

HybriDrive® propulsion systems

Welcome aboard the Orion VII NG next-generation hybrid electric bus

Daimler Buses North America and BAE Systems teamed in 1997 to develop a hybrid electric bus for the urban transit market. The goal was to produce a bus that would reduce emissions, increase fuel economy, and meet the durability requirements of urban transit. The result is a mechanically simple series hybrid system that is clean, efficient, and compatible with future clean-vehicle technologies.

The Orion VII NG hybrid electric bus is a leading brand of hybrid buses worldwide, with thousands of units in service in or on order cities such as New York, Toronto, San Francisco, Houston, and Ottawa.

- Accumulated nearly 100 million miles of passenger service.
- Saved about 5 million gallons of fuel.
- Reduced CO₂ emissions by more than 50,000 tons.
- Transported more than half a billion passengers.

Advanced, yet mechanically simple

At the heart of the Orion VII NG hybrid bus is the HybriDrive® propulsion system developed by BAE Systems. This advanced propulsion system comprises a diesel engine, a generator, an electric motor, and an energy storage system, all managed by a computerized propulsion control system. The diesel engine that powers the generator is smaller than that used in conventional buses. Additionally, because the engine is not directly coupled with the electric drive motor, it runs at optimal speed for maximum efficiency.

The design reduces emissions, improves fuel economy, and reduces maintenance costs compared to conventionally powered buses. Zero-emission technology may still be several years away, but this system's electric propulsion makes it readily adaptable to such future technologies. When fuel cells or other clean technologies become commercially viable, they will replace the engine and generator, supplying clean electric power to the series electric drive system.

Designed — and best suited — for urban transit

The Orion VII NG hybrid electric bus employs a regenerative braking system that uses the drive motor to slow the bus, effectively turning the motor into a generator to help recharge the energy storage system. This feature saves energy and reduces brake wear, lowering the frequency and cost of maintenance.

The HybriDrive system design also eliminates the transmission, removing a major maintenance component on vehicles operated in heavy stop-and-go conditions. Electric propulsion provides quick acceleration to help drivers more easily merge into heavy traffic.

HybriDrive propulsion systems benefits

Lower fuel consumption

Reduced operation and maintenance expense

More choices and features, including electric accessories

Fuel cell-ready

Reduced emissions

Quieter operation

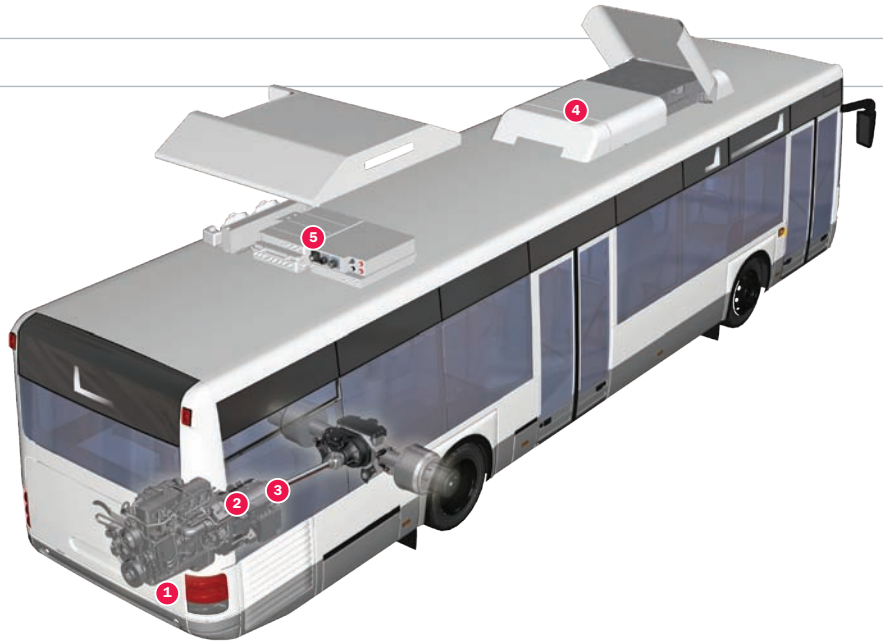
Smoother ride



HybriDrive[®] propulsion systems

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- 1 The **engine** used in this bus is about half the size of the engine used in a typical bus. It runs cleaner on less fuel.
- 2 The **generator** supplies power to the electric traction motor and the energy storage system.
- 3 The **motor** turns the drive wheels, just like in a subway car. That means the bus accelerates smoothly, with no sudden jerks. When the bus slows down, the motor acts as a generator to recapture energy for later use.
- 4 The **energy storage system** provides power during acceleration. The lithium-ion batteries in the HybriDrive propulsion system are lighter, longer-lasting, easier to maintain, less expensive, and more efficient than competing alternatives.
- 5 The **propulsion control system** directs the flow of energy to the right place at the right time. For example, when the bus needs to accelerate quickly, it draws power from the batteries and generator to drive the motor.



System facts and features

	Power	Specifications	Weight/size
Energy storage system	+/- 200kW peak	<ul style="list-style-type: none"> Breakthrough nano-phosphate-based lithium-ion technology High power and charge capacity Lightweight Longer life, with warranty options available Cooled with forced ambient air 	800lbs./364 kg
Propulsion control system	+/- 200kW continuous	<ul style="list-style-type: none"> Selectable acceleration and braking settings Minimal internal interconnects On-board diagnostics SAE 1939 CAN interface 	187lbs./85 kg
Traction motor	160kW (215 hp) continuous 200kW (268xhp) peak	<ul style="list-style-type: none"> Superior acceleration and gradeability Reduced maintenance Flexible for worldwide bus platforms Inherently reliable, with low life-cycle cost Easy installation 	770lbs./350 kg
Integrated starter/generator	200kW (265hp) continuous	<ul style="list-style-type: none"> Quieter start Eliminates starter motor and flywheel Reduced maintenance, parts count, and life-cycle cost Enables electric accessories 	315lbs./143 kg
Engine	280 hp @ 2,300 rpm	<ul style="list-style-type: none"> EPA-compliant; hybrid-certified 	6.7L
Auxiliary power system	28VDC and 208 3-phase AC	<ul style="list-style-type: none"> Eliminates hydraulics, belts, and alternators Reduces maintenance Enables electric accessories Enables engine-off operation and zero-emission mode 	150 lbs.

FOR MORE INFORMATION, CONTACT:

BAE Systems
600 Main Street
Johnson City, New York 13790
Telephone: 607 770 4188
Fax: 607 770 3524
E-mail: platformsolutions@baesystems.com
www.hybridrive.com

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