

## **TOYOTA AND LEXUS EXPAND DRIVING FUN AND SECURITY WITH NEW VEHICLE DYNAMICS INTEGRATED MANAGEMENT SYSTEM**

In 2005, the 2006 Toyota Highlander Hybrid opened a window to the future of advanced handling and stability technology with its introduction of the Vehicle Dynamics Integrated Management system (VDIM). Through the intelligent use of the latest technology, VDIM helps to improve handling and driving pleasure, in some of the most challenging conditions. VDIM is standard equipment on most Lexus models and the Toyota Camry Hybrid, and Toyota Highlander Hybrid.

VDIM enhances handling, traction and braking systems that normally react to vehicle driving conditions by anticipating tire slippage before a skid, slide or wheel spin occurs and making corrections in a smooth, progressive way. This ability, coupled with tight integration of all dynamic systems, makes VDIM feel transparent to the driver and driving more enjoyable.

To do this, VDIM uses an active control strategy that takes its cues from a comprehensive range of sensors including steering angle, yaw rate, deceleration, brake pressure, brake pedal stroke, wheel speed and others. Their signals are used individually by the various traction control systems and collectively by VDIM. Data are gathered from more sources and processed rapidly, helping to make VDIM less obtrusive yet highly effective.

These proven systems include Vehicle Stability Control (VSC), Traction Control (TRC), Brake Assist (BA), Anti-Lock Brakes (ABS) and Electronic Throttle Control with intelligence (ETC-i). In addition, two important technologies are employed: Electric Power Steering (EPS) and Electronically Controlled Brakes (ECB). VDIM then integrates all of these elements with powerful proprietary software to help seamlessly manage the total vehicle dynamic package.

ECB is one of the key technologies that make VDIM possible. It's a "brake-by-wire" system that translates brake pedal pressure into electric signals that, via computer control, help provide precise and optimized braking control in virtually any traction condition. The ECB system is also backed by conventional hydraulic brake control in the unlikely event of electronic failure. ECB's electronic control provides quick brake response when needed, which helps VDIM anticipate and assist in correcting skids before they happen.

VDIM also influences Variable Gear Ratio Steering (VGRS) on some Lexus models to affect minor steering corrections when needed. VGRS in the LS 600h L, GS 460 and GS 450h models electronically adjusts the steering ratio according to vehicle speed.

### **VGRS Adds New Dimensions to Lexus**

In this application (on GS 460, GS 450h, LS 460 L and LS 600h L), VGRS is a further development of the technology introduced on the Lexus LX 470. VGRS provides several benefits, including active steering, that helps enhance driving feel in lane changes and other transitional maneuvers.

First, it provides a relatively quick steering ratio in very low speed conditions, which notably improves maneuverability for parking and similar situations. From low to medium speeds the steering ratio progressively slows to levels more appropriate for driver comfort in city driving. In higher speed conditions such as freeway driving, the steering ratio is reduced even further to help provide a more secure and comfortable feel for the driver.

Another important function of VGRS is called “differential steering control” which helps the steering system correct for a slight delay in steering response—something that occurs in all vehicles.

Perhaps most important, in difficult driving conditions VGRS interacts with other systems via VDIM to actively and automatically apply subtle changes in steering angle ratio and effort in order to assist the driver in maintaining smooth control, even in side winds, all while remaining virtually transparent to the driver.

### **Electronic Assist = Steering Feel With Intelligence**

EPS is yet another steering development that contributes to driving feel and controllability in most Lexus vehicles, the Toyota Prius and Toyota Highlander Hybrid. Rather than using the purely passive hydraulic assist found in conventional power steering systems, EPS uses precise electronic assist via the built-in DC motor in the steering gear housing.

The assist is computer controlled to help provide comfortable and controllable levels of steering effort in most driving situations. With VDIM interaction, the amount of assist can be instantly varied for the conditions at hand.

By eliminating the engine-driven hydraulic pump, EPS also helps reduce fuel consumption. The simplified steering gear is lighter and more compact than conventional power steering systems as it is stripped of the usual hydraulic system of pump, hoses, pipes and fluid.

With all of the traction control technologies working together under the VDIM “umbrella,” handling smoothness is dramatically enhanced. Whether driving through town or enthusiastically on a winding road, the VDIM system works constantly and seamlessly to help maintain comfort and driving balance, without spoiling the fun.

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