

VEHICLE SPEED CONTROL SYSTEM

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DESCRIPTION AND OPERATION

SPEED CONTROL SYSTEM

DESCRIPTION

The speed control system is electronically controlled and vacuum operated. The electronic control is integrated into the powertrain control module, located on the left side of the engine compartment next to the air cleaner. The controls are located on the steering wheel and consist of five switches. The ON and OFF buttons are located on the left side of the airbag module. The RESUME, ACCEL, SET, COAST and CANCEL buttons are located on the right side of the airbag module (Fig. 1). For identification and location of the major components (Fig. 2).

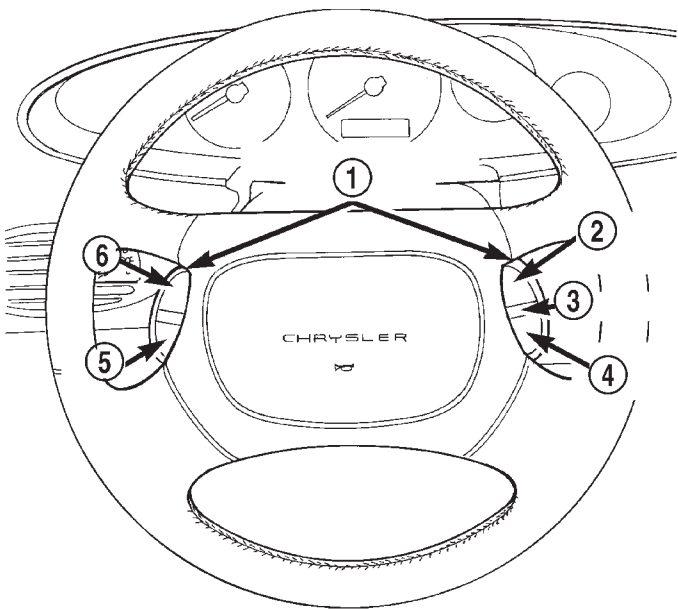
The system is designed to operate at speeds above 30 mph (50 km/h).

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.

OPERATION

When speed control is activated by depressing the ON 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 30 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.

The speed control can be disengaged manually by:



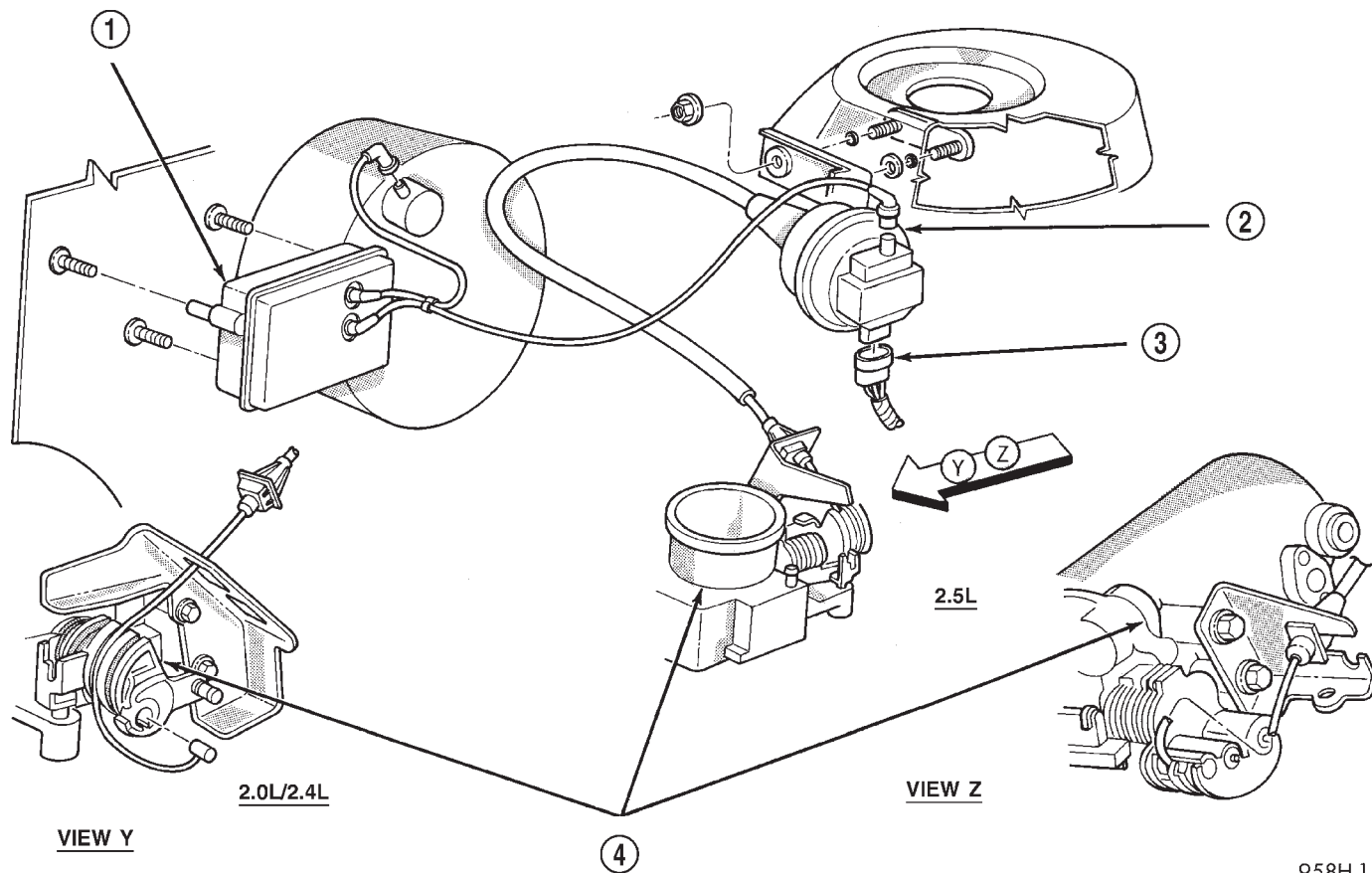
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Fig. 1 Speed Control Switch

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

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

DESCRIPTION AND OPERATION (Continued)



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Fig. 2 Speed Control System

1 - VACUUM RESERVOIR
2 - SPEED CONTROL SERVO

3 - SERVO CONNECTOR
4 - THROTTLE BODY

NOTE: Depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM.

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed 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)
- The speed signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

Once the speed control has been disengaged, depressing the RESUME switch when speed is greater than 25 mph allows the vehicle to resume control to the target speed that was stored in the PCM.

While the speed control is engaged, the driver can increase the vehicle speed by depressing the ACCEL switch. The new target speed is stored in the PCM when the ACCEL switch is released. The PCM also has a "tap-up" feature in which target speed increases by 2 mph for each momentary switch activation of the ACCEL switch. The PCM also provides a means to decelerate to a new lower target speed without disengaging speed control. Depress and hold the COAST switch until the desired speed is reached, then release the switch.

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.

DESCRIPTION AND OPERATION (Continued)

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 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.

SPEED CONTROL SWITCHES

DESCRIPTION

There are two separate switch pods that operate the speed control system.

OPERATION

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.

INTERACTIVE SPEED CONTROL

DESCRIPTION

Interactive means that communication between the PCM and the TCM is taking place. Interactive speed

control avoids unnecessary shifting for smoother, quieter operation and when downshifts are required, makes the shifts smoother.

CLIMBING A GRADE

DESCRIPTION

When climbing a grade the interactive speed control tries to maintain the set speed by increasing the throttle opening, while inability/delaying downshifts.

OPERATION

If opening the throttle alone cannot maintain the set speed and the vehicle speed drops more than three mph below the set speed, the transmission will downshift to third gear. If the vehicle continues to lose speed, by more than 6 mph, the transmission will downshift again maintain the set speed. After the vehicle encounters a less-steep grade, or has crested the grade (reduced the load on the powertrain) and can maintain the set speed at a reduced throttle position, the transmission will upshift, as appropriate, until the set speed can be maintained in Overdrive.

DOWNSHIFT DELAY

DESCRIPTION

Downshift delay features have been added to reduce the number and frequency of downshifts when operating in hilly or mountainous country.

OPERATION

While operating, interactive speed control delays or avoids downshifts by allowing up to nearly wide open throttle without the TCM scheduling a downshift. If the interactive speed control is not engaged or the throttle is manually overridden by the driver while interactive speed control is engaged, the downshift delay feature is not activated.

Torque converter lock and unlock shifts are not affected by the downshift delay feature and will occur at the same throttle angle at a given speed regardless of whether interactive speed control operates or not.

GRADE HUNTING

DESCRIPTION

All vehicles equipped with a four speed automatic transmission have a grade hunting feature for the 2nd to 3rd gear upshift and the 3rd to Overdrive upshift.

DESCRIPTION AND OPERATION (Continued)

OPERATION

The TCM identifies the powertrain loading conditions and selects the proper gear to maintain the current vehicle speed. Under moderate loading conditions the transaxle will stay in 3rd gear until the top of the grade is reached or the powertrain loading is reduced.

If powertrain loading is severe, the transaxle may shift into 2nd gear and remain there until powertrain loading is reduced, then a 2nd to 3rd gear upshift will be scheduled. Grade hunting features always operate regardless of whether or not the interactive speed control is engaged. **If the interactive speed control is not engaged and powertrain loading is not reduced, the driver may have to completely lift off of the throttle before an upshift will occur.** If the driver does lift off the throttle to induce an upshift under these conditions, vehicle speed will reduce and the Overdrive to 3rd and 3rd to 2nd gear downshifts will reoccur when the throttle is reapplied. If grade hunting is repeatedly induced by the driver, transaxle damage may result.

AUTOMATIC SPEED CONTROL OVERSPEED REDUCTION

DESCRIPTION

Transmission control software includes an automatic speed control overspeed reduction feature. This maintains vehicle speed at the selected set point when descending a grade.

OPERATION

The Transmission Control Module (TCM) first senses that the speed control is set. If the set speed is exceeded by more than 4 mph (6.5 km/hr) and the throttle is closed, the TCM causes the transaxle to downshift to THIRD gear. After downshifting, the automatic speed control resumes normal operation. To ensure that an upshift is appropriate after the set speed is reached, the TCM waits until the speed control system opens the throttle at least 6 degrees before upshifting to OVERDRIVE again.

If the driver applies the brakes, canceling automatic speed control operation with the transaxle still in THIRD gear, the TCM maintains this gear until the driver opens the throttle at least 6 degrees to avoid an inappropriate upshift. The upshift is also delayed for 2.5 seconds after reaching the 6 degrees throttle opening in anticipation that the driver might open the throttle enough to require THIRD gear. This will avoid unnecessary and disturbing transmission cycling. If the automatic speed control RESUME feature is used after braking, the upshift is delayed until the set speed is achieved to reduce cycling and provide better response.

BRAKE 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 brake lamp switch. The PCM monitors the state of the dual function brake lamp switch. Refer to the Brake section for more information on brake 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 returned to the PCM as a brake switch state signal. 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 brake signal to go high, disengaging the speed control, cutting off PCM power to the speed control solenoids.

The second set of normally closed contacts supplies 12 volts from the PCM any time speed control is turned on. Through 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 brake 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.

POWERTRAIN CONTROL MODULE

DESCRIPTION

The PCM is located in the engine compartment.

DESCRIPTION AND OPERATION (Continued)

OPERATION

The speed control electronic control circuitry is integrated into the Powertrain Control Module (PCM). The PCM speed control functions are monitored by the On-Board Diagnostics (OBD). All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. The PCM cannot be repaired and must be replaced if faulty.

USE THE DRB SCAN TOOL TO REPROGRAM THE NEW PCM WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

VACUUM RESERVOIR

The vacuum reservoir is located in the engine compartment.

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 AND DISTANCE**OPERATION**

The 4 speed automatic Transmission Control Module (TCM) supplies the speed input to the PCM. The PCM determines acceleration rates. The speed control software in the PCM uses vehicle speed and acceleration to control to the set speed.

Vehicles with a 3 speed automatic or manual transmission have a Vehicle Speed Sensor (VSS) 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 is monitored by the PCM to determine vehicle speed and to maintain speed control set speed. Refer to the appropriate Powertrain Diagnostic Procedures manual for diagnosis and testing of this component.

ROAD TEST**OPERATION**

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to the Instrument Panel and Gauges for speedometer diagnosis.

If a road test verifies a surge following a set and the speedometer operates properly see "Overshoot/Undershoot on speed control set".

If a road test verifies an inoperative system, and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a DTC exists, conduct tests per the Powertrain Diagnostic Procedures service manual.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose or corroded electrical connections at the servo. Corrosion should be removed from electrical terminals and a light coating of Mopar Multipurpose Grease, or equivalent, applied.
- Leaking vacuum reservoir.
- Loose or leaking vacuum hoses or connections.
- Defective one-way vacuum check valve.
- Secure attachment at both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- Conduct electrical test at PCM.
- Failed speed control servo. Do the servo vacuum test.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

CHECKING FOR DIAGNOSTIC CODES**OPERATION**

When trying to verify a speed control system electronic malfunction: Connect a DRB scan tool if available to the data link connector. The connector is located at left side of the steering column, and at lower edge of the panel.

(1) A speed control malfunction may occur without a diagnostic code being indicated.

For further information and usage of the DRB scan tool and a more complete list of Diagnostic Trouble Code and No Trouble Codes, refer to the Powertrain Diagnostic Manual.

REMOVAL AND INSTALLATION

SERVO

REMOVAL

- (1) Remove the negative battery cable.
- (2) Disconnect the vacuum hose from servo.
- (3) Remove two nuts attaching speed control cable and mounting bracket to servo.
- (4) Remove servo from the mounting bracket.
- (5) Disconnect electrical connectors and vacuum hose.
- (6) Remove cable from throttle cam. Refer to Speed Control Servo Cable Removal/Installation in this section.
- (7) Remove clip attaching cable to servo.

INSTALLATION

- (1) Install servo cable through large hole in bracket, to servo and install clip.
- (2) Install speed control cable to throttle cam. Refer to Speed Control Servo Cable Removal/Installation in this section.
- (3) Connect electrical connector.
- (4) Insert servo studs through holes in speed control mounting bracket and cable.
- (5) Install nuts, tighten to 7 N·m (60 in. lbs.).
- (6) Connect the vacuum hose to servo.
- (7) Install the negative battery cable.

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

INSTALLATION

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

SPEED CONTROL SERVO CABLE

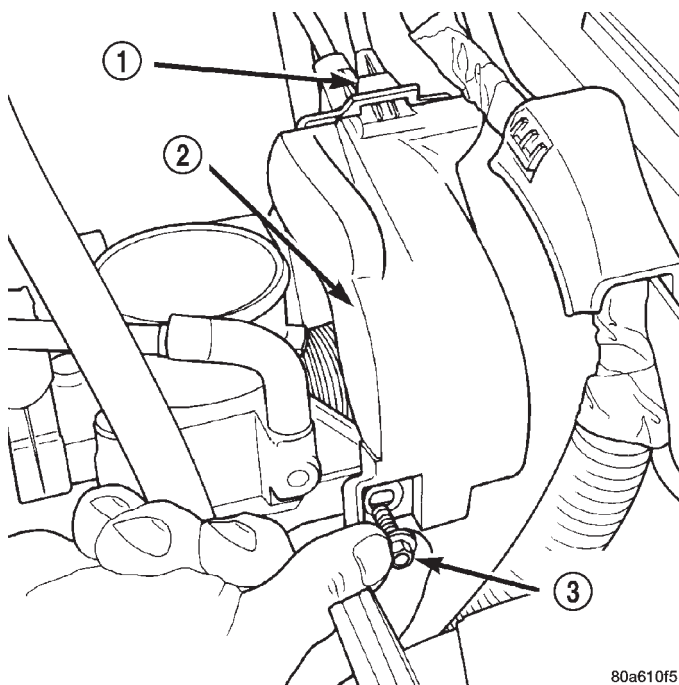
REMOVAL

- (1) Remove the negative battery cable.
- (2) Remove the air inlet resonator.
- (3) Remove throttle control shield, if equipped (Fig. 3).
- (4) Remove throttle cable clasp from the throttle body cam.
- (5) Remove speed control cable from throttle cam by sliding clasp out hole used for throttle cable.
- (6) Compress the retaining tabs on the cable and slide cable out of bracket.
- (7) Remove 2 nuts retaining cable and bracket to servo.
- (8) Slide cable bell housing off of servo mounting studs.
- (9) Remove retaining clip holding cable to servo.

INSTALLATION

- (1) Install cable core wire through center hole on bracket, onto servo center post.
- (2) Install retaining clip to cable at servo.
- (3) Slide cable bell housing over servo mounting studs (bracket in between).
- (4) Install 2 nuts at cable to and servo bracket to servo, tighten to 7 N·m (60 ins. lbs.).
- (5) Slide cable into throttle cable bracket and engage retaining tabs.
- (6) Rotate the throttle cam forward to the wide open position and install speed control cable clasp.
- (7) Rotate the throttle cam forward to the wide open position and install throttle cable clasp.
- (8) Install throttle control shield, if equipped.
- (9) Install the air inlet resonator.
- (10) Install the negative battery cable.

REMOVAL AND INSTALLATION (Continued)



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Fig. 3 Throttle Control Shield

- 1 - MOUNTING TAB
2 - THROTTLE CONTROL SHIELD
3 - MOUNTING SCREW

VACUUM RESERVOIR

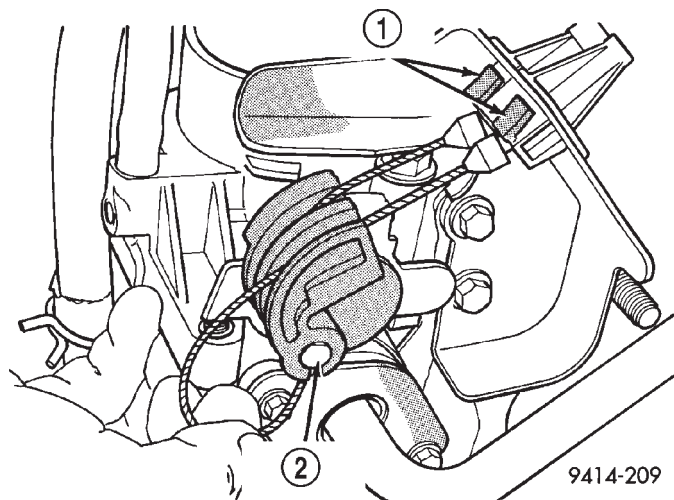
The vacuum reservoir is located on the dash panel next to the brake booster.

REMOVAL

- (1) **2.5L ONLY** Remove the intake manifold, refer to the Engine section.
- (2) Disconnect vacuum hoses from reservoir.
- (3) Pull vacuum reservoir from dash panel.

INSTALLATION

- (1) Push reservoir onto dash panel.
- (2) Connect hoses to reservoir.
- (3) **2.5L ONLY** Install intake manifold, refer to the Engine section.



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Fig. 4 Disconnecting Throttle Cable—Typical

- 1 - TABS
2 - CABLE CLASP

