Multi-Day Diurnal Testing

EPA United States Environmental Protection Agency

Multi-Day Diurnal Testing

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

Prepared for EPA by
Eastern Research Group, Inc.
EPA Contract No. EP-C-06-0-80
Work Assignment No. 5-11

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EPA United States Environmental Protection Agency

EPA-420-R-14-006
March 2014

Eastern Research Group, Inc.

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Final Report

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March 22, 2012

Revised October 25, 2013

ERG No. 0218.05.011.001
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March 22, 2012
Revised October 25, 2013

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1. OBJECTIVES AND BACKGROUND

Eastern Research Group (ERG) and Environmental Testing Corporation (ETC, now SGS-ETC) were tasked by United States Environmental Protection Agency (EPA) to design a Sealed Housing for Evaporative Determination (SHED) test procedure that would monitor canister loading over a 14-day diurnal SHED test. The goal was to monitor the evaporative emissions and canister loading profiles of 9 vehicles over a 14-day diurnal period with temperatures ranging from 72 to 95ºF, which is the temperature range used in the Federal Test Procedure (FTP). Two separate 14-day diurnals were performed on each vehicle with fuels having two different Reid vapor pressures (RVP). The actual blended RVP values were chosen to be representative of 9 and 10 psi RVP in-use fuels at sea level. This study was designed to provide hydrocarbon (HC) evaporative emissions test data that could be used for evaporative emissions modeling algorithms that estimate HC emissions over extended vehicle soak periods.

2. VEHICLE PROCUREMENT AND PRE-TESTING PREPARATION

The ERG/ETC team tested nine vehicles for this study. All vehicles were selected by EPA's National Vehicle and Fuel Emissions Laboratory (NVFEL) and are listed in Table 1 below. Three of these vehicles were certified as Partial Zero Emission Vehicles (PZEVs) and are shaded in Table 1. Transportation to the ETC laboratory was the responsibility of ETC. Two vehicles, the 2010 Toyota Prius and 2010 Ford Focus, were purchased for this study because it was less expensive to purchase the vehicles rather than rent them for the time needed to perform the extended SHED testing. When testing was completed on these two vehicles, they were sent directly to the NVFEL so that they could be used in future test programs at the EPA laboratory.

Table 1: Vehicles Tested

					VECI Labels		Canister	Tank	Canister/Tank Ratio
Vehicle ID	Make	Model	MY	Odo	Engine	Evap	WC* (g)	Vol. (gal)	WC (g) / Vol (gal)
228572	Subaru	Legacy	2010	17,237	AFJXJ02.5NVD	AFJXR01444DR	144	18.5	7.78
128421	Saturn	Outlook	2009	120,403	9GMXT03.6151	9GMXR0197972	197	22	8.95
128419	Toyota	Camry	2009	121,187	9TYXV02.4BEA	9TYXR0130A12	130	18.5	7.03
128417	Ford	Focus	2009	120,785	9FMXV02.0VDX	9FMXR0125NAA	125	13.5	9.26
154114	Chevrolet	Silverado	2006	109,954	6GMXR0176820	6GMXT05.3379	176	32.4	5.43
198208	Nissan	Altima	2008	123,261	8NSXV02.5G5A	8NSXR0120PBA	120	20	6.00
272304	Ford	Focus	2010	28,390	AFMXV02.0VZX	AFMXR0110GCX	110	14.5	7.59
174230	Ford	Taurus	2008	115,599	8FMXV03.5VEP	8FMXR0145KBK	145	20	7.25
51360	Toyota	Prius	2010	27,789	ATYXV01.8HC3	ATYXR0110P42	110	11.9	9.24

Shaded vehicles are certified PZEVs
*Canister working capacity in grams

Once vehicles were received at the ETC Laboratory, the following steps were taken to prepare each vehicle for the multi-day, multi-temperature diurnal testing.

1. The vehicle was checked to ensure it was safe to operate on a dynamometer.

2. The vehicle was examined for signs of potentially extraneous evaporative emissions, such as indications of collision, recent painting, tampering, new tires, and interior vinyl treatments.

3. Vehicle information, such as vehicle identification number or VIN, model year, make, model, engine and evaporative families, was documented. Pictures were taken of each vehicle and the vehicle emission control information (VECI) label.

4. A static pressure test was performed on the evaporative emissions system by pressurizing the system to 15 in. of water and then measuring the pressure decay over the following 30 minutes*. If the pressure dropped by more than 2 in. of water, ETC was to notify the EPA and then perform leak check diagnostics to find and repair the leak. None of the vehicles failed this leak check.

5. All fluids and filters were checked and adjusted as needed. Since previous studies had raised concerns regarding crankcase oil impacting emissions, ETC avoided adding oil unless necessary because new oil could impact evaporative testing results.

6. The appropriate vehicle road load settings for dynamometer testing were derived.

7. The wiper fluid reservoir was drained and flushed to eliminate potential release of wiper fluid hydrocarbons into the SHED. This was done because only evaporative emissions related to the fuel system were of interest in this study.

8. The air conditioning system was inspected for leaks using a flame ionization detector (FID) total hydrocarbon analyzer attached to a flexible sample probe. The FID system is able to detect low levels of escaping refrigerant as hydrocarbons. The engine compartment and interior of each vehicle were inspected for refrigerant leaks. In the engine compartment; the compressor, condenser, and high and low pressure plumbing were closely inspected using the FID analyzer. Inside the vehicle, the air conditioning evaporator and other components of the air conditioning system were inspected. No leaks were found.

9. After the above steps were completed, the vehicle exterior was washed. The vehicle engine compartment and undercarriage were also washed, and the vehicle was "baked" for 24 hours at 120ºF in the ETC hot cell with the windows down, trunk lid and hood open, a fan blowing across the interior of the vehicle and make up ventilation air supplied to the room. This make-up air was outside ambient air conditioned to 3 ppm hydrocarbon (total HC measured as methane).

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* This is a tighter specification than stated in CFR 86.608-98, where the required decay time is 5 minutes.

3. FUEL PROCUREMENT AND PREPARATION

ETC purchased the fuel with 10% ethanol from a local source in the Denver area. The fuel was then split into two batches and the RVP of each batch was adjusted to a sea level equivalent of either 9.0 or 10.0 psi. Based on EPA guidance, it was determined that 7.6 psi represented 9.0 psi RVP fuel at sea level and 8.8 psi represented 10.0 psi RVP fuel at sea level. Any mention of fuel RVP hereafter refers to the nominal, sea-level equivalent RVP of that fuel. ETC used their on-site infrared spectrometer which is capable of measuring ethanol content in gasoline to an accuracy of 0.19% to determine the actual ethanol content in each fuel batch. Other fuel parameters, such as the distillation curve and HC composition (olefins, aromatics, and saturates) were measured by an outside laboratory specializing in hydrocarbon analysis to verify fuel compliance with the standards set forth in 40 CFR 86.113. The results from the fuel test laboratory are documented in Appendix B.

After the initial testing of the as-received fuel was complete, the two batches were stored in totes in the ETC fuel room, which is a climate controlled containment area, to minimize any further weathering of the fuel during the test program.

4. PRE-MODIFICATION TESTING, VEHICLE MODIFICATIONS, AFTER MODIFICATION TESTING

After the vehicle preparation described in Section 2.0 was completed, the vehicles were subjected to an "initial qualification" static evaporative test in the SHED at 86ºF and a 48-hour diurnal to determine the evaporative emissions before any modifications were made to the vehicle's systems. The testing followed standard EPA protocols and included the following steps:

1. Drain and 40% fill with 9 RVP fuel.
2. Soak the vehicle at 68-86 ºF for 6 to 36 hours.
3. Prep 1 – Drive an EPA 2-phase test (LA-4) on the dynamometer with no emissions measurements.
4. Drain and 40% fill with 9 RVP fuel.
5. Perform a canister loading procedure using butane to 2g after breakthrough.
6. Soak the vehicle at 68-86 ºF for 12 to 36 hours.
7. Prep 2 - Drive an EPA 3-phase test (EPA 75) on the dynamometer with no emissions measurements.

8. 1 hour EPA hot soak test in the SHED at 86 +/- 2ºF.

9. Remove vehicle from SHED and allow to cool to 72°F and then soak at that temperature for 6 hours

10. 48 hour diurnal test; federal cycle of 72 to 95 ºF.

The results in grams per hour from the hot soak and the 48-hour diurnal tests were then determined.

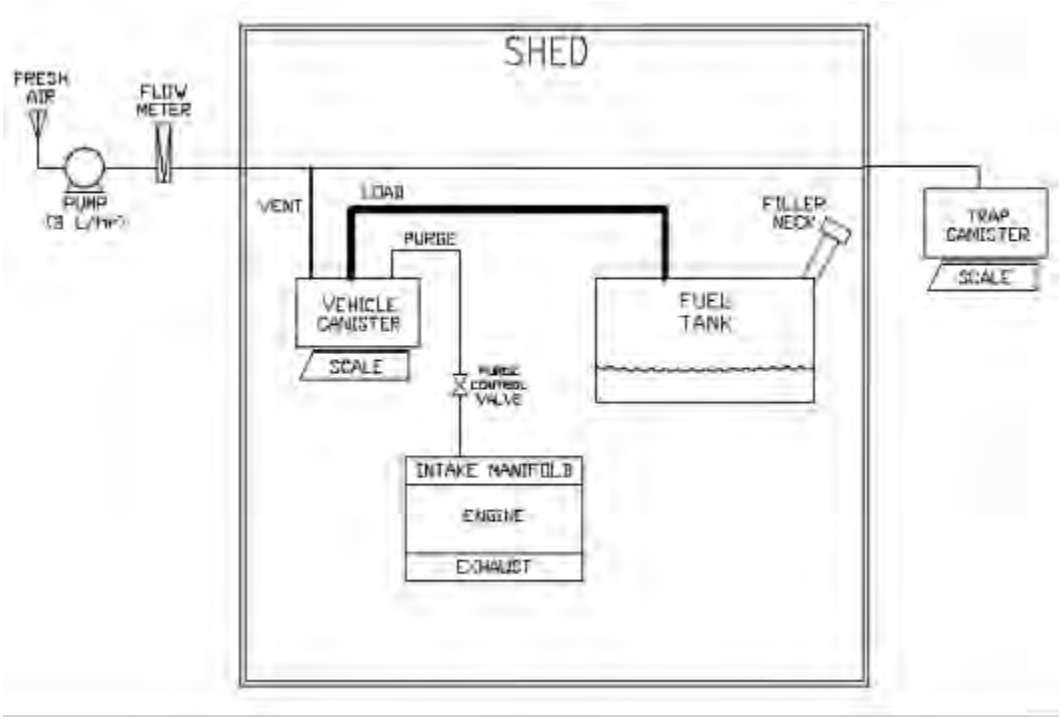
Vehicle Modification:

The hoses from each canister were disconnected and the canister was relocated to an outside scale. The vehicle canister was placed on the scale in an orientation as if it were in its native environment when it was in the vehicle. Maintaining this native orientation is critical as canisters fill with HC vapor as if the HC vapor were a liquid; therefore, a non-native orientation can reduce the canister's design capacity. Initially, attempts were made to reconnect the canister using the original hoses; if additional hose lengths were required, ETC attempted to minimize the additional length in order to limit the effect of any volume change.

In the first method to measure canister bleed emissions, the vent line from the vehicle canister was connected to a diverter valve mounted as close to the canister vent as possible. The diverter prevented the vehicle canister inside the SHED from drawing fuel vapors trapped in the line back into the canister as the SHED cooled, which is not representative of real-world behavior. To mitigate this effect, ETC used a diverter valve to supply fresh air to the canister which would prevent any bleed emissions from being drawn back into the canister as the SHED temperature fell. The diverter valves failed after several days of operation and a new method was developed that eliminated use of the diverter valve. All results presented in this report were collected using the new method described below for measuring emissions from the canister vent.

In the revised method, a small air pump was used to drive the bleed emissions from the canister vent to a trap canister located outside the SHED and also to supply fresh air for canister back purge during the cooler segments of the diurnal cycle. The pump moved a small amount of ambient air (3 liters per hour) through a "T" located at the canister vent to the trap canister where the vapors were collected and measured gravimetrically on a scale. Bleed emissions were measured continuously over the 14-day series of diurnal cycles. This method's study design is depicted in Figure 1 below.

Figure 1: SHED Schematic



A pressure transducer was placed in the fuel tank via the fuel cap so that pressure or vacuum in the tank could be monitored. In addition to the canister modifications, a thermocouple was adhered to the fuel tank skin and insulated, so the fuel tank temperature could be recorded during the diurnal testing. This was done because the fuel tank temperature generally lags behind changes in the SHED ambient temperature; therefore, in order to properly time-align the vehicle canister weight gain, the fuel temperature must be known.

After Modification Testing:

After these modifications, each vehicle was processed from steps 11 to 21 ending with a one-hour hot soak test.

11. Drain and 40% fill with 9.0 psi RVP fuel.

12. Soak the vehicle at 68-86ºF for 6 to 36 hours.

13. Prep 1 – Drive an EPA 2-phase test (LA-4) on the dynamometer with no emissions measurements.

14. Drain and 40% fill with 9.0 psi RVP fuel.

15. Perform a canister loading procedure using butane to 2g after breakthrough.

16. Soak the vehicle at 68-86ºF for 12 to 36 hours.

17. Prep 2 - Drive an EPA 3-phase test (EPA 75) on the dynamometer with no emissions measurements.

18. Move the vehicle to the SHED, connect necessary instrumentation, place the vehicle canister on the scale and connect a trap canister and fresh air vent. This step was completed in less than 10 minutes.

19. 1 hour EPA hot-soak test in the SHED at 86 +/- 2ºF.

20. Remove vehicle from SHED and allow to cool to 72°F and then soak at that temperature for 6 hours

21. 48 hour diurnal test; federal cycle of 72 to 95 ºF.

Results from the after modification test were compared to the results from the pre-modification test and if the difference between the results was less than 5 mg per hour, it was concluded that the vehicle modifications had not created any leaks.

5. MULTI-DAY DIURNAL TESTING

After each vehicle passed the post-modification check; the vehicle was processed through steps 22 through 33. Step 33 is the multi-day diurnal test consisting of 14 days of the federal diurnal cycles.

22. Drain and 40% fill with 10.0 psi RVP fuel.

23. Soak the vehicle at 68-86ºF for 6 to 36 hours.

24. Prep 1 – Drive an EPA 2-phase test (LA-4) on the dynamometer with no emissions measurements.

25. Drain and 40% fill with 9.0 psi RVP fuel.

26. Perform a canister loading procedure using butane to 2g after breakthrough.

27. Weigh canister.

28. Soak the vehicle at 68-86ºF for 12 to 36 hours.

29. Prep 2 - Drive an EPA 3-phase test (EPA 75) on the dynamometer with no emissions measurements.

30. Move the vehicle to the SHED, connect necessary instrumentation, place the vehicle canister on the scale and connect a trap canister and fresh air vent. This step was completed in less than 10 minutes.

31. 1 hour EPA hot soak test in the SHED at 86 +/- 2ºF.

32. Remove vehicle from SHED and allow to cool to 72ºF and then soak at that temperature for 6 hours

33. 14-day diurnal test: 14 federal cycles of 72 to 95ºF.

Each vehicle was subjected to the fourteen days of diurnal testing (step 33) with temperatures ranging from 72 to 95ºF. During this testing, SHED temperature, SHED HC concentrations, fuel tank temperature and pressure, and vehicle and trap canister masses were measured once per minute. Once an hour, the mass of HC in the SHED was calculated, as well as the change from the previous hour. The weights of both canisters and the fuel tank temperature were also recorded hourly. Once a day the total change in grams of HC within the SHED as well as in each canister were determined and recorded.

In addition to the procedure described above, the battery voltage was recorded after completing the multi-day sequence. The Legacy, Outlook, and Camry had issues retaining battery charge for the two week duration. It was necessary to charge the batteries on these vehicles following the multi-day sequence.

Data checks were performed following the one hour hot soak test (Step 31), and after the first 2 days of the multi-day sequence (step 33) to verify that the numbers were comparable to the numbers obtained during the pre and post modification testing.

After testing on the 10.0 psi RVP fuel was completed, the fuel was changed to the 9.0 psi RVP fuel and tested using the identical process as used for the 10.0 psi RVP fuel described above.

Once the testing was completed on both fuels, the vehicle's fuel tank vent line, canister and purge lines were all returned to their original connections and the vehicles were made available for EPA to determine their disposition.

6. DATA COLLECTION, ANALYSIS AND DELIVERY

Findings from the initial inspections of the vehicles, pre-modification testing, documentation of the modifications made to the vehicles, and the results of after modification testing were made available as soon as possible after a procedure was completed. This

information was in electronic format (Word or Excel) and usually available within one day. The daily results of the diurnal testing were available within 12 hours of the completion of each 24 hour testing period. A testing log for each vehicle was maintained and also provided electronically in Excel format. The figures which follow were made available each week as testing progressed. Their purpose in this report is to provide a clear illustration of each vehicle's canister loading profile over the 14-day diurnal test. Additional details of each vehicle's testing are provided in Appendix A.

Processing the multi-day diurnal testing data required the following steps:

1. Raw shed data was obtained from ETC every 2-4 days (more frequently if unusual trends had been observed) in CSV format.

2. Each vehicle was assigned its own unique Excel workbook, which was used to process all the data for that particular vehicle throughout the study. This included the reporting and analysis of the results for tests on both fuels.

    a. Any new raw CSV data series were pasted into the appropriate tab in the vehicles workbook (these tabs were labeled "RAW 10 RVP Data" and "RAW 9 RVP Data"). Any data that was obtained from an ongoing test was appended to existing data to form a complete up-to-date data series.

    b. Relevant columns within the data were copied to a workbook tab labeled as "Simple Data". The purpose of this sheet was to reduce the amount of data to manipulate because all of the fields (columns) of data in the raw file were not necessary for this study; therefore, this sheet made it easier to see just the data relevant for this testing. This tab contained only the necessary data required to evaluate the results of the multi-day diurnal SHED testing on both fuels.

        The "Simple Data" tab included the following fields for both 9.0 psi RVP and 10.0 psi RVP fuel test results (the results of testing on both fuels were combined into this sheet to make comparisons easier, and to assist in the plots):

        - Test Time (Minutes) – This is the only field that was shared by both fuel results, and was retained to provide an additional time reference for those evaluating and appending data.

        - Test Time (Hours) – Elapsed test time since start of test.

        - Shed Temperature (Deg F) – Recorded SHED temperature at displayed time interval.

        - Tank Temperature (Deg F) – Recorded vehicle fuel tank temperature at displayed time interval.

- Adjusted SHED HC – XX RVP (grams) – This field compensates for background HC by subtracting the HC reading obtained at time = 0 from all subsequent readings.

- Vehicle Canister Weight – XX RVP (Grams) – This records the vehicle's internal HC canister weight, which has been offset to 0 at Time = 0.

- Outside Canister Weight – XX RVP (Grams) – This records the external canister weight, which has been offset to 0 at Time = 0.

c. The data found in the "Simple Data" tab were then plotted to the tab labeled "Shed Data Chart". The data in this chart are simple scatter plots of the data listed in the "Simple Data" tab.

3. In terms of additional data processing, some factors such as canister weighing scale drift or hysteresis required some manual realignment of the data. Since each vehicle was subjected to two continuous 14-day test cycles, some minor problems were expected over this long of a testing period. Manual data correction was performed for these short duration complications which included changing the canister because it was becoming full, power outages, sample system issues, and computer reboots which necessitated resetting the zero point on the measurements so the data were continuous. None of these impacted the quality of the data. No adjustments were made to the "raw" data files, but all of the data in the "Simple" data files have been corrected, and users of the data should use this data for analysis. In the case where the data could not be confidently realigned due to testing difficulties, the 14 day cycle and data were abandoned, the vehicle canister was again preconditioned and the entire test was performed again. Data correction for time alignment was not performed, the following graphs demonstrate a small lag in mass gain compared to SHED temperature. The tank temperature was also measured and this data does not demonstrate a lag in the mass gain. Any necessary adjustments were left to the users of the data, what is in the "Simple" sheet is the un-time aligned data.

Figure 2: 2010 Subaru Legacy (PZEV)

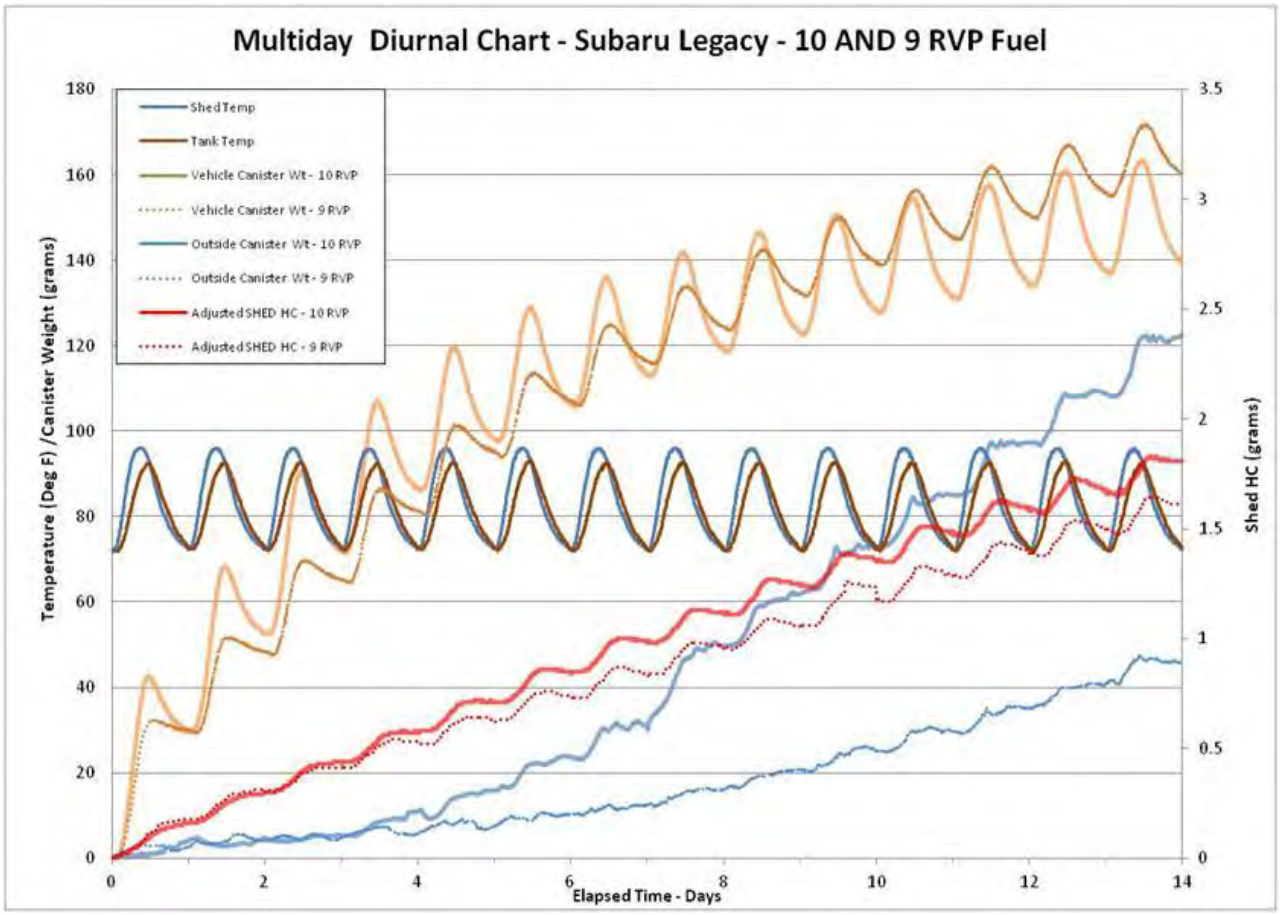


Figure 3: 2009 Saturn Outlook

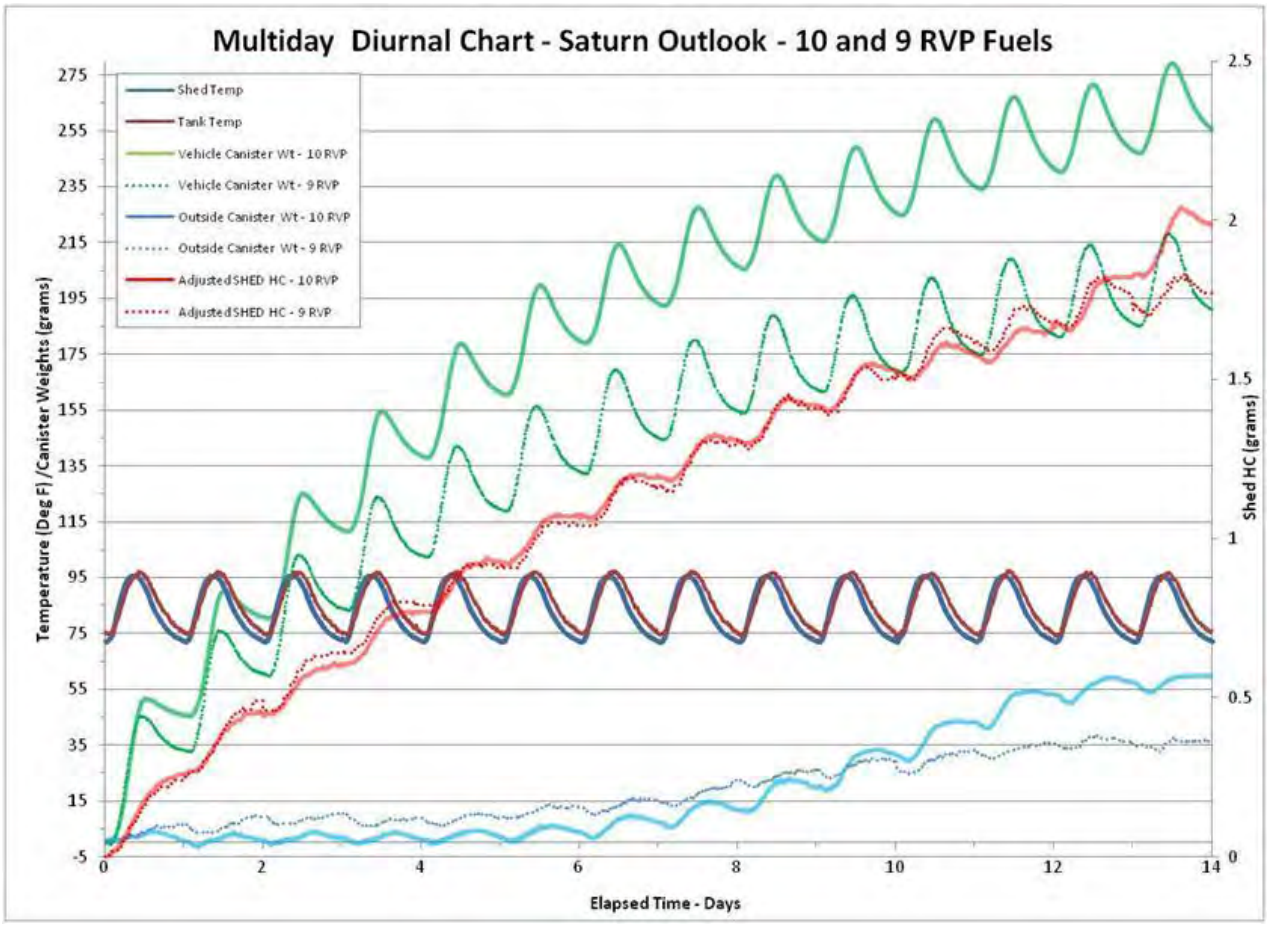


Figure 4: 2009 Toyota Camry

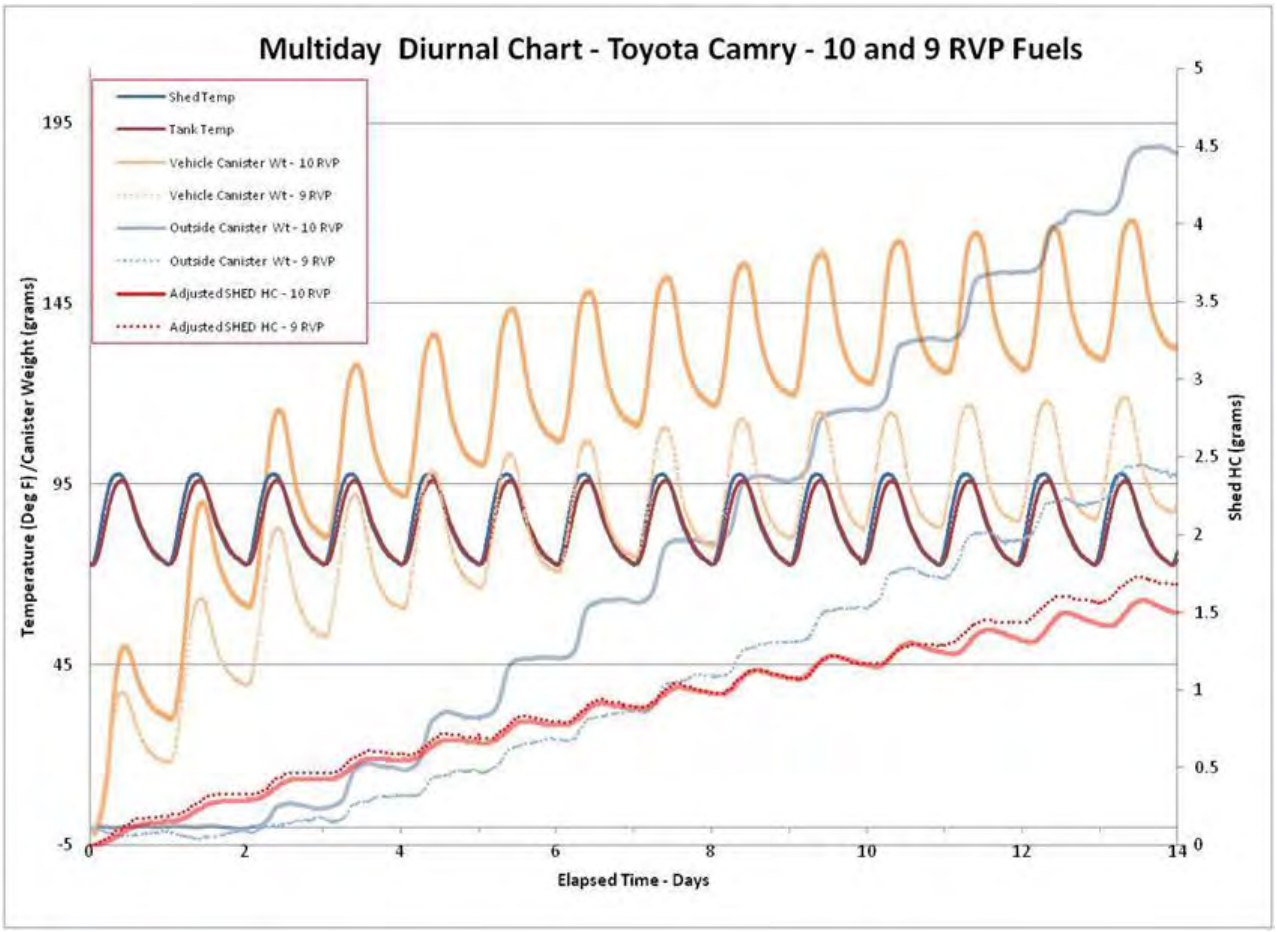


Figure 5: 2009 Ford Focus

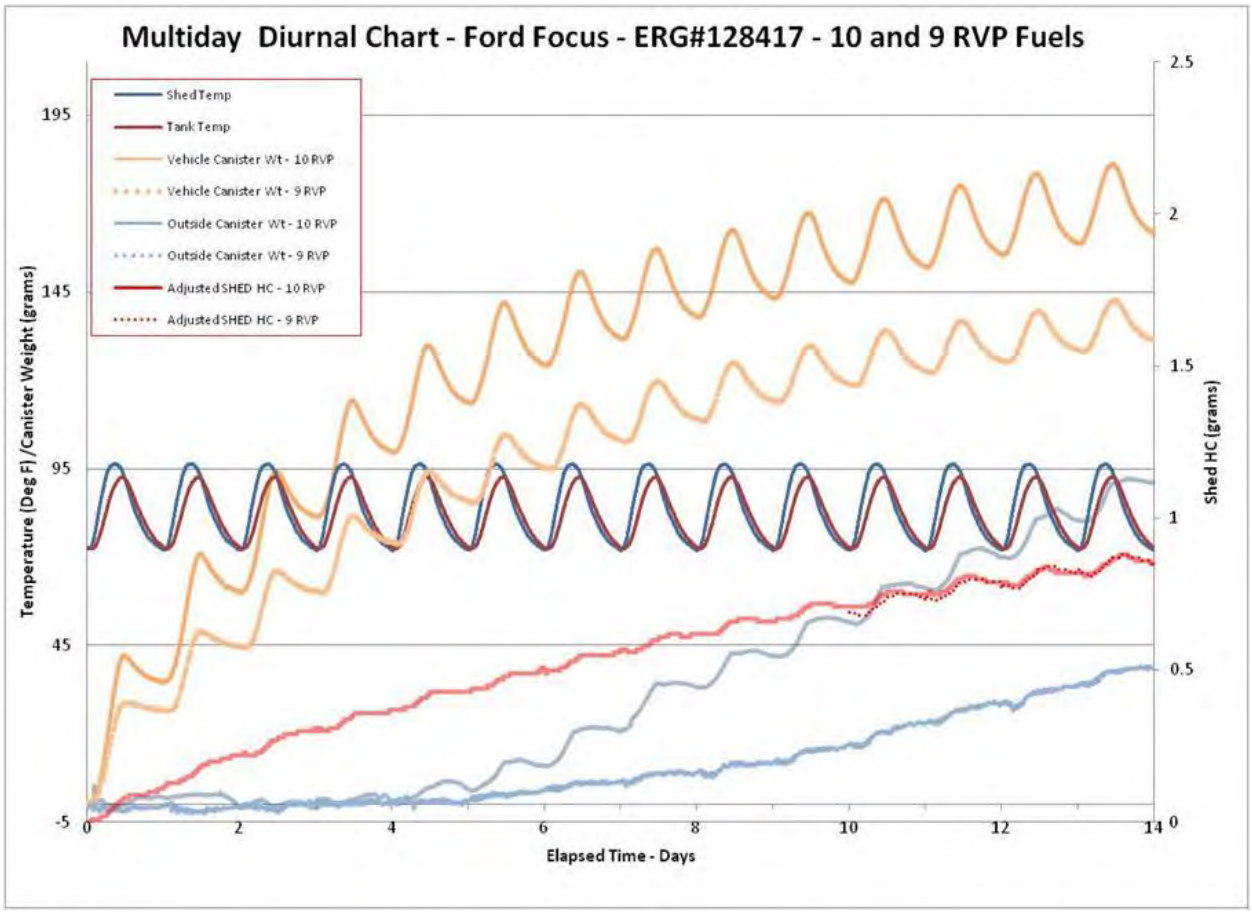


Figure 6: 2006 Chevy Silverado

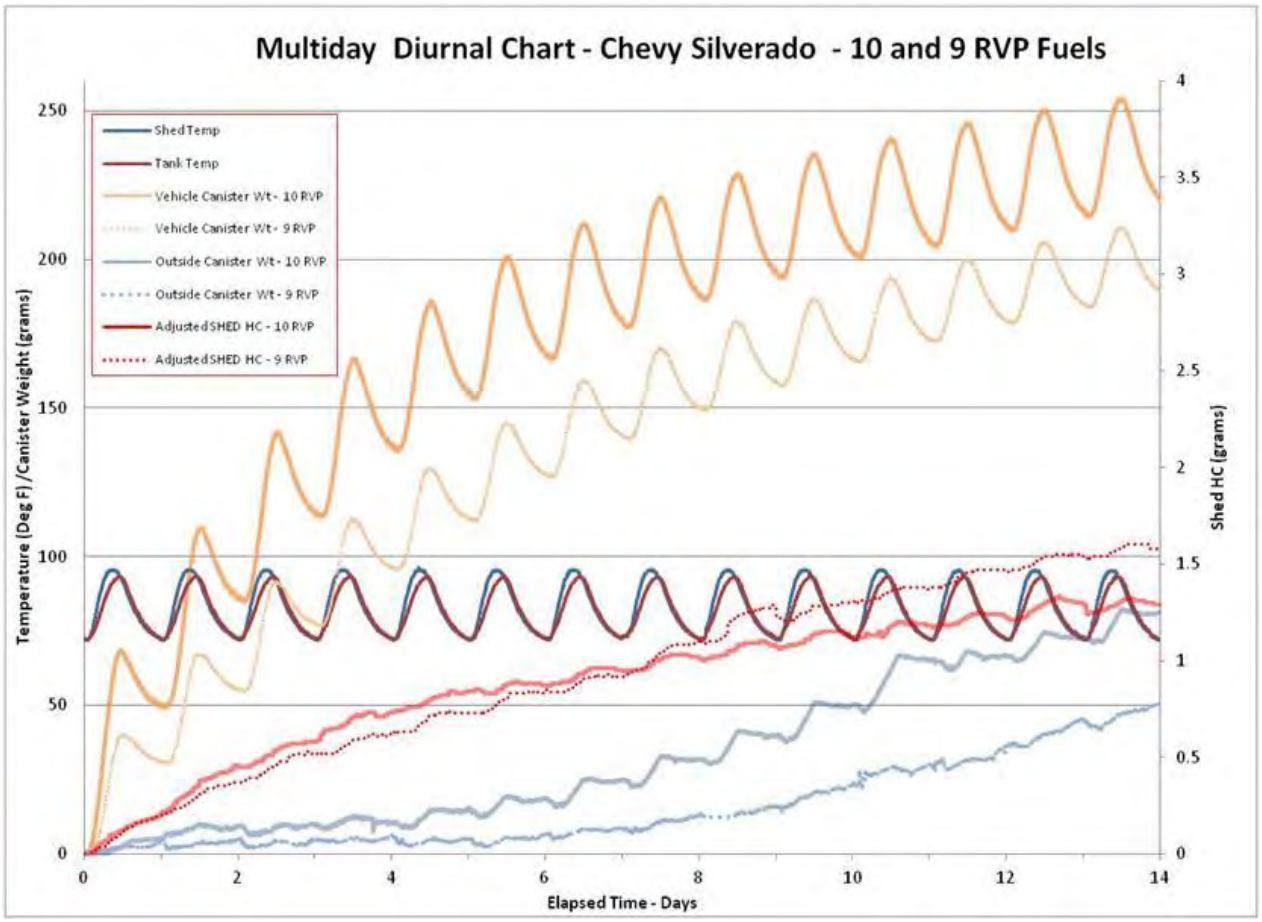


Figure 7: 2008 Nissan Altima

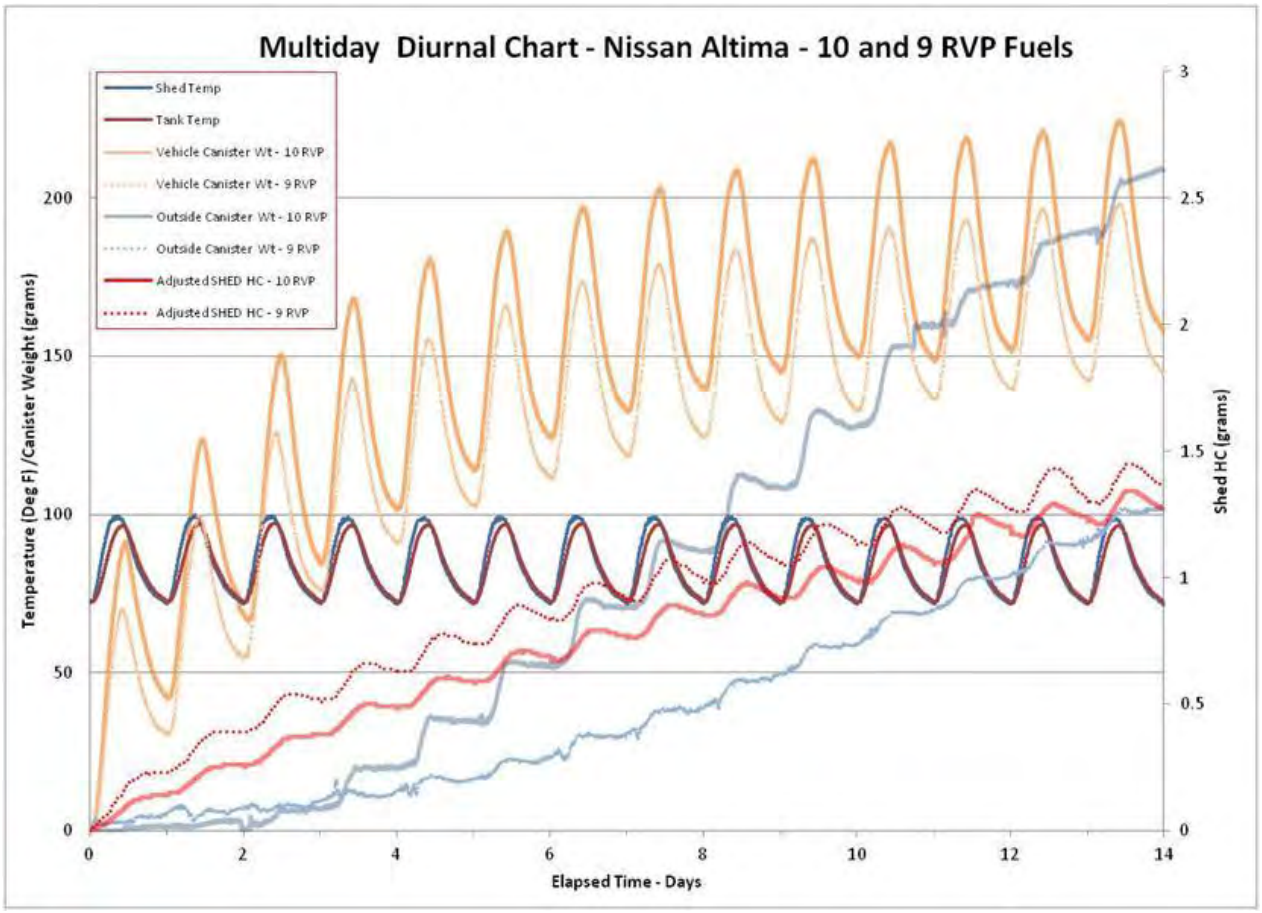


Figure 8: 2010 Ford Focus (PZEV)

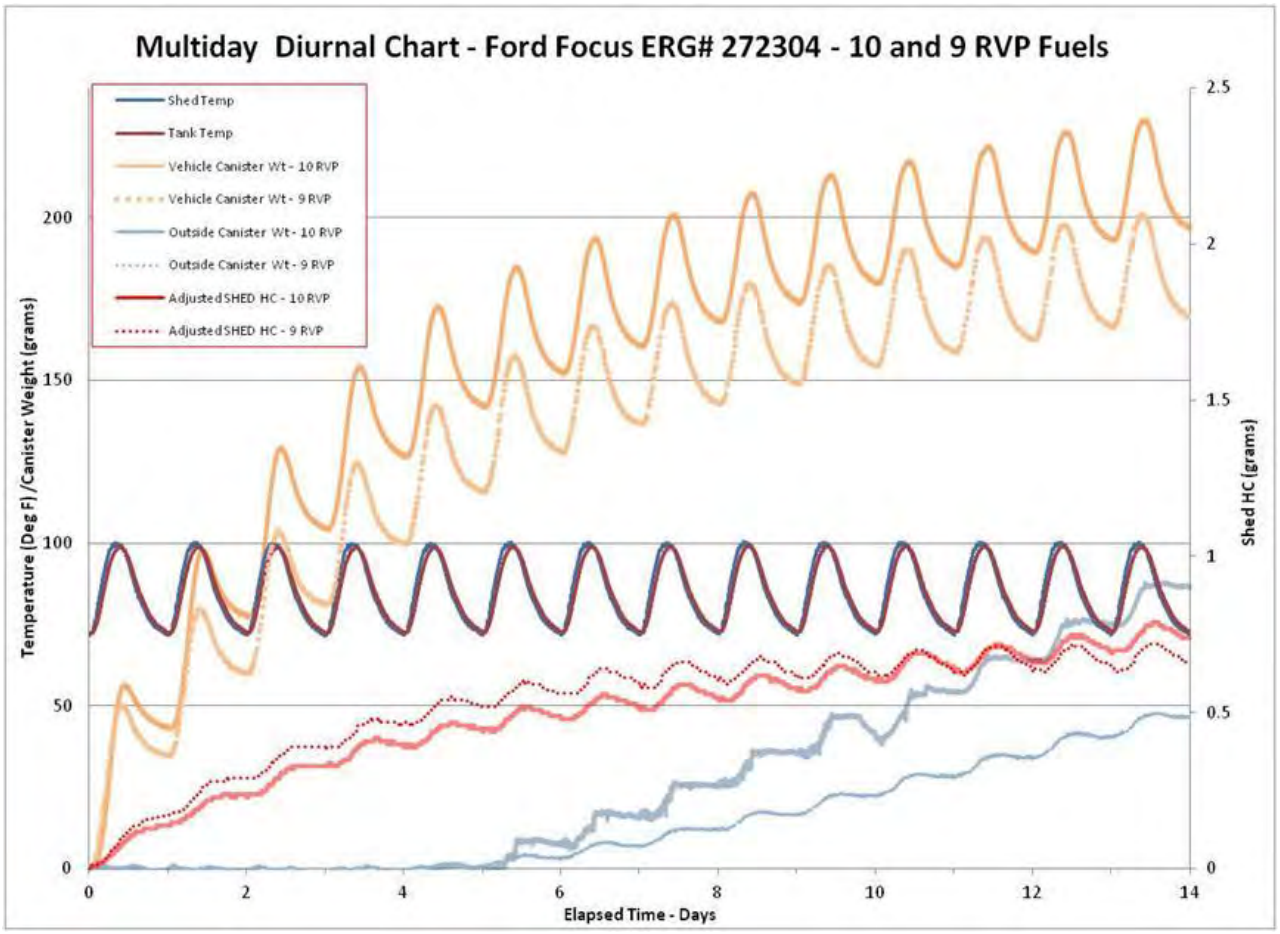


Figure 9: 2008 Ford Taurus

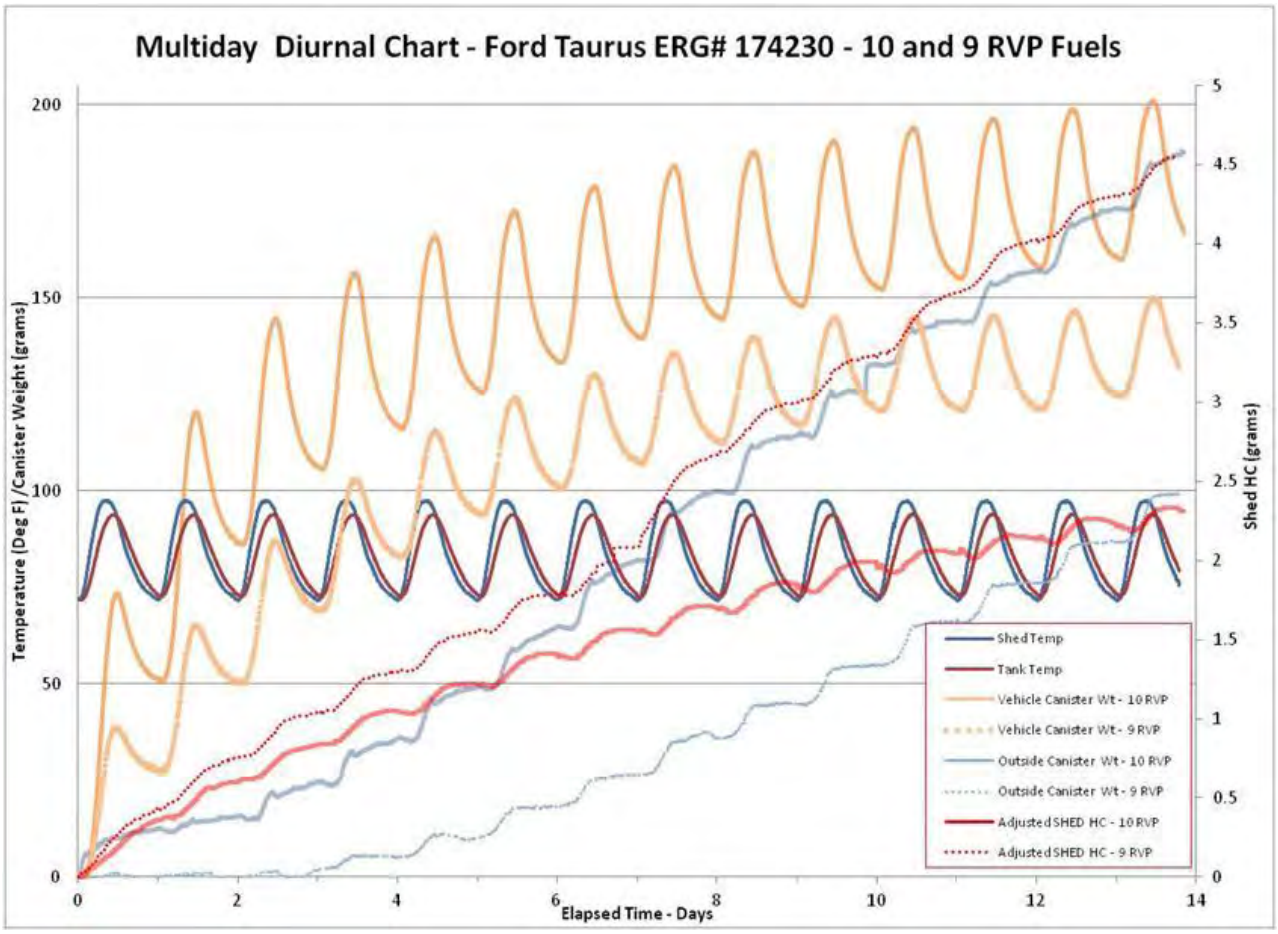
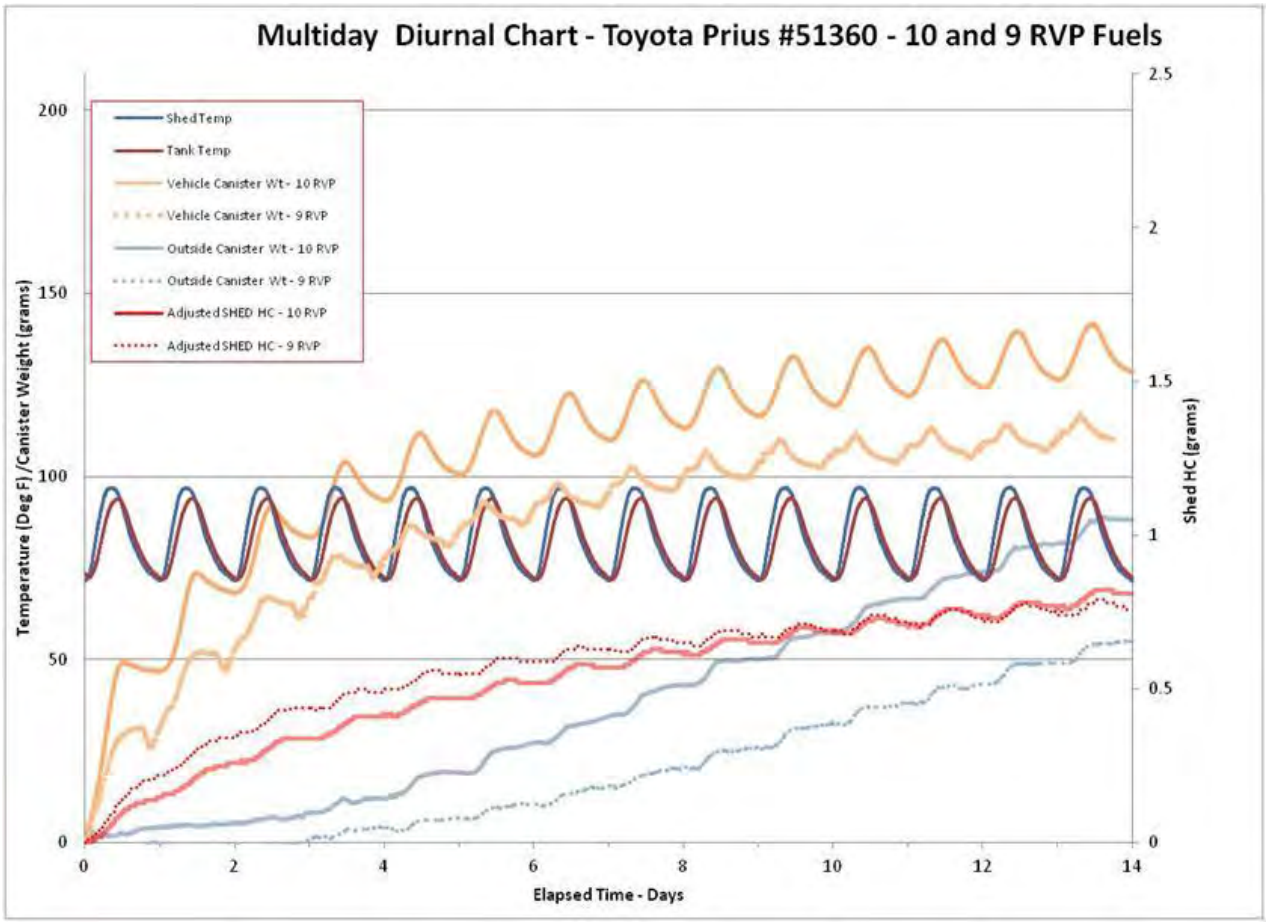


Figure 10: 2010 Toyota Prius (PZEV)



7. CONCLUSIONS

The evaporative emissions and canister loading profiles of 9 vehicles were monitored and recorded over a 14-day diurnal period to provide hydrocarbon evaporative emissions test data needed for evaporative emissions modeling algorithms. Many of the procedures used in this study were non-routine and were developed during the testing program. Two separate 14-day diurnals ranging from 72 to 95ºF were performed on each vehicle using fuels blended to be representative of 9 and 10 psi RVP fuel at sea level. The trap canister weight gain data is an important parameter used in this study to monitor the vehicle canister performance; however, other methods such as using a calibrated flame ionization detector with a venturi technique to quantify the hydrocarbon flow may be another way to obtain this information.

A few general trends are noted in the data:

- The vehicle canister took on more fuel vapor earlier and consistently for the representative 10 RVP fuel.
- The back-purge rate (rate of hydrocarbons being drawn back into the fuel tank from the evaporative canister during the cooling phase of a diurnal) tended to slightly increase each day during the start of testing and then level off around half way through the first week.
- The overall vehicle canister weight gain starts to level off halfway through the fourteen day period.
- Most vehicles experienced breakthough earlier for the 10.0 psi RVP fuel than the 9.0 psi RVP fuel. Once breakthrough occurred, the breakthrough emission rate was generally higher for the 10.0 psi RVP fuel than for the 9.0 psi RVP fuel (the mass gain at the trap canister has a steeper slope for 10.0 psi RVP fuel than for the 9.0 psi RVP fuel on the same vehicle).
- Some of the vehicles broke through right after the third day on the representative 9.0 psi RVP fuel, which just passes the certification test.
- Both Focuses, the PZEV and the non-PZEV, as well as the Outlook held out the longest before breaking through the canister. All three of these vehicles had relatively large canister/tank ratios (Table 1), therefore having high canister capacity per vapor space. However, the Silverado, which had a low canister capacity versus tank ratio, held out roughly as long as the Focuses, suggesting canister to tank ratio may be a contributing, but not only, factor influencing time to breakthrough.
- PZEVs did not have a consistent performance trend, with the Legacy breaking through on the fourth day of the fourteen day test for both fuels.

APPENDIX A
VEHICLE TESTING REPORTS

Subaru Legacy

VIN	4S3BMBA65A3228572
Year	2010
Make	Subaru
Model	Legacy
Engine Family	AFJXJ02.5NVD
Evaporative Family	AFJXR01444DR

	Vehicle Bake At 115 degrees for 24 hours						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
Vehicle Bake Off	913927	5-Apr	4/5/2011	--	--	--	--

	Baseline Test (10 RVP)							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			SHED Hot Soak Test reading was 0.107 grams With the 48 hour VT SHED 1st day was 1.055, 2nd day was 0.878 grams with a total of 1.932. Performed EVAP Leak check and vehicle inspection. We found that an insulation pad at the fire wall was holding HC causing high reading. VOID
					Start	Hot Soak	End	
LA 4 Prep (No Emissions)		1957	4/7/2011	--	--	--	--	
Can load - 2g breakthrough				--				
FTP w/ emissions & purge vol. (dry gas)	**913957**	213544			--	--	--	
1 hr. hot soak @ 86°F		1592	4/8/2011	--				
48hr VT SHED		1593		--				

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)		1961	4/11/2011	--	--	--	--
Can load - 2g breakthrough				--			
FTP w/ emissions & purge vol. (dry gas)	**913982**	213546			--	--	--
1 hr. hot soak @ 86°F		1594	4/12/2011	--			
48hr VT SHED		1595		--			

	10 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)		1991	4/21/2011	2274.4						
Can load - 2g breakthrough	**914118**			2355.7						
FTP w/ emissions & purge vol. (dry gas)		213561	4/22/2011							14 day VT SHED stopped after the 10th day due to a vehicle scale problem, not reading correctly.
1 hr. hot soak @ 86°F		1510		2272.5						
14-day VT SHED		1511	4/23/2011	2401.1						
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										
Collect fuel sample - test RVP										

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		2023	5/13/2011	2357.7	454.83	463.85	467.7		
Can load - 2g breakthrough	**914463**			2350.4					
FTP w/ emissions & purge vol. (dry gas)		213619	5/14/2011		467.7	476.54	480.46		
1 hr. hot soak @ 86°F		1523		2269.7					
14-day VT SHED	**914488**	1618	5/16/2011	2404.4					12.29
Charge battery									--
FTP w/ emissions & purge vol. (dry gas)	**914709**	213650	5/31/2011	2308.5	141.31	149.83	153.49		
Collect fuel sample - test RVP								8.93	

	9 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		2055	6/1/2011	2267.1	153.4	162.39	165.72		
Can load - 2g breakthrough				2347.8					
FTP w/ emissions & purge vol. (dry gas)	**914714**	213655			165.73	173.71	177.21		
1 hr. hot soak @ 86°F		100029	6/2/2011	2264.8					
14-day VT SHED		100039		2395.5					12.37
Charge battery									13.07
FTP w/ emissions & purge vol. (dry gas)	**915019**	2100182	6/17/2011	2307.7	246.65	254.62	257.85		
Collect fuel sample - test RVP								8.02	

Saturn Outlook

VIN	5GZER13D49J181741
Year	2009
Make	Saturn
Model	Outlook
Engine Family	9GMXT03.6151
Evaporative Family	9GMXR0197972

	Vehicle Bake At 115 degrees for 24 hours						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
Vehicle Bake Off	913916	4-Apr	4/4/2011	--	--	--	--

	Baseline Test (10 RVP)							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
2xFTP Prep (No Emissions)		1958	4/7/2011	--	--	--	--	
Can load - 2g breakthrough				--				48 hour VT Shed stopped at 33 hour into shed due to VZS failures caused by Fid 1 fuel solenoid not working and analyzer's flame to go out. VOID
FTP w/ emissions & purge vol. (dry gas)	**913955**	412140			--	--	--	
1 hr. hot soak @ 86°F		1536	4/8/2011	--				
48hr VT SHED		1537		--				

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)		100001271	4/11/2011	--	--	--	--
Can load - 2g breakthrough				--			
FTP w/ emissions & purge vol. (dry gas)	**913981**	100412142			--	--	--
1 hr. hot soak @ 86°F		100001538	4/12/2011	--			
48hr VT SHED		100001539		--			

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		1992	4/21/2011	2453.5					
Can load - 2g breakthrough				2593.2					
FTP w/ emissions & purge vol. (dry gas)	**914117**	213562							14 day VT SHED
1 hr. hot soak @ 86°F		1543	4/22/2011	2466					ended on day 2
14-day VT SHED		1544							due to a vehicle
Charge battery									scale problem.
FTP w/ emissions & purge vol. (dry gas)									Scale was reading
Collect fuel sample - test RVP									backwards. VOID

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		1996	4/28/2011	2490.3	991.46	4.41	9.41		
Can load - 2g breakthrough				2605.3					
FTP w/ emissions & purge vol. (dry gas)	**914226**	412186			67.11	76.75	82.11		14 day VT SHED
1 hr. hot soak @ 86°F		1602	4/29/2011	2626					ended on day 1
14-day VT SHED		1548							due to a vehicle
Charge battery									scale problem.
FTP w/ emissions & purge vol. (dry gas)									Scale was not
Collect fuel sample - test RVP									reading. VOID

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		100000934	5/17/2011	1922.3	80.63	97.18	101.7		
Can load - 2g breakthrough				2394.1					
FTP w/ emissions & purge vol. (dry gas)	**914506**	100412223			538	553.5	559.07		
1 hr. hot soak @ 86°F		100001530	5/18/2011	2294.6					
14-day VT SHED		100001565		2303.7					10.09
Charge battery									12.97
FTP w/ emissions & purge vol. (dry gas)	**914742**	117044	6/2/2011	2179.9	177.22	188	192.27		
Collect fuel sample - test RVP								8.88	

	9 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		1409	6/3/2011	2351.7	724.72	738.69	743.98		
Can load - 2g breakthrough				2271.7					
FTP w/ emissions & purge vol. (dry gas)	**914762**	412259			763.21	774.73	779.71		
1 hr. hot soak @ 86°F		1569		2151.4					
14-day VT SHED		100043	6/4/2011	2344.1					11.8
Charge battery									12.76
FTP w/ emissions & purge vol. (dry gas)	**915066**	2100234	6/20/2011	2223.4	274.04	285.92	290.77		
Collect fuel sample - test RVP								7.92	

Toyota Camry

VIN	4T1BE46K79U892484
Year	2009
Make	Toyota
Model	Camry
Engine Family	9TYXV02.4BEA
Evaporative Family	9TYXR0130A12

Vehicle Bake At 115 degrees for 24 hours

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End
Vehicle Bake Off	913990	12-Apr	4/12/2011	--	--	--	--

Vehicle Conditioning

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End
4x LA 4 Drive Trace (No Emissions)	914036	100001974	4/15/2011	--	--	--	--

Baseline Test (10 RVP)

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End
2xFTP Prep (No Emissions)	**914020**	1277	4/17/2011	--	--	--	--
Can load - 2g breakthrough				--			
FTP w/ emissions		116970	4/18/2011		--	--	--
1 hr. hot soak @ 86°F		1596		--			
48hr VT SHED		1597		--			

10 RVP Test

	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End	Post-test RVP	Battery Voltage	
FTP Prep (No Emissions)	**914116/914164/ 914179**	1292	4/22/2011	2140.9						
Can load - 2g breakthrough				2236.2						
FTP w/ emissions & purge vol. (dry gas)		412222	4/23/2011							
1 hr. hot soak @ 86°F		1528		2153						14 Day VT SHED was stopped during the first day due to high concentrations of HC. VOID
14-day VT SHED		1531								

10 RVP Test

	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End	Post-test RVP	Battery Voltage	
FTP Prep (No Emissions)	**914203**	920	4/26/2011	2121						
Can load - 2g breakthrough				2227.5						
FTP w/ emissions & purge vol. (dry gas)		412172	4/27/2011							
1 hr. hot soak @ 86°F		1528		2150						Test procedure was stopped after the SHED Hot Soak due to a high concentration of HC. VOID
14-day VT SHED		Not Ran								

10 RVP Test

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End	Post-test RVP	Battery Voltage	
FTP Prep (No Emissions)	**914222**	100001301	4/28/2011							
Can load - 2g breakthrough										
FTP w/ emissions & purge vol.										
1 hr. hot soak @ 86°F										
14-day VT SHED										
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										Test procedure was stopped after the canister load of 2 gram brake through to perform vehicle inspection and EVAP leak check.
Collect fuel sample - test RVP										

10 RVP Test

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End	Post-test RVP	Battery Voltage	
FTP Prep (No Emissions)	**914227**	923	4/28/2011	2112.8	773.06	786.53	791.56			
Can load - 2g breakthrough				2230						
FTP w/ emissions & purge vol. (dry gas)		412184			48.76	61.58	67.11			
1 hr. hot soak @ 86°F		1497		2132.8						Test procedure was stopped after the SHED Hot Soak due to high concentrations of HC. VOID
14-day VT SHED										
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										
Collect fuel sample - test RVP										

Vehicle EVAP System Debug

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow Start	Purge Flow Hot Soak	Purge Flow End	
FTP Prep (No Emissions)		925		--	--	--	--	1 hour SHED Hot Soak Performed to check EVAP system on vehicle. Readings at 0.161 grams
1 hr. hot soak @ 86°F	913990	100001498	4/29/2011					

Toyota Camry (cont.)

	Vehicle EVAP System Debug							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
FTP Prep (No Emissions)		926		--	--	--	--	1 hour SHED Hot Soak Performed to check EVAP system on vehicle. Readings at 0.187 grams
1 hr. hot soak @ 86°F	914242	100001499	4/29/2011					

	Vehicle EVAP System Debug							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
FTP Prep (No Emissions)		927		--	--	--	--	1 hour SHED Hot Soak Performed to check EVAP system on vehicle. Readings at 0.017 grams
1 hr. hot soak @ 86°F	914252	100001500	4/29/2011					

	10 RVP Test SHED DEBUG									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
FTP Prep (No Emissions)				2101.8						
Can load - 2g breakthrough			4/30/2011	2207.4						
FTP w/ emissions & purge vol. (dry gas)	914255\914257	412191			0	13.68	18.58			
1 hr. hot soak @ 86°F		1503		2131						VT SHED test
14-day VT SHED		1504	5/1/2011							stopped after the 4th
Charge battery										day due to vehicle
FTP w/ emissions & purge vol. (dry gas)										scale not reading.
Collect fuel sample - test RVP										VOID

	Vehicle EVAP System Debug							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
FTP Prep (No Emissions)		1318		--	--	--	--	1 hour SHED Hot Soak Performed to check EVAP system on vehicle. Readings at 0.133 grams
1 hr. hot soak @ 86°F	914381	100001512	5/9/2011					

	Vehicle Conditioning & EVAP System Debug							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
IFET W/warm-up + FTP Prep (No Emissions)		1319\1320		--	--	--	--	1 hour SHED Hot Soak Performed to check EVAP system on vehicle. Readings at 0.021 grams
1 hr. hot soak @ 86°F	914393\914398	100001514	5/9/2011					

	Finial Vehicle Conditioning & EVAP System Debug							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
IFET W/warm-up + FTP Prep (No Emissions)		1326\1327		--	--	--	--	1 hour SHED Hot Soak Performed to check EVAP system on vehicle. Readings at 0.016 grams
1 hr. hot soak @ 86°F	914422	100001518	5/11/2011					

	10 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
FTP Prep (No Emissions)		1336								VT SHED Test
Can load - 2g breakthrough			5/13/2011	2208.6						Number 1525 was
FTP w/ emissions & purge vol. (dry gas)	914462\914480	412219			480.45	494.03	499.93			stopped during the
1 hr. hot soak @ 86°F		1524		2131.3						first day due vehicle
14-day VT SHED		1525\1526	5/15/2011							scale not reading. VT
Charge battery										SHED Test number
FTP w/ emissions & purge vol. (dry gas)										1526 started then
Collect fuel sample - test RVP										stopped after the
										2nd day due vehicle
										scale not reading.
										VOID

	10 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
FTP Prep (No Emissions)		1347		2136.3	500.05	513.6	518.8			
Can load - 2g breakthrough			5/17/2011	2233						
FTP w/ emissions & purge vol. (dry gas)	914505	412222			518.98	532.66	538.09			
1 hr. hot soak @ 86°F		1528		2304						
14-day VT SHED		1531	5/18/2011	2304					1.9	
Charge battery									12.48	
FTP w/ emissions & purge vol. (dry gas)	914743	213657	6/2/2011	2219.6	192.27	202.28	206.4			
Collect fuel sample - test RVP								8.83		

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
FTP Prep (No Emissions)		1410		2181.3	743.98	757.73	763.21			
Can load - 2g breakthrough			6/3/2011	2321.5						
FTP w/ emissions & purge vol. (dry gas)	914777	213661			779.71	791.35	796.26			
1 hr. hot soak @ 86°F		1533		2224.8						
14-day VT SHED		1534	6/4/2011	2321.3					11.93	
Charge battery									12.7	
FTP w/ emissions & purge vol. (dry gas)	915064	2100230	6/20/2011	2238.8	257.84	269.8	274.04			
Collect fuel sample - test RVP								8.13		

2009 Ford Focus

VIN	1FAHP35NX9W178664
Year	2009
Make	Ford
Model	Focus
Engine Family	9FMXV02.0VDX
Evaporative Family	9FMXR0125NAA

	Vehicle Bake At 115 degrees for 24 hours						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
Vehicle Bake Off	915104	21-Jun	6/21/2011	--	--	--	--

	Baseline Test (10 RVP)							
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			
					Start	Hot Soak	End	
2xFTP Prep (No Emissions)		100343	6/22/2011	1910	290.77	300.96	307	The SHED Hot soak test was at a 0.024
Can load - 2g breakthrough				1980.7				grams and for the 48 hour VT Shed 1st day
FTP w/ emissions & purge vol. (dry gas)	**915093**	4100367			952.92	962.73	964.67	reading was a 1.403 grams and the second
1 hr. hot soak @ 86°F		100366	6/23/2011	--				day read was a 3.441 with a total of 4.844
48hr VT SHED		100375		1969.9				grams. Vehicle failed the 48 hour VT shed.

	EVAP Leak Check and Vehicle inspection						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
EVAP Leak check and Vehicle Inspection			6/25/2011	--	--	--	--

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)		100453	6/27/2011	1877.6	995.04	1015.61	1022.53
Can load - 2g breakthrough				2008.5			
FTP w/ emissions & purge vol. (dry gas)	**915198**	4100468			22.54	38.62	47.53
1 hr. hot soak @ 86°F		100467	6/28/2011	--			
48hr VT SHED		100473		1969.9			

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		100536	6/30/2011	1904.7	83.93	103.29	109.38		
Can load - 2g breakthrough				1988.9					
FTP w/ emissions & purge vol. (dry gas)	**915253**	4100548	7/1/2011		378.43	392.03	399.03		
1 hr. hot soak @ 86°F		100546		1900.2					
14-day VT SHED		100575	7/2/2011	2046.6					12.3
Charge battery									13.17
FTP w/ emissions & purge vol. (dry gas)	**915437**	4100805	7/16/2011	1952	272.27	288.91	296.03		
Collect fuel sample - test RVP								8.85	

2009 Ford Focus (cont.)

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)		100811	7/18/2011	1934.8	343.64	358.65	364.48			
Can load - 2g breakthrough				2002.8						
FTP w/ emissions & purge vol. (dry gas)	915439	4100827	7/18/2011		412.05	428.39	434.12			During the 14 day VT SHED Test the building had a power outage causing the SHED to self abort. VOID
1 hr. hot soak @ 86°F		100830		1919.5						
14-day VT SHED		100831	7/18/2011							
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										
Collect fuel sample - test RVP										

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)		101021	7/29/2011		475.3	493.1	497.9			Test procedure stopped after the hot soak SHED due to high HC concentration caused by the trap canister bleeding back into SHED.
Can load - 2g breakthrough				2033						
FTP w/ emissions & purge vol. (dry gas)	915587	4101033	7/30/2011		497.88	510.41	517.7			
1 hr. hot soak @ 86°F		101013		1919.5						
14-day VT SHED										
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										
Collect fuel sample - test RVP										

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)		101049	8/1/2011	1906	568.34	579.71	584.7			14 day VT SHED stopped on the 5th day due to the canister vent line in the SHED came loose causing high HC ambient readings. VOID
Can load - 2g breakthrough				2038.6						
FTP w/ emissions & purge vol. (dry gas)	915601	4101068	8/1/2011		497.88	510.41	517.7			
1 hr. hot soak @ 86°F		101064		1946						
14-day VT SHED		101098	8/3/2011							
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										
Collect fuel sample - test RVP										

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)		101150	8/8/2011	2116	696.76	710.6	715.42			14 day VT SHED stopped after the 10th day due to the canister hose in the SHED split causing HC reading to be high in the SHED ambient. VOID
Can load - 2g breakthrough				2009.4						
FTP w/ emissions & purge vol. (dry gas)	915676	4101168	8/9/2011		715.42	730.49	734.88			
1 hr. hot soak @ 86°F		101169		1934.2						
14-day VT SHED		101186	8/9/2011							
Charge battery										
FTP w/ emissions & purge vol. (dry gas)										
Collect fuel sample - test RVP										

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)		101486	8/24/2011	1931.3	868.7	887.6	893.4			
Can load - 2g breakthrough				2017.4						
FTP w/ emissions & purge vol. (dry gas)	915921	4101497	8/25/2011		893.56	908.68	915.47			
1 hr. hot soak @ 86°F		101496		1935.6						
14-day VT SHED		101512	8/26/2011	2054.1					12.39	
Charge battery									12.82	
FTP w/ emissions & purge vol. (dry gas)	916144	4101780	9/9/2011	1966.6	254.5	269.5	275.3			
Collect fuel sample - test RVP								8.01		

Chevy Silverado

VIN	1GCEK19B66Z154114
Year	2006
Make	Chevrolet
Model	Silverado 1500
Engine Family	6GMXT05.3379
Evaporative Family	6GMXR0176820

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)	**915213**	1100463\1100466	6/27/2011	2276.81	358.14	372.42	378.43
Can load - 2g breakthrough				2193.7			
FTP w/ emissions & purge vol. (dry gas)		2100480	6/28/2011		45.74	59.04	66.34
1 hr. hot soak @ 86°F		1100478		--			
48hr VT SHED		1100486		2161.8			

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)	**915290**	100563	7/1/2011	2069.2	418.32	434.72	441.66		
Can load - 2g breakthrough				2197.6					
FTP w/ emissions & purge vol. (dry gas)		4100574	7/2/2011		109.3	122.8	130.2		
1 hr. hot soak @ 86°F		100573		2100.3					
14-day VT SHED	**915312**	100586	7/4/2011	2303.4					12.08
Charge battery									13.19
FTP w/ emissions & purge vol. (dry gas)	**915440**	4100809	7/17/2011	2172.3	296.01	309.83	317.5		
Collect fuel sample - test RVP								8.79	

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)	**915442 / 915524**	100813	7/18/2011	2146.7	387.53	404.82	412.04			
Can load - 2g breakthrough				2213.1						VT SHED number 100843 was ended on the 8th day due to SHED issues then restarted VT SHED number 100995 for the remaining 6 days.
FTP w/ emissions & purge vol. (dry gas)		4100833			434.18	447.62	455.33			
1 hr. hot soak @ 86°F		100832		2114						
14-day VT SHED		100843 / 100995	7/19/2011	2299.4					12.34	
Charge battery									13.22	
FTP w/ emissions & purge vol. (dry gas)	**915650**	4101121	8/4/2011	2298.2	671.17	688.98	696.76			
Collect fuel sample - test RVP								7.89		

Nissan Altima

VIN	1N4AAL21E08C19820
Year	2009
Make	Nissan
Model	Altima
Engine Family	8NSXV02.5G5A
Evaporative Family	8NSXR0120PBA

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)	915352	100627	7/7/2011	--	181.55	189.28	194.11
Can load - 2g breakthrough				--			
FTP w/ emissions & purge vol. (dry gas)		4100641			194.14	207.24	212.16
1 hr. hot soak @ 86°F		100640		--			
48hr VT SHED		100644	7/8/2011	--			

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)	915428	100791	7/14/2011	1761.1	246.7	253.6	257.2		
Can load - 2g breakthrough				1844.7					
FTP w/ emissions & purge vol. (dry gas)		4100798	7/15/2011		257.21	266.9	272.27		
1 hr. hot soak @ 86°F		100796		1764.4					
14-day VT SHED		100804	7/16/2011	1919.4					12.47
Charge battery									12.9
FTP w/ emissions & purge vol. (dry gas)	915595	4101040	7/31/2011	1814.1	517.76	534.04	540.68		
Collect fuel sample - test RVP								8.85	

	9 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)	915602	101052	8/1/2011	1761.7	604.57	624.44	631.03		
Can load - 2g breakthrough				1834.5					
FTP w/ emissions & purge vol. (dry gas)		4101070			654.57	666.63	671.27		
1 hr. hot soak @ 86°F		101069		1758					
14-day VT SHED		101079	8/2/2011	1911.9					12.47
Charge battery									13.18
FTP w/ emissions & purge vol. (dry gas)	915785	4101310	8/16/2011	1824.3	734.8	747.33	751.87		
Collect fuel sample - test RVP								7.85	

2010 Ford Focus

VIN	1FAHP3FN8AW272304
Year	2010
Make	Ford
Model	Focus
Engine Family	AFMXV02.0VZX
Evaporative Family	AFMXR0110GCX

Check Out Test

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
FTP w/ emissions & purge vol. (dry gas)		4101338	8/17/2011	--	751.86	761.24	766.19
1 hr. hot soak @ 86°F	915803	101336	8/17/2011				

Baseline Test (10 RVP)

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)		101419	8/22/2011	1872	827.8	842.6	847.4
Can load - 2g breakthrough				1991.6			
FTP w/ emissions & purge vol. (dry gas)	**915881**	4101437			845.58	861.92	868.78
1 hr. hot soak @ 86°F		101435	8/23/2011	--			
48hr VT SHED		101438		2010			

10 RVP Test

	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		101649	9/2/2011	1885.2	581.6	600.9	607.6		
Can load - 2g breakthrough				1989.7					
FTP w/ emissions & purge vol. (dry gas)	**916045**	4101660			195.42	215.95	222.83		
1 hr. hot soak @ 86°F		101659	9/3/2011	1902.2					
14-day VT SHED		101662		2093.5					11.8
Charge battery									13.28
FTP w/ emissions & purge vol. (dry gas)	**916267**	4102002	9/17/2011	1991.5	678.59	696.77	702.78		
Collect fuel sample - test RVP								8.77	

9 RVP Test

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		102005	9/18/2011	1927.7	729.86	746.93	752.76		
Can load - 2g breakthrough				2024.1					
FTP w/ emissions & purge vol. (dry gas)	**916269**	4102018	9/19/2011		752.78	770.92	778.45		
1 hr. hot soak @ 86°F		102017		1932.3					
14-day VT SHED		102024		2041.5					
Charge battery									
FTP w/ emissions & purge vol. (dry gas)									
Collect fuel sample - test RVP									

14 day VT SHED was ended on the 10th day due to a vehicle scale problem. VOID

9 RVP Test

	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)		102206	9/29/2011	1937.5	835.7	857.9	864.1		
Can load - 2g breakthrough				2027.8					
FTP w/ emissions & purge vol. (dry gas)	**916403**	4102219	9/30/2011		864.1	878.19	885.1		
1 hr. hot soak @ 86°F		102217		1943.1					
14-day VT SHED		102221		2096.6					12.52
Charge battery									13.35
FTP w/ emissions & purge vol. (dry gas)	**916530**	4102457	10/15/2011	2054.5	922.9	924.1	924.83		
Collect fuel sample - test RVP								7.82	

2008 Ford Taurus

VIN	1FAHP24W58G174230
Year	2008
Make	Ford
Model	Taurus
Engine Family	8FMXV03.5VEP
Evaporative Family	8FMXR0145KBK

	Check out Test (Tier 2 Shed 7.8)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
FTP w/ emissions & purge vol. (dry gas)	**916218**	4101939	9/14/2011	--	625.2	631.5	636.4
1 hr. hot soak @ 86°F				--			
		101940	9/14/2011				

	EVAP LEAK TEST PERFORMED
EVAP Leak test performed with Snap On	Snap On Tool showed a .02 offices leak. No repairs made test as is.

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)	**916246**	101972	9/15/2011	--	652.99	664	666.7
Can load - 2g breakthrough				--			
FTP w/ emissions & purge vol. (dry gas)		4101986	9/16/2011		666.79	674.31	678.67
1 hr. hot soak @ 86°F		101987		--			
48hr VT SHED		101988		--			

	10 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)	**916412**	102230	10/2/2011	2189.9	896.51	902.07	904.14			
Can load - 2g breakthrough				2276.1						
FTP w/ emissions & purge vol. (dry gas)		4102236	10/3/2011		904.13	911.43	913.15			14-day SHED ENDED 3 Hour early. Trap canister changed on 10/13/11. Removed canister #3 - 1703.5g Installed canister #2 - 1584.0g After shed weight - 1665.4g.
1 hr. hot soak @ 86°F		102235		2210.9						
14-day VT SHED		102244		2357.5					12.35	
Charge battery									13.28	
FTP w/ emissions & purge vol. (dry gas)	**916539**	4102461	10/17/2011	2264.6	924.8	936.55	938.9			
Collect fuel sample - test RVP								8.88		

	9 RVP Test									
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage	
					Start	Hot Soak	End			
2xFTP Prep (No Emissions)	**916553/916689**	102491	10/18/2011	2208.2	954.8	961.1	963.5			
Can load - 2g breakthrough				2288.7						
FTP w/ emissions & purge vol. (dry gas)		4102500	10/19/2011		963.55	971.95	975.15			
1 hr. hot soak @ 86°F		102499		2217.1						
14-day VT SHED		102507/102688		2357.1					12.38	
Charge battery									13.24	14-day SHED re-started on day 12 due to SHED not performing scheduled reads.
FTP w/ emissions & purge vol. (dry gas)	**916749**	4102798	11/4/2011	2265.1	975.14	985.78	988.36			
Collect fuel sample - test RVP								7.83		

2010 Toyota Prius

VIN	JTDKN3DU5A0051360
Year	2010
Make	Toyota
Model	Prius
Engine Family	ATYXV01.8HCS
Evaporative Family	ATYXR0110P42

	Baseline Test (10 RVP)						
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow		
					Start	Hot Soak	End
2xFTP Prep (No Emissions)	**915949**	101520	8/26/2011	--	945.52	950.48	953.39
Can load - 2g breakthrough			8/27/2011	--			
FTP w/ emissions & purge vol. (dry gas)		4101529	8/28/2011		953.38	958.62	961.49
1 hr. hot soak @ 86°F		101528		--			
48hr VT SHED		101530		--			

	10 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight (After)	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)	**916034**	101772	9/9/2011	2177.5	247.7	251.61	254.54		
Can load - 2g breakthrough				2266.8					
FTP w/ emissions & purge vol. (dry gas)		4101785			275.32	280.29	284.25		
1 hr. hot soak @ 86°F		101787		2205.7					
14-day VT SHED		101802	9/10/2011	2303.2					12.23
Charge battery									13.09
FTP w/ emissions & purge vol. (dry gas)	**916315**	4102120	9/24/2011	2240.9	778.45	783.82	786.42		
Collect fuel sample - test RVP								8.90	

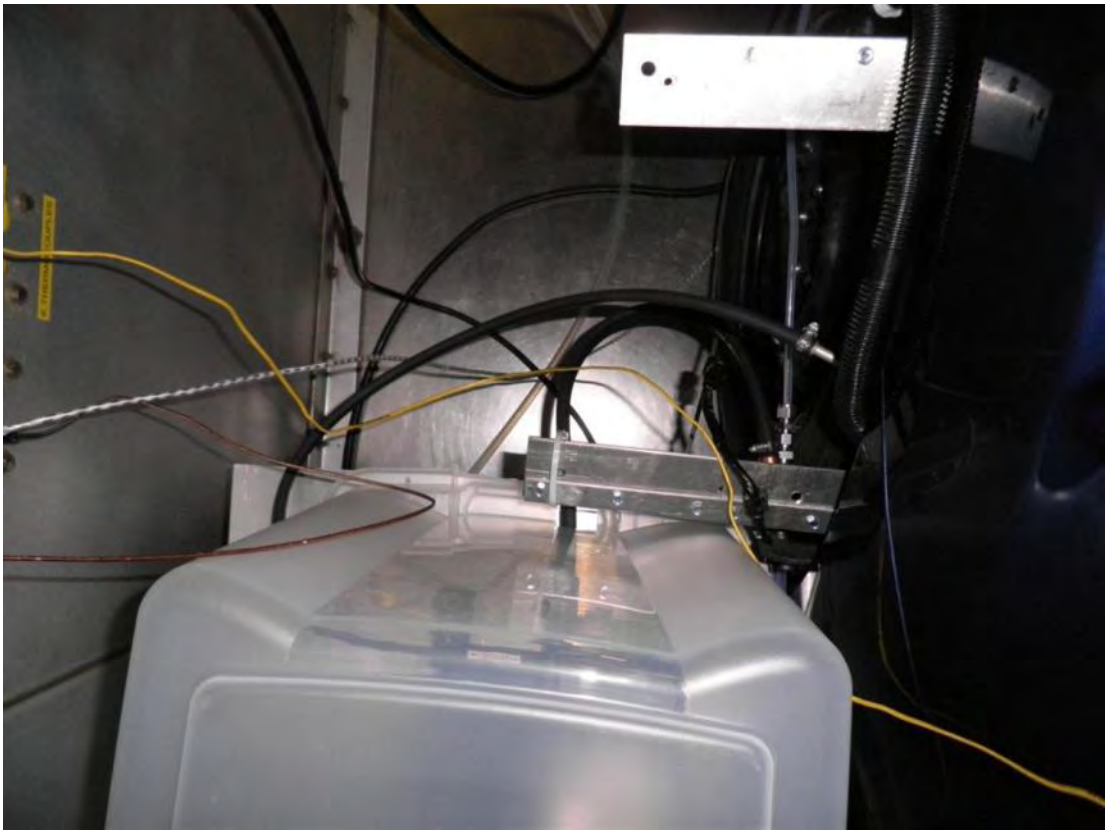
	9 RVP Test								
	VTR #	Test #	Test Start Date	Can Weight	Purge Flow			Post-test RVP	Battery Voltage
					Start	Hot Soak	End		
2xFTP Prep (No Emissions)	**916313**	102126	9/25/2011	2205.9	797.29	801.53	804.11		
Can load - 2g breakthrough				2282.1					
FTP w/ emissions & purge vol. (dry gas)		4102130	9/26/2011		804.11	809.08	811.21		
1 hr. hot soak @ 86°F		102129		2229.9					
14-day VT SHED		102132		2309.6					12.47
Charge battery									13.09
FTP w/ emissions & purge vol. (dry gas)	**916473**	4102349	10/10/2011	2249.3	913.15	918.75	922.18		
Collect fuel sample - test RVP								7.89	

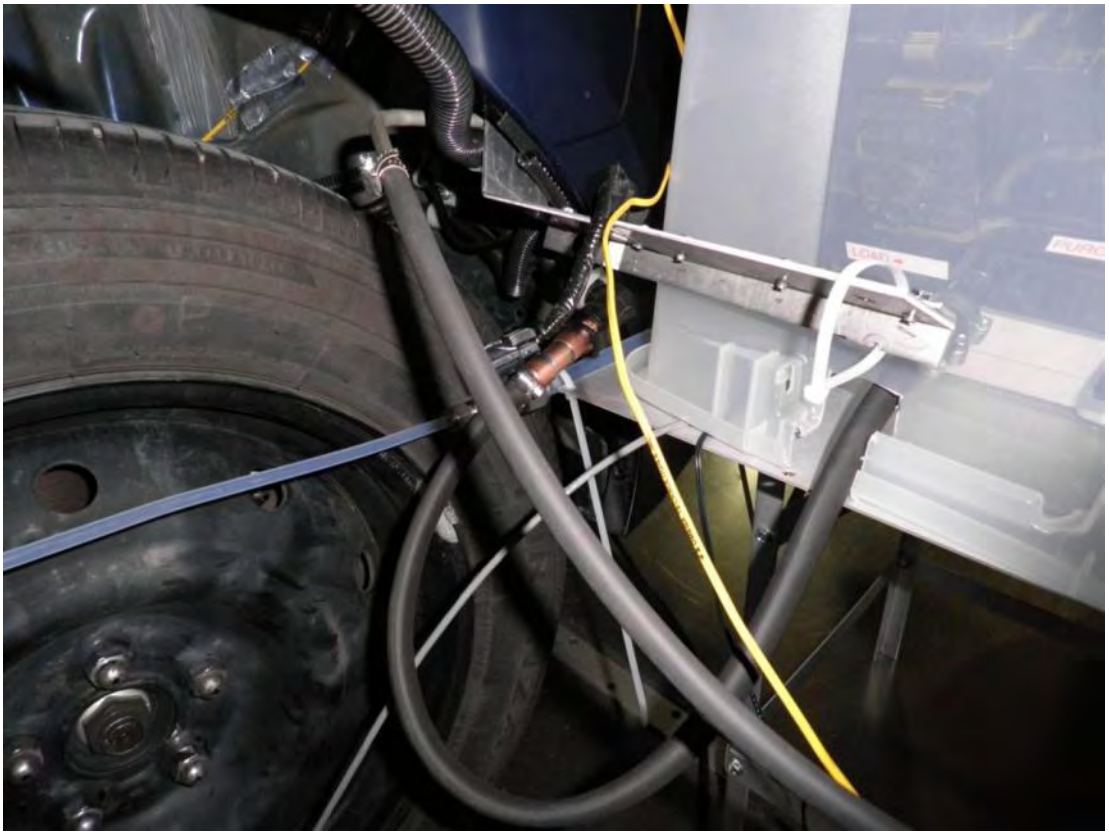
APPENDIX B
FUEL BLENDING DETAILS

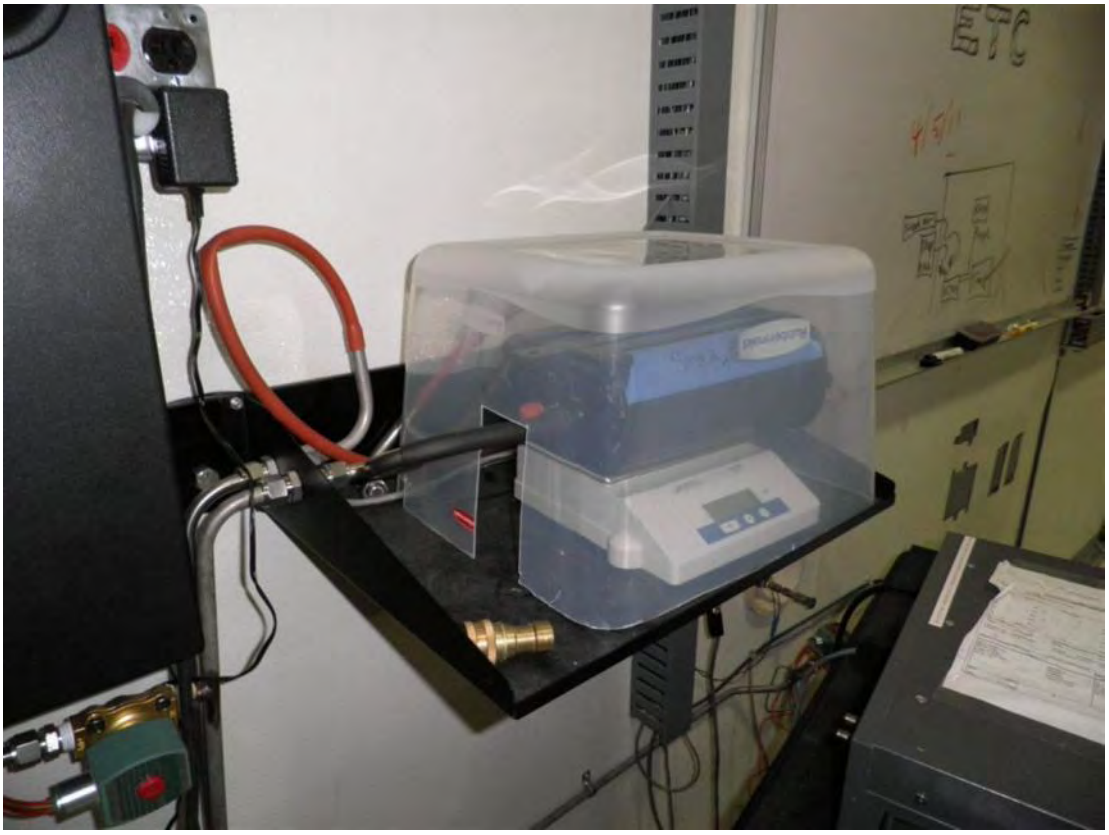
			Base Fuel	High RVP	Low RVP
Property	**Result**	**Rep#**	**979296**	**979298**	**979297**
	ProjName		oddb	oddb	oddb
	ProjSeq		97380	97382	97381
	WorkOrdr		57355	57355	57355
	SmplCode		E10 Fuel #1	E10 Fuel #3	E10 Fuel #2
	SmplSize		1L Al cans	1L Al cans	1L Al cans
	Descript			Batch A	Batch B
D5191	DVPE	psi	11.75	9.02	7.81
D1319	Aromatic	%	30.9		
	Olefins	%	12.3		
	Saturate	%	56.8		
D4052s	API@60F		59.1		
	SPGr@60F		0.7424		
	Dens@15C	grams/L	742.1		
D5291 CH	Carbon	wt%	82.85		
	Hydrogen	wt%	13.42		
D5453	Sulfur	ppm	32.7		
D5599	EtOHWt	Wt%	10.8653	11.4133	11.3779
	TtlWt	Wt%	3.77	3.96	3.95
D613	CetaneNo				
D6729	DHA	.			
D86	IBP	deg F	85.9	95.3	102.2
	Evap_5	degF	104.5	117.6	124.3
	Evap_10	degF	114.8	126.2	132.1
	Evap_15	degF	122.2	132.6	136.8
	Evap_20	degF	129.1	137.5	141.8
	Evap_30	degF	141.6	146.9	149.7
	Evap_40	degF	150.7	153.6	155.9
	Evap_50	degF	159.9	184.7	201.3
	Evap_60	degF	217.5	228.9	234
	Evap_70	degF	247.5	255.1	259.7
	Evap_80	degF	276.3	279.8	288.5
	Evap_90	degF	316.1	320.2	319.6
	Evap_95	degF	343.6	346.5	351.2
	FBP	degF	387.5	389.5	392.8
	Recoverd	mL	97.5	98.2	98.1
	Residue	mL	0.8	0.8	0.9
	Loss	mL	1.7	1	1
	EVP200		56.02	52.42	49.76
	EVP300		85.92	84.73	84.4
	DrvIndx		968	1063.6	1121.65
	DIEtOH		992.39	1063.6	1121.65
D976	CetanInd				

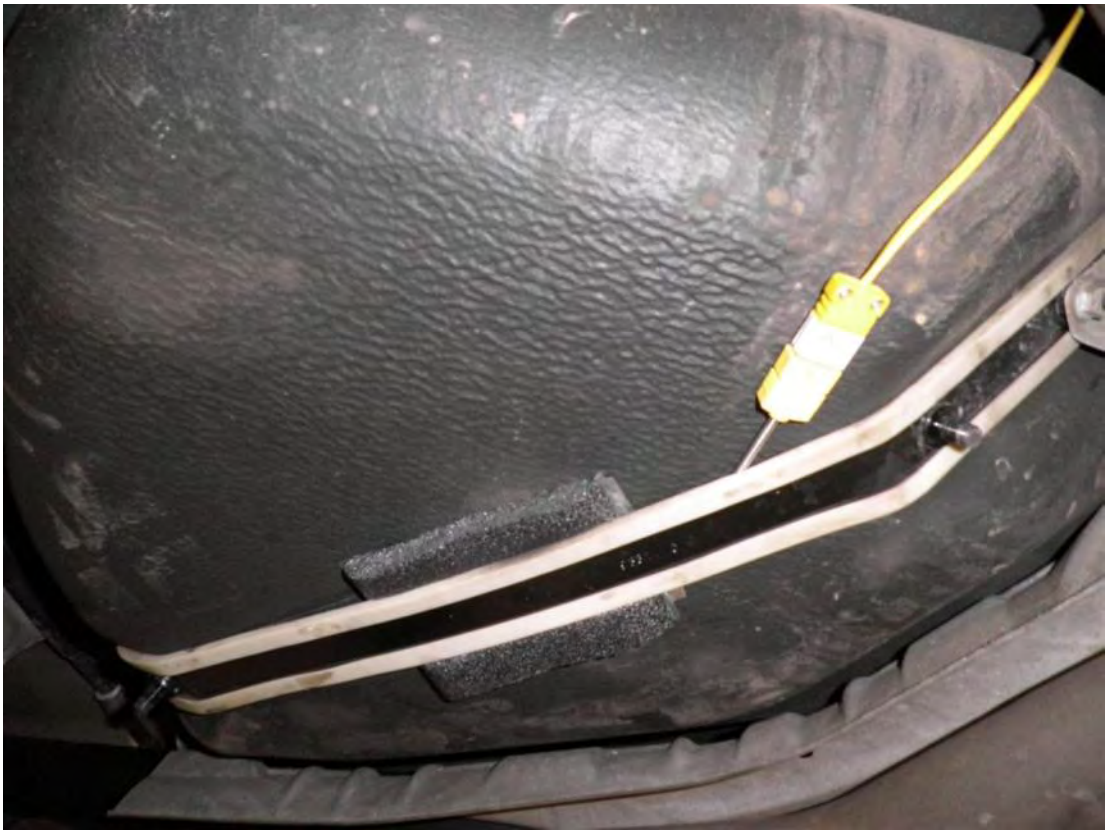
APPENDIX C
VEHICLE PHOTOGRAPHS

2010 Subaru Legacy

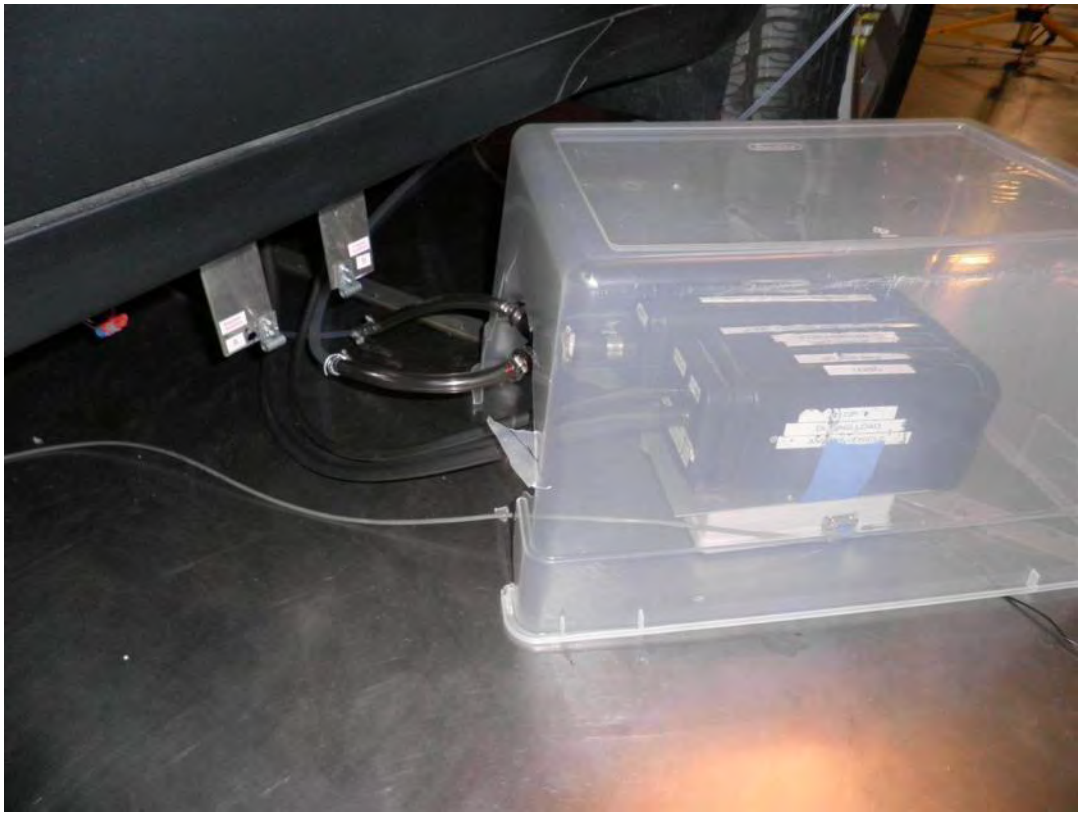








2009 Saturn Outlook

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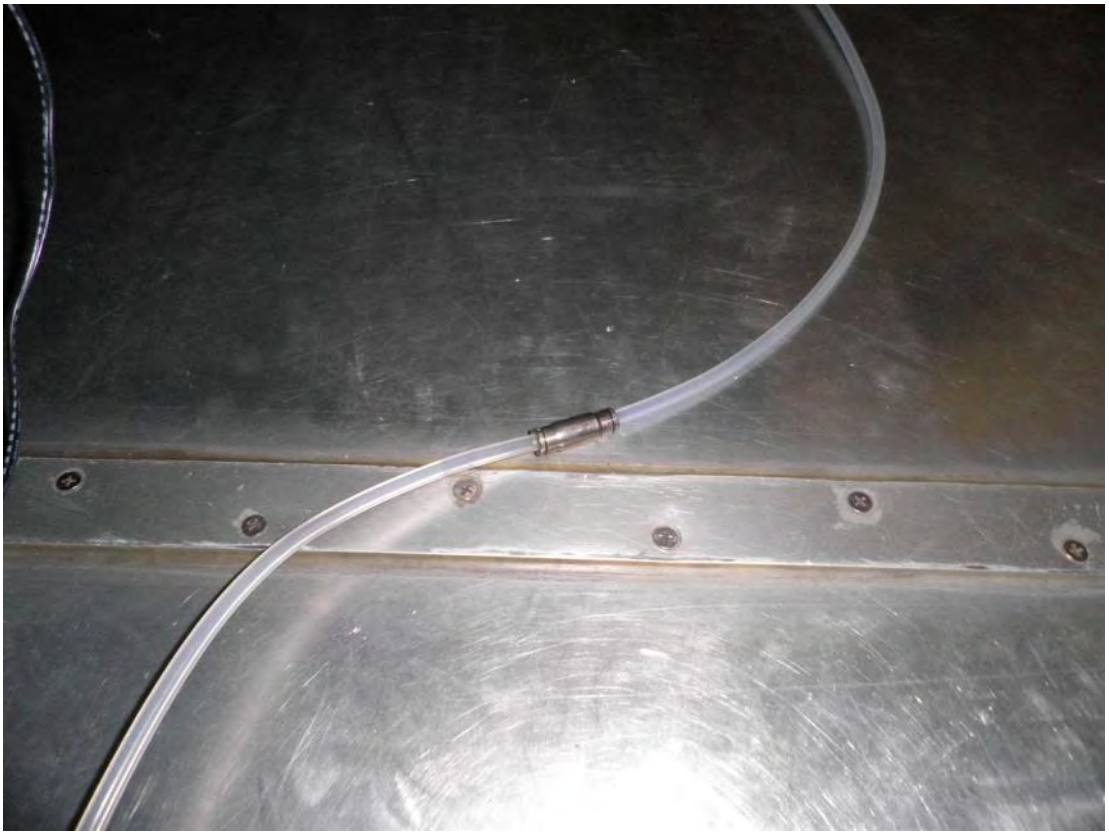

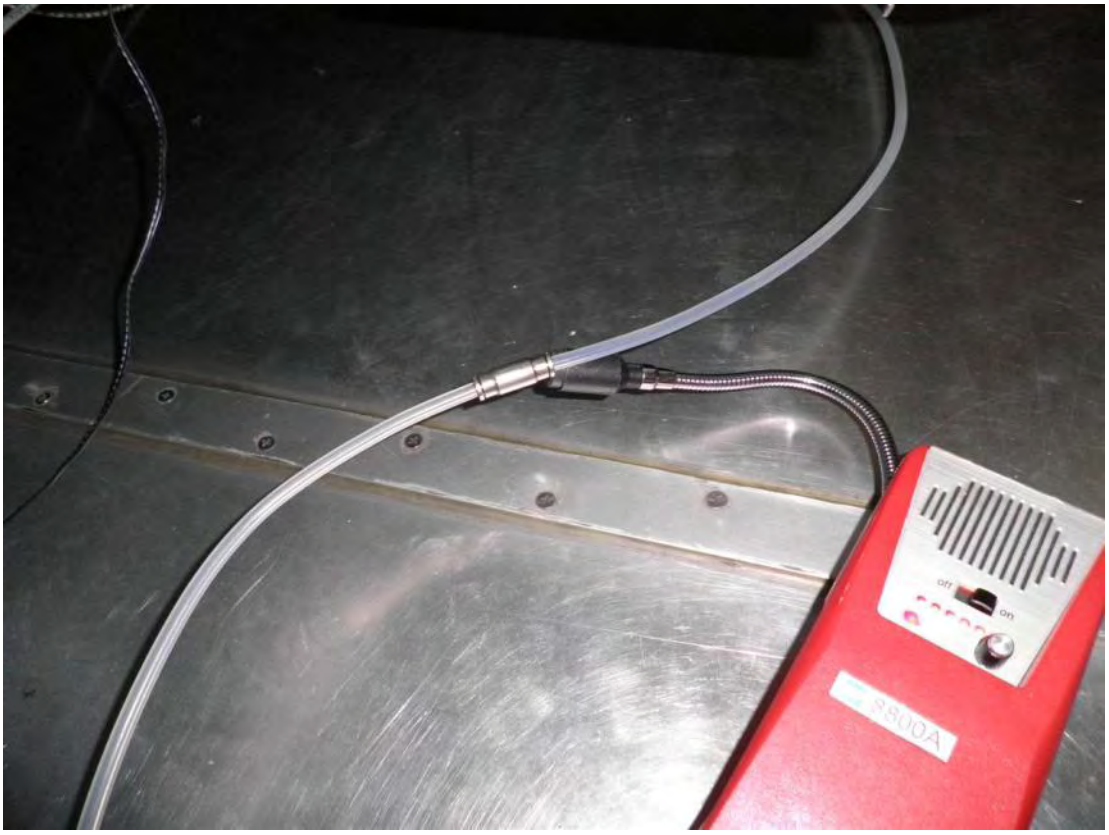
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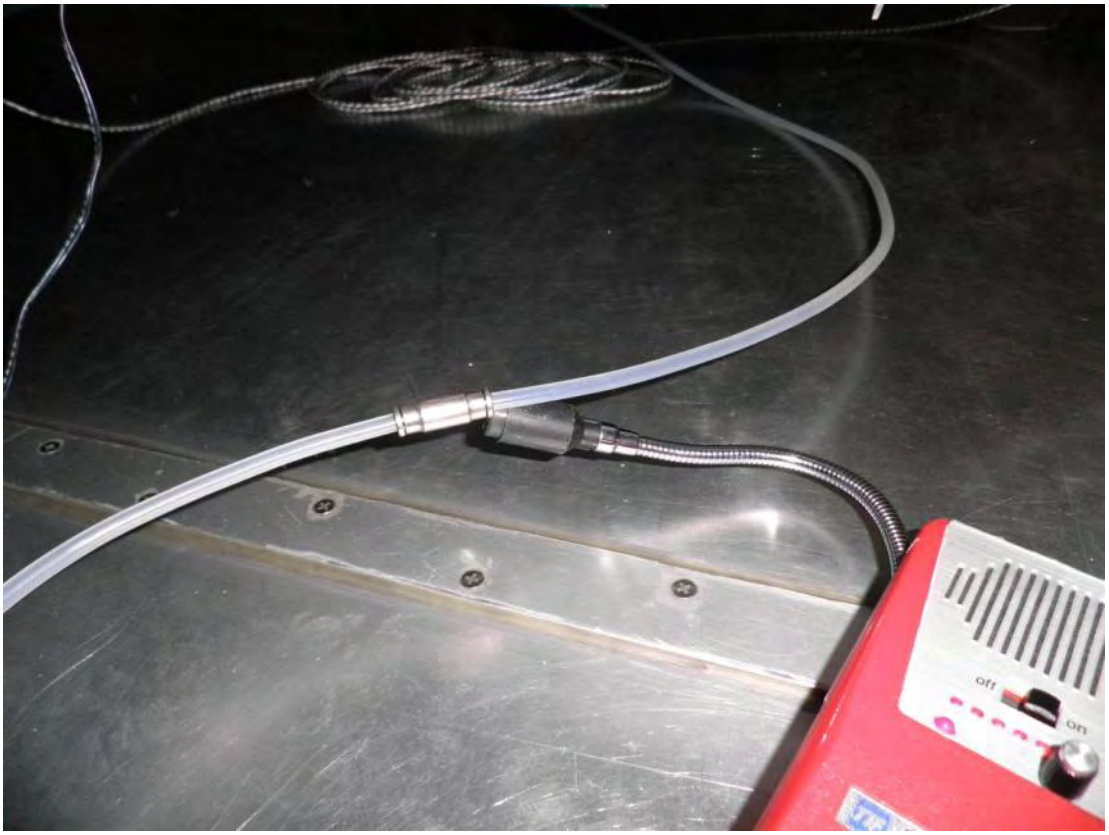
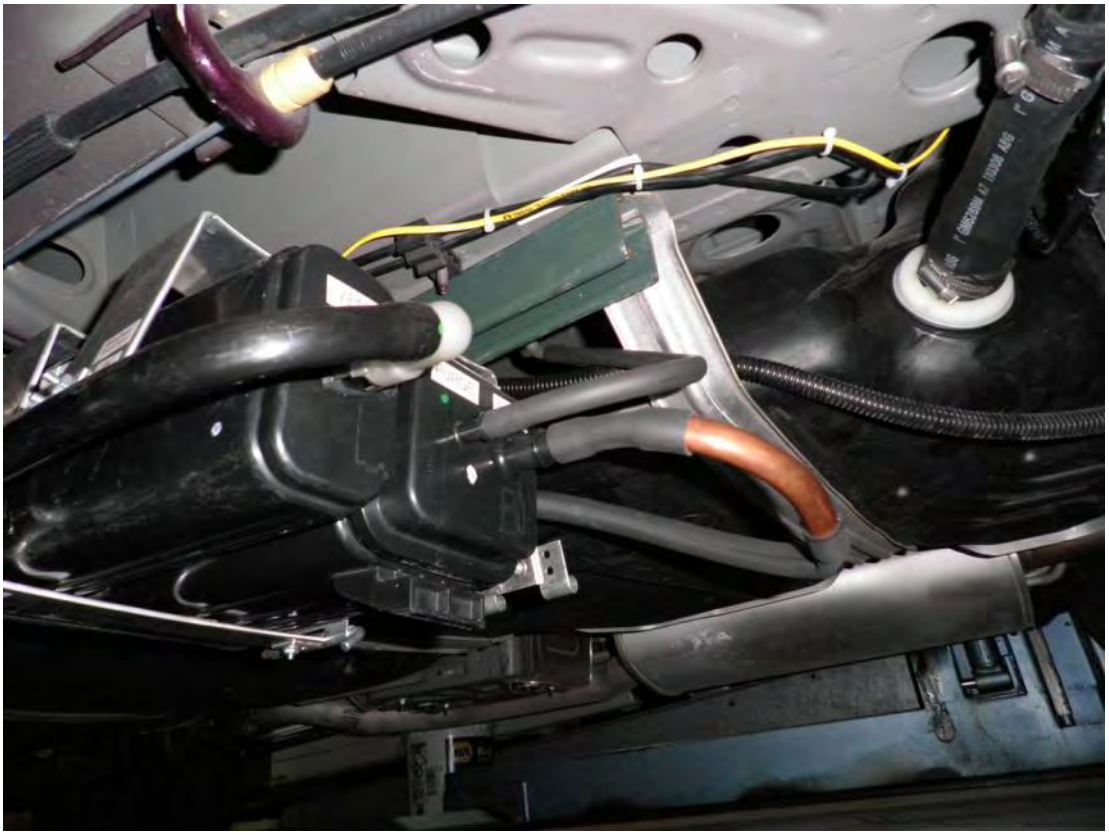

off
on

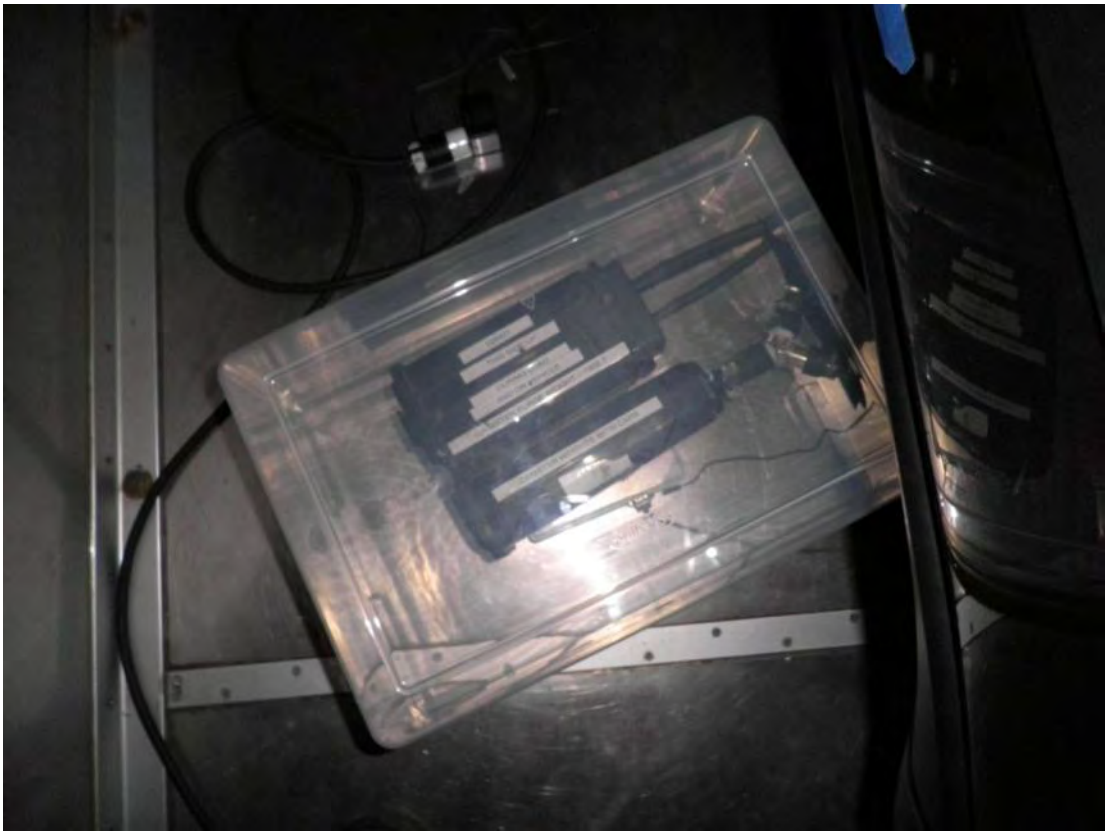

Shed Probe 1
Canister Vent
Canister

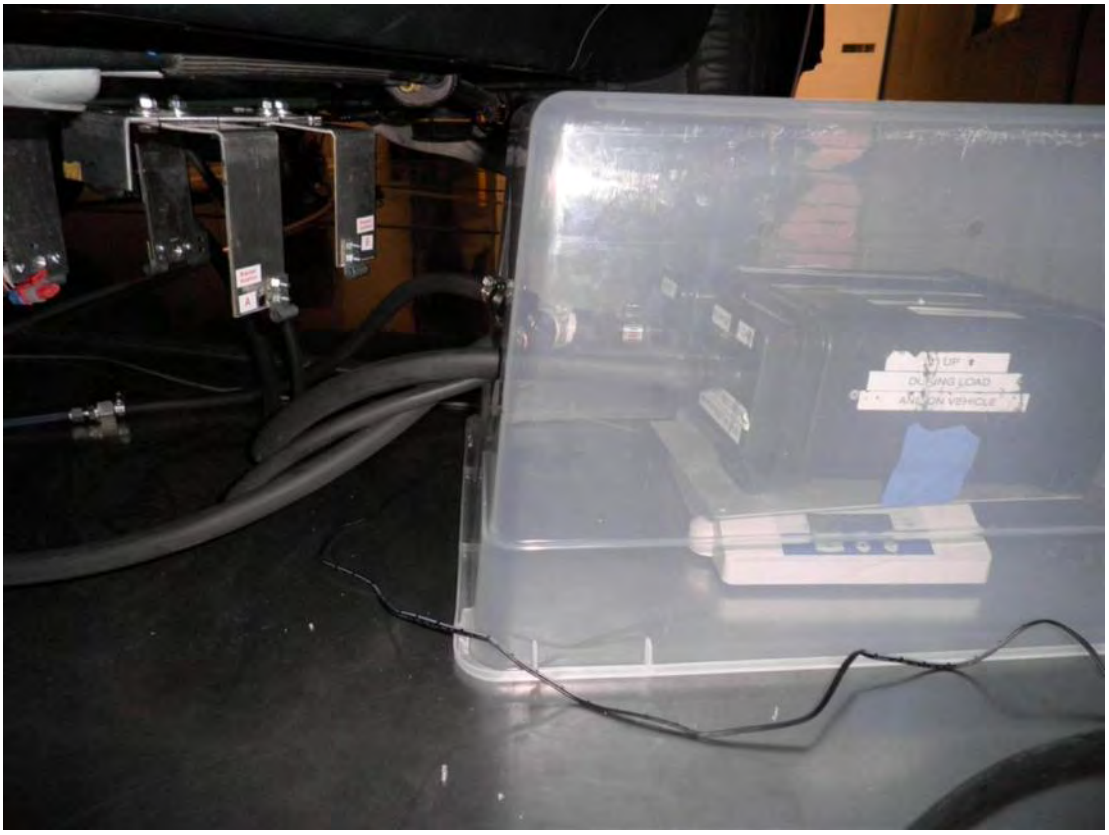

UP
DURING LOAD
AND ON VEHICL
Bracket location
B

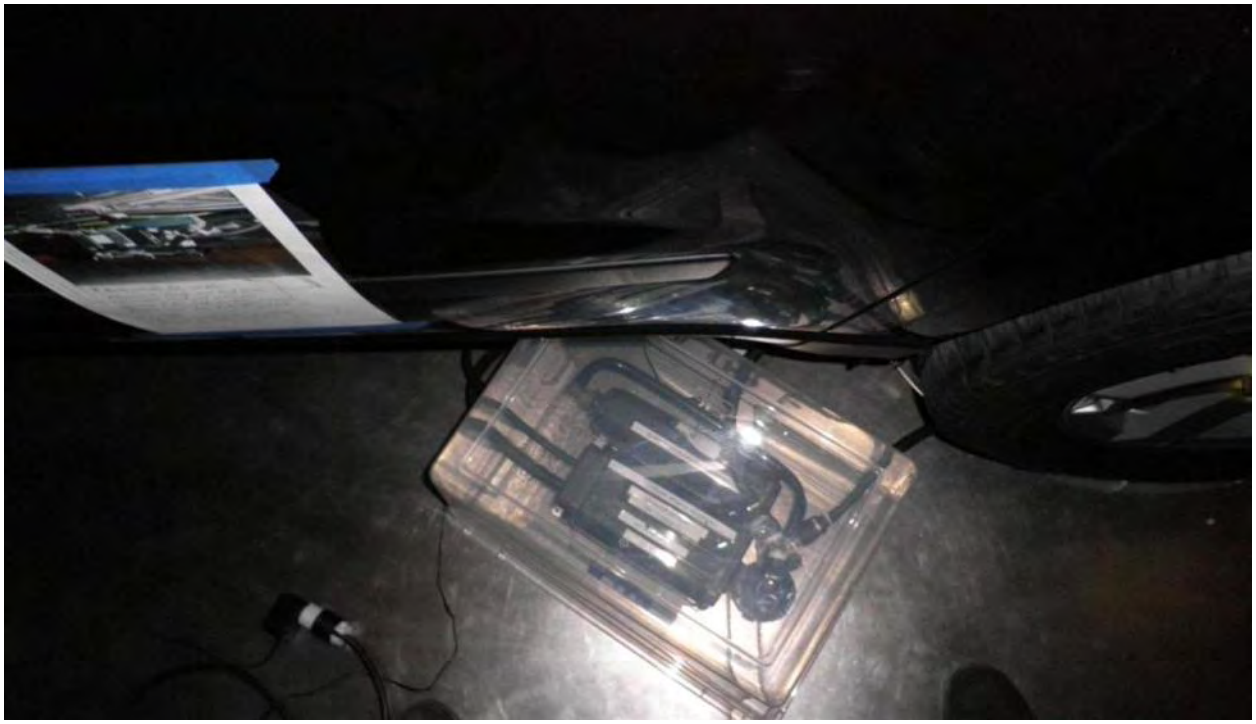

UP
DURING LOAD
AND ON VEHICLE



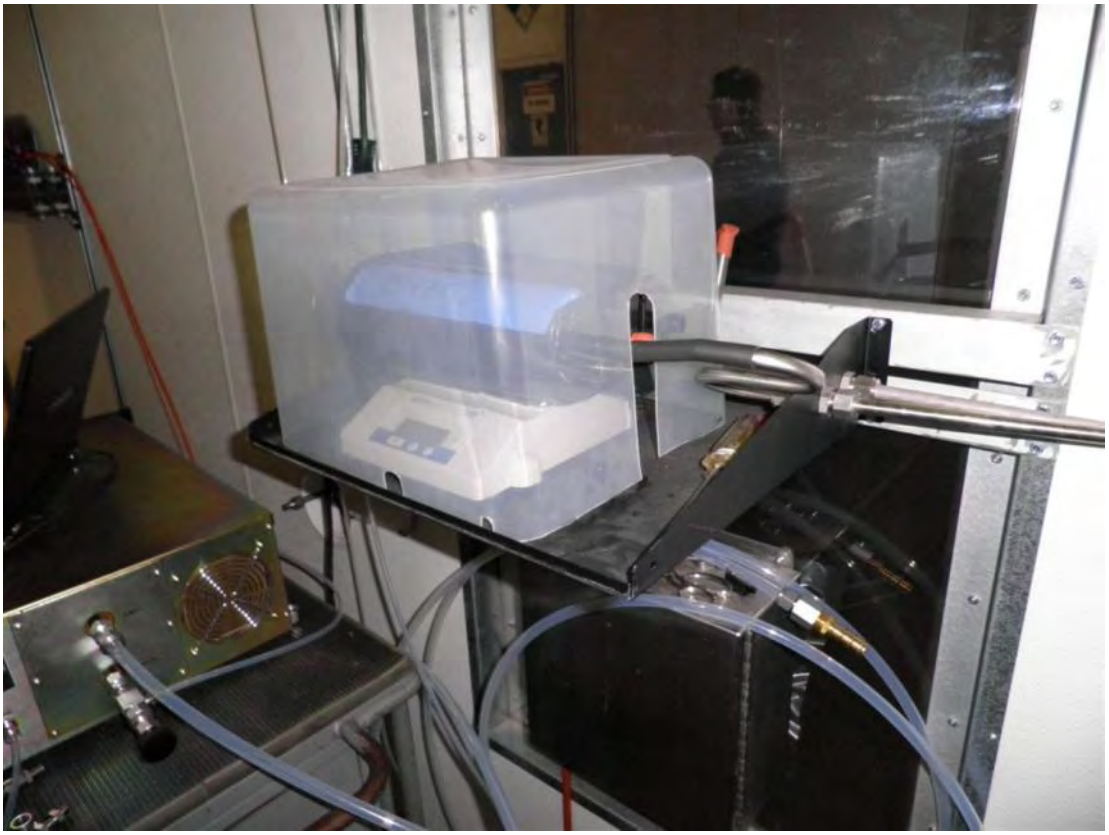

GM
GENERAL MOTORS CORPORATION
VEHICLE EMISSION CONTROL INFORMATION
Conforms to regulations: 2009
U.S. EPA class / stds: LDT / TIER2
California class / stds: LDT / ULEV2
Group: 9GMXT03.6151 3.6L
Evap: 9GMXR0197972
DGI/HO2S/TWC, OBD: II
Fuel: Gasoline

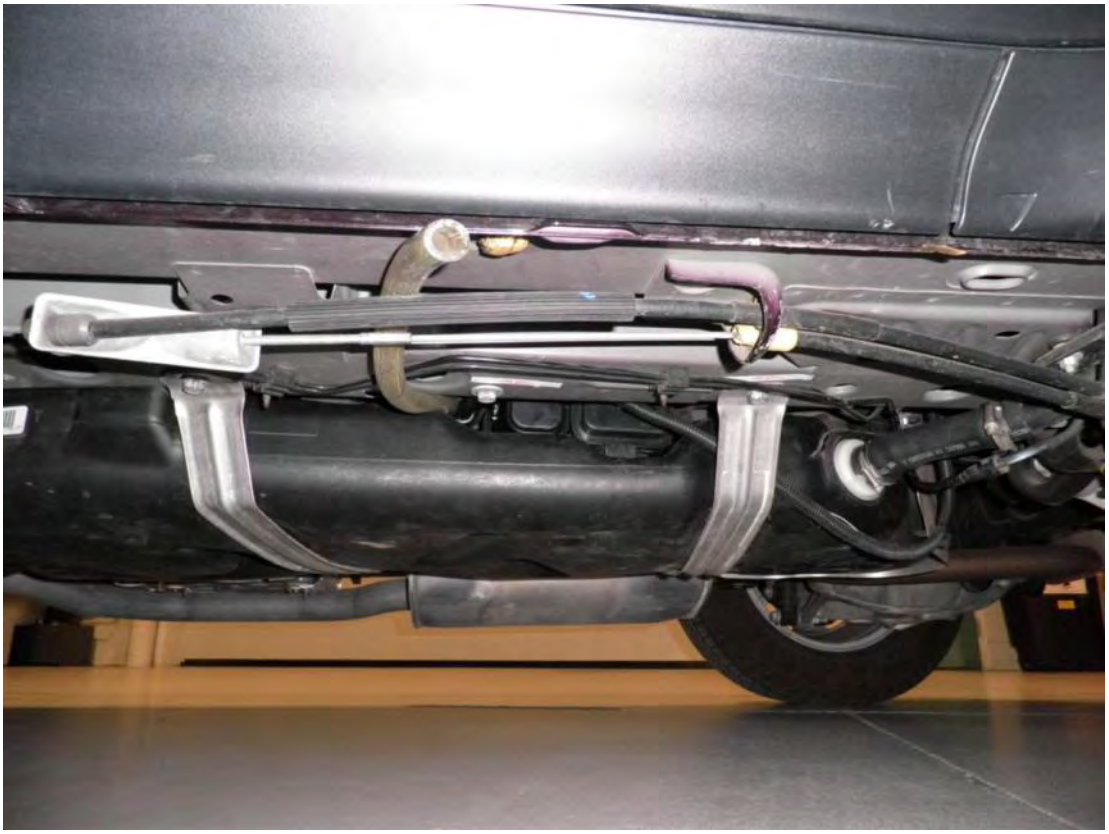


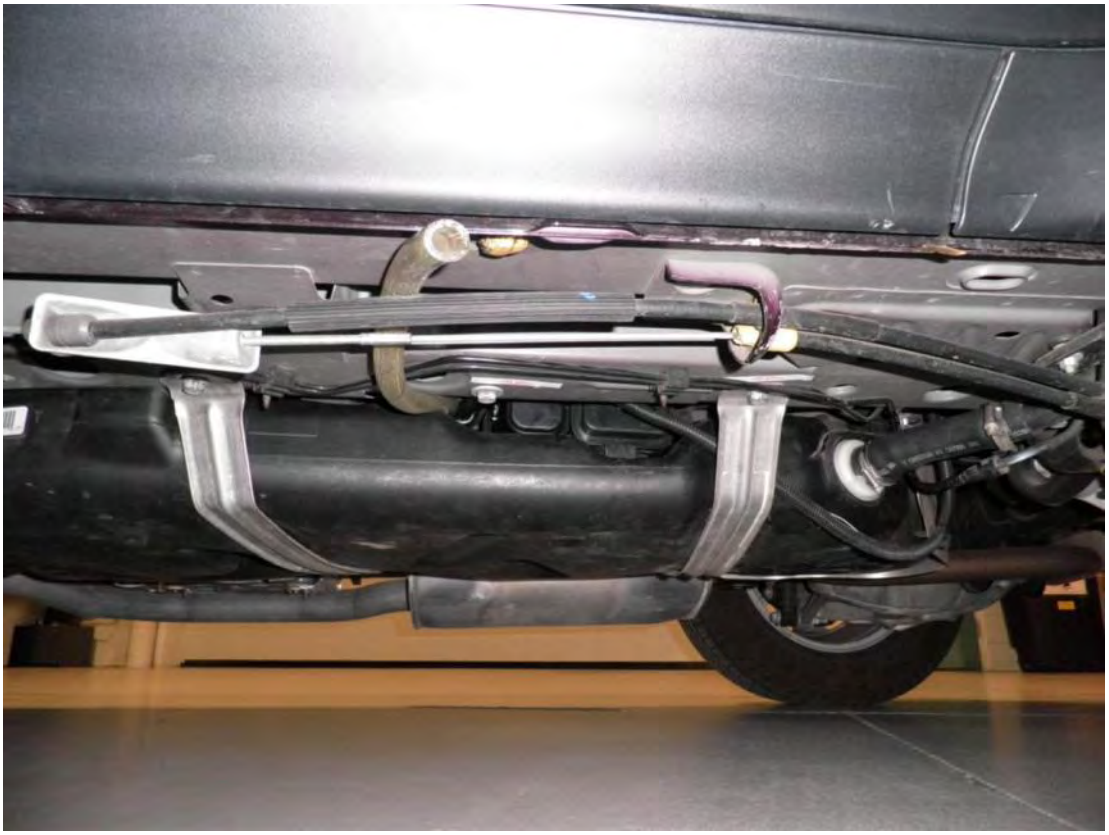





Shed 5

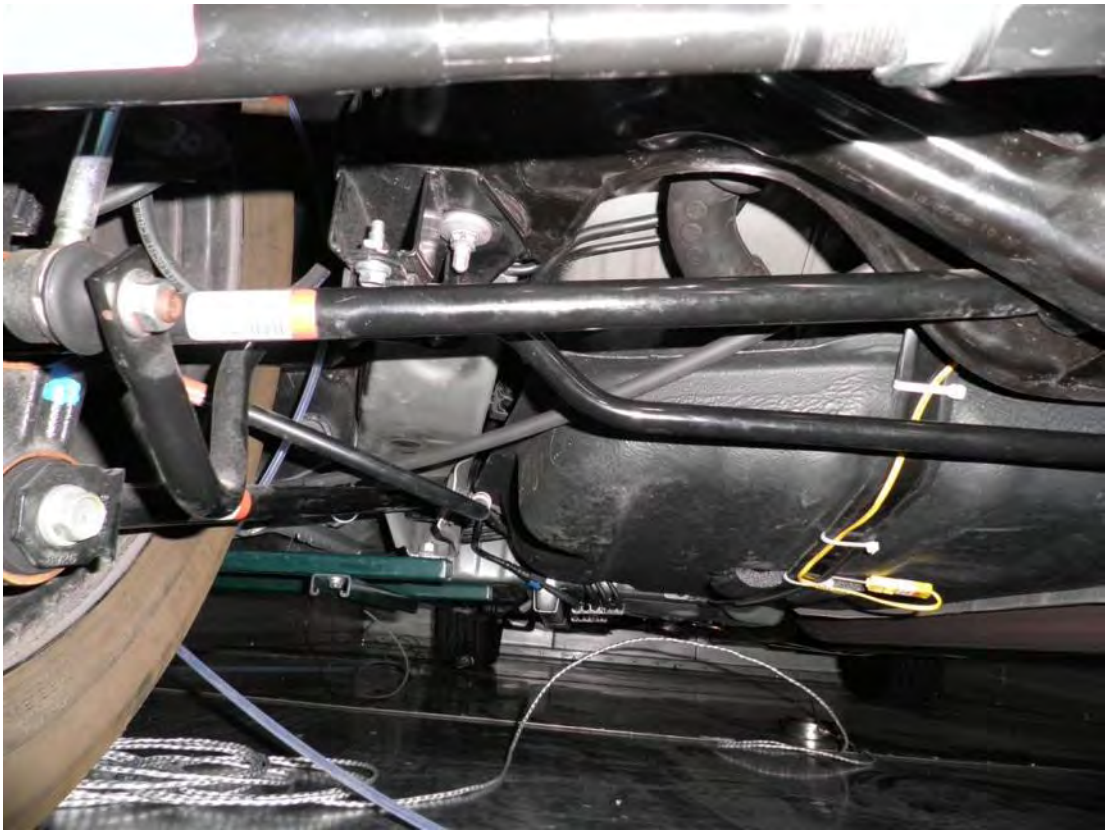




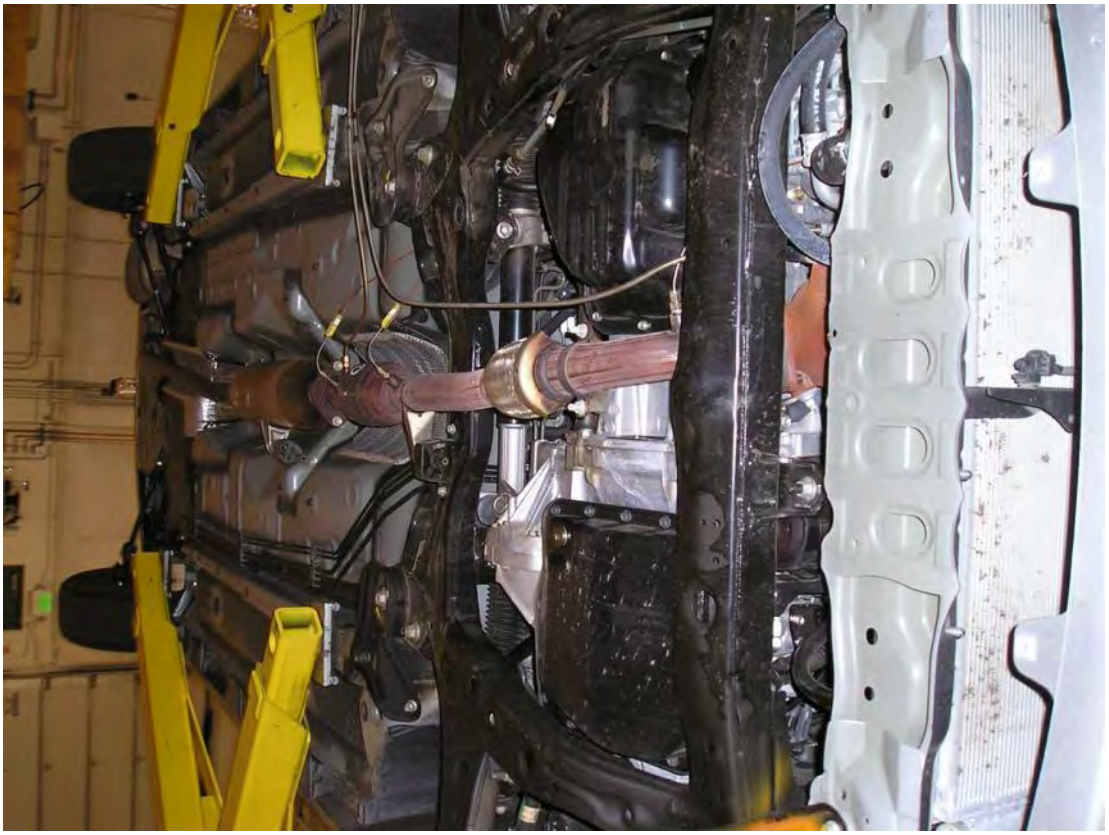


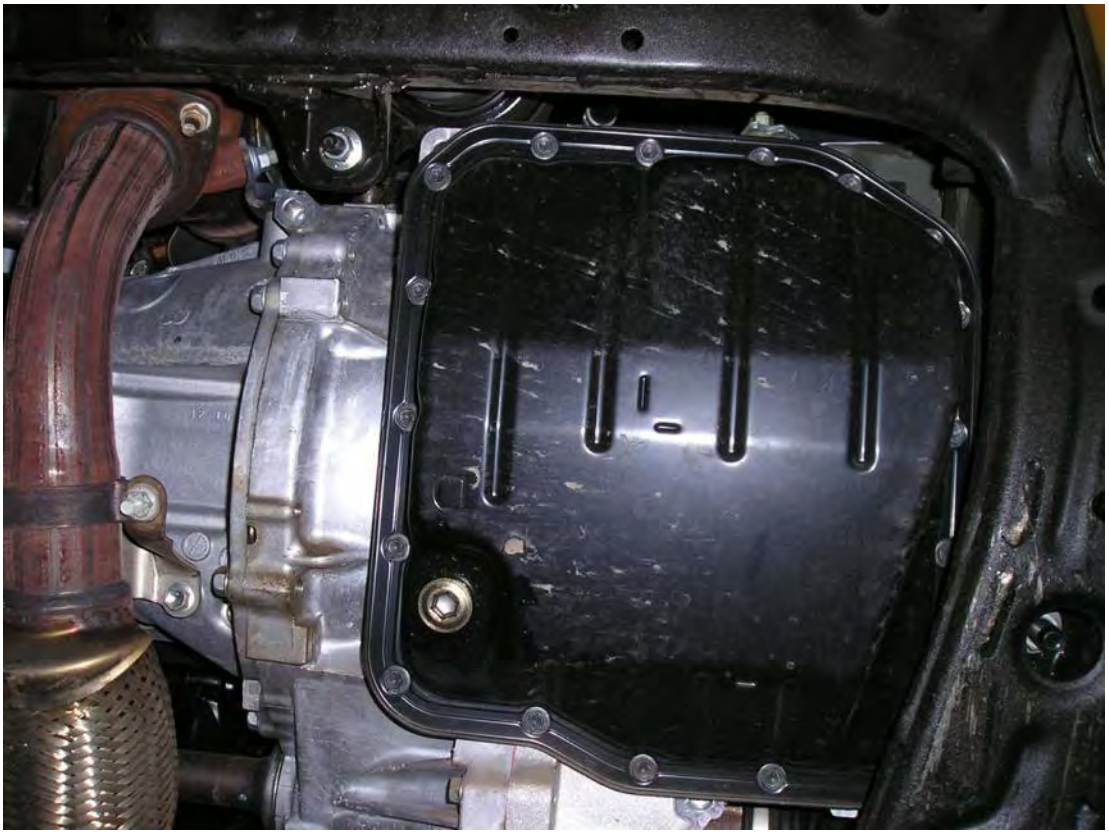

FUEL TEMP

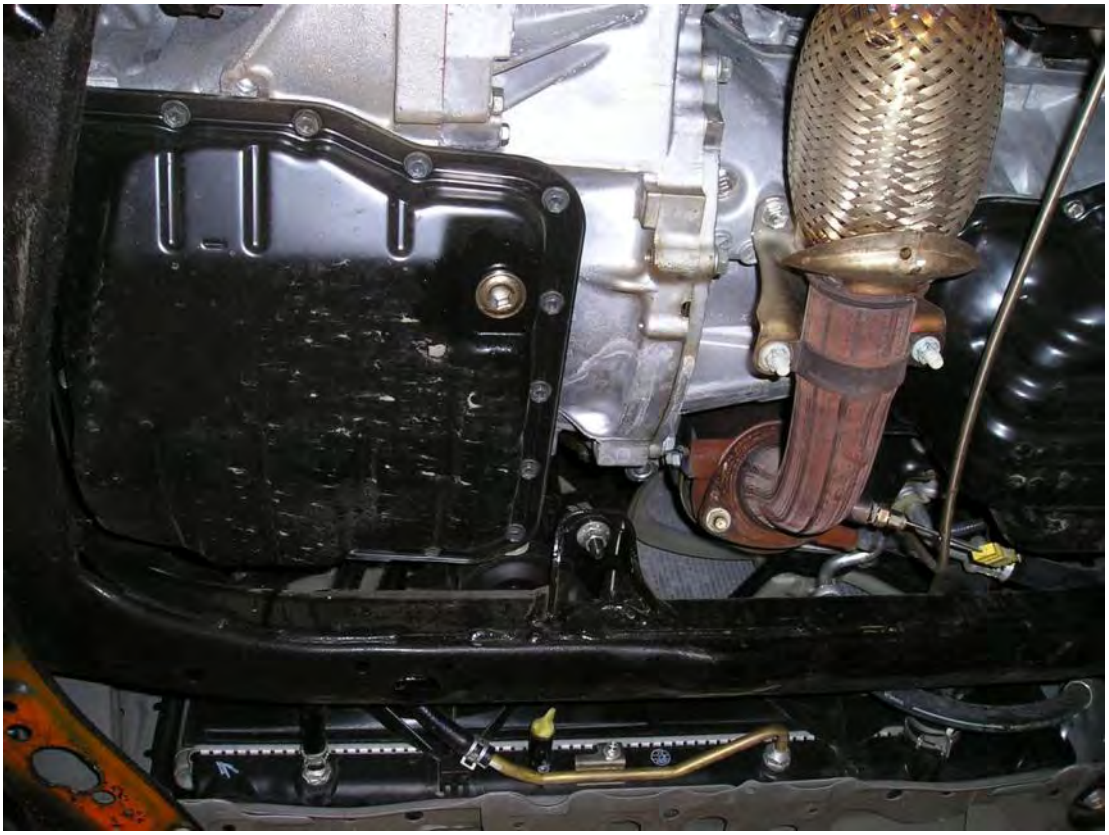
2009 Toyota Camry

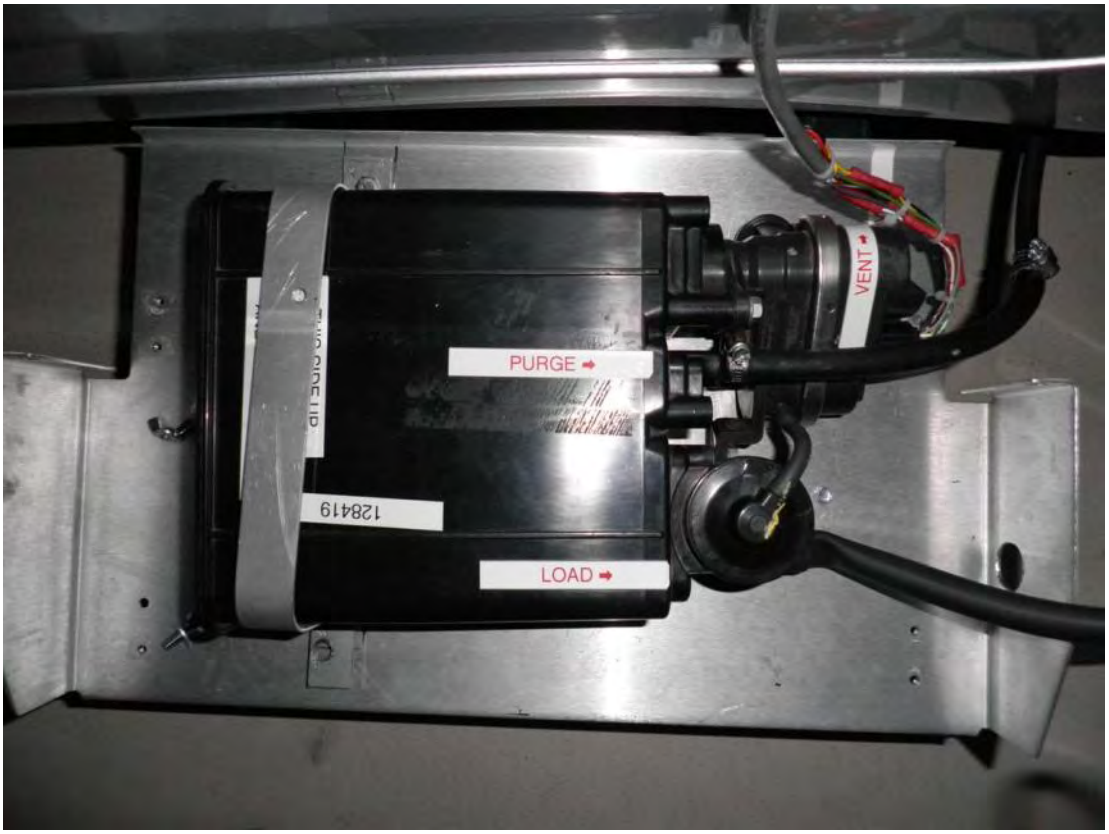



NAPA 5W20 API SN
ODOMETER 121645 MILES
DATE 7-20-2011
NAPA
PREMIUM
PERFORMANCE
MULTI-VISCOSITY
SAE 5W-20
MOTOR OIL
FOR GASOLINE ENGINES
1 U.S. Qt./.946 Liters

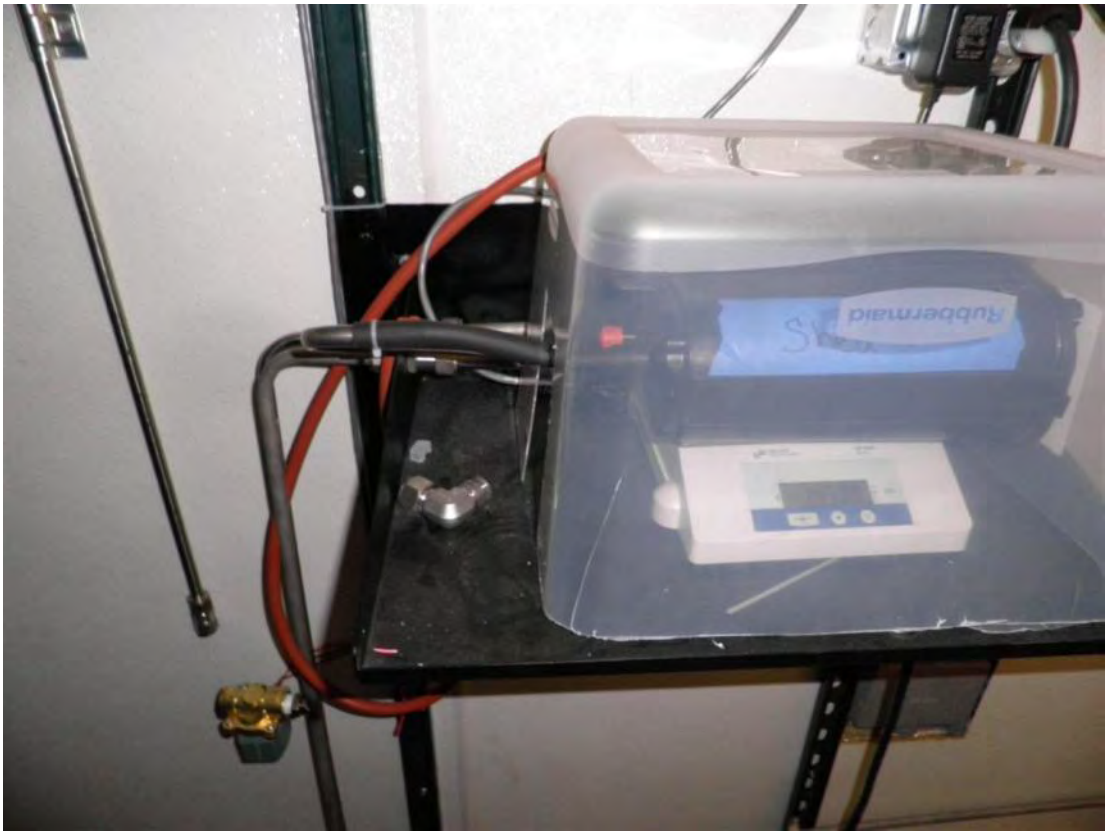







VENT
PURGE
128419
LOAD


TOYOTA
VEHICLE EMISSION CONTROL INFORMATION
TOYOTA MOTOR CORPORATION
TEST GROUP : 9TYXV02.4BEA SFI, A/FS, WU-TWC, HO2S, TWC
EVAP. FAMILY : 9TYXR0130A12 2.4 LITER
THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO GASOLINE-FUELED 2009 MODEL YEAR NEW TIER 2 BIN 5 MOTOR VEHICLES AND TO CALIFORNIA REGULATIONS APPLICABLE TO 2009 MODEL YEAR NEW LEV-II ULEV PASSENGER CARS.
CATALYST
OBD II CERTIFIED
28710 2AZ-FE USA&CANADA
M4


Rubbermaid

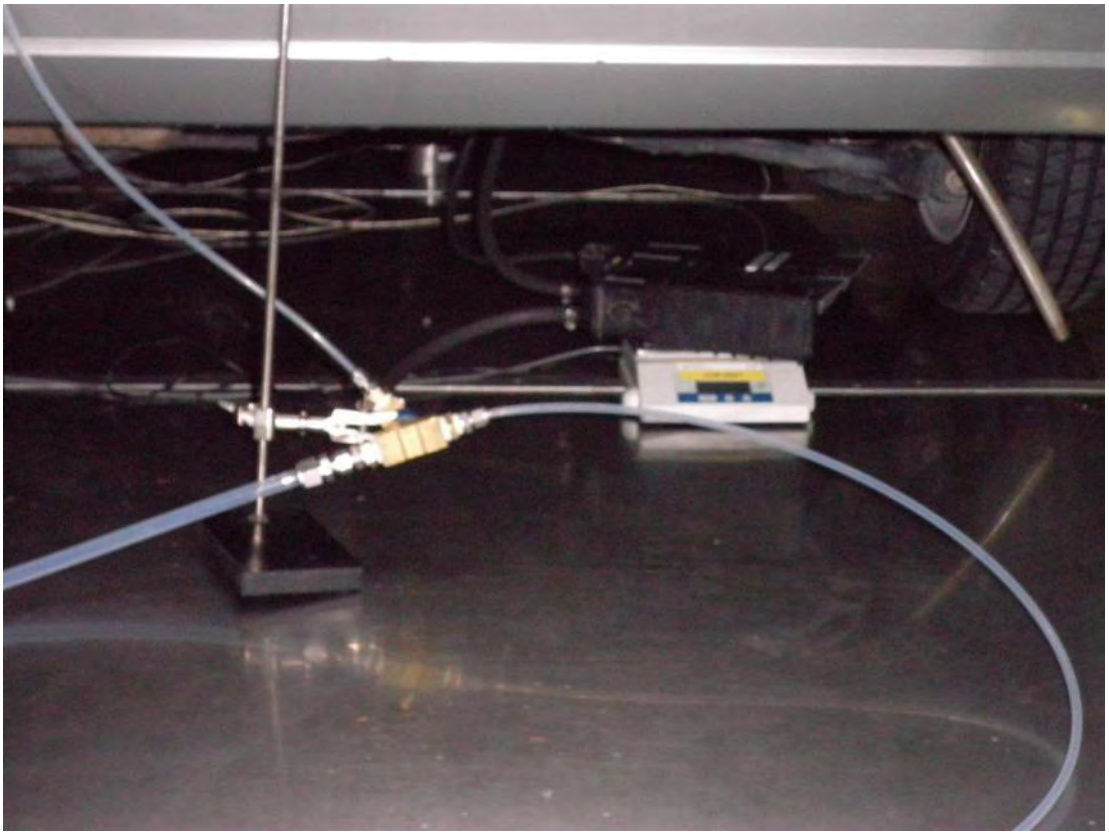

VENT


MICHELIN

2009 Ford Focus


E53938

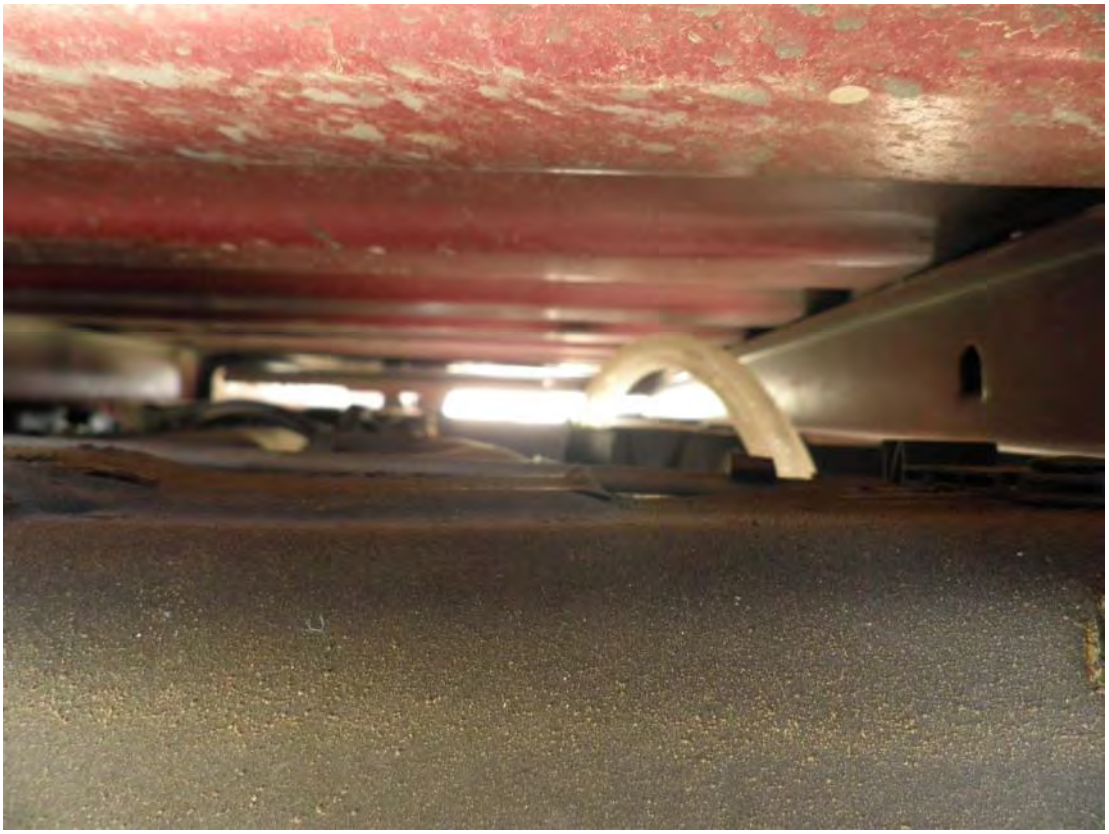

Ford
Ford Motor Company
VEHICLE EMISSION CONTROL INFORMATION
Conforms to regulations: 2009 MY
U.S. EPA: T2B4 LDV
OBD: CA II
Fuel: Gasoline
California: Certified for sale ULEV II qualified PC
OBD: CA II
Fuel: Gasoline
EGR/SFI/TWC/HO2S
No adjustments needed.
2.0L-Group: 9FMXV02.0VDX
Evap: 9FMXR0125NAA
▽9W7E-9C485-S E C



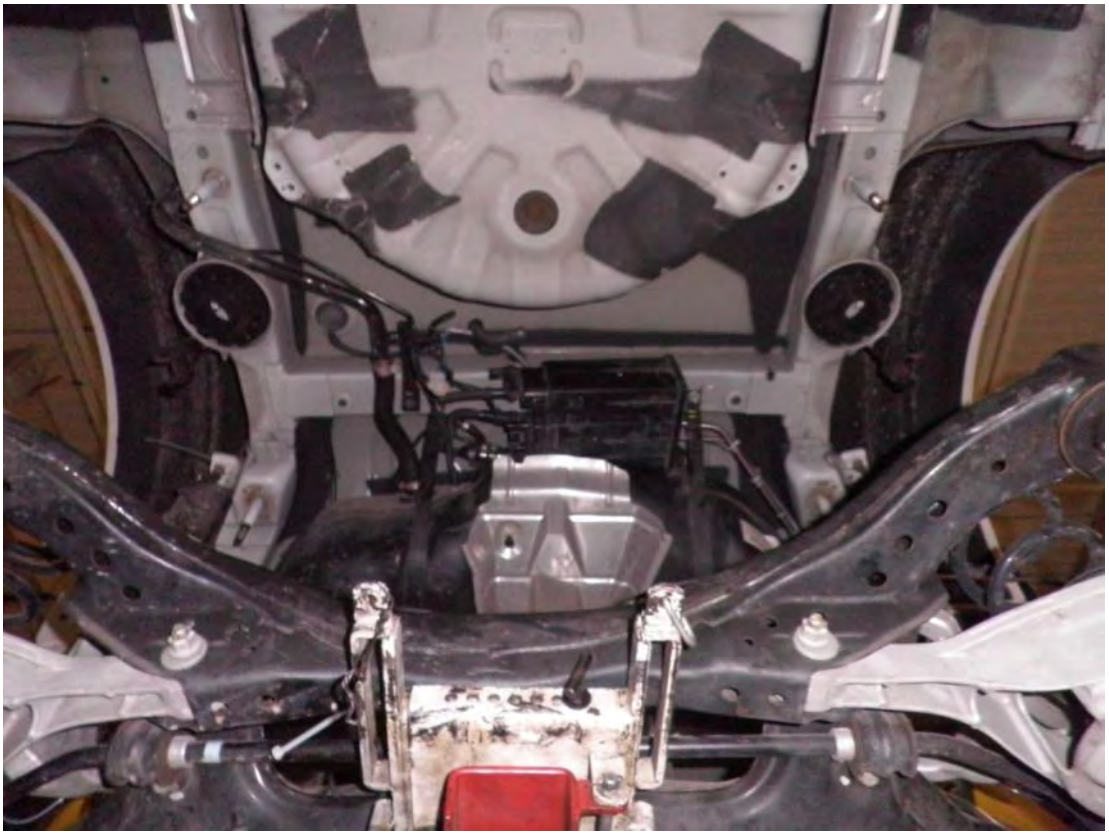

POWER CAT

2006 Chevrolet Silverado


A1
2006 MODEL YEAR
VEHICLE EMISSION CONTROL INFORMATION
GENERAL MOTORS CORPORATION
NO ADJUSTMENTS NEEDED. SEE SERVICE MANUAL OR OWNERS MANUAL FOR MORE INFORMATION.
CATALYST
SFI/HO2S/TWC
5.3 LITERS
6GMXT05.3379
6GMXR0176820
INTAKE MANIFOLD
EVAP CANISTER PURGE SOLENOID VALVE
TO EVAP CANISTER
THROTTLE BODY
FRONT OF VEH
32
THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO NEW LIGHT – DUTY TRUCKS. THIS VEHICLE CONFORMS TO FEDERAL REGULATIONS AND IS CERTIFIED FOR SALE IN CALIFORNIA, AND QUALIFIES AS A SULEV1. THIS VEHICLE IS CERTIFIED TO THE CLEAN FUEL FLEET LEV STANDARDS WHEN OPERATED ON GASOLINE AND MEETS ALL THE APPLICABLE REQUIREMENTS OF 40 CFR PART 88. OBD II CERTIFIED.



2008 Nissan Altima

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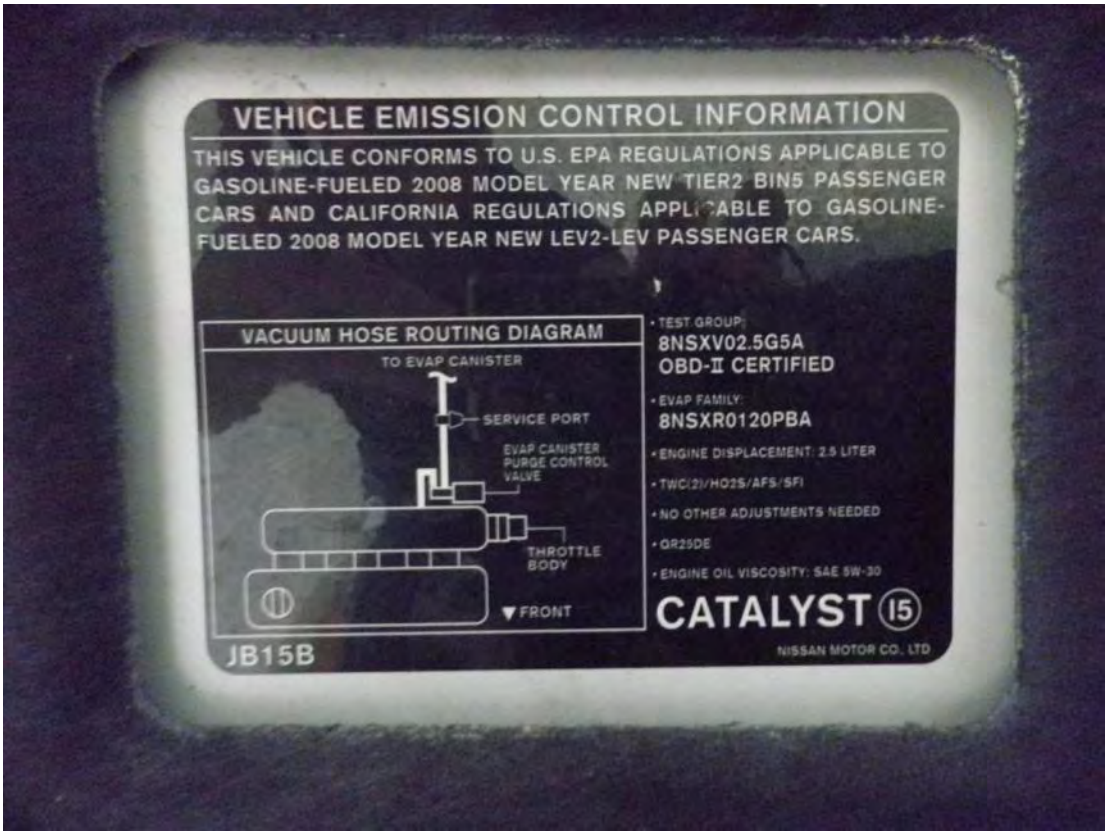

VEHICLE EMISSION CONTROL INFORMATION
THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO GASOLINE-FUELED 2008 MODEL YEAR NEW TIER2 BIN5 PASSENGER CARS AND CALIFORNIA REGULATIONS APPLICABLE TO GASOLINE-FUELED 2008 MODEL YEAR NEW LEV2-LEV PASSENGER CARS.
VACUUM HOSE ROUTING DIAGRAM
TO EVAP CANISTER
SERVICE PORT
EVAP CANISTER PURGE CONTROL VALVE
THROTTLE BODY
▼FRONT
JB15B
• TEST GROUP:
8NSXV02.5G5A
OBD-II CERTIFIED
• EVAP FAMILY:
8NSXR0120PBA
• ENGINE DISPLACEMENT: 2.5 LITER
• TWC(2)/HO2S/AFS/SFI
• NO OTHER ADJUSTMENTS NEEDED
• QR25DE
• ENGINE OIL VISCOSITY: SAE 5W-30
CATALYST 15
NISSAN MOTOR CO., LTD

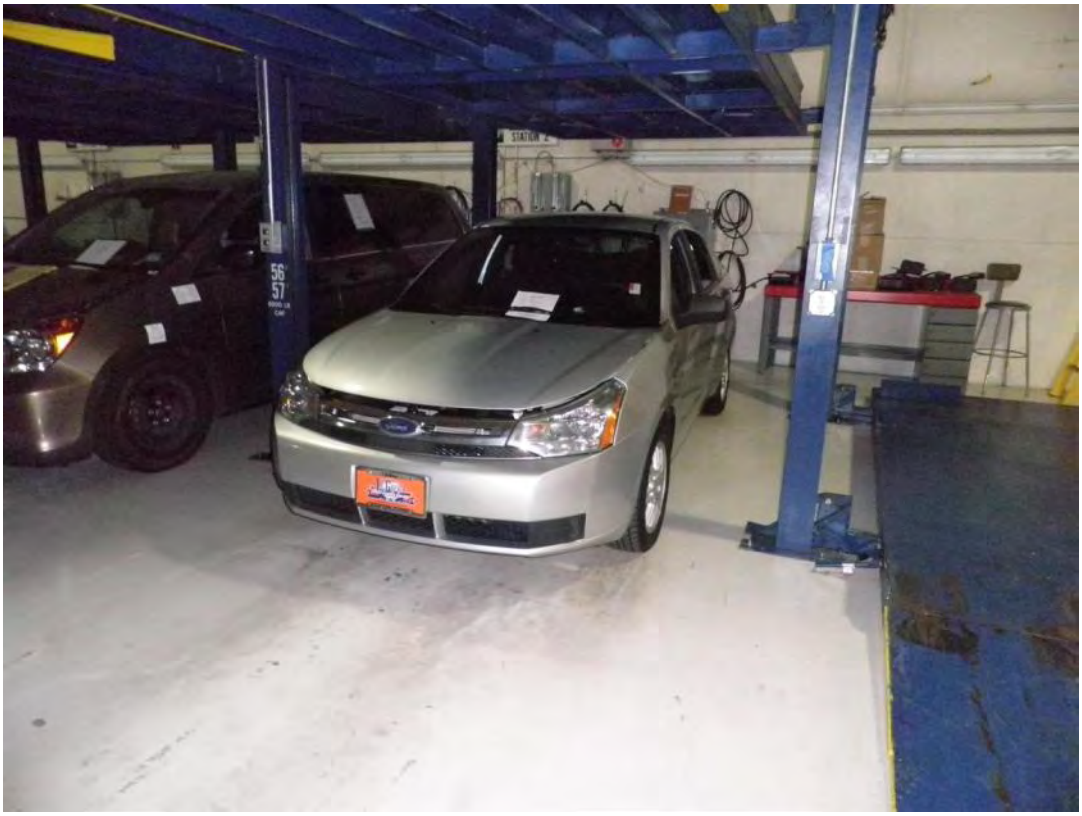

PIN RELEASE
RESET

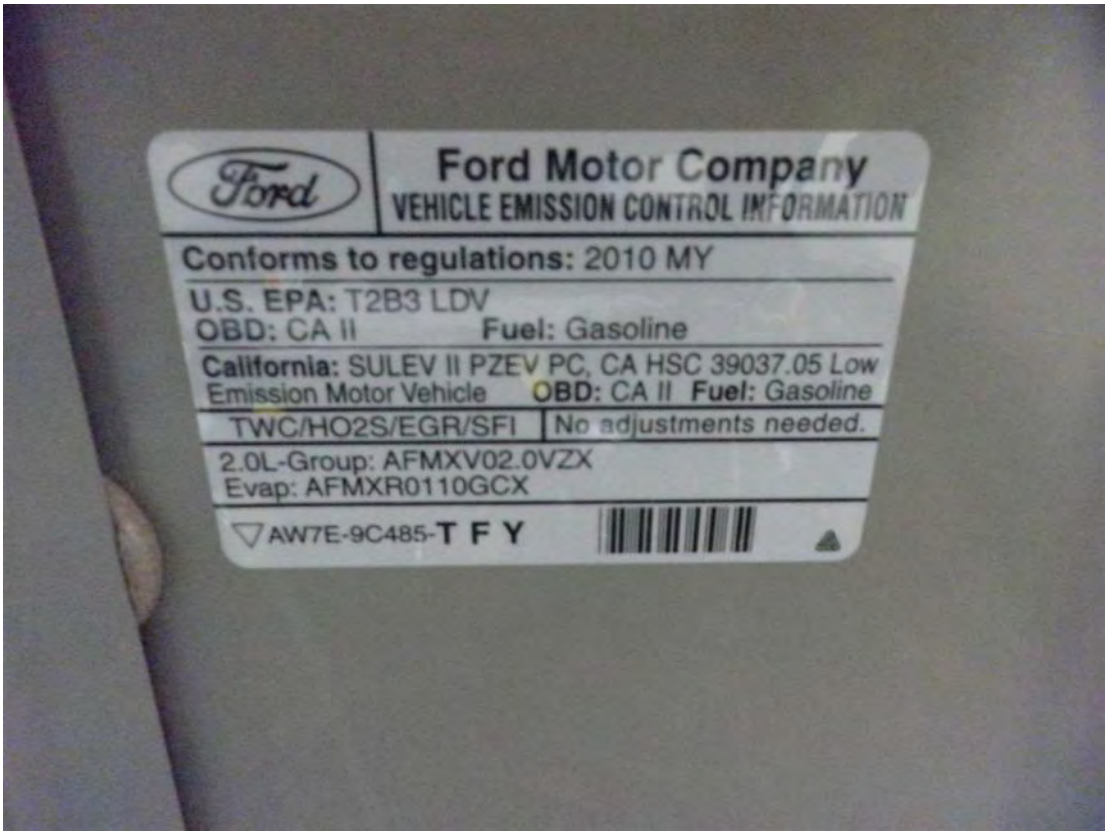

PURGE
LOAD
THIS SIDE UP
VENT

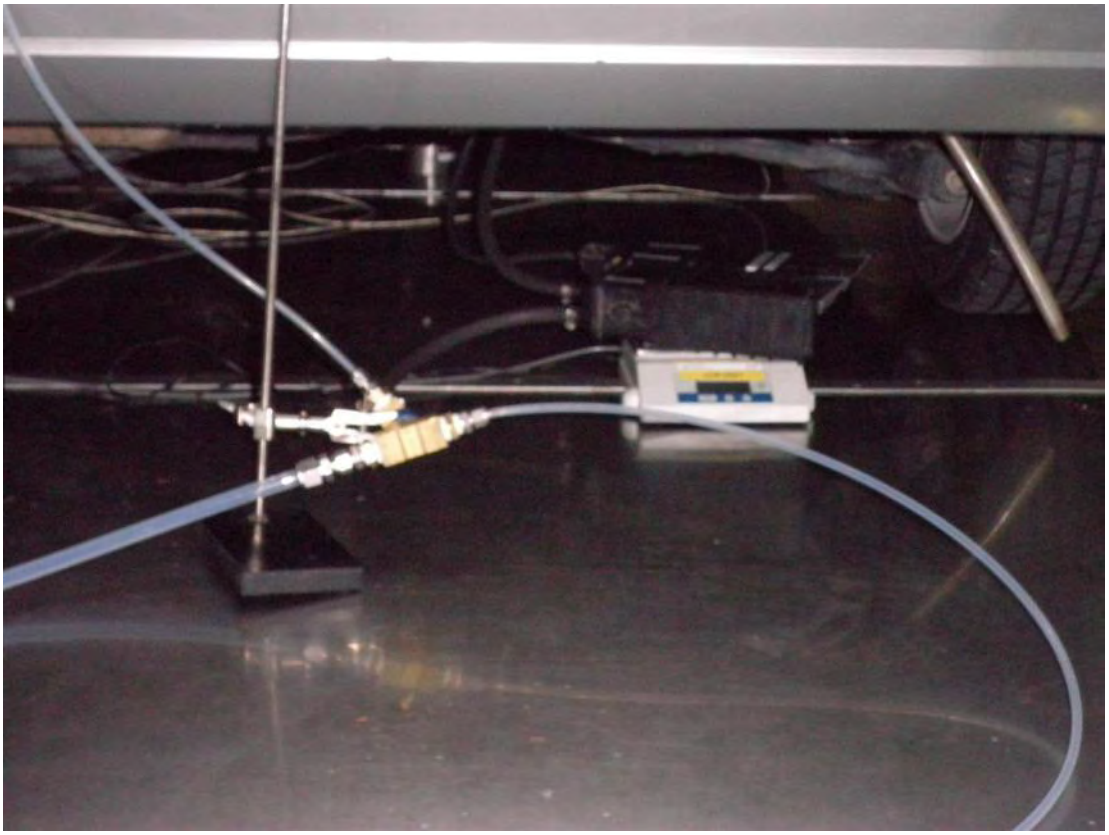

PURGE
LOAD
THIS SIDE UP
VENT


Goodyear

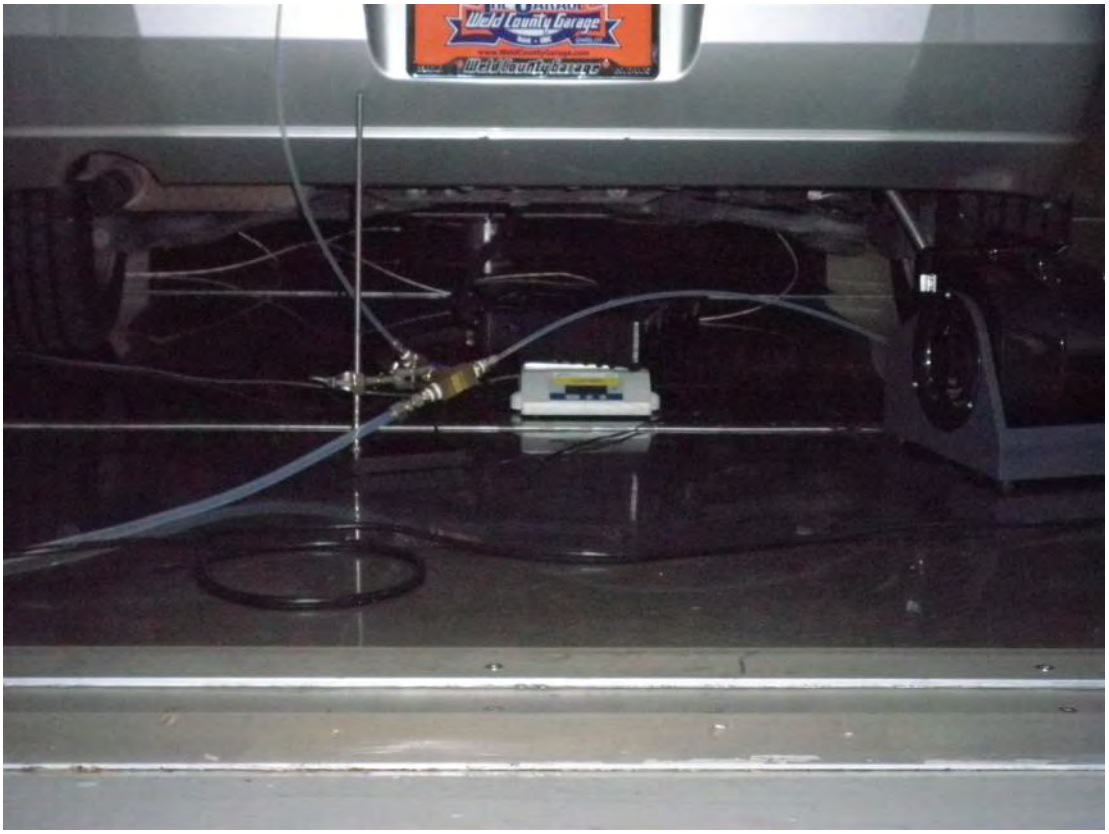
2010 Ford Focus



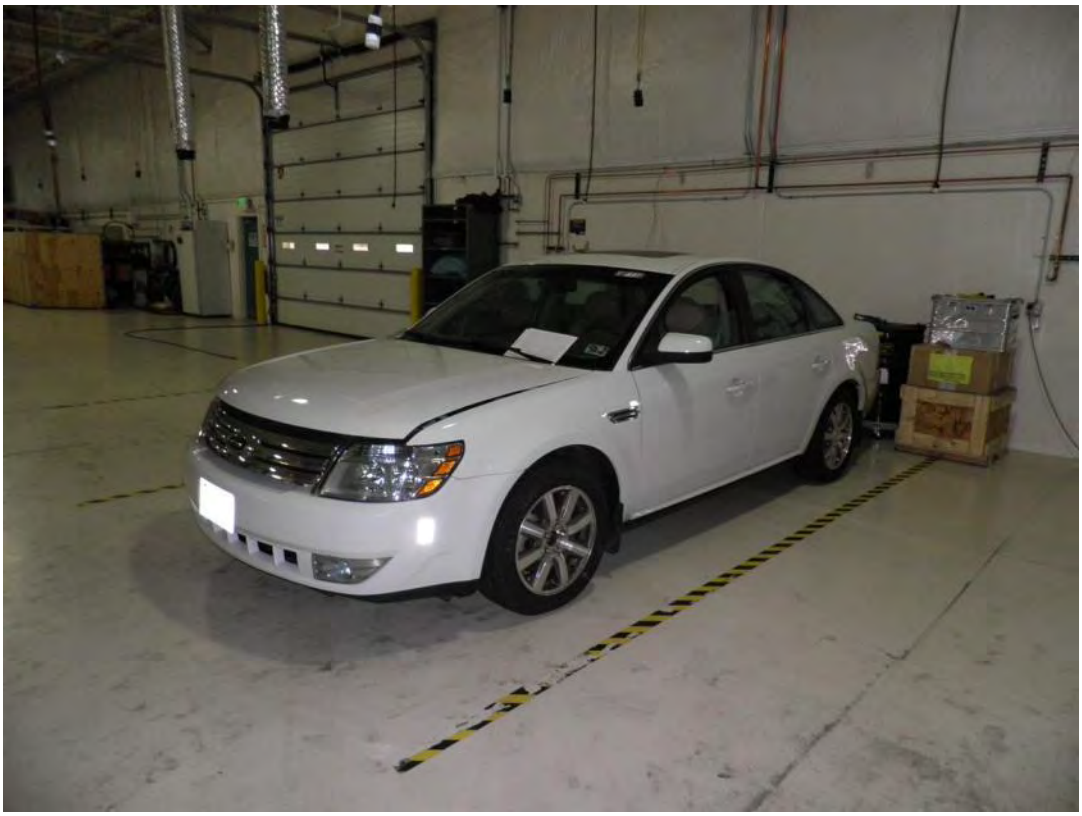

Ford
Ford Motor Company
VEHICLE EMISSION CONTROL INFORMATION
Conforms to regulations: 2010 MY
U.S. EPA: T2B3 LDV
OBD: CA II
Fuel: Gasoline
California: SULEV II PZEV PC, CA HSC 39037.05 Low Emission Motor Vehicle
OBD: CA II
Fuel: Gasoline
TWC/HO2S/EGR/SFI
No adjustments needed.
2.0L-Group: AFMXV02.0VZX
Evap: AFMXR0110GCX
AW7E-9C485-T F Y

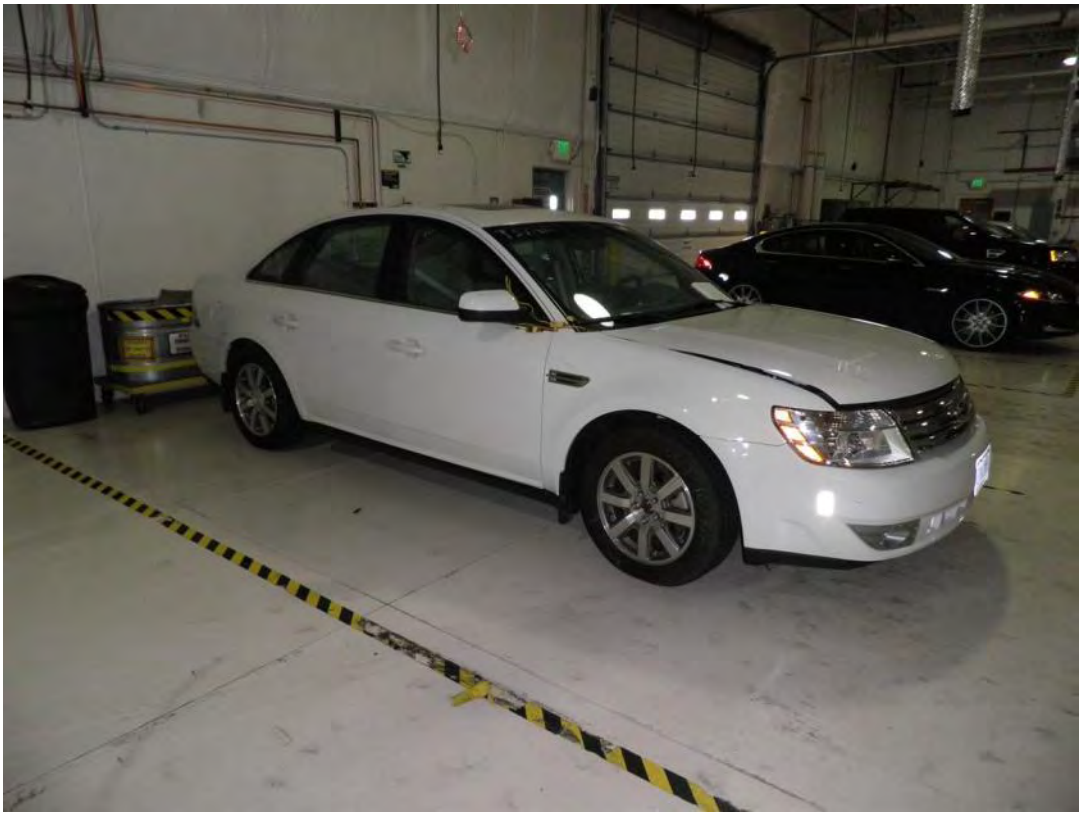



POWER CAT

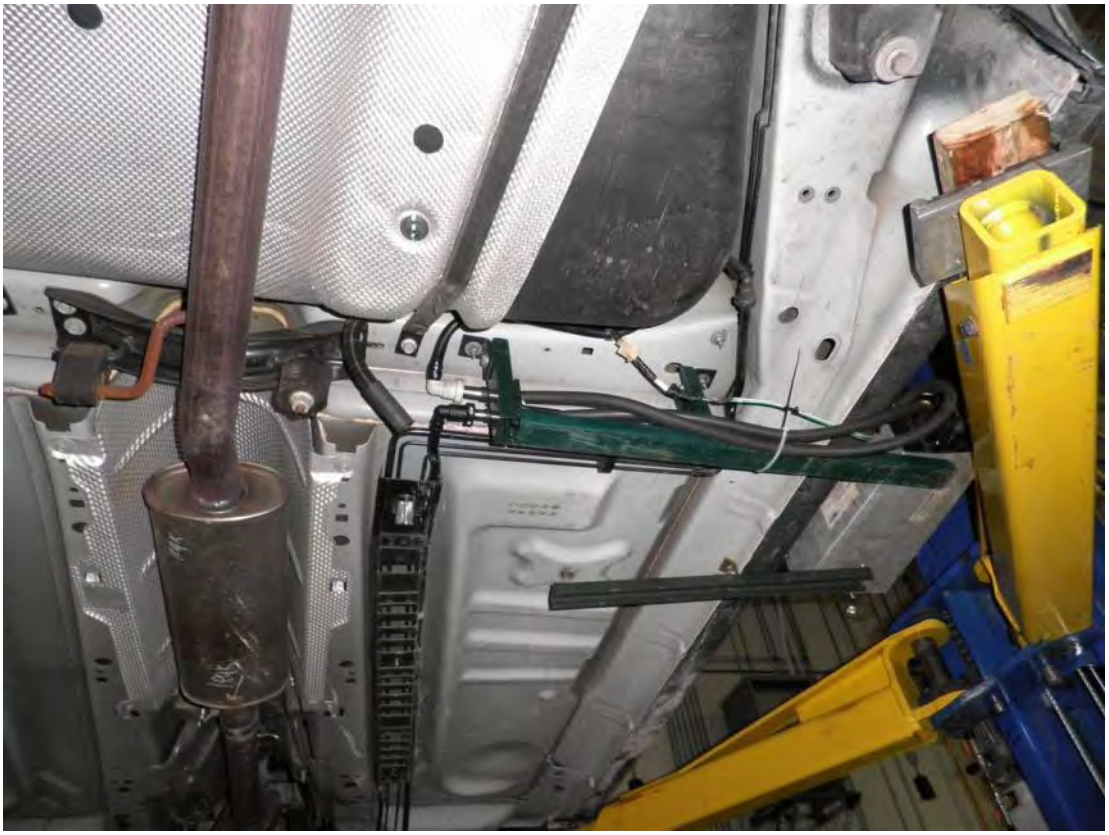

Weld County Garage

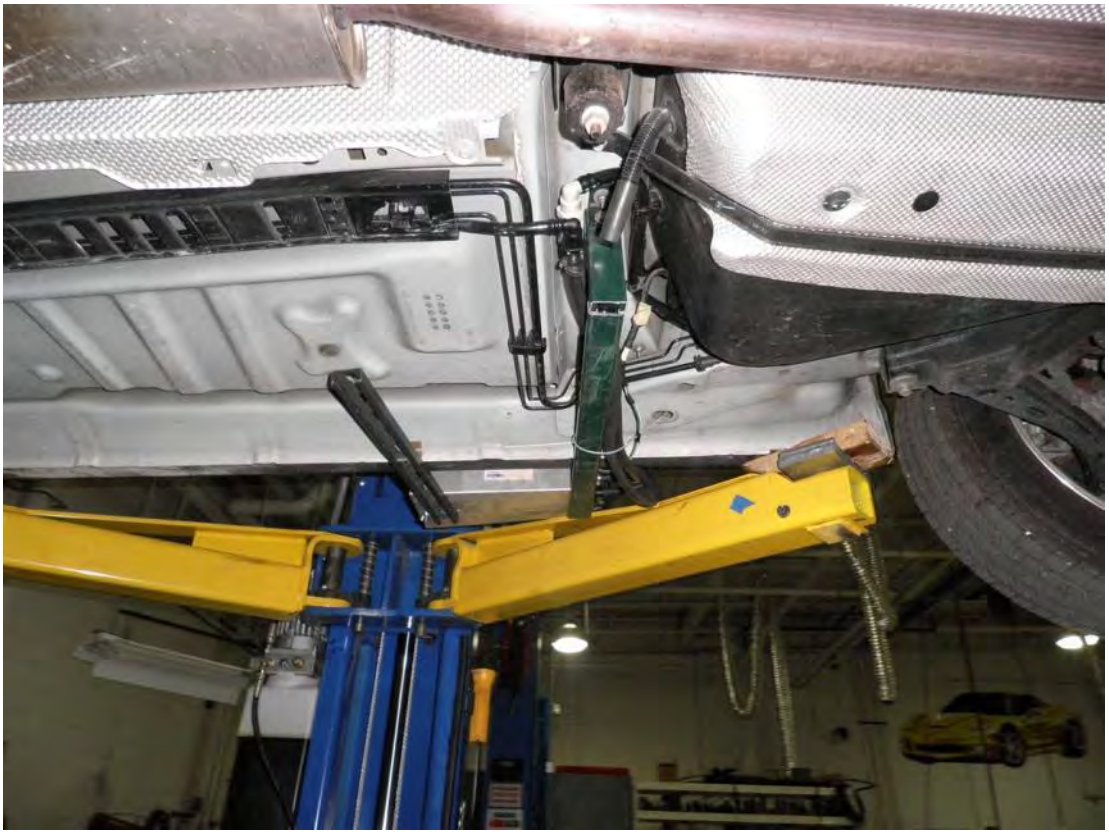
2008 Ford Taurus



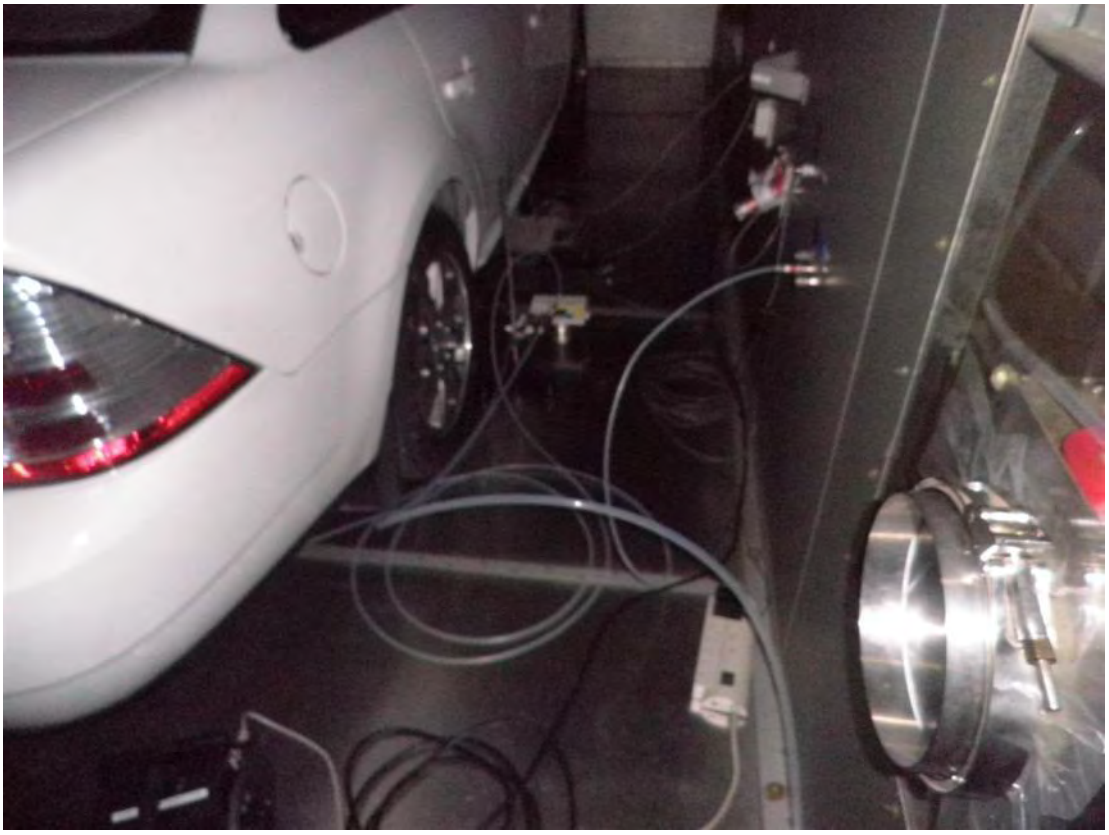


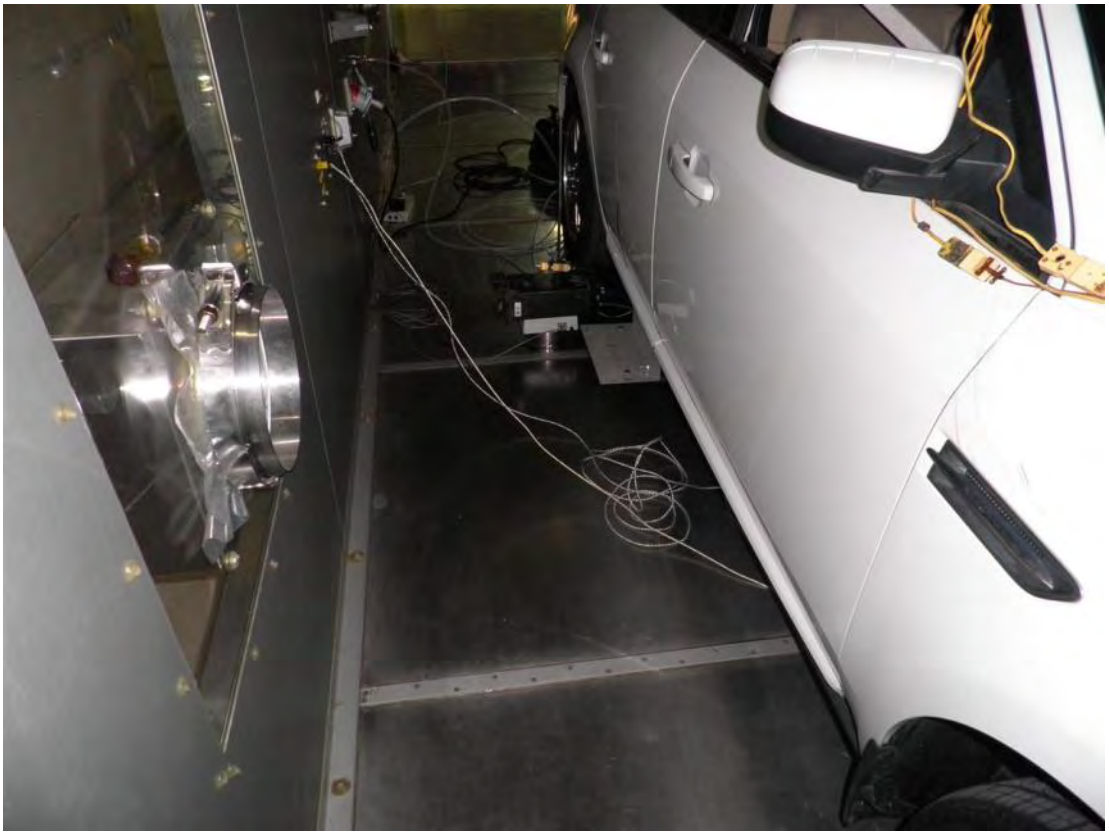

Ford Motor Company
VEHICLE EMISSION
CONTROL INFORMATION
Conforms to regulations: 2008 MY
U.S. EPA: T2B5 LDV
OBD: F II
Fuel: Gasoline
California: Not for sale in states with California emissions.
OBD: N/A
Fuel: N/A
TWC/HO2S/SFI
No adjustments needed.
3.5L-Group: 8FMXV03.5VEP
Evap: 8FMXR0145KBK
8W7E-9C485-
RAM






SEL

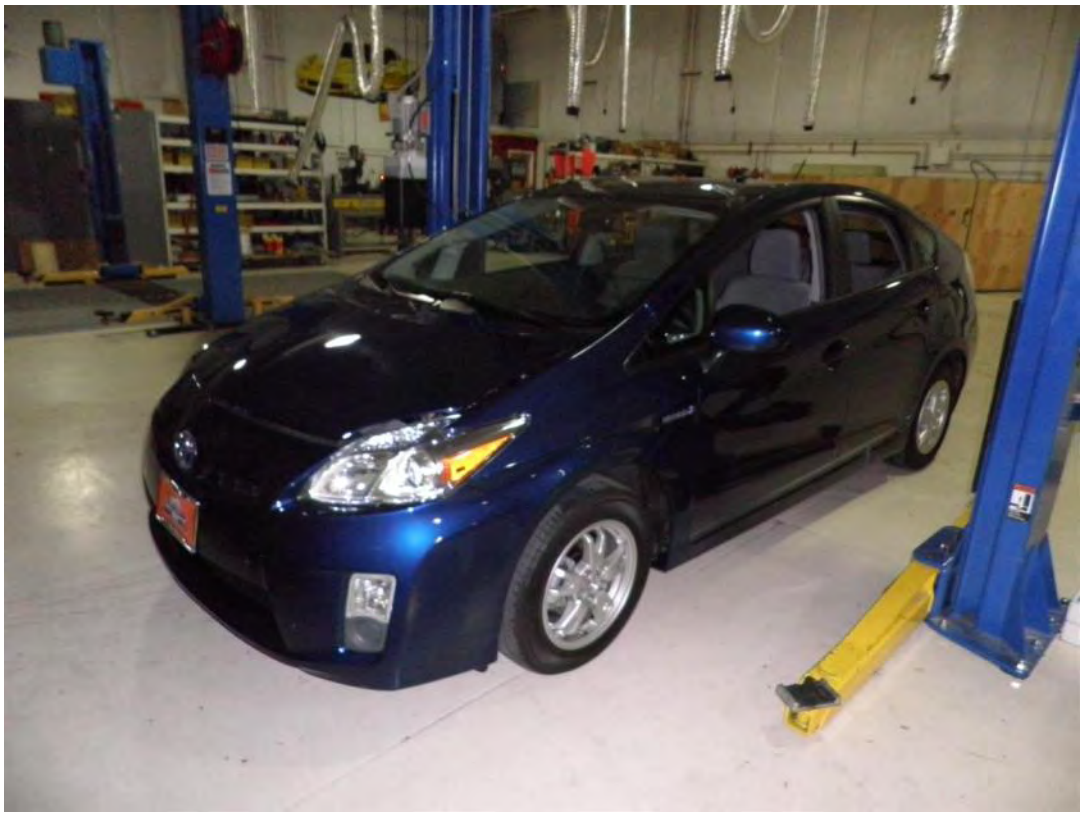


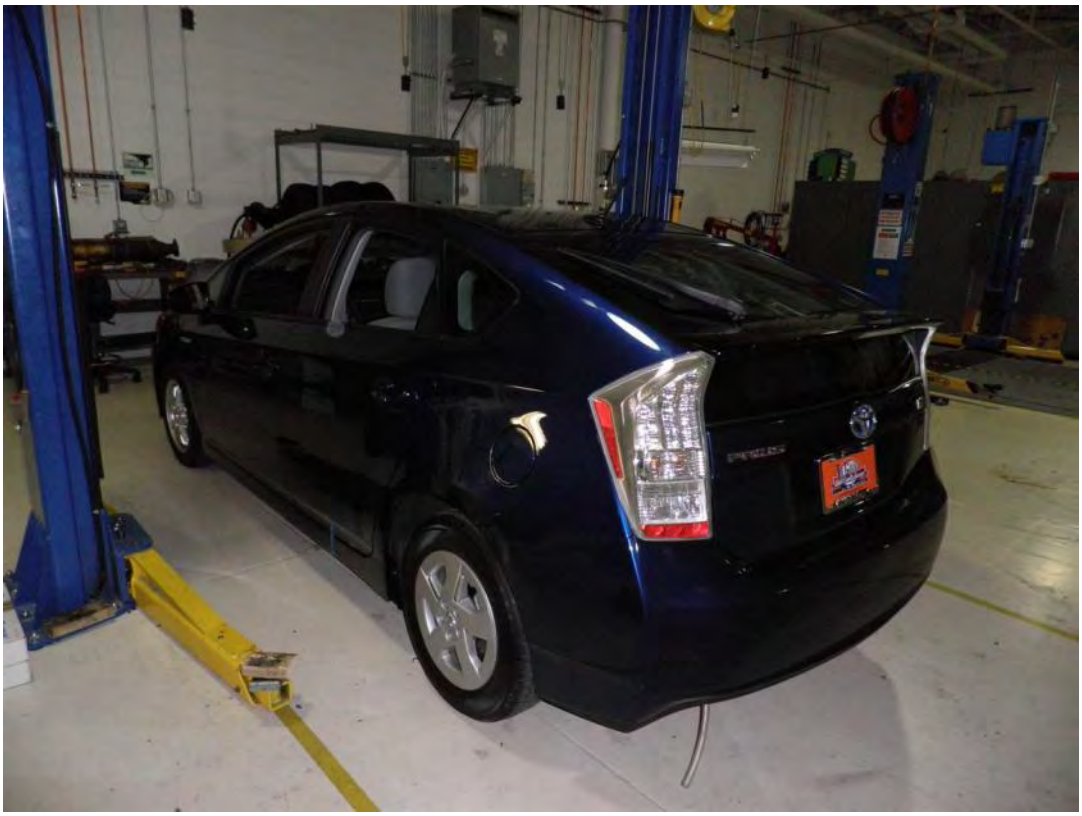


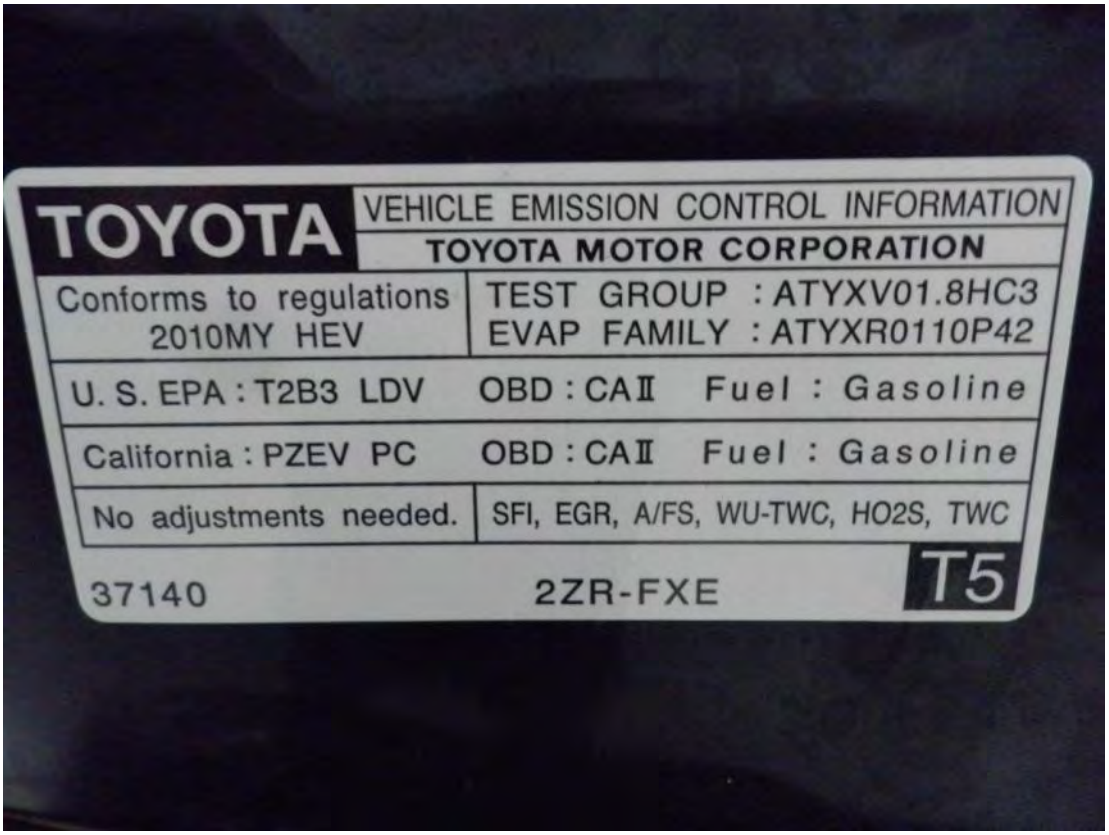

TAURUS
SEL


SEL

2010 Toyota Prius

4. 




TOYOTA
VEHICLE EMISSION CONTROL INFORMATION
TOYOTA MOTOR CORPORATION
Conforms to regulations 2010MY HEV
TEST GROUP : ATYXV01.8HC3
EVAP FAMILY : ATYXR0110P42
U. S. EPA : T2B3 LDV
OBD : CAII
Fuel : Gasoline
California : PZEV PC
OBD : CAII
Fuel : Gasoline
No adjustments needed.
SFI, EGR, A/FS, WU-TWC, HO2S, TWC
37140
2ZR-FXE
T5