PARTIAL

STURAA TEST

12 YEAR

500,000 MILE BUS

FROM

BLUE BIRD BODY COMPANY

MODEL XCEL 102

SEPTEMBER 2003

PTI-BT-R0320-P

The Pennsylvania Transportation Institute

201 Research Office Building (814) 865-1891
The Pennsylvania State University
University Park, PA 16802

Bus Testing and Research Center

6th Avenue and 45th Street (814) 949-7944
Altoona, PA 16602

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Blue Bird Body Company submitted a model XCEL 102, diesel-powered 22 seat (including the driver) 30-foot bus, for a partial STURAA test in the 12yr/500,000 mile category. The Federal Transit Administration determined that the following tests would be performed: 3. Safety, 4. Performance, 6. Fuel Economy, 7.1 Interior Noise and 7.2 Exterior Noise. Testing started on August 28, 2003 and was completed on September 12, 2003. The Check-in section of the report provides a description of the bus and specifies its major components.

The interior of the bus is configured with seating for 22 passengers including the driver. Free floor space will accommodate 11 standing passengers resulting in a potential load of 33 persons. At 150 lbs per person, this load results in a measured gross vehicle weight of 29,900 lbs. The seated load weight of the bus is 28,150 lbs and curb weight is 24,710 lbs.

The Safety Test, (a double-lane change, obstacle avoidance test) was safely performed in both right-hand and left-hand directions up to a maximum test speed of 45 mph. The performance of the bus is illustrated by a speed vs. time plot. Acceleration and gradeability test data are provided in Section 4, Performance. The average time to obtain 50 mph was 30.11 seconds.

A Fuel Economy Test was run on simulated central business district, arterial, and commuter courses. The results were 4.37 mpg, 4.96 mpg, and 9.37 mpg respectively; with an overall average of 5.37 mpg.

A series of Interior and Exterior Noise Tests was performed. These data are listed in Section 7.1 and 7.2 respectively.

ABBREVIATIONS

ABTC	-	Altoona Bus Test Center
A/C	-	air conditioner
ADB	-	advance design bus
ATA-MC	-	The Maintenance Council of the American Trucking Association
CBD	-	central business district
CW	-	curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	-	decibels with reference to 0.0002 microbar as measured on the "A" scale
DIR	-	test director
DR	-	bus driver
EPA	-	Environmental Protection Agency
FFS	-	free floor space (floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area)
GVL	-	gross vehicle load (150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space)
GVW	-	gross vehicle weight (curb weight plus gross vehicle load)
GVWR	-	gross vehicle weight rating
MECH	-	bus mechanic
mpg	-	miles per gallon
mph	-	miles per hour
PM	-	Preventive maintenance
PSBRTF	-	Penn State Bus Research and Testing Facility
PTI	-	Pennsylvania Transportation Institute
rpm	-	revolutions per minute
SAE	-	Society of Automotive Engineers
SCH	-	test scheduler
SEC	-	secretary
SLW	-	seated load weight (curb weight plus 150 lb for every designed passenger seating position and for the driver)
STURAA	-	Surface Transportation and Uniform Relocation Assistance Act
TD	-	test driver
TECH	-	test technician
TM	-	track manager
TP	-	test personnel

TEST BUS CHECK-IN

I. OBJECTIVE

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

II. TEST DESCRIPTION

The test consists of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer must certify that the bus meets all Federal regulations.

III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consists of a Blue Bird Body Company, model XCEL 102. The bus has a front door, forward of the front axle, and a rear door centered between the axles which is equipped with a Ricon model F9T-SG002 handicap lift. Power is provided by a diesel-fueled, Cummins model ISC 260 engine coupled to an Allison model B300 transmission.

The measured curb weight is 7,830 lbs for the front axle and 16,880 lbs for the rear axle. These combined weights provide a total measured curb weight of 24,710 lbs. There are 22 seats including the driver and room for 11 standing passengers bringing the total passenger capacity to 33. Gross load is 150 lb x 33 = 4,950 lbs. At full capacity, the measured gross vehicle weight is 29,900 lbs.

VEHICLE DATA FORM

Bus Number: 0320	Arrival Date: 8-28-03
Bus Manufacturer: Blue Bird Body Company	Vehicle Identification Number (VIN): 1BAGEBXA93F212899
Model Number: Xcel 102	Date: 8-28-03
Personnel: E.L., E.D. & D.L.	

WEIGHT:

Individual Wheel Reactions:

Weights (lb)	Front Axle		Middle Axle		Rear Axle	
	Right	Left	Right	Left	Right	Left
CW	3,900	3,930	N/A	N/A	8,270	8,610
SLW	4,280	4,450	N/A	N/A	9,680	9,740
GVW	4,710	4,830	N/A	N/A	10,100	10,260

Total Weight Details:

Weight (lb)	CW	SLW	GVW	GAWR
Front Axle	7,830	8,730	9,540	13,200
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	16,880	19,420	20,360	23,000
Total	24,710	28,150	29,900	GVWR: 36,200

Dimensions:

Length (ft/in)	30.0 / 3.5
Width (in)	100.5
Height (in)	124.0
Front Overhang (in)	92.5
Rear Overhang (in)	121.0
Wheel Base (in)	150.0
Wheel Track (in)	Front: 86.0
	Rear: 72.0

Bus Number: 0320	Date: 8-28-03

CLEARANCES:

Lowest Point Outside Front Axle	Location: Skid plate Clearance(in): 14.0
Lowest Point Outside Rear Axle	Location: Transmission Clearance(in): 9.7
Lowest Point between Axles	Location: Air tanks Clearance(in): 8.3
Ground Clearance at the center (in)	14.3
Front Approach Angle (deg)	8.6
Rear Approach Angle (deg)	4.6
Ramp Clearance Angle (deg)	10.8
Aisle Width (in)	31.2
Inside Standing Height at Center Aisle (in)	79.3

BODY DETAILS:

Body Structural Type	Integral		
Frame Material	Steel		
Body Material	Fiberglass		
Floor Material	Plywood		
Roof Material	Fiberglass		
Windows Type	■ Fixed	□ Movable	
Window Mfg./Model No.	HEHR Glass Company / A2-3 DOT 399M228G		
Number of Doors	1 Front	1 Rear	
Mfr. / Model No.	Center: Bode / 3351 Front: Bode / 3350		
Dimension of Each Door (in)	Front–81.0 x 34.4	Rear – 92.2 x 41.6	
Passenger Seat Type	□ Cantilever	■ Pedestal	□ Other (explain)
Mfr. / Model No.	Freedman / Shuttle ARAC		
Driver Seat Type	■ Air	□ Spring	□ Other (explain)
Mfr. / Model No.	Bostrom Seating / Route Master + Aire		
Number of Seats (including Driver)	22		

Bus Number: 0320	Date: 8-28-03

BODY DETAILS (Contd..)

Free Floor Space (ft^2)	17.5
Height of Each Step at Normal Position (in)	Front 1. 16.6 2. 9.9 3. 9.8 4. N/A
	Middle 1. 16.1 2. 11.0 3. 11.0 4. N/A
	Rear 1. N/A 2. N/A 3. N/A 4. N/A
Step Elevation Change - Kneeling (in)	Not functioning – no data.

ENGINE

Type	■ C.I.	□ Alternate Fuel	
	□ S.I.	□ Other (explain)	
Mfr. / Model No.	Cummins / ISC 260		
Location	□ Front	■ Rear	□ Other (explain)
Fuel Type	□ Gasoline	□ CNG	□ Methanol
	■ Diesel	□ LNG	□ Other (explain)
Fuel Tank Capacity (indicate units)	109 gals		
Fuel Induction Type	■ Injected	□ Carburetion	
Fuel Injector Mfr. / Model No.	Cummins / ISC 260		
Carburetor Mfr. / Model No.	N/A		
Fuel Pump Mfr. / Model No.	Cummins / ISC 260		
Alternator (Generator) Mfr. / Model No.	Leece-Neville / A00148612B		
Maximum Rated Output (Volts / Amps)	14 / 200		
Air Compressor Mfr. / Model No.	Cummins / QE296		
Maximum Capacity (ft^3 / min)	18.7		
Starter Type	■ Electrical	□ Pneumatic	□ Other (explain)
Starter Mfr. / Model No.	Denso / 228000-5311		

Bus Number: 0320	Date: 8-28-03

TRANSMISSION

Transmission Type	□ Manual	■ Automatic	
Mfr. / Model No.	Allison / B300		
Control Type	□ Mechanical	■ Electrical	□ Other
Torque Convertor Mfr. / Model No.	Allison / B300		
Integral Retarder Mfr. / Model No.	Allison / B300		

SUSPENSION

Number of Axles	2		
Front Axle Type	□ Independent	■ Beam Axle	
Mfr. / Model No.	Meritor / FG943LX91		
Axle Ratio (if driven)	N/A		
Suspension Type	■ Air	■ Spring	□ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Henrickson / 481700131438		
Middle Axle Type	□ Independent	□ Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	□ Air	□ Spring	□ Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	□ Independent	■ Beam Axle	
Mfr. / Model No.	Meritor / RS23160NFL1237		
Axle Ratio (if driven)	5.38		
Suspension Type	■ Air	■ Spring	□ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Henrickson / 60998-001		

Bus Number: 0320	Date: 8-28-03

WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Accuride / 22.5 x 8.25
	Tire Mfr./ Model No.	Michelin / XZA 275/70R 22.5
Rear	Wheel Mfr./ Model No.	Accuride / 22.5 x 8.25
	Tire Mfr./ Model No.	Michelin / XZA 275/70R 22.5

BRAKES

Front Axle Brakes Type	■ Cam	□ Disc	□ Other (explain)
Mfr. / Model No.	Arvin Meritor / 16.5 x 6.00		
Middle Axle Brakes Type	□ Cam	□ Disc	□ Other (explain)
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	■ Cam	□ Disc	□ Other (explain)
Mfr. / Model No.	Arvin Merotor / 16.5 x 8.25		
Retarder Type	N/A		
Mfr. / Model No.	N/A		

HVAC

Heating System Type	□ Air	■ Water	□ Other
Capacity (Btu/hr)	Front: 50,000 IMACA @ 550 CFM air outlet Body: 95,000		
Mfr. / Model No.	Front: Bergstrom / 782110 Body: Carrier / RM35		
Air Conditioner	■ Yes	□ No	
Location	Rear		
Capacity (Btu/hr)	N/A		
A/C Compressor Mfr. / Model No.	Carrier / 05KB324400		

STEERING

Steering Gear Box Type	Hydraulic gear
Mfr. / Model No.	Ross / TAS65115
Steering Wheel Diameter	18.0
Number of turns (lock to lock)	4.25

Bus Number: 0320	Date: 8-28-03

OTHERS

Wheel Chair Ramps	Location: N/A	Type: N/A
Wheel Chair Lifts	Location: Middle/right	Type: Platform
Mfr. / Model No.	Ricon / F9T-SG002	
Emergency Exit	Location: Doors Windows Roof	Number: 2 4 2

CAPACITIES

Fuel Tank Capacity (units)	109 gals
Engine Crankcase Capacity (gallons)	5.25
Transmission Capacity (gallons)	7.25
Differential Capacity (gallons)	4 15/16 (nominal-proper procedure is to fill until running out of hole
Cooling System Capacity (quarts)	11.5
Power Steering Fluid Capacity (gallons)	5.5 (also supplies hydraulic circuit for engine cooling fan)

VEHICLE DATA FORM

Bus Number: 0320	Date: 8-28-03

List all spare parts, tools and manuals delivered with the bus.

Part Number	Description	Qty.
N/A	Manuals	2

COMPONENT/SUBSYSTEM INSPECTION FORM

Bus Number: 0320	Date: 9-3-03

Subsystem	Checked	Comments
Air Conditioning Heating and Ventilation	✓	
Body and Sheet Metal	✓	
Frame	✓	
Steering	✓	
Suspension	✓	
Interior/Seating	✓	
Axles	✓	
Brakes	✓	
Tires/Wheels	✓	
Exhaust	✓	
Fuel System	✓	
Power Plant	✓	
Accessories	✓	
Lift System	✓	
Interior Fasteners	✓	
Batteries	✓	

CHECK - IN

BLUE BIRD BODY COMPANY
MODEL XCEL 102

CHECK - IN CONT.

BLUE BIRD BODY COMPANY
MODEL XCEL 102 EQUIPPED WITH A RICON MODEL F9T-SG002 HANDICAP LIFT

3. SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3-I. TEST OBJECTIVE

The objective of this test is to determine handling and stability of the bus by measuring speed through a double lane change test.

3-II. TEST DESCRIPTION

The Safety Test is a vehicle handling and stability test. The bus will be operated at SLW on a smooth and level test track. The bus will be driven through a double lane change course at increasing speed until the test is considered unsafe or a speed of 45 mph is reached. The lane change course will be set up using pylons to mark off two 12 foot center to center lanes with two 100 foot lane change areas 100 feet apart. The bus will begin in one lane, change to the other lane in a 100 foot span, travel 100 feet, and return to the original lane in another 100 foot span. This procedure will be repeated, starting first in the right-hand and then in the left-hand lane.

3-III. DISCUSSION

The double-lane change was performed in both right-hand and left-hand directions. The bus was able to safely negotiate the test course in both the right-hand and left-hand directions up to the maximum test speed of 45 mph.

SAFETY DATA FORM

Bus Number: 0320	Date: 9-9-03
Personnel: R.C. & S.C.	

Temperature (°F): 66	Humidity (%): 82
Wind Direction: NNE	Wind Speed (mph): 3
Barometric Pressure (in.Hg): 30.27	

SAFETY TEST: DOUBLE LANE CHANGE	
Maximum safe speed tested for double-lane change to left	45 mph
Maximum safe speed tested for double-lane change to right	45 mph
Comments of the position of the bus during the lane change: A safe profile was maintained through all portions of testing.	
Comments of the tire/ground contact patch: Tire/ground contact was maintained through all portions of testing.	

3. SAFETY

LEFT - HAND APPROACH

4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus will be operated at SLW on the skid pad at the PSBRTF. The bus will be accelerated at full throttle from a standstill to a maximum "geared" or "safe" speed as determined by the test driver. The vehicle speed is measured using a Correvit non-contacting speed sensor. The times to reach speed between ten mile per hour increments are measured and recorded using a stopwatch with a lap timer. The time to speed data will be recorded on the Performance Data Form and later used to generate a speed vs time plot and gradeability calculations.

4-III. DISCUSSION

This test consists of three runs in both the clockwise and counterclockwise directions on the Test Track. Velocity versus time data is obtained for each run and results are averaged together to minimize any test variability which might be introduced by wind or other external factors. The test was performed up to a maximum speed of 50 mph. The fitted curve of velocity vs time is attached, followed by the calculated gradeability results. The average time to obtain 50 mph was 30.11 seconds.

PERFORMANCE DATA FORM

Bus Number: 0320	Date: 9-9-03
Personnel: R.C. & S.C.	

Temperature (°F): 66	Humidity (%): 82
Wind Direction: NNE	Wind Speed (mph): 3
Barometric Pressure (in.Hg): 30.27	

Air Conditioning compressor-OFF	✓ Checked
Ventilation fans-ON HIGH	✓ Checked
Heater pump motor-Off	✓ Checked
Defroster-OFF	✓ Checked
Exterior and interior lights-ON	✓ Checked
Windows and doors-CLOSED	✓ Checked

ACCELERATION, GRADEABILITY, TOP SPEED

Counter Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	4.18	4.11	4.42
20 mph	8.71	8.71	9.11
30 mph	16.55	16.43	16.27
40 mph	24.21	24.11	24.08
Top Test Speed(mph) 50	31.46	31.46	30.89

Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	4.18	4.46	4.24
20 mph	9.02	9.30	8.80
30 mph	15.58	16.68	15.49
40 mph	23.11	23.68	23.65
Top Test Speed(mph) 50	29.08	28.99	28.75

0320.ACC

PERFORMANCE SUMMARY SHEET

BUS MANUFACTURER :Blue Bird
BUS MODEL :XCEL 102
BUS NUMBER :0320
TEST DATE :9/9/03

TEST CONDITIONS :

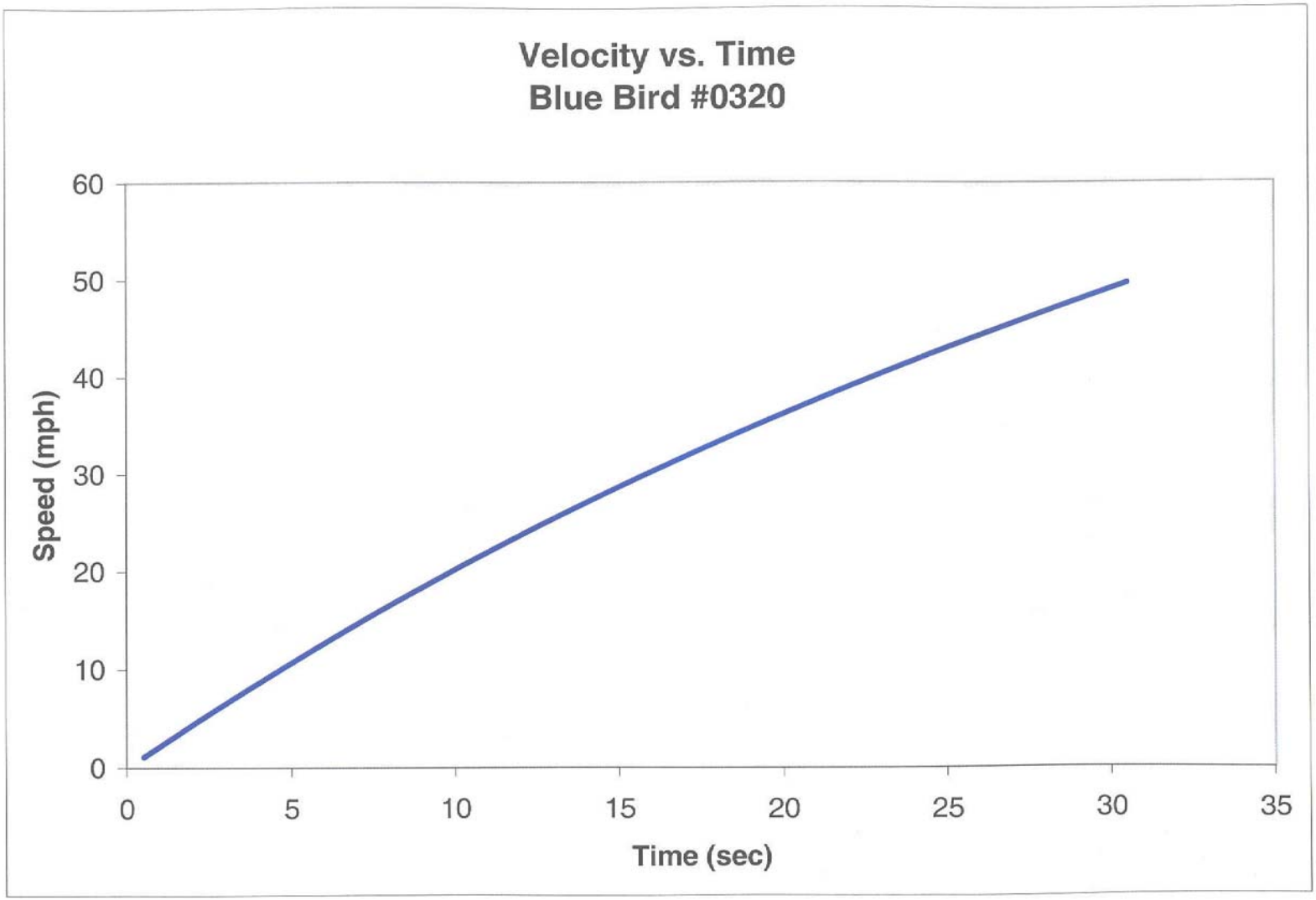
TEMPERATURE (DEG F) : 66.0
WIND DIRECTION : NNE
WIND SPEED (MPH) : 3.0
HUMIDITY (%) : 82
BAROMETRIC PRESSURE (IN. HG) : 30.3

VEHICLE SPEED	AVERAGE TIME (SEC)		
(MPH)	CCW DIRECTION	CW DIRECTION	TOTAL
10.0	4.24	4.29	4.27
20.0	8.84	9.04	8.94
30.0	16.42	15.92	16.17
40.0	24.13	23.48	23.81
50.0	31.27	28.94	30.11

TEST SUMMARY :

VEHICLE SPEED (MPH)	TIME (SEC)	ACCELERATION (FT/SEC^2)	MAX. GRADE (%)
1.0	.44	3.3	10.3
5.0	2.26	3.2	9.9
10.0	4.65	3.0	9.3
15.0	7.18	2.8	8.8
20.0	9.88	2.6	8.2
25.0	12.76	2.5	7.7
30.0	15.84	2.3	7.1
35.0	19.16	2.1	6.6
40.0	22.73	2.0	6.1
45.0	26.60	1.8	5.7
50.0	30.81	1.7	5.2

NOTE : Gradeability results were calculated from performance test data. Actual sustained gradeability performance for vehicles equipped with auto transmission may be lower than the values indicated here.


Velocity vs. Time
Blue Bird #0320
Speed (mph)
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
Time (sec)

6. FUEL ECONOMY TEST - A FUEL CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable fuel consumption data on transit buses produced by different manufacturers. This fuel economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This fuel economy test, as designated here, is a measurement of the fuel expended by a vehicle traveling a specified test loop under specified operating conditions. The results of this test will not represent actual mileage but will provide data that can be used by recipients to compare buses tested by this procedure.

6-II. TEST DESCRIPTION

This test requires operation of the bus over a course based on the Transit Coach Operating Duty Cycle (ADB Cycle) at seated load weight using a procedure based on the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82. The procedure has been modified by elimination of the control vehicle and by modifications as described below. The inherent uncertainty and expense of utilizing a control vehicle over the operating life of the facility is impractical.

The fuel economy test will be performed as soon as possible (weather permitting) after the completion of the GVW portion of the structural durability test. It will be conducted on the bus test lane at the Penn State Test Facility. Signs are erected at carefully measured points which delineate the test course. A test run will comprise 3 CBD phases, 2 Arterial phases, and 1 Commuter phase. An electronic fuel measuring system will indicate the amount of fuel consumed during each phase of the test. The test runs will be repeated until there are at least two runs in both the clockwise and counterclockwise directions in which the fuel consumed for each run is within $\pm$ 4 percent of the average total fuel used over the 4 runs. A 20-minute idle consumption test is performed just prior to and immediately after the driven portion of the fuel economy test. The amount of fuel consumed while operating at normal/low idle is recorded on the Fuel Economy Data Form. This set of four valid runs along with idle consumption data comprise a valid test.

The test procedure is the ADB cycle with the following four modifications:

1. The ADB cycle is structured as a set number of miles in a fixed time in the following order: CBD, Arterial, CBD, Arterial, CBD, Commuter. A separate idle fuel consumption measurement is performed at the beginning and end of the fuel economy test. This phase sequence permits the reporting of fuel consumption for each of these phases separately, making the data more useful to bus manufacturers and transit properties.

2. The operating profile for testing purposes shall consist of simulated transit type service at seated load weight. The three test phases (figure 6-1) are: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph; an arterial phase of 2 miles with 2 stops per mile and a top speed of 40 mph; and a commuter phase of 4 miles with 1 stop and a maximum speed of 40 mph. At each designated stop the bus will remain stationary for seven seconds. During this time, the passenger doors shall be opened and closed.

3. The individual ADB phases remain unaltered with the exception that 1 mile has been changed to 1 lap on the Penn State Test Track track. One lap is equal to 5,042 feet. This change is accommodated by adjusting the cruise distance and time.

4. The acceleration profile, for practical purposes and to achieve better repeatability, has been changed to "full throttle acceleration to cruise speed".

Several changes were made to the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82:

1. Sections 1.1, and 1.2 only apply to diesel, gasoline, methanol, and any other fuel in the liquid state (excluding cryogenic fuels).

1.1 SAE 1376 July 82 requires the use of at least a 16-gal fuel tank. Such a fuel tank when full would weigh approximately 160 lb. It is judged that a 12-gal tank weighing approximately 120 lb will be sufficient for this test and much easier for the technician and test personnel to handle.

1.2 SAE 1376 July 82 mentions the use of a mechanical scale or a flowmeter system. This test procedure uses a load cell readout combination that provides an accuracy of 0.5 percent in weight and permits on-board weighing of the gravimetric tanks at the end of each phase. This modification permits the determination of a fuel economy value for each phase as well as the overall cycle.

2. Section 2.1 applies to compressed natural gas (CNG), liquified natural gas (LNG), cryogenic fuels, and other fuels in the vapor state.

2.1 A laminar type flowmeter will be used to determine the fuel consumption. The pressure and temperature across the flow element will be monitored by the flow computer. The flow computer will use this data to calculate the gas flow rate. The flow computer will also display the flow rate (scfm) as well as the total fuel used (scf). The total fuel used (scf) for each phase will be recorded on the Fuel Economy Data Form.

3. Use both Sections 1 and 2 for dual fuel systems.

FUEL ECONOMY CALCULATION PROCEDURE

A. For diesel, gasoline, methanol and fuels in the liquid state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (pounds); standard reference values--density of water at 60°F (8.3373 lbs/gal) and volumetric heating value of standard fuel; and test fuel specific gravity (unitless) and volumetric heating value (BTU/gal). These combine to give a fuel economy in miles per gallon (mpg) which is corrected to a standard gallon of fuel referenced to water at 60°F. This eliminates fluctuations in fuel economy due to fluctuations in fuel quality. This calculation has been programmed into a computer and the data processing is performed automatically.

The fuel economy correction consists of three steps:

1.) Divide the number of miles of the phase by the number of pounds of fuel consumed

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$\mathbf{FEo_{mi/lb}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{lb of fuel}}$$

2.) Convert the observed fuel economy to miles per gallon [mpg] by multiplying by the specific gravity of the test fuel Gs (referred to water) at 60°F and multiply by the density of water at 60°F

$$\mathbf{FEo_{mpg}} = \mathbf{FEc_{mi/lb}} \times Gs \times Gw$$

where **Gs** = Specific gravity of test fuel at 60°F (referred to water)
Gw = 8.3373 lb/gal

3.) Correct to a standard gallon of fuel by dividing by the volumetric heating value of the test fuel (H) and multiplying by the volumetric heating value of standard reference fuel (Q). Both heating values must have the same units.

$$\mathbf{FEc} = \mathbf{FEo_{mpg}} \times \frac{Q}{H}$$

where

H = Volumetric heating value of test fuel [BTU/gal]
Q = Volumetric heating value of standard reference fuel

Combining steps 1-3 yields

$$\Rightarrow FEc = \frac{miles}{lbs} \times (Gs \times Gw) \times \frac{Q}{H}$$

4.) Covert the fuel economy from mpg to an energy equivalent of miles per BTU. Since the number would be extremely small in magnitude, the energy equivalent will be represented as miles/BTUx10^6.

Eq = Energy equivalent of converting mpg to mile/BTUx10^6.

$Eq = ((mpg)/(H))x10^6$

B. CNG, LNG, cryogenic and other fuels in the vapor state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (scf); density of test fuel, and volumetric heating value (BTU/lb) of test fuel at standard conditions (P=14.73 psia and T=60 °F).

These combine to give a fuel economy in miles per lb. The energy equivalent (mile/BTUx10^6) will also be provided so that the results can be compared to buses that use other fuels.

1.) Divide the number of miles of the phase by the number of standard cubic feet (scf) of fuel consumed.

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$FEo_{mi/scf}$ = Observed fuel economy = $\frac{\text{miles}}{\text{scf of fuel}}$

2.) Convert the observed fuel economy to miles per lb by dividing FEo by the density of the test fuel at standard conditions (Lb/ft^3).

Note: The density of test fuel must be determined at standard conditions as described above. If the density is not defined at the above standard conditions, then a correction will be needed before the fuel economy can be calculated.

$$FEo_{mi/lb} = FEo / Gm$$

where Gm = Density of test fuel at standard conditions

3.) Convert the observed fuel economy (FEomi/lb) to an energy equivalent of (miles/BTUx10^6) by dividing the observed fuel economy (FEomi/lb) by the heating value of the test fuel at standard conditions.

$$Eq = ((FEomi/lb)/H)x10^6$$

where

Eq = Energy equivalent of miles/lb to mile/BTUx10^6
H = Volumetric heating value of test fuel at standard conditions

6-III. DISCUSSION

This is a comparative test of fuel economy using number one diesel fuel with a heating value of 20,214.0 btu/lb. The driving cycle consists of Central Business District (CBD), Arterial (ART), and Commuter (COM) phases as described in 6-II. The fuel consumption for each driving cycle and for idle is measured separately. The results are corrected to a reference fuel with a volumetric heating value of 127,700.0 btu/gal.

An extensive pretest maintenance check is made including the replacement of all lubrication fluids. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection. The next sheet shows the correction calculation for the test fuel. The next four Fuel Economy Forms provide the data from the four test runs. Finally, the summary sheet provides the average fuel consumption. The overall average is based on total fuel and total mileage for each phase. The overall average fuel consumption values were; CBD – 4.37 mpg, ART – 4.96 mpg, and COM – 9.37 mpg. Average fuel consumption at idle was 9.00 lb/hr (1.44 gph).

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 0320	Date: 9-3-03	SLW (lbs): 28,150
Personnel: S.C.		

FUEL SYSTEM	OK	Date	Initials
Install fuel measurement system	✓	9/3/03	S.C.
Replace fuel filter	✓	9/3/03	S.C.
Check for fuel leaks	✓	9/3/03	S.C.
Specify fuel type (refer to fuel analysis)			
Remarks: None			
BRAKES/TIRES	**OK**	**Date**	**Initials**
Inspect hoses	✓	9/3/03	S.C.
Inspect brakes	✓	9/3/03	S.C.
Relube wheel bearings	✓	9/3/03	S.C.
Check tire inflation pressures (mfg. specs.)	✓	9/3/03	S.C.
Remarks: None			
COOLING SYSTEM	**OK**	**Date**	**Initials**
Check hoses and connections	✓	9/3/03	S.C.
Check system for coolant leaks	✓	9/3/03	S.C.
Remarks: None			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 2)

Bus Number: 0320	Date: 9-3-03
Personnel: S.C.	

ELECTRICAL SYSTEMS	OK	Date	Initials
Check battery	✓	9/3/03	S.C.
Inspect wiring	✓	9/3/03	S.C.
Inspect terminals	✓	9/3/03	S.C.
Check lighting	✓	9/3/03	S.C.
Remarks: None			
DRIVE SYSTEM	OK	Date	Initials
Drain transmission fluid	✓	9/3/03	S.C.
Replace filter/gasket	✓	9/3/03	S.C.
Check hoses and connections	✓	9/3/03	S.C.
Replace transmission fluid	✓	9/3/03	S.C.
Check for fluid leaks	✓	9/3/03	S.C.
Remarks: None			
LUBRICATION	OK	Date	Initials
Drain crankcase oil	✓	9/3/03	S.C.
Replace filters	✓	9/3/03	S.C.
Replace crankcase oil	✓	9/3/03	S.C.
Check for oil leaks	✓	9/3/03	S.C.
Check oil level	✓	9/3/03	S.C.
Lube all chassis grease fittings	✓	9/3/03	S.C.
Lube universal joints	✓	9/3/03	S.C.
Replace differential lube including axles	✓	9/3/03	S.C.
Remarks: None			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 3)

Bus Number: 0320	Date: 9/3/03
Personnel: S.C.	

EXHAUST/EMISSION SYSTEM	OK	Date	Initials
Check for exhaust leaks	✓	9/3/03	S.C.
Remarks: None			

ENGINE	OK	Date	Initials
Replace air filter	✓	9/3/03	S.C.
Inspect air compressor and air system	✓	9/3/03	S.C.
Inspect vacuum system, if applicable	✓	9/3/03	S.C.
Check and adjust all drive belts	✓	9/3/03	S.C.
Check cold start assist, if applicable	✓	9/3/03	S.C.
Remarks: None			

STEERING SYSTEM	OK	Date	Initials
Check power steering hoses and connectors	✓	9/3/03	S.C.
Service fluid level	✓	9/3/03	S.C.
Check power steering operation	✓	9/3/03	S.C.
Remarks: None			

	OK	Date	Initials
Ballast bus to seated load weight	✓	9/3/03	S.C.

TEST DRIVE	OK	Date	Initials
Check brake operation	✓	9/3/03	S.C.
Check transmission operation	✓	9/3/03	S.C.
Remarks: None			

FUEL ECONOMY PRE-TEST INSPECTION FORM

Bus Number: 0320	Date: 9-8-03
Personnel: S.C.	

PRE WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	S.C.
Cold tire pressure (psi): Front 130 Middle N/A Rear 120	S.C.
Tire wear:	S.C.
Engine oil level	S.C.
Engine coolant level	S.C.
Interior and exterior lights on, evaporator fan on	S.C.
Fuel economy instrumentation installed and working properly.	S.C.
Fuel line -- no leaks or kinks	S.C.
Speed measuring system installed on bus. Speed indicator installed in front of bus and accessible to TECH and Driver.	S.C.
Bus is loaded to SLW	S.C.
WARM-UP	**If OK, Initial**
Bus driven for at least one hour warm-up	S.C.
No extensive or black smoke from exhaust	S.C.
POST WARM-UP	**If OK, Initial**
Warm tire pressure (psi): Front 132 Middle N/A Rear 123	S.C.
Environmental conditions Average wind speed <12 mph and maximum gusts <15 mph Ambient temperature between 30°(-1°) and 90°F(32°C) Track surface is dry Track is free of extraneous material and clear of interfering traffic	S.C.

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0320	Manufacturer: Blue Bird	Date: 9-5-03
Run Number: 1	Personnel: G.M., T.S. & S.C.	
Test Direction: □CW or ■CCW	Temperature (°F): 64	Humidity (%): 63
SLW (lbs): 28,150	Wind Speed (mph) & Direction: 7 / NW	Barometric Pressure (in.Hg): 30.09

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	9:01	9:01	21.2	109.85	107.15	2.70
ART #1	0	4:01	4:01	21.6	107.15	104.55	2.60
CBD #2	0	8:45	8:45	21.8	104.55	101.85	2.70
ART #2	0	4:09	4:09	22.5	101.85	99.30	2.55
CBD #3	0	9:03	9:03	24.0	99.30	96.50	2.80
COMMUTER	0	6:30	6:30	24.5	96.50	93.75	2.75
							Total Fuel = 16.10 lbs

20 minute idle : Total Fuel Used = 2.95 lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0320	Manufacturer: Blue Bird	Date: 9-5-03
Run Number: 2	Personnel: G.M., T.S. & S.C.	
Test Direction: ■CW or □CCW	Temperature (°F): 66	Humidity (%): 63
SLW (lbs): 28,150	Wind Speed (mph) & Direction: 7 / NW	Barometric Pressure (in.Hg): 30.09

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	9:02	9:02	25.7	93.75	90.85	2.90
ART #1	0	4:20	4:20	25.9	90.85	88.55	2.30
CBD #2	0	8:51	8:51	26.8	88.55	85.95	2.60
ART #2	0	4:19	4:19	27.4	95.95	83.65	2.30
CBD #3	0	8:55	8:55	28.0	83.65	81.10	2.55
COMMUTER	0	6:20	6:20	28.5	81.10	78.45	2.65
							Total Fuel = 15.30 lbs

20 minute idle : Total Fuel Used = N/A lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0320	Manufacturer: Blue Bird	Date: 9-8-03
Run Number: 3	Personnel: G.M., T.S. & S.C.	
Test Direction: □CW or ■CCW	Temperature (°F): 68	Humidity (%): 77
SLW (lbs): 28,150	Wind Speed (mph) & Direction: 6 / NNE	Barometric Pressure (in.Hg): 30.15

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:53	8:53	24.8	78.45	75.65	2.80
ART #1	0	4:14	4:14	25.6	75.65	73.25	2.40
CBD #2	0	8:54	8:54	27.1	73.25	70.45	2.80
ART #2	0	4:13	4:13	29.0	70.45	68.20	2.25
CBD #3	0	8:35	8:35	29.8	68.20	65.35	2.85
COMMUTER	0	6:22	6:22	31.5	65.35	63.15	2.20
							Total Fuel = 15.30 lbs

20 minute idle : Total Fuel Used = N/A lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0320	Manufacturer: Blue Bird	Date: 9-8-03
Run Number: 4	Personnel: G.M., T.S. & S.C.	
Test Direction: ■CW or □CCW	Temperature (°F): 73	Humidity (%): 65
SLW (lbs): 28,150	Wind Speed (mph) & Direction: Calm	Barometric Pressure (in.Hg): 30.15

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:54	8:54	30.7	63.15	60.30	2.85
ART #1	0	4:25	4:25	31.3	60.30	57.95	2.35
CBD #2	0	8:59	8:59	32.1	57.95	55.30	2.65
ART #2	0	4:19	4:19	34.3	55.30	52.70	2.60
CBD #3	0	8:55	8:55	34.8	52.70	50.03	2.65
COMMUTER	0	6:25	6:25	35.2	50.05	47.35	2.70
							Total Fuel = 15.80 lbs

20 minute idle : Total Fuel Used = 3.05 lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

0320.FUL
FUEL ECONOMY SUMMARY SHEET

BUS MANUFACTURER :Blue Bird BUS NUMBER :0320
BUS MODEL :XCEL 102 TEST DATE :9/5/03

FUEL TYPE : DIESEL
SP. GRAVITY : .8095
HEATING VALUE : 20214.00 BTU/Lb
Standard Conditions : 60 deg F and 14.7 psi
Density of Water : 8.3373 lb/gallon at 60 deg F

CYCLE	TOTAL FUEL USED (Lb)	TOTAL MILES	FUEL ECONOMY M/Lb(Measured)	FUEL ECONOMY MPG(Corrected)
Run # :1, CCW				
CBD	8.20	5.73	.70	4.38
ART	5.15	3.82	.74	4.65
COM	2.75	3.82	1.39	8.71
TOTAL	16.10	13.37	.83	5.21
Run # :2, CW				
CBD	8.05	5.73	.71	4.46
ART	4.60	3.82	.83	5.21
COM	2.65	3.82	1.44	9.04
TOTAL	15.30	13.37	.87	5.48
Run # :3, CCW				
CBD	8.45	5.73	.68	4.25
ART	4.65	3.82	.82	5.15
COM	2.20	3.82	1.74	10.88
TOTAL	15.30	13.37	.87	5.48
Run # :4, CW				
CBD	8.15	5.73	.70	4.41
ART	4.95	3.82	.77	4.84
COM	2.70	3.82	1.41	8.87
TOTAL	15.80	13.37	.85	5.30

IDLE CONSUMPTION

First 20 Minutes Data : 2.95 Lb Last 20 Minutes Data : 3.05 Lb
Average Idle Consumption : 9.00 Lb/Hr

RUN CONSISTENCY: % Difference from overall average of total fuel used

Run 1 : -3.0 Run 2 : 2.1 Run 3 : 2.1 Run 4 : -1.1

SUMMARY

Average Idle Consumption : 1.44 G/Hr
Average CBD Phase Consumption : 4.37 MPG
Average Arterial Phase Consumption : 4.96 MPG
Average Commuter Phase Consumption : 9.37 MPG
Overall Average Fuel Consumption : 5.37 MPG
Overall Average Fuel Consumption : 39.33 Miles/ Million BTU

7. NOISE

7.1 INTERIOR NOISE AND VIBRATION TESTS

7.1-I. TEST OBJECTIVE

The objective of these tests is to measure and record interior noise levels and check for audible vibration under various operating conditions.

7.1-II. TEST DESCRIPTION

During this series of tests, the interior noise level will be measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system shall provide a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories will be switched off and all openings including doors and windows will be closed. This test will be performed at the ABTC.

2. The bus accelerating at full throttle from a standing start to 35 mph on a level pavement. All openings will be closed and all accessories will be operating during the test. This test will be performed on the track at the Test Track Facility.

3. The bus will be operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles will be noted. This test will be performed on the test segment between the Test Track and the Bus Testing Center.

All tests will be performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions will be recorded in the test data.

7.1-III. DISCUSSION

This test is performed in three parts. The first part exposes the exterior of the vehicle to 80.0 dB(A) on the left side of the bus and the noise transmitted to the interior is measured. The overall average of the six measurements was 47.0 dB(A); ranging from 45.3 dB(A) in line with the rear speakers to 49.7 dB(A) at the driver's seat. The interior ambient noise level for this test was 34.8 dB(A).

The second test measures interior noise during acceleration from 0 to 35 mph. This noise level ranged from 71.6 dB(A) at the front passenger seats to 76.3 dB(A) at the rear passenger seats. The overall average was 73.2 dB(A). The interior ambient noise level for this test was 34.0 dB(A).

The third part of the test is to listen for resonant vibrations, rattles, and other noise sources while operating over the road. No vibrations or rattles were noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise

Bus Number: 0320	Date: 8-29-03
Personnel: S.C. & E.D.	
Temperature (°F): 78	Humidity (%): 75
Wind Speed (mph): Calm	Wind Direction: Calm
Barometric Pressure (in.Hg): 30.00	
Initial Sound Level Meter Calibration: ⊠ checked by: S.C.	
Interior Ambient Noise Level dB(A): 34.8	Exterior Ambient Noise Level dB(A): 46.0
Microphone Height During Testing (in): 48	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	49.7
Front Passenger Seats	47.3
In Line with Front Speaker	48.4
In Line with Middle Speaker	45.4
In Line with Rear Speaker	45.3
Rear Passenger Seats	45.7

Final Sound Level Meter Calibration: ⊠ checked by: S.C.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test

Bus Number: 0320	Date: 9-9-03
Personnel: R.C. & S.C.	
Temperature (°F): 68	Humidity (%): 77
Wind Speed (mph): 3	Wind Direction: NE
Barometric Pressure (in.Hg): 30.27	
Initial Sound Level Meter Calibration: ☒ checked by: S.C.	
Interior Ambient Noise Level dB(A): 34.0	Exterior Ambient Noise Level dB(A): 44.5
Microphone Height During Testing (in): 48	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	72.0
Front Passenger Seats	71.6
Middle Passenger Seats	72.8
Rear Passenger Seats	76.3

Final Sound Level Meter Calibration: ☒ checked by: S.C.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test

Bus Number: 0320	Date: 9-9-03
Personnel: R.C & S.C.	
Temperature (°F): 68	Humidity (%): 77
Wind Speed (mph): 3	Wind Direction: NE
Barometric Pressure (in.Hg): 30.27	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location
Engine and Accessories	None noted.
Windows and Doors	None noted.
Seats and Wheel Chair lifts	None noted.

Comment on any other vibration or noise source which may have occurred that is not described above:
None noted.

7.1 INTERIOR NOISE TEST

TEST BUS SET-UP FOR 80 dB(A)
INTERIOR NOISE TEST

7.2 EXTERIOR NOISE TESTS

7.2-I. TEST OBJECTIVE

The objective of this test is to record exterior noise levels when a bus is operated under various conditions.

7.2-II. TEST DESCRIPTION

In the exterior noise tests, the bus will be operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed at or below 35 mph and just prior to transmission upshift.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide open throttle.

In addition, the buses will be tested with and without the air conditioning and all accessories operating. The exterior noise levels will be recorded.

The test site is at the PSBRTF and the test procedures will be in accordance with SAE Standards SAE J366b, Exterior Sound Level for Heavy Trucks and Buses. The test site is an open space free of large reflecting surfaces. A noise meter placed at a specified location outside the bus will measure the noise level.

During the test, special attention should be paid to:

1. The test site characteristics regarding parked vehicles, signboards, buildings, or other sound-reflecting surfaces
2. Proper usage of all test equipment including set-up and calibration
3. The ambient sound level

7.2-III. DISCUSSION

The Exterior Noise Test determines the noise level generated by the vehicle under different driving conditions and at stationary low and high idle, with and without air conditioning and accessories operating. The test site is a large, level, bituminous paved area with no reflecting surfaces nearby.

With an exterior ambient noise level of 43.9 dB(A), the average test result obtained while accelerating from a constant speed was 76.8 dB(A) on the right side and 80.6 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 44.7 dB(A), the average of the results obtained were 76.8 dB(A) on the right side and 80.7 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 64.7 dB(A) at low idle, 68.4 dB(A) at high idle, and 76.9 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 1.6 dB(A) lower at low idle, 0.7 dB(A) higher at high idle, and the same, 76.9 dB(A) at wide open throttle. The exterior ambient noise level measured during this test was 44.2 dB(A).

EXTERIOR NOISE TEST DATA FORM
Accelerating from Constant Speed

Bus Number: 0320	Date: 9-9-03
Personnel: R.C. & S.C.	
Temperature (°F): 69	Humidity (%): 75
Wind Speed (mph): 5	Wind Direction: NNE
Barometric Pressure (in.Hg): 30.27	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ⊠ checked by: S.C.	
Initial Sound Level Meter Calibration: ⊠ checked by: S.C.	
Exterior Ambient Noise Level dB(A): 43.9	

Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	76.5	1	79.8
2	76.5	2	79.9
3	76.8	3	79.9
4	76.7	4	80.6
5	76.7	5	80.6
Average of two highest actual noise levels = 76.8 dB(A)		Average of two highest actual noise levels = 80.6 dB(A)	

Final Sound Level Meter Calibration Check: ⊠ checked by: S.C.
Comments: None

EXTERIOR NOISE TEST DATA FORM
Accelerating from Standstill

Bus Number: 0320	Date: 9-9-03
Personnel: R.C. & S.C.	
Temperature (°F): 69	Humidity (%): 75
Wind Speed (mph): 5	Wind Direction: NNE
Barometric Pressure (in.Hg): 30.27	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ⊠ checked by: S.C.	
Initial Sound Level Meter Calibration: ⊠ checked by: S.C.	
Exterior Ambient Noise Level dB(A): 43.9	

Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	76.7	1	80.7
2	76.5	2	80.7
3	76.6	3	80.3
4	76.8	4	80.3
5	76.5	5	80.5
Average of two highest actual noise levels = 76.8 dB(A)		Average of two highest actual noise levels = 80.7 dB(A)	

Final Sound Level Meter Calibration Check: ⊠ checked by: S.C.
Comments: None

EXTERIOR NOISE TEST DATA FORM
Stationary

Bus Number: 0320	Date: 9-9-03
Personnel: R.C. & S.C.	
Temperature (°F): 69	Humidity (%): 75
Wind Speed (mph): 5	Wind Direction: NNE
Barometric Pressure (in.Hg): 30.27	

Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ⊠ checked by: S.C.

Initial Sound Level Meter Calibration: ⊠ checked by: S.C.

Exterior Ambient Noise Level dB(A): 44.2

Accessories and Air Conditioning ON

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	800	64.7	64.6
High Idle	1,310	68.0	68.8
Wide Open Throttle	2,405	76.8	76.9

Accessories and Air Conditioning OFF

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	800	62.8	63.4
High Idle	1,305	67.3	70.9
Wide Open Throttle	2,425	77.3	76.4

Final Sound Level Meter Calibration Check: ⊠ checked by: S.C.

Comments: None

7.2 EXTERIOR NOISE TEST

TEST BUS UNDER GOING
EXTERIOR
NOISE TESTING