



Vehicle Catalog

A Compendium of Vehicles and Powertrain Systems for Bus Rapid Transit Service

2006 Update



Summer 2006

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Foreword

This report represents one part of an effort to provide information to the U.S. transit authorities on activities related to Bus Rapid Transit (BRT). This document is prepared in partnership with the Federal Transit Administration as part of a “BRT Tool Box” which is designed to assist transit planners, management planning organizations and local transit stakeholders with readily-available, pertinent information about vehicles for use in BRT implementations. This information can aid in conceptual decision-making and communication to the community about features that encourage the use of cleaner, lower-emission vehicles.

Notice

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

The United States Government does not endorse products of manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the objective of this report.

Preface

This report was prepared by Weststart-CALSTART. Weststart-CALSTART is a non-profit organization that works with the public and private sectors to develop advanced transportation technologies and foster companies that will help clean the air, lessen our dependence on foreign oil, reduce global warming, and create jobs. CALSTART, Inc. is the California operating division of Weststart-CALSTART. The data contained in this report includes public information and/or information provided by other organizations. Website and contact information is provided with each description as a source of more detailed information.

Acknowledgements

The Federal Transit Administration (FTA), Office of Mobility Innovation, sponsored the effort to compile data for this report. CALSTART would like to acknowledge the contributions in time and data from original equipment manufacturers and suppliers that made this report possible.

About This Document

WestStart-CALSTART, in partnership with the Federal Transit Administration (FTA), is playing a vital role in the mainstreaming of Bus Rapid Transit (BRT) in the United States with a strong focus on new vehicle concepts, vehicle development strategies, and vehicles that are cleaner, quieter, and more fuel-efficient. The intent of this document is to disseminate information on currently available clean transportation bus transit vehicles and their drive systems for potential use in BRT service. This updated report was developed with the knowledge and assistance of the FTA, manufacturers and suppliers.

Vehicles. The vehicle section of this document contains summary information about vehicles offered for BRT service by various bus manufacturers, both U.S. and foreign. The vehicles are organized by a convention developed in another FTA document, "Characteristics of Bus Rapid Transit for Decision Making" (FTA-VA-26-7222-2004.1, August 2004). That report provides the latest information about each of the six BRT elements, including buses, their costs, and their potential impact on ridership, capacity, system performance, safety, security, and image. The CBRT describes the buses for BRT service in the following categories of 1) conventional standard, 2) stylized standard, 3) conventional articulated, 4) stylized articulated and 5) specialized BRT vehicles.

This convention focuses on the exterior image and interior amenities that make the vehicles suitable for BRT service. The same convention is used to organize the vehicle information in this document, with the addition of two more section on drivetrains (see below). The vehicle section has five subsections (standard, stylized standard, articulated, stylized articulated and specialized BRT vehicles) with vehicles in ascending order of length and manufacturers name.

One page is presented for each vehicle providing an overview of key performance parameters, features that are important to BRT service implementations and transit applications or customers. Company web site and contact links are also provided as a convenient research tool or to request additional information directly from the various organizations.

This document represents a sampling of the vehicles offered for BRT service. As a result, not all manufacturers and not all vehicles in BRT service applications are found here. The information contained here is gathered from manufacturers and/or public sources. The absence of a specific vehicle description may be a result of insufficient information at the time of publication or a specific request by the manufacturer to exclude a vehicle in this sample. Conversely, the presence of a description is merely to inform and convey information and is not meant as an endorsement by Weststart-CALSTART or the FTA. From time-to-time, this document may be revised to add more vehicles or to update information as it is made public.

Drive Systems. Additionally, there are two drive system sections in this document update to highlight the clean fuel propulsion system options that are now showing up in bus manufacturer offerings. The first is focused on hybrid propulsion systems, and the second on natural gas engines. Pricing information for these systems are typically available from the bus manufacturers. This is just a sample, based on supplier inputs and will be revised from time to time to reflect the state of the industry.

General Information about BRT

Federal Transit Administration vision for Bus Rapid Transit (BRT) Service reflects the FTA desire to “change America’s mind about transit.” An important ingredient of this change is making transit a more desirable choice in American communities. The FTA strives toward a public transit goal of increasing transit ridership. Its successes to date shows that BRT can share a significant place in public transit overall. The bus vehicles are an important element of BRT in promoting public transportation system improvements, realizing economic and environmental benefits.

Local communities must ultimately decide which BRT components meet their needs. Well-organized bus routes and good land use planning are important and go hand-in-hand. Reducing actual and perceived travel time by transit is an essential element in attracting new riders, along with clear customer information, easy and safe access to stops, as well as clean and comfortable places to wait for transit. Having service that is both frequent and reliable throughout the day means reduced waiting times, which makes short trips by transit more attractive.

Many American Communities deploying Bus Rapid Transit (BRT) are endeavoring to raise the level, the quality, and the image of the bus. As a result, the bus design, appearance, and amenities are changing. The information contained in this document provides a sampling of the vehicles designs that are being deployed worldwide for BRT service applications.

As BRT allows us to rethink the transit system, it also allows us to rethink the bus. BRT buses with low-emission fuel-efficient powertrains can be cleaner and quieter, offering lower costs for increased service and more neighborhood flexibility. This compendium endeavors to feature buses that can meet this promise. If you would like to comment on the contents of this document or provide new vehicle information, please send an email to Fred Silver at fsilver@weststart.org.

1.0 Conventional Standard Vehicles

40 Foot Standard

NABI 40 LFW

Step low-floor bus with standard transit configuration body and amenities, 35' available



Dimensions

Length 40 ft
 Width 102 in
 Height 116 in

Curb Weight

28,500 lbs

Price

\$300,000 to \$340,000

Capacity, Floor and Doors

- Seats – 40 transit and suburban configurations available
- Standees – 30
- Front or rear door wheelchair ramp
- Two wheelchair positions
- Low floor entry/exit at all doors



Electronics Options

- GPS, AVL
- Automatic Passenger Counting
- Destination Signs
- Voice Messaging
- Video Surveillance
- Onboard Diagnostics
- Vehicle Monitoring
- Transit Signal Priority

Comfort Items and Amenities

- Interior/exterior noise 75/79 dBA
- Electronic climate control
- Windows – Non-opening bottom, top ventilation opening



Propulsion and Fuel

- Diesel DDC, Caterpillar
- Natural Gas Cummins

<u>Fuel</u>	<u>Economy</u>	<u>Storage</u>
• ULSD	3.3 – 3.5 mpg	125 gal
• CNG	–	8 roof tanks
• LNG	0.68–1.27 mi/lb	2 rear tanks

Construction

- Electrically-welded integral monocoque construction
- Mild or stainless steel structure with bonded FRP sheet roof
- Stainless steel side skins and non-hinged skirt panels

Customers

- Los Angeles County MTA – Metro Rapid BRT Network

Website: www.nabiusa.com

Contact: bussales@nabiusa.com

Revised: June, 2006

40 Foot Standard

Orion VII

Step low-floor bus with transit configuration body, amenities, hybrid-electric or CNG



Dimensions

Length 40 ft
 Width 101.8 in
 Height 132 in, 135 in
 Hybrid, CNG

Curb Weight

30,500 lbs

Price

\$525,000 to \$550,000 Hybrid
 \$325,000 to \$350,000 CNG

Capacity, Floor and Doors

- Seats – 44 (or 37 with two wheelchair positions)
- Standees – 34
- Front or rear door wheelchair ramp
- Low floor entry/exit at all doors

Comfort Items and Amenities

- APTA spec Interior/Exterior Noise
- Thermo King/Carrier HVAC
- Red Dot front heater/defroster
- Windows – Opening with Pillar Covers
- Optional overhead luggage storage
- Vacuum/Thermal Formed Panel Trim
- Full Air Ride

Electronics Options

- GPS, AVL
- Automatic Passenger Counting
- Destination Signs – LED
- Voice/Visual Messaging
- Video Surveillance
- Onboard Diagnostics
- Vehicle Monitoring
- LED Exterior Lighting – standard
- I/O Multiplexed electrical system – standard

Propulsion and Fuel

- Hybrid: Cummins ISB 5.9L
BAE Systems Hybridrive™
Genset & AC Traction Motor
- Natural Gas: Cummins C8.3 G
Deere 6081

- | | |
|-------------|------------------------------|
| <u>Fuel</u> | <u>Storage</u> |
| • ULSD | 100 gal |
| • CNG | up to 8 SCI tanks, 22000 SCF |

Construction

- Integral Construction
- Mild or stainless steel structure
- Aluminum or fiberglass skins, exterior rub rails

Customers

- Hybrid – San Francisco MUNI; Toronto TTC; NYC MTA
- CNG – Numerous Locations in U.S.

Website: www.orionbus.com

Contact: sales@orionbus.com

Revised: July, 2006

2.0 Stylized Standard Vehicles

40 Foot Stylized

New Flyer Invero D40i

Advanced features with panoramic windows, comfortable ride, and passenger amenities



Dimensions

Length 41 ft

Width 102 in

Height 126 in

(with rear mount HVAC)

Curb Weight

27,600 lbs

Price

Call for Quote

Capacity, Floor & Doors

- Seats – 44 (90% forward facing)
- Perimeter seating available
- Standees – 46
- Patented 2 stage wheelchair ramp
- Low floor at all doors, step rear
- Plug Slide Front and Rear Doors

Comfort Items and Amenities

- Interior/exterior noise to 70 dBA
- AC, warm wall and floor heat
- 4 way panoramic windows
- Patented interior lighting system
- Commuter-style, high-back seats
- Luggage Accommodations

Electronics Options

- GPS, AVL
- Automatic Passenger Counting
- Luminator Destination Signs
- Onboard Routing/Travel Time/Stop
- Voice Messaging
- Video Surveillance
- Onboard Diagnostics
- Vehicle Monitoring
- Transit Signal Priority
- Automatic Guidance Ready

Propulsion and Fuel

- Diesel (Allison)
- Diesel Hybrid-Electric (Allison)
- Gasoline Hybrid-Electric (ISE)

<u>Fuel</u>	<u>Economy</u>	<u>Storage</u>
• ULSD	4.4 mpg	1 floor tank
• ULSD H-E	5.1 mpg	1 floor tank
• Gas H-E	4.5 mpg	1 floor tank

Construction

- Welded monocoque carbon steel using high tensile steel plate and tubing
- Phenolic balsa core fiberglass floor

Customers and Applications

- Ottawa, ON; Aspen, CO; Everett, WA

Website: www.newflyer.com

Contact: buses@newflyer.com

Revised: June, 2006

40 Foot Stylized

New Flyer D40LF

Step low-floor bus with restyled front mask and rear cap available on all models



Dimensions

Length 40 ft
 Width 102 in
 Height 111 in
 (with rear mount HVAC)

Curb Weight

27,000 lbs

Price

Call for Quote

Capacity, Floor & Doors

- Seats – 39 (70% forward facing)
- Perimeter seating available
- Standees – 43
- Flip out wheelchair ramp
- Low floor at all doors, step rear
- Slide Glide Front and Rear Doors

Comfort Items and Amenities

- Interior/exterior noise < 70 dBA
- Air conditioning Available
- Warm wall; floor heat Available
- Interior lighting Individual
- Continuous flush-mount windows available
- Luggage accommodations

Electronics Options

- GPS, AVL
- Automatic Passenger Counting
- Luminator Destination Signs
- Onboard Routing/Travel Time/Stop
- Voice Messaging
- Video Surveillance
- Onboard Diagnostics
- Vehicle Monitoring
- Transit Signal Priority
- Automatic Guidance Ready

Propulsion and Fuel

- Diesel Allison, ZF, Voith
- Diesel Hybrid-Electric Allison
- Gasoline Hybrid-Electric ISE
- Natural Gas Cummins, DDC, JD
- Trackless Trolley Kiepe

<u>Fuel</u>	<u>Economy</u>	<u>Storage</u>
• ULSD	4.4 mpg	1 floor tank
• ULSD H-E	5.1 mpg	1 floor tank
• Gas H-E	4.5 mpg	1 floor tank
• CNG	3.2 mgge	6 roof bottles

Construction

- Welded monocoque carbon steel using high tensile steel plate and tubing
- Aluminum body panels; ACQ pressure preserved plywood floor

Customers and Applications

- TransLink – Vancouver, BC Canada
- WMATA – Washington D.C. and SEPTA

Website: www.newflyer.com

Contact: buses@newflyer.com

Revised: June, 2006

41 Foot Stylized Standard

Van Hool A330

Full low-floor bus with European styling and a rear door for rapid boarding and alighting



Dimensions

Length 40 ft 6.6 in
 Width 102 in
 Height 122 in

Curb Weight
 (unavailable)

Price
 Call for Quote

Capacity, Floor & Doors

- Seats – 28 (+ 4 folding seats) – forward facing
- Standees – 49, Total capacity – 81
- Flip out wheelchair ramp
- Low floor at all doors
- 3 Doors – 1 and 3 pivot in, center
- wide door opens out



Comfort Items and Amenities

- Electric open-assist doors, touch sensitive exterior controls
- LED Multi-color Destination Signs
- Interior route map w/super stops
- Smart Card readers, all-door boarding
- Large windows all four sides
- Door 2 Wide with wheel chair access (ramp less than 2° all curb heights)
- Large, open standing areas improves passenger circulation

Electronics Options

- GPS, AVL, Location ID
- Proof of payment card readers
- Multi-color Head Signs
- Public Address Messaging
- Traffic Light Controller
- LCD Dashboards with integrated diagnostics, multiplex electronics



Propulsion and Fuel

- Cummins ISL 280 bhp, ZF Rear Axle with offset, Voith D8643 transmission and integrated retarder

Fuel – Economy – Storage

- ULSD TBD 92 gal floor tank
- Hydrogen TBD

Construction

- Electrically Welded Steel/Stainless Steel Structure
- Fiberglass-Reinforced Polyester Front/Rear
- Aircraft Aluminum Roof

Customers and Applications

- AC Transit – BRT – WMATA

Website: www.vanhool.com

Contact: bborwege@abc-companies.com

Revised: June, 2006

40-Foot Stylized

Nova LFS

Low-floor with exterior graphic body and amenities



Dimensions
 Length 40 ft
 Width 102 in
 Height 123 in

Curb Weight
 27,000 lbs
Price
 Call for Quote

Capacity, Floor and Doors

- Seats – up to 49, various configurations
- Standees – 32 Capacity – 81
- Two ultra-wide doors
- Wheelchair ramps
- Low floor entry/exit at all doors
- ADA compliant



Electronics Options

- Automatic passenger counter
- On-board video surveillance
- Front, side and rear destination signs
- Public Address System
- Ergonomic driver area
- Audio/video system

Construction

Customers

Comfort Items and Amenities

- Modern and attractive styling
- Spacious and efficient interior
- Comfortable seating and lighting
- Large panoramic windows
- High quality materials and finishes
- Optimal visibility through one-piece windshield with upper tinted sun-guard
- Heating and/or air conditioning
- Comes in transit, suburban and shuttle



Propulsion and Fuel

- Diesel Cummins ISL 8.3 L (280/250 hp)
- **Fuel** ULSD
- **Storage** 125 gal

- Durable stainless steel structure for longer lifetime
- Body – fiber-glass outer shell
- High impact thermoplastic skirt-panels

- Various Canadian and American transit agencies

Website: www.novabus.com

Contact: novabus.sales@volvo.com

Revised: June, 2006

42 Foot Standard

NABI 42 BRT

BRT-stylized, composite floor and environmentally-friendly



Dimensions

Length 40 ft
Width 102 in
Height 137 in

Curb Weight

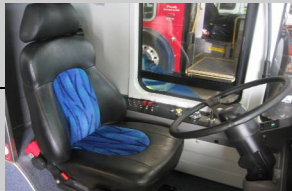
30,980 lbs

Price

\$375,000 to \$525,000

Capacity, Floor and Doors

- Seats – 43
- Standees – 32
- Two doors, wheelchair ramp accessible on either
- Two wheelchair positions
- Composite floor



Comfort Items and Amenities

- Interior/exterior – compliant with SBPG
- Electronic climate control
- Windows – Non-opening bottom, top ventilation opening
- Frameless windows, full-height door glazing, single piece front windshield.



Electronics Options

- GPS, AVL
- Automatic visual messaging
- Voice messaging
- Video surveillance
- Onboard diagnostics
- Vehicle monitoring
- Transit Signal Priority

Propulsion and Fuel

- Diesel, CNG, LNG, diesel-electric
- Caterpillar, Cummins, John Deere

<u>Fuel</u>	<u>Economy</u>	<u>Storage</u>
• ULSD	–	125 gal
• CNG	–	19.748 SCF
• LNG	–	204 gal

Construction

- Monocoque construction
- Mild steel structure with aluminum side skins
- Enclosed roof cavity conceals rooftop equipment

Customers

- BRT Transit Property Customers

Website: www.nabiusa.com

Contact: bussales@nabiusa.com

Revised: June, 2006

40 Foot Stylized Standard

Gillig 41 BRT

Step low-floor with transit body, amenities, plus hybrid drive economy and performance.



Dimensions

Length 41 ft, 35ft, 29 ft
 Width 102 in
 Height 115 to 132 in

Curb Weight

28,500 to 29,500 lbs.

Price

\$325,000 to \$525,000

Capacity, Floor & Doors

- 41 (seated)
- 20-30 (standing)
- Transit, perimeter, forward facing
- Ramp, restraints, signage, announcements
- Step low-floor
- Two doors (one-sided)

Comfort Items and Amenities

- Interior Exterior Noise Level (73.5 to 77.0/73.5 to 75.0)
- Fully automatic & environmentally friendly climate control
- LED signage

Electronics Options

- GPS, AVL, APC
- Video surveillance
- Onboard diagnostics
- Vehicle monitoring
- Transit Signal Priority
- Magnetic guidance in development
- Collision avoidance

Fuel and Propulsion

- Conventional hybrid
- Cummins (Allison) EP Hybrid Drive System
- Ultra Low Sulfur Diesel

<u>Fuel</u>	-	<u>Economy</u>	-	<u>Storage</u>
ULSD		4.0 mpg		125 gal.

Construction

- Modified monocoque
- Stainless steel and aluminum
- Quick change skirt panels

Customers and Applications

- | | |
|-------------------|-------------------|
| • Kansas City MAX | • HARTline (FL) |
| • Denver RTD | • Palm Trans (FL) |
| • LYNX (FL) | • TANK (KY) |

Website: www.gillig.com

Contacts: bmacleod@gillig.com

Revised: June, 2006

3.0 Conventional Articulated Vehicles

60 Foot Conventional Articulated

NABI 60 LFW

Step low floor high capacity bus with conventional body design and customer styled livery



Dimensions

Length 60 ft
 Width 102 in
 Height 116 in

Curb Weight
 42,800 lbs

Price
 \$525,000 to \$725,000

<p><u>Capacity, Floor and Doors</u></p> <ul style="list-style-type: none"> • Seats – 62 Standees – 31 • Total capacity – 93 passengers • Two doors, third door optional • Choice of door width and type • Front or rear door wheelchair ramp • Two wheelchair positions • Low floor entry/exit at all doors 	<p><u>Comfort Items and Amenities</u></p> <ul style="list-style-type: none"> • HVAC selections available • Electronic climate control • Windows openable top only, bottom only, full-height or non-openable • Stainless steel stanchion system • Selectable seat and floor styles • Stylized front mask • Fluorescent Passenger Lighting 															
<p><u>Electronics Options</u></p> <ul style="list-style-type: none"> • GPS, AVL • Destination sign/location selection • Automatic passenger counter • Automatic stop announcement • Automatic vehicle monitoring • Conventional public address • On-board video surveillance • Multiplex, programmable system • Onboard diagnostics, LED display 	<p><u>Fuel and Propulsion</u></p> <ul style="list-style-type: none"> • Diesel Caterpillar, Cummins • Natural Gas Cummins • Diesel Hybrid-Electric Caterpillar, Cummins <table border="0"> <tr> <td><u>Fuel</u></td> <td>–</td> <td><u>Economy</u></td> <td>–</td> <td><u>Storage</u></td> </tr> <tr> <td>• ULSD</td> <td></td> <td>TBD</td> <td></td> <td>125 gal</td> </tr> <tr> <td>• CNG</td> <td></td> <td>TBD</td> <td></td> <td>TBD</td> </tr> </table>	<u>Fuel</u>	–	<u>Economy</u>	–	<u>Storage</u>	• ULSD		TBD		125 gal	• CNG		TBD		TBD
<u>Fuel</u>	–	<u>Economy</u>	–	<u>Storage</u>												
• ULSD		TBD		125 gal												
• CNG		TBD		TBD												
<p><u>Construction</u></p>	<ul style="list-style-type: none"> • Structure coating: internal anti-corrosion, external epoxy • Electrical welded stainless steel structure with stainless steel side skins and welded steel-sheet roof, FRP end caps 															
<p><u>Customers</u></p>	<ul style="list-style-type: none"> • Chicago Transit Authority – regular route service 															

Website: www.nabiusa.com

Contact: bussales@nabiusa.com

Revised: June, 2006

60 Foot Articulated

New Flyer DE60LF

Step low floor bus with conventional styling, diesel hybrid-electric drive and amenities



Dimensions
 Length 61 ft
 Width 102 in
 Height 132 in
 (with roof mount battery pack)

Curb Weight
 43,700 lbs

Price
 Call for Quote

<p>Capacity, Floor & Doors</p> <ul style="list-style-type: none"> • Seats - 62 (forward facing) • Perimeter seating available • Standees - 53 • Flip out wheelchair ramp • Low floor at all doors, rear riser • Up to 3 Slide and Glide Doors 	<p>Comfort Items and Amenities</p> <ul style="list-style-type: none"> • 5.1 mpg in revenue service • Up to 40% better mileage than diesel alone • 50% reduction in NOx • 90% reduction in PM, CO, HC • Quiet, smooth take off • Perfect for BRT Lite applications 															
<p>Electronics Options</p> <ul style="list-style-type: none"> • GPS, AVL • Automatic Passenger Counting • Luminator Destination Signs • Onboard Routing/Travel Time/Stop • Voice Messaging • Video Surveillance • Onboard Diagnostics • Vehicle Monitoring • Transit Signal Priority • Automatic Guidance Ready 	<p>Propulsion and Fuel</p> <ul style="list-style-type: none"> • Diesel Allison, ZF, Voith • Diesel Hybrid-Electric Allison EP50 with 330 hp CAT C9 • Gasoline Hybrid-Electric ISE <table border="0"> <tr> <td><u>Fuel</u></td> <td>–</td> <td><u>Economy</u></td> <td>–</td> <td><u>Storage</u></td> </tr> <tr> <td>• ULSD</td> <td></td> <td>3.8 mpg</td> <td></td> <td>1 floor tank</td> </tr> <tr> <td>• ULSD H-E</td> <td></td> <td>5.1 mpg</td> <td></td> <td>1 floor tank</td> </tr> </table>	<u>Fuel</u>	–	<u>Economy</u>	–	<u>Storage</u>	• ULSD		3.8 mpg		1 floor tank	• ULSD H-E		5.1 mpg		1 floor tank
<u>Fuel</u>	–	<u>Economy</u>	–	<u>Storage</u>												
• ULSD		3.8 mpg		1 floor tank												
• ULSD H-E		5.1 mpg		1 floor tank												
<p>Construction</p>	<ul style="list-style-type: none"> • Welded monocoque carbon steel using high tensile steel plate and tubing 															
<p>Customers and Applications</p>	<ul style="list-style-type: none"> • Seattle, WA (King County) • Seattle, WA (Sound Transit) • Albuquerque, NM (Albuquerque Transit) • Honolulu, HI (The Bus) 															

Website: www.newflyer.com

Contact: buses@newflyer.com

Revised: June, 2006

4.0 Stylized Articulated Vehicles

60 Foot Standard

NABI 60 BRT

BRT-stylized, 60' low-floor articulated bus



Dimensions

Length 60 ft
 Width 102 in
 Height 137 in

Curb Weight

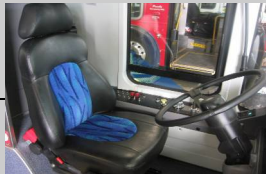
47,200 lbs

Price

\$650,000 to \$850,000

Capacity, Floor and Doors

- Seats - 62
- Standees - 30
- Composite, low-floor
- Low-floor entry all doors
- Wheelchair ramp in front, up to 3 wheelchair securement positions



Comfort Items and Amenities

- Interior/exterior – compliant with SBPG
- Electronic climate control
- Windows – bonded or clamp-in
- Frameless windows, full-height door glazing, single piece front windshield.



Electronics Options

- GPS, AVL
- Automatic visual messaging
- Voice messaging
- Video surveillance
- Onboard diagnostics
- Vehicle monitoring
- Transit Signal Priority

Propulsion and Fuel

- Diesel, CNG, LNG, diesel-electric
- Caterpillar, Cummins

<u>Fuel</u>	<u>Economy</u>	<u>Storage</u>
• ULSD	–	125 gal
• CNG	–	27,000 SCF
• LNG	–	204 gal

Construction

- Monocoque construction
- Mild steel structure with aluminum side skins
- Enclosed roof cavity conceals rooftop equipment

Customers

- LA Orange Line dedicated BRT route and Metro Rapid routes
- RTPA, City of Mesa, AZ
- Foothill Transit, West Covina, CA

Website: www.nabiusa.com

Contact: bussales@nabiusa.com

Revised: June, 2006

60 Foot Stylized Articulated

New Flyer DE60LF-BRT

Step low-floor bus with advanced styling, diesel electric drive and amenities



Dimensions
 Length 61 ft
 Width 102 in
 Height 136 in
 (with roof mount battery pack)

Curb Weight
 43,700 lbs

Price
 Call for Quote

Capacity, Floor & Doors

- Seats – 47 to 53 (75% forward facing)
- Perimeter seating available
- Standees - 53
- Flip out wheelchair ramp
- Low floor at all doors, rear riser
- 3 to 5 Slide and Glide Doors

Comfort Items and Amenities

- 5.1 mpg fuel economy with Hybrid
- Up to 40% better mileage than diesel alone
- 50% reduction in NOx
- 90% reduction in PM, CO, HC
- Quiet, smooth take off
- Also available in 40 ft configuration

Electronics Options

- GPS, AVL
- Automatic Passenger Counting
- Luminator Destination Signs
- Onboard Routing/Travel Time/Stop
- Voice Messaging
- Video Surveillance
- Onboard Diagnostics
- Vehicle Monitoring
- Transit Signal Priority
- Automatic Guidance Ready

Propulsion and Fuel

- Diesel (Allison, ZF, Voith)
- Diesel Hybrid-Electric (Allison EP50 with 330 hp CAT C9)
- Gasoline Hybrid-Electric (ISE)

<u>Fuel</u>	–	<u>Economy</u>	–	<u>Storage</u>
-------------	---	----------------	---	----------------

- | | | |
|------------|---------|--------------|
| • ULSD | 3.8 mpg | 1 floor tank |
| • ULSD H-E | 5.1 mpg | 1 floor tank |

Construction

- Welded monocoque carbon steel using high tensile steel plate and tubing

Customers and Applications

- Lane Transit (Eugene, OR)
- Greater Cleveland RTA (Cleveland, OH)

Website: www.newflyer.com

Contact: buses@newflyer.com

Revised: June, 2006

61 Foot Stylized Articulated

Van Hool AG300

Full low-floor bus with European styling and a rear door for rapid boarding and alighting



Dimensions

Length 60 ft 6.6 in
 Width 102 in
 Height 134 in

Curb Weight

38,720 lbs

Price

Call for Quote

Capacity, Floor & Doors

- Seats – 45 (+ 4 folding seats) – forward facing
- Standees – 57
- Flip out wheelchair ramp
- Full low floor and at all doors
- 4 Doors – 1, 3 and 4 pivot in, center wide door 2 opens out



Comfort Items and Amenities

- Electric open-assist doors, touch sensitive exterior controls
- LED Multi-color Destination Signs
- Interior route map w/super stops
- Smart Card readers, all-door boarding
- Large windows all four sides
- Door 2 Wide with wheel chair access (ramp less than 2° all curb heights)
- Large, open standing areas improves passenger circulation



Electronics Options

- GPS, AVL - Location ID
- Proof of payment card readers
- Multi-color Head Signs
- Public Address Messaging
- Traffic Light Controller
- LCD Dashboards with integrated diagnostics, multiplex electronics

Fuel and Propulsion

- ULSD Cummins ISL 330 bhp, ZF Rear Axle with offset, Voith D864.3 transmission/integrated retarder

Fuel – Economy – Storage

- ULSD – 115 gal floor tank

Construction

- Electrically welded/stainless steel
- Fiberglass-reinforced polyester front/rear
- Aircraft aluminum roof, galvanized walls, stainless skirts

Customers and Applications

- AC Transit – BRT

Website: www.vanhool.com

Contact: bborwege@abc-companies.com

Revised: June, 2006

5.0 BRT Specialized Vehicles

60 Foot Specialized BRT

APTS Phileas 60

Full low-floor bus with European exterior/interior styling and magnetic guidance system



Dimensions

Length 60.5 ft
Width 100 in
Height 123 in

Curb Weight

35,300 lbs

Price

Call for Quote

Capacity, Floor & Doors

- Seats - 29 (forward facing)
- Standees - 111 (6 passengers/m2)
- Full low-floor (100%)
- 3 doors, on one side, or 6 doors on both sides



Comfort Items and Amenities

- Futuristic and innovative styling
- Fully guided as tram or manually driven as bus
- Spacious and flexible interior (seats, doors)
- High quality passenger information, audible and visual systems
- Flexibility, large doors both sides
- Fully independent suspension
- Low interior and exterior noise levels
- All-wheel steering

Electronics Options

- GPS, AVL, APC, TSP, Surveillance
- Electronic fare payment
- Electronic automatic guidance until 50 mph with magnetic markers
- Automatic precision docking
- All-wheel steering

Fuel and Propulsion

- ULSD
- GM-Allison Parallel Hybrid-Electric Drive System
- Fuel economy is at least 25% greater than conventional European buses due to its hybrid element and light weight construction

Construction

- Lightweight corrosion-resistant monocoque body
- Lightweight modular sandwich composite

Customers and Applications

- Region of Eindhoven, Netherlands – BRT
- Region of Douai, France
- License agreement with South Korea

Website: www.apts-phileas.com

Contact: apts.info@apts-phileas.com

Revised: June, 2006

60 Foot Specialized BRT

Irisbus CIVIS

Full low-floor bus with European exterior/ interior styling and optical guidance system



Dimensions

Length 60 ft
Width 100 in
Height 134 in

Curb Weight

47,300 lbs

Price

\$980,000

Capacity, Floor & Doors

- Seats - 27 (forward and perimeter)
- Standees - 90 (4 passengers/m2)
- Flip out wheelchair ramp
- Full low floor
- 4 wide doors, on one side



Comfort Items and Amenities

- Exterior noise level 83 dBA
- Large, panoramic windows on 4 sides
- Spacious interior, modern Malanite trim
- High comfort seating
- High quality passenger information, audible and visual systems
- Level board platforms at all doors
- Enclosed tubular lighting

Electronics Options

- GPS, AVL
- Automatic Passenger Counting
- Destination Signs
- Onboard Routing/Travel Time/Stop Visual and Voice Messaging
- Video Surveillance
- Onboard Diagnostics
- Vehicle Monitoring
- Transit Signal Priority
- Siemens Optical Guidance



Fuel and Propulsion

- Diesel Diesel-electric drive system

Fuel - Economy - Storage

- ULSD 2.4 mpg 125 gal tank

Construction

- Stainless steel body frame
- Lightweight fiberglass body panels

Customers and Applications

- Las Vegas, NV – BRT

Website: www.irisbus.com

Contacts: info@irisbus.com

Revised: 2006

80 Foot Specialized BRT

APTS Phileas 80 & 85

Full low-floor bus with European exterior/ interior styling and magnetic guidance system



Dimensions

Length 80 and 85ft

Width 100 in

Height 123 in

Curb Weight

47,600 lbs

Price

Call for quote

Capacity, Floor & Doors

- Seats – 46 to 52 (forward facing)
- Standees – 125-133 (6 passengers/m²)
- Full low floor (100%)
- 4 (one side) or 8 (two sides) doors



Comfort Items and Amenities

- Low interior and exterior noise
- Futuristic and innovative styling
- Spacious interior feel, front axle under driver and rear axle under the motor
- High quality passenger information, audible and visual systems
- Flexibility, large doors both sides
- Fully independent suspension

Electronics Options

- GPS, AVL, APC, Video surveillance
- Transit signal priority
- Electronic fare payment
- Electronic automatic guidance until 50 mph with magnetic markers
- Automatic precision docking
- All-wheel steering
- Precision docking



Fuel and Propulsion

- ULSD
- Allison Parallel Hybrid-Electric
- Fuel economy is at least 25% greater than comparable European vehicles due to hybrid system and light weight body.

Construction

- Lightweight corrosion-resistant monocoque body

Customers and Applications

- Region of Eindhoven, Netherlands – BRT
- Region of Douai, France
- License agreement with South Korea

Website: www.aps-phileas.com

Contact: aps.info@aps-phileas.com

Revised: June, 2006

62 Ft Stylized Articulated

Wrightbus StreetCar RTV

Hybrid diesel-electric, multiple door-loading vehicle that creates a "wow" feeling



Dimensions

Length 61.5 ft

Width 99 in

Height 129 in

Curb Weight

30,500 lbs

Price

\$950,000 – 1,250,000

Capacity, Floor and Doors

- Seats - 45
- Flat floor
- 3 doors curb side, possible door locations on roadside
- 13 ½" floor height at doors



Electronics Options

- Traffic signal priority
- On-board fare machinery
- AVL & CCTV

Comfort Items and Amenities

- Ergonomic driver's interior
- Tinted, double-glazed windows
- LED lighting



Propulsion and Fuel

- Hybrid diesel-electric
- ISE
- Cummins ISL engine

Fuel

Storage

- TBD

Construction

- Bolted aluminum system
- Modular construction

Customers

- RTC Las Vegas

Website: www.the-wright-group.com

Contact: info@wright-bus.com

Revised: June, 2006

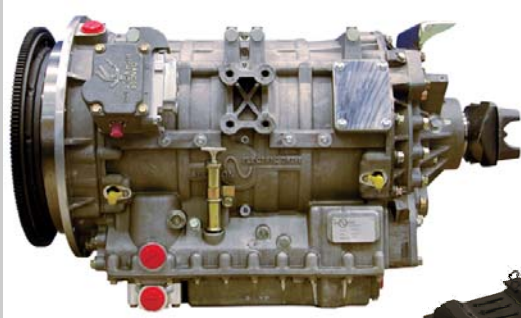
6.0 Hybrid Propulsion Systems

Allison Electric Drives

Allison E^P System

Six-component bus hybrid-electric drive improves performance, fuel economy, emissions

E^V Drive Unit
Weight 944 lbs (wet)



System Controllers
Weight 3.4 lbs each



Dual Power Inverter Module
Weight 165



Energy Storage Unit
Weight 963 lbs



Total System Weight
2080 lbs

Range Selector Push Buttons



Performance

- 28% gradeability
- Accelerate 35,000 lb 40 ft urban bus to 30 mph in 11 seconds compared to 23 seconds for a diesel powered bus
- Top speed governed to 65 mph

Operating Characteristics

- Parallel Hybrid-Electric drive system
- E^V Drive Unit blends power from two motor/generators and thermal engine
- Controllers process system and driver inputs to command propulsion
- DPIM conditions and controls electrical energy for transfer/storage between the Energy Storage (ESS) and E^V Drive Unit

Applications and Fuel Economy

- 40 ft Transit & 60 ft articulated buses
- Suburban coaches
- 460 units in service
- 5.5 mpg on CBD-14 duty cycle

Emissions

- CBD-14 cycle emission test with DPF
- ULSD compare to conventional diesel
- Further NOx & PM emission reductions realized with Allison E^P System with any Clean Fuel Engine

Customers and Applications

- Houston, TX (MTA Harris Cty)
- St. Paul, MN (Metro)
- Newark, NJ (NJT)
- Hartford, CT (CT Transit)
- Salt Lake City, UT (UTA)
- Austin, TX (Capital Metro)

- Seattle, WA (King County)
- Seattle, WA (Sound Transit)
- Orange County, CA (OCTA)
- Portland, OR (Tri-Met)
- Philadelphia, PA (SEPTA)
- Norwalk, CA (Norwalk)

Website: www.allisontransmission.com

Contact: David Mikoryak 317-242-318

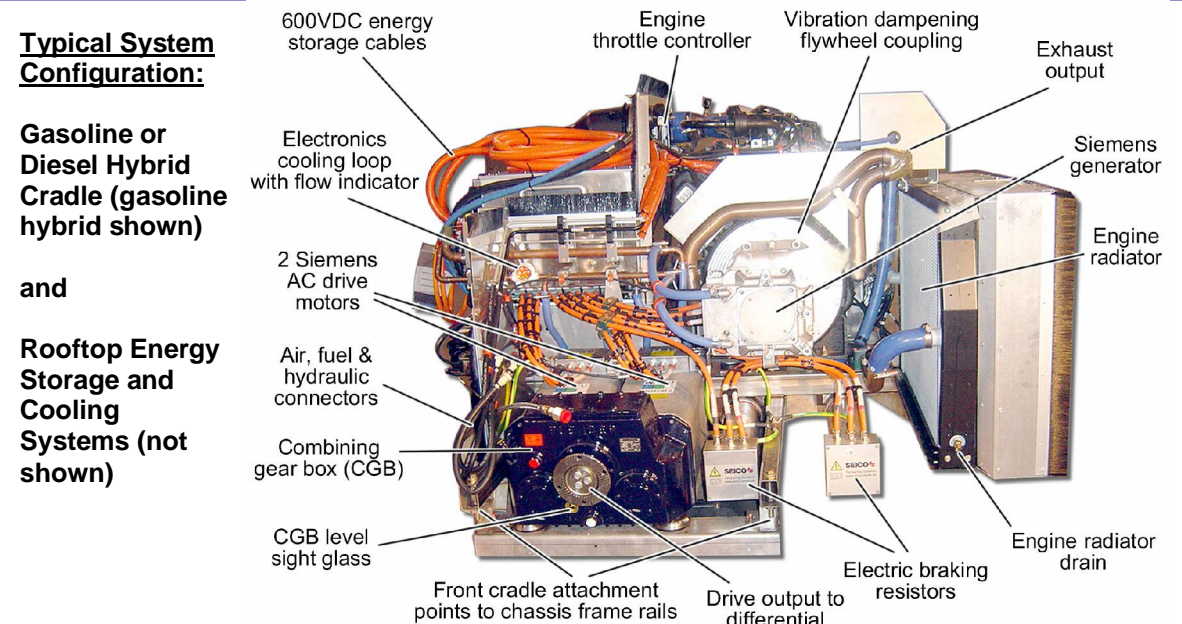
Revised: June, 2006

Hybrid-electric system that improves performance, fuel economy, and emissions

<p>Traction Motor Weight 450 lbs</p> 		<p>Hybrid Series Operation</p> <ul style="list-style-type: none"> Control system module directs power flow based on driver/system inputs Engine, controlled by the HybriDrive® system, drives the generator Generator supplies electricity to the traction motor and recharges the traction battery system Traction battery system stores energy and supplies power for acceleration Traction motor drives the wheels and acts as a generator to return deceleration energy that recharges the batteries 	
<p>Generator Weight 275 lbs</p> 	<p>Traction Battery System Weight 3950 lbs</p> 	<p>Control System Module Weight 215 lbs</p> 	
<p>Performance</p> <ul style="list-style-type: none"> Traction Motor: 250 hp continuous/320 hp intermittent peak power Speed, acceleration customizable 		<p>Operating Characteristics</p> <ul style="list-style-type: none"> Series hybrid-electric propulsion Mechanically simple, no transmission Cummins 5.9 L ISB thermal engine, EPA-certified 	
<p>Applications and Fuel Economy</p> <ul style="list-style-type: none"> Transit buses, other heavy duty More than 1,000 delivered or on order 6.5 mpg on CBD-14 duty cycle ULSD Up to 35% greater fuel efficiency 		<p>Emissions</p> <ul style="list-style-type: none"> ULSD/DPF, CBD-14 cycle, versus diesel NOx emissions reduced > 50% PM reduced by 90% Lowers greenhouse gas emissions 	
<p>Customers and Applications</p>		<ul style="list-style-type: none"> Toronto Transit Commission MTA New York City Transit San Francisco MUNI 	
<p>Website: www.hybridrive.com</p>		<p>Contact: BAE Systems Platform Solutions 607-770-2000</p>	

Revised: June, 2006

ISE Corporation ThunderVolt® Hybrid TB40HG-BRT & TB60HD-BRT
Hybrid-electric system cradle & roof rack: improved performance, noise, fuel use, emissions



Version	GASOLINE HYBRID 40-ft BRT	DIESEL HYBRID 60-ft BRT
General Characteristics	<p>Drive system type: Series Hybrid Weight: 3400 - 3700 lbs Packaging: Rear engine cradle assembly and roof mounted energy storage and electronics cooling systems. Ford Triton V10 with 160 kW_{pk} generator. Twin Siemens drive motors. Energy storage – Maxwell Ultracaps or NiMH Battery System Dual 100 kW Siemens Inverters</p>	<p>Drive system type: Series Hybrid Weight: 4300 - 4900 lbs Packaging: Rear engine cradle assembly and roof mounted energy storage and cooling systems</p> <ul style="list-style-type: none"> ▪ Cummins ISB 260H with 160 kW_{pk} generator Twin Siemens drive motors. ▪ Energy storage – Maxwell Ultracaps or NiMH Battery System ▪ Dual 100 kW Siemens Inverters
Performance	<p>Starting Grade: > 16% - Top Speed: rated at 65 mph - Acceleration (0-30): < 20 sec. - Noise Level: Very quiet inside & outside, EV mode possible with battery energy storage option - Low Maintenance: 25-50 % less than standard drive system.</p>	
	<p>Range: > 300 miles (100 gallon tank) Gasoline MPG: 3.7 (Long Beach Transit service average) Emissions: NOx and NMHC at least 25% less than CARB cert (0.6 g/bhp-hr and <0.01 g/bhp-hr PM)</p>	<p>Range: > 400 miles (100 gallon tank) MPG: 4.5 mpg (New Jersey Transit average) Emissions: NOx and NMHC at least 25% less than EPA cert (2.5 g/bhp-hr, and 0.01 g/bhp-hr PM w/exhaust treatment)</p>
Applications	<ul style="list-style-type: none"> ▪ Transit buses, trucks, trams, airport equipment, and military vehicles ▪ Various OEMs ▪ Available in 30-ft, 40-ft, and 60-ft bus models 	
Customers	<p>Long Beach, CA (Long Beach Transit) • Elk Grove, CA (Elk Grove e-tran) • San Bernardino, CA (Omnitrans) • Orange County, CA (OCTA) • Montebello, CA (Montebello Transit) • Norwalk, CA (Norwalk Transit) • Fresno, CA (FAX) • Los Angeles, CA (LADOT) • Gardena, CA (Gardena Municipal Bus Lines) • New Jersey, NJ (New Jersey Transit) • RTC-Las Vegas</p>	

Website: www.isecorp.com Contact: marketing@isecorp.com

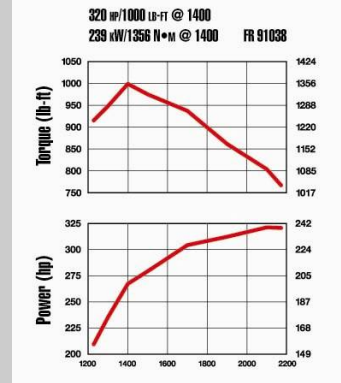
Revised: July, 2006

7.0 Natural Gas Engines

Cummins-Westport

Cummins LG-320

Cummins "Plus" technology produces better performance and longer service intervals



Performance

- 320 HP @ 2300 RPM
- 1000 LB-FT @ 1400 RPM
- Top speed governed to 2300 RPM
- Variable geometry turbo-charging
- Uses ECM to control fuel system, engine sensors, and ignition.

Operating Characteristics

- CNG/LNG
- 6 cylinders
- 8.9 Liters
- 10:1 compression ratio
- 6.3-7.3 US Gallons oil system
- Spark-ignited combustion

Applications and Fuel Economy

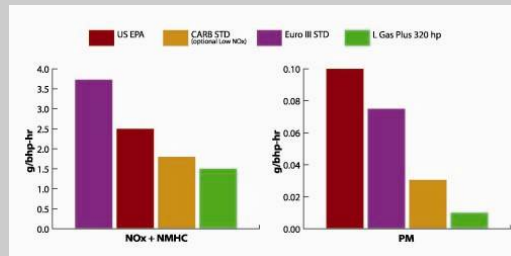
- 60 ft articulated buses, refuse trucks
- Electronic idle control
- Cummins INSITE™ and QuckCheck diagnostic service tools used for fast troubleshooting

Emissions

- 1.4 NOx + NMHC, 0.01 PM
- Can already meet 2010 standards in 2007 with aftertreatment.
- Ultra-low emissions and low NOx:
 - U.S. EPA 2005 standard
 - U.S. EPA 2004 transit bus standard
 - CARB optional low NOx + NMHC and low PM
 - Euro V/EEV capable

Customers and Applications

- NABI
- Los Angeles County MTA

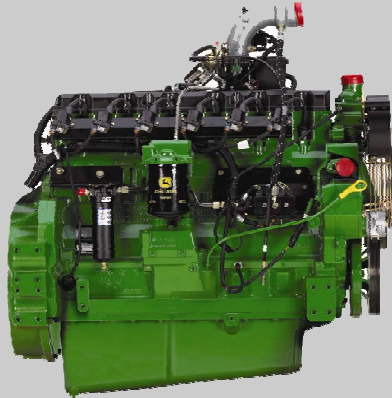


Website: <http://www.cumminswestport.com>

Contact: Jeff Campbell 604-718-2099

Revised: June, 2006

John Deere Power Systems 6081HFN04 Natural Gas Engine
Turbocharged spark-ignited combustion system with programmable electronic features



Performance

- 250, 275, and 280 HP @ 2200 rpm;
- 735, 800, and 900 LB-FT @ 1500 rpm
- 750 rpm low idle speed
- Superior torque rise offers quick response and acceleration

Operating Characteristics

- 6 cylinders, 8.1 Liters
- CNG/LNG capable
- 11:1 compression ratio
- Wastegate turbocharger
- Lean burn, Closed Loop Adaptive Learn Technology
- Robust construction contributes to long engine life while providing durability and reliability

Applications and Fuel Economy

- School bus, transit bus, and refuse truck applications
- Diesel-like fuel economy

Emissions

- CARB optional low 1.2 g/bhp-hr NOx + NMHC
- CARB/EPA certified for 50 states

Customers and Applications

- | | |
|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • El Dorado • Orion Bus • New Flyer • Blue Bird | <ul style="list-style-type: none"> • Thomas Bus • Crane Carrier • NABI • Millennium Bus |
|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|

Website: www.JohnDeere.com/altfuels

Contact: Susie Patterson 319-292-5146

Revised: June, 2006