

Kansas City PM Characterization Study

Final Report

Appendix N

Onsite Quality Assurance and Analysis

Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

Sponsors:

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Notes for Proper SEMTECH Installation, Testing, and Post-Test Procedures

GENERAL

- Ensure power supplies are hooked up and functioning during test preparations (this will help ensure battery voltages are adequate for testing)
- Ensure test is conducted in a relatively short amount of time after the FID is ignited, and ensure the FID flame is turned off after the post-test audit is conducted (this will minimize the rate of depletion of the mini-FID cylinders)
- However, ensure the FID flame has been on for at least 15 minutes before the pre-test zero and audit are conducted (this will help ensure the FID chamber is stabilized, and therefore reduce measurement error)
- Ensure exhaust flow tube is oriented such that sample port is closest to tailpipe
- Ensure all malfunctioning equipment is labeled, logged, and removed from service

SOFTWARE SETUP BEFORE “SESSION MANAGER” – These steps help reduce wasted setup time and wasted test records, since none of these settings may be altered after the “Session Manager” is started.

- Verify GPS, flow meter, and VI (if applicable) values through “Road Test” screen (emissions cannot be calculated without these parameters)
- Ensure all “Test Setup” values (such as transport delays, calc input settings, upper detection range(10k), and vehicle info and notes) are correct. Ensure the correct filename is entered (this ensures appropriate default settings are set in the file, and it eliminates the time required to identify proper filenames and rename files during post-processing)

DURING “SESSION MANAGER”

- Ensure the “Session Manager” (and all associated activities) are conducted in the proper sequence (this helps ensure test records contain all pre and post-test audits and calibrations and also ensures all test files can be processed). The proper sequence is:
 - Ensure all pre-test settings are correct (use “Road Test” screen)
 - Open session manager window
 - Perform “Test Setup” using “Setup” button (this may also be done before opening the “Session Manager” window)
 - Click the Session Manager “Start” button to start the session manager
 - Conduct a pre-test zero
 - Conduct a pre-test audit (see notes below)
 - Conduct a pre-test span (*only if audit fails*)
 - Conduct a pre-test re-audit (*only if a span was conducted*)
 - Immediately before the test is started, review the “Road Test” screen to ensure GPS, flow meter, and VI (if applicable) data is still being collected by the SEMTECH
 - Click the test “Start” button to start the test
 - Do the preconditioning drive
 - Click the test “Stop” button to stop the test when the driver returns from the drive
 - Conduct a post-test audit – don’t worry about it if it fails!
 - Conduct a post-test zero
 - Click the Session Manager “Stop” button to stop the session manager
 - “Close” the Session Manager” window
 - Upload, process, and analyzer the test file (see SEMTECH file collection SOPs)
- For spans and audits: Ensure the correct ports and gasses are used, ensure the correct bottle concentrations are entered, ensure the “THC” gas is set to “propane” **before** the gas concentration is entered (so the concentration is not improperly converted), ensure the upper detection range is appropriate, and ensure any failed pre-test audits are followed by a span and a re-audit (ensures equipment is properly calibrated before testing)

Immediately Before Vehicle Leaves Checklist

- ☐ Ensure laptop is communicating with the correct SEMTECH
- ☐ Flip FID to “On”, then back to “Auto”
- ☐ Verify autozero is enabled
- ☐ Ensure HC range is 10000
- ☐ Ensure installer is entering info for correct vehicle
- ☐ Ensure correct software and firmware are in use
- ☐ Check test settings in setup menu are correct
- ☐ Check road test screen for to check for the following:
 - ☐ GPS and VI are being collected
 - ☐ exhaust flow is valid ($> 2 \text{ kg/hr}$)
 - ☐ exhaust flow temp is valid (*ambient if vehicle is off, 20 C and up if on*)
 - ☐ ambient temp and RH is reasonable (*same as independent weather station*)
 - ☐ aux temp is reasonable (*close to ambient temp*)
 - ☐ $\text{CO}_2 > 13$ (hybrid may be exception of running on electric)
 - ☐ FID fuel pressure is sufficient ($> 1300 \text{ psi}$)
 - ☐ Chiller and heated FID temperatures are OK (*chiller $\approx 4 \text{ C}$, FID $\approx 193 \text{ C}$*)
- ☐ Disconnect power supply, hook in 2nd battery, check voltage
- ☐ Ensure VI cable isn't where it will be kicked off or is in the way of driver
- ☐ Ensure no warnings (i.e., temp or pressure) are displayed on flowmeter transducer box
- ☐ Ensure flowmeter is matched to correct box
- ☐ Verify flowmeter is installed in proper direction
- ☐ Verify the flowmeter has been purged
- ☐ Ensure the SEMTECH has passed a leak check
- ☐ Ensure 2.5" flowmeters used for 3.0 L and larger engines, 2" flowmeters for under 3.0 L
- ☐ Ensure all tubing leading to flowmeter has an equal or greater diameter than that of the flowmeter
- ☐ Ensure tubing has sufficient ground clearance
- ☐ Ensure flowmeter box is placed securely (not on top of SEMTECH)
- ☐ Ensure metalized flowmeter tubing sheath isn't touching battery terminals
- ☐ Ensure boots are on battery terminals
- ☐ Ensure foam is stuffed in trunk lid or hatch gaps, & Ethernet cord is coming out of trunk
- ☐ Ensure test is started (within the session manager)
- ☐ Ensure event marker is set right before preconditioning run
- ☐ Ensure picture has been taken of flowmeter and tubing setup
- ☐ Pull on exhaust tubing setup to make sure all tube connections & flowmeter are secure
- ☐ After preconditioning run, stop the event marker and do the mass emissions rates & mpg analysis

AFTER TESTING IS COMPLETE, TEST STOPPED, & “SESSION MANAGER” IS CLOSED

- Turn FID flame off (helps conserve FID fuel)
- Hook up power supply (to help ensure battery voltage is adequate for next test), purge flowmeter

Rcommended SEMTECH Test Record Review (after testing is completed)

- ☐ Verify a zero and an audit are conducted before the test record was created
- ☐ Verify the pre-test audit is either passed or followed by a span and another audit
- ☐ Ensure test is preceded by a “passed” audit
- ☐ Ensure correct gas concentrations are entered for audits
- ☐ Ensure correct gas concentrations are entered for spans
- ☐ Ensure propane is used for all audits and spans
- ☐ Ensure correct sample ports are used for audits and spans
- ☐ Verify post-test audit was conducted (use test start/end times)
- ☐ Verify cumulative emissions are provided (ensures GPS and flowmeter)
- ☐ Verify upper concentration limit is appropriate for the vehicle that was tested
- ☐ Check for any faults and warnings
- ☐ Check for appropriate software and firmware versions
- ☐ Sanity check on total distance traveled
- ☐ Sanity check on total test duration
- ☐ Verify transport delays applied to test are appropriate
- ☐ Verify VI is gathered for 1996 and newer vehicles
- ☐ Verify flow meter ID number is in test record