§ 86.165–12 Air conditioning idle test procedure.

(a) Applicability. This section describes procedures for determining air conditioning-related CO\textsubscript{2} emissions from light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles. The results of this test are used to qualify for air conditioning efficiency CO\textsubscript{2} credits according to §86.1866–12(c).

(b) Overview. The test consists of a brief period to stabilize the vehicle at idle, followed by a ten-minute period at idle when CO\textsubscript{2} emissions are measured without any air conditioning systems operating, followed by a ten-minute period at idle when CO\textsubscript{2} emissions are measured with the air conditioning system operating. This test is designed to determine the air conditioning-related CO\textsubscript{2} emission value, in grams per minute. If engine stalling occurs during cycle operation, follow the provisions of §86.136–90 to restart the test. Measurement instruments must meet the specifications described in this subpart.

(c) Test cell ambient conditions. (1) Ambient humidity within the test cell during all phases of the test sequence shall be controlled to an average of 40–60 grains of water/pound of dry air.

(2) Ambient air temperature within the test cell during all phases of the test sequence shall be controlled to 73–80 °F on average and 75 ± 5 °F as an instantaneous measurement. Air temperature shall be recorded continuously at intervals of not more than 30 seconds.

(d) Test sequence. (1) Connect the vehicle exhaust system to the raw sampling location or dilution stage according to the provisions of this subpart. For dilution systems, dilute the exhaust as described in this subpart.

(2) Test the vehicle in a fully warmed-up condition. If the vehicle has soaked for two hours or less since the last exhaust test element, preconditioning may consist of a 505 Cycle, 866 Cycle, US06, or SC03, as these terms are defined in §86.1803–01, or a highway fuel economy test procedure, as defined in §600.002–08 of this chapter. For soak...
periods longer than two hours, pre-condition the vehicle using one full Urban Dynamometer Driving Schedule. Ensure that the vehicle has stabilized at test cell ambient conditions such that the vehicle interior temperature is not substantially different from the external test cell temperature. Windows may be opened during pre-conditioning to achieve this stabilization.

(3) Immediately after the pre-conditioning, turn off any cooling fans, if present, close the vehicle’s hood, fully close all the vehicle’s windows, ensure that all the vehicle’s air conditioning systems are set to full off, start the CO₂ sampling system, and then idle the vehicle for not less than 1 minute and not more than 5 minutes to achieve normal and stable idle operation.

(4) Measure and record the continuous CO₂ concentration for 600 seconds. Measure the CO₂ concentration continuously using raw or dilute sampling procedures. Multiply this concentration by the continuous (raw or dilute) flow rate at the emission sampling location to determine the CO₂ flow rate. Calculate the CO₂ cumulative flow rate continuously over the test interval. This cumulative value is the total mass of the emitted CO₂. Alternatively, CO₂ may be measured and recorded using a constant velocity sampling system as described in §§86.106–96(a)(2) and 86.109.

(5) Within 60 seconds after completing the measurement described in paragraph (d)(4) of this section, turn on the vehicle’s air conditioning system. Set automatic air conditioning systems to a temperature 9 °F (5 °C) below the ambient temperature of the test cell. Set manual air conditioning systems to maximum cooling with recirculation turned off, except that recirculation shall be enabled if the air conditioning system automatically defaults to a recirculation mode when set to maximum cooling and maintains recirculation with the low fan speed, then recirculation shall continue to be enabled. After the fan speed has been set, continue idling the vehicle while measuring and recording the continuous CO₂ concentration for a total of 600 seconds as described in paragraph (d)(4) of this section.

(e) Calculations. (1) For the measurement with no air conditioning operation, calculate the CO₂ emissions (in grams per minute) by dividing the total mass of CO₂ from paragraph (d)(4) of this section by 10.0 (the duration in minutes for which CO₂ is measured). Round this result to the nearest tenth of a gram per minute.

(ii) For the measurement with air conditioning in operation for automatic air conditioning systems, calculate the CO₂ emissions (in grams per minute) by dividing the total mass of CO₂ from paragraph (d)(5) of this section by 10.0. Round this result to the nearest tenth of a gram per minute.

(3) Calculate the increased CO₂ emissions due to air conditioning (in grams per minute) by subtracting the results of paragraph (e)(1) of this section from the results of paragraph (e)(2)(i) or (ii) of this section, whichever is applicable.

(f) The Administrator may prescribe procedures other than those in this section for air conditioning systems and/
or vehicles that may not be susceptible to satisfactory testing by the procedures and methods in this section. For example, the Administrator may prescribe alternative air conditioning system settings for systems with controls that are not able to meet the requirements in this section. For example, the Administrator may prescribe alternative air conditioning system settings for systems with controls that are not able to meet the requirements in this section.


§ 86.166–12 [Reserved]

§ 86.167–17 AC17 Air Conditioning Emissions Test Procedure.

(a) Overview. The AC17 test procedure consists of four elements: a pre-conditioning cycle, a 30-minute soak period under simulated solar heat, followed by measurement of emissions over an SC03 drive cycle and a Highway Fuel Economy Driving Schedule (HFET) drive cycle. The vehicle is preconditioned with a single UDDS to bring the vehicle to a warmed-up stabilized condition. This preconditioning is followed by a 30 minute vehicle soak (engine off) that proceeds directly into the SC03 driving schedule, during which continuous proportional samples of gaseous emissions are collected for analysis. The SC03 driving schedule is followed immediately by the HFET cycle, during which continuous proportional samples of gaseous emissions are collected for analysis. This entire sequence is conducted in an environmental test facility. Vehicles are tested for any or all of the following emissions, depending upon the specific test requirements and the vehicle fuel type: gaseous exhaust THC, NMHC, NMOG, CO, NOx, CO2, N2O, CH3, CH4, CH2OH, C2H5OH, C2H4O, and HCHO. For purposes of measuring the impact of air conditioning systems on CO2 emissions, this sequence is run twice: once with air conditioning on and once with air conditioning off. The following figure shows the basic sequence of the test procedure.

(b) Equipment requirements. Equipment requirements are specified in subpart B of part 86 of this chapter.

(c) Fuel specifications. The test fuel specifications are given in §86.113. Test fuels representing fuel types for which there are no specifications provided in §86.113 may be used if approved in advance by the Administrator.

(d) Analytical gases. The analytical gases must meet the criteria given in §86.114.

(e) Driving cycles. (1) The driving schedules for the EPA Urban Dynamometer Driving Schedule (UDDS) and the SC03 cycle are contained in appendix I of this part. The driving schedule for the Highway Fuel Economy Driving Schedule (HFET) is set forth in appendix I of part 600 of this chapter.

(2) The speed tolerance at any given time on the driving schedules is defined by upper and lower limits. The upper limit is 2 mph higher than the highest point on trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they occur for less than 2 seconds on any occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

( f) Equipment calibration. The equipment used for fuel economy testing must be calibrated according to the provisions of §86.116.

(g) Vehicle preparation. The vehicle shall be prepared for testing according to §86.132(a) through (g), concluding with a 12-36 hour soak.

(h) Dynamometer procedures. (1) The AC17 test procedure consists of a preconditioning UDDS, a 30-minute soak period under simulated solar heat, followed by measurement of emissions over an SC03 drive cycle and a Highway Fuel Economy Driving Schedule (HFET) drive cycle.

(2) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle must be functioning during all procedures in this subpart. The Administrator may authorize maintenance to correct component malfunction or failure.

(3) Use §86.129 to determine road load power and test weight. The dynamometer's horsepower adjustment settings shall be set such that the force