

VEHICLE SPEED CONTROL SYSTEM

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DESCRIPTION AND OPERATION

SPEED CONTROL SYSTEM

OPERATION

The speed control system is electronically controlled and vacuum operated. The electronic control is integrated into the Powertrain Control Module which is located in the engine compartment. The controls are located on the steering wheel and consist of five switches. The ON, OFF and SET buttons are located on the left side of the airbag module. The RESUME, ACCEL, COAST and CANCEL buttons are located on the right side of the airbag module (Fig. 1).

The system is designed to operate at speeds above 25 mph (40 km/h).

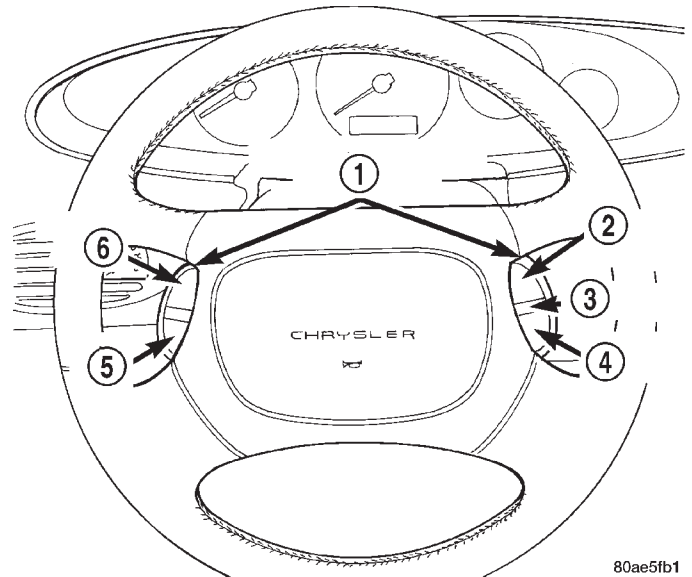
WARNING: THE USE OF SPEED CONTROL IS NOT RECOMMENDED WHEN DRIVING CONDITIONS DO NOT PERMIT MAINTAINING A CONSTANT SPEED, SUCH AS IN HEAVY TRAFFIC OR ON ROADS THAT ARE WINDING, ICY, SNOW COVERED, OR SLIPPERY.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

The speed control can be disengaged also by any of the following conditions:

- An indication of Park or Neutral
- The VSS signal increases at a rate of 10 mph per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
 - Depressing the clutch pedal.
 - Excessive engine rpm (indicates that the transmission may be in a low gear)



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Fig. 1 Speed Control Switch

- 1 - SPEED CONTROL SWITCHES
- 2 - RES ACCEL
- 3 - CANCEL
- 4 - COAST
- 5 - SET
- 6 - ON/OFF

- The VSS signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

- If the actual speed is not within 20 mph of the set speed

The previous disengagement conditions are programmed for added safety.

DESCRIPTION AND OPERATION (Continued)

SPEED CONTROL SERVO-PCM OUTPUT

DESCRIPTION

The servo unit consists of a solenoid valve body, and a vacuum chamber. The solenoid valve body contains three solenoids:

- Vacuum
- Vent
- Dump

The vacuum chamber contains a diaphragm with a cable attached to control the throttle linkage.

OPERATION

The PCM controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

Power is supplied to the servo's by the PCM through the brake switch. The PCM controls the ground path for the vacuum and vent solenoids.

The dump solenoid is energized anytime it receives power. If power to the dump solenoid is interrupted, the solenoid dumps vacuum in the servo. This provides a safety backup to the vent and vacuum solenoids.

The vacuum and vent solenoids must be grounded at the PCM to operate. When the PCM grounds the vacuum servo solenoid, the solenoid allows vacuum to enter the servo and pull open the throttle plate using the cable. When the PCM breaks the ground, the solenoid closes and no more vacuum is allowed to enter the servo. The PCM also operates the vent solenoid via ground. The vent solenoid opens and closes a passage to bleed or hold vacuum in the servo as required.

The PCM duty cycles the vacuum and vent solenoids to maintain the set speed, or to accelerate and decelerate the vehicle. To increase throttle opening, the PCM grounds the vacuum and vent solenoids. To decrease throttle opening, the PCM removes the grounds from the vacuum and vent solenoids. When the brake is released, if vehicle speed exceeds 25 mph to resume, 30 mph to set, and the RES/ACCEL switch has been depressed, ground for the vent and vacuum circuits is restored.

SPEED CONTROL SWITCHES—PCM INPUT

Description

There are two separate switch pods that operate the speed control system. The steering-wheel-mounted switches use multiplexed circuits to provide inputs to the PCM for ON, OFF, RESUME, ACCELERATE, SET, DECEL and CANCEL modes. Refer to

the owner's manual for more information on speed control switch functions and setting procedures.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

Operation

When speed control is selected by depressing the ON, OFF switch, the PCM allows a set speed to be stored in RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between 25 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

Once the speed control has been disengaged, depressing the ACCEL switch restores the vehicle to the target speed that was stored in the PCM's RAM.

NOTE: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the RAM when the ACCEL switch is released. The PCM also has a "tap-up" feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the COAST switch until the desired speed is reached. Then release the switch. The ON, OFF switch operates two components: the PCM's ON, OFF input, and the battery voltage to the brake switch, which powers the speed control servo.

Multiplexing

The PCM sends out 5 volts through a fixed resistor and monitors the voltage change between the fixed resistor and the switches. If none of the switches are depressed, the PCM will measure 5 volts at the sensor point (open circuit). If a switch with no resistor is closed, the PCM will measure 0 volts (grounded circuit). Now, if a resistor is added to a switch, then the PCM will measure some voltage proportional to the size of the resistor. By adding a different resistor to each switch, the PCM will see a different voltage depending on which switch is pushed.

DESCRIPTION AND OPERATION (Continued)

On most vehicles another resistor has been added to the at rest circuit causing the PCM to never see 5 volts. This was done for diagnostic purposes. If the switch circuit should open (bad connection) then the PCM will see the 5 volts and know the circuit is bad. The PCM will then set an open circuit fault.

STOP LAMP SWITCH**DESCRIPTION**

The switch is mounted on the brake pedal mounting bracket under the instrument panel.

OPERATION

Vehicles equipped with the speed control option use a dual function stop lamp switch. The PCM monitors the state of the dual function stop lamp switch. Refer to the Brake section for more information on stop lamp switch service and adjustment procedures.

The brake switch is equipped with three sets of contacts, one normally open and the other two normally closed (brakes disengaged). The PCM sends a 12 volt signal to one of the normally closed contacts in the brake switch, which is connected to a ground. With the contacts closed, the 12 volt signal is pulled to ground causing the signal to go low. The low voltage signal, monitored by the PCM, indicates that the brakes are not applied. When the brakes are applied, the contacts open, causing the PCM's output voltage to go high, disengaging the speed control also grounding the dump solenoid.

The second set of normally closed contacts is supplied battery voltage any time speed control is selected. From the brake switch, current is routed to the speed control servo solenoids. The speed control solenoids (vacuum, vent and dump) are provided this current any time the speed control is ON and the brakes are disengaged. When the driver applies the brakes, the contacts open and current is interrupted to the solenoids. The normally open contacts are fed battery voltage. When the brakes are applied, battery voltage is supplied to the stop lamps.

SERVO CABLE**DESCRIPTION**

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage.

OPERATION

This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

VACUUM RESERVOIR**OPERATION**

The reservoir stores engine vacuum in the reservoir. When engine vacuum drops, as in climbing a grade while driving, the reservoir supplies the vacuum needed to maintain proper speed control operation. The vacuum reservoir cannot be repaired and must be replaced if faulty.

VEHICLE SPEED SENSOR

The Vehicle Speed Sensor (VSS) is a pulse generator mounted to an adapter near the transmission output shaft. The sensor is driven through the adapter by a speedometer pinion gear. The VSS pulse signal to the speedometer/odometer is monitored by the PCM speed control circuitry to determine vehicle speed and to maintain speed control set speed.

REMOVAL AND INSTALLATION**SPEED CONTROL SERVO****REMOVAL**

- (1) Disconnect electrical connector from servo (Fig. 2).
- (2) Disconnect vacuum hose from servo
- (3) Remove 2 nuts retaining cable to servo.
- (4) Remove retaining clip pin holding cable to servo.

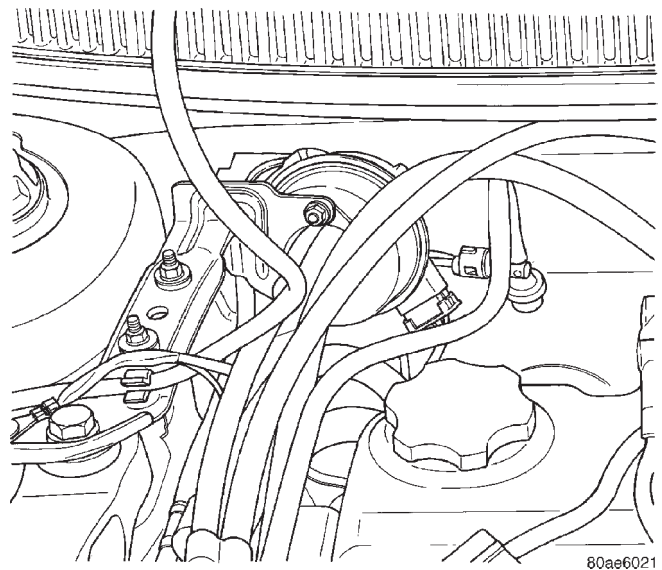


Fig. 2 Speed Control Servo

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

- (1) Install retaining clip to cable at servo.
- (2) Install 2 nuts at cable to servo and servo bracket, tighten to 7 N·m (60 ins. lbs.).
- (3) Connect electrical connector to servo.
- (4) Connect vacuum hose to servo

SPEED CONTROL SWITCH

The speed control switches are mounted in the steering wheel and wired through the clock spring device under the airbag module (Fig. 1).

WARNING: IF REMOVAL OF AIRBAG MODULE IS NECESSARY, REFER TO THE RESTRAINT SYSTEMS.

REMOVAL

- (1) Turn off ignition.
- (2) Remove two screws from side of each switch.
- (3) Rock switch away from airbag and steering wheel.
- (4) Disconnect two-way electrical connector.
- (5) Repeat for the other switch.

INSTALLATION

- (1) Install switches.
- (2) Connect two-way electrical connector.
- (3) Install two screws to the side of each switch.
- (4) Install airbag, refer to the Restraint Systems

SPEED CONTROL SERVO CABLE**REMOVAL**

- (1) Disconnect the negative battery cable.
- (2) Remove the throttle cable cover.
- (3) Remove speed control cable from throttle lever by sliding clasp out of the hole (Fig. 4).
- (4) Lift the retaining tab on the throttle cable and slide cable out of bracket. Lift the retaining tab on the speed control cable and slide cable out of bracket.
- (5) Disconnect electrical connector from servo.
- (6) Disconnect vacuum hose from servo
- (7) Remove 2 nuts retaining bracket to servo (Fig. 3).
- (8) Remove push nuts holding cable housing to servo.
- (9) Remove retaining clip holding cable to servo.

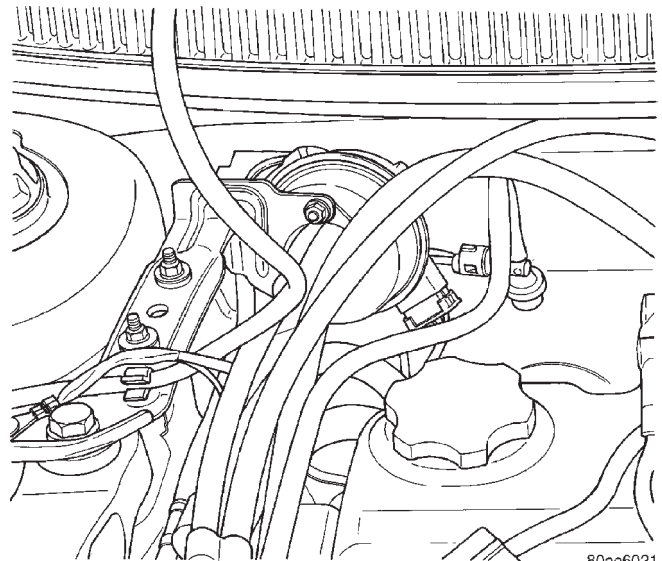


Fig. 3 Speed Control Servo

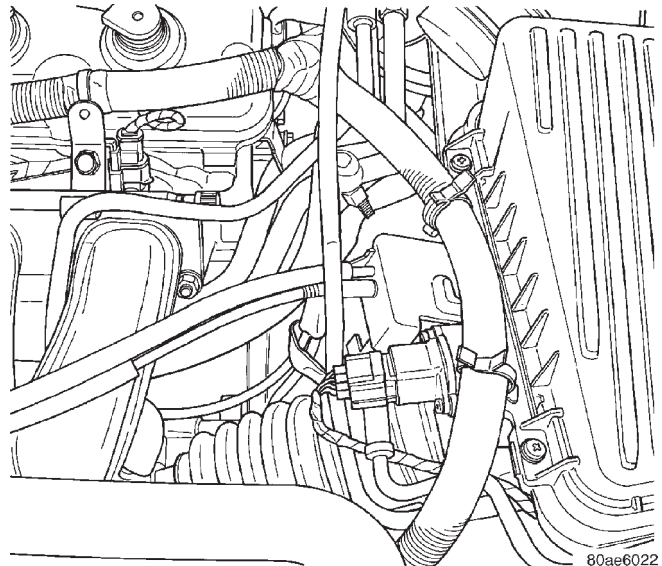


Fig. 4 Speed Control Cable

INSTALLATION

- (1) Install retaining clip to cable at servo.
- (2) Slide cable bell housing over servo mounting studs.
- (3) Install servo mounting studs into bracket.
- (4) Install 2 nuts at cable to servo and servo bracket, tighten to 7 N·m (60 ins. lbs.).
- (5) Connect electrical connector to servo.
- (6) Connect vacuum hose to servo
- (7) Rotate the throttle lever forward to the wide open position and install speed control cable clasp.
- (8) Slide speed control cable into throttle cable bracket and engage retaining tab. Slide throttle cable into throttle cable bracket and engage retaining tab.
- (9) Install the Throttle cable cover.
- (10) Connect the negative battery cable.

REMOVAL AND INSTALLATION (Continued)

VACUUM RESERVOIR

REMOVAL

- (1) Raise and support vehicle.
- (2) Remove screws on top of vacuum reservoir.
- (3) Remove vacuum hose.
- (4) Remove vacuum reservoir (Fig. 5).

INSTALLATION

- (1) Install vacuum reservoir, install screws and tighten to 5 N.m (44 in. lbs.).
- (2) Install vacuum hose.
- (3) Lower vehicle.

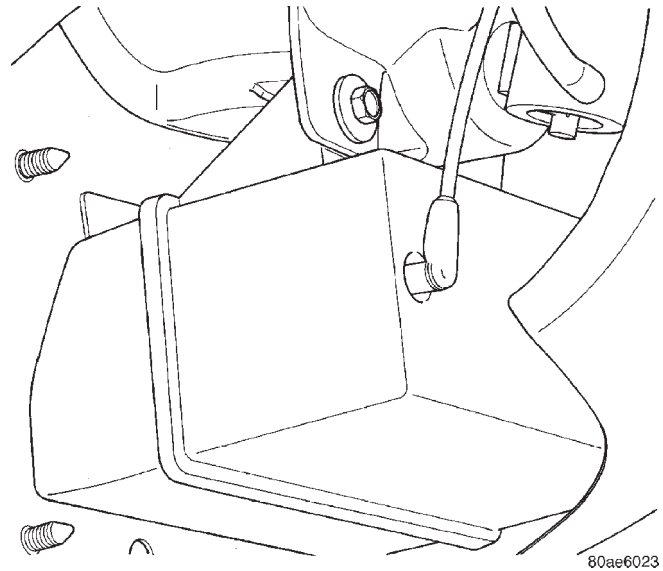


Fig. 5 Vacuum Reservoir

