

Fig. 8. Steering sensor.

TABLE II
MOTOR CHARACTERISTICS

Item	Specification
Rated voltage	12V
Rated torque	0.7N·m
Rated speed	2250rpm
Rated current	20A
Starting torque	Min. 2.9N·m

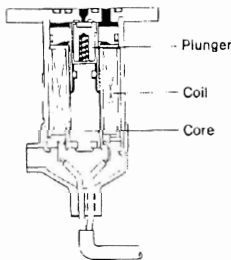


Fig. 9. Height control valve.

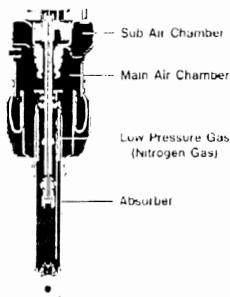
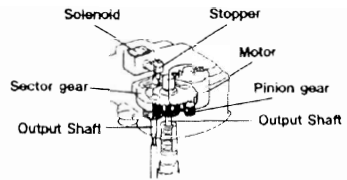
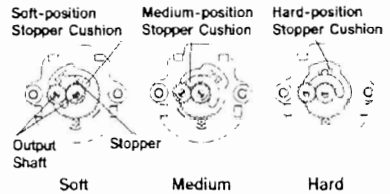


Fig. 10. Air spring and shock absorber unit.



Construction



Operation

Fig. 11. Spring rate and damping force control actuator

To simplify the construction, the actuator is driven by energizing the motor for a predetermined period and is stopped by the stopper before power supply to the motor is cut off. The stopper operates at three positions. Two of these three positions determine the stroke ends of the motor rotation in each direction while the solenoid is not energized. The remaining position is the middle position between these stroke ends, which is effective when the solenoid is energized.

Since the valve operation is controlled by controlling the length of power application period to the actuator, it is necessary to apply power to the actuator for a period longer than the valve response time to drive the valve up to the required position. However, the response time of the valve varies according to voltage applied as shown in Fig. 12. If the power application period is made longer than the response time at the lower limit of the voltage applied, such a problem can be cleared. But such a solution will bring another problem in that the allowable maximum drive frequency must be reduced if the power application period per cycle is made longer since motors have a maximum allowable power application duty due to thermal restrictions. To eliminate the occurrence of problems due to long power application time, the actuator drive time is broken into two steps depending on power supply voltage.

Response time in normal operation conditions is approximately 70 ms, which will not cause problems for predictive control (to be discussed later).

IV CONTROL

A. Control Mode

Although suspension characteristics are automatically adjusted to meet vehicle travelling conditions, optimum characteristics will differ depending on drivers' preference. To cope with this, the mode select switch is provided to allow the drivers to select the required control mode from the four

chamber and is constructed to drive the two rotary valves using a single motor. A dc motor using a rare earth magnet to provide the magnetic field is used. To reduce the size of the motor Motor output speed is reduced by a pinion gear and a sector gear to drive the two output shafts.