FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT
In accordance with 49 CFR, Part 665

Manufacturer: New Flyer of America
Model: XE60

Partial Test

October 2025

Report Number: LTI-BT-R2025-02-P

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AND TESTING CENTER

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration, U.S. DOT
1200 New Jersey Avenue, SE
Washington, DC 20590

In accordance with 49 CFR Part, 665

Manufacturer: New Flyer of America

Manufacturer's address:
214 5th Avenue, SW
Crookston, MN 56716

Model: XE60

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David Klinikowski	Director, Bus Research and Testing Center	October 28,2025
Quality Authorization	*Title*	*Date*

TABLE OF CONTENTS

EXECUTIVE SUMMARY

TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	New Flyer of America
Model	XE60
Chassis Make/Model	New Flyer / Xcelsior
Chassis Modified	No
Overall Length	60 feet, 10.25 inches
Fuel	Battery Electric
Service Life	12 Years / 500,000 Miles-Partial Test
Number of Seats (including driver)	52 or 45 and two wheelchairs
Manufacturer-Designated Standing Passenger Capacity	67
Gross Vehicle Weight used for testing	69,530*
Gross Vehicle Weight Rating	73,414
Mileage at Delivery	426 miles
Test Start Date	July 10, 2025
Test Completion Date	September 3, 2025
Report Issuance Date	October 28, 2025

*This partial test did not have any tests performed at gross vehicle weight.

The measured curb weight was 11,250 lb. for the front axle, 17,330 lb. for the middle axle, and 23,130 lb. for the rear axle. These combined weights provided a total measured curb weight of 51,710 lb. There are 52 seats including the driver and free floor space for 71 standing passengers bringing the potential total passenger capacity to 123. However, a placard shows the maximum number of standing passengers as 67. This bus also has 10 stowable seats, 7 of the stowable seats provide two wheelchair positions. The heaviest configuration for gross vehicle weight is with 52 seated passengers and 67 standees. Gross load is calculated as 150 lb. x 119 = 17,850 lb. At full declared capacity, the measured gross vehicle weight was 69,530 lb. There were no tests performed at gross vehicle weight. There is a potential to overload this bus with the available floor space for standing passengers. The heaviest seated configuration for testing was achieved with 45 seated passengers (including the driver) and two wheelchair positions.

The FTA determined that this bus be tested for Check in, Safety -Double Lane Change, Static Towing, Dynamic Towing and Energy Economy; the baseline reports for this test are LTI-BT-R1615, LTI-BT-R2022-03-P, and LTI-BT-R2022-04.

ABBREVIATIONS AND ACRONYMS

ABS - anti-skid braking system
ABTC - Altoona Bus Test Center
A/C - air conditioner, or air conditioning
AC - alternating current
ADA - American Disability Act
Ah - Ampere hours
CDCTS - chassis dynamometer test control system
CVS - constant volume sampling
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
DC - direct current
DIR - test director
DR - bus driver
EPA - Environmental Protection Agency
GAWR – gross axle weight rating
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
HD-UDDS – Heavy Duty-Urban Dynamometer Driving Schedule
LTI - Larson Transportation Institute
mpg - miles per gallon
mph - miles per hour
PM - Preventive maintenance
PSTT - Penn State Test Track
rpm - revolutions per minute
SAE - Society of Automotive Engineers
SCF - Standard cubic foot
SCH - test scheduler
SA - staff assistant
SLW - seated load weight (curb weight plus 150 lb. for every designed passenger seating position and for the driver)
TD - test driver
TECH - test technician
TM - track manager
TP - test personnel
Wh - Watt hour

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 consisted 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 certified 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 consisted of a New Flyer of America, model XE60. The bus has a front passenger door forward of the front axle, a middle passenger door between the front and middle axle and a rear passenger door forward of the rear axle. The front passenger door is equipped with a New Flyer electric flip out ADA ramp. Tractive power for the bus is provided by two ZF / A1300V2B1-165 traction motors on the center axle, one Accelera / 1DB2016-6NB06 traction motor on the rear axle, and eight nickel-cobalt-manganese-aluminum (NCMA) lithium-ion battery packs totaling a nominal energy capacity of 888 kWh.

The measured curb weight was 11,250 lb. for the front axle, 17,330 lb. for the middle axle, and 23,130 lb. for the rear axle. These combined weights provided a total measured curb weight of 51,710 lb. There are 52 seats including the driver and free floor space for 71 standing passengers, bringing the potential total passenger capacity to 123. However, a placard shows the maximum number of standing passengers as 67. This bus also has 10 stowable seats, 7 of the stowable seats provide two wheelchair positions. The heaviest configuration for gross vehicle weight is with 52 seated passengers and 67 standees. Gross load is calculated as 150 lb. x 119 = 17,850 lb. At full declared capacity, the measured gross vehicle weight was 69,530 lb. There were no tests performed at gross vehicle weight. There is a potential to overload this bus with the available floor space for standing passengers. The heaviest seated configuration for testing was achieved with 45 seated passengers (including the driver) and two wheelchair positions.

VEHICLE DATA FORM

Bus Number: 2025-02-P	Date of Check-In: 07/10/25
Bus Manufacturer: New Flyer of America	Vehicle Identification Number (VIN): 5FYB8YJ12SC112338
Model Number: XE60	Chassis Mfr./Mod. #: New Flyer / Xcelsior
Personnel: S.R., J.M., T.G. & P.D.	Starting Odometer Reading: 426 miles

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	5,640	5,610	8,380	8,950	11,410	11,720
SLW	6,490	5,950	8,890	11,340	13,250	13,720
GVW	7,830	7,140	11,930	13,970	14,520	14,140

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	11,250	12,440	14,970	16,094
Middle Axle	17,330	20,230	25,900	28,660
Rear Axle	23,130	26,970	28,660	28,660
Total	51,710	59,640	69,530	GVWR: 73,414 (Declared by Manufacturer)

Dimensions:

Body Length (ft/in)	59 / 9.5
Length Over Bumpers (ft/in)	60 / 10.25
Overall Length with add-ons (ft/in)	60 / 10.25
Width (in) – Excluding mirrors	102.2 (front coach) 102.4 (behind joint)
Width (in) – Including mirrors	123.5 (arms adjusted to operating position)
Height of bus (in)	112.4
Overall Height (in)	133.0
Front Overhang (in)	87.3
Rear Overhang (in)	120.7
Wheelbase (in)	Front to Middle: 229.0 Middle to Rear: 293.25
Wheel Track (in)	Front: 86.5
	Middle: 76.1
	Rear: 75.4

Bus Number: 2025-02-P	Date:07/10/25

CLEARANCES:

Lowest Point Outside Front Axle	Location: Curbside jacking pad	Clearance(in): 9
Lowest Point Outside Rear Axle	Location: LV 12/24 battery box frame	Clearance(in): 11.7
Lowest Point between Axles	Location: WB#1 – Curbside jack pad WB#2 – Curbside jack pad	Clearance(in): 8.0 Clearance(in): 9.3
Front Bumper Height (in)	11.4 to bumper Skid plate mounted beneath bumper at curbside corner is 9.9	
Rear Bumper Height (in)	17.8	
Ground Clearance at the center (in)	Wheelbase #1 – 10.3 Wheelbase #2 – 10.7	
Front Approach Angle (deg)*	6.5	
Rear Approach Angle (deg)*	8.4	
Ramp Clearance Angle (deg)	Wheelbase #1 – 5.1 Wheelbase #2 – 4.2	
Aisle Width (in)	24.5	
Inside Standing Height at Center Aisle (in)	95.8	

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Semi-monocoque		
Frame Material	Ferritic stainless steel		
Body Material	Composite and aluminum		
Floor Material	Fiberglass		
Roof Material	Fiberglass		
Windows Type	■ Fixed	■ Movable	
Window Mfg./Model No.	Arow Global / Top Tip-in		
Number of Doors	Front: 1 Curbside Other: 1 in Front of Middle Axle, curbside Rear: 1 Curbside		
Mfr. / Model No.	Front: Curbside – Vapor / Vapor Slide Glide Electric Rear: Curbside – Vapor / Vapor Slide Glide Electric Other: Curbside - Vapor / Vapor Slide Glide Electric		
Dimension of Each Door (in)	Front: Curbside – 42.8 x 78.7 Rear: Curbside – 50.7 x 78.5 Other: Curbside – 50.5 x 78.7		
Clearance of Each Door (in)	Front: Curbside – 31.1 x 77.4 Rear: Curbside – 39.9 x 76.9 Other: Curbside – 39.7 x 76.6		
Passenger Seat Type	■ Cantilever	☐ Pedestal	☐ Other
Passenger Seat Mfg./ Model No.	USS / Gemini		
Driver Seat Type	■ Air	☐ Spring	☐ Other
Mfr. / Model No.	Recaro / Ergo Metro AM80		
Number of Seats (including Driver)	52 or 45 and two wheelchairs		

Bus Number: 2025-02-P	Date: 07/10/25

BODY DETAILS (Contd.)

Free Floor Space (ft^2)	106.7 (127.1 including artic joint)
Height of Each Step at Normal Position (in)	Front 1. 13.9 2. N/A 3. N/A 4. N/A
	Middle 1. 14.0 2. N/A 3. N/A 4. N/A
	Rear 1. 14.0 2. N/A 3. N/A 4. N/A
Step Elevation Change - Kneeling (in)	Front: 4.5 Middle: 1.7 Rear: 1.8

ELECTRIC DRIVE SYSTEM

Type	Battery Electric
Number of Traction Motors	3
Mfr. / Model No.	Middle axle, curbside: ZF Freidrichschafen AG/ A1300V2B1-165 / SN: 8478601 Middle axle, streetside: ZF Freidrichschafen AG/ A1300V2B1-165 / SN: 8479532 Behind rear axle: Accelera by Cummins / 1DB2016-6NB06
Location of Traction Motors	Curbside and streetside on middle axle and behind rear axle
Type	Axle mounted individual wheel motors and drive motor
Max Rated Power Output (kW)	125 for wheel motors and 230 for rear drive motor
Motor Control System Mfr./Model No.	Accelera by Cummins/ ELFA 3
Location	Rear compartment
Drive Motor Inverter Mfr./Model No.	Center Axle: Accelera / A5E5107641(two) Rear Axle: Accelera / A5E5107643 (one)
Other Inverter(s)	Accelera EMDAG for Auxillary Functions
Energy Storage System Mfr./ Model No.	ABS / PN 20000060-AJ
Nominal Voltage (volts)*	664
Number of Battery Packs	8
Location of Battery Packs	6 on rooftop; 2 in rear compartment
Individual Battery Capacity (kWh)*	111
Total Nominal Battery Capacity (kWh)*	888
Total Usable Battery Capacity (kWh)*	752
Total Nominal Battery Capacity (Ah)*	1328
Battery Type (Chemistry)	Li-ion NCMA
Nominal Voltage (Vdc)*	664
Low Voltage Battery	24 Volt
Low Voltage Battery Mfr./Model No.	EnerSys / Odyssey / ODP-AGM8DT

*As declared by Manufacturer

Bus Number: 2025-02-P	Date: 07/24/25

OTHERS

Air Compressor Mfr. / Model No.	VMAC / E1056586
Maximum Capacity (ft^3 / min)	14

SUSPENSION

Number of Axles	3		
Front Axle Type	☐ Independent	■ Beam Axle	
Mfr. / Model No.	Man / VOK-8		
GAWR (lb.)	16,094		
Axle Ratio (if driven)	N/A		
Suspension Type	■ Air	☐ Spring	☐ Other
Mfr. / Model No.	Firestone / Airide		
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni Evo / 99B 3204S92 / 845035		
Sway Bar Equipped	■ Front ■ Rear		
Middle Axle Type	☐ Independent	■ Beam Axle	
Mfr. / Model No.	ZF Friedrichshafen AG / ZF AVN 130		
GAWR (lb.)	28,660		
Axle Ratio (if driven)	17.80		
Suspension Type	■ Air	☐ Spring	☐ Other
Mfr. / Model No.	Firestone / Airide		
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni / 90 2518SP1 / 4214		
Rear Axle Type	☐ Independent	■ Beam Axle	
Mfr. / Model No.	MAN Truck & Bus AG / MAN HY-1350		
GAWR (lb.)	28,660		
Axle Ratio (if driven)	5.67		
Suspension Type	■ Air	☐ Spring	☐ Other
Mfr. / Model No.	Firestone / Airide		
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni EVO / 99B 3307		

Bus Number: 2025-02-P	Date: 07/10/25

WHEELS & TIRES

Front, Middle, and Rear	Wheel Mfr./ Model No.	Alcoa High Polish / Part # 886517
	Wheel Weight Rating (lb.)	8,050
	Tire Mfr./ Model No.	Bridgestone R192 / 305 70R 22.5
	Tire Weight Rating (lb.)	8,050 single; 7,390 dual

BRAKES

Front Axle Brakes Type	☐Cam	■Disc	☐ Other (explain)
Mfr. / Model No.	MAN / KNORR SN7000		
Middle Axle Brakes Type	☐ Cam	■ Disc	☐ Other
Mfr. / Model No.	MAN / KNORR SN7000		
Rear Axle Brakes Type	☐Cam	■Disc	☐ Other (explain)
Mfr. / Model No.	MAN / KNORR SN7000		
Parking Brake Mfr. / Model No.	Park brake applied with push/pull control valve on driver's side console Center brake chamber: ZF / part number 0501329529 Rear brake chamber: MGM / part number MJB2424ET762		

HVAC

Driver Heating System Type	☐ Engine Coolant ■ Electric
Capacity (Btu/hr)	55,600
Mfr./Model No.	Bus Climate Control (BCC) / T12-60134
Passenger Heating System Type	☐ Engine Coolant ■ Electric
Capacity (Btu/hr)	105,000 (front) 98,000 (rear)
Mfr./Model No.	ThermoKing / RLFE (Front) ThermoKing / T15 (Rear)
Auxiliary Heater	■ Yes - Type: Electric ☐ No
Mfr./Model No.	Mobile Climate Control / 458665
Driver Air Conditioner	■Yes ☐ No
Location	Front section of roof
Capacity (Btu/hr)	85,000 (front roof unit)
A/C Compressor Mfr./Model Number	Copeland / ZR49KCE-TF7-130
Passenger Air Conditioner	■ Yes ☐ No
Passenger Air Conditioner	☐ Engine Driven ■ Electric ☐ Other
Location	Rear upper compartment
Capacity (Btu/hr)	85,000 (front) 72,000(rear)
A/C Compressor Mfr./Model No.	Copeland / ZR49KCE-TF7-130

Bus Number: 2025-02-P	Date: 07/10/25

STEERING

Steering Gear Box Type	Hydraulic
Mfr. / Model No.	ZF TRW / TAS85
Steering Wheel Diameter	19.5”
Number of turns (lock to lock)	4 3/4

OTHERS

ADA Ramps	Location: Front Curbside Entry	Type: Electric bi-fold
Mfr. / Model No	New Flyer Electric Flip out	
ADA Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	N/A	
Emergency Exits	Location: Doors Windows Roof Hatches	Number: 3 7 2
Fire Suppression System Type	N/A (There is a fire extinguisher behind the driver’s seat – ABC Fire & Safety Equipment / AA05S-1)	
Mfr./Model No.	N/A	

CAPACITIES

Fuel Tank Capacity (gallons)	N/A
Engine Crankcase Capacity (gallons)	N/A
Transmission Capacity (gallons)	N/A
Differential Capacity (gallons)	3.83 (rear)
Wheel Motor Gearbox Capacity (gallons)	1.06 (center)
Engine Cooling System Capacity (gallons)	N/A
Battery Cooling System Capacity (gallons)	23.2
Power Electronics Cooling System Capacity (gallons)	5.5 (center) 7.0 (rear)
Drive Motor Cooling System (gallons)	Included with Power Electronics
Power Steering Fluid Capacity (gallons)	2.25

Bus Number: 2025-02-P	Date: 07/10/25

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

☐ Service manual and operator's manual documentation available
■ Service manual and operator's manual documentation NOT available

Part Number	Description	Qty.
No parts, tools or manuals delivered with bus.	N/A	N/A

COMPONENT/SUBSYSTEM INSPECTION FORM

Bus Number: 2025-02-P	Date: 7/10/25

Subsystem	Checked	Initials	Comments
Engine	N/A	S.R.	None noted.
Fuel System	N/A	S.R.	None noted.
Transmission	N/A	S.R.	None noted.
Exhaust	N/A	S.R.	None noted.
Engine Cooling System	N/A	S.R.	None noted.
Electronics Cooling System	✓	S.R.	None noted.
Drive Motor Cooling System	✓	S.R.	None noted.
Drive Motors/Axle	✓	S.R.	None noted.
High Voltage Batteries	✓	S.R.	None noted.
Body and Sheet Metal	✓	S.R.	None noted.
Frame	✓	S.R.	None noted.
Steering	✓	S.R.	None noted.
Suspension	✓	S.R.	Ride height confirmed by rep.
Interior/Seating	✓	S.R.	None noted.
Interior Fasteners	✓	S.R.	None noted.
Axles	✓	S.R.	None noted.
Brakes	✓	S.R.	None noted.
Tires/Wheels	✓	S.R.	None noted.
Air Conditioning Heating and Ventilation	✓	S.R.	None noted.
Accessories	✓	S.R.	None noted.
ADA Lift System	N/A	S.R.	None noted.
ADA Ramp System	✓	S.R.	None noted.
Low Voltage Batteries	✓	S.R.	None noted.
Emergency Exits	✓	S.R.	None noted.
Fire Suppression System	N/A	S.R.	Fire extinguisher only – behind driver

CHECK - IN

NEW FLYER OF AMERICA
XE60

CHECK - IN CONT.

NEW FLYER OF AMERICA
XE60

CHECK - IN CONT.

NEW FLYER ELECTRIC FLIP OUT ADA RAMP

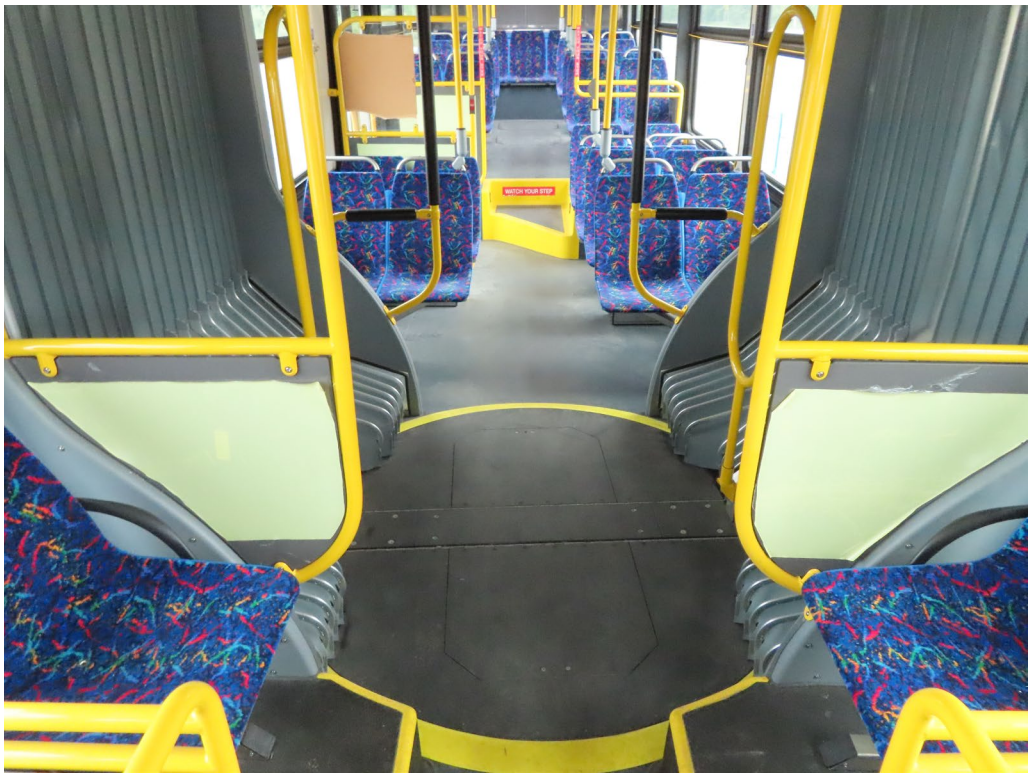
OPERATOR'S AREA

CHECK - IN CONT.

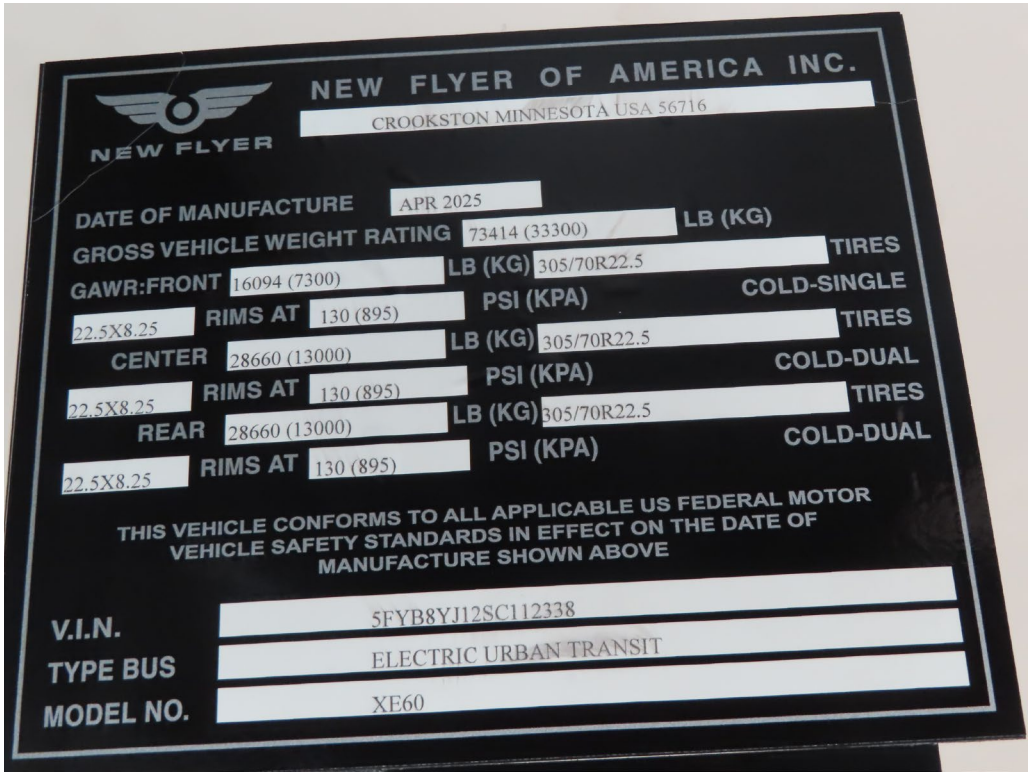
INTERIOR FROM FRONT

INTERIOR FROM REAR

CHECK - IN CONT.



ARTICULATING JOINT



VIN TAG

CHECK - IN CONT.

PLACARD SHOWING MAXIMUM STANDING PASSENGERS

ROOFTOP – FRONT TO REAR

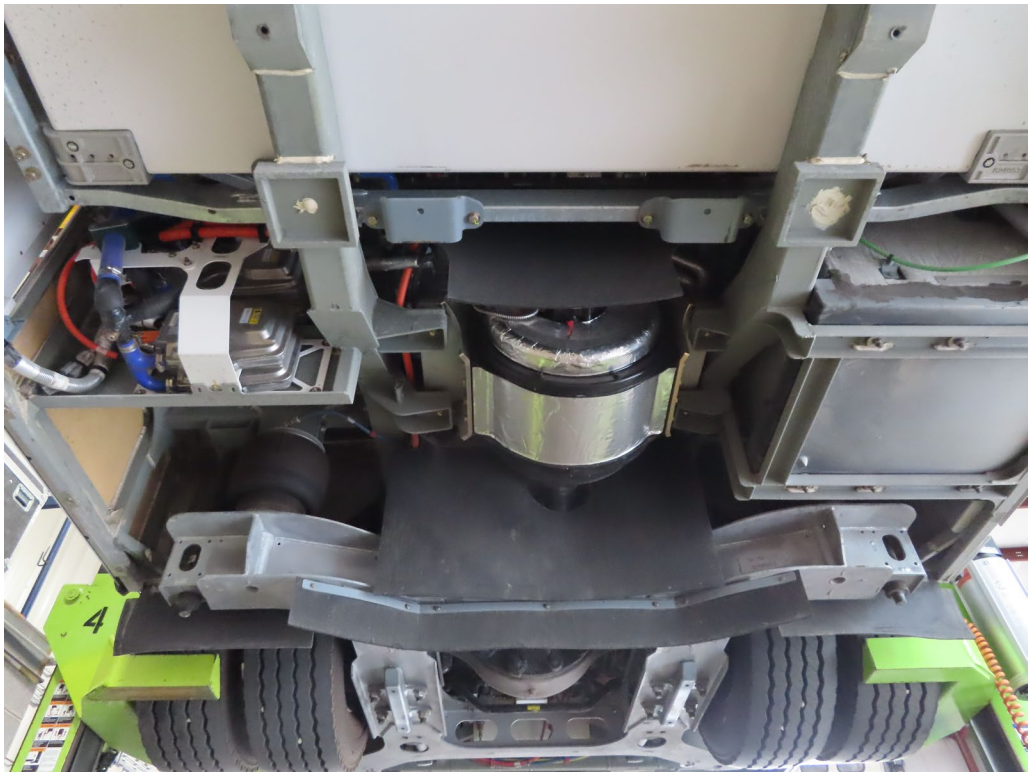
CHECK - IN CONT.

BATTERY PACKS IN REAR COMPARTMENT

UNDERSIDE OF BUS – FRONT TO REAR

CHECK - IN CONT.

UNDERSIDE OF BUS – MIDDLE DRIVE AXLE



UNDERSIDE OF BUS – REAR DRIVE MOTOR AND AXLE

3.1 SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3.1-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.

3.1-II. TEST DESCRIPTION

The Safety Test consisted of an obstacle avoidance maneuver to evaluate the handling and stability of the bus. The test was conducted at the LTI test track on the vehicle dynamics pad. The bus was driven through a double-lane change course at increasing speeds until the test was determined to be unsafe or a speed of 45 mph is reached. The test is determined unsafe if vehicle handling becomes unstable or if any of the tires lose contact with the pavement.

The layout of the test course was defined by placing pylons along painted guidelines that delineated the course. The guidelines marked off two 12-foot center-to-center lanes. Each lane had two 100-foot-long gates with a spacing distance of 100 feet between them. The bus entered the test course in one lane, crossed over to the other lane within the 100-foot gate, traveled for 100 feet, and then returned back into the original lane within the next 100-foot gate. This maneuver was repeated from 20 mph with speed increasing in increments of 5 mph. The test was performed starting from both the right and left lanes.

A test run is considered valid if the bus is able to perform the maneuver at a constant speed without deviating from the test course or striking pylons. If the bus is not able to successfully complete the maneuver due to vehicle instability, the test will be terminated. The highest speed at which the maneuver can be successfully performed up to a maximum speed of 45 mph is recorded on the Safety Data Form.

3.1-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.

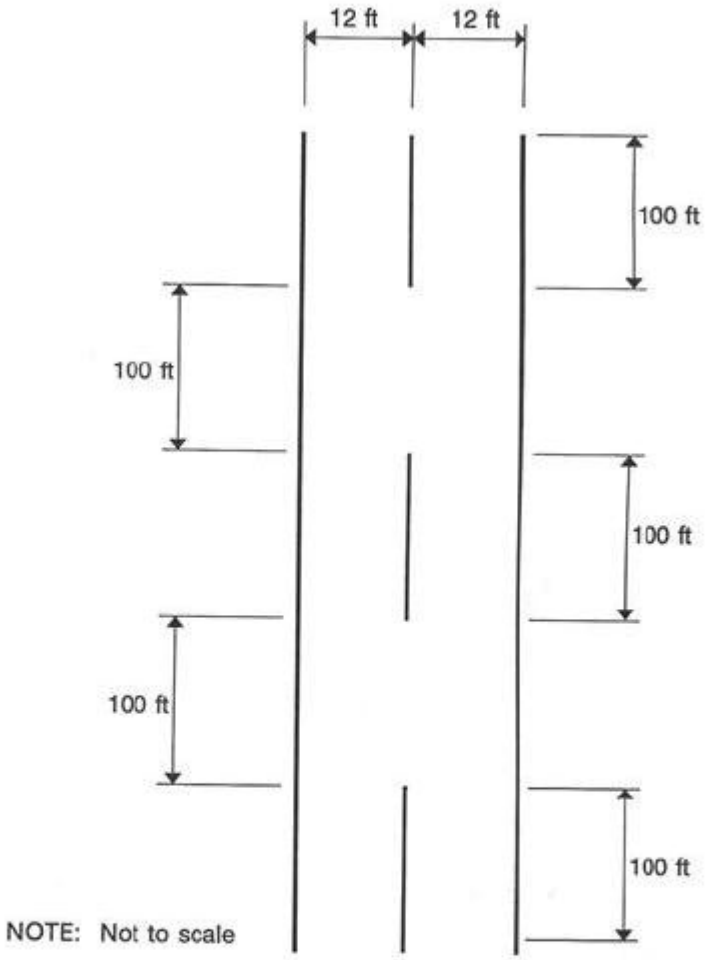


Figure 3.1. Double lane change test course

SAFETY DATA FORM

Bus Number: 2025-02-P	Date: 07/23/25
Personnel: F.T., R.M. & B.C.	

Temperature (°F): 65	Humidity (%): 83
Wind Direction: NE	Wind Speed (mph): 2
Barometric Pressure (mbar): 983	

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:	
Bus maintained position during lane change.	
Comments of the tire/ground contact patch:	
Tires maintained proper contact during test.	

3.1 SAFETY

RIGHT - HAND APPROACH

LEFT - HAND APPROACH

5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

5.3-I. TEST OBJECTIVE

The objective of this test is to determine the characteristics of the bus towing mechanisms under static loading conditions.

5.3-II. TEST DESCRIPTION

Utilizing a load-distributing yoke, a hydraulic cylinder was used to apply a static tension load equal to 1.2 times the bus curb weight. The load was applied to both the front and rear (if applicable) towing fixtures at an angle of 20 degrees with the longitudinal axis of the bus, first to one side then the other in the horizontal plane, and then upward and downward in the vertical plane. Any permanent deformation or damage to the tow eyes or adjoining structure was recorded.

5.3-III. DISCUSSION

The load-distributing yoke was incorporated as the interface between the Static Tow apparatus and the test bus tow hook/eyes. The test was performed to the full target test weight of 62,052 lb. (1.2 x 51,710 lb. CW). This bus has no rear tow eyes; therefore, the rear tow test was not performed. No damage or deformation was observed during all four pulls of the test.

STATIC TOWING TEST DATA FORM

Bus Number: 2025-02-P	Date: 09/03/25
Personnel: R.M., F.T., P.D. & T.G.	Temperature (°F): 68

Inspect right front tow eye and adjoining structure.
Comments: Inspected right front tow eye and structure –no damage or deformation.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: Tow eye attached with pin and cotter pin.
Inspect left front tow eye and adjoining structure.
Comments: Inspected left front tow eye and structure–no damage or deformation.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: Tow eye attached with pin and cotter pin.
Inspect right rear tow eye and adjoining structure.
Comments: No rear tow eyes.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: No rear tow eyes.
Inspect left rear tow eye and adjoining structure.
Comments: No rear tow eyes.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: No rear tow eyes.
General comments of any other structure deformation or failure:
None noted.

5.3 STATIC TOWING TEST

20° DOWNWARD PULL

TOW EYE ATTACHMENT

5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING TEST

5.4-I. TEST OBJECTIVE

The objective of this test is to verify the integrity of the towing fixtures and determine the feasibility of towing the bus under manufacturer specified procedures.

5.4-II. TEST DESCRIPTION

This test required the bus to be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus was towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus was visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms were inspected for proper operation.

5.4-III. DISCUSSION

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by incorporating a hydraulic under-lift. A front lift tow was performed. No problems, deformation, or damage was noted during testing.

DYNAMIC TOWING TEST DATA FORM

Bus Number: 2025-02-P	Date: 08/28/25
Personnel: P.D., T.G., F.T. & S.R.	

Temperature (°F): 72	
Wind Direction: SW	Wind Speed (mph): 8

Inspect tow equipment-bus interface.

Comments: A safe and adequate connection was made between the tow equipment and the bus.

Inspect tow equipment-wrecker interface.

Comments: A safe and adequate connection was made between the tow equipment and the wrecker.

Towing Comments: A front lift tow was performed incorporating a hydraulic under-lift wrecker.

Description and location of any structural damage: No damage to note.

General Comments: Removed the curbside driveshaft from the rear axle prior to towing.

5.4 DYNAMIC TOWING TEST

TOWING INTERFACE

TEST BUS IN TOW

6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable energy consumption data on transit buses produced by different manufacturers. This energy 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 energy economy test, as designated here, is a measurement of the energy 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.

In accordance with FTA policy for buses having a two-axle drive system, this test was performed at the PSBRTC test track using CBD, Arterial, and Commuter drive cycles.

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 ‘Battery Electric Vehicle Energy Consumption and Range Test Procedure J1634_2021, as practically determined by the FTA Energy Consumption Testing Protocol developed by Penn State University.

This bus has two drive axles. The chassis dynamometer at LTI can test buses with only one drive axle. In accordance with FTA policy for buses with a two-drive axle system, this test was performed at the PSBRTC test track using CBD, Arterial and Commuter drive cycles.

Signs are erected at carefully measured points which delineate the test course. The test started with a fully charged battery. A test run was comprised of three CBD phases, two Arterial phases, and one Commuter phase, described later in this section. A test run was completed in the clockwise and counterclockwise direction to minimize effects of grade and wind. At the end of this run, the bus was run at constant speed (40 mph) on the test track until the battery SOC reached approximately 50%, as shown on the vehicle’s dashboard. Another test run comprising of the same three phases above was then run in the counterclockwise and clockwise directions. At the end of this test run, the bus was again run at constant speed (40 mph). The ‘end of test’ was determined when the SOC of the ESS dropped to 5% as recommended by the manufacturer’s representative. The depleted battery was then fully charged, and the AC and DC energy required to charge the battery back to full capacity was measured.

Energy consumption during the test runs and constant speed runs was measured using Fluke 345 Power Quality meters. The voltage and current (in/out) of the battery pack were recorded. The energy consumed from the high voltage battery pack as well as the energy recuperated during braking that is fed back into the battery were calculated. The energy consumption (kWh/mile) and the range of the bus (miles) for all three phases were then calculated following procedures in SAE J 1634 2021.

The three test phases are: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph (Figure 1); an arterial phase of 2 miles with 2 stops per mile and a top speed of 40 mph (Figure 2); and a commuter phase of 4 miles with 1 stop and a maximum speed of 40 mph (Figure 3). At each designated stop the bus will remain stationary for seven seconds. During this time, the passenger doors shall be opened and closed.

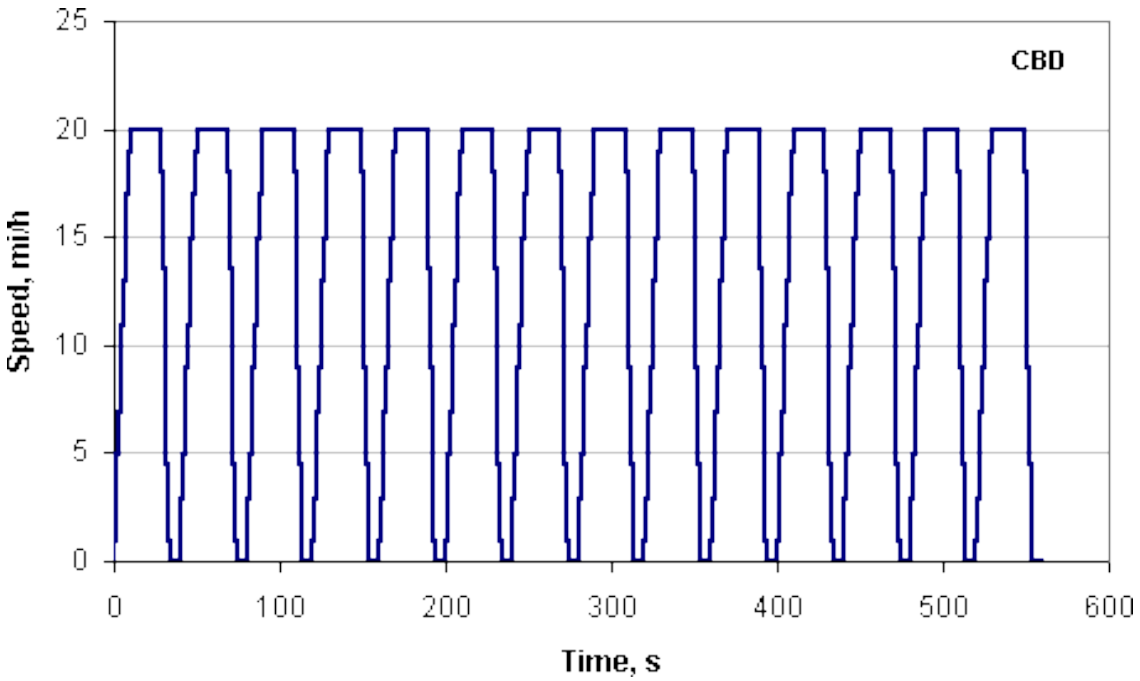


Figure 1. The CBD cycle

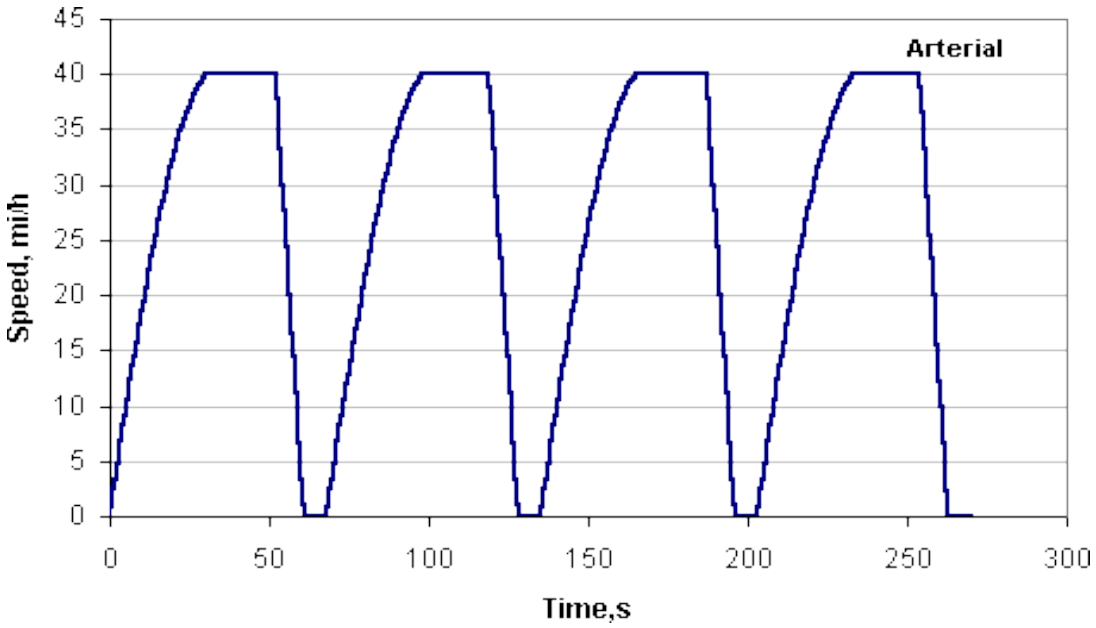


Figure 2. The Arterial cycle

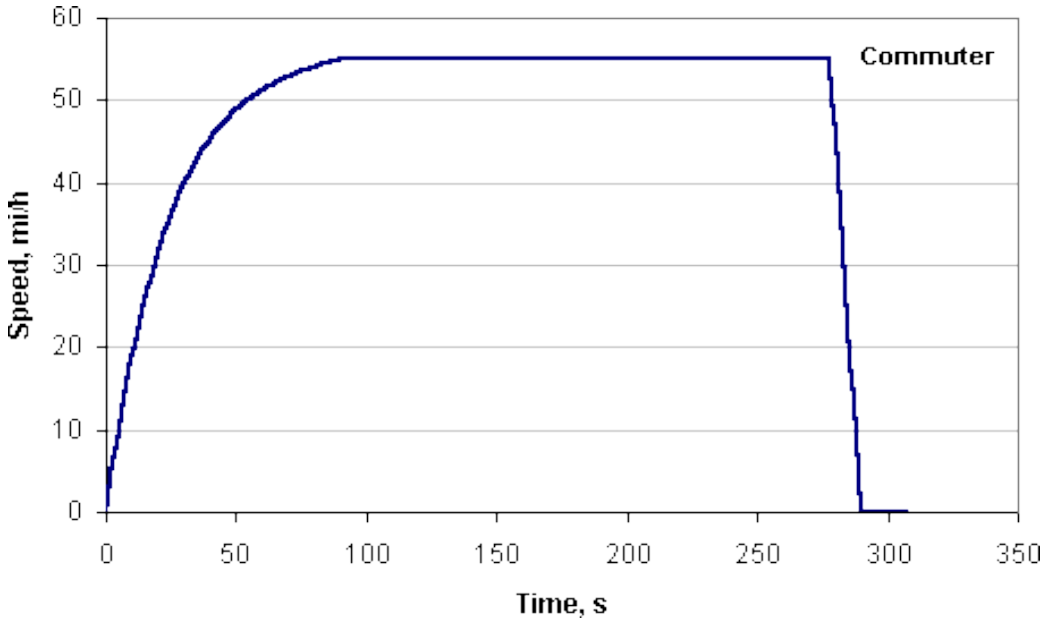


Figure 3. The Commuter cycle

6-III. DISCUSSION

This bus was tested using the CBD, Arterial and Commuter driving cycles. The energy economy and range results for buses tested using these cycles are not directly comparable to buses tested under the current protocol that uses the Manhattan, Orange County and HD-UDDS driving cycles.

This is a comparative test of energy economy and range. An extensive pretest maintenance check was performed, including checking 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 four Energy Economy Forms provide the data from the four test runs. In order to reduce the effect of high energy consumption during the first test run on the calculated averages, phase scaling factors were applied, as suggested in SAE J1634. Finally, the summary sheet provides the average energy consumption and range of bus for the three test cycles. The test was conducted at a seated load weight of 59,640 lbs. The average AC energy consumption for the CBD, Arterial and Commuter were 4,086 Wh/mile, 4,051 Wh/mile and 2,443 Wh/mile respectively. The range for the three driving cycles were 186 miles, 188 miles and 312 miles respectively. The charger efficiency was 96%.

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 2025-02-P	Date: 08/19/25	SLW (lb.): 59,640
Personnel: R.M & F.T.		

ENERGY SYSTEM	OK
Install energy measurement system	✓
Remarks: None noted.	
BRAKES/TIRES	**OK**
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: No issues found with brake system or brake hoses. Tires inflated to specs.	
BATTERY COOLING SYSTEM	**OK**
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: No issues found with battery cooling system. No leaks found.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 2025-02-P	Date: 08/19/25
Personnel: R.M. & F.T.	

ELECTRICAL SYSTEM	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: No issues found with electrical system.	

DRIVE SYSTEM	OK
Drain transmission fluid	N/A
Replace filter/gasket	N/A
Check hoses and connections	✓
Replace transmission fluid	N/A
Check for fluid leaks	✓
Remarks: Bus is electric – no filter or fluid to replace. No leaks found in drive system.	

LUBRICATION	OK
Lubricate all chassis grease fittings	✓
Lubricate universal joints	✓
Replace differential lubrication including axles	N/A
Remarks: All grease fittings and universal joints were greased.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 2025-02-P	Date: 08/19/25
Personnel: R.M. & F.T.	

OTHER ITEMS	OK
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	N/A
Remarks: Bus is electric – no drive belts or air filters to replace. No issues with air system.	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: No issues found with steering system.	
	OK
Ballast bus to seated load weight	✓
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation	✓
Remarks: No issues with test drive.	

ENERGY ECONOMY PRE-TEST INSPECTION FORM

Bus Number: 2025-02-P	Date: 08/19/25
Personnel: R.M. & F.T.	

PRE WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	R.M.
Cold tire pressure (psi): Front 130 Middle 130 Rear 130	R.M.
Energy economy instrumentation installed and working properly.	S.I.
Bus is loaded to SLW	R.M.
WARM-UP	**If OK, Initial**
Interior and exterior lights on, evaporator fan on	B.C.
Air conditioner off	B.C.
Defroster off	B.C.
Windows and doors closed	B.C.
Do not drive with left foot on brake	B.C.

ENERGY ECONOMY DATA FORM (Electric Vehicles)

Bus Number: 2025-02-P	Manufacturer: New Flyer of America	Date: 08/26/25
Run Number: 1	Personnel: S.R., T.G., F.T. & B.C.	
Test Direction: ❑ CW or ■ CCW	Ambient Temperature (°F):58	Humidity (%): 80
Barometric Pressure (mbar): 984	Wind Speed (mph): 5	Wind Direction: W
SLW (lb.): 59,640		

Cycle Type	Run Time (min:sec)		Pack SOC (%) Start	Pack SOC (%) Finish
	Start	Finish		
CBD #1	0	8:46	100	100
ART #1	0	4:11	100	100
CBD #2	0	8:43	99	99
ART #2	0	4:13	98	98
CBD #3	0	8:43	98	98
COMMUTER	0	6:09	96	96

Comments: None noted.

ENERGY ECONOMY DATA FORM (Electric Vehicles)

Bus Number: 2025-02-P	Manufacturer: New Flyer of America	Date: 08/26/25
Run Number: 2	Personnel: S.R., T.G., F.T. & B.C.	
Test Direction: ■ CW or ❑ CCW	Ambient Temperature (°F): 58	Humidity (%): 80
Barometric Pressure (mbar): 984	Wind Speed (mph): 5	Wind Direction: W
SLW (lb.):59,640		

Cycle Type	Run Time (min:sec)		Pack SOC (%) Start	Pack SOC (%) Finish
	Start	Finish		
CBD #1	0	8:41	96	96
ART #1	0	4:13	96	94
CBD #2	0	8:42	94	94
ART #2	0	4:10	94	93
CBD #3	0	8:39	93	92
COMMUTER	0	6:06	92	91

Comments: None noted.

ENERGY ECONOMY DATA FORM (Electric Vehicles)

Bus Number: 2025-02-P	Manufacturer: New Flyer of America	Date: 08/27/25
Run Number: 3	Personnel: S.R., T.G., F.T. & B.C.	
Test Direction: ❑ CW or ■ CCW	Ambient Temperature (°F): 50	Humidity (%): 82
Barometric Pressure (mbar): 1022	Wind Speed (mph): 3	Wind Direction: WSW
SLW (lb.):59,640		

Cycle Type	Run Time (min:sec)		Pack SOC (%) Start	Pack SOC (%) Finish
	Start	Finish		
CBD #1	0	8:42	54	53
ART #1	0	4:09	53	52
CBD #2	0	8:39	52	51
ART #2	0	4:06	51	50
CBD #3	0	8:40	50	49
COMMUTER	0	6:08	49	48

Comments: None noted.

ENERGY ECONOMY DATA FORM (Electric Vehicles)

Bus Number: 2025-02-P	Manufacturer: New Flyer of America	Date: 08/26/25
Run Number: 4	Personnel: S.R., T.G., F.T. & B.C.	
Test Direction: ■ CW or ❑ CCW	Ambient Temperature (°F): 50	Humidity (%): 82
Barometric Pressure (mbar): 1022	Wind Speed (mph): 3	Wind Direction: WSW
SLW (lbs): 59,640		

Cycle Type	Run Time (min:sec)		Pack SOC (%) Start	Pack SOC (%) Finish
	Start	Finish		
CBD #1	0	8:40	48	47
ART #1	0	4:10	47	46
CBD #2	0	8:39	46	46
ART #2	0	4:09	46	44
CBD #3	0	8:42	44	44
COMMUTER	0	6:02	44	42

Comments: None noted.

ENERGY ECONOMY DATA FORM
(Battery Electric Buses)

Bus Number: 2025-02-P	Manufacturer: New Flyer	Date: 08/26/25
Fuel Type: Electric	Personnel: B.C., S.R., T.G. & S.I.	
Temperature (°F): 50-58	Humidity (%): 80-82	Barometric Pressure (mbar): 984-1022
SLW (lb.): 59,640	Charger: ChargePoint	

	CBD	Arterial	Commuter
AC Energy (Wh/mile)	4086	4051	2443
AC Energy Consumption (Wh/Seated Passenger Mile)	86.9	86.2	52.0
Range (miles)	186	188	312
Charger Efficiency (%)	96		

Comments: In accordance with FTA policy for buses with a two-axle drive system, this test was performed at the PSBRTC test track using CBD, Arterial and Commuter drive cycles.

6.0 ENERGY ECONOMY

BUS TESTED FOR ENERGY ECONOMY

CHARGEPOINT CHARGER