

(3) Span the HC analyzer using span gas introduced at the analyzer span or sample port. Span on a carbon number basis of one (C_1). For example, if you use a C_3H_8 span gas of concentration 200 $\mu\text{mol/mol}$, span the FID to respond with a value of 600 $\mu\text{mol/mol}$.

(4) Overflow zero gas at the HC probe inlet or into a tee near the probe outlet.

(5) Measure the THC concentration in the sampling and background systems as follows:

(i) For continuous sampling, record the mean THC concentration as overflow zero air flows.

(ii) For batch sampling, fill the sample medium (e.g., bag) and record its mean THC concentration.

(iii) For the background system, record the mean THC concentration of the last fill and purge.

(6) Record this value as the initial THC concentration, $x_{\text{THC}[\text{THC-FID}]_{\text{init}}}$, and use it to correct measured values as described in §1065.660.

(7) If any of the $x_{\text{THC}[\text{THC-FID}]_{\text{init}}}$ values exceed the greatest of the following values, determine the source of the contamination and take corrective action, such as purging the system during an additional preconditioning cycle or replacing contaminated portions:

(i) 2% of the flow-weighted mean wet, net concentration expected at the HC (THC or NMHC) standard.

(ii) 2% of the flow-weighted mean wet, net concentration of HC (THC or NMHC) measured during testing.

(iii) 2 $\mu\text{mol/mol}$.

(8) If corrective action does not resolve the deficiency, you may request to use the contaminated system as an alternate procedure under §1065.10.

[73 FR 37320, June 30, 2008, as amended at 73 FR 59330, Oct. 8, 2008; 75 FR 23043, Apr. 30, 2010]

§ 1065.525 Engine starting, restarting, and shutdown.

(a) Start the engine using one of the following methods:

(1) Start the engine as recommended in the owners manual using a production starter motor or air-start system and either an adequately charged battery, a suitable power supply, or a suitable compressed air source.

(2) Use the dynamometer to start the engine. To do this, motor the engine within $\pm 25\%$ of its typical in-use cranking speed. Stop cranking within 1 second of starting the engine.

(b) If the engine does not start after 15 seconds of cranking, stop cranking and determine why the engine failed to start, unless the owners manual or the service-repair manual describes the longer cranking time as normal.

(c) Respond to engine stalling with the following steps:

(1) If the engine stalls during warm-up before emission sampling begins, restart the engine and continue warm-up.

(2) If the engine stalls during preconditioning before emission sampling begins, restart the engine and restart the preconditioning sequence.

(3) Void the entire test if the engine stalls at any time after emission sampling begins, except as described in §1065.526. If you do not void the entire test, you must void the individual test mode or test interval in which the engine stalls.

(4) Except as described in paragraph (d) of this section, void the test if the engine stalls at any time after emission sampling begins.

(d) Shut down the engine according to the manufacturer's specifications.

[73 FR 37320, June 30, 2008, as amended at 75 FR 68463, Nov. 8, 2010]

§ 1065.526 Repeating void modes or test intervals.

(a) Test modes and test intervals can be voided because of instrument malfunctions, engine stalling, or emissions exceeding instrument ranges. This section specifies circumstances for which a test mode or test interval can be repeated without repeating the entire test.

(b) This section is intended to result in replicate test modes and test intervals that are identical to what would have occurred if the cause of the voiding had not occurred. It does not allow you to repeat test modes or test intervals in any circumstances that would be inconsistent with good engineering judgment. For example, the procedures specified here for repeating a mode or interval may not apply for certain engines that include hybrid energy storage features or emission controls that

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involve physical or chemical storage of pollutants. This section applies for circumstances in which emission concentrations exceed the analyzer range only if it is due to operator error or analyzer malfunction. It does not apply for circumstances in which the emission concentrations exceed the range because they were higher than expected.

(c) If one of the modes of a discrete-mode test is voided as provided in this section, you may void the results for that individual mode and continue the test as follows:

(1) If the engine has stalled or been shut down, restart the engine.

(2) Use good engineering judgment to restart the test sequence using the appropriate steps in §1065.530(b).

(3) Precondition the engine by operating it at the previous mode for approximately the same amount of time it operated at that mode for the previous emission measurement.

(4) Advance to the mode at which the test was interrupted and continue with the duty cycle as specified in the standard-setting part.

(d) If a transient or ramped-modal cycle test interval is voided as provided in this section, you may repeat the test interval as follows:

(1) Use good engineering judgment to restart (as applicable) and precondition the engine and emission sampling system to the same condition as would apply for normal testing. This may require you to complete the voided test interval. For example, you may generally repeat a hot-start test of a heavy-duty highway engine after completing the voided hot-start test and allowing the engine to soak for 20 minutes.

(2) Complete the remainder of the test according to the provisions in this subpart.

(e) Keep records from the voided test mode or test interval in the same manner as required for unvoided tests, and include a description of the reason for voiding the test mode or test interval.

[75 FR 68463, Nov. 8, 2010]

§ 1065.530 Emission test sequence.

(a) Time the start of testing as follows:

(1) Perform one of the following if you precondition sampling systems as described in §1065.520(f):

(i) For cold-start duty cycles, shut down the engine. Unless the standard-setting part specifies that you may only perform a natural engine cooldown, you may perform a forced engine cooldown. Use good engineering judgment to set up systems to send cooling air across the engine, to send cool oil through the engine lubrication system, to remove heat from coolant through the engine cooling system, and to remove heat from any exhaust aftertreatment systems. In the case of a forced aftertreatment cooldown, good engineering judgment would indicate that you not start flowing cooling air until the aftertreatment system has cooled below its catalytic activation temperature. For platinum-group metal catalysts, this temperature is about 200 °C. Once the aftertreatment system has naturally cooled below its catalytic activation temperature, good engineering judgment would indicate that you use clean air with a temperature of at least 15 °C, and direct the air through the aftertreatment system in the normal direction of exhaust flow. Do not use any cooling procedure that results in unrepresentative emissions (see §1065.10(c)(1)). You may start a cold-start duty cycle when the temperatures of an engine's lubricant, coolant, and aftertreatment systems are all between (20 and 30) °C.

(ii) For hot-start emission measurements, shut down the engine. Start the hot-start duty cycle as specified in the standard-setting part.

(iii) For testing that involves hot-stabilized emission measurements, such as any steady-state testing, you may continue to operate the engine at maximum test speed and 100% torque if that is the first operating point. Otherwise, operate the engine at warm idle or the first operating point of the duty cycle. In any case, start the emission test within 10 min after you complete the preconditioning procedure.

(2) If you do not precondition sampling systems, perform one of the following:

(i) For cold-start duty cycles, prepare the engine according to paragraph (a)(1)(i) of this section.