

Kansas City PM Characterization Study

Final Report

Appendix I

Install Guidelines

Assessment and Standards Division
Office of Transportation and Air Quality
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Prepared for EPA by
Eastern Research Group, Incorporated
Austin, TX

Bevilacqua-Knight Incorporated
Oakland, CA

NuStats LLC
Austin, TX

Desert Research Institute
Reno, NV

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SEMTECH Installation Guidelines for the Kansas City Study

Part A: Task Instructions

Important Operation Notes:

Whenever updating SEMTECH firmware, individual bench firmware must be manually updated after the main flash card firmware is updated (i.e., the NDIV AMBII bench firmware must be manually updated through the Tech Support/Maintenance/Firmware update menu). This is not prompted, and not automatic.

Never insert or remove a memory card when the SEMTECH is powered up.

Never interchange memory cards between SEMTECH units without first reformatting the card.

Always back up all data on a memory card before reformatting the card.

When a memory card is first used in a SEMTECH, it must either be new or be reformatted.

To reformat a card, use a PCMCIA flashcard adaptor in a laptop's port. Open "my computer", and select the drive that represents the flash card. Then, in the file menu, select "format". Format as "FAT16", **NOT** "FAT32" ("FAT32" will probably be the default, and "FAT16" will probably just be listed as "FAT").

#	Task	Description
1	Connect power to SEMTECH	Connect power cable to SEMTECH.
2	Turn SEMTECH on	Press the front panel main power switch (to begin the 1-hour warm-up process).
3	Connect host computer	Home / N/A If not already logged on, initialize SENSOR Tech PC software on host computer. Establish communications between host computer and SEMTECH unit with Ethernet cable or wireless connection.
4	Check FID pressure regulator	FID pressure regulator should read 30 PSIG. ENSURE the right nylon washer is used (not the seal cap that comes with the refilled FID bottles).
5	Open FID fuel supply	N/A / N/A Open the FID cover on the back of the SEMTECH and open main FID gas bottle valve.
6	Verify FID fuel pressure	Status / Summary Verify FID fuel pressure shown on summary screen is greater than 100 psig, and record FID fuel pressure on data collection sheet. Replace bottle if necessary (usage rate is 200 psig/hour) using guidelines in Section 7.6. If bottle replacement is necessary, ensure output pressure as shown on FID regulator is 30 psig. Note: FID output pressure is critical as it affects HC reading.

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7	FID leak check	Status / Summary Perform FID leak check by closing main FID bottle valve and measuring pressure drop. The displayed pressure should not drop by more than 1% in 30 seconds. If unit passes leak check, reopen main bottle valve, then close FID cover on back of unit. Otherwise, repair system and recheck.			
8	Record system data	Status / Summary Record the independently measured ambient temperature and relative humidity on the data collection sheet. Note that these measurements should be taken at the front of the vehicle (air introduced to engine). 9.1			
9	Verify system pressures (FID off)	Status / Flow SEMTECH system pressures are provided on the unit's "Flow" screen. Check to see no cap is on the ambient port at the back of the SEMTECH, and ensure that the various ports are open and able to flow. Quick disconnects should be depressed to allow a free flow of gasses on each port tested. Ensure SEMTECH system pressures at points shown as P1, P2, and P3 on SEMTECH flow diagram are within acceptable ranges for the various input flows (ambient, sample, span, and zero) and record values on the data collection sheet. Toggle between "ambient", "sample", "span", and "zero" inputs using the sample input button on the lower right of the flow screen. The "Allowable ΔP (mbar)" column in each table indicates the maximum allowable pressure drop (below ambient pressure) for each system location (disregard pressures for the shaded cells). If pressures drop below these limits, service unit as outlined in Section 12 of the SEMTECH user's manual.			
	Flow Point	Ambient Port	Sample Port	Zero Port	Span Port
		Allowable Pressure Drop (mbar)	Allowable Pressure Drop (mbar)	Allowable Pressure Drop (mbar)	Allowable Pressure Drop (mbar)
		P1	-200	-300	
		P2	-250	-250	-250
		P3	-250	-250	-250
10	Perform a leak check	System Setup / Leak Test Using the supplied soft plastic cap (or other appropriate device), seal the end of the ¼" sample port line to perform a leak check. On the host computer, select the "Start" button to initiate the leak test. The system will automatically perform the leak test and display the results. If the unit fails the leak check, repair as necessary. Once the unit has successfully completed the leak test, connect the ¼" sample port line to the exhaust flow port.			
11	Verify analyzer sample rates	System Setup / Configure 1 Ensure the system's sample rates are set to the appropriate values (system control = 1000 ms, FID = 500 ms, NDIR=1200, NDUV = 500 ms.			

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12	Ignite FID	System Setup / Configure 1 Check the FID temperature using the Status/Summary screen. If the FID oven is 170 deg C or hotter, the FID may be ignited (ignition may be performed at lower temperatures, but fuel is then wasted during warm-up). To ignite the FID, select the flame "on" button. Approximately 15 minutes are required for the FID to come to equilibrium after the flame is ignited.
13	Install SEMTECH in vehicle	Move SEMTECH to vehicle. Ensure all necessary connections, lines, wires, etc. are installed and routed securely. Secure SEMTECH and battery in trunk.
14	Install FID exhaust and drain tubes	Attach the flexible tubing to the FID exhaust port and the ambient air port on the back of the unit. Route the tubing out of the trunk, and away from the vehicle's exhaust.
15	Install GPS receiver	Install magnetic GPS unit to top of vehicle, and connect GPS wiring to front of SEMTECH.
16	Install weather probe	Install the weather probe on roof or back window of vehicle using provided suction-cup. Connect wiring to front of the SEMTECH.
17	Install vehicle interface cable	Connect the SEMTECH to the vehicle's OBDII diagnostic link connector (DLC) with the supplied cable (running the cable past the back seat). The DLC is typically located under the vehicle's instrument panel, within arm's reach of the steering wheel.
18	Install exhaust flow meter tube and flow meter	Install external exhaust tube to bumper of vehicle and connect to tailpipe with appropriate adaptors and hardware. Note that the two flow meter connectors should be near the tube's outlet, and the sample port should be closer to the vehicle exhaust system than the flow meter connectors. Connect the flow meter to the SEMTECH with the two electrical lines. Connect the 1/4" sample port line to the exhaust tube port. Note: Use 2" pitot tube flowmeters for engines < 3L, and 2.5" pitot tube flowmeters for engines > 3L. Ensure diameter of all tubing leading to flowmeter is equivalent to or great than diameter of the flowmeter.
19	Connect Power Supply	Connect power supply to battery, then plug charger in. Power supply should be used during warm-up and calibration.
20	Install trunk latch	Install the extended trunk latch to prevent trunk from closing on cables.

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21	Establish vehicle interface (VI) communication	<p>System Setup / Configure 1</p> <p>On 1996 and newer vehicles, select the appropriate SEMTECH connector port (VI). Select the “Edit PIDs” button at the bottom of the screen, and verify the “LD OBDII” option is highlighted. Once LD OBDII is selected, use “set group” to save the LD PIDs. Then, determine the appropriate OBDII communication protocol for the vehicle, using handheld scanner info or guidelines in Part B of this document. To select the protocol, use the “Protocol” button’s drop-down menu. After the protocol is selected, start the vehicle to ensure communication is established (as evidenced by a live data stream display shown on the “Vehicle Interface” screen.) If communication is not established, try another possible protocol. Several attempts may be necessary. Indicate which protocol is used (or indicate if the vehicle will not communicate) below. If communication isn’t established, it may be necessary to pull the DLC connector off the vehicle for at least 10 seconds to allow the system to reset (probably after each time a new protocol is attempted). Also, if the SEMTECH is switched from AUX2 to VI or from VI to AUX2, the SEMTECH must be shut down and restarted to reset.</p>
22	Set auxiliary inputs / outputs	<p>System Setup / Configure 2</p> <p>Set conditions for auxiliary inputs and outputs in the Configure 2 screen. At a minimum, this involves turning the GPS receiver on, and setting the units desired for CO measurement display. Input and/or output triggers may also be set in this screen, as well as ranges for analog outputs.</p>
23	Review collected parameters	<p>Test / Road Test</p> <p>Switch the SEMTECH to the “Road Test” menu and review the display screen to ensure all desired information is available for recording.</p>
24	Check for system faults and warnings	<p>Status / Faults</p> <p>Use the “System Information Bar” at the bottom of the SEMTECH screen to determine if system faults or warnings are present. If any faults or warnings are present, review and correct the faults and warnings listed in the “faults” display screen.</p>
25	Verify battery voltage	<p>Status / Summary</p> <p>Temporarily remove power supply from battery and verify the battery voltage is sufficient for the testing to be performed (voltage should be over 13 volts). Record battery voltage in the space above. Replace the battery with a charged unit, if necessary. Immediately after checking voltage, replace power supply to avoid draining the battery during FID warm-up.</p>

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26	Set transport delays and other test parameters	<p>Test / Test Setup</p> <p>Under the “Settings” tab, use the “Edit Test Configuration” button to set the NDIR, NDUV, SCB, FID, methane FID, and EFM transport delays to 6, 6, 0, 5, 5, and 0, respectively (for the pitot tube flowmeter). Set all pollutant detection limits to zero, and set the “Calculation Control” parameters to the appropriate configuration (mass emission calc from flow meter, vehicle speed from GPS, and engine speed from ECM). Set calculation limits for engine speed at 1000 RPM/s, vehicle speed at 21.0 mph/s, fuel rate at 0.050 gal/s, and fuel specific dropout at 0.50 %C. Don’t enter independent weather station data, unless the SEMTECH’s weather station probe isn’t used for some reason. Set the fuel H/C ratio at 1.8, and the fuel specific gravity at 0.744. For the NMHC cutter for the methane FID, enter the CH₄ (propane) cut as 1.0 and the C₂H₆ (ethane) as 0.015. Then, select the “open marker window”, and move this marker window to the upper right-hand of the screen for future use in setting markers in the recorded data file.</p>
27	Configure analog inputs	<p>Test / Test Setup</p> <p>Still within the “Edit Test Configuration” window, select the “Analog Inputs” tab and configure all analog input data as appropriate.</p>
29	Enter test identification info	<p>Test / Test Setup</p> <p>Still within the “Edit Test Configuration” window, select the “Test Info” tab and enter test identification information. Use the “Scratch Pad” to record any unique test conditions or situations and all appropriate test details. Also record the flowmeter ID # in the scratch pad.</p>
28	Establish post-processing output groups	<p>Test / Test Setup</p> <p>Still within the “Edit Test Configuration” window, select the “Outputs” tab and ensure “select all” is select for output post-processing.</p>
30	Save setup	<p>Test / Test Setup</p> <p>After all test setup parameters are selected, switch back to the “Setup” tab, and click on the “Save” button. IMPORTANT: All test settings will be lost unless the data is saved.</p>
31	Verify warm-up	<p>Status / Summary</p> <p>Use the “System Information Bar” at the bottom of the SEMTECH screen to determine if warm-up has been completed, and view details in the “Status / Summary” screen. When the SEMTECH indicates warm-up is complete, record the FID oven temperature and chiller temperature on the data collection sheet.</p>
32	Record zero, audit and span gas bottle information	<p>Record cylinder numbers for the zero, audit and span gasses on the data collection sheet. Begin the session manager. Note that gas concentrations that may be used for the various audits and spans are provided in the “Calibration and Audit Gas Blend Ranges” section in Part C of this document.</p>

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33	Perform a zero calibration	<p>System Setup / Zero</p> <p>Once the system is fully warmed up, and the FID has been burning for at least 15 minutes, the system may be zeroed (ensure your session is started). To prepare for a zero, hook the zero gas bottle to the zero port on the front panel of the unit, open the zero air valve, and adjust the pressure regulator to approximately 30 psig. Then, on the SEMTECH display, select all gas channels (except CH₄, methane, which would be measured by the additional methane FID), select the zero port, then click the zero button. Note the HC (ppmC₃) is ppm HC expressed as propane, measured by NDIR, and the THC (PPM) is total hydrocarbon measured by the FID). After the zero calibration is complete, close the zero bottle valve and disconnect the zero air tube from the SEMTECH zero port. Note: do not zero on ambient air, as this will result in decreased accuracy of CO₂ readings.</p>
34	Perform a gas audit	<p>System Setup / Audit</p> <p>After the zero calibration has been completed, the gas audit may be performed. To prepare for a gas audit, determine the proper gas range (use high concentration range for 1995 and older vehicles, low concentration range for 1996 and newer vehicles), hook the audit gas bottle to the span port on the front panel of the unit, open the audit gas bottle valve, and adjust the pressure regulator to approximately 30 psig. Then, on the SEMTECH display, select all gasses to be audited (excluding O₂ and CH₄, the methane FID), enter the bottle concentrations for each of the gasses, and select the appropriate type of hydrocarbon gas (i.e., methane or propane). Note the HC (ppmC₃) is ppm HC expressed as propane, measured by NDIR, and the THC (PPM) is total hydrocarbon measured by the FID). Select the "span" port, and click the start button to initiate the audit. If unit fails the audit, perform a span calibration (described below) and then re-audit. After the gas audit is complete, close the audit bottle valve and disconnect the audit gas tube from the SEMTECH span port.</p>
35	Perform an O ₂ audit	<p>System Setup / Audit</p> <p>After the gas audit has been completed, perform an O₂ audit. To perform an O₂ audit, select O₂ on the SEMTECH unit, enter 20.9 % as the O₂ concentration, and select "ambient" as the port (if not automatic). Begin the audit by selecting the start button. If unit fails the O₂ audit, perform a span calibration (described below) and then re-audit.</p>

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36	Perform a span calibration	<p>System Setup / Span</p> <p>If the unit fails any part of the gas or O₂ audit, a span calibration must be performed to recalibrate the unit. To prepare for a span calibration, determine the proper gas range (use high concentration range for 1995 and older vehicles, low concentration range for 1996 and newer vehicles), hook the appropriate span gas bottle to the span port on the front panel of the unit (see "Calibration and Audit Gas Blend Ranges" section at the end of this checklist to determine the appropriate span gas), open the span gas bottle valve, and adjust the pressure regulator to approximately 30 psig. Select the appropriate THC FID range for the span calibration (under the "Settings/Configure 1" menu). Then, on the SEMTECH display, select all gasses to be spanned (excluding O₂ and CH₄, the methane FID), enter the bottle concentrations for each of the gasses, select the appropriate type of hydrocarbon gas (i.e., methane or propane), and select the appropriate span range (guidelines are listed in Part C of this document). Note the HC (ppmC3) is ppm HC expressed as propane, measured by NDIR, and the THC (PPM) is total hydrocarbon measured by the FID). Select the "span" port, and click the start button to initiate the span calibration. If unit fails the calibration, perform necessary repairs, re-zero, and then perform another span calibration. After the span calibration is complete, close the span calibration bottle valve and disconnect the span gas tube from the SEMTECH span port.</p>
37	Perform an O ₂ calibration	<p>System Setup / Span</p> <p>After the span calibration has been completed, perform an O₂ calibration. To perform an O₂ calibration, select O₂ on the SEMTECH unit, enter 20.9 % as the O₂ concentration, and select "ambient" as the port (if not automatic). Click the start button to begin the calibration. If unit fails the O₂ calibration, perform necessary repairs, re-zero, and then perform another O₂ calibration. After the span and O₂ calibrations are complete, perform gas and O₂ follow-up audits.</p>
38	Perform a gas re-audit	<p>System Setup / Audit</p> <p>This post-calibration audit only needs to be performed if unit fails original audit and a span calibration is performed. Use "gas audit" procedures outlined above.</p>
39	Perform an O ₂ re-audit	<p>System Setup / Audit</p> <p>This post-calibration audit only needs to be performed if unit fails original audit and an O₂ calibration is performed. Use "O₂ audit" procedures outlined above.</p>
40	Prepare vehicle for testing	<p>Remove the power supply, extension cord, and any other connections external to the vehicle. Walk around and inspect the vehicle to make sure nothing is being overlooked. Verify suction cups and external exhaust pipe are still secure. Latch the trunk with the latch extension.</p>
41	Switch input from ambient to exhaust sample	<p>Test / Test Setup</p> <p>Prior to starting the test, change the source input from "Ambient Air" to "Sample", using the input source selection button displayed at the lower right corner of the screen.</p>

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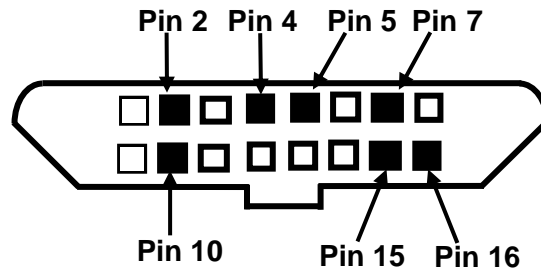
42	Begin recording test record	Test / Test Setup Begin recording data by clicking the “Start” button on the Test Setup screen.
43	Set proper HC range	Immediately before testing, start the vehicle, note the HC reading (in the road test screen), and write the HC reading (PPM) on the first page of the vehicle information packet (to help dyne SEMTECH folks set it properly). Then, select the appropriate THC FID range for the vehicle (under the “Settings/Configure 1” menu). Nearly all vehicles will have HC readings over 1000 PPM (some only at cold-start), so generally the range is either going to be set at 10,000 or 40,000 (some vehicles ARE over 10,000). NOTE: range setting can be changed AFTER the session is started, and even after a test is started. Please watch the road test screen during testing. If readings max out in the road test screen, switch to the next higher range.
44	Conduct testing	Conduct drive (or dyne) testing as required. Watch the CO and CO2 readings in the road test screen during testing. If the sum of the CO and CO2 readings is less than 13, generally excessive dilution is occurring (hybrids may be exception). Also check road test screen for GPS, VI, exhaust flow, exhaust flow temp, weather station, aux temp, and HC range. Using the emissions screen, evaluate cumulative MPG values after a short drive.
45	Set post-test time-alignment stamp	After all testing has been completed, but before stopping data collection, turn the vehicle off, wait for a few seconds, then start the vehicle up again. This provides a second (post-test) time-alignment stamp for all recorded parameters.
46	Perform a gas audit	System Setup / Audit Immediately after testing has been completed, and before any equipment is removed from the vehicle, perform a post-test gas audit. This step is necessary in order to help quantify analyzer drift during testing. Use “gas audit” procedures outlined above.
47	Backup and transfer data	Test data should be copied to a remote, non-volatile medium and archived.
48	Recharge batteries	After testing is concluded, ensure all batteries are charged for future testing. (Note: Make sure a powered-on SEMTECH is not connected to the power supply while charging batteries. The power supply is unable to charge batteries and power the SEMTECH unit concurrently.

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Part B: Selection of OBDII Communication Protocol for VI

Try to find the correct communication protocol using the “OBDII Generic Communication Protocols by Manufacturer” table. If the vehicle is not listed, or if communication is not established, the general guidance below may be of benefit.

The image below indicates pin locations on a typical OBDII connector. Metal contacts in these pin locations, as described in the table below, can sometimes be used to determine the communication protocol used by the vehicle.



Communication Protocol	Pin Locations and Typical Manufacturers
SAE-J1850 VPW (Variable Pulse Width)	Pins 2, 4, 5, and 16 (NOT 10) General Motors vehicles (including Buick, Cadillac, Chevrolet, GMC, Olds, Pontiac, Saturn), some “older” Chrysler vehicles (96-99) and select other vehicles (’03 Chrysler PT Cruiser, ’02 Dodge Neon, ’98 Isuzu Trooper, ’03 Jeep Liberty, and ’97 Toyota Corolla)
SAE-J1850 PWM (Pulse Width Modulation)	Pins 2, 4, 5, 10, and 16 Generally “older” (96-99) Ford vehicles (including Mercury and the Mazda B-Series pickups and Tribute)
ISO-9141-2	Pins 4, 5, 7, 16, and sometimes 15 Typically newer Chrysler, Ford, European, and most Asian vehicles (such as Acura, Audi, BMW, Citroen, Fiat, Honda, Hyundai, Infiniti, Jaguar, Kia, Land Rover, Mazda, Mercedes-Benz, Mini, Mitsubishi, Nissan, Open, Peugeot, Renault, Saab, Subaru, Suzuki, Toyota, Volkswagen, Volvo, and some oddballs such as ’96 Chrysler vans, ’97 Chev Camaro, various Dodge vehicles, some Jeep Grand Cherokees, and the ’96 Geo Metro)
ISO-14230 (Keyword Protocol 2000)	Pins 4, 5, 7, 16, and sometimes 15 This will probably not be too common. If found, perhaps newer Chrysler, Ford, European, and Asian vehicles.
ISO-11898 (Controller Area Network)	A few manufacturers, such as Ford, Saturn (Ion), Saab (9-3), and Mazda began phasing CAN into their fleets in 2003.
ISO-15765 (Controller Area Network)	CAN may also be found in select model year 2004 vehicles manufactured by Bentley, Chrysler, Ford (family), GM (family), Saab, Mazda, Mercedes, Toyota/Lexus, and Volvo.
SAE-J1939 (Controller Area Network)	This is primarily used on heavy-duty vehicles
SAE-J1708	This is primarily used on heavy-duty vehicles

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Part C: Audit and Span Gas Information

Calibration and Audit Gas Blend Ranges

Low-range gasses – Use blends similar to that shown in the table below when auditing and span calibrating the SEMTECH for testing newer, low-emitting vehicles.

Gas	Audit Gas Blend	Span Cal Gas Blend
HC	30 to 50 ppm (propane) (or 90 – 150 ppm THC)	200 – 300 ppm (propane) (or 600 – 900 ppm THC)
CO	200 – 400 ppm	1,200 – 1,400 ppm
CO ₂	4 – 6 %	12 – 14 %
NO _x	200 – 400 ppm	1,500 – 2,000 ppm

High-range gasses – Use blends similar to those shown in the table below when auditing and span calibrating the SEMTECH for testing older, potentially higher-emitting vehicles. Note that these are standardized BAR97 blends.

Gas	Audit Gas Blend (BAR97 Low)	Span Cal Gas Blend (BAR97 High)
HC	300 ppm (propane) (or 900 ppm THC)	3,200 ppm (propane) (or 9,600 ppm THC)
CO	0.5% (5,000 ppm)	8%
CO ₂	6 %	12 %
NO _x	300 ppm	3,000 ppm

Note: When performing a span calibration, use the span range appropriate for the HC concentration in the blend being used. The range selected should be within 15% of the HC concentration in the gas blend. Use the 1,000 ppm range for the low-range gas span, and the 10,000 ppm range for the high-range gas span.

Note: To convert from a percentage to PPM, multiply by 10,000

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Part D: Performing Visual Inspections of Emissions Equipment

For 1970 and newer vehicles, an emissions control component inspection should begin with a review of the vehicle's "vehicle emissions control" (VEC) label. If present, this will be located in the engine compartment, generally on the underside of the hood. The VEC label lists the vehicle's type of emissions certification, vehicle model year, and the pollution control components that were originally present on the vehicle. After the VEC label has been reviewed, the components should be physically inspected, to ensure they appear functional and have not been removed (removal is common for older vehicles).

Positive Crankcase Ventilation (PCV) System

Inspect engines for rubber lines $\approx 5/8$ " in diameter running from the valve cover to the intake manifold, intake air plenum, or air filter assembly. If these are present, the engine is probably equipped with a PCV valve. Verify by looking for the valve inserted into one of the hoses going into the valve cover.

Thermostatic Air Cleaner (TAC) System

Generally present on carbureted vehicles (although some throttle-body injected vehicles may be equipped with a TAC system). A TAC system may be identified by a flexible tube approximately 2" in diameter routed from an exhaust manifold to the air cleaner's inlet snorkel. Note damaged/missing tubing or snorkel valves.

Air Injection System (AIS)

This is generally either an air pump mounted on the front of the engine and driven by a belt or a "pulse air valve" box also mounted near the front of the engine. Either system will have tubes leading from the pump (or valve) to the exhaust manifold or exhaust pipe. Please note missing belts or damaged/missing tubing, since these will render the system inoperable.

Exhaust Gas Recirculation (ERG) System

The EGR valve is usually located on intake manifold or intake air plenum, with an external metal tube often connecting a point on the exhaust manifold to the EGR valve. The EGR valve is generally 2" to 3" high and 2" to 3" in diameter and will have either a vacuum diaphragm or an electronic solenoid.

Evaporative Emissions Control System (EECS)

Generally the best way to determine if a vehicle has an EECS is by reading the VEC label. The EECS is a combination of tubing, canisters, and valves attached to the fuel tank and fuel lines to control evaporative emissions. If information cannot be obtained from the vehicles' VEC, indicate "unknown" on the data collection sheet.

Catalytic Converter

The catalytic converter is located in the exhaust system upstream of the muffler. Unlike mufflers, which generally have square ends, catalytic converters are typically tapered at their ends. On newer vehicles, catalytic converters are typically integrated with or directly behind the exhaust manifold.

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Part D: Performing Visual Inspections of Emissions Equipment

Fuel Fill Pipe Restrictor

This is simply a thin metal ring inside the fuel filler neck inlet (to prevent use of large-diameter leaded fuel nozzle). Remove fuel cap to verify presence of a fill pipe restrictor.

Oxygen Sensors

These are designated as O2 or HO2S on VEC labels. Fuel injected vehicles (including TBI & TPI) will be equipped with oxygen sensors. Verify presence at an O2 sensor by inspecting the exhaust system upstream of the catalytic converter. The O2 sensor will be located in the exhaust manifold or pipe directly after the manifold. The sensor will generally be the size of a spark plug and have one or more wires coming from it. Please note any missing oxygen sensors or damaged/disconnected wiring.

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Part E: How to Configure Host Computer to Communication With the SEMTECH through an Ethernet Cable

These are based on XP operating systems. Other systems may vary somewhat.

Select "My Computer" Icon on desktop

Select "Control Panel" when the "My Computer" screen pops up

Select the "Network Connections" icon in the "Control Panel" screen

Either create new connection (LAN, NOT wireless) or open existing LAN connection

Ensure "Internet Protocol" TCP/IP is checked, and highlighted

Once the "Internet Protocol TCP/IP" is highlighted, select "Properties"

Select "Use the following IP address", and enter "10.10.1.#", where number is the last 2 digits of the SEMTECH's IP address (use NO leading zeros). If the SEMTECH's IP address is unknown, this may be assigned. Don't assign it "55" (since this is the default for new units), and don't assign it to be the same as any of the other SEMTECHs (otherwise wireless communication will be screwed up). Then, enter "255.255.255.0" for the subnet mask. " Leave everything else on the screen (such as default gateway, preferred DNS server, etc.) blank. Select "Use the following DNS server addresses", but leave all rows blank. Select "OK", and exit the connection screens.

If after SEMTECH login the host does not recognize the SEMTECH, try creating a connection manually by right-clicking on the connection icon on the lower right of the screen.