Lexus RX 400h Made History as Industry's First Hybrid Luxury Utility Vehicle

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The Lexus RX 400h was the first full hybrid luxury-utility vehicle when it was introduced in 2005. The RX hybrid received styling and equipment enhancements for 2008 and carries into 2009 unchanged.

Engine/Transmission/Drivetrain/Performance
The RX 400h hybrid combines the power of a 3.3-liter V6 gasoline engine with that of an electric drive motor to deliver performance on par with some V8-powered luxury SUVs, but with better fuel efficiency. In the all-wheel-drive model only, an additional, rear-mounted electric-drive motor/generator provides on-road, all-wheel-drive capability.

The all-wheel-drive RX 400h's EPA-estimated city/highway rating is 26/24 mpg, with the front-wheel-drive model rated at 27 mpg city/24 mpg highway. The RX 400h achieves Super Ultra Low Emission Vehicle II (SULEV II) certification in California (Tier 2-Bin 3 in other states), producing nearly 70 percent fewer smog-forming emissions than the average new car.

With a combined system output of approximately 268 horsepower, and 3,500 lb.-ft. of axle torque at launch, the RX 400h delivers powerful acceleration. At 7.3 seconds (7.5 for the all-wheel drive model), acceleration from zero to 60 mph is better than some V8-powered competitors. The combination of engine and electric-motor torque makes for particularly impressive 30-50 mph passing power.

The RX 400h is a full hybrid, which means it can operate in electric-only or gas-engine-only modes as well as a mode that combines the power of the gas engine and electric motor. Lexus Hybrid Drive technology allows extended electric-mode operation during low speed or stop-and-go driving conditions, reducing fuel consumption and noise. Energy is stored by a 288-volt DC Nickel Metal Hydride (Ni-MH) battery pack under the rear seat area. The battery's power is directed through a boost converter that efficiently raises voltage to 650V DC. An inverter changes this to 650V AC, providing its elevated power to a front-mounted 123-kW electric motor that turns as high as 12,400 RPM.

The RX 400h front-wheel-drive model's hybrid powertrain employs two motor-generators. Known as MG1 and MG2, each one performs specific functions and each does double duty as a motor and a generator (although MG1 is a starter and provides no motive force). The engine-driven generator (MG1) can charge the battery pack or power other electric motors as needed. The all-wheel-drive RX 400h adds a third motor-generator, MGR, to drive the rear wheels.

Power from the gas engine and front electric drive motor (MG2) is distributed to the drive wheels via a planetary gear-type continuously variable transmission, which eliminates specific gear ratios. Two planetary gear units are used in the system. The Power-Split unit divides the engine's drive force two ways: one to drive the wheels and the other to drive MG1 so it may function as a generator. The Motor Speed Reduction unit reduces the speed of MG2 and increases its drive torque, boosting acceleration performance.

MG2 produces peak torque from zero-to-1,500 rpm, giving the RX 400h powerful and instantaneous response in low- and mid-speed situations. In addition to its motor/generator duties, MG1 also functions as a starter motor for the gas engine and as a regulator for the amount of electrical power it generates. MG1 controls the output speed of the transaxle through the planetary gear set, without clutches or a viscous coupling. This is one of the key elements of the Lexus Hybrid Drive powertrain and is how it eliminates the "shift shock" that is typically felt as even the most refined modern automatic transmissions change gears.

The all-wheel-drive RX 400h model uniquely generates rear-wheel power with a separate 50-kW electric motor (MGR) that provides up to 650 lb.-ft. of additional drive torque on demand. Thus, the RX 400h does not require power-transfer gearing or a driveshaft from the front. The system electronically varies front and rear torque distribution depending on traction conditions.

The power-steering pump, water pump and air-conditioning compressor are driven electrically to reduce fuel consumption and because the gas engine often shuts down – a fuel-saving benefit of the hybrid system – especially when the vehicle is stopped or driven slowly through traffic. A regenerative-braking system further boosts efficiency. When the RX 400h is coasting or its brakes are applied, the electric motors function as generators, capturing kinetic energy that would normally be lost as heat through the brakes and transforming it into useable electricity to recharge the batteries.

Chassis/Body/Suspension/Tires/Brakes
Specific suspension tuning gives the RX 400h sportier handling than the RX 350. For even more responsive handling, standard 17-inch alloy wheels can be replaced with optional 18-inch alloy wheels with 235/55VR18 tires. The compact steering unit contributes to fuel efficiency by eliminating the traditional power-steering pump and by providing computer-controlled assist only when called for by the driver.

The RX 400h was the first Lexus model to feature Vehicle Dynamics Integrated Management (VDIM). This vehicle stability control system goes well beyond conventional controls that simply react to challenging conditions. VDIM continuously calculates vehicle motion based on signals from a yaw rate and deceleration sensor, speed sensor and steering sensor. Using these inputs, VDIM controls all of the vehicle's dynamic handling systems and can employ them collectively and seamlessly. VDIM quickly detects and then helps to correct the onset of a loss of traction in turns.

Electronically Controlled Brakes (ECB) are a vital element of VDIM. This advanced braking system translates brake pedal stroke speed and pressure and generates the precise amount of combined electric regeneration and hydraulic pressure needed for virtually any driving condition. Under guidance from VDIM, such precise brake control at individual wheels helps optimize operation of the vehicle's dynamic handling systems that employ the brakes, including the Anti-lock Braking System (ABS), Brake Assist, Vehicle Stability Control (VSC) and Traction Control (TRAC). VDIM also interfaces with the electric power steering system and the electronic throttle control system, allowing it to control vehicle power when needed.

Safety/Security Features
The RX 400h features the same passive-safety protection for occupants as the RX 350 model. A high-strength cabin design and comprehensive Supplemental Restraint System (SRS) are designed to help provide a high level of crash-energy management for the occupants. The SRS includes advanced front airbags for the driver and passenger, a knee airbag for the driver and front-seat-mounted side airbags. Side-curtain airbags are designed to help offer additional crash energy-management for the front- and rear-seat occupants. A roll sensor signals the side- curtain airbags to inflate if a predetermined threshold of vehicle tip-up is detected.

Luxury/Comfort/Convenience
The RX 400h closely follows the RX 350 in terms of equipment and options. Standard features include dual-zone automatic climate control and 10-way power front seats with memory. The steering wheel features easy-to-use integrated controls for the audio system, trip computer and multi-information display within the speedometer.

Because Lexus luxury also means outstanding convenience, the RX 400h comes equipped as standard with an auto-dimming rearview mirror with an integrated digital compass; auto-dimming, heated exterior mirrors; a power-rear lift gate, and integrated HomeLink® transmitter. Comfort and convenience extend to the smallest details in the RX 400h, such as adjustable lights in the visor vanity mirrors and illuminated front cup holders. A water-repellant surface on the front side windows helps to bead rainwater.

The RX 350's hushed interior provides a superb listening environment for the standard premium, satellite radio-ready, eight-speaker AM/FM/CD audio player with in-dash six-disc CD changer. The system is compatible with MP3/WMA-formatted CDs and is equipped with a digital signal processor, Automatic Sound Levelizer (ASL) and the Radio Data System (RDS).

Luxury Options
The RX 400h can be enhanced by a number of luxury options available separately or in packages. Leather trim is available in several option packages. Other options include power tilt/telescope steering wheel with memory, power tilt/slide moonroof with one-touch open/close feature and jam protection, memory for driver's seat and outside mirrors, towing-preparation package, roof rack and roof rails.

Available High Intensity Discharge (HID) headlamps include the Adaptive Front-lighting System (AFS), which helps to illuminate a turn or curve as the driver steers into it. A rear back-up camera, part of the available navigation package, projects a color image of what the camera lens can detect behind the vehicle onto the navigation screen when reverse gear is engaged. Dynamic Laser Cruise Control measures and helps maintain a set distance from a vehicle traveling ahead.

The Lexus Navigation System with rear back-up camera integrates Bluetooth® wireless capability and voice activation. When combined with a compatible phone, Bluetooth allows the driver to make hands-free phone calls through its touch-screen control panel and to transfer personal phone books to the navigation unit.

The navigation system is offered in an option package with the 11-speaker Mark Levinson® Premium Audio System is available. This audiophile-pleasing system features an in-dash six-disc DVD/CD changer, DVD-audio, and DVD-video playback as well as remarkable sound clarity at all volumes, with 210 watts at 0.1% THD, 20-20,000 Hz. Rear-seat passengers can enjoy the optional rear-seat DVD entertainment system with individual wireless headphones and a large nine-inch LCD screen.

The Lexus Navigation System allows the driver to input a desired destination by voice command while driving. A central VGA screen features a high-resolution 800x480 pixel display in 32,000 colors. On-screen details are crisp and clean, and maps and roads include 3D shadow effects. Text-display choices include English, Spanish and French, and the user can select the language preference at system start-up. System functions include multiple route calculation, route preview, simplified highway-junction graphics and a dual-map screen mode. The DVD map database contains more than five million points of interest. The database for Chicago, Detroit, Los Angeles, and New York includes a "building footprint" display feature that can show graphic representations of buildings and structures to help the driver identify surroundings.

Exterior Design
Visually, the RX 400h differs from the conventionally powered RX 350 model in subtle ways. The RX 400h features a unique grille design, a different front fascia with additional air intake and round fog lamps, and Light Emitting Diode (LED) tail lamps. The blue badge color is a consistent feature on all Lexus hybrid models. A body-color rear-gate spoiler adds a sporty styling touch.

Interior Design
Lexus craftsmanship and renowned attention to detail provide true luxury by design. In addition to the standard brushed aluminum interior accents, customers can also specify wood trim with any interior color. In the RX 400h, in place of a tachometer, a power meter displays the level of power generated by the hybrid powertrain. The driver can also monitor the gas-electric power distribution on the multi-information display or on the optional navigation system's seven-inch touch panel display screen.

The RX 400h does not sacrifice space, comfort or versatility to deliver the benefits of hybrid technology. The rear seatbacks feature a versatile 40/20/40-split design, and the seats offer both sliding and reclining adjustments. The rear cargo area measures the same as in the

gas-only RX 350 model: 38.3 cubic feet expandable to 84.7 cubic feet with the rear seatbacks folded down. An automatic retracting tonneau cover adds a measure of security and convenience to the cargo area.

Warranty
All new Lexus vehicles come with a 48-month/50,000-mile basic limited warranty with roadside assistance for 48-months/unlimited miles. Powertrain and restraint system coverage is provided for 72 months/70,000 miles. Corrosion perforation protection is covered for 72 months, regardless of mileage. The hybrid-related components, including the HV battery, battery control module, hybrid control module and inverter with converter, are covered for eight years/100,000 miles.

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