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TO: ALL LARGE SPARK-IGNITION (LSI) ENGINE MANUFACTURERS
ALL OTHER INTERESTED PARTIES

SUBJECT: CERTIFICATION GUIDELINE FOR 2001 MODEL-YEAR (MY) AND LATER
LSI ENGINES

Enclosed are the guidelines for preparing and submitting applications for certification of MY 2001 and later LSI engines. Applications prepared following this guideline will permit an expedited review and certification approval by the Air Resources Board's (ARB's) staff. New LSI engines are not legal for sale and use in California until they are certified by the ARB. Violations of the certification requirements will subject the engine manufacturer and selling dealers to enforcement actions by the State.

This guideline includes the following parts:

- Part I: Certification Overview
- Part II: General Instructions
- Part III: Application Format Instructions
- Attachment 1: Certification Summary Sheet and Supplemental Information Formats
- Attachment 2: Certification Database

For an engine family to be certified by the ARB, the manufacturer's application package must include the following that have been properly prepared:

1. Cover Letter
2. Certification Summary Sheet
3. Supplemental Information
4. Certification Database. This can be transmitted electronically to the manufacturer's assigned ARB Certification Section staff.

Should you have further questions on this matter, please contact Mr. Tom Chang, Staff Engineer, Certification Section, at (626) 575-6809, or by e-mail at ychang@arb.ca.gov.

Sincerely,

/s/

R. B. Summerfield, Chief
Mobile Source Operations Division

Enclosures

California Environmental Protection Agency

REFERENCES

References 1 through 14 below can be accessed from the Air Resources Board's **website** at <http://www.arb.ca.gov/regact/lore/lore.htm>.

In this certification guideline, large spark-ignition (LSI) engines are grouped into **Class 1** for engines **less than or equal to 1.0 liter** in displacement, and **Class 2** for those **over 1.0 liter**. References marked with an **asterisk (*)** are specific to **Class 1** engines; those with a **double asterisk (**)** are specific for **Class 2**.

1. Title 13, California Code of Regulations, (13 CCR) Section 2430 (**Applicability**)
2. 13 CCR Section 2431 (**Definitions**)
3. 13 CCR Section 2432 (**Test Procedures**)
4. 13 CCR Section 2433 (**Emission Standards**)
- 5.a. 13 CCR Section 2404* (**Emission Control Labels**)
b. 13 CCR Section 2434** (**Emission Control Labels**)
- 6.a. 13 CCR Section 2405* (**Emission Warranty**)
b. 13 CCR Section 2435** (**Emission Warranty**)
- 7.a. 13 CCR Section 2406* (**Emission Warranty**)
b. 13 CCR Section 2436** (**Emission Warranty**)
- 8.a. 13 CCR Section 2407* (**New Engine Compliance and Production-Line Testing**)
b. 13 CCR Section 2437** (**New Engine Compliance and Production-Line Testing**)
9. 13 CCR Section 2438** (**In-Use Compliance**)
10. 13 CCR Section 2439** (**Engine Recall Procedures**)
11. California Exhaust Emission Standards and Test Procedures for 2001 Model Year and Later Off-Road Large Spark-Ignition Engines, adopted September 1, 1999. (**LSI Engine Emission Testing and Certification Procedures**)
12. California Exhaust Emission Standards and Test Procedures for 2000 Model Year and Later Small Off-Road Engines, amended March 23, 1999. (*) (for **Emission Testing of Class 1 Engines**)
13. California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, as adopted May 20, 1987, and last amended June 24, 1996. (**for Test Fuel Specifications purposes**)
14. Attachment C (**List of Pre-Empted Equipment**) to Air Resources Board Mail-Out #MSC 98-20, "Notice to Public Hearing and Staff Report to Consider Adoption of Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines," dated September 4, 1998.

PART I

CERTIFICATION OVERVIEW

For this certification guideline, large spark ignition (LSI) engines are grouped into **Class 1** for engines **less than or equal to 1.0 liter** in displacement, and **Class 2** for those **over 1.0 liter**.

New LSI engines rated **at and above 25 horsepower (HP)** for powering non-road equipment such as forklift trucks, turf care equipment, generators, compressors, refrigeration units below 50 HP, sweeper devices, tractors, etc. must be certified by the Air Resources Board (ARB) from model-year (**MY**) **2001** for **Class 2** engines and from **MY 2002** for **Class 1** engines to be legal for sale and use in California. The **Executive Orders** certifying these engines are valid for only **one model-year** of production. **New Executive Orders for production in each subsequent model year** must be obtained from ARB. Selling an engine before the engine receives ARB certification will subject the engine manufacturer and the selling dealers to ARB **enforcement actions** as authorized by state laws.

For **Class 2** engines, compliance with the **exhaust emission standards** is required according to the following **phase-in** schedule: **25** percent (%) of a manufacturer's LSI engines "fleet" must meet the emission standards in MY 2001, **50%** in MY 2002, **75%** in MY 2003, and **100%** from MY 2004. During MY 2001-2003, a manufacturer only has to test a stabilized engine to demonstrate compliance with the emission standards for ARB certification. From MY **2004**, the certification process includes a **durability demonstration** and the **determination of deterioration factors (DFs)** whereby compliance with the emission standards must be demonstrated for the useful life of the engines. Class 2 engines produced by **small-volume manufacturers (SVMs)** are not required to meet the exhaust emission standards until MY **2004**.

Note that MY **2001-2003** engines that are not required to meet the exhaust emission standards (i.e., **emission non-compliant** or **ENC** engines) (e.g., the 75-50-25% "phase-out" engines, and the SVM engines) **must still be certified** via ARB Executive Orders although the certification of such ENC engines is much simpler and does not require emission testing.

For **Class 1** engines, there is **no similar SVM deferment or phase-in compliance schedule**. **All** engines must meet the **exhaust emission standards** and **durability requirements** from **MY 2002**. The **emission test procedures, labeling, warranty**, new engine compliance and production-line testing (**NEC/PLT**) requirements for Class 1 engines are those applicable to **small off-road engines**.

Closed crankcases are required for **all** LSI engines that are subject to ARB certification. That is, all **MY 2001 and newer Class 2 engines including the ENC engines** must have closed crankcases. All **Class 1** engines must have their crankcases closed beginning in **MY 2002**.

LSI engines are grouped in **engine families** for certification and other implementation purposes (e.g., NEC/PLT, in-use testing, and recall). An engine family includes engine models that share similar engine design and emission control features such that the engines can be expected to exhibit similar emission performance. The ARB's emission control program for LSI engines can be roughly divided into three phases: **Pre-Production** with certification, running changes and field fixes; **Production** with NEC/PLT; and **Post-Production** with in-use testing.

Part I provides an overview of the pre-production (**certification**), production (**NEC/PLT**) and post-production (**in-use**) phases of the ARB's LSI engine control program.

1. CERTIFICATION

- Certification Process
- Certification Responsibilities
- Phase-In Requirements
- Durability Testing and Determining DFs
- Certification Testing
- Engine Families with Multiple Fuel Systems
- Data Carry-Over and Carry-Across
- Running Changes and Field Fixes

a. Certification Process

(i) **Emission-Compliant Engines:** For each engine family, the manufacturer must test a prototype engine that has been selected and stabilized as the official certification engine to show compliance with the emission standards. For an engine family that is subject to durability requirements (from MY 2002 for Class 1 engines; from MY 2004 for Class 2 engines), the manufacturer must determine the emission **DFs** over the appropriate durability period for the family. The DFs are applied to the emission results from the family's official certification engine to demonstrate that the deteriorated emission rates (i.e., after applying the DFs) comply with the applicable emission standards. The ARB may direct the manufacturer to conduct a **retest** if the original test result indicates marginal compliance. **Anti-tampering devices** that will be installed on production engines for protection against unauthorized adjustments of emission-related adjustable parameters must be approved by ARB. The manufacturer's format for the **certification label** and the location where the label is affixed to each production engine must be approved by the ARB. The manufacturer's **emission warranty statement** provided with each production engine must also be approved by ARB.

(ii) **Emission-Non-Compliant (ENC) Engines:** (This paragraph is applicable only to **Class 2 engines that are not required to meet the emission standards during MY 2001-2003**; these engines are (A) produced by non-SVMs outside the 25-50-75% phase-in requirements, or (B) produced by SVMs.) For ENC engine certification, there are no requirements for certification testing, emission warranty, running change and field fix approval, NEC/PLT, or in-use testing and recalls. The certification and labeling of ENC engines serves to identify them from emission-compliant engines during the phase-in period. The **application** for certification of ENC engines consists only of the **certification label, Certification Summary and Model Summary** pages from Attachment 1.

(iii) **Application for Certification:** For each engine family (emission-compliant and ENC), the manufacturer must submit to ARB an **application for certification** containing all the required information and/or test data in the **ARB-specified format**. The ARB is required to approve or disapprove an application within **90 days** after receipt of the **complete application**. The normal processing time is about **4-6 weeks**. To **expedite the certification approval**, requests for ARB approval of anti-tampering devices, labels, the emission warranty statement, and any modification to the test procedures should be submitted in advance of the application.

b. Certification Responsibilities

Under **ARB's general policy**, the **party that completes the engine assembly and renders the engines operable** is required to **obtain ARB certification** for the engines and is held **liable for complying with all of ARB's certification, emission warranty, NEC/PLT, and in-use testing and compliance requirements**.

However, it is common in the LSI engine industry that manufacturer “A” may only offer bare engines that lack a number of essential subsystems (e.g., fuel, ignition, lubrication or exhaust systems, etc.) for engine operation. An engine dresser “B” uses the basic engines from “A” and adds all of the essential subsystems to complete the engines and render them operable before “B” sells the complete engines to an original equipment manufacturer (OEM) “X” for installation in X’s equipment applications. Another engine dresser “C” uses the basic engines from “A” and adds many of the essential subsystems before “C” sells the incomplete engines to (i) another engine dresser “D” for final engine completion before “D” sells the complete engines to an OEM “Y” for installation in Y’s equipment applications, or (ii) another OEM “Z” who will complete the engine assembly and install the complete engines in Z’s equipment applications. Under ARB’s policy, “B,” “D” and “Z” are expected to **certify** their respective engines with the ARB and will be held **liable for complying with all of ARB’s requirements** for LSI engines.

In some situations, the equipment assembly process may make it **impractical to provide a complete engine for installation into a piece of equipment** (e.g., for “B” to ship the engines to “X” and for “D” to ship the engines to “Y” that are complete with all of the necessary subsystems). For example, it may be necessary for a catalytic converter or exhaust system to be installed by “X” and “Y” only after the engine is placed in the equipment. Further, for marketing reasons, “B” and “D” may allow “X” and “Y” to source the catalytic converter or exhaust system directly from suppliers.

For the scenarios above, “B” and “D” are still **responsible for complying with all of ARB’s requirements** for these LSI engines. “B’s” and “D’s” **applications for certification must describe the technical specifications and procedures** that will be provided to “X” and “Y” for installing the catalytic converter and exhaust system, as applicable. “B” and “D” must also obtain **ARB approval for their NEC / PLT plans involving the third parties “X” and “Y.”** “B” and “D” should, for their own protection, obtain a **written agreement** from “X” and “Y” to (i) **adhere to the technical specifications and/or installation procedures** that are provided by “B” and “D” concerning the catalytic converter and exhaust system installation, and (ii) **cooperate** with “B” and “D” in **complying with the NEC / PLT requirements**. Should engines completed by “X” or “Y” be selected for NEC / PLT but “X” or “Y” **refuse to cooperate** in providing the selected engines, or to grant ARB access to the selected engines, the Executive Orders for the affected engine families can be **revoked** and the affected engines will be deemed uncertified, subjecting all involved parties to **enforcement actions**.

For **other** engine completion **arrangements**, please **contact** your assigned ARB Certification Section staff for determining the certification and related responsibilities of the parties involved.

c. Phase-In Compliance (Non-SVM Class 2 Engines Only)

The phase-in compliance is determined based on a manufacturer’s California “**fleet**” (**F**) of **LSI engines that are subject to ARB certification**. Engines that are used exclusively in **pre-empted equipment** (Reference 14) are **not** subject to ARB certification and they are **excluded** from a manufacturer’s “fleet” for phase-in compliance purposes. For example, manufacturer **ABC** produces the following numbers of engines **for sale and use in California** in a model-year:

- “**P**”: the number of engines that are for **exclusive** use in **pre-empted** equipment;
- “**NP**”: the number of engines that are for use only in **non-pre-empted** equipment; and
- “**DNP**”: (D for dual pre-empted and non-pre-empted uses.) the number of engines that can be used to power **either pre-empted or non-pre-empted** equipment. (When an engine can be used in both pre-empted and non-pre-empted equipment but the engine manufacturer does not have effective controls to ensure the ultimate use of the engine in only pre-empted equipment, the engine is subject to the LSI engine regulations.)

For manufacturer ABC, the **sum F = NP + DNP** is its “fleet “ of LSI engines that are subject to ARB certification and the 25-50-75-100% phase-in compliance requirements. For example, at least 25% of the NP+DNP production for MY 2001 must meet the emission standards. The remaining portion of the fleet would be certified as non-emission compliant. A manufacturer should obtain **concurrence from ARB for the methods to determine the relevant California “NP” and “DNP” production numbers** based on, for example, warranty card returns, factory shipping records, purchase orders, historical data, or any other data and information to delineate California versus non-California use of the engines with a reasonable degree of accuracy and certainty.

d. Durability Testing and Determining DFs

Durability testing and the determination of DFs for affected engine families are required from MY 2002 for Class 1 LSI engines and from MY 2004 for Class 2 LSI engines. The DF is a measure of the emission deterioration over the family’s useful life. DFs are determined through the manufacturer’s **durability testing**. A manufacturer should submit its durability test plan for ARB approval prior to conducting the testing to avoid rejection of the resulting DF.

The following is a summary of the elements of an acceptable durability test program. A prototype **durability data engine** in the configuration expected to exhibit a **high deterioration rate** (e.g., the hottest engine conditions and catalyst temperature) is run on an **operating schedule** and **commercially available fuels** to accumulate service hours that age the engine and its emission controls up to the equivalent of the specified durability period. Emission-related **scheduled maintenance** as permitted in the regulations may be performed. **Unscheduled maintenance** may be performed only with prior ARB approval. During service accumulation, engine emissions are **periodically measured** using the regulation-specified test fuel and test procedure to establish the trend line that will be used to determine the DF. Depending on the type of anti-tampering device used, the ARB may specify the **settings of the adjustable parameters** for the purpose of conducting the durability test. **Whole-engine aging** (normal or accelerated) and **component bench aging** are acceptable methods for service accumulation.

e. Certification Testing

Close to the time of production, an **emission data engine** (a prototype engine with **production-intent calibrations**) which is expected to exhibit **worst-case emissions** (e.g., highest specific fuel rate, coolest catalyst temperature) is run according to the manufacturer’s **break-in** procedure to stabilize the engine’s emissions. An emission test is then conducted using the specified test fuel and test procedure. Depending on the type of anti-tampering device used, the ARB may specify the **settings of the adjustable parameters** for the purpose of conducting the certification test. For the engine family to be certified, its **certification emission level**, which is the emission data engine’s test result adjusted by the DF (i.e., added or multiplied), must not exceed the applicable emission standard.

f. Engine Families with Multiple Fuel Systems

Under the LSI test procedures, an engine family may include engine models that have different fuel systems if, based on engine characteristics other than the fuel systems, these engine models can normally be classified in the same engine family. For example, an engine family may include engine models that operate exclusively on gasoline and models that operate exclusively on propane fuels. For such an engine family, the engine configuration that is expected to exhibit the highest deterioration rates using **any** of the fuels will be selected for

durability testing and determining the DFs. However, an engine configuration that is expected to yield the highest emissions for **each** fuel must be tested for certification. In the example above, either a gasoline or propane engine can be used for durability testing and determining the DFs depending on which one has the highest operating or catalyst temperature. However, two worst-case certification engines will be needed, one for gasoline and one for propane fuel.

g. Data Carryover and Carryacross

Subject to ARB approval, the durability data and/or certification emission data may be **carried over**, in lieu of new tests, to subsequent engine families in the following model years, provided there have been no changes that would result in the new selection of the durability engine or emission data engine. Also, subject to ARB approval, the durability data and/or certification emission data may be **carried across**, in lieu of new tests, to a different engine family in the same model year if the manufacturer adequately demonstrates that the DF and/or emission data is representative of the new engine family.

h. Running Changes and Field Fixes

Any factory change to the engines during the model-year production must be approved by ARB via a **running change (RC)** request. Any change to the engines where the change is implemented after the engines left the assembly line (e.g., at factory warehouses, distribution centers, dealers) must be approved by ARB via a **field fix (FF)** request. A field fix request typically occurs after the model-year production has ended. Running changes and field fixes not approved by ARB will render affected engines uncertified and subject the manufacturer to ARB enforcement actions.

For questions regarding certification, please **contact** your **assigned Certification Section staff person** or Mr. Duc Nguyen, Manager, Certification Section, at (626) 575-6844, or by e-mail at dnguyen@arb.ca.gov.

2. NEW ENGINE COMPLIANCE (NEC) AND PRODUCTION LINE TESTING (PLT)

During production, the manufacturer is subject to NEC and PLT requirements to show that the engine family is in compliance with the emission standard. For **NEC** testing, the ARB will select samples of production engines for testing at ARB or another designated facility. For **PLT**, the manufacturer will select and test samples of production engines according to its **sampling plan** and **test procedure** that have been approved by ARB. For **Class 1** LSI engines, either the cumulative sum (**CumSum**) or the "1%" PLT method may be used. The manufacturer must declare its selection of either method prior to the start of the model-year production. Mid-year changing to the other method is not allowed. For **Class 2** LSI engines, the **CumSum** PLT procedure must be used. **Quarterly reports** of the PLT test results must be submitted to ARB in a specified format and within specified time limits. For more information, please **contact** Ms. Maggie Wilkinson, Manager, New Vehicle and Engine Audit Section, at (626) 575-7040, or by e-mail at mwilkins@arb.ca.gov.

3. IN-USE TESTING (Applicable to MY **2004** and later **Class 2** LSI engines only.)

Manufacturers are subject to in-use testing to demonstrate continued engine compliance. The **ARB will select** certain engine families for in-use testing. Upon ARB notification, the **manufacturer** shall **procure and test** in-use engines in accordance with the test procedures (Reference #7). To avoid rejection of the gathered in-use data, a manufacturer should submit its **in-use test plan** for ARB approval prior to conducting the in-use testing. If the in-use test results exceed the applicable emission standard, the manufacturer will be subject to **remedial actions** that are accepted and approved by ARB. For more information, please **contact** Mr. Michael O'Connor, Manager, In-Use Vehicle Testing Section, at (626) 575-6814, or by e-mail at moconnor@arb.ca.gov.

PART II**GENERAL INSTRUCTIONS**

These instructions provide guidance regarding the preparation, submission and revision of certification applications for 2001 and subsequent model year LSI engines. Only **information essential for certification** is required in this format. **Other information** required by the test procedures (e.g., test engine build records, test and maintenance records, etc.) must be maintained by the manufacturer and made available to the ARB within **30 days** upon request. An application submitted in accordance with these instructions will enable an expedited review and approval by the ARB. Manufacturers must submit all **revisions** to the application to the ARB for approval. Part II covers the following subject matter:

- Where To Submit Applications For Certification
- Letter Of Intent
- Cover Letter
- Labeling
- Emission Warranty
- Test Procedures
- Modified Test Procedures
- Adjustable Parameters And Anti-Tampering Devices
- Certification Test Fuels
- Amendments To The Applications
- Running Changes And Field Fixes
- Confidentiality

1. WHERE TO SUBMIT APPLICATIONS FOR CERTIFICATION

All certification-related applications and correspondence should be forwarded to:

Mr. R. B. Summerfield, Chief
Mobile Source Operations Division
Air Resources Board
9480 Telstar Avenue, Suite 4
El Monte, California 91731-2988

2. LETTER OF INTENT

A letter of intent should be submitted to the ARB **prior to the first application** for certification for the model-year. The letter of intent should list **planned engine families**, the projected **dates** when the **applications will be submitted**, and the **dates by which the Executive Orders are needed**. The manufacturer's **phase-in compliance plan** during MY 2001 through 2003 should also be included in the letter of intent. Any **certification or testing issues** that could delay the certification process of any engine family may be included in the letter of intent. **Updates** to the manufacturer's certification plan should be submitted in a timely manner. ARB staff uses the information provided in the letter of intent to plan ahead for the certification year and to resolve issues in advance so that manufacturers' certification schedules can be met.

3. COVER LETTER

A cover letter, **signed** by the manufacturer's authorized representative, must accompany each engine family application. The cover letter should **recap highlights about the engine family**, such as its new or carry-over test data status, the use of a new engine and/or emission control technology, the use of a modified test procedure, and the anticipated start date of production. The following statements of compliance must be provided in the letter:

a) Conformance with the general standards regarding no increase in emissions or unsafe conditions as stated in section 4 of the "California Exhaust Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines," adopted September 1, 1999.

b) Conformance with the specifications for the emission control label per 13 CCR Section 2404 (Reference 5.a. for Class 1 engines) or 2434 (Reference 5.b. for Class 2 engines).

c) That the test engine for which data have been submitted has been tested in accordance with the applicable test procedures, that it meets the requirements of such tests, and, on the basis of such tests, that it conforms to the requirements of this Part (Reference 11).

4. LABELING

The labeling requirements are specified in **Reference 5.a.** for **Class 1** LSI engines (**at or below 1.0 liter**), and in **Reference 5.b.** for **Class 2** LSI engines (**greater than 1.0 liters**). The engine certification label is an important ARB requirement for identifying certified and legal engines from those uncertified. The labels are used to assist enforcement activities such as in-use testing procurement and in-use emission credits accounting (averaging, banking and trading, or ABT for short). To accomplish these objectives, the certification label must have the **correct engine family name, applicable model-year of certification, compliance statement**, and other important information as specified in the regulations. Labels must be **readily legible and visible** on the engine.

Note that engines for **exclusive** use in **pre-empted equipment** are **not** subject to the LSI engine certification or labeling requirements. However, when an engine is capable of **dual use in both pre-empted and non-pre-empted equipment**, and the engine manufacturer does **not have effective controls regarding the ultimate use of the engine** in only pre-empted equipment, the engine is considered to be **subject to ARB regulations for LSI engines** and must be labeled accordingly. (This dual-use engine is part of the manufacturer's "**DNP**" production as discussed in Part I, Section 1.c. of this guideline.)

For **Class 2** engines that are **not** required to comply with the emission standards during the MY 2001-2003 phase-in period (so-called emissions-non-compliant engines or **ENC** engines) (e.g., engines in the 75-50-25% phase-out part of a non-SVM manufacturer's "fleet", and SVMs' engines), the following compliance statements are suggested in preference order:

- "This engine conforms to 2001 (2002 or 2003) California regulations applicable to emissions-non-compliant off-road large spark-ignition engines."; or
- "This emissions-non-compliant engine conforms to 2001 (2002 or 2003) California regulations for off-road large spark-ignition engines."; or

- "This engine is subject to 2001 (2002 or 2003, as applicable) California 13 CCR 2443(b) for off-road large spark-ignition engines but is emissions-non-compliant."

In the compliance statement examples above, the acronym "**LSI**" may be **substituted** for the term "large spark-ignition". **Other** compliance statements for ENC engines may be used only when **approved in advance by ARB**.

Manufacturers are required to submit **samples** of the engine labels (or **copies**) for each engine family to the **ARB for review and approval** of the **format, content and placement location**. The proposed location(s) must be shown by either a drawing or photograph. Detailed written explanations of the label locations are also acceptable. Label samples and proposed label locations may be **submitted** to ARB for approval **in advance** of the actual certification application to **prevent any certification delay**.

If the engine label will be obscured by the OEM's equipment or housing, a **supplemental label** must be provided for affixing on the exterior of the equipment. It must contain the same information as the engine label except for manufacture date, which may be omitted. However, if the **manufacture date** is not included on the supplemental label, it must be stamped or indicated elsewhere on the exterior of the equipment.

5. EMISSION WARRANTY

A copy of the engine manufacturer's emission warranty statement that will be provided to end-users must be submitted for ARB review and approval. The ARB's emission warranty requirements can be found in **References 6.a. and 7.a.** for **Class 1** engines, and in **References 6.b. and 7.b.** for **Class 2** engines. Manufacturers may submit their proposed warranty statements for approval in advance of the application to prevent any certification delay. For **Class 2** engines, the **list of high-cost warranty parts** must be included.

6. TEST PROCEDURES

The test equipment provisions and emission test procedures are specified in **Reference 11** for **Class 2** engines, and in **Reference 12** for Class 1 engines.

7. MODIFIED TEST PROCEDURES

Any modifications to the prescribed test equipment and/or test procedures due to unique engine designs, laboratory equipment arrangements, facility limitations, etc. must be approved in advance by the Executive Officer and described in the application. The **use of unapproved test equipment or procedures can result in rejection of generated test data**.

8. ADJUSTABLE PARAMETERS AND ANTI-TAMPERING DEVICES

If a test engine has a **parameter that can be adjusted** in a way that can significantly affect emissions, it will be **tested at the possible extremes of the adjustment** (i.e., maximum rich and lean settings). **Samples** of a manufacturer's **proposed anti-tampering measure** to prevent unauthorized adjustments, preferably as implemented on the carburetor or engine as applicable, should be **submitted** in advance of the application to the ARB for approval. All adjustable

parameters, sealed and unsealed, and the corresponding **ARB approval number** must be reported in the application. If the parameter or method of tamper-resistance is subsequently modified, a new ARB approval will be required.

9. CERTIFICATION EMISSION TEST FUELS

The fuel for emission testing must meet the specifications in the test procedures to reduce emission variations. Testing with **unauthorized fuel** will result in **rejection of the test results**. The **allowable test fuels** for LSI engines are **the same as** the allowable test fuels for **on-road light-duty vehicles and trucks**. (Reference 13) The test fuel specifications are listed here for manufacturer's convenience.

a. Gasoline. **Two** test fuels are allowed:

- (i) Indolene Clear. This certification gasoline is specified in the Code of Federal Regulations, Title 40, Part 86, section 113-94(a)(1). [40 CFR 86.113-94(a)(1)].
- (ii) California Phase 2 Gasoline (Cleaner Burning Gasoline). The specifications of this certification gasoline are provided in the on-road test procedures (Reference #13, Section 9(a)(1)(ii)). This gasoline may be used as an **option** to Indolene Clear.

b. Gaseous Fuels (LPG, Propane, CNG, LNG):

- (i) LPG and Propane. The emission test fuel must meet the following specifications:
 - propane content of 93.5 volume percent +/- 1.0%;
 - propene content of 3.8 volume percent +/- 0.5%; and
 - butane and heavier components of 1.9 volume percent +/- 0.3%.
- (ii) CNG and LNG. The emission test fuel must meet the following specifications:
 - methane content of 90.0 mole percent +/- 1.0%;
 - ethane content of 4.0 mole percent +/- 0.5%;
 - C₃-and-higher hydrocarbon content of 2.0 mole percent +/- 0.3%;
 - oxygen content of 0.5 mole percent maximum;
 - inert gas (sum of CO₂ and N₂) content of 3.5 mole percent +/- 0.5%.

10. AMENDMENTS TO THE APPLICATIONS

Any revisions to an application due to typographical errors, corrections, running changes or field fixes, new test data or information must be **submitted to the ARB**. If the changes affect the **Certification Summary** and/or the **Model Summary forms**, the revised forms must be completely filled and submitted. For the other parts of the application, only the revised information on the **affected application pages** has to be submitted, together with the following for identification purposes:

- Manufacturer Name
- Model Year
- Engine Family
- Process Code (e.g., correction, running change)
- Engine Displacement
- Comments Field (describing the update or change)

-The fields that have been changed or corrected.

11. RUNNING CHANGES AND FIELD-FIXES

Any **factory change** to the engines **during the model-year production** must be approved by ARB via a manufacturer's submitted **running change request**. Any change to the engines where the change is **implemented after the engines leave the assembly line** (e.g., at factory warehouses, distribution centers, dealers) must be approved by ARB via a manufacturer's submitted **field fix request**; a field fix request **typically** occurs **after** the model-year production has ended. Running changes and field fixes **not approved by ARB** will render affected engines **uncertified** and subject the manufacturer to **ARB enforcement actions**. If the change affects an emission-related part or results in a new "worst-case" test engine, **new test data or engineering evaluations** will be required to demonstrate that the engine family will remain in compliance. Only the **affected pages and information fields** of the application need to be submitted.

12. CONFIDENTIALITY

The ARB will deem the engine manufacturer's **projected California sales, production periods and catalytic converter composition (precious metal ratio and loading) confidential**. Any **other information** that is designated by the manufacturer as **confidential** may not receive automatic treatment for confidentiality unless the manufacturer can **justify** that the information is truly privileged, confidential business information. California guidelines (Sections 91000-91002, Title 17, California Code of Regulations, and Health and Safety Code Section 39660(e)) will be followed in the handling of confidential information.

PART III

APPLICATION FORMAT INSTRUCTIONS

The **Certification Summary Sheet** and **Supplemental Information Sheets** in **Attachment 1** are self-explanatory. However, further explanation is deemed useful for certain items in these application pages. The **detailed explanations below are numbered corresponding to the numbered items of the application forms**. That is, numbers 1-11 correspond to items 1-11 of the Certification Summary Sheet and numbers S01-S24 correspond to items S01-S24 of the Supplemental Information Part.

1-2: (RESERVED)

3. ALL ENGINE SALES CODES WITHIN EF: (check all applicable)
CALIFORNIA-ONLY ___ **50-STATE** ___ **49-STATE** ___.

Certain engines within an engine model and family and/or certain distinct models within an engine family may be intended by the manufacturer to comply with all of California and/or U.S. Environmental Protection Agency (U.S. EPA) regulations for LSI engines. Each type of these engines can be offered for sale and use in California only, or in the other 49 states only, or in all 50 states, accordingly. The **compliance statement on the engine certification label** reflects which requirements are being met. A compliance statement like, “**...conforms to California...**” will identify an engine for sale and use in California only. One with “**...conforms to U.S. EPA...**” is found on an engine that may be sold and used in the other 49 states only. An engine that is legal for sale and use in all 50 states must have a certification label containing a compliance statement like, “**...conforms to California and U.S. EPA...**”

The box or boxes in item 3 should be checked as applicable based on the types of labels used.

At present, the **U.S. EPA has not adopted regulations for off-road LSI engines**. As a result, for a compliance statement like “**...conforms to California...**”, the California-Only box should be checked if the manufacturer only markets the engines for use in California; the 50-State box should be checked if the engines are for sale and use in California and any of the other 49 states.

Upon U.S. EPA adoption of similar regulations for LSI engines, the appropriate box or boxes should be checked corresponding to the types of the certification labels in the engine family as discussed in first paragraph. Suppose that engine family abc has three models, 123, 456 and 789. Example 1: If all three models have only the California-Only label, then only the California-Only box should be checked. Example 2: If engine models 123 and 456 have the California-Only label and engine model 789 has the 49-State label, then the California-Only and 49-State boxes should be checked. Example 3: If each of the engine models 123, 456 and 789 has some engines bearing the California-Only label and some bearing the 49-State label, the California-Only and 49-State boxes should be checked. Example 4: If engine models 123 and 456 have only the California-Only label, and engine model 789 has some engines bearing the California-Only label and some bearing the 50-State label, the California-Only and 50-State boxes should be checked.

4. PRODUCTION ENGINE ASSEMBLY

Please refer to Part I, Section 1.b. for related explanations of terms and manufacturer's responsibilities.

5-7.g.: (RESERVED)

7.h.: **OPERATING FUEL:** Please refer to Part I, Section 1.f. for related explanations.

8-10: (RESERVED)

11. CERTIFICATION EMISSION LEVELS

For Class 1 engines, and MY 2004 and newer Class 2 engines, the certification levels are the deteriorated emission rates that are determined by applying the DFs to the emission test results of the engine family's official certification engine. For MY 2001-2003 Class 2 engines, the certification levels are the emission test results of the engine family's official certification engine without the application of any DFs.

If there are duplicate tests, an engine family's official **certification levels** (deteriorated or un-deteriorated, as applicable) are the **highest for each of the pollutants**. Example 1: For MY 2001 Class 2 gasoline engine family ABC, the manufacturer conducted duplicate tests of the family's certification engine. The first test produced certification levels (which, in this case, are equal to un-deteriorated test results), in g/bhp-hr, of 2.3 HC+NO_x and **24.6** CO; the second test produced **2.5** HC+NO_x and 12.3 CO. The ARB did not request a retest. For engine family ABC, the official certification levels are 2.5 HC+NO_x and 24.6 CO (which are the highest values and indicated in **bold** in the sets of data).

Occasionally, the **ARB may require a confirmatory test**. The retest may take place at ARB or another designated facility (e.g., the manufacturer's or an independent laboratory). The ARB may require a confirmatory test for any of the following reasons:

- (i) Compliance based on the original data is marginal (which is generally considered by ARB to be less than 15% below the standard);
- (ii) The manufacturer is new and certifying for the first time (retest to confirm the repeatability of the laboratory test equipment and procedures);
- (iii) The initial test results are unusually high or low compared to what are normally expected for the engine and/or emission control technology being employed (retest to confirm that the exceedingly high or low data are not a result of an equipment or procedure aberration);
- (iv) The engine and/or emission control technology being employed are new or innovative (retest to ensure that test equipment and/or procedures are not incompatible with the new or innovative technology); or
- (v) The ARB randomly requests a retest in order to maintain the high quality of manufacturer-submitted test data.

If the ARB requires a confirmatory test, the **ARB-required retest results take priority** over those from the initial test. Example 2: For MY 2001 Class 2 gasoline engine family DEF, the manufacturer conducted duplicate tests on the family's certification engine. The first test produced certification levels, in g/bhp-hr, of 2.3 HC+NO_x and 24.6 CO; the second test produced 2.5 HC+NO_x and 12.3 CO. The ARB requested a retest that resulted in certification levels of **2.4** HC+NO_x and **11.1** CO. For engine family DEF, the official certification levels are 2.4 HC+NO_x and 11.1 CO (which came solely from the retest, in **bold**, that took priority over the initial tests).

In a more complicated scenario, an **engine family requires two separate sets of emission data, Sets I and II** (e.g., from testing the gasoline and LPG engine configurations in a dual-fuel engine family, or from testing the highest and lowest rated power engine configurations in an engine family that has a wide power range). Set I data results in marginal compliance and the ARB requires a retest for this engine configuration. Set II data results in a good compliance margin and the ARB waives a retest for this engine configuration. The official HC+NO_x and CO certification levels for this engine family are determined as the highest values from the retested Set I and the original Set II data. Example 3: MY 2001 Class 2 dual-fuel engine family GHI has two engine models, the gasoline model 123 and LPG model 456. The manufacturer conducted two tests on model 123 that produced the following certification levels: 2.3 HC+NO_x / 24.6 CO and **2.5** HC+NO_x / 12.3 CO. The manufacturer also conducted two tests on model 456 that produced 2.1 HC+NO_x / 22.2 CO and 2.2 HC+NO_x / 33.3 CO certification levels. The ARB only requested a retest of model 456; the retest produced 2.4 HC+NO_x and **32.1** CO. For engine family GHI, the official certification levels of 2.5 HC+NO_x and 32.1 CO are the highest levels (in **bold**) produced during the initial testing of model 123 and the retesting of model 456. (The initial tests of model 456 were taken over in priority by the ARB-required retest and were not included for determining engine family GHI's official certification levels.)

S01-S24: (RESERVED)

ATTACHMENT 1

Certification Summary Sheet: (2 pages)

- Blank Form in Word 97 format
- Sample as printed (and can be used in lieu of the Word 97 form) from entries that were entered for the Access 97 Certification Database Form (see Attachment 2).

Supplemental Information Formats (8 pages)

AIR RESOURCES BOARD CERTIFICATION SUMMARY OFF-ROAD LSI ENGINES
MODEL-YEAR _____ MANUFACTURER: _____ EXECUTIVE ORDER: U-L- _____.
_____ Emission-Compliant Engines: fill in 1-11 _____ Emission Non-Compliant Engines: fill in 1-8

1. **Engine Family (EF) Name:** a. EPA-Standardized: _____
 b. EF Name on Engine Label: _____ c. Trade Name (e.g., Vortec): _____
2. **Equipment Applications:** (list all applicable) _____ A = Fork Lift B = Turf Care C = Generator
 D = Sweeper E = Compressor F = Refrigeration < 50 hp G = Tractor O = Other _____ P = Pre-Empted Eqmt
3. **All Engine Sales Codes within EF:**(check all applicable) California-Only _____ 50-State _____ 49-State Only _____
4. **Production Engine Assembly** (as leaving the Certifying Manufacturer's factory): (list all applicable) _____
 A = complete engine without equipment B = complete engine integrated with equipment C = incomplete engine (i.e., catalytic converter and / or exhaust system to be installed by OEM per Certifying Manufacturer's specifications and agreement. The Certifying Manufacturer is still held liable if these engines are not completed as described in its application for certification.)
5. **All Engine Displacement in EF:** (in liters, L) 1) _____ 2) _____ 3) _____ 4) _____
6. **Rated Power within Engine Family:** (in HP): Highest Model: _____ Lowest Model: _____
7. **Engine Design:** a. Combustion Cycle: (check one) 4-stroke _____ 2-stroke _____ @ Oil/Fuel Ratio _____
 b. Engine Type: (check one) Reciprocating _____ Rotary _____ Other (e.g., turbine, etc.) (specify) _____
 c. Valvetrain: (check one) Overhead _____ Side _____ Reed Valve _____ Piston Ported _____ Other (specify) _____
 d. Total Number of Intake and Exhaust Valves (Ports) per Cylinder: 2 _____ 3 _____ 4 _____ 5 _____ Other (specify) _____
 e. Type of Engine Cooling: (check one) Air _____ Water _____ Oil _____ Other (specify) _____
 f. Number of Cylinders: (check one) 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 8 _____ 10 _____ 12 _____ 16 _____ Other (specify) _____
 g. Cylinder Arrangement: (check one) Inline _____ Vee _____ Hori.Opposed (Flat) _____ Other (specify) _____
 h. Operating Fuel: (An EF may have engine models that operate on different fuels. **Example 1:** EF 123 has Models ABC and DEF that are dedicated gasoline engines. For EF 123, the "1" check box in (i) and "Dedicated" check box in (ii) are checked and "Gas" is filled in (iii). **Example 2:** Within EF 456 are Model GHI that is a dedicated gasoline engine and Model JKL that is a dedicated LPG engine. For EF 456, the "2" check box in (i) and "Dedicated" check box in (ii) are checked and "Gas" and "LPG" are filled in (iii).)
 (i) Number of Fuel Systems in EF: (check one) 1 _____ 2 _____ 3 _____ 4 _____ 5 _____
 (ii) Fuel System Types: (check all applicable) Dedicated _____ Flexible Fuel _____ Dual Fuel _____ Bi Fuel _____
 (iii) Fuel: (specify Gasoline, Liquefied Petroleum Gas (LPG, Propane), Natural Gas (CNG, LNG)) _____
8. **Intake, Fuel and Emission Control Systems**¹: _____
9. **Deterioration Factors (DFs):** a. New Durability Testing: Yes _____ No _____ Carryover from EF: _____
 b. Durability Engine Model: _____ ID: _____ Service Accumulation Hours: _____
 c. DF Type: (check one) Multiplicative (no less than 1.000; no units) _____ Additive (no less than 0.000; in g/bhp-hr) _____
 d. DF Values: HC: _____ NOx: _____ HC+NOx: (optional) (for additive DF only) _____ CO: _____
10. **Certification Test Engine Information:** New Test _____ Carryover from Engine Family _____
 a. Test Engine: Model _____ ID: _____ Rated Power, HP: _____ @ _____ rpm.
 Break-in/Stabilization Hours: _____ Test Dates: _____
 b. Test Fuel: (i) Gasoline: Indolene Clear _____ Calif. Ph2 _____ Other (specify) _____
 (ii) LPG, Propane, CNG or LNG: ARB Test Procedure Specs. _____ Approved Alternative Specs. _____
 c. Test Procedure (TP): (i) Sampling Method: Raw Gas Method (RGM) _____ Constant Volume Sampling (CVS) _____
 (ii) Test Cycle: "C": _____ "D": _____ "G-1": _____ Approved Modified "C": _____ Modified "D": _____ Modified "G-1": _____
 Approved Alternative or Special Cycle: (specify) _____ (iii) Special Test Equipment (e.g., cooling fans, special couplings, etc.): No _____ Yes/Describe: _____
11. **Certification Emission Levels** (in g/bhp-hr): HC+NOx _____ CO _____
 (Enter level from confirmatory test, if any. If none, enter the highest value from all tests below.)
 in compliance with **Emission Standards** of: (in g/bhp-hr) HC+NOx _____ CO _____
 for a **Durability Period** of: (check one) 1000 Hours _____ 3500 Hours _____ 5000 Hours _____ Other / Specify: _____

Test No. And Type ²	Official Test Results, g/bhp-hr				Deteriorated Certification Emissions, g/bhp-hr (i.e., with DFs applied)			
	HC	NOx	HC+NOx	CO	HC	NOx	HC+NOx	CO
1								
2								
3								
4								

Production Line Testing: CumSum _____ 1% _____ **Issue Date:** _____ **Revision Date:** _____
Remarks: _____

FOR ARB USE ONLY. Processed by: _____ Date: _____ Reviewed by: _____ Date: _____
--

¹ Use SAE J1930 abbreviations. Examples: NA for natural aspiration; TC turbocharging; SC supercharging; CAC charge air cooling; CARB carburetion; TBI throttle body fuel injection; MPI multipoint fuel injection; SMPI sequential MPI; DGI direct gasoline injection; AIR secondary air injection; PAIR pulsed AIR; EGR exhaust gas recirculation; O2S oxygen sensor; HO2S heated O2S; OC for oxidation catalyst; TWC three-way catalyst; OC+TWC for OC plus TWC in one container; EM for Engine Modification (use if only NA and/or CARB are the only other selections in the field).
 Use prefix "2" or "3" etc. in front of O2S, TWC, etc. to designate parallel arrangement, e.g., 2TWC for two TWC in parallel. Use suffix "2" or "3" etc. to designate series arrangement, e.g., TWC-3 for three TWC in three separate containers, one after the other.

Model Year: _____
Manufacturer Name: _____
Engine Family: _____
OFF-ROAD LSI ENGINE SUPPLEMENTAL INFORMATION

Page: _____
Issued: _____
Revised: _____
E.O.#: _____

S09. CATALYTIC CONVERTER: Yes _____ No _____

- a. Type/Number/Arrangement (e.g., TWC, OC, 2TWC for 2 parallel, TWC-2 for 2 in series): _____
- b. Location (e.g., close coupled, exhaust manifold, muffler): _____
- c. Catalyst Manufacturer.: _____
- d. Substrate: (i) Volume: _____ cc (ii) Construction: Pellet _____ Honeycomb _____
Number of cells: _____ (per cm²)
(iii) Composition: Ceramic _____ Metallic _____ (iv) Containment Method: Wire mesh _____ Other (specify) _____
- e. Active Material:

Composition (Pt, Pd, Rh): _____ Ratio: _____ Loading (g/L) _____
--

CONFIDENTIAL

S10. PROJECTED SALES AND PRODUCTION PERIOD

CONFIDENTIAL

- a. Projected California Annual Sales (units): _____ Projected 50 State Sales (units): _____
- b. Estimated Production Period: Start Date: _____ End Date: _____
- c. Estimated Introduction into Commerce Date: _____

S11. MANUFACTURER'S AUTHORIZED CONTACTS

Certification Contact

Name: Title: Address: Telephone Number: Fax Number: E-Mail Address:
--

Recipient of Executive Order

Name: Title: Address: Telephone Number: Fax Number: E-Mail Address:
--

Plant Contact

Name: Title: Address: Telephone Number: Fax Number E-Mail Address:

Plant Contact

Name: Title: Address: Telephone Number: Fax Number E-Mail Address:

Model Year: _____
Manufacturer Name: _____
Engine Family: _____
OFF-ROAD LSI ENGINE SUPPLEMENTAL INFORMATION

Page: _____
Issued: _____
Revised: _____
E.O.#: _____

S21. EMISSION-RELATED PART NUMBERS

(Part numbers as stamped on the component, not the stock or inventory numbers, should be listed here.)

		S11. Engine Model			
Fuel System:					
Carb/Mixer Assy.					
Fuel Injector					
Fuel Pump					
ECM					
Pressure Regulator					
Oxygen Sensor					
Other (specify)					
Intake System:					
Air Cleaner Element					
Intake Manifold					
Turbocharger					
Supercharger					
Charge Air Cooler					
Other (specify)					
Ignition System:					
Spark Plug					
Ignition Coil					
Ignition Control Valve Module					
Distributor					
Other (specify)					
EGR:					
EGR Valve Assembly					
Vacuum Control Valve					
Air Injection					
Control Valve					
Check Valve					
Solenoid Valve					
Aftertreatment System:					
Catalyst					
Exhaust Manifold					
Crankcase System:					
PCV Valve					

Model Year: _____
Manufacturer Name: _____
Engine Family: _____
OFF-ROAD LSI ENGINE SUPPLEMENTAL INFORMATION

Page: _____
Issued: _____
Revised: _____
E.O.#: _____

S22. LABELING:

- a. Emission label format approved? No___ Yes ___ If yes, reference approval: _____
Sample label attached? No___ Yes (put label in #S24)___

S23. WARRANTY: Emission warranty approved? No___ (Provide full warranty statement in #S24)
Yes ___ (Reference approval: _____)

Have any changes been made since the last approval?

No___ Yes ___ If yes, provide an explanation of the changes:

Model Year: _____
Manufacturer Name: _____
Engine Family: _____
OFF-ROAD LSI ENGINE SUPPLEMENTAL INFORMATION

Page: _____
Issued: _____
Revised: _____
E.O.#: _____

S24. ADDITIONAL INFORMATION AND COMMENTS

OFF-ROAD LSI ENGINES

ATTACHMENT 2

CERTIFICATION DATABASE FORM

The certification database form closely follows the Certification Summary described in Attachment 1. The database form is an **Access 97** file; the **electronic version** of this form can be **obtained by contacting your assigned ARB Certification Section staff person**. An imprint of this database form is enclosed for information purposes (only for hard copy mailings of this guidance). In the Access 97 file, the light blue fields indicate fill-in boxes, dark blue fields indicate pull-down menus and red fields indicate they are “reserved for ARB use only”. The optimal screen viewing setting for your computer display is 600 x 800 pixels on 256-colors or better.

After **completing** and **verifying** this database form for each engine family, the manufacturer should (1) print a **hard copy** and submit it in lieu of the Certification Summary form described in Attachment 1 (which is a Word 97 document) as part of the engine family’s certification application package, and (2) **electronically send** the certification database information to its assigned Certification staff person.

Below is a list of the information fields that manufacturers must provide in order to complete an application for certification. **Incorrect or missing information will render the application incomplete and result in a certification delay.** The fields below are numbered in the order encountered when one fills in the Certification Database Form.

Field	Reserved for ARB Use Only	Pull-Down Menu	Fill-In/Describe
1. Model Year		<input type="checkbox"/>	
2. Application Type		<input type="checkbox"/>	
3. Manufacturer		<input type="checkbox"/>	
4. EO No.	<input type="checkbox"/>		
5. Emission Compliant EF?		<input type="checkbox"/>	
6. Engine Family Name			12 alphanumeric characters
7. EF Name on Engine Label			12 alphanumeric characters
8. Trade Name			Up to 32 alphanumeric characters
9. Equipment Applications (six pulldown fields)		<input type="checkbox"/>	
10. Sales_Code		<input type="checkbox"/>	
11. EF CA Projected Sales			Up to 10 digits
12. EF US Projected Sales			Up to 10 digits
13. Production Engine Assembly		<input type="checkbox"/>	
14. Engine_Displace_x (five fill-in fields)			xxxx.xxx (in cc)
15. Highest Power (in hp)			xxx.xxx (in hp)
16. Lowest Power (in hp)			xxx.xxx (in hp)
17. Engine Models			Up to 200 alphanumeric characters
18. Combustion Cycle		<input type="checkbox"/>	

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Field	Reserved for ARB Use Only	Pull-Down Menu	Fill-In/Describe
19. Oil/Fuel Ratio			Up to 10 alphanumeric characters (e.g., 40:1, 50:1); enter "N/A" for 4-strokes
20. Engine Type		<input checked="" type="checkbox"/>	
21. Valvetrain		<input checked="" type="checkbox"/>	
22. Valve (Ports)/Cylinder		<input checked="" type="checkbox"/>	
23. Cooling Medium		<input checked="" type="checkbox"/>	
24. # of Cylinders		<input checked="" type="checkbox"/>	
25. Cylinder Arrangement		<input checked="" type="checkbox"/>	
26. Fuel System Configuration		<input checked="" type="checkbox"/>	
27. # of Fuel System		<input checked="" type="checkbox"/>	
28. Operating Fuel		<input checked="" type="checkbox"/>	
29. ECS_Cat		<input checked="" type="checkbox"/>	
30. ECS_O ₂ S		<input checked="" type="checkbox"/>	
31. ECS_fuelsys1		<input checked="" type="checkbox"/>	
32. ECS_fuelsys2		<input checked="" type="checkbox"/>	
33. ECS_fuelsys3		<input checked="" type="checkbox"/>	
34. ECS_egr		<input checked="" type="checkbox"/>	
35. ECS_asp		<input checked="" type="checkbox"/>	
36. ECS_air		<input checked="" type="checkbox"/>	
37. ECS_em:		<input checked="" type="checkbox"/>	Use "EM" only when CARB (carburetor) fuel system and NA (natural aspiration) are the only other information. Use "*" otherwise.
38. New Durability Testing?		<input checked="" type="checkbox"/>	
39. Durability Carryover EF Name			12 alphanumeric characters; enter "N/A" if #38 is "Yes"
40. Durability Engine Model			Up to 32 characters
41. Durability Engine ID Number			Up to 32 characters
42. Service Accumulation Hours			xxx.xxx (in hours)
43. DF_Type		<input checked="" type="checkbox"/>	
44. xxHC_DF			xx.xxx
45. NO _x _DF			xx.xxx
46. xxHC+NO _x _DF			xx.xxx (This is optional and for additive DF type only.)
47. CO_DF			xx.xxx
48. CERT_EDE_type		<input checked="" type="checkbox"/>	
49. Emission Carryover Engine Family Name			12 alphanumeric characters; enter "N/A" if #48 is "NEW"
50. Cert_engine model			Up to 32 characters

OFF-ROAD LSI ENGINES

Field	Reserved for ARB Use Only	Pull-Down Menu	Fill-In/Describe
51. Cert_engine_id			Up to 32 characters
52. Rated Power (hp)			xxx.xxx (in hp)
53. @ Rated_rpm			Up to 5 digits; no decimals
54. Cert_engine_stabilization_hours (for certification emission test)			Up to 3 digits
55. cert_test_date			month/date/year (e.g., 06/19/00 for June 19, 2000)
56. Certification Test Fuel		<input checked="" type="checkbox"/>	
57. Certification Test Procedure		<input checked="" type="checkbox"/>	
58. Certification Test Cycle		<input checked="" type="checkbox"/>	
59. Cert_TP: List all special test equipment...			Up to 200 alphanumeric characters
60. HC+Nox_Hi (Certification Level)			xxx.xxx (in g/bhp-hr); (Enter level from confirmatory test, if any. If none, enter highest value from all certification tests for this EF.)
61. CO_Hi (Certification Level)			xxx.xxx (in g/bhp-hr), (Enter level from confirmatory test, if any. If none, enter highest value from all certification tests for this EF.)
62. HC+Nox_standard			xxx.x (in g/bhp-hr)
63. CO_standard			xxx.x (in g/bhp-hr)
64. Emission Standard Durability Period			xxxx.x (in hours); enter "0" for emission compliance phase-in and non-compliant EFs.
65. TEST_SET_x; (_x-denotes upto 4 sets of data, if applicable)		<input checked="" type="checkbox"/>	
66. HC_x; (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)
67. Nox_x; (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)
68. HC+Nox_x; (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (This is optional and for additive DF only.)
69. CO_x; (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)

OFF-ROAD LSI ENGINES

Field	Reserved for ARB Use Only	Pull-Down Menu	Fill-In/Describe
70. HC_x (Deteriorated); (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)
71. Nox_x (Deteriorated); (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)
72. HC+Nox_x (Deteriorated); (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)
73. CO_x (Deteriorated); (_x-denotes upto 4 sets of data, if applicable)			xxx.xxx (in g/bhp-hr)
74. QA_Procedure		<input checked="" type="checkbox"/>	
75. Date_issued			month/date/year (e.g., 06/19/00 for June 19, 2000)
76. Date_revision			month/date/year (e.g., 06/19/00 for June 19, 2000)
77. Remarks			Up to 200 alphanumeric characters
78. Processed By:	<input checked="" type="checkbox"/>		
79. Process_Date	<input checked="" type="checkbox"/>		
80. Review By:	<input checked="" type="checkbox"/>		
81. Review_date	<input checked="" type="checkbox"/>		