations are as follows:

- blank, A (Add)*** Use this code to enter new data into the CAFE database. CFEIS will generate an exception condition if the data are already in the database. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also CAFE Input Notes Subsection 11.3.**
- D (Delete)*** Use this code to delete existing data in the CAFE database. CFEIS generates an exception condition if the database does not contain the data to be deleted. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also CAFE Input Notes Subsection 11.3.**
- R (Replace)*** Use this code to replace with input data all existing data in the CAFE database. *Replace* can be considered equivalent to a *Delete* transaction followed by an *Add* transaction. Unlike the *Modify* process code, a blank input in optional fields does replace existing database values. CFEIS generates an exception condition if the database does not contain data to be replaced. The exception condition results in the transaction being rejected after the input data have been scanned for as many additional error conditions as possible. **See also CAFE Input Notes Subsection 11.3.**
- S (Re-process)*** Use this code to re-compute or re-evaluate any corrected/ updated CAFE data and to record re-computed or re-evaluated results. **See also CAFE Input Notes Subsection 11.3.**

11.3 CAFE Input Notes

The rules are as follows:

- Use a Manufacturer code, compliance category, and index number that when concatenated together represent a unique Basic Engine Index within a model year.
- If you are spanning multiple input records for a group of city or highway tests, you must specify an averaging group indicator.
- Only refer to Engine subsystems whose data are active in the CFEIS database for ESI or EvSI.

11.4 System-Generated Calculations

CFEIS calculates the official CAFE for a manufacturer based on their submission of the actual total sales for a specified compliance category. The CAFE calculations are performed in accordance to the provisions as defined in the CFR. Specifically, the following formulas, as stated in Part 600, Subpart F, § 600.207-86, § 600.208-77, § 600.209-85, § 600.510-86 of the 7-1-94 edition of the 40 CFR, are identified for these calculations:

11.4.1 CAFE

$$\text{CAFE} = \text{ASTM}(4) \left[\text{Total Sales} / \sum_{i=1}^n (\text{Sales}_i (1.0 \text{ DO}) / \text{FEM}_i) \right]$$

where:

CAFE = City, highway or combined CAFE for a compliance category.

Total Sales = Total of all model type sales within a compliance category.

Sales_i = Sales of model type i within a compliance category.

DO = Double precision.

FEM_i = City, highway or combined model type mpg (from section 11.4.8) as applicable.

NOTE: Combined CAFE rounded to 1 decimal place instead of 4 is the official CAFE for trucks. If rounding to a different number of decimal places are called for, i in ASTM(i) will be adjusted as applicable.

11.4.2 Adjusted Combined CAFE

Note: Adjusted Combined CAFE applies to passenger automobiles only.

$$CAFE_{adj} = ASTM(1)[CAFE_{comb} (0.55a + 0.450c + 0.5556a + 0.4487) / (0.55a + 0.45) + FEIW]$$

where:

$CAFE_{adj}$ = Adjusted CAFE for a compliance category.

$CAFE_{comb}$ = Combined CAFE for a compliance category (from section 11.4.1).

a = $ASTM(4)[CAFE_{hwy} / CAFE_{city}]$.

$CAFE_{city}$ = City CAFE (from section 11.4.1) .

$CAFE_{hwy}$ = Highway CAFE (from section 11.4.1) .

c = 0.0022, for model year 1986.

= 0.0050, for model year 1987.

= 0.0011, for model year 1988.

= 0.0011, for model year 1989.

= 0.0010, for model year 1990.

= 0.0011, for model year 1991.

= 0.0010, for model year 1992.

= 0.0095, for model year 1993.

= 0.0011, for model year 1994.

= 0.0011, for model year 1995.

= 0.00095, for model year 1996.

= 0.001, for model year 1997.

$$FEIW = 0.0092917(SF_{IW3000})(FE_{IW3000}) - 0.0035123(SF_{EW4000})(FE_{IW4000})$$

Note: Any calculated value of FEIW less than zero shall be set equal to zero.

$$SF_{IW3000} = ASTM(4)[(\text{sales at 3000 lb IWT}) / \text{total sales}] .$$

$$SF_{EW4000} = ASTM(4)[(\text{sales at 4000 lb ETW}) / \text{total sales}] .$$

$$FE_{IW3000} = ASTM(4)[1 / \sum_{i=1}^n (SF_{3000} / \text{base-level } i \text{ combined fuel economy at 3000 IWT})]$$

$$SF_{3000} = ASTM(4)[\text{base-level } i \text{ sales at 3000 IWT} / \text{total sales at 3000 IWT}]$$

$$FE_{IW4000} = ASTM(4)[1 / \sum_{i=1}^n (SF_{4000} / \text{base-level } i \text{ combined fuel economy at 4000 IWT})]$$

$$SF_{4000} = ASTM(4)[\text{base-level } i \text{ sales at 4000 IWT} / \text{total sales at 4000 IWT}]$$

$$\text{base-level } i \text{ fuel economy} = \text{Combined fuel economy FEB from section 11.4.7.}$$

$$\text{Total Sales} = \text{Total production sales of a compliance category.}$$

NOTE: If rounding to a different number of decimal places are called for, i in ASTM(i) will be adjusted as applicable.

All the terms and equations are applicable within a particular compliance category, e.g., “base-level i fuel economy at 4000 IWT” indicates that each base level i is within the compliance category being worked on.

11.4.3 Multiple tests on one test vehicle within one subconfiguration

$$FEV_{city/hwy} = n / \sum_{i=1}^n (1.0 \text{ DO} / FET_i)$$

where:

$$FEV_{city/hwy} = \text{City or highway fuel economy for this vehicle.}$$

$$\text{DO} = \text{Double precision.}$$

$$FET_i = \text{Fuel economy of test } i \text{ which has been ASTM rounded to 1 decimal place.}$$

City test are used for FEV_{city} calculation and highway tests are used for FEV_{hwy} .

11.4.4 Subconfiguration-level MPG/City or Highway

$$FES_{city/hwy} = \text{ASTM}(4)[n / \sum_{i=1}^n (1.0 \text{ DO} / FEV_i)]$$

where:

$$FES_{city/hwy} = \text{City or highway fuel economy for this subconfiguration.}$$

$$\text{DO} = \text{Double precision.}$$

$$FEV_i = \text{City or highway fuel economy for vehicle } i \text{ (from section 11.4.3) within this subconfiguration.}$$

11.4.5 Configuration-level MPG/City or Highway

$$FEC_{city/hwy} = \text{ASTM}(4)[1.0 \text{ DO} / \sum_{i=1}^n (SF_i / FES_i)]$$

where:

- FEC_{city/hwy} = City or highway fuel economy for this configuration.
- DO = Double precision.
- SF_i = (ASTM(4)[(Sales_i / Total Sales)])
- Sales_i = Sales for tested subconfiguration i at this configuration.
- Total Sales = Total tested subconfiguration sales at this configuration.
- FES_i = City or highway fuel economy for subconfiguration i (from section 11.4.4) within this configuration.

11.4.6 Configuration-level MPG/Combined

$$FEC_{comb} = ASTM(4)[1.0 DO / (0.55 DO / FEC_{city} + 0.45 DO / FEC_{hwy})]$$

where:

- FEC_{comb} = Combined fuel economy for this configuration.
- DO = Double precision.
- FEC_{city} = City fuel economy for this configuration from section 11.4.5.
- FEC_{hwy} = Highway fuel economy for this configuration from section 11.4.5.

11.4.7 Base-level MPG/City, Highway, or Combined

$$FEB = ASTM(4)[1.0 DO / \sum_{i=1}^n (SF_i / FEC_i)]$$

where:

FEB	=	City, highway or combined fuel economy for this base level.
DO	=	Double precision.
SF _i	=	ASTM(4)[(Sales _i / Sales _{total})]
Sales _i	=	Sales for tested configuration i within this base-level.
Sales _{total}	=	Total tested configuration sales within this base level.
FEC _i	=	City, highway or combined fuel economy for configuration i (from section 11.4.5 or 11.4.6) within this base-level.

11.4.8 Model-level MPG/City, Highway, or Combined

$$FEM = ASTM(1)[1.0 DO / \sum_{i=1}^n (SF_i / FEB_i)]$$

where:

FEM	=	City, highway or combined fuel economy for this model type.
DO	=	Double precision.
SF _i	=	ASTM(4)[(Sales _i / Sales _{total})]
Sales _i	=	Sales for base-level i at this model type.
Sales _{total}	=	Model type sales.
FEB _i	=	City, highway or combined fuel economy for base-level i (from section 11.4.7) within this model type.

11.5 Input Record Dependencies

Because there are combinations of input records that can be submitted, you must follow the allowed valid transaction and input record dependency rules. Exhibit 11-1 shows the Input record dependencies for the CAFE subsystem.

Corporate Average Fuel Economy

Input Record Type	Input Record Dependency	Valid Transactions	CFEIS Table(s)
F1	None	A,R,D,S ¹	CAFE Basic Engine
F2	F1	A,R	CAFE Base Level
FF	F2	A,R	CAFE Configuration CAFE Subconfiguration CAFE Configuration Xref
FR	FF	A,R	CAFE Gear Ratios
FL	FF	A,R	CAFE Lockup RPM
FT	FF	A,R	CAFE Test Group
FC	F1	A,R	CAFE Basic Engine
FS	None	A,R,D,S	MFR Average Fuel Economy
ZZ		All Transactions	

Exhibit 11-1. CAFE Input Record Dependencies

¹Transactions Legend:

A= Add R= Replace D= Delete S= Re-process ZZ= Termination

The *Input Record Types* are the first two characters in the input record submission format. See Appendix D or E for other field content and format. The *Input Record Dependency* column shows whether the input record is independent or must be accompanied in the transaction by an additional input record. The *Valid Transactions* column show the kind of transactions that you can submit. Your input record data are stored in the respective CFEIS table.

12.0 REPORTS

All entries submitted either by paper form or electronically result in generating a Submission Status report. Part I of the Submission Status Report is a printout of the data submitted. The data is arranged in columns as specified in the input data record layout for each subsystem. Errors found during the processing of a submission are embedded after the applicable record. Errors generated because of faulty data input should be corrected by entering a new submission with a replacement for the rejected transactions, and *Modify/Replace* transactions for the transactions that were accepted with numeric data out of range. Any out-of-range data not corrected prior to requesting a Summary Sheet, result in the Summary Sheet request being rejected.

Part II of the Submission Status Report provides statistics on how many transactions were accepted and rejected, how many of each record type were accepted and rejected, and total quantities of transactions and records of a given type.

Part III of the Submission Status Report varies depending on the subsystem. For all subsystems, Part III contains the content of the CFEIS database, for the specified subsystem, as a result of processing the submission. The content of Part III is restricted by the key information for the subsystem. The specific restrictions on Part III are explained by subsystem in subsections 12.1 through 12.9.

In addition to the Submission Status Report, some of the subsystems have *Report* transactions. The reports that are generated as a result of the *Report* transactions are described by applicable subsystem in subsections 12.1 through 12.9.

12.1 Car Line

As a result of all Car Line submissions, you will receive a Submission Status Report. Part III of the Submission Status Report contains the content of the CFEIS database for Car Lines that match the model year, Manufacturer code, Division code, and Car Line codes specified in the transactions contained in the submission. See Appendix C for a sample of the car line Submission Status Report.

There is no *Report* transaction for the Car Line subsystem.

12.2 Engine Systems Information

As a result of all ESI submissions you will receive a Submission Status Report. Part III of the Submission Status Report for ESI contains two parts: (1) Engine Family/Test Group, Sales, and System Summary information; and (2) Exhaust Emission Specification and Deterioration Factor Summary information. The data presented in this subsection are constrained by the Engine Family/Test Group names and Engine system numbers supplied as part of the ESI submission.

As a result of an ESI *Report* transaction, you will receive an ESI Database Report. The ESI Database Report has the same format as Part III of the Submission Status Report. The difference is that the data contained in the ESI Database Report are constrained by the input report parameters; whereas, Part III of the Submission Status Report is constrained by the data submitted as part of the ESI submission.

12.3 EvSI Systems Information

As a result of all EvSI submissions you will receive a Submission Status Report. Part III of the Submission Status Report for EvSI contains two parts EvSI Family, Sales, and System Summary information; and Evaporative Emission Specification and Deterioration Factor Summary information. The data presented in this subsection are constrained by the Engine Family/Test Group names and Engine system numbers supplied as part of the EvSI submission.

As a result of an EvSI *Report* transaction, you will receive an EvSI Database Report. The EvSI Database Report has the same format as Part III of the Submission Status Report. The difference is that the data contained in the EvSI Database Report are constrained by the input report parameters; whereas, Part III of the Submission Status Report is constrained by the data submitted as part of the EvSI Submission.

12.4 Vehicle Information

As a result of all VI submissions you will receive a Submission Status Report. Part III of the Submission Status Report for VI contains all of the information in CFEIS database about the specified vehicles. The data presented in this subsection are constrained by the Manufacturer code, vehicle Ids, vehicle configuration numbers, and certification model years specified or implied by the VI submission.

As a result of a VI *Report* transaction, you will receive a VI Database Report. CFEIS will forward a copy of the VI Database Report to EPA's LNS computer as a delimited file without

titles and column headers. The VI Database Report has the same format as Part III of the Submission Status Report. The difference is that the data contained in the VI Database Report are constrained by the input report parameters; whereas, Part III of the Submission Status Report is constrained by the data submitted as part of the VI Submission.

12.5 Shift Schedule

As a result of all Shift Schedule submissions you will receive a Submission Status Report. Part III of the Submission Status Report for Shift Schedule contains all of the information in CFEIS database about the shift schedules specified in the submission. Part III of the Submission Status Report for Shift Schedule is actually three separate reports, the Shift Schedule Report, the Shift Point Report, and the Manufacturer Submission Summary Report.

As a result of the Shift Schedule *Report* transaction, you will receive a Shift Schedule Report and a Shift Point Report. These reports have the same format as the corresponding subsection of Part III of the Submission Status Report for Shift Schedule. As a result of the *Report* transaction you will receive a Manufacturer Submission Summary Report. The Manufacturer Submission Summary Report has the same format as the corresponding subsection of Part III of the Submission Status Report for Shift Schedule. The difference between the *Report* transactions and Part III of the Submission Status Report is that the data contained in each of the reports are constrained by input report parameters; whereas, Part III of the Submission Status Report is constrained by the data submitted as part of the Shift Schedule submission.

12.6 Manufacturer/EPA Test Data

As a result of all MTDS submissions you will receive a Submission Status Report. Part III of the Submission Status Report for MTDS contains three reports, the MTDS Database Report, the Projected Pass/Fail Report, and the Carry Over/Carry Across Report. They are described as follows:

- **MTDS Database Report:** This report lists the test data submitted by the manufacturer and relevant VI.
- **Projected Pass/Fail Report:** This report lists the emissions test results, the maximum amount of emissions permitted for each emission type (as required by the emissions standards), and a pass/fail indicator showing whether the vehicle met the maximum value permitted by the standard during the test.
- **Carry Over/Carry Across Report:** This report lists the carried over or carried across data, identifying the test data specific to each model year that the test data were used.

NOTE: This report is only generated if there were *Carry Over* or *Carry Across* transactions included in the MTDS submission.

As a result of the MTDS *Report* transaction, you will receive a MTDS Database Report and a Projected Pass/Fail Report. These reports have the same format as the corresponding subsection of Part III of the Submission Status Report for MTDS. The difference between the *Report* transactions and Part III of the Submission Status Report is that the data contained in each of the reports are constrained by input report parameters (Manufacturer code and test number); whereas, Part III of the Submission Status Report is constrained by the data submitted as part of the MTDS Submission (Manufacturer code, test number, and *Carry Over/Carry Across* transactions).

12.7 Summary Sheet

As a result of all Summary Sheet submissions, you will receive a Summary Sheet Submission Status Report. Part III of the Submission Status Report for Summary Sheet contains all of the information in CFEIS database about the summary sheets specified in the submission. Part III of the Submission Status Report for Summary Sheet contains three reports: Summary Sheet Database Report, Summary Sheet Vehicles Covered by Certificate, and Summary Sheet Emission Data Vehicles.

As a result of a *Report* transaction, you will receive the following three reports: Summary Sheet Database Report, Summary Sheet Vehicles Covered by Certificate, and Summary Sheet Emission Data Vehicles. The format of the reports generated by a *Report* transaction is the same as the corresponding subsections of Part III of the Summary Sheet Submission Status Report.

12.8 General Label

As a result of all General Label submissions you will receive a Submission Status Report. Part III of the Submission Status Report for General Label contains three reports, the Fuel Economy Calculations, the Fuel Economy Range Report, and the Receipt Letter. They are described as follows:

- **Fuel Economy Calculations:** Lists the results of vehicle-configuration-level, base-level, and model-level calculations in addition to the attributive data defining each level of aggregation. Additionally, this report displays the Test Car List and the Fuel Economy Guide.

- **Fuel Economy Range Report:** Lists ranges of fuel economy values achieved by each class of comparable automobiles.
- **Receipt Letter:** Generates a letter to the manufacturer and an enclosure displaying fuel economy label values.

There is no *Report* transaction for the General Label subsystem.

12.9 Corporate Average Fuel Economy

As a result of all CAFE submissions you will receive a Submission Status Report. Part III of the Submission Status Report for CAFE contains two reports: the CAFE Report, and the Manufacturer Fuel Economy Calculations. They are described as follows:

- **CAFE Report:** This report summarizes the calculated CAFE values along with a statistical listing of model year data, to include the number of model types, number of base levels, number of vehicle configurations, percent of total production represented by test vehicles, total number of vehicles tested, and the total number of vehicles reported by compliance category for a manufacturer.
- **Manufacturers Fuel Economy Calculations:** This report lists the results of vehicle-configuration-level, base-level, and model-level fuel economy calculations in addition to the attributive data defining each level of aggregation.

There is no *Report* transaction for the CAFE subsystem.

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13.0 ERRORS

Two types of errors are reported on the Submission Status Report and on the database reports: user-induced errors and system or database errors. User-induced errors are caused by problems in the data submitted. System or database errors are caused by circumstances outside of the submitted data. User-induced errors need to be fixed by the manufacturer submitting the data. System or database errors should be reported to the CFEIS system administrator.

13.1 User-induced Errors

CFEIS processes the submissions for each subsystem. CFEIS checks all submissions to make sure that the record types are allowable for the subsystem, the fields on the record are of the proper type, and required fields are present. If applicable, CFEIS also checks to see if the data fall within allowable ranges and appear on a list of values.

In addition, most subsystems have rules that must be followed regarding the relationship between two or more fields in the transaction or between fields in the transaction and fields in the CFEIS database. CFEIS checks to make sure that these relational rules are followed. In addition, CFEIS detects errors.

Failing any edit check generates an error message that is written to the Submission Status Report, Part I. The error message indicates the nature of the problem. It is extracted from a common list of error messages and pre-fixed or appended with additional information for clarity. Appendix B contains the common list of error messages.

Out-of-range data are reported on the Submission Status Report but do not cause the transaction to be rejected. All other errors cause the transaction to be rejected until the errors are corrected and the transaction re-submitted. Although CFEIS stores out-of-range data, the certification analyst cannot generate a Certificate of Conformity until the out-of-range data have been corrected.

13.2 System or Database Errors

While processing a batch submission, CFEIS may encounter errors independent of the data in the submission. Most of those problems must be resolved by the CFEIS Systems Administrator. The nature of the problem is reported on the Submission Status Report, Part I, which appears after the record that was being processed when the error occurred.

If your partition is too full to handle the reports requested, remove all unnecessary files. If the Submission Status Report cannot be written to the report directory, contact the VPCD ADP analyst, who will retrieve a copy of the Submission Status Report and deliver it to you. You cannot re-send your submission as it has already been processed. To prevent space problems from occurring, remember to remove report files from your partition.