California Environmental Protection Agency
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES

Adopted:	August 5, 1999
Amended:	December 27, 2000
Amended:	July 30, 2002
Amended:	September 5, 2003 (corrected February 20, 2004)
Amended:	May 28, 2004
Amended:	[INSERT DATE OF AMENDMENT]

NOTE: Amendments to this document that were originally proposed in this rulemaking are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended May 28, 2004. Modifications to the originally proposed language made available in connection with this "15-Day Notice" are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions.

Date of Release: 10/19/04; 15-day Notice version
Board Hearing: 9/23-24/04

NOTE: This document is incorporated by reference in sections 1960.1(k) and 1961(d), title 13, California Code of Regulations (CCR). It contains the majority of the requirements necessary for certification of a passenger car, light-duty truck or medium-duty vehicle for sale in California, in addition to containing the exhaust emission standards and test procedures for these motor vehicles. However, reference is made in these test procedures to other ARB documents that contain additional requirements necessary to complete an application for certification. These other documents are designed to be used in conjunction with this document. They include:

1. "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" (incorporated by reference in section 1962, title 13, CCR);

2. "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" (incorporated by reference in section 1976(c), title 13, CCR);

3. "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" (incorporated by reference in section 1978(b), title 13, CCR);

4. OBD II (section 1968, et seq. title 13, CCR, as applicable);

5. "California Smog Index Label Specifications" (incorporated by reference in section 1965, title 13, CCR);

6. Warranty Requirements (sections 2037 and 2038, title 13, CCR);

7. "Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks" (incorporated by reference in section 2235, title 13, CCR);

8. Guidelines for Certification of Federally Certified Light-Duty Motor Vehicles for Sale in California (incorporated by section 1960.5, title 13, CCR); and

9. "California Non-Methane Organic Gas Test Procedures," (incorporated by reference in section 1961(d), title 13, CCR).

The section numbering conventions for this document are set forth in Part I, section A.3 on page A-2.

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CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES

The provisions of Subparts B, C, and S, Part 86, Title 40, Code of Federal Regulations, as adopted or amended on May 4, 1999 or as last amended on such other date set forth next to the 40 CFR Part 86 section title listed below, and to the extent they pertain to exhaust emission standards and test procedures, are hereby adopted as the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," with the following exceptions and additions.

PART I: GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS

A. General Applicability

1. §86.1801 Applicability.

1.1 §86.1801-01. ~~October 6, 2000~~ December 6, 2002. Amend as follows:

1.1.1 Amend subparagraph (a) as follows: Except as otherwise indicated, the provisions of this subpart apply to new 2001 and later model year Otto-cycle and diesel-cycle passenger cars, light-duty trucks and medium-duty vehicles, including alternative fuel and hybrid electric vehicles. In cases where a provision applies only to a certain vehicle group based on its model year, vehicle class, motor fuel, engine type, or other distinguishing characteristics, the limited applicability is cited in the appropriate section or paragraph.

1.1.2 Subparagraph (b) *Aftermarket conversions*. [n/a]

1.1.3 Amend subparagraph (c) *Optional Applicability* as follows:

(a) Amend subparagraph (c)(1) as follows: A manufacturer must certify any heavy-duty complete Otto-cycle vehicle of 14,000 pounds Gross Vehicle Weight Rating (GVWR) or less in accordance with the medium-duty chassis-standards of Section E.1. of these test procedures. A manufacturer must certify all heavy-duty diesel engines or vehicles of 14,000 pounds GVWR or less to the medium-duty engine standards in title 13, CCR, section 1956.8(g) or (h). A manufacturer may request to certify heavy-duty complete diesel vehicles to the chassis-standards in Section E.1 of these test procedures. Heavy-duty engine or heavy-duty vehicle provisions of 40 CFR subpart A do not apply to such a vehicle or engine.

(b) Subparagraph (c)(2) [No change.]

(c) Subparagraph (c)(3) [No change.]

(d) Subparagraph (c)(4) [n/a]

(e) Subparagraph (c)(5) [n/a]

1.1.4 Amend subparagraph (d) as follows: Small volume manufacturers. Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For manufacturers certifying for the first time in California, model-year production volume shall be based on projected California sales. The small-volume manufacturer's light- and medium-duty vehicle and truck certification procedures are described in 40 CFR §86.1838.

1.1.5 Subparagraph (e). [n/a; NLEVs.]

1.1.6 Subparagraph (f) [n/a; Tier 2 phase-in provisions]

1.1.7 Subparagraph (g) [n/a; Tier 2 phase-in provisions]

1.1.8 Subparagraph (h) [No change.]

2. California Provisions.

2.1 References to "light-duty trucks" in 40 CFR 86 shall apply to both "light-duty trucks" and "medium-duty vehicles" in these procedures. References to "light-duty vehicles" shall apply to "passenger cars" in these procedures. References to dual fuel vehicles shall also mean bi-fuel vehicles.

2.2 Any reference to vehicle sales throughout the United States shall mean vehicle sales in California.

2.3 Regulations concerning U.S. EPA hearings, U.S. EPA inspections, specific language on the Certificate of Conformity, evaporative emissions, high-altitude vehicles and testing, particulate and oxides of nitrogen averaging and test group standards applicable in such averaging, alternative useful life, selective enforcement audit, Certification Short Test, and heavy-duty engines and vehicles shall not be applicable to these procedures, except where specifically noted.

2.4 Regulations both herein and in Title 40, CFR Part 86, Subparts B, C, and S, concerning Otto-cycle and diesel-cycle vehicles shall be applicable to ethanol vehicles, including dual fuel, bi-fuel and fuel-flexible vehicles, except where specifically noted otherwise.

2.5 For engines used in medium-duty vehicles that are not distinctly diesel engines nor derived from such, the Executive Officer shall determine whether the engines shall be subject to diesel or Otto-cycle engine regulations, in consideration of the relative similarity of the engines' torque-speed characteristics and vehicle applications with those of Otto-cycle and diesel engines.

2.6 Regulations concerning federal OBD system requirements shall mean the California OBD requirements, except where specifically noted otherwise.

3. §86.1802 Section Numbering; Construction.

3.1 §86.1802-01. [No change.]

3.2 The section numbering convention employed in these test procedures, in order of priority, is A.1.1.1. in order to distinguish California procedures and requirements from those of the U.S. EPA. References in these test procedures to specific sections of the Code of Federal Regulations maintain the same numbering system employed in the Code of Federal Regulations.

3.3 In cases where the entire CFR section is incorporated by reference with no modifications, the notation "[No change.]" is used. In cases where there are no changes to the CFR language but there are additional California requirements, the notation "[No change.]" is used and the additional California requirements are then noted in a separate subsection with the numbering convention set forth in subparagraph 3.2, above.

3.4 The notation "[n/a]" indicates that the subject matter of the federal regulation does not apply to California passenger cars, light-duty trucks or medium-duty vehicles. In some cases the subject of the federal regulation is indicated in the bracket for clarity.

B. Definitions, Acronyms and Abbreviations

1. §86.1803 Definitions.

1.1 §86.1803-01. January 18, 2001. [No change, except as otherwise noted below.]

2. California Definitions.

"**AB 965 vehicle**" means a vehicle certified pursuant to section 1960.5, title 13, CCR.

"**A/C Direct Emissions"** means any refrigerant releases from a motor vehicle's air conditioning system.

"**A/C Indirect Emissions**" means any increase in motor vehicle exhaust CO_2 emissions that can be attributed to the operation of the air conditioning system.

"**Administrator**" means the Executive Officer of the Air Resources Board (ARB).

"**Alcohol fuel**" means either methanol or ethanol as those terms are defined in these test procedures.

"**All-Electric Range Test**" means a test sequence used to determine the range of an electric or hybrid electric vehicle without the use of its auxiliary power unit. The All-Electric Range Test is described in the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962(e), title 13, CCR.

"**Battery assisted combustion engine vehicle**" means any vehicle that allows power to be delivered to the driven wheels solely by a combustion engine, but which uses a battery pack to store energy which may be derived through remote charging, regenerative braking, and/or a flywheel energy storage system or other means which will be used by an electric motor to assist in vehicle operation.

"**Bi-fuel vehicle**" is any motor vehicle that is engineered and designed to be capable of operating on two fuels wherein the two fuels are stored on board in separate fuel tanks and metered separately, but in operation the two fuels are combusted together.

"**Certificate of Conformity**" means Executive Order certifying vehicles for sale in California.

"**Certification**" means certification as defined in section 39018 of the Health and Safety Code.

"**Certification level**" means the official exhaust or evaporative emission result from an emission-data vehicle which has been adjusted by the applicable mass deterioration factor and is submitted to the Executive Officer for use in determining compliance with an emission standard for the purpose of certifying a particular test group. For those test groups that are certified using reactivity adjustment factors developed by the manufacturer pursuant to Part II, Section D of these test procedures, the exhaust NMOG certification level shall include adjustment by the ozone deterioration factor.

"**Conventional gasoline**" means any certification gasoline which meets the specifications of 40 CFR 86.113-94(a), but does not include gasoline that meets the specifications of California reformulated gasoline as set forth in Part II, section A.100.3.1. of these test procedures. For the

purpose of determining the ozone-forming potential of conventional gasoline vehicle exhaust emissions, gasoline meeting the specifications of Part II, Section D of these test procedures shall be used.

"**Dedicated Ethanol Vehicle**" means any ethanol-fueled motor vehicle that is engineered and designed to be operated solely on ethanol.

"**Dedicated Methanol Vehicle**" means any methanol-fueled motor vehicle that is engineered and designed to be operated solely on methanol.

"**Diesel Engine**" means any engine powered with diesel fuel, gaseous fuel, or alcohol fuel for which diesel engine speed/torque characteristics and vehicle applications are retained.

"Dual-fuel vehicle" means any motor vehicle that is engineered and designed to be capable of operating on gasoline or diesel and on compressed natural gas or liquefied petroleum gas, with separate fuel tanks for each fuel on-board the vehicle. In operation, only one fuel is used at a time.

"**Ethanol**" means any fuel for motor vehicles and motor vehicle engines that is composed of either commercially available or chemically pure ethanol (CH_3CH_2OH) and gasoline as specified in Part II, section A.100.3 (Certification Fuel Specifications) of these test procedures. The required fuel blend is based on the type of ethanol-fueled vehicle being certified and the particular aspect of the certification procedure being conducted.

"**Ethanol vehicle**" means any motor vehicle that is engineered and designed to be operated using ethanol as a fuel.

"Fuel-fired heater" means a fuel burning device that creates heat for the purpose of warming the passenger compartment of a vehicle but does not contribute to the propulsion of the vehicle.

"**Fuel-Flexible Vehicle"** or "**FFV**" means any motor vehicle engineered and designed to be operated on a petroleum fuel and an alcohol fuel, or any mixture of the two. Alcohol-fueled vehicles that are only marginally functional when using gasoline (e.g., the engine has a drop in rated horsepower of more than 80 percent) are not flexible fuel vehicles.

"**GHG Vehicle Test Group**" means vehicles that have an identical test group, vehicle make and model, transmission class and driveline, aspiration method (e.g., naturally aspirated, turbocharged), camshaft configuration, valvetrain configuration, and inertia weight class.

"**Global Warming Potential**" or "**GWP**" means the 100-year global warming potential specified in IPCC (Intergovernmental Panel on Climate Change) 2000: *Emissions Scenarios*. N. Nakicenovic et. al. editors, Special Report of Working Group III of the IPCC, Cambridge University Press, Cambridge UK, ISBN 0-521-80493-0.

"**Greenhouse gas**" means the following gases: carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons.

"**Grid-connected hybrid electric vehicle**" means a hybrid electric vehicle that has the capacity for the battery to be recharged from an off-board source of electricity and has some all-electric range.

"**Heavy-duty engine**" means an engine which is used to propel a heavy-duty vehicle.

"**Heavy-duty vehicle**" means any motor vehicle having a manufacturer's gross vehicle weight rating greater than 6,000 pounds for vehicles certifying to the standards in Section E.1.1.1 or any motor vehicle having a manufacturer's gross vehicle weight rating greater than 8,500 pounds for vehicles certifying to the standards in Section E.1.1.2, except passenger cars.

"**High-priced part**" means a part determined to be high-priced in accordance with section 2037(c), title 13, CCR.

"**Highway Test Cycle**" means the driving schedule as set forth in Part II, section F of these test procedures.

"**Highway Test Procedures**" means the Federal Test Procedure as set forth in Subpart B, 40 CFR Part 86, as modified in Part II of these test procedures, except that emissions shall be measured using the Highway Driving Schedule as set forth in Part II Section F.

"**Hybrid electric vehicle**" or "**HEV**" means any vehicle which is included in the definition of a "series hybrid electric vehicle," a "parallel hybrid electric vehicle," or a "battery assisted combustion engine vehicle."

"**Incomplete vehicle**" means any vehicle that ~~which~~ does not have the primary load carrying device or container attached. In situations where individual marketing relationships makes the status of the vehicle questionable, the Executive Officer shall determine whether a specific model complies with the definition of incomplete vehicle.

"Independent Low Volume Manufacturer" means any manufacturer that meets the "independent low volume manufacturer" definition as set forth in section 1900, title 13, CCR.

"Intermediate Volume Manufacturer" means any 2009 and subsequent model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer.

For purposes of applying the 2009 and subsequent model year Greenhouse Gas requirements for intermediate volume manufacturers, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, each one of which either has a greater than 10% equity ownership in another or is more than 10% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 10% in each firm.

"Large volume manufacturer" means a manufacturer that is not a small volume manufacturer, ~~or~~ an independent low volume manufacturer, or an intermediate volume manufacturer.

"**LEV I**" refers to the low-emission vehicle standards that were initially adopted by the Board on July 12, 1991 and are set forth in Section E.1.1.1 of these test procedures.

"**LEV II**" refers to the standards that were initially adopted by the Board on August 5, 1999 and are set forth in Section E.1.1.2 of these test procedures.

"**Light-duty truck**" or "**LDT**" means any 2000 and subsequent model motor vehicle certified to the standards in Section E.1.1.2 rated at 8,500 pounds gross vehicle weight or less, and any other motor vehicle rated at 6,000 pounds gross vehicle weight or less, that is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street or off-highway operation and use.

"**LDT1**" means a light-duty truck with a loaded vehicle weight of 0-3750 pounds.

"**LDT2**" means a "LEV II" light-duty truck with a loaded vehicle weight of 3751 to a gross vehicle weight of 8500 pounds or a "LEV I" light-duty truck with a loaded vehicle weight of 3751-5750 pounds.

"**Low-emission vehicle**" or "**LEV**" means any vehicle certified to low-emission standards.

"**Medium-duty vehicle**" or "**MDV**" means any pre-1995 model year heavy-duty vehicle having a manufacturer's gross vehicle weight rating of 8,500 pounds or less; any 1992 through 2006 model-year heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in Section E.1.1.1, or in title 13, CCR, section 1962, having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; any 1995 through 2002 model year heavy-duty vehicle certified to the Tier 1 standards in Section E.1.1.1 having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2000 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in Section E.1.1.2, or in title 13, CCR, section 1962, having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

"**Methane Reactivity Adjustment Factor**" means a factor applied to the mass of methane emissions from natural gas fueled vehicles for the purpose of determining the gasoline equivalent ozone-forming potential of the methane emissions.

"**Methanol**" means any fuel for motor vehicles and motor vehicle engines that is composed of either commercially available or chemically pure methanol (CH_3OH) and gasoline as specified in Part II, section A.100.3.1 (Certification Fuel Specifications) of these procedures. The required fuel blend is based on the type of methanol-fueled vehicle being certified and the particular aspect of the certification procedure being conducted.

"**Natural gas vehicle**" means any motor vehicle that is engineered and designed to be operated using either compressed natural gas or liquefied natural gas.

"**Non-methane organic gas**" (or "**NMOG**") means the sum of non-oxygenated and oxygenated hydrocarbons contained in a gas sample as measured in accordance with the "California Non-Methane Organic Gas Test Procedures," as incorporated by reference in Part II, section A.100.5.4 of these test procedures.

"Optional GHG Test Vehicle Configuration" means any GHG vehicle configuration that is selected for testing by the manufacturer as allowed by section G.2.3, other than the "worst-case" configuration.

"**Organic material non-methane hydrocarbon equivalent**" (or "**OMNMHCE**") for methanol-fueled vehicles means the sum of the carbon mass contribution of non-oxygenated hydrocarbons (excluding methane), methanol, and formaldehyde as contained in a gas sample, expressed as gasoline-fueled hydrocarbons. For ethanol-fueled vehicles, "organic material non-methane hydrocarbon equivalent" (or "OMNMHCE") means the sum of carbon mass contribution of non-oxygenated hydrocarbons (excluding methane), methanol, ethanol, formaldehyde and acetaldehyde as contained in a gas sample, expressed as gasoline-fueled hydrocarbons.

"**Ozone deterioration factor**" means a factor applied to the mass of NMOG emissions from TLEVs, LEVs, ULEVs or SULEVs which accounts for changes in the ozone-forming potential of the NMOG emissions from a vehicle as it accumulates mileage.

"**Parallel hybrid electric vehicle**" means any vehicle that allows power to be delivered to the driven wheels by either a combustion engine and/or by a battery powered electric motor.

"**Passenger car**" or "**PC**" means any motor vehicle designed primarily for transportation of persons and having a design capacity of 12 persons or less.

"**Reactivity adjustment factor**" or "**RAF**" means a fraction applied to the mass of NMOG emissions from a vehicle powered by a fuel other than conventional gasoline for the purpose of determining a gasoline-equivalent NMOG emission value. The reactivity adjustment factor is defined as the ozone-forming potential of the exhaust from a vehicle powered by a fuel other than conventional gasoline divided by the ozone-forming potential of conventional gasoline vehicle exhaust.

"Renewable Energy Resource" means a facility that meets all of the criteria set forth in Public Resources Code section 25741(a), except that the facility is not required to be located in California or near the border of California.

"**Series hybrid electric vehicle**" means any vehicle that ~~which~~ allows power to be delivered to the driven wheels solely by a battery powered electric motor, but which also incorporates the use of a combustion engine to provide power to the battery and/or electric motor.

"**Small volume manufacturer**" means any manufacturer whose projected or combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. Beginning with the 2009 model year, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by all firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

"**Specific reactivity**" is defined as the grams of ozone created per gram of NMOG emitted. This term is also known as ozone-forming potential.

"**Super-u~~U~~ltra-l~~L~~ow-e~~E~~mission v~~V~~ehicle"** or **"SULEV**" means any vehicle certified to super-ultra-low-emission standards.

"**Tier 1 vehicle**" means any passenger car and light-duty truck certified to the standards in section 1960.1(f)(2), title 13, CCR, and any medium-duty vehicle certified to the standards in section 1960.1(h)(1), title 13, CCR.

"**Transitional low-emission vehicle**" or "**TLEV**" means any vehicle certified to transitional low-emission standards.

"**Ultra-low-emission vehicle**" or "**ULEV**" means any vehicle certified to ultra-low emission standards.

"Unified Cycle" or **"UC"** means the driving schedule as set forth in Part II, section E of these test procedures.

"Variable Displacement Compressor" means a compressor in which the mass flow rate of refrigerant can be adjusted independently of compressor speed by the control system in response to cooling load demand.

"Variable Speed Compressor" means a compressor in which the mass flow rate of refrigerant can be adjusted by control of the compressor input shaft speed, independent of vehicle engine speed. For example, a variable speed compressor can have electric drive, hydraulic drive, or mechanical drive through a variable speed transmission.

"**Zero-emission vehicle**" or "**ZEV**" means any vehicle certified to the zero-emission standards set forth in the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR.

3. §86.1804 Acronyms and Abbreviations.

3.1 §86.1804.01 October 6, 2000. [No change.]

3.2 **California Acronyms and Abbreviations.**

"ALVW" means adjusted loaded vehicle weight, which is the average of a vehicle's curb weight and gross vehicle weight.

"CCR" means California Code of Regulations.

"ccs" means cubic centimeters.

"CFR" means Code of Federal Regulations.

"CH_4" means methane.

"GHG" means greenhouse gas.

"GWP" means Global Warming Potential.

"HEV" means hybrid-electric vehicle.

"LDT" means light-duty truck.

"LDT1" means a light-duty truck with a loaded vehicle weight of 0-3750 pounds.

"LDT2" means a "LEV II" light-duty truck with a loaded vehicle weight of 3751 to a gross vehicle weight of 8500 pounds or a "LEV I" light-duty truck with a loaded vehicle weight of 3751-5750 pounds.

"LEV" means low-emission vehicle.

"LVW" means loaded vehicle weight.

"MDPV" means medium-duty passenger vehicle.

"MDV" means medium-duty vehicle.

"n/a" means not applicable.

"N_2O" means nitrous oxide.

"Non-Methane Organic Gases" or "NMOG" means the total mass of oxygenated and non-oxygenated hydrocarbon emissions.

"OBD" means on-board diagnostic system.

"PC" means passenger car.

"SULEV" means super-ultra-low-emission vehicle.

"TLEV" means transitional low-emission vehicle.

"UC" means Unified Cycle.

"ULEV" means ultra-low-emission vehicle.

C. General Requirements for Certification

1. §86.1805 Useful Life.

1.1 §86.1805-01. October 6, 2000. Amend as follows:

1.1.1 Subparagraph (a). [No change.]

1.1.2 Amend subparagraph (b) to add the following: For vehicles certified to the LEV II emission standards in Section E.1.1.2 of these test procedures, full useful life is as follows:

(a) For passenger cars, light-duty trucks, and medium-duty vehicles (including hybrid electric vehicles), the full useful life shall be 10 years or 120,000 miles, whichever occurs first.

(b) The full useful life of LEV, ULEV and SULEV passenger cars, light-duty trucks and medium-duty vehicles certified to the optional LEV II 150,000 mile standards in section E.1.1.2 shall be 15 years or 150,000 miles, whichever occurs first.

1.2 §86.1805-04. October 6, 2000. Amend as follows:

1.2.1 Subparagraph (a). [No change.]

1.2.2 Amend subparagraph (b) as follows: The full useful life of LEV, ULEV and SULEV passenger cars, light-duty trucks and medium-duty vehicles certified to the optional LEV II 150,000 mile standards in section E.1.1.2 shall be 15 years or 150,000 miles, whichever occurs first.

1.2.3 Subparagraph (c) [No change.]

1.2.4 Subparagraph (d) [No change.]

1.2.5 Subparagraph (e) [n/a]

1.2.6 Subparagraph (f) [n/a]

2. §86.1806 On-Board Diagnostics.

2.1 §86.1806-01; §86.1806-05 Delete.

2.2 **California On-Board Diagnostic System Requirements.**

All vehicles shall be subject to the provisions of section 1968, et seq., title 13, CCR, as applicable. No vehicle shall be certified unless the Executive Officer finds that the vehicle complies with the requirements of section 1968, et seq., title 13, CCR, as applicable.

3. §86.1807 Vehicle Labeling.

3.1 §86.1807-01. October 6, 2000. Amend as follows:

3.1.1 Subparagraph (a). Add the following sentence to the introductory paragraph: The labeling requirements of this section shall apply to all new motor vehicles, and new motor vehicle engines certified according to the provisions of California Health and Safety Code Section 43100.

3.1.2 Subparagraphs (a)(1) through (c)(1)(i). [No change.]

3.1.3 Subparagraph (c)(1)(ii): Amend as follows: For passenger cars, light-duty trucks, and medium-duty vehicles, the statement: "This vehicle conforms to California regulations applicable to XXX-fueled 20XX model-year new (specify LEV, ULEV, SULEV, or ZEV, as applicable) (specify passenger cars, light-duty trucks, medium-duty vehicles)." For federally certified vehicles certified for sale in California the statement must include the phrase "conforms to U.S. EPA regulations and is certified for sale in California." Such statements shall not be used on labels placed on vehicles or engines which, in fact, do not comply with all applicable California regulations, including assembly-line test requirements, if any.

3.1.4 Subparagraphs (c)(1)(iii) through (c)(3): [No change.]

3.1.5 Subparagraph (d): Delete and replace with: Incomplete medium-duty vehicles shall have the following statement printed prominently on the label required by paragraph (a)(3)(v) of this section: "This vehicle conforms to California regulations applicable to new 20xx model-year (specify LEV, ULEV or SULEV, as applicable) medium-duty vehicles when it does not exceed XXX pounds in curb weight, XXX pounds in gross vehicle weight rating, and XXX square feet in frontal area."

3.1.6 Subparagraph (e): [No change.]

3.1.7 Subparagraph (f): [No change.]

3.1.8. Subparagraph (g): Add the following: The manufacturer shall obtain approval from the Executive Officer for all emission control label formats and locations prior to use. Approval of the specific tune-up settings is not required; however, the format for all such settings and tolerances, if any, is subject to review. If the Executive Officer finds that the information on the label is vague or subject to misinterpretation, or that the location does not comply with these specifications, he or she may require that the label or its location be modified accordingly. Samples of all actual production emission control labels used within a test group shall be submitted to the Executive Officer within thirty days after the start of production. The Executive Officer may approve alternate label locations or may, upon request, waive or modify the label content requirements provided that the intent of these requirements is met. If the Executive Officer finds any motor vehicle or motor vehicle engine manufacturer using emission control labels which are different from those approved or which do not substantially comply with the readability or durability requirements set forth in these labeling requirements, the Executive Officer may invoke §2109, title 13, CCR.

3.2 §86.1807-07. January 18, 2001. [No change, except that the amendments to §86.1807-01 still apply.]

3.3 **California Labeling Requirements**.

3.3.1. In addition to the federal requirements set forth in §86.1807, labeling shall conform with the requirements specified in section 1965, title 13, CCR and the “California Smog Index Label Specifications” as incorporated by reference in section 1965, title 13, CCR. In cases where there is conflict with the federal label specifications, the California requirements shall apply.

3.3.2. For all 2004 and subsequent model-year vehicles (except zero-emission vehicles (ZEVs)), the tune-up label shall also contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(a) “OBD II certified" or "OBD Exempt".

(b) Identification of the Exhaust Emission Control System, including but not limited to:

	ADSTWC	Adsorbing Three-Way Catalyst
	AFS	Air-Fuel Ratio Sensor
	AIR -	Secondary Air Injection (Pump);
	CAC -	Charge Air Cooler;
	CFI -	Continuous Fuel Injection;
	CTOX -	Continuous Trap Oxidizer;
	DFI -	Direct Fuel Injection;
	EGR -	Exhaust Gas Recirculation;
*	EHOC -	Electrically Heated Oxidation Catalyst;
*	EHTWC -	Electrically Heated Three-Way Catalyst;
	EM -	Engine Modification;
*	FFS -	Flexible Fuel Sensor;
	HO2S -	Heated Oxygen Sensor;
	IFI -	Indirect Diesel Injection;
	MFI -	Multiport (Electronic) Fuel Injection, (Central) Multiport Fuel Injection;
	OC -	Oxidation Catalyst Only;
	O2S -	Oxygen Sensor;
	PAIR -	Pulsed Secondary Air Injection;
	PTOX -	Periodic Trap Oxidizer;
	SC -	Supercharger;
	SFI -	Sequential Multipoint (Electronic) Fuel Injection; and
	SPL -	Smoke Puff Limiter;
	TBI -	Throttle Body (Electronic) Fuel Injection;
	TC -	Turbocharger;
	TWC -	Three-Way Catalyst;
	TWC+OC -	Three-Way Catalyst + Oxidation Catalyst;
	WU-TWC -	Warm-Up Catalyst with Three-Way Catalyst;
	WU-OC -	Warm-Up Catalyst with Oxidation Catalyst;

* Pending confirmation as SAE protocol

Abbreviations used shall be in accordance with SAE J1930, JUN 1993, including the above nomenclature unless the Executive Officer approves a more current version of SAE J1930. The Executive Officer shall recommend abbreviations for components not listed in SAE J1930, JUN 1993.

3.3.3 Manufacturers may elect to use a supplemental label in addition to the original label if there is not sufficient space to include all the required information. The supplemental label must conform to all specifications as the original label. In the case that a supplemental label is used, the original label shall be numbered "1 of 2" and the supplemental label shall be numbered "2 of 2."

3.3.4 Statements shall not be used on labels placed on vehicles or engines which, in fact, do not comply with all applicable California regulations, including assembly-line test requirements, if any.

4. §86.1808 Maintenance Instructions.

4.1 §86.1808-01. October 6, 2000. [No change.]
4.2 §86.1808-07. January 18, 2001. [No change.]

5. §86.1809 Prohibition of Defeat Devices.

5.1 §86-1809-01. October 6, 2000. [No change except that subparagraph (e) shall apply to vehicles subject to the California TLEV, LEV, ULEV and SULEV standards.]

D. §86.1810 General standards; increase in emissions; unsafe conditions; waivers

1. §86.1810-01. ~~January 18, 2001~~ April 13, 2001. Amend §86.1810-01 as follows:

This section applies to model year 2001 and later light-duty vehicles, light-duty trucks, and medium-duty vehicles fueled by gasoline, diesel, methanol, ethanol, natural gas and liquefied petroleum gas fuels. Multi-fueled vehicles (including bi-fueled, dual-fueled and flexible-fueled vehicles) shall comply with all requirements established for each consumed fuel (or blend of fuels in the case of flexible-fueled vehicles). This section also applies to hybrid electric vehicles. The standards of this subpart apply to both certification and in-use vehicles unless otherwise indicated.

(a) through (d) [No change.]

(e) On-board diagnostics. Delete and replace with:

All passenger cars, light-duty trucks and medium-duty vehicles are subject to the on-board diagnostic system requirements in section 1968 et seq., title 13, CCR, as applicable.

(f) Altitude Requirements. Delete and replace with:

Altitude Requirements. Except for supplemental exhaust emission standards (which apply only at low altitude conditions), all emission standards apply at low altitude conditions and only CO emission standards apply at high altitude conditions.

(g) [No change.]

(h) [Delete; see D.1.1 below.]

(i) **Supplemental FTP general provisions**. [Delete; see D.2. below]

(j) **Evaporative emissions general provisions**. [Delete. (The provisions of this section are contained the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, Heavy-Duty Vehicles and Motorcycles.")]

(k) through (n) [Delete. (The provisions of these sections are contained the "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.")]

(o) [Delete. See D.1.1 below]

(p) [No change, except that references to Tier 2 and interim non-Tier 2 vehicles shall mean California LEVs, ULEVs and SULEVs. A manufacturer shall not apply a reactivity adjustment factor to the exhaust NMHC mass emissions for the purpose of determining compliance with the NMOG standard pursuant to this subparagraph.]

1.1 Measurement of Hydrocarbon Emissions.

1.1.1 Except as otherwise indicated in these test procedures, for vehicles fueled by gasoline, methanol, ethanol, natural gas, or liquefied petroleum gas and certified to the Tier 1 standards, hydrocarbon emissions shall mean non-methane hydrocarbons (NMHC) and shall be measured in accordance with Part B (Determination of NMHC Emissions by Flame Ionization

Detection) of the "California Non-Methane Organic Gas Test Procedures," as incorporated by reference in Part II, section A.100.5.4 of these test procedures. For vehicles fueled by gasoline, methanol, ethanol, natural gas, or liquefied petroleum gas and certified to the TLEV, LEV, ULEV and SULEV standards, hydrocarbon emissions shall mean non-methane organic gases (NMOG) and shall be measured in accordance with the "California Non-Methane Organic Gas Test Procedures" as incorporated by reference in Part II, section A.100.5.4 of these test procedures.

1.1.2 For diesel vehicles, NMOG shall mean non-methane hydrocarbons and shall be measured in accordance with Part B of the "California Non-Methane Organic Gas Test Procedures," as incorporated by reference in Part II, section A.100.5.4 of these test procedures."

1.1.3 For vehicles certifying to the SFTP standards set forth in Section E.1.2.1 of these test procedures, hydrocarbon emissions shall be measured as follows: for PCs and LDTs certified to the Tier 1 exhaust standards, hydrocarbon emissions shall be measured in accordance with the "California Non-Methane Hydrocarbon Test Procedures," as last amended May 15, 1990, which is incorporated herein by reference. For PCs and LDTs certified to the TLEV exhaust standards hydrocarbon emissions shall be measured in accordance with Part B (Determination of Non-Methane Hydrocarbon Mass Emissions by Flame Ionization Detection) of the "California Non-Methane Organic Gas Test Procedures," as incorporated by reference in Part II, section A.100.5.4 of these test procedures. For alcohol-fueled vehicles certifying to the standards in Section E.1.2.1., "Non-Methane Hydrocarbons" shall mean "Organic Material Non-Methane Hydrocarbon Equivalent."

2. Supplemental FTP General Provisions for California.

2.1 Amend 40 CFR §86.1810-01(i) as follows:

2.1.1 Delete subparagraphs (1) through (3) [The implementation schedules for SFTP are set forth in Section E.2 of these test procedures.]

2.1.2 Subparagraph (4) [No change.]

2.1.3 Subparagraph (5) [No change.]

2.1.4 Delete subparagraph (6); replace with: **Air to Fuel Ratio Requirement.** With the exception of cold-start conditions, warm-up conditions and rapid-throttle motion conditions ("tip-in" or "tip-out" conditions), the air to fuel ratio shall not be richer at any time than, for a given engine operating condition (e.g., engine speed, manifold pressure, coolant temperature, air charge temperature, and any other parameters), the leanest air to fuel mixture required to obtain maximum torque (lean best torque) with a tolerance of six percent of the fuel consumption. The Executive Officer may approve a manufacturer's request for approval to use additional enrichment in subsequent testing if the manufacturer demonstrates that additional enrichment is needed to protect the vehicle, occupants, engine, or emission control hardware.

2.1.5 Delete subparagraph (7); replace with: **Single Roll Electric Dynamometer Requirement.** For all vehicles certified to the SFTP standards, a single-roll electric dynamometer or a dynamometer which produces equivalent results, as set forth in 40 CFR §86.108-00, must be used for all types of emission testing to determine compliance with the applicable emission standards.

2.1.6 Delete subparagraph (8); replace with: **Small Volume Provisions.** Small volume manufacturers of PCs, LDTs, and MDVs shall certify 100% of their PC and LDT fleet in 2004 and subsequent model years, and 100% of their MDV fleet in 2005 and subsequent model years under the supplemental FTP requirements.

2.1.7 Subparagraphs (9) through (12) [No change.]

2.1.8 Subparagraph (13) [No change, except that references to Tier 2 and non-Tier 2 vehicles shall mean California LEVs, ULEVs and SULEVs.]

2.1.9 Add the following sentence to subparagraph (14):

The above provisions shall not apply to vehicles powered by "lean-burn" engines or Diesel-cycle engines. A "lean-burn" engine is defined as an Otto-cycle engine designed to run at an air-fuel ratio significantly greater than stoichiometry during the large majority of its operation.

E. California Exhaust Emission Standards.

Delete 40 CFR §§86.1811 through 86.1819.

Introduction. The following Section E. contains the exhaust emission standards, phase-in requirements and reactivity adjustment factors applicable to California passenger cars, light-duty trucks and medium-duty vehicles. A manufacturer must demonstrate compliance with the exhaust standards applicable to specific test groups, and with the composite phase-in requirements applicable to the manufacturer's entire fleet.

A manufacturer has the option of certifying engines used in incomplete and diesel MDVs with a gross vehicle weight rating of greater than 8,500 lbs. to the heavy-duty engine standards and test procedures set forth in sections 1956.8(g) and (h), title 13, CCR, except when the federal vehicle is chassis-certified. If a federal vehicle with a gross vehicle weight rating of greater than 8,500 lbs. is certified to chassis standards, then the equivalent California vehicle must either be certified to the exhaust emission standards applicable to medium-duty vehicles as set forth in section 1961, title 13, CCR or to the federal Tier 2 standards, as per the requirements of section H.1.4 of these test procedures.

The procedures for meeting the ZEV phase-in requirements and for earning ZEV credits are contained in the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR.

1. Exhaust Emission Standards.

1.1 FTP Exhaust Emission Standards for Light- and Medium-Duty Vehicles.

The exhaust emission standards set forth in this section refer to the exhaust emitted over the driving schedule set forth in title 40, CFR, Subparts B and C, except as amended in these test procedures.

1.1.1 LEV I and Tier 1 Exhaust Standards. The following standards represent the maximum exhaust emissions for the intermediate and full useful life from new 2001 through 2003 model-year Tier 1 passenger cars, light-duty trucks and medium-duty vehicles, and from new 2001 through 2003 model year "LEV I" TLEV passenger cars and light-duty trucks, 2001 through 2006 model year "LEV I" LEVs and ULEVs in the light- and medium-duty vehicle classes and 2001 through 2006 model year "LEV I" SULEVs in the medium-duty vehicle classes, including bi-fuel, fuel-flexible and dual fuel vehicles when operating on the gaseous or alcohol fuel they are designed to use:

Exhaust Mass Emission Standards for New 2001 - 2003 Model Year Tier 1 Vehicles and TLEV Passenger Cars and Light-Duty Trucks; 2001 - 2006 Model Year LEV I LEV and ULEV Passenger Cars and Light-Duty Trucks; 2001-2003 Model Year Tier 1 Medium-Duty Vehicles; and 2001-2006 Model Year LEV I LEV, ULEV and SULEV Medium-Duty Vehicles

Vehicle Type	Durability Vehicle Basis (mi.)	Vehicle Emission Category	NMOG (g/mi)	Carbon Monoxide (g/mi)	Oxides of Nitrogen (g/mi)	Formaldehyde (mg/mi)	Particulate from diesel vehicles** (g/mi)
All PCs; LDTs (0-3750 lbs. LVW)	50,000	Tier 1	0.25*	3.4	0.4	n/a	0.08
		TLEV	0.125	3.4	0.4	15	n/a
		LEV	0.075	3.4	0.2	15	n/a
		ULEV	0.040	1.7	0.2	8	n/a
	100,000	Tier 1	0.31	4.2	0.6	n/a	n/a
		Tier 1 - diesel option	0.31	4.2	1.0	n/a	n/a
		TLEV	0.156	4.2	0.6	18	0.08
		LEV	0.090	4.2	0.3	18	0.08
		ULEV	0.055	2.1	0.3	11	0.04
LDTs (3751-5750 lbs. LVW)	50,000	Tier 1	0.32	4.4	0.7	n/a	0.08
		TLEV	0.160	4.4	0.7	18	n/a
		LEV	0.100	4.4	0.4	18	n/a
		ULEV	0.050	2.2	0.4	9	n/a
	100,000	Tier 1	0.40	5.5	0.97	n/a	n/a
		Tier 1 - diesel option	0.40	5.5	1.5	n/a	n/a
		TLEV	0.200	5.5	0.9	23	0.10
		LEV	0.130	5.5	0.5	23	0.10
		ULEV	0.070	2.8	0.5	13	0.05
MDVs (3751-5750 lbs. ALVW)	50,000	Tier 1	0.32	4.4	0.7	18	n/a
		LEV	0.160	4.4	0.4	18	n/a
		ULEV	0.100	4.4	0.4	9	n/a
		SULEV	0.050	2.2	0.2	4	n/a
	120,000	Tier 1	0.46	6.4	0.98	n/a	0.10
		LEV	0.230	6.4	0.6	27	0.10
		ULEV	0.143	6.4	0.6	13	0.05
		SULEV	0.072	3.2	0.3	13	0.05

Vehicle Type	Durability Vehicle Basis (mi.)	Vehicle Emission Category	NMOG (g/mi)	Carbon Monoxide (g/mi)	Oxides of Nitrogen (g/mi)	Formaldehyde (mg/mi)	Particulate from diesel vehicles** (g/mi)
MDVs (5751-8500 lbs. ALVW)	50,000	Tier 1	0.39	5.0	1.1	22	n/a
		LEV	0.195	5.0	0.6	22	n/a
		ULEV	0.117	5.0	0.6	11	n/a
		SULEV	0.059	2.5	0.3	6	n/a
	120,000	Tier 1	0.56	7.3	1.53	n/a	0.12
		LEV	0.280	7.3	0.9	32	0.12
		ULEV	0.167	7.3	0.9	16	0.06
		SULEV	0.084	3.7	0.45	8	0.06
MDVs 8501 -10,000 lbs. ALVW	50,000	Tier 1	0.46	5.5	1.3	28	n/a
		LEV	0.230	5.5	0.7	28	n/a
		ULEV	0.138	5.5	0.7	14	n/a
		SULEV	0.069	2.8	0.35	7	n/a
	120,000	Tier 1	0.66	8.1	1.81	n/a	0.12
		LEV	0.330	8.1	1.0	40	0.12
		ULEV	0.197	8.1	1.0	21	0.06
		SULEV	0.100	4.1	0.5	10	0.06
MDVs 10,001-14,000 lbs. ALVW	50,000	Tier 1	0.60	7.0	2.0	36	n/a
		LEV	0.300	7.0	1.0	36	n/a
		ULEV	0.180	7.0	1.0	18	n/a
		SULEV	0.09	3.5	0.5	9	n/a
	120,000	Tier 1	0.86	10.3	2.77	n/a	n/a
		LEV	0.430	10.3	1.5	52	0.12
		ULEV	0.257	10.3	1.5	26	0.06
		SULEV	0.130	5.2	0.7	13	0.06

* For Tier 1 vehicles, NMOG shall mean NMHC as set forth in Section I.D.1.1 of these test procedures.

** Particulate standards are determined on a 50,000 mile basis for Tier 1 passenger cars and light-duty trucks, on a 100,000 mile basis for all other passenger cars and light-duty trucks and on a 120,000 mile basis for medium-duty vehicles.

1.1.2 **LEV II Exhaust Standards.** The following LEV II standards represent the maximum exhaust emissions for the intermediate and full useful life from new 2004 and subsequent model-year LEVs, ULEVs, and SULEVs, including fuel-flexible, bi-fuel and dual fuel vehicles when operating on the gaseous or alcohol fuel they are designed to use. Prior to the 2004 model year, a manufacturer that produces vehicles meeting these standards has the option of certifying the vehicles to the standards, in which case the vehicles will be treated as LEV II vehicles for purposes of the fleet-wide phase-in requirements.

LEV II Exhaust Mass Emission Standards for New 2004 and Subsequent Model LEVs, ULEVs, and SULEVs in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes

Vehicle Type	Durability Vehicle Basis (mi)	Vehicle Emission Category	NMOG (g/mi)	Carbon Monoxide (g/mi)	Oxides of Nitrogen (g/mi)	Formaldehyde (mg/mi)	Particulates (g/mi)
All PCs; LDTs 8,500 lbs. GVW or less Vehicles in this category are tested at their loaded vehicle weight.	50,000	LEV	0.075	3.4	0.05	15	n/a
		LEV, Option 1	0.075	3.4	0.07	15	n/a
		ULEV	0.040	1.7	0.05	8	n/a
	120,000	LEV	0.090	4.2	0.07	18	0.01
		LEV, Option 1	0.090	4.2	0.10	18	0.01
		ULEV	0.055	2.1	0.07	11	0.01
		SULEV	0.010	1.0	0.02	4	0.01
	150,000 (optional)	LEV	0.090	4.2	0.07	18	0.01
		LEV, Option 1	0.090	4.2	0.10	18	0.01
		ULEV	0.055	2.1	0.07	11	0.01
		SULEV	0.010	1.0	0.02	4	0.01
MDVs 8,501 - 10,000 lbs. GVW Vehicles in this category are tested at their adjusted loaded vehicle weight.	120,000	LEV	0.195	6.4	0.2	32	0.12
		ULEV	0.143	6.4	0.2	16	0.06
		SULEV	0.100	3.2	0.1	8	0.06
	150,000 (Optional)	LEV	0.195	6.4	0.2	32	0.12
		ULEV	0.143	6.4	0.2	16	0.06
		SULEV	0.100	3.2	0.1	8	0.06

Vehicle Type	Durability Vehicle Basis (mi)	Vehicle Emission Category	NMOG (g/mi)	Carbon Monoxide (g/mi)	Oxides of Nitrogen (g/mi)	Formaldehyde (mg/mi)	Particulates (g/mi)
MDVs 10,001-14,000 lbs. GVW Vehicles in this category are tested at their adjusted loaded vehicle weight.	120,000	LEV	0.230	7.3	0.4	40	0.12
		ULEV	0.167	7.3	0.4	21	0.06
		SULEV	0.117	3.7	0.2	10	0.06
	150,000 (Optional)	LEV	0.230	7.3	0.4	40	0.12
		ULEV	0.167	7.3	0.4	21	0.06
		SULEV	0.117	3.7	0.2	10	0.06

1.2 Supplemental Federal Test Procedure ("SFTP") Exhaust Emission Standards for Light- and Medium-Duty Vehicles.

1.2.1 The following standards represent the maximum SFTP exhaust emissions for the intermediate and full useful life from new 2001 through 2003 model year Tier 1 and TLEV passenger cars and light-duty trucks:

SFTP EXHAUST EMISSION STANDARDS FOR 2001 THROUGH 2003 MODEL-YEAR TIER 1 AND TLEV PASSENGER CARS AND LIGHT-DUTY TRUCKS

(grams per mile)

Vehicle Type	Loaded Vehicle Weight (lbs.)	Durability Vehicle Basis (mi)	Fuel Type	NMHC + NOx Composite	CO		
					A/C Test	US06 Test	Composite Option
PC	All	50,000	Gasoline	0.65	3.0	9.0	3.4
			Diesel	1.48	n/a	9.0	3.4
		100,000	Gasoline	0.91	3.7	11.1	4.2
			Diesel	2.07	n/a	11.1	4.2
LDT	0-3750	50,000	Gasoline	0.65	3.0	9.0	3.4
			Diesel	1.48	n/a	9.0	3.4
		100,000	Gasoline	0.91	3.7	11.1	4.2
			Diesel	2.07	n/a	11.1	4.2
LDT	3751-5750	50,000	Gasoline	1.02	3.9	11.6	4.4
			Diesel	n/a	n/a	n/a	n/a
		100,000	Gasoline	1.37	4.9	14.6	5.5
			Diesel	n/a	n/a	n/a	n/a

1.2.2 The following standards represent the maximum SFTP exhaust emissions at 4,000 miles for new 2001 and subsequent model LEVs, ULEVs, and SULEVs in the passenger car and light-duty truck class, and new 2003 and subsequent model year LEV, ULEV and SULEV medium-duty vehicles less than 8,500 pounds gross vehicle weight rating:

SFTP EXHAUST EMISSION STANDARDS
FOR LEVS, ULEVS, AND SULEVS IN THE PASSENGER CAR, LIGHT-DUTY TRUCK, AND MEDIUM-DUTY VEHICLE CLASSES
(grams per mile)

Vehicle Type**	LVW/ALVW (lbs.)	US06 Test*		A/C Test*	
		NMHC + NOx	CO	NMHC + NOx	CO
PC	All	0.14	8.0	0.20	2.7
LDT	0-3750 lbs.(LVW)	0.14	8.0	0.20	2.7
LDT	3751-5750 lbs. (LVW)	0.25	10.5	0.27	3.5
MDV	3751-5750 lbs. (ALVW)	0.40	10.5	0.31	3.5
MDV	5751-8500 lbs. (ALVW)	0.60	11.8	0.44	4.0

* For certification purposes, testing shall be conducted at 4000 miles ±250 miles or at the mileage determined by the manufacturer for emission-data vehicles.

** The following definitions apply for purposes of this SFTP standards table only:

"LDT" (light-duty truck) is any motor vehicle rated at 6,000 pounds gross vehicle weight or less, which is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street or off-highway operation and use.

"MDV" (medium-duty truck) is any motor vehicle having a manufacturer's gross vehicle weight rating of greater than 6,000 pounds and less than 14,001 pounds, except passenger cars.

1.3 NMOG Standards for Fuel-Flexible, Bi-Fuel and Dual-Fuel Vehicles Operating on Gasoline.

For fuel-flexible, bi-fuel and dual-fuel PCs, LDTs and MDVs, compliance with the NMOG exhaust mass emission standards shall be based on exhaust emission tests both when the vehicle is operated on the gaseous or alcohol fuel it is designed to use, and when the vehicle is operated on gasoline. A manufacturer must demonstrate compliance with the applicable exhaust mass emission standards for NMOG, CO, NOx and formaldehyde set forth in the tables in Section E.1.1 when certifying the vehicle for operation on the gaseous or alcohol fuel.

If the manufacturer elects to use them, the following standards may represent the maximum NMOG emissions when the vehicle is operating on gasoline. A manufacturer shall not apply a reactivity adjustment factor to the exhaust NMOG mass emission result when operating on gasoline. A manufacturer may measure NMHC in lieu of NMOG when fuel-flexible, bi-fuel and dual-fuel vehicles are operated on gasoline, subject to the requirements of Section D.1., subparagraph (p). Testing at 50^{o}F is not required for fuel-flexible, bi-fuel and dual-fuel vehicles when operating on gasoline. The applicable CO, NOx and formaldehyde standards are set forth in Section E.1.1 above.

1.3.1 **LEV I Standards for 2001 through 2006 Model Year Bi-Fuel, Fuel-Flexible and Dual Fuel Vehicles Operating on Gasoline.** The applicable exhaust mass emission standards for NMOG when certifying the vehicle for operation on gasoline (as specified in Part II, Section A. paragraph 100.3.1) are:

LEV I NMOG Standards for Bi-Fuel, Fuel-Flexible and Dual-Fuel Vehicles Operating on Gasoline
(g/mi)

Vehicle Type, LVW/ALVW	Emission Category	Durability Vehicle Basis	
		50,000 mi	100,000 mi
All PCs, LDTs, 0-3750 lbs. LVW (2001 through 2003 model years only, for TLEVs)	TLEV	0.25	0.31
	LEV	0.125	0.156
	ULEV	0.075	0.090
LDTs, 3751-5750 lbs. LVW (2001 through 2003 model years only, for TLEVs)	TLEV	0.32	0.40
	LEV	0.160	0.200
	ULEV	0.100	0.130
MDVs, 3751-5750 lbs. ALVW	LEV	0.32	0.46
	ULEV	0.160	0.230
	SULEV	0.100	0.143
MDVs, 5751-8500 lbs. ALVW	LEV	0.39	0.56
	ULEV	0.195	0.280
	SULEV	0.117	0.167
MDVs, 8501-10,000 lbs. ALVW	LEV	0.46	0.66
	ULEV	0.230	0.330
	SULEV	0.138	0.197
MDVs, 10,001-14,000 lbs. ALVW	LEV	0.60	0.86
	ULEV	0.300	0.430
	SULEV	0.180	0.257

1.3.2 **LEV II Standards for 2004 and Subsequent Model Year Bi-fuel, Fuel-Flexible and Dual Fuel Vehicles Operating on Gasoline.** The applicable exhaust mass emission standards for NMOG when certifying the vehicle for operation on gasoline (as specified in Part II, Section A. paragraph 100.3.1) are:

LEV II NMOG Standards for Bi-Fuel, Fuel-Flexible and Dual-Fuel Vehicles Operating on Gasoline (g/mi)

Vehicle Type	Vehicle Emission Category	Durability Vehicle Basis	
		50,000 mi	120,000 mi
All PCs; LDTs, 0-8500 lbs. GVW	LEV	0.125	0.156
	ULEV	0.075	0.090
	SULEV	0.010	0.040
MDVs, 8501-10,000 lbs. GVW	LEV	n/a	0.230
	ULEV	n/a	0.167
	SULEV	n/a	0.117
MDVs, 10,001-14,000 lbs. GVW	LEV	n/a	0.280
	ULEV	n/a	0.195
	SULEV	n/a	0.143

1.4 50°F Exhaust Emission Standards.

All light- and medium-duty TLEVs, LEVs, ULEVs and SULEVs must demonstrate compliance with the following exhaust emission standards for NMOG and formaldehyde measured on the FTP (40 CFR, Part 86, Subpart B) conducted at a nominal test temperature of 50°F, as modified by Part II, Section C of these test procedures. The NMOG mass emission result shall be multiplied by the applicable reactivity adjustment factor, if any, prior to comparing to the applicable adjusted 50,000 mile certification standards set forth in subparagraphs 1.4.1 and 1.4.2 below. A manufacturer may demonstrate compliance with the NMOG and HCHO certification standards contained in subparagraphs 1.4.1 and 1.4.2 by measuring NMHC exhaust emissions in accordance with Section D.1., subparagraph (p) and Section G.3.1.2, respectively, of these test procedures. Emissions of CO and NOx measured at 50°F shall not exceed the standards set forth in Section E.1.1 applicable to vehicles of the same emission category and vehicle type subject to a cold soak and emission test at 68° to 86°F. Natural gas and diesel-fueled vehicles are exempt from the 50° F test requirements.

1.4.1 Standards for Vehicles Certified to the LEV I Standards.

Vehicle Weight Class	Vehicle Emission Category (g/mi)							
	TLEV		LEV		ULEV		SULEV	
	NMOG	HCHO	NMOG	HCHO	NMOG	HCHO	NMOG	HCHO
PCs; LDTs 0-3750 lbs. LVW	0.250	0.030	0.150	0.030	0.080	0.016	n/a	n/a
LDTs 3751-5750 lbs. LVW	0.320	0.036	0.200	0.036	0.100	0.018	n/a	n/a
MDVs 3751-5750 lbs. TW	n/a	n/a	0.320	0.036	0.200	0.018	0.100	0.008
MDVs 5751-8500 lbs. TW	n/a	n/a	0.390	0.044	0.234	0.022	0.118	0.012
MDVs 8501-10,000 lbs. TW	n/a	n/a	0.460	0.056	0.276	0.028	0.138	0.014
MDVs 10,001-14,000 lbs. TW	n/a	n/a	0.600	0.072	0.360	0.036	0.180	0.018

1.4.2 Standards for Vehicles Certified to the LEV II Standards

Vehicle Weight Class	Vehicle Emission Category (g/mi)					
	LEV		ULEV		SULEV	
	NMOG	HCHO	NMOG	HCHO	NMOG	HCHO
PCs; LDTs 0-8500 lbs. GVW	0.150	0.030	0.080	0.016	0.020	0.008
MDVs 8501-10,000 lbs. GVW	0.390	0.064	0.286	0.032	0.200	0.016
MDVs 10,001-14,000 lbs. GVW	0.460	0.080	0.334	0.042	0.234	0.020

1.5 Cold CO Standards.

The following standards represent the 50,000 mile cold temperature exhaust carbon monoxide emission levels from new 2001 and subsequent model-year passenger cars, light-duty trucks, and medium-duty vehicles:

2001 AND SUBSEQUENT MODEL-YEAR COLD TEMPERATURE CARBON MONOXIDE EXHAUST EMISSIONS STANDARDS FOR PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES

(grams per mile)

Vehicle Type	Carbon Monoxide
All PCs, LDTs 0-3750 lbs. LVW	10.0
LDTs 3751 lbs. LVW - 8500 lbs. GVW LEV I and Tier 1 MDVs 8,500 lbs. GVW and less	12.5

These standards are applicable to vehicles tested in accordance with 40 CFR Part 86 Subpart C, as modified in Part II, Section B of these test procedures at a nominal temperature of 20°F (-7°C). Natural gas vehicles, diesel-fueled vehicles, and medium-duty vehicles with a gross vehicle weight rating greater than 8,500 lbs. are exempt from these standards.

1.6 Highway NOx Standard.

The maximum emissions of oxides of nitrogen measured on the federal Highway Fuel Economy Test (HWFET; 40 CFR 600 Subpart B, which is incorporated herein by reference) shall not be greater than 1.33 times the applicable PC and LDT standards or 2.0 times the applicable MDV standards set forth in section E.1.1. Both the projected emissions and the HWFET standard shall be rounded in accordance with ASTM E29-67 to the nearest 0.1 g/mi (or 0.01 g/mi for vehicles certified to the 0.05 or 0.02 g/mi NOx standards) before being compared.

1.7 Requirements for Vehicles Certified to the Optional 150,000 Mile Standards.

(a) Requirement to Generate Additional NMOG Fleet Average Credit. A vehicle that is certified to the 150,000 mile standards in section E.1.1.2 shall generate additional NMOG fleet average credit as set forth in section E.3.1 or additional vehicle equivalent credits as set forth in E.3.2, provided that the manufacturer extends the warranty on high-priced parts to 8 years or 100,000 miles, whichever occurs first, and agrees to extend the limit on high mileage in-use testing to 112,500 miles.

(b) Requirement to Generate a Partial ZEV Allowance. A manufacturer that certifies to the 150,000 mile SULEV standards shall also generate a partial ZEV allocation according to the criteria set forth in section C.3 of the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and

Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR.

1.8 Optional LEV NOx Standard.

A manufacturer may certify up to 4% of its light-duty truck fleet from 3751 lbs. LVW - 8500 lbs. GVW with a maximum base payload of 2500 lbs. or more, to the LEV, option 1, standard set forth in Section E.1.1.2 based on projected sales of trucks in this category. Passenger cars and light-duty trucks 0-3750 lbs. LVW are not eligible for this option.

1.9 NMOG Credit for Vehicles with Zero-Evaporative Emissions.

In determining compliance of a vehicle with the applicable exhaust NMOG standard, a gram per mile NMOG factor, to be determined by the Executive Officer based on available data, shall be subtracted from the reactivity-adjusted NMOG exhaust emission results for any vehicle that has been certified to the "zero" evaporative emission standard set forth in title 13, CCR, section 1976(b)(1)(E). This credit shall not apply to a SULEV that generates a partial ZEV allowance.

1.10 NMOG Credit for Direct Ozone Reduction Technology.

A manufacturer that certifies vehicles equipped with direct ozone reduction technologies shall be eligible to receive NMOG credits that can be applied to the NMOG exhaust emissions of the vehicle when determining compliance with the standard. In order to receive credit, the manufacturer must submit the following information for each vehicle model, including, but not limited to:

(a) a demonstration of the airflow rate through the direct ozone reduction device and the ozone-reducing efficiency of the device over the range of speeds encountered in the UC as set forth in Part II, section E of these test procedures;
(b) an evaluation of the durability of the device for the full useful life of the vehicle; and
(c) a description of the on-board diagnostic strategy for monitoring the performance of the device in-use.

Using the above information, the Executive Officer shall determine the value of the NMOG credit based on the calculated change in the one-hour peak ozone level using an approved airshed model.

1.11 NOx Credits for Pre-2004 MDVs Certified to the LEV I LEV or ULEV Standards.

Prior to the 2004 model year, a manufacturer may earn a 0.02 g/mi per vehicle NOx credit for MDVs between 6,000-8500 lbs. GVW certified to the LEV I LEV or ULEV standards for PCs and LDTs set forth in section E.1.1.1 of these test procedures. The manufacturer may apply the credit on a per vehicle basis to the NOx emissions of LDTs between 6,000-8500 lbs. GVW certified to the PC/LDT LEV or ULEV standards in section E.1.1.2 for the 2004 through 2008 model years.

1.12 When a Federally-Certified Vehicle Model is Required in California.

1.12.1 **Basic Requirement.** Whenever a manufacturer federally-certifies a 2004 or subsequent model-year passenger car, light-duty truck or medium-duty vehicle model to the standards for a particular emissions bin that are more stringent than the standards for an applicable California vehicle emissions category, the equivalent California model may only be certified to (i) the California standards for a vehicle emissions category that are at least as stringent as the standards for the corresponding federal emissions bin, or (ii) the exhaust emission standards to which the federal model is certified. However, where the federal exhaust emission standards for the particular emissions bin and the California standards for a vehicle emissions category are equally stringent, the California model may only be certified to either the California standards for that vehicle emissions category or more stringent California standards. The federal emission bins are those contained Tables S04-1 and S04-2 of 40 CFR section 86.1811-04(c) as adopted February 10, 2000. The criteria for applying this requirement are set forth in Part I. Section H.1 of these test procedures.

1.12.2 **Exception for Clean Fuel Fleet Vehicles.** This requirement does not apply in the case of a federally-certified vehicle model that is only marketed to fleet operators for applications that are subject to clean fuel fleet requirements established pursuant to section 246 of the federal Clean Air Act (42 U.S.C. sec. 7586). In addition, the Executive Officer shall exclude from the requirements a federally-certified vehicle model where the manufacturer demonstrates to the Executive Officer's reasonable satisfaction that the model will primarily be sold or leased to clean fuel fleet operators for such applications, and that other sales or leases of the model will be incidental to marketing to those clean fuel fleet operators.

1.12.3 **Opt-in for 2003 or Prior Model-Year Vehicles.** A manufacturer may certify a passenger car, light-duty truck or medium-duty vehicle to federal exhaust emission standards pursuant to Section E.1.12.1 prior to the 2004 model year.

1.13 Emission Standard for Fuel-Fired Heaters. Whenever a manufacturer elects to utilize an on-board fuel-fired heater on any passenger car, light-duty truck or medium-duty vehicle, the heater must meet the LEV II ULEV standards for passenger cars and light-duty trucks less than 8,500 pounds GVW set forth in Section E.1.1.2 of these test procedures. The exhaust emissions from the fuel-fired heater shall be determined in accordance with the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes". On-board fuel-fired heaters may not be operable at ambient temperatures above 40°F.

1.14 Greenhouse Gas Emission Requirements. The greenhouse gas emission levels from new 2009 and subsequent model year passenger cars, light-duty trucks, and medium-duty passenger vehicles shall not exceed the requirements set forth in Section E.2.5 of these test procedures. Light-duty trucks from 3751 lbs. LVW – 8500 lbs. GVW that are certified to the ~~Optional~~ Option 1 LEV II NOx Standard in Section E.1.1.2 of these test procedures are exempt from these greenhouse gas emission requirements, however, passenger cars, light-duty trucks 0-3750 lbs. LVW, and medium-duty passenger vehicles are not eligible for this exemption.

2. Emission Standards Phase-In Requirements for Manufacturers

2.1 Fleet Average NMOG Requirements for Passenger Cars and Light-Duty Trucks.

2.1.1 The fleet average non-methane organic gas exhaust mass emission values from the passenger cars and light-duty trucks produced and delivered for sale in California each model year by a manufacturer other than a small volume manufacturer or an independent low volume manufacturer shall not exceed:

FLEET AVERAGE NON-METHANE ORGANIC GAS EXHAUST MASS EMISSION REQUIREMENTS FOR LIGHT-DUTY VEHICLE WEIGHT CLASSES (50,000 mile Durability Vehicle Basis)		
Model Year	Fleet Average NMOG (g/mi)	
	All PCs; LDTs 0-3750 lbs. LVW	LDTs 3751 lbs. LVW - 8500 lbs. GVW
2001	0.070	0.098
2002	0.068	0.095
2003	0.062	0.093
2004	0.053	0.085
2005	0.049	0.076
2006	0.046	0.062
2007	0.043	0.055
2008	0.040	0.050
2009	0.038	0.047
2010+	0.035	0.043

2.1.2 **Calculation of Fleet Average NMOG Value**.

2.1.2.1 **Basic Calculation.**

(a) Each manufacturer's PC and LDT1 fleet average NMOG value for the total number of PCs and LDT1s produced and delivered for sale in California shall be calculated as follows:

(Σ [Number of vehicles in a test group x applicable emission standard] +

Σ [Number of hybrid electric vehicles in a test group x HEV NMOG factor])÷

Total Number of Vehicles Produced, Including ZEVs and HEVs

~~2.1.2.1~~ (b) Each manufacturer's LDT2 fleet average NMOG value for the total number of LDT2s produced and delivered for sale in California shall be calculated as follows:

(Σ [Number of vehicles in a test group x applicable emission standard] +
Σ [Number of hybrid electric vehicles in a test group x HEV NMOG factor]) ÷
Total Number of Vehicles Produced, Including ZEVs and HEVs

The applicable emission standards to be used in the above equations are as follows:

Model Year	**Emission Category**	**Emission Standard Value**	
		All PCs; LDTs 0-3750 lbs. LVW	**LDTs 3751-5750 lbs. LVW**
2001 and subsequent (AB 965 vehicles only)	All	Federal Emission Standard to which Vehicle is Certified	Federal Emission Standard to which Vehicle is Certified
2001 - 2003	Tier 1	0.25	0.32
2001 - 2006 model year vehicles certified to the "LEV I" standards in E.1.1.1 (For TLEVs, 2001 - 2003 model years only)	TLEVs	0.125	0.160
	LEVs	0.075	0.100
	ULEVs	0.040	0.050
Model Year	**Emission Category**	**All PCs; LDTs 0-3750 lbs. LVW**	**LDTs 3751 lbs. LVW - 8500 lbs. GVW**
2001 and subsequent model year vehicles certified to the "LEV II" standards in E.1.1.2	LEVs	0.075	0.075
	ULEVs	0.040	0.040
	SULEVs	0.01	0.01
2001 and subsequent model year vehicles certified to the optional 150,000 mile "LEV II" standards for PCs and LDTs in E.1.1.2	LEVs	0.064	0.064
	ULEVs	0.034	0.034
	SULEVs	0.0085	0.0085

2.1.2.2 **HEV NMOG Factor.** The HEV NMOG factor for light-duty vehicles is calculated as follows:

LEV HEV Contribution Factor = 0.075 - [(Zero-emission VMT Factor) x 0.035]
ULEV HEV Contribution Factor = 0.040 - [(Zero-emission VMT Factor) x 0.030]

where Zero-emission VMT Factor for HEVs is determined in accordance with Section C.3 of the "California Exhaust Emission Standards and Test Procedures for

2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR.

2.1.2.3 **Federally-Certified Vehicles**. A vehicle certified to the standards for a federal exhaust emissions bin in accordance with Section H.1 of these test procedures shall use the corresponding NMOG emission category value set forth in the table in Section E.2.1.2 of these test procedures for the fleet average calculation. If a vehicle is certified to 150,000 mile standards for a federal exhaust emission bin and the corresponding California NMOG emission category is LEV I or LEV II LEV, it may use the emission standard value for the optional 150,000 mile LEV II LEV standards set forth in the Section E.2.1.2 table. If a vehicle is certified to 150,000 mile standards for a federal exhaust emission bin and the corresponding California NMOG emission category is LEV I or LEV II ULEV, it may use the emission standard value for the optional 150,000 mile LEV II ULEV standards set forth in the Section E.2.1.2 table.

2.1.3 **Phase-in Requirements for Small Volume Manufacturers.**

(a) In 2001 through 2006 model years, a small volume manufacturer shall not exceed a fleet average NMOG value of 0.075 g/mi for PCs and LDTs from 0-3750 lbs. LVW or 0.100 g/mi for LDTs from 3751-5750 lbs. LVW calculated in accordance with subsection E.2.1.2. In 2007 and subsequent model years, a small volume manufacturer shall not exceed a fleet average NMOG value of 0.075 for PCs and LDTs from 0-3750 lbs. LVW or 0.075 for LDTs from 3751 lbs. LVW - 8,500 lbs. GVW calculated in accordance with subsection E.2.1.2.

(b) If a manufacturer's average California sales exceeds 4500 units of new PCs, LDTs, MDVs and heavy duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as a small volume manufacturer and shall comply with the fleet average requirements applicable to larger manufacturers as specified in section E.2.1.2 beginning with the fourth model year after the last of the three consecutive model years.

(c) If a manufacturer's average California sales falls below 4500 units of new PCs, LDTs, MDVs and heavy duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall be treated as a small volume manufacturer and shall be subject to the requirements for small volume manufacturers beginning with the next model year.

2.1.4 **Phase-in Requirements for Independent Low Volume Manufacturers**

In 2001 through 2006 model years, an independent low volume manufacturer shall not exceed a fleet average NMOG value of 0.075 g/mi for PCs and LDTs from 0-3750 lbs. LVW or 0.100 g/mi for LDTs from 3751-5750 lbs. LVW calculated in accordance with section E.2.1.2. In 2007 and subsequent model years, an independent low volume manufacturer shall not exceed a fleet average NMOG value of 0.060 for PCs and LDTs from 0-3750 lbs. LVW

or 0.065 g/mi for LDTs from 3751 lbs. LVW - 8500 lbs. GVW calculated in accordance with section E.2.1.2.

2.1.5 **Treatment of ZEVs.** ZEVs classified as LDTs (>3750 lbs. LVW) that have been counted toward the ZEV requirement for PCs and LDTs (0-3750 lbs. LVW) as specified in Section C of the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR, shall be included in this equation.

2.2 LEV II Phase-In Requirement.

Beginning in the 2004 model year, a manufacturer, except a small volume manufacturer or an independent low volume manufacturer, shall certify a percentage of its PC and LDT fleet to the LEV II standards in section E.1.1.2 according to the following phase-in schedule:

Model Year	PC/LDT1 (%)	LDT2 (%)
2004	25	25
2005	50	50
2006	75	75
2007	100	100

In determining compliance with the phase-in schedule, the fleet shall consist of LEV I and LEV II PCs and LDT1s for the PC/LDT1 calculation, and LEV I and LEV II LDT2s for the LDT2 calculation. LEV I MDVs are not counted in the calculation until they are certified as LEV II LDT2s.

A manufacturer may use an alternative phase-in schedule to comply with these phase-in requirements as long as equivalent NOx emission reductions are achieved by the 2007 model year from each of the two categories – PC/LDT1 or LDT2. Model year emission reductions shall be calculated by multiplying the percent of either PC/LDT1 or LDT2 vehicles meeting the LEV II standards in a given model year (based on a manufacturer's projected sales volume of vehicles in each category) by 4 for the 2004 model year, 3 for the 2005 model year, 2 for the 2006 model year and 1 for the 2007 model year. The yearly results for PCs/LDT1s shall be summed together to determine a separate cumulative total for PCs/LDT1s and the yearly results for LDT2s shall be summed together to determine a cumulative total for LDT2s. The cumulative total for each category must be equal to or exceed 500 to be considered equivalent. A manufacturer may add vehicles introduced before the 2004 model year (e.g., the percent of vehicles introduced in 2003 would be multiplied by 5) to the cumulative total.

2.3 Medium-Duty Low-Emission Vehicle Phase-In Requirements.

2.3.1 (a) A manufacturer of MDVs, other than a small volume manufacturer, shall certify an equivalent percentage of its MDV fleet according to the following phase-in schedule:

Model Year	Vehicles Certified to Section E.1.1 (%)		Vehicles Certified to title 13 CCR Section 1956.8(g) or (h) (%)		
	LEV	ULEV	Tier 1	LEV	ULEV
2001	80	20	100	0	0
2002	70	30	0	100	0
2003	60	40	0	100	0
2004 +	40	60	0	0	100

(b) **Requirements for Small Volume Manufacturers.** In 2001 through 2003 model years, a small volume manufacturer shall certify, produce, and deliver for sale in California vehicles or engines certified to the MDV Tier 1 standards in a quantity equivalent to 100% of its MDV fleet. In 2004 through 2006 model years, a small volume manufacturer shall certify, produce, and deliver for sale in California vehicles or engines certified to the MDV LEV standards in a quantity equivalent to 100% of its MDV fleet. Engines certified to these MDV LEV standards are not eligible for emissions averaging.

(c) **Phase-In Requirements for LEV II MDVs**. For the 2004 through 2006 model years, a manufacturer, other than a small volume manufacturer must phase-in at least one test group per model year to the MDV LEV II standards. All 2007 and subsequent model year MDVs, including those produced by a small volume manufacturer, are subject to the LEV II MDV standards. Beginning in the 2005 model year, all medium-duty engines certified to the optional medium-duty engine standards in title 13, CCR §1956.8(c) or (h), including those produced by a small volume manufacturer, must meet the standard set forth in title 13, CCR §1956.8(c) or (h), as applicable. A manufacturer that elects to certify to the Option 1 or Option 2 federal standards as set forth in 40 CFR §86.005-10(f) is not subject to these phase-in requirements.

2.3.2 **Identifying a Manufacturer's MDV Fleet**. For the 2001 and subsequent model years, each manufacturer's MDV fleet shall be defined as the total number of California-certified MDVs produced and delivered for sale in California. The percentages shall be applied to the manufacturer's total production of California-certified medium-duty vehicles delivered for sale in California. For the 2005 and subsequent model years, a manufacturer that elects to certify engines to the optional medium-duty engine standards in title 13, CCR, §1956.8(c), or

(h) shall not count those engines in the manufacturer's total production of California-certified medium-duty vehicles for purposes of this subparagraph.

2.4 Implementation Schedules for SFTP Emission Standards

2.4.1 A manufacturer of PCs and of LDTs certified to the Tier 1 and TLEV standards as set forth in Section E.1 of these test procedures, except a small volume manufacturer, shall certify a minimum percentage of its PC and LDT fleet according to the following phase-in schedule.

Model Year	Percentage of PC and LDT Fleet
2001	25
2002	50
2003	85
2004 and subsequent	100

(a) For the purposes of the implementation schedule set forth in this subparagraph 2.4.1, each manufacturer's PC and LDT fleet shall be defined as the total projected number of Tier 1 and TLEV PCs and LDTs from 0-5750 lbs. LVW sold in California. As an option, a manufacturer may elect to have its total PC and LDT fleet defined, for the purposes of this implementation schedule only, as the total projected number of the manufacturer's PCs and LDTs, other than zero-emission vehicles, certified and sold in California.

(b) The phase-in requirements for small volume manufacturers are set forth in Section D.2.1.6 of these test procedures.

2.4.2 (a) A manufacturer of PCs, LDTs, and MDVs certified to the LEV, ULEV and SULEV standards as set forth in Section E.1 of these test procedures, except a small volume manufacturer, shall certify a minimum percentage of its PC and LDT fleet, and a minimum percentage of its MDV fleet, according to the following phase-in schedule.

Model Year	Percentage	
	PC, LDT	MDV
2001	25	NA
2002	50	NA
2003	85	25
2004	100	50
2005 and subsequent	100	100

(b) A manufacturer may use an "Alternative or Equivalent Phase-in Schedule" to comply with the phase-in requirements. An "Alternative Phase-in" is one that achieves at least equivalent emission reductions by the end of the last model year of the scheduled phase-in. Model-year emission reductions shall be calculated by multiplying the percent of vehicles (based on the manufacturer's projected California sales volume of the applicable vehicle fleet) meeting the new requirements per model year by the number of model years implemented prior to and including the last model year of the scheduled phase-in. The "cumulative total" is the summation of the model-year emission reductions (e.g., a four model-year 25/50/85/100 percent phase-in schedule would be calculated as: (25%*4 years) + (50%*3 years) + (85%*2 years) + (100%*1 year) = 520). Any alternative phase-in that results in an equal or larger cumulative total than the required cumulative total by the end of the last model year of the scheduled phase-in shall be considered acceptable by the Executive Officer under the following conditions: 1) all vehicles subject to the phase-in shall comply with the respective requirements in the last model year of the required phase-in schedule and 2) if a manufacturer uses the optional phase-in percentage determination in Section 2.4.1(a) above, the cumulative total of model-year emission reductions as determined only for PCs and LDTs certified to this Section 2.4.2. must also be equal to or larger than the required cumulative total by end of the 2004 model year. A manufacturer shall be allowed to include vehicles introduced before the first model year of the scheduled phase-in (e.g., in the previous example, 10 percent introduced one year before the scheduled phase-in begins would be calculated as: (10%*5 years) and added to the cumulative total).

2.4.2.1 For the purposes of the implementation schedule set forth in this subparagraph 2.4.2, each manufacturer's PC and LDT fleet shall be defined as the total projected number of low-emission, ultra-low-emission and super-ultra-low-emission PCs and LDTs from 0-5750 pounds loaded vehicle weight sold in California. Each manufacturer's MDV fleet shall be defined as the total projected number of low-emission, ultra-low-emission, and super-ultra-low-emission MDVs less than 8501 pounds gross vehicle weight rating sold in California.

2.5 Fleet Average Greenhouse Gas Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.

2.5.1 The fleet average greenhouse gas exhaust mass emission values from passenger cars, light-duty trucks, and medium-duty passenger vehicles that are produced and delivered for sale in California each model year by a large volume manufacturer shall not exceed:

FLEET AVERAGE GREENHOUSE GAS EXHAUST MASS EMISSION REQUIREMENTS FOR PASSENGER CAR, LIGHT-DUTY TRUCK, AND MEDIUM-DUTY PASSENGER VEHICLE WEIGHT CLASSES[1] (4,000 mile Durability Vehicle Basis)		
Model Year	*Fleet Average Greenhouse Gas Emissions (grams per mile CO_2-equivalent)*	
	All PCs; LDTs 0-3750 lbs. LVW	*LDTs 3751 lbs. LVW - 8500 lbs. GVW; MDPVs*
2009	323	439
2010	301	420
2011	267	390
2012	233	361
2013	227	355
2014	222	350
2015	213	341
2016+	205	332

[1] Each manufacturer shall demonstrate compliance with these values in accordance with Section E.2.5.2.

2.5.2 Calculation of Fleet Average Greenhouse Gas Value.

2.5.2.1 **Basic Calculation.**

2.5.2.1.1 Each manufacturer shall calculate both a "city" grams per mile average CO_2-equivalent value for each GHG vehicle test group and a "highway" grams per mile average CO_2-equivalent value for each GHG vehicle test group, including AB 965 vehicles and vehicles certified in accordance with Section E.1.12 of these test procedures, using the following formula. Greenhouse Gas emissions used for the "city" CO_2-equivalent value calculation shall be measured using the "FTP" test cycle (40 CFR, Part 86, Subpart B), as modified in Part II of these test procedures. Greenhouse Gas emissions used for the "highway" CO_2-equivalent value calculation shall be based on emissions measured using the Highway Test Procedures.

$$CO_2\text{-Equivalent Value} = CO_2 + 296 \times N_2O + 23 \times CH_4 - \text{A/C Direct Emissions Allowance} - \text{A/C Indirect Emissions Allowance}$$

A manufacturer may use N_2O = 0.006 grams per mile in lieu of measuring N_2O exhaust emissions.

2.5.2.1.2 **A/C Direct Emissions Allowance.** A manufacturer may use the following A/C Direct Emission Allowances, upon approval of the Executive Officer, if that manufacturer demonstrates that the ~~corresponding~~ following requirements are met. Such demonstration shall include specifications of the components used and an engineering evaluation that verifies the estimated lifetime emissions from the components and the system. A manufacturer shall also provide confirmation that the number of fittings and joints has been minimized and components have been optimized to minimize leakage. No A/C Direct Emissions Allowance is permitted if the following requirements are not met.

(a) A "low-leak air conditioning system" shall be defined as one that meets the following criteria:

i. All pipe and hose connections are equipped with multiple o-rings, seal washers, or metal gaskets only (e.g., no single o-rings);

ii. All hoses in contact with the refrigerant must be ultra-low permeability barrier or veneer hose on both the high-pressure and the low-pressure sides of the system (e.g., no rubber hoses); and

iii. Only multiple-lip compressor shaft seals shall be used (with either body o-rings or gaskets).

(b) For an air conditioning system that uses HFC-134a as the refrigerant:

i. An A/C Direct Emissions Allowance of 3.0 CO_2-equivalent grams per mile shall apply if the system meets the criteria for a "low-leak air conditioning system."

ii. An A/C Direct Emissions Allowance of 3.0 CO_2-equivalent grams per mile shall apply if the manufacturer demonstrates alternative technology that achieves equal or lower direct emissions than a "low-leak air conditioning system."

iii. An A/C Direct Emissions Allowance greater than 3.0 CO_2-equivalent grams per mile may apply for an air conditioning system that reduces refrigerant leakage further than would be obtained from a "low-leak air conditioning system." A maximum A/C Direct Emissions Allowance of 6.0 CO_2-equivalent grams per mile may be earned for an air conditioning system that has 100 percent containment of refrigerant during normal operation, where "normal operation" means typical everyday use of the A/C system to cool a vehicle. "Normal operation" does not include car accidents, dismantling of an A/C system, or any other non-typical events. To obtain an A/C Direct Emissions Allowance greater than 3.0 CO_2-equivalent grams per mile, the manufacturer must provide an engineering evaluation that supports the allowance requested.

(c) For an air conditioning system that uses HFC 152a, CO_2 refrigerant, or any refrigerant with a GWP of 150 or less:
An A/C Direct Emissions Allowance shall be calculated using the following formula:

$$\text{A/C Direct Emissions Allowance} = A - (B \times C)$$

where: A = 9 CO_2-equivalent grams per mile (the lifetime vehicle emissions from an air conditioning system that uses refrigerant HFC-134a);

$$B = 9\ CO_2\text{-equivalent grams per mile} \times \frac{GWP}{1300}$$

where: B is the lifetime vehicle emissions from an air conditioning system that uses a refrigerant with a GWP of 150 or less and

"GWP" means the GWP of this refrigerant; and

C = 1, except for an air conditioning system that meets the criteria of a "low-leak air conditioning system."

For an air conditioning system that meets or exceeds the criteria of a "low-leak air conditioning system," the following formula shall apply:

$$C = 1 - (0.12 \times \text{credit})$$

where: "credit" equals 3.0 CO_2-equivalent grams per mile for a "low-leak air conditioning system" that meets the criteria of Section E.2.5.2.1.2(a) or

"credit" equals a value greater than 3.0 CO_2-equivalent grams per mile for an air conditioning system that reduces refrigerant leakage further than would be obtained from a "low-leak air conditioning system." A maximum credit of 6.0 CO_2-equivalent grams per mile may be earned for an air conditioning system that has 100 percent containment of refrigerant during normal operation. To obtain a credit greater than 3.0 CO_2-equivalent grams per mile, the manufacturer must provide an engineering evaluation that supports the credit requested.

2.5.2.1.3 **A/C Indirect Emissions Allowance.** A manufacturer may use the following A/C Indirect Emissions Allowances, upon approval of the Executive Officer, if the manufacturer demonstrates using data or an engineering evaluation that the air conditioning system meets the ~~corresponding~~ following requirements. A manufacturer may use the following A/C Indirect Emissions Allowances for other technologies, upon approval of the Executive Officer, if that manufacturer demonstrates that the air conditioning system achieves equal CO_2-equivalent grams per mile emissions reductions.

(a) ~~An allowance of 5.0 CO_2-equivalent grams per mile per 100ccs of compressor displacement shall be given for an air conditioning~~ An "A/C system with reduced indirect emissions" shall be defined as one that meets all of the following criteria:

i. Has managed outside and recirculated air balance to achieve comfort, demisting, and safety requirements, based on such factors as temperature, humidity, pressure, and level of fresh air in the passenger compartment to minimize compressor usage;~~,~~

ii. Is optimized for energy efficiency by utilizing state-of-the-art high efficiency evaporators, condensors, and other components;~~,~~ and

iii. Has an externally controlled compressor (such as an externally controlled variable displacement or variable speed compressor or an externally controlled fully cycling fixed displacement compressor) that adjusts evaporative temperature to minimize the necessity of reheating cold air to satisfy occupant comfort.

(b) For an A/C system that meets all of the criteria for an "A/C system with reduced indirect emissions," the allowance shall be calculated using the following emission factors, up to a maximum allowance of 9.0 CO_2-equivalent grams per mile for a system that has one evaporator and up to a maximum allowance of 11.0 CO_2-equivalent grams per mile for a system that has two evaporators:

i. 5.0 CO_2-equivalent grams per mile per 100 cc of maximum compressor displacement for a system that does not use CO_2 as the refrigerant

ii. 27.5 CO_2-equivalent grams per mile per 100 cc of maximum compressor displacement for a system that uses CO_2 as the refrigerant

(c~~b~~) ~~An allowance of 0.2 CO_2-equivalent grams per mile per 100ccs of compressor displacement shall be given f~~ For an air conditioning system equipped with a refrigerant having a GWP of 150 or less, the allowance shall be calculated using the following emission factors, up to a maximum allowance of 0.5 CO_2-equivalent grams per mile:

i. 0.2 CO_2-equivalent grams per mile per 100cc of maximum compressor displacement for a system that does not use CO_2 as the refrigerant and

ii. 1.1 CO2-equivalent grams per mile per 100cc of maximum compressor displacement for a system that uses CO2 as the refrigerant.

2.5.2.1.4 **Upstream Greenhouse Gas Emission Adjustment Factor for Alternative Fuel Vehicles.** A grams per mile average CO_2-equivalent value for each GHG vehicle test group certifying on a fuel other than conventional gasoline, including AB 965 vehicles and vehicles certified in accordance with Section E.1.12 of these test procedures, shall be calculated as follows:

$$(CO_2 + \text{A/C Indirect Emissions}) \times (\text{Fuel Adjustment Factor}) + 296 \times N_2O + 23 \times CH_4 + \text{A/C Direct Emissions}$$

where: A/C Indirect Emissions = A-B

where: "A" represents the indirect emissions associated with an A/C system that does not incorporate any of the A/C improvements described in Section E.2.5.2.1.3. "A" is determined by the following emission factors, with a maximum value of 17.0 CO_2-equivalent grams per mile for a system that has one evaporator and a maximum value of 21.0 CO_2-equivalent grams per mile for a system that has two evaporators.

A = 9.6 CO_2-equivalent grams per mile per 100cc of maximum compressor displacement for an A/C system that does not use CO_2 as the refrigerant or

A = 52.8 CO2-equivalent grams per mile per 100cc of maximum compressor displacement for an A/C system that uses CO2 as the refrigerant.

B = A/C Indirect Emissions Allowance as calculated per Section E.2.5.2.1.3.

~~A/C Indirect Emissions = 9.0 CO_2-equivalent grams per mile per 100ccs of compressor displacement – A/C Indirect Emissions Allowance as calculated per Section E.2.5.2.1.3.~~

A/C Direct Emissions = 9 CO_2-equivalent grams per mile – A/C Direct Emissions Allowance as calculated per Section E.2.5.2.1.2.

The Fuel Adjustment Factors are:

Fuel	**Fuel Adjustment Factor**
Natural Gas	1.03
LPG	0.89
E85	0.74

2.5.2.1.5 **Calculation of CO_2-equivalent Emissions for Hydrogen Internal Combustion Engine Vehicles and for Electric and Hydrogen ZEVs.** The grams per mile average CO_2-equivalent value for each GHG vehicle test group certifying to ZEV standards, including AB 965 vehicles and vehicles certified in accordance with Section E.1.12 of these test procedures, shall be:

A/C Direct Emissions + Upstream Emissions Factor

~~A/C Direct Emissions + 130 CO_2-equivalent grams per mile for electric ZEVs, A/C Direct Emissions + 290 CO_2-equivalent grams per mile for hydrogen internal combustion engine vehicles, and~~

~~A/C Direct Emissions + 210 CO_2-equivalent grams per mile for hydrogen ZEVs.~~

where: A/C Direct Emissions = 9 CO_2-equivalent grams per mile – A/C Direct Emissions Allowance as calculated per Section E.2.5.2.1.2.

The Upstream Emissions Factors are:

Vehicle Type	**Upstream Emissions Factor**[1] (CO_2-equivalent g/mi)
Electric ZEV	130
Hydrogen Internal Combustion Engine Vehicle	290
Hydrogen ZEV	210

[1] The Executive Officer may approve use of a lower upstream emissions factor if a manufacturer demonstrates the appropriateness of the lower value by providing information that includes, but is not limited to the percentage of hydrogen fuel or the percentage of electricity produced for sale in California using a "renewable energy resource."

2.5.2.2 **Calculation of Greenhouse Gas Values for Bi-Fuel Vehicles, Fuel-Flexible Vehicles, Dual-Fuel Vehicles, and Grid-connected Hybrid Electric Vehicles.** For bi-fuel, fuel-flexible, dual-fuel, and grid-connected hybrid electric vehicles, a manufacturer shall calculate a grams per mile average CO_2-equivalent value for each GHG vehicle test group, in accordance with Section E.2.5.2.1~~.~~ of these test procedures, based on exhaust mass emission tests when the vehicle is operating on gasoline.

2.5.2.2.1 **Optional Alternative Compliance Mechanisms.** Beginning with the 2010 model year, a manufacturer that demonstrates that a bi-fuel, fuel-flexible, dual-fuel, or grid-connected hybrid electric GHG vehicle test group will be operated in use in California on the alternative fuel ~~may~~ shall be eligible to certify those vehicles using this optional alternative compliance procedure, upon approval of the Executive Officer.

(a) To demonstrate that bi-fuel, fuel-flexible, dual-fuel, or grid-connected hybrid electric vehicles within a GHG vehicle test group will be operated in use in California on the alternative fuel, the manufacturer shall provide data that shows the

previous model year sales of such vehicles to fleets that provide the alternative fuel on-site, or, for grid-connected hybrid electric vehicles, to end users with the capability to recharge the vehicle on-site. This data shall include both the total number of vehicles sales that were made to such fleets or end users with the capability to recharge the vehicle on-site and as the percentage of total GHG vehicle test group sales. The manufacturer shall also provide data demonstrating the percentage of total vehicle miles traveled by the bi-fuel, fuel-flexible, dual-fuel, or grid-connected hybrid electric vehicles sold to each fleet or to end users with the capability to recharge the vehicle on-site in the previous model year using the alternative fuel and using gasoline.

(b) For each GHG vehicle test group that receives approval by the Executive Officer under Section E.2.5.2.2.1(a)~~,~~, a grams per mile CO_2-equivalent value shall be calculated as follows:

$$CO_2\text{-equivalent value} = \left[A \times E \times B \times C\right] + \left[\left(1 - (A \times E \times B)\right) \times D\right]$$

where: A = the percentage of previous model year vehicles within a GHG vehicle test group that were operated in use in California on the alternative fuel during the previous calendar year;

B = the percentage of miles traveled by "A" during the previous calendar year;

C = the CO_2-equivalent value for the GHG vehicle test group, as calculated in Section E.2.5.2.1, when tested using the alternative fuel; ~~and~~

D = the CO_2-equivalent value for the GHG vehicle test group, as calculated in Section E.2.5.2.1, when tested using gasoline; and~~.~~

E = 0.9 for grid-connected hybrid electric vehicles or

E = 1 for bi-fuel, fuel-flexible, and dual-fuel vehicles.

The Executive Officer may approve use of a higher value for "E" for a grid-connected hybrid electric vehicle GHG vehicle test group if a manufacturer demonstrates that the vehicles can reasonably be expected to maintain more than 90 percent of their original battery capacity over a 200,000 mile vehicle lifetime. The manufacturer may demonstrate the appropriateness of a higher value either by providing data from real world vehicle operation; or by showing that these vehicles are equipped with batteries that do not lose energy storage capacity until after 100,000 miles; or by offering 10 year/150,000 mile warranties on the batteries.

2.5.2.3 **Calculation of Fleet Average Greenhouse Values.**

2.5.2.3.1. Each manufacturer's PC and LDT1 fleet average Greenhouse Gas value for the total number of PCs and LDT1s produced and delivered for sale in California, including AB 965 vehicles and vehicles certified in accordance with Section E.1.12 of these test procedures, shall be calculated as follows:

[0.55 x (Σ City Test Group Greenhouse Gas Values) + 0.45 x (Σ Highway Test Group Greenhouse Gas Values)] ÷ Total Number of PCs and LDT1s Produced, Including ZEVs and HEVs

where: City Test Group Greenhouse Gas Value = [(Total Number of Vehicles in a Test Group - Σ Number of Vehicles in Optional GHG Test Vehicle Configurations) x "worst-case" calculated CO_2-equivalent value + Σ (Number of vehicles in Optional GHG Test Vehicle Configurations x applicable calculated CO_2-equivalent value)] measured using the FTP test cycle; and

Highway Test Group Greenhouse Gas Value = [(Total Number of Vehicles in a Test Group - Σ Number of Vehicles in Optional GHG Test Vehicle Configurations) x "worst-case" calculated CO_2-equivalent value + Σ (Number of vehicles in Optional GHG Test Vehicle Configurations x applicable calculated CO_2-equivalent value)] measured using the Highway Test Procedures.

2.5.2.3.2. Each manufacturer's LDT2 and MDPV fleet average Greenhouse Gas value for the total number of LDT2s and MDPVs produced and delivered for sale in California, including AB 965 vehicles and vehicles certified in accordance with Section E.1.12 of these test procedures, shall be calculated as follows:

[0.55 x (Σ City Test Group Greenhouse Gas Values) + 0.45 x (Σ Highway Test Group Greenhouse Gas Values)] ÷ Total Number of LDT2s and MDPVs Produced, Including ZEVs and HEVs

where: City Test Group Greenhouse Gas Value = [(Total Number of Vehicles in a Test Group - Σ Number of Vehicles in Optional GHG Test Vehicle Configurations) x "worst-case" calculated CO_2-equivalent value + Σ (Number of vehicles in Optional GHG Test Vehicle Configurations x applicable calculated CO_2-equivalent value)] measured using the FTP test cycle; and

Highway Test Group Greenhouse Gas Value = [(Total Number of Vehicles in a Test Group - Σ Number of Vehicles in Optional GHG Test Vehicle Configurations) x "worst-case" calculated CO_2-equivalent value + Σ (Number of vehicles in Optional GHG Test Vehicle Configurations x applicable calculated CO_2-equivalent value)] measured using the Highway Test Procedures.

2.5.3 **Requirements for Intermediate Volume Manufacturers.**

2.5.3.1 Before the 2016 model year, compliance with the Greenhouse Gas requirements in section E.2.5 shall be waived for intermediate volume manufacturers.

2.5.3.2 For each intermediate volume manufacturer, the manufacturer's baseline fleet average greenhouse gas value for PCs and LDT1s and baseline fleet average greenhouse gas value for LDT2s and MDPVs shall be calculated in accordance with Section E.2.5.2.1 of these test procedures using its 2002 model year fleet.

2.5.3.3 In the 2016 and subsequent model years, an intermediate volume manufacturer shall either:

(a) not exceed a fleet average greenhouse gas emissions value of 233 g/mi for PCs and LDT1s and 361 g/mi for LDT2s and MDPVs, or

(b) not exceed a fleet average greenhouse gas value of 0.75 times the baseline fleet average greenhouse gas value for PCs and LDT1s or 0.82 times the baseline fleet average greenhouse gas value for LDT2s and MDPVs, as calculated in Section E.2.5.3.2.

2.5.3.4 If a manufacturer's average California sales exceed 60,000 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as an intermediate volume manufacturer and shall comply with the fleet average requirements applicable to large volume manufacturers as specified in Section E.2.5.1 beginning with the fourth model year after the last of the three consecutive model years.

2.5.3.5 If a manufacturer's average California sales fall below 60,001 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall be treated as an intermediate volume manufacturer and shall be subject to the requirements for intermediate volume manufacturers beginning with the next model year.

2.5.4 **Requirements for Small Volume Manufacturers and Independent Low Volume Manufacturers.**

2.5.4.1 Before the 2016 model year, compliance with the Greenhouse Gas requirements in section E.2.5 shall be waived for small volume manufacturers and independent low volume manufacturers.

2.5.4.2 At the beginning of the 2013 model year, each small volume manufacturer and independent low volume manufacturer shall identify all 2012 model year vehicle models, certified by a large volume manufacturer that are comparable to that small volume manufacturer or independent low volume manufacturer's 2016 model year vehicle models, based on horsepower and horsepower to weight ratio. The small volume manufacturer and independent low volume manufacturer shall demonstrate to the Executive Officer the appropriateness of each comparable vehicle model selected. Upon approval of the Executive Officer, s/he shall provide to the small volume manufacturer and to the independent low volume manufacturer the CO_2-equivalent value for each 2012 model year vehicle model that is approved. The small volume manufacturer and independent low volume manufacturer shall calculate an average greenhouse gas emissions value for each its greenhouse gas vehicle test groups based on the CO_2-equivalent values provided by the Executive Officer.

2.5.4.3 In the 2016 and subsequent model years, a small volume manufacturer and an independent low volume manufacturer shall either:

(a) not exceed the fleet average greenhouse gas emissions value calculated for each GHG vehicle test group for which a comparable vehicle is sold by a large volume manufacturer, in accordance with Section E.2.5.4; or

(b) not exceed a fleet average greenhouse gas emissions value of 233 g/mi for PCs and LDT1s and 361 g/mi for LDT2s and MDPVs; or

(c) upon approval of the Executive Officer, if a small volume manufacturer demonstrates a vehicle model uses an engine, transmission, and emission control system that is identical to a configuration certified for sale in California by a large volume manufacturer, those small volume manufacturer vehicle models are exempt from meeting the requirements in paragraphs E.2.5.4.3(a) and (b) of this Section.

2.5.4.4 If a manufacturer's average California sales exceed 4,500 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as a small volume manufacturer and shall comply with the fleet average requirements applicable to larger volume manufacturers as specified in Section E.2.5.1 beginning with the fourth model year after the last of the three consecutive model years.

2.5.4.5 If a manufacturer's average California sales exceed 10,000 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall no longer be treated as an independent low volume manufacturer and shall comply with the fleet average requirements applicable to larger volume manufacturers as specified in Section E.2.5.1 beginning with the fourth model year after the last of the three consecutive model years.

2.5.4.6 If a manufacturer's average California sales fall below 4,501 units of new PCs, LDTs, MDVs and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years, the manufacturer shall be treated as an small

volume manufacturer and shall be subject to the requirements for small volume manufacturers beginning with the next model year.

3. Calculation of ~~NMOG~~ Credits/Debits

3.1 Calculation of NMOG Credits/Debits

3.1.1 Calculation of NMOG Credits for Passenger Cars and Light-Duty Trucks.

3.1.1.1 In 2001 and subsequent model years, a manufacturer that achieves fleet average NMOG values lower than the fleet average NMOG requirement for the corresponding model year shall receive credits in units of g/mi NMOG determined as:

> [(Fleet Average NMOG Requirement) - (Manufacturer's Fleet Average NMOG Value)]
> x
> (Total No. of Vehicles Produced and Delivered for Sale in California, Including ZEVs and HEVs).

A manufacturer with 2001 and subsequent model year fleet average NMOG values greater than the fleet average requirement for the corresponding model year shall receive debits in units of g/mi NMOG equal to the amount of negative credits determined by the aforementioned equation. For the 2001 through 2006 model year, the total g/mi NMOG credits or debits earned for PCs and LDTs 0-3750 lbs. LVW and for LDTs 3751-5750 lbs. and LDTs 3751 lbs. LVW - 8500 lbs. GVW shall be summed together. For the 2007 and subsequent model years, the total g/mi NMOG credits or debits earned for PCs and LDTs 0-3750 lbs. LVW and for LDTs 3751 lbs. LVW - 8500 lbs. GVW shall be summed together. The resulting amount shall constitute the g/mi NMOG credits or debits accrued by the manufacturer for the model year.

3.1.2 **Calculation of Vehicle Equivalent NMOG Credits for Medium-Duty Vehicles.** In 2001 and subsequent model years, a manufacturer that produces and delivers for sale in California MDVs in excess of the equivalent requirements for LEVs, ULEVs and/or SULEVs certified to the exhaust emission standards set forth in section E.1 of these test procedures or to the exhaust emission standards set forth in section 1956.8(h), title 13, CCR shall receive "Vehicle-Equivalent Credits" (or "VECs") calculated in accordance with the following equation, where the term "produced" means produced and delivered for sale in California:

> {[(No. of LEVs Produced excluding HEVs) +
> (No. of LEV HEVs x HEV VEC factor for LEVs)] +
> (1.20 x No. of LEVs certified to the 150,000 mile standards)} -
> (Equivalent No. of LEVs Required to be Produced)} +

{[(1.4) x (No. of ULEVs Produced excluding HEVs) +
(No. of ULEV HEVs x HEV VEC factor for ULEVs)] +
(1.50 x No. of ULEVs certified to the 150,000 mile standards)} -
[(1.4) x (Equivalent No. of ULEVs Required to be Produced)]} +

{[(1.7) x (No. of SULEVs Produced excluding HEVs) +
(No. of SULEV HEVs x HEV VEC factor for SULEVs)] +
(1.75 x No. of SULEVs certified to the 150,000 mile standards)} -
[(1.7) x [(Equivalent No. of SULEVs Required to be Produced)]} +
[(2.0) x (No. of ZEVs Certified and Produced as MDVs)].

MDVs certified prior to the 2004 model year to the LEV I LEV or ULEV standards for PCs and LDTs 0-3750 lbs. LVW set forth in section E.1 of these test procedures shall receive VECs calculated in accordance with the following equation, where the term "produced" means produced and delivered for sale in California:

[(1.6) x (No. of MDVs meeting the LEV I LEV standards for PCs and LDTs 0-3750 lbs. LVW excluding HEVs) + (No. of HEVs meeting the LEV I LEV standards for PCs and LDTs 0-3750 lbs. LVW x HEV VEC factor for MDVs meeting the LEV I LEV standards for PCs and LDTs 0-3750 lbs. LVW)]+
[(1.65 x No. of MDVs certified to the 150,000 mile LEV I LEV standards for PCs and LDTs 0-3750 lbs.)] +

[(1.8) x (No. of MDVs meeting the LEV I ULEV standards for PCs and LDTs 0-3750 lbs. LVW excluding HEVs) + (No. of HEVs meeting the LEV I ULEV standards for PCs and LDTs 0-3750 lbs. LVW x HEV VEC factor for MDVs meeting the LEV I ULEV standards for PCs and LDTs 0-3750 lbs. LVW)]+
[(1.85 x No. of MDVs certified to the 150,000 mile LEV I ULEV standards for PCs and LDTs 0-3750 lbs.)].

3.1.2.1 The MDV HEV VEC allowance is calculated as follows:

1 + [(LEV standard - ULEV standard) x (Zero-emission VMT Allowance) ÷ LEV standard] for LEVs;
1 + [(ULEV standard - SULEV standard) x (Zero-emission VMT Allowance) ÷ ULEV standard] for ULEVs;
1 + [(SULEV standard - ZEV standard) x (Zero-emission VMT Allowance) ÷ SULEV standard] for SULEVs;

where "Zero-emission VMT Allowance" for an HEV is determined in accordance with Section C.3 of the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes, as incorporated in section 1962, title 13, CCR."

The HEV VEC allowance for MDVs prior to model year 2004 meeting the LEV I LEV and ULEV standards for PCs and LDTs 0-3750 lbs. LVW is calculated as follows:

1 + [(MDV SULEV standard - PC LEV I LEV standard) x (Zero-emission VMT Allowance) ÷ PC LEV I LEV standard] for MDVs meeting the LEV I LEV standards for PCs and LDTs 0-3750 lbs. LVW;
1 + [(MDV SULEV standard - PC ULEV standard) x (Zero-emission VMT Allowance) ÷ PC LEV I ULEV standard] for MDVs meeting the ULEV I LEV standards for PCs and LDTs 0-3750 lbs. LVW.

3.1.2.2 A manufacturer that fails to produce and deliver for sale in California the equivalent quantity of MDVs certified to LEV, ULEV and/or SULEV exhaust emission standards, shall receive "Vehicle-Equivalent Debits" (or "VEDs") equal to the amount of negative VECs determined by the aforementioned equation.

3.1.2.3 Only ZEVs certified as MDVs and not used to meet the ZEV requirement shall be included in the calculation of VECs.

3.1.2.4 For a manufacturer that elects to certify engines to the optional medium-duty engine standards in title 13, CCR §1956.8(c) or (h), all such 2005 and subsequent model year engines used in MDVs, including those produced by a small volume manufacturer, shall be subject to the emissions averaging provisions applicable to heavy-duty diesel or Otto-cycle engines as set forth in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," or the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines, incorporated by reference in title 13, CCR, §1956.8(b) or (d), as applicable.

3.1.3 **Procedure for Offsetting NMOG Debits.**

3.1.3.1 A manufacturer shall equalize emission debits by earning g/mi NMOG emission credits or VECs in an amount equal to the g/mi NMOG debits or VEDs, or by submitting a commensurate amount of g/mi NMOG credits or VECs to the Executive Officer that were earned previously or acquired from another manufacturer. For 2001 through 2003 and for 2007 and subsequent model years, manufacturers shall equalize emission debits by the end of the following model year. For 2004 through 2006 model years, a manufacturer shall equalize NMOG debits for PCs and LDTs and LEV II MDVs within three model years and prior to the end of the 2007 model year. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code §43211 civil penalty applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. For the purposes of Health and Safety Code §43211, the number of passenger cars and light-duty trucks not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi NMOG emission debits for the model year by the g/mi NMOG fleet average requirement for PCs and LDTs 0-3750 lbs. LVW and LDTs 3751 lbs. LVW - 8500 lbs. GVW applicable for the model year in which the debits were first incurred and the number of medium-duty vehicles not meeting the state board's emission standards shall be equal to the amount of VEDs incurred.

3.1.3.2 The emission credits earned in any given model year shall retain full value through the subsequent model year. The value of any credits not used to equalize the previous model-year's debit shall be discounted by 50% at the beginning of second model year after being earned, shall be discounted to 25% of its original value if not used by the beginning of the third model year after being earned, and will have no value if not used by the beginning of the fourth model year after being earned.

3.2 Calculation of Greenhouse Gas Credits/Debits.

3.2.1 Calculation of Greenhouse Gas Credits for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.

3.2.1.1 In the 2000 through 2008 model years, a manufacturer that achieves fleet average Greenhouse Gas values lower than the fleet average Greenhouse Gas requirement applicable to the 2012 model year shall receive credits for each model year in units of g/mi Greenhouse Gas determined as:

[(Fleet Average Greenhouse Gas Requirement for the 2012 model year)
- (Manufacturer's Fleet Average Greenhouse Gas Value)]
x (Total No. of Vehicles Produced and Delivered for Sale
in California, Including ZEVs and HEVs).

3.2.1.2 In 2009 and subsequent model years, a manufacturer that achieves fleet average Greenhouse Gas values lower than the fleet average Greenhouse Gas requirement for the corresponding model year shall receive credits in units of g/mi Greenhouse Gas determined as:

[(Fleet Average Greenhouse Gas Requirement) - (Manufacturer's Fleet Average Greenhouse Gas Value)] x (Total No. of Vehicles Produced and Delivered for Sale in California, Including ZEVs and HEVs).

3.2.2 A manufacturer with 2009 and subsequent model year fleet average Greenhouse Gas values greater than the fleet average requirement for the corresponding model year shall receive debits in units of g/mi Greenhouse Gas equal to the amount of negative credits determined by the aforementioned equation. For the 2009 and subsequent model years, the total g/mi Greenhouse Gas credits or debits earned for PCs and LDT1s and for LDT2s and MDPVs shall be summed together. The resulting amount shall constitute the g/mi Greenhouse Gas credits or debits accrued by the manufacturer for the model year.

3.2.3 **Procedure for Offsetting Greenhouse Gas Debits.**

3.2.3.1. A manufacturer shall equalize Greenhouse Gas emission debits by earning g/mi Greenhouse Gas emission credits in an amount equal to the g/mi Greenhouse Gas debits, or by submitting a commensurate amount of g/mi Greenhouse Gas credits to the Executive Officer that were earned previously or acquired from another manufacturer. ~~For 2012 and for 2016 and subsequent model years, manufacturers shall equalize emission debits by the end of the following model year. For the 2009, 2010, and 2011 model years, a manufacturer shall equalize Greenhouse Gas debits for PCs, LDTs, and MDPVs within four model years and prior to the end of the 2013 model year. For the 2013, 2014, and 2015 model years, a~~ A manufacturer shall equalize Greenhouse Gas debits for PCs, LDTs, and MDPVs within ~~four~~ five model years after they are earned ~~and prior to the end of the 2017 model year~~. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. For the purposes of Health and Safety Code section 43211, the number of passenger cars and LDT1s not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year by the g/mi Greenhouse Gas fleet average requirement for PCs and LDTs 0-3750 lbs. LVW applicable for the model year in which the debits were first incurred and the number of LDT2s and MDPVs not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year by the g/mi Greenhouse Gas fleet average requirement for LDTs 3751 lbs. LVW – 8500 lbs. GVW and MDPVs applicable for the model year in which the debits were first occurred.

3.2.3.2 Greenhouse Gas emission credits earned in the 2000 through 2008 ~~2011~~ model years shall be treated as if they were earned in the 2011 model year and shall retain full value through the 2012 model year. Greenhouse Gas emission credits earned in the ~~2012 through 2015 model years shall be treated as if they were earned in the 2015 model year and shall retain full value through the 2016 model year. Greenhouse Gas emission credits earned in the 2016~~ 2009 and subsequent model years shall retain full value through the ~~subsequent~~ fifth model year after they are earned. The value of any credits earned in the 2000 through 2008 ~~2011~~ model years that not used to equalize debits accrued in the 2009 through 2012 model years shall be discounted by 50% at the beginning of the 2013 ~~2014~~ model year, shall be discounted to 25% of its original value if not used by the beginning of the 2014 ~~2015~~ model year, and will have no value if not used by the beginning of the 2015 ~~2016~~ model year. ~~The value of any credits earned in the 2012 through 2015 model years that not used to equalize debits accrued in the 2012 through 2016 model years shall be discounted by 50% at the beginning of the 2018 model year, shall be discounted to 25% of its original value if not used by the beginning of the 2019 model year, and will have no value if not used by the beginning of the 2020 model year.~~ Any credits earned in the 2009 ~~2016~~ and subsequent model years that are not used ~~to equalize the previous model year's debit~~ by the end of the fifth model year after they are accrued shall be discounted by 50% at the beginning of the sixth ~~second~~ model year after being earned, shall be discounted to 25% of its original value if not used by the beginning of the seventh ~~third~~ model year after being earned, and will have no value if not used by the beginning of the eighth ~~fourth~~ model year after being earned.

4. Intermediate In-Use Compliance Standards.

4.1 LEV I Intermediate In-Use Compliance Standards.

4.1.1 **LEV I ULEV Standards.** For 2001 and 2002 model year PCs and LDTs certified to the ULEV standards in Section E.1.1.1, including fuel-flexible, and dual-fuel vehicles when operating on an available fuel other than gasoline, the following intermediate in-use standards shall apply:

Vehicle Type	Durability Vehicle Basis (miles)	Intermediate In-Use Compliance Standards (g/mi)		
		NMOG	CO	NOx
PCs, 0-3750 lbs. LVW LDTs	50,000	0.055	2.1	0.3
	100,000	0.075	3.4	0.4
3751-5750 lb. LVW LDTs	50,000	0.070	2.8	0.5
	100,000	0.100	4.4	0.7

4.1.2 **LEV I Standards for MDVs.** The following intermediate in-use compliance standards for 50,000 miles and 120,000 miles for MDVs from 3751-14,000 lbs. ALVW certified to the LEV I standards in Section E.1.1.1, including fuel-flexible, bi-fuel and dual-fuel vehicles when operating on an available fuel other than gasoline, shall apply for the specified model years only. In-use compliance with standards beyond 50,000 miles shall be waived through the 2001 model year for SULEVs.

Intermediate In-Use Compliance Standards * (in grams per mile)										
Emission Category	Model Year	Durability Vehicle Basis (mi)	3751-5750 lbs.		5751 - 8500 lbs.		8501-10,000 lbs.		10,001-14,000 lbs.	
			NMOG	NOx	NMOG	NOx	NMOG	NOx	NMOG	NOx
ULEV	-2002	50,000	0.128	--	0.156	--	0.184	--	0.240	--
	-2002	120,000	0.160	--	0.195	--	0.230	--	0.300	--
SULEV	through 2002	50,000	0.072	0.3	0.084	0.45	0.100	0.5	0.130	0.7
	2002	120,000	0.100	0.4	0.117	0.6	0.138	0.65	0.180	1.0

* Dashes mean that the standards in Section E.1.1 apply.

4.1.3 **Intermediate In-Use Compliance Standards for Fuel-Flexible, Bi-Fuel and Dual-Fuel Medium-Duty LEV I SULEVs Operating on Gasoline.** For fuel-flexible, bi-fuel and dual-fuel 2001 model year MDV SULEVs operating on gasoline, the following intermediate in-use compliance standards for NMOG emissions at 50,000 miles, apply:

Fuel-Flexible, Bi-Fuel and Dual-Fuel MDVs Intermediate In-Use Compliance Standards		
Test Weight (lbs.)	Vehicle Emission Category	50,000 (g/mi)
3751-5750	SULEV	0.128
5751-8500	SULEV	0.156
8501-10,000	SULEV	0.184
10,001-14,000	SULEV	0.240

Compliance with the standards beyond 50,000 miles shall be waived for the 2001 model year for SULEVs.

4.2 Intermediate LEV II In-Use Compliance Standards.

For test groups certified prior to the 2007 model year, the following intermediate in-use compliance standards shall apply for the first two model years the test group is certified to the new standard. For SULEVs certified prior to the 2004 model year, the following intermediate in-use compliance SULEV standards shall apply through the 2006 model year.

Emission Category	Durability Vehicle Basis	LEV II PCs and LDTs		LEV II MDVs 8501 - 10,000 lbs. GVW
		NMOG	NOx	NOx
LEV/ULEV	50,000	n/a	0.07	n/a
	120,000	n/a	0.10	0.3
	150,000	n/a	0.10	0.3
LEV, Option 1	50,000	n/a	0.10	n/a
	120,000	n/a	0.14	n/a
	150,000	n/a	0.14	n/a
SULEV	120,000	0.020	0.03	0.15
	150,000	0.020	0.03	0.15

5. Reactivity Adjustment Factors.

A reactivity adjustment factor is the ratio of the specific reactivity of a low-emission vehicle designed to operate on a fuel other than conventional gasoline (including a fuel-flexible, bi-fuel or dual-fuel vehicle when operating on any fuel other than conventional gasoline) compared to the NMOG baseline specific reactivity of vehicles in the same vehicle emission category operating on conventional

gasoline. The procedure for determining compliance with the standard is set forth in Section H.1.1 of these test procedures.

5.1 The following specific reactivity values and generic reactivity adjustment factors have been established pursuant to the criteria established in Part II.D. of these test procedures. A manufacturer requesting to certify to existing standards utilizing an adjustment factor unique to its vehicle/fuel system must follow the data requirements described in Part II, Section D of these test procedures.

5.1.1 The following reactivity adjustment factors apply:

	Passenger Cars and Light-Duty Trucks			**Medium-Duty Vehicles**	
	TLEV	LEV	ULEV	LEV	ULEV
Fuel*	**Baseline Specific Reactivity** (grams ozone / gram NMOG)				
Conventional Gasoline	3.42	3.13	3.13	3.13	3.13
	Reactivity Adjustment Factors				
RFG (through the 2003 model year)	0.98	0.94	0.94	0.94	0.94
M85	0.41	0.41	0.41	0.41	0.41
Natural Gas	1.0	0.43	0.43	0.43	0.43
LPG	1.0	0.50	0.50	0.50	0.50
	Methane Reactivity Adjustment Factors				
Natural Gas	0.0043	0.0047	0.0047	0.0047	0.0047

* The fuel specifications are set forth in Part II. section A.100.3 (reformulated gasoline, M85, CNG and LPG) and Part I.D. (conventional gasoline specification) of these test procedures.

6. Severability. Each provision of these standards and test procedures is severable, and in the event that any provision of these standards and test procedures is held to be invalid, the remainder of the standards and test procedures remains in full force and effect.

F. Requirements and Procedures for Durability Demonstration

1. §86.1820 Durability group determination.

1.1 §86.1820-01 [No change.]

2. §86.1821 Evaporative/refueling emission family determination.

[Delete. (The provisions of this section are set forth in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, Heavy-Duty Vehicles and Motorcycles," and "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.")]

3. §86.1822 Durability data vehicle selection. [No change.]

4. §86.1823 Durability demonstration procedures for exhaust emissions.

4.1 §86.1823-01 October 6, 2000. [No change.]

4.2 **SFTP**. These procedures are not applicable to vehicles certified to the SFTP standards set forth in Section E.1.2.2.

4.3 **HEVs**. A manufacturer shall consider expected customer usage as well as emissions deterioration when developing its durability demonstration for HEVs.

5. §86.1824 Durability demonstration procedures for evaporative emissions.

[Delete. (The provisions of this section are set forth in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, Heavy-Duty Vehicles and Motorcycles.")]

6. §86.1825 Durability demonstration procedures for refueling emissions.

[Delete. (The provisions of this section are set forth in the "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.")]

7. §86.1826 Assigned Deterioration Factors for Small Volume Manufacturers and Small Volume Test Groups.

7.1 §86.1826-01. October 6, 2000. [No change.]

G. Procedures for Demonstration of Compliance with Emission Standards

1. §86.1827 Test Group Determination.

1.1 §86.1827-01. October 6, 2000. [No change.]

2. §86.1828 Emission data vehicle selection

2.1 §86.1828-01. [No change.]

2.2 **50°F Requirements.**

2.2.1 Vehicle Selection. A manufacturer shall select at least three emission data and/or engineering development vehicles each year from PC or LDT test groups and at least three emission data and/or engineering development vehicles from MDV test groups.

2.2.2 The same test group shall not be selected in the succeeding two years unless the manufacturer produces fewer than three test groups. If the manufacturer produces more than three TLEV, LEV, ULEV or SULEV test groups per model year, the Executive Officer may request 50°F testing of specific test groups. If the manufacturer provides a list of the TLEV, LEV, ULEV and SULEV test groups that it will certify for a model year and provides a description of the technologies used on each test group (including the information in Section G.2.1.2(1)), the Executive Officer shall select the test groups subject to 50°F testing within a 30 day period after receiving such a list and description. The Executive Officer may revise the test groups selected after the 30 day period if the information provided by the manufacturer does not accurately reflect the test groups actually certified by the manufacturer.

2.3 **Greenhouse Gas Vehicle Test Group.**

2.3.1 Within each test group, a manufacturer shall group vehicles into Greenhouse Gas Vehicle Test Groups based on the following criteria being identical.

(a) Vehicle make and model;
(b) Transmission class and driveline;
(c) Aspiration method (e.g., naturally aspirated, turbocharged);
(d) Camshaft configuration;
(e) Valvetrain configuration; and
(f) Inertia weight class.

2.3.2 Greenhouse Gas Emission Test Vehicle Selection. Within each test group, the vehicle configuration shall be selected from the greenhouse gas vehicle test group that is expected to be "worst-case" for greenhouse gas emissions, as calculated in Section E.2.5.2.1, subject to approval by the Executive Officer. A manufacturer may select additional vehicle configurations from greenhouse gas vehicle test groups with lower greenhouse emissions values than the "worst-case" configuration.

3. §86.1829 Durability data and emission data testing requirements; waivers.

3.1 §86.1829-01. July 12, 2001. Amend as follows:

3.1.1 Delete (b)(1)(ii) and replace with: For Otto-cycle vehicles or hybrid vehicles that use Otto-cycle engines, evidence shall be supplied showing that the air/fuel metering system or secondary air injection system is capable of providing sufficient oxygen to theoretically allow enough oxidation to attain the CO emission standards at barometric pressures equivalent to those expected at altitudes ranging from sea level to an elevation of 6000 feet. For fuel injected vehicles or hybrid electric vehicles that use fuel-injected engines, compliance may be demonstrated upon a showing by the manufacturer that the fuel injection system distributes fuel based on mass air flow, rather than volume flow, and is therefore self-compensating. All submitted test proposals will be evaluated on their acceptability by the Executive Officer. As an alternative to the demonstration described above, a manufacturer may demonstrate compliance by testing California vehicle configurations as part of its federal high altitude certification requirements. Engine families that meet all the applicable California low altitude emission standards when tested at the EPA test elevation are deemed to be in compliance. The SFTP standards do not apply to testing at high altitude.

3.1.2 (b)(1)(iii)(E) [No change, except that references to Tier 2 or interim non-Tier 2 vehicles shall mean California LEVs, ULEVs or SULEVs.]

3.1.3 Amend (b)(4)(i) as follows: All 2001 and subsequent model-year emission-data vehicles shall be required to be tail-pipe tested at 4,000 miles or at the mileage at which the vehicle is stabilized as determined in §86.1827-01 and demonstrate compliance with the California Inspection and Maintenance ("I/M") emission standards as specified in the "Mandatory Exhaust Emissions Inspection Standards and Test Procedures," title 16, California Code of Regulations, Section 3340.42. A manufacturer shall have the option of using the I/M test procedures in place at the time of certification or, if the I/M test procedures have been amended within two years of the time of certification, a manufacturer may use the preceding procedures. Test vehicles shall undergo preconditioning procedures prior to the tail-pipe test, which consist of idle conditions for a minimum period of ten minutes after the thermostat is open. Preconditioning and test procedures shall be conducted at an ambient temperature from 68^{o} to 86^{o} F. The manufacturer shall, in accordance with good engineering practices, attest that such test vehicles will meet the requirements of this section when preconditioned and tested at ambient temperatures from 35^{o} to 68^{o} F.

3.1.4 Amend (b)(4)(ii) as follows: In lieu of testing vehicles according to the provisions of §86.1829(b)(4)(i), a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such I/M testing as the manufacturer deems appropriate, all light-duty vehicles and light-duty trucks comply with the I/M emission standards.

3.1.5 Delete (b)(5). Idle CO Testing.

3.2 50^{o}F Requirements.

A manufacturer shall demonstrate compliance with the 50^{o}F requirement each year by testing at least three PC or LDT and three MDV emission data and/or engineering development vehicles (with at least 4000 miles) as determined under the provisions of Section G.2.2 of these test procedures. Only

TLEVs, LEVs, ULEVs and SULEVs are to be considered for testing at 50°F. It is not necessary to apply deterioration factors (DFs) to the 50°F test results to comply with this requirement.

3.3 Highway Fuel Economy Test.

The exhaust emissions shall be measured from all exhaust emission data vehicles tested in accordance with the federal Highway Fuel Economy Test (HWFET; 40 CFR Part 600, Subpart B). The oxides of nitrogen emissions measured during such tests shall be multiplied by the oxides of nitrogen deterioration factor computed in accordance with 40 CFR §86.1823, and then rounded and compared with the standard as set forth in Section E.1.1 preceding. All data obtained pursuant to this paragraph shall be reported in accordance with procedures applicable to other exhaust emissions data required pursuant to these procedures. In the event that one or more of the manufacturer's emission data vehicles fail the HWFET standard listed in Section E of these test procedures, the manufacturer may submit to the Executive Officer engineering data or other evidence showing that the system is capable of complying with the standard. If the Executive Officer finds, on the basis of an engineering evaluation, that the system can comply with the HWFET standard, he or she may accept the information supplied by the manufacturer in lieu of vehicle test data.

3.4 Greenhouse Gas Testing Requirements.

A manufacturer shall demonstrate compliance with the greenhouse requirements each year by testing one vehicle per each test group that represents the vehicle configuration that is expected to be "worst-case" for greenhouse gas emissions, as calculated in Section E.2.5.2.1, subject to approval by the Executive Officer. A manufacturer may test additional vehicles within the test group that represent vehicle configuration with lower greenhouse gas emissions values than the "worst-case" configuration. All vehicles shall be tested using both the FTP and Highway Test Procedures as modified in Part II of these test procedures.

4. §86.1830-01 Acceptance of Vehicles for Testing [No change.]

5. §86.1831-01 Mileage accumulation requirements for test vehicles. [No change.]

6. §86.1832-01 Optional equipment and air conditioning. [No change.]

7. §86.1833-01 Adjustable parameters. [No change.]

8. §86.1834 Allowable maintenance.

8.1 §86.1834-01. October 6, 2000. [No change except that the first allowable maintenance interval under subparagraphs (b)(3)(v) and (b)(4)(ii) shall be at the full useful life of the vehicle.]

8.2 HEVs.

(a) The manufacturer shall equip the vehicle with a maintenance indicator consisting of a light that shall activate automatically by illuminating the first time the minimum performance level is observed for all battery system components. Possible battery system components requiring monitoring

are: (i) battery water level; (ii) temperature control; (iii) pressure control; and (iv) other parameters critical for determining battery condition.

(b) The manufacturer shall equip "off-vehicle charge capable HEVs" with a useful life indicator for the battery system consisting of a light that shall illuminate the first time the battery system is unable to achieve an all-electric operating range (starting from a full state-of-charge) which is at least 75% of the range determined for the vehicle in the Urban Driving Schedule portion of the All-Electric Range Test (see the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR).

9. §86.1835-01 Confirmatory certification testing. July 12, 2001. [No change.]

10. §86.1836-01 Manufacturer-supplied production vehicles for testing. [Delete.]

11. §86.1837 Rounding of emission measurements.

11.1 §86.1837-01 February 10, 2000. [No change.]

11.2 Fleet average NMOG value calculations shall be rounded, in accordance with ASTM E29-67, to four significant figures before comparing with fleet average NMOG requirements.

12. §86.1838 Small volume manufacturers certification procedures.

12.1 §86.1838-01. ~~February 10, 2000~~ December 6, 2002. [No change, except that the reference to 15,000 units shall mean 4,500 units in California and the reference to 14,999 units shall mean 4,499 units in California.]

13. §86.1839-01 Carryover of certification data. [No change.]

13.1 Greenhouse Gas Requirements.

The provisions of Section E.13 shall apply to greenhouse gas certification data only if the following conditions are met.

(a) To carry over greenhouse gas certification data for a greenhouse gas vehicle group, a manufacturer must demonstrate to the Executive Officer, using good engineering judgement, that design changes to the vehicle from the previous model year do not increase greenhouse gas emissions or

(b) To carry over greenhouse gas certification data for a "worst-case" vehicle configuration, a manufacturer must demonstrate to the Executive Officer, using good engineering judgement, that the previous model-year "worst-case" vehicle configuration still represents the "worst-case" vehicle configuration for the current model-year.

14. §86.1840 Special test procedures.

14.1 §86.1840-01 October 6, 2000. [No change.]

H. Certification, Information and Reporting Requirements.

1. §86.1841 Compliance with emission standards for the purpose of certification

1.1 §86.1841-01. July 12, 2001.

1.1.1 Subparagraph (a) through (d) [No Change.]

1.1.2 Delete subparagraph (e) and replace with: **Reactivity Adjustment Factors.** The NMOG emission results from all TLEVs, LEVs, ULEVs and SULEVs certifying on a fuel other than conventional gasoline, shall be numerically adjusted to establish an NMOG exhaust mass emission value equivalent. A manufacturer shall multiply the NMOG exhaust emission result for each emission-data vehicle by the appropriate reactivity adjustment factor listed in Section E.5. of these test procedures or established by a manufacturer pursuant to Part II, Section D of these test procedures. This product shall be multiplied by, or added to in the case of additive DFs, the applicable deterioration factor to determine compliance with the standard. Reactivity adjustment factors may not be applied to determine compliance with applicable exhaust emission standards for gasoline vehicles certified pursuant to Section D.1.(p) of these test procedures.

1.1.3 For vehicles operating on natural gas, the product of the methane mass emission value and the methane reactivity adjustment factor shall be add to the result of subparagraph 1.1.2. This result shall be compared to the NMOG exhaust emission standards to determine compliance with the standards.

1.2 **Scope of Certification**. Certification, if granted, is effective only for the vehicle/test group described in the original manufacturer's certification application. Modifications by a secondary manufacturer to vehicles/engines shall be deemed not to increase emissions above the standards under which those vehicles/engines were certified and to be within the original certification if such modifications do not: (1) increase vehicle weight more than 10 percent above the curb weight, increase frontal area more than 10 percent, or result in a combination increase of weight plus frontal area of more than 14 percent; or (2) include changes in axle ratio, tire size, or tire type resulting in changes in the drive train ratio of more than 5 percent; or (3) include any modification to the emission control system. No originally certified vehicle/engine which is modified by a secondary manufacturer in a manner described in items (1) through (3) of the preceding sentence may be sold to an ultimate purchaser, offered or delivered for sale to an ultimate purchaser, or registered in California unless the modified vehicle/engine is certified by the state board in accordance with applicable test procedures to meet emission standards for the model year for which the vehicle/engine was originally certified. For the purposes of this subsection, "secondary manufacturer" means any person, other than the original manufacturer, who modifies a new motor vehicle prior to sale to the ultimate purchaser.

1.3 **SFTP.** For vehicles certified to the SFTP standards in Section E.1.2.2, full and intermediate useful life shall mean 4,000 miles.

1.4 **Certification of a Federal Vehicle in California.** Whenever a manufacturer federally-certifies a 2004 or subsequent model-year passenger car, light-duty truck or medium-duty vehicle model to the standards for a particular emissions bin that are more stringent than the standards for an applicable California vehicle emissions category, the equivalent California model may only be certified to (i) the California standards for a vehicle emissions category that are at least as stringent as

the standards for the corresponding federal emissions bin, or (ii) the exhaust emission standards to which the federal model is certified. However, where the federal exhaust emission standards for the particular emissions bin and the California standards for a vehicle emissions category are equally stringent, the California model may only be certified to either the California standards for that vehicle emissions category or more stringent California standards. The federal emission bins are those contained Tables S04-1 and S04-2 of 40 CFR section 86.1811-04(c) as adopted February 10, 2000. A California vehicle model is to be treated as equivalent to a federal vehicle model if all of the following characteristics are identical:

(a) Vehicle make and model;
(b) Cylinder block configuration (e.g., L-6, V-8);
(c) Displacement;
(d) Combustion cycle;
(e) Transmission class;
(f) Aspiration method (e.g., naturally aspirated, turbocharged); and
(g) Fuel (e.g., gasoline, natural gas, methanol).

The comparative stringency of the standards for the federal exhaust emissions bin and for the California vehicle emissions category shall be based on a comparison of the sum of the 100,000, 120,000, or 150,000 mile standards for NMOG and NOx.

1.4.1 If a federally-certified vehicle model is certified in California in accordance with subparagraph 1.4, the model shall be subject to the federal requirements for exhaust emissions, SFTP emissions, cold CO emissions and highway NOx. The vehicle model shall be subject to all other California requirements including evaporative emissions, OBD II, greenhouse gas emissions, and emissions warranty, except that a 2004 or earlier model-year vehicle in the federal heavy light-duty truck or medium-duty passenger vehicle classes may at the manufacturer's option be subject to the federal requirements for evaporative emissions and OBD II.

1.4.2 Prior to certification of a 2004 or subsequent model-year vehicle, a manufacturer must submit information sufficient to enable the Executive Officer to determine whether there is a federally-certified vehicle model for that model year that is equivalent to the California vehicle model based on the criteria listed in subparagraph 1.4.

1.4.3 If the Executive Officer determines that there is a federally-certified vehicle model for that model year that is equivalent to the California vehicle model, the following information shall be submitted with the Part I or Part II Application for Certification as set forth below:

(a) Part I Application for Certification: (i) Evidence of federal certification including, but not limited to, federal certification exhaust emission levels and compliance with federal SFTP, cold CO and highway NOx emission levels; and (ii) evidence of compliance with California evaporative emission requirements, ~~and~~ California OBD II requirements, and California greenhouse gas requirements or, where permitted under Section 1.4.1 for a 2004 or earlier model-year vehicle, evidence of federal certification evaporative emission levels and compliance with federal OBD II requirements.

(b) Part II Application for Certification: evidence of a warranty on emission-related parts in accordance with sections 2035 et seq., title 13 CCR as they apply to vehicles certified under the primary California standard.

1.4.4 For purposes of meeting the California NMOG fleet average phase-in requirements or for determining vehicle equivalent credits, the applicable California NMOG value for passenger cars and light-duty trucks or vehicle equivalent credits for medium-duty vehicles shall be determined as follows:

(a) The sum of the federal full useful life (100,000, 120,000 or 150,000) NMOG and NOx value shall be compared with the next less stringent California full useful life NMOG plus NOx value to determine which emission category (e.g., LEV, ULEV or SULEV) is to be used for the fleet average value or vehicle equivalent credit calculation.

(b) For passenger cars and light-duty trucks, once the equivalent California emission category is determined (e.g., whether the vehicle is considered a LEV, ULEV or SULEV), the applicable NMOG value to be used in the fleet average calculation is set forth in the table in section E.2.1.2 of these test procedures for passenger cars and light-duty trucks. For example, if the full useful life (120,000 miles) NMOG plus NOx standard to which the federal vehicle is certified is 0.110 grams per mile, that vehicle would be considered a LEV II ULEV for fleet average purposes because the combined LEV full useful life NMOG plus NOx value is 0.125 and is the next less stringent emission category. The applicable emission standard to be used in the fleet average calculation would therefore be 0.040 grams per mile.

1.4.5 The vehicle shall be subject to the federal in-use requirements and the emission standard applicable for in-use compliance purposes shall be the federal standard to which the vehicle was federally-certified.

1.4.6 The tune up label shall meet the federal requirements applicable to such a vehicle with an additional sentence which reads: "This vehicle conforms to federal regulations and is certified for sale in California." The value used in the smog index label shall be the California emission category to which the vehicle was deemed certified for fleet average NMOG purposes.

1.4.7 The requirements in Section H.1.4 do not apply in the case of a federally-certified vehicle model that is only marketed to fleet operators for applications that are subject to clean fuel fleet requirements established pursuant to section 246 of the federal Clean Air Act (42 U.S.C. sec. 7586). In addition, the Executive Officer shall exclude from the requirements a federally-certified vehicle model where the manufacturer demonstrates to the Executive Officer's reasonable satisfaction that the model will primarily be sold or leased to clean fuel fleet operators for such applications, and that other sales or leases of the model will be incidental to marketing to those clean fuel fleet operators.

1.4.8 A manufacturer may certify a passenger car, light-duty truck or medium-duty vehicle to federal exhaust emission standards pursuant to Section H.1.4 prior to the 2004 model year.

2. §86.1842 Addition of a vehicle after certification; and changes to a vehicle covered by certification.

2.1 §86.1842-01. Amend as follows: Add the following sentence: Changes proposed by a manufacturer in accordance with this section shall be deemed "approved" after 30 days unless the Executive Officer has requested additional information from the manufacturer or has denied the proposed changes.

3. §86.1843 General information requirements

3.1 §86.1843-01 [No change.]

3.2 **Alternative Fuel Information.**

For TLEVs, LEVs, ULEVs, and SULEVs not certified exclusively on gasoline or diesel, the manufacturer shall submit projected California sales and fuel economy data nineteen months prior to January 1 of the model year for which the vehicles are certified.

3.3 **Credit Reporting.**

In order to verify the status of a manufacturer's compliance with the fleet average, ~~or~~ phase-in requirements, or greenhouse gas requirements for a given model year, and in order to confirm the accrual of credits or debits, each manufacturer shall submit an annual report to the Executive Officer which sets forth the production data used to establish compliance, by no later than March 1 of the calendar year following the close of the model year.

3.4 **SFTP.**

Prior to 2003 model year, a manufacturer that introduces MDVs certified to the SFTP requirements set forth in E1.2.2 must submit the implementation information required for vehicles produced in subsequent model years.

4. §86.1844 Information Requirements: Application for Certification and Submittal of Information Upon Request.

4.1 §86.1844-01. October 6, 2000. Amend as follows:

4.1.1 All references to "test group" shall mean "test group and greenhouse gas vehicle group."

4.1.2 Modify §86.1844-01(d) as follows:

(a) Delete §86.1844-01(d)(9).

(b) Add the following requirement: A description of each greenhouse gas test vehicle including the criteria listed in Section G.2.3. and any additional information used by a manufacturer to demonstrate a "worst-case" vehicle configuration used to comply with the requirements of Section G.2.3.

4.1.3~~2~~ Add the following requirements to §86.1844-01(e):

(a) The information required in sections 2037, 2038 and 2039, title 13, CCR.

(b) The NMOG/NMHC and/or formaldehyde to NMHC ratios established according to Section I.1.4 of these test procedures

4.2 **OBD Requirements.**

For 2001 and subsequent model-year passenger cars, light-duty trucks and medium-duty vehicles, information shall be submitted in the application for certification according to the requirements of section 1968, et seq., title 13, CCR, as applicable.

4.3 **HEVs.**

For HEVs, the information required in the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as incorporated by reference in section 1962, title 13, CCR, must be supplied with the Part I application for certification.

4.4 **Fuel-Fired Heaters.**

For vehicles that use fuel-fired heaters, the manufacturer shall provide with the Part I application for certification:

(a) a description of the control system logic of the fuel-fired heater, including an evaluation of the conditions under which the fuel-fired heater can be operated and an evaluation of the possible operational modes and conditions under which evaporative emissions can exist;

(b) the exhaust emissions value per mile produced by the auxiliary fuel-fired heater operated between 68°F and 86°F; and

(c) the test plan which describes the procedure used to determine the mass emissions of the fuel-fired heater.

I. In-Use Compliance Requirements and Procedures

1. §86.1845 Manufacturer in-use verification testing requirements.

1.1 §86.1845-01. October 6, 2000. Amend as follows:

1.1.1 **Table S01-5 California Small Volume Manufacturers and Small Volume Test Groups**

California only test group annual sales[(1)]	1-1,500	1,501-4,500
High Mileage	voluntary	2

[(1)] Total annual production of groups eligible for testing under small volume sampling plan is capped at a maximum of 4,500 California-only production volume per model year, per large volume manufacturer. All other remaining large volume manufacturers small volume test groups shall meet the requirements in Table S01-06 below.

1.1.2 **Table S01-6 - California Large Volume Manufacturers**

California only test group - annual sales	4,500-15,000	15,001-25,000	>25,000
High Mileage	4	5	6

1.1.3 **High Mileage Testing.** Amend subparagraph (c)(2) of 40 CFR §86.1845-01 to read: All test vehicles must have a minimum odometer mileage of 50,000 miles. At least one vehicle of each test group certified to the emission standards in Section E.1.1.1 must have a minimum age and odometer mileage of 75,000 for light-duty vehicles and 90,000 miles for medium-duty vehicles. At least one vehicle of each test group certified to the 120,000-mile and 150,000-mile emission standards in Section E.1.1.2 must have a minimum age and odometer mileage of 90,000 miles and 112,500 miles, respectively. See §86.1838-01(c)(2) for small volume manufacturer mileage requirements.

1.1.4 **High Altitude Testing.** Amend subparagraph (c)(5)(i) of 40 CFR §86.1845-01 to read: Each test vehicle shall be tested in accordance with the Federal Test Procedure and the US06 portion of the Supplemental Federal Test Procedure (if applicable) as described in subpart B of this part, when such test vehicle is tested for compliance with the applicable exhaust emission standards under this subpart. High altitude testing shall not apply.

1.2 §86.1845-04. July 12, 2001. Amend as follows:

1.2.1 **Table S04-5 California Small Volume Manufacturers and Small Volume Test Groups**

California only test group annual sales[(1)]	1-1,500	1,501-4,500
Low Mileage	Voluntary	0
High Mileage	Voluntary	2

[(1)] Total annual production of groups eligible for testing under small volume sampling plan is capped at a maximum of 4,500 California-only production volume per model year, per large volume manufacturer. All other remaining large volume manufacturers small volume test groups shall meet the requirements in Table S04-06 below.

1.2.2 **Table S04-6 - California Large Volume Manufacturers**

California only test groups - annual sales	4,500-15,000	15,001-25,000	>25,000
Low Mileage	2	3	4
High Mileage	4	5	6

1.2.3 **High Mileage Testing.** Amend subparagraph (c)(2) of 40 CFR §86.1845-04 to read as follows: All test vehicles must have a minimum odometer mileage of 50,000 miles. At least one vehicle of each test group certified to the emission standards in Part I, Section E.1.1.1 of these procedures must have a minimum age and odometer mileage of 75,000 for light-duty vehicles and 90,000 miles for medium-duty vehicles. At least one vehicle of each test group certified to the emission standards in Part I, Section E.1.1.2 of these test procedures must have a minimum age and odometer mileage of 90,000 miles. See §86.1838-01(c)(2) for small volume manufacturer mileage requirements.

1.3 **SFTP.**

The manufacturer in-use verification testing requirements shall not apply to vehicles certified to the SFTP standards set forth in Section E.1.2.2 of these test procedures.

1.4 **Test Ratios.**

(a) As an alternative to measuring the NMOG content, the Executive Officer may approve, upon submission of supporting data by a manufacturer, the use of NMOG to NMHC ratios. To request the use of NMOG to NMHC ratios, a manufacturer shall establish during certification testing the ratio of measured NMOG exhaust emissions to measured NMHC exhaust emissions for each emission data vehicle for the applicable test group. The results shall

be submitted to the Executive Officer in the Part II application for certification. A manufacturer may conduct in-use testing on the test group by measuring NMHC exhaust emissions rather than NMOG exhaust emissions. After approval by the Executive Officer, the measured NMHC exhaust emissions shall be multiplied by the NMOG to NMHC ratio submitted in the application for certification for the test group to determine the equivalent NMOG exhaust emission values for the test vehicle. The equivalent NMOG exhaust emission value shall be used in place of the measured NMOG exhaust emission value in determining the reactivity adjusted exhaust NMOG results. The equivalent reactivity adjusted NMOG exhaust emission values shall be compared to the NMOG exhaust emission standard applicable to the vehicle emission category (TLEV, LEV, ULEV or SULEV) in which the test group was certified.

(b) For fuel-flexible vehicles certified to NMOG standards, the manufacturer may request from the Executive Officer the use of a methanol (M85) or ethanol (E85) NMOG exhaust emission to gasoline NMHC exhaust emission ratio which shall be established during certification testing for each emission data vehicle for the applicable test group. The results shall be submitted to the Executive Officer in the Part II application for certification. After approval by the Executive Officer, the measured gasoline NMHC exhaust emissions shall be multiplied by the M85 or E85 NMOG to gasoline NMHC ratio submitted in the application for certification for the test group to determine the equivalent NMOG exhaust emission values for the test vehicle. The equivalent NMOG exhaust emission value shall be used in place of the measured NMOG exhaust emission value in determining the reactivity adjusted exhaust NMOG results. The equivalent reactivity adjusted NMOG exhaust emission values shall be compared to the NMOG exhaust emission standard applicable to the vehicle emission category (TLEV, LEV, ULEV, or SULEV) in which the test group was certified.

(c) As an alternative to measuring the HCHO content, the Executive Officer may approve, upon submission of supporting data by a manufacturer, the use of HCHO to NMHC ratios. To request the use of HCHO to NMHC ratios, the manufacturer shall establish during certification testing the ratio of measured HCHO exhaust emissions to measured NMHC exhaust emissions for each emission data vehicle for the applicable test group. The results shall be submitted to the Executive Officer in the Part II application for certification. Following approval of the application for certification, the manufacturer may conduct in-use testing on the test group by measuring NMHC exhaust emissions rather than HCHO exhaust emissions. The measured NMHC exhaust emissions shall be multiplied by the HCHO to NMHC ratio submitted in the application for certification for the test group to determine the equivalent HCHO exhaust emission values for the test vehicle. The equivalent HCHO exhaust emission values shall be compared to the HCHO exhaust emission standard applicable to the test group.

1.5 **Greenhouse Gas Requirements.**

The manufacturer in-use verification testing requirements shall not apply to the greenhouse gas emission requirements set forth in Section E.2.5 of these test procedures.

2. §86.1846 Manufacturer in-use confirmatory testing requirements.

2.1 §86.1846-01 July 12, 2001. [No Change.]

2.2 If a gasoline vehicle test group that is certified according to the provisions of Section D.1 (p) fails in-use verification testing, as set forth in Section I, NMOG and formaldehyde exhaust emissions must be measured for that test group in accordance with Section D.1.1 for the purpose of in-use confirmatory testing.

2.3 **SFTP**.

The manufacturer in-use compliance testing requirements shall not apply to vehicles certified to the SFTP standards set forth in Section E.1.2.2 of these test procedures.

2.4 **Greenhouse Gas Requirements.**

The manufacturer in-use compliance testing requirements shall not apply to the greenhouse gas emission requirements set forth in Section E.2.5 of these test procedures.

3. §86.1847 Manufacturer in-use verification and in-use confirmatory testing; submittal of information and maintenance of records. .

3.1 §86.1847-01 Amend as follows:

3.1.1 Amend subparagraph (a)(3) of 40 CFR §86.1847-01 to add: Procurement documentation. A description of the procurement area, a record of the source(s) of any list(s) of vehicles used as a basis for procurement, and a complete record of the number of vehicles rejected after positive vehicle owner response, reason(s) for manufacturer rejection of each rejected vehicles and the method used for random selection of positive owner response vehicles. A complete record of the number of vehicle owners/lessees in which attempt to contact was made and the number of vehicle owners/lessees actually contacted, the number of owners/lessees not contacted and the reasons and number of each for failure to contact, and the number of owners contacted who declined to participate.

3.1.2 Amend subparagraph (b)(1) of 40 CFR §86.1847-01 to read: A complete printout of each and every emission test performed, including, but not limited to, all test results, the date of each test, the full useful life emission standards to which the test group is certified, and the phase mass values for fuel economy, carbon dioxide and each pollutant measured by the Federal Test Procedure and Supplemental Test Procedure as prescribed by subpart B of this part.

3.1.3 Amend subparagraph (f)(1) of 40 CFR §86.1847-01 to read: A complete printout of each and every emission test performed, including, but not limited to, all test results, the date of each test, the full useful life emission standards to which the test group is certified, and the phase mass values for fuel economy, carbon dioxide and each pollutant measured by the Federal Test Procedure and Supplemental Test Procedure as prescribed by subpart B of this part.

Appendices I, II, and III to §86.1845-01 [No change.]

J. Procedural Requirements

1. §86.1848-01 Certification. October 6, 2000. [No change.]
2. §86.1849-01 Right of entry. [No change.]
3. §86.1850-01 Denial, Suspension or Revocation of Certificate of Conformity. [No change.]
4. §86.1851 Application of good engineering judgment to manufacturers' decisions. [No change.]
5. §86.1852 Waivers for good in-use emission performance. [No change.]
6. §86.1853 Certification hearings. [No change.]
7. §§86.1854 - 86.1859. [Reserved]
8. §86.1860-04 How to comply with the Tier 2 and interim Tier 2 fleet average NOx standards. [n/a]
9. §86.1861-04 How do the Tier 2 and interim Tier 2 NOx averaging, banking and trading programs work? [n/a]
10. §86.1862-04 Maintenance of records and submittal of information relevant to compliance with fleet average NOx standards. [n/a]
11. §86.1863-07 Optional Chassis Certification for Diesel Vehicles. January 18, 2001. [No change]

PART II: CALIFORNIA EXHAUST AND PARTICULATE EMISSION TEST PROCEDURES FOR PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES

This part describes the equipment required and the procedures necessary to perform gaseous and particulate exhaust emission tests (40 CFR Part 86, Subpart B); cold temperature test procedures (40 CFR Part 86, Subpart C); the California 50°F test procedure; the development of reactivity adjustment factors; and the supplemental federal test procedure (40 CFR Part 86, Subpart B) on passenger cars, light-duty trucks and medium-duty vehicles.

A. 40 CFR Part 86, Subpart B - Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles and New Light-Duty Trucks; Test Procedures.

100.1 General applicability.

86.101 General applicability. October 6, 2000.
86.102 Definitions. March 5, 1980.
86.103 Abbreviations. March 5, 1980.
86.104 Section numbering, construction. September 21, 1994.
86.105 Introduction; structure of subpart. September 21, 1994.

100.2 Equipment and Facility Requirements.

86.106-00 Equipment required; overview. October 22, 1996.
86.107-98 Sampling and analytical system, evaporative emissions. August 23, 1995.
86.108-00 Dynamometer. October 22, 1996.
86.109-94 Exhaust gas sampling system; Otto-cycle vehicles not requiring particulate emission measurements. June 30, 1995.
86.110-94 Exhaust gas sampling system; diesel-cycle vehicles, and Otto-cycle vehicles requiring particulate emissions measurements. June 30, 1995.
86.111-94 Exhaust gas analytical-system. September 30, 1994.
86.112-91 Weighing chamber (or room) and microgram balance specifications. June 5, 1991.

100.3 Certification Fuel Specifications.

86.113-94 Fuel Specifications. February 18, 2000.
86.113-04 Fuel Specifications. February 10, 2000.
86.113-07 Fuel Specifications. January 18, 2001.

100.3.1 California Certification Gasoline Specification.

Add the following subparagraph which reads: Gasoline having the specifications listed below may be used in exhaust and evaporative emission testing as an option to the specifications referred to in §86.113-94(a)(1) and in §86.113-04(a)(1). If a manufacturer elects to utilize this option, both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline

having the specifications listed below, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below.

California Certification Gasoline Specifications		
Fuel Property[a]	**Limit**	**Test Method [b]**
Octane (R+M)/2	91 (min)	D 2699-88, D 2700-88
Sensitivity	7.5 (min)	D 2699-88, D 2700-88
Lead	0-0.01g/gal (max); no lead added	§2253.4(c), title 13 CCR
Distillation Range:		§2263, title 13 CCR[c]
10% point	130-150 ^{o}F	
50% point [d]	200-210 ^{o}F	
90% point [e]	290-300 ^{o}F	
EP, maximum	390 ^{o}F	
Residue	2.0 vol. % (max)	
Sulfur	30-40 ppm by wt.	§2263, title 13 CCR
Phosphorous	0.005 g/gal (max)	§2253.4(c), title 13 CCR
RVP	6.7-7.0 psi	§2263, title 13 CCR
Olefins	4.0-6.0 vol. %	§2263, title 13 CCR
Total Aromatic Hydrocarbons	22-25 vol. %	§2263, title 13 CCR
Benzene	0.8-1.0 vol. %[f]	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	12-14 vol. %[g]	
MTBE	10.8-11.2 vol. %	§2263, title 13 CCR
Additives	Sufficient to meet requirements of §2257, title 13 CCR	
Copper Corrosion	No. 1	D 130-88
Gum, washed	3.0 mg/100 mL (max)	D 381-86
Oxidation Stability	1000 minutes (min)	D 525-88
Specific Gravity	Report [h]	
Heat of Combustion	Report [h]	
Carbon	Report wt. % [h]	
Hydrogen	Report wt. % [h]	

[a] The gasoline must be blended from typical refinery feedstocks.

[b] ASTM specification unless otherwise noted. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results with the specified method.

[c] Although §2263, title 13, CCR refers to the temperatures of the 50 and 90 percent points, this procedure can be extended to the 10 percent and end point temperatures, and to the determination of the residue content.

[d] The range for interlaboratory testing is 195-215° F.

[e] The range for interlaboratory testing is 285-305° F.

[f] The range for interlaboratory testing is 0.7-1.1 percent by volume.

[g] "Detailed Hydrocarbon Analysis of Petroleum Hydrocarbon Distillates, Reformates, and Gasoline by Single Column High Efficiency (Capillary) Column Gas Chromatography," by Neil Johansen, 1992, Boulder, CO.

[h] The fuel producer should report this fuel property to the fuel purchaser. Any generally accepted test method may be used and shall be identified in the report.

100.3.2 Certification Diesel Fuel Specifications.

100.3.2.1 Certification Diesel Fuel Specifications for the 2001-2006 Model Years.

Amend subparagraphs §86.113-94(b)(2) and (b)(3):

(b)(2) Except as noted below, petroleum fuel for diesel vehicles meeting the specifications referenced in 40 CFR §86.113-94(b)(2), or substantially equivalent specifications approved by the Executive Officer, shall be used in exhaust emission testing. The grade of petroleum fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel, shall be used. The petroleum fuel used in exhaust emission testing may meet the specifications listed below, or substantially equivalent specifications approved by the Executive Officer, as an option to the specifications in 40 CFR §86.113-94(b)(2). Where a manufacturer elects pursuant to this subparagraph to conduct exhaust emission testing using the specifications of 86.113-94(b)(2), or the specifications listed below, the Executive Officer shall conduct exhaust emission testing with the diesel fuel meeting the specifications elected by the manufacturer.

California Certification Diesel Fuel Specifications For the 2001-2006 Model Years		
Fuel Property	**Limit**	**Test Method [(a)]**
Natural Cetane Number	47-55	D 613-86
Distillation Range		§2282(g)(3), title 13, CCR
IBP	340-420 ^{o}F	
10% point	400-490 ^{o}F	
50% point	470-560 ^{o}F	
90% point	550-610 ^{o}F	
EP	580-660 ^{o}F	
API Gravity	33-39^{o}	D 287-82
Total Sulfur	0.01-0.05 wt. %	§2282(g)(3), title 13, CCR
Nitrogen Content	100-500 ppmw	§2282(g)(3), title 13, CCR
Total Aromatic Hydrocarbons	8-12 vol. %	§2282(g)(3), title 13, CCR
Polycyclic Aromatic Hydrocarbons	1.4 wt. % (max)	§2282(g)(3), title 13, CCR
Flashpoint	130 ^{o}F (max)	D 93-80
Viscosity @ 40^{o}F	2.0-4.1 centistokes	D 445-83

[(a)] ASTM specifications unless otherwise noted. A reference to a subsection of §2282, title 13, CCR, means the test method identified in that subsection for the particular property. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results of the specified method.

(b)(3) Diesel fuel representative of commercial diesel fuel which will be generally available through retail outlets shall be used in service accumulation.

100.3.2.2 Certification Diesel Fuel Specifications for the 2007 and Subsequent Model Years.

Amend subparagraphs §86.113-07(b)(2) and (b)(3) as follows:

(b)(2) Except as noted below, petroleum fuel for diesel vehicles meeting the specifications referenced in 40 CFR §86.113-07(b)(2), or substantially equivalent specifications approved by the Executive Officer, shall be used in exhaust emission testing. The grade of petroleum fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel, shall be used. The petroleum fuel used in exhaust emission testing may meet the specifications listed below, or substantially equivalent specifications approved by the Executive Officer, as an option to the specifications in 40 CFR §86.113-07(b)(2). Where a manufacturer elects pursuant to this subparagraph to conduct exhaust emission testing using the specifications of 86.113-94(b)(2) and in §86.113-07(b)(2), or the specifications listed below, the Executive Officer shall conduct exhaust emission testing with the diesel fuel meeting the specifications elected by the manufacturer.

California Certification Diesel Fuel Specifications For the 2007 and Subsequent Model Years		
Fuel Property	**Limit**	**Test Method [(a)]**
Natural Cetane Number	47-55	D 613-86
Distillation Range		§2282(g)(3), title 13, CCR
IBP	340-420 ^{o}F	
10% point	400-490 ^{o}F	
50% point	470-560 ^{o}F	
90% point	550-610 ^{o}F	
EP	580-660 ^{o}F	
API Gravity	33-39^{o}	D 287-82
Total Sulfur	7-15 ppm	§2282(g)(3), title 13, CCR
Nitrogen Content	100-500 ppmw	§2282(g)(3), title 13, CCR
Total Aromatic Hydrocarbons	8-12 vol. %	§2282(g)(3), title 13, CCR
Polycyclic Aromatic Hydrocarbons	1.4 wt. % (max)	§2282(g)(3), title 13, CCR
Flashpoint	130 ^{o}F (max)	D 93-80
Viscosity @ 40^{o}F	2.0-4.1 centistokes	D 445-83

[(a)] ASTM specifications unless otherwise noted. A reference to a subsection of §2282, title 13, CCR, means the test method identified in that subsection for the particular property. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results of the specified method.

(b)(3) Diesel fuel representative of commercial diesel fuel which will be generally available through retail outlets shall be used in service accumulation.

100.3.3 Alcohol Fuels.

Amend §86.113-94(c) as follows:

1. Delete subparagraphs (c)(1) and (c)(2); replace with:

(c)(1) **Emission test fuel.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust and evaporative emission testing shall meet the specifications set forth in section 2292.1, title

13, CCR, (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol) as modified by the following:

Specification	Limit
M-100 Fuel Methanol	
Methanol	98.0 ± 0.5 vol. percent
Ethanol	1.0 vol. percent max.
Petroleum fuel meeting the specifications of section 100.3.1	1.0 ± 0.1 vol. percent
E-100 Fuel Ethanol	
Ethanol	98.0 ± 0.5 vol. percent
Methanol	1.0 vol. percent max.
Petroleum fuel meeting the specifications of section 100.3.1	1.0 ± 0.1 vol. percent

(c)(2) **Mileage accumulation fuel.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for service accumulation shall meet the applicable specifications set forth in section 2292.1, title 13, CCR, (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol).

2. Subparagraph (c)(3) [No Change.]

3. Add the following subparagraph. Fuel additives and ignition improvers intended for use in alcohol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

100.3.4 Mixtures of Petroleum and Alcohol Fuels for Flexible Fuel Vehicles.

Amend §86.113-94(d) as follows:

1. Delete subparagraphs (d)(1) and (d)(2); replace with:

(d)(1) **Exhaust emission test fuel for emission-data and durability-data vehicles.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following:

Specification	Limit
M-85 Fuel Methanol	
Petroleum fuel meeting the specifications of section 100.3.1.	13-16 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.
E-85 Fuel Ethanol	
Petroleum fuel meeting the specifications of section 100.3.1.	15-21 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.

(d)(2) **Mileage accumulation fuel.** For flexible fuel Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles that use Otto-cycle or diesel alcohol engines, petroleum fuel shall meet the applicable specifications in Part II, Sections A.100.3.1 or 100.3.2 and methanol or ethanol fuel shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specification for E-85 Fuel Ethanol). Mileage accumulation procedures shall be subject to the requirements set forth in 40 CFR §86.1831-01(a) and (b) and are subject to the prior approval of the Executive Officer. A manufacturer shall consider expected customer fuel usage as well as emissions deterioration when developing its durability demonstration.

2. Subparagraph (d)(3) [No Change.]

3. Add the following subparagraphs. **Evaporative emission test fuel for emission-data and durability-data vehicles.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, a blend of methanol or ethanol fuel used for evaporative emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) and gasoline meeting the specifications of Part II section A.100.3.1 of these test procedures such that the final blend is composed of either 35 volume percent methanol (± 1.0 volume percent of total blend) for methanol-fueled vehicles or 10 volume percent ethanol (± 1.0 volume percent of total blend) for ethanol-fueled vehicles. Alternative alcohol-gasoline blends may be used in place of M35 or E10 if demonstrated to result in equivalent or higher evaporative emissions, subject to prior approval of the Executive Officer.

Additive requirements. Fuel additives and ignition improvers intended for use in alcohol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

100.3.5 Natural Gas Fuels.

Amend §86.113-94(e) as follows:

1. Delete subparagraphs (e)(1), (e)(2) and (e)(3); replace with:

(e)(1) **Exhaust emission test fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use natural gas, fuel used for exhaust and evaporative emission testing shall meet the specifications listed in section 2292.5, title 13, CCR, (Specifications for Compressed Natural Gas) as modified by the following:

Specification	Limit
Compressed Natural Gas Certification Test Fuel	
Methane	90.0 ± 1.0 mole percent
Ethane	4.0 ± 0.5 mole percent
C_3 and higher hydrocarbon content	2.0 ± 0.3 mole percent
Oxygen	0.5 mole percent maximum
Inert gases (CO_2 + N_2)	3.5 ± 0.5 vol. percent

(e)(2) **Mileage accumulation fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use natural gas, fuel used for service accumulation shall meet the specifications listed in section 2292.5, title 13, CCR, (Specifications for Compressed Natural Gas).

100.3.6 Liquefied Petroleum Gas Fuels.

Amend §86.113-94(f) as follows:

1. Delete subparagraphs (f)(1) and (f)(2); replace with:

(f)(1) **Evaporative and exhaust emission test fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use liquefied petroleum gas, fuel used for exhaust and evaporative emission testing shall meet the specifications listed in section 2292.6, title 13, CCR, (Specifications for Liquefied Petroleum Gas) as modified by the following:

Specification	Limit
Liquefied Petroleum Gas Certification Test Fuel	
Propane	93.5 ± 1.0 volume percent
Propene	3.8 ± 0.5 volume percent
Butane and heavier components	1.9 ± 0.3 volume percent

(f)(2) **Mileage accumulation fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use liquefied petroleum gas, fuel used for service accumulation shall meet the specifications listed in section 2292.6, title 13, CCR, (Specifications for Liquefied Petroleum Gas).

2. Subparagraph (f)(3). [No Change.]

100.3.7 §86.113-94(g). [No Change.]

100.3.8 §86.113-07(h). [No Change.]

100.3.9 Identification of New Clean Fuels to be Used in Certification Testing.

Any person may petition the state board to establish by regulation certification testing specifications for a new clean fuel for which specifications for a new clean fuel are not specifically set forth in paragraph 86.113-94 as amended herein. Prior to adopting such specifications, the state board shall consider the relative cost-effectiveness of use of the fuel in reducing emissions compared to the use of other fuels. Whenever the state board adopts specifications for a new clean fuel for certification testing, it shall also establish by regulation specifications for the fuel as it is sold commercially to the public.

(a) If the proposed new clean fuel may be used to fuel existing motor vehicles, the state board shall not establish certification specifications for the fuel unless the petitioner has demonstrated that:

(1) Use of the new clean fuel in such existing motor vehicles would not increase emissions of NMOG (on a reactivity-adjusted basis), NOx, CO, and the potential risk associated with toxic air contaminants, as determined pursuant to the procedures set forth in "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels," as adopted September 17, 1993. In the case of fuel-flexible vehicles or dual-fuel vehicles which were not certified on the new clean fuel but are capable of being operated on it, emissions during operation with the new clean fuel shall not increase compared to emissions during vehicle operation on gasoline.

(2) Use of the new clean fuel in such existing motor vehicles would not result in increased deterioration of the vehicle and would not void the warranties of any such vehicles.

(b) Whenever the state board designates a new clean fuel pursuant to this section, the state board shall also establish by regulation required specifications for the new clean fuel sold commercially in California.

86.114-94 Analytical gases. June 30, 1995.
86.115-00 EPA urban dynamometer driving schedules. October 22, 1996.

100.4 Calibration methods and frequency.

86.116-94 Calibrations, frequency and overview. June 30, 1995.
86.117-96 Evaporative emission enclosure calibrations. August 23, 1995.
86.118-00 Dynamometer calibrations. October 22, 1996.
86.119-90 CVS calibration. February 18, 2000.

86.120-94 Gas meter or flow instrumentation calibration, particulate, methanol and formaldehyde measurement. June 30, 1995.
86.121-90 Hydrocarbon analyzer calibration. June 30, 1995.
86.122-78 Carbon monoxide analyzer calibration. June 28, 1977.
86.123-78 Oxides of nitrogen analyzer calibration. June 30, 1995.
86.124-78 Carbon dioxide analyzer calibration. June 28, 1977.
86.125-94 Methane analyzer calibration. June 5, 1991.
86.126-90 Calibration of other equipment. April 11, 1989.

100.5 Test Procedures and Data Requirements.

86.127-00 Test procedures; overview. May 4, 1999.
86.128-00 Transmissions. October 22, 1996.
86.129-00 Road load power, test weight, inertia weight class determination, and fuel temperature profile. October 6, 2000.

100.5.1 California Road Load Power, Test Weight and Inertia Weight Class Determination.

100.5.1.1 Amend §86.129-00(b) to add the following specifications for medium-duty vehicles:
Power absorption unit adjustment- medium-duty vehicles.

(1) The power absorption unit shall be adjusted to reproduce road load power at 50 miles per hour true speed. The dynamometer power absorption shall take into account the dynamometer friction, as discussed in paragraph 86.118-78.

(2) The dynamometer road load setting is determined from the loaded test weight, the reference frontal area, vehicle protuberances, and an aerodynamic drag coefficient as determined appropriate by the Executive Officer. The vehicle manufacturer shall submit the procedure by which the aerodynamic drag coefficient was determined in the test vehicle information section in the certification application. The dynamometer road load setting shall be determined by the following equation.

(i) For medium-duty vehicles to be tested on twin or single large roll dynamometers:

$$Hp = (0.00182)V((0.015)(W)+(0.0375)(Cd)(A)(V^2)/(32.2ft/s^2))+P$$

where:
Hp = the dynamometer power absorber setting at 50 mph (horsepower).
0.00182 = conversion factor to horsepower.
V = velocity in feet/sec.
0.015 = coefficient of rolling resistance.
W = loaded vehicle weight in pounds.
0.0375 = air density in lbm/cubic ft.
Cd = aerodynamic drag coefficient.
A = reference frontal area in square ft.
32.2 ft/s^2 = gravitational acceleration

P = protuberance power (horsepower)

(ii) The protuberance power, P shall be determined per subparagraph 86.129-80(c)(2)(i).

(iii) The dynamometer power absorber setting for medium-duty vehicles shall be rounded to the nearest 0.1 horsepower.

(3) The road load power calculated above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Executive Officer.

(4) Where it is expected that more than 33 percent of a vehicle line within an engine-system combination will be equipped with air conditioning, per §86.1828-01, the road load power as determined in paragraph (2) or (3) of this section shall be increased by 10 percent up to a maximum increment of 1.4 horsepower, for testing all test vehicles of that vehicle line within that engine-system combination if those vehicles are intended to be offered with air conditioning in production. This power increment shall be added to the indicated dynamometer power absorption setting prior to rounding off this value.

86.130-00 Test sequence; general requirements. October 22, 1996.

100.5.2 California test sequence; general requirements.

100.5.2.1 Delete subparagraph (a) of §86.130-00 and replace with:

For purposes of determining conformity with 50°F test requirements, the procedures set forth in Part II, Section C. For all hybrid electric vehicles and all 2001 and subsequent model-year vehicles certifying to running loss and useful life evaporative emission standards, the test sequence specified in "California Evaporative Emission Standards and Test Procedures for 1978 and Subsequent Model Motor Vehicles" as incorporated by reference in section 1976, title 13, CCR shall apply.

100.5.2.2 Add the following:

A manufacturer has the option of simulating air conditioning operation during testing at other ambient test conditions provided it can demonstrate that the vehicle tailpipe exhaust emissions are representative of the emissions that would result from the SC03 cycle test procedure and the ambient conditions of paragraph 86.161-00. The Executive Officer has approved two optional air conditioning test simulation procedures, AC1 and AC2, for the 2001 to 2003 model years only. If a manufacturer desires to conduct an alternative SC03 test simulation other than AC1 and AC2, or the AC1 and AC2 simulations for the 2004 and subsequent model years, the simulation test procedure must be approved in advance by the Executive Officer (see paragraphs 86.162-00 and 86.162-03).

100.5.2.1 Greenhouse Gas Requirements.

For the purpose of determining conformity with greenhouse gas fleet average requirements, the CO_2, CH_4, and N_2O emissions from all passenger cars, light-duty trucks and medium-duty passenger vehicles shall be measured in accordance with the Federal Test Procedure as set forth in Subpart B, 40 CFR Part 86, as modified in Part II of these test procedures. Emissions shall be measured using both the EPA Urban Dynamometer Driving Schedule as set forth in Appendix I to Part 86, 40 CFR to

determine "City" emission values and the Highway Driving Schedule as set forth in Part II Section F of these test procedures to determine "Highway" emission values.

86.131-00 Vehicle preparation. October 22, 1996.

86.132-00 Vehicle preconditioning. October 22, 1996.

100.5.3 California Vehicle Preconditioning Requirements.

100.5.3.1 Add the following subparagraph: For all hybrid electric vehicles and all 2000 and subsequent model-year vehicles subject to running loss and useful life evaporative emission standards, the preconditioning sequence for the Federal Test Procedure specified in "California Evaporative Emission Standards and Test Procedures for 1978 and Subsequent Model Motor Vehicles" as incorporated by reference in section 1976, title 13, CCR shall apply. In addition, the preconditioning sequence for the SFTP described in subparagraphs (n) and (o) of paragraph 86.132-00 shall apply.

100.5.3.2 Add the following subparagraph: The preconditioning sequence described in §86.132-00 shall apply to all vehicles tested for the purpose of demonstrating compliance with greenhouse gas requirements with the following addition. The dynamometer procedure used to precondition a vehicle being tested to measure "highway" emission values shall consist of one cycle of the Highway Driving Schedule followed by 15 seconds of idle prior to initiation of a second Highway Driving Schedule, which is driven to test the vehicle. As an alternative, emission testing may be conducted using the Highway Driving Schedule within three hours following the Federal Test Procedure, if the soak temperature is maintained between 68°F – 86°F, without additional preconditioning required.

86.133-96 Diurnal breathing loss test. August 23, 1995.
86.134-96 Running loss test. August 23, 1995.
86.135-00 Dynamometer procedure. October 22, 1996.
86.136-90 Engine starting and restarting. September 21, 1994.
86.137-96 Dynamometer test run, gaseous and particulate emissions. March 24, 1993.
86.138-96 Hot soak test. August 23, 1995.
86.139-90 Diesel particulate filter handling and weighing. April 11, 1989.
86.140-94 Exhaust sample analysis. June 30, 1995.
86.142-90 Records required. June 30, 1995.
86.143-96 Calculations; evaporative emissions. August 23, 1995.
86.144-94 Calculations; exhaust emissions. September 5, 1997.

100.5.4 Calculations; exhaust emissions.

100.5.4.1 The exhaust emission calculations for California are set forth in the "California Non-Methane Organic Gas Test Procedures," which is incorporated by reference in section 1961(d), title 13, CCR.

100.5.4.2 Add the following calculation:

Organic material non-methane hydrocarbon equivalent mass for ethanol vehicles:

$OMNMHCE_{mass} = NMHC_{mass} + (13.8756/32.042) \times (CH_3OH)_{mass} + (13.8756/23.035) \times (CH_3CH_2OH)_{mass} + (13.8756/30.0262) \times (HCHO)_{mass} + (13.8756/22.027) \times (CH_3CHO)_{mass}$

86.145-82 Calculations; particulate emissions. November 2, 1982.
86.146-96 to 85.157-98 [n/a; (ORVR)]
86.158-00 Supplemental Federal Test Procedures; overview. October 22, 1996.
86.159-00 Exhaust emission test procedures for US06 emissions. October 22, 1996.
86.160-00 Exhaust emission test procedure for SC03 emissions. October 22, 1996.
86.161-00 Air conditioning environmental test facility ambient requirements. October 22, 1996.
86.162-00 Approval of alternative air conditioning test simulations and descriptions of AC1 and AC2. October 22, 1996.
86.162-03 Approval of alternative air conditioning test simulations. October 22, 1996.
86.163-00 Spot check correlation procedures for vehicles tested using a simulation of the environmental test cell for air conditioning emission testing. October 22, 1996.
86.164-00 Supplemental federal test procedure calculations. October 22, 1996.

B. Subpart C - Emission Regulations for 1994 and Later Model Year Gasoline-Fueled New Light-Duty Vehicles and New Light-Duty Trucks; Cold Temperature Test Procedures

86.201-94 General applicability. July 17, 1992.

200.1 California applicability.

Amend subparagraph 86.201-94(a) as follows: This subpart describes procedures for determining the cold temperature carbon monoxide (CO) emissions from 2000 and later model year new passenger cars, light-duty trucks, and medium-duty vehicles (excluding natural gas, diesel-fueled, and zero-emission vehicles).

86.202-94 Definitions. July 17, 1992.
86.203-94 Abbreviations. July 17, 1992.
86.204-94 Section number construction. July 17, 1992.
86.205-94 Introduction; structure of subpart. July 17, 1992.
86.206-94 Equipment required; overview. July 17, 1992.

200.2 California Equipment Required; Overview.

Amend §86.206-94, as follows:

This subpart contains procedures for exhaust emission tests on passenger cars, light-duty trucks, and medium-duty vehicles (excluding natural gas, diesel-fueled, and zero-emission vehicles.) Equipment required and specifications are as follows:

(a)(1) **Exhaust emission tests**. Exhaust from vehicles (excluding natural gas, diesel-fueled, and zero-emission vehicles) is tested for gaseous emissions using the Constant Volume Sampler (CVS) concept (§86.209). Equipment necessary and specifications appear in 40 CFR Part 86, §§86.208 through 86.214.

(a)(2) **Fuel, analytical gas, and driving schedule specifications**. Fuel specifications for exhaust emission testing for gasoline-fueled vehicles are specified in 40 CFR Part 86, §86.213. As an option, a manufacturer may utilize the fuel specified in §86.213 with the sulfur content limited to 30-40 ppm by weight. Fuel specifications for exhaust emission testing for alcohol-fueled vehicles and liquefied petroleum gas vehicles are specified in Part II, Section A.100.3 of these test procedures. Analytical gases are specified in 40 CFR Part 86, §86.214. The EPA Urban Dynamometer Driving Schedule (UDDS) for use in emission tests is specified in 40 CFR Part 86, §86.215 and appendix I to this part.

86.208-94 Dynamometer. July 17, 1992.
86.209-94 Exhaust gas sampling system; gasoline-fueled vehicles. July 17, 1992.
86.211-94 Exhaust gas analytical system. July 17, 1992.
86.213-04 Fuel specifications. February 10, 2000.
86.214-94 Analytical gases. July 17, 1992.
86.215-94 EPA urban dynamometer driving schedule. July 17, 1992.
86.216-94 Calibrations, frequency and overview. July 17, 1992.

86.218-94 Dynamometer calibration. July 17, 1992.
86.219-94 CVS calibration. July 17, 1992.
86.221-94 Hydrocarbon analyzer calibration. July 17, 1992.
86.222-94 Carbon monoxide analyzer calibration. July 17, 1992.
86.223-94 Oxides of nitrogen analyzer calibration. July 17, 1992.
86.224-94 Carbon dioxide analyzer calibration. July 17, 1992.
86.226-94 Calibration of other equipment. July 17, 1992.
86.227-94 Test procedures; overview. July 17, 1992.
86.228-94 Transmissions. July 17, 1992.
86.229-94 Road load force, test weight, and inertia weight class determination. July 17, 1992.
86.230-94 Test Sequence; general requirements. July 17, 1992.
86.231-94 Vehicle Preparation. July 17, 1992.
86.232-94 Vehicle Preconditioning. July 17, 1992.
86.235-94 Dynamometer procedure. July 17, 1992.
86.236-94 Engine starting and restarting. July 17, 1992.
86.237-94 Dynamometer test run, gaseous emissions. July 17, 1992.
86.240-94 Exhaust sample analysis. July 17, 1992.
86.242-94 Records required. July 17, 1992.
86.244-94 Calculations; exhaust emissions. July 17, 1992.
86.246-94 Intermediate temperature testing. July 17, 1992.

Appendix I to Part 86 -- Urban Dynamometer Schedules. April 29, 1998.

C. 50ºF Emission Test Procedure.

The NMOG, CO, NOx and formaldehyde emissions from all light- and medium-duty TLEVs, LEVs, ULEVs and SULEVs shall be measured according to the Federal Test Procedure as set forth in Subpart B, 40 CFR Part 86 at a nominal temperature of 50°F with the following modifications:

(1) **Test Procedure.**

(a) The test vehicles shall not be subject to a diurnal heat build prior to the cold start exhaust test or evaporative emission testing.

(b) Following a 12 to 36 hour cold soak at a nominal temperature of 50°F, the nominal preconditioning, soak, and test temperatures shall be maintained within 3°F of the nominal temperature on an average basis and within 5°F of the nominal temperature on a continuous basis. The temperature shall be sampled at least once every 15 seconds during the preconditioning and test periods and at least once each 5 minutes during the soak period. A continuous strip chart recording of the temperature with these minimum time resolutions is an acceptable alternative to employing a data acquisition system.

(c) The test site temperature shall be measured at the inlet of the vehicle cooling fan used for testing.

(d) The test vehicle may be fueled before the preconditioning procedure in a fueling area maintained within a temperature range of 68 to 86°F. The requirement to saturate the evaporative control canister(s) shall not apply.

(e) If a soak area remote from the test site is used, the vehicle may pass through an area maintained within a temperature range of 68 to 86°F during a time interval not to exceed 10 minutes. In such cases, the vehicle shall be restabilized to 50°F by soaking the vehicle in the nominal 50°F test area for six times as long as the exposure time to the higher temperature area, prior to starting the emission test.

(f) The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

D. Procedure for Determining Specific Reactivity.

The following procedure shall be used by the Executive Officer to establish reactivity adjustment factors for exhaust emissions of non-methane organic gases (NMOG) for the purpose of certifying a vehicle of specific emission category and fuel for sale in California.

1. Procedure for Determining Specific Reactivity.

(a) A representative speciated NMOG exhaust emission profile for light- and medium-duty low-emission vehicles shall be established according to the following conditions:

i. Speciated NMOG profiles shall be obtained from a statistically valid number of vehicles in each vehicle emission category and fuel type. The maximum incremental reactivities to be used are provided in the "California Non-Methane Organic Gas Test Procedures," incorporated by reference in Part II, section A.100.5.4 of these test procedures.

ii. The speciated NMOG profiles shall identify and quantify, in units of grams per mile or milligrams per mile, all compounds above the specified laboratory limit of detection as measured in accordance with the procedures specified in the "California Non-Methane Organic Gas Test Procedures."

(b) The "grams ozone per mile" value of each organic compound identified in the speciated profile shall be determined by multiplying the "grams per mile NMOG" emission value of each compound by the applicable maximum incremental reactivity value as specified in the "California Non-Methane Organic Gas Test Procedures."

(c) The "total grams ozone per mile" of NMOG exhaust emissions from each vehicle emission category and fuel type shall be the sum of all the organic compounds values calculated in step (b).

(d) The specific reactivity of each vehicle emission category and fuel type shall be determined by dividing the "total grams ozone per mile" value calculated in step (c) by the "total grams per mile of NMOG emissions."

2. Procedure for Determining Reactivity Adjustment Factors.

(a) The baseline specific reactivity of vehicle emission categories operating on conventional gasoline shall be determined by the Executive Officer in accordance with the procedure outlined in subparagraph 1., above.

i. Gasoline meeting the specifications listed below shall be used to determine the baseline specific reactivity low-emission vehicles operating on conventional gasoline:

Specifications for Conventional Gasoline	
Fuel Property	**Limit**
Sulfur	300 ± 50 ppm by weight
Benzene	1.6 ± 0.3 volume percent
Reid vapor pressure	8.7 ± 0.3 psi
Distillation, D-86, ^{o}F	
10%	115-135
50%, maximum	240
90%,	323-333
EP, maximum	420
Hydrocarbons	
Total Aromatics	32 ± 3.0 volume percent
Multi-substituted alkyl aromatics	21 ± 3.0 volume percent
Olefins	12 ± 3.0 volume percent
Saturates	Remainder

(The test methods used for each fuel property shall be the same as the test method for the identical fuel property listed in Part II, Section A.100.3 of these test procedures.)

(b) The generic specific reactivity of vehicle emission categories operating on clean fuels shall also be determined by the Executive Officer according to the procedure outlined in subparagraph 1. above.

(c) The candidate vehicle/fuel "reactivity adjustment factor" shall be determined by dividing the specific reactivity of a candidate fuel and vehicle by the baseline specific reactivity of vehicles in the same vehicle emission category using the procedure outline in subparagraph 1. above.

(d) For a candidate vehicle/fuel system operating on natural gas, a "methane reactivity adjustment factor" shall be calculated by dividing the maximum incremental reactivity value for methane given in the California Non-Methane Organic Gas Test Procedures by the specific reactivity for the vehicle in the same emission control technology category operated on conventional gasoline as listed in subparagraph (a)i. above or established by the Executive Officer pursuant to paragraph 4 and 5 below. The current methane reactivity adjustment factors are listed in Part I.E.4 of these test procedures.

3. Procedures for Establishing Test Group Specific Reactivity Adjustment Factors.

A manufacturer may request the use of a unique specific reactivity for a specific vehicle test group category and fuel only if a baseline specific reactivity factor for the applicable test group class and emission category is provided in section E.5.1.1 of these test procedures. The Executive Officer shall approve such a request provided the criteria outlined below are met.

(a) The manufacturer submits speciated NMOG exhaust emission profiles to the Executive Officer obtained from emission testing a minimum of four different vehicles representative of vehicles that will be certified in the test group. The test vehicles shall include the official emission-data vehicle(s) for the engine family, and the mileage accumulation of each vehicle shall be at or greater than 4000 miles. One speciated profile shall be submitted for each test vehicle. Emission levels of each constituent NMOG shall be measured according to the "California Non-Methane Organic Gas Test Procedures." For the emission-data vehicle(s), the speciated profile(s) shall be obtained from the same test used to obtain the official exhaust emission test results for the emission-data vehicle at the 4,000 mile test point. The manufacturer shall calculate specific reactivity for each speciated NMOG exhaust emission profile in accordance with the procedures specified in paragraph 2. above. By using these specific reactivity values, the manufacturer shall calculate a "reactivity adjustment factor" for each test vehicle in accordance with the procedure specified in paragraph 3. above. A "reactivity adjustment factor" for the test group shall be calculated by taking the arithmetic mean of the "reactivity adjustment factor"' obtained for each test vehicle. The 95 percent upper confidence bound (95% UCB) shall be calculated according to the equation:

$$95\%\ UCB = RAF + 1.96 \times \left[\sum_{I=1}^{n} (RAF_i - RAF_m)^2 / (n-1) \right]^{1/2}$$

where:

RAF_m = mean "reactivity adjustment factor" calculated for the test group

RAF_i = "reactivity adjustment factor" calculated for the i'th test vehicle

n = number of test vehicles

The 95 percent upper confidence bound of the "reactivity adjustment factor" for the test group shall be less than or equal to 115 percent of the test group "reactivity adjustment factor."

(b) The manufacturer submits an "ozone deterioration factor" for the test group. To determine the "ozone deterioration factor," the manufacturer shall perform two tests at each mileage interval for one or more durability vehicle(s) tested in accordance with the procedures and conditions for calculating mass deterioration factors specified in Part I, Section F.3 (40 CFR §86.1819) of these test procedures. The Executive Officer shall approve the use of other mileage intervals and procedures if the manufacturer can demonstrate that equivalently representative "ozone deterioration factors" are obtained. One speciated profile shall be submitted for each test. Emission levels of each constituent NMOG shall be measured according to the "California Non-Methane Organic Gas Test Procedures." A mean gram per mile NMOG mass value and a mean specific reactivity value shall be calculated by

taking the arithmetic mean of each measurement from the speciated profiles. These results shall be multiplied together to obtain a mean "total grams ozone per mile" value at each mileage interval. A mean "ozone deterioration factor" shall be calculated in accordance with the procedures in Part I Section F.3 (40 CFR §86.1819) of these test procedures except that the mean total "grams ozone per mile" value determined at each mileage interval shall be used in place of measured mass emissions. If the "ozone deterioration factor" is determined to be less than 1.00, the "ozone deterioration factor" shall be assigned a value of 1.00. The "ozone deterioration factor" shall be multiplied by the product of the official exhaust NMOG mass emission results at the 4,000 mile test point and the mean "reactivity adjustment factor" for the test group to obtain the NMOG certification levels used to determine compliance with the NMOG emission standards.

(c) The speciated profiles, mean "reactivity adjustment factor" for the test group, and "ozone deterioration factor" are provided to the Executive Officer with the certification application for the engine family.

(d) The maximum incremental reactivities to be used are provided in the "California Non-Methane Organic Gas Test Procedures." Any manufacturer which intends to use the table shall submit to the Executive Officer a list which provides the specific organic gases measured by the manufacturer and the maximum incremental reactivity value assigned to each organic gas prior to or with the submittal of a request for the use of a reactivity adjustment factor unique to a specific test group. The Executive Officer may deny such requests if he or she determines that the maximum incremental reactivity value assignments are made incorrectly.

(e) Methanol and LPG Requirements. For a candidate vehicle/fuel system powered by methanol or liquefied petroleum gas, the reactivity adjustment factor determined by the manufacturer shall be multiplied by 1.1. The resulting value shall constitute the "reactivity adjustment factor" for the methanol or liquefied petroleum gas-powered vehicle/fuel system.

4. Procedure for Establishing A New Reactivity Adjustment Factor.

The Executive Officer may establish by executive order new reactivity adjustment factor pursuant to the procedures set forth above. The Executive Officer shall notify manufacturers in writing of a new reactivity adjustment factor within 30 days of their establishment.

5. Procedure for Revising Reactivity Adjustment Factors.

The Executive Officer may revise any reactivity adjustment factor listed in Part I.E.5 of these test procedures or established by the Executive Officer pursuant to the above criteria if he or she determines that the revised reactivity adjustment factor is more representative of the ozone-forming potential of vehicle NMOG emissions based on the best available scientific knowledge and sound engineering judgment. The Executive Officer shall notify manufacturers in writing of any such reactivity adjustment factor at least 3 years prior to January 1 of the calendar year which has the same numerical designation as the model year for which the revised reactivity adjustment factor first becomes effective. However, a manufacturer may use the revised reactivity adjustment factor in certifying any new test group whose certification application is submitted following such notification, if it so chooses. A manufacturer may also continue to use the original reactivity adjustment factor for any existing test group

previously certified with that reactivity adjustment factor until a new durability-data vehicle is tested for that test group.

E. Unified Cycle Driving Schedule.

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Unified Test Cycle

(Speed vs Time Sequence)

Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)
1	0	74	12.3	147	20	220	0	293	0	366	45.3	439	60.3	512	28
2	0	75	8.1	148	23	221	0	294	0	367	46.5	440	60.3	513	26.5
3	0	76	6.1	149	25.7	222	0	295	0	368	48	441	60.3	514	24.2
4	0	77	9.6	150	28	223	0	296	0	369	48.8	442	59.5	515	22.7
5	0	78	12.7	151	30.7	224	0	297	0	370	49.5	443	58.8	516	20.4
6	0	79	15.7	152	32.6	225	0	298	0	371	49.9	444	59.1	517	17.7
7	0	80	18	153	34.2	226	0	299	0	372	49.9	445	58.8	518	15.7
8	0	81	20.4	154	35.3	227	0	300	0	373	49.9	446	58.8	519	13.1
9	0	82	21.9	155	36.9	228	0	301	0	374	49.5	447	58.8	520	10.8
10	0	83	23.4	156	36.9	229	0	302	0	375	49.5	448	58.4	521	8.4
11	0	84	23.8	157	37.2	230	0	303	0	376	48.8	449	58	522	7.3
12	0	85	24.6	158	37.6	231	0	304	0	377	48.8	450	58	523	5
13	0	86	25	159	37.6	232	0	305	0	378	48.8	451	58	524	3.8
14	0	87	26.1	160	37.6	233	0	306	0	379	48.4	452	58.4	525	3.5
15	0	88	26.1	161	37.2	234	0	307	0	380	48.8	453	59.1	526	1.9
16	0	89	26.9	162	37.2	235	0	308	0	381	49.5	454	59.5	527	0.8
17	0	90	26.9	163	36.9	236	0	309	0	382	50.3	455	59.9	528	0
18	0	91	26.9	164	36.5	237	0	310	0	383	50.7	456	59.9	529	0
19	0	92	26.5	165	36.5	238	1.5	311	0	384	51.8	457	60.3	530	0
20	0	93	25.7	166	34.9	239	5	312	0	385	52.6	458	61.1	531	0.8
21	1.2	94	21.9	167	33.4	240	8.8	313	0.4	386	53.4	459	61.1	532	1.9
22	4.2	95	16.5	168	31.9	241	11.5	314	2.7	387	54.1	460	61.1	533	3.8
23	7.3	96	10	169	29.2	242	14.2	315	7.3	388	55.3	461	61.4	534	6.9
24	8.8	97	4.6	170	25	243	15.4	316	11.5	389	55.3	462	61.4	535	9.6
25	10.8	98	1.5	171	25	244	16.1	317	15.4	390	56.1	463	61.1	536	11.1
26	12.3	99	0.4	172	26.1	245	16.1	318	18.4	391	56.4	464	60.7	537	11.1
27	13.1	100	0	173	27.6	246	16.9	319	20.7	392	56.4	465	59.9	538	10.4
28	12.3	101	0	174	29.2	247	16.5	320	24.2	393	56.4	466	59.1	539	8.8
29	12.3	102	0	175	31.1	248	16.9	321	26.9	394	57.2	467	59.1	540	9.2
30	11.5	103	0	176	32.3	249	18	322	29.6	395	56.8	468	59.1	541	10
31	11.5	104	0	177	34.2	250	19.2	323	31.1	396	57.6	469	59.9	542	10.4
32	11.1	105	0	178	34.9	251	20.4	324	32.6	397	57.6	470	59.5	543	10.4
33	11.1	106	0	179	35.7	252	20.4	325	33.8	398	57.6	471	59.9	544	5.4
34	11.1	107	0	180	36.5	253	21.1	326	34.9	399	58	472	58.8	545	1.9
35	13.1	108	0.4	181	36.9	254	21.1	327	36.9	400	58	473	58	546	0
36	15	109	1.2	182	36.9	255	22.3	328	39.2	401	58.4	474	57.6	547	0
37	16.9	110	1.9	183	37.2	256	23	329	41.1	402	58.4	475	56.8	548	0
38	16.9	111	3.8	184	37.6	257	23.8	330	43	403	58.8	476	56.1	549	0
39	16.1	112	7.7	185	37.2	258	24.2	331	43.8	404	59.1	477	55.3	550	0
40	15.7	113	11.5	186	37.6	259	24.6	332	44.5	405	58.8	478	54.1	551	0
41	15.4	114	14.6	187	38	260	25	333	45.3	406	58.8	479	52.6	552	0
42	15	115	18	188	38.4	261	25.7	334	45.3	407	58	480	49.2	553	0
43	13.8	116	21.5	189	39.2	262	25.7	335	44.9	408	58	481	46.1	554	0
44	10.8	117	25	190	39.6	263	26.5	336	44.5	409	57.6	482	43	555	0
45	8.4	118	28.4	191	39.9	264	27.6	337	43.8	410	57.6	483	37.2	556	0
46	6.1	119	30.7	192	40.7	265	28.4	338	43.4	411	57.6	484	29.6	557	0
47	4.2	120	31.9	193	40.3	266	29.2	339	42.6	412	57.6	485	21.5	558	0
48	3.5	121	32.3	194	41.1	267	30.3	340	41.9	413	57.6	486	16.5	559	0
49	3.5	122	32.3	195	41.1	268	31.1	341	41.5	414	59.1	487	15.7	560	0
50	1.5	123	31.9	196	40.7	269	31.1	342	40.7	415	59.5	488	18.4	561	0
51	0	124	30.3	197	31.9	270	30.7	343	40.3	416	59.9	489	21.5	562	0
52	0	125	28	198	23.9	271	31.1	344	41.1	417	60.3	490	25	563	0
53	0	126	24.2	199	15.9	272	29.6	345	41.5	418	60.3	491	27.3	564	0
54	0	127	20	200	7.9	273	29.2	346	42.6	419	61.1	492	29.2	565	0
55	0	128	16.1	201	2.7	274	29.2	347	43.4	420	60.3	493	30.7	566	0
56	0	129	11.5	202	0.4	275	28.8	348	44.2	421	59.9	494	31.5	567	0
57	0	130	8.1	203	0.4	276	28	349	44.9	422	59.5	495	31.1	568	0
58	0	131	5	204	2.7	277	23	350	45.7	423	59.1	496	31.1	569	0
59	0	132	3.5	205	3.8	278	21.1	351	46.5	424	59.1	497	30.3	570	0
60	0	133	1.9	206	3.8	279	21.5	352	46.8	425	59.5	498	30	571	0
61	0	134	0	207	1.5	280	20.7	353	47.2	426	59.5	499	30	572	0.4
62	0	135	0	208	0	281	20.7	354	48	427	59.5	500	29.6	573	1.5
63	1.2	136	0	209	0	282	19.6	355	47.6	428	59.9	501	30	574	3.5
64	3.5	137	0	210	0	283	16.5	356	48.4	429	60.3	502	28.8	575	6.1
65	7.7	138	0	211	0	284	13.1	357	48	430	60.7	503	28.8	576	10.4

66	11.1	139	0	212	0	285	9.6	358	47.2	431	60.7	504	28	577	14.2
67	13.8	140	0	213	0	286	7.3	359	46.1	432	61.4	505	28.4	578	16.9
68	16.5	141	0	214	0	287	3.8	360	45.7	433	61.8	506	28	579	19.2
69	18.4	142	0	215	0	288	0.8	361	44.9	434	61.8	507	28.4	580	20
70	20.4	143	1.5	216	0	289	0	362	44.2	435	61.8	508	28.4	581	21.5
71	20.7	144	6.9	217	0	290	0	363	43.8	436	61.8	509	28.8	582	23.4
72	19.6	145	12.7	218	0	291	0	364	44.5	437	61.1	510	28.4	583	24.6
73	17.3	146	16.5	219	0	292	0	365	44.9	438	60.7	511	28.4	584	24.2

Unified Test Cycle
(Speed vs Time Sequence)

Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)
585	20	658	33	731	4.2	804	20.4	877	62.2	950	16.5	1023	0.4	1096	9.6
586	16.9	659	34.2	732	1.2	805	18.8	878	62.2	951	15	1024	2.7	1097	8.8
587	13.4	660	34.6	733	0	806	17.3	879	62.6	952	11.9	1025	6.1	1098	10.8
588	13.4	661	35.3	734	0	807	15	880	63.7	953	9.6	1026	9.2	1099	12.7
589	15.7	662	36.1	735	0	808	13.1	881	64.5	954	8.4	1027	11.5	1100	14.2
590	18.4	663	36.1	736	0	809	9.2	882	64.9	955	5.8	1028	14.2	1101	14.6
591	21.1	664	36.9	737	0	810	6.9	883	66	956	1.2	1029	16.1	1102	13.1
592	23.4	665	36.9	738	0	811	4.6	884	66	957	0	1030	18	1103	11.1
593	25.3	666	37.6	739	0	812	4.6	885	66.8	958	0	1031	20	1104	11.1
594	27.6	667	37.6	740	0	813	4.6	886	66.4	959	0	1032	21.5	1105	11.1
595	28.8	668	38.4	741	0	814	4.2	887	66.8	960	1.2	1033	23	1106	13.1
596	30.3	669	38	742	0	815	5.4	888	67.2	961	3.1	1034	24.2	1107	15.7
597	30.7	670	37.6	743	0	816	4.6	889	66.4	962	5	1035	25	1108	18.4
598	31.5	671	37.6	744	0	817	3.5	890	66.4	963	8.4	1036	25.7	1109	20.7
599	31.1	672	37.2	745	0	818	2.3	891	66	964	11.5	1037	26.9	1110	23.8
600	31.1	673	36.9	746	0	819	2.3	892	65.7	965	14.6	1038	27.6	1111	25.7
601	30.3	674	36.1	747	0	820	1.9	893	65.7	966	16.9	1039	27.6	1112	28
602	30.3	675	35.7	748	0	821	3.1	894	66.4	967	18.8	1040	28.4	1113	30
603	30.3	676	36.1	749	0	822	6.1	895	66	968	21.1	1041	29.2	1114	31.1
604	30.7	677	35.7	750	0	823	4.6	896	65.7	969	23.8	1042	29.2	1115	32.3
605	31.1	678	35.7	751	0	824	2.7	897	65.3	970	26.5	1043	30	1116	34.2
606	32.3	679	35.7	752	0	825	2.3	898	65.3	971	28	1044	29.6	1117	35.7
607	32.6	680	36.1	753	0	826	2.3	899	64.5	972	29.6	1045	29.6	1118	36.9
608	32.6	681	36.1	754	0	827	3.1	900	64.5	973	30.7	1046	28.8	1119	38.8
609	32.6	682	35.7	755	0	828	4.2	901	64.1	974	32.6	1047	28	1120	40.3
610	31.1	683	35.7	756	0	829	3.5	902	63.7	975	34.2	1048	23.8	1121	41.5
611	26.9	684	34.9	757	0	830	3.8	903	63.7	976	35.3	1049	18.8	1122	42.2
612	22.3	685	34.6	758	0	831	4.2	904	63.7	977	36.1	1050	11.9	1123	43
613	18	686	34.2	759	0	832	3.5	905	64.5	978	36.9	1051	6.1	1124	43.8
614	13.8	687	33.8	760	0	833	3.5	906	64.5	979	38	1052	1.5	1125	43.8
615	9.6	688	33.4	761	0	834	3.5	907	64.9	980	38	1053	1.5	1126	43.4
616	4.6	689	33	762	0	835	4.6	908	64.5	981	38	1054	4.2	1127	43
617	6.1	690	30.3	763	1.5	836	5.8	909	64.1	982	38	1055	8.1	1128	42.2
618	10	691	29.2	764	5.4	837	3.5	910	64.9	983	38	1056	10.4	1129	41.9
619	14.2	692	28.4	765	9.2	838	0.8	911	65.3	984	37.2	1057	13.1	1130	41.5
620	17.3	693	25	766	11.5	839	3.5	912	65.3	985	36.9	1058	15.4	1131	41.9
621	20	694	21.1	767	14.6	840	3.8	913	65.3	986	36.1	1059	18	1132	41.9
622	21.5	695	16.9	768	17.3	841	2.3	914	64.1	987	35.7	1060	20.4	1133	41.9
623	22.3	696	13.4	769	19.2	842	0	915	63.4	988	34.9	1061	23	1134	42.2
624	22.3	697	13.1	770	21.1	843	1.2	916	63	989	34.9	1062	25.3	1135	42.6
625	22.3	698	12.3	771	20.7	844	6.9	917	63.4	990	33.8	1063	27.3	1136	42.6
626	22.3	699	12.7	772	20.7	845	13.8	918	64.1	991	31.5	1064	28.8	1137	42.6
627	23	700	15.7	773	19.6	846	18.8	919	64.9	992	28.8	1065	30.3	1138	42.6
628	23	701	19.2	774	18.4	847	23.8	920	65.3	993	25.7	1066	31.1	1139	42.6
629	22.7	702	22.3	775	16.9	848	27.3	921	64.5	994	24.6	1067	32.3	1140	42.6
630	22.3	703	24.6	776	16.9	849	30.7	922	64.1	995	23.4	1068	31.9	1141	42.6
631	21.9	704	25.7	777	16.5	850	33.8	923	63.4	996	22.3	1069	32.3	1142	42.2
632	22.7	705	26.5	778	16.9	851	37.6	924	63.7	997	21.5	1070	31.9	1143	43
633	23.8	706	26.5	779	16.9	852	40.7	925	63.4	998	20	1071	31.1	1144	43.4
634	25	707	26.9	780	16.9	853	43.8	926	63.4	999	20	1072	28.8	1145	43
635	25.3	708	27.3	781	17.3	854	46.1	927	63.4	1000	19.2	1073	25	1146	42.6
636	25.7	709	27.3	782	19.2	855	48	928	63.4	1001	19.2	1074	22.7	1147	41.9
637	26.5	710	27.6	783	20.4	856	49.5	929	63.7	1002	18	1075	18.8	1148	40.7
638	26.9	711	28.4	784	21.1	857	51.5	930	64.5	1003	11.9	1076	15.4	1149	36.9
639	27.3	712	28.8	785	22.3	858	53	931	65.3	1004	6.9	1077	13.4	1150	32.6

640	28	713	28.8	786	22.3	859	54.5	932	64.9	1005	2.7	1078	11.9	1151	28
641	29.2	714	29.2	787	22.7	860	55.7	933	63.7	1006	0.8	1079	8.8	1152	23.4
642	30	715	28.8	788	22.3	861	56.8	934	63	1007	0.4	1080	5	1153	18.4
643	30	716	28.8	789	22.7	862	58	935	59.9	1008	0	1081	1.9	1154	14.6
644	29.6	717	28	790	22.3	863	59.1	936	55.3	1009	0	1082	2.3	1155	12.3
645	29.6	718	28	791	23.8	864	60.3	937	50.7	1010	0	1083	2.7	1156	9.2
646	28.8	719	27.6	792	25.7	865	61.1	938	49.2	1011	0	1084	3.5	1157	5.8
647	28.4	720	26.5	793	27.6	866	61.8	939	48	1012	0	1085	6.5	1158	1.9
648	28	721	24.6	794	29.6	867	61.8	940	46.1	1013	0	1086	10.8	1159	0.4
649	27.3	722	20.7	795	30	868	61.8	941	44.2	1014	0	1087	13.8	1160	0
650	25.7	723	16.5	796	29.2	869	61.8	942	41.1	1015	0	1088	16.1	1161	0
651	24.6	724	15	797	27.6	870	62.6	943	39.9	1016	0	1089	18.4	1162	0
652	25	725	14.2	798	25	871	63.4	944	36.1	1017	0	1090	20.4	1163	0
653	26.5	726	14.2	799	23.8	872	63	945	32.6	1018	0	1091	21.9	1164	0
654	28	727	13.8	800	23.4	873	63	946	29.2	1019	0	1092	21.9	1165	0.4
655	29.6	728	13.8	801	24.2	874	62.6	947	24.6	1020	0	1093	20.7	1166	4.2
656	30.7	729	11.9	802	23.4	875	61.8	948	20.7	1021	0	1094	17.3	1167	9.2
657	32.3	730	8.4	803	23	876	61.8	949	19.2	1022	0	1095	13.1	1168	11.9

Unified Test Cycle
(Speed vs Time Sequence)

Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)
1169	14.2	1240	3.5	1311	40.7	1382	2.7	1453	0	1524	26.9	1595	37.6	1666	0
1170	15.7	1241	10.4	1312	40.3	1383	2.3	1454	0	1525	26.9	1596	37.2	1667	0
1171	15	1242	15.4	1313	39.6	1384	1.5	1455	0	1526	26.9	1597	37.2	1668	0
1172	14.2	1243	17.3	1314	39.2	1385	1.2	1456	1.2	1527	26.5	1598	36.9	1669	0
1173	13.4	1244	17.3	1315	38.8	1386	0	1457	4.2	1528	25.7	1599	36.5	1670	0
1174	13.8	1245	18.4	1316	38	1387	1.2	1458	7.3	1529	21.9	1600	36.5	1671	0
1175	14.6	1246	21.5	1317	37.6	1388	4.2	1459	8.8	1530	16.5	1601	34.9	1672	0
1176	14.6	1247	24.6	1318	37.2	1389	7.3	1460	10.8	1531	10	1602	33.4	1673	1.5
1177	14.2	1248	27.3	1319	36.5	1390	8.8	1461	12.3	1532	4.6	1603	31.9	1674	5
1178	16.1	1249	30	1320	34.6	1391	10.8	1462	13.1	1533	1.5	1604	29.2	1675	8.8
1179	15.7	1250	31.5	1321	31.5	1392	12.3	1463	12.3	1534	0.4	1605	25	1676	11.5
1180	15.7	1251	31.9	1322	29.6	1393	13.1	1464	12.3	1535	0	1606	25	1677	14.2
1181	14.6	1252	32.6	1323	29.2	1394	12.3	1465	11.5	1536	0	1607	26.1	1678	15.4
1182	13.1	1253	33.4	1324	28.8	1395	12.3	1466	11.5	1537	0	1608	27.6	1679	16.1
1183	10	1254	34.9	1325	28.8	1396	11.5	1467	11.1	1538	0	1609	29.2	1680	16.1
1184	7.3	1255	36.5	1326	28	1397	11.5	1468	11.1	1539	0	1610	31.1	1681	16.9
1185	3.5	1256	37.6	1327	28	1398	11.1	1469	11.1	1540	0	1611	32.3	1682	16.5
1186	0.8	1257	39.2	1328	28.4	1399	11.1	1470	13.1	1541	0	1612	34.2	1683	16.9
1187	0	1258	40.3	1329	29.6	1400	11.1	1471	15	1542	0	1613	34.9	1684	18
1188	0	1259	40.7	1330	30	1401	13.1	1472	16.9	1543	0.4	1614	35.7	1685	19.2
1189	0	1260	41.1	1331	30.3	1402	15	1473	16.9	1544	1.2	1615	36.5	1686	20.4
1190	0	1261	40.7	1332	29.2	1403	16.9	1474	16.1	1545	1.9	1616	36.9	1687	20.4
1191	0.4	1262	40.7	1333	26.5	1404	16.9	1475	15.7	1546	3.8	1617	36.9	1688	21.1
1192	2.7	1263	40.7	1334	25.3	1405	16.1	1476	15.4	1547	7.7	1618	37.2	1689	21.1
1193	7.3	1264	41.5	1335	25	1406	15.7	1477	15	1548	11.5	1619	37.6	1690	22.3
1194	11.5	1265	42.6	1336	24.6	1407	15.4	1478	13.8	1549	14.6	1620	37.2	1691	23
1195	15.4	1266	43	1337	24.6	1408	15	1479	10.8	1550	18	1621	37.6	1692	23.8
1196	19.2	1267	44.5	1338	25.3	1409	13.8	1480	8.4	1551	21.5	1622	38	1693	24.2
1197	21.9	1268	45.3	1339	26.1	1410	10.8	1481	6.1	1552	25	1623	38.4	1694	24.6
1198	23.8	1269	45.3	1340	27.3	1411	8.4	1482	4.2	1553	28.4	1624	39.2	1695	25
1199	25	1270	44.9	1341	28.4	1412	6.1	1483	3.5	1554	30.7	1625	39.6	1696	25.7
1200	26.1	1271	43.4	1342	29.2	1413	4.2	1484	3.5	1555	31.9	1626	39.9	1697	25.7
1201	27.3	1272	40.3	1343	29.2	1414	3.5	1485	1.5	1556	32.3	1627	40.7	1698	26.5
1202	28.8	1273	38	1344	29.6	1415	3.5	1486	0	1557	32.3	1628	40.3	1699	27.6
1203	30	1274	36.1	1345	30	1416	1.5	1487	0	1558	31.9	1629	41.1	1700	28.4
1204	29.6	1275	36.5	1346	31.1	1417	0	1488	0	1559	30.3	1630	41.1	1701	29.2
1205	29.6	1276	38	1347	32.6	1418	0	1489	0	1560	28	1631	40.7	1702	30.3
1206	28.8	1277	39.2	1348	33.8	1419	0	1490	0	1561	24.2	1632	31.9	1703	31.1
1207	26.1	1278	40.7	1349	34.6	1420	0	1491	0	1562	20	1633	23.9	1704	31.1
1208	22.3	1279	42.2	1350	34.9	1421	0	1492	0	1563	16.1	1634	15.9	1705	30.7
1209	19.2	1280	43.4	1351	34.6	1422	0	1493	0	1564	11.5	1635	7.9	1706	31.1
1210	16.5	1281	44.9	1352	34.9	1423	0	1494	0	1565	8.1	1636	2.7	1707	29.6
1211	12.7	1282	45.7	1353	34.6	1424	0	1495	0	1566	5	1637	0.4	1708	29.2
1212	9.6	1283	46.1	1354	34.9	1425	0	1496	0	1567	3.5	1638	0.4	1709	29.2
1213	6.9	1284	46.8	1355	34.9	1426	0	1497	0	1568	1.9	1639	2.7	1710	28.8
1214	4.2	1285	46.5	1356	34.9	1427	0	1498	1.2	1569	0	1640	3.8	1711	28
1215	2.3	1286	46.5	1357	34.2	1428	0	1499	3.5	1570	0	1641	3.8	1712	23
1216	0.8	1287	46.5	1358	33.8	1429	0	1500	7.7	1571	0	1642	1.5	1713	21.1
1217	0	1288	46.1	1359	32.6	1430	0	1501	11.1	1572	0	1643	0	1714	21.5
1218	0	1289	46.1	1360	31.5	1431	0	1502	13.8	1573	0	1644	0	1715	20.7
1219	0	1290	46.1	1361	30	1432	0	1503	16.5	1574	0	1645	0	1716	20.7
1220	0	1291	46.8	1362	28.8	1433	0	1504	18.4	1575	0	1646	0	1717	19.6
1221	0	1292	47.6	1363	27.3	1434	0	1505	20.4	1576	0	1647	0	1718	16.5
1222	0	1293	48	1364	23.8	1435	0	1506	20.7	1577	0	1648	0	1719	13.1
1223	0	1294	48.4	1365	23	1436	0	1507	19.6	1578	1.5	1649	0	1720	9.6
1224	0	1295	48	1366	23	1437	0	1508	17.3	1579	6.9	1650	0	1721	7.3
1225	0	1296	48	1367	22.3	1438	0	1509	12.3	1580	12.7	1651	0	1722	3.8
1226	0	1297	47.2	1368	20.4	1439	0	1510	8.1	1581	16.5	1652	0	1723	0.8
1227	0	1298	46.5	1369	18.8	1440	0	1511	6.1	1582	20	1653	0	1724	0
1228	0	1299	46.8	1370	17.7	1441	0	1512	9.6	1583	23	1654	0	1725	0
1229	0	1300	47.2	1371	16.1	1442	0	1513	12.7	1584	25.7	1655	0	1726	0
1230	0	1301	48.4	1372	14.6	1443	0	1514	15.7	1585	28	1656	0	1727	0
1231	0	1302	48.4	1373	12.7	1444	0	1515	18	1586	30.7	1657	0	1728	0
1232	0	1303	48.8	1374	11.1	1445	0	1516	20.4	1587	32.6	1658	0	1729	0

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1233	0	1304	48.4	1375	9.2	1446	0	1517	21.9	1588	34.2	1659	0	1730	0
1234	0	1305	47.6	1376	8.8	1447	0	1518	23.4	1589	35.3	1660	0	1731	0
1235	0	1306	46.5	1377	7.3	1448	0	1519	23.8	1590	36.9	1661	0	1732	0
1236	0	1307	44.2	1378	6.1	1449	0	1520	24.6	1591	36.9	1662	0	1733	0
1237	0	1308	42.2	1379	5	1450	0	1521	25	1592	37.2	1663	0	1734	0
1238	0	1309	41.5	1380	4.2	1451	0	1522	26.1	1593	37.6	1664	0	1735	0
1239	0	1310	41.1	1381	3.5	1452	0	1523	26.1	1594	37.6	1665	0		

F. Highway Driving Schedule.

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Highway Test Cycle
(Speed vs Time Sequence)

Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)
1	0	74	47.2	147	42	220	43.1	293	30.6	366	56.9	439	58	512	54
2	0	75	47.3	148	43.1	221	43.2	294	29.6	367	56.9	440	57.9	513	54
3	2.0	76	47.2	149	43.7	222	43.4	295	28.8	368	57	441	57.9	514	54
4	4.9	77	47.1	150	44.1	223	43.9	296	28.4	369	57	442	57.9	515	54
5	8.1	78	47	151	44.3	224	44.3	297	28.6	370	57	443	57.9	516	54
6	11.3	79	46.9	152	44.4	225	44.7	298	29.5	371	57	444	57.9	517	54.1
7	14.5	80	46.9	153	44.6	226	45.1	299	31.4	372	57	445	58	518	54.2
8	17.3	81	46.9	154	44.7	227	45.4	300	33.4	373	57	446	58.1	519	54.5
9	19.6	82	47	155	44.9	228	45.8	301	35.6	374	57	447	58.1	520	54.8
10	21.8	83	47.1	156	45.2	229	46.5	302	37.5	375	57	448	58.2	521	54.9
11	24	84	47.1	157	45.7	230	46.9	303	39.1	376	57	449	58.2	522	55
12	25.8	85	47.2	158	45.9	231	47.2	304	40.2	377	56.9	450	58.2	523	55.1
13	27.1	86	47.1	159	46.3	232	47.4	305	41.1	378	56.8	451	58.1	524	55.2
14	28	87	47	160	46.8	233	47.3	306	41.8	379	56.5	452	58	525	55.2
15	29	88	46.9	161	46.9	234	47.3	307	42.4	380	56.2	453	58	526	55.3
16	30	89	46.5	162	47	235	47.2	308	42.8	381	56	454	58	527	55.4
17	30.7	90	46.3	163	47.1	236	47.2	309	43.3	382	56	455	58	528	55.5
18	31.5	91	46.2	164	47.6	237	47.2	310	43.8	383	56	456	58	529	55.6
19	32.2	92	46.3	165	47.9	238	47.1	311	44.3	384	56.1	457	58	530	55.7
20	32.9	93	46.5	166	48	239	47	312	44.7	385	56.4	458	57.9	531	55.8
21	33.5	94	46.9	167	48	240	47	313	45	386	56.7	459	57.9	532	55.9
22	34.1	95	47.1	168	47.9	241	46.9	314	45.2	387	56.9	460	58	533	56
23	34.6	96	47.4	169	47.8	242	46.8	315	45.4	388	57.1	461	58.1	534	56
24	34.9	97	47.7	170	47.3	243	46.9	316	45.5	389	57.3	462	58.1	535	56
25	35.1	98	48	171	46.7	244	47	317	45.8	390	57.4	463	58.2	536	56
26	35.7	99	48.2	172	46.2	245	47.2	318	46	391	57.4	464	58.3	537	56
27	35.9	100	48.5	173	45.9	246	47.5	319	46.1	392	57.2	465	58.3	538	56
28	35.8	101	48.8	174	45.7	247	47.9	320	46.5	393	57	466	58.3	539	56
29	35.3	102	49.1	175	45.5	248	48	321	46.8	394	56.9	467	58.2	540	56
30	34.9	103	49.2	176	45.4	249	48	322	47.1	395	56.6	468	58.1	541	56
31	34.5	104	49.1	177	45.3	250	48	323	47.7	396	56.3	469	58	542	56
32	34.6	105	49.1	178	45	251	48	324	48.3	397	56.1	470	57.8	543	56
33	34.8	106	49	179	44	252	48	325	49	398	56.4	471	57.5	544	56
34	35.1	107	49	180	43.1	253	48.1	326	49.7	399	56.7	472	57.1	545	56
35	35.7	108	49.1	181	42.2	254	48.2	327	50.3	400	57.1	473	57	546	56
36	36.1	109	49.2	182	41.5	255	48.2	328	51	401	57.5	474	56.6	547	55.9
37	36.2	110	49.3	183	41.5	256	48.1	329	51.7	402	57.8	475	56.1	548	55.9
38	36.5	111	49.4	184	42.1	257	48.6	330	52.4	403	58	476	56	549	55.9
39	36.7	112	49.5	185	42.9	258	48.9	331	53.1	404	58	477	55.8	550	55.8
40	36.9	113	49.5	186	43.5	259	49.1	332	53.8	405	58	478	55.5	551	55.6
41	37	114	49.5	187	43.9	260	49.1	333	54.5	406	58	479	55.2	552	55.4
42	37	115	49.4	188	43.6	261	49.1	334	55.2	407	58	480	55.1	553	55.2
43	37	116	49.1	189	43.3	262	49.1	335	55.8	408	58	481	55	554	55.1
44	37	117	48.9	190	43	263	49.1	336	56.4	409	57.9	482	54.9	555	55
45	37	118	48.6	191	43.1	264	49	337	56.9	410	57.8	483	54.9	556	54.9
46	37	119	48.4	192	43.4	265	48.9	338	57	411	57.7	484	54.9	557	54.6
47	37.1	120	48.1	193	43.9	266	48.2	339	57.1	412	57.7	485	54.9	558	54.4
48	37.3	121	47.7	194	44.3	267	47.7	340	57.3	413	57.8	486	54.9	559	54.2
49	37.8	122	47.4	195	44.6	268	47.5	341	57.6	414	57.9	487	54.9	560	54.1
50	38.6	123	47.3	196	44.9	269	47.2	342	57.8	415	58	488	55	561	53.8
51	39.3	124	47.5	197	44.8	270	46.7	343	58	416	58.1	489	55	562	53.4
52	40	125	47.8	198	44.4	271	46.2	344	58.1	417	58.4	490	55	563	53.3
53	40.7	126	47.9	199	43.9	272	46	345	58.4	418	58.9	491	55	564	53.1
54	41.4	127	48	200	43.4	273	45.8	346	58.7	419	59.1	492	55	565	52.9
55	42.2	128	47.9	201	43.2	274	45.6	347	58.8	420	59.4	493	55	566	52.6
56	42.9	129	47.9	202	43.2	275	45.4	348	58.9	421	59.8	494	55.1	567	52.4
57	43.5	130	47.9	203	43.1	276	45.2	349	59	422	59.9	495	55.1	568	52.2
58	44	131	48	204	43	277	45	350	59	423	59.9	496	55	569	52.1
59	44.3	132	48	205	43	278	44.7	351	58.9	424	59.8	497	54.9	570	52
60	44.5	133	48	206	43.1	279	44.5	352	58.8	425	59.6	498	54.9	571	52
61	44.8	134	47.9	207	43.4	280	44.2	353	58.6	426	59.4	499	54.8	572	52
62	44.9	135	47.3	208	43.9	281	43.5	354	58.4	427	59.2	500	54.7	573	52
63	45	136	46	209	44	282	42.8	355	58.2	428	59.1	501	54.6	574	52.1
64	45.1	137	43.3	210	43.5	283	42	356	58.1	429	59	502	54.4	575	52

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65	45.4	138	41.2	211	42.6	284	40.1	357	58	430	58.9	503	54.3	576	52
66	45.7	139	39.5	212	41.5	285	38.6	358	57.9	431	58.7	504	54.3	577	51.9
67	46	140	39.2	213	40.7	286	37.5	359	57.6	432	58.6	505	54.2	578	51.6
68	46.3	141	39	214	40	287	35.8	360	57.4	433	58.5	506	54.1	579	51.4
69	46.5	142	39	215	40	288	34.7	361	57.2	434	58.4	507	54.1	580	51.1
70	46.8	143	39.1	216	40.3	289	34	362	57.1	435	58.4	508	54.1	581	50.7
71	46.9	144	39.5	217	41	290	33.3	363	57	436	58.3	509	54	582	50.3
72	47	145	40.1	218	42	291	32.5	364	57	437	58.2	510	54	583	49.8
73	47.1	146	41	219	42.7	292	31.7	365	56.9	438	58.1	511	54	584	49.3

Highway Test Cycle
(Speed vs Time Sequence)

Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)	Time (sec.)	Speed (mph)
585	48.7	608	49.1	631	55.1	654	52.2	677	52.1	700	54.2	723	57.7	746	39.2
586	48.2	609	49	632	55.4	655	52.5	678	51.7	701	54.5	724	57.3	747	35.9
587	48.1	610	48.9	633	55.4	656	52.1	679	51.1	702	54.8	725	57.1	748	32.6
588	48	611	48	634	55	657	51.6	680	50.5	703	55	726	56.8	749	29.3
589	48	612	47.1	635	54.5	658	51.1	681	50.1	704	55.5	727	56.5	750	26.8
590	48.1	613	46.2	636	53.6	659	51	682	49.8	705	55.9	728	56.2	751	24.5
591	48.4	614	46.1	637	52.5	660	51	683	49.7	706	56.1	729	55.5	752	21.5
592	48.9	615	46.1	638	50.2	661	51.1	684	49.6	707	56.3	730	54.6	753	19.5
593	49	616	46.2	639	48.2	662	51.4	685	49.5	708	56.4	731	54.1	754	17.4
594	49.1	617	46.9	640	46.5	663	51.7	686	49.5	709	56.5	732	53.7	755	15.1
595	49.1	618	47.8	641	46.2	664	52	687	49.7	710	56.7	733	53.2	756	12.4
596	49	619	49	642	46	665	52.2	688	50	711	56.9	734	52.9	757	9.7
597	49	620	49.7	643	46	666	52.5	689	50.2	712	57	735	52.5	758	7
598	48.9	621	50.6	644	46.3	667	52.8	690	50.6	713	57.3	736	52	759	5
599	48.6	622	51.5	645	46.8	668	52.7	691	51.1	714	57.7	737	51.3	760	3.3
600	48.3	623	52.2	646	47.5	669	52.6	692	51.6	715	58.2	738	50.5	761	2
601	48	624	52.7	647	48.2	670	52.3	693	51.9	716	58.8	739	49.5	762	0.7
602	47.9	625	53	648	48.8	671	52.3	694	52	717	59.1	740	48.5	763	0
603	47.8	626	53.6	649	49.5	672	52.4	695	52.1	718	59.2	741	47.6	764	0
604	47.7	627	54	650	50.2	673	52.5	696	52.4	719	59.1	742	46.8	765	0
605	47.9	628	54.1	651	50.7	674	52.7	697	52.9	720	58.8	743	45.6		
606	48.3	629	54.4	652	51.1	675	52.7	698	53.3	721	58.5	744	44.2		
607	49	630	54.7	653	51.7	676	52.4	699	53.7	722	58.1	745	42.5		