

Lexus CT 200h Dynamic Package

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CHAPTER 3: DYNAMIC PACKAGE

- Combines agility and stability with a comfortable and supple ride
- First Lexus with front and rear lateral performance damper system for minimization of body vibrations and improved dynamics.
- Sporty, highly focused, ergonomic driving position
- EV, ECO and NORMAL drive modes for Relaxing driving
- SPORT drive mode for Dynamic driving with enhanced acceleration and agility
- All-new, fully independent double wishbone rear suspension for superior ride comfort and handling, tuned MacPherson strut front suspension
- Precise Electric Power Steering for enhanced driver feedback and rewarding driving dynamics
- Extensively developed aerodynamics enhance stability, handling and ride comfort

The new CT 200h has been specifically developed to combine superior handling and a rewarding driving experience with the ride comfort expected of any Lexus.

The CT 200h benefits from a highly modified existing platform incorporating numerous, exclusively developed body, chassis and Lexus Hybrid Drive powertrain control system engineering applications designed to offer customers a choice of two distinct driving moods – Dynamic, or Relaxing – in conjunction with the full hybrid's EV, ECO, NORMAL and SPORT, 'on-demand' drive modes.

Focusing on every aspect of the CT 200h's bodyshell construction, Lexus engineers have developed both Dynamic and Relaxing driving moods through a low center of gravity, the optimization of the body rigidity, and the reduction of NVH levels.

Introduced for the first time on a Lexus, a unique lateral performance damper system has been designed to absorb and minimize body vibrations to offer a more linear steering feel and further enhanced ride comfort.

Setting a new benchmark in premium compact segment ride comfort and handling, the Lexus CT 200h features a bespoke suspension design which combines a MacPherson strut front system with a new, fully independent double wishbone rear suspension.

High Body Rigidity

Particular attention has been paid to promoting superior handling stability through the structural rigidity of the bodyshell. The CT 200h's torsional stiffness has been enhanced throughout by the optimization of weld points.

Underbody rigidity is maximized through the application of front and rear suspension member bracing, and high-rigidity front floor brace, HV battery carrier and rear lower support members.

The steering wheel mounts, steering gearbox mount, steering column assembly and suspension members have all been reinforced in the interests of maximum rigidity. The front suspension towers are connected by a straight front cowl reinforcement and a network of bracing connects the front suspension towers, front cowl and front pillars. The front engine mounts feature unique lateral stabilizers, and vibration in the exhaust system main muffler has been minimized.

Torsional rigidity has also been enhanced in the upper body through the use of a fully closed cross-section around the entire circumference of the back door opening, reinforcement on the backside of the rear side member and the application of an inner gusset and outer reinforcement to the rear wheel housings.

Lateral Performance Damper System

Because any high rigidity body has a tendency to transmit vibrations, the CT 200h also features front and rear lateral performance damping system designed to absorb and minimize undesirable body vibrations, offering a more linear steering feel while improving handling and ride comfort.

In lieu of conventional fixed bracing, this system features a front performance damper connecting the left and right front suspension towers, and a rear damper connecting the left and right sides of the rear structural frame.

With construction similar to that of a typical monotube suspension damper, the front and rear performance damper assemblies differ according to the variations in body rigidity, noise and vibration of their surroundings, optimizing their ability to absorb body torsion, flexure and fine vibrations.

Their installation has reduced vehicle floor vibrations across a wide frequency range, reduced body flex in left and right front suspension tower displacement, and even lowered audio system white noise levels.

Lightweight Body Design with Low Center of Gravity

Offering superior dynamic abilities, numerous measures have been adopted to ensure the CT 200h has a low center of gravity and moment of inertia. The bodysell features a long, 102.4-inch wheelbase with short front and rear overhangs, in which occupants sit as close to the center as possible to reduce the moment of inertia.

In order to minimize the yaw inertia moment and improve the CT 200h's agility, bodywork components most distant from the vehicle's center of gravity have been designed to be lightweight.. As a result, the hood, tailgate and bumper reinforcements have been fabricated in aluminum.

Overall vehicle height, ride height and the driver's hip point have been set low.. And the hybrid battery has been located under the loadspace floor yet within the wheelbase, optimizing weight distribution and balance. Further lowering the center of gravity while also maximizing fuel efficiency by minimizing weight, the body itself incorporates not only aluminum, but also a high percentage of lightweight, high tensile steel.

Low, Highly Focused Driving Position

Key to the new premium compact full hybrid's sporty driving experience is its highly focused driver's environment. It features an optimized seating position which combines a low hip point height with enhanced lateral and lumbar support.

Support wires have been built into the seat side bolsters to improve lateral holding performance, and lumbar support may be power adjusted through a 1.2-inch range. The front edge of the base cushion has been shaped to provide a large contact area, reducing fatigue on long drives, and the cover incorporates a support pleat to better coordinate the motion of the driver's body with the vehicle.

The driver further benefits from a sporty, 14.6-inch diameter, wide-grip wheel with a lowered, 21 degree steering angle, accelerator and brake pedal angles optimized to suit the low hip point, and a driver-focused instrument panel housing three large, high-visibility dials.

Helping to maximize forward visibility, the hood has also been lowered in conjunction with the hip point. In order to maintain the appropriate spacing between hood and engine componentry for optimum frontal impact performance, this, in turn, required the design of a completely new air intake system unique to the CT 200h.

Drive Mode Select Switch

Supplementing the NORMAL drive mode of the new Lexus, three 'on-demand' drive modes may be selected via the Drive Mode Select switch, adapting the CT 200h to either a Dynamic or Relaxing driving mood, while further improving either performance and dynamic ability, or driving efficiency, fuel economy and emissions.

EV, ECO and NORMAL drive modes place the emphasis on a Relaxing driving mood, with particular attention paid to ride comfort, smooth acceleration and the minimization of NVH within the body, chassis and powertrain.

From start-up, at speeds of less than 28 mph and up to a mile, the CT 200h can automatically operate in EV mode, driving under electric motor power alone.

The driver may also select EV mode manually. This unique driving mode is not available to drivers of mild hybrid vehicles, requiring the full hybrid technology of Lexus Hybrid Drive.

With vehicle range dictated by battery charge, the EV drive mode allows for relaxing urban driving with minimal noise, and zero NOx and particulate emissions, for up to one mile. Because the gas engine is switched off throughout its operation, the EV drive mode contributes to a significant reduction in the new Lexus' overall fuel consumption.

In ECO mode, throttle response to aggressive accelerator pedal inputs is reduced and air-conditioning control optimized for improved fuel economy. Depending on driving conditions, the ECO mode can help customers adopt a relaxed driving style, and can achieve a perceptible reduction in fuel consumption.

Specifically tuned to deliver greater electric motor power, SPORT mode focuses on a Dynamic driving mood, maximizing the new CT 200h's performance and agility. Engine revs are held higher, and throttle and Electric Power Steering (EPS) settings are modified to give a faster response to driver inputs.

In addition, SPORT mode provides less intrusive operation of the Vehicle Stability Control (VSC) and Traction Control (TRAC) systems, allowing experienced drivers to fully utilize the new Lexus full hybrid's extended dynamic abilities.

The highly distinct character of both the CT 200h's Dynamic and Relaxing driving moods is further reinforced through changes to the driver's instruments synchronized to driving mode selection. Backlit in hybrid blue for the EV, ECO and normal drive modes, the instrument panel illumination, Drive Mode Select switch and a spotlight in the center cluster automatically alter to red when the SPORT mode is selected. Simultaneously, the hybrid power indicator function alters to that of tachometer.

Suspension

The Lexus CT 200h features a bespoke suspension design which combines a MacPherson strut front system with a fully independent double wishbone rear suspension.

Unsprung weight has been minimized and shock absorber damping response enhanced through the use of aluminum steering knuckles and stabilizer links, and lightweight lower arms, hub bearings and shock absorbers.

The shock absorbers themselves feature low friction valves, seals and oil, further improving damping response. The adoption of lateral force control coil springs also reduces suspension friction, enhancing ride comfort. And the steering gearbox mounts are connected directly to the front suspension member, ensuring a linear steering feel and enhancing the CT 200h's straight line stability.

The lightweight, large diameter, front anti-sway bar improves the controllability, braking stability and evasive maneuverability of the CT 200h. It features a ball joint link strut connection for good sway rigidity, and a fluorine resin coating between the bushings and the bar itself reduces friction and further enhances ride quality.

A fully independent double wishbone rear suspension incorporates a lightweight trailing arm, and positions the coil spring and shock absorber separately to minimize system intrusion into the loadspace floor. Suspension geometry including camber angle, toe angle and arm layout has been optimized for handling stability and ride comfort.

As with the front suspension, the shock absorbers incorporate low friction valves, seals and oil to improve damping response. Rebound springs have been adopted to optimize lean posture when cornering, and urethane bump stops combine excellent sway rigidity with ride comfort. Low resistance rear axle hub bearings are used to help improve fuel economy, and a resin aerodynamic cover has been fitted to the front of the number two lower arm to help direct underbody air flow, enhancing both handling stability and fuel economy.

The rear anti-sway bar bushings feature resin spacers at the bushings and optimized rubber characteristics for greater support and stiffness and, as with the front suspension, a fluorine resin coating between the bushings and the bar itself reduces friction and further enhances ride quality.

These front and rear suspension systems compliment the new CT 200h's two distinct driving moods, combining excellent ride comfort essential to a Relaxing driving mood with the handling agility and stability appropriate to a Dynamic driving mood.

Electric Power Steering (EPS)

The CT200h is equipped with Electric Power Steering (EPS). Its energy saving and lightweight design characteristics make it ideally suited for use in conjunction with the Lexus Hybrid Drive powertrain. With a quick ratio of 14.6:1 and just 2.7 turns lock-to-lock, the CT 200h's speed-sensitive EPS is also the most direct steering in the Lexus model range.

Powered by the 202V hybrid battery, EPS improves fuel economy by consuming power only when steering force assistance is needed. It is highly durable and requires no hydraulic fluid.

The EPS' compact, high output motor and torque sensor are built into the steering column, optimizing steering assistance for more precise control of the vehicle. Steering precision is further improved through the mounting of the gearbox directly to the suspension subframe for greater installation rigidity, whilst the high rigidity of both the steering column and support bracket promotes enhanced driver feedback and a more linear steering feel.

When SPORT drive mode is selected, the EPS is modified to provide sportier driving dynamics. The system automatically governs the amount of steering assistance to offer more direct steering feedback and a more involving driving experience.

Aerodynamics

With the benefits of extensive Computer Aided Design and wind tunnel testing, particular attention has been paid to the aerodynamic efficiency of the CT 200h. A resultant, drag coefficient (C_d) of just 0.29 not only improves fuel efficiency, but also significantly enhances high speed stability, handling and ride comfort.

Every aspect of the CT 200h's upper bodywork has been painstakingly detailed for superb airflow management. The deep front bumper, sharply sculpted front air dam, optimized bumper corner angles and LFA-style door mirrors have been designed to smooth airflow over the front and down the sides of the vehicle, minimizing wheel arch turbulence.

The flow of air away from the rear of the CT 200h is carefully controlled through tapered cabin sides, a deep roof spoiler, aerodynamic fins at the corners of the rear windows and the sharp, near-vertical junction of rear wing and bumper.

Equal attention has been paid to underbody airflow management, the minimization of the vehicle's coefficient of lift essential to both fuel efficiency and handling stability.

Numerous aerodynamic underbody elements include a front lower absorber, engine under cover and wheel arch spats, a rear engine undercover, center floor under covers, rocker mouldings, tank side and rear floor under covers and rear wheel arch spats. In addition, diffuser fins have been added to the front under cover, and even the installation of the main exhaust muffler and the shape of the rear bumper cover have been optimized to create the smoothest possible underbody airflow.

NVH

The CT 200h benefits from a variety of measures designed to minimize wind and road noise, resulting in an outstandingly quiet cabin environment.

Sound absorbing and insulating materials have been comprehensively incorporated within the engine compartment, firewall, floor panel and cabin construction. Front wing side protectors prevent both road and engine noise entering the cabin, and wheel arch liners further inhibit the ingress of road noise.

Sealant and urethane foam has been used to fill bodyshell holes created during construction, and foam-based sound insulating materials have been positioned throughout the body -including all cabin pillars and the door sill and head sections- to minimize the transmission of noise through the bodyshell.

A damping channel has been adopted on the beltline of each door window, increasing the rigidity of the glass and strengthening the window's seal to reduce road noise penetration. A dynamic damper inside the tailgate panel reduces booming to further enhance cabin quietness.

A drag coefficient of only 0.29 minimizes wind noise from the CT 200h's body. Further wind noise reduction measures include the adoption of a sound insulating, acoustic windshield featuring an inner layer of film. The rear edge of the hood has been shaped to minimize turbulence generated by air flow over the wipers. The step between the windshield and both the roof and the side rain gutter mouldings has also been minimized to reduce wind noise. A seal positioned in the center pillar gap between the front and rear doors smoothes the flow of air down the sides of the body.