

Fuel and Lubricant Effects on Exhaust Emissions from a Light-Duty CIDI Powered Vehicle

**INTERIM REPORT
TFLRF No. 369**

by

Edwin A. Frame

Keith A. Shaw

**U.S. Army TARDEC Fuels and Lubricants Research Facility (SwRI)
Southwest Research Institute
San Antonio, TX**

for

**U.S. Department of Energy (DOE)
Washington, DC**

Under Contract to

**U.S. Army TARDEC
Petroleum and Water Business Area
Warren, MI**

**Contract No. DAAE-07-99-C-L053 (WD03)
SwRI Project No. 03.03227.03**

Approved for public release; distribution unlimited

September 2003

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Edwin C. Owens, Director
U.S. Army TARDEC Fuels and Lubricants
Research Facility (SwRI)

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EXECUTIVE SUMMARY

Fuel and lube effects on gaseous and particulate emissions were examined on a 1999 Mercedes Benz C220 D. Test cycles included the FTP and the US06. Statistical analyses were performed on the summary emissions for both lube and fuel testing, while real-time conversion efficiencies were also examined for the fuel results.

Several statistically significant effects were observed as a result of the differences in the viscosities of engine lubricants tested. The only lube that demonstrated significant effects over several of the measured parameters was AL-26850, the synthetic lube with the highest SAE viscosity grade (SAE 15W-50). This lube resulted in higher FTP NO_x emissions, lower FTP CO emissions, and reduced FTP fuel economy. No lube had a statistically significant effect on particulate matter emissions during either the FTP or the US06.

The fuels investigated were observed to have several effects on emissions and fuel economy. All the fuels tested reduced average composite FTP and US06 particulate mass emissions compared to the reference BP15, though not all the reductions were statistically significant. The following fuels produced statistically significant particulate mass reductions over the FTP and US06 cycles:

- AL-26944 (Base fuel with 7% oxygen as tripropylene glycol monomethyl ether)
- AL-26922 (Base fuel with 7% oxygen as dibutyl maleate)
- AL-26938 (Base fuel water macroemulsion)

Each fuel carried a fuel economy penalty that correlated to the amount of oxygen or inert material (water) blended into the fuel, ranging from three to nineteen percent. The water emulsion fuel had much a higher HC and CO emissions increase over the reference fuel than the other blended fuels in the study. It also displayed difficult starting and poor driveability. It did produce NO_x emission levels during the US06 that were a statistically significant reduction over the baseline BP15.

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I. INTRODUCTION

The U.S. Department of Energy (DOE) and others have investigated advanced diesel fuels including oxygenated fuel blends for their ability to reduce exhaust emissions (1-13). In previous work using an OM 611 CIDI engine installed on a test stand, oxygen containing compounds blended with diesel fuel were found to reduce exhaust particulate matter (1-5, 7,13).

The effect of crankcase lubricant type on exhaust emissions was previously investigated using the same OM 611 CIDI engine (14). This project was conducted using steady-state engine operating conditions, and heavy-duty diesel transient test cycle. Exhaust particulate emissions were reduced when using SAE 15W50 oil as compared to SAE 10W30 oils. Exhaust NO_x emissions were increased with the SAE 15W50 oil.

In the current project, the effects of fuel and engine lubricant on particulate and gaseous exhaust emissions from a modern, light-duty diesel vehicle were determined. Four engine crankcase lubricants and six fuels were evaluated by operating the test vehicle on a 48-inch single roll chassis dynamometer, utilizing the Federal Test Procedure (FTP-75) for light-duty vehicles and the SFTP-US06 aggressive driving cycle. Lubricants used were both conventional and synthetic formulations, and they varied in viscosity from SAE 0W30 to SAE 15W50. The fuels were a prototype ultra-low sulfur diesel, and blends containing various oxygenate compounds. A water macroemulsion fuel was also evaluated.

II. PROGRAM DESCRIPTION

The test vehicle was a 1999 Mercedes-Benz C220 D equipped with a diesel-powered 2.2L OM611 engine, and was provided to SwRI by the U.S. Department of Energy. This vehicle is manufactured for sale in Europe, and as such, is calibrated to meet ECE15/EUDC emission standards. The four-valve-per-cylinder engine is turbocharged and intercooled, and includes a high pressure, common rail fuel injection system, exhaust gas recirculation, and intake port cut-off. The vehicle is equipped with “lean NO_x” catalyst technology. According to the vehicle manufacturer, the emission control system of this vehicle includes one catalytic converter close to the engine with a volume of 2.1 L and an additional underbody catalytic converter with a volume of 1.8 L. Both converters have a platinum coating on a zeolite substrate and provide oxidation of HC and CO with a slight reduction in NO_x. The converter closest to the engine has an internal by-pass so that the underbody converter is supplied with hydrocarbons to assist in an additional slight reduction in NO_x. The engine has a power output of 125 hp (nominal) at a rated speed of 4200 rpm.

For the engine lubricant portion of the program, the vehicle was evaluated using four oils (three synthetic and one mineral) while operating on two fuels. These fuels included BP15, a low sulfur refinery run diesel at 15 ppm sulfur, and BP15 doped with tripropylene glycol monomethyl ether (TPGME) to contain 6.8% oxygen. The fuels portion of the program evaluated six fuels on a single lube. These fuels included standard low sulfur diesels such as BP15, several oxygenated diesels, and a water emulsion diesel fuel. Details of the fuels and lubes used for these evaluations are presented at the beginning of Sections III and IV.

The vehicle was operated on a Horiba light-duty 48-inch diameter single-roll chassis dynamometer (Figure 1). This dynamometer electrically simulates inertia weights up to 12,000 lb over the FTP-75, and provides programmable road load simulation of up to 125 hp continuous at 65 mph (300 hp momentary duty at 65 mph).

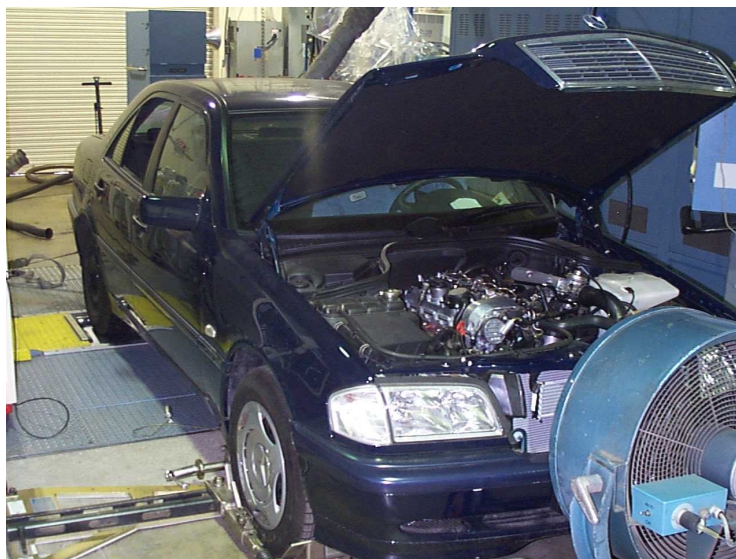


FIGURE 1. MERCEDES-BENZ C220D VEHICLE ON CHASSIS DYNAMOMETER

SwRI followed methods obtained from EPA for developing “a”, “b”, and “c” chassis dynamometer coefficients using a Mears Model to calculate a road load curve for the vehicle. This model required coastdown data from drive and non-drive axles. Triplicate 65 to 15 mph coastdowns were conducted on each axle, and the average results were used as input for the Mears Model in order to calculate dynamometer “a”, “b”, and “c” coefficients. The chassis dynamometer settings used during this test program are given in Table 1.

TABLE 1. CHASSIS DYNAMOMETER SETTINGS

ETW	3,500 lbs
“a” coeff.	14.87
“b” coeff.	-0.0047
“c” coeff.	0.0185

All evaluations were conducted in triplicate with each fuel/lube combination using the chassis dynamometer portion of the Federal Test Procedure (FTP) for light-duty vehicles and the supplemental US06 cycle, as specified in the *U.S. Code of Federal Regulations, Title 40, Part 86, Subpart B*. The FTP utilizes the Urban Dynamometer Driving Schedule (UDDS). The UDDS is the result of more than ten years of effort by various groups to translate the Los Angeles smog-producing driving conditions to dynamometer operations, and is a nonrepetitive driving cycle covering 7.5 miles in 1372 seconds, with an average speed of 19.7 mph. Its maximum speed is 56.7 mph. An FTP consists of a cold-start, 505-second, transient phase (Bag 1), followed immediately by an 867-second stabilized phase (Bag 2). Following the stabilized phase, the vehicle is allowed to soak for 10 minutes with the engine turned off before proceeding with a hot-start, 505-second, transient phase (Bag 3) to complete the test. For a 3-bag FTP, the distance traveled is 11.1 miles at an average speed of 21.6 mph. The emissions are mathematically weighted to represent the average of several 7.5 mile trips made from hot and cold starts. A speed versus time illustration of the FTP driving cycle is given in Figure 2. The US06 Supplemental Federal Test Procedure (SFTP) was developed to address the shortcomings with the FTP-75 test cycle in the representation of aggressive, high speed and/or high acceleration driving behavior, rapid speed fluctuations, and driving behavior following startup. The cycle represents an 8.01 mile (12.8 km) route with an average speed of 48.4 miles/h (77.9 km/h), maximum speed 80.03 miles/h (129.2 km/h), and a duration of 596 seconds. A representation of the cycle is shown in Figure 3.

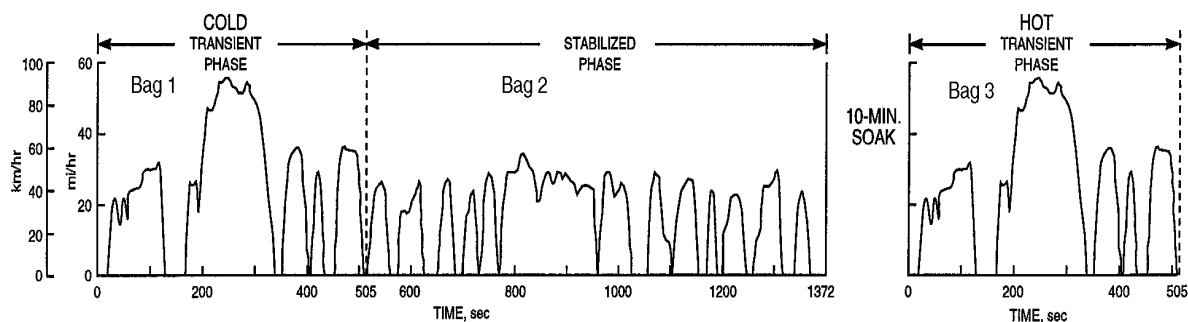


FIGURE 2. FTP DRIVING CYCLE

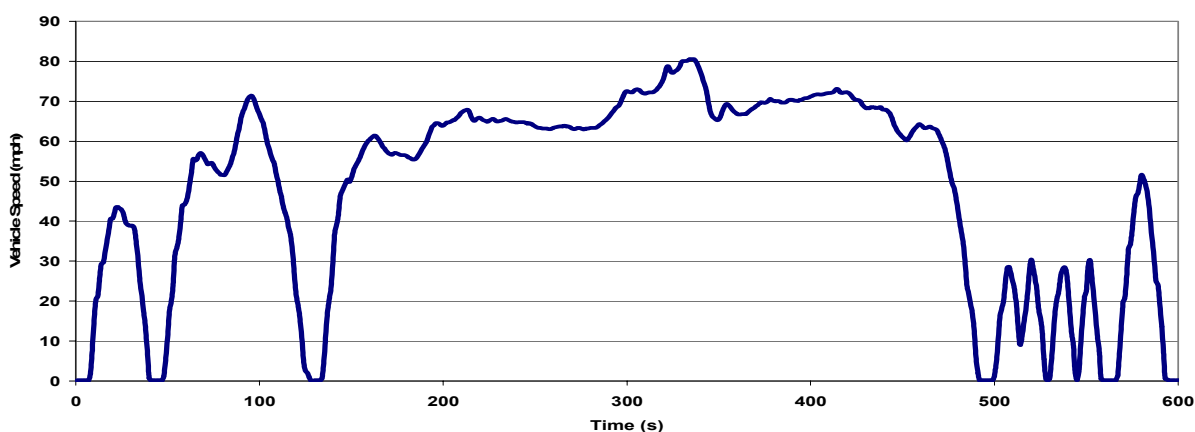


FIGURE 3. US06 DRIVING CYCLE

SwRI constant volume sampler (CVS) system No. 8 was used to dilute the exhaust and collect all necessary samples. This positive displacement pump (PDP) CVS system includes an 18-inch diameter by 16-foot stainless steel dilution tunnel for the collection of particulate samples. This CVS was operated at a nominal flow rate of 600 scfm. The average temperature in the dilution tunnel at the particulate sampling zone was 115°F during the standard FTP. The temperature of dilute exhaust at the face of the filter remained below 125°F during all testing.

Dilute exhaust emissions were sampled and measured in a manner consistent with EPA protocols for light-duty vehicle emission testing as given in the *U.S. Code of Federal Regulations, Title 40, Part 86, Subpart B*. Proportional dilute exhaust gas samples were collected in Tedlar bags for analysis of carbon monoxide and carbon dioxide. Total hydrocarbons and oxides of nitrogen were measured continuously from the dilution tunnel. Concurrently, a proportional sample of the dilute exhaust was drawn through Pallflex T60A20 fluorocarbon-coated glass fiber filters for gravimetric determination of particulate matter. Filter samples were analyzed by direct filter injection gas chromatography (DFI/GC) to determine the particulate volatile organic fraction and by ion chromatography for sulfate content. Exhaust constituents were analyzed as follows.

Constituent**Analysis Method**

Total Hydrocarbon	Heated Flame Ionization Detection
Carbon Monoxide	Non-Dispersive Infrared Analysis
Carbon Dioxide	Non-Dispersive Infrared Analysis
Oxides of Nitrogen	Chemiluminescent Analysis
Particulate Matter	Gravimetric
Volatile Organic Fraction of PM	Direct Filter Injection Gas Chromatography
Sulfate Fraction of PM	Ion Chromatography

Fuel economy was calculated using a carbon balance method in a manner consistent with 40CFR§600.113-88.

III. ENGINE LUBRICANT TESTING AND RESULTS

The engine lubricant portion of the program involved testing four lubes each in combination with two different fuels. The fuels and lubes properties for this section are detailed in Tables 2 and 3, respectively. Each fuel and lube combination was tested in triplicate over the FTP plus US06 sequence.

TABLE 2. FUEL PROPERTIES

Fuel	AL-26888 (BP15)	AL-26918 (BP15 with 7% oxygen as TPGME)
Cetane Number	47.7, 49.7	48.4
Density (lb/gal)	7.030	7.150
Carbon (%)	86.7	80.3
Hydrogen (%)	13.3%	12.9
Oxygen (%)	0	6.8

TABLE 3. LUBRICANT PROPERTIES

Lubricant Code		AL-26849	AL-26850	AL-26851	AL-26852
Type		Mineral	Synthetic	Synthetic	Synthetic
SAE Viscosity Grade		5W-30	15W-50	5W-30	0W-30
Property	ASTM Method				
Viscosity, 40°C, cSt	D445	55.8	123.9	58.4	53.51
Viscosity, 100°C, cSt	D445	9.6	18.5	10.4	9.73
Viscosity Index	D2270	158	168	169	169
HTHS Viscosity, 150°C, cP	D4683	2.96	4.5	3.0	3.07
Evaporation Loss, NOACK, 250°C, %w	D5800	20.9	4.9	7.2	11.8
Sulfur, %w	D2622	0.439	0.317	0.250	0.272

All four test oils were conditioned in the OM611 engine to remove volatile light ends. The oil conditioning procedure consisted of four hours operation at 2800 RPM, 8.8 bar BMEP (14).

Summaries of THC, CO, NO_x, and PM average emission rates, as well as fuel economy, are presented in Tables 4 and 5. Table 4 lists the results for the ultra low sulfur diesel fuel AL-26888, while Table 5 summarizes the emissions for the same fuel doped to contain nearly 7 percent oxygen. The results are listed as an average followed by a standard deviation. Individual test results are given in Appendix A.

TABLE 4. EMISSIONS RESULTS USING AL-26888 (BP15) FUEL

Cycle	Measurement	Engine Lube			
		AL-26849	AL-26850	AL-26851	AL-26852
FTP	HC(g/mi)	0.017 ± 0.006	0.012 ± 0.002	0.020 ± 0.007	0.028 ± 0.006
	CO (g/mi)	0.189 ± 0.033	0.126 ± 0.008	0.175 ± 0.005	0.203 ± 0.016
	NO _x (g/mi)	0.791 ± 0.005	0.915 ± 0.024	0.855 ± 0.032	0.817 ± 0.036
	PM (g/mi)	0.073 ± 0.004	0.073 ± 0.002	0.067 ± 0.004	0.070 ± 0.005
	FE (mi/gal)	36.3 ± 0.3	35.4 ± 0.4	36.7 ± 0.3	36.5 ± 0.5
US06	HC(g/mi)	0.001 ± 0.001	< 0.001	< 0.001	< 0.001
	CO (g/mi)	0.004 ± 0.002	0.006 ± 0.008	0.009 ± 0.013	0.003 ± 0.002
	NO _x (g/mi)	1.47 ± 0.03	1.61 ± 0.09	1.49 ± 0.03	1.49 ± 0.06
	PM (g/mi)	0.14 ± 0.01	0.13 ± 0.002	0.14 ± 0.005	0.15 ± 0.02
	FE (mi/gal)	36.2 ± 0.2	35.6 ± 0.04	35.2 ± 1.1	35.9 ± 0.8

TABLE 5. EMISSIONS RESULTS USING AL-26918 (OXYGENATED BP15) FUEL

Cycle	Measurement	Engine Lube			
		AL-26849	AL-26850	AL-26851	AL-26852
FTP	HC(g/mi)	0.021 ± 0.005	0.015 ± 0.008	0.026 ± 0.004	0.013 ± 0.004
	CO (g/mi)	0.168 ± 0.011	0.095 ± 0.018	0.166 ± 0.017	0.163 ± 0.032
	NO _x (g/mi)	0.916 ± 0.016	1.019 ± 0.034	0.948 ± 0.016	0.944 ± 0.013
	PM (g/mi)	0.034 ± 0.003	0.034 ± 0.003	0.035 ± 0.001	0.037 ± 0.004
	FE (mi/gal)	33.9 ± 0.2	32.5 ± 0.5	34.3 ± 0.1	34.0 ± 0.2
US06	HC(g/mi)	< 0.001	< 0.001	0.001 ± 0.002	< 0.001
	CO (g/mi)	0.003 ± 0.004	0.006 ± 0.007	0.009 ± 0.012	0.003 ± 0.005
	NO _x (g/mi)	1.68 ± 0.03	1.69 ± 0.06	1.59 ± 0.03	1.64 ± 0.05
	PM (g/mi)	0.065 ± 0.005	0.066 ± 0.003	0.082 ± 0.015	0.076 ± 0.004
	FE (mi/gal)	33.9 ± 0.3	33.6 ± 1.0	34.5 ± 0.2	34.0 ± 0.2

Individual FTP bag results for each fuel are shown in Figures 4 through 9. Lube results for fuel AL-26888 are shown in Figures 4, 5, and 6, while lube results for fuel AL-26918 are shown in Figures 7, 8, and 9. Several lube effects are observed to be common to both fuels. The viscosity of the lube oil does have a measurable impact on fuel economy, especially in the case of the SAE 15W50-weight AL-26850. The fuel economy impact of the lubes is most easily seen in Bag 1 of the FTP where the oil is still cold. The higher viscosity oils will exert the most friction during this cold start phase and influence the emissions and performance most strongly. The AL-26850 lube tests show the lowest fuel economy and CO emissions with the highest NO_x emissions for both fuels tested. No impact on particulate matter (PM) mass was observed as a function of any of the lube oils tested.

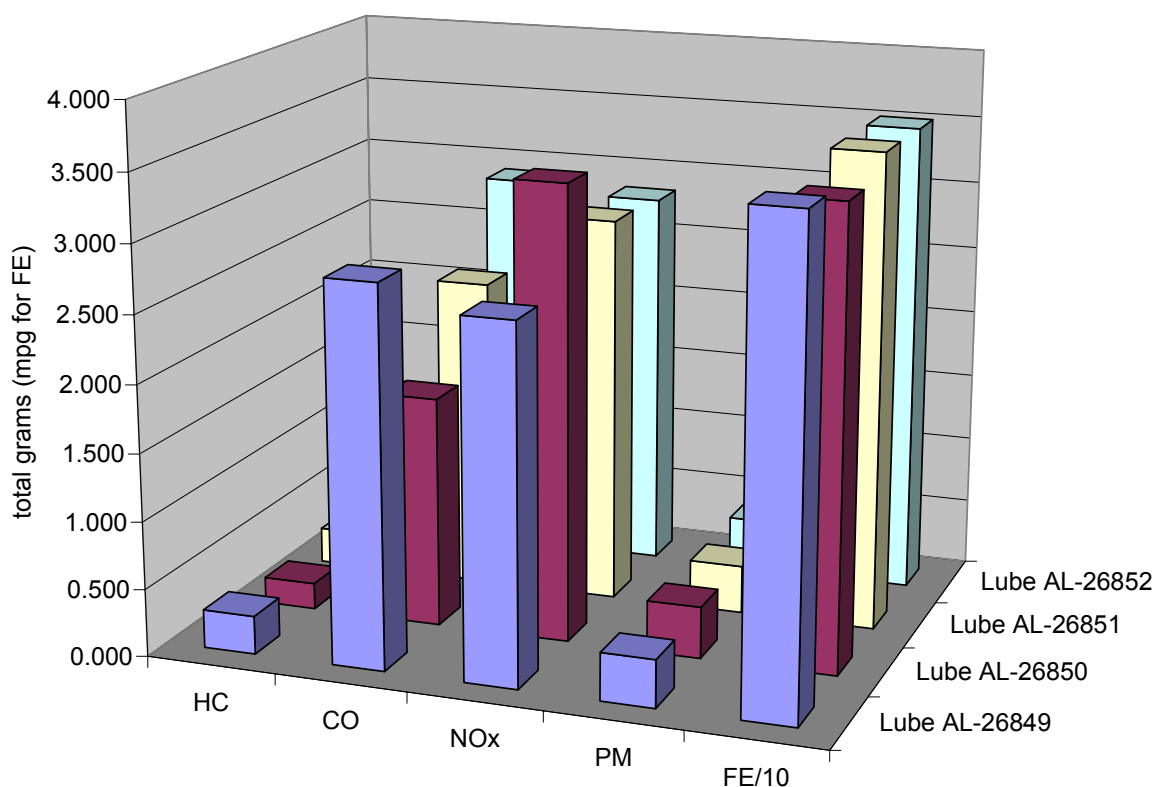


FIGURE 4. FTP BAG 1 EMISSIONS FOR AL-26888 FUEL

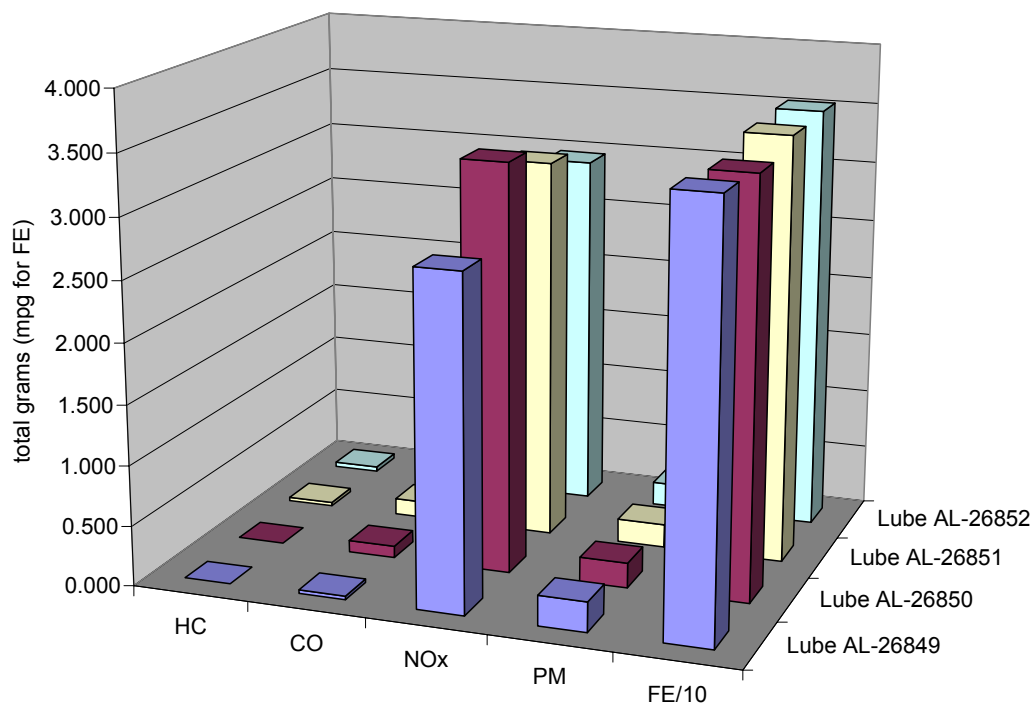


FIGURE 5. FTP BAG 2 EMISSIONS FOR AL-26888 FUEL

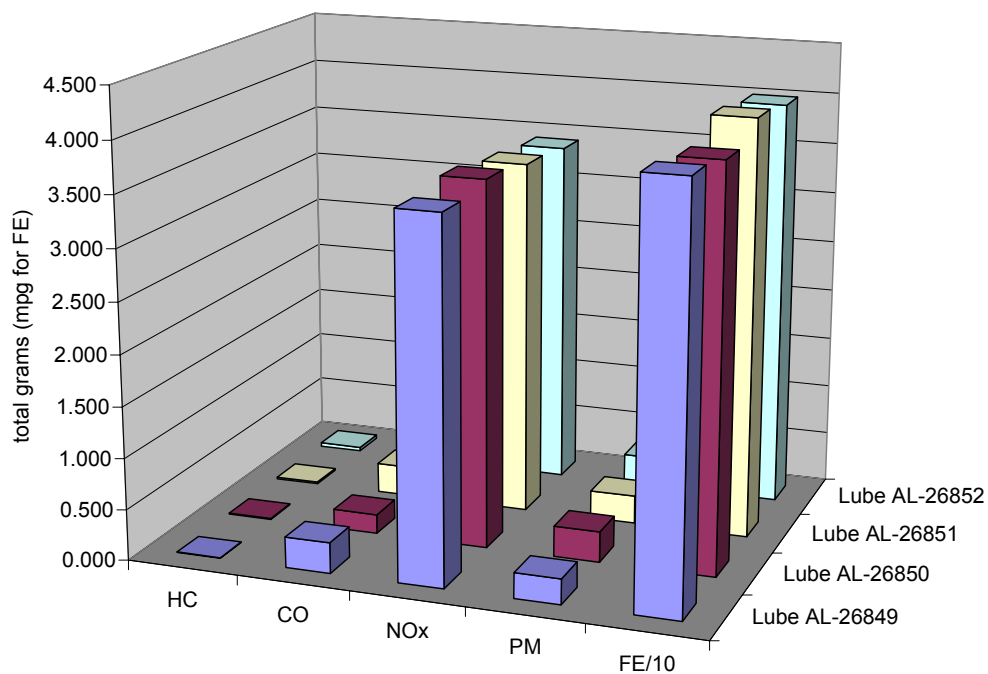


FIGURE 6. FTP BAG 3 EMISSIONS FOR AL-26888 FUEL

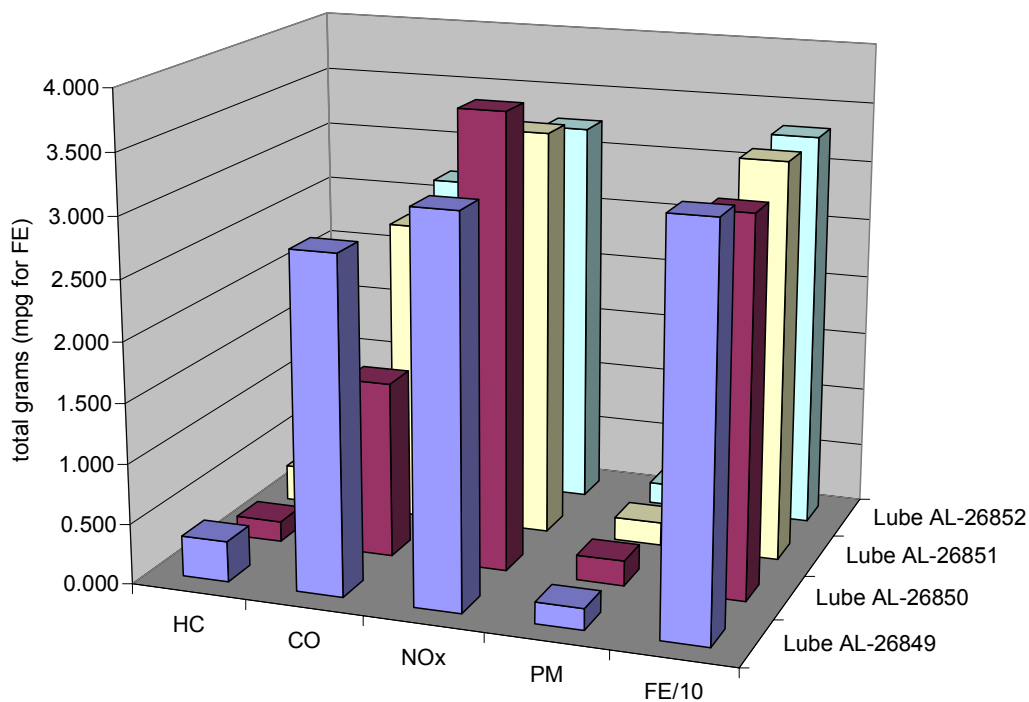


FIGURE 7. FTP BAG 1 EMISSIONS FOR AL-26918 FUEL

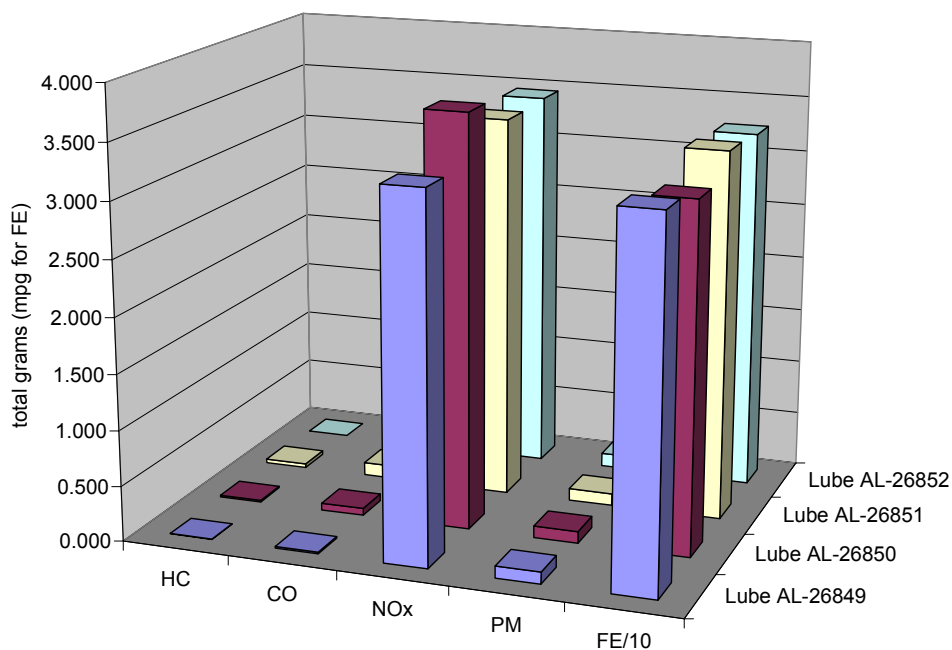


FIGURE 8. FTP BAG 2 EMISSIONS FOR AL-26918 FUEL

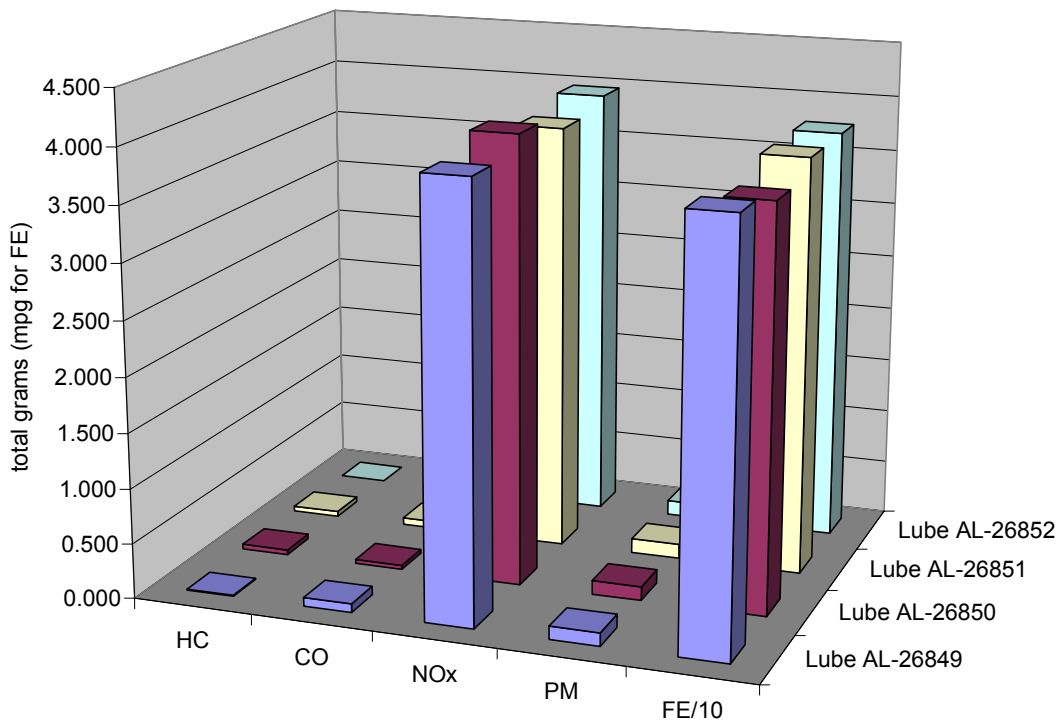


FIGURE 9. FTP BAG 3 EMISSIONS FOR AL-26918 FUEL

Emission rates and fuel economy data collected on four lubricants and two fuels were analyzed using an analysis of variance (ANOVA) statistical procedure. The average emissions and fuel economy responses were compared among four lubricants, and to determine if there were any interactions between the fuels and lubricants. If significant differences in the average emissions or fuel economy responses were discovered, a Tukey's multiple-comparison procedure was used to discriminate the average emission rates and fuel economics among the four lubricants. All statistical tests were made at the 5 percent level of significance. Data from the FTP and US06 cycles were analyzed separately.

A summary of the ANOVA results is shown in Table 6. Graphical representations of the ANOVA results for certain emissions components are shown in Figures 10 through 14 for the FTP and US06 cycles, respectively. A complete listing of all ANOVA graphical results can be found in Appendix D. The mean response and the 95% Tukey Honestly Significant Difference (HSD) intervals are displayed for each factor. Intervals which overlap indicate that there is no significant difference in the average emission or fuel economy at the 95 percent confidence level for the factor levels plotted.

TABLE 6. ANOVA STATISTICALLY SIGNIFICANT DIFFERENCES AMONG LUBES

	AL-26849	AL-26850	AL-26851	AL-26852
AL-26849		FTP-CO, NO _x , FE	FTP-NO _x	None
AL-26850	FTP-CO, NO _x , FE		FTP-CO, NO _x , FE; US06-NO _x , FE	FTP-CO, NO _x , FE; US06-NO _x
AL-26851	FTP-NO _x	FTP-CO, NO _x , FE; US06-NO _x , FE		None
AL-26852	None	FTP-CO, NO _x , FE; US06-NO _x	None	

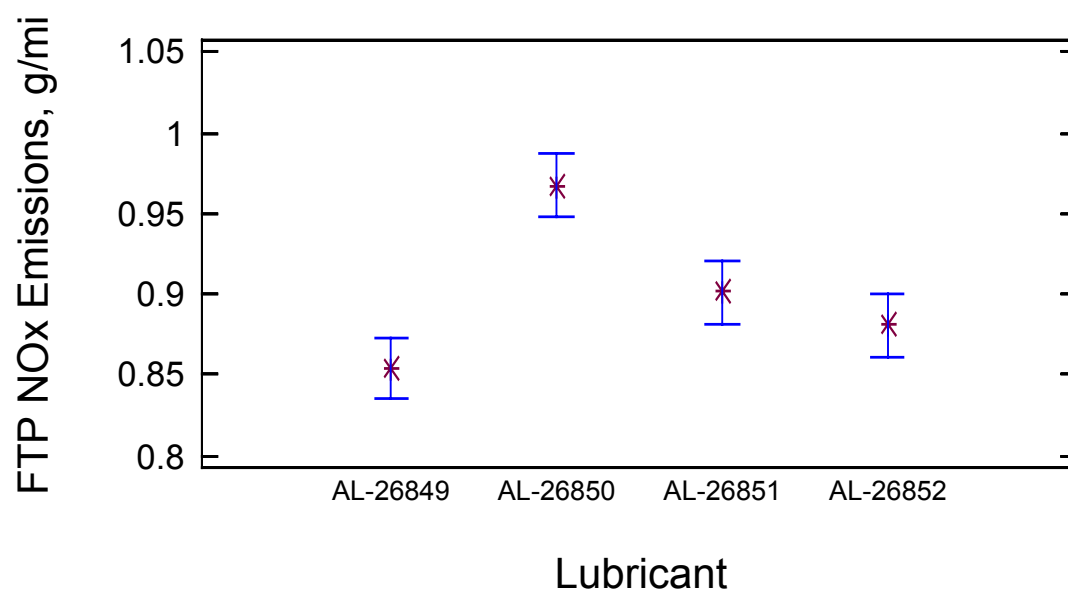


FIGURE 10. AVERAGE FTP NO_x EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

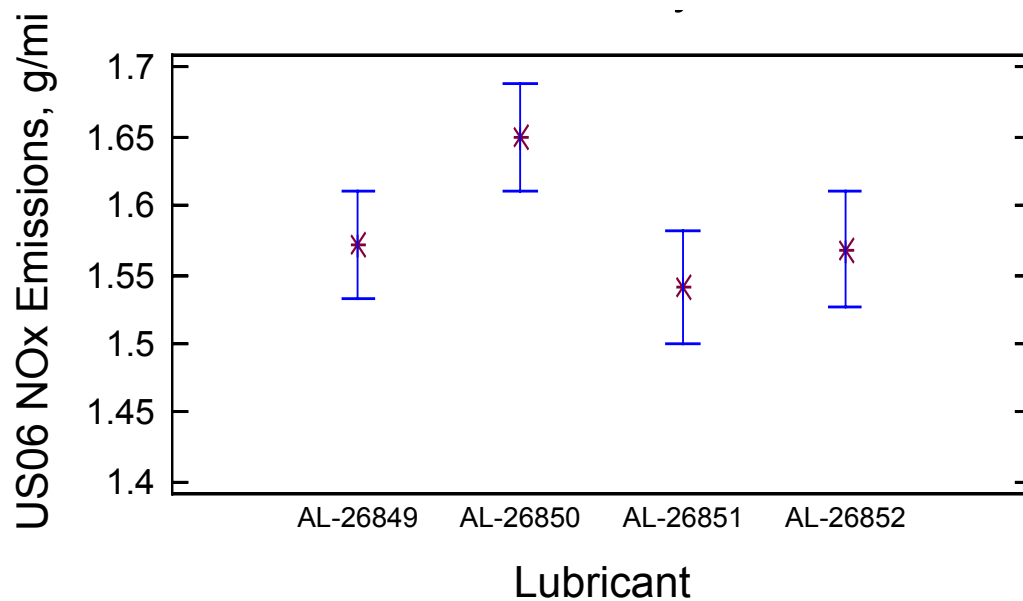


FIGURE 11. AVERAGE US06 NO_x EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

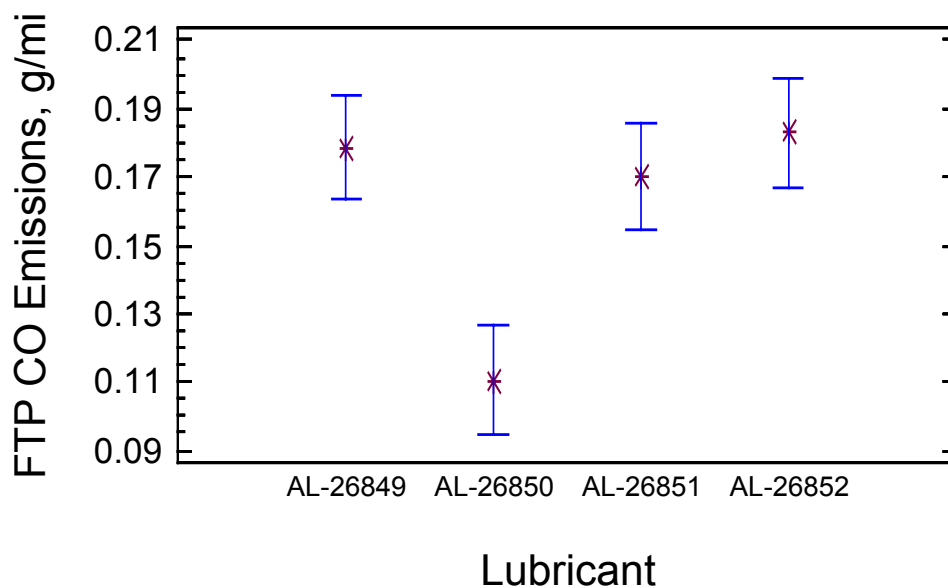


FIGURE 12. AVERAGE FTP CO EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

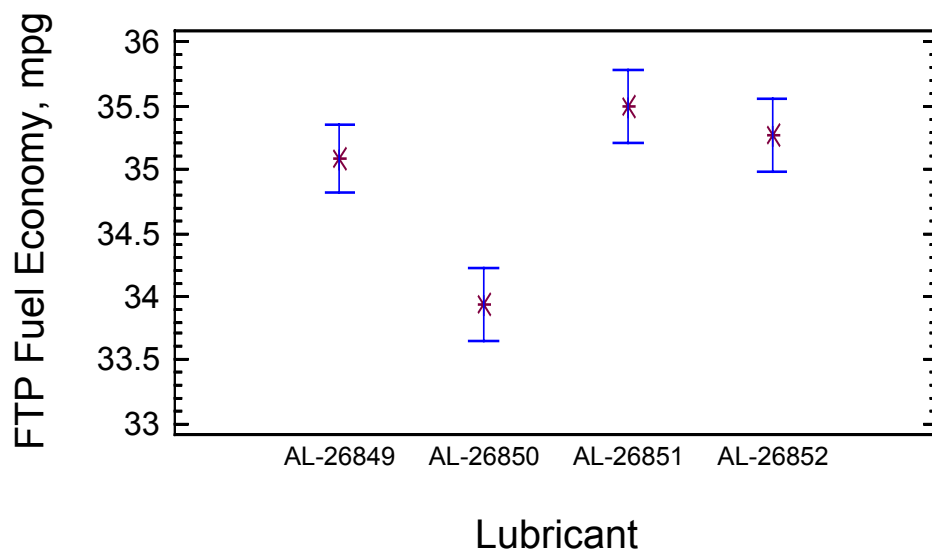


FIGURE 13. AVERAGE FTP FUEL ECONOMY EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

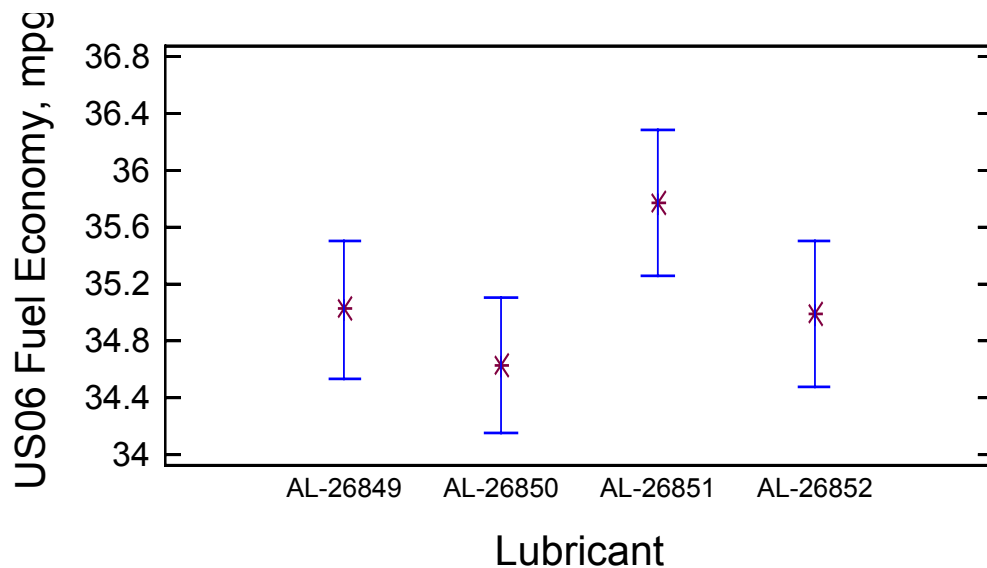


FIGURE 14. AVERAGE US06 FUEL ECONOMY EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

Particulate samples were analyzed to determine the particulate volatile organic fraction (VOF), the contribution of unburned lubricating oil to VOF, and the sulfate fraction of particulate. These results are summarized in Tables 7 and 8. Sulfate emissions for these low sulfur (15 ppm or less) fuels were near the detection limits and offer little in the way of discernable trends. The measured VOF was highest for AL-26852 (synthetic SAE 0W30) for both fuels tested while the VOF for the heaviest weight oil, AL-26850, was generally the lowest over both of the test cycles.

TABLE 7. VOF AND SULFATE EMISSIONS USING FUEL AL-26888

Cycle	Measurement	Engine Lube			
		AL-26849	AL-26850	AL-26851	AL-26852
FTP Bag 1	VOF (%)	20 ± 2	15 ± 4	18 ± 2	32 ± 2
	Wet Sulfate (mg/mi) ^a	1.0 ± 0.5	0.2 ± 0.2	0.1 ± 0.2	< 0.1
	Unburned Oil (% of VOF)	30 ± 4	35 ± 8	31 ± 2	31 ± 2
FTP Bag 2	VOF (%)	18 ± 1	22 ± 6	16 ± 2	37 ± 5
	Wet Sulfate (mg/mi) ^a	0.5 ± 0.2	< 0.1	0.2 ± 0.3	< 0.1
	Unburned Oil (% of VOF)	32 ± 9	31 ± 6	28 ± 2	30 ± 1
FTP Bag 3	VOF (%)	16 ± 5	13 ± 1	15 ± 3	25 ± 2
	Wet Sulfate (mg/mi) ^a	0.6 ± 0.5	0.1 ± 0.1	0.1 ± 0.2	< 0.1
	Unburned Oil (% of VOF)	15 ± 7	18 ± 4	18 ± 4	19 ± 5
US06	VOF (%)	8 ± 1	5 ± 1	6 ± 1	11 ± 1
	Wet Sulfate (mg/mi) ^a	1.0 ± 0.7	0.2 ± 0.1	0.4 ± 0.2	0.3 ± 0.2
	Unburned Oil (% of VOF)	7 ± 2	9 ± 6	6 ± 3	7 ± 3
^a Total includes "dry" sulfate value plus associated water of hydration					

**TABLE 8. VOF AND SULFATE EMISSIONS USING FUEL AL-26918
(OXYGENATED BP15)**

Cycle	Measurement	Engine Lube			
		AL-26849	AL-26850	AL-26851	AL-26852
FTP Bag 1	VOF (%)	36 ± 4	25 ± 2	27 ± 1	48 ± 4
	Wet Sulfate (mg/mi) ^a	0.1 ± 0.2	0.1 ± 0.1	0.4 ± 0.7	< 0.1
	Unburned Oil (% of VOF)	50 ± 6	51 ± 2	39 ± 3	36 ± 3
FTP Bag 2	VOF (%)	33 ± 7	28 ± 6	28 ± 6	48 ± 4
	Wet Sulfate (mg/mi) ^a	0.5 ± 0.3	0.3 ± 0.3	0.1 ± 0.2	< 0.1
	Unburned Oil (% of VOF)	38 ± 1	29 ± 3	35 ± 10	29 ± 3
FTP Bag 3	VOF (%)	28 ± 3	22 ± 9	22 ± 2	46 ± 7
	Wet Sulfate (mg/mi) ^a	0.1 ± 0.2	0.4 ± 0.3	< 0.1	< 0.1
	Unburned Oil (% of VOF)	27 ± 1	33 ± 14	25 ± 5	25 ± 1
US06	VOF (%)	11 ± 2	10 ± 1	8 ± 2	18 ± 4
	Wet Sulfate (mg/mi) ^a	0.1 ± 0.1	0.5 ± 0.8	0.2 ± 0.2	0.1 ± 0.1
	Unburned Oil (% of VOF)	21 ± 3	10 ± 1	11 ± 4	22 ± 1
^a Total included "dry" value plus associated water of hydration					

IV. FUELS TESTING AND RESULTS

The second section of the project involved testing of the following six fuels:

- BP15 Fuel (prototype 2007 U.S. ultra low sulfur diesel fuel)
- BP15 Fuel + tripropylene glycol monomethyl ether (TPGME) @ 7% oxygen
- BP15 Fuel + TPGME @ 3.5% oxygen
- BP15 Fuel + di-butyl maleate (DBM) @ 7% oxygen
- BP15 Fuel + 10% ethanol
- BP15 Fuel based water macroemulsion blend

All testing was conducted using synthetic SAE 5W30 engine oil (Table 3). The properties for the fuels tested are listed in Table 9. Each fuel was tested in triplicate over the FTP plus US06 sequence.

TABLE 9. FUEL PROPERTIES

Fuel Type	BP-15	BP-15 + TPGME @ 3.5% Oxygen	BP-15 + DBM @ 7% Oxygen	Water Macro-Emulsion	BP-15 + TPGME @ 7% Oxygen	BP-15 + 10% Ethanol
Fuel code	AL-26888	AL-26921	AL-26922	AL-26938	AL-26944	AL-26952
Cetane Number	47.7, 49.7	N/A	45.9	42.5	50.8	43.1
Density (lb/gal)	7.030	7.072	7.256	7.242	7.175	6.941
Carbon (%)	86.7%	83.33%	80.47%	68.89%	80.7%	83.89%
Hydrogen (%)	13.3%	13.21%	12.32%	12.72%	13.01%	13.51%
Oxygen (%)	0%	3.46%	7.21%	18.39% ^a	6.29%	2.60%
Water (%)	0%	0%	0%	20.71%	0%	0%
a- Standard practice is to treat water as an inert component for this fuel						

Summaries of THC, CO, NO_x, and PM average emission rates, as well as fuel economy, are presented in Table 10. Statistically significant differences from the reference AL-26888 are highlighted in the table. The standard BP15 fuel (AL-26888) had the lowest HC and CO emissions for the FTP, while HC or CO emissions were virtually indistinguishable from background levels over the US06 cycle. This demonstrates that once the vehicle and catalyst have reached operating temperatures, the oxidation capabilities of the factory aftertreatment are quite effective at removing these components. Fuel AL-26938, a water emulsion diesel, had dramatically higher HC and CO emissions during the FTP along with poor driveability and difficult starting. Each of the oxygenated fuels had a fuel economy penalty proportional to the percentage of oxygen contained in the fuel. AL-26938, with over 18 percent water (an inert component), had the largest fuel economy penalty. There were differences in NO_x and particulate matter emissions for each fuel, but the statistical significance of these differences must be evaluated to determine the confidence of any improvements.

TABLE 10. EMISSIONS RESULTS FOR FUELS TESTING

Cycle	Measurement	Fuel					
		AL-26888	AL-26921	AL-26922	AL-26938	AL-29944	AL-29952
FTP	HC(g/mi)	0.011 ± 0.003	0.013 ± 0.004	0.092 ± 0.009	0.170 ± 0.019	0.036 ± 0.005	0.033± 0.005
	CO (g/mi)	0.151 ± 0.013	0.171 ± 0.026	0.026 ± 0.233	0.532 ± 0.004	0.289 ± 0.016	0.249 ± 0.010
	NO _x (g/mi)	0.693 ± 0.040	0.720 ± 0.021	0.766 ± 0.049	0.746 ± 0.014	0.761 ± 0.009	0.641 ± 0.027
	PM (g/mi)	0.058 ± 0.004	0.048 ± 0.002	0.038 ± 0.003	0.046 ± 0.001	0.034 ± 0.003	0.049 ± 0.001
	FE (mi/gal)	36.2 ± 0.3	35.33 ± 0.1	34.1 ± 0.6	29.0 ± 0.2	34.5 ± 0.2	35.0 ± 0.1
US06	HC(g/mi)	0.000 ± 0.000	0.000 ± 0.000	0.000 ± 0.000	0.004 ± 0.004	0.000 ± 0.000	0.000 ± 0.000
	CO (g/mi)	0.005 ± 0.003	0.002 ± 0.003	0.004 ± 0.001	0.006 ± 0.001	0.004 ± 0.002	0.005 ± 0.003
	NO _x (g/mi)	1.39 ± 0.05	1.47 ± 0.05	1.49 ± 0.03	1.29 ± 0.02	1.49 ± 0.01	1.31 ± 0.06
	PM (g/mi)	0.13 ± 0.00	0.113 ± 0.003	0.063 ± 0.004	0.044 ± 0.003	0.081 ± 0.006	0.104 ± 0.001
	FE (mi/gal)	36.4 ± 0.2	35.2 ± 0.2	34.6 ± 0.4	30.4 ± 0.04	35.0 ± 0.1	35.6 ± 0.4

Emission rates and fuel economy data collected in the fuels program were analyzed using an analysis of variance (ANOVA) statistical procedure in which the average emissions and fuel economy responses were compared across the six fuels. Of primary interest is the comparison of the baseline fuel (AL-26888) to the remaining five fuels. If significant differences in the average emissions or fuel economy responses were discovered, a Tukey's multiple-comparison procedure was used to discriminate differences in exhaust emission and fuel economy among the six fuels. All statistical tests were made at the 5% level of significance. Data from the FTP and US06 cycles were analyzed separately.

The ANOVA summary information is shown in the highlighted (shaded) sections of Table 10. Graphical representations for selected emissions parameters from the ANOVA results are given in Figures 15 through 20 for the FTP and US06 cycles, respectively. The mean response and the 95 percent Tukey HSD intervals are displayed for each fuel. Intervals which overlap indicate that there is no significant difference in the average emission or fuel economy at the 95 percent confidence level for the fuels compared.

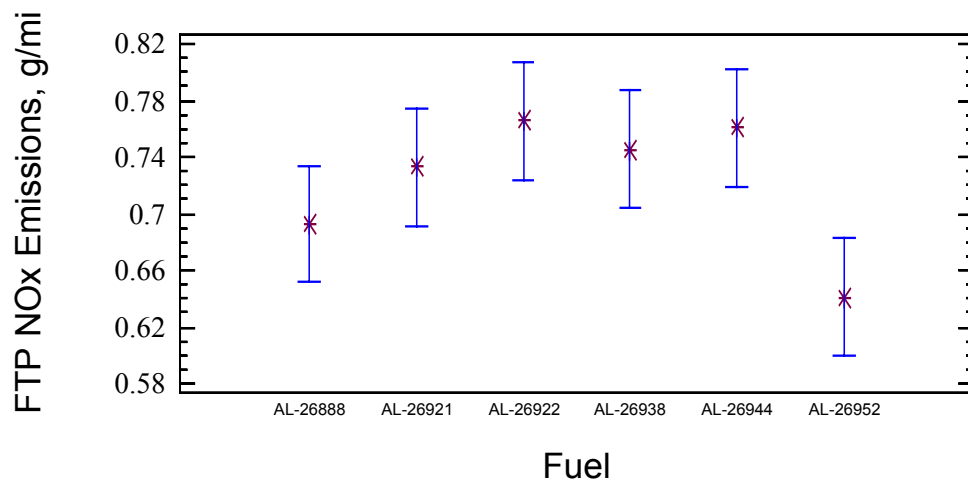


FIGURE 15. AVERAGE FTP NO_x EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

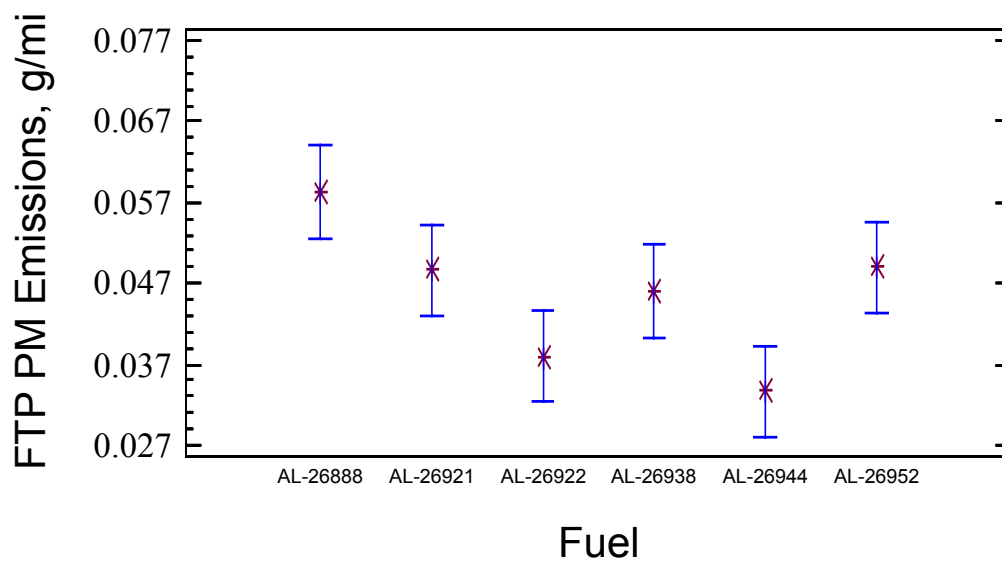


FIGURE 16. AVERAGE FTP PM EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

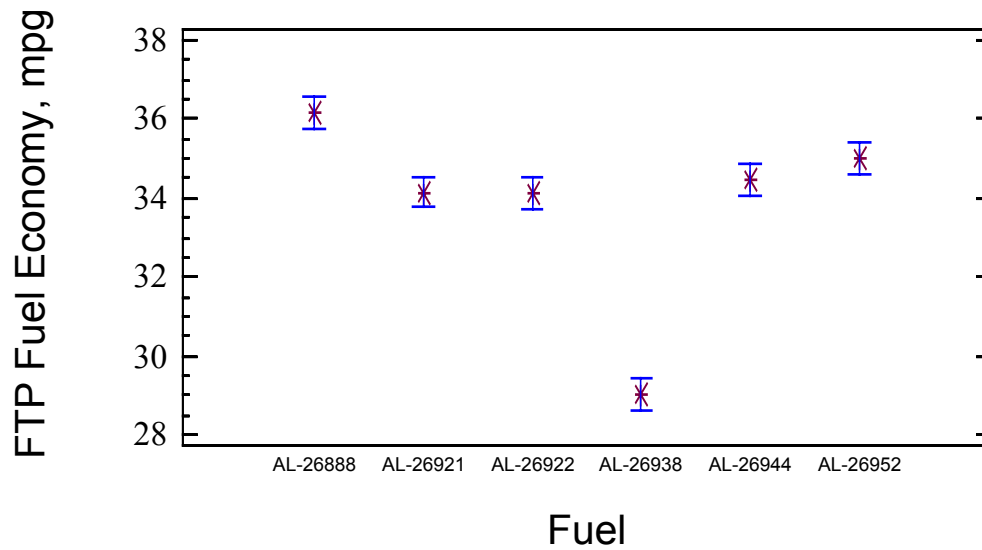


FIGURE 17. AVERAGE FTP FUEL ECONOMY EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

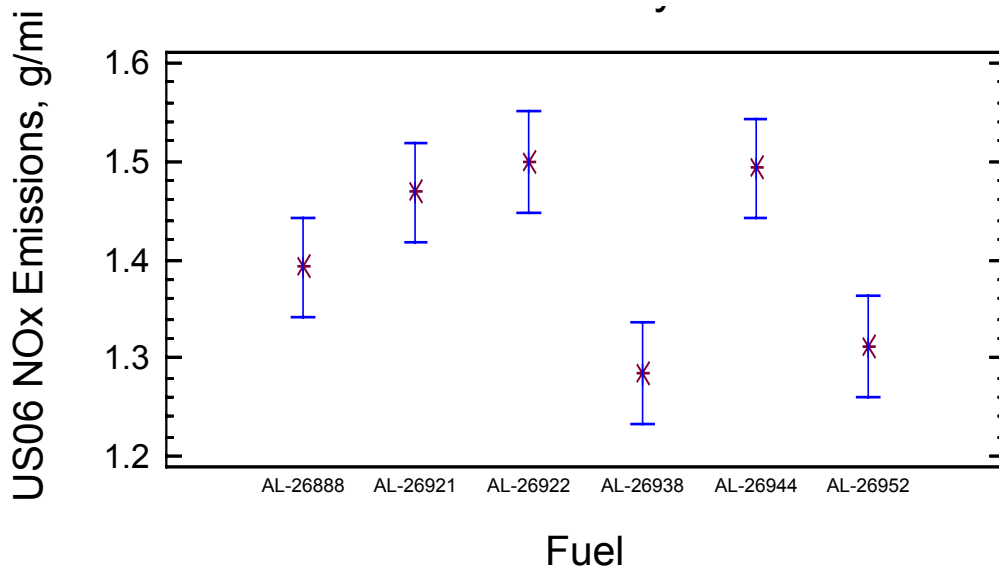


FIGURE 18. AVERAGE US06 NO_x EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

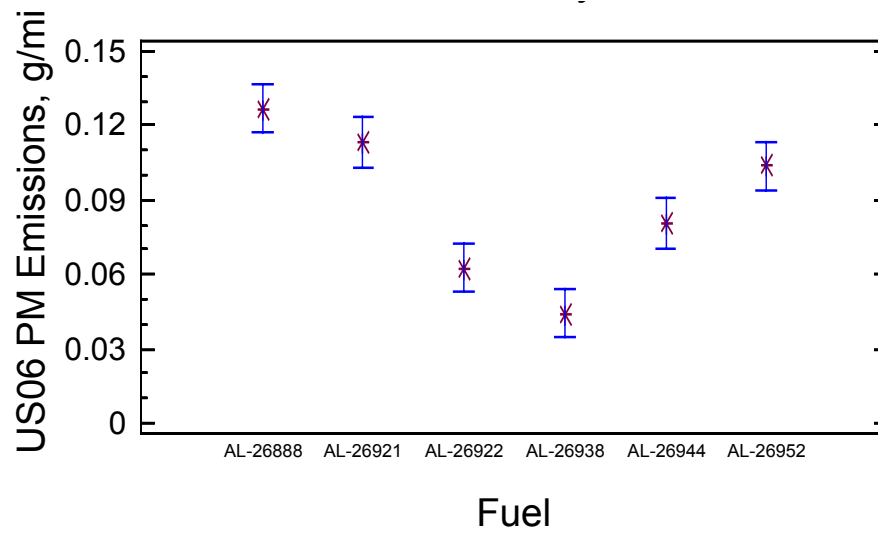


FIGURE 19. AVERAGE US06 PM EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

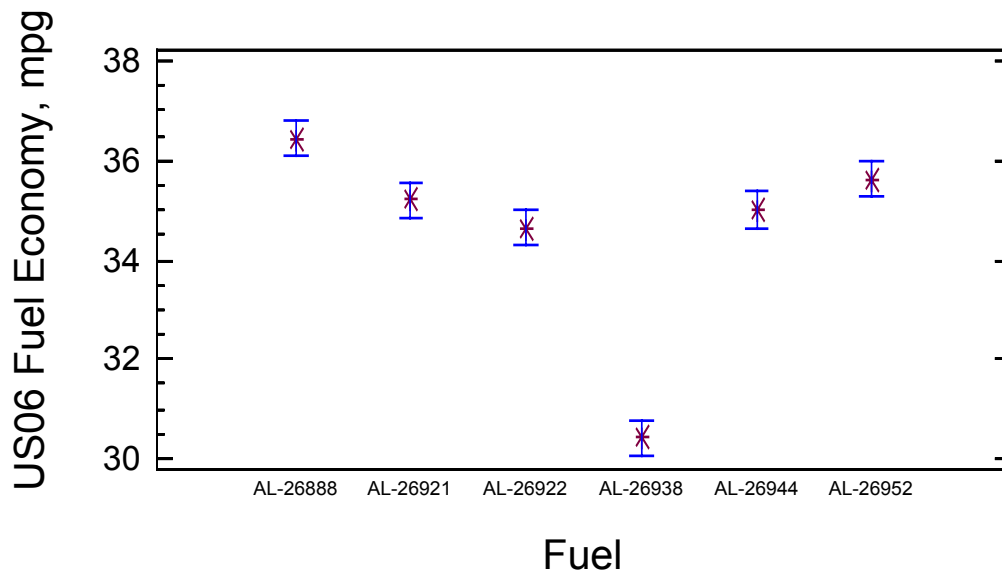


FIGURE 20. AVERAGE US06 FUEL ECONOMY EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

Particulate samples were analyzed to determine the particulate volatile organic fraction (VOF), the contribution of unburned lubricating oil to VOF, and the sulfate fraction of particulate. These results are summarized in Table 11. Sulfate emissions for these low sulfur (15 ppm or less) fuels were near the detection limits, and only the US06 cycle consistently produced measurable amounts of sulfate emissions. Fuels AL-26944 and AL-26952, however, did produce the most sulfate on average. The measured VOF was highest for AL-26938 (the water emulsion diesel that had poor driveability) and lowest for the standard BP15 reference fuel (AL-26888). Unburned oil, as a percentage of the VOF, was low for fuel AL-26938, but this is likely due to the fact that the overall VOF was higher (meaning that overall oil consumption was likely similar).

TABLE 11. VOF AND SULFATE EMISSIONS FOR FUELS TESTING

Cycle	Measurement	AL-26888	AL-26921	AL-26922	AL-26938	AL-26944	AL-26952
FTP Bag 1	VOF (%)	9.1 ± 0.7	10.5 ± 0.3	16 ± 1	28 ± 4	25 ± 2	16 ± 4
	Wet Sulfate (mg/mi) ^a	0.0 ± 0.1	0 ± 0.1	0.1 ± 0.1	0.2 ± 0.1	0.6 ± 0.2	0.5 ± 0.1
	Unburned Oil (% of VOF)	29.3 ± 3.1	31.7 ± 3.2	28 ± 3	14 ± 1	35 ± 4	24 ± 2
FTP Bag 2	VOF (%)	8.8 ± 1.3	16 ± 6.3	15 ± 1	17 ± 1	25 ± 2	14 ± 3
	Wet Sulfate (mg/mi) ^a	0.1 ± 0.1	0 ± 0.03	0.3 ± 0.2	0.4 ± 0.2	0.8 ± 0.1	0.8 ± 0.4
	Unburned Oil (% of VOF)	33.7 ± 7	32 ± 3	31 ± 4	24 ± 6	31 ± 4	26 ± 7
FTP Bag 3	VOF (%)	9.5 ± 0.5	10 ± 1	18 ± 2	21 ± 4	16 ± 2	13 ± 5
	Wet Sulfate (mg/mi) ^a	0 ± 0.14	0 ± 0.1	0.1 ± 0.1	0.1 ± 0.02	0.3 ± 0.1	0.7 ± 0.6
	Unburned Oil (% of VOF)	19 ± 6	18 ± 6	31 ± 3	29 ± 4	26 ± 6	16 ± 3
US06	VOF (%)	2.8 ± 0.7	3 ± 0.1	5 ± 0.4	12 ± 2	7 ± 0.2	5 ± 0.9
	Wet Sulfate (mg/mi) ^a	0.3 ± 0.1	0.3 ± 0.1	0.2 ± 0.1	0.6 ± 0.1	1.0 ± 0.2	0.5 ± 0.2
	Unburned Oil (% of VOF)	4 ± 1	4 ± 1	11 ± 2	16 ± 4	9 ± 2	0 ± 4
^a Total includes "dry" sulfate value plus associated water of hydration							

In an effort to further understand the impact that each fuel had on vehicle emissions, engine-out emissions and engine mass air flow measurements were also taken. These measurements allowed for real-time analysis of the engine-out mass emissions as well as the standard dilute data. The vehicle's own mass air flow (MAF) sensor was utilized in order to monitor the amount of air being drawn into the engine. The calibration for this sensor is shown in Figure 20.

Because the transport and analyzer response times were different for each emission analyzer, it was necessary to assign individual modal delay times for each raw and dilute measurement. These delays are assigned based on emissions response times to step change inputs made by the engine. The modal delays, in seconds, are shown in Table 12.

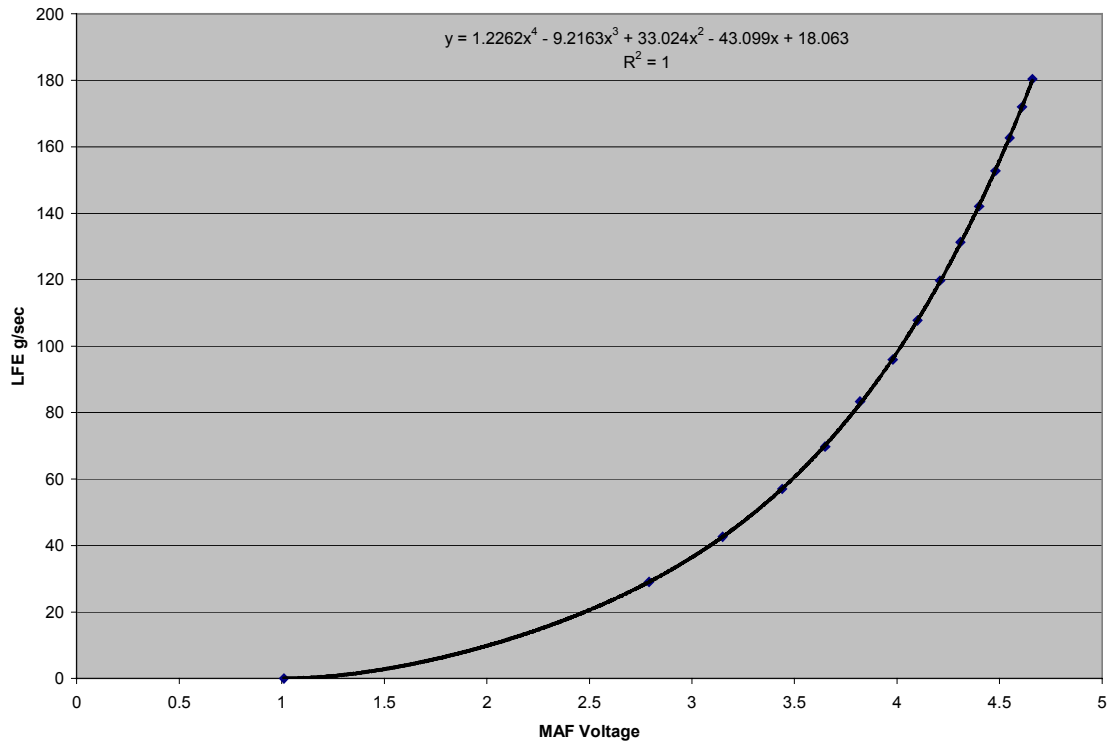


FIGURE 21. VEHICLE MASS AIR FLOW CALIBRATION

TABLE 12. MODAL ANALYZER DELAYS

Type	Analyzer	Delay Time (seconds)
Raw	HC	6
	CO	9
	NO _x	7
	CO ₂	8
Dilute	HC	9
	CO	16
	NO _x	11
	CO ₂	13

The raw emissions and real-time catalyst efficiency data can be evaluated in many different ways. Because this program was aimed at evaluating the effect that different types of fuels have on several emissions parameters, the data were structured to best gauge how a fuel effects HC, CO, and NO_x emission rates throughout a driving cycle. For control of HC and CO emissions, the most important consideration for a cold-start test is catalyst light-off time. Once the diesel oxidation catalyst has reached operating temperature, the vehicle will have very little in the way of HC or CO emissions from that point forward. The effect of a fuel, then, on HC and CO emissions can be gauged by the time it takes for the catalyst to reach sustained 99 percent conversion efficiency during Bag 1 of the FTP. Table 13 lists the time it takes to reach this conversion efficiency for each representative fuel. A graphical representation of real-time catalyst conversion efficiency for each fuel can be found in Appendix C. In order to show the characteristics of the curve, the time shown on each plot is limited to 90 seconds. Shorter times to reach complete conversion correlate well with reduced HC and CO emissions. Though light-off time can be defined in many ways, for the purposes of this report it will always designate the time needed to reach 99 percent conversion for a particular emissions parameter.

TABLE 13. FTP BAG 1 TIMES TO REACH 100 PERCENT CONVERSION

Fuel	HC Light-off Time (s)	CO Light-off Time (s)
AL-26888	25	78
AL-26921	34	62
AL-26922	60	106
AL-26938	232	197
AL-26944	62	109
AL-26952	60	107

While emissions reductions in HC and CO require a faster light-off time, fuel driven reductions in NO_x emissions are facilitated by in-cylinder changes that lower engine-out NO_x levels. Because there is very little in the way of NO_x conversion by the diesel aftertreatment on this vehicle, an assessment of accumulated engine-out NO_x mass over the FTP and US06 cycles gives a good indication of each fuel's performance in reducing NO_x emissions. Table 14 lists the accumulated engine-out NO_x mass for bags one and two of the FTP and for the US06. Bags one and two of the FTP are used because they represent continuous vehicle operation without a soak. A graphical representation of accumulated NO_x mass during Bags 1 and 2 is shown for each fuel in Appendix C.

TABLE 14. ACCUMULATED ENGINE-OUT NO_x MASS

Fuel	Engine-out NO_x Mass- FTP Bags 1 and 2 (g)	Engine-out NO_x Mass- US06 (g)
AL-26888	6.3 ± 0.2	13.3 ± 0.2
AL-26921	6.7 ± 0.1	13.7 ± 0.1
AL-26922	7.4 ± 0.3	14.5 ± 0.6
AL-26938	7.2 ± 0.2	12.4 ± 0.1
AL-26944	6.8 ± 0.1	13.7 ± 0.1
AL-26952	6.4 ± 0.3	13.3 ± 0.6

The fuels offered little in the way of a NO_x reduction during the FTP compared to the baseline BP15 (AL-26888) fuel. The water emulsion diesel (AL-26938) did reduce the engine-out NO_x levels by nearly 7 percent during the high load US06. However, power output levels were reduced and the driver had difficulty following the US06 trace while the vehicle was running on the water emulsion. It should be noted that although the engine-out NO_x emissions listed in Table 14 are higher than the dilute mass emissions from Appendix B, the majority of this difference is likely due to differences in analyzer response and flow measurement, and not necessarily linked to aftertreatment conversion of NO_x. This vehicle is thought to have a NO_x conversion efficiency of approximately 10 percent.

V. SUMMARY

Fuel and lube effects on gaseous and particulate emissions were examined on a 1999 Mercedes Benz C220 with a CIDI engine. Test cycles included the FTP and the US06. Statistical analyses were performed on the summary emissions for both lube and fuel testing, while real-time conversion efficiencies were also examined for the fuel results.

Several statistically significant effects were observed as a result of the differences in the viscosity of engine lubricants tested. The only lube that demonstrated significant effects over several of the measured parameters was AL-26850, the oil with the highest viscosity (SAE15W-50). This lube resulted in higher FTP NO_x emissions, lower FTP CO emissions, and reduced FTP fuel economy. No lube had a statistically significant effect on particulate matter emissions during either the FTP or the US06.

The evaluated fuels were observed to have several effects on emissions and fuel economy. All the fuels tested reduced average composite FTP and US06 particulate mass emissions compared to the reference BP15, though not all the reductions were statistically significant. The following fuels produced statistically significant particulate mass reductions over the FTP and US06 cycles:

- AL-26922 (BP-15+DBM @ 7% oxygen)
- AL-26938 (water emulsion)
- AL-26944 (BP-15+TPGME @ 7% oxygen)

FTP NO_x emissions tended to be increased slightly with the fuels containing TPGME, DBM, and the water emulsion; however, the differences were not statistically significant compared to the base fuel. The fuel containing ethanol had reduced NO_x emissions compared to BP-15; however these also were not statistically significant.

US06 NO_x emissions were significantly higher for the fuel with DBM, and significantly lower for the water emulsion fuel compared to BP-15.

Each fuel carried a fuel economy penalty that correlated to the amount of oxygen or inert material (water) blended into the fuel, ranging from three to nineteen percent. AL-26938 (water emulsion) produced much higher HC and CO emissions increase over the reference fuel than the other blended fuels in the study. Difficult starting and poor driveability was also observed when using the water emulsion fuel. However, the water emulsion fuel produced NO_x emission levels during the US06 that were a statistically significant reduction over the baseline BP15.

VI. REFERENCES

1. Sirman, M. B., E. C. Owens and K. A. Whitney, "Emissions Comparison of Alternate Fuels in An Advanced Automotive Diesel Engine", Southwest Research Institute Report for DOE and US Army TARDEC, Interim Report TFLRF No. 338, and SAE Paper 2000-01-2048.
2. Dimethoxy Methane in Diesel Fuel: Part 1. The Effect of Engine Operating Mode and Fuels on Emissions of Toxic Air Pollutants and Gas and Solid Phase PAH. Ball, J.C., Lapin, C., Buckingham, J., Frame, E., Yost, D., Gonzalez, M., Liney, E., Natarajan, M., and Wallace, J.P.III. SAE Paper 2001-01-3627.
3. Dimethoxy Methane in Diesel Fuel: Part 2. The Effect of Fuels on Emissions of Toxic Air Pollutants and Gas/Solid Phase PAH Using a Composite Of Engine Operating Modes. Ball, J.C., Lapin, C., Buckingham, J., Frame, E., Yost, D., Gonzalez, M., Liney, E., Natarajan, M., and Wallace, J.P.III. SAE Paper 2001-01-3628.
4. Dimethoxy Methane in Diesel Fuel: Part 3. The Effect of Pilot Injection, Fuels and Engine Operating Modes on Emissions of Toxic Air Pollutants and Gas/Solid Phase PAH". Ball, J.C., Lapin, C., Buckingham, J., Frame, E., Yost, D., Gonzalez, M., Liney, E., Natarajan, M., and Wallace, J.P.III. SAE Paper 2001-01-3629.
5. Oxygenates for Advanced Petroleum-Based Fuels: Part 1. Screening and Selection Methodology for the Oxygenates. Natarajan, M., Naegeli, D. W., Frame, E. A., Asmus T., Clark W., Garbak J., González D., M. A., Liney, E., Piel W. and Wallace III. James P. SAE Paper 2001-01-3631.
6. The Emissions Performance of Oxygenated Diesel Fuels in a Prototype DI Diesel Engine. Hilden, D.L., Eckstrom, J.C., and Wolf, L.R., SAE paper 2001-01-0650.
7. Oxygenates Screening for Advanced Petroleum-Based Diesel Fuels: Part 2. The Effect of Oxygen-ate Blending Compounds on Exhaust Emissions. González D., M. A., Piel, W., Asmus, T., Clark, W., Garbak, J., Liney, E., Natarajan, M., Naegeli, D. W., Yost, D., Frame, E. A., Wallace III. James P. SAE Paper 2001-01-3632.
8. Effects of Oxygenated Compounds on Combustion and Soot Evolution in a DI Diesel Engine: Direct Luminosity Imaging. Mueller, C. J., Martin G. C. SAE Paper 2002-01-631.
9. The Effects of Oxygenates on Diesel Engine Particulate Matter. Cheng, A.S., Dibble, R. W., Buchholz, B. A. SAE Paper 2002-01-1705
10. Performance of Fischer-Tropsch Liquids with Oxygenates in a VW 1.9L TDI. Suppes, G. J., Burkhart, M. L., Cordova, J. C., Sorem, R. M., Russell, B. SAE Paper 2001-01-3521.

11. Effects of Advanced Fuels on the Particulate and NO_x Emissions from an Optimized Light-Duty CIDI Engine. Szymkowicz, P., French, D., Crellin, T., SAE Paper 2001-01-48.
12. Overall Results: Phase I Ad Hoc Diesel Fuel Test Program. Kenney, T., Gardner, T., Low, S., Eckstrom, J., Wolf, L., Korn, S., Szymkowicz, P., SAE Paper 2001-01-0151.
13. Impact of Engine Operating Conditions on Low-NO_x Emissions in a Light-Duty CIDI Engine using Advanced Fuels. Yost, D., Frame, E., et al, SAE Paper 2002-01-2884.
14. Impact of Lubricant Oil on Regulated Emissions of a Light-Duty Mercedes-Benz OM611 CIDI-Engine, Froelund, K., et. al., SAE Paper 2001-01-1901.

APPENDIX A

DATA SHEETS FOR ENGINE LUBRICANT STUDY

Lube	Fuel	Page
AL-26849	AL-26888	A-1 to A-6
AL-26849	AL-26918	A-7 to A-14
AL-26850	AL-26888	A-15 to A-20
AS-26850	AL-26918	A-21 to A-28
AL-26851	AL-26888	A-29 to A-34
AL-26851	AL-26918	A-35 to A-40
AL-26852	AL-26888	A-41 to A-46
AL-26852	AL-26918	A-47 to A-52

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4988-FTP1	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/11/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17737 MILES (28538 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.08 IN HG (738.7 MM HG)	DRY BULB TEMPERATURE 69.0pF (20.6pC)	NOX HUMIDITY C.F. .995
RELATIVE HUMIDITY 67.8 PCT.		

	1 COLD TRANSIENT (0-505 SEC.)	2 STABILIZED (505-1372 SEC.)	3 HOT TRANSIENT (0- 505 SEC.)
BAG NUMBER	1	2	3
BAG DESCRIPTION			
RUN TIME SECONDS	504.6	870.0	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.58 (5.76)	3.83 (6.17)	3.59 (5.77)
BLOWER FLOW RATE SCFM (SCMM)	610.0 (17.28)	609.2 (17.25)	603.1 (17.08)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5138. (145.5)	8847. (250.6)	5085. (144.0)

HC SAMPLE METER/RANGE/PPM (BAG)	7.1/ 9/ 7.06	3.6/ 9/ 3.60	3.9/ 9/ 3.89
HC BCKGRD METER/RANGE/PPM	4.2/ 2/ 4.25	4.1/ 2/ 4.15	4.0/ 2/ 4.05
CO SAMPLE METER/RANGE/PPM	16.2/ 12/ 15.49	.6/ 12/ .56	1.9/ 12/ 1.78
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .75	.9/ 12/ .84	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	54.5/ 11/ .4224	39.7/ 11/ .2838	51.2/ 11/ .3893
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0419	6.7/ 11/ .0425	6.9/ 11/ .0438
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.2/ 9/ 9.23	5.7/ 9/ 5.71	13.3/ 9/ 13.31
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.2/ 1/ .05	.1/ 1/ .03

DILUTION FACTOR	31.90	47.65	34.74
HC CONCENTRATION PPM	2.94	-.47	-.04
CO CONCENTRATION PPM	14.31	-.26	1.11
CO2 CONCENTRATION PCT	.3818	.2422	.3467
NOX CONCENTRATION PPM	9.20	5.66	13.28

HC MASS GRAMS	.246	.000	.000
CO MASS GRAMS	2.424	.000	.186
CO2 MASS GRAMS	1017.06	1110.93	914.06
NOX MASS GRAMS	2.549	2.701	3.641
PM MASS GRAMS	.395	.267	.219
FUEL MASS KG	.322	.350	.288
FUEL ECONOMY MPG (L/100KM)	35.53 (6.62)	34.95 (6.73)	39.73 (5.92)

3-BAG COMPOSITE RESULTS

HC	G/MI	.014	
CO	G/MI	.155	
NOX	G/MI	.792	
PM	G/MI	.076	
FUEL ECONOMY MPG (L/100KM)		36.30 (6.48)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4988-US061	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/11/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17755 MILES (28567 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.08 IN HG (738.7 MM HG)	DRY BULB TEMPERATURE 69.0pF (20.6pC)	NOX HUMIDITY C.F. .995
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983
MEASURED DISTANCE MILES (KM)	7.97 (12.82)
BLOWER FLOW RATE SCFM (SCMM)	604.9 (17.13)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6062. (171.7)

HC SAMPLE METER/RANGE/PPM (BAG)	3.3/	9/	3.26
HC BCKGRD METER/RANGE/PPM	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	.5/	12/	.47
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	61.4/	11/	.4963
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	19.4/	9/	19.42
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	27.27
HC CONCENTRATION PPM	-.35
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.4584
NOX CONCENTRATION PPM	19.40

HC MASS GRAMS	.000
CO MASS GRAMS	.055
CO2 MASS GRAMS	1440.75
NOX MASS GRAMS	6.340
PM MASS GRAMS	.584
FUEL MASS KG	.453
FUEL ECONOMY MPG (L/100KM)	56.05 (4.20)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000
CO	G/MI	.007
NOX	G/MI	.795
PM	G/MI	.073
FUEL ECONOMY MPG (L/100KM)		56.05 (4.20)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4988-FTP2	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/12/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17763 MILES (28580 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.07 IN HG (738.3 MM HG)	DRY BULB TEMPERATURE 69.0pF (20.6pC)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.8	870.0	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.59 (5.78)	3.83 (6.17)	3.58 (5.76)
BLOWER FLOW RATE SCFM (SCMM)	605.2 (17.14)	605.9 (17.16)	602.0 (17.05)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)	.92 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5099. (144.4)	8798. (249.2)	5076. (143.8)

HC SAMPLE METER/RANGE/PPM (BAG)	8.1/	9/	8.14	3.4/	9/	3.41	3.7/	9/	3.74
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65	3.6/	2/	3.65	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	21.0/	12/	20.17	1.2/	12/	1.12	1.0/	12/	.94
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28	1.2/	12/	1.12	.6/	12/	.56
CO2 SAMPLE METER/RANGE/PCT	55.0/	11/	.4275	40.1/	11/	.2873	50.5/	11/	.3824
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393	6.3/	11/	.0400	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.8/	9/	9.85	5.9/	9/	5.94	12.4/	9/	12.38
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03	.1/	1/	.03	.1/	1/	.03

DILUTION FACTOR	31.48	47.08	35.37
HC CONCENTRATION PPM	4.61	-.16	.19
CO CONCENTRATION PPM	19.29	.02	.38
CO2 CONCENTRATION PCT	.3895	.2481	.3436
NOX CONCENTRATION PPM	9.82	5.91	12.36

HC MASS GRAMS	.383	.000	.016
CO MASS GRAMS	3.244	.005	.063
CO2 MASS GRAMS	1029.74	1131.98	904.34
NOX MASS GRAMS	2.702	2.806	3.383
PM MASS GRAMS	.321	.251	.280
FUEL MASS KG	.326	.356	.285
FUEL ECONOMY MPG (L/100KM)	35.13 (6.70)	34.30 (6.86)	40.13 (5.86)

3-BAG COMPOSITE RESULTS

HC	G/MI	.023	
CO	G/MI	.193	
NOX	G/MI	.795	
PM	G/MI	.074	
FUEL ECONOMY MPG (L/100KM)		35.95 (6.54)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4988-US062	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/12/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17781 MILES (28609 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.06 IN HG (738.0 MM HG)	DRY BULB TEMPERATURE 69.0pF (20.6pC)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	7.97 (12.82)
BLOWER FLOW RATE SCFM (SCMM)	600.2 (17.00)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6012. (170.3)

HC SAMPLE METER/RANGE/PPM (BAG)	3.5/	9/	3.46
HC BCKGRD METER/RANGE/PPM	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	.6/	12/	.56
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	81.4/	11/	.7503
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	35.7/	9/	35.67
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.04
HC CONCENTRATION PPM	.20
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.7119
NOX CONCENTRATION PPM	35.65

HC MASS GRAMS	.020
CO MASS GRAMS	.056
CO2 MASS GRAMS	2219.33
NOX MASS GRAMS	11.560
PM MASS GRAMS	1.186
FUEL MASS KG	.699
FUEL ECONOMY MPG (L/100KM)	36.36 (6.47)

1-BAG COMPOSITE RESULTS

HC G/MI	.003
CO G/MI	.007
NOX G/MI	1.451
PM G/MI	.149
FUEL ECONOMY MPG (L/100KM)	36.36 (6.47)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4988-FTP3	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/13/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17790 MILES (28624 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.04 IN HG (737.7 MM HG)	DRY BULB TEMPERATURE 69.0°F (20.6°C)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	870.3	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.60 (5.79)	3.84 (6.17)	3.57 (5.75)
BLOWER FLOW RATE SCFM (SCMM)	609.9 (17.27)	607.9 (17.21)	602.5 (17.06)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5142. (145.6)	8830. (250.1)	5080. (143.9)

HC SAMPLE METER/RANGE/PPM (BAG)	7.3/ 9/ 7.31	3.7/ 9/ 3.67	3.9/ 9/ 3.94
HC BCKGRD METER/RANGE/PPM	4.7/ 2/ 4.76	4.6/ 2/ 4.66	4.4/ 2/ 4.46
CO SAMPLE METER/RANGE/PPM	18.0/ 12/ 17.24	1.4/ 12/ 1.31	4.8/ 12/ 4.52
CO BCKGRD METER/RANGE/PPM	.6/ 12/ .56	1.1/ 12/ 1.03	.6/ 12/ .56
CO2 SAMPLE METER/RANGE/PCT	54.5/ 11/ .4224	39.3/ 11/ .2804	50.3/ 11/ .3805
CO2 BCKGRD METER/RANGE/PCT	6.3/ 11/ .0400	6.4/ 11/ .0406	6.2/ 11/ .0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.5/ 9/ 9.53	5.7/ 9/ 5.70	12.8/ 9/ 12.78
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	31.88	48.22	35.52
HC CONCENTRATION PPM	2.70	-.89	-.39
CO CONCENTRATION PPM	16.19	.29	3.86
CO2 CONCENTRATION PCT	.3837	.2406	.3423
NOX CONCENTRATION PPM	9.50	5.68	12.76

HC MASS GRAMS	.226	.000	.000
CO MASS GRAMS	2.744	.084	.646
CO2 MASS GRAMS	1022.89	1101.78	901.53
NOX MASS GRAMS	2.635	2.705	3.497
PM MASS GRAMS	.339	.224	.245
FUEL MASS KG	.324	.347	.284
FUEL ECONOMY MPG (L/100KM)	35.45 (6.64)	35.27 (6.67)	40.12 (5.86)

3-BAG COMPOSITE RESULTS

HC	G/MI	.013	
CO	G/MI	.220	
NOX	G/MI	.786	
PM	G/MI	.069	
FUEL ECONOMY MPG (L/100KM)		36.55 (6.44)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4988-US063	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/13/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17808 MILES (28653 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.02 IN HG (737.1 MM HG)	DRY BULB TEMPERATURE 69.0°F (20.6°C)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.00 (12.87)
BLOWER FLOW RATE SCFM (SCMM)	600.7 (17.01)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6017. (170.4)

HC SAMPLE METER/RANGE/PPM (BAG)	3.3/	9/	3.27
HC BCKGRD METER/RANGE/PPM	4.0/	2/	4.05
CO SAMPLE METER/RANGE/PPM	.7/	12/	.66
CO BCKGRD METER/RANGE/PPM	.6/	12/	.56
CO2 SAMPLE METER/RANGE/PCT	82.0/	11/	.7589
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.9/	9/	36.95
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.84
HC CONCENTRATION PPM	-.56
CO CONCENTRATION PPM	.11
CO2 CONCENTRATION PCT	.7211
NOX CONCENTRATION PPM	36.90

HC MASS GRAMS	.000
CO MASS GRAMS	.022
CO2 MASS GRAMS	2249.76
NOX MASS GRAMS	11.980
PM MASS GRAMS	1.129
FUEL MASS KG	.708
FUEL ECONOMY MPG (L/100KM)	36.02 (6.53)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.003
NOX G/MI	1.498
PM G/MI	.141
FUEL ECONOMY MPG (L/100KM)	36.02 (6.53)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-FTP1	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/16/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17790 MILES (28624 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.2 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.025
RELATIVE HUMIDITY 76.2 PCT.		

	1	2	3
BAG DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT
	(0-505 SEC.)	(505-1372 SEC.)	(0- 505 SEC.)
RUN TIME SECONDS	505.0	870.0	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.982	.979/.982	.978/.982
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.89 (6.26)	3.56 (5.73)
BLOWER FLOW RATE SCFM (SCMM)	613.5 (17.37)	611.3 (17.31)	605.5 (17.15)
GAS METER FLOW RATE SCFM (SCMM)	.91 (.03)	.92 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5171. (146.4)	8877. (251.4)	5106. (144.6)

HC SAMPLE METER/RANGE/PPM (BAG)	7.2/ 9/ 7.25	3.6/ 9/ 3.65	3.8/ 9/ 3.80
HC BCKGRD METER/RANGE/PPM	3.8/ 2/ 3.85	3.8/ 2/ 3.85	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	18.0/ 12/ 17.24	.7/ 12/ .66	1.0/ 12/ .94
CO BCKGRD METER/RANGE/PPM	1.1/ 12/ 1.03	.9/ 12/ .84	.8/ 12/ .75
CO2 SAMPLE METER/RANGE/PCT	55.7/ 11/ .4348	40.9/ 11/ .2942	50.5/ 11/ .3824
CO2 BCKGRD METER/RANGE/PCT	7.3/ 11/ .0464	7.1/ 11/ .0451	7.0/ 11/ .0445
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.7/ 9/ 11.68	6.6/ 9/ 6.57	13.1/ 9/ 13.12
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.5/ 1/ .13	.3/ 1/ .08

DILUTION FACTOR	30.95	45.92	35.33
HC CONCENTRATION PPM	3.52	-.12	.15
CO CONCENTRATION PPM	15.69	-.17	.20
CO2 CONCENTRATION PCT	.3899	.2500	.3392
NOX CONCENTRATION PPM	11.61	6.44	13.05

HC MASS GRAMS	.320	.000	.014
CO MASS GRAMS	2.676	.000	.033
CO2 MASS GRAMS	1045.29	1150.74	898.01
NOX MASS GRAMS	3.333	3.175	3.698
PM MASS GRAMS	.154	.107	.109
FUEL MASS KG	.357	.391	.305
FUEL ECONOMY MPG (L/100KM)	32.76 (7.18)	32.28 (7.29)	37.84 (6.22)

3-BAG COMPOSITE RESULTS

HC G/MI	.019		
CO G/MI	.156		
NOX G/MI	.899		
PM G/MI	.032		
FUEL ECONOMY MPG (L/100KM)	33.77 (6.97)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-US061	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/16/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17808 MILES (28653 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.19 IN HG (741.5 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.025
RELATIVE HUMIDITY 76.2 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.975/.982
MEASURED DISTANCE MILES (KM)	7.94 (12.78)
BLOWER FLOW RATE SCFM (SCMM)	605.7 (17.15)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6068. (171.8)

HC SAMPLE METER/RANGE/PPM (BAG)	3.2/	9/	3.22
HC BCKGRD METER/RANGE/PPM	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	1.5/	12/	1.41
CO BCKGRD METER/RANGE/PPM	.6/	12/	.56
CO2 SAMPLE METER/RANGE/PCT	81.8/	11/	.7560
CO2 BCKGRD METER/RANGE/PCT	7.1/	11/	.0451
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	39.8/	9/	39.79
NOX BCKGRD METER/RANGE/PPM	.4/	1/	.10

DILUTION FACTOR	17.88
HC CONCENTRATION PPM	-.32
CO CONCENTRATION PPM	.83
CO2 CONCENTRATION PCT	.7134
NOX CONCENTRATION PPM	39.70

HC MASS GRAMS	.000
CO MASS GRAMS	.167
CO2 MASS GRAMS	2244.45
NOX MASS GRAMS	13.370
PM MASS GRAMS	.462
FUEL MASS KG	.763
FUEL ECONOMY MPG (L/100KM)	33.77 (6.97)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.021
NOX G/MI	1.684
PM G/MI	.058
FUEL ECONOMY MPG (L/100KM)	33.77 (6.97)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-FTP2	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/17/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17885 MILES (28776 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.03 IN HG (737.5 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. 1.035
RELATIVE HUMIDITY 72.5 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	870.1	505.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.981	.979/.981	.978/.981
MEASURED DISTANCE MILES (KM)	3.59 (5.78)	3.87 (6.23)	3.63 (5.85)
BLOWER FLOW RATE SCFM (SCMM)	609.3 (17.26)	607.8 (17.21)	602.3 (17.06)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5136. (145.4)	8828. (250.0)	5086. (144.0)

HC SAMPLE METER/RANGE/PPM (BAG)	7.7/ 9/ 7.74	3.7/ 9/ 3.68	4.0/ 9/ 3.97
HC BCKGRD METER/RANGE/PPM	3.4/ 2/ 3.45	3.6/ 2/ 3.65	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	18.7/ 12/ 17.92	.4/ 12/ .37	1.1/ 12/ 1.03
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09	.2/ 12/ .19	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	55.0/ 11/ .4275	40.5/ 11/ .2907	51.4/ 11/ .3912
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0419	6.8/ 11/ .0432	6.7/ 11/ .0425
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.9/ 9/ 10.91	6.7/ 9/ 6.69	14.0/ 9/ 13.98
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .13	.3/ 1/ .08	.4/ 1/ .10

DILUTION FACTOR	31.46	46.47	34.53
HC CONCENTRATION PPM	4.40	.11	.33
CO CONCENTRATION PPM	17.26	.18	.55
CO2 CONCENTRATION PCT	.3870	.2484	.3499
NOX CONCENTRATION PPM	10.79	6.62	13.88

HC MASS GRAMS	.398	.018	.029
CO MASS GRAMS	2.923	.054	.093
CO2 MASS GRAMS	1030.42	1137.17	922.71
NOX MASS GRAMS	3.105	3.275	3.957
PM MASS GRAMS	.183	.122	.125
FUEL MASS KG	.352	.386	.314
FUEL ECONOMY MPG (L/100KM)	33.08 (7.11)	32.49 (7.24)	37.57 (6.26)

3-BAG COMPOSITE RESULTS

HC	G/MI	.028	
CO	G/MI	.183	
NOX	G/MI	.917	
PM	G/MI	.036	
FUEL ECONOMY MPG (L/100KM)		33.91 (6.94)	

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 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-US062	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/17/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17902 MILES (28804 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.00 IN HG (736.7 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .989
RELATIVE HUMIDITY 64.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.984
MEASURED DISTANCE MILES (KM)	7.99 (12.86)
BLOWER FLOW RATE SCFM (SCMM)	600.8 (17.01)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6018. (170.4)

HC SAMPLE METER/RANGE/PPM (BAG)	3.2/	9/	3.16
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.5/	11/	.7517
CO2 BCKGRD METER/RANGE/PCT	6.6/	11/	.0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.8/	9/	41.76
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.99
HC CONCENTRATION PPM	-.28
CO CONCENTRATION PPM	.01
CO2 CONCENTRATION PCT	.7121
NOX CONCENTRATION PPM	41.71

HC MASS GRAMS	.000
CO MASS GRAMS	.001
CO2 MASS GRAMS	2222.25
NOX MASS GRAMS	13.442
PM MASS GRAMS	.527
FUEL MASS KG	.755
FUEL ECONOMY MPG (L/100KM)	34.32 (6.86)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.000	
NOX	G/MI	1.682	
PM	G/MI	.066	
FUEL ECONOMY MPG (L/100KM)		34.32 (6.86)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-FTP3	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/18/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17913 MILES (28822 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.95 IN HG (735.4 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.029
RELATIVE HUMIDITY 76.2 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.9	869.6	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.982	.979/.982	.978/.982
MEASURED DISTANCE MILES (KM)	3.59 (5.78)	3.90 (6.27)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	605.2 (17.14)	604.2 (17.11)	600.1 (16.99)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.03)	.93 (.03)	1.04 (.03)
TOTAL FLOW SCF (SCM)	5100. (144.4)	8771. (248.4)	5060. (143.3)

HC SAMPLE METER/RANGE/PPM (BAG)	7.5/ 9/ 7.52	3.8/ 9/ 3.76	3.9/ 9/ 3.94
HC BCKGRD METER/RANGE/PPM	4.1/ 2/ 4.15	4.2/ 2/ 4.25	4.0/ 2/ 4.05
CO SAMPLE METER/RANGE/PPM	18.1/ 12/ 17.34	.0/ 12/ .00	1.2/ 12/ 1.12
CO BCKGRD METER/RANGE/PPM	.5/ 12/ .47	.3/ 12/ .28	.6/ 12/ .56
CO2 SAMPLE METER/RANGE/PCT	55.3/ 11/ .4306	40.8/ 11/ .2933	50.7/ 11/ .3844
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0445	6.9/ 11/ .0438	6.6/ 11/ .0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.4/ 9/ 11.42	7.2/ 9/ 7.17	14.0/ 9/ 14.01
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .13	.7/ 1/ .18	.7/ 1/ .18

DILUTION FACTOR	31.24	46.07	35.15
HC CONCENTRATION PPM	3.50	-.40	.00
CO CONCENTRATION PPM	16.32	-.27	.56
CO2 CONCENTRATION PCT	.3876	.2504	.3437
NOX CONCENTRATION PPM	11.30	7.00	13.84

HC MASS GRAMS	.315	.000	.000
CO MASS GRAMS	2.744	.000	.093
CO2 MASS GRAMS	1024.94	1138.80	901.69
NOX MASS GRAMS	3.210	3.419	3.901
PM MASS GRAMS	.178	.096	.098
FUEL MASS KG	.350	.387	.306
FUEL ECONOMY MPG (L/100KM)	33.31 (7.06)	32.65 (7.21)	38.10 (6.17)

3-BAG COMPOSITE RESULTS

HC	G/MI	.018	
CO	G/MI	.165	
NOX	G/MI	.937	
PM	G/MI	.031	
FUEL ECONOMY MPG (L/100KM)		34.15 (6.89)	

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VEHICLE NUMBER 220	TEST AL-4918-US063	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/18/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17930 MILES (28849 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.96 IN HG (760.9 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.014
RELATIVE HUMIDITY 76.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.975/.982
MEASURED DISTANCE MILES (KM)	7.97 (12.82)
BLOWER FLOW RATE SCFM (SCMM)	622.4 (17.63)
GAS METER FLOW RATE SCFM (SCMM)	.91 (.03)
TOTAL FLOW SCF (SCM)	6243. (176.8)

HC SAMPLE METER/RANGE/PPM (BAG)	3.1/	9/	3.12
HC BCKGRD METER/RANGE/PPM	3.8/	2/	3.85
CO SAMPLE METER/RANGE/PPM	1.1/	12/	1.03
CO BCKGRD METER/RANGE/PPM	.8/	12/	.75
CO2 SAMPLE METER/RANGE/PCT	80.8/	11/	.7417
CO2 BCKGRD METER/RANGE/PCT	6.9/	11/	.0438
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	40.2/	9/	40.16
NOX BCKGRD METER/RANGE/PPM	.1/	2/	.10

DILUTION FACTOR	18.23
HC CONCENTRATION PPM	-.52
CO CONCENTRATION PPM	.30
CO2 CONCENTRATION PCT	.7003
NOX CONCENTRATION PPM	40.06

HC MASS GRAMS	.000
CO MASS GRAMS	.062
CO2 MASS GRAMS	2266.80
NOX MASS GRAMS	13.731
PM MASS GRAMS	.551
FUEL MASS KG	.770
FUEL ECONOMY MPG (L/100KM)	33.56 (7.01)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.008	
NOX	G/MI	1.723	
PM	G/MI	.069	
FUEL ECONOMY MPG (L/100KM)			33.56 (7.01)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-FTP4	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/19/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17941 MILES (28867 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.88 IN HG (733.5 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .989
RELATIVE HUMIDITY 57.7 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.7	870.1	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.89 (6.26)	3.61 (5.81)
BLOWER FLOW RATE SCFM (SCMM)	604.6 (17.12)	603.7 (17.10)	598.9 (16.96)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)	.93 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5093. (144.3)	8768. (248.3)	5050. (143.0)

HC SAMPLE METER/RANGE/PPM (BAG)	7.5/ 9/ 7.54	3.2/ 9/ 3.21	3.4/ 9/ 3.44
HC BCKGRD METER/RANGE/PPM	4.0/ 2/ 4.05	3.9/ 2/ 3.95	4.0/ 2/ 4.05
CO SAMPLE METER/RANGE/PPM	18.7/ 12/ 17.92	.7/ 12/ .66	2.1/ 12/ 1.97
CO BCKGRD METER/RANGE/PPM	.9/ 12/ .84	.7/ 12/ .66	1.5/ 12/ 1.41
CO2 SAMPLE METER/RANGE/PCT	55.8/ 11/ .4358	41.2/ 11/ .2968	51.5/ 11/ .3922
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0432	7.0/ 11/ .0445	6.9/ 11/ .0438
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.7/ 9/ 11.65	6.9/ 9/ 6.86	15.0/ 9/ 15.04
NOX BCKGRD METER/RANGE/PPM	.8/ 1/ .20	.3/ 1/ .08	.2/ 1/ .05

DILUTION FACTOR	30.86	45.53	34.44
HC CONCENTRATION PPM	3.62	-.66	-.49
CO CONCENTRATION PPM	16.63	.01	.58
CO2 CONCENTRATION PCT	.3940	.2533	.3497
NOX CONCENTRATION PPM	11.46	6.78	14.99

HC MASS GRAMS	.325	.000	.000
CO MASS GRAMS	2.793	.003	.096
CO2 MASS GRAMS	1040.63	1151.41	915.58
NOX MASS GRAMS	3.127	3.186	4.057
PM MASS GRAMS	.192	.107	.143
FUEL MASS KG	.355	.391	.311
FUEL ECONOMY MPG (L/100KM)	32.96 (7.14)	32.24 (7.30)	37.64 (6.25)

3-BAG COMPOSITE RESULTS

HC	G/MI	.019	
CO	G/MI	.168	
NOX	G/MI	.912	
PM	G/MI	.036	
FUEL ECONOMY MPG (L/100KM)		33.75 (6.97)	

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 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-4918-US064	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/19/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 17957 MILES (28892 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.88 IN HG (733.5 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .989
RELATIVE HUMIDITY 57.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	599.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.00 (12.87)
BLOWER FLOW RATE SCFM (SCMM)	598.5 (16.95)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	5992. (169.7)

HC SAMPLE METER/RANGE/PPM (BAG)	3.1/	9/	3.08
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.5/	12/	.47
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	82.4/	11/	.7646
CO2 BCKGRD METER/RANGE/PCT	6.6/	11/	.0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.0/	9/	40.99
NOX BCKGRD METER/RANGE/PPM	.4/	1/	.10

DILUTION FACTOR	17.68
HC CONCENTRATION PPM	-.36
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.7251
NOX CONCENTRATION PPM	40.89

HC MASS GRAMS	.000
CO MASS GRAMS	.038
CO2 MASS GRAMS	2252.88
NOX MASS GRAMS	13.131
PM MASS GRAMS	.525
FUEL MASS KG	.766
FUEL ECONOMY MPG (L/100KM)	33.89 (6.94)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.005	
NOX	G/MI	1.642	
PM	G/MI	.066	
FUEL ECONOMY MPG (L/100KM)		33.89 (6.94)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5088-FTP1	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/26/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18168 MILES (29232 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.92 IN HG (734.7 MM HG)	DRY BULB TEMPERATURE 69.0°F (20.6°C)	NOX HUMIDITY C.F. .998
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	870.2	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.980/.983	.979/.983
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.87 (6.23)	3.61 (5.81)
BLOWER FLOW RATE SCFM (SCMM)	611.0 (17.30)	609.7 (17.27)	604.5 (17.12)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.91 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5151. (145.9)	8856. (250.8)	5097. (144.4)

HC SAMPLE METER/RANGE/PPM (BAG)	5.9/ 9/ 5.88	3.5/ 9/ 3.46	3.8/ 9/ 3.78
HC BCKGRD METER/RANGE/PPM	3.7/ 2/ 3.75	3.6/ 2/ 3.65	3.5/ 2/ 3.55
CO SAMPLE METER/RANGE/PPM	12.1/ 12/ 11.51	1.1/ 12/ 1.03	1.7/ 12/ 1.59
CO BCKGRD METER/RANGE/PPM	1.6/ 12/ 1.50	.3/ 12/ .28	1.2/ 12/ 1.12
CO2 SAMPLE METER/RANGE/PCT	57.1/ 11/ .4495	41.0/ 11/ .2950	52.0/ 11/ .3972
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0438	6.8/ 11/ .0432	6.5/ 11/ .0413
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	12.1/ 9/ 12.10	7.1/ 9/ 7.11	12.8/ 9/ 12.84
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	30.02	45.84	34.06
HC CONCENTRATION PPM	2.26	.11	.33
CO CONCENTRATION PPM	9.74	.73	.48
CO2 CONCENTRATION PCT	.4071	.2528	.3571
NOX CONCENTRATION PPM	12.05	7.08	12.82

HC MASS GRAMS	.190	.000	.028
CO MASS GRAMS	1.655	.214	.081
CO2 MASS GRAMS	1087.33	1160.81	943.85
NOX MASS GRAMS	3.354	3.389	3.530
PM MASS GRAMS	.382	.217	.305
FUEL MASS KG	.343	.365	.297
FUEL ECONOMY MPG (L/100KM)	33.53 (7.02)	33.79 (6.96)	38.76 (6.07)

3-BAG COMPOSITE RESULTS

HC	G/MI	.013	
CO	G/MI	.130	
NOX	G/MI	.915	
PM	G/MI	.074	
FUEL ECONOMY MPG (L/100KM)		35.00 (6.72)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
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VEHICLE NUMBER 220	TEST AL-5088-US061	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/26/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18185 MILES (29259 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.93 IN HG (734.9 MM HG)	DRY BULB TEMPERATURE 69.0°F (20.6°C)	NOX HUMIDITY C.F. .997
RELATIVE HUMIDITY 67.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.3
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.02 (12.90)
BLOWER FLOW RATE SCFM (SCMM)	603.6 (17.09)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6028. (170.7)

HC SAMPLE METER/RANGE/PPM (BAG)	2.9/	9/	2.91
HC BCKGRD METER/RANGE/PPM	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	1.0/	12/	.94
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	82.5/	11/	.7661
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	40.1/	9/	40.06
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.67
HC CONCENTRATION PPM	-.34
CO CONCENTRATION PPM	.64
CO2 CONCENTRATION PCT	.7290
NOX CONCENTRATION PPM	40.01

HC MASS GRAMS	.000
CO MASS GRAMS	.128
CO2 MASS GRAMS	2278.25
NOX MASS GRAMS	13.028
PM MASS GRAMS	1.039
FUEL MASS KG	.717
FUEL ECONOMY MPG (L/100KM)	35.64 (6.60)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.016	
NOX	G/MI	1.625	
PM	G/MI	.130	
FUEL ECONOMY MPG (L/100KM)		35.64 (6.60)	

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5088-FTP2	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/27/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18196 MILES (29277 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.97 IN HG (735.8 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.8	869.9	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.62 (5.82)	3.90 (6.28)	3.64 (5.86)
BLOWER FLOW RATE SCFM (SCMM)	612.4 (17.34)	611.2 (17.31)	603.7 (17.10)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5160. (146.1)	8875. (251.3)	5091. (144.2)

HC SAMPLE METER/RANGE/PPM (BAG)	5.8/ 9/ 5.78	3.1/ 9/ 3.10	3.2/ 9/ 3.22
HC BCKGRD METER/RANGE/PPM	3.2/ 2/ 3.24	3.1/ 2/ 3.14	3.2/ 2/ 3.24
CO SAMPLE METER/RANGE/PPM	11.6/ 12/ 11.03	.7/ 12/ .66	1.0/ 12/ .94
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .37	.4/ 12/ .37	.6/ 12/ .56
CO2 SAMPLE METER/RANGE/PCT	56.7/ 11/ .4452	40.5/ 11/ .2907	51.8/ 11/ .3952
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406	6.4/ 11/ .0406	6.3/ 11/ .0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	12.5/ 9/ 12.53	7.3/ 9/ 7.32	13.4/ 9/ 13.37
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	30.31	46.53	34.24
HC CONCENTRATION PPM	2.64	.02	.07
CO CONCENTRATION PPM	10.37	.28	.38
CO2 CONCENTRATION PCT	.4060	.2510	.3564
NOX CONCENTRATION PPM	12.50	7.29	13.35

HC MASS GRAMS	.222	.004	.006
CO MASS GRAMS	1.764	.082	.063
CO2 MASS GRAMS	1086.15	1154.84	940.75
NOX MASS GRAMS	3.480	3.491	3.665
PM MASS GRAMS	.376	.202	.294
FUEL MASS KG	.343	.364	.296
FUEL ECONOMY MPG (L/100KM)	33.66 (6.99)	34.22 (6.87)	39.20 (6.00)

3-BAG COMPOSITE RESULTS

HC	G/MI	.014	
CO	G/MI	.116	
NOX	G/MI	.939	
PM	G/MI	.071	
FUEL ECONOMY MPG (L/100KM)		35.38 (6.65)	

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VEHICLE NUMBER 220	TEST AL-5088-US062	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/27/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18214 MILES (29306 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.95 IN HG (735.4 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.04 (12.93)
BLOWER FLOW RATE SCFM (SCMM)	603.7 (17.10)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6046. (171.2)

HC SAMPLE METER/RANGE/PPM (BAG)	2.9/	9/	2.92
HC BCKGRD METER/RANGE/PPM	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	1.1/	12/	1.03
CO BCKGRD METER/RANGE/PPM	1.0/	12/	.94
CO2 SAMPLE METER/RANGE/PCT	82.5/	11/	.7661
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.6/	9/	41.60
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.67
HC CONCENTRATION PPM	-.62
CO CONCENTRATION PPM	.13
CO2 CONCENTRATION PCT	.7278
NOX CONCENTRATION PPM	41.55

HC MASS GRAMS	.000
CO MASS GRAMS	.026
CO2 MASS GRAMS	2281.48
NOX MASS GRAMS	13.554
PM MASS GRAMS	1.053
FUEL MASS KG	.718
FUEL ECONOMY MPG (L/100KM)	35.70 (6.59)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.003	
NOX	G/MI	1.686	
PM	G/MI	.131	
FUEL ECONOMY MPG (L/100KM)		35.70 (6.59)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5088-FTP3	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/30/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18254 MILES (29370 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.14 IN HG (740.2 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .993
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.7	869.8	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.58 (5.76)	3.84 (6.18)	3.59 (5.77)
BLOWER FLOW RATE SCFM (SCMM)	615.8 (17.44)	613.6 (17.38)	608.1 (17.22)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5187. (146.9)	8908. (252.3)	5128. (145.2)

HC SAMPLE METER/RANGE/PPM (BAG)	5.7/	9/	5.74	3.3/	9/	3.28	3.5/	9/	3.46
HC BCKGRD METER/RANGE/PPM	3.8/	2/	3.85	3.8/	2/	3.85	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	11.3/	12/	10.74	.5/	12/	.47	3.6/	12/	3.39
CO BCKGRD METER/RANGE/PPM	.5/	12/	.47	.7/	12/	.66	.9/	12/	.84
CO2 SAMPLE METER/RANGE/PCT	55.6/	11/	.4337	39.6/	11/	.2830	50.9/	11/	.3863
CO2 BCKGRD METER/RANGE/PCT	6.6/	11/	.0419	6.6/	11/	.0419	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.7/	9/	11.68	6.7/	9/	6.74	12.7/	9/	12.74
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05	.1/	1/	.03	.1/	1/	.03

DILUTION FACTOR	31.11	47.80	35.00
HC CONCENTRATION PPM	2.01	-.49	-.18
CO CONCENTRATION PPM	10.00	-.17	2.49
CO2 CONCENTRATION PCT	.3932	.2419	.3469
NOX CONCENTRATION PPM	11.63	6.72	12.71

HC MASS GRAMS	.170	.000	.000
CO MASS GRAMS	1.710	.000	.421
CO2 MASS GRAMS	1057.46	1117.54	922.29
NOX MASS GRAMS	3.246	3.221	3.507
PM MASS GRAMS	.393	.201	.302
FUEL MASS KG	.334	.352	.290
FUEL ECONOMY MPG (L/100KM)	34.22 (6.88)	34.81 (6.76)	39.39 (5.97)

3-BAG COMPOSITE RESULTS

HC	G/MI	.010	
CO	G/MI	.131	
NOX	G/MI	.891	
PM	G/MI	.073	
FUEL ECONOMY MPG (L/100KM)		35.86 (6.56)	

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VEHICLE NUMBER 220	TEST AL-5088-US063	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/30/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18272 MILES (29399 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.13 IN HG (739.8 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .994
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.01 (12.88)
BLOWER FLOW RATE SCFM (SCMM)	607.8 (17.21)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6087. (172.4)

HC SAMPLE METER/RANGE/PPM (BAG)	2.9/	9/	2.91
HC BCKGRD METER/RANGE/PPM	3.3/	2/	3.34
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.5/	12/	.47
CO2 SAMPLE METER/RANGE/PCT	82.0/	11/	.7589
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.0/	9/	37.01
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	17.84
HC CONCENTRATION PPM	-.24
CO CONCENTRATION PPM	-.07
CO2 CONCENTRATION PCT	.7211
NOX CONCENTRATION PPM	36.99

HC MASS GRAMS	.000
CO MASS GRAMS	.000
CO2 MASS GRAMS	2276.09
NOX MASS GRAMS	12.116
PM MASS GRAMS	1.069
FUEL MASS KG	.716
FUEL ECONOMY MPG (L/100KM)	35.63 (6.60)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.000
NOX G/MI	1.514
PM G/MI	.133
FUEL ECONOMY MPG (L/100KM)	35.63 (6.60)

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COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5018-FTP1	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/20/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 17997 MILES (28957 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.99 IN HG (736.3 MM HG) DRY BULB TEMPERATURE 71.0°F (21.7°C) NOX HUMIDITY C.F. .981
RELATIVE HUMIDITY 60.5 PCT.

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.6	870.2	505.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.981/.984	.980/.984
MEASURED DISTANCE MILES (KM)	3.63 (5.84)	3.88 (6.25)	3.64 (5.86)
BLOWER FLOW RATE SCFM (SCMM)	607.4 (17.20)	606.1 (17.16)	601.0 (17.02)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5116. (144.9)	8803. (249.3)	5066. (143.5)

HC SAMPLE METER/RANGE/PPM (BAG)	5.5/ 9/ 5.50	3.4/ 9/ 3.39	1.6/ 9/ 1.56
HC BCKGRD METER/RANGE/PPM	3.7/ 2/ 3.75	3.6/ 2/ 3.65	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	10.6/ 12/ 10.07	.8/ 12/ .75	.3/ 12/ .28
CO BCKGRD METER/RANGE/PPM	.5/ 12/ .47	1.0/ 12/ .94	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	57.2/ 11/ .4505	41.2/ 11/ .2968	52.0/ 11/ .3972
CO2 BCKGRD METER/RANGE/PCT	6.1/ 11/ .0387	6.2/ 11/ .0393	6.0/ 11/ .0380
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	13.5/ 9/ 13.51	7.5/ 9/ 7.51	41.8/ 9/ 41.76
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.3/ 1/ .08	.2/ 1/ .05

DILUTION FACTOR	29.93	45.52	34.05
HC CONCENTRATION PPM	1.88	-.18	-2.08
CO CONCENTRATION PPM	9.34	-.17	.01
CO2 CONCENTRATION PCT	.4131	.2583	.3602
NOX CONCENTRATION PPM	13.43	7.44	41.71

HC MASS GRAMS	.169	.000	.000
CO MASS GRAMS	1.575	.000	.001
CO2 MASS GRAMS	1095.87	1179.05	946.28
NOX MASS GRAMS	3.652	3.479	11.229
PM MASS GRAMS	.222	.119	.154
FUEL MASS KG	.373	.401	.322
FUEL ECONOMY MPG (L/100KM)	31.53 (7.46)	31.45 (7.48)	36.75 (6.40)

3-BAG COMPOSITE RESULTS

HC	G/MI	.010
CO	G/MI	.090
NOX	G/MI	1.522
PM	G/MI	.040
FUEL ECONOMY MPG (L/100KM)		32.81 (7.17)

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 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5018-US061	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/20/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18015 MILES (28986 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.96 IN HG (761.1 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .969
RELATIVE HUMIDITY 60.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.985
MEASURED DISTANCE MILES (KM)	8.11 (13.05)
BLOWER FLOW RATE SCFM (SCMM)	622.8 (17.64)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)
TOTAL FLOW SCF (SCM)	6238. (176.7)

HC SAMPLE METER/RANGE/PPM (BAG)	3.0/	9/	3.00
HC BCKGRD METER/RANGE/PPM	3.5/	2/	3.55
CO SAMPLE METER/RANGE/PPM	.5/	12/	.47
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	82.6/	11/	.7675
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.8/	9/	41.76
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08

DILUTION FACTOR	17.62
HC CONCENTRATION PPM	-.35
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.7304
NOX CONCENTRATION PPM	41.69

HC MASS GRAMS	.000
CO MASS GRAMS	.057
CO2 MASS GRAMS	2362.36
NOX MASS GRAMS	13.641
PM MASS GRAMS	.523
FUEL MASS KG	.803
FUEL ECONOMY MPG (L/100KM)	32.76 (7.18)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.007
NOX G/MI	1.682
PM G/MI	.064
FUEL ECONOMY MPG (L/100KM)	32.76 (7.18)

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5018-FTP2	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/23/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18054 MILES (29048 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.19 IN HG (741.3 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.002
RELATIVE HUMIDITY 71.7 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	869.9	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.980/.983	.979/.983
MEASURED DISTANCE MILES (KM)	3.62 (5.83)	3.87 (6.22)	3.57 (5.74)
BLOWER FLOW RATE SCFM (SCMM)	615.7 (17.44)	614.8 (17.41)	610.1 (17.28)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5190. (147.0)	8926. (252.8)	5145. (145.7)

HC SAMPLE METER/RANGE/PPM (BAG)	5.8/	9/	5.81	3.5/	9/	3.55	3.8/	9/	3.79
HC BCKGRD METER/RANGE/PPM	3.8/	2/	3.85	3.8/	2/	3.85	3.8/	2/	3.85
CO SAMPLE METER/RANGE/PPM	10.5/	12/	9.97	.3/	12/	.28	.7/	12/	.66
CO BCKGRD METER/RANGE/PPM	.5/	12/	.47	.2/	12/	.19	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	57.4/	11/	.4527	41.3/	11/	.2976	51.7/	11/	.3942
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406	6.5/	11/	.0413	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	13.6/	9/	13.63	7.6/	9/	7.61	15.4/	9/	15.37
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03	.0/	1/	.00	.0/	1/	.00

DILUTION FACTOR	29.79	45.39	34.28
HC CONCENTRATION PPM	2.09	-.22	.05
CO CONCENTRATION PPM	9.21	.09	.37
CO2 CONCENTRATION PCT	.4134	.2573	.3548
NOX CONCENTRATION PPM	13.61	7.61	15.37

HC MASS GRAMS	.191	.000	.004
CO MASS GRAMS	1.576	.028	.063
CO2 MASS GRAMS	1112.54	1190.85	946.39
NOX MASS GRAMS	3.832	3.686	4.291
PM MASS GRAMS	.208	.111	.051
FUEL MASS KG	.379	.405	.322
FUEL ECONOMY MPG (L/100KM)	31.00 (7.59)	30.98 (7.59)	35.96 (6.54)

3-BAG COMPOSITE RESULTS

HC	G/MI	.011	
CO	G/MI	.099	
NOX	G/MI	1.044	
PM	G/MI	.031	
FUEL ECONOMY MPG (L/100KM)		32.24 (7.30)	

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VEHICLE NUMBER 220	TEST AL-5018-US062	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/23/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18072 MILES (29077 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.2 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.002
RELATIVE HUMIDITY 71.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	7.98 (12.84)
BLOWER FLOW RATE SCFM (SCMM)	608.6 (17.24)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6097. (172.7)

HC SAMPLE METER/RANGE/PPM (BAG)	3.1/	9/	3.10
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	82.4/	11/	.7646
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	42.8/	9/	42.77
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	17.69
HC CONCENTRATION PPM	-.34
CO CONCENTRATION PPM	.10
CO2 CONCENTRATION PCT	.7263
NOX CONCENTRATION PPM	42.75

HC MASS GRAMS	.000
CO MASS GRAMS	.020
CO2 MASS GRAMS	2296.06
NOX MASS GRAMS	14.142
PM MASS GRAMS	.555
FUEL MASS KG	.780
FUEL ECONOMY MPG (L/100KM)	33.18 (7.09)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.003
NOX G/MI	1.772
PM G/MI	.070
FUEL ECONOMY MPG (L/100KM)	33.18 (7.09)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5018-FTP3	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/24/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18083 MILES (29095 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.3 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .971
RELATIVE HUMIDITY 57.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.2	869.8	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.982/.984	.981/.984
MEASURED DISTANCE MILES (KM)	3.62 (5.82)	3.89 (6.25)	3.58 (5.76)
BLOWER FLOW RATE SCFM (SCMM)	617.5 (17.49)	615.8 (17.44)	610.4 (17.29)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5197. (147.2)	8941. (253.2)	5147. (145.8)

HC SAMPLE METER/RANGE/PPM (BAG)	6.9/ 9/ 6.95	4.6/ 9/ 4.62	4.3/ 9/ 4.32
HC BCKGRD METER/RANGE/PPM	5.8/ 2/ 5.87	4.8/ 2/ 4.86	3.8/ 2/ 3.85
CO SAMPLE METER/RANGE/PPM	8.3/ 12/ 7.86	.3/ 12/ .28	.4/ 12/ .37
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28	.2/ 12/ .19	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	57.5/ 11/ .4537	41.7/ 11/ .3011	51.5/ 11/ .3922
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406	6.5/ 11/ .0413	6.4/ 11/ .0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	14.0/ 9/ 14.02	8.2/ 9/ 8.15	14.7/ 9/ 14.72
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	29.72	44.85	34.45
HC CONCENTRATION PPM	1.28	-.13	.59
CO CONCENTRATION PPM	7.38	.09	-.08
CO2 CONCENTRATION PCT	.4145	.2608	.3528
NOX CONCENTRATION PPM	13.98	8.13	14.69

HC MASS GRAMS	.117	.000	.053
CO MASS GRAMS	1.265	.028	.000
CO2 MASS GRAMS	1116.78	1209.04	941.45
NOX MASS GRAMS	3.820	3.822	3.977
PM MASS GRAMS	.217	.109	.116
FUEL MASS KG	.380	.411	.320
FUEL ECONOMY MPG (L/100KM)	30.87 (7.62)	30.68 (7.67)	36.30 (6.48)

3-BAG COMPOSITE RESULTS

HC	G/MI	.011	
CO	G/MI	.076	
NOX	G/MI	1.033	
PM	G/MI	.036	
FUEL ECONOMY MPG (L/100KM)		32.12 (7.32)	

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VEHICLE NUMBER 220	TEST AL-5018-US063	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/24/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18100 MILES (29122 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.19 IN HG (741.4 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .971
RELATIVE HUMIDITY 57.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	7.98 (12.84)
BLOWER FLOW RATE SCFM (SCMM)	609.2 (17.25)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6103. (172.8)

HC SAMPLE METER/RANGE/PPM (BAG)	3.3/	9/	3.27
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.9/	12/	.84
CO2 SAMPLE METER/RANGE/PCT	79.6/	11/	.7248
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	40.8/	9/	40.77
NOX BCKGRD METER/RANGE/PPM	.4/	1/	.10

DILUTION FACTOR	18.66
HC CONCENTRATION PPM	-.18
CO CONCENTRATION PPM	-.60
CO2 CONCENTRATION PCT	.6876
NOX CONCENTRATION PPM	40.68

HC MASS GRAMS	.000
CO MASS GRAMS	.000
CO2 MASS GRAMS	2175.94
NOX MASS GRAMS	13.057
PM MASS GRAMS	.503
FUEL MASS KG	.739
FUEL ECONOMY MPG (L/100KM)	34.99 (6.72)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000
CO	G/MI	.000
NOX	G/MI	1.637
PM	G/MI	.063
FUEL ECONOMY MPG (L/100KM)		34.99 (6.72)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5018-FTP4	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/25/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18111 MILES (29140 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.08 IN HG (738.6 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .973
RELATIVE HUMIDITY 57.1 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT
	(0-505 SEC.)	(505-1372 SEC.)	(0- 505 SEC.)
RUN TIME SECONDS	504.9	869.8	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.982/.984	.981/.984
MEASURED DISTANCE MILES (KM)	3.63 (5.84)	3.87 (6.23)	3.62 (5.83)
BLOWER FLOW RATE SCFM (SCMM)	612.3 (17.34)	612.3 (17.34)	607.8 (17.21)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5160. (146.1)	8890. (251.8)	5125. (145.2)

HC SAMPLE METER/RANGE/PPM (BAG)	5.7/	9/	5.69	3.8/	9/	3.75	4.0/	9/	4.02
HC BCKGRD METER/RANGE/PPM	3.5/	2/	3.55	3.5/	2/	3.55	3.2/	2/	3.24
CO SAMPLE METER/RANGE/PPM	10.2/	12/	9.68	1.4/	12/	1.31	.7/	12/	.66
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28	.9/	12/	.84	.4/	12/	.37
CO2 SAMPLE METER/RANGE/PCT	57.0/	11/	.4484	40.7/	11/	.2924	51.5/	11/	.3922
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406	6.4/	11/	.0406	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	13.4/	9/	13.42	7.7/	9/	7.68	14.3/	9/	14.31
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08	.1/	1/	.03	.1/	1/	.03

DILUTION FACTOR	30.07	46.18	34.45
HC CONCENTRATION PPM	2.26	.28	.87
CO CONCENTRATION PPM	9.15	.47	.28
CO2 CONCENTRATION PCT	.4092	.2527	.3528
NOX CONCENTRATION PPM	13.35	7.65	14.29

HC MASS GRAMS	.205	.044	.079
CO MASS GRAMS	1.557	.138	.048
CO2 MASS GRAMS	1094.67	1164.74	937.53
NOX MASS GRAMS	3.628	3.582	3.857
PM MASS GRAMS	.199	.089	.135
FUEL MASS KG	.373	.396	.319
FUEL ECONOMY MPG (L/100KM)	31.56 (7.45)	31.69 (7.42)	36.85 (6.38)

3-BAG COMPOSITE RESULTS

HC	G/MI	.024
CO	G/MI	.111
NOX	G/MI	.980
PM	G/MI	.034
FUEL ECONOMY MPG (L/100KM)		32.98 (7.13)

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VEHICLE NUMBER 220	TEST AL-5018-US064	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 9/25/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18129 MILES (29169 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.09 IN HG (738.8 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .972
RELATIVE HUMIDITY 57.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.3
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	8.04 (12.94)
BLOWER FLOW RATE SCFM (SCMM)	606.4 (17.17)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6076. (172.1)

HC SAMPLE METER/RANGE/PPM (BAG)	3.1/	9/	3.14
HC BCKGRD METER/RANGE/PPM	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	.9/	12/	.84
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	82.5/	11/	.7661
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.2/	9/	41.17
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.65
HC CONCENTRATION PPM	-.11
CO CONCENTRATION PPM	.64
CO2 CONCENTRATION PCT	.7284
NOX CONCENTRATION PPM	41.12

HC MASS GRAMS	.000
CO MASS GRAMS	.129
CO2 MASS GRAMS	2294.66
NOX MASS GRAMS	13.159
PM MASS GRAMS	.545
FUEL MASS KG	.780
FUEL ECONOMY MPG (L/100KM)	33.44 (7.04)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.016
NOX G/MI	1.637
PM G/MI	.068
FUEL ECONOMY MPG (L/100KM)	33.44 (7.04)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5188-FTP1	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 2/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18316 MILES (29470 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.07 IN HG (738.3 MM HG)	DRY BULB TEMPERATURE 73.0pF (22.8pC)	NOX HUMIDITY C.F. .987
RELATIVE HUMIDITY 57.7 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.6	869.9	504.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.981/.984	.980/.984
MEASURED DISTANCE MILES (KM)	3.60 (5.79)	3.84 (6.18)	3.59 (5.78)
BLOWER FLOW RATE SCFM (SCMM)	613.8 (17.38)	613.5 (17.38)	608.4 (17.23)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5169. (146.4)	8908. (252.3)	5127. (145.2)

HC SAMPLE METER/RANGE/PPM (BAG)	7.0/ 9/ 7.05	4.0/ 9/ 4.03	4.2/ 9/ 4.15
HC BCKGRD METER/RANGE/PPM	3.9/ 2/ 3.95	3.8/ 2/ 3.85	3.9/ 2/ 3.95
CO SAMPLE METER/RANGE/PPM	14.6/ 12/ 13.93	1.1/ 12/ 1.03	2.6/ 12/ 2.44
CO BCKGRD METER/RANGE/PPM	.9/ 12/ .84	.3/ 12/ .28	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	54.5/ 11/ .4224	39.0/ 11/ .2779	49.3/ 11/ .3708
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406	6.4/ 11/ .0406	6.2/ 11/ .0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.1/ 9/ 10.14	6.2/ 9/ 6.22	12.5/ 9/ 12.52
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.2/ 1/ .05	.2/ 1/ .05

DILUTION FACTOR	31.91	48.66	36.46
HC CONCENTRATION PPM	3.22	.26	.31
CO CONCENTRATION PPM	12.76	.74	1.93
CO2 CONCENTRATION PCT	.3830	.2381	.3326
NOX CONCENTRATION PPM	10.09	6.17	12.47

HC MASS GRAMS	.271	.037	.026
CO MASS GRAMS	2.175	.216	.327
CO2 MASS GRAMS	1026.69	1099.69	884.09
NOX MASS GRAMS	2.788	2.936	3.417
PM MASS GRAMS	.347	.179	.250
FUEL MASS KG	.324	.346	.278
FUEL ECONOMY MPG (L/100KM)	35.38 (6.65)	35.36 (6.65)	41.13 (5.72)

3-BAG COMPOSITE RESULTS

HC	G/MI	.023
CO	G/MI	.180
NOX	G/MI	.818
PM	G/MI	.063
FUEL ECONOMY MPG (L/100KM)		36.83 (6.39)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5188-US061	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 2/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18333 MILES (29497 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.06 IN HG (738.0 MM HG)	DRY BULB TEMPERATURE 73.0pF (22.8pC)	NOX HUMIDITY C.F. .987
RELATIVE HUMIDITY 57.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	7.99 (12.85)
BLOWER FLOW RATE SCFM (SCMM)	606.9 (17.19)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6079. (172.2)

HC SAMPLE METER/RANGE/PPM (BAG)	3.7/	9/	3.65
HC BCKGRD METER/RANGE/PPM	3.8/	2/	3.85
CO SAMPLE METER/RANGE/PPM	.8/	12/	.75
CO BCKGRD METER/RANGE/PPM	.7/	12/	.66
CO2 SAMPLE METER/RANGE/PCT	80.9/	11/	.7432
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.6/	9/	36.59
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	18.21
HC CONCENTRATION PPM	.02
CO CONCENTRATION PPM	.12
CO2 CONCENTRATION PCT	.7060
NOX CONCENTRATION PPM	36.54

HC MASS GRAMS	.002
CO MASS GRAMS	.023
CO2 MASS GRAMS	2225.11
NOX MASS GRAMS	11.871
PM MASS GRAMS	1.116
FUEL MASS KG	.700
FUEL ECONOMY MPG (L/100KM)	36.38 (6.47)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.003	
NOX	G/MI	1.486	
PM	G/MI	.140	
FUEL ECONOMY MPG (L/100KM)		36.38 (6.47)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5188-FTP2	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 3/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18344 MILES (29515 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.98 IN HG (736.0 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 61.0 PCT.		

	1 COLD TRANSIENT (0-505 SEC.)	2 STABILIZED (505-1372 SEC.)	3 HOT TRANSIENT (0- 505 SEC.)
BAG NUMBER	1	2	3
BAG DESCRIPTION			
RUN TIME SECONDS	504.4	870.4	505.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.60 (5.80)	3.87 (6.22)	3.62 (5.83)
BLOWER FLOW RATE SCFM (SCMM)	610.5 (17.29)	608.0 (17.22)	605.3 (17.14)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5140. (145.6)	8833. (250.1)	5102. (144.5)

HC SAMPLE METER/RANGE/PPM (BAG)	6.4/	9/	6.37	3.3/	9/	3.34	3.5/	9/	3.54
HC BCKGRD METER/RANGE/PPM	3.9/	2/	3.95	3.8/	2/	3.85	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	14.7/	12/	14.03	1.1/	12/	1.03	3.1/	12/	2.91
CO BCKGRD METER/RANGE/PPM	.4/	12/	.37	.5/	12/	.47	1.4/	12/	1.31
CO2 SAMPLE METER/RANGE/PCT	55.0/	11/	.4275	40.1/	11/	.2873	50.7/	11/	.3844
CO2 BCKGRD METER/RANGE/PCT	6.6/	11/	.0419	6.7/	11/	.0425	6.6/	11/	.0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.6/	9/	10.62	7.0/	9/	6.97	12.7/	9/	12.74
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08	.3/	1/	.08	.3/	1/	.08

DILUTION FACTOR	31.53	47.08	35.18
HC CONCENTRATION PPM	2.54	.43	.10
CO CONCENTRATION PPM	13.28	.56	1.59
CO2 CONCENTRATION PCT	.3870	.2456	.3437
NOX CONCENTRATION PPM	10.55	6.90	12.66

HC MASS GRAMS	.213	.000	.000
CO MASS GRAMS	2.251	.162	.267
CO2 MASS GRAMS	1031.29	1124.86	909.17
NOX MASS GRAMS	2.923	3.285	3.484
PM MASS GRAMS	.342	.205	.278
FUEL MASS KG	.326	.354	.286
FUEL ECONOMY MPG (L/100KM)	35.25 (6.67)	34.82 (6.76)	40.36 (5.83)

3-BAG COMPOSITE RESULTS

HC	G/MI	.012	
CO	G/MI	.172	
NOX	G/MI	.873	
PM	G/MI	.068	
FUEL ECONOMY MPG (L/100KM)		36.32 (6.48)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5188-US062	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 3/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18362 MILES (29544 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.97 IN HG (735.8 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .996
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	599.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	7.99 (12.85)
BLOWER FLOW RATE SCFM (SCMM)	604.8 (17.13)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6056. (171.5)

HC SAMPLE METER/RANGE/PPM (BAG)	3.4/	9/	3.39
HC BCKGRD METER/RANGE/PPM	4.0/	2/	4.05
CO SAMPLE METER/RANGE/PPM	.3/	12/	.28
CO BCKGRD METER/RANGE/PPM	.8/	12/	.75
CO2 SAMPLE METER/RANGE/PCT	81.4/	11/	.7503
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.0/	9/	35.98
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08

DILUTION FACTOR	18.04
HC CONCENTRATION PPM	-.44
CO CONCENTRATION PPM	-.42
CO2 CONCENTRATION PCT	.7119
NOX CONCENTRATION PPM	35.91

HC MASS GRAMS	.000
CO MASS GRAMS	.000
CO2 MASS GRAMS	2235.38
NOX MASS GRAMS	11.729
PM MASS GRAMS	1.156
FUEL MASS KG	.704
FUEL ECONOMY MPG (L/100KM)	36.19 (6.50)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.000	
NOX	G/MI	1.469	
PM	G/MI	.145	
FUEL ECONOMY MPG (L/100KM)		36.19 (6.50)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5188-FTP3	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 4/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18371 MILES (29558 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.03 IN HG (737.3 MM HG)	DRY BULB TEMPERATURE 68.0°F (20.0°C)	NOX HUMIDITY C.F. 1.004
RELATIVE HUMIDITY 71.7 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	870.5	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.980/.983	.979/.983
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.88 (6.25)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	612.7 (17.35)	611.4 (17.32)	606.3 (17.17)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)	.92 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5164. (146.3)	8884. (251.6)	5112. (144.8)

HC SAMPLE METER/RANGE/PPM (BAG)	6.7/	9/	6.72	3.5/	9/	3.51	3.7/	9/	3.70
HC BCKGRD METER/RANGE/PPM	3.1/	2/	3.14	3.2/	2/	3.24	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	16.3/	12/	15.58	.4/	12/	.37	2.5/	12/	2.35
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19	.3/	12/	.28	.6/	12/	.56
CO2 SAMPLE METER/RANGE/PCT	54.8/	11/	.4255	39.3/	11/	.2804	50.0/	11/	.3776
CO2 BCKGRD METER/RANGE/PCT	6.5/	11/	.0413	6.6/	11/	.0419	6.7/	11/	.0425
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.5/	9/	10.51	6.8/	9/	6.80	12.8/	9/	12.77
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08	.3/	1/	.08	.2/	1/	.05

DILUTION FACTOR	31.67	48.24	35.82
HC CONCENTRATION PPM	3.68	.33	.35
CO CONCENTRATION PPM	14.92	.10	1.74
CO2 CONCENTRATION PCT	.3855	.2394	.3362
NOX CONCENTRATION PPM	10.44	6.72	12.73

HC MASS GRAMS	.310	.048	.029
CO MASS GRAMS	2.540	.028	.294
CO2 MASS GRAMS	1032.30	1102.70	891.08
NOX MASS GRAMS	2.932	3.249	3.538
PM MASS GRAMS	.386	.195	.302
FUEL MASS KG	.326	.347	.281
FUEL ECONOMY MPG (L/100KM)	35.22 (6.68)	35.66 (6.60)	40.91 (5.75)

3-BAG COMPOSITE RESULTS

HC	G/MI	.026	
CO	G/MI	.172	
NOX	G/MI	.872	
PM	G/MI	.071	
FUEL ECONOMY MPG (L/100KM)		36.91 (6.37)	

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VEHICLE NUMBER 220	TEST AL-5188-US063	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 4/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18388 MILES (29586 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.04 IN HG (737.7 MM HG)	DRY BULB TEMPERATURE 68.0pF (20.0pC)	NOX HUMIDITY C.F. 1.004
RELATIVE HUMIDITY 71.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.01 (12.89)
BLOWER FLOW RATE SCFM (SCMM)	606.5 (17.18)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6074. (172.0)

HC SAMPLE METER/RANGE/PPM (BAG)	2.9/	9/	2.94
HC BCKGRD METER/RANGE/PPM	3.2/	2/	3.24
CO SAMPLE METER/RANGE/PPM	2.0/	12/	1.88
CO BCKGRD METER/RANGE/PPM	1.0/	12/	.94
CO2 SAMPLE METER/RANGE/PCT	81.0/	11/	.7446
CO2 BCKGRD METER/RANGE/PCT	6.7/	11/	.0425
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.1/	9/	37.10
NOX BCKGRD METER/RANGE/PPM	.4/	1/	.10

DILUTION FACTOR	18.18
HC CONCENTRATION PPM	-.13
CO CONCENTRATION PPM	.94
CO2 CONCENTRATION PCT	.7044
NOX CONCENTRATION PPM	37.00

HC MASS GRAMS	.000
CO MASS GRAMS	.189
CO2 MASS GRAMS	2218.33
NOX MASS GRAMS	12.219
PM MASS GRAMS	1.080
FUEL MASS KG	.698
FUEL ECONOMY MPG (L/100KM)	36.57 (6.43)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.024
NOX G/MI	1.526
PM G/MI	.135
FUEL ECONOMY MPG (L/100KM)	36.57 (6.43)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5118-FTP1	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 7/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18427 MILES (29649 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.2 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. 1.009
RELATIVE HUMIDITY 68.2 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.8	870.1	504.8
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.983	.980/.983	.979/.983
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.89 (6.26)	3.62 (5.82)
BLOWER FLOW RATE SCFM (SCMM)	616.3 (17.45)	614.6 (17.41)	609.6 (17.26)
GAS METER FLOW RATE SCFM (SCMM)	.90 (.03)	.93 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5193. (147.1)	8926. (252.8)	5136. (145.5)

HC SAMPLE METER/RANGE/PPM (BAG)	6.6/ 9/ 6.56	3.6/ 9/ 3.55	3.8/ 9/ 3.77
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.55	3.4/ 2/ 3.45	3.4/ 2/ 3.45
CO SAMPLE METER/RANGE/PPM	16.0/ 12/ 15.29	.8/ 12/ .75	.5/ 12/ .47
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.2/ 12/ .19	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	54.6/ 11/ .4234	39.7/ 11/ .2838	50.4/ 11/ .3815
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406	6.4/ 11/ .0406	6.3/ 11/ .0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.8/ 9/ 11.80	7.0/ 9/ 7.00	13.7/ 9/ 13.69
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.2/ 1/ .05	.1/ 1/ .03

DILUTION FACTOR	31.79	47.59	35.43
HC CONCENTRATION PPM	3.13	.18	.42
CO CONCENTRATION PPM	14.65	.55	-.17
CO2 CONCENTRATION PCT	.3841	.2441	.3426
NOX CONCENTRATION PPM	11.76	6.95	13.66

HC MASS GRAMS	.286	.028	.038
CO MASS GRAMS	2.508	.162	.000
CO2 MASS GRAMS	1034.14	1129.56	912.41
NOX MASS GRAMS	3.335	3.391	3.833
PM MASS GRAMS	.183	.114	.138
FUEL MASS KG	.353	.384	.310
FUEL ECONOMY MPG (L/100KM)	33.14 (7.10)	32.85 (7.16)	37.82 (6.22)

3-BAG COMPOSITE RESULTS

HC	G/MI	.023	
CO	G/MI	.165	
NOX	G/MI	.935	
PM	G/MI	.036	
FUEL ECONOMY MPG (L/100KM)		34.18 (6.88)	

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 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5118-US061	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 7/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18445 MILES (29678 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.3 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. 1.009
RELATIVE HUMIDITY 68.2 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.03 (12.92)
BLOWER FLOW RATE SCFM (SCMM)	609.6 (17.26)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6104. (172.9)

HC SAMPLE METER/RANGE/PPM (BAG)	3.0/	9/	3.03
HC BCKGRD METER/RANGE/PPM	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	1.3/	12/	1.22
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	80.3/	11/	.7347
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	38.4/	9/	38.35
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.40
HC CONCENTRATION PPM	-.23
CO CONCENTRATION PPM	.91
CO2 CONCENTRATION PCT	.6969
NOX CONCENTRATION PPM	38.33

HC MASS GRAMS	.000
CO MASS GRAMS	.184
CO2 MASS GRAMS	2205.63
NOX MASS GRAMS	12.780
PM MASS GRAMS	.550
FUEL MASS KG	.750
FUEL ECONOMY MPG (L/100KM)	34.73 (6.77)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.023
NOX G/MI	1.592
PM G/MI	.069
FUEL ECONOMY MPG (L/100KM)	34.73 (6.77)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5118-FTP2	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 8/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18454 MILES (29692 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.98 IN HG (736.1 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. 1.011
RELATIVE HUMIDITY 61.5 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.7	870.1	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.982	.980/.982	.979/.982
MEASURED DISTANCE MILES (KM)	3.63 (5.84)	3.88 (6.24)	3.63 (5.85)
BLOWER FLOW RATE SCFM (SCMM)	610.8 (17.30)	610.6 (17.29)	606.8 (17.18)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)	.93 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5146. (145.7)	8868. (251.2)	5115. (144.9)

HC SAMPLE METER/RANGE/PPM (BAG)	7.2/ 9/ 7.21	3.7/ 9/ 3.68	3.9/ 9/ 3.89
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.55	3.4/ 2/ 3.45	3.4/ 2/ 3.45
CO SAMPLE METER/RANGE/PPM	17.0/ 12/ 16.26	.4/ 12/ .37	.5/ 12/ .47
CO BCKGRD METER/RANGE/PPM	.7/ 12/ .66	.4/ 12/ .37	.4/ 12/ .37
CO2 SAMPLE METER/RANGE/PCT	55.5/ 11/ .4327	39.5/ 11/ .2821	50.6/ 11/ .3834
CO2 BCKGRD METER/RANGE/PCT	6.5/ 11/ .0413	6.5/ 11/ .0413	5.9/ 11/ .0374
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	12.2/ 9/ 12.16	7.4/ 9/ 7.38	13.9/ 9/ 13.92
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	31.10	47.89	35.25
HC CONCENTRATION PPM	3.77	.31	.54
CO CONCENTRATION PPM	15.18	.01	.10
CO2 CONCENTRATION PCT	.3928	.2417	.3471
NOX CONCENTRATION PPM	12.11	7.36	13.89

HC MASS GRAMS	.342	.048	.049
CO MASS GRAMS	2.576	.002	.017
CO2 MASS GRAMS	1047.91	1111.47	920.49
NOX MASS GRAMS	3.412	3.573	3.892
PM MASS GRAMS	.191	.105	.122
FUEL MASS KG	.358	.378	.313
FUEL ECONOMY MPG (L/100KM)	32.91 (7.15)	33.32 (7.06)	37.68 (6.24)

3-BAG COMPOSITE RESULTS

HC	G/MI	.030	
CO	G/MI	.149	
NOX	G/MI	.966	
PM	G/MI	.034	
FUEL ECONOMY MPG (L/100KM)		34.36 (6.85)	

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 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5118-US062	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 8/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18472 MILES (29721 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.96 IN HG (735.6 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. 1.011
RELATIVE HUMIDITY 61.5 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.3
DRY/WET CORRECTION FACTOR, SAMP/BACK	.975/.982
MEASURED DISTANCE MILES (KM)	8.00 (12.87)
BLOWER FLOW RATE SCFM (SCMM)	604.8 (17.13)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6040. (171.0)

HC SAMPLE METER/RANGE/PPM (BAG)	3.2/	9/	3.19
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.0/	11/	.7446
CO2 BCKGRD METER/RANGE/PCT	5.9/	11/	.0374
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	38.9/	9/	38.95
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.16
HC CONCENTRATION PPM	-.26
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.7092
NOX CONCENTRATION PPM	38.92

HC MASS GRAMS	.000
CO MASS GRAMS	.037
CO2 MASS GRAMS	2220.97
NOX MASS GRAMS	12.875
PM MASS GRAMS	.636
FUEL MASS KG	.755
FUEL ECONOMY MPG (L/100KM)	34.37 (6.85)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.005	
NOX	G/MI	1.610	
PM	G/MI	.080	
FUEL ECONOMY MPG (L/100KM)		34.37 (6.85)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5118-FTP3	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 9/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18481 MILES (29735 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.10 IN HG (739.2 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .972
RELATIVE HUMIDITY 57.1 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	869.4	504.8
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.982/.984	.981/.984
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.90 (6.27)	3.65 (5.87)
BLOWER FLOW RATE SCFM (SCMM)	615.5 (17.43)	614.4 (17.40)	608.5 (17.23)
GAS METER FLOW RATE SCFM (SCMM)	.90 (.03)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5188. (146.9)	8916. (252.5)	5127. (145.2)

HC SAMPLE METER/RANGE/PPM (BAG)	6.6/ 9/ 6.55	3.8/ 9/ 3.77	4.1/ 9/ 4.10
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.55	3.6/ 2/ 3.65	3.6/ 2/ 3.65
CO SAMPLE METER/RANGE/PPM	16.6/ 12/ 15.87	1.0/ 12/ .94	1.9/ 12/ 1.78
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .75	.3/ 12/ .28	.8/ 12/ .75
CO2 SAMPLE METER/RANGE/PCT	54.4/ 11/ .4214	39.5/ 11/ .2821	50.7/ 11/ .3844
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406	6.4/ 11/ .0406	6.3/ 11/ .0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	12.7/ 9/ 12.70	7.2/ 9/ 7.22	14.5/ 9/ 14.53
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.2/ 1/ .05	.1/ 1/ .03

DILUTION FACTOR	31.94	47.87	35.14
HC CONCENTRATION PPM	3.12	.19	.56
CO CONCENTRATION PPM	14.74	.64	1.02
CO2 CONCENTRATION PCT	.3820	.2423	.3455
NOX CONCENTRATION PPM	12.65	7.18	14.51

HC MASS GRAMS	.285	.030	.051
CO MASS GRAMS	2.521	.190	.173
CO2 MASS GRAMS	1027.64	1120.39	918.51
NOX MASS GRAMS	3.457	3.369	3.916
PM MASS GRAMS	.201	.107	.136
FUEL MASS KG	.351	.381	.312
FUEL ECONOMY MPG (L/100KM)	33.34 (7.06)	33.17 (7.09)	37.88 (6.21)

3-BAG COMPOSITE RESULTS

HC	G/MI	.024		
CO	G/MI	.183		
NOX	G/MI	.942		
PM	G/MI	.036		
FUEL ECONOMY MPG (L/100KM)		34.42 (6.84)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5118-US063	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/ 9/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18498 MILES (29763 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.06 IN HG (738.1 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .973
RELATIVE HUMIDITY 57.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	599.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	607.3 (17.20)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6081. (172.2)
HC SAMPLE METER/RANGE/PPM (BAG)	3.3/ 9/ 3.31
HC BCKGRD METER/RANGE/PPM	3.2/ 2/ 3.24
CO SAMPLE METER/RANGE/PPM	.3/ 12/ .28
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .37
CO2 SAMPLE METER/RANGE/PCT	81.1/ 11/ .7460
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	39.0/ 9/ 39.03
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08

DILUTION FACTOR	18.13
HC CONCENTRATION PPM	.24
CO CONCENTRATION PPM	-.08
CO2 CONCENTRATION PCT	.7076
NOX CONCENTRATION PPM	38.96

HC MASS GRAMS	.026
CO MASS GRAMS	.000
CO2 MASS GRAMS	2230.97
NOX MASS GRAMS	12.480
PM MASS GRAMS	.782
FUEL MASS KG	.758
FUEL ECONOMY MPG (L/100KM)	34.31 (6.86)

1-BAG COMPOSITE RESULTS

HC	G/MI	.003	
CO	G/MI	.000	
NOX	G/MI	1.556	
PM	G/MI	.098	
FUEL ECONOMY MPG (L/100KM)		34.31 (6.86)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5288-FTP1	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/23/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18654 MILES (30014 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.12 IN HG (739.7 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .994
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.7	870.2	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.981/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.62 (5.82)	3.90 (6.27)	3.60 (5.80)
BLOWER FLOW RATE SCFM (SCMM)	614.8 (17.41)	613.4 (17.37)	608.2 (17.23)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5179. (146.7)	8910. (252.3)	5128. (145.2)

HC SAMPLE METER/RANGE/PPM (BAG)	8.0/ 9/ 8.02	3.7/ 9/ 3.72	3.8/ 9/ 3.83
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.55	3.4/ 2/ 3.45	3.4/ 2/ 3.45
CO SAMPLE METER/RANGE/PPM	20.0/ 12/ 19.19	.5/ 12/ .47	4.0/ 12/ 3.77
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28	.4/ 12/ .37	.9/ 12/ .84
CO2 SAMPLE METER/RANGE/PCT	55.2/ 11/ .4296	40.0/ 11/ .2864	51.4/ 11/ .3912
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0419	6.6/ 11/ .0419	6.3/ 11/ .0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.2/ 9/ 10.19	6.6/ 9/ 6.64	13.2/ 9/ 13.18
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.3/ 1/ .08	.1/ 1/ .03

DILUTION FACTOR	31.33	47.22	34.55
HC CONCENTRATION PPM	4.59	.35	.49
CO CONCENTRATION PPM	18.39	.10	2.86
CO2 CONCENTRATION PCT	.3890	.2454	.3524
NOX CONCENTRATION PPM	10.11	6.57	13.16

HC MASS GRAMS	.387	.050	.041
CO MASS GRAMS	3.140	.029	.484
CO2 MASS GRAMS	1044.69	1133.61	937.00
NOX MASS GRAMS	2.819	3.150	3.631
PM MASS GRAMS	.416	.202	.295
FUEL MASS KG	.331	.357	.295
FUEL ECONOMY MPG (L/100KM)	34.89 (6.74)	34.83 (6.75)	38.91 (6.05)

3-BAG COMPOSITE RESULTS

HC	G/MI	.032	
CO	G/MI	.220	
NOX	G/MI	.857	
PM	G/MI	.073	
FUEL ECONOMY MPG (L/100KM)		35.89 (6.55)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5288-US061	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/23/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18671 MILES (30041 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.15 IN HG (740.3 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .993
RELATIVE HUMIDITY 61.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	608.5 (17.23)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6095. (172.6)

HC SAMPLE METER/RANGE/PPM (BAG)	3.4/	9/	3.36
HC BCKGRD METER/RANGE/PPM	3.5/	2/	3.55
CO SAMPLE METER/RANGE/PPM	.7/	12/	.66
CO BCKGRD METER/RANGE/PPM	.7/	12/	.66
CO2 SAMPLE METER/RANGE/PCT	82.5/	11/	.7661
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.8/	9/	37.79
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.67
HC CONCENTRATION PPM	.01
CO CONCENTRATION PPM	.03
CO2 CONCENTRATION PCT	.7284
NOX CONCENTRATION PPM	37.74

HC MASS GRAMS	.001
CO MASS GRAMS	.005
CO2 MASS GRAMS	2301.64
NOX MASS GRAMS	12.374
PM MASS GRAMS	1.390
FUEL MASS KG	.724
FUEL ECONOMY MPG (L/100KM)	35.32 (6.66)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.001	
NOX	G/MI	1.542	
PM	G/MI	.173	
FUEL ECONOMY MPG (L/100KM)		35.32 (6.66)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5288-FTP2	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/24/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18680 MILES (30056 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.01 IN HG (736.9 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .981
RELATIVE HUMIDITY 60.5 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.7	870.0	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.981/.984	.980/.984
MEASURED DISTANCE MILES (KM)	3.64 (5.86)	3.92 (6.30)	3.61 (5.81)
BLOWER FLOW RATE SCFM (SCMM)	615.4 (17.43)	613.0 (17.36)	606.9 (17.19)
GAS METER FLOW RATE SCFM (SCMM)	.91 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5184. (146.8)	8903. (252.1)	5117. (144.9)

HC SAMPLE METER/RANGE/PPM (BAG)	7.6/ 9/ 7.64	3.8/ 9/ 3.83	3.9/ 9/ 3.92
HC BCKGRD METER/RANGE/PPM	3.9/ 2/ 3.95	3.8/ 2/ 3.85	3.8/ 2/ 3.85
CO SAMPLE METER/RANGE/PPM	18.0/ 12/ 17.24	.5/ 12/ .47	3.7/ 12/ 3.48
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .37	.3/ 12/ .28	.9/ 12/ .84
CO2 SAMPLE METER/RANGE/PCT	55.1/ 11/ .4286	39.4/ 11/ .2813	50.3/ 11/ .3805
CO2 BCKGRD METER/RANGE/PCT	6.5/ 11/ .0413	6.4/ 11/ .0406	6.4/ 11/ .0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.3/ 9/ 10.28	6.2/ 9/ 6.25	12.3/ 9/ 12.34
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	31.43	48.08	35.53
HC CONCENTRATION PPM	3.81	.06	.18
CO CONCENTRATION PPM	16.40	.19	2.59
CO2 CONCENTRATION PCT	.3886	.2415	.3410
NOX CONCENTRATION PPM	10.26	6.22	12.31

HC MASS GRAMS	.322	.009	.015
CO MASS GRAMS	2.804	.055	.436
CO2 MASS GRAMS	1044.56	1114.73	904.76
NOX MASS GRAMS	2.826	2.944	3.347
PM MASS GRAMS	.368	.206	.325
FUEL MASS KG	.330	.351	.285
FUEL ECONOMY MPG (L/100KM)	35.17 (6.69)	35.58 (6.61)	40.42 (5.82)

3-BAG COMPOSITE RESULTS

HC	G/MI	.021	
CO	G/MI	.200	
NOX	G/MI	.805	
PM	G/MI	.073	
FUEL ECONOMY MPG (L/100KM)		36.73 (6.40)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5288-US062	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/24/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18697 MILES (30083 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.99 IN HG (736.4 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .981
RELATIVE HUMIDITY 60.5 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	606.0 (17.16)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6071. (171.9)

HC SAMPLE METER/RANGE/PPM (BAG)	3.1/	9/	3.12
HC BCKGRD METER/RANGE/PPM	3.9/	2/	3.95
CO SAMPLE METER/RANGE/PPM	.3/	12/	.28
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	82.3/	11/	.7632
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.3/	9/	37.35
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	17.74
HC CONCENTRATION PPM	-.60
CO CONCENTRATION PPM	.10
CO2 CONCENTRATION PCT	.7249
NOX CONCENTRATION PPM	37.32

HC MASS GRAMS	.000
CO MASS GRAMS	.020
CO2 MASS GRAMS	2281.83
NOX MASS GRAMS	12.042
PM MASS GRAMS	1.149
FUEL MASS KG	.718
FUEL ECONOMY MPG (L/100KM)	35.63 (6.60)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.002	
NOX	G/MI	1.501	
PM	G/MI	.143	
FUEL ECONOMY MPG (L/100KM)		35.63 (6.60)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5288-FTP3	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/25/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18706 MILES (30097 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.08 IN HG (738.5 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .959
RELATIVE HUMIDITY 56.5 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.8	869.9	505.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.985	.982/.985	.982/.985
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.89 (6.25)	3.59 (5.78)
BLOWER FLOW RATE SCFM (SCMM)	613.8 (17.38)	613.8 (17.38)	609.6 (17.27)
GAS METER FLOW RATE SCFM (SCMM)	.91 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5172. (146.5)	8912. (252.4)	5139. (145.5)

HC SAMPLE METER/RANGE/PPM (BAG)	7.3/ 9/ 7.35	3.7/ 9/ 3.70	3.9/ 9/ 3.88
HC BCKGRD METER/RANGE/PPM	3.4/ 2/ 3.45	3.3/ 2/ 3.34	3.3/ 2/ 3.34
CO SAMPLE METER/RANGE/PPM	17.6/ 12/ 16.85	.4/ 12/ .37	2.6/ 12/ 2.44
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.5/ 12/ .47	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	54.7/ 11/ .4244	39.3/ 11/ .2804	49.9/ 11/ .3766
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0419	6.7/ 11/ .0425	6.6/ 11/ .0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.7/ 9/ 10.65	6.1/ 9/ 6.07	12.3/ 9/ 12.29
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.0/ 1/ .00	.1/ 1/ .03

DILUTION FACTOR	31.73	48.23	35.91
HC CONCENTRATION PPM	4.01	.42	.63
CO CONCENTRATION PPM	16.23	-.08	2.29
CO2 CONCENTRATION PCT	.3839	.2387	.3359
NOX CONCENTRATION PPM	10.63	6.07	12.27

HC MASS GRAMS	.338	.061	.053
CO MASS GRAMS	2.767	.000	.388
CO2 MASS GRAMS	1029.40	1103.22	894.86
NOX MASS GRAMS	2.856	2.812	3.276
PM MASS GRAMS	.360	.176	.259
FUEL MASS KG	.326	.347	.282
FUEL ECONOMY MPG (L/100KM)	35.33 (6.66)	35.69 (6.59)	40.66 (5.79)

3-BAG COMPOSITE RESULTS

HC	G/MI	.032	
CO	G/MI	.188	
NOX	G/MI	.789	
PM	G/MI	.064	
FUEL ECONOMY MPG (L/100KM)		36.88 (6.38)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5288-US063	DIESEL 26888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/25/2002 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18723 MILES (30125 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.09 IN HG (738.8 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .959
RELATIVE HUMIDITY 56.5 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.985
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	609.3 (17.26)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6104. (172.9)

HC SAMPLE METER/RANGE/PPM (BAG)	3.2/	9/	3.21
HC BCKGRD METER/RANGE/PPM	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	.6/	12/	.56
CO BCKGRD METER/RANGE/PPM	.4/	12/	.37
CO2 SAMPLE METER/RANGE/PCT	80.4/	11/	.7361
CO2 BCKGRD METER/RANGE/PCT	6.6/	11/	.0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.1/	9/	36.09
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.39
HC CONCENTRATION PPM	-.04
CO CONCENTRATION PPM	.20
CO2 CONCENTRATION PCT	.6965
NOX CONCENTRATION PPM	36.07

HC MASS GRAMS	.000
CO MASS GRAMS	.039
CO2 MASS GRAMS	2204.23
NOX MASS GRAMS	11.437
PM MASS GRAMS	1.001
FUEL MASS KG	.694
FUEL ECONOMY MPG (L/100KM)	36.88 (6.38)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.005
NOX G/MI	1.425
PM G/MI	.125
FUEL ECONOMY MPG (L/100KM)	36.88 (6.38)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5218-FTP1	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/15/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18543 MILES (29835 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.19 IN HG (741.5 MM HG)	DRY BULB TEMPERATURE 69.0°F (20.6°C)	NOX HUMIDITY C.F. .994
RELATIVE HUMIDITY 67.7 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	869.8	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.983	.980/.983	.980/.983
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.92 (6.30)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	617.8 (17.50)	616.5 (17.46)	610.3 (17.28)
GAS METER FLOW RATE SCFM (SCMM)	.90 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5207. (147.5)	8951. (253.5)	5145. (145.7)

HC SAMPLE METER/RANGE/PPM (BAG)	7.2/ 9/ 7.20	3.7/ 9/ 3.73	4.0/ 9/ 4.00
HC BCKGRD METER/RANGE/PPM	4.3/ 2/ 4.35	4.2/ 2/ 4.25	4.1/ 2/ 4.15
CO SAMPLE METER/RANGE/PPM	18.1/ 12/ 17.34	.4/ 12/ .37	2.0/ 12/ 1.88
CO BCKGRD METER/RANGE/PPM	.5/ 12/ .47	.4/ 12/ .37	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	54.3/ 11/ .4203	40.3/ 11/ .2890	50.4/ 11/ .3815
CO2 BCKGRD METER/RANGE/PCT	6.5/ 11/ .0413	6.5/ 11/ .0413	6.3/ 11/ .0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.6/ 9/ 11.60	7.2/ 9/ 7.20	14.1/ 9/ 14.14
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.2/ 1/ .05	.1/ 1/ .03

DILUTION FACTOR	32.00	46.75	35.41
HC CONCENTRATION PPM	2.98	-.43	-.03
CO CONCENTRATION PPM	16.37	.01	1.38
CO2 CONCENTRATION PCT	.3804	.2486	.3426
NOX CONCENTRATION PPM	11.53	7.16	14.12

HC MASS GRAMS	.273	.000	.000
CO MASS GRAMS	2.810	.002	.234
CO2 MASS GRAMS	1026.95	1153.75	914.00
NOX MASS GRAMS	3.231	3.448	3.910
PM MASS GRAMS	.179	.121	.154
FUEL MASS KG	.351	.392	.311
FUEL ECONOMY MPG (L/100KM)	33.38 (7.05)	32.41 (7.26)	37.56 (6.26)

3-BAG COMPOSITE RESULTS

HC	G/MI	.016	
CO	G/MI	.178	
NOX	G/MI	.940	
PM	G/MI	.038	
FUEL ECONOMY MPG (L/100KM)		33.91 (6.94)	

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VEHICLE NUMBER 220	TEST AL-5218-US061	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/15/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18561 MILES (29864 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.20 IN HG (741.8 MM HG)	DRY BULB TEMPERATURE 69.0°F (20.6°C)	NOX HUMIDITY C.F. .994
RELATIVE HUMIDITY 67.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	599.7
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.983
MEASURED DISTANCE MILES (KM)	8.06 (12.97)
BLOWER FLOW RATE SCFM (SCMM)	610.2 (17.28)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)
TOTAL FLOW SCF (SCM)	6108. (173.0)

HC SAMPLE METER/RANGE/PPM (BAG)	3.3/	9/	3.29
HC BCKGRD METER/RANGE/PPM	3.9/	2/	3.95
CO SAMPLE METER/RANGE/PPM	.7/	12/	.66
CO BCKGRD METER/RANGE/PPM	.7/	12/	.66
CO2 SAMPLE METER/RANGE/PCT	81.5/	11/	.7517
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.2/	9/	41.25
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.99
HC CONCENTRATION PPM	-.44
CO CONCENTRATION PPM	.03
CO2 CONCENTRATION PCT	.7140
NOX CONCENTRATION PPM	41.20

HC MASS GRAMS	.000
CO MASS GRAMS	.005
CO2 MASS GRAMS	2261.08
NOX MASS GRAMS	13.544
PM MASS GRAMS	.627
FUEL MASS KG	.768
FUEL ECONOMY MPG (L/100KM)	34.03 (6.91)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.001
NOX G/MI	1.680
PM G/MI	.078
FUEL ECONOMY MPG (L/100KM)	34.03 (6.91)

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5218-FTP2	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/16/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18570 MILES (29879 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.10 IN HG (739.1 MM HG)	DRY BULB TEMPERATURE 70.0°F (21.1°C)	NOX HUMIDITY C.F. .987
RELATIVE HUMIDITY 64.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	869.4	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.984	.981/.984	.980/.984
MEASURED DISTANCE MILES (KM)	3.63 (5.84)	3.93 (6.33)	3.65 (5.88)
BLOWER FLOW RATE SCFM (SCMM)	607.2 (17.20)	609.0 (17.25)	606.0 (17.16)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5119. (145.0)	8837. (250.3)	5110. (144.7)

HC SAMPLE METER/RANGE/PPM (BAG)	8.0/ 9/ 8.03	3.7/ 9/ 3.74	4.0/ 9/ 3.97
HC BCKGRD METER/RANGE/PPM	6.7/ 2/ 6.77	6.2/ 2/ 6.27	6.1/ 2/ 6.17
CO SAMPLE METER/RANGE/PPM	20.4/ 12/ 19.58	.6/ 12/ .56	.9/ 12/ .84
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .75	.4/ 12/ .37	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	55.6/ 11/ .4337	40.6/ 11/ .2916	51.3/ 11/ .3903
CO2 BCKGRD METER/RANGE/PCT	6.4/ 11/ .0406	6.5/ 11/ .0413	6.4/ 11/ .0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.8/ 9/ 11.80	7.6/ 9/ 7.55	15.1/ 9/ 15.13
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.3/ 1/ .08	.2/ 1/ .05

DILUTION FACTOR	31.00	46.33	34.62
HC CONCENTRATION PPM	1.47	-2.40	-2.02
CO CONCENTRATION PPM	18.30	.19	.20
CO2 CONCENTRATION PCT	.3944	.2512	.3508
NOX CONCENTRATION PPM	11.75	7.48	15.08

HC MASS GRAMS	.133	.000	.000
CO MASS GRAMS	3.088	.055	.033
CO2 MASS GRAMS	1046.81	1151.04	929.46
NOX MASS GRAMS	3.216	3.534	4.121
PM MASS GRAMS	.199	.132	.146
FUEL MASS KG	.357	.391	.316
FUEL ECONOMY MPG (L/100KM)	32.92 (7.15)	32.60 (7.22)	37.52 (6.27)

3-BAG COMPOSITE RESULTS

HC	G/MI	.008	
CO	G/MI	.185	
NOX	G/MI	.959	
PM	G/MI	.040	
FUEL ECONOMY MPG (L/100KM)		33.92 (6.94)	

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VEHICLE NUMBER 220	TEST AL-5218-US062	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/16/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18588 MILES (29908 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.07 IN HG (738.5 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .988
RELATIVE HUMIDITY 64.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	600.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.976/.984
MEASURED DISTANCE MILES (KM)	8.06 (12.97)
BLOWER FLOW RATE SCFM (SCMM)	606.0 (17.16)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6071. (171.9)

HC SAMPLE METER/RANGE/PPM (BAG)	3.4/	9/	3.40
HC BCKGRD METER/RANGE/PPM	5.0/	2/	5.06
CO SAMPLE METER/RANGE/PPM	.6/	12/	.56
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.6/	11/	.7531
CO2 BCKGRD METER/RANGE/PCT	6.5/	11/	.0413
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	39.4/	9/	39.35
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.95
HC CONCENTRATION PPM	-1.38
CO CONCENTRATION PPM	.37
CO2 CONCENTRATION PCT	.7142
NOX CONCENTRATION PPM	39.31

HC MASS GRAMS	.000
CO MASS GRAMS	.074
CO2 MASS GRAMS	2248.07
NOX MASS GRAMS	12.766
PM MASS GRAMS	.563
FUEL MASS KG	.764
FUEL ECONOMY MPG (L/100KM)	34.23 (6.87)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.009	
NOX	G/MI	1.583	
PM	G/MI	.070	
FUEL ECONOMY MPG (L/100KM)		34.23 (6.87)	

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-401

VEHICLE NUMBER 220	TEST AL-5218-FTP3	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/17/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18597 MILES (29922 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.3 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .971
RELATIVE HUMIDITY 57.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.9	869.7	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.982/.984	.981/.984
MEASURED DISTANCE MILES (KM)	3.65 (5.87)	3.92 (6.30)	3.60 (5.80)
BLOWER FLOW RATE SCFM (SCMM)	616.6 (17.46)	615.2 (17.42)	610.1 (17.28)
GAS METER FLOW RATE SCFM (SCMM)	.90 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5196. (147.2)	8930. (252.9)	5143. (145.7)

HC SAMPLE METER/RANGE/PPM (BAG)	6.9/ 9/ 6.86	3.9/ 9/ 3.94	4.1/ 9/ 4.09
HC BCKGRD METER/RANGE/PPM	4.2/ 2/ 4.25	4.2/ 2/ 4.25	4.3/ 2/ 4.35
CO SAMPLE METER/RANGE/PPM	14.8/ 12/ 14.13	.5/ 12/ .47	.2/ 12/ .19
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .75	.9/ 12/ .84	.6/ 12/ .56
CO2 SAMPLE METER/RANGE/PCT	55.0/ 11/ .4275	40.1/ 11/ .2873	50.0/ 11/ .3776
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0419	6.7/ 11/ .0425	6.6/ 11/ .0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	12.2/ 9/ 12.16	7.3/ 9/ 7.28	14.4/ 9/ 14.43
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.2/ 1/ .05	.1/ 1/ .03

DILUTION FACTOR	31.49	47.02	35.79
HC CONCENTRATION PPM	2.75	-.22	-.14
CO CONCENTRATION PPM	13.04	-.35	-.35
CO2 CONCENTRATION PCT	.3870	.2456	.3368
NOX CONCENTRATION PPM	12.08	7.23	14.41

HC MASS GRAMS	.251	.000	.000
CO MASS GRAMS	2.233	.000	.000
CO2 MASS GRAMS	1042.54	1137.29	898.29
NOX MASS GRAMS	3.303	3.397	3.898
PM MASS GRAMS	.160	.116	.109
FUEL MASS KG	.356	.386	.305
FUEL ECONOMY MPG (L/100KM)	33.25 (7.07)	32.88 (7.15)	38.29 (6.14)

3-BAG COMPOSITE RESULTS

HC	G/MI	.014	
CO	G/MI	.127	
NOX	G/MI	.934	
PM	G/MI	.033	
FUEL ECONOMY MPG (L/100KM)		34.32 (6.85)	

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VEHICLE NUMBER 220	TEST AL-5218-US063	DIESEL 26918
VEHICLE MODEL 99 MERCEDES BENZ	DATE 10/17/2002 RUN	FUEL DENSITY 7.150 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .129 C .803 O .068 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18615 MILES (29951 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.19 IN HG (741.5 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .971
RELATIVE HUMIDITY 57.0 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	599.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	8.01 (12.89)
BLOWER FLOW RATE SCFM (SCMM)	609.8 (17.27)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6105. (172.9)

HC SAMPLE METER/RANGE/PPM (BAG)	3.4/	9/	3.35
HC BCKGRD METER/RANGE/PPM	4.0/	2/	4.05
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.6/	12/	.56
CO2 SAMPLE METER/RANGE/PCT	81.4/	11/	.7503
CO2 BCKGRD METER/RANGE/PCT	6.1/	11/	.0387
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	40.9/	9/	40.92
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08

DILUTION FACTOR	18.02
HC CONCENTRATION PPM	-.47
CO CONCENTRATION PPM	-.16
CO2 CONCENTRATION PCT	.7137
NOX CONCENTRATION PPM	40.85

HC MASS GRAMS	.000
CO MASS GRAMS	.000
CO2 MASS GRAMS	2259.34
NOX MASS GRAMS	13.115
PM MASS GRAMS	.622
FUEL MASS KG	.768
FUEL ECONOMY MPG (L/100KM)	33.85 (6.95)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000
CO	G/MI	.000
NOX	G/MI	1.637
PM	G/MI	.078
FUEL ECONOMY MPG (L/100KM)		33.85 (6.95)

APPENDIX B

DATA SHEETS FOR FUEL STUDY

Fuel	Page
AL-26888	B-1 to B-6
AL-26921	B-7 to B-12
AL-26922	B-13 to B-18
AL-26938	B-19 to B-24
AL-26944	B-25 to B-30
AL-26952	B-31 to B-36

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COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-888-FTP1	DIESEL AL-888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/21/2003 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19107 MILES (30743 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.12 IN HG (739.6 MM HG) DRY BULB TEMPERATURE 72.0°F (22.2°C) NOX HUMIDITY C.F. .952
RELATIVE HUMIDITY 53.3 PCT.

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.2	870.1	504.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.985	.983/.985	.982/.985
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.86 (6.22)	3.60 (5.80)
BLOWER FLOW RATE SCFM (SCMM)	610.7 (17.30)	611.8 (17.33)	608.1 (17.22)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)	.90 (.03)	.86 (.02)
TOTAL FLOW SCF (SCM)	5139. (145.5)	8886. (251.6)	5124. (145.1)

HC SAMPLE METER/RANGE/PPM (BAG)	7.0/ 9/ 7.02	3.0/ 9/ 3.04	2.8/ 9/ 2.85
HC BCKGRD METER/RANGE/PPM	4.2/ 2/ 4.25	4.2/ 2/ 4.25	3.9/ 2/ 3.95
CO SAMPLE METER/RANGE/PPM	18.4/ 12/ 17.63	.5/ 12/ .47	.3/ 12/ .28
CO BCKGRD METER/RANGE/PPM	.7/ 12/ .66	.6/ 12/ .56	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	55.0/ 11/ .4275	39.8/ 11/ .2847	50.5/ 11/ .3824
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0432	6.7/ 11/ .0425	6.6/ 11/ .0419
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.3/ 9/ 9.28	5.0/ 9/ 5.01	11.7/ 9/ 11.70
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.2/ 1/ .05	.2/ 1/ .05

DILUTION FACTOR	31.46	47.46	35.34
HC CONCENTRATION PPM	2.91	-1.13	-.99
CO CONCENTRATION PPM	16.56	-.08	.10
CO2 CONCENTRATION PCT	.3857	.2430	.3417
NOX CONCENTRATION PPM	9.21	4.96	11.65

HC MASS GRAMS	.243	.000	.000
CO MASS GRAMS	2.805	.000	.016
CO2 MASS GRAMS	1027.83	1119.70	907.94
NOX MASS GRAMS	2.439	2.272	3.077
PM MASS GRAMS	.337	.208	.203
FUEL MASS KG	.325	.353	.286
FUEL ECONOMY MPG (L/100KM)	35.41 (6.64)	34.95 (6.73)	40.19 (5.85)

3-BAG COMPOSITE RESULTS

HC	G/MI	.014
CO	G/MI	.163
NOX	G/MI	.679
PM	G/MI	.063
FUEL ECONOMY MPG (L/100KM)		36.38 (6.47)

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 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-888-US06-1	DIESEL AL-888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/21/2003 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19125 MILES (30772 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.12 IN HG (739.7 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .952
RELATIVE HUMIDITY 53.3 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.985
MEASURED DISTANCE MILES (KM)	8.04 (12.93)
BLOWER FLOW RATE SCFM (SCMM)	607.7 (17.21)
GAS METER FLOW RATE SCFM (SCMM)	.83 (.02)
TOTAL FLOW SCF (SCM)	6069. (171.9)

HC SAMPLE METER/RANGE/PPM (BAG)	2.7/	9/	2.71
HC BCKGRD METER/RANGE/PPM	4.0/	2/	4.05
CO SAMPLE METER/RANGE/PPM	.3/	12/	.28
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.6/	11/	.7531
CO2 BCKGRD METER/RANGE/PCT	6.5/	11/	.0413
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.1/	9/	36.13
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	17.95
HC CONCENTRATION PPM	-1.12
CO CONCENTRATION PPM	.10
CO2 CONCENTRATION PCT	.7142
NOX CONCENTRATION PPM	36.09

HC MASS GRAMS	.000
CO MASS GRAMS	.020
CO2 MASS GRAMS	2247.48
NOX MASS GRAMS	11.288
PM MASS GRAMS	1.152
FUEL MASS KG	.708
FUEL ECONOMY MPG (L/100KM)	36.22 (6.49)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.002
NOX G/MI	1.404
PM G/MI	.143
FUEL ECONOMY MPG (L/100KM)	36.22 (6.49)

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VEHICLE NUMBER 220	TEST AL-888-FTP2	DIESEL AL-888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/22/2003 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19134 MILES (30786 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.22 IN HG (742.3 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .963
RELATIVE HUMIDITY 53.8 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.8	870.0	506.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.985	.982/.985	.981/.985
MEASURED DISTANCE MILES (KM)	3.62 (5.82)	3.86 (6.21)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	614.9 (17.42)	615.5 (17.43)	612.5 (17.35)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)	.92 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5191. (147.0)	8938. (253.1)	5174. (146.5)

HC SAMPLE METER/RANGE/PPM (BAG)	5.7/	9/	5.68	2.7/	9/	2.69	2.7/	9/	2.72
HC BCKGRD METER/RANGE/PPM	3.7/	2/	3.75	3.6/	2/	3.65	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	15.1/	12/	14.42	.2/	12/	.19	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19	.3/	12/	.28	.1/	12/	.09
CO2 SAMPLE METER/RANGE/PCT	55.1/	11/	.4286	39.8/	11/	.2847	50.1/	11/	.3785
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406	6.2/	11/	.0393	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.3/	9/	9.26	5.4/	9/	5.43	12.5/	9/	12.46
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03	.1/	1/	.03	.1/	1/	.03

DILUTION FACTOR	31.42	47.47	35.71
HC CONCENTRATION PPM	2.06	-.88	-.82
CO CONCENTRATION PPM	13.87	-.09	.09
CO2 CONCENTRATION PCT	.3892	.2462	.3403
NOX CONCENTRATION PPM	9.23	5.41	12.43

HC MASS GRAMS	.174	.000	.000
CO MASS GRAMS	2.374	.000	.016
CO2 MASS GRAMS	1047.67	1140.89	912.90
NOX MASS GRAMS	2.501	2.522	3.356
PM MASS GRAMS	.338	.190	.163
FUEL MASS KG	.331	.359	.287
FUEL ECONOMY MPG (L/100KM)	34.83 (6.75)	34.24 (6.87)	39.93 (5.89)

3-BAG COMPOSITE RESULTS

HC	G/MI	.010	
CO	G/MI	.138	
NOX	G/MI	.738	
PM	G/MI	.057	
FUEL ECONOMY MPG (L/100KM)		35.81 (6.57)	

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VEHICLE NUMBER 220	TEST AL-888-US06-2	DIESEL AL-888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/22/2003 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19152 MILES (30815 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.23 IN HG (742.5 MM HG)	DRY BULB TEMPERATURE 73.0pF (22.8pC)	NOX HUMIDITY C.F. .963
RELATIVE HUMIDITY 53.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.7
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.985
MEASURED DISTANCE MILES (KM)	8.04 (12.94)
BLOWER FLOW RATE SCFM (SCMM)	609.9 (17.27)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6095. (172.6)

HC SAMPLE METER/RANGE/PPM (BAG)	2.3/	9/	2.30
HC BCKGRD METER/RANGE/PPM	4.2/	2/	4.25
CO SAMPLE METER/RANGE/PPM	.5/	12/	.47
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.0/	11/	.7446
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.2/	9/	36.19
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08

DILUTION FACTOR	18.16
HC CONCENTRATION PPM	-1.72
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.7062
NOX CONCENTRATION PPM	36.12

HC MASS GRAMS	.000
CO MASS GRAMS	.056
CO2 MASS GRAMS	2231.64
NOX MASS GRAMS	11.481
PM MASS GRAMS	1.000
FUEL MASS KG	.703
FUEL ECONOMY MPG (L/100KM)	36.50 (6.45)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.007	
NOX	G/MI	1.428	
PM	G/MI	.124	
FUEL ECONOMY MPG (L/100KM)		36.50 (6.45)	

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COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-888-FTP3	DIESEL AL-888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/23/2003 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19161 MILES (30830 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.69 IN HG (754.2 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .883
RELATIVE HUMIDITY 41.1 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.7	869.3	505.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.986/.989	.987/.989	.986/.989
MEASURED DISTANCE MILES (KM)	3.61 (5.82)	3.87 (6.22)	3.61 (5.81)
BLOWER FLOW RATE SCFM (SCMM)	630.1 (17.84)	629.2 (17.82)	625.1 (17.70)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.03)	.93 (.03)	.88 (.02)
TOTAL FLOW SCF (SCM)	5318. (150.6)	9130. (258.6)	5273. (149.3)

HC SAMPLE METER/RANGE/PPM (BAG)	5.5/ 9/ 5.52	2.4/ 9/ 2.38	2.4/ 9/ 2.41
HC BCKGRD METER/RANGE/PPM	3.8/ 2/ 3.85	3.7/ 2/ 3.75	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	16.1/ 12/ 15.39	.5/ 12/ .47	.3/ 12/ .28
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28	.4/ 12/ .37	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	53.3/ 11/ .4102	38.5/ 11/ .2736	49.4/ 11/ .3718
CO2 BCKGRD METER/RANGE/PCT	6.1/ 11/ .0387	5.9/ 11/ .0374	6.1/ 11/ .0387
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.2/ 9/ 9.17	5.1/ 9/ 5.07	12.2/ 9/ 12.18
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	32.81	49.39	36.36
HC CONCENTRATION PPM	1.78	-1.29	-1.23
CO CONCENTRATION PPM	14.80	.10	-.17
CO2 CONCENTRATION PCT	.3727	.2370	.3342
NOX CONCENTRATION PPM	9.14	5.04	12.15

HC MASS GRAMS	.155	.000	.000
CO MASS GRAMS	2.594	.029	.000
CO2 MASS GRAMS	1027.60	1121.85	913.62
NOX MASS GRAMS	2.325	2.202	3.063
PM MASS GRAMS	.299	.175	.187
FUEL MASS KG	.325	.353	.288
FUEL ECONOMY MPG (L/100KM)	35.47 (6.63)	34.92 (6.74)	40.01 (5.88)

3-BAG COMPOSITE RESULTS

HC	G/MI	.009	
CO	G/MI	.153	
NOX	G/MI	.661	
PM	G/MI	.055	
FUEL ECONOMY MPG (L/100KM)		36.33 (6.47)	

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VEHICLE NUMBER 220	TEST AL-888-US06-3	DIESEL AL-888
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/23/2003 RUN	FUEL DENSITY 7.030 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .133 C .867 O .000 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19178 MILES (30857 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.65 IN HG (753.1 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .883
RELATIVE HUMIDITY 41.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	597.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.983/.989
MEASURED DISTANCE MILES (KM)	8.04 (12.94)
BLOWER FLOW RATE SCFM (SCMM)	621.3 (17.59)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6191. (175.3)

HC SAMPLE METER/RANGE/PPM (BAG)	2.1/	9/	2.07
HC BCKGRD METER/RANGE/PPM	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	.5/	12/	.47
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	80.0/	11/	.7304
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	36.5/	9/	36.53
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.51
HC CONCENTRATION PPM	-1.48
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.6932
NOX CONCENTRATION PPM	36.51

HC MASS GRAMS	.000
CO MASS GRAMS	.057
CO2 MASS GRAMS	2225.40
NOX MASS GRAMS	10.811
PM MASS GRAMS	.910
FUEL MASS KG	.701
FUEL ECONOMY MPG (L/100KM)	36.61 (6.43)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.007	
NOX	G/MI	1.344	
PM	G/MI	.113	
FUEL ECONOMY MPG (L/100KM)		36.61 (6.43)	

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-921-FTP1	DIESEL 26921
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/ 7/2003 RUN	FUEL DENSITY 7.070 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .132 C .833 O .035 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18895 MILES (30402 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.87 IN HG (758.6 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .924
RELATIVE HUMIDITY 49.1 PCT.		

	1 COLD TRANSIENT (0-505 SEC.)	2 STABILIZED (505-1372 SEC.)	3 HOT TRANSIENT (0- 505 SEC.)
BAG NUMBER	1	2	3
BAG DESCRIPTION			
RUN TIME SECONDS	505.1	869.9	505.5
DRY/WET CORRECTION FACTOR, SAMP/BACK	.983/.987	.984/.987	.983/.987
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.88 (6.24)	3.63 (5.84)
BLOWER FLOW RATE SCFM (SCMM)	635.4 (18.00)	635.4 (17.99)	630.0 (17.84)
GAS METER FLOW RATE SCFM (SCMM)	.91 (.03)	.95 (.03)	.91 (.03)
TOTAL FLOW SCF (SCM)	5357. (151.7)	9225. (261.3)	5315. (150.5)

HC SAMPLE METER/RANGE/PPM (BAG)	6.2/ 9/ 6.20	2.7/ 9/ 2.75	2.8/ 9/ 2.76
HC BCKGRD METER/RANGE/PPM	4.0/ 2/ 4.05	4.2/ 2/ 4.25	4.5/ 2/ 4.56
CO SAMPLE METER/RANGE/PPM	18.5/ 12/ 17.73	.3/ 12/ .28	.5/ 12/ .47
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.2/ 12/ .19	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	53.7/ 11/ .4142	38.8/ 11/ .2762	49.5/ 11/ .3727
CO2 BCKGRD METER/RANGE/PCT	7.3/ 11/ .0464	6.7/ 11/ .0425	6.7/ 11/ .0425
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.7/ 9/ 9.69	5.4/ 9/ 5.37	12.4/ 9/ 12.36
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .05	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	32.34	48.74	36.12
HC CONCENTRATION PPM	2.27	-1.42	-1.67
CO CONCENTRATION PPM	17.12	.09	.01
CO2 CONCENTRATION PCT	.3693	.2345	.3314
NOX CONCENTRATION PPM	9.64	5.35	12.33

HC MASS GRAMS	.206	.000	.000
CO MASS GRAMS	3.024	.029	.002
CO2 MASS GRAMS	1025.62	1121.66	913.28
NOX MASS GRAMS	2.586	2.470	3.282
PM MASS GRAMS	.264	.096	.133
FUEL MASS KG	.338	.367	.299
FUEL ECONOMY MPG (L/100KM)	34.29 (6.86)	33.86 (6.95)	38.87 (6.05)

3-BAG COMPOSITE RESULTS

HC	G/MI	.012	
CO	G/MI	.178	
NOX	G/MI	.727	
PM	G/MI	.038	
FUEL ECONOMY MPG (L/100KM)		35.23 (6.68)	

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VEHICLE NUMBER 220	TEST AL-921-US06-1	DIESEL 26921
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/ 7/2003 RUN	FUEL DENSITY 7.070 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .132 C .833 O .035 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18912 MILES (30429 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.87 IN HG (758.6 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .924
RELATIVE HUMIDITY 49.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.6
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.987
MEASURED DISTANCE MILES (KM)	8.05 (12.95)
BLOWER FLOW RATE SCFM (SCMM)	627.1 (17.76)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6265. (177.4)

HC SAMPLE METER/RANGE/PPM (BAG)	2.3/	9/	2.34
HC BCKGRD METER/RANGE/PPM	4.6/	2/	4.66
CO SAMPLE METER/RANGE/PPM	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	79.8/	11/	.7276
CO2 BCKGRD METER/RANGE/PCT	6.7/	11/	.0425
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.0/	9/	36.97
NOX BCKGRD METER/RANGE/PPM	.0/	2/	.00

DILUTION FACTOR	18.51
HC CONCENTRATION PPM	-2.07
CO CONCENTRATION PPM	-.08
CO2 CONCENTRATION PCT	.6874
NOX CONCENTRATION PPM	36.97

HC MASS GRAMS	.000
CO MASS GRAMS	.000
CO2 MASS GRAMS	2233.00
NOX MASS GRAMS	11.596
PM MASS GRAMS	.882
FUEL MASS KG	.732
FUEL ECONOMY MPG (L/100KM)	35.28 (6.67)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.000	
NOX	G/MI	1.441	
PM	G/MI	.110	
FUEL ECONOMY MPG (L/100KM)		35.28 (6.67)	

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VEHICLE NUMBER 220	TEST AL-921-FTP2	DIESEL 26921
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/ 8/2003 RUN	FUEL DENSITY 7.070 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .132 C .833 O .035 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18921 MILES (30443 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.39 IN HG (746.4 MM HG)	DRY BULB TEMPERATURE 70.0°F (21.1°C)	NOX HUMIDITY C.F. .925
RELATIVE HUMIDITY 51.8 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.2	869.8	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.983/.987	.984/.987	.983/.987
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.89 (6.26)	3.61 (5.81)
BLOWER FLOW RATE SCFM (SCMM)	613.6 (17.38)	616.2 (17.45)	614.6 (17.41)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5174. (146.5)	8946. (253.3)	5182. (146.7)

HC SAMPLE METER/RANGE/PPM (BAG)	6.0/ 9/ 5.95	2.7/ 9/ 2.69	2.7/ 9/ 2.67
HC BCKGRD METER/RANGE/PPM	4.1/ 2/ 4.15	4.1/ 2/ 4.15	3.5/ 2/ 3.55
CO SAMPLE METER/RANGE/PPM	15.5/ 12/ 14.81	.2/ 12/ .19	.2/ 12/ .19
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.2/ 12/ .19	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	54.6/ 11/ .4234	39.4/ 11/ .2813	50.0/ 11/ .3776
CO2 BCKGRD METER/RANGE/PCT	6.5/ 11/ .0413	6.5/ 11/ .0413	6.5/ 11/ .0413
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.0/ 9/ 9.99	5.4/ 9/ 5.38	11.7/ 9/ 11.65
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	31.67	47.86	35.66
HC CONCENTRATION PPM	1.93	-1.37	-.78
CO CONCENTRATION PPM	14.26	.00	.00
CO2 CONCENTRATION PCT	.3835	.2409	.3375
NOX CONCENTRATION PPM	9.97	5.35	11.63

HC MASS GRAMS	.169	.000	.000
CO MASS GRAMS	2.432	.001	.001
CO2 MASS GRAMS	1028.67	1117.22	906.66
NOX MASS GRAMS	2.583	2.400	3.019
PM MASS GRAMS	.258	.181	.169
FUEL MASS KG	.338	.366	.297
FUEL ECONOMY MPG (L/100KM)	34.24 (6.87)	34.08 (6.90)	39.01 (6.03)

3-BAG COMPOSITE RESULTS

HC	G/MI	.010
CO	G/MI	.140
NOX	G/MI	.697
PM	G/MI	.052
FUEL ECONOMY MPG (L/100KM)		35.37 (6.65)

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VEHICLE NUMBER 220	TEST AL-921-US06-2	DIESEL 26921
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/ 8/2003 RUN	FUEL DENSITY 7.070 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .132 C .833 O .035 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18939 MILES (30472 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.35 IN HG (745.5 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .937
RELATIVE HUMIDITY 52.5 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.7
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.986
MEASURED DISTANCE MILES (KM)	8.03 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	612.4 (17.34)
GAS METER FLOW RATE SCFM (SCMM)	.83 (.02)
TOTAL FLOW SCF (SCM)	6119. (173.3)

HC SAMPLE METER/RANGE/PPM (BAG)	2.2/	9/	2.22
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.3/	12/	.28
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	80.5/	11/	.7375
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.3/	9/	37.35
NOX BCKGRD METER/RANGE/PPM	.0/	2/	.00

DILUTION FACTOR	18.26
HC CONCENTRATION PPM	-1.23
CO CONCENTRATION PPM	.10
CO2 CONCENTRATION PCT	.6997
NOX CONCENTRATION PPM	37.35

HC MASS GRAMS	.000
CO MASS GRAMS	.020
CO2 MASS GRAMS	2219.98
NOX MASS GRAMS	11.595
PM MASS GRAMS	.933
FUEL MASS KG	.727
FUEL ECONOMY MPG (L/100KM)	35.39 (6.65)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.002
NOX G/MI	1.445
PM G/MI	.116
FUEL ECONOMY MPG (L/100KM)	35.39 (6.65)

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VEHICLE NUMBER 220	TEST AL-921-FTP3	DIESEL 26921
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/ 9/2003 RUN	FUEL DENSITY 7.070 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .132 C .833 O .035 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 18948 MILES (30487 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.94 IN HG (735.2 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .974
RELATIVE HUMIDITY 57.2 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	870.1	506.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.982/.984	.981/.984
MEASURED DISTANCE MILES (KM)	3.63 (5.84)	3.88 (6.24)	3.62 (5.83)
BLOWER FLOW RATE SCFM (SCMM)	610.5 (17.29)	609.6 (17.26)	604.7 (17.12)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.91 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5146. (145.7)	8853. (250.7)	5109. (144.7)

HC SAMPLE METER/RANGE/PPM (BAG)	7.0/ 9/ 7.02	2.8/ 9/ 2.78	2.7/ 9/ 2.75
HC BCKGRD METER/RANGE/PPM	3.6/ 2/ 3.65	3.8/ 2/ 3.85	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	20.5/ 12/ 19.68	.3/ 12/ .28	.2/ 12/ .19
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.2/ 12/ .19	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	55.1/ 11/ .4286	39.2/ 11/ .2796	50.5/ 11/ .3824
CO2 BCKGRD METER/RANGE/PCT	6.3/ 11/ .0400	6.2/ 11/ .0393	6.0/ 11/ .0380
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.3/ 9/ 9.30	5.5/ 9/ 5.50	12.2/ 9/ 12.21
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.0/ 1/ .00	.0/ 1/ .00

DILUTION FACTOR	31.25	48.15	35.21
HC CONCENTRATION PPM	3.49	-.99	-.89
CO CONCENTRATION PPM	18.97	.09	.00
CO2 CONCENTRATION PCT	.3899	.2410	.3455
NOX CONCENTRATION PPM	9.28	5.50	12.21

HC MASS GRAMS	.305	.000	.000
CO MASS GRAMS	3.219	.027	.001
CO2 MASS GRAMS	1040.15	1106.51	915.10
NOX MASS GRAMS	2.519	2.570	3.292
PM MASS GRAMS	.290	.166	.184
FUEL MASS KG	.343	.363	.300
FUEL ECONOMY MPG (L/100KM)	33.94 (6.93)	34.33 (6.85)	38.75 (6.07)

3-BAG COMPOSITE RESULTS

HC	G/MI	.017	
CO	G/MI	.188	
NOX	G/MI	.737	
PM	G/MI	.053	
FUEL ECONOMY MPG (L/100KM)		35.39 (6.65)	

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VEHICLE NUMBER 220	TEST AL-921-US06-3	DIESEL 26921
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/ 9/2003 RUN	FUEL DENSITY 7.070 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .132 C .833 O .035 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 18948 MILES (30487 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 28.93 IN HG (734.8 MM HG)	DRY BULB TEMPERATURE 74.0pF (23.3pC)	NOX HUMIDITY C.F. .981
RELATIVE HUMIDITY 54.5 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	8.05 (12.96)
BLOWER FLOW RATE SCFM (SCMM)	603.4 (17.09)
GAS METER FLOW RATE SCFM (SCMM)	.83 (.02)
TOTAL FLOW SCF (SCM)	6026. (170.7)

HC SAMPLE METER/RANGE/PPM (BAG)	2.5/	9/	2.45
HC BCKGRD METER/RANGE/PPM	3.7/	2/	3.75
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.0/	11/	.7446
CO2 BCKGRD METER/RANGE/PCT	6.2/	11/	.0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.5/	9/	37.52
NOX BCKGRD METER/RANGE/PPM	.0/	2/	.00

DILUTION FACTOR	18.09
HC CONCENTRATION PPM	-1.09
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.7074
NOX CONCENTRATION PPM	37.52

HC MASS GRAMS	.000
CO MASS GRAMS	.037
CO2 MASS GRAMS	2210.47
NOX MASS GRAMS	12.013
PM MASS GRAMS	.898
FUEL MASS KG	.724
FUEL ECONOMY MPG (L/100KM)	35.67 (6.60)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.005
NOX G/MI	1.491
PM G/MI	.112
FUEL ECONOMY MPG (L/100KM)	35.67 (6.60)

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VEHICLE NUMBER 220	TEST AL-922-FTP1	DIESEL 26922
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/14/2003 RUN	FUEL DENSITY 7.250 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .123 C .805 O .072 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19001 MILES (30572 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.49 IN HG (749.1 MM HG)	DRY BULB TEMPERATURE 79.0°F (26.1°C)	NOX HUMIDITY C.F. .868
RELATIVE HUMIDITY 28.4 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.5	870.7	506.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.986/.990	.988/.990	.987/.990
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.88 (6.24)	3.63 (5.83)
BLOWER FLOW RATE SCFM (SCMM)	619.1 (17.53)	620.9 (17.58)	619.5 (17.55)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5224. (147.9)	9024. (255.6)	5232. (148.2)

HC SAMPLE METER/RANGE/PPM (BAG)	10.8/ 9/ 10.75	2.9/ 9/ 2.85	2.7/ 9/ 2.75
HC BCKGRD METER/RANGE/PPM	3.9/ 2/ 3.95	4.0/ 2/ 4.05	3.8/ 2/ 3.85
CO SAMPLE METER/RANGE/PPM	27.3/ 12/ 26.35	.2/ 12/ .19	.2/ 12/ .19
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09	.2/ 12/ .19	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	55.8/ 11/ .4358	40.0/ 11/ .2864	50.8/ 11/ .3854
CO2 BCKGRD METER/RANGE/PCT	6.3/ 11/ .0400	6.1/ 11/ .0387	6.2/ 11/ .0393
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.4/ 9/ 10.38	5.7/ 9/ 5.69	13.2/ 9/ 13.20
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .10	.2/ 1/ .05	.1/ 1/ .03

DILUTION FACTOR	31.34	48.04	35.71
HC CONCENTRATION PPM	6.93	-1.11	-.99
CO CONCENTRATION PPM	25.80	.00	.00
CO2 CONCENTRATION PCT	.3971	.2485	.3471
NOX CONCENTRATION PPM	10.29	5.64	13.18

HC MASS GRAMS	.636	.000	.000
CO MASS GRAMS	4.443	.001	.001
CO2 MASS GRAMS	1075.59	1162.74	941.72
NOX MASS GRAMS	2.525	2.390	3.240
PM MASS GRAMS	.264	.138	.097
FUEL MASS KG	.368	.394	.319
FUEL ECONOMY MPG (L/100KM)	32.27 (7.29)	32.32 (7.28)	37.32 (6.30)

3-BAG COMPOSITE RESULTS

HC	G/MI	.037	
CO	G/MI	.255	
NOX	G/MI	.710	
PM	G/MI	.041	
FUEL ECONOMY MPG (L/100KM)		33.58 (7.01)	

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VEHICLE NUMBER 220	TEST AL-922-US061	DIESEL 26922
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/14/2003 RUN	FUEL DENSITY 7.250 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .123 C .805 O .072 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19018 MILES (30599 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.48 IN HG (748.9 MM HG)	DRY BULB TEMPERATURE 73.0pF (22.8pC)	NOX HUMIDITY C.F. .960
RELATIVE HUMIDITY 53.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	599.8
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.985
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	616.2 (17.45)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6168. (174.7)

HC SAMPLE METER/RANGE/PPM (BAG)	2.3/	9/	2.35
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.3/	12/	.28
CO2 SAMPLE METER/RANGE/PCT	81.4/	11/	.7503
CO2 BCKGRD METER/RANGE/PCT	6.4/	11/	.0406
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	38.0/	9/	38.03
NOX BCKGRD METER/RANGE/PPM	.0/	2/	.00

DILUTION FACTOR	18.35
HC CONCENTRATION PPM	-1.10
CO CONCENTRATION PPM	.10
CO2 CONCENTRATION PCT	.7119
NOX CONCENTRATION PPM	38.03

HC MASS GRAMS	.000
CO MASS GRAMS	.021
CO2 MASS GRAMS	2276.83
NOX MASS GRAMS	12.197
PM MASS GRAMS	.538
FUEL MASS KG	.772
FUEL ECONOMY MPG (L/100KM)	34.16 (6.89)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000
CO	G/MI	.003
NOX	G/MI	1.520
PM	G/MI	.067
FUEL ECONOMY MPG (L/100KM)		34.16 (6.89)

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VEHICLE NUMBER 220	TEST AL-922-FTP2	DIESEL 26922
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/15/2003 RUN	FUEL DENSITY 7.250 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .123 C .805 O .072 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19027 MILES (30614 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.43 IN HG (747.5 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .961
RELATIVE HUMIDITY 53.7 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.6	870.4	505.7
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.985	.982/.985	.981/.985
MEASURED DISTANCE MILES (KM)	3.61 (5.81)	3.85 (6.20)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	619.6 (17.55)	620.3 (17.57)	618.8 (17.53)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.94 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5229. (148.1)	9012. (255.2)	5223. (147.9)

HC SAMPLE METER/RANGE/PPM (BAG)	10.4/ 9/ 10.39	3.8/ 9/ 3.77	3.8/ 9/ 3.82
HC BCKGRD METER/RANGE/PPM	4.6/ 2/ 4.66	4.5/ 2/ 4.56	4.2/ 2/ 4.25
CO SAMPLE METER/RANGE/PPM	25.1/ 12/ 24.18	1.5/ 12/ 1.41	1.3/ 12/ 1.22
CO BCKGRD METER/RANGE/PPM	1.5/ 12/ 1.41	1.4/ 12/ 1.31	1.3/ 12/ 1.22
CO2 SAMPLE METER/RANGE/PCT	56.0/ 11/ .4379	40.4/ 11/ .2898	50.8/ 11/ .3854
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0471	7.5/ 11/ .0477	7.4/ 11/ .0471
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.7/ 9/ 10.68	5.9/ 9/ 5.92	13.5/ 9/ 13.46
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .13	.8/ 1/ .20	.5/ 1/ .13

DILUTION FACTOR	31.21	47.44	35.69
HC CONCENTRATION PPM	5.88	-.69	-.32
CO CONCENTRATION PPM	22.22	.11	.02
CO2 CONCENTRATION PCT	.3924	.2431	.3396
NOX CONCENTRATION PPM	10.56	5.72	13.33

HC MASS GRAMS	.541	.000	.000
CO MASS GRAMS	3.831	.033	.004
CO2 MASS GRAMS	1063.76	1136.17	919.77
NOX MASS GRAMS	2.873	2.684	3.624
PM MASS GRAMS	.236	.117	.094
FUEL MASS KG	.363	.385	.312
FUEL ECONOMY MPG (L/100KM)	32.67 (7.20)	32.86 (7.16)	37.95 (6.20)

3-BAG COMPOSITE RESULTS

HC	G/MI	.031	
CO	G/MI	.226	
NOX	G/MI	.803	
PM	G/MI	.037	
FUEL ECONOMY MPG (L/100KM)		34.12 (6.89)	

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VEHICLE NUMBER 220	TEST AL-922-US06-2	DIESEL 26922
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/15/2003 RUN	FUEL DENSITY 7.250 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .123 C .805 O .072 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19045 MILES (30643 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.43 IN HG (747.5 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .948
RELATIVE HUMIDITY 53.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.5
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.986
MEASURED DISTANCE MILES (KM)	8.04 (12.93)
BLOWER FLOW RATE SCFM (SCMM)	616.3 (17.45)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6156. (174.3)

HC SAMPLE METER/RANGE/PPM (BAG)	2.9/	9/	2.89
HC BCKGRD METER/RANGE/PPM	4.2/	2/	4.25
CO SAMPLE METER/RANGE/PPM	1.4/	12/	1.31
CO BCKGRD METER/RANGE/PPM	1.3/	12/	1.22
CO2 SAMPLE METER/RANGE/PCT	81.0/	11/	.7446
CO2 BCKGRD METER/RANGE/PCT	7.3/	11/	.0464
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	38.4/	9/	38.43
NOX BCKGRD METER/RANGE/PPM	.1/	2/	.10

DILUTION FACTOR	18.49
HC CONCENTRATION PPM	-1.13
CO CONCENTRATION PPM	.14
CO2 CONCENTRATION PCT	.7007
NOX CONCENTRATION PPM	38.34

HC MASS GRAMS	.000
CO MASS GRAMS	.028
CO2 MASS GRAMS	2236.37
NOX MASS GRAMS	12.115
PM MASS GRAMS	.478
FUEL MASS KG	.759
FUEL ECONOMY MPG (L/100KM)	34.83 (6.75)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.003	
NOX	G/MI	1.508	
PM	G/MI	.059	
FUEL ECONOMY MPG (L/100KM)		34.83 (6.75)	

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VEHICLE NUMBER 220	TEST AL-922-FTP3	DIESEL 26922
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/16/2003 RUN	FUEL DENSITY 7.250 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .123 C .805 O .072 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19054 MILES (30657 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.54 IN HG (750.2 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .869
RELATIVE HUMIDITY 37.6 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.2	870.0	506.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.986/.990	.988/.990	.987/.990
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.86 (6.21)	3.61 (5.81)
BLOWER FLOW RATE SCFM (SCMM)	625.3 (17.71)	626.1 (17.73)	622.9 (17.64)
GAS METER FLOW RATE SCFM (SCMM)	.90 (.03)	.95 (.03)	.90 (.03)
TOTAL FLOW SCF (SCM)	5273. (149.3)	9093. (257.5)	5262. (149.0)

HC SAMPLE METER/RANGE/PPM (BAG)	8.3/ 9/ 8.33	2.7/ 9/ 2.74	2.6/ 9/ 2.60
HC BCKGRD METER/RANGE/PPM	4.7/ 2/ 4.76	5.5/ 2/ 5.57	5.8/ 2/ 5.87
CO SAMPLE METER/RANGE/PPM	23.2/ 12/ 22.32	.3/ 12/ .28	.3/ 12/ .28
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.3/ 12/ .28	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	54.8/ 11/ .4255	38.5/ 11/ .2736	49.3/ 11/ .3708
CO2 BCKGRD METER/RANGE/PCT	6.2/ 11/ .0393	6.0/ 11/ .0380	6.3/ 11/ .0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	11.2/ 9/ 11.17	6.2/ 9/ 6.21	14.2/ 9/ 14.22
NOX BCKGRD METER/RANGE/PPM	.0/ 1/ .00	.0/ 1/ .00	.1/ 1/ .03

DILUTION FACTOR	32.14	50.28	37.11
HC CONCENTRATION PPM	3.72	-2.72	-3.11
CO CONCENTRATION PPM	21.69	.00	.10
CO2 CONCENTRATION PCT	.3874	.2363	.3319
NOX CONCENTRATION PPM	11.17	6.21	14.19

HC MASS GRAMS	.345	.000	.000
CO MASS GRAMS	3.771	.001	.017
CO2 MASS GRAMS	1059.06	1114.23	905.63
NOX MASS GRAMS	2.772	2.658	3.516
PM MASS GRAMS	.232	.108	.101
FUEL MASS KG	.362	.378	.307
FUEL ECONOMY MPG (L/100KM)	32.80 (7.17)	33.56 (7.01)	38.66 (6.08)

3-BAG COMPOSITE RESULTS

HC	G/MI	.020	
CO	G/MI	.219	
NOX	G/MI	.784	
PM	G/MI	.036	
FUEL ECONOMY MPG (L/100KM)		34.70 (6.78)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-922-US06-3	DIESEL 26922
VEHICLE MODEL 99 MERCEDES BENZ	DATE 1/16/2003 RUN	FUEL DENSITY 7.250 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .123 C .805 O .072 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19072 MILES (30686 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.55 IN HG (750.5 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .857
RELATIVE HUMIDITY 32.4 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	597.8
DRY/WET CORRECTION FACTOR, SAMP/BACK	.984/.991
MEASURED DISTANCE MILES (KM)	8.04 (12.94)
BLOWER FLOW RATE SCFM (SCMM)	620.6 (17.58)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6192. (175.4)

HC SAMPLE METER/RANGE/PPM (BAG)	2.2/	9/	2.19
HC BCKGRD METER/RANGE/PPM	5.3/	2/	5.36
CO SAMPLE METER/RANGE/PPM	.6/	12/	.56
CO BCKGRD METER/RANGE/PPM	.4/	12/	.37
CO2 SAMPLE METER/RANGE/PCT	80.2/	11/	.7333
CO2 BCKGRD METER/RANGE/PCT	6.3/	11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	41.1/	9/	41.13
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.78
HC CONCENTRATION PPM	-2.89
CO CONCENTRATION PPM	.20
CO2 CONCENTRATION PCT	.6954
NOX CONCENTRATION PPM	41.11

HC MASS GRAMS	.000
CO MASS GRAMS	.040
CO2 MASS GRAMS	2232.79
NOX MASS GRAMS	11.821
PM MASS GRAMS	.501
FUEL MASS KG	.758
FUEL ECONOMY MPG (L/100KM)	34.91 (6.74)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.005	
NOX	G/MI	1.470	
PM	G/MI	.062	
FUEL ECONOMY MPG (L/100KM)		34.91 (6.74)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-938-FTP1	DIESEL AL-938
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/ 5/2003 RUN	FUEL DENSITY 7.240 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .104 C .689 O .000 X .207
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19256 MILES (30982 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.16 IN HG (740.7 MM HG)	DRY BULB TEMPERATURE 72.00F (22.20C)	NOX HUMIDITY C.F. .951
RELATIVE HUMIDITY 53.2 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.5	870.6	505.1
DRY/WET CORRECTION FACTOR, SAMP/BACK	.982/.985	.983/.985	.982/.985
MEASURED DISTANCE MILES (KM)	3.61 (5.82)	3.86 (6.21)	3.60 (5.80)
BLOWER FLOW RATE SCFM (SCMM)	615.7 (17.44)	613.5 (17.38)	609.7 (17.27)
GAS METER FLOW RATE SCFM (SCMM)	.88 (.02)	.92 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5195. (147.1)	8916. (252.5)	5140. (145.6)

HC SAMPLE METER/RANGE/PPM (BAG)	27.2/ 9/ 27.18	4.1/ 9/ 4.13	4.6/ 9/ 4.63
HC BCKGRD METER/RANGE/PPM	3.9/ 2/ 3.95	3.7/ 2/ 3.75	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	55.0/ 12/ 53.80	.2/ 12/ .19	1.3/ 12/ 1.22
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.2/ 12/ .19	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	55.4/ 11/ .4317	40.3/ 11/ .2890	50.3/ 11/ .3805
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0419	6.8/ 11/ .0432	6.5/ 11/ .0413
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.7/ 9/ 9.71	5.7/ 9/ 5.69	11.7/ 9/ 11.67
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	30.95	47.01	35.70
HC CONCENTRATION PPM	23.36	.46	.98
CO CONCENTRATION PPM	52.26	.00	1.01
CO2 CONCENTRATION PCT	.3911	.2467	.3404
NOX CONCENTRATION PPM	9.69	5.67	11.64

HC MASS GRAMS	2.490	.084	.104
CO MASS GRAMS	8.950	.001	.171
CO2 MASS GRAMS	1053.42	1140.49	907.17
NOX MASS GRAMS	2.592	2.604	3.082
PM MASS GRAMS	.415	.105	.095
FUEL MASS KG	.425	.452	.360
FUEL ECONOMY MPG (L/100KM)	27.90 (8.43)	28.04 (8.39)	32.89 (7.15)

3-BAG COMPOSITE RESULTS

HC	G/MI	.162	
CO	G/MI	.528	
NOX	G/MI	.733	
PM	G/MI	.045	
FUEL ECONOMY MPG (L/100KM)		29.24 (8.05)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-938-US06-1	DIESEL AL-938
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/ 6/2003 RUN	FUEL DENSITY 7.240 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .104 C .689 O .000 X .207
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19274 MILES (31011 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.15 IN HG (740.3 MM HG)	DRY BULB TEMPERATURE 72.00F (22.20C)	NOX HUMIDITY C.F. .951
RELATIVE HUMIDITY 53.2 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.985
MEASURED DISTANCE MILES (KM)	7.99 (12.86)
BLOWER FLOW RATE SCFM (SCMM)	607.4 (17.20)
GAS METER FLOW RATE SCFM (SCMM)	.84 (.02)
TOTAL FLOW SCF (SCM)	6065. (171.8)

HC SAMPLE METER/RANGE/PPM (BAG)	3.6/ 9/	3.60
HC BCKGRD METER/RANGE/PPM	3.7/ 2/	3.75
CO SAMPLE METER/RANGE/PPM	.3/ 12/	.28
CO BCKGRD METER/RANGE/PPM	.1/ 12/	.09
CO2 SAMPLE METER/RANGE/PCT	79.9/ 11/	.7290
CO2 BCKGRD METER/RANGE/PCT	6.3/ 11/	.0400
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	32.9/ 9/	32.89
NOX BCKGRD METER/RANGE/PPM	.1/ 1/	.03

DILUTION FACTOR	18.65
HC CONCENTRATION PPM	.05
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.6912
NOX CONCENTRATION PPM	32.87

HC MASS GRAMS	.007
CO MASS GRAMS	.037
CO2 MASS GRAMS	2173.51
NOX MASS GRAMS	10.270
PM MASS GRAMS	.364
FUEL MASS KG	.861
FUEL ECONOMY MPG (L/100KM)	30.48 (7.72)

1-BAG COMPOSITE RESULTS

HC G/MI	.001	
CO G/MI	.005	
NOX G/MI	1.285	
PM G/MI	.046	
FUEL ECONOMY MPG (L/100KM)	30.48 (7.72)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-938-FTP2	DIESEL AL-938
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/ 6/2003 RUN	FUEL DENSITY 7.240 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .104 C .689 O .000 X .207
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19283 MILES (31026 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.05 IN HG (738.0 MM HG)	DRY BULB TEMPERATURE 71.0°F (21.7°C)	NOX HUMIDITY C.F. .940
RELATIVE HUMIDITY 52.7 PCT.		

	1 COLD TRANSIENT (0-505 SEC.)	2 STABILIZED (505-1372 SEC.)	3 HOT TRANSIENT (0- 505 SEC.)
BAG NUMBER			
BAG DESCRIPTION			
RUN TIME SECONDS	505.2	870.0	505.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.982/.986	.983/.986	.983/.986
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.86 (6.22)	3.60 (5.80)
BLOWER FLOW RATE SCFM (SCMM)	614.8 (17.41)	613.3 (17.37)	610.0 (17.28)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5184. (146.8)	8906. (252.2)	5146. (145.7)

HC SAMPLE METER/RANGE/PPM (BAG)	29.1/ 9/ 29.09	4.5/ 9/ 4.52	5.0/ 9/ 4.96
HC BCKGRD METER/RANGE/PPM	3.7/ 2/ 3.75	3.6/ 2/ 3.65	3.4/ 2/ 3.45
CO SAMPLE METER/RANGE/PPM	54.3/ 12/ 53.11	.5/ 12/ .47	2.5/ 12/ 2.35
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28	.4/ 12/ .37	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	56.2/ 11/ .4400	40.5/ 11/ .2907	51.0/ 11/ .3873
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0432	6.7/ 11/ .0425	7.0/ 11/ .0445
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.1/ 9/ 10.06	6.0/ 9/ 5.98	12.3/ 9/ 12.30
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	30.36	46.72	35.06
HC CONCENTRATION PPM	25.47	.95	1.61
CO CONCENTRATION PPM	51.49	.10	2.02
CO2 CONCENTRATION PCT	.3982	.2491	.3441
NOX CONCENTRATION PPM	10.03	5.96	12.28

HC MASS GRAMS	2.709	.173	.170
CO MASS GRAMS	8.801	.029	.343
CO2 MASS GRAMS	1070.44	1150.09	918.10
NOX MASS GRAMS	2.648	2.701	3.217
PM MASS GRAMS	.438	.108	.081
FUEL MASS KG	.432	.456	.364
FUEL ECONOMY MPG (L/100KM)	27.40 (8.59)	27.83 (8.45)	32.49 (7.24)

3-BAG COMPOSITE RESULTS

HC	G/MI	.192	
CO	G/MI	.537	
NOX	G/MI	.760	
PM	G/MI	.046	
FUEL ECONOMY MPG (L/100KM)		28.92 (8.13)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-938-US06-2	DIESEL AL-938
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/ 6/2003 RUN	FUEL DENSITY 7.240 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .104 C .689 O .000 X .207
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19300 MILES (31053 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.07 IN HG (738.4 MM HG)	DRY BULB TEMPERATURE 71.00F (21.70C)	NOX HUMIDITY C.F. .940
RELATIVE HUMIDITY 52.7 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.986
MEASURED DISTANCE MILES (KM)	8.03 (12.92)
BLOWER FLOW RATE SCFM (SCMM)	607.7 (17.21)
GAS METER FLOW RATE SCFM (SCMM)	.77 (.02)
TOTAL FLOW SCF (SCM)	6068. (171.9)

HC SAMPLE METER/RANGE/PPM (BAG)	3.6/ 9/	3.64
HC BCKGRD METER/RANGE/PPM	3.3/ 2/	3.34
CO SAMPLE METER/RANGE/PPM	.5/ 12/	.47
CO BCKGRD METER/RANGE/PPM	.2/ 12/	.19
CO2 SAMPLE METER/RANGE/PCT	80.4/ 11/	.7361
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/	.0432
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	33.9/ 9/	33.90
NOX BCKGRD METER/RANGE/PPM	.1/ 1/	.03

DILUTION FACTOR	18.47
HC CONCENTRATION PPM	.47
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.6952
NOX CONCENTRATION PPM	33.88

HC MASS GRAMS	.059
CO MASS GRAMS	.056
CO2 MASS GRAMS	2187.51
NOX MASS GRAMS	10.467
PM MASS GRAMS	.373
FUEL MASS KG	.867
FUEL ECONOMY MPG (L/100KM)	30.42 (7.73)

1-BAG COMPOSITE RESULTS

HC G/MI	.007	
CO G/MI	.007	
NOX G/MI	1.304	
PM G/MI	.046	
FUEL ECONOMY MPG (L/100KM)	30.42 (7.73)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-938-FTP3	DIESEL AL-938
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/ 7/2003 RUN	FUEL DENSITY 7.240 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .104 C .689 O .000 X .207
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19309 MILES (31068 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.51 IN HG (749.6 MM HG)	DRY BULB TEMPERATURE 70.00F (21.10C)	NOX HUMIDITY C.F. .924
RELATIVE HUMIDITY 51.8 PCT.		

	1 COLD TRANSIENT (0-505 SEC.)	2 STABILIZED (505-1372 SEC.)	3 HOT TRANSIENT (0- 505 SEC.)
BAG NUMBER			
BAG DESCRIPTION			
RUN TIME SECONDS	505.4	869.6	505.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.983/.987	.984/.987	.983/.987
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.86 (6.21)	3.60 (5.80)
BLOWER FLOW RATE SCFM (SCMM)	623.8 (17.67)	623.3 (17.65)	620.2 (17.57)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.96 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5262. (149.0)	9047. (256.2)	5232. (148.2)

HC SAMPLE METER/RANGE/PPM (BAG)	26.2/ 9/ 26.20	3.8/ 9/ 3.81	4.4/ 9/ 4.42
HC BCKGRD METER/RANGE/PPM	3.6/ 2/ 3.65	3.6/ 2/ 3.65	3.5/ 2/ 3.55
CO SAMPLE METER/RANGE/PPM	52.5/ 12/ 51.31	.4/ 12/ .37	2.9/ 12/ 2.73
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.3/ 12/ .28	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	55.4/ 11/ .4317	40.0/ 11/ .2864	50.3/ 11/ .3805
CO2 BCKGRD METER/RANGE/PCT	6.3/ 11/ .0400	6.6/ 11/ .0419	6.5/ 11/ .0413
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.0/ 9/ 9.99	5.8/ 9/ 5.84	12.0/ 9/ 12.03
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.1/ 1/ .03

DILUTION FACTOR	30.97	47.44	35.69
HC CONCENTRATION PPM	22.68	.24	.97
CO CONCENTRATION PPM	49.85	.10	2.39
CO2 CONCENTRATION PCT	.3930	.2454	.3404
NOX CONCENTRATION PPM	9.97	5.82	12.01

HC MASS GRAMS	2.448	.045	.104
CO MASS GRAMS	8.649	.029	.413
CO2 MASS GRAMS	1072.18	1151.03	923.38
NOX MASS GRAMS	2.625	2.633	3.143
PM MASS GRAMS	.407	.122	.092
FUEL MASS KG	.433	.456	.366
FUEL ECONOMY MPG (L/100KM)	27.38 (8.59)	27.79 (8.46)	32.32 (7.28)

3-BAG COMPOSITE RESULTS

HC	G/MI	.155	
CO	G/MI	.533	
NOX	G/MI	.744	
PM	G/MI	.047	
FUEL ECONOMY MPG (L/100KM)		28.85 (8.15)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
 COMPUTER PROGRAM LDT 2.7-R 1-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-938-US06-3	DIESEL AL-938
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/ 7/2003 RUN	FUEL DENSITY 7.240 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .104 C .689 O .000 X .207
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19326 MILES (31095 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.51 IN HG (749.6 MM HG)	DRY BULB TEMPERATURE 70.00F (21.10C)	NOX HUMIDITY C.F. .924
RELATIVE HUMIDITY 51.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	594.3
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.987
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	617.7 (17.49)
GAS METER FLOW RATE SCFM (SCMM)	.87 (.02)
TOTAL FLOW SCF (SCM)	6126. (173.5)

HC SAMPLE METER/RANGE/PPM (BAG)	3.3/ 9/	3.31
HC BCKGRD METER/RANGE/PPM	3.3/ 2/	3.34
CO SAMPLE METER/RANGE/PPM	.3/ 12/	.28
CO BCKGRD METER/RANGE/PPM	.1/ 12/	.09
CO2 SAMPLE METER/RANGE/PCT	79.5/ 11/	.7234
CO2 BCKGRD METER/RANGE/PCT	5.8/ 11/	.0368
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	33.1/ 9/	33.09
NOX BCKGRD METER/RANGE/PPM	.1/ 1/	.03

DILUTION FACTOR	18.80
HC CONCENTRATION PPM	.14
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.6886
NOX CONCENTRATION PPM	33.07

HC MASS GRAMS	.018
CO MASS GRAMS	.037
CO2 MASS GRAMS	2187.49
NOX MASS GRAMS	10.135
PM MASS GRAMS	.331
FUEL MASS KG	.867
FUEL ECONOMY MPG (L/100KM)	30.40 (7.74)

1-BAG COMPOSITE RESULTS

HC G/MI	.002	
CO G/MI	.005	
NOX G/MI	1.263	
PM G/MI	.041	
FUEL ECONOMY MPG (L/100KM)	30.40 (7.74)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-944-FTP1	DIESEL AL-944
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/18/2003 RUN	FUEL DENSITY 7.175 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .130 C .807 O .062 X .001
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19377 MILES (31177 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.22 IN HG (742.2 MM HG)	DRY BULB TEMPERATURE 72.0°F (22.2°C)	NOX HUMIDITY C.F. .971
RELATIVE HUMIDITY 57.0 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.0	874.6	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.980/.984	.982/.984	.981/.984
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.87 (6.23)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	607.8 (17.21)	611.0 (17.30)	609.2 (17.25)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.94 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5124. (145.1)	8920. (252.6)	5137. (145.5)

HC SAMPLE METER/RANGE/PPM (BAG)	11.0/ 9/ 10.98	3.2/ 9/ 3.24	3.2/ 9/ 3.21
HC BCKGRD METER/RANGE/PPM	3.4/ 2/ 3.45	3.5/ 2/ 3.55	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	32.3/ 12/ 31.27	.2/ 12/ .19	.4/ 12/ .37
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.1/ 12/ .09	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	56.2/ 11/ .4283	41.1/ 11/ .2849	51.2/ 11/ .3777
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0415	7.2/ 11/ .0421	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	10.1/ 9/ 10.12	5.8/ 9/ 5.78	12.8/ 9/ 12.75
NOX BCKGRD METER/RANGE/PPM	.6/ 1/ .15	.6/ 1/ .15	.2/ 1/ .05

DILUTION FACTOR	31.17	47.26	35.66
HC CONCENTRATION PPM	7.64	-.23	-.43
CO CONCENTRATION PPM	30.26	.09	.19
CO2 CONCENTRATION PCT	.3882	.2437	.3368
NOX CONCENTRATION PPM	9.98	5.63	12.70

HC MASS GRAMS	.686	.000	.000
CO MASS GRAMS	5.111	.027	.032
CO2 MASS GRAMS	1031.15	1127.01	896.95
NOX MASS GRAMS	2.687	2.641	3.431
PM MASS GRAMS	.180	.113	.116
FUEL MASS KG	.352	.381	.303
FUEL ECONOMY MPG (L/100KM)	33.32 (7.06)	33.04 (7.12)	38.58 (6.10)

3-BAG COMPOSITE RESULTS

HC	G/MI	.039	
CO	G/MI	.300	
NOX	G/MI	.770	
PM	G/MI	.034	
FUEL ECONOMY MPG (L/100KM)		34.50 (6.82)	

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VEHICLE NUMBER 220	TEST AL-944-US06-1	DIESEL AL-944
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/18/2003 RUN	FUEL DENSITY 7.175 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .130 C .807 O .062 X .001
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19394 MILES (31204 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.06 IN HG (738.2 MM HG)	DRY BULB TEMPERATURE 72.0pF (22.2pC)	NOX HUMIDITY C.F. .973
RELATIVE HUMIDITY 57.1 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.5
DRY/WET CORRECTION FACTOR, SAMP/BACK	.977/.984
MEASURED DISTANCE MILES (KM)	8.03 (12.92)
BLOWER FLOW RATE SCFM (SCMM)	605.9 (17.16)
GAS METER FLOW RATE SCFM (SCMM)	.84 (.02)
TOTAL FLOW SCF (SCM)	6052. (171.4)

HC SAMPLE METER/RANGE/PPM (BAG)	2.8/	9/	2.80
HC BCKGRD METER/RANGE/PPM	3.5/	2/	3.55
CO SAMPLE METER/RANGE/PPM	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.1/	12/	.09
CO2 SAMPLE METER/RANGE/PCT	81.7/	11/	.7468
CO2 BCKGRD METER/RANGE/PCT	7.4/	11/	.0433
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	38.0/	9/	37.99
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08

DILUTION FACTOR	18.04
HC CONCENTRATION PPM	-.55
CO CONCENTRATION PPM	.09
CO2 CONCENTRATION PCT	.7059
NOX CONCENTRATION PPM	37.92

HC MASS GRAMS	.000
CO MASS GRAMS	.019
CO2 MASS GRAMS	2215.20
NOX MASS GRAMS	12.089
PM MASS GRAMS	.706
FUEL MASS KG	.749
FUEL ECONOMY MPG (L/100KM)	34.86 (6.75)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.002	
NOX	G/MI	1.506	
PM	G/MI	.088	
FUEL ECONOMY MPG (L/100KM)		34.86 (6.75)	

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VEHICLE NUMBER 220	TEST AL-944-FTP2	DIESEL AL-944
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/19/2003 RUN	FUEL DENSITY 7.175 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .130 C .807 O .062 X .001
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19403 MILES (31219 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.18 IN HG (741.2 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .964
RELATIVE HUMIDITY 53.8 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	870.6	505.3
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.985	.982/.985	.981/.985
MEASURED DISTANCE MILES (KM)	3.59 (5.78)	3.87 (6.22)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	616.6 (17.46)	615.1 (17.42)	610.4 (17.29)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.93 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5198. (147.2)	8939. (253.2)	5148. (145.8)

HC SAMPLE METER/RANGE/PPM (BAG)	9.6/ 9/ 9.56	3.3/ 9/ 3.28	3.3/ 9/ 3.25
HC BCKGRD METER/RANGE/PPM	3.7/ 2/ 3.75	3.9/ 2/ 3.95	3.8/ 2/ 3.85
CO SAMPLE METER/RANGE/PPM	28.3/ 12/ 27.33	.3/ 12/ .28	.5/ 12/ .47
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09	.2/ 12/ .19	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	56.0/ 11/ .4262	41.7/ 11/ .2901	51.5/ 11/ .3806
CO2 BCKGRD METER/RANGE/PCT	8.9/ 11/ .0524	8.3/ 11/ .0488	7.9/ 11/ .0463
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.8/ 9/ 9.81	5.8/ 9/ 5.77	12.1/ 9/ 12.08
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .08	.4/ 1/ .10	.3/ 1/ .08

DILUTION FACTOR	31.36	46.42	35.38
HC CONCENTRATION PPM	5.93	-.58	-.49
CO CONCENTRATION PPM	26.54	.09	.37
CO2 CONCENTRATION PCT	.3755	.2424	.3356
NOX CONCENTRATION PPM	9.73	5.68	12.01

HC MASS GRAMS	.540	.000	.000
CO MASS GRAMS	4.548	.028	.062
CO2 MASS GRAMS	1012.08	1123.31	895.84
NOX MASS GRAMS	2.641	2.648	3.227
PM MASS GRAMS	.203	.114	.117
FUEL MASS KG	.345	.380	.303
FUEL ECONOMY MPG (L/100KM)	33.88 (6.94)	33.12 (7.10)	38.65 (6.09)

3-BAG COMPOSITE RESULTS

HC	G/MI	.031	
CO	G/MI	.271	
NOX	G/MI	.753	
PM	G/MI	.036	
FUEL ECONOMY MPG (L/100KM)		34.67 (6.78)	

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VEHICLE NUMBER 220	TEST AL-944-US06-2	DIESEL AL-944
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/19/2003 RUN	FUEL DENSITY 7.175 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .130 C .807 O .062 X .001
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19421 MILES (31248 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.19 IN HG (741.6 MM HG)	DRY BULB TEMPERATURE 73.0pF (22.8pC)	NOX HUMIDITY C.F. .964
RELATIVE HUMIDITY 53.8 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	597.9
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.985
MEASURED DISTANCE MILES (KM)	8.02 (12.90)
BLOWER FLOW RATE SCFM (SCMM)	609.3 (17.26)
GAS METER FLOW RATE SCFM (SCMM)	.85 (.02)
TOTAL FLOW SCF (SCM)	6080. (172.2)

HC SAMPLE METER/RANGE/PPM (BAG)	2.8/	9/	2.81
HC BCKGRD METER/RANGE/PPM	3.4/	2/	3.45
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.3/	11/	.7409
CO2 BCKGRD METER/RANGE/PCT	7.7/	11/	.0451
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.5/	9/	37.47
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	18.19
HC CONCENTRATION PPM	-.45
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.6983
NOX CONCENTRATION PPM	37.42

HC MASS GRAMS	.000
CO MASS GRAMS	.038
CO2 MASS GRAMS	2201.47
NOX MASS GRAMS	11.875
PM MASS GRAMS	.628
FUEL MASS KG	.745
FUEL ECONOMY MPG (L/100KM)	35.03 (6.72)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.005
NOX G/MI	1.482
PM G/MI	.078
FUEL ECONOMY MPG (L/100KM)	35.03 (6.72)

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-944-FTP3	DIESEL AL-944
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/20/2003 RUN	FUEL DENSITY 7.175 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .130 C .807 O .062 X .001
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19429 MILES (31261 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.11 IN HG (739.3 MM HG)	DRY BULB TEMPERATURE 73.0°F (22.8°C)	NOX HUMIDITY C.F. .965
RELATIVE HUMIDITY 53.9 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	869.7	505.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.985	.982/.985	.981/.985
MEASURED DISTANCE MILES (KM)	3.61 (5.80)	3.88 (6.25)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	616.0 (17.44)	614.4 (17.40)	609.3 (17.25)
GAS METER FLOW RATE SCFM (SCMM)	.90 (.03)	.93 (.03)	.89 (.03)
TOTAL FLOW SCF (SCM)	5193. (147.1)	8919. (252.6)	5138. (145.5)

HC SAMPLE METER/RANGE/PPM (BAG)	10.9/ 9/ 10.91	3.4/ 9/ 3.37	3.3/ 9/ 3.34
HC BCKGRD METER/RANGE/PPM	3.6/ 2/ 3.65	3.6/ 2/ 3.65	3.7/ 2/ 3.75
CO SAMPLE METER/RANGE/PPM	31.9/ 12/ 30.88	.3/ 12/ .28	.4/ 12/ .37
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19	.3/ 12/ .28	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	56.4/ 11/ .4304	41.7/ 11/ .2901	51.7/ 11/ .3826
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0445	7.7/ 11/ .0451	7.7/ 11/ .0451
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.9/ 9/ 9.95	5.8/ 9/ 5.85	11.8/ 9/ 11.82
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .03	.1/ 1/ .03	.0/ 1/ .00

DILUTION FACTOR	31.02	46.41	35.20
HC CONCENTRATION PPM	7.38	-.20	-.30
CO CONCENTRATION PPM	29.90	.00	.10
CO2 CONCENTRATION PCT	.3873	.2459	.3388
NOX CONCENTRATION PPM	9.92	5.82	11.82

HC MASS GRAMS	.671	.000	.000
CO MASS GRAMS	5.120	.001	.016
CO2 MASS GRAMS	1042.94	1137.24	902.43
NOX MASS GRAMS	2.693	2.713	3.172
PM MASS GRAMS	.163	.106	.100
FUEL MASS KG	.356	.385	.305
FUEL ECONOMY MPG (L/100KM)	32.94 (7.14)	32.84 (7.16)	38.37 (6.13)

3-BAG COMPOSITE RESULTS

HC	G/MI	.039	
CO	G/MI	.295	
NOX	G/MI	.759	
PM	G/MI	.031	
FUEL ECONOMY MPG (L/100KM)		34.25 (6.87)	

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VEHICLE NUMBER 220	TEST AL-944-US06-3	DIESEL AL-944
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/20/2003 RUN	FUEL DENSITY 7.175 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .130 C .807 O .062 X .001
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19447 MILES (31290 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.09 IN HG (738.9 MM HG)	DRY BULB TEMPERATURE 73.0pF (22.8pC)	NOX HUMIDITY C.F. .965
RELATIVE HUMIDITY 53.9 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	597.8
DRY/WET CORRECTION FACTOR, SAMP/BACK	.978/.985
MEASURED DISTANCE MILES (KM)	8.03 (12.92)
BLOWER FLOW RATE SCFM (SCMM)	607.2 (17.20)
GAS METER FLOW RATE SCFM (SCMM)	.84 (.02)
TOTAL FLOW SCF (SCM)	6058. (171.6)

HC SAMPLE METER/RANGE/PPM (BAG)	2.9/	9/	2.92
HC BCKGRD METER/RANGE/PPM	3.8/	2/	3.85
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.3/	11/	.7409
CO2 BCKGRD METER/RANGE/PCT	7.4/	11/	.0433
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.8/	9/	37.85
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	18.19
HC CONCENTRATION PPM	-.71
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.7000
NOX CONCENTRATION PPM	37.80

HC MASS GRAMS	.000
CO MASS GRAMS	.038
CO2 MASS GRAMS	2198.93
NOX MASS GRAMS	11.969
PM MASS GRAMS	.608
FUEL MASS KG	.744
FUEL ECONOMY MPG (L/100KM)	35.13 (6.70)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.005	
NOX	G/MI	1.491	
PM	G/MI	.076	
FUEL ECONOMY MPG (L/100KM)		35.13 (6.70)	

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VEHICLE NUMBER 220	TEST AL-952-FTP2	DIESEL AL-952
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/27/2003 RUN	FUEL DENSITY 6.941 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .135 C .839 O .026 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19512 MILES (31394 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.08 IN HG (738.6 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .813
RELATIVE HUMIDITY 23.2 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	870.0	505.6
DRY/WET CORRECTION FACTOR, SAMP/BACK	.990/.994	.991/.994	.990/.994
MEASURED DISTANCE MILES (KM)	3.61 (5.82)	3.84 (6.18)	3.60 (5.79)
BLOWER FLOW RATE SCFM (SCMM)	613.7 (17.38)	613.8 (17.38)	610.4 (17.29)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.91 (.03)
TOTAL FLOW SCF (SCM)	5174. (146.5)	8914. (252.4)	5151. (145.9)

HC SAMPLE METER/RANGE/PPM (BAG)	10.7/	9/	10.67	2.7/	9/	2.72	2.9/	9/	2.93
HC BCKGRD METER/RANGE/PPM	3.1/	2/	3.14	3.2/	2/	3.24	3.3/	2/	3.34
CO SAMPLE METER/RANGE/PPM	25.4/	12/	24.48	.3/	12/	.28	.3/	12/	.28
CO BCKGRD METER/RANGE/PPM	.1/	12/	.09	.1/	12/	.09	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	56.4/	11/	.4304	40.3/	11/	.2780	50.9/	11/	.3748
CO2 BCKGRD METER/RANGE/PCT	7.0/	11/	.0409	7.0/	11/	.0409	7.0/	11/	.0409
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.7/	9/	9.65	5.3/	9/	5.30	12.1/	9/	12.12
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05	.3/	1/	.08	.3/	1/	.08

DILUTION FACTOR	30.81	48.04	35.64
HC CONCENTRATION PPM	7.63	-.46	-.32
CO CONCENTRATION PPM	24.00	.19	.10
CO2 CONCENTRATION PCT	.3908	.2380	.3350
NOX CONCENTRATION PPM	9.60	5.22	12.05

HC MASS GRAMS	.665	.000	.000
CO MASS GRAMS	4.094	.055	.016
CO2 MASS GRAMS	1048.48	1099.85	894.81
NOX MASS GRAMS	2.187	2.049	2.732
PM MASS GRAMS	.309	.138	.175
FUEL MASS KG	.344	.358	.291
FUEL ECONOMY MPG (L/100KM)	33.08 (7.11)	33.80 (6.96)	38.93 (6.04)

3-BAG COMPOSITE RESULTS

HC	G/MI	.038
CO	G/MI	.245
NOX	G/MI	.610
PM	G/MI	.050
FUEL ECONOMY MPG (L/100KM)		34.96 (6.73)

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VEHICLE NUMBER 220	TEST AL-952-US06-2	DIESEL AL-952
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/27/2003 RUN	FUEL DENSITY 6.941 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .135 C .839 O .026 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19530 MILES (31423 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.05 IN HG (737.9 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .813
RELATIVE HUMIDITY 23.3 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.0
DRY/WET CORRECTION FACTOR, SAMP/BACK	.987/.994
MEASURED DISTANCE MILES (KM)	8.03 (12.92)
BLOWER FLOW RATE SCFM (SCMM)	607.7 (17.21)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6066. (171.8)

HC SAMPLE METER/RANGE/PPM (BAG)	2.6/	9/	2.57
HC BCKGRD METER/RANGE/PPM	3.3/	2/	3.34
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	81.0/	11/	.7365
CO2 BCKGRD METER/RANGE/PCT	6.9/	11/	.0403
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	37.5/	9/	37.50
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05

DILUTION FACTOR	18.14
HC CONCENTRATION PPM	-.59
CO CONCENTRATION PPM	.19
CO2 CONCENTRATION PCT	.6985
NOX CONCENTRATION PPM	37.45

HC MASS GRAMS	.000
CO MASS GRAMS	.038
CO2 MASS GRAMS	2196.68
NOX MASS GRAMS	10.002
PM MASS GRAMS	.835
FUEL MASS KG	.715
FUEL ECONOMY MPG (L/100KM)	35.36 (6.65)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.005	
NOX	G/MI	1.246	
PM	G/MI	.104	
FUEL ECONOMY MPG (L/100KM)		35.36 (6.65)	

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VEHICLE NUMBER 220	TEST AL-952-FTP3	DIESEL AL-952
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/28/2003 RUN	FUEL DENSITY 6.941 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .135 C .839 O .026 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19539 MILES (31438 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.11 IN HG (739.4 MM HG)	DRY BULB TEMPERATURE 70.0°F (21.1°C)	NOX HUMIDITY C.F. .911
RELATIVE HUMIDITY 48.1 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	504.9	870.7	505.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.984/.988	.985/.988	.984/.988
MEASURED DISTANCE MILES (KM)	3.59 (5.78)	3.86 (6.21)	3.59 (5.78)
BLOWER FLOW RATE SCFM (SCMM)	614.1 (17.39)	613.0 (17.36)	611.6 (17.32)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.92 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5175. (146.6)	8909. (252.3)	5159. (146.1)

HC SAMPLE METER/RANGE/PPM (BAG)	9.7/	9/	9.67	2.8/	9/	2.79	2.8/	9/	2.84
HC BCKGRD METER/RANGE/PPM	4.1/	2/	4.15	3.9/	2/	3.95	3.8/	2/	3.85
CO SAMPLE METER/RANGE/PPM	25.8/	12/	24.87	.2/	12/	.19	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.2/	12/	.19	.1/	12/	.09	.2/	12/	.19
CO2 SAMPLE METER/RANGE/PCT	55.3/	11/	.4190	40.3/	11/	.2780	51.1/	11/	.3767
CO2 BCKGRD METER/RANGE/PCT	7.0/	11/	.0409	7.0/	11/	.0409	7.0/	11/	.0409
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	9.4/	9/	9.38	5.0/	9/	5.05	11.7/	9/	11.69
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05	.2/	2/	.20	.1/	1/	.03

DILUTION FACTOR	31.65	48.04	35.46
HC CONCENTRATION PPM	5.65	-1.08	-.90
CO CONCENTRATION PPM	24.10	.09	.00
CO2 CONCENTRATION PCT	.3794	.2380	.3370
NOX CONCENTRATION PPM	9.33	4.85	11.67

HC MASS GRAMS	.492	.000	.000
CO MASS GRAMS	4.113	.027	.001
CO2 MASS GRAMS	1017.93	1099.21	901.41
NOX MASS GRAMS	2.382	2.131	2.969
PM MASS GRAMS	.267	.146	.172
FUEL MASS KG	.334	.358	.293
FUEL ECONOMY MPG (L/100KM)	33.87 (6.94)	33.97 (6.93)	38.55 (6.10)

3-BAG COMPOSITE RESULTS

HC	G/MI	.028	
CO	G/MI	.241	
NOX	G/MI	.651	
PM	G/MI	.048	
FUEL ECONOMY MPG (L/100KM)		35.12 (6.70)	

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VEHICLE NUMBER 220	TEST AL-952-US06-3	DIESEL AL-952
VEHICLE MODEL 99 MERCEDES BENZ	DATE 2/28/2003 RUN	FUEL DENSITY 6.941 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .135 C .839 O .026 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19556 MILES (31465 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.09 IN HG (739.0 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .911
RELATIVE HUMIDITY 48.2 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.2
DRY/WET CORRECTION FACTOR, SAMP/BACK	.981/.988
MEASURED DISTANCE MILES (KM)	8.02 (12.91)
BLOWER FLOW RATE SCFM (SCMM)	609.0 (17.25)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6080. (172.2)

HC SAMPLE METER/RANGE/PPM (BAG)	2.6/	9/	2.60
HC BCKGRD METER/RANGE/PPM	3.6/	2/	3.65
CO SAMPLE METER/RANGE/PPM	.4/	12/	.37
CO BCKGRD METER/RANGE/PPM	.1/	12/	.09
CO2 SAMPLE METER/RANGE/PCT	80.8/	11/	.7336
CO2 BCKGRD METER/RANGE/PCT	7.1/	11/	.0415
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	35.9/	9/	35.92
NOX BCKGRD METER/RANGE/PPM	.1/	1/	.03

DILUTION FACTOR	18.22
HC CONCENTRATION PPM	-.85
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.6944
NOX CONCENTRATION PPM	35.90

HC MASS GRAMS	.000
CO MASS GRAMS	.055
CO2 MASS GRAMS	2189.14
NOX MASS GRAMS	10.766
PM MASS GRAMS	.828
FUEL MASS KG	.712
FUEL ECONOMY MPG (L/100KM)	35.45 (6.64)

1-BAG COMPOSITE RESULTS

HC G/MI	.000
CO G/MI	.007
NOX G/MI	1.342
PM G/MI	.103
FUEL ECONOMY MPG (L/100KM)	35.45 (6.64)

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 COMPUTER PROGRAM LDT 2.7-R 3-BAG EPA FTP VEHICLE EMISSION RESULTS PROJECT NO. 08-3227-701

VEHICLE NUMBER 220	TEST AL-952-FTP4	DIESEL AL-952
VEHICLE MODEL 99 MERCEDES BENZ	DATE 3/ 1/2003 RUN	FUEL DENSITY 6.941 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .135 C .839 O .026 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	FTP
ODOMETER 19565 MILES (31480 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.06 IN HG (738.1 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .947
RELATIVE HUMIDITY 55.9 PCT.		

BAG NUMBER	1	2	3
BAG DESCRIPTION	COLD TRANSIENT (0-505 SEC.)	STABILIZED (505-1372 SEC.)	HOT TRANSIENT (0- 505 SEC.)
RUN TIME SECONDS	505.1	870.1	505.4
DRY/WET CORRECTION FACTOR, SAMP/BACK	.982/.986	.983/.986	.982/.986
MEASURED DISTANCE MILES (KM)	3.60 (5.80)	3.85 (6.20)	3.59 (5.78)
BLOWER FLOW RATE SCFM (SCMM)	614.5 (17.40)	612.7 (17.35)	608.6 (17.24)
GAS METER FLOW RATE SCFM (SCMM)	.89 (.03)	.94 (.03)	.87 (.02)
TOTAL FLOW SCF (SCM)	5180. (146.7)	8899. (252.0)	5134. (145.4)

HC SAMPLE METER/RANGE/PPM (BAG)	9.7/	9/	9.74	3.0/	9/	2.97	3.2/	9/	3.17
HC BCKGRD METER/RANGE/PPM	3.5/	2/	3.55	3.5/	2/	3.55	3.5/	2/	3.55
CO SAMPLE METER/RANGE/PPM	27.4/	12/	26.45	.5/	12/	.47	1.0/	12/	.94
CO BCKGRD METER/RANGE/PPM	.1/	12/	.09	.5/	12/	.47	.4/	12/	.37
CO2 SAMPLE METER/RANGE/PCT	55.8/	11/	.4242	40.8/	11/	.2823	51.6/	11/	.3816
CO2 BCKGRD METER/RANGE/PCT	7.4/	11/	.0433	7.4/	11/	.0433	7.3/	11/	.0427
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	8.8/	9/	8.82	4.7/	9/	4.74	11.8/	9/	11.81
NOX BCKGRD METER/RANGE/PPM	.2/	1/	.05	.0/	1/	.00	.1/	1/	.03

DILUTION FACTOR	31.26	47.30	35.00
HC CONCENTRATION PPM	6.31	-.50	-.27
CO CONCENTRATION PPM	25.66	.01	.56
CO2 CONCENTRATION PCT	.3822	.2399	.3401
NOX CONCENTRATION PPM	8.77	4.74	11.78

HC MASS GRAMS	.550	.000	.000
CO MASS GRAMS	4.382	.002	.094
CO2 MASS GRAMS	1026.63	1106.92	905.42
NOX MASS GRAMS	2.331	2.161	3.103
PM MASS GRAMS	.301	.138	.168
FUEL MASS KG	.337	.360	.295
FUEL ECONOMY MPG (L/100KM)	33.66 (6.99)	33.66 (6.99)	38.37 (6.13)

3-BAG COMPOSITE RESULTS

HC	G/MI	.032	
CO	G/MI	.260	
NOX	G/MI	.662	
PM	G/MI	.049	
FUEL ECONOMY MPG (L/100KM)		34.87 (6.75)	

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VEHICLE NUMBER 220	TEST AL-952-US06-4	DIESEL AL-952
VEHICLE MODEL 99 MERCEDES BENZ	DATE 3/ 1/2003 RUN	FUEL DENSITY 6.941 LB/GAL
ENGINE 2.2 L (134 CID)-4	DYNO 7 BAG CART 1	H .135 C .839 O .026 X .000
TRANSMISSION M5	ACTUAL ROAD LOAD 8.12 HP (6.06 KW)	US06
ODOMETER 19583 MILES (31509 KM)	TEST WEIGHT 3500 LBS (1587 KG)	

BAROMETER 29.06 IN HG (738.0 MM HG)	DRY BULB TEMPERATURE 70.0pF (21.1pC)	NOX HUMIDITY C.F. .947
RELATIVE HUMIDITY 55.9 PCT.		

BAG NUMBER	1
BAG DESCRIPTION	
RUN TIME SECONDS	598.3
DRY/WET CORRECTION FACTOR, SAMP/BACK	.979/.986
MEASURED DISTANCE MILES (KM)	8.01 (12.89)
BLOWER FLOW RATE SCFM (SCMM)	607.2 (17.20)
GAS METER FLOW RATE SCFM (SCMM)	.86 (.02)
TOTAL FLOW SCF (SCM)	6064. (171.7)

HC SAMPLE METER/RANGE/PPM (BAG)	2.8/	9/	2.81
HC BCKGRD METER/RANGE/PPM	3.5/	2/	3.55
CO SAMPLE METER/RANGE/PPM	.2/	12/	.19
CO BCKGRD METER/RANGE/PPM	.1/	12/	.09
CO2 SAMPLE METER/RANGE/PCT	80.2/	11/	.7249
CO2 BCKGRD METER/RANGE/PCT	7.4/	11/	.0433
NOX SAMPLE METER/RANGE/PPM (BAG) (D)	34.7/	9/	34.71
NOX BCKGRD METER/RANGE/PPM	.3/	1/	.08

DILUTION FACTOR	18.44
HC CONCENTRATION PPM	-.54
CO CONCENTRATION PPM	.09
CO2 CONCENTRATION PCT	.6839
NOX CONCENTRATION PPM	34.64

HC MASS GRAMS	.000
CO MASS GRAMS	.019
CO2 MASS GRAMS	2150.31
NOX MASS GRAMS	10.774
PM MASS GRAMS	.832
FUEL MASS KG	.700
FUEL ECONOMY MPG (L/100KM)	36.03 (6.53)

1-BAG COMPOSITE RESULTS

HC	G/MI	.000	
CO	G/MI	.002	
NOX	G/MI	1.345	
PM	G/MI	.104	
FUEL ECONOMY MPG (L/100KM)		36.03 (6.53)	

APPENDIX C

LIGHT-OFF CURVES AND NO_x ACCUMULATION

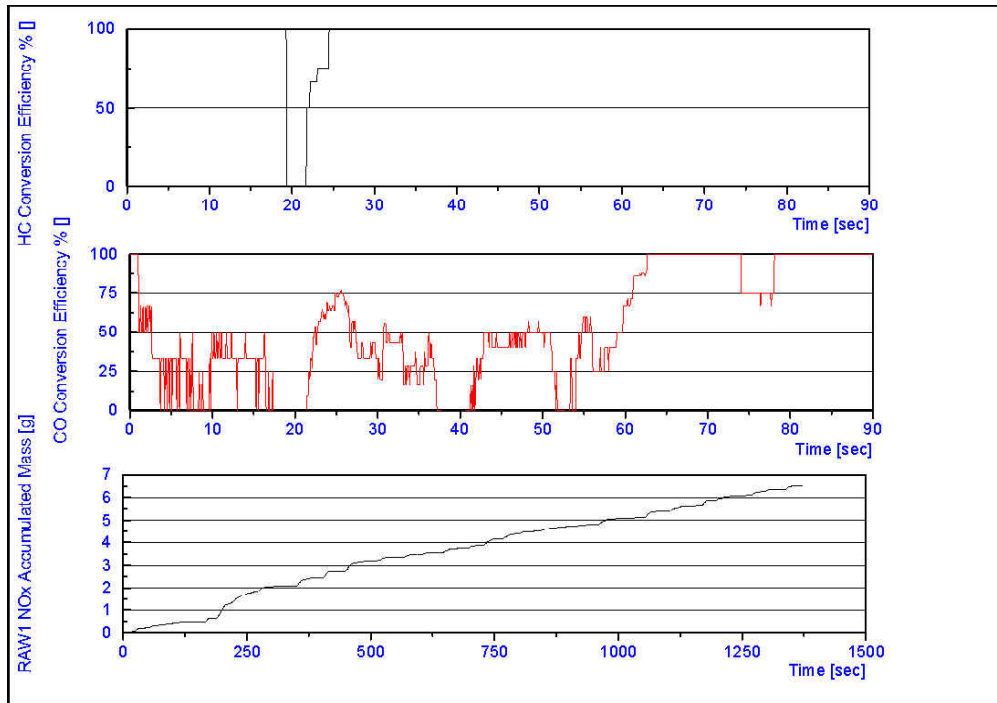


FIGURE C-1. LIGHT-OFF CRUVES FOR FUEL AL-26888

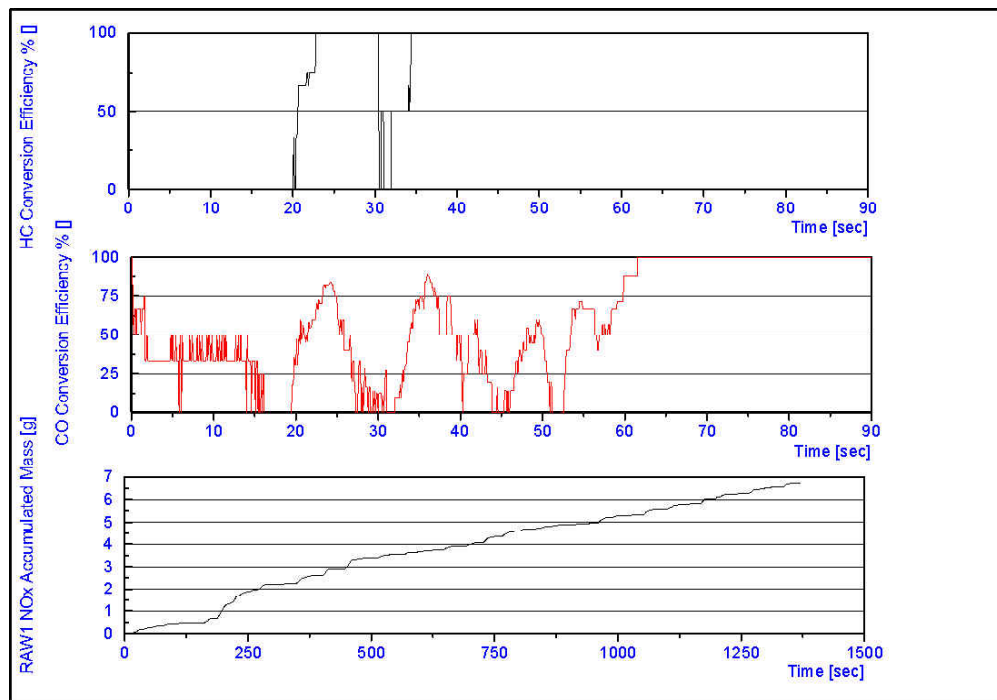


FIGURE C-2 LIGHT-OFF CURVES FOR FUEL AL-26921

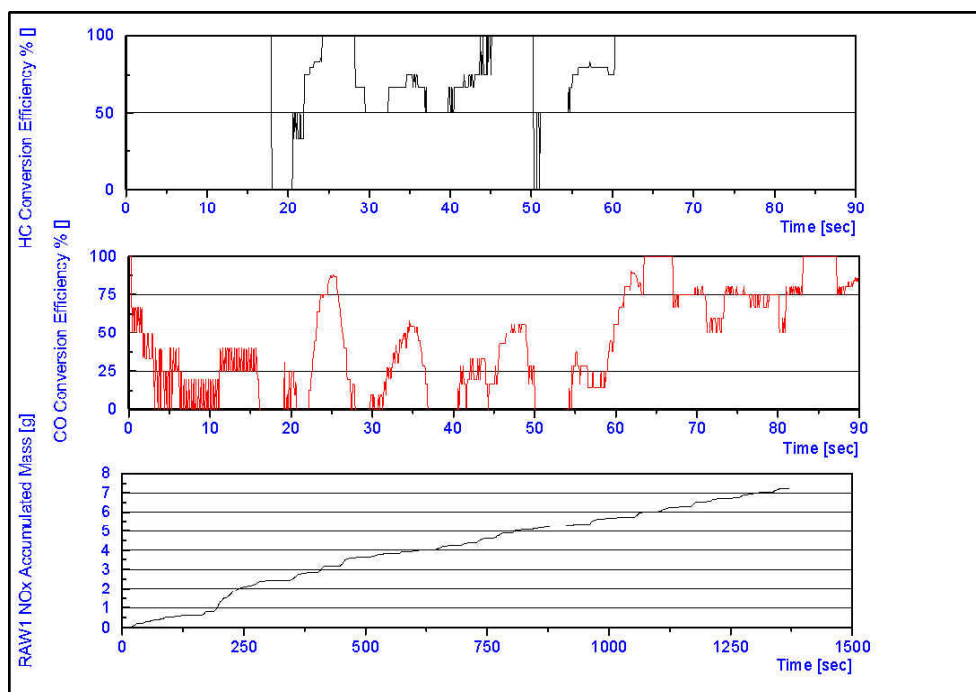


FIGURE C-3. LIGHT-OFF CURVES FOR FUEL AL-26922

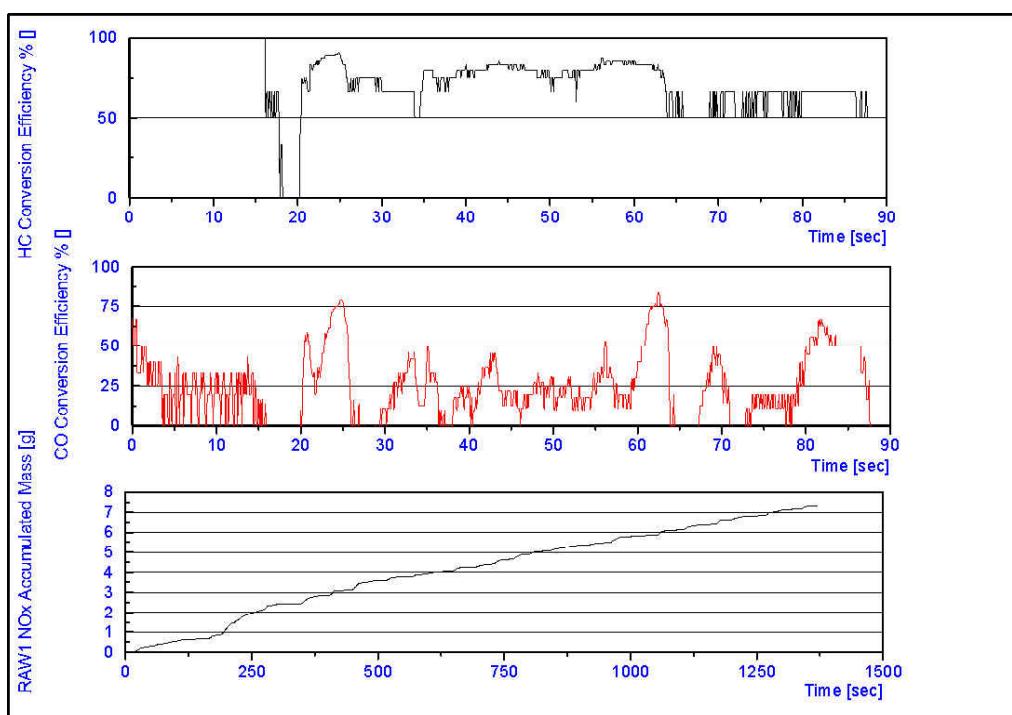


FIGURE C-4. LIGHT-OFF CURVES FOR FUEL AL-26938

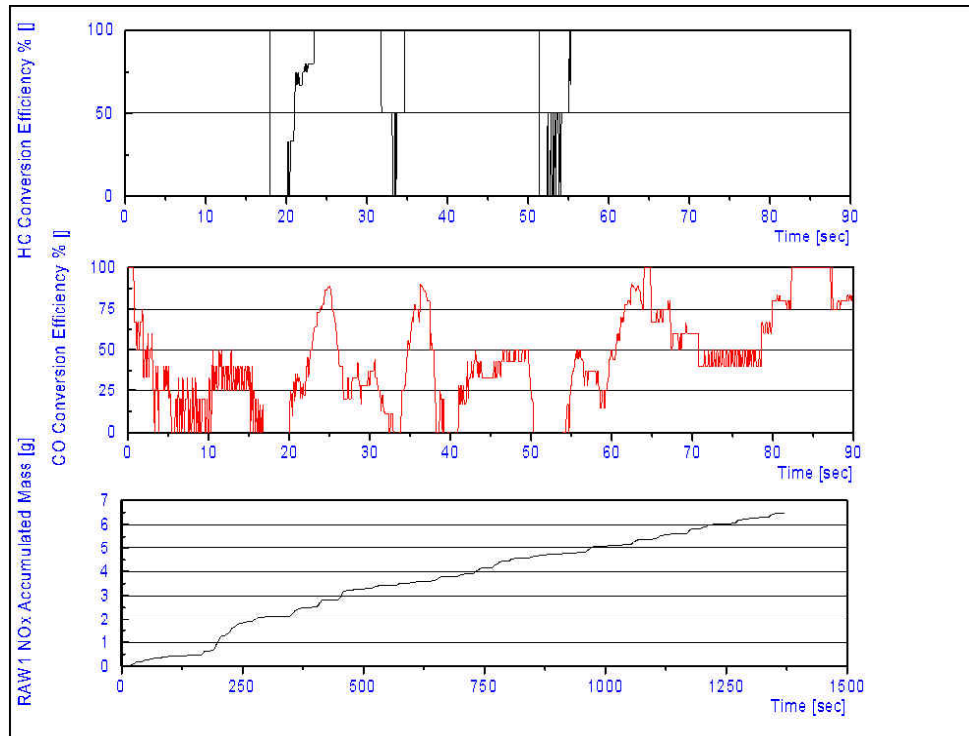


FIGURE C-5. LIGHT-OFF CURVES FOR FUEL AL-26944

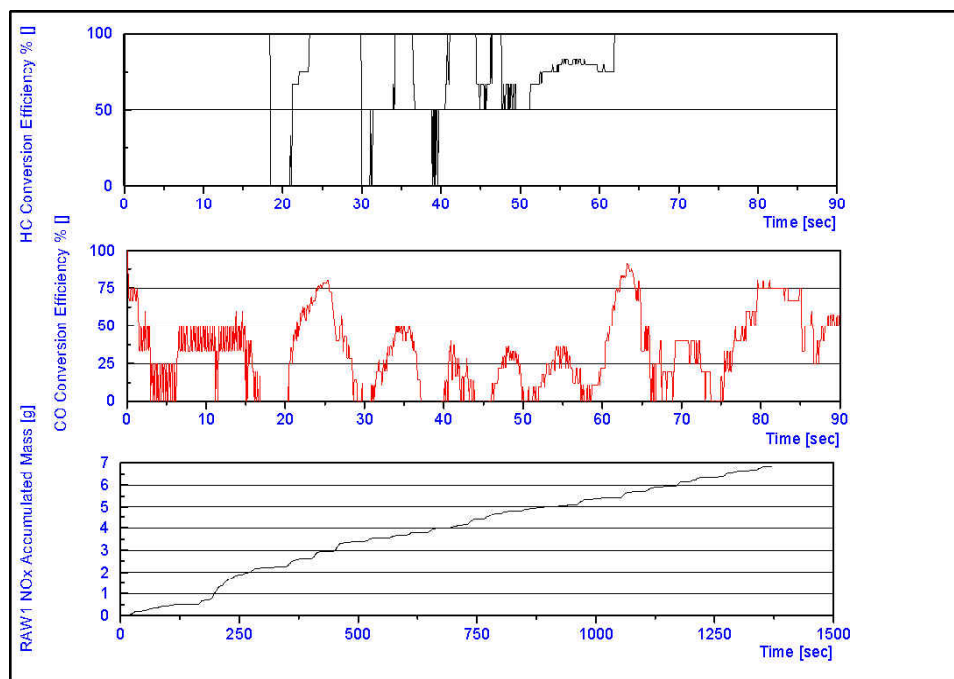


FIGURE C-6. LIGHT-OFF CURVES FOR FUEL AL-26952

APPENDIX D

LUBES STATISTICAL CHARTS

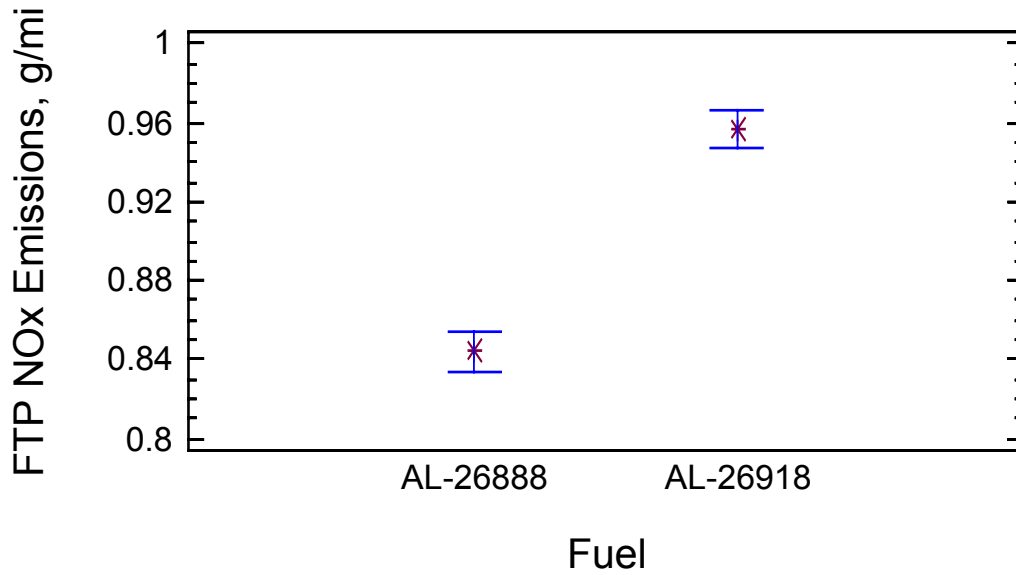


FIGURE D-1. AVERAGE FTP NO_x EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

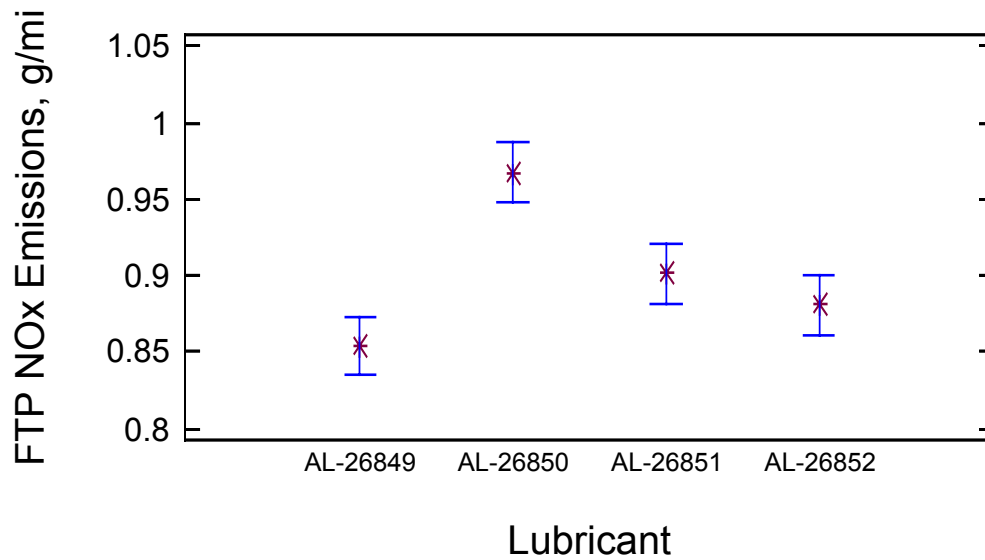


FIGURE D-2. AVERAGE FTP NO_x EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

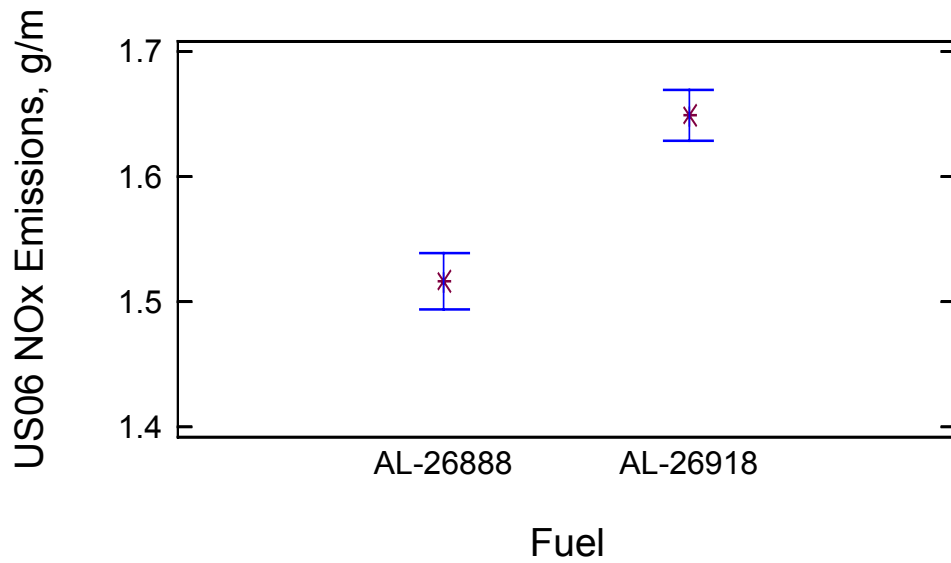


FIGURE D-3. AVERAGE US06 NO_x EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

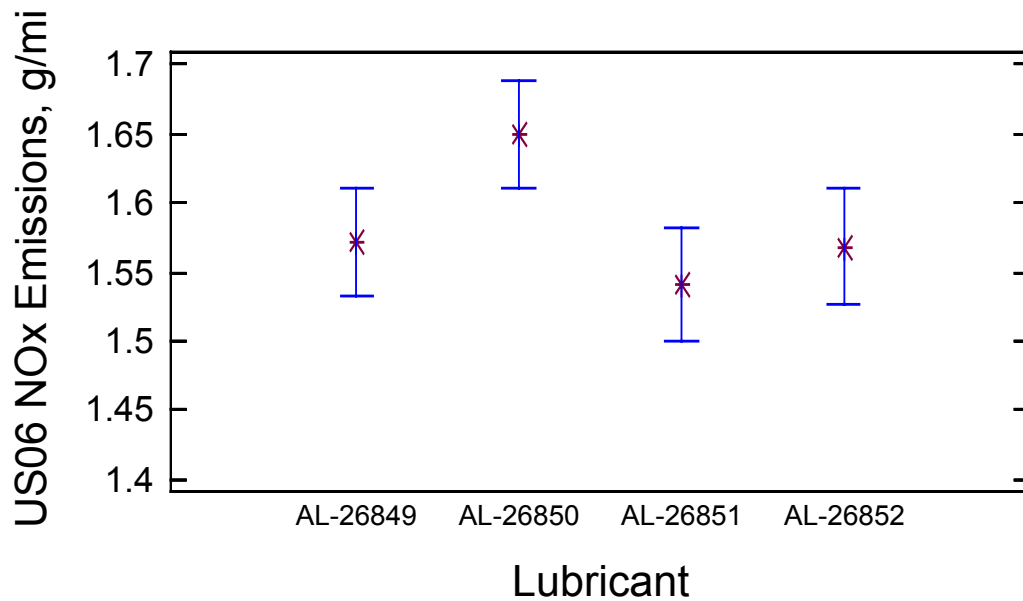


FIGURE D-4. AVERAGE US06 NO_x EMISSION NRATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

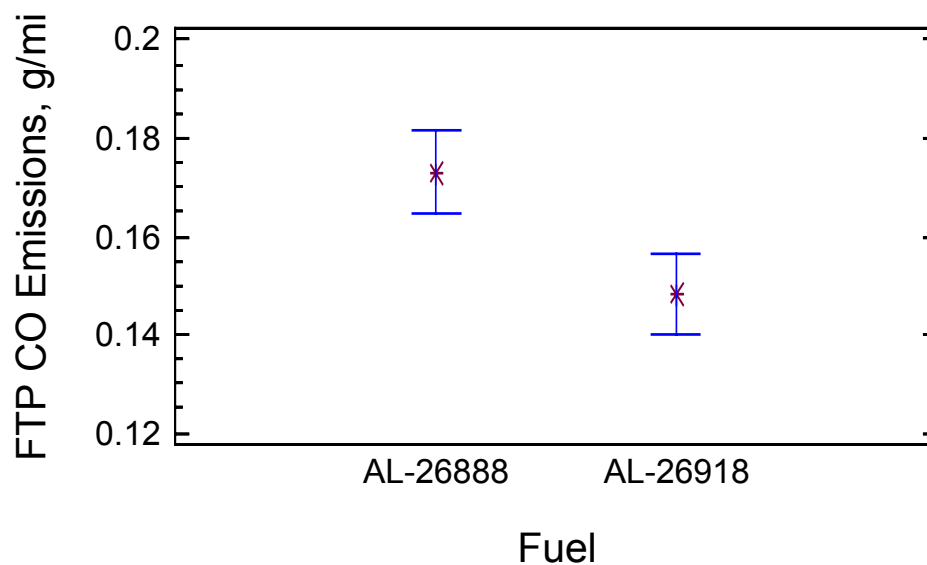


FIGURE D-5. AVERAGE FTP CO EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

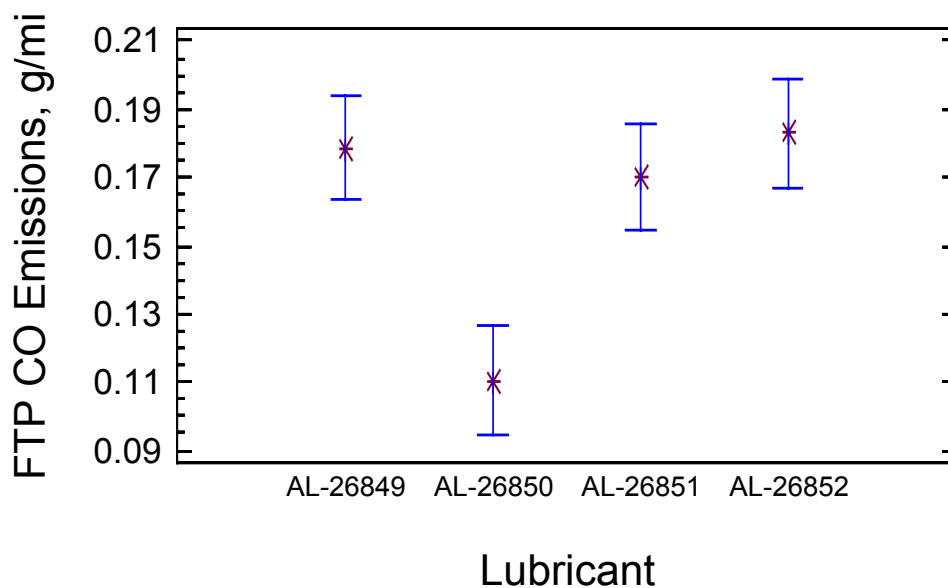


FIGURE D-6. AVERAGE FTP CO EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

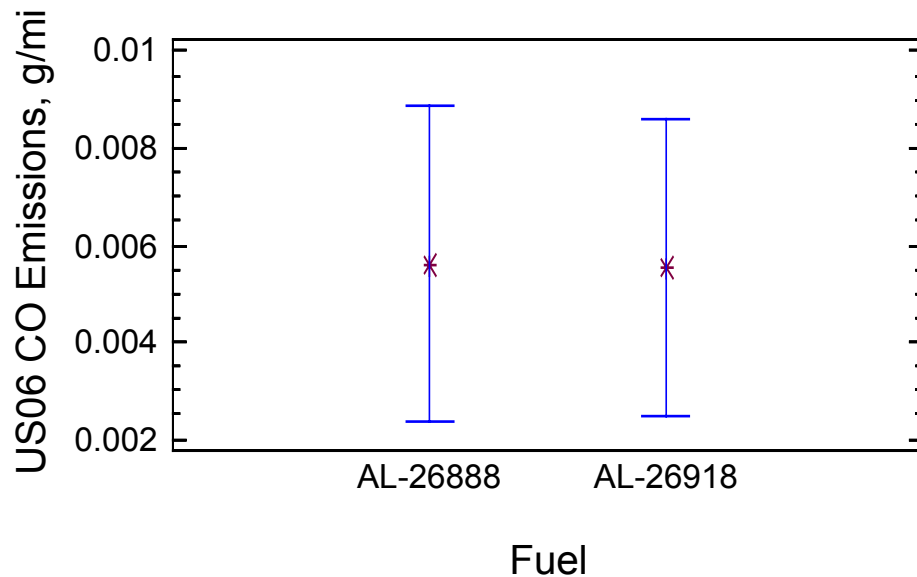


FIGURE D-7. AVERAGE US CO EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

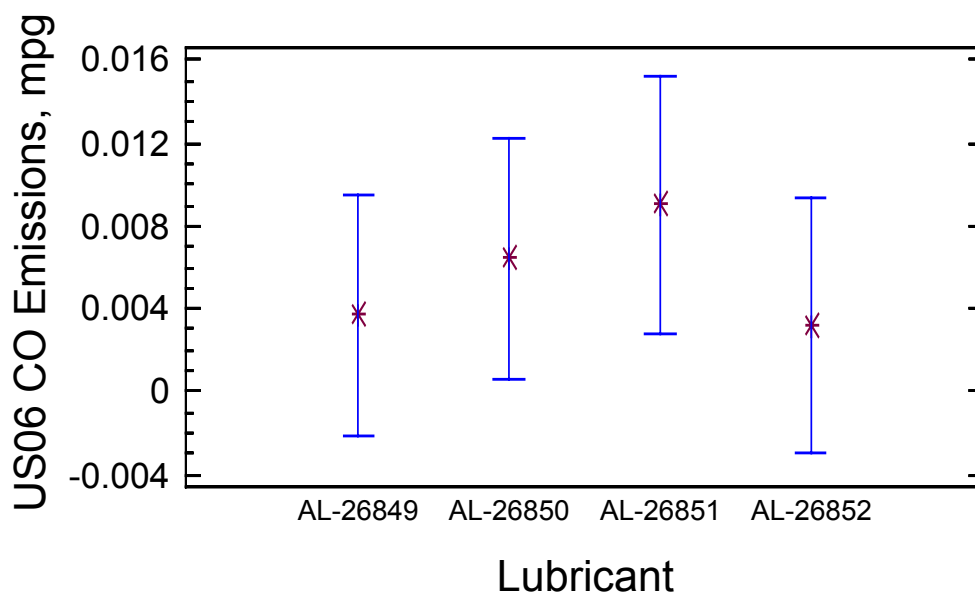


FIGURE D-8. AVERAGE US06 CO EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

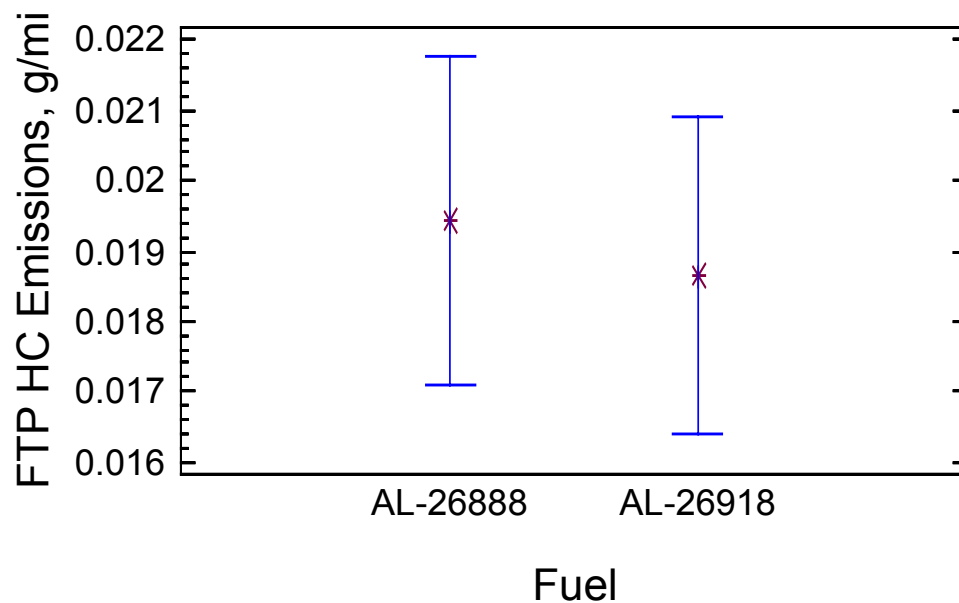


FIGURE D-9. AVERAGE FTP HC EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

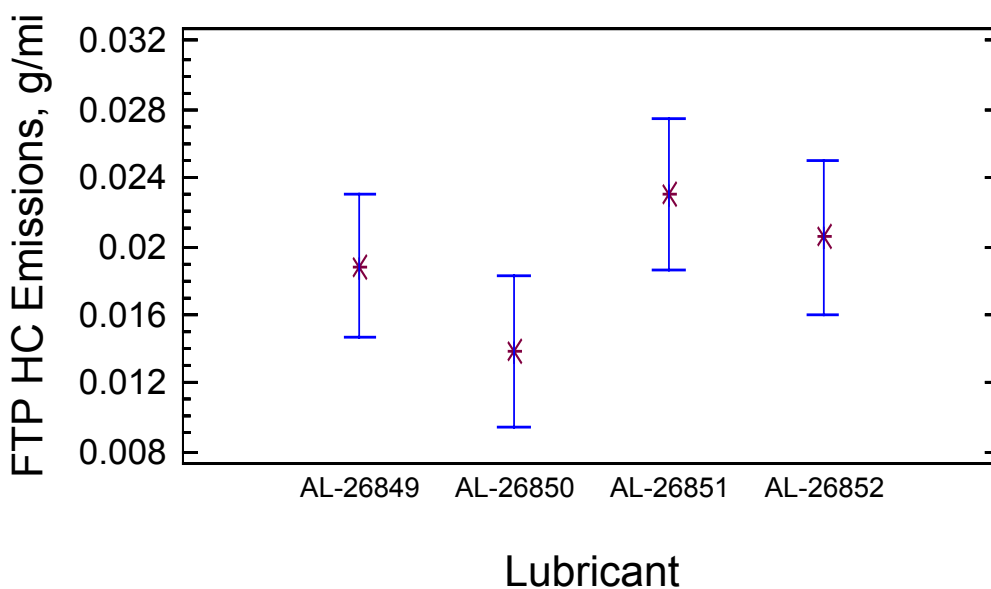


FIGURE D-10. AVERAGE FTP HC EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

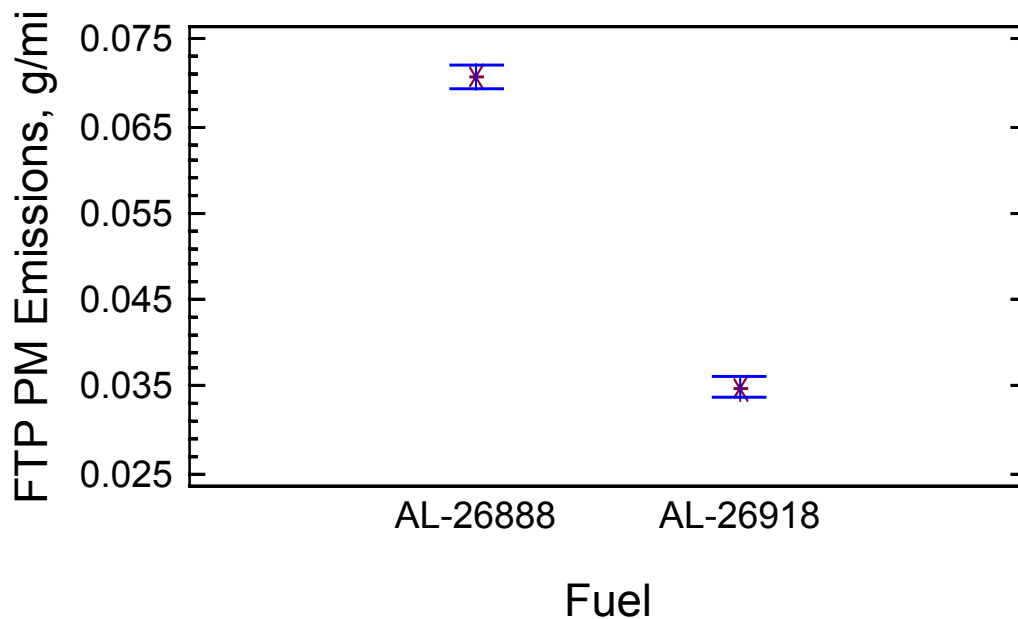


FIGURE D-11. AVERAGE FTP PM EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

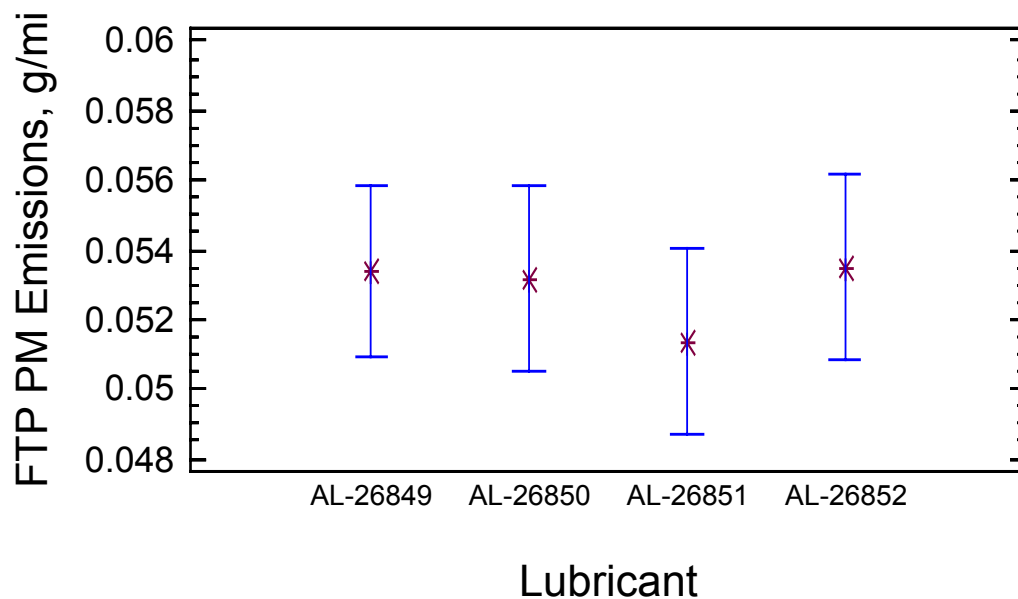


FIGURE D-12. AVERAGE FTP PM EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

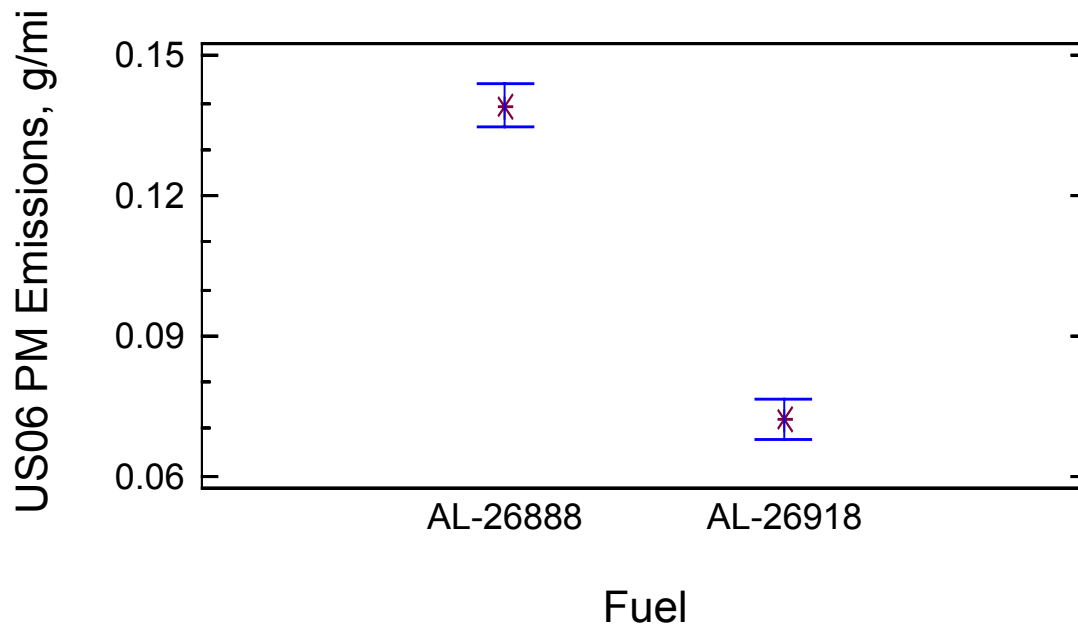


FIGURE D-13. AVERAGE US06 PM EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

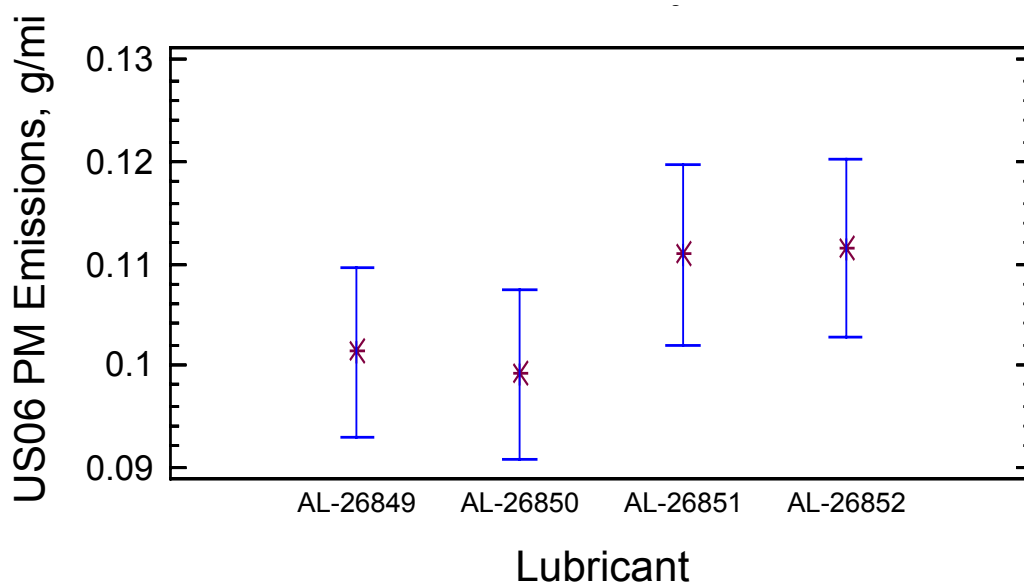


FIGURE D-14. AVERAGE US06 PM EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

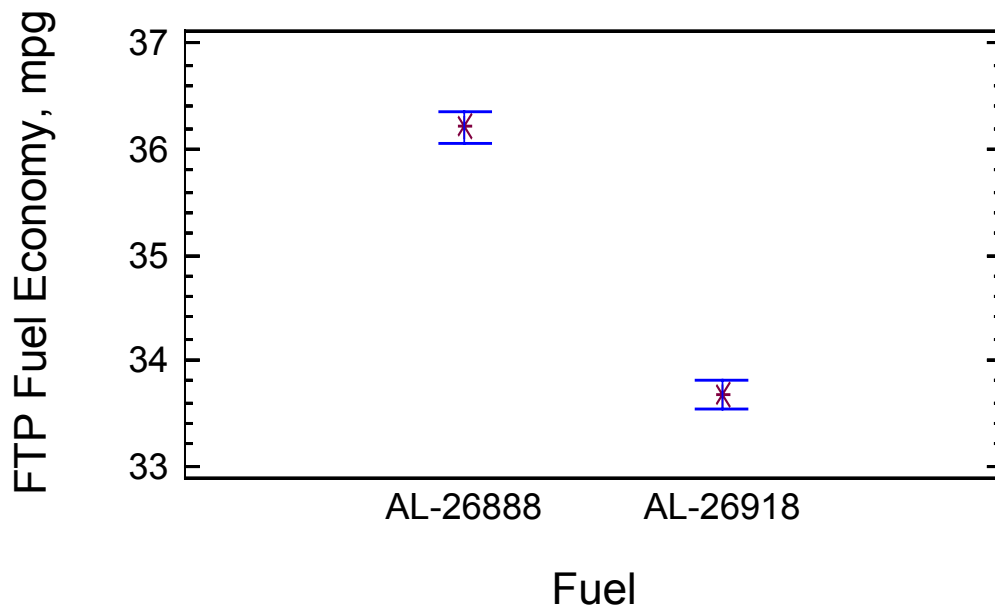


FIGURE D-15. AVERAGE FTP FUEL ECONOMY EMISSION RATES AND 85% TUKEY HSD INTERVALS FOR FUELS

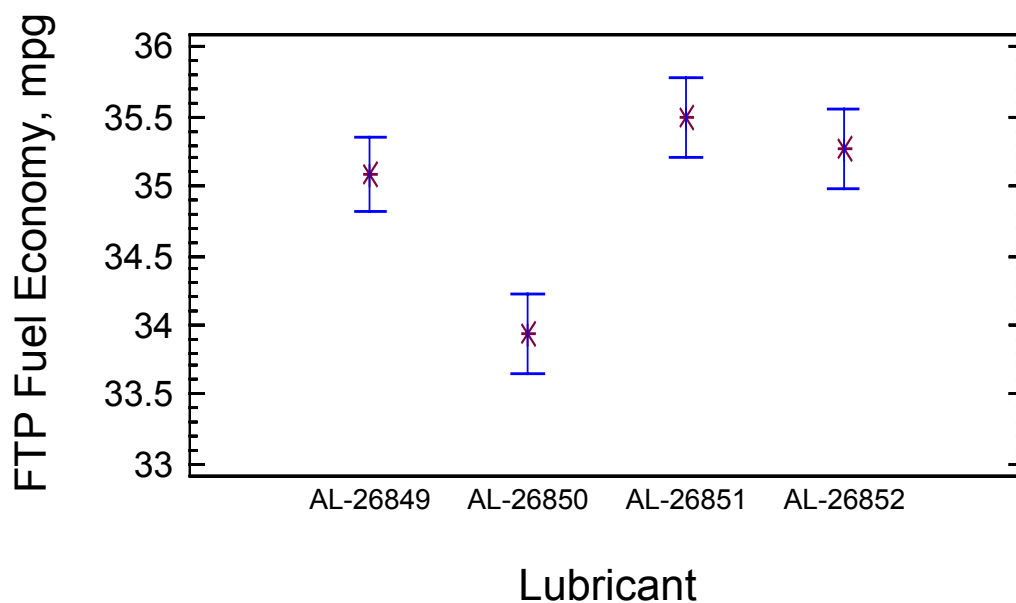


FIGURE D-16. AVERAGE FTP FUEL ECONOMY EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

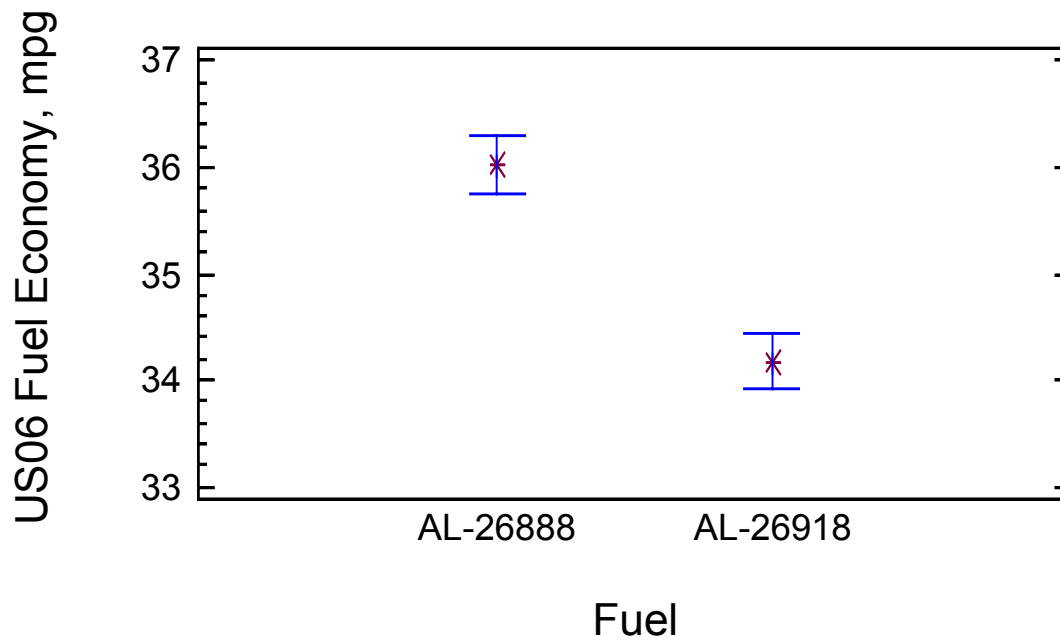


FIGURE D-17. AVERAGE US06 FUEL ECONOMY EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR FUELS

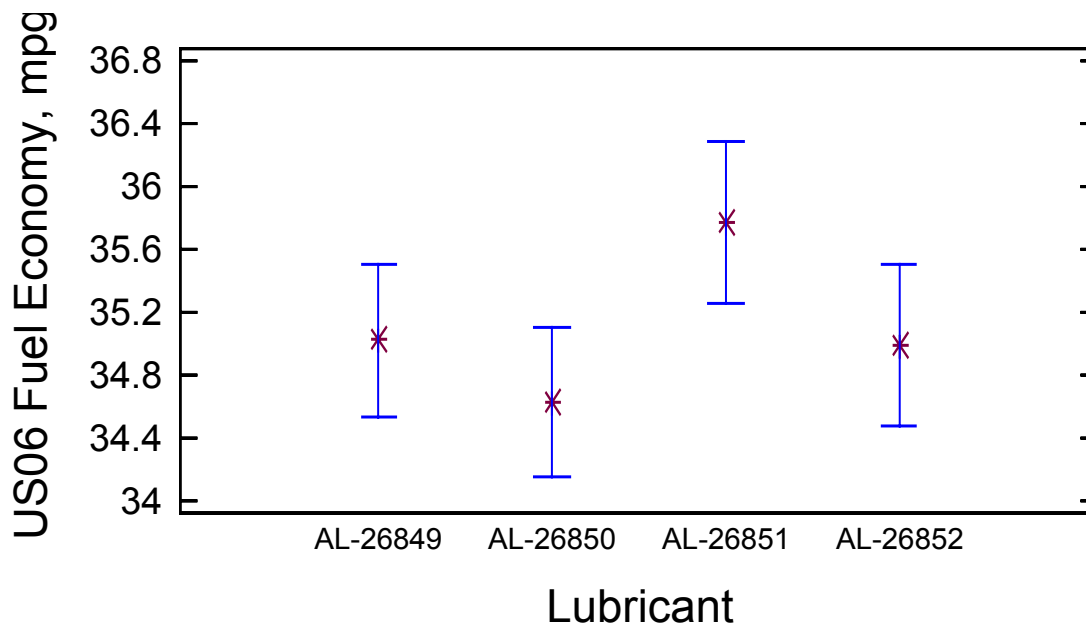


FIGURE D-18. AVERAGE US06 FUEL ECONOMY EMISSION RATES AND 95% TUKEY HSD INTERVALS FOR LUBRICANTS

APPENDIX E

FUELS STATISTICAL CHARTS

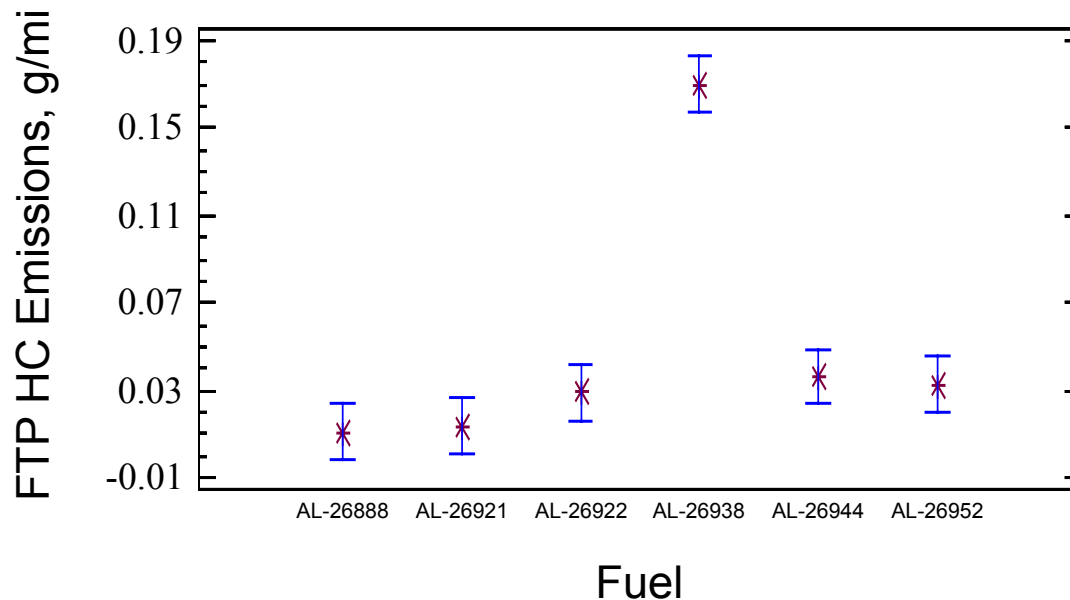


FIGURE E-1. AVERAGE FTP HC EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

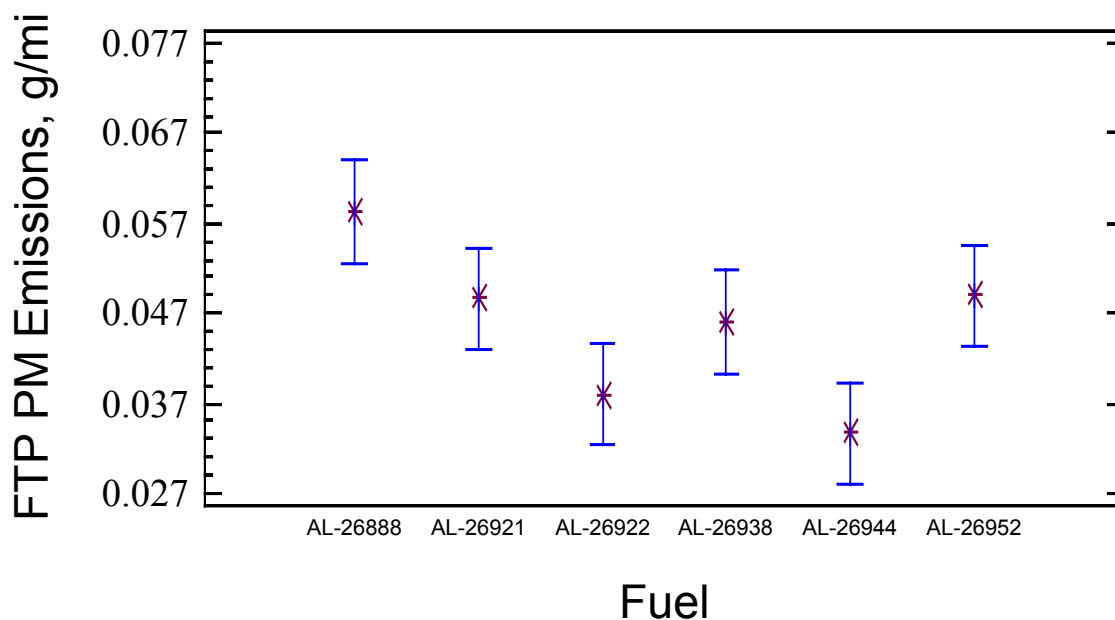


FIGURE E-2. AVERAGE FTP PM EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

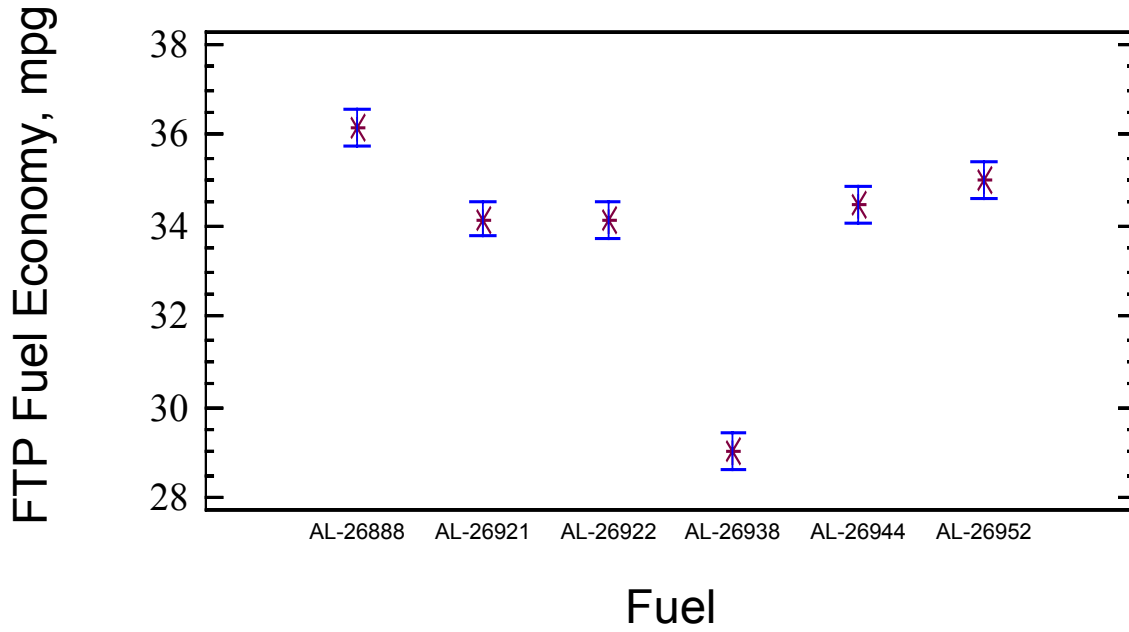


FIGURE E-3. AVERAGE FTP FUEL ECONOMY EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

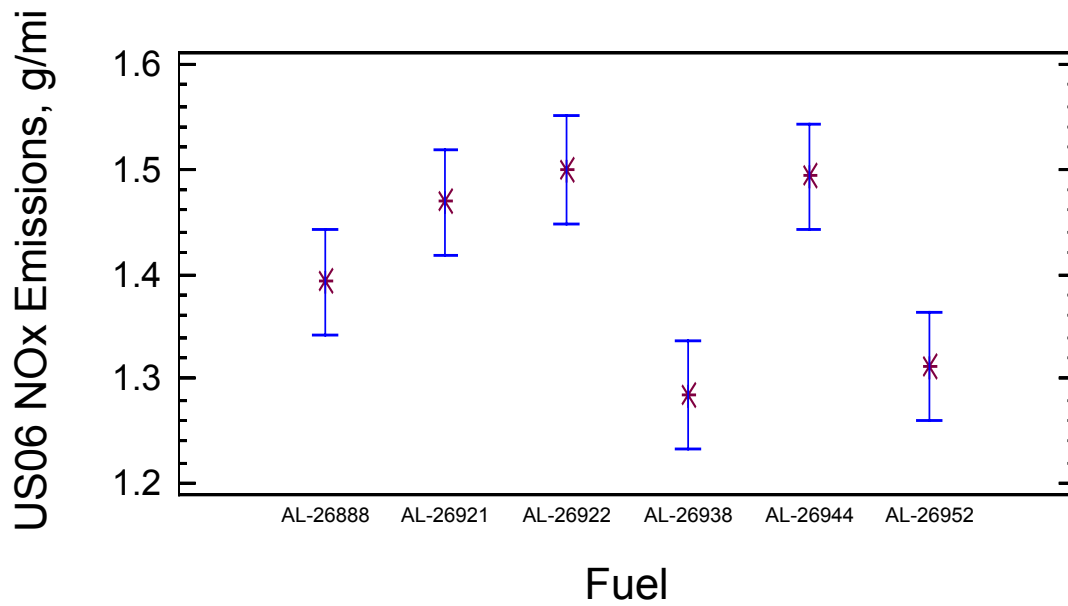


FIGURE E-4. AVERAGE US06 NO_x EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

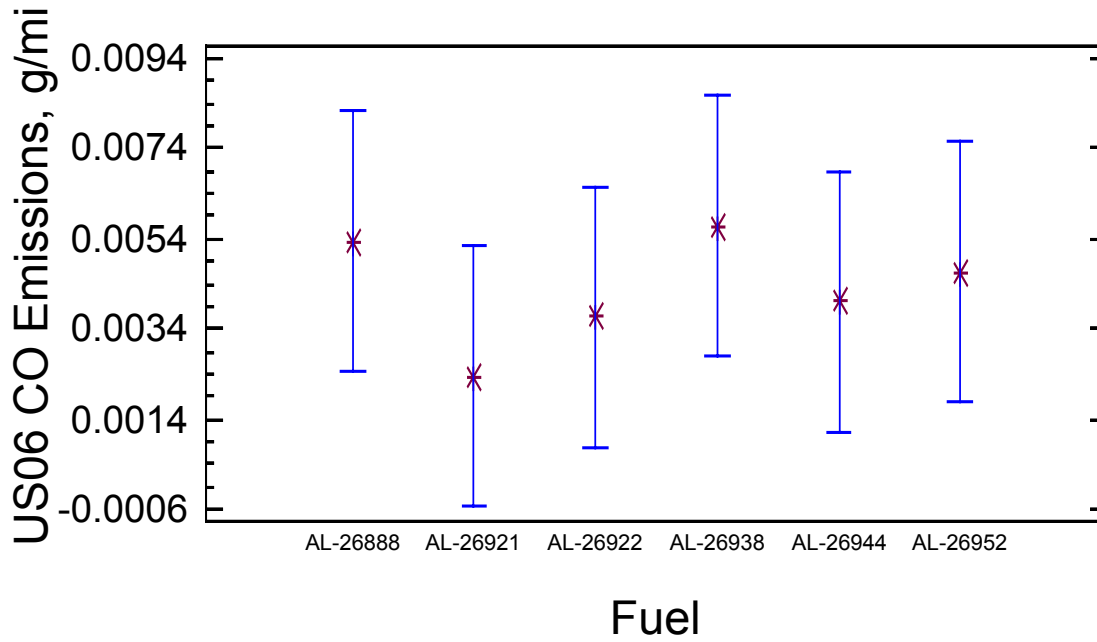


FIGURE E-5. AVERAGE US06 CO EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

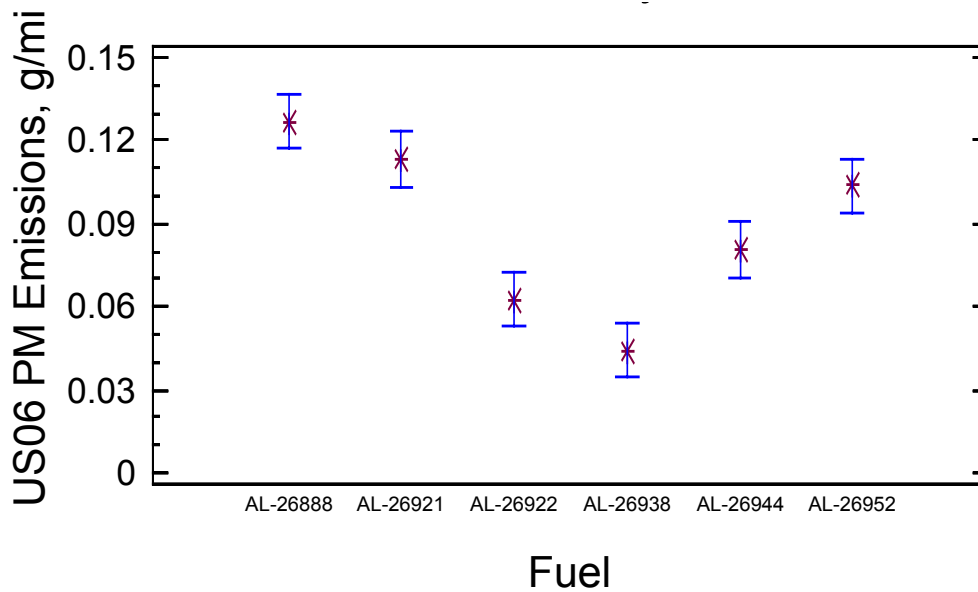


FIGURE E-6. AVERAGE US06 PM EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS

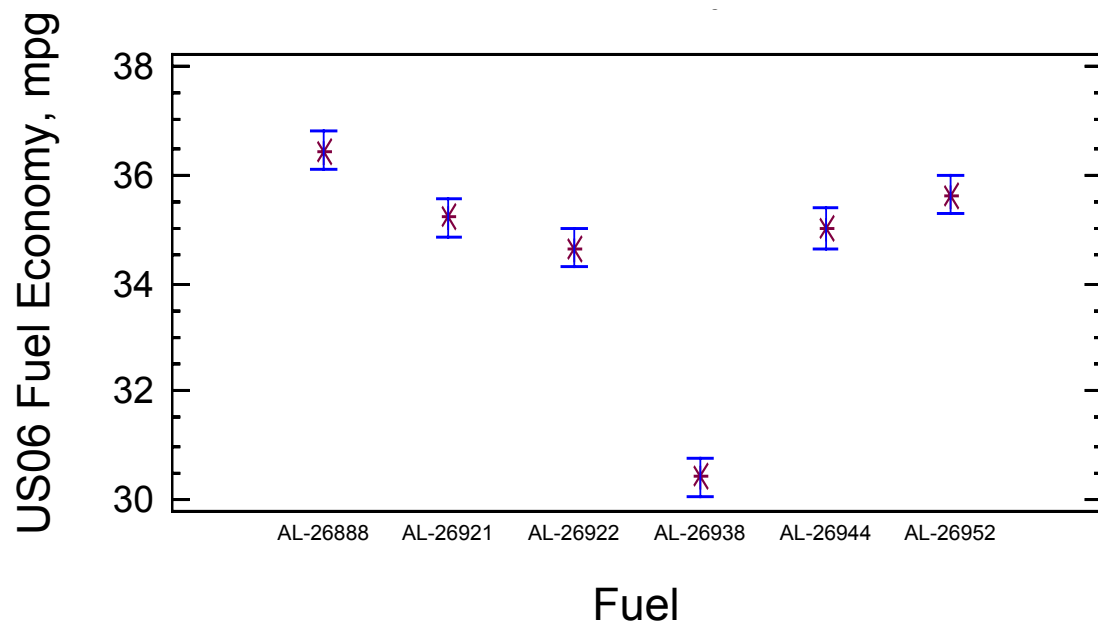


FIGURE E-7. AVERAGE US06 FUEL ECONOMY EXHAUST EMISSIONS AND 95% TUKEY HSD INTERVALS