



# Air Resources Board



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February 24, 2009

Manufacturers Advisory Correspondence MAC #2009-01

To: ALL VEHICLE MANUFACTURERS OF PASSENGER CARS,  
LIGHT DUTY TRUCKS, AND MEDIUM-DUTY PASSENGER  
VEHICLES

Subject: Implementation of the New Environmental Performance Label.

This letter transmits the enclosed Manufacturers Advisory Correspondence (MAC) which outlines the process for implementing the new Environmental Performance (EP) label. The MAC discusses the EP label approval process for vehicles produced after January 1, 2009, and for vehicles produced prior to that date for which the manufacturer is voluntarily applying the EP label. In addition, the MAC discusses the approval process for receiving air conditioning (AC) emission reduction credits based on AC-direct and AC-indirect system improvements. And finally, the MAC outlines the global warming scoring procedure for Medium-Duty Passenger Vehicles certified under California's Cleaner Federal Vehicle rule subject only to FTP testing from which only the measured city CO<sub>2</sub> values are reported.

If you have any questions regarding EP label format, please contact Mr. Craig Duehring, Air Resources Engineer, ZEV Infrastructure Section, at (916) 323-2361 or by email at [cduehrin@arb.ca.gov](mailto:cduehrin@arb.ca.gov). For approval of credits for improved air conditioning systems, please contact Mr. Tao Huai, Manager, Climate Change Mitigation and Emission Research Section, at (916) 324-2981 or by email at [thuai@arb.ca.gov](mailto:thuai@arb.ca.gov). For EP label score matters, please contact Ms. Rhonda Runyon, Air Pollution Specialist, On-Road Certification / Audit Section, at (626) 575-6653 or by email at [rrunyon@arb.ca.gov](mailto:rrunyon@arb.ca.gov).

Sincerely,

/s/

Annette Hebert, Chief  
Mobile Source Operations Division

Attachment

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>.*

California Environmental Protection Agency

State of California  
AIR RESOURCES BOARD

MANUFACTURERS ADVISORY CORRESPONDENCE (MAC) 2009-01

**SUBJECT:** Implementation of the new Environmental Performance Label.

**APPLICABILITY:** All 2009 and subsequent model year passenger cars, light-duty trucks and medium-duty passenger vehicles produced on or after January 1, 2009, including those produced by small and intermediate volume manufacturers.

The global warming scores (GWS) discussed in this MAC are determined pursuant to section 3(a)(2) of the California Environmental Performance Label Specifications. Upon California receiving the federal waiver, the GWS will be determined based on the requirements in 13 CCR 1961.1; additional guidance will be issued as needed.

**REFERENCES:** Title 13, California Code of Regulations (CCR), Section 1965 and "California Environmental Performance Label Specifications For 2009 And Subsequent Model Year Passenger Cars, Light-Duty Trucks, And Medium-Duty Passenger Vehicles" Adopted: May 2, 2008

Mailout MSO# 2007-03 "New Requirement to Report Carbon Dioxide Emissions from 2008 and Subsequent Model Year California Certified Vehicles and Engines"

**BACKGROUND:** Currently, all vehicle manufacturers are prohibited from selling a passenger car or light duty vehicle lacking a Smog Index label affixed for display at the point of sale. For vehicles produced on or after January 1, 2009, the manufacturers are required to replace the Smog Index label with the new Environmental Performance (EP) label which includes both a Smog and Global Warming score. The new regulation allows for early implementation to accommodate a smooth transition for replacing the Smog Index label with the new EP label. This transition period ends on January 1, 2009 when only the new EP label will be displayed on each new vehicle. The regulation requires manufacturers to submit labels to the ARB for review and approval prior to display of the new EP label. Since the majority of 2009 model year test groups are already certified, this MAC describes the approval process for 2009 model year test groups already certified and the approval

process for pending 2009 and subsequent model year applications. Both scenarios are discussed below.

In addition, this MAC will discuss the application and approval process for receiving air conditioning (AC) emission reduction credits based on AC-direct and AC-indirect system improvements. Finally, this MAC outlines the global warming scoring procedure for Medium-Duty Passenger Vehicles certified under California's Cleaner Federal Vehicle rule subject only to FTP testing, from which only the measured city CO<sub>2</sub> values are reported.

PROCESS:

**Approval of New Environmental Performance Label**

A request for approval must contain the following two parts:

1. A sample EP label to evaluate the format in accordance with the regulations. And,
2. The data necessary to determine the Smog and Global Warming scores.

A request for approval of the EP label format and the request to approve smog and global warming scores may be made under separate cover.

Requests for label format approval shall be submitted to:

Craig Duehring  
Mobile Source Control Division  
1001 I Street, P.O. Box 2815  
Sacramento, CA 95812  
Email: [cduerhin@arb.ca.gov](mailto:cduerhin@arb.ca.gov)

Requests for smog and global warming score approval shall be submitted to the On-Road Certification / Audit Section via the ARB's Document Management System (DMS). Manufacturers shall submit their request to the following folder within their DMS directory:

`\\ARB MFR code – Manufacturer Name\PC-LDT\2009\CBI APPLICATION\CORRESPONDENCE\MISCELLANEOUS`

Manufacturers shall give their request the following file name:

`CBI_9MFR_CORRESP_RFA*LAB_` where MFR is the U.S. EPA manufacturers code.

For 2009 model year test groups which are certified as of the date of this MAC, manufacturers shall submit one request for approval of their sample label and smog and global warming scores for all certified 2009 model vehicles.

For pending 2009 model year applications and 2010 and subsequent model year applications, manufacturers shall submit sample labels for format approval and the data necessary to determine the smog and global warming scores for the vehicle models within their test group application. Manufacturers shall submit the data necessary for score approval in the format attachment to this MAC.

For 2009 model year vehicles manufactured prior to January 1, 2009, manufacturers may affix an approved EP label to vehicles in any of the following manners: (i) the EP label in lieu of the Smog Index label; (ii) the EP label overlaying the Smog Index label; or (iii) the EP label in the proximity of the Smog Index label. All 2009 model year vehicles manufactured on or after January 1, 2009 must display only the new EP label.

The information necessary for approval of both the label format and the label scores are described below.

#### Label Format Approval

Prior to displaying the new EP label on any vehicle, the manufacturer must submit a sample label to the person identified above for format review and approval. Only one sample label per manufacturer is required for format and size approval. However, if a manufacturer uses both the standard 4 x 6 inch label and the reduced 2½ x 4½ inch label, ARB will require samples of both label formats for approval. Staff will be looking for label color, size, font, style and overall specification compliance.

If the new EP label will be placed on label feedstock that contains other vehicle information, the sample label must include the other vehicle information to be displayed. If the manufacturer will be placing the new EP label within the vehicle's Monroney Sticker, staff will require a sample of the entire Monroney sticker with the new EP label displayed. Finally, if a sample label is not immediately available due to feedstock ordering lead time, staff will accept a .pdf file of the proposed label for review and temporary approval. However, once the feedstock is available with the new label format, the manufacturer must submit a sample label to staff for final approval.

Annual approval of label format is not required. However, ARB may require submission of sample labels periodically for compliance purposes. Staff will contact the manufacturer if additional sample labels are required.

#### Smog and Global Warming Score Approval

In order to receive approval of the smog and global warming scores the following information shall be submitted. This information shall be submitted in the attached format by test group.

#### For Each Test Group:

- Models within the test group
- Emissions standard category
- The smog score
- CO<sub>2</sub> city and CO<sub>2</sub> highway values as reported in accordance with the August 29, 2007, ARB Mailout, MSO #2007-03
- Fuel adjustment factor
- Approved AC-direct and AC-indirect credit values
- CO<sub>2</sub>-equivalent combined value
- The global warming score

As mentioned above for 2009 model year test groups already certified, this information may be submitted for all test groups in a single request. For pending 2009 applications and 2010 model year applications, this information shall be included in each manufacturer's test group specific application for certification. As mentioned above, submit requests via the ARB's DMS. Please submit the data in the excel format prescribed in the attachment to this MAC.

A/C CREDITS:

#### **Emission Reduction Credits for Improved Air Conditioning (A/C) Systems**

In accordance with section 3.(a)(2) of the "California Environmental Performance Label Specifications For 2009 And Subsequent Model Year Passenger Cars, Light-Duty Trucks, And Medium-Duty Passenger Vehicles." adopted May 2, 2008, vehicle manufacturers may submit applications for ARB approval to determine A/C-direct and A/C-indirect emission reduction credits for A/C systems designed to reduce the amount of greenhouse gas emissions from A/C operation and leakage. Applications for emission reduction credits for improved A/C systems must be submitted separately from other approval requests and must be applicable to all vehicles identified in each test group. Applications for A/C credits must clearly indicate that the A/C system emissions data submitted

applies to all vehicles within the specified test group. If the A/C system emissions data does not apply to all vehicles within the test group, then no A/C credits will be earned for that test group.

In general, the regulatory equation used to calculate the global warming score of the vehicle assigns default values for the increased greenhouse gases emitted when using a typical air conditioner with HFC-134a as the refrigerant. These default values, six grams carbon dioxide equivalents (CO<sub>2</sub>e)/mile for A/C-direct and 17 grams CO<sub>2</sub>e/mile for A/C-indirect are inherently conservative since they represent the nominal level of emissions expected for a range of vehicles and systems. They are based on prior research and emissions modeling.

Applications to receive A/C-direct and A/C-indirect emission reduction credits must provide an engineering analysis with laboratory results clearly showing the technical and design advances that will yield reductions to these default values. The application must also contain descriptions of component-by-component modifications made to achieve increased refrigerant containment and system efficiencies. All applications for A/C emission reduction credits must provide actual certification test data to support the results submitted and must clearly show all improvements made to achieve these results. In addition, the Executive Officer retains the right to ask for additional information as part of this application process.

The regulatory language provides the minimum application submission requirements to support claims for A/C improvements. These submission requirements are repeated and further clarified below for convenience.

Requests shall be submitted to:

Tao Huai, Manager  
Climate Change Mitigation and Emissions Research Section  
Research Division  
1001 I Street, P.O. Box 2815  
Sacramento, CA 95812  
(916) 324-2981  
Email: [thuai@arb.ca.gov](mailto:thuai@arb.ca.gov)

Craig Duehring  
Mobile Source Control Division  
1001 I Street, P.O. Box 2815  
Sacramento, CA 95812  
(916) 323-2361  
Email: [cduehrin@arb.ca.gov](mailto:cduehrin@arb.ca.gov)

A/C DIRECT: A/C-Direct Emission Reduction Credits

For A/C-direct emission improvements in systems using HFC-134a as the refrigerant, the manufacturer must demonstrate and submit for approval the following:

1. The manufacturer must demonstrate via engineering evaluation that the A/C system minimizes overall refrigerant leakage by:
  - a. Minimizing the number of or improving fittings and joints.
  - b. Limiting the use of single O-rings for pipe and hose connections.
  - c. Using lowest permeability hose for containment of the refrigerant.
  - d. Minimizing leakage from compressor shaft seal and housing seals.

Based on the above regulatory language, staff is requesting the following information:

- Specify (types, numbers, lengths, hose permeability and the permeability test procedures employed, etc) the A/C system components that contribute to refrigerant leakage in the system in question. Provide sufficient specifications for the system in question to enable replication of the system refrigerant emissions calculation using SAE International Standard J2727. Attach the calculation spreadsheet based on SAE J2727 spreadsheet template.
- Provide illustrations or pictures of the placement of components in the system in question.
- Provide description of design changes and explain how the number of fittings and joints has been minimized relative to a previous design/system.
- Justification of the use of single O-rings to qualify as a “low-leak” system, as applicable.
- Justification of the use of hose if lowest permeability hose (ultra-low permeability barrier or veneer hose) is not used to qualify as a “low leak” system, as applicable.
- Explain how leakage from the compressor shaft seal and housing seals has been minimized.

If other improvements not reflected in SAE J2727 Standard are made to the system in question, the manufacturer is encouraged to provide other relevant information to ARB as part of the application.

ARB is continually exploring how demonstration of leakage determination via SAE J2727 can be enhanced. Results from mini-SHED leak testing, results quantifying production line mis-assembly rates, and any related information manufacturers wish to include in the application package would be very useful.

2. Annual leakage refrigerant emissions as tested and measured in accordance with SAE International standard J2727 indicating a measured annual refrigerant leakage of less than 55 grams. Although the regulation specifies the July 2007 revision of SAE J2727, staff will accept data using the latest revision available. Each application must provide the leakage rate used to calculate A/C-direct emission credits as determined using the SAE J2727 calculation. In addition, each application must provide sufficient information for staff to replicate the SAE J2727 calculation for the system in question.

If the A/C system is determined to be a “low-leak” system in accordance with paragraphs 1 and 2 above and if approved by ARB, the A/C-direct emission reduction credit will then be calculated using the following equation:

$$\text{A/C-direct emission reduction credit} = 6 - (\text{SAE J2727 measured annual refrigerant leakage in grams}) \times 1,300 / 12,000$$

All applications requesting A/C-direct emission reduction credits must demonstrate they comply with the requirements and improvements identified in paragraphs 1 and 2 above.

For A/C systems using a refrigerant with a global warming potential of less than or equal to 150 times that of CO<sub>2</sub>, the global warming potential from refrigerant leakage is considerably less than other annual greenhouse gas emissions and the manufacturer will get the maximum A/C-direct emission reduction credit of six grams CO<sub>2</sub>e/mile.

A/C INDIRECT: *A/C-Indirect Emission Reduction Credit*

A/C-indirect emission reductions can be achieved if the A/C system is designed to be an “improved” system. To qualify as an “improved” system that uses CO<sub>2</sub>, HFC-134a, HFC-152a, or other halocarbon refrigerant, the following requirements apply and the Executive Officer will review submitted demonstrations for approval:

1. The manufacturer must demonstrate using test data in an engineering evaluation that the A/C system achieves lower A/C-indirect emissions than the default value of 17 grams CO<sub>2</sub>e/mile.

The engineering evaluation in the application package should include CO<sub>2</sub> vehicle test emissions data for operation without A/C (FTP) and with A/C (SFTP: SC03 test cycle conducted under test conditions described in 40 CFR 86.158 and related sections) as a means for determining indirect A/C emissions. The manufacturer must submit CO<sub>2</sub> emissions results from these tests for the test group which the application for A/C credits applies. The eligibility of A/C-indirect credit is determined from the FTP and SC03 CO<sub>2</sub> measured emission rates as follows:

The system qualifies if:

$$[(SC03_{CO_2} - 112) / (0.954 \times FTP_{CO_2}) \times 17] < 17.0 \text{ g/mi}$$

The system does not qualify if:

$$[(SC03_{CO_2} - 112) / (0.954 \times FTP_{CO_2}) \times 17] \geq 17.0 \text{ g/mi}$$

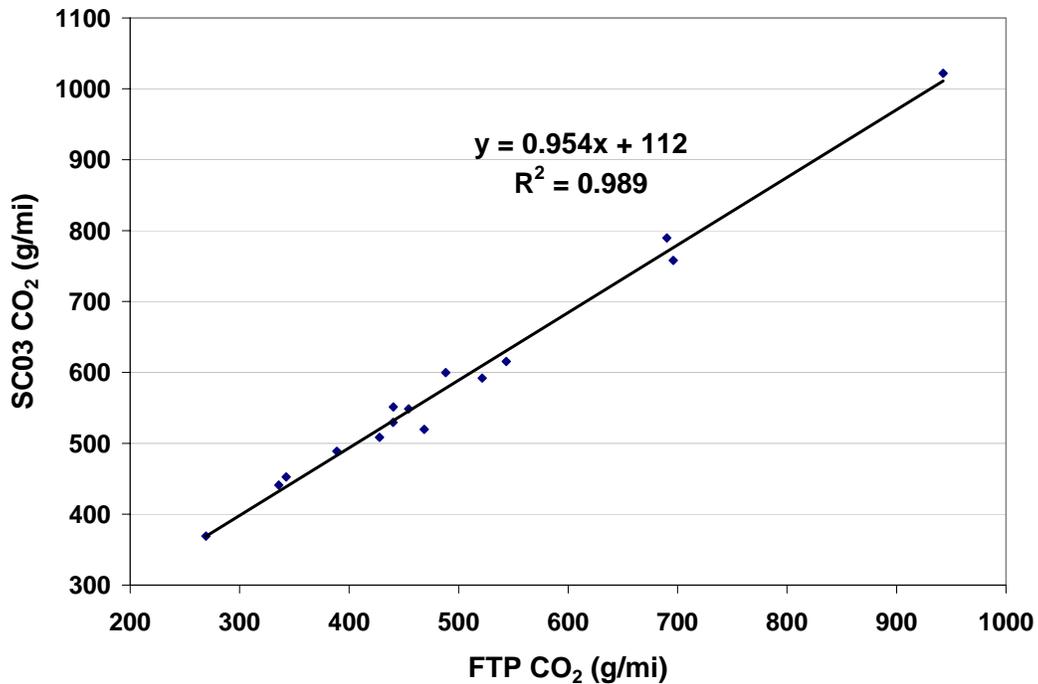
The default value of 17 g/mi represents the difference between FTP with A/C operation and FTP without A/C operation, and is adjusted for the average fraction of time a vehicle's A/C system is on in California. Existing certification test procedures do not include an FTP test cycle with A/C operation, but they do include an SC03 test cycle with A/C operation under specified conditions of temperature, humidity, and solar load. In order to avoid the need for additional testing, ARB will rely on data from existing certification test results to demonstrate A/C-indirect impacts.

For dedicated alternative-fueled vehicles (AFVs), which are not subject to SFTP testing, two options are available with prior ARB approval. Manufacturers may test the official certification test vehicle under the SC03 test procedure to determine the SC03 CO<sub>2</sub>-equivalent value. Or, manufacturers may provide an engineering evaluation comparing the A/C system on the AFV to an identical or similar A/C system on an identical or similar gasoline or diesel vehicle and determining the CO<sub>2</sub>-equivalent emission reduction due to A/C system improvements.

A/C-indirect impacts are shown in Table 1. CO<sub>2</sub> emissions are higher during the SC03 than during the FTP, partly due to the A/C and partly due to cycle effects. The overall relationship is shown in Figure 1. This regression line is used to represent default values for the purpose of demonstrating improvements. A vehicle having a reduced contribution of A/C to CO<sub>2</sub> emissions will fall below this line, and will be considered to have demonstrated improved A/C system performance.

**Table 1: Emissions Measured under FTP and SC03 Test Procedures**

Vehicle ID	Vehicle Class	FTP with no A/C	SC03 with A/C
1	Small Car	269.2	369.2
2	Midsize Car	342.4	452.7
3	Midsize Car	440.2	529.5
4	Large Car	454.3	548.7
5	Small Car	335.8	441.2
6	Midsize Car	388.8	488.8
7	Large Van	942.6	1021.9
8	Minivan	440.4	551.4
9	Small SUV	521.5	592.0
10	Minivan	468.6	519.6
11	Minivan	488.3	599.9
12	Large SUV	690.3	789.7
13	Van	696.0	758.1
14	Large Truck	543.6	615.5
15	Midsize Car	427.7	508.5



**Figure 1: Correlation between Emissions Measured under FTP and SC03**

2. The system must manage outside and re-circulated air balance to achieve comfort, demisting, and safety requirements, based on factors such as temperature, humidity, pressure, and level of fresh air in the passenger compartment in order to minimize compressor usage.
3. The system must be optimized for energy efficiency by utilizing state-of-the-art high efficiency evaporators, expansion devices, condensers, and other components.
4. The system must have external controls that adjust the evaporative temperature to minimize the necessity of reheating cold air to satisfy occupant comfort.

Each application must provide information about the configurations of the A/C system, including, but not limited to, the types, sizes and features of each major component. Explain how the system has been designed so that it meets the above criteria 2 through 4.

An internally controlled A/C system could also qualify as an “improved” system as long as the manufacturer demonstrates that the system achieves the same goal as minimizing the necessity for reheating cold air to satisfy occupant comfort. A detailed technical description of the system and system components proposed for qualification is required.

Staff will review the application on a case-by-case basis to determine if the system meets the criteria. Manufacturers are encouraged to provide additional technical assessment and other relevant information beyond the minimum specified in this guidance if the applicants believes it will facilitate staff’s determination.

If the A/C system is determined to be an “improved” system in accordance with paragraphs 1 through 4 above and if approved by the Executive Officer, the A/C-indirect emission reduction credit will be calculated using the following equation:

$$\text{A/C-indirect emission reduction credit} = 17 - (\text{Compressor Displacement in cubic centimeters}) \times 5 / 100$$

Staff will review each application on a case-by-case basis and may generate an application template for future use in requesting AC system improvement assessment.

### **Global Warming Scores for Medium-Duty Passenger Vehicles (MDPVs)**

Currently, MDPVs are certified to California medium-duty vehicle (MDV) standards or, under California’s Cleaner Federal Vehicle rule, to a federal Tier 2 standard that is deemed more stringent than

California's based on a comparison of the sums of the respective NMOG and NOx useful life standards. Independent of the EP labeling regulations, MDPV certified to California MDV standards are tested under both the FTP and Highway Fuel Economy test procedures; their measured city and highway CO<sub>2</sub> values are used for determining the CO<sub>2</sub>-equivalent combined values discussed above.

MDPV certified under California's Cleaner Federal Vehicle rule are subject only to FTP testing from which only the measured city CO<sub>2</sub> values are to be reported. Based on 2007 model year certification data, MDPV certified to California's MDV standards have a CO<sub>2</sub>-equivalent combined range from 565 – 729 grams per mile CO<sub>2</sub>-equivalent. Per the EP labeling regulations, any CO<sub>2</sub> combined value greater than 520 grams per mile CO<sub>2</sub>-equivalent will receive a global warming score of "1", the lowest possible. Therefore, ARB concludes that all MDPVs will get a global warming score of "1."

ARB encourages manufacturers of MDPV, especially those MDPV to be certified under California's Cleaner Federal Vehicle rule, to submit both CO<sub>2</sub> city and CO<sub>2</sub> highway values when applying for the new EP label. Manufacturers may use the Highway Fuel Economy test procedure applicable to California's MDV – again, independent of the EP labeling regulations – to test the official MDPV emission data vehicle and submit the measured CO<sub>2</sub> highway value for determining the CO<sub>2</sub>-equivalent combined values of the MDPV families certified under California's Cleaner Federal Vehicle rule. If the manufacturer of a MDPV does not submit CO<sub>2</sub> highway values with their application, the CO<sub>2</sub> city value alone shall be used to calculate the CO<sub>2</sub>-equivalent combined value for purposes of determining the global warming score.