



H 40 EP™ / H 50 EP™





Allison®
Hybrid

Allison is the world's largest producer of hybrid systems for heavy-duty transit applications.

- ✦ *Over 4,836 Allison Hybrids in operation worldwide*
- ✦ *In 230 cities worldwide*
- ✦ *In 41 of 50 states in the United States*
- ✦ *100,000,000 miles (161,000,000 km) achieved without any end-of-life battery failures*
- ✦ *389,552,125 miles (626,923,375 km) of reliable operation*
- ✦ *20,707,090 gallons (78,384,862 liters) of fuel saved*
- ✦ *204,923 metric tons of CO₂ prevented*
- ✦ *Available from all U.S. heavy-duty bus OEMs*



PROVEN RELIABILITY, DURABILITY AND PERFORMANCE.

A World of Experience

Allison Hybrids have proven to be the most dependable and efficient hybrid systems at work anywhere in the world. Since being introduced in 2003, Allison Hybrid H 40 EP™ and H 50 EP™ equipped buses have traveled over 100 million miles without a single "end-of-life" battery failure. They have saved an estimated 20,707,090 gallons of fuel. And, eliminated over 204,923 metric tons of CO₂. Allison Hybrid EP systems have demonstrated real, bottom-line operating benefits to municipalities and fleet operators.

The Allison Hybrid EP system features a two-mode split parallel architecture – a pure mechanical path and a pure electrical path to achieve the highest energy efficiency. The technology operates automatically as a series or parallel hybrid. The efficiency gains over other technologies enable this system to perform in both transit buses and coaches.

Fuel and Emissions Reduced

When operating with 2010 EPA diesel engines, the Allison Hybrid EP system dramatically reduces both diesel fuel consumption and CO₂ emissions. Typical fuel economy improves 20-30% over similar vintage standard diesel buses. (Results can vary depending on the duty-cycles.)

Regenerative Braking and Savings

When decelerating or stopping, the system converts the vehicle's kinetic energy to stored electric energy. In effect, the motor becomes a generator. Forty percent of the energy to accelerate the bus comes from the braking energy saved.

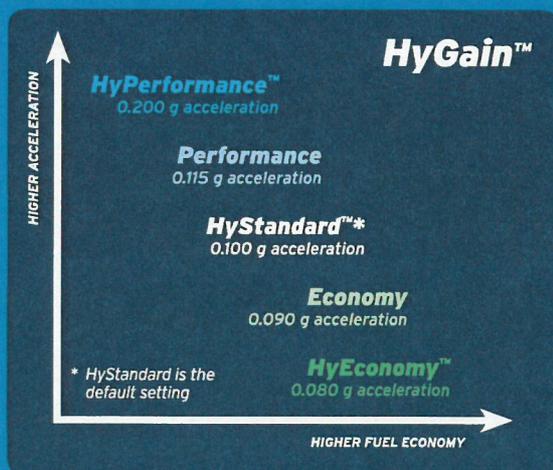
The regenerative braking also saves on brake maintenance costs. Some properties are

experiencing brake life of 170,000 miles with Allison Hybrids as compared to 55,000 miles with a standard bus. For instance, some of King County Metro's 60-foot articulated hybrids deployed in 2004 are still operating with their original brakes.

Fast, Smooth Acceleration

A bus equipped with the Allison Hybrid EP system significantly out-accelerates a similar bus equipped with a conventional drivetrain or an alternative fuel system. And, the acceleration is smooth and seamless. In fact, drivers and passengers prefer Allison Hybrid to standard buses because the ride is so much smoother and more comfortable.

With Allison's **HyGain™** feature, a transit property can adjust the acceleration rate to fit their operating requirements. Adjusting HyGain downward further increases fuel economy.

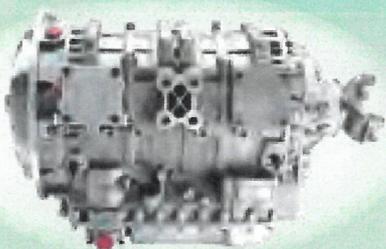


Quiet Operation

The Allison Hybrid EP system helps reduce noise pollution compared to conventional buses. At 79 db @ 10 meters, buses equipped with the system approach the sound level of passenger cars.

EASY INSTALLATION. EASY MAINTENANCE.

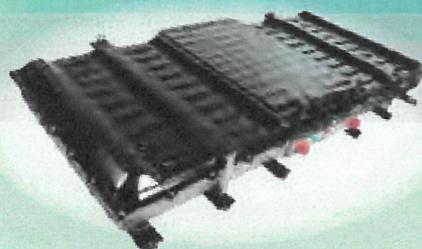
2011 Allison Hybrid EP System Components fit in virtually the same space claim as a conventional drivetrain. This compact package easily installs in T-drive driveline layout. The drive unit was intentionally designed to resemble an Allison Bus Series transmission so maintenance training and repairs are easier. The H 40 EP and H 50 EP share common parts to minimize fleet inventory.



H 40 EP and H 50 EP Drive Unit

Same Proven Form, Fit And Function

- TWO-MODE PARALLEL HYBRID OPERATES AUTOMATICALLY AS A PARALLEL HYBRID OR SERIES HYBRID
- CONTINUOUSLY VARIABLE DRIVE WITH AN INFINITE NUMBER OF RATIOS
- AUTOMATICALLY ADJUSTS RATIOS TO OPERATE AT OPTIMUM POWER CURVES TO ATTAIN BEST PERFORMANCE AND FUEL ECONOMY



ESS2 (Energy Storage System)

The latest Nickel Metal Hydride battery cell technology from PEVE, one of the world's largest manufacturers of proven nickel metal hydride batteries, is utilized in this second-generation unit.

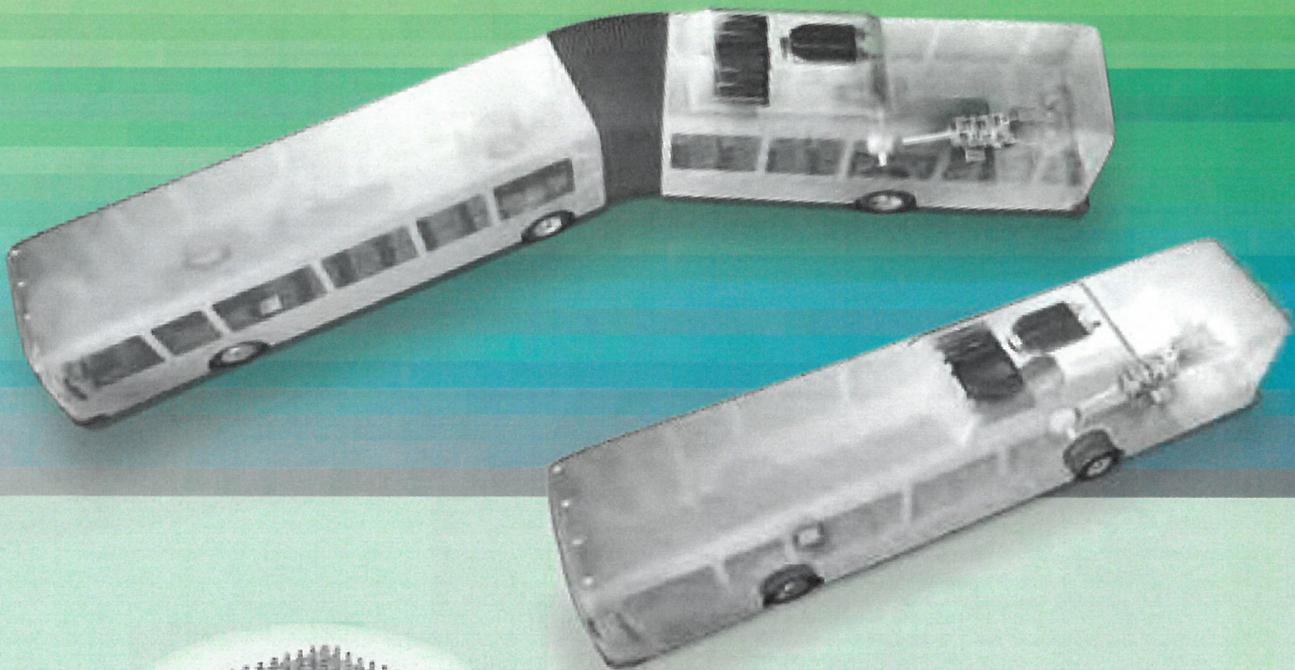
- COMMON, HIGH-CAPACITY HARDWARE TO HANDLE EVERY BUS SIZE
- FIRST GENERATION ESS ACHIEVED OVER 100 MILLION MILES OF REVENUE SERVICE WITHOUT ANY END-OF-LIFE BATTERY CELL FAILURES
- NEW TECHNOLOGY PROVEN DURABLE AND RELIABLE TO AVOID RISKS ASSOCIATED WITH EXPERIMENTAL ENERGY STORAGE DEVICES
- NO SPECIAL HANDLING PERMITS REQUIRED WITH THIS BATTERY CHEMISTRY



DPIM2 (Dual Power Inverter Module)

This second-generation unit features more robust internal hardware with *enhanced redundancy for greater reliability*. Externally, this new unit is fully interchangeable with all prior production units.





Fourth Generation Electronic Controls

The latest commercial high-volume, high-quality controller features common hardware to all the latest Allison transmissions and hybrids.

- GREATER PROCESSING POWER AND MEMORY CAPABILITY
- MEMORY EXPANSION ALLOWS FOR FURTHER TECHNOLOGY EVOLUTION
- FEWER ELECTRICAL CONNECTIONS FOR GREATER SYSTEM DURABILITY AND RELIABILITY
- FULL OPTIMIZATION WITH LATEST ENGINES
- ALLISON HYVALUE™ PERFORMANCE FEATURES HYGAIN™, HYIDLE™ AND HYTRACTION™

HyGain™ allows OEMs and transit properties to adjust bus acceleration to one of five settings. Lowering the setting reduces acceleration and fuel consumption, as well as engine speed and noise.

HyIdle™ provides higher engine idle speeds at stop automatically. The driver is not required to put the drive system into neutral.

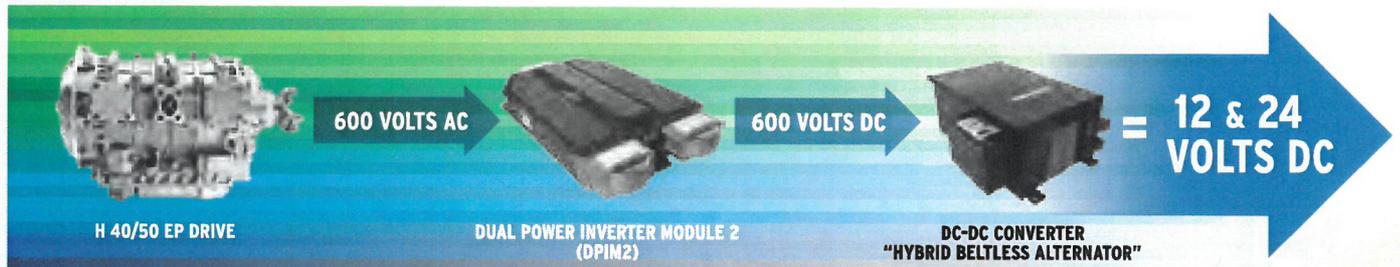
HyTraction™ takes precise control of torque to regain rear wheel traction when it is lost driving in slick conditions, such as ice and snow.

ESS and ESS2 Refresh Kit

With this cost-effective battery cell replacement kit, there is no need to replace the entire system (ESS or ESS2).

- INCLUDES 6-SUBPACK OF LATEST NICKEL METAL HYDRIDE BATTERY CELLS AS USED IN ESS2
- SERVICEABLE FOR ALL ALLISON HYBRID SYSTEMS PRODUCED SINCE 2001, INCLUDING EP40, EP50, H 40 EP AND H 50 EP
- OPTIMUM FOR MID-LIFE BUS REFURBISHMENT

Smart Electrification



Allison has taken the next major technology step with the introduction of DC to DC converter capabilities. A solid-state DC to DC converter eliminates the traditional alternator to provide greater reliability while lowering operational costs and maintenance issues. The converter will not use the ESS2 for any stored energy, thereby maintaining our unequalled hybrid battery life.

DC to DC converters have the nickname of "beltless alternator" since they are solid-state devices that maintain electrical efficiencies of 91-95%. Having such a high electrical efficiency, these converters replace large belt-driven alternators. They do not require any type of mechanical belt drive system and associated maintenance requirements.

The converter powers not only traditional 12/24-volt busloads, but also accommodates the electric radiator,

charge-air-cooling and hybrid drive electric fans. This not only provides better efficiency, it eliminates hydraulic fan drives.

The DC to DC converter has been tested extensively under the extremely hot conditions of Death Valley, California. The system proved to be very robust with no failures.

The following DC-DC converter capabilities are available:

- **250 Amp-at-Idle DC-DC Converter**
(equivalent to some 400 amp belt driven alternators)
- **300 Amp-at-Idle DC-DC Converter**
(equivalent to some 450 and 500 amp belt driven alternators)

Comprehensive Coverage

Our extensive network of over 1,550 authorized Allison Distributors and Dealers worldwide, means convenient, factory-quality Allison service is always close at hand.



New 2011 Model Identification

With Allison Transmission aggressively moving forward with hybrids, not only for buses, but commercial trucks, we decided to adopt new model designations for this family of hybrids.

NEW MODEL	PRIOR MODEL	BUS/COACH
H 40 EP	EP40	29' to 42' transit bus
H 50 EP	EP50	60' to 80' articulated bus or 40' to 45' coach

SPECIFICATIONS

ARTICULATED BUS | SUBURBAN COACH | TRANSIT BUS

Allison H 40 EP and H 50 EP Drive Unit

Physical Characteristics

WEIGHT: 919 LBS (417 KG) DRY, 944 LBS (428 KG) WET

SIZE: 32 (813) L X 17 (432) W X 12 (305) H* IN (MM)

*HEIGHT MEASURED FROM CENTERLINE TO SUMP

Input

Allison H 40 EP Drive Unit - Transit Bus

CONTINUOUS: 280 HP (209 KW)

RATED INPUT TORQUE: 910 LB-FT (1234 NM)

RATED INPUT SPEED: 2300 RPM

Allison H 50 EP Drive Unit - Suburban Coach/Articulated Bus

CONTINUOUS: 330 HP (246 KW)

RATED INPUT TORQUE: 1050 LB-FT (1424 NM)

RATED INPUT SPEED: 2300 RPM

Energy Storage System 2 (ESS2)

FULL REGENERATIVE BRAKING RECOVERY FROM 50 MPH

WEIGHT: 970 LBS (440 KG)

Dual Power Inverter Module 2 (DPIM2)

430-900 VDC 160 KW CONTINUOUS 3-PHASE AC

WEIGHT: 165 LBS (75 KG)

System Controller

ALLISON FOURTH GENERATION ELECTRONIC CONTROLS

WEIGHT: 2.46 LBS (1.12 KG)

Performance

Typical acceleration power with energy storage:

H 40 EP DRIVE UNIT - 350 HP (261 KW)

H 50 EP DRIVE UNIT - 400 HP (298 KW)

Available Engine Options

CUMMINS ISB - 280 HP (209 KW)

CUMMINS ISL - 280 HP (209 KW) OR 330 HP (246 KW)



ALLISON'S TRANSIT HISTORY

In 1947, Allison Transmission revolutionized the transit industry with the introduction of its first bus transmission. Over 60 years later, Allison continues its leadership in the transit and coach industry with a full complement of Allison fully automatic transmissions and hybrid propulsion systems.

Allison's journey in hybrid technology development began in the 1980s and accelerated in 2001 with the pivotal decision to pursue the two-mode split parallel hybrid path. The technology operates automatically as a series or parallel hybrid. The efficiency gains over other technologies enabled this hybrid architecture to perform in transit buses and coaches.

Allison provided 36 preview hybrid bus models to select transit agencies to evaluate and provide critical feedback before we began commercial production. Armed with this field knowledge, Allison began commercial production in October 2003. King County Metro in Seattle, Washington, immediately ordered 213 Allison Hybrid-equipped 60-foot articulated buses for delivery in 2004. Their fleet now has over 300 Allison Hybrid buses providing reliable daily service.

Allison has become the world's largest hybrid producer for heavy-duty transit buses. In 2009, we achieved two major milestones by shipping 1,349 systems in one year and 205 systems in a single month. Allison has now produced and shipped over 4,000 hybrid systems from our dedicated hybrid factory in Indianapolis, Indiana. Allison Hybrids are now released for all North American heavy-duty transit vehicles.

In June 2010, Allison announced an additional \$130,000,000 investment in Allison Hybrid technology for commercial trucks with the dedication of its commercial truck hybrid factory. Soon your service and maintenance trucks can be equipped with trusted Allison Hybrid technology.



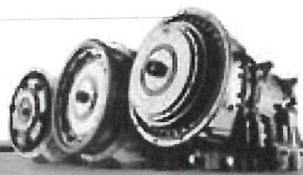
**AVAILABLE IN THE MOST BUSES
AND COACHES WORLDWIDE**

- Alexander Dennis
- APTS
- El Dorado-National
- Gillig
- Iveco/Volgren
- MCI
- NABI
- New Flyer
- Nova
- Optare
- Orion
- Solaris
- SOR

*Experience the future with the most proven
hybrid technology. Choose Allison Hybrid.*

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ALLISON BRAND PROMISE

The Allison Brand Promise is the automatic experience with an unrivaled combination of Quality, Reliability, Durability, Vocational Value, and Customer Service.

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