

Sixth Quarter CTTRANSIT

Demonstration and Evaluation of Hybrid Diesel Electric Transit Buses

October, November & December 2004

Report No. CT-170-1884-06-05-1



PROGRAM PARTNERS

CTTRANSIT

Allison Transmission

Horiba Instruments Inc.

New Flyer Bus Industries

University of Connecticut

CDOT Division of Research

The East Coast Hybrid Consortium

CDOT Bureau of Public Transportation

Connecticut Academy of Science and Engineering

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16. Abstract The project goal is to identify the next generation of transit vehicles for future fleet replacement that are cost effective, reliable, produce fewer emissions, and have improved fuel economy compared to the standard heavy-duty diesel powered bus. Data are being collected to produce an estimated life-cycle cost analysis, using emissions information, mileage, fuel economy, power production, brake pad wear, maintenance & repair costs. Driver & customer surveys are also being performed. Two 2003 model year 40 ft low floor New Flyer Allison hybrid diesel electric buses were placed into service in June 2003. Performance data collection began on July 1, 2003 on these buses as well as two virtually identical 2002 model year 40 ft low floor New Flyer standard diesel buses. The hybrids and base buses operate in virtually identical conditions on equivalent routes each day.				
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Sixth Quarter
CTTRANSIT
Demonstration and Evaluation of
Hybrid Diesel Electric Transit Buses

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This project was sponsored by the Connecticut Department of Transportation in Cooperation with the U.S. Department of Transportation, Federal Highway Administration. The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented. The contents do not necessarily reflect the views or policies of the Connecticut Department of Transportation or the U.S. Department of Transportation, Federal Highway Administration. This report does not constitute a standard, specification, or regulation. This is an interim report for this project and the reader should be cautioned that the data has not yet been fully analyzed.

Sixth Quarter CTTRANSIT

Demonstration and Evaluation of Hybrid Diesel Electric Transit Buses Summary of Activities and Findings

- Two 2003 model year 40' low floor New Flyer Allison hybrid diesel electric buses were placed into revenue service in mid-June, 2003. Performance data collection began on July 1st 2003, on these buses as well as two virtually identical 2002 model year 40' low floor New Flyer standard diesel buses.
- The test buses were randomly assigned to operate on every route in the system in order to test their capability and versatility in different operating conditions. These routes vary in passenger loads, operating speed and terrain. In order to make the test data as comparable as possible a standard base diesel bus was assigned to "shadow" a hybrid bus on following trips each day as much as possible. The hybrids and base buses therefore should operate in virtually identical conditions each day.
- Performance data collected included route and driver assigned, noon temperature and weather, miles operated, fuel and oil consumed, road calls, trouble codes, maintenance performed and cost of maintenance and repair.
- To date the new hybrid buses have operated very well. Only one hybrid system related road call has been experienced. The other road calls have been attributed to oil cooler and engine harness issues which are not related to the hybrid bus design.
- The hybrid buses have been popular with our customers and Drivers. A survey of Drivers was conducted and documented in the third quarter report. A passenger survey was conducted last quarter with very favorable results summarized.
- The hybrids are in great demand for demonstrations by various groups and special events. The only downside is that this has reduced their in-service testing time.
- To date the hybrids demonstrated good reliability and low maintenance costs. They have shown to average about 10% to 15% better fuel economy than their peer test diesel buses and 35% better than the fleet average.
- The emissions testing component of the test program began in the third quarter. Some emissions testing delays were experienced by very cold weather and snow conditions.
- Three standard bus routes are utilized for emission tests. The E-Farmington Avenue service is our heaviest ridership route and is representative of a common transit route with frequent stops to board and alight passengers. The Enfield express is a high speed park and ride which uses the HOV lanes on the interstate highway and has only one initial pickup and one final destination stop. The Avon Express is a route which traverses a very steep grade over Avon Mountain.
- The test buses were transferred to the CTTRANSIT Stamford division in mid-June, 2004, for emissions testing on ultra low sulfur diesel fuel.
- Diesel particulate filters were installed at the end of September to allow for this emission component testing during the last quarter of this year.
- Presentations were made on our hybrid bus project at the First Transit Maintenance Regional Maintenance meeting on November 9th, the APTA Maintenance Conference on November 15th and at the New England ITE Annual Meeting on December 6th. Stephen Warren also wrote the feature article about the project which was published in the New England ITE Chronicle, the newsletter for the New England Section of ITE.
- All data collection was completed this quarter. Data formatting and analysis will take place during the next two quarters and a report will be published this Summer.

hybrid bus vs. standard bus facts

HYBRID BUS

WEIGHT (EMPTY)	29,360 lbs.
HEIGHT	131"
WIDTH x LENGTH	102" x 40'
SEATS	38
FUEL ECONOMY	10%-15% Improvement—Expected 4.0 mpg transit duty cycle
RANGE	550 miles
EMISSIONS	50%-90% Improvement (ultralow & PM Filter) PM=.05, HC=1.3, CO=15.5, NOx=.4
TOP SPEED	68mph
BRAKE LIFE	25% Improvement—Expected 30,000 miles
REGENERATIVE BRAKING	Electric Motors become Generators on Braking
ENGINE	Cummins ISL @280hp
TRANSMISSION	Allison EP 40 Electric Drive
ELECTRIC MOTORS	(2) Concentric AC Induction Motors
TRACTION BATTERIES	Sealed Nickel-Metal Hydride
ACCELERATION	Up to 50% Improvement—31 sec. to 40mph at gross weight
COST	\$500,000
LIFE CYCLE COST	To be determined—Expected to be about equal due to hybrid fuel economy and extended brake and engine life.

STANDARD BUS

WEIGHT (EMPTY)	28,850 lbs.
HEIGHT	111"
WIDTH x LENGTH	102" x 40'
SEATS	38
RANGE	440 miles
TOP SPEED	68mph
ENGINE	Detroit Diesel Series 40 @280hp
TRANSMISSION	Allison B400R Automatic
ELECTRIC MOTORS	None
TRACTION BATTERIES	None
COST	\$270,000

CTTRANSIT Hybrid Diesel-Electric Bus Evaluation Program

July 1, 2003 through December 31, 2004

Goals

- Identify the next generation of transit vehicles for future fleet replacement;
- Find a vehicle that is cost effective, reliable, produces fewer emissions, and operates with improved fuel economy when compared to the standard heavy-duty diesel powered bus;
- Collect data to produce an estimated life cycle cost analysis to determine the above.



Project Description

Two New Flyer 40-foot 2003 model low floor Allison hybrid diesel-electric powered buses were purchased in June 2003. CTTRANSIT is operating the vehicles in normal revenue service and is comparing their operating characteristics to a set of virtually identical New Flyer 2002 model year low floor standard 40-foot heavy duty clean diesel buses. The vehicles are operated for scheduled and controlled periods of time in local, slow average speed, high stop-and-go service, and higher speed commuter express operations. They are also being evaluated under light and heavy loads and for their ability to climb and descend steep roads.

Data on mileage, fuel economy and other consumable fluids used are collected daily via the automated TRAK and Ultramain maintenance management computer systems. Emissions information is collected utilizing mobile exhaust gas analyzer (EGA) equipment. Brake pad wear, battery condition and fault codes are checked on a regular and continuing basis. All maintenance and repair labor and parts costs are documented by vehicle utilizing the Ultramain computer work order and maintenance management system. Bus Operator and customer input about the vehicles' operating characteristics has also been obtained via surveys.

Program Funding

This project has been funded by a Congestion Mitigation Air Quality grant CM-005984, Project 170-1884 for a total of \$1,485,000.00. An additional capital grant CT-90-X250 provided funding of \$119,000.00 to purchase new mobile exhaust gas analyzer equipment. Finally, the East Coast Hybrid Consortium has provided \$100,000 in additional project funding.

Program Partners

Allison Electric Drive Transmissions
Connecticut Academy of Science & Engineering
Connecticut Department of Transportation Bureau of Public Transportation
Connecticut Department of Transportation Division of Research
CTTRANSIT
Horiba Instruments, Inc.
New Flyer Industries
The East Coast Hybrid Consortium
University of Connecticut

Vehicles to be Tested

Two 2003 New Flyer Hybrid Diesel-Electric Buses
Two 2002 New Flyer Diesel Buses

Data Collection on Each Vehicle

Daily Data Collection

Route operated (from Dispatcher)
Temperature and weather (from Dispatcher)
Vehicle mileage (from TRAK and Ultramain)
Vehicle fuel and fluids used (from TRAK and Ultramain)
All maintenance done on the vehicle (Ultramain)

Monthly Data Collection

CO, HC, NOx, PM (Mobile EGA, Particulate Matter (PM) Measuring Equipment)

Bus Operator & Passenger Surveys

Bus operators have been surveyed to get their input about the operating characteristics of the hybrid bus as compared to the standard diesel bus. They indicated by over a 90% margin that they preferred driving the hybrid bus due to its great acceleration.

The passengers were also surveyed and they had a very favorable impression of the hybrid bus. They especially liked that it was an environmentally friendly vehicle.

EGA & PM Monthly Emissions Testing (First Eight Months)

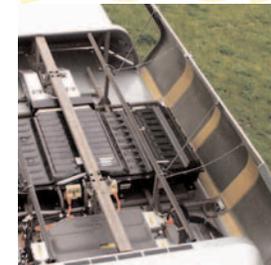
- (2) Hybrid diesel-electric buses (#1 diesel)
- (2) Identical diesel buses (#1 diesel)

EGA & PM Monthly Emissions Testing (Next Four Months)

- (2) Hybrid diesel-electric buses (Ultralow sulfur fuel no PM Filter)
- (2) Identical diesel buses (Ultralow sulfur fuel no PM Filter)

EGA & PM Monthly Emissions Testing (Last Four Months)

- (2) Hybrid diesel-electric buses (Ultralow sulfur fuel & PM Filter)
- (2) Identical diesel buses (Ultralow sulfur fuel & PM Filter)





Advanced Electricity Energy Storage Module

Contains sealed nickel-metal hydride batteries that provide power to the electric drive motors. The batteries also store electricity, which is produced when the motors turn into generators as they help to brake the bus.



Connecticut's First Hybrid Electric Bus

40-foot New Flyer low-floor bus with hybrid parallel Allison electric drive.

An electrical generator and air compressor are installed on a trailer to provide the electricity and clean compressed air for the sophisticated emissions test equipment located inside the bus.



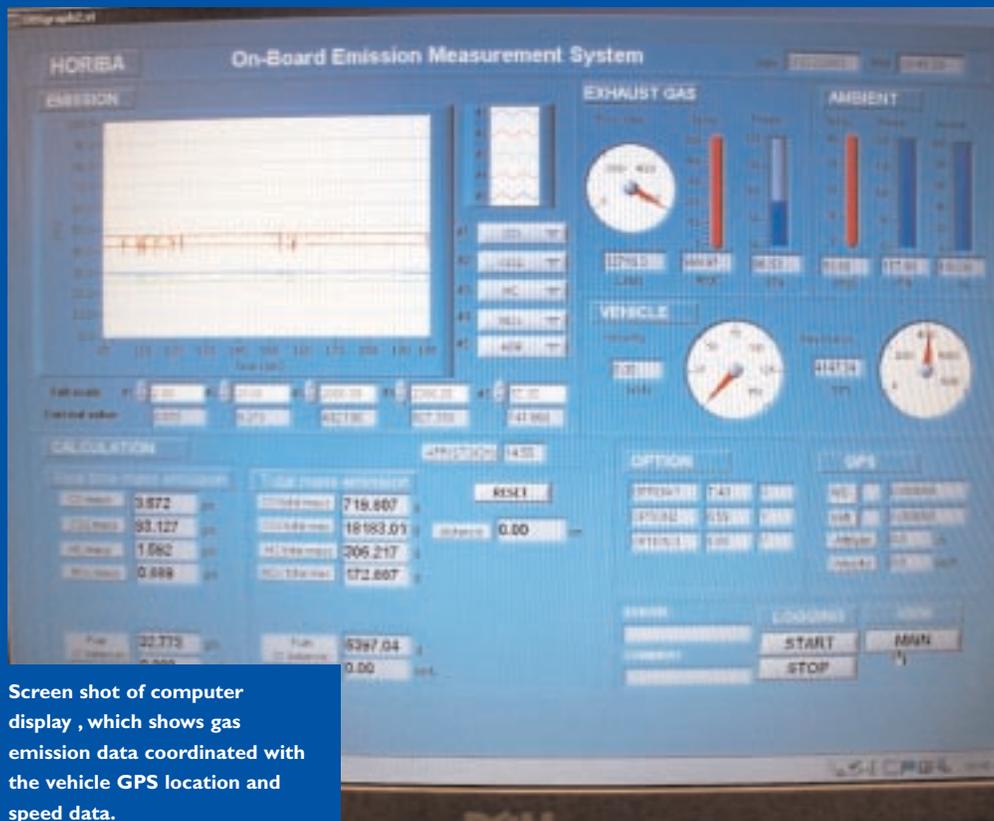
Emissions tests are collected on three different route types: low speed/frequent stops; high speed highway; and steep grade roadways. Testing is also done on #1 diesel, ultralow sulfur diesel, and ultralow sulfur diesel with a particulate filter.



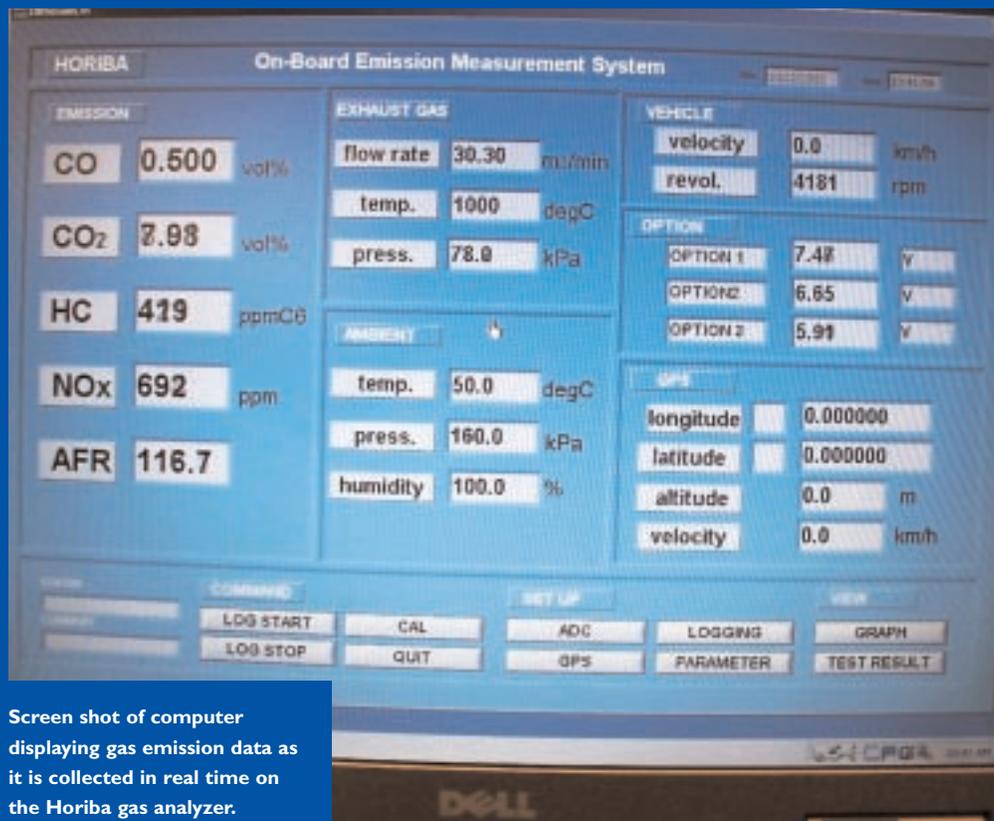
University of Connecticut graduate students operate and monitor the particulate matter mass and particle size measurement equipment.



A University of Connecticut graduate student calibrates the lab emissions test equipment using known calibration gas before each test is run.



Screen shot of computer display , which shows gas emission data coordinated with the vehicle GPS location and speed data.



Screen shot of computer displaying gas emission data as it is collected in real time on the Horiba gas analyzer.



The Clean Fuel Solution Hybrid Diesel Electric

- Hybrid electric buses combine a diesel engine and electric drive components
- Improved performance
 - Significant emissions reduction
 - Increased fuel economy
 - Smooth & quiet operation
- Avoids the infrastructure costs of CNG; no special fuel handling is required

CTTRANSIT Hybrid Project

- \$1,275,513 FHWA Grant
- \$100,000 TECHC Grant
- Eight project partners:
 - Allison Electric Drive Transmission
 - CT Academy of Science & Engineering
 - CDOT Bureau of Public Transportation
 - CDOT Division of Research
 - CTTRANSIT
 - Horiba Instruments, Inc.
 - New Flyer Bus Industries
 - The East Coast Hybrid Consortium
 - University of Connecticut
- 24-month project
- Innovative & unique mobile emissions test

Hybrid bus project reports can be found at: www.ct.gov/dot/LIB/documents/dresearch/CT-170-1884-3-04-5.pdf

CTTRANSIT OCTOBER, 2004 HYBRID BUS TEST PROGRAM DATA

Total Fleet	Fleet Total	Fleet Avg
Miles	984,652.00	2492.8
Fuel - Gallons	262,955.00	665.7
Oil - Quarts	1,299.00	3.3
Road Calls	185	0.5
Maintenance Parts Cost	\$260,898.18	\$660.50
Maintenance Labor Cost	\$130,388.77	\$330.10
Total Maintenance Cost	\$391,286.95	\$990.60
Total Cost/Mile	\$0.40	\$0.40
Miles/Gallon Fuel	3.74	3.74
Miles/Quart Oil	758.0	758.0
Miles/Road Call	5,322.4	5,322.4



Base Comparison Buses	201	202	201 & 202	Base Avg	Hybrid vs Base
Miles	2,455	3,616	6,071	3,036	-797.85
Fuel - Gallons	596.6	818.6	1,415.2	707.6	-263
Oil - Quarts	0.0	7.0	7.0	3.5	-0.5
Road Calls	0	1	1	0.5	-0.5
Maintenance Parts Cost	\$25.04	\$193.24	\$218.28	\$109.14	-\$25.89
Maintenance Labor Cost	\$61.70	\$150.11	\$211.81	\$105.91	-\$6.62
Total Maintenance Cost	\$86.74	\$343.35	\$430.09	\$215.05	-\$32.50
Total Cost/Mile	\$0.04	\$0.09	\$0.07	\$0.07	\$0.01
Miles/Gallon Fuel	4.11	4.42	4.29	4.29	17.32%
Miles/Quart Oil	N/A	516.61	867.33	867.33	-14.0%
Miles/Road Call	N/A	N/A	N/A	N/A	N/A

Hybrid Buses	H301	H302	H301 & H302	Hybrid Avg	Hybrid vs Fleet
Miles	2,114	2,362	4,476	2,238	-255
Fuel - Gallons	429.3	459.9	889.2	444.6	-221.1
Oil - Quarts	6.0	0.0	6.0	3.0	-0.3
Road Calls - Hybrid Related	0	0	0	0	N/A
Road Calls	0	0	0	0	N/A
Maintenance Parts Cost	\$0.00	\$166.51	\$166.51	\$83.26	-\$577.25
Maintenance Labor Cost	\$61.98	\$136.60	\$198.58	\$99.29	-\$230.81
Total Maintenance Cost	\$61.98	\$303.11	\$365.09	\$182.55	-\$808.05
Total Cost/Mile	\$0.03	\$0.13	\$0.08	\$0.08	-\$0.32
Miles/Gallon Fuel	4.92	5.14	5.03	5.03	34.42%
Miles/Quart Oil	352.25	N/A	745.93	745.93	-1.62%
Miles/Road Call - Hybrid Related	N/A	N/A	N/A	N/A	N/A
Miles/ Road Call Total	N/A	N/A	N/A	N/A	N/A

**CTTRANSIT
H301 and 201 BUS TEST DATA
OCTOBER, 2004**

			H301				201								
DATE	NOON TEMP.	CONDITIONS	RUN NO.	BLOCK #	BADGE #	FUEL	MILES	MPG	RUN NO.	BLOCK#	BADGE #	FUEL	MILES	MPG	% CHANGE
10/1/2004	65	CLEAR	44	S202	1968	3.1	15	4.84	Tripper			18.4	74	4.02	20.31%
10/2/2004	65	CLEAR							14/28	A03	1974/1934	33.4	127	3.80	
10/3/2004															
10/4/2004	70	CLEAR	22/6	511	1922/1963	30.6	148	4.84	30/2	502	1933/1977	51.5	182	3.53	36.86%
10/5/2004	72	CLEAR	22/6	511	1922/1963	30.1	144	4.78	42	101	1957	41.3	200	4.84	-1.21%
10/6/2004	69	CLOUDY	22/6	511	1922/1963	30	143	4.77	21/19	510	1947/1963	40.2	148	3.68	29.47%
10/7/2004	65	CLOUDY	22/6	511	1922/1984	31.4	154	4.90	21/10	519	1917/1971	38.9	166	4.27	14.93%
10/8/2004	66	CLEAR	22/6	511	1922/1963	33.1	158	4.77	45/25	503	1951/1979	48.1	173	3.60	32.72%
10/9/2004	67	RAIN													
10/10/2004															
10/11/2004	63	CLEAR							14	113	1983	48	172	3.58	
10/12/2004	65	CLOUDY							22	109	1963	37.4	159.9	4.28	
10/13/2004	63	CLEAR							Tripper			8.7	34.4	3.95	
10/14/2004	67	CLEAR							22/6	511	1922/1984	38.9	144.8	3.72	
10/15/2004	65	CLOUDY							35/4	509	1912/1937	53.8	205.1	3.81	
10/16/2004	63	CLOUDY	Tripper			68.6	362.2	5.28							
10/17/2004															
10/18/2004	59	CLEAR	22/6	511	1922/1963	28.2	133.8	4.74							
10/19/2004	59	CLOUDY	22/6	511	1922/1963	28.6	133.2	4.66							
10/20/2004	60	CLEAR	13	102	1953	32.2	158	4.91							
10/21/2004	64	CLEAR	43	H101	1948	13.7	69.2	5.05							
10/22/2004	66	CLOUDY	22/6	511	1922/1963	21.5	105.2	4.89							
10/23/2004	59	CLOUDY													
10/24/2004															
10/25/2004	62	CLEAR													
10/26/2004	58	CLOUDY	22/6	511	1922/1963	11.1	60.7	5.47	40	306	1901	67.7	346.3	5.12	6.91%
10/27/2004	57	CLEAR	34/1	501	1926/1947	37.1	171.4	4.62	40	306	1901	21.7	77	3.55	30.20%
10/28/2004	61	CLEAR													
10/29/2004	58	CLOUDY	22/6	511	1922/1963	30	157.8	5.26	30/2	502	1933/1921	48.6	245.5	5.05	4.13%
10/30/2004															
10/31/2004															
Totals						429.3	2113.5	4.92				596.6	2455.0	4.11	19.64%

**CTTRANSIT
H302 and 202 BUS TEST DATA
OCTOBER, 2004**

			H302				202								
<u>DATE</u>	<u>NOON TEMP.</u>	<u>CONDITIONS</u>	<u>RUN NO.</u>	<u>BLOCK #</u>	<u>BADGE #</u>	<u>FUEL</u>	<u>MILES</u>	<u>MPG</u>	<u>RUN NO.</u>	<u>BLOCK#</u>	<u>BADGE #</u>	<u>FUEL</u>	<u>MILES</u>	<u>MPG</u>	<u>% MPG CHANGE</u>
10/1/2004	65	CLEAR	22/6	511	1922/1963	30.8	155	5.03	32/7	513	1928/1913	45.3	185	4.08	23.23%
10/2/2004	65	CLEAR							Tripper			69	395	5.72	
10/3/2004									Tripper			49	274	5.59	
10/4/2004	70	CLEAR	19	104	1904	18.6	93	5.00	31/3	507	1954/1960	51.4	203	3.95	26.60%
10/5/2004	72	CLEAR	50/40	CC2/306	1959/1901	14	68	4.86	27	110	1975	9.2	44	4.78	1.56%
10/6/2004	69	CLOUDY	24/12	504	1966/1907	32	164	5.13	21/10	519	1917/1931	35.5	164	4.62	10.94%
10/7/2004	65	CLOUDY	30/2	502	1933/1921	34	173	5.09	45/25	503	1951/1910	35.7	140	3.92	29.75%
10/8/2004	66	CLEAR	20/43	105/H101	1961/1948	12.3	67	5.45	38/37	512	1938/1955	12.7	46	3.62	50.39%
10/9/2004	67	RAIN							17/11	A02	1906/1902	30.3	121	3.99	
10/10/2004															
10/11/2004	63	CLEAR	13/24	102/S203	1946/1966	15.3	83	5.42	36/9	517	1917/1947	56.2	212	3.77	43.81%
10/12/2004	65	CLOUDY	22/6	511	1922/11963	26.6	133	5.00	49/33	520	1943/1985	39.7	145.3	3.66	36.61%
10/13/2004	63	CLEAR	24/12	504	1966/1907	31.1	157.5	5.06	29	304	1965	21.9	99.1	4.53	11.92%
10/14/2004	67	CLEAR	24/12	504	1966/1907	31.2	152.1	4.88	20/44	105/S202	1961/1968	16.5	70	4.24	14.91%
10/15/2004	65	CLOUDY	24/12	504	1984/1907	29.9	153.7	5.14	22/6	511	1922/1963	36.2	141.6	3.91	31.42%
10/16/2004	63	CLOUDY							14/28	A03	1974/34	38.6	169.8	4.40	
10/17/2004															
10/18/2004	59	CLEAR	43	H101	1948	22	109	4.95	20	105	1961	15.1	60.3	3.99	24.07%
10/19/2004	59	CLOUDY	34/1	501	1926/1962	36.5	174.9	4.79	46	508	1941	25.5	99.8	3.91	22.44%
10/20/2004	60	CLEAR	24	S203	1966	14.9	81.5	5.47	18	H201	1923	31.3	124	3.96	38.07%
10/21/2004	64	CLEAR	14	113	1974	11.9	66.4	5.58	49/33	520	1909/1985	39.1	153.5	3.93	42.13%
10/22/2004	66	CLOUDY	Tripper			25.9	129.4	5.00	38/37	512	1938/1955	40.9	159.4	3.90	28.19%
10/23/2004	59	CLOUDY							27/801	GJ1	1975/1980	30.9	143	4.63	
10/24/2004															
10/25/2004	62	CLEAR													
10/26/2004	58	CLOUDY	22/6	511	1922/1963	28.8	170.3	5.91	27	303	1975	20.5	119.8	5.84	1.19%
10/27/2004	57	CLEAR	22/6	511	1922/1963	30.7	155.3	5.06	Tripper			34.9	160	4.58	10.34%
10/28/2004	61	CLEAR													
10/29/2004	58	CLOUDY	Tripper			13.4	76	5.67	18/5	510	1914/1923	33.2	186.7	5.62	0.86%
10/30/2004															
10/31/2004															
Totals						459.9	2,362.1	5.14				818.6	3,616.3	4.42	16.26%

CTTRANSIT NOVEMBER, 2004 HYBRID BUS TEST PROGRAM DATA

Total Fleet	Fleet Total	Fleet Avg
Miles	975,457	2469.5
Fuel - Gallons	253,245	641.1
Oil - Quarts	1,387	3.5
Road Calls	217	0.5
Maintenance Parts Cost	\$292,629.83	\$740.84
Maintenance Labor Cost	\$139,844.67	\$354.04
Total Maintenance Cost	\$432,474.50	\$1,094.87
Total Cost/Mile	\$0.44	\$0.44
Miles/Gallon Fuel	3.85	3.85
Miles/Quart Oil	703.3	703.3
Miles/Road Call	4,495.2	4,495.2



Base Comparison Buses	201	202	201 & 202	Base Avg	Hybrid vs Base
Miles	2,703	2,715	5,417	2,709	-526.3
Fuel - Gallons	731.5	538.6	1,270.1	635.1	-170.6
Oil - Quarts	5.1	12.2	17.3	8.7	-5.7
Road Calls	1	0	1	0.5	-0.5
Maintenance Parts Cost	\$308.78	\$378.08	\$686.86	\$343.43	\$132.86
Maintenance Labor Cost	\$258.12	\$455.38	\$713.50	\$356.75	-\$87.36
Total Maintenance Cost	\$566.90	\$833.46	\$1,400.36	\$700.18	\$45.50
Total Cost/Mile	\$0.21	\$0.31	\$0.26	\$0.26	\$0.08
Miles/Gallon Fuel	3.69	5.04	4.27	4.27	10.16%
Miles/Quart Oil	529.92	222.50	313.13	313.13	132.3%
Miles/Road Call	2703	N/A	5417	5417	N/A

Hybrid Buses	H301	H302	H301 & H302	Hybrid Avg	Hybrid vs Fleet
Miles	2,149	2,215	4,365	2,182	-287
Fuel - Gallons	460.6	468.3	928.9	464.5	-176.7
Oil - Quarts	3.0	3.0	6.0	3.0	-0.5
Road Calls - Hybrid Related	0	0	0	0	N/A
Road Calls	0	0	0	0	N/A
Maintenance Parts Cost	\$460.54	\$492.04	\$952.58	\$476.29	-\$264.55
Maintenance Labor Cost	\$473.66	\$65.12	\$538.78	\$269.39	-\$84.65
Total Maintenance Cost	\$934.20	\$557.16	\$1,491.36	\$745.68	-\$349.19
Total Cost/Mile	\$0.43	\$0.25	\$0.34	\$0.34	-\$0.10
Miles/Gallon Fuel	4.67	4.73	4.70	4.70	21.98%
Miles/Quart Oil	716.43	738.40	727.42	727.42	3.32%
Miles/Road Call - Hybrid Related	N/A	N/A	N/A	N/A	N/A
Miles/ Road Call Total	N/A	N/A	N/A	N/A	N/A

CTTRANSIT
H301 and 201 BUS TEST DATA
November, 2004

			H301					201							
DATE	NOON TEMP.	CONDITIONS	RUN NO.	BLOCK #	BADGE #	FUEL	MILES	MPG	RUN NO.	BLOCK#	BADGE #	FUEL	MILES	MPG	% MPG CHANGE
11/1/2004	58	Ptly Cloudy	43	S101	1948	34.2	151.5	4.43	27	303	1975				
11/2/2004	50	Cloudy	22/6	511	1922/1963	30.6	133.4	4.36	18/5	510	1914/1980	39.2	173.9	4.44	-1.73%
11/3/2004	52	Ptly Cloudy	22/6	511	1922/1963	30.4	134.1	4.41	31/3	507	1954/47	45	152.8	3.40	29.91%
11/4/2004	42	Cloudy	22/6	511	1922/1984	30.8	134.4	4.36	41	CCE4	1935	17	61	3.59	21.61%
11/5/2004	46	Ptly Cloudy	22/6	511	1922/1963	29.4	134.1	4.56	18/5	510	1914/1923	38.9	132.3	3.40	34.11%
11/6/2004	51	Clear							19/20	KO1	1904/1946	29.6	98.3	3.32	
11/7/2004	58	Clear													
11/8/2004	49	Ptly Cloudy	Tripper			3.2	16.3	5.09	22/6	511	1922/1963	38.8	134.3	3.46	47.16%
11/9/2004	42	Ptly Cloudy	13/40	102/306	1953/1901	20.3	89.4	4.40	Tripper			37	143	3.86	13.95%
11/10/2004	37	Cloudy	28	CCE2	1931	14.9	65.7	4.41	36/9	517	1916/1967	53.2	213.2	4.01	10.03%
11/11/2004	56	Cloudy	23/43	111/H101	1979/1948	17.1	75.6	4.42	37	K101	1937	14.3	47	3.29	34.51%
11/12/2004	30	Sleet	43	S101	1948	10.6	45	4.25	14/27	113/303	1974/1982	24.6	106.3	4.32	-1.76%
11/13/2004	42	Clear													
11/14/2004	42	Clear													
11/15/2004	49	Ptly Cloudy							23/43	111/H101	1920/1948	18.8	75.7	4.03	
11/16/2004	51	Ptly Cloudy							43	H101	1948	24.1	83.3	3.46	
11/17/2004	48	Cloudy							Tripper			10.7	36.9	3.45	
11/18/2004	57	Cloudy							45/25	503	1951/1910	2.1	8.4	4.00	
11/19/2004	56	Ptly Cloudy							45/25	503	1951/1910	38	144	3.79	
11/20/2004	54	Cloudy	Tripper			61.5	314	5.11	27/801	GJ1	1975/1980	32.8	125.4	3.82	33.55%
11/21/2004	50	Clear							27/804	501	1975/1984	38.5	133	3.45	
11/22/2004	52	Ptly Cloudy	30/2	502	1933/1921	35.6	171.4	4.81	31/3	507	1947/1960	54.8	199.5	3.64	32.25%
11/23/2004	50	Ptly Cloudy	24/12	504	1966/1907	30.4	147.7	4.86	30/2	502	1933/1921	20.5	70.6	3.44	41.08%
11/24/2004	49	Drizzle	23/43	111/H101	1956/1948	24.2	111.6	4.61	27	303	1975	17.9	63.4	3.54	30.20%
11/25/2004	52	Cloudy													
11/26/2004	47	Ptly Cloudy	24/12	504	1984/1907	29.7	146.3	4.93	22/6	511	1922/1963	36.1	135.5	3.75	31.24%
11/27/2004	49	Clear							13/12/16	501	953/1907/198	10.4	42	4.04	
11/28/2004	52	Rain													
11/29/2004	48	Ptly Cloudy	22/6	511	1922/1963	30.1	135.7	4.51	30/2	502	1933/1947	48.8	172.9	3.54	27.24%
11/30/2004	42	Ptly Cloudy	14/40	113/306	1974/1901	27.6	143.1	5.18	48/49	516	1964/1943	40.4	149.9	3.71	39.74%
Totals						460.6	2149.3	4.67				731.5	2702.6	3.69	26.30%

CTTRANSIT
H302 and 202 BUS TEST DATA
NOVEMBER, 2004

			H302					202							
<u>DATE</u>	<u>NOON TEMP.</u>	<u>CONDITIONS</u>	<u>RUN NO.</u>	<u>BLOCK #</u>	<u>BADGE #</u>	<u>FUEL</u>	<u>MILES</u>	<u>MPG</u>	<u>RUN NO.</u>	<u>BLOCK#</u>	<u>BADGE #</u>	<u>FUEL</u>	<u>MILES</u>	<u>MPG</u>	<u>% MPG CHANGE</u>
11/1/2004	58	Ptly Cloudy							13	102	1978	14.8	52.6	3.55	
11/2/2004	50	Cloudy							46	508/CC4	1946	19.4	70.9	3.65	
11/3/2004	52	Ptly Cloudy							39	H203	1924	19.4	78.5	4.05	
11/4/2004	42	Cloudy	Tripper			55.1	283.8	5.15	21/44	107/S202	1971/1968	23.1	83.5	3.61	42.49%
11/5/2004	46	Ptly Cloudy	43	S101/H101	1948	16.6	75.7	4.56	36/9	517	1916/1967	55	209	3.80	20.01%
11/6/2004	51	Clear													
11/7/2004	58	Clear													
11/8/2004	49	Ptly Cloudy	30/2	502	1933/1921	37.1	174.3	4.70							
11/9/2004	42	Ptly Cloudy	40/24	CC1/S203	1901/1966	13.7	64	4.67							
11/10/2004	37	Cloudy	22/6	511	1922/1963	29.5	135.5	4.59							
11/11/2004	56	Cloudy	22/6	511	1922/1984	29	140.5	4.84							
11/12/2004	30	Sleet	22/6	511	1922/1963	29.1	128.2	4.41							
11/13/2004	42	Clear													
11/14/2004	42	Clear													
11/15/2004	49	Ptly Cloudy	30/2	502	1933/1977	35.4	173.8	4.91	39	H203	1924	69.2	340.2	4.92	-0.13%
11/16/2004	51	Ptly Cloudy	50/44	CCC2/S202	1959/1968	17.2	80.4	4.67	25/16	505	1910/1930	36.3	129.7	3.57	30.83%
11/17/2004	48	Cloudy	27/20	518	1976/1927	28.3	137.7	4.87	43	H101	1948	12.3	44.8	3.64	33.59%
11/18/2004	57	Cloudy	40	306	1901	18.1	83.8	4.63	45/25	503	1951/1910	34.9	141.6	4.06	14.11%
11/19/2004	56	Ptly Cloudy	22/6	511	1922/1963	29.7	136.6	4.60	34/1	501	1926/1962	47.3	172.3	3.64	26.26%
11/20/2004	54	Cloudy													
11/21/2004	50	Clear							904	IO3	1943	22.5	107.6	4.78	
11/22/2004	52	Ptly Cloudy	22/6	511	1922/1963	31.4	141.6	4.51	24/12	504	1966/1980	38.7	148	3.82	17.92%
11/23/2004	50	Ptly Cloudy	14/43	113/H101	1974/1948	17.2	88.2	5.13	22	109	1963	33	132.9	4.03	27.33%
11/24/2004	49	Drizzle							43	S101	1948	12.3	44.7	3.63	
11/25/2004	52	Cloudy													
11/26/2004	47	Ptly Cloudy	Tripper			9.4	41.7	4.44	Tripper			29.8	126.4	4.24	4.59%
11/27/2004	49	Clear													
11/28/2004	52	Rain							Tripper			12.5	55	4.40	
11/29/2004	48	Ptly Cloudy	34/1	501	1987/1962	40.9	180.9	4.42	31/3	507	1946/1960	48.4	196.5	4.06	8.94%
11/30/2004	42	Ptly Cloudy	24/12	504	1966/1907	30.6	148.5	4.85	Tripper			9.7	40.3	4.15	16.81%
Totals						468.3	2,215.2	4.73				538.6	2,174.5	4.04	17.16%

CTTRANSIT DECEMBER, 2004 HYBRID BUS TEST PROGRAM DATA

Total Fleet	Fleet Total	Fleet Avg
Miles	1,021,161	2585.2
Fuel - Gallons	267,790	677.9
Oil - Quarts	1,430	3.6
Road Calls	303	0.8
Maintenance Parts Cost	\$211,752.38	\$536.08
Maintenance Labor Cost	\$135,509.65	\$343.06
Total Maintenance Cost	\$347,262.03	\$879.14
Total Cost/Mile	\$0.34	\$0.34
Miles/Gallon Fuel	3.81	3.81
Miles/Quart Oil	714.1	714.1
Miles/Road Call	3,370.2	3,370.2



Base Comparison Buses	201	202	201 & 202	Base Avg	Hybrid vs Base
Miles	2,795	1,935	4,729	2,365	127.9
Fuel - Gallons	677.7	483.1	1,160.8	580.4	-66.8
Oil - Quarts	4.0	0.0	4.0	2.0	-5.7
Road Calls	0	0	0	N/A	N/A
Maintenance Parts Cost	\$348.59	\$90.09	\$438.68	\$219.34	-\$68.09
Maintenance Labor Cost	\$176.61	\$1,051.96	\$1,228.57	\$614.29	-\$545.99
Total Maintenance Cost	\$525.20	\$1,142.05	\$1,667.25	\$833.63	-\$614.08
Total Cost/Mile	\$0.19	\$0.59	\$0.35	\$0.35	-\$0.26
Miles/Gallon Fuel	4.12	4.00	4.07	4.07	19.12%
Miles/Quart Oil	698.63	#DIV/0!	1,182.28	1,182.28	-57.8%
Miles/Road Call	N/A	N/A	N/A	N/A	N/A

Hybrid Buses	H301	H302	H301 & H302	Hybrid Avg	Hybrid vs Fleet
Miles	2,380	2,605	4,985	2,492	-93
Fuel - Gallons	484	543.2	1027.2	513.6	-164.3
Oil - Quarts	3.0	7.0	10.0	5.0	1.4
Road Calls - Hybrid Related	0	0	0	N/A	N/A
Road Calls	0	0	0	N/A	N/A
Maintenance Parts Cost	\$0.00	\$302.50	\$302.50	\$151.25	-\$384.83
Maintenance Labor Cost	\$49.35	\$87.24	\$136.59	\$68.30	-\$274.77
Total Maintenance Cost	\$49.35	\$389.74	\$439.09	\$219.55	-\$659.60
Total Cost/Mile	\$0.02	\$0.15	\$0.09	\$0.09	-\$0.25
Miles/Gallon Fuel	4.92	4.80	4.85	4.85	27.26%
Miles/Quart Oil	793.20	372.19	498.49	498.49	-43.25%
Miles/Road Call - Hybrid Related	N/A	N/A	N/A	N/A	N/A
Miles/ Road Call Total	N/A	N/A	N/A	N/A	N/A

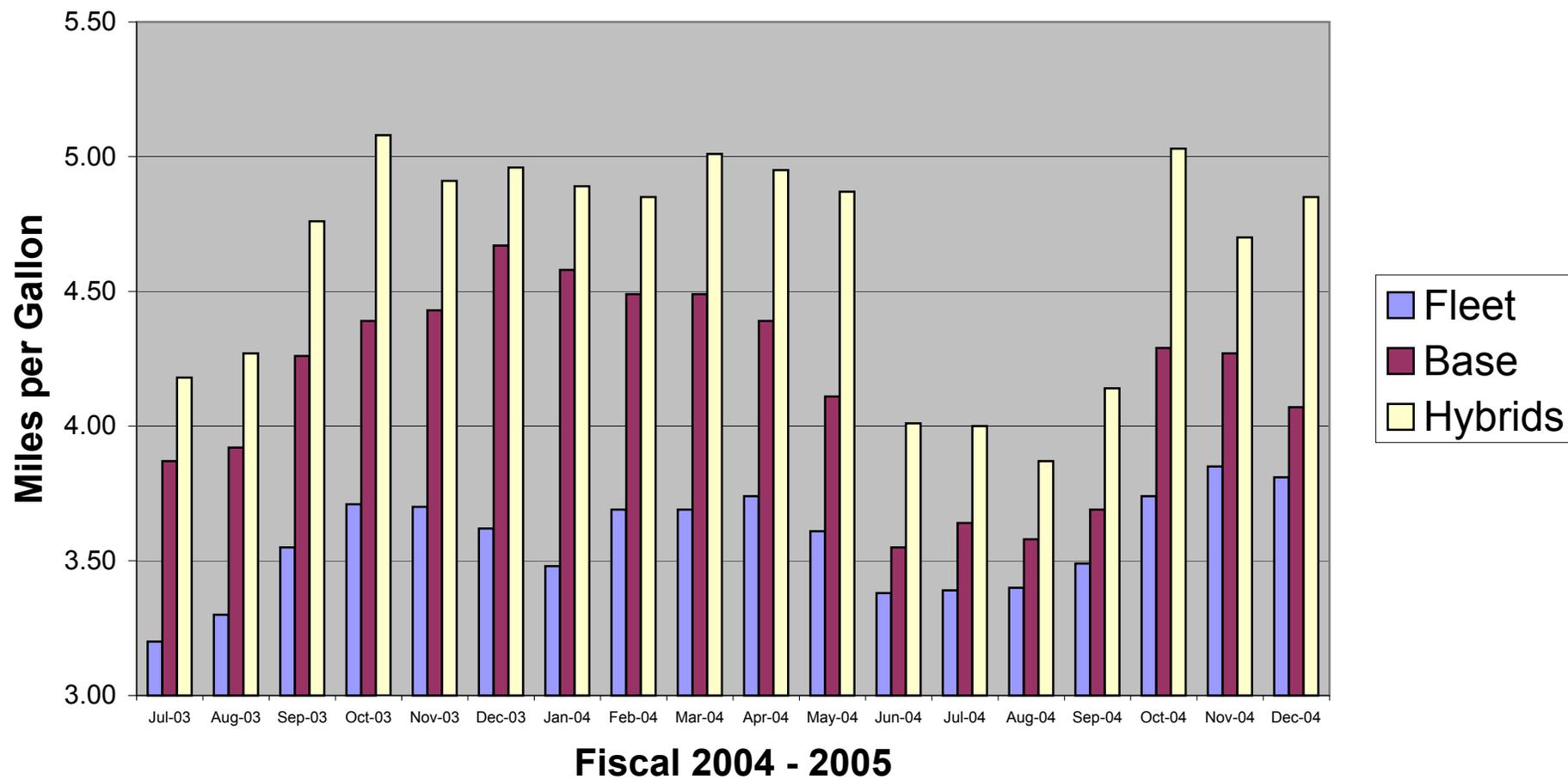
CCTSTRANSIT
H301 and 201 BUS TEST DATA
DECEMBER, 2004

			H301					201							
DATE	NOON TEMP.	CONDITIONS	RUN NO.	BLOCK #	BADGE #	FUEL	MILES	MPG	RUN NO.	BLOCK#	BADGE #	FUEL	MILES	MPG	% MPG CHANGE
12/1/2004	56	Rain													
12/2/2004	47	Cloudy	22/6	511	1922/1966	3.2	16.2	5.06	25/16	505	1931/1930	36.4	168	4.62	9.69%
12/3/2004	42	Ptly Cloudy	44	S202	1968	7.8	39	5.00	46	CCC4	1941	16	70	4.38	14.29%
12/4/2004	34	Clear							17/11	A02	1906/1977	32.3	124	3.84	
12/5/2004	47	Cloudy													
12/6/2004	32	Ptly Cloudy	22/6	511	1922/1963	31.8	155	4.87	21	107	1971	14.9	57	3.83	27.41%
12/7/2004	42	Light Rain	43	H101	1948	15	76	5.07	45/25	503	1951/1910	35.1	139	3.96	27.94%
12/8/2004	47	Cloudy	22/6	511	1922/1963	28.3	137	4.84	36/9	517	1916/1967	57.1	217	3.80	27.38%
12/9/2004	42	Light Rain	22/6	511	1922/1963	30.2	146	4.83	33	520	1985	31.2	134	4.29	12.56%
12/10/2004	42	Cloudy	22/6	511	1922/1963	28.4	136	4.79	20	105	1961	20.6	84	4.08	17.44%
12/11/2004	42	Cloudy													
12/12/2004	43	Cloudy													
12/13/2004	44	Cloudy	22/6	511	1922/1963	30.7	148	4.82							
12/14/2004	26	Ptly Cloudy							40	306	1901	14.6	67	4.59	
12/15/2004	22	Clear							35/4	509	1912/1937	49.7	207	4.16	
12/16/2004	28	Ptly Cloudy							20/39	105/H203	1961/1924	12.3	54.8	4.46	
12/17/2004	38	Ptly Cloudy	40	306	1901	44.3	224.8	5.07	35/4	509	1912/1937	52.7	207	3.93	29.19%
12/18/2004	36	Clear													
12/19/2004	28	Cloudy													
12/20/2004	10	Cloudy	34/1	501	1926/1962	48.8	239.4	4.91	43	S101	1948	47.6	197.8	4.16	18.06%
12/21/2004	9	Ptly Cloudy	24/12	504	1966/1907	28.5	146.1	5.13	22	109	1963	9.9	43.2	4.36	17.48%
12/22/2004	42	Ptly Cloudy	34/1	501	1926/1962	37.1	175.6	4.73							
12/23/2004	42	Ptly Cloudy	43	S101	1948	11	55.3	5.03	45/25	503	1951/1910	36.8	143.7	3.90	28.74%
12/24/2004	42	Ptly Cloudy	40	306	1901	16.8	85.6	5.10	32/7	513	1928/1913	43.3	179.7	4.15	22.77%
12/25/2004	29	Clear													
12/26/2004	25	Cloudy													
12/27/2004	26	Ptly Cloudy	30/2	502	1933/1929	36.6	179.2	4.90	45/25	503	1951/1910	33.7	142.8	4.24	15.55%
12/28/2004	26	Ptly Cloudy	23	111	1956	17.2	83.7	4.87	36/9	517	1929/1967	48	218.2	4.55	7.05%
12/29/2004	38	Ptly Cloudy	18	H201	1923	11	53.5	4.86	29	304	1947	26.7	109.4	4.10	18.70%
12/30/2004	39	Ptly Cloudy	22/6	511	1922/1984	29.4	144.2	4.90	44	S202	1968	19.6	76.3	3.89	25.99%
12/31/2004	48	Ptly Cloudy	22/6	511	1922/1966	27.9	139	4.98	48/49	516	1964/1909	39.2	154.6	3.94	26.32%
Totals						484.0	2379.6	4.92				677.7	2794.5	4.12	19.23%

CTTRANSIT
H302 and 202 BUS TEST DATA
DECEMBER, 2004

			H302					202							
<u>DATE</u>	<u>NOON TEMP.</u>	<u>CONDITIONS</u>	<u>RUN NO.</u>	<u>BLOCK #</u>	<u>BADGE #</u>	<u>FUEL</u>	<u>MILES</u>	<u>MPG</u>	<u>RUN NO.</u>	<u>BLOCK#</u>	<u>BADGE #</u>	<u>FUEL</u>	<u>MILES</u>	<u>MPG</u>	<u>% MPG CHANGE</u>
12/1/2004	56	Rain													
12/2/2004	47	Cloudy	44	S202	1968	10.3	52.7	5.12							
12/3/2004	42	Ptly Cloudy	22/6	511	1922/1966	30.1	139.9	4.65							
12/4/2004	34	Clear													
12/5/2004	47	Cloudy													
12/6/2004	32	Ptly Cloudy	34/1	501	1926/1962	39.2	184	4.69							
12/7/2004	42	Light Rain	44	S202	1968	8.3	44	5.30							
12/8/2004	47	Cloudy	43/40	S101/306	1948/1901	16.8	81	4.82							
12/9/2004	42	Light Rain	34/1	501	1926/1962	36.5	174	4.77							
12/10/2004	42	Cloudy	Tripper			34	167	4.91							
12/11/2004	42	Cloudy													
12/12/2004	43	Cloudy													
12/13/2004	44	Cloudy	34/1	501	1926/1962	38.5	178	4.62							
12/14/2004	26	Ptly Cloudy	14	113	1974	35.5	177	4.99							
12/15/2004	22	Clear	24	S203	1966	9.5	49	5.16							
12/16/2004	28	Ptly Cloudy	22/43	109/H101	1984/1848	16.3	77.6	4.76	40	306	1901	28.1	125	4.45	7.02%
12/17/2004	38	Ptly Cloudy	19/43	104/H101	1961/1948	15.9	77.8	4.89	30/2	502	1933/1921	44.2	170.6	3.86	26.77%
12/18/2004	36	Clear							14/28	A03	1943/1987	40.4	167.3	4.14	
12/19/2004	28	Cloudy													
12/20/2004	10	Cloudy	30/2	502	1933/1921	46.5	217.7	4.68	49/33	520	1909/1985	44.7	164.8	3.69	26.99%
12/21/2004	9	Ptly Cloudy	42/44	101/S202	1957/1968	16.1	75.6	4.70	48/49	516	1964/1909	38.2	147.1	3.85	21.94%
12/22/2004	42	Ptly Cloudy	20/24	105/S203	1927/1966	10	50.7	5.07	48/49	516	1964/1909	40.5	147.4	3.64	39.30%
12/23/2004	42	Ptly Cloudy	22/6	511	1922/1984	31	145.6	4.70	31/3	507	1954/1960	47.6	193.7	4.07	15.42%
12/24/2004	42	Ptly Cloudy	22/6	511	1922/1963	30.2	144.1	4.77	36/9	517	1929/1967	52.2	216.3	4.14	15.15%
12/25/2004	29	Clear													
12/26/2004	25	Cloudy													
12/27/2004	26	Ptly Cloudy	34/1	501	1926/1962	38.6	179.9	4.66	Tripper			7.8	32.9	4.22	10.49%
12/28/2004	26	Ptly Cloudy	24/12	504	1966/1907	31	148.2	4.78	18/5	510	1914/19887	33.7	131.5	3.90	22.52%
12/29/2004	38	Ptly Cloudy	24/12	504	1966/1907	29.2	147.7	5.06	34/1	501	1986/1962	41.2	167	4.05	24.79%
12/30/2004	39	Ptly Cloudy	42/43	101/H101	1957/1948	12.3	58.1	4.72	Tripper			19.5	69.4	3.56	32.72%
12/31/2004	48	Ptly Cloudy	19	104	1904	7.4	35.7	4.82	35/4	509	1912/1937	45	201.6	4.48	7.69%
Totals						543.2	2,605.3	4.80				483.1	1,934.6	4.00	19.77%

CTTRANSIT BUS FUEL ECONOMY



Bus Type	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04
Fleet	3.20	3.30	3.55	3.71	3.70	3.62	3.48	3.69	3.69	3.74	3.61	3.38	3.39	3.40	3.49	3.74	3.85	3.81
Base	3.87	3.92	4.26	4.39	4.43	4.67	4.58	4.49	4.49	4.39	4.11	3.55	3.64	3.58	3.69	4.29	4.27	4.07
Hybrids	4.18	4.27	4.76	5.08	4.91	4.96	4.89	4.85	5.01	4.95	4.87	4.01	4.00	3.87	4.14	5.03	4.70	4.85



FLEET MILES & MILES PER GALLON
OCTOBER, 2004

HARTFORD DIVISION

<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
MCI 911-915 & 9001-9200	23	21,127	5,932	3.56	145,363	42,615	3.41	-124,236	-36,683	0.15
NFI 6V92 9301-9338	38	58,543	18,740	3.12	95,523	31,000	3.08	-36,980	-12,260	0.04
NFI S-50 9339-9340 & 9401-9428	30	59,427	14,823	4.01	83,287	19,737	4.22	-23,860	-4,914	-0.21
NFI S-50 941-965	25	41,584	8,031	5.18	55,610	10,350	5.37	-14,026	-2,319	-0.20
NOVA 1121 9637-9647	13	26,961	7,166	3.76	35,392	8,737	4.05	-8,431	-1,571	-0.29
NFI S-40 201-240	40	130,643	31,949	4.09	179,346	40,129	4.47	-48,703	-8,180	-0.38
MCI Commuter 303-309	7	22,749	5,139	4.43	19,293	4,214	4.58	3,456	925	-0.15
<u>NFI S-50 310-324, 401-441</u>	<u>56</u>	<u>214,827</u>	<u>55,709</u>	<u>3.86</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<i>Hartford Totals</i>	232	575,861	147,489	3.90	613,814	156,782	3.92	-252,780	-65,002	-0.01

NEW HAVEN DIVISION

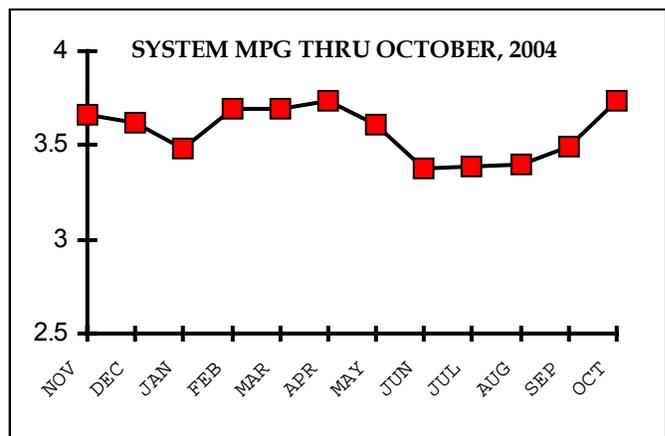
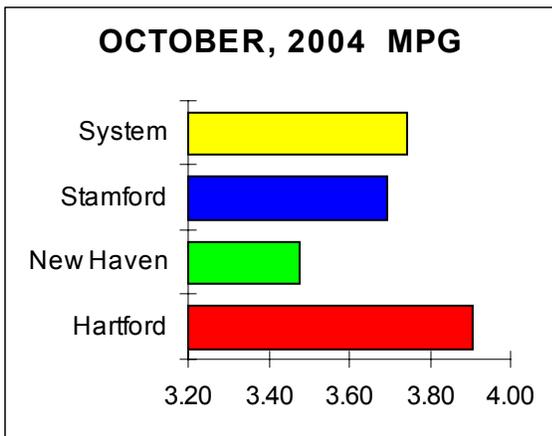
<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
NOVA 1121 9601-9623, 9626	24	53,106	15,606	3.40	69,283	19,797	3.50	-16,177	-4,191	-0.10
<u>NFI S-50 330-371 451-492</u>	<u>84</u>	<u>230,991</u>	<u>66,097</u>	<u>3.49</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<i>New Haven Totals</i>	108	284,097	81,703	3.48	69,283	19,797	3.50	214,814	61,906	-0.02

STAMFORD DIVISION

<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
NOVA 1121 9626-9636	10	23,600	6,627	3.56	31,754	9,323	3.41	-8,154	-2,696	0.16
EIDorado 9904-9913	11	9,064	2,754	3.29	14,116	4,057	3.48	-5,052	-1,303	-0.19
NFI S-40 101-126	26	65,051	18,184	3.58	103,041	24,918	4.14	-37,990	-6,734	-0.56
NFI S-40 127-132	6	22,504	5,309	4.24	28,155	6,043	4.66	-5,651	-734	-0.42
<u>NFI Hybrid H301 & H302</u>	<u>2</u>	<u>4,476</u>	<u>889</u>	<u>5.03</u>	<u>7,858</u>	<u>1,537</u>	<u>5.11</u>	<u>-3,382</u>	<u>-648</u>	<u>-0.08</u>
<i>Stamford Totals</i>	55	124,695	33,763	3.69	184,924	45,878	4.03	-60,229	-12,115	-0.34

SYSTEM

<u>Make</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
<i>All buses</i>	395	984,653	262,955	3.74	868,021	222,457	3.90	116,632	40,498	-0.16





FLEET MILES & MILES PER GALLON
NOVEMBER, 2004

HARTFORD DIVISION

<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
MCI 911-915 & 9001-9200	23	20,263	5,606	3.61	119,544	35,461	3.37	-99,281	-29,855	0.24
NFI 6V92 9301-9338	38	61,439	18,828	3.26	84,146	27,341	3.08	-22,707	-8,513	0.19
NFI S-50 9339-9340 & 9401-9428	30	61,399	14,759	4.16	68,180	16,437	4.15	-6,781	-1,678	0.01
NFI S-50 941-965	25	42,616	7,923	5.38	44,941	8,600	5.23	-2,325	-677	0.15
NOVA 1121 9637-9647	13	25,837	6,583	3.92	31,510	8,085	3.90	-5,673	-1,502	0.03
NFI S-40 201-240	40	125,678	29,125	4.32	162,778	36,586	4.45	-37,100	-7,461	-0.13
MCI Commuter 303-309	7	23,496	5,163	4.55	18,058	3,957	4.56	5,438	1,206	-0.01
<u>NFI S-50 310-324, 401-441</u>	<u>56</u>	<u>210,573</u>	<u>52,160</u>	<u>4.04</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<i>Hartford Totals</i>	232	571,301	140,147	4.08	529,157	136,467	3.88	-168,429	-48,480	0.20

NEW HAVEN DIVISION

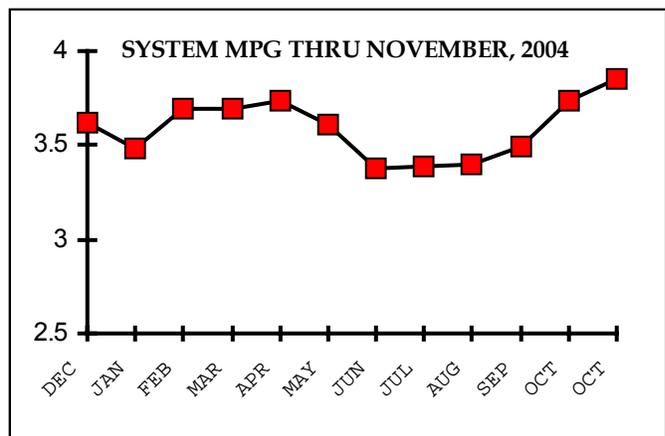
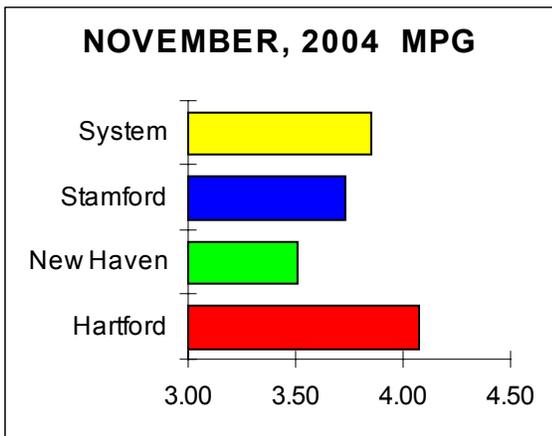
<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
NOVA 1121 9601-9623, 9626	24	50,396	14,869	3.39	67,029	18,934	3.54	-16,633	-4,065	-0.15
<u>NFI S-50 330-371 451-492</u>	<u>84</u>	<u>229,003</u>	<u>64,823</u>	<u>3.53</u>	<u>197,287</u>	<u>62,362</u>	<u>3.16</u>	<u>31,716</u>	<u>2,461</u>	<u>0.37</u>
<i>New Haven Totals</i>	108	279,399	79,692	3.51	264,316	81,296	3.25	15,083	-1,604	0.25

STAMFORD DIVISION

<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
NOVA 1121 9626-9636	10	22,368	6,424	3.48	26,249	8,478	3.10	-3,881	-2,054	0.39
EIDorado 9904-9913	11	8,424	2,634	3.20	10,004	3,120	3.21	-1,580	-486	-0.01
NFI S-40 101-126	26	62,473	17,063	3.66	73,365	18,811	3.90	-10,892	-1,748	-0.24
NFI S-40 127-132	6	27,128	6,356	4.27	24,240	5,264	4.60	2,888	1,092	-0.34
<u>NFI Hybrid H301 & H302</u>	<u>2</u>	<u>4,364</u>	<u>929</u>	<u>4.70</u>	<u>4,496</u>	<u>927</u>	<u>4.85</u>	<u>-132</u>	<u>2</u>	<u>-0.15</u>
<i>Stamford Totals</i>	55	124,757	33,406	3.73	138,354	36,600	3.78	-13,597	-3,194	-0.05

SYSTEM

<u>Make</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
<i>All buses</i>	395	975,457	253,245	3.85	931,827	254,363	3.66	43,630	-1,118	0.19





FLEET MILES & MILES PER GALLON
DECEMBER, 2004

HARTFORD DIVISION

<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
MCI 911-915 & 9001-9200	23	21,907	6,443	3.40	138,971	41,329	3.36	-117,064	-34,886	0.04
NFI 6V92 9301-9338	38	66,189	21,170	3.13	92,459	30,264	3.06	-26,270	-9,094	0.07
NFI S-50 9339-9340 & 9401-9428	30	71,708	17,948	4.00	78,462	19,064	4.12	-6,754	-1,116	-0.12
NFI S-50 941-965	25	45,837	8,866	5.17	52,037	10,006	5.20	-6,200	-1,140	-0.03
NOVA 1121 9637-9647	13	30,017	7,896	3.80	34,442	8,591	4.01	-4,425	-695	-0.21
NFI S-40 201-240	40	126,425	28,589	4.42	170,479	37,632	4.53	-44,054	-9,043	-0.11
MCI Commuter 303-309	7	23,560	5,435	4.33	21,139	4,651	4.55	2,421	784	-0.21
<u>NFI S-50 310-324, 401-441</u>	<u>56</u>	<u>212,924</u>	<u>53,927</u>	<u>3.95</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<i>Hartford Totals</i>	232	598,567	150,274	3.98	587,989	151,537	3.88	-202,346	-55,190	0.10

NEW HAVEN DIVISION

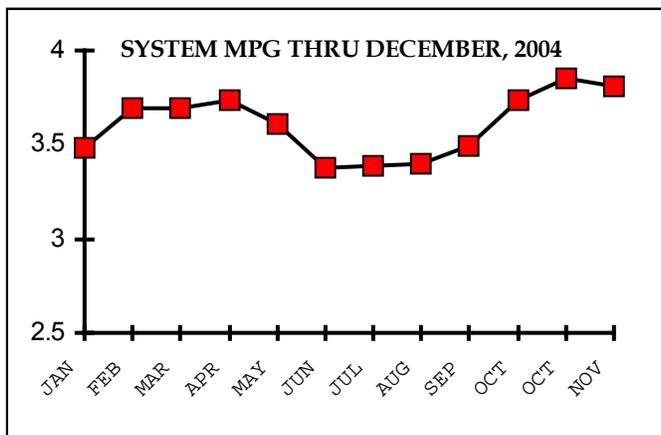
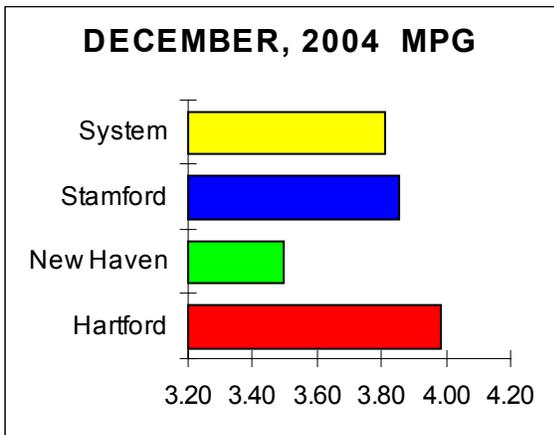
<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
NOVA 1121 9601-9623, 9626	24	55,792	16,539	3.37	69,794	20,166	3.46	-14,002	-3,627	-0.09
<u>NFI S-50 330-371 451-492</u>	<u>84</u>	<u>241,861</u>	<u>68,585</u>	<u>3.53</u>	<u>219,029</u>	<u>69,117</u>	<u>3.17</u>	<u>22,832</u>	<u>-532</u>	<u>0.36</u>
<i>New Haven Totals</i>	108	297,653	85,124	3.50	288,823	89,283	3.23	8,830	-4,159	0.26

STAMFORD DIVISION

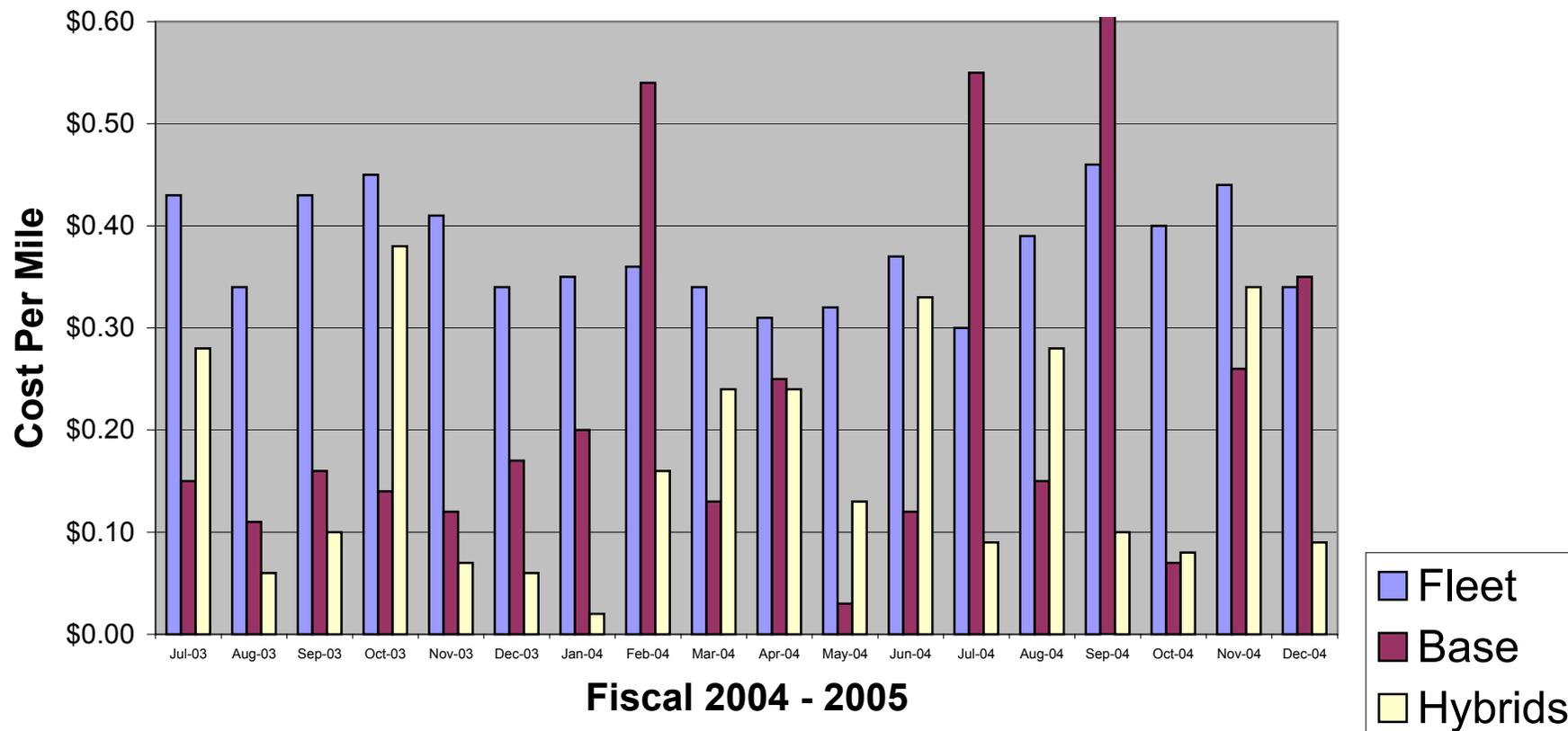
<u>Make & Series</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
NOVA 1121 9626-9636	10	21,890	6,242	3.51	30,974	10,010	3.09	-9,084	-3,768	0.41
EIDorado 9904-9913	11	10,908	3,405	3.20	10,487	4,013	2.61	421	-608	0.59
NFI S-40 101-126	26	63,851	16,589	3.85	63,999	17,787	3.60	-148	-1,198	0.25
NFI S-40 127-132	6	23,307	5,129	4.54	21,666	4,790	4.52	1,641	339	0.02
<u>NFI Hybrid H301 & H302</u>	<u>2</u>	<u>4,985</u>	<u>1,027</u>	<u>4.85</u>	<u>7,665</u>	<u>1,557</u>	<u>4.92</u>	<u>-2,680</u>	<u>-530</u>	<u>-0.07</u>
<i>Stamford Totals</i>	55	124,941	32,392	3.86	134,791	38,157	3.53	-9,850	-5,765	0.32

SYSTEM

<u>Make</u>	<u>No.</u>	<u>Current Month</u>			<u>Prior Year Month</u>			<u>Difference</u>		
		<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>	<u>Miles</u>	<u>Gallons</u>	<u>MPG</u>
<i>All buses</i>	395	1,021,161	267,790	3.81	1,011,603	278,977	3.63	9,558	-11,187	0.19

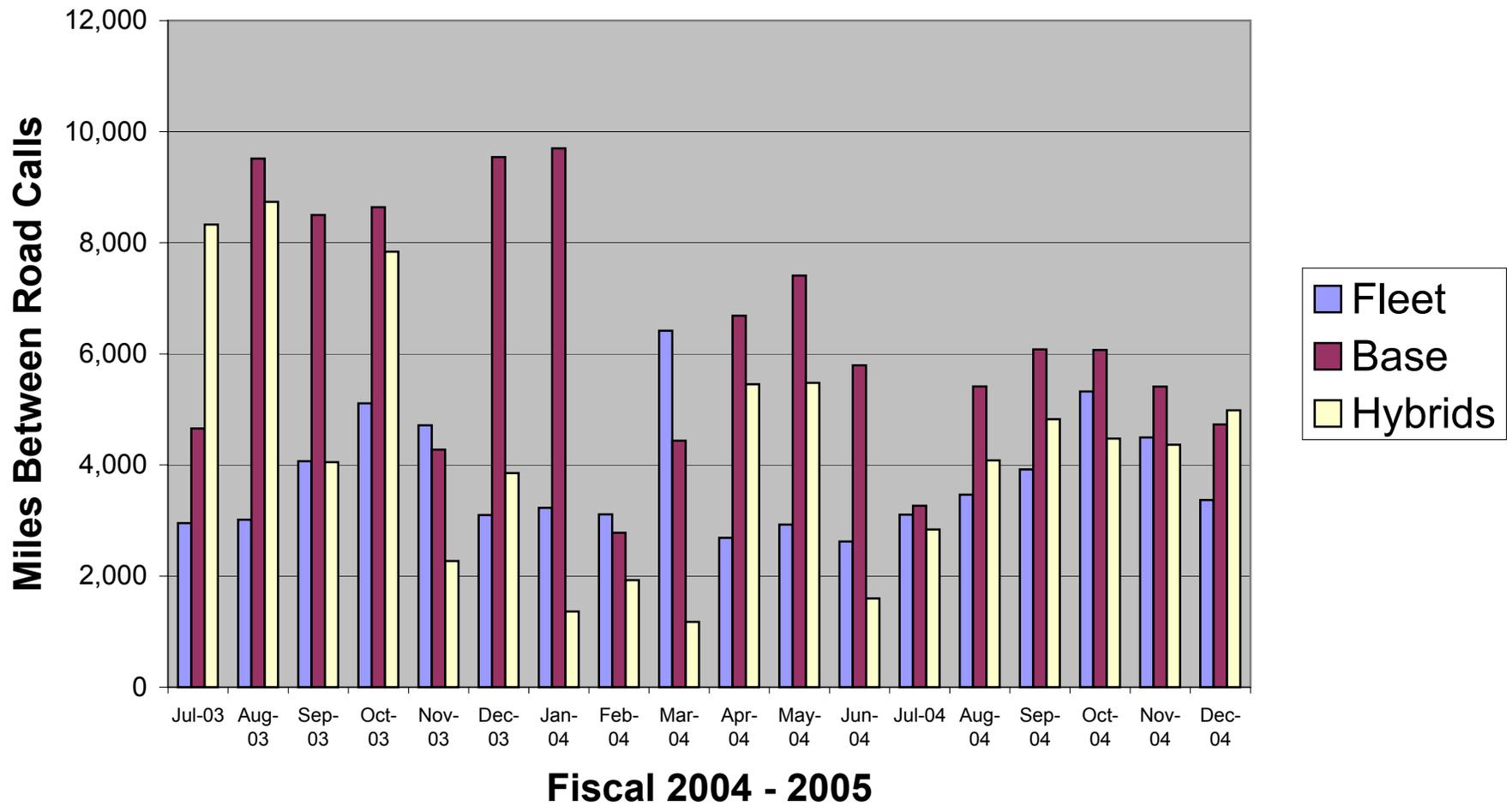


CTTRANSIT BUS MAINTENANCE COST PER MILE

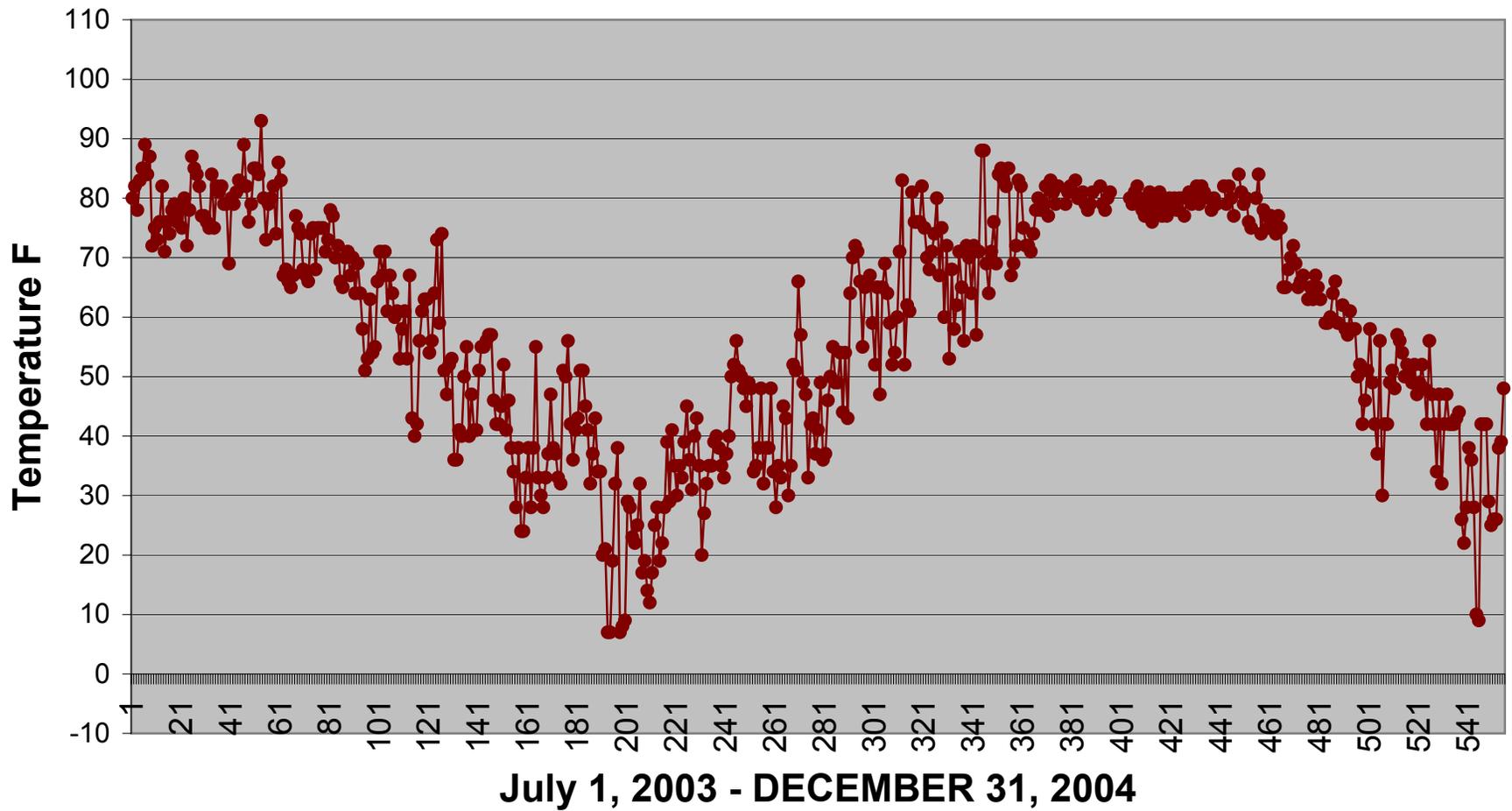


Bus Type	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04
Fleet	0.43	0.34	0.43	0.45	0.41	0.34	0.35	0.36	0.34	0.31	0.32	0.37	0.30	0.39	0.46	0.4	0.44	0.34
Base	0.15	0.11	0.16	0.14	0.12	0.17	0.2	0.54	0.13	0.25	0.03	0.12	0.55	0.15	1.24	0.07	0.26	0.35
Hybrids	0.28	0.06	0.10	0.38	0.07	0.06	0.02	0.16	0.24	0.24	0.13	0.33	0.09	0.28	0.1	0.08	0.34	0.09

CTTRANSIT BUS MILES BETWEEN ROAD CALLS



HYBRID BUS DAILY NOON IN-SERVICE FIELD TEMPERATURE



WO	Asset Task Part Number	Asset Description Task Description/Work Done	Opened	Closed	Hours	Labor Cost	Parts Cost	Equip Cost	Vend Cost
Asset	301	New Flyer Hybrid Bus							
0426992	1 301	New Flyer Hybrid Bus a/c ideler pulley bracket broken replace bracket	11/18/04	11/18/04	4.00	85.52	135.08	0.00	0.00
0424046	1 301	New Flyer Hybrid Bus e inspection e inspection completed.	10/22/04	10/22/04	1.75	36.47	0.00	0.00	0.00
0423315	1 301	New Flyer Hybrid Bus muffler pipe muffler pipe	10/15/04	10/15/04	0.25	5.35	0.00	0.00	0.00
0427711	1 301	New Flyer Hybrid Bus Defects from insp. Repair all insp. defects.	11/26/04	11/26/04	6.00	131.58	0.00	0.00	0.00
0425649	1 301	New Flyer Hybrid Bus B inspection. Replace front door glass. B inspection. Replace front door glass.	11/08/04	11/08/04	7.00	149.66	191.44	0.00	0.00
0430714	1 301	New Flyer Hybrid Bus A insp Complete A insp	12/23/04	12/23/04	2.25	49.35	0.00	0.00	0.00
0426412	1 301	New Flyer Hybrid Bus B inspection. B inspection and defects.	11/13/04	11/13/04	5.00	106.90	134.02	0.00	0.00
0421964	1 301	New Flyer Hybrid Bus Worn tire RRI Replace both tires right side rear.	10/02/04	10/02/04	1.00	20.16	0.00	0.00	0.00
Asset	301	New Flyer Hybrid Bus	Subtotal -->		27.25	584.99	460.54	0.00	0.00

WO	Asset Task Part Number	Asset Description Task Description/Work Done	Opened	Closed	Hours	Labor Cost	Parts Cost	Equip Cost	Vend Cost
Asset	302	New Flyer Hybrid Bus							
0429715	1 302	New Flyer Hybrid Bus Replace road recorder Replace road recorder	12/15/04	12/15/04	1.00	21.38	302.50	0.00	0.00
0429722	1 302	New Flyer Hybrid Bus Preventative maintenance due "E" inspection. Did an "E" inspection. {ALL WHEEL NUTS TORQUE CHECKED @450FT/LBS}	12/15/04	12/15/04	2.33	49.82	0.00	0.00	0.00
0427562	1 302	New Flyer Hybrid Bus A Insp. Performed A-inspection	11/24/04	11/24/04	2.00	43.86	492.04	0.00	0.00
0425612	1 302	New Flyer Hybrid Bus E inspection Perfirmed E inspection	11/06/04	11/06/04	1.02	21.26	0.00	0.00	0.00
0423949	1 302	New Flyer Hybrid Bus b inspection b inspection	10/21/04	10/21/04	4.25	93.84	157.38	0.00	0.00
0422058	1 302	New Flyer Hybrid Bus E inspection. E inspection and defects.	10/04/04	10/04/04	2.00	42.76	9.13	0.00	0.00
0429722	2 302	New Flyer Hybrid Bus Recorder system not working. Replaced system with another one.	12/15/04	12/15/04	0.75	16.04	0.00	0.00	0.00
Asset	302	New Flyer Hybrid Bus	Subtotal -->		13.35	288.96	961.05	0.00	0.00
			Grand Total -->		40.60	873.95	1421.59	0.00	0.00

CTTRANSIT Hybrid Bus Trouble Codes

Date	H301	H302	Notes
7/14/2003	D1=7319=Inverter A Can link from TCM lost D2=7419=Inverter B Can link from TCM lost D3=6618=Can link lost with Inverter A	All clear	No service disruption - transparent to user
7/15/2003	All clear	All clear	Follow-up check
7/21/2003	All clear	D1=6624=Can link lost with Battery Controller D2=6619=Can link lost with Inverter B	No service disruption - transparent to user
7/29/2003	All clear	All clear	Follow-up check
8/4/2003	All clear	D1=6624=Can link lost with Battery Controller	No service disruption - transparent to user
8/13/2003	All clear	D1s19=Inverter A Can link from TCM lost D2t19=Inverter B Can link from TCM lost D3f19=Can link lost with Inverter B	No service disruption - transparent to user
8/25/2003	All clear	All clear	Follow-up check
9/2/2003	All clear	All clear	Follow-up check
9/7/2003	D1=8002=High Voltage Discharge Fault D2=7491=Inverter B Isolation Fault-Shutdown D3=7391=Inverter A Isolation Fault-Shutdown D4=7390=Inverter A Isolation Fault-Caution D5=7490=Inverter B Isolation Fault-Caution D6=6618 Can Link Lost with Inverter A	All clear	H301 Shut down and was flat bedded in. The system was checked and rest at the garage. A road test by a Technician noted a momentary loss of power on a 4.5 5 degree ramp @ 35mph. System reset on own and the problem cleared and could not be replicated. Bus was returned to service operating OK.
9/9/2003	All clear	All clear	Follow-up check
09/15/2003 AM	All clear	All clear	Follow-up check
09/15/2003 PM	D1=8002 = High Voltage Discharge Fault D2=7391 = Inverter B Isolation Fault-Shutdown D3=7491 = Inverter A Isolation Fault-Shutdown D4=7390 = Inverter A Isolation Fault-Caution D5=7490 = Inverter B Isolation Fault-Caution		System failed light on the dash this afternoon. The following codes were logged in the transmission keypad. The bus was driven back under its own power, but the dash switched was cycled numerous times. The road call mechanic did not detect any fault, defect or reduced power situation.

CTTRANSIT Hybrid Bus Trouble Codes

Date	H301	H302	Notes
9/25/2003	All clear	D1=6634= Can Link lost with eng. Controller, long time out D2=2312=Push Button Shift Selector	These codes had no adverse affect on the bus operation
10/6/2003	All clear	No Code But Note	Indicated transmission fluid was one quart over. It has been found that the two minute waiting period for a cold bus check is insufficient. Up to 5 minutes or a drive around the facility will set the bus for proper level check. The dipstick is not considered as accurate as the electronic level sensor per Allison.
10/6/2003	All clear	D1=6634= Can Link lost with eng. Controller, long time out D2=2312=Push Button Shift Selector	These codes had no adverse affect on the bus operation
11/3/2003	OL Hi 01qt.	D1=2815=Clutch 1 pressure failed on shutdown D2=5615=Range2 verification-disabled clutch D3=5614=Range2 verification-limit transmission output torque D4=8132=Motor B overspeed - warning D5=7421=inverter B Motor overspeed D6=5613=range 1 verification - disable clutch D7=5612=range1 verification-limit transmission output torque D8=2816=No code info	
11/11/2003	D1 = Engine Torque Verification= stop system C276 = High current detected C277=failure in the injection control valve C449=fuel pressure exceeded maximum C456= fuel pressure accumulator not changing	D1-2816 = There is no listing D2-5614=Range 2 verification-Limit Transmission Output Torque D3-5613=Range 1 verification - Disable Clutch D4-5612=Range 1 Verification - Limit Transmission Output Torque D5-5615=Range 2 Verification - Disabled Clutch D2-2815=Clutch 1 pressure failed on Shutdown D8-2916 = there is no listing	Cummins injection control valve found to be faulty
11/13/2003	D1 = 2312 = pushbutton shift selector	All Clear	2312 is usually generated by switching off power to the transmission keypad only, while power is still applied to the system. It is a Cummins engine issue.
11/24/2003	D1 = 6523 = Enginge Torque Verification	D1 = 6634 = Can link lost	No adverse bus operations

CTTRANSIT Hybrid Bus Trouble Codes

Date	H301	H302	Notes
12/1/2003	All Clear	D1=6634	Not cleared from previous week
12/8/2003	D1=2312 Push button shift selector D2=6523 Engine torque verification	D1=7605 Battery State of Charge Low Warning D2=6634 Can link lost with engine controller D3=7452 Inverter B, AC current invalid D4=6523 Engine torque verification	No adverse bus operations
12/14/2003	All Clear	D1=7605 Battery Stte of Charge Low - Warning D2=6634 Can Link lost with engine controller D3=7452 Inverter B, AC current invalid D4=6523 Engine torque verification	No adverse bus operations
12/31/2003	D1=7014 Controller Watchdog timeout TCM D2=6513 Engine Controller Warning	D1=6618 Can link lost with Inverter A D2=Can link lost with Inverter B D3=Can link lost with Engine Controller D4= Can link lost with Vehicle Controller D5=6513 Engine controller warning D6=7319 Inverter A CAN link with TCM lost D7=7419 Inverter B CAN link with TCM lost D8=6629 Can link lost with Minor Engine Messages	No adverse bus operations
1/5/2004	All Clear	All Clear	
1/12/2004	All Clear	All Clear	
1/19/2004	All Clear	All Clear	
1/25/2004	6513=Engine Controller warning 5614=Range 2 verification- limit Transmission output torque 5612= Range 1 verification- limit transmission output torque 2815= Clutch 1 pressure failed on shutdown 2816= Clutch 1 pressure switch failed off	7421=Inverter B motor overspeed 7435=Inverter B primary encoder signal lost	

CTTRANSIT Hybrid Bus Trouble Codes

Date	H301	H302	Notes
2/2/2004	Oil Cooler Failure had these codes	Pac Brake/Exhaust Brake Pivot Failure Codes	
	5614=Range 2 verification- limit Transmission output torque	7604=Battery State of Charge Low Caution	
	5613= Range 1 verification- disable clutch	7452=Inverter B AC current invalid	
	5612= Range 1 verification- limit transmission output torque	6513=engine controller warning	
	2815= Clutch 1 pressure failed on shutdown	6628=can link lost with electronic brake controller	
	2816= no code listed	7421=inverter B motor overspeed	
	5615= Range 2 verification- disable clutch	7435=inverter B primary encoder signal lost	
		7437=inverter B loss of both encoder signals	
		7438=inverter B secondary encoder signal lost	
		1718=inverter b can enable mismatch	
		1724=reported/calculated engine speed mismatch	
2/8/2004	All Clear	All Clear	
2/15/2004	All Clear	All Clear	
2/22/2004	All Clear	7421=inverter B motor overspeed	
		7435=inverter B primary encoder signal lost	
		7437=inverter B loss of both encoder signals	
		7438=inverter B secondary encoder signal lost	
		1718=inverter b can enable mismatch	
		8133=motor B overspeed shutdown	
2/29/2004	All Clear	All Clear	
3/7/2004	7604=battery state of charge low caution	All Clear	
	6513=engine controller warning		
	7605=battery state of charge low warning		
	7606=battery state of charge low shutdown		
3/14/2004	All Clear	All Clear	
3/21/2004	All Clear	6513=engine controller warning	
3/28/2004	All Clear	6513=engine controller warning	
4/4/2004	All Clear	All Clear	

CTTRANSIT Hybrid Bus Trouble Codes

Date	H301	H302	Notes
4/12/2004	7014=Controller Software Watchdog Timeout TCM 6513=engine controller warning 6629=Can Link Lost with Minor Engine Messages	6513=engine controller warning	
4/18/2004	6513= Engine Controller Warning 1313=TCM Ignition Circuit Voltage Low - Cauti	6513= Engine Controller Warning 2815= Clutch 1 pressure failed on shutdown 5612=Range 1 verification - limit transmission output torque 5614=Range 2 verification- limit Transmission output torque 5615= Range 2 verification- disable clutch 2816= Clutch 1 Pressure Switch Failed Off	H302 shutdown and road call - oil cooler problem
4/25/2004	All Clear	All Clear	
5/9/2004	6513 = Engine Controller Warning	All Clear	
6/30/2004	All Clear	7460=inverter B low voltage interrupt	H302 - Shutdown but started with reboot
7/24/2004	All Clear	All Clear	
8/21/2004	All Clear	All Clear	
8/28/2004	6513 = Engine Controller Warning	All Clear	
9/4/2004	All Clear	All Clear	
9/11/2004	All Clear	All Clear	
9/18/2004	All Clear	All Clear	
9/25/2004	6513 = Engine Controller Warning	All Clear	
10/2/2004	All Clear	78-91=Battery subpack current deviation high	No adverse operation and on reset code went away
10/9/2004	6513 = Engine Controller Warning	All Clear	
10/23/2004	All Clear	6513= Engine Controller Warning 34-21, 34-22, 34-23, 34-24, 34-25 & 34-26	No adverse operation and on reset code went away No adverse operation and on reset code went away

CTTRANSIT Hybrid Bus Trouble Codes

Date	H301	H302	Notes
10/30/2004	6513 = Engine Controller Warning	6513 = Engine Controller Warning	No adverse operation and on reset code went away
11/6/2004	All Clear	All Clear	
11/20/2004	434=Ghost Code	23-12 & 66-24	No adverse operation and on reset code went away
11/27/2004	All Clear	All Clear	
12/18/2004	6513 = Engine Controller Warning	All Clear	No adverse operation and on reset code went away
1/8/2005	6513 = Engine Controller Warning	6513 = Engine Controller Warning	No adverse operation and on reset code went away