

Electronic Active Stabilizer Suspension System Development & Realization

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1. Overview

Vehicle maneuverability, stability, and ride comfort often contradict one another. For example, it is difficult to achieve sports-car handling and soft riding comfort as with air suspension at the same time. Therefore, the eternal struggle of chassis developers is to satisfy the contradictory functions. In order to achieve the objective as much as possible, we developed a powerful active stabilizer actuator (Called electronic actuator), which reduces the roll angle by 50% when turning. As a result, vehicle maneuverability and stability are improved. In addition, the electronic actuator rotates on rough roads so that the apparent spring constant is reduced with ride comfort improvement.

Figure 1 shows the system configuration layout diagram of the system.

2. Technical Contents

We installed an electronic actuator that generates anti-roll moment and a control unit (Called ECU) to control the electronic actuator in the front and rear of the vehicle. The ECU determines the target output for the front and rear based on the information from various sensors that detect the condition and driving status of the vehicle including the speed and steering angle in order to control the electronic actuator. **Figure 2** shows the cross-sectional diagram of the electronic actuator. The electronic actuator mainly consists of an electric motor, reduction gears, and stabilizer bar. The electric motor rotates based on the command of the ECU, and the rotation can be slowed using gears. Then the rotation transferred to the stabilizer. As a result, the vehicle turning roll angle is reduced as shown in **Figure 3**. **Figure 4** shows the evaluation results from actual vehicle test. As shown in the pictures, the vehicle turning roll angle was reduced by 50%, and the driver's visual lines were minimized. This made it possible to achieve greater driving stability. We were also able to save energy by using electronic power-on-demand control.

3. Conclusion

In August 2005, The Electronic Active Stabilizer Suspension System was installed for the first time on a mass produced vehicle in the Lexus GS Series. We have been continuing to develop the system in North America and Europe.

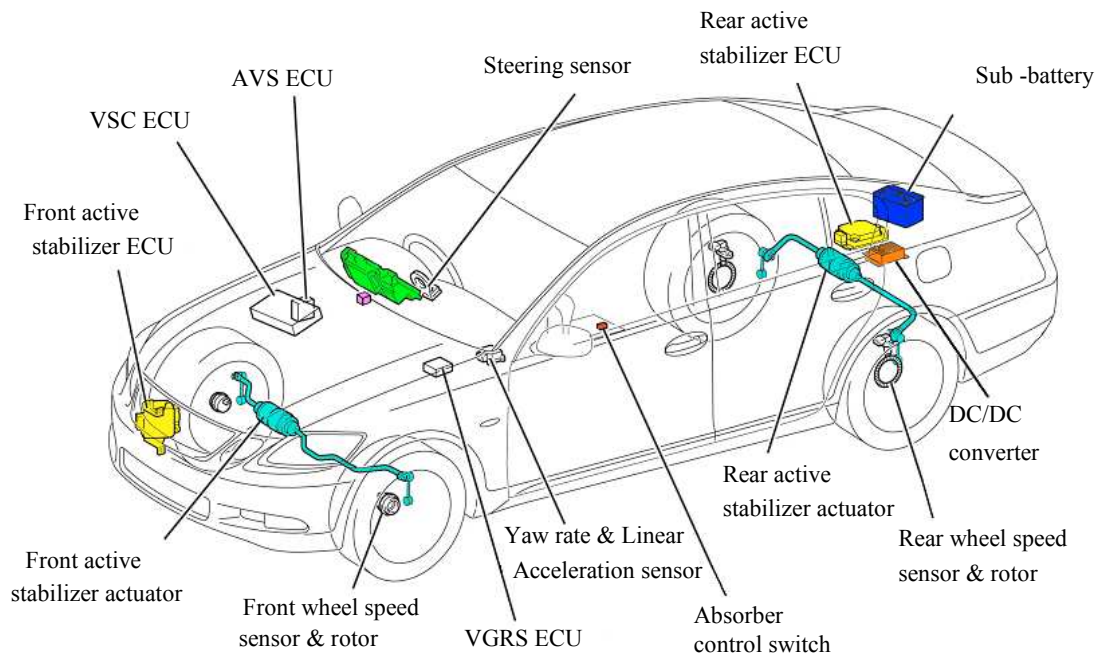


Figure 1. System Configuration Layout Drawing

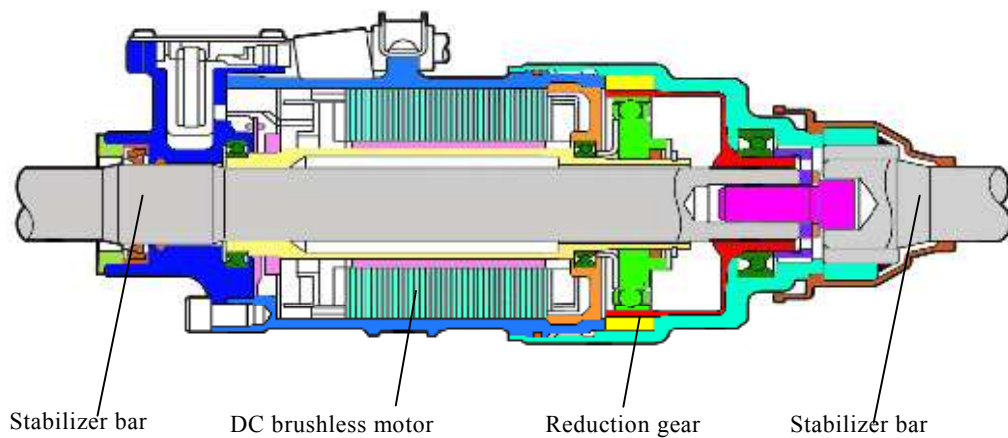


Figure 2. Cross-Section of the Electronic Actuator

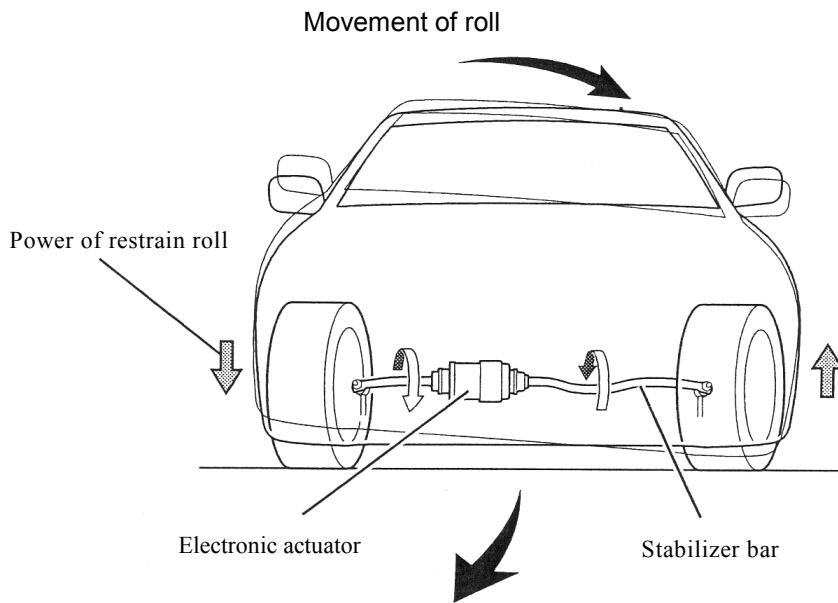


Figure 3. Roll Suppression Mechanism



With normal stabilizer



With electric stabilizer

Figure 4. Stability Control Efficiency