

State of California  
AIR RESOURCES BOARD

**CALIFORNIA ASSEMBLY-LINE TEST PROCEDURES  
FOR 1998-2000 MODEL-YEAR PASSENGER CARS,  
LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES**

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CALIFORNIA ASSEMBLY-LINE TEST PROCEDURES  
FOR 1998-2000 MODEL-YEAR PASSENGER CARS,  
LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES

**A. GENERAL PROVISIONS**

**1. APPLICABILITY**

These test procedures, adopted pursuant to Section 43210 of the California Health and Safety Code (H & SC), are applicable to all new 1998-2000 model-year passenger cars, light-duty trucks, and medium-duty vehicles subject to certification and manufactured for sale in California, except for zero-emission vehicles and medium-duty vehicles certified according to the optional standards and test procedures of section 1956.8, Title 13, California Code of Regulations (CCR).

**2. COMPLIANCE**

The procedures specify two types of tests: (1) an inspection test to be applied to every vehicle before sale; and (2) a quality-audit test according to the "CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1988-2000 MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES," for vehicles selected in accordance with paragraph C.1. of these procedures. Demonstration of compliance with cold temperature carbon monoxide standards and the Supplemental Federal Test Procedure non-methane hydrocarbon plus oxides of nitrogen and carbon monoxide standards shall be exempt from quality-audit testing. A vehicle is in compliance with these assembly-line test procedures when that vehicle is in compliance with the inspection test requirements and that vehicle's engine family is in compliance with the quality-audit test requirements. Since quality-audit evaluations occur less frequently than the inspection tests, a vehicle that passes the inspection test may be presumed to be in compliance with the full assembly-line procedures pending meeting the quality-audit evaluation of that vehicle's engine family.

**3. ACCESS**

Air Resources Board (ARB) personnel and mobile laboratories shall have access to vehicle assembly plants, distribution facilities, and test facilities for the purpose of vehicle selection, testing, and observation. Scheduling of access shall be arranged with the designated manufacturer's representative and shall not unreasonably disturb normal operations.

**4. VARIATIONS AND EXEMPTIONS**

Variations from these procedures which produce substantially equivalent results may be authorized by the Executive Officer. In extraordinary circumstances where compliance with these procedures is not possible or practicable, a manufacturer may appeal to the Air Resources Board for a temporary exemption.

## **5. COMMUNICATIONS**

All reports required by these procedures shall be sent to:

Chief, Mobile Source Division  
California Air Resources Board  
9528 Telstar Avenue  
El Monte, CA 91731

## **B. INSPECTION TEST PROCEDURES**

This inspection test shall be performed on all 1998 and subsequent model-year passenger cars, light-duty trucks and medium-duty vehicles subject to these assembly-line test procedures.

### **1. INSPECTION TEST PROCEDURES**

This inspection test is a functional tests of the emission control components and systems used on the vehicle and shall be conducted in accordance with a plan approved by the Executive Officer. At least 90 days prior to the start of production, the manufacturer shall submit to the Executive Officer a plan for functional testing which lists the emission control components and systems to be tested and specifies the testing procedures to be used. This plan shall include, but not be limited to, the list of components and systems contained in Appendix B, which sets forth typical types of components and systems. If an on-board emission control diagnostic system of any type, either completely self-contained or requiring external peripheral equipment, is installed on a vehicle, it must be included in the components to be functionally tested and the on-board diagnostic system must be used to the fullest extent practical in functionally testing the vehicle emission control system. In appropriate instances, functional tests may be conducted during the vehicle assembly process before the end of the assembly line. For components that cannot practically be functionally checked on every vehicle, a statistically valid sampling test may be used as the functional tests. The Executive Officer shall approve the plan unless he or she determines that the tests are not designated for the appropriate control components and systems or that the tests will be inadequate to reasonably assure that the components and systems are correctly installed and are functioning properly. Approval of the test plan applies to subsequent model years until changes are made to the emission control components or systems being used, or to the approved test plan. The manufacturer may at any time submit proposed changes to the plan for functional testing. An update to an approved plan or resubmittal of a new plan is required when changes are made to the emission control components or systems necessitating a change in the functional tests, or changes are proposed to the test plan.

### **2. EVALUATION**

Only vehicles that pass every test sequence in the approved functional test plan will be considered to be in compliance with the inspection test requirements. In order for a vehicle to

satisfy the inspection test requirements, each of the emission control components and systems identified in the approved plan for testing must be correctly installed and functioning properly pursuant to the specified approved test.

### **3. REPORTING**

Each manufacturer shall submit quarterly a statement that the functional tests included in the approved test plan have been conducted on all vehicles produced for sale in California. The statement shall be signed by an official of the manufacturer who has verified the accuracy of the statement and shall accompany the quarterly audit test report.

## **C. QUALITY-AUDIT TEST PROCEDURES**

### **1. VEHICLE SAMPLE SELECTION**

The vehicle manufacturer shall randomly select vehicles from each engine family for quality-audit testing. Each vehicle selected for quality-audit testing must pass the inspection test, be equipped with emission control systems certified by the ARB, and be representative of vehicles certified for sale in California. The procedure for randomly selecting vehicles must be submitted to the Chief, Mobile Source Division, El Monte, California and an approved plan must be on file with the ARB prior to production.

A continuous random sample rate shall be chosen by the manufacturer to provide a sample which is representative of the total engine family production. The manufacturer shall select a sample rate which he or she determines will be satisfactory for use by the ARB in determining the number of vehicles in the entire population of a particular engine family which do not meet Board-established emission standards by extrapolation from the percentage of the sample not meeting the standards. The results from the sample may be extrapolated to the entire population subject to the provisions relating to vehicle exclusion contained in paragraph C.3. The sample rate so chosen shall not be less than 2.0 percent except for fuel-flexible and dual-fuel vehicles where the sample rate chosen shall not be less than 1.0 percent. A vehicle manufacturer may use, as an alternate to the above vehicle selection procedure, the optional procedure outlined in Appendix A. The manufacturer shall notify the Executive Officer of any change to the sample rate and the date of implementation of such change in the quality audit test report.

Four-wheel drive vehicles that can be manually shifted to a two-wheel drive mode will be tested in the normal on-highway two-wheel drive mode of operation. If full-time four-wheel drive vehicles are selected, substitutions may be made with comparable two-wheel drive vehicles of the same engine family. If comparable two-wheel drive vehicles are not available, selected full-time four-wheel drive vehicles will be tested on a four-wheel drive dynamometer, or alternatively, on a two-wheel drive dynamometer, by having the front wheels temporarily disengaged or the front end of the vehicle elevated.

The Executive Officer may, upon notice to the manufacturer, require the sample rate to be increased to a maximum of ten percent of production (not to exceed 30 additional vehicles) of the calendar quarterly production of any engine family by invoking CCR, Title 13, Section 2110.

## **2. VEHICLE PREPARATION AND PRECONDITIONING**

(a) After the inspection tests, no emissions tests may be performed on a quality-audit vehicle prior to the first quality-audit test, except where such tests are run on all vehicles certified for sale in California.

(b) The vehicle shall begin the test sequence as received from the inspection test, except for mileage accumulation or engine run-in. The schedule for mileage accumulation or engine run-in and any changes to the schedule for an engine family must be submitted to the Executive Officer with each quarterly audit test report. This schedule must be adhered to for all vehicles quality-audit tested within an engine family and subgroup at all assembly plants. An acceptable plan for accelerated mileage accumulation/engine break-in schedules (high engine rpm for an extended period of time or other abnormal driving conditions) and special preparation (e.g., disabling the traction control) for an engine family or subgroup must be submitted to the Executive Officer for approval prior to the planned implementation. The plan will be deemed acceptable if the manufacturer demonstrates that the plan does not alter the emission control effectiveness of a vehicle under conditions that may reasonably be expected to be encountered in normal operation and use.

(c) For vehicles which are certified to the running loss and useful life standards for evaporative emissions contained in Title 13, CCR, Section 1976(b)(1), and the incorporated "California Evaporative Emissions Standards and Test Procedures for 1978 and Subsequent Model Motor Vehicles," as last amended, the vehicle preparation and preconditioning procedure shall be conducted in accordance with the evaporative emissions test procedures contained in section 4.g.i., "Test Procedure, General Requirements," subsections A.-F., as codified in subsections 4.g.ii.(c), 4.g.ii.(d), and 4.g.iii., with the exception that: (1) the cold soak prior to the preconditioning, and the fuel drain and fuel fill following the vehicle preconditioning, as described in subsections 4.g.i.B. and 4.g.i.C., respectively, may be omitted at the discretion of the manufacturer and (2) the vehicle canister loading procedure contained in subsection 4.g.iii. shall be conducted using one of the following options:

(i) The vehicle canister loading procedure shall be conducted in accordance with subsections 4.g.iii.C. and 4.g.iii.D., except that prior to the canister loading, the canister shall be cycled no less than 2 times, utilizing the fuel used in normal operation (bench test procedures), or utilizing a 50/50 mixture by volume of butane and nitrogen in order to place a heel on the canister. Alternative methods of loading the original canister may be used, provided such a method is

approved in advance by the Executive Officer on the basis of achieving canister loading comparable to the prescribed method.

OR

(ii) The vehicle canister loading procedure described in subsections 4.g.iii.C. and 4.g.iii.D. shall be employed for a canister which is loaded separate from the vehicle, and then attached prior to the exhaust tests, with the original canister disabled. Such a canister loaded separate from the vehicle shall be identical in nominal working bed capacity, charcoal bed volume and configuration to the original canister present on the vehicle. The loading procedure for this canister shall be as described in subsections 4.g.iii.C. and 4.g.iii.D., except for the following: (1) the rate of butane loading shall not exceed 40 grams/hour, and (2) prior to the loading, the canister shall be cycled at least 2 times utilizing the fuel used in normal operation (bench test procedure), or utilizing a 50/50 mixture by volume of butane and nitrogen. If the canister has been cycled for use in a previous exhaust test, this step may be omitted. An alternative to this option (ii) may be used provided such a method is approved in advance by the Executive Officer on the basis of whether the flow of vapor from the canister to the engine is comparable to the prescribed method.

OR

(iii) Data shall be submitted to the Executive Officer demonstrating the difference or lack of difference in exhaust emissions, for hydrocarbons, OMNMFCE and carbon monoxide, between vehicles possessing a canister(s) loaded in accordance with subsections 4.g.iii.C. and 4.g.iii.D. and cycled no less than 2 times utilizing the fuel used in normal operation (bench test procedure) or utilizing a 50/50 mixture by volume of butane and nitrogen, and vehicles possessing an unloaded canister(s). For the purposes of this section, the preparation and preconditioning of vehicles with an unloaded canister shall be conducted in an identical manner as described in 2.(c)(1) of this procedure for vehicles equipped with a loaded canister, except that canister loading requirements contained in subsections 4.g.iii.C. and 4.g.iii.D. shall be omitted.

OR

(iv) As an alternative to loading the on-board canister in option (iii), a surrogate canister may be used as in option (ii); however, the surrogate canister may not be used more than once, and the loading procedure shall be as specified in section 4.g.iii.C. and 4.g.iii.D. except that prior to the canister loading, each canister shall be cycled no less than two times utilizing the fuel used in normal operation, or utilizing a 50/50 mixture by volume of butane and nitrogen, in order to place a heel on each canister.

A test plan for generation of the data requested in option (iii) and (iv) shall be submitted to the Executive Officer for approval prior to testing. Such testing shall involve a minimum of ten (10) vehicles for each engine family chosen to use option (iii) or (iv), tested both with loaded and unloaded canisters. This testing shall be conducted during the first calendar quarter of production for a given model-year in order to properly apply the results to each quality-audit vehicle which is tested. Such testing shall establish a measured exhaust emissions difference for each vehicle, for hydrocarbons, OMNMFCE, and carbon monoxide. For each pollutant these differences shall be averaged to generate average exhaust emissions differences ("D"). These differences shall be applied, as an additive factor, to the applicable exhaust emissions results of each quality-audit vehicle that is not tested with a canister loaded in accordance with 2.(c)(1)(i) or 2.(c)(1)(ii). Compliance with the applicable exhaust emission standards shall be based on the sum of D and the measured quality-audit emission data for each vehicle. However, in no case shall this additive factor be applied when its value is less than zero.

The manufacturer may request permission to use an alternate preconditioning procedure provided the manufacturer demonstrates that it will not affect the loading of the carbon canister when compared with the Urban Dynamometer Driving Schedule (UDDS).

(d) Except as provided in paragraph C.2.(e) below, no vehicle selected for quality-audit testing shall be repaired or adjusted after passing the inspection test, except for a vehicle that: (1) is not testable, e.g., cannot be started, transmission or brakes lock-up; (2) is not reasonably operative, e.g., some transmission gears not functioning; (3) is unsafe to test; or (4) would be damaged by testing. All adjustments, preparations or repairs performed on vehicles prior to each test shall be reported to the Executive Officer by inclusion in the quarterly audit test report. The vehicle condition, symptoms and reason(s) for each repair or adjustment shall be listed. A fault condition indicated by a fault code in the memory of the on-board computer may be repaired according to manufacturer's published service procedures and shall be reported as noted before.

(e) If a vehicle is shipped to a remote facility for quality-audit testing, no pre-delivery type inspection, adjustment, or repair of vehicles selected for quality-audit is allowed, except as provided in C.2.(d) and as follows: if, subsequent to shipping from the assembly-line, the manufacturer performs the particular inspection and correction of damage or maladjustment at designated preparation facility locations for all vehicles produced, and the manufacturer's written inspection instructions are approved by the Executive Officer, then these specific inspections and corrections will be allowed prior to testing quality-audit vehicles.

(f) If a test is aborted, or the emission test results of a vehicle are determined to be invalid by the manufacturer, the vehicle must be retested. Emission results from all



tests shall be reported. A report on the reasons for each invalid test shall be included in the quarterly audit test report.

(g) Testing may be aborted if the MIL illuminates and, before retesting, the manufacturer may perform any repairs necessary to extinguish the MIL using the manufacturer's published service procedures. All repairs must be reported in the quarterly audit test report.

(h) In the event a retest is performed after an initial valid test, application may be made to the Executive Officer for permission to substitute the retest results for the initial valid test results. The Executive Officer will either approve or deny the application. When requested by the manufacturer, no more than ten days after the production quarter, the response from the Executive Officer shall be within ten working days.

### **3. STANDARDS AND TEST PROCEDURES**

The emission standards and the exhaust sampling analytical procedures shall be those described in the "CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1988 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES", as applicable, for vehicles tested for exhaust emissions only, with exceptions or additions as shown in paragraph C.2.

### **4. EVALUATION**

The evaluation shall be performed on sample sizes containing 30 or more vehicles. Each vehicle manufacturer shall review the test results of the first 30 test vehicles of each engine family for each calendar quarter of production. Once 30 vehicles have been tested and evaluated in a quarter(s), the manufacturer must conduct evaluations at the end of each month for the rest of the quarter. If a sample size for a particular production quarter is less than 30 vehicles, the data from that quarter shall be combined with all the data from the previous quarter until data from at least 30 vehicles have been quality-audit tested are included in the quarterly evaluation. All subgroups in an engine family (e.g., two- and four-wheel drive vehicles) shall be included in the emissions evaluation of the engine family.

Based upon additional information submitted by a manufacturer, the Executive Officer may allow rejection of any data from vehicles if they are considered to be not representative of production.

If the sample size is 30 or more vehicles, the Chief, Mobile Source Division, shall be notified in writing within ten working days whenever an engine family exceeds an emission standard. Probable cause exists for finding a violation by any engine family if the average emissions of any pollutant, after applying the appropriate certification deterioration factor (DF) to the emission data of each vehicle, exceeds the applicable year exhaust emission standards, when rounded to the same number of significant digits as the standard.

The Executive Officer may invoke Section 2109, Title 13 CCR, if probable cause is found for a full or combined production quarter. The Executive Officer may invoke Section 2110, Title 13 CCR, if probable cause is found for a short start-up production period (less than a full calendar quarter), for the first 30 vehicles quality-audit tested during any production quarter or from the start of production, or for vehicles evaluated in accordance with the monthly evaluation required above. In addition, the ARB may seek statutory penalties pursuant to H & SC Sections 43211 and 43212 at the end of each full or combined calendar quarter of production. If the Executive Officer invokes CCR Section 2109 or 2110, an evaluation will be made on vehicles produced subsequent to the invocation of a plan adopted pursuant to Section 2109 or 2110 as long as the sample size contains at least 30 vehicles.

A manufacturer shall submit the following information within 30 days if more than 1.0 percent (at least 2 vehicles) of the sample within an engine family has (a) emissions which exceed the applicable standards by more than 2.33 standard deviations at the time of any evaluation of that family's average emissions; (b) undeteriorated emissions which exceed the applicable emission standards by more than 1.5 times and the MIL does not illuminate; or (c) the MIL illuminates during vehicle break-in, preconditioning or testing for the malfunction of a specific component or system:

- (1) an analysis of the projected average emissions for each engine code/transmission type/inertia weight combination within that family;
- (2) an engineering evaluation of the cause of failure for each vehicle;
- (3) the manufacturer's opinion as to the nature of the problem; and
- (4) any corrective action proposed by the manufacturer.

The Executive Officer shall review the report, and may require that the proposed corrective action be taken. If, after review of the report, the Executive Officer finds the proposed corrective action inadequate, the Executive Officer may invoke Section 2109 or 2110, as appropriate.

## **5. HYDROCARBON (HC) MEASUREMENTS**

(a) For an engine family certified to non-methane hydrocarbon (NMHC) standards, the manufacturer shall measure the NMHC content and apply the NMHC DF to the result.

(b) For an engine family certified to total hydrocarbon (THC) standards, the measured THC values shall be multiplied by the THC DF.

(c) For an engine family certified to organic material non-methane hydrocarbon equivalent (OMNMHCE) standards, the manufacturer shall measure the OMNMHCE content which shall be multiplied by the OMNMHCE DF. As an alternative to measuring the OMNMHCE content, the Executive Officer may approve, upon submission of

supporting data by a manufacturer, the use of OMNMFCE to NMHC ratios. To request the use of OMNMFCE to NMHC ratios, the manufacturer shall establish during certification testing the ratio of measured OMNMFCE exhaust emissions to measured NMHC exhaust emissions for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured OMNMFCE to NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality-audit testing on the engine family by measuring NMHC exhaust emissions rather than OMNMFCE exhaust emissions. The measured NMHC exhaust emissions shall be multiplied by the OMNMFCE to NMHC ratio submitted in the application for certification for the engine family to determine the equivalent OMNMFCE exhaust emission values for the quality audit test vehicle. The equivalent OMNMFCE exhaust emission values shall be compared to the OMNMFCE exhaust emission standard applicable to the engine family.

(d) For an engine family certified to non-methane organic gas (NMOG) standards, the manufacturer shall measure the NMOG content which shall have the NMOG DF and the reactivity adjustment factor and ozone DF applied, if applicable. 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, the manufacturer shall establish during certification testing the ratio of measured NMOG exhaust emissions to measured NMHC exhaust emissions for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured NMOG to NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality-audit testing on the engine family by measuring NMHC exhaust emissions rather than NMOG exhaust emissions. The measured NMHC exhaust emissions shall be multiplied by the NMOG to NMHC ratio submitted in the application for certification for the engine family to determine the equivalent NMOG exhaust emission values for the quality audit 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 engine family was certified.

(e) For fuel-flexible vehicles certified to either organic material non-methane hydrocarbon equivalent (OMNMFCE) or non-methane organic gas (NMOG) standards, the manufacturer may request from the Executive Officer the use of a methanol (M85) or ethanol (E85) exhaust emission to gasoline NMHC exhaust emission ratio which shall be established during certification testing for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured M85 NMOG to gasoline NMHC emissions for the engine family shall be submitted to the

Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality- audit testing on the engine family by measuring gasoline NMHC exhaust emissions rather than M85 NMOG exhaust emissions. The measured gasoline NMHC exhaust emissions shall be multiplied by the M85 NMOG to gasoline NMHC ratio submitted in the application for certification for the engine family to determine the equivalent NMOG exhaust emission values for the quality audit 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 engine family was certified. Manufacturers which choose this option shall test the full two percent of the vehicles selected for quality-audit testing.

(f) All 1998 and subsequent conventional and low-emission vehicles that certify with fuel meeting the specifications set forth in Section 9.a(1) of the California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles must use that fuel for purposes of quality audit testing. All 1998 and subsequent conventional and low-emission vehicles that certify with fuel meeting the specifications set forth in Section 9.a(1)(ii) of the California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles must use that fuel for purposes of quality audit testing.

## **6. FORMALDEHYDE (HCHO) MEASUREMENTS**

For an engine family certified to HCHO standards, the manufacturer shall measure the HCHO content which shall be multiplied by the HCHO DF. 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 certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured HCHO to NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality-audit testing on the engine family 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 engine family to determine the equivalent HCHO exhaust emission values for the quality audit test vehicle. The equivalent HCHO exhaust emission values shall be compared to the HCHO exhaust emission standard applicable to the engine family.

## **7. REPORTS**

Each vehicle manufacturer shall submit a quality audit test report to the ARB within 45 calendar days after the end of each calendar quarter and 45 calendar days after the end of the production year. More frequent reports may be required if the Executive Officer invokes Title 13 CCR Section 2109 or 2110.

The quarterly quality audit test report shall include the following:

(a) A description of the engine family that includes the total engine family quarterly production of vehicles produced and delivered for sale in California for the quarter, the vehicle class, the standards to which the engine family is certified, the production start date, the sampling option being used (2%, alternate or other) and, for the final quarter, the final production date.

(b) A description of each test vehicle (i.e., date of test, engine family, engine size, vehicle identification number, transmission type, test weight used, dynamometer power absorber setting in horsepower, engine code or calibration number, build date or month, and test location).

(c) The CVS exhaust emission data and carbon dioxide emission data for each test vehicle. For methanol vehicles not certified as TLEVs, LEVs, or ULEVs, OMNMFCE data shall be substituted for NMHC or THC data, and formaldehyde (HCHO) data shall also be submitted. For vehicles certified as TLEVs, LEVs, or ULEVs, NMOG data shall be substituted for NMHC or THC data, and HCHO data shall also be submitted. If the MIL illuminates during the test, the fault code must be reported.

The data reported shall be rounded to one significant figure beyond the number of significant figures in the applicable standard. DF's (for 50,000, 100,000 or 120,000 miles), canister loading factors, conversion ratios (OMNMFCE to NMHC, NMOG to NMHC, M85 to gasoline NMHC, HCHO to NMHC) shall be stated, then applied to the data. After the DF's are applied, the data shall be reported and shall be rounded using the rounding method specified in ASTM E29 -67 to the number of places to the right of the decimal point indicated below, in accordance with the emission standards to which the vehicle was certified:

THC, NMHC, or OMNMFCE	NMOG	CO	NO <sub>x</sub>	HCHO	CO <sub>2</sub>	PM <sub>10</sub>
.XXX	.XXXX	.XX	.XX or .XXX	.XXXX	.X	.XXX

(d) The retest emissions data, as described in paragraph 7.(c) above, for any vehicle failing the initial test, and description of the corrective measures taken, including specific components replaced or adjusted.

(e) A statistical analysis of the quality-audit test results for each engine family stating:

(1) Number of vehicles tested.

(2) Average emissions and standard deviations of the sample for HC, NMHC, or OMNMHCE or NMOG, as applicable, CO, NO<sub>x</sub>, PM<sub>10</sub> and HCHO, as applicable, both before and after applying DF's, reactivity adjustment factors, and ozone DF's, as applicable. In the latter case, the individual test results shall be multiplied by or added to the DF's (for 50K, 100K or 120K, where applicable), reactivity adjustment factors, canister loading factors, conversion ratios (OMNMHCE to NMHC, NMOG to NMHC, M85 to gasoline NMHC, or HCHO to NMHC) and ozone DF's, as applicable, prior to computing the average and standard deviation. The average emissions and standard deviation of the sample for carbon dioxide shall also be listed.

(3) The applicable exhaust emission standards to be met by listing specific options selected, designating when 100,000 or 120,000 mile standards apply, and designation where NMHC, THC, OMNMHCE, or NMOG standards apply.

(f) Every aborted test and reason for abort shall be reported.

(g) If both four-wheel and two-wheel drive vehicles are included in an engine family, the quality-audit test data from four-wheel drive vehicles shall be distinguished from and summarized separately from two-wheel drive vehicles.

(h) If vehicles from different model-years are produced in any production quarter, separate reports shall be submitted for each model-year.

(i) For federally certified light-duty vehicles produced under the provisions of H & SC 43102(b), the emissions data and other information required in the quarterly reports shall be included in a separate section of the report. Where such federally certified light-duty vehicles are in the same engine family as medium-duty vehicles, all data from these medium-duty vehicles shall be deleted from the separate section. The separate section shall include the statistical summary required by Section (e)(2). The separate section of the report shall also include identical data for California engine families used for offsetting emissions of federally certified light-duty vehicles.

(j) The quarterly reports shall be submitted electronically (i.e. 3.5" diskette or electronic submission) in a format specified by the Executive Officer. In addition, a

summary of the quarterly report shall be submitted in hard copy in a format specified by the Executive Officer.

## **8. RETENTION OF DATA**

All vehicle emissions test data shall be retained for three calendar years from the end of model-year production.

## DEFINITIONS

The definitions in CCR Title 13 Section 1900 (b) shall apply with the following additions:

1. Calendar Quarter is defined as those three month period of time which start on the first days of January, April, July and October.
2. First or Final Calendar Quarter Production is defined as the calendar quarter in which the production of an engine family begins or ends.
3. End of Assembly-Line is defined as that place where the final inspection test or quality-audit test is performed.
4. Assembly-Line Tests are those tests or inspections which are performed on or at the end of the assembly-line.
5. Assembly-Line Quality Audit-Test is defined as the test performed on a minimum sample of 2.0 percent (or other approved sample) of the production vehicles produced and delivered for sale in California.
6. Assembly-Line Inspection Tests are those tests performed pursuant to Section B of these procedures.
7. Functional Test is defined as a type of test or inspection which is performed on engines or vehicles to detect if the emission control system is operating properly.
8. Subgroup means a set of vehicles within an engine family distinguishable by characteristics contained in the manufacturer's application for certification.
9. Vehicles certified for sale in California means all vehicles certified to California emission requirements and all federally certified vehicles legal for sale in California.



## APPENDIX A

### ALTERNATE QUALITY-AUDIT VEHICLE SELECTION CRITERIA

This appendix sets forth the alternative procedure for selection of Quality -Audit vehicles. It includes the flow diagram in Figure A-1.

1. Vehicles shall be randomly selected at a rate of 2.0 percent of engine family production at the beginning of production. When test results of 30 vehicles have been accumulated, an evaluation as indicated below shall be made.
2. Calculate the family mean and standard deviation of each pollutant (HC, CO, NO<sub>x</sub>). Identify vehicles which have emission levels greater than three standard deviations above the mean. Eliminate these emission data points and recalculate the mean and standard deviation. Continue the calculation until there are no values greater than three standard deviations above the mean. Count the number of these data points greater than the standard (outliers). If the number of outliers is equal to or less than the allowable number in Table A -1 for each pollutant, the engine family is eligible to continue to a second evaluation shown in paragraph 3 below. Otherwise, sampling must continue at a rate of 2.0 percent of production for the rest of the month.
3. If the allowable outlier criteria is met, the family mean, standard deviation, and sample size determined for each contaminant before excluding any outliers, is substituted in the following expression:

$$\frac{(\text{emission standard} - \text{mean}) (N^{1/2})}{(\text{standard deviation})}$$

If the expression is greater than C in Table A -2 below, and the manufacturer reasonably estimates that the quarterly engine family production will exceed 5,000 vehicles, the sampling rate for the remaining portion of the calendar month following the date of selection of the last of the 30 vehicles shall be 30 per month, applied on a prorated basis. If the expression is greater than C in Table A-2 below, and the manufacturer reasonably estimates that the quarterly engine family production will be 5,000 vehicles or less, the sampling rate for the remaining portion of the calendar month following the date of selection of the last of the 30 vehicles shall be 17 per month, applied on a prorated basis. If the expression is equal to or less than C in Table A -2, the sampling rate shall continue to be 2.0 percent of production for the remaining portion of the month in which selection of the 30 vehicles is completed. The value of C is a function of the coefficient of variation (standard deviation/mean). The coefficient of variation and "C" shall be rounded to the number of decimal places shown in Table A-2.

**Table A-1**

Sample Size	Allowable Outliers	Sample size	Allowable Outliers
1- 32	1	430-478	11
33- 68	2	479-528	12
69-107	3	529-578	13
108-149	4	579-629	14
150-193	5	630-680	15
194-238	6	681-731	16
239-285	7	732-783	17
286-332	8	784-835	18
333-380	9	836-887	19
381-429	10	888-939	20

**Table A-2**

Coefficient of Variation	C
0.1	0.5
0.2	1.2
0.3	1.8
0.4	2.5
0.5	3.1
0.6	3.8
0.7	4.4
0.8	5.1
0.9	5.7

4. For each remaining calendar month in the quarter, both mathematical procedures set forth in paragraph 2 and 3 shall be repeated at the end of the preceding month, using all of the test data accumulated in the quarter. The sampling rate for each remaining calendar month in the quarter shall be 30 vehicles per month, 17 vehicles per month, or 2.0 percent of the production as determined under the standards in paragraph 3.

5. At the end of the quarter, all of the data accumulated during the quarter is evaluated, and the compliance of the family with emission standards is determined.

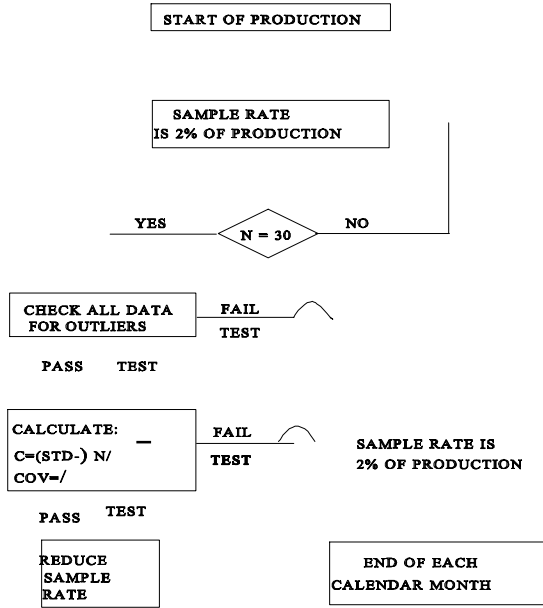
6. For each subsequent quarter, the preceding sample selection method shall be followed. The sample rate determination for the first month of each subsequent quarter shall be based on the accumulated data from the previous quarter. The sample rate for the succeeding months of the quarter shall be determined as previously set forth.

7. If the start of production does not coincide with the first of a quarter, the sequence for sample rate determination shall be followed, but references to remaining calendar months may not be appropriate.

8. Where a manufacturer has sampled vehicles at a rate of 17 per month following a reasonable estimate that the quarterly engine family production will be 5,000 vehicles or less, and subsequently determines, or reasonably should determine based on information available to the manufacturer, that the quarterly engine family production will exceed 5,000 vehicles, the manufacturer shall increase the sampling rate for the quarter such that the requirements of paragraph 3 applicable to families reasonably estimated to exceed a quarterly production of 5,000 vehicles are satisfied.

FIGURE A-1

FIRST QUARTER OF PRODUCTION



As amended August 5, 1999

FIGURE A-1

SUBSEQUENT QUARTERS

FIRST MONTH SAMPLE  
RATE IS BASED ON  
ANALYSIS OF ALL PRIOR  
QUARTER DATA

CHECK ALL DATA  
FROM CURRENT  
QUARTER FOR  
OUTLIERS

FAIL  
TEST

PASS TEST

CALCULATE:  
C=(STD-) N/  
COV=/  
-

FAIL  
TEST

SAMPLE RATE IS  
2% OF PRODUCTION

PASS TEST

REDUCE  
SAMPLE  
RATE

END OF EACH  
CALENDAR MONTH

**FIGURE A-1  
OUTLIER CALCULATION PROCEDURE**

1. CALCULATE THE MEAN AND STANDARD DEVIATION FOR EACH POLLUTANT WITH DF APPLIED.
2. CALCULATE THE MEAN PLUS THREE STANDARD DEVIATIONS.
3. IDENTIFY ALL EMISSION DATA GREATER THAN  $X + 3s$  STANDARD DEVIATIONS.
4. REMOVE THE OUTLIERS FROM THE DATA AND RECALCULATE THE MEAN AND STANDARD DEVIATION.
5. REPEAT STEPS 2, 3, 8, 4.
6. REPEAT STEPS 2, 8, 3
7. IDENTIFY ALL OUTLIERS THAT EXCEED APPLICABLE CERTIFICATION STANDARD AND COUNT THE NUMBER.
8. COMPARE THE NUMBER OF OUTLIERS WITH THE MAXIMUM ALLOWED BY THE OUTLIER TABLE. IF THE NUMBER OF OUTLIERS EXCEEDS THE MAXIMUM, SAMPLE RATE IS 2.0% OF PRODUCTION. IF THE NUMBER IS LESS THAN THE MAXIMUM ALLOWED, CALCULATE "C".

## **APPENDIX B**

### **EMISSION CONTROL COMPONENTS AND SYSTEMS**

Air Diverter Valve  
Air/Fuel Control System  
Air Injection Control Valves  
Air Injection Pump  
Camshaft Position Sensor  
Canister Purge Valve  
Carburetor or Fuel Injection System  
Catalyst  
Choke  
Controlled Air Intake System  
Coolant Temperature Sensor  
Crankshaft Position Sensor  
Diesel Particulate Control System  
Distributor  
EGR Control System Components  
Electronic (Computer) Control System  
Emissions Related Hoses, Tubing, Clamps, Belts, Fittings, Wiring,  
Connectors, Sensors and Switches.  
Evaporative System  
Exhaust Gas Recirculation  
Ignition Coil & Wires  
Ignition Control Module  
Intake Air Temperature Sensor  
Malfunction Indicator Light (MIL)  
Mass Air Flow Sensor  
Misfire Detection System  
On-Board Diagnostic System  
Oxygen Sensor  
Positive Crankcase Ventilation  
Power Train Control Module (Built-in test, BIT)  
Throttle Position Sensor  
Vacuum Hose Connections