§ 600.210–12 Calculation of fuel economy and CO₂ emission values for labeling.

(a) General labels. Except as specified in paragraphs (d) and (e) of this section, fuel economy and CO₂ emissions for general labels may be determined by one of two methods. The first is based on vehicle-specific model-type 5-cycle data as determined in §600.209–12(b). This method is available for all vehicles and is required for vehicles that do not qualify for the second method as described in §600.115 (other than electric vehicles). The second method, the derived 5-cycle method, determines fuel economy and CO₂ emissions values from the FTP and HFET tests using equations that are derived from vehicle-specific 5-cycle model type data, as determined in paragraph (a)(2) of this section. Manufacturers may voluntarily lower fuel economy values and raise CO₂ values if they determine that the label values from any method are not representative of the fuel economy and CO₂ emissions for that model type. MPG values may not be lowered without also making a corresponding change to the CO₂ value for a model type.

1. Vehicle-specific 5-cycle labels. The city and highway model type fuel economy determined in §600.209–12(b), rounded to the nearest mpg, and the city and highway model type CO₂ emissions determined in §600.209–12(b), rounded to the nearest gram per mile, comprise the fuel economy and CO₂ emission values for general fuel economy labels, or, alternatively;

2. Derived 5-cycle labels. Derived 5-cycle city and highway label values are determined according to the following method:

(A) For each model type, determine the derived five-cycle city fuel economy using the following equation and coefficients determined by the Administrator:

\[
\text{Derived 5-cycle City Fuel Economy} = \frac{1}{\left(\text{City Intercept} + \frac{\{\text{City Slope}\}}{\text{MT FTP FE}}\right)}
\]

Where:
- City Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
- City Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
- MT FTP FE = the model type FTP-based city fuel economy determined under §600.208–12(b), rounded to the nearest 0.0001 mpg.

(B) For each model type, determine the derived five-cycle city CO₂ emissions using the following equation and coefficients determined by the Administrator:
Derived 5-cycle City CO\(_2\) = ([City Intercept] \(\times\) A) + ([City Slope] \(\times\) MT FTP CO\(_2\))

Where:
A = 8,887 for gasoline-fueled vehicles, 10,180 for diesel-fueled vehicles, or an appropriate value specified by the Administrator for other fuels.
City Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
City Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
MT FTP CO\(_2\) = the model type FTP-based city CO\(_2\) emissions determined under §600.208-12(b), rounded to the nearest 0.1 grams per mile.

(ii)(A) For each model type, determine the derived five-cycle highway fuel economy using the equation below and coefficients determined by the Administrator:

Derived 5-cycle Highway Fuel Economy = \(\frac{1}{\left(\frac{\text{Highway Intercept}}{\text{Highway Slope}}\right) + \left(\frac{\text{Highway Slope}}{\text{MT HFET FE}}\right)}\)

Where:
Highway Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
Highway Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
MT HFET FE = the model type highway fuel economy determined under §600.208-12(b), rounded to the nearest 0.0001 mpg.

(B) For each model type, determine the derived five-cycle highway CO\(_2\) emissions using the equation below and coefficients determined by the Administrator:

Derived 5-cycle Highway CO\(_2\) = ([Highway Intercept] \(\times\) A) + ([Highway Slope] \(\times\) MT HFET CO\(_2\))

Where:
A = 8,887 for gasoline-fueled vehicles, 10,180 for diesel-fueled vehicles, or an appropriate value specified by the Administrator for other fuels.
Highway Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
Highway Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
MT HFET CO\(_2\) = the model type highway CO\(_2\) emissions determined under §600.208-12(b), rounded to the nearest 0.1 grams per mile.

(iv) The Administrator will periodically update the slopes and intercepts through guidance and will determine the model year that the new coefficients must take effect. The Administrator will issue guidance no later than six months prior to the earliest starting date of the effective model year (e.g., for 2011 models, the earliest start of the model year is January 2, 2010, so guidance would be issued by July 1, 2009.) Until otherwise instructed by written guidance from the Administrator, manufacturers must use the coefficients that are currently in effect.

(3) General alternate fuel economy and CO\(_2\) emissions label values for dual fuel vehicles.

(i)(A) City and Highway fuel economy label values for dual fuel alcohol-based and natural gas vehicles when using the alternate fuel are separately determined by the following calculation:

\[
\text{Derived FE}_{\text{alt}} = \text{FE}_{\text{alt}} \times \frac{5\text{cycle}_{\text{gas}}}{\text{FE}_{\text{gas}}}.
\]

Where:
\(\text{FE}_{\text{alt}}\) = The unrounded FTP-based model-type city or HFET-based model-type highway fuel economy from the alternate fuel, as determined in §600.208-12(b)(5)(ii).
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Vehicle-specific 5-cycle FE = The unrounded vehicle-specific or derived 5-cycle model-type city or highway fuel economy, as determined in paragraph (a)(1) or (2) of this section.

FE\text{gas} = The unrounded FTP-based city or HFET-based model-type highway fuel economy from gasoline (or diesel), as determined in §600.208–12(b)(5)(i).

The result, rounded to the nearest whole number, is the alternate fuel label value for dual fuel vehicles.

(B) City and Highway CO\text{2} label values for dual fuel alcohol-based and natural gas vehicles when using the alternate fuel are separately determined by the following calculation:

\[
\text{Derived } CO_2\text{alt} = CO_2\text{alt} \times \frac{\text{5cycle } CO_2\text{gas}}{CO_2\text{gas}}
\]

Where:

\begin{align*}
CO_2\text{alt} & = \text{The unrounded FTP-based model-type city or HFET-based model-type CO}_2 \text{ emissions value from the alternate fuel, as determined in §600.208–12(b)(5)(i).} \\
\text{5cycle } CO_2\text{alt} & = \text{The unrounded vehicle-specific or derived 5-cycle model-type city or highway } CO_2 \text{ emissions value, as determined in paragraph (a)(1) or (2) of this section.} \\
CO_2\text{gas} & = \text{The unrounded FTP-based model-type city or HFET-based model-type highway } CO_2 \text{ emissions value from gasoline (or diesel), as determined in §600.208–12(b)(5)(i).}
\end{align*}

The result, rounded to the nearest whole number, is the alternate fuel CO\text{2} emissions label value for dual fuel vehicles.

(ii) Optionally, if complete 5-cycle testing has been performed using the alternate fuel, the manufacturer may choose to use the alternate fuel city or highway fuel economy and CO\text{2} emissions values determined in §600.209–12(b)(5)(ii), rounded to the nearest whole number.

(4) General alternate fuel economy and CO\text{2} emissions label values for electric vehicles. Determine FTP-based city and HFET-based highway fuel economy label values for electric vehicles as described in §600.116. Convert W-hour/mile results to miles per kW-hr and miles per gasoline gallon equivalent. CO\text{2} label information is based on tailpipe emissions only, so CO\text{2} emissions from electric vehicles are assumed to be zero.

(b) Specific labels. Except as specified in paragraphs (d) and (e) of this section, fuel economy and CO\text{2} emissions for specific labels may be determined by one of two methods. The first is based on vehicle-specific configuration 5-cycle data as determined in §600.207. This method is available for all vehicles and is required for vehicles that do not qualify for the second method as described in §600.115 (other than electric vehicles). The second method, the derived 5-cycle method, determines fuel economy and CO\text{2} emissions values from the FTP and HFET tests using equations that are derived from vehicle-specific 5-cycle configuration data, as determined in paragraph (b)(2) of this section. Manufacturers may voluntarily lower fuel economy values and raise CO\text{2} values if they determine that the label values from either method are not representative of the fuel economy or CO\text{2} emissions for that model type.

(1) Vehicle-specific 5-cycle labels. The city and highway configuration fuel economy determined in §600.207, rounded to the nearest mpg, and the city and highway configuration CO\text{2} emissions determined in §600.207, rounded to the nearest gram per mile, comprise the fuel economy and CO\text{2} emission values for specific fuel economy labels, or, alternatively:

(2) Derived 5-cycle labels. Specific city and highway label values from derived
5-cycle are determined according to the following method:

(i)(A) Determine the derived five-cycle city fuel economy of the configuration using the equation below and coefficients determined by the Administrator:

\[
\text{Derived 5-cycle City Fuel Economy} = \frac{1}{\text{City Intercept} + \frac{\text{City Slope}}{\text{Config FTP FE}}}
\]

Where:
City Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
City Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
Config FTP FE = the configuration FTP-based city fuel economy determined under §600.206, rounded to the nearest 0.0001 mpg.

(B) Determine the derived five-cycle city CO₂ emissions of the configuration using the equation below and coefficients determined by the Administrator:

\[
\text{Derived 5-cycle City CO₂} = \{\text{City Intercept}\} + \{\text{City Slope}\} \times \text{Config FTP CO₂}
\]

Where:
City Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
City Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle city fuel economy data.
Config FTP CO₂ = the configuration FTP-based city CO₂ emissions determined under §600.206, rounded to the nearest 0.1 grams per mile.

(ii)(A) Determine the derived five-cycle highway fuel economy of the configuration using the equation below and coefficients determined by the Administrator:

\[
\text{Derived 5-cycle Highway Fuel Economy} = \frac{1}{\text{Highway Intercept} + \frac{\text{Highway Slope}}{\text{Config HFET FE}}}
\]

Where:
Highway Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
Highway Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
Config HFET FE = the configuration highway fuel economy determined under §600.206, rounded to the nearest tenth.

(B) Determine the derived five-cycle highway CO₂ emissions of the configuration using the equation below and coefficients determined by the Administrator:

\[
\text{Derived 5-cycle Highway CO₂} = \{\text{Highway Intercept}\} + \{\text{Highway Slope}\} \times \text{Config HFET CO₂}
\]

Where:
Highway Intercept = Intercept determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
Highway Slope = Slope determined by the Administrator based on historic vehicle-specific 5-cycle highway fuel economy data.
Config HFET CO₂ = the configuration highway fuel economy determined under §600.206, rounded to the nearest tenth.

(iii) The slopes and intercepts of paragraph (a)(2)(iii) of this section apply.

(3) Specific alternate fuel economy and CO₂ emissions label values for dual fuel vehicles. (i)(A) Specific city and highway fuel economy label values for dual
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fuel alcohol-based and natural gas vehicles when using the alternate fuel are separately determined by the following calculation:

\[
\text{Derived } \text{FE}_\text{alt} = \frac{5 \text{ cycle } \text{FE}_\text{gas}}{\text{FE}_\text{gas}} \times \text{FE}_\text{alt}
\]

Where:

- \( \text{FE}_\text{alt} \) = The unrounded FTP-based configuration city or HFET-based configuration highway fuel economy from the alternate fuel, as determined in §600.206.
- \( 5 \text{ cycle } \text{FE}_\text{gas} \) = The unrounded vehicle-specific or derived 5-cycle configuration city or highway fuel economy as determined in paragraph (b)(1) or (2) of this section.
- \( \text{FE}_\text{gas} \) = The unrounded FTP-based city or HFET-based configuration highway fuel economy from gasoline, as determined in §600.206.

The result, rounded to the nearest whole number, is the alternate fuel label value for dual fuel vehicles.

(b) Specific city and highway CO\(_2\) emission label values for dual fuel alcohol-based and natural gas vehicles when using the alternate fuel are separately determined by the following calculation:

\[
\text{Derived } \text{CO}_2\text{alt} = \frac{5 \text{ cycle } \text{CO}_2\text{gas}}{\text{CO}_2\text{gas}} \times \text{CO}_2\text{alt}
\]

Where:

- \( \text{CO}_2\text{alt} \) = The unrounded FTP-based configuration city or HFET-based configuration highway CO\(_2\) emissions value from the alternate fuel, as determined in §600.206.
- \( 5 \text{ cycle } \text{CO}_2\text{gas} \) = The unrounded vehicle-specific or derived 5-cycle configuration city or highway CO\(_2\) emissions value as determined in paragraph (b)(1) or (b)(2) of this section.
- \( \text{CO}_2\text{gas} \) = The unrounded FTP-based city or HFET-based configuration highway CO\(_2\) emissions value from gasoline, as determined in §600.206.

The result, rounded to the nearest whole number, is the alternate fuel CO\(_2\) emissions label value for dual fuel vehicles.

(ii) Optionally, if complete 5-cycle testing has been performed using the alternate fuel, the manufacturer may choose to use the alternate fuel CO\(_2\) emissions label values determined in §600.207–12(a)(4)(ii), rounded to the nearest whole number.

(c) Calculating combined fuel economy.

(1) For the purposes of calculating the combined fuel economy for a model type, to be used in displaying on the label and for determining annual fuel costs under subpart D of this part, the manufacturer shall use one of the following procedures:

- (i) For gasoline-fueled, diesel-fueled, alcohol-fueled, and natural gas-fueled vehicles. Determine FTP-based city and HFET-based highway fuel economy label values for electric vehicles as described in §600.116. Determine these values by running the appropriate repeat test cycles. Convert W-hour/mile results to miles per kW-hr and miles per gasoline gallon equivalent. CO\(_2\) label information is based on tailpipe emissions only, so CO\(_2\) emissions from electric vehicles are assumed to be zero.

- (ii) Optionally, if complete 5-cycle testing has been performed using the alternate fuel, the manufacturer may choose to use the alternate fuel city or highway CO\(_2\) emissions label values determined in paragraph (b) of this section, rounded to the nearest whole number.

- (iii) Optionally, if complete 5-cycle testing has been performed using the alternate fuel, the manufacturer may choose to use the alternate fuel CO\(_2\) emissions label values determined in paragraph (b) of this section, rounded to the nearest whole number.
automobiles, and for dual fuel automobiles that can operate on gasoline or diesel fuel, harmonically average the unrounded city and highway fuel economy values, determined in paragraphs (a)(1) or (2) of this section and (b)(1) or (2) of this section, weighted 0.55 and 0.45 respectively. Round the result to the nearest whole mpg. (An example of this calculation procedure appears in Appendix II of this part).

(ii) For alcohol dual fuel and natural gas dual fuel automobiles operated on the alternate fuel, harmonically average the unrounded city and highway values from the tests performed using the alternative fuel as determined in paragraphs (a)(3) and (b)(3) of this section, weighted 0.55 and 0.45 respectively. Round the result to the nearest whole mpg.

(iii) For electric vehicles, calculate the combined fuel economy, in miles per kWh/hr and miles per gasoline gallon equivalent, by harmonically averaging the unrounded city and highway fuel economy values, weighted 0.55 and 0.45 respectively. Round miles per kWh/hr to the nearest 0.001 and round miles per gasoline gallon equivalent to the nearest whole number.

(iv) For plug-in hybrid electric vehicles, calculate a combined fuel economy value, in miles per gasoline gallon equivalent as follows:

(A) Determine city and highway fuel economy values for vehicle operation after the battery has been fully discharged ("gas only operation" or "charge-sustaining mode") as described in §600.116. For battery energy, convert W-hour/mile results to miles per gasoline gallon equivalent or miles per diesel gallon equivalent, as applicable. Note that you must also express battery-based fuel economy values in miles per kWh/hr for calculating annual fuel cost as described in §600.311.

(B) Calculate a composite city fuel economy value and a composite highway fuel economy value by combining the separate results for battery and engine operation using the procedures described in §600.116. Apply the derived 5-cycle adjustment to these composite values. Use these values to calculate the vehicle's combined fuel economy as described in paragraph (c)(1)(i) of this section.

(v) For fuel cell vehicles, calculate the combined fuel economy, in miles per kilogram and miles per gasoline gallon equivalent, by harmonically averaging the unrounded city and highway CO₂ emission values from the tests performed using the alternative fuel as determined in paragraphs (a)(3) and (b)(3) of this section, weighted 0.55 and 0.45 respectively. Round miles per kilogram to the nearest whole number and round miles per gasoline gallon equivalent to the nearest whole number.

(2) For the purposes of calculating the combined CO₂ emissions value for a model type, to be used in displaying on the label under subpart D of this part, the manufacturer shall:

(i) For gasoline-fueled, diesel-fueled, alcohol-fueled, and natural gas-fueled automobiles, and for dual fuel automobiles that can operate on gasoline or diesel fuel, arithmetically average the unrounded city and highway CO₂ emission values, determined in paragraphs (a)(1) or (2) of this section and (b)(1) or (2) of this section, weighted 0.55 and 0.45 respectively, and round to the nearest whole gram per mile.

(ii) For alcohol dual fuel and natural gas dual fuel automobiles operated on the alternate fuel, arithmetically average the unrounded city and highway CO₂ emission values from the tests performed using the alternative fuel as determined in paragraphs (a)(3) and (b)(3) of this section, weighted 0.55 and 0.45 respectively, and round to the nearest whole gram per mile.

(iii) CO₂ label information is based on tailpipe emissions only, so CO₂ emissions from electric vehicles and fuel cell vehicles are assumed to be zero.

(iv) For plug-in hybrid electric vehicles, calculate combined CO₂ emissions as follows:

(A) Determine city and highway CO₂ emission rates for vehicle operation after the battery has been fully discharged ("gas only operation" or "charge-sustaining mode") as described in paragraphs (a) and (b) of this section.

(B) Calculate a composite city fuel economy value and a composite highway fuel economy value by combining

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(B) Determine city and highway CO\textsubscript{2} emission rates for vehicle operation starting with a full battery charge ("all-electric operation" or "gas plus electric operation", as appropriate, or "charge-depleting mode") as described in §600.116. Note that CO\textsubscript{2} label information is based on tailpipe emissions only, so CO\textsubscript{2} emissions from electricity are assumed to be zero.

(C) Calculate a composite city CO\textsubscript{2} emission rate and a composite highway CO\textsubscript{2} emission rate by combining the separate results for battery and engine operation using the procedures described in §600.116. Use these values to calculate the vehicle’s combined fuel economy as described in paragraph (c)(1)(i) of this section.

(d) Calculating combined fuel economy and CO\textsubscript{2} emissions.

(1) If the criteria in §600.115–11(a) are met for a model type, both the city and highway fuel economy and CO\textsubscript{2} emissions values must be determined using the vehicle-specific 5-cycle method. If the criteria in §600.115–11(b) are met for a model type, the city fuel economy and CO\textsubscript{2} emissions values may be determined using either method, but the highway fuel economy and CO\textsubscript{2} emissions values must be determined using the vehicle-specific 5-cycle method as allowed under §600.114–12(b)(2).

(2) If the criteria in §600.115 are not met for a model type, the city and highway fuel economy and CO\textsubscript{2} emission label values must be determined by using the same method, either the derived 5-cycle or vehicle-specific 5-cycle.

(3) Manufacturers may use any of the following methods for determining 5-cycle values for fuel economy and CO\textsubscript{2} emissions for electric vehicles:

(i) Generate 5-cycle data as described in paragraph (a)(1) of this section.

(ii) Multiply 2-cycle fuel economy values by 0.7 and divide 2-cycle CO\textsubscript{2} emission values by 0.7.

(iii) Manufacturers may ask the Administrator to approve adjustment factors for deriving 5-cycle fuel economy results from 2-cycle test data based on operating data from their in-use vehicles. Such data should be collected from multiple vehicles with different drivers over a range of representative driving routes and conditions. The Administrator may approve such an adjustment factor for any of the manufacturer’s vehicle models that are properly represented by the collected data.

(e) Fuel economy values and other information for advanced technology vehicles.

(1) The Administrator may prescribe an alternative method of determining the city and highway model type fuel economy and CO\textsubscript{2} emission values for general, unique or specific fuel economy labels other than those set forth in this subpart C for advanced technology vehicles including, but not limited to fuel cell vehicles, hybrid electric vehicles using hydraulic energy storage, and vehicles equipped with hydrogen internal combustion engines.

(2) For advanced technology vehicles, the Administrator may prescribe special methods for determining information other than fuel economy that is required to be displayed on fuel economy labels as specified in §600.302–12(e).

(f) Sample calculations. An example of the calculation required in this subpart is in Appendix III of this part.


Subpart D—Fuel Economy Labeling

SOURCE: 41 FR 49761, Nov. 10, 1976, unless otherwise noted.

§ 600.301 Labeling requirements.

(a) Prior to being offered for sale, each manufacturer shall affix or cause to be affixed and each dealer shall maintain or cause to be maintained on each automobile:

(1) A general fuel economy label (initial, or updated as required in §600.314) as described in §600.302 or:

(2) A specific label, for those automobiles manufactured or imported before the date that occurs 15 days after general labels have been determined by the manufacturer, as described in §600.210–08(b) or §600.210–12(b).

(i) If the manufacturer elects to use a specific label within a model type (as defined in §600.002, he shall also affix