

# SPEED CONTROL SYSTEM

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## GENERAL INFORMATION

### INTRODUCTION

The vehicle speed control system is electronically controlled and vacuum operated. The system is designed to operate between approximately 35 and 85 mph (56 and 137 km/h). Following are general descriptions of the major components in the speed control system. For diagnosis of the entire speed control system, refer to the appropriate Powertrain Diagnostic Procedures service manual and the DRB scan tool. Refer to Group 8W, Wiring Diagrams for complete circuit descriptions and wiring diagrams.

## DESCRIPTION AND OPERATION

### SPEED CONTROL SERVO

The servo unit consists of a solenoid valve body, a vacuum servo and the mounting bracket. The Powertrain Control Module (PCM) controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. A cable connects the servo with the throttle linkage. The servo unit cannot be repaired and is serviced only as a complete assembly.

### SPEED CONTROL SOLENOID CIRCUITS

When all of the speed control parameters are met, and the SET button is pressed, the PCM actuates the

vent solenoid and “duty-cycles” the vacuum solenoid to open the throttle and bring the vehicle up to target speed. When the vehicle is at target speed, it will actuate the vent solenoid with the vacuum solenoid de-activated to maintain the vehicle at target speed. When the vehicle is above target speed, the PCM will “duty-cycle” the vent solenoid with the vacuum solenoid still de-activated to close the throttle to return to target speed.

### SPEED CONTROL SWITCHES

Two separate speed control switch modules are mounted on the steering wheel to the left and right side of the driver's airbag module. Within the two switch modules, five **momentary** contact switches, supporting seven different speed control functions are used. The outputs from these switches are filtered into one input. The Powertrain Control Module (PCM) determines which output has been applied through **resistive multiplexing**. The input circuit voltage is measured by the PCM to determine which switch function has been selected.

A speed control indicator lamp, located on the instrument panel cluster is energized by the PCM via the CCD Bus. This occurs when speed control system power has been turned ON, and the engine is running.

The two switch modules are labeled: ON/OFF, SET, RESUME/ACCEL, CANCEL and COAST. Refer to the owner's manual for more information on speed

## DESCRIPTION AND OPERATION (Continued)

control switch functions and setting procedures. The individual switches cannot be repaired. If one individual switch fails, the switch module must be replaced.

**STOP LAMP SWITCH**

Vehicles equipped with the speed control option use a dual function stop lamp switch. The switch is mounted on the brake pedal mounting bracket under the instrument panel. The PCM monitors the state of the dual function stop lamp switch. Refer to Group 5, Brakes for more information on stop lamp switch service and adjustment procedures.

**SERVO CABLE**

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

The speed control electronic control circuitry is integrated into the Powertrain Control Module (PCM). The PCM is located in the engine compartment. 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 certain failures it detects. See On-Board Diagnostic Test For Speed Control System in this group for more information. The PCM cannot be repaired and must be replaced if faulty.

**VACUUM RESERVOIR**

**Gasoline Powered Engines:** A vacuum reservoir is used to supply the vacuum needed to maintain proper speed control operation when engine vacuum drops, such as in climbing a grade while driving. A one-way check valve is used in the vacuum line between the reservoir and the vacuum source. This check valve is used to trap engine vacuum in the reservoir. On certain vehicle applications, this reservoir is shared with the heating/air-conditioning system. The vacuum reservoir cannot be repaired and must be replaced if faulty.

**Diesel Powered Engines:** A vacuum reservoir is not used if equipped with a diesel powered engine. Instead, an engine driven pump is used to supply vacuum for speed control operation. Refer to Vacuum Pump in Group 9, Engines for information.

**VEHICLE SPEED INPUT**

The Vehicle Speed Sensor (VSS) is no longer used for any Dodge truck in the 1998 model year.

Vehicle speed and distance covered are measured by the Rear Wheel Speed Sensor. The sensor is mounted to the rear axle. A signal is sent from this sensor to the Controller Antilock Brake (CAB) computer. A signal is then sent from the CAB to the Powertrain Control Module (PCM) to determine vehicle speed and distance covered. The PCM will then determine strategies for speed control system operation.

**DIAGNOSIS AND TESTING****ROAD TEST**

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 Group 8E, Instrument Panel and Gauges for speedometer diagnosis.

If a road test verifies a system problem 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, damaged 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 of both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- 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.

## DIAGNOSIS AND TESTING (Continued)

## ON-BOARD DIAGNOSTIC TEST FOR SPEED CONTROL SYSTEM

The Powertrain Control Module (PCM) monitors critical input and output circuits of the speed control system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some circuits are checked continuously and some are checked only under certain conditions.

For DTC information, refer to Diagnostic Trouble Codes in Group 25, Emission Control System. This will include a complete list of DTC's including DTC's for the speed control system.

## SPEED CONTROL SWITCHES

For complete speed control system diagnosis, refer to the appropriate Powertrain Diagnostic Procedures manual. To test each of the speed control switches only, refer to the following:

**WARNING: BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS, YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. WAIT 2 MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Disconnect negative battery cable. Wait 2 minutes for airbag system capacitor to discharge.

(2) Remove the two speed control switch modules from steering wheel. Refer to the removal/installation section for procedures.

(3) Check continuity of each individual speed control switch module as shown in chart (Fig. 1). If OK, reinstall switch. If not OK, replace switch module assembly.

## STOP LAMP SWITCH

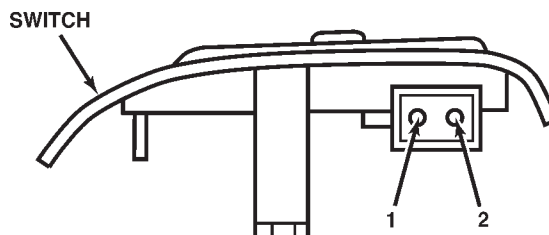
For continuity checks and switch adjustment, refer to Group 5, Brakes.

## VACUUM SUPPLY TEST

*Gasoline Powered Engines:*

On gasoline powered engines: actual engine vacuum, a vacuum reservoir, a one-way check valve and vacuum lines are used to supply vacuum to the speed control servo.

(1) Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.



| SWITCH POSITION | RESISTANCE BETWEEN PINS 1 AND 2 |
|-----------------|---------------------------------|
| ON              | 909 ohms<br>+/- 9 ohms          |
| SET             | 6650 ohms<br>+/- 66 ohms        |
| RESUME/ACCEL    | 15,400 ohms<br>+/- 154 ohms     |
| CANCEL          | 0 ohms<br>(CLOSED CIRCUIT)      |
| COAST           | 2940 ohms<br>+/- 29 ohms        |

80a53490

**Fig. 1 Speed Control Switch Continuity (Typical Switch Shown)**

(2) Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.

(3) If vacuum is less than ten inches of mercury, determine source of leak. Check vacuum line to engine for leaks. Also check actual engine intake manifold vacuum. If manifold vacuum does not meet this requirement, check for poor engine performance and repair as necessary.

(4) If vacuum line to engine is not leaking, check for leak at vacuum reservoir. To locate and gain access to reservoir, refer to Vacuum Reservoir Removal/Installation in this group. Disconnect vacuum line at reservoir and connect a hand-operated vacuum pump to reservoir fitting. Apply vacuum. Reservoir vacuum should not bleed off. If vacuum is being lost, replace reservoir.

(5) Verify operation of one-way check valve and check it for leaks.

(a) Locate one-way check valve. The valve is located in vacuum line between vacuum reservoir and engine vacuum source. Disconnect vacuum hoses (lines) at each end of valve.

(b) Connect a hand-operated vacuum pump to reservoir end of check valve. Apply vacuum. Vacuum should not bleed off. If vacuum is being lost, replace one-way check valve.

(c) Connect a hand-operated vacuum pump to vacuum source end of check valve. Apply vacuum. Vacuum should flow through valve. If vacuum is not flowing, replace one-way check valve. Seal the fitting at opposite end of valve with a finger and

## DIAGNOSIS AND TESTING (Continued)

apply vacuum. If vacuum will not hold, diaphragm within check valve has ruptured. Replace valve.

*Diesel Powered Engines:*

On diesel powered engines: an engine driven vacuum pump, a one-way check valve and vacuum lines are used to supply vacuum to the speed control servo. A vacuum reservoir is not used with diesel engines.

(1) Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.

(2) Start engine and observe gauge at idle. For vacuum testing and vacuum specifications, refer to Vacuum Pump Output—Diesel Engine in Group 9, Engines.

(3) If vacuum pump output is OK, determine other source of leak. Check all vacuum lines to: speed control servo, engine vacuum pump and heating/air conditioning system for leaks.

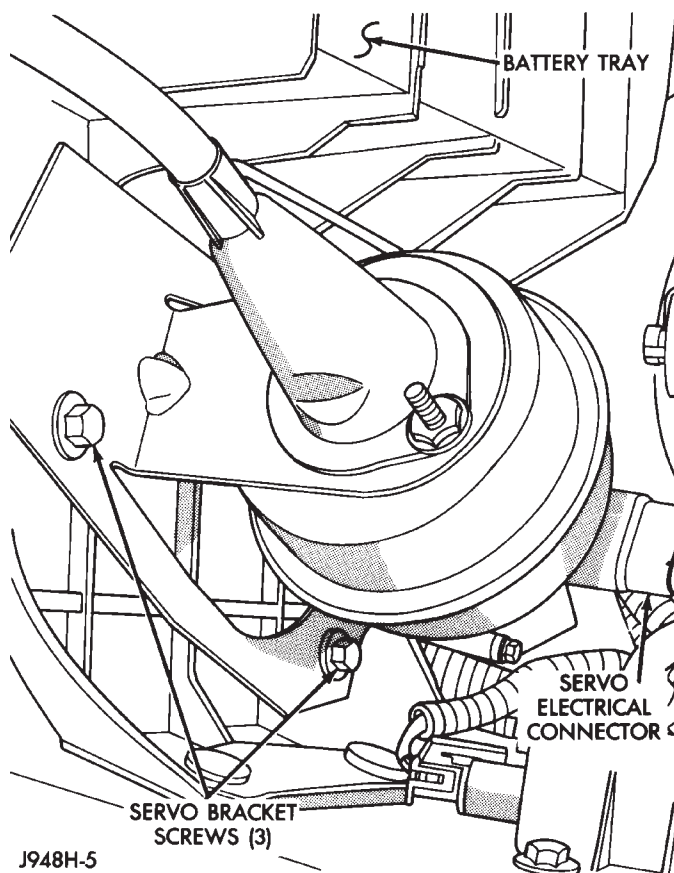
(4) Verify operation of one-way check valve and check it for leaks.

(a) Locate one-way check valve. The valve is located in vacuum line between speed control servo and engine vacuum pump. Disconnect vacuum hoses (lines) at each end of valve.

(b) Connect a hand-operated vacuum pump to reservoir end of check valve. Apply vacuum. Vacuum should not bleed off. If vacuum is being lost, replace one-way check valve.

(c) Connect a hand-operated vacuum pump to vacuum source end of check valve. Apply vacuum. Vacuum should flow through valve. If vacuum is not flowing, replace one-way check valve. Seal the fitting at opposite end of valve with a finger and apply vacuum. If vacuum will not hold, diaphragm within check valve has ruptured. Replace valve.

(5) Connect a small gauge jumper wire between the disconnected servo harness 4-way connector pin-3, and pin-3 on the servo. Check for battery voltage at pins-1, 2 and 4 of the servo. If battery voltage is not at these pins, replace the servo.



**Fig. 2 Speed Control Servo Location**

**SPEED CONTROL SERVO**

For complete speed control system diagnosis, refer to the appropriate Powertrain Diagnostic Procedures manual. To test the speed control servo only, refer to the following:

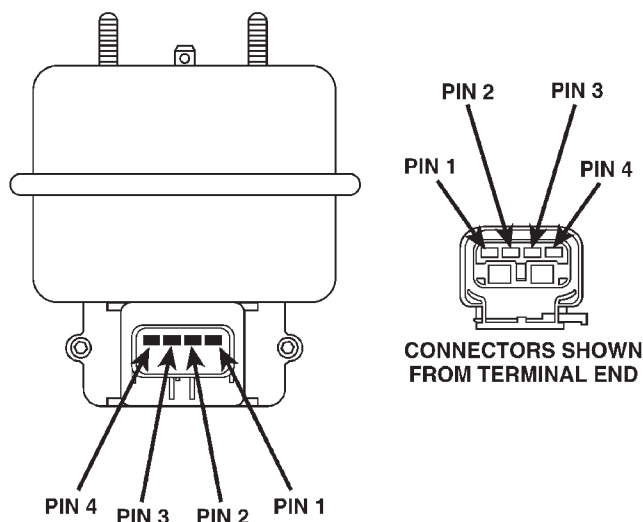
The engine must be started and running for the following voltage tests.

(1) Start engine.

(2) Disconnect 4-way electrical connector at servo. Servo is attached to battery tray (Fig. 2).

(3) Turn speed control switch to ON position.

(4) Check for battery voltage at pin-3 of wiring harness 4-way connector (Fig. 3). This is the 12 volt feed from the stoplamp switch. When the brake pedal is depressed, voltage should not be present at pin-3. If voltage is not present with brake pedal **not** depressed, check for continuity between servo and stop lamp switch. Also check stop lamp switch adjustment. Refer to Group 5, Brakes for procedures.



**Fig. 3 Servo 4-Way Harness Connector**



## DIAGNOSIS AND TESTING (Continued)

(6) Turn ignition switch to OFF position. Check for continuity between disconnected servo harness 4-way connector pin-4 and a good ground. There should be continuity. If not OK, repair open circuit to ground as required.

## OVERSHOOT/UNDERSHOOT FOLLOWING SPEED CONTROL SET

If the operator repeatedly presses and releases the set button with their foot off of the accelerator (a "lift foot set" to begin speed control operation), the vehicle may accelerate and exceed the desired set speed by up to 5 MPH (8 km/h) and then decelerate to less than the desired set speed before finally achieving the desired set speed.

The Speed Control has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths. When the speed control is set with the vehicle operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts. If the lift foot sets are continually used, the speed control overshoot/undershoot condition will develop.

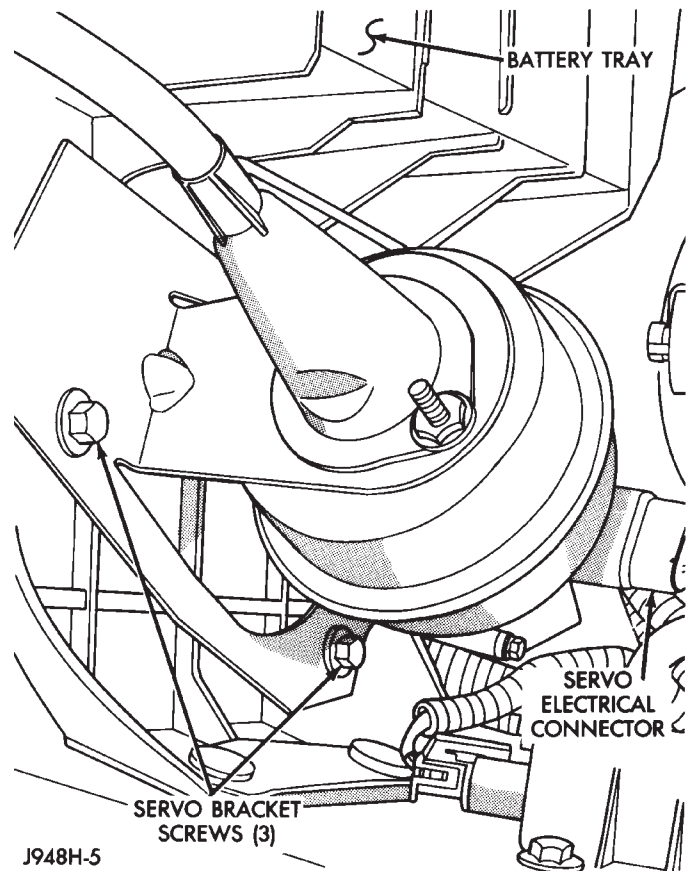
To "unlearn" the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed with the accelerator pedal (not decelerating or accelerating), and then turn the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds. This procedure must be performed approximately 10–15 times to completely unlearn the overshoot/undershoot condition.

## REMOVAL AND INSTALLATION

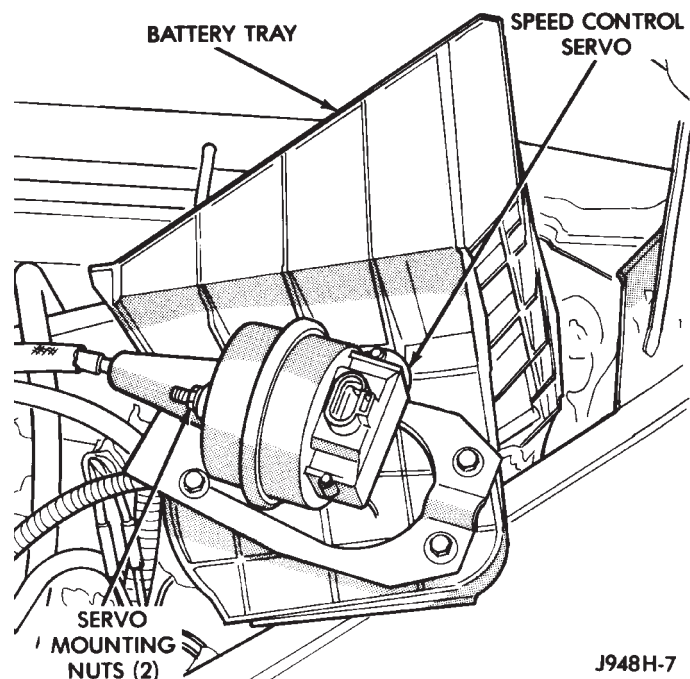
## SPEED CONTROL SERVO

## V-6/V-8 GAS POWERED ENGINES—REMOVAL

- (1) Disconnect negative battery cable at battery.
- (2) Disconnect electrical connector at servo (Fig. 4).
- (3) Disconnect vacuum hose at servo.
- (4) Disconnect servo cable at throttle body. Refer to Servo Cable Removal/Installation in this group.
- (5) Remove three bolts retaining servo/servo mounting bracket to side of battery tray (Fig. 5).
- (6) Position servo assembly to gain access to 2 servo mounting nuts (Fig. 5) or (Fig. 6).
- (7) Remove 2 mounting nuts holding servo cable sleeve to bracket (Fig. 6).
- (8) Pull speed control cable sleeve and servo away from servo mounting bracket to expose cable retaining clip (Fig. 6) and remove clip. Note: The servo mounting bracket displayed in (Fig. 6) is a typical bracket and may/may not be applicable to this model vehicle.



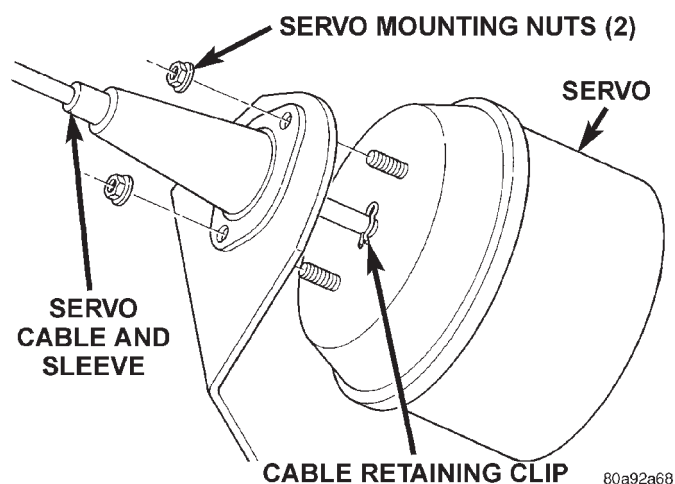
**Fig. 4 Servo Location—Removal/Installation**



**Fig. 5 Servo Mounting at Battery Tray**

- (9) Remove servo from mounting bracket.

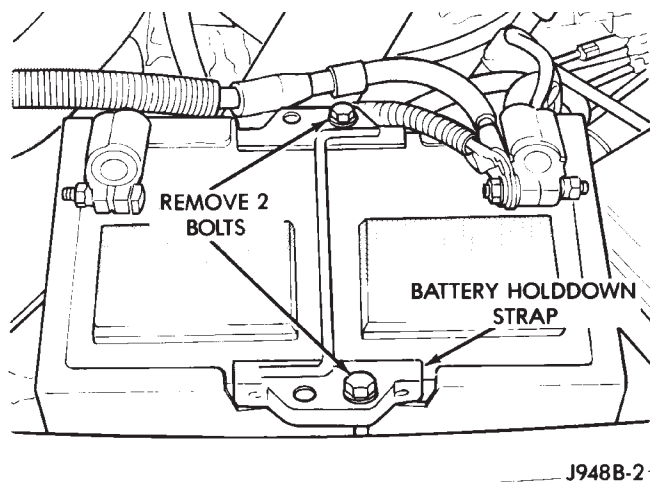
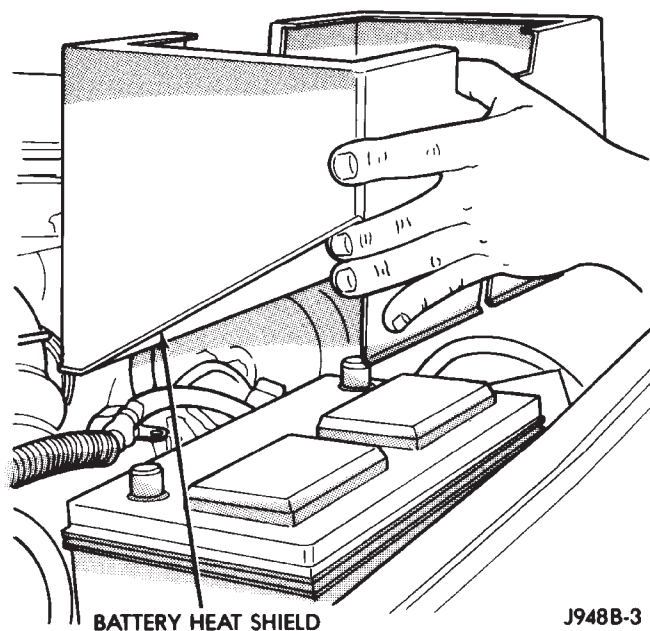
## REMOVAL AND INSTALLATION (Continued)

**Fig. 6 Servo Cable Clip Remove/Install—Typical****INSTALLATION**

- (1) Position servo to mounting bracket.
- (2) Align hole in cable connector with hole in servo pin. Install cable-to-servo retaining clip.
- (3) Insert servo studs through holes in servo mounting bracket.
- (4) Insert servo studs through holes in servo cable sleeve.
- (5) Install servo mounting nuts and tighten to 8.5 N·m (75 in. lbs.) torque.
- (6) Connect vacuum line to servo.
- (7) Connect electrical connector to servo terminals.
- (8) Install three bolts retaining servo/servo mounting bracket to battery tray.
- (9) Connect servo cable to throttle body. Refer to Servo Cable Removal/Installation in this group.
- (10) Connect negative battery cable to battery.
- (11) Before starting engine, operate accelerator pedal to check for any binding.

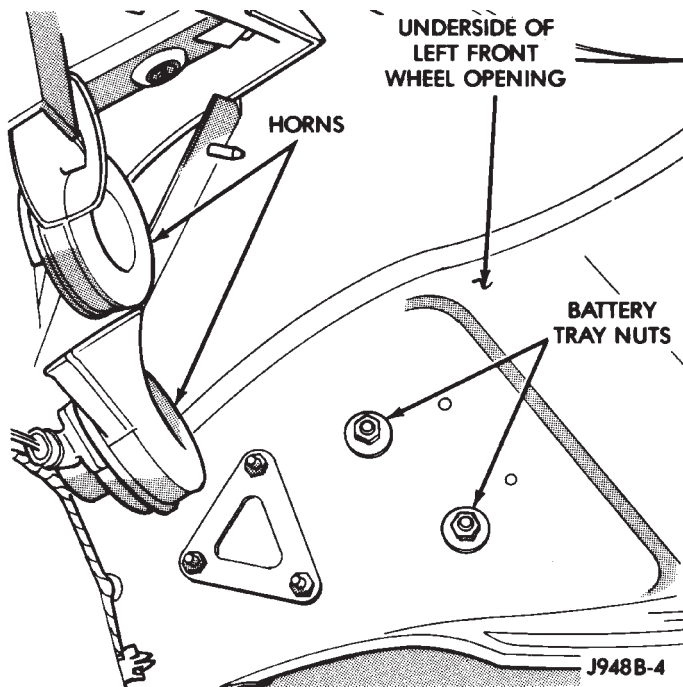
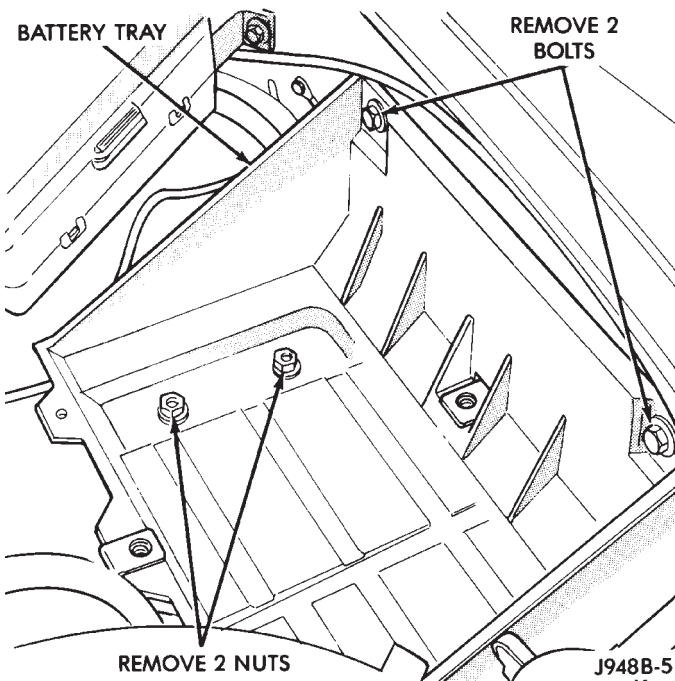
**8.0L V-10 AND 5.9L DIESEL ENGINE—REMOVAL**

- (1) Disconnect negative battery cable at battery. Diesel Engines: Disconnect both battery cables, negative cables first.
- (2) Remove 2 bolts and battery holddown (Fig. 7).
- (3) If equipped, pull up on battery heat shield to remove it (Fig. 8).
- (4) Remove battery from vehicle.
- (5) From under left front wheel opening, remove 2 forward battery tray nuts (Fig. 9).
- (6) Remove 2 nuts and 2 bolts holding battery tray to vehicle (Fig. 10).
- (7) Disconnect servo cable at throttle body. Refer to Servo Cable Removal/Installation in this group.
- (8) Position battery tray up far enough for access to speed control servo electrical connector and vacuum line.

**Fig. 7 Battery Holddown****Fig. 8 Battery Heat Shield**

- (9) Disconnect electrical connector and vacuum line at servo.
- (10) Position battery tray with attached servo assembly to gain access to 2 servo mounting nuts (Fig. 5) or (Fig. 6).
- (11) Remove 2 mounting nuts holding servo cable sleeve to bracket (Fig. 6).
- (12) Pull speed control cable sleeve and servo away from servo mounting bracket to expose cable retaining clip (Fig. 6) and remove clip. Note: The servo mounting bracket displayed in (Fig. 6) is a typical bracket and may/may not be applicable to this model vehicle.
- (13) Remove servo from mounting bracket.

## REMOVAL AND INSTALLATION (Continued)

**Fig. 9 Forward Battery Tray Nuts****Fig. 10 Battery Tray Mounting****INSTALLATION**

- (1) Position servo to mounting bracket.
- (2) Align hole in cable connector with hole in servo pin. Install cable-to-servo retaining clip.
- (3) Insert servo studs through holes in servo mounting bracket.
- (4) Insert servo studs through holes in servo cable sleeve.

- (5) Install servo mounting nuts and tighten to 8.5 N·m (75 in. lbs.) torque.
- (6) Connect vacuum line to servo.
- (7) Connect electrical connector to servo terminals.
- (8) Connect servo cable to throttle body. Refer to Servo Cable Removal/Installation in this group.
- (9) Install battery tray. Tighten all battery tray mounting hardware to 16 N·m (140 in. lbs.) torque.
- (10) Position battery into battery tray.
- (11) If equipped, install battery heat shield.
- (12) Install battery holddown clamp. Tighten bolt to 4 N·m (35 in. lbs.) torque.
- (13) Connect negative battery cable(s) to battery(s).
- (14) Before starting engine, operate accelerator pedal to check for any binding.

**SPEED CONTROL SWITCHES****REMOVAL**

**WARNING: BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION, REMOVE AND ISOLATE THE NEGATIVE (-) CABLE FROM THE BATTERY. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. THEN WAIT TWO MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE INJURY.**

- (1) Disconnect and isolate negative battery cable.
- (2) Remove airbag module. Refer to Group 8M, Passive Restraint Systems for procedures.
- (3) Remove switch-to-steering wheel mounting screws (Fig. 11).
- (4) Remove switch.
- (5) Remove electrical connector at switch.

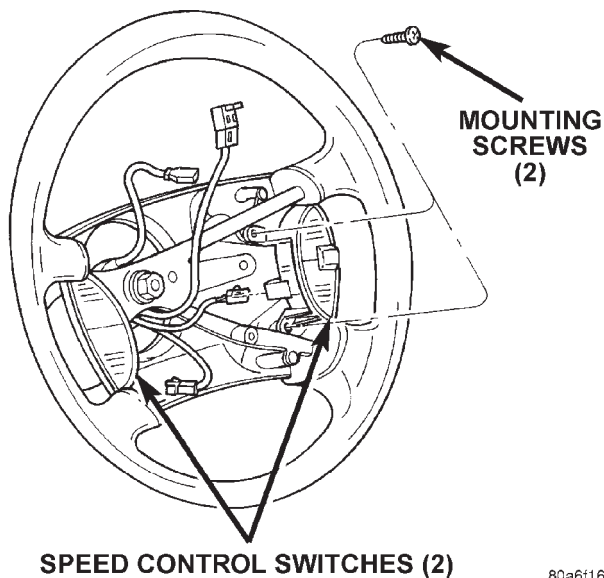
**INSTALLATION**

- (1) Install electrical connector to switch.
- (2) Install switch and mounting screws.
- (3) Tighten screws to 1.5 N·m (14 in. lbs.) torque.
- (4) Install airbag module. Refer to Group 8M, Passive Restraint Systems for procedures.
- (5) Connect negative battery cable.

**STOP LAMP SWITCH**

Refer to Stop Lamp Switch in Group 5, Brakes for removal/installation and adjustment procedures.

## REMOVAL AND INSTALLATION (Continued)

*Fig. 11 Speed Control Switches*

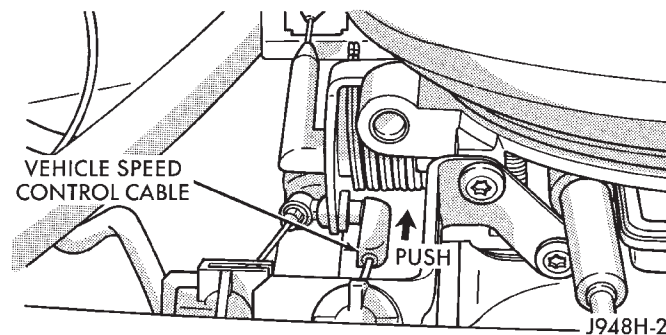
## SERVO CABLE

## REMOVAL

(1) Disconnect negative battery cable at battery. Diesel Engine: Remove both negative battery cables at both batteries.

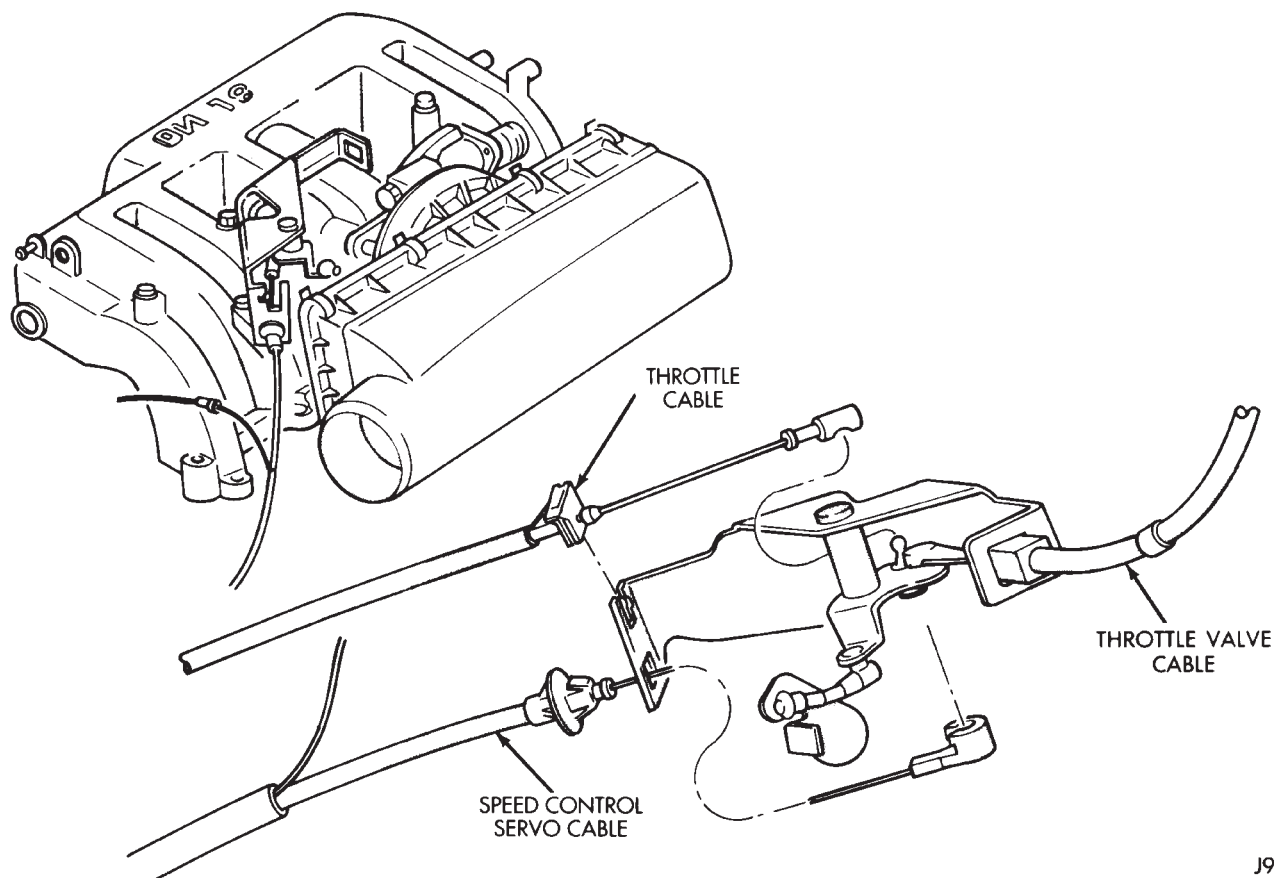
(2) Remove air cleaner (all except V-10 and diesel engine).

(3) Using finger pressure only, remove speed control cable connector at bellcrank by pushing connector off the bellcrank pin (Fig. 12), (Fig. 13) or (Fig. 14). DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.

*Fig. 12 Servo Cable at Throttle Body—V-6/V-8 Engine*

(4) Squeeze 2 tabs on sides of speed control cable at throttle body mounting bracket (locking plate) and push out of bracket.

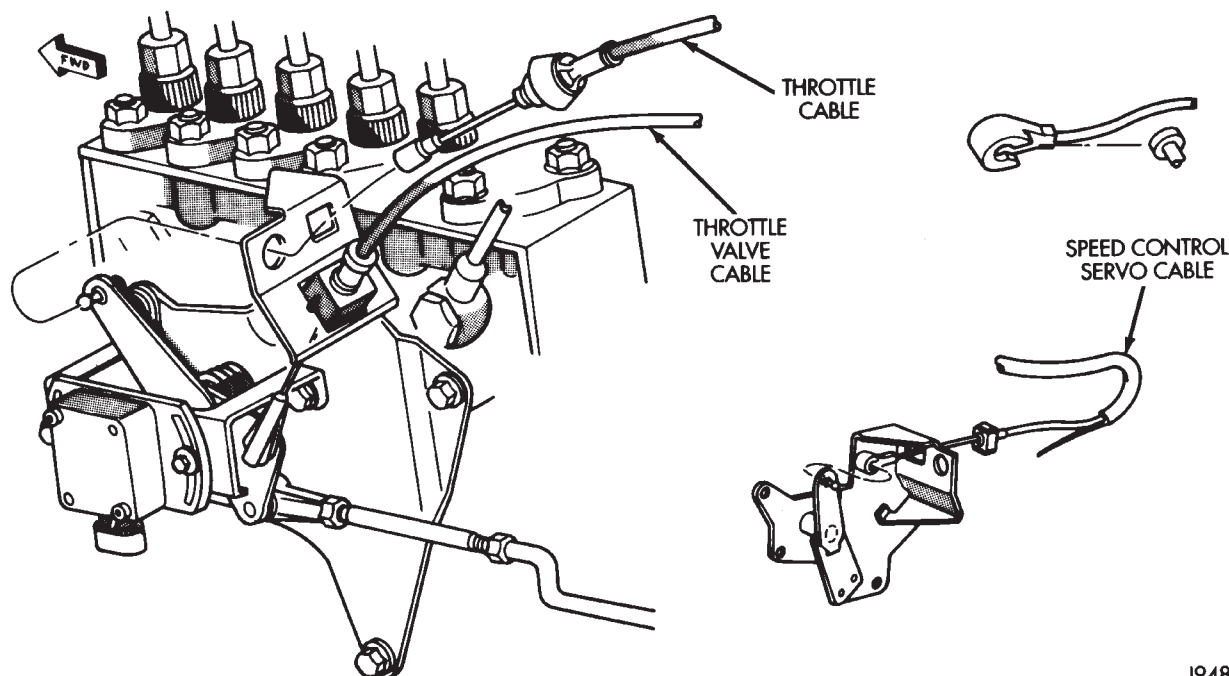
(5) Remove servo cable from servo. Refer to Speed Control Servo Removal/Installation in this group.

*Fig. 13 Servo Cable at Throttle Body—V-10 Engine*

J948H-10



## REMOVAL AND INSTALLATION (Continued)



J948H-12

**Fig. 14 Servo Cable—Diesel Engine****INSTALLATION**

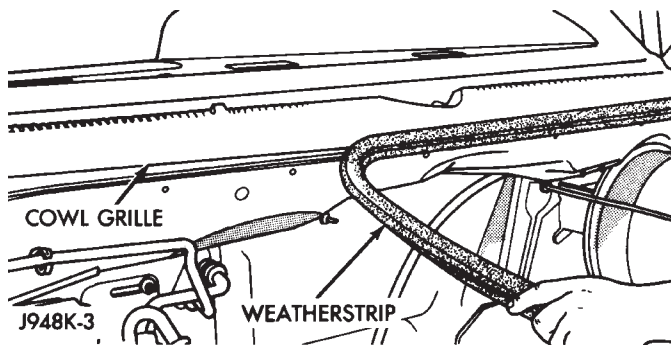
- (1) Install end of cable to speed control servo. Refer to Speed Control Servo Removal/Installation.
- (2) Install cable into throttle body mounting bracket (injection pump bracket on diesel engine). Cable snaps into bracket.
- (3) Install speed control cable connector at throttle body bellcrank pin (injection pump bellcrank pin on diesel engine). Connector snaps onto pin.
- (4) Connect negative battery cable(s) to battery(s).
- (5) Before starting engine, operate accelerator pedal to check for any binding.

**VACUUM RESERVOIR**

The vacuum reservoir is located under the plastic cowl plenum cover at lower base of windshield. The vacuum reservoir is not used if equipped with a diesel engine.

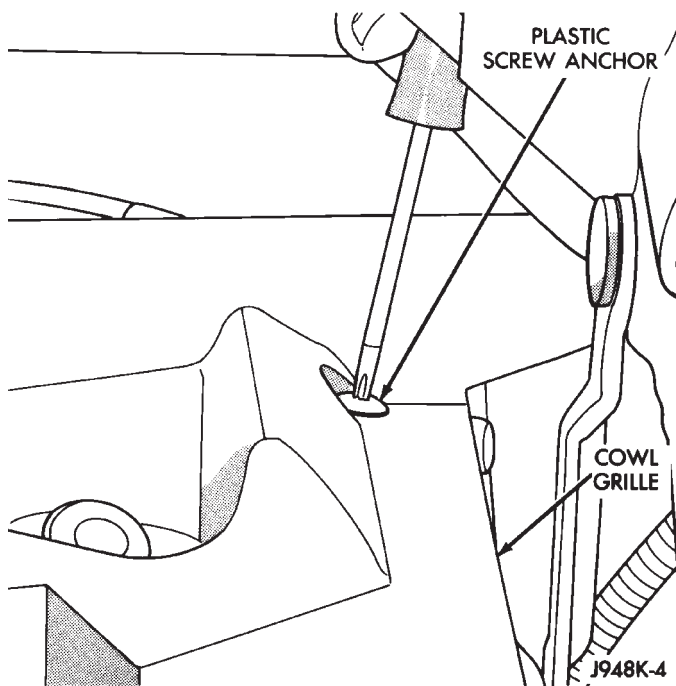
**REMOVAL**

- (1) Disconnect and isolate battery negative cable.
- (2) Remove both windshield wiper arm/blade assemblies. Refer to Group 8K, Wiper and Washer Systems.
- (3) Remove rubber weather-strip at front edge of cowl grille (Fig. 15).

**Fig. 15 Cowl Grille Panel Weather-strip**

## REMOVAL AND INSTALLATION (Continued)

- (4) Release cowl grill plastic anchor screws (Fig. 16).

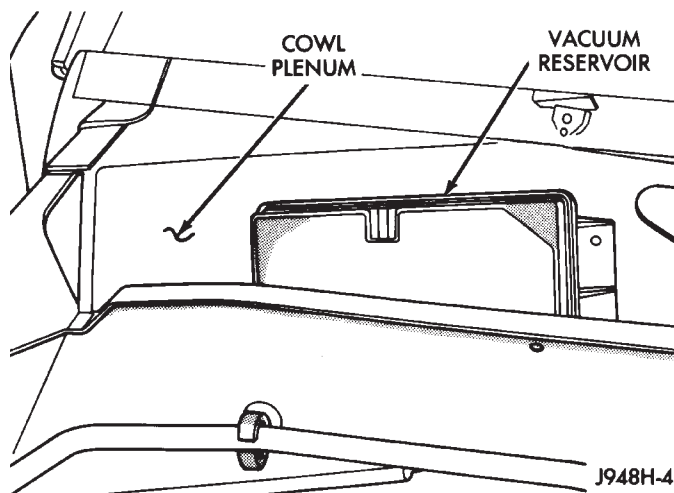


**Fig. 16 Plastic Anchor Screws Remove/Install**

- (5) Lift cowl plenum cover/grille panel from vehicle far enough to access vacuum reservoir.
- (6) Disconnect vacuum supply line from vacuum reservoir (Fig. 17).
- (7) Remove 2 vacuum reservoir mounting screws.
- (8) Remove vacuum reservoir from vehicle.

## INSTALLATION

- (1) Install vacuum reservoir and two mounting screws. Tighten screws to 2.2 N·m (20 in. lbs.) torque.
- (2) Connect vacuum supply hose to vacuum reservoir.



**Fig. 17 Vacuum Reservoir Remove/Install**

- (3) Position cowl plenum cover/grille panel to vehicle.
- (4) Install and tighten cowl cover fasteners to vehicle body.
- (5) Install rubber weather-strip at front edge of cowl grill.
- (6) Install windshield wiper arms. Refer to Group 8K, Wiper and Washer Systems.
- (7) Connect negative battery to cable.

## SPECIFICATIONS

## TORQUE CHART

| Description                          | Torque                 |
|--------------------------------------|------------------------|
| Servo Mounting Bracket Nuts. . . . . | .8.5 N·m (75 in. lbs.) |
| Switch Module                        |                        |
| Mounting Screws. . . . .             | 1.5 N·m (15 in. lbs.)  |
| Vacuum Reservoir                     |                        |
| Mounting Screws. . . . .             | 2.2 N·m (20 in. lbs.)  |