CRUISE COMMAND 1H

SECTION INDEX

SIX-CYLINDER ENGINE SYSTEM

GENERAL

The Jeep six-cylinder engine electronic Cruise Command operation is limited to speeds above 30 mph (48 km/h). At any speed above 30 mph (48 km/h), the unit will maintain the selected vehicle speed within 3.5 mph (5.6 km/h) on upgrades not exceeding 3 percent (most interstate highways). A change greater than 3.5 mph (3.6 km/h) may be experienced with vehicles having an economy axle ratio or when driving in unusually steep terrain, or at high altitudes.

To activate the system, move the slide switch to the ON position and accelerate to the desired speed. Depress the SET button on the end of the turn signal switch lever and release. The system will be activated when the SET button is released.

The driver may regain normal control by moving the slide switch to the OFF position or by lightly depressing the brake pedal. If the brake method is used, the previously selected vehicle speed will remain in memory and may be regained by momentarily sliding the switch to the RESUME/ACCEL position when the speed is above 30 mph (48 km/h). The memory is erased by turning the unit OFF or by turning the ignition switch Off.

If a lower speed is desired while cruising at a selected speed, depress the SET pushbutton and hold until the vehicle decelerates to the new speed. When the button is released, the new selected speed will be maintained.

If a higher speed is desired, accelerate to the desired speed, depress the SET button and release.

A higher speed may also be attained by moving the RESUME/ACCEL slide switch to the left and holding. The vehicle will accelerate until the switch is released. When released, the vehicle will decelerate until the speed control resumes controlling the throttle at the previously set speed. If the speed control is ON but not set at a cruise speed, when the RESUME/ACCEL switch is released the vehicle will decelerate as the throttle moves to the curb idle position.

WARNING: *Do not use the Cruise Command when driving on slippery or congested roads.*

COMPONENTS

The Cruise Command is a closed loop electro-mechanical servo system that consists of the following components: electronic regulator, speed sensor, servo, control switch assembly (fig. 1H-1), and the release mechanisms, which consist of a vacuum dump valve, vacuum storage can and check valve.

Electronic Regulator

The electronic regulator receives an input voltage that represents vehicle speed from the speed sensor, which is

driven by the speedometer cable. The regulator (located under the instrument panel) has a low speed circuit that prevents operation below 30 mph (48 km/h).

The regulator is sealed by the manufacturer and cannot be serviced internally, although an external adjustment is possible.

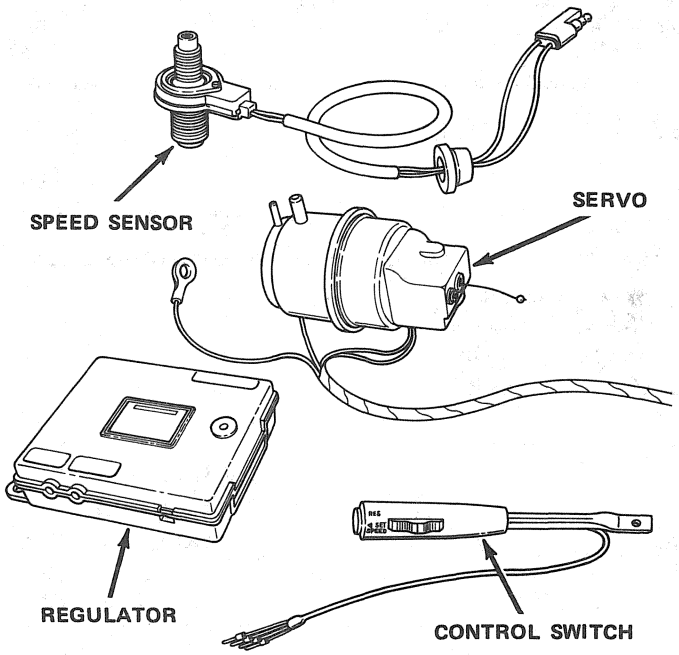

Fig. 1H-1 Electronic Cruise Command Components

Speed Sensor

The speed sensor is a tach-generator installed between upper and lower speedometer cables. It converts speedometer cable revolutions into a speed analog voltage input for the regulator.

Servo

The servo, mounted in the engine compartment, is controlled by the regulator and, in turn, uses manifold vacuum to control the throttle. A bead-link chain connects the servo cable to the throttle linkage.

Control Switch Assembly

The control switch assembly is an integral part of the turn signal switch lever. It functions as a communication link between the driver and the regulator assembly.

Release System

The release system deenergizes the Cruise Command by two methods and both are activated when the brake pedal is depressed. The valves that control vacuum in the servo are electrically controlled by the regulator. When the brake pedal is depressed, current flow through the brake lamps causes the regulator to deactivate the servo. The vacuum charge valve is closed and the servo vent valve is opened. To further ensure immediate servo release, a brake pedal-activated mechanical vacuum vent switch (operating independently of the electrical valves) admits atmospheric pressure into the servo whenever the brake pedal is depressed. A hissing sound may be heard momentarily.

OPERATION

Servo

The selected vehicle speed is maintained by the servo, which controls the carburetor throttle position according to regulator output. Two solenoid-controlled valves are used to control manifold vacuum applied to the servo (fig. 1H-2). In the deactivated state, the charge valve blocks manifold vacuum, while the vent valve admits atmospheric pressure. The spring relaxes the diaphragm and throttle position is unaffected. When the charge valve is energized, manifold vacuum moves the diaphragm and opens the throttle. Throttle position is maintained for any speed above 30 mph (48 km/h) by balancing the vacuum charge and vacuum vent. The controlled voltage that accomplishes this is provided by the regulator.

NOTE: *Manifold vacuum is applied to the vacuum storage can through the one-way valve whenever the engine is operating. As the Cruise Command depletes the vacuum in the can, it is replaced as needed. The can functions as a storage reservoir and provides relatively steady vacuum even when engine manifold vacuum is temporarily low.*

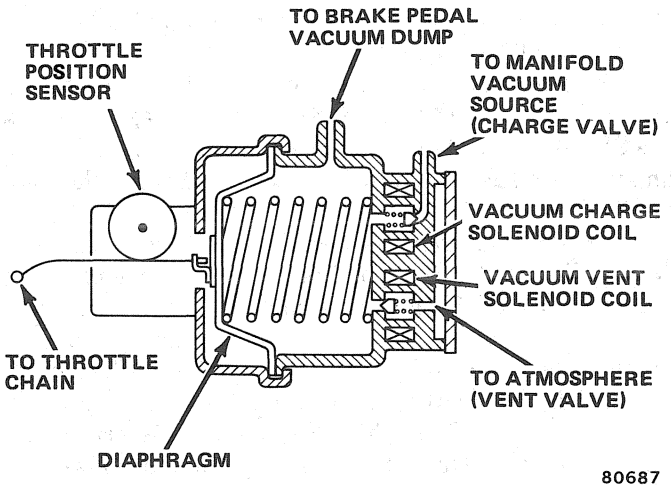

Fig. 1H-2 Servo Assembly

Electronic Regulator

The electronic regulator is a sealed black box that contains several electronic circuits.

The speed sensor, driven by the speedometer cable, is a tach-generator that functions as the source for the vehicle speed analog voltage. The AC voltage generated by the sensor is applied to the amplifier section of the regulator, which amplifies and shapes it. The amplified voltage signal is further modified by the frequency-to-DC converter, which transforms the variable AC voltage into a DC voltage that is proportional to the vehicle speed.

The DC voltage is supplied to three circuits for further action. The low speed switch compares the amplitude of the DC voltage with a reference voltage that is equivalent to 30 mph (48 km/h). If the DC voltage amplitude is greater than the reference, the engage/resume/accelerate circuit of the system is activated. The vehicle speed DC voltage is also applied to the high and low comparators and to the memory.

When the SET button is depressed, the memory stores the DC voltage for future reference. Two reference voltages are produced by the memory, one represents the set speed plus 1/4 mph (0.4 km/h) and the other represents set speed minus 1/4 mph (0.4 km/h). The plus reference voltage is applied to the high comparator and the minus reference voltage is applied to the low comparator.

If the DC voltage amplitude from the DC converter (representing vehicle speed) remains between the plus and minus reference voltages, the regulator maintains the charge valve in the closed position. The vent valve is also maintained in the closed position. In this condition, the throttle position remains fixed.

NOTE: *In the closed position, the charge valve solenoid is deenergized and the vent valve solenoid is energized.*

Whenever a grade is encountered, road speed decreases, speed sensor output decreases and the DC voltage amplitude from the DC converter also decreases a proportional amount. This creates an error voltage that will be detected by the low comparator. When the amplitude of this voltage drops below the low comparator reference voltage (set speed minus 1/4 mph or 0.4 km/h), the charge valve is energized, the diaphragm moves to pull the throttle cable and chain and the throttle is opened further. As the throttle moves, a throttle-position sensor inside the servo is activated to provide feedback to both comparators. Without it, the throttle would continue to be opened further than necessary to maintain the set speed. The throttle-position sensor feedback voltage eliminates the error voltage by increasing the DC voltage input to the comparators. When this voltage is increased to an amplitude that is between the high and low reference voltages, the charge valve is deenergized (closed) and maintains the throttle in its new position. In this manner, changes in throttle position are proportional to the amount that vehicle speed differs from the set speed. For over-speed conditions (such as descending a hill), the operation is similar, except the high comparator and vent valve are involved. The high comparator detects the DC voltage amplitude increase (error voltage) from the DC converter and deenergizes (opens) the vent valve, admitting atmospheric pressure. The throttle begins to close. The throttle closing activates the throttle-position sensor and the feedback eliminates the error voltage when the vehicle speed decreases to the set speed and the input to the comparators is again between the two speed reference voltages.

The high and low comparators operate only when the engage/resume/accelerate circuit is activated. This is accomplished by depressing the SET button or by moving the slide switch to RESUME/ACCEL. When the SET button is depressed and released, the memory is updated to store the current vehicle speed voltage. The engage/resume/accelerate circuit is deactivated by depressing the brake pedal or by the vehicle speed voltage falling below the low speed reference voltage (30 mph or 48 km/h).

TROUBLESHOOTING

To troubleshoot the Cruise Command system, refer to the Service Diagnosis Chart and Testing.

Refer to Chapter 3C—Instrument Panels and Components for details of speedometer cable and gear relacement.

TESTING

Perform the following tests as part of the service diagnosis to determine the cause of the malfunction and the correction required.

Control Switch Continuity Test

Use a 12-volt test lamp to test control switch continuity. Connect the tester to the wires indicated in the Control Switch Continuity Test (fig. 1H-3).

Circuitry Tests

Wire Harness Connector

Perform the following tests as part of the service diagnosis to determine the cause and correction of a Cruise Command malfunction. Refer to figure 1H-4 for wiring diagram.

(1) Disconnect wire harness connector at regulator. Use suitable thin tool to depress tab inside hole on regulator marked "Terminal Release."

(2) Verify that each wire is installed in correct location. Refer to figures 1H-4 and 1H-5.

Service Diagnosis

Condition	Possible Cause	Correction
SYSTEM DOES NOT ENGAGE IN"ON" POSITION	(1) Restricted vacuum or no vacuum.	(1) Locate blockage or leak and repair.
	(2) Control switch defective.	(2) Replace switch.
	(3) Regulator defective.	(3) Replace regulator.
	(4) Speed sensor defective.	(4) Replace sensor.
	(5) Brake lamps defective.	(5) Replace brake lamps.
	(6) Brake light switch defective.	(6) Replace switch.
	(7) Brake light switch disconnected.	(7) Connect wire to switch.
	(8) Open circuit between brake light switch and brake lamps.	(8) Repair open circuit.
	(9) Dump valve improperly adjusted.	(9) Adjust dump valve.
RESUME FEATURE INOPERATIVE	(1) Bad ground.	(1) Check ground wire at servo.
	(2) Control switch defective.	(2) Replace switch.
ACCELERATE FUNCTION INOPERATIVE	(1) Accelerate circuit in regulator inoperative.	(1) Replace Regulator.
	(2) Control Switch Defective.	(2) Replace Switch.
SYSTEM RE-ENGAGES WHEN BRAKE IS RELEASED	(1) Regulator defective.	(1) Replace regulator.
	(2) Dump valve not opening.	(2) Adjust or replace valve.
	(3) Kink in dump valve hose.	(3) Reroute to remove kink.
	(4) Brake light switch defective.	(4) Adjust or replace switch.
CARBURETOR DOES NOT RETURN TO IDLE	(1) Improper linkage adjustment.	(1) Adjust properly.
	(2) Improper chain adjustment.	(2) Adjust chain.
ROAD SPEED CHANGES MORE THAN 2 MPH WHEN SETTING SPEED	(1) Centering adjustment set wrong.	(1) Adjust centering screw.
ENGINE ACCELERATES WHEN STARTED	(1) No slack in bead chain.	(1) Adjust chain.
	(2) Vacuum connections reversed at servo.	(2) Check connection and correct.
	(3) Servo defective.	(3) Replace servo.

Service Diagnosis (Continued)

Condition	Possible Cause	Correction
SYSTEM DISENGAGES ON LEVEL ROAD WITHOUT APPLYING BRAKE	(1) Loose wiring connection.	(1) Tighten connections.
	(2) Loose vacuum connection.	(2) Check vacuum connections.
	(3) Servo linkage broken.	(3) Repair linkage.
	(4) Defective stop lamp switch.	(4) Replace switch.
ERRATIC OPERATION	(1) No polarity.	(1) Check connection of sensor wires.
	(2) Servo defective.	(2) Replace servo.
	(3) Regulator defective.	(3) Replace regulator.
VEHICLE CONTINUES TO ACCELERATE WHEN PUSH BUTTON IS RELEASED	(1) Servo defective.	(1) Replace servo.
	(2) Regulator defective.	(2) Replace regulator.
SYSTEM ENGAGES, LOSES SET SPEED SLOWLY	(1) Vacuum leak at hose connection or in hose.	(1) Check hoses and connections.
	(2) Vacuum leak at dump valve on brake pedal.	(2) Replace dump valve.

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Speed Sensor Test

(1) Disconnect wire harness connector at speed sensor.

(2) Connect voltmeter set on low AC scale to wire terminals from speed sensor.

(3) Raise front and rear wheels of vehicle off ground and support vehicle with safety stands.

(4) Operate engine (wheels spinning freely) at 30 mph (48 km/h) and note voltage. Voltage should be approximately 0.9 volt. Increases of 0.1 volt per each 10 mph (16 km/h) increase in speed should also be indicated.

(5) Turn off engine and slowly halt wheels.

(6) Disconnect voltmeter.

(7) Connect speed sensor wire harness.

(8) Remove safety stands and lower vehicle.

Cruise Command System Diagnosis

A Cruise Command System diagnosis can be quickly and accurately performed with the Cruise Command Tester (AM-PC-1-R).

(1) Remove harness connector from regulator.

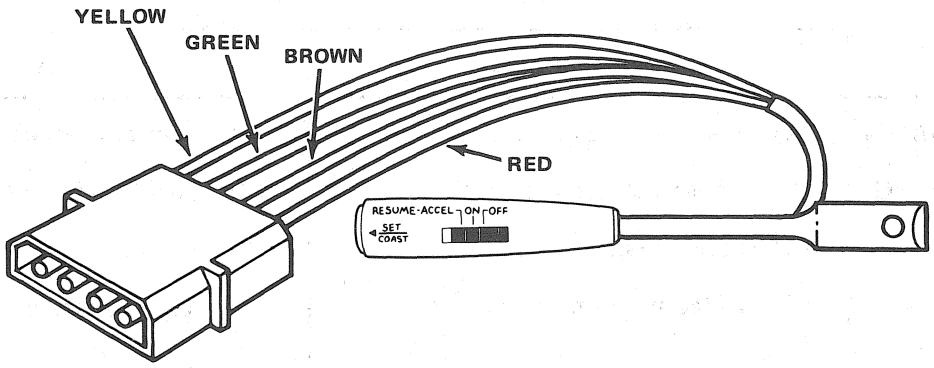
(2) Connect Cruise Command System Tester to harness connector.

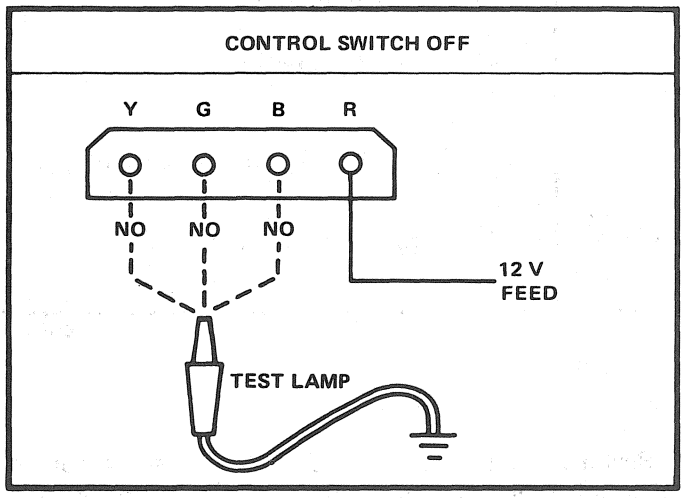
Perform the five tests listed in the Cruise Command Diagnosis Chart for a rapid diagnosis of the Cruise Command System.

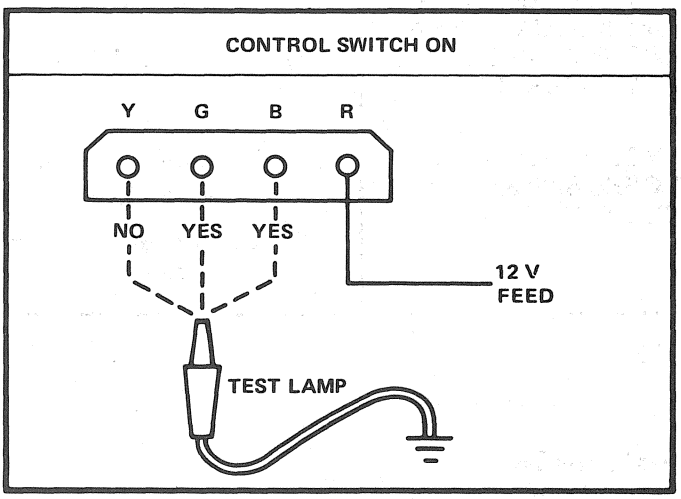
Tester AM-PC-1-R

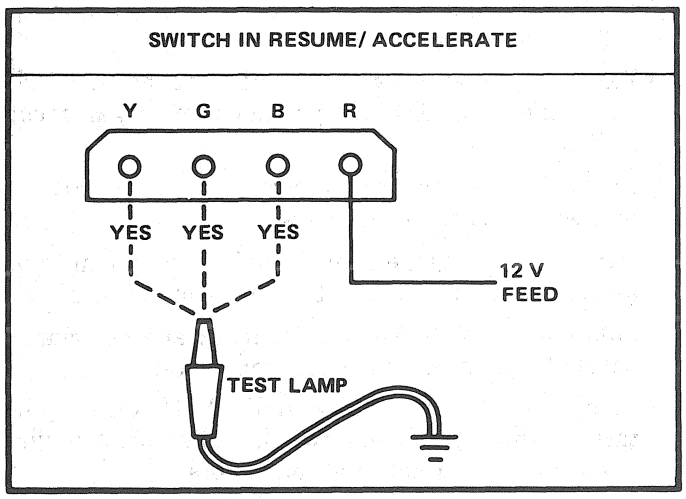
The tester lamps are associated with the following components, circuits, etc.

- Lamp 1—Power source, fuse and ground and ON-OFF and SET-SPEED positions of engagement switch.
- Lamp 2—Speed sensor, associated wiring harness and terminals and connectors.
- Lamp 3—Disengagement switch adjustment and associated wiring harness terminals and connectors.
- Lamp 4—Throttle position feedback and associated wiring harness terminals and connectors.
- Lamp 5—Servo vent valve, RESUME/ACCEL contacts in the engagement switch and associated wiring harness terminals and connectors.
- Lamp 6—Servo charge valve, RESUME/ACCEL contacts of the engagement switch and associated wiring harness terminals and connectors.









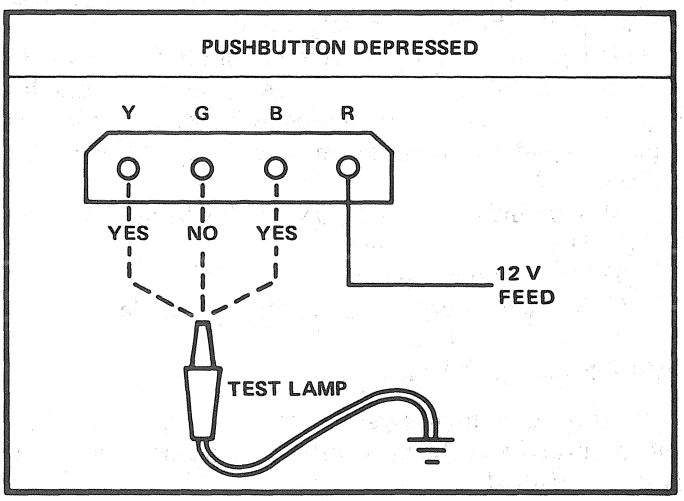


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Fig. 1H-3 Control Switch Continuity Test

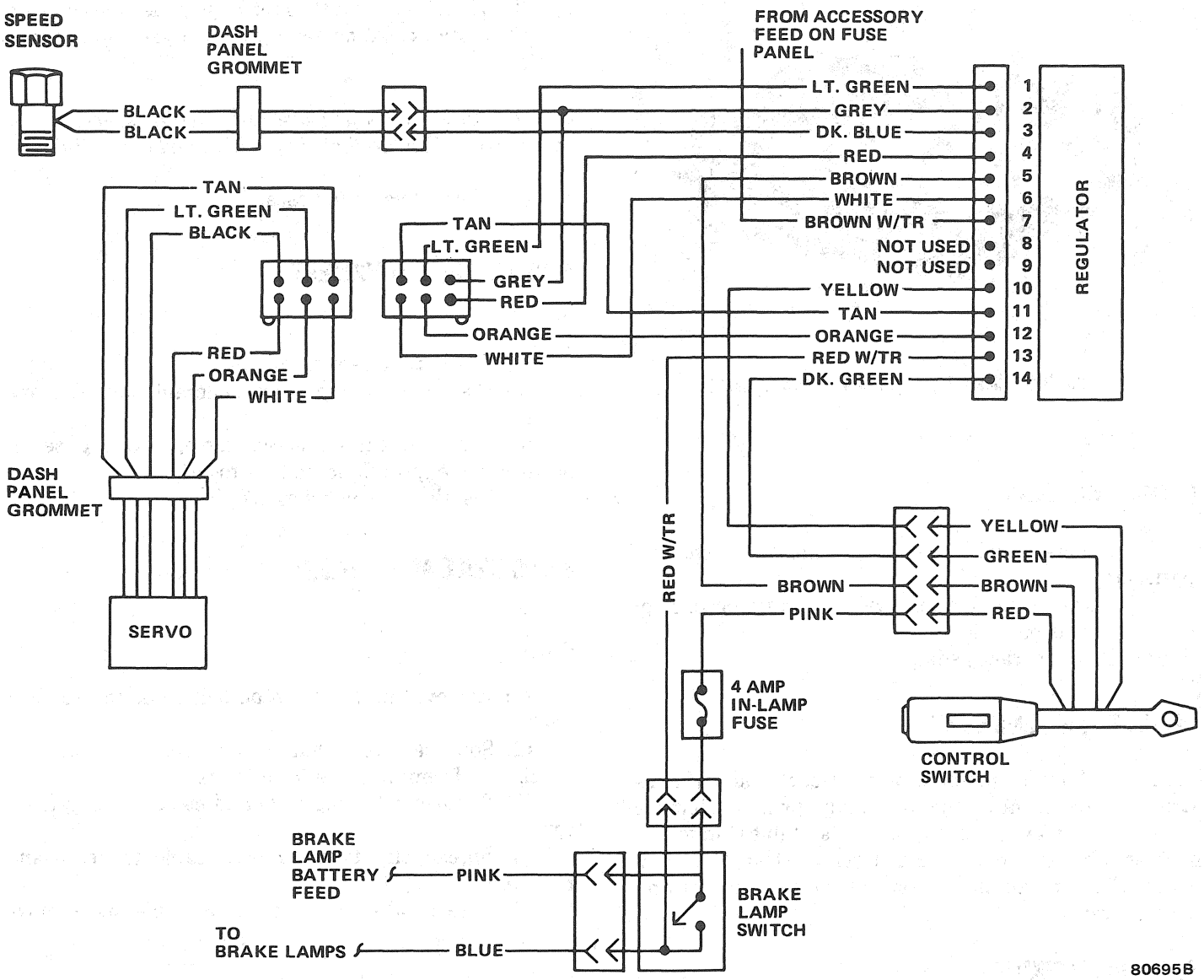

Fig. 1H-4 Cruise Command Wiring Diagram

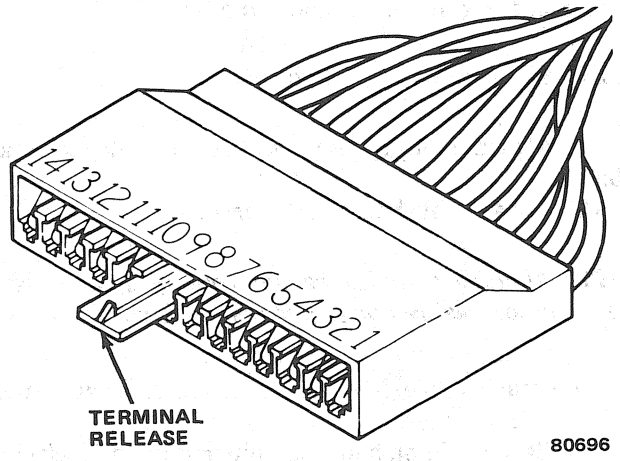

Fig. 1H-5 Harness Connector at Regulator

ADJUSTMENTS

Centering Adjustment

Adjustment is made by turning the centering adjustment screw on the regulator (fig. 1H-6).

If the speed control engages at two or more mph (3.2 km/h) higher than the selected vehicle speed, turn centering adjusting screw counterclockwise a small amount. If engagement speed is two or more mph (3.2 km/h) below selected speed, turn centering adjusting screw clockwise a small amount (fig. 1H-6).

NOTE: *Check for proper centering adjustment on a level road after each adjustment.*

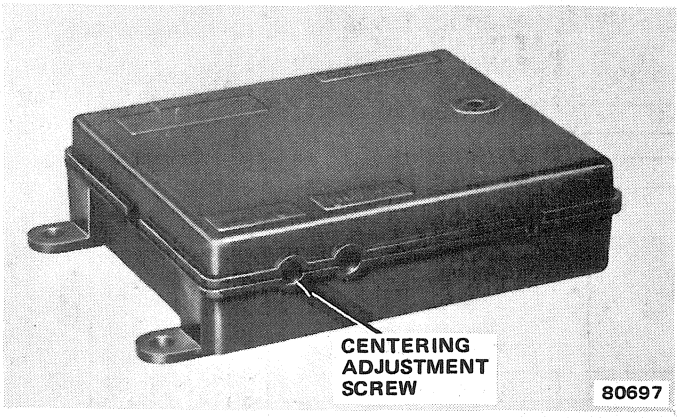

Fig. 1H-6 Centering Adjustment Screw Location

Vacuum Dump Valve

(1) Depress brake pedal and hold in depressed position.
(2) Move vacuum dump valve toward bracket on pedal as far as possible.
(3) Release brake pedal.

REGULATOR REPLACEMENT

The regulator is mounted on a bracket under the instrument panel near the headlamp switch. Remove screws and remove connector. Insert suitable thin tool to depress tab inside hole on regulator marked "Terminal Release." To install, insert connector into regulator and install screws.

SERVO REPLACEMENT

Removal

(1) Remove retaining nuts and cable housing from servo.
(2) Spread clip connecting cable to servo and remove.
(3) Disconnect vacuum hoses from servo.
(4) Remove retaining nut and servo from bracket. Note position of ground cable.
(5) Disconnect harness under instrument panel. Carefully thread harness through dash panel and remove servo.

Installation

(1) Attach servo and nut to bracket. Tighten with 60 inch-pounds (7 N•m) torque. Ensure ground cable is positioned on stud.
(2) Thread harness through dash panel and connect.
(3) Install cable on servo and squeeze clip to retain cable.

NOTE: *Mounting studs are not equally spaced from hole in servo. Ensure housing is installed correctly.*

(4) Connect vacuum hoses.

SERVO CHAIN REPLACEMENT

(1) Open tabs on servo cable.
(2) Disconnect chain from bellcrank pin. Remove chain.
(3) Install chain on servo cable, allowing seven beads outside tabs. Squeeze tabs together.
(4) Install chain on bellcrank pin.

SERVO CABLE REPLACEMENT

Removal

(1) Remove clip from pin on bellcrank and remove chain.
(2) Squeeze tabs that retain cable housing in bracket and remove cable from bracket.
(3) Remove retaining nuts and cable housing from servo.
(4) Spread clip that connects cable to servo and remove.
(5) Spread tabs on chain end of cable and remove chain.

Installation

(1) Connect chain to cable and squeeze tabs. Allow seven beads to remain outside cable tab.

NOTE: *Beads must be free to rotate.*

(2) Attach cable to servo and squeeze clip to retain cable.
(3) Install cable housing on servo.

NOTE: *Mounting studs are not equally spaced from hole in servo. Ensure housing is installed correctly.*

(4) Attach cable housing to bracket. Ensure tabs are locked in bracket.
(5) Place chain on bellcrank pin and install lock clip. Seven beads must be visible between bellcrank clip and cable clip.

CONTROL SWITCH ASSEMBLY REPLACEMENT

The Cruise Command control switch assembly is integral with the turn signal switch lever. The switch is not repairable. The switch and harness assembly can be replaced only as a complete unit.

Removal

(1) Remove following items.
- (a) Horn button insert
- (b) Steering wheel
- (c) Anti-theft cover
- (d) Locking plate and horn contact

(2) Remove turn signal switch lever and control switch assembly (allow handle to hang loose outside steering column).

(3) Remove four-way flasher knob.

(4) Remove holddown screws and turn signal switch.

(5) Remove trim piece from under steering column.

(6) Disconnect four-wire connector.

(7) *Tilt Column*—**Remove harness from plastic connector. Tape two of four wires back along harness (to allow smaller diameter) and tape string to harness.**

(8) *Standard Column*—**Tie or tape string to plastic connector.**

(9) Remove lever and harness assembly from column.

Installation

(1) Test replacement Cruise Command control switch by connecting to wire harness before installing in steering column. Refer to Control Switch Continuity Test.

NOTE: *When installing, the harness must be routed through the turn signal lever opening because the handle will not fit through the opening.*

(2) Tape two of four leads back along harness. Tape harness to string that was attached to original harness before removal.

(3) Pull replacement harness down through steering column. On tilt column, harness must pass through hole on left side of steering shaft.

NOTE: *It may be necessary to loosen steering column mounting screws for easier routing of harness.*

(4) Install turn signal switch and four-way flasher knob.

(5) Install turn signal switch lever and control switch assembly.

(6) Install horn contact, locking plate and lock ring anti-theft cover.

(7) Install steering wheel and horn button insert.

(8) Install trim on steering column.

Cruise Command Diagnosis Chart

TEST AND CONDITIONS	TEST LAMP RESULTS	CHECK—REPAIR
(1) Test for Correct Power Source Connection Ignition Switch—Off Engagement Switch—Off	All Lamps Off	None
	One or More Lamps On	Remove brown wire (5) from direct source of voltage or repair defective engagement switch.
(2) Test for System Electrical Continuity Ignition Switch—On Engagement Switch—On	Lamps 1, 2, 3, & 4 On, Lamps 5 & 6 Off	None
	Lamp 1 Off	Check for blown fuse in pink wire circuit. Check red, brown & grey wires at engagement switch connector for continuity to switch. Check dark green wire at regulator connector for continuity to regulator.
	Lamp 2 Off	Check speed sensor continuity. Check grey & dark blue wire at speed sensor for continuity. Check terminals 2, 3, 5 & 7 at regulator connector for proper connection to wires.

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TEST AND CONDITIONS	TEST LAMP RESULTS	CHECK—REPAIR
(2) Test for System Electrical Continuity Ignition Switch—On Engagement Switch—On	Lamp 3 Off	Check brake light switch adjustment. Check brown, light blue & green wire connections for continuity.
	Lamp 4 Off	Check terminals 2 & 11 on regulator connector. Check continuity of throttle position feedback potentiometer on servo.
(3) Test for Servo Valve Continuity Ignition Switch—On Engagement Switch—On Set Speed Switch—Depressed WARNING: If engine is operating, servo will move throttle to wide open position.	Lamp 2, 3, 4, 5 & 6 On Lamp 1 Off Lamp 4 will dim when servo moves throttle to wide open position with engine operating.	None
	Lamp 2 Off	Refer to Test 2, Lamp 2 Off.
	Lamp 3 Off	Refer to Test 2, Lamp 3 Off.
	Lamp 4 Off	Refer to Test 2, Lamp 4 Off.
	Lamp 5 Off	Check for defective connections at terminals 6 & 12 on regulator connector. Replace defective servo.
	Lamp 6 Off	Check for defective connection at terminals 4 & 12 on regulator connector. Replace defective servo.
	All lamps Off after depressing set speed switch or moving engagement switch to resume/ acceleration position.	Check for blown fuse. Check for shorts in red, pink & brown wire circuits. Replace defective servo.
(4) Test for System Disengagement with Brake Pedal Depressed Ignition Switch—On Engagement Switch—On Brake Pedal Depressed	Lamps 1, 2 & 4 On Lamps 3, 5 & 6 Off Lamp 3 On when brake pedal is released.	None
	Lamp 1 Off	Refer to Test 2, Lamp 1 Off.
	Lamp 2 Off	Refer to Test 2, Lamp 2 Off.
	Lamp 4 Off	Refer to Test 2, Lamp 4 Off.
	Lamp 3 Off when brake pedal is released.	Refer to Test 2, Lamp 3 Off.

TEST AND CONDITIONS	TEST LAMP RESULTS	CHECK—REPAIR
(5) Test Resume/Acceleration Position of Engagement Switch Ignition Switch—On Engagement Switch—On Move engagement switch to resume/accelerate position. WARNING: If engine is operating, servo will move throttle to wide open position.	All Lamps On Lamp 4 will dim when servo moves throttle to wide open poision.	None
	Lamp 1 Off	Refer to Test 2, Lamp 1 Off.
	Lamp 2 Off	Refer to Test 2, Lamp 2 Off.
	Lamp 3 Off	Refer to Test 2, Lamp 3 Off.
	Lamp 4 Off	Refer to Test 2, Lamp 4 Off.
	Lamp 5 Off	Refer to Test 3, Lamp 5 Off.
	Lamp 6 Off	Refer to Test 3, Lamp 6 Off.
	All Lamps Off	Refer to Test 3, All Lamps Off.

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EIGHT-CYLINDER ENGINE SYSTEM

GENERAL

The Jeep Cruise Command automatic speed control system for eight-cylinder engines receives vehicle speed by way of the speedometer cable and uses engine intake manifold vacuum to regulate the throttle to automatically maintain any preset cruising speed between 30 mph (48 km/h) and the legal maximum speed limit.

A slight increase or decrease of speed (as much as 3.5 mph or 5.6 km/h) is normal when a vehicle is driven up or down grades not exceeding 7 percent (most interstate highways). A change of speed greater than 3.5 mph (5.6 km/h) may be experienced when driving on unusually steep (or mountain) terrain or at high altitudes.

The Cruise Command control assembly is an integral part of the turn signal switch lever and consists of two separate switches, the OFF-ON-RES (resume) slide switch and the pushbutton set switch.

To engage the speed control system, move the OFF-ON-RES slide switch to the ON position and accelerate the vehicle to the desired speed. Press the set switch pushbutton on the end of the turn signal switch lever and release. The speed control system will now automatically maintain the selected speed. The system will be disengaged when the brake pedal is lightly depressed.

After accelerating to 30 mph (48 km/h), the speed control system can be reengaged at the previously selected speed by moving the OFF-ON-RES slide switch to the RES (resume) position and releasing the switch. When the resume function is used, the rate of acceleration is controlled by engine intake manifold vacuum. The rate of acceleration cannot be adjusted. On large displacement eight-cylinder engines, the acceleration rate will be firm.

WARNING: *Cruise Command should not be used when driving on slippery roads or in congested traffic areas.*

NOTE: *When the ignition switch is turned OFF or slide switch is moved to the OFF position, the preset speed*

selection and the resume speed function are canceled. The speed selection must be reset when the system is re-actuated.

The Cruise Command can be set for a higher speed than initially selected by accelerating to the desired speed and then depressing and releasing the set push-button. Depressing and holding the set pushbutton while cruising at a preset speed will also cause a slow increase in speed. A lower controlled speed can be achieved by lightly depressing the brake pedal momentarily, allowing the vehicle to slow to the desired speed and then depressing and releasing the set pushbutton.

COMPONENTS

The Jeep Cruise Command automatic speed control system for eight-cylinder engines consists of five major components: the regulator, relay, bellows, control switch assembly and release circuit.

Regulator

The regulator receives vehicle speed from the speedometer cable, which is connected between the regulator and the transmission. The flyweight-type governor reacts to the centrifugal force imparted by the rotating cable and engages the low speed switch at a rotation speed equivalent to approximately 30 mph (48 km/h). When the low speed switch is closed, the driver may set the selected vehicle speed.

The regulator is serviced as an assembly.

Relay

The speed control system relay is energized only when the ignition switch is turned to the ON position. This prevents a battery drain when the ignition switch is in the OFF position.

Bellows

The bellows, a vacuum servo, reacts to the modulated vacuum and controls the vehicle speed by actuating the throttle through a beaded chain.

Control Switch Assembly

The control switch assembly is an integral part of the turn signal switch lever. When actuated, it energizes either the solenoid valve, the coupling coil or both.

Release Circuit

When the brake pedal is depressed slightly, ground is removed to deenergize the solenoid valve and disengage the speed control system.

OPERATION

Regulator

The regulator consists of three functional sub-assemblies: the governor, solenoid valve, and coupling coil and centering spring.

Governor

The governor consists of two flyweights on a shaft, an actuator and a spring (fig. 1H-7). The shaft passes through the actuator but is not attached to it (i.e., the actuator is free to slide on the shaft). The spring applies tension that holds the actuator against the flyweights. When the shaft is rotated by the speedometer cable, the flyweights are thrown outward by centrifugal force. This forces the actuator to slide away from the flyweights against the tension of the spring. At a vehicle speed of approximately 30 mph (48 km/h), the actuator has moved far enough to close the low speed switch. This occurs when the spring-loaded slider on the actuator contacts the drive pin (fig. 1H-9) on the coupling coil.

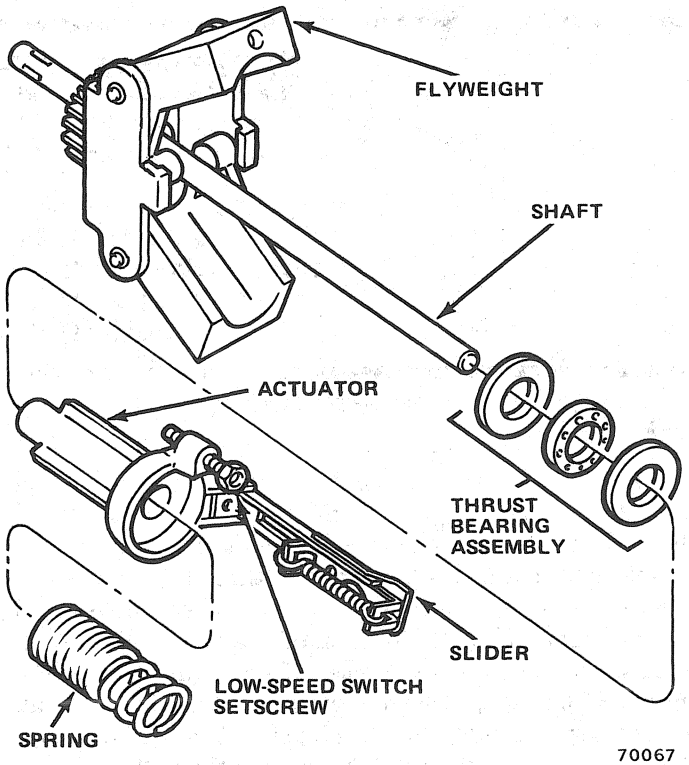

Fig. 1H-7 Regulator Governor

Solenoid Valve

The valve controls air pressure leaving the regulator by sealing the manifold vacuum port until the solenoid coil is energized (fig. 1H-8). When current is supplied to

the coil, the valve stem is pulled upward and opens the manifold vacuum port. When the coil is deenergized, the valve is closed by action of the spring.

A glass-encapsuled reed switch is mounted on the outside of the solenoid coil. The electromagnetic field surrounding the energized coil closes the reed switch and allows current to flow to the solenoid coil. As long as current is supplied via the closed reed switch, the coil remains energized and holds the valve open.

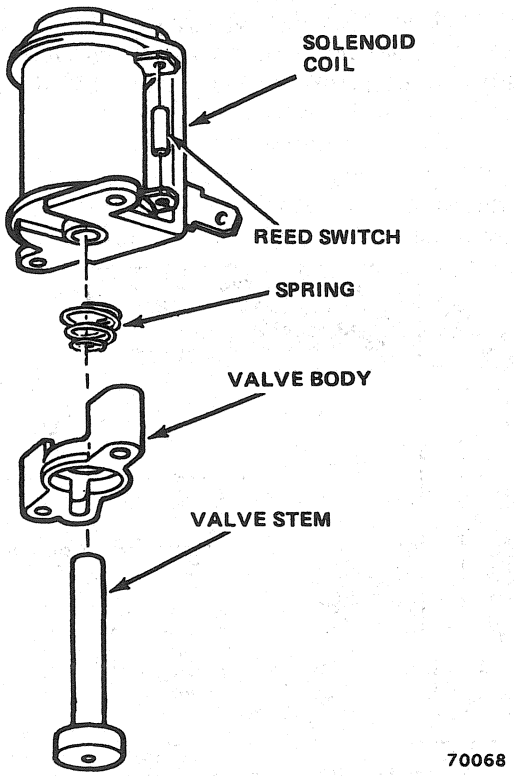

Fig. 1H-8 Regulator Solenoid Valve

Coupling Coil and Centering Spring

The coupling coil is the mechanism that provides the speed control system with the memory for the resume speed function (fig. 1H-9). When not under the influence of the electromagnetic field surrounding the coupling coil, the rotating vacuum regulator plate is held in a centered position by the centering spring (fig. 1H-10).

The coupling coil is rotated on its axis by motion of the governor actuator. When the coupling coil is not energized, it can be rotated without affecting the position of the rotating vacuum regulator plate. When energized, the electromagnetic field surrounding the coupling coil captures the vacuum regulator plate and forces it to rotate in union with the coupling coil. Slight rotational movement of the vacuum regulator plate either uncovers or blocks the vacuum vent port.

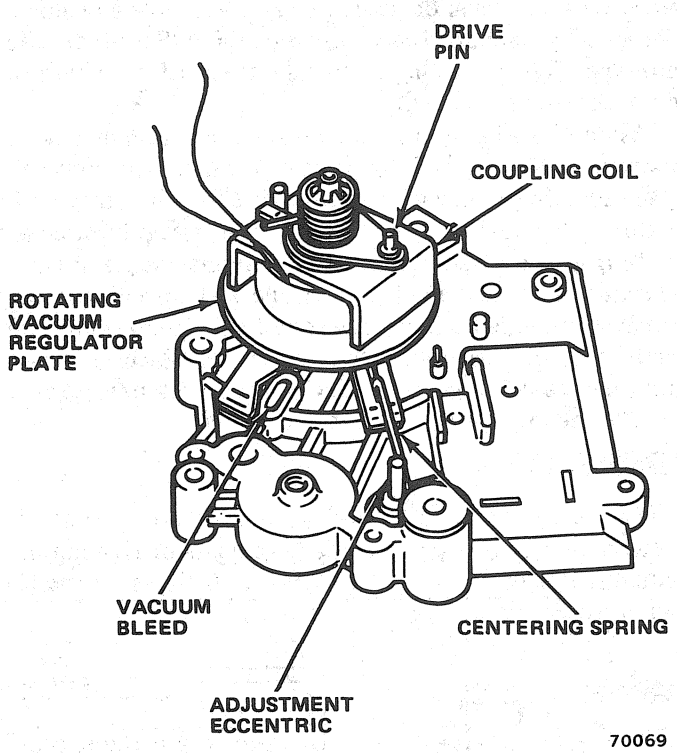

Fig. 1H-9 Regulator Coupling Coil and Centering Spring

The centering spring controls the position of the rotating vacuum regulator plate over the vacuum vent port when the set speed pushbutton switch is depressed (fig. 1H-10). Its adjustment is accomplished by an eccentric. Adjustments of more than 1/8 turn of the eccentric should not be attempted.

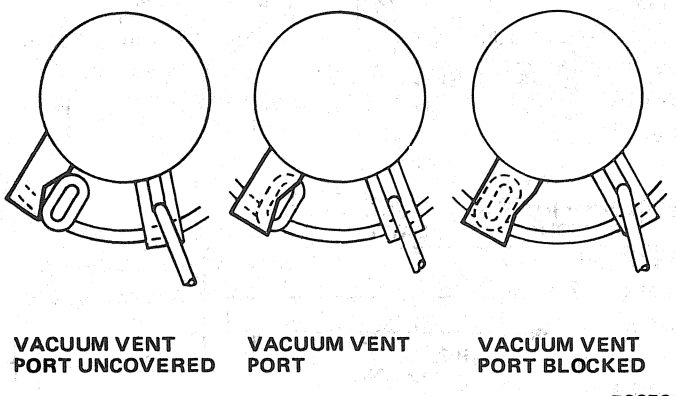

Fig. 1H-10 Vacuum Regulator Plate Positions

Control Switch Assembly

Slide Switch ON

With the ignition switch ON and the engine operating, the speed control system relay is energized and current

is supplied to the slide switch (fig. 1H-11). When vehicle speed reaches approximately 30 mph (48 km/h), the governor flyweights have moved outward far enough to close the low speed switch.

When the slide switch is moved to the ON position, current is supplied through the set speed pushbutton switch to the coupling coil, which is then energized. The coupling coil is provided a ground by the regulator case. Note that the solenoid valve is in the deenergized position and seals the vacuum source because no current has yet been supplied to energize the solenoid valve coil. The system is now ready to be set for the selected speed provided vehicle speed is above 30 mph (48 km/h), which causes the low speed switch to be closed.

Set Speed Pushbutton Switch Depressed

When the desired vehicle speed is reached, the set speed pushbutton switch is depressed momentarily (fig. 1H-12). Current to the coupling coil is interrupted and the coil is deenergized. This uncouples the vacuum regulator plate from the coupling coil. Spring tension from the governor actuator causes the freed coupling coil to rotate until it is in the position that corresponds to the selected vehicle speed. The vacuum regulator plate is moved by the centering spring to its neutral (calibrated vent) position. Simultaneously, current is supplied to energize the solenoid valve coil, which closes the reed switch and pulls the vacuum valve off its seat. The

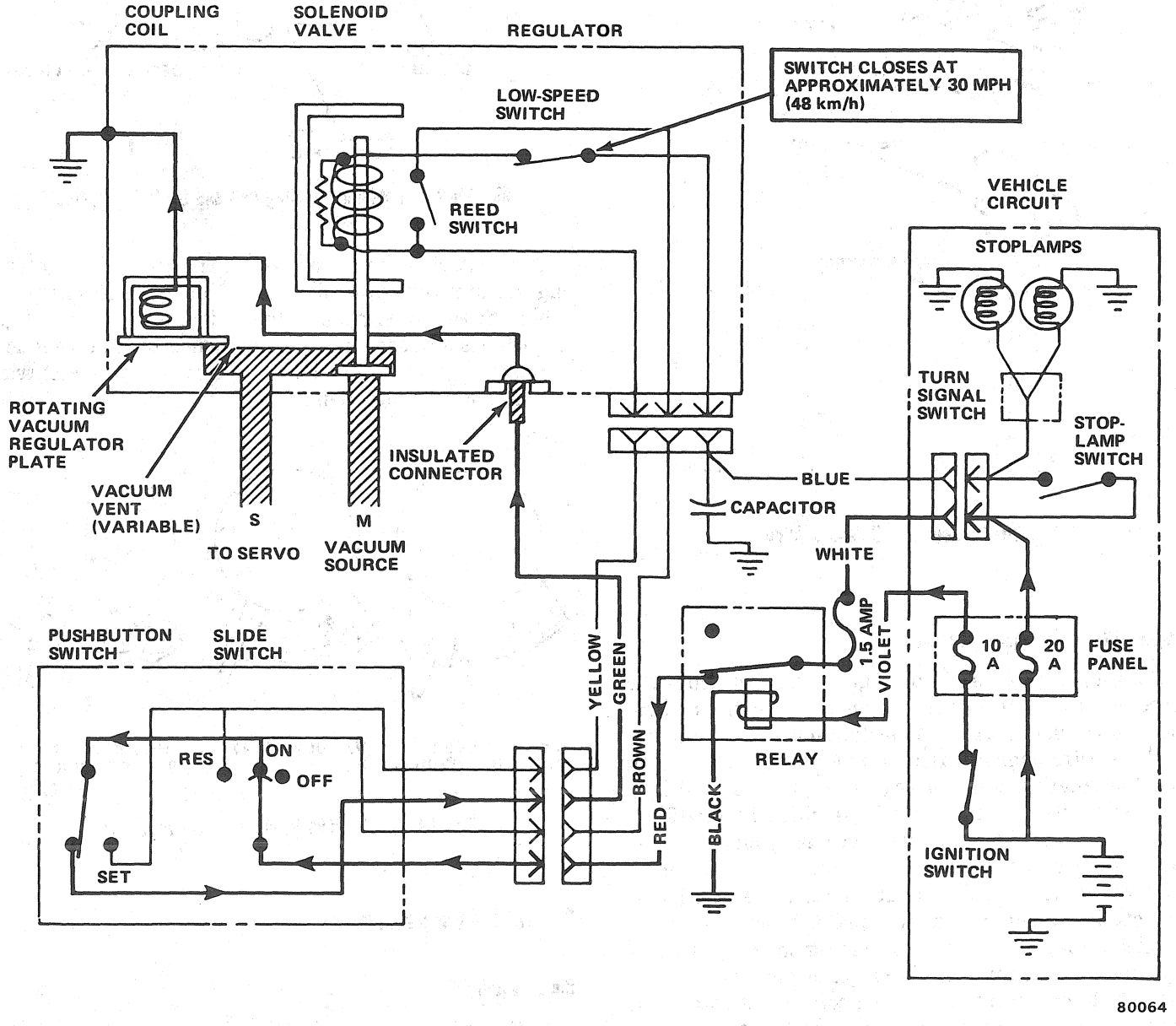

Fig. 1H-11 Current Flow—Slide Switch On

vacuum source begins to evacuate air from the mixing chamber of the regulator valve and the bellows.

The regulator solenoid valve coil is grounded through the stoplamp bulbs.

Set Speed Pushbutton Switch Released—Maintaining Speed

This mode of operation begins when the regulator solenoid valve is maintained in the energized position by the holding current flowing through the reed switch (fig. 1H-13). At that time, current flows from ground at the stoplamp bulbs, through the low-speed switch, through the solenoid coil, through the reed switch to the voltage source. This current holds the solenoid in the energized position. When the pushbutton is released, the hold-in current maintains the solenoid valve in the open position. Current is simultaneously supplied to the coupling coil, which electromagnetically captures the vacuum regulator plate. The coupling coil and vacuum regulator plate are electromagnetically locked together and may be regarded as a single unit. The coupling coil is grounded through the regulator case.

Varying vehicle speed causes the governor flyweights to turn the coupling coil. Lower speeds cause the weights to collapse, blocking the vacuum vent port. This directs all the vacuum to the bellows and causes the throttle to open further. Higher speeds cause the weights to move outward and uncover the vacuum vent port. Decreased vacuum at the bellows causes the throttle to close.

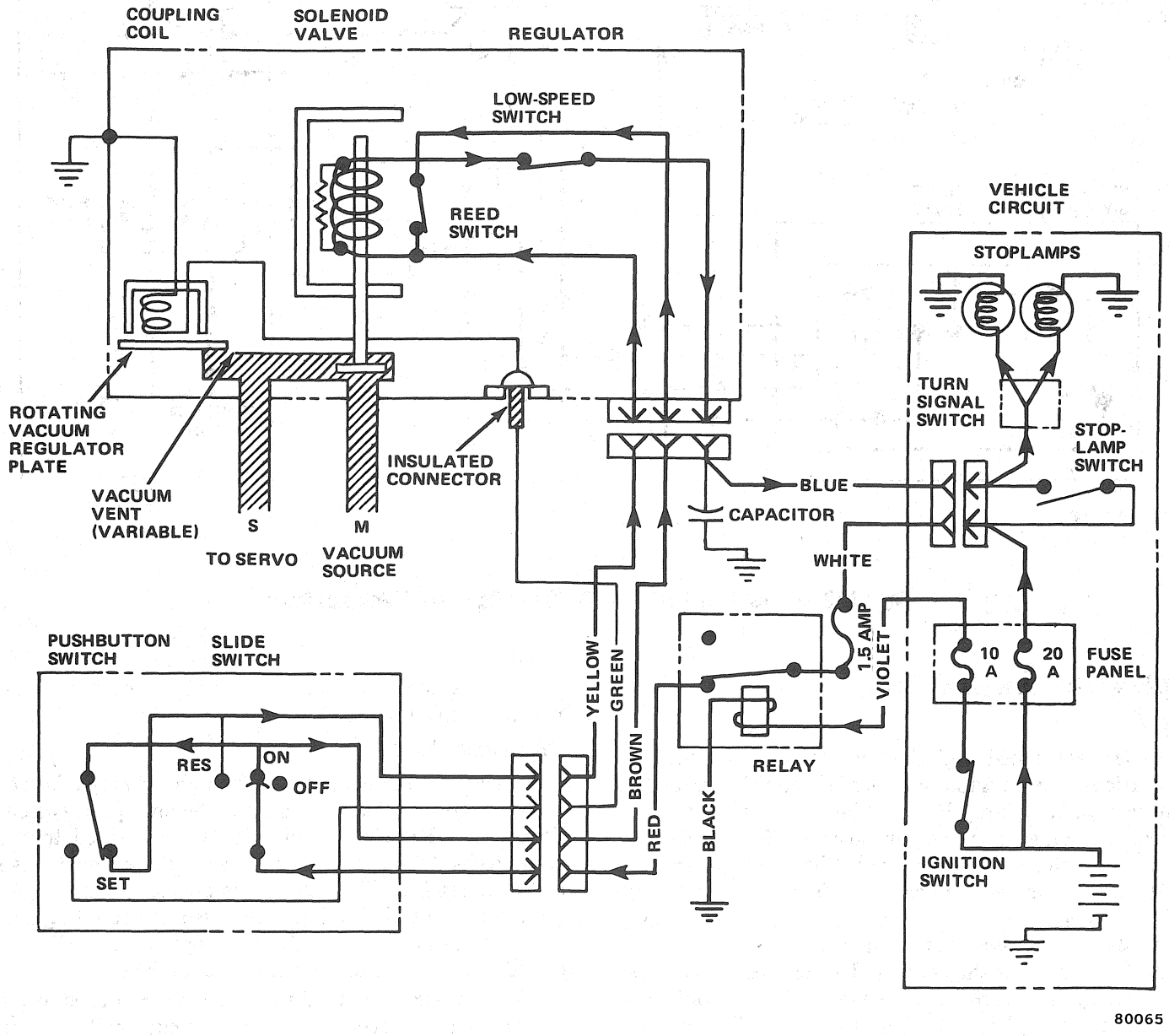

Fig. 1H-12 Current Flow—Set Speed Pushbutton Switch Depressed

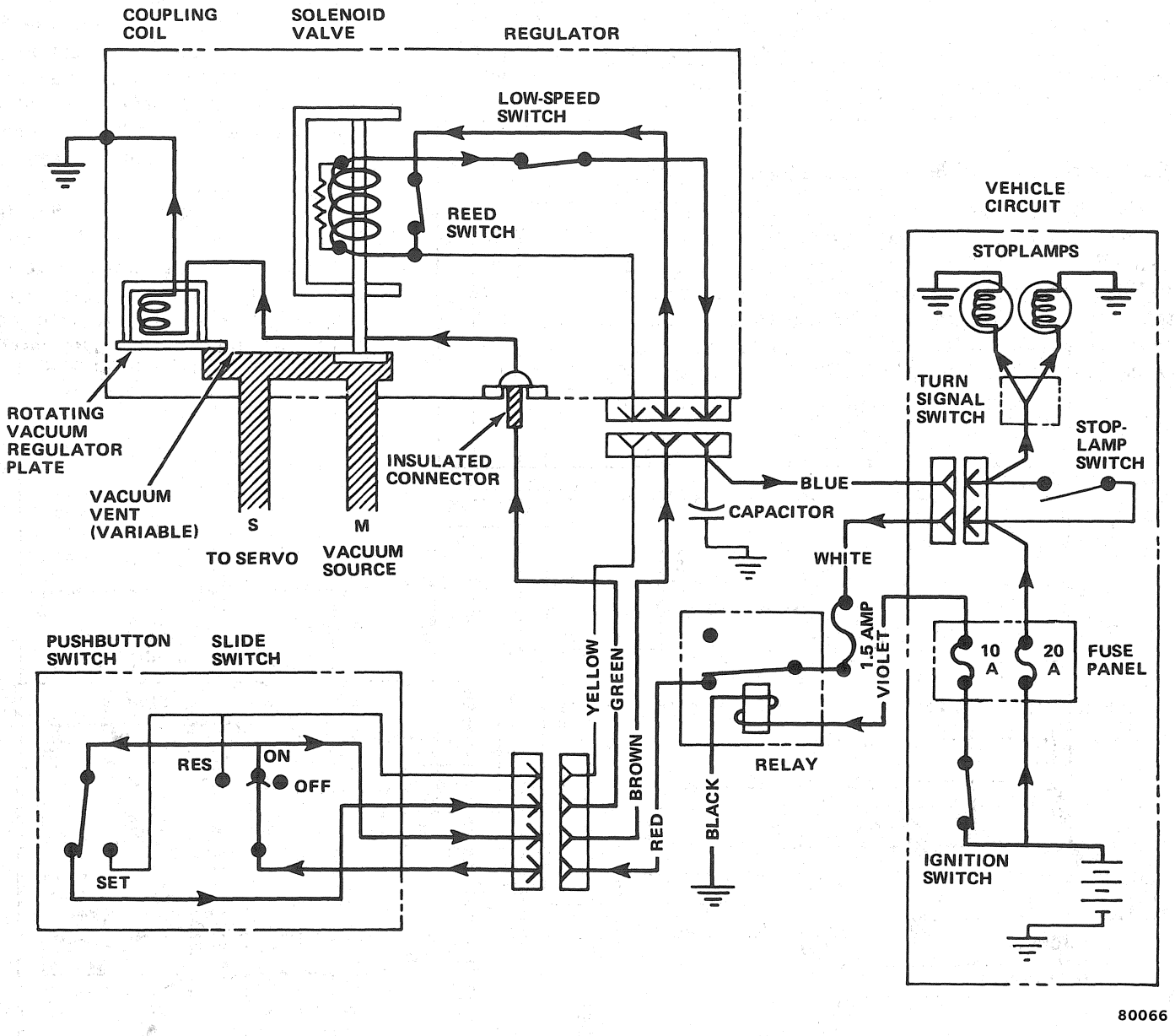

Fig. 1H-13 Current Flow—Set Speed Pushbutton Released—Maintaining Speed

Stoplamp Switch Closed (Disengagement)

In the set speed and the maintain speed mode of operations, the regulator solenoid coil is grounded through the stoplamp bulbs. When the brakes are applied, the same voltage potential is applied to the previously grounded end of the coil. With no difference of voltage potential, current ceases to flow through the coil and it immediately deenergizes (fig. 1H-14). This allows the valve to seat against the manifold vacuum port and relieves vacuum at the bellows. This causes the throttle to close, and the engine is no longer under the control of the speed control system. The coupling coil is not affected because it is not grounded through the stoplamp bulbs. The coupling coil and vacuum regulator plate remain coupled together.

Resume Switch Operation

Vehicle speed must be above 30 mph (48 km/h) before the governor flyweights will close the low-speed switch. When the OFF-ON-RES slide switch is moved to the resume position, current is supplied to the solenoid valve coil (fig. 1H-15). When the valve opens, manifold vacuum evacuates the bellows. Because the coupling coil was not deenergized when the stoplamp switch was closed, it continues to control the vacuum vent.

When the OFF-ON-RES slide switch is returned to the ON position, the reed switch holding current keeps the solenoid valve open and manifold vacuum causes the

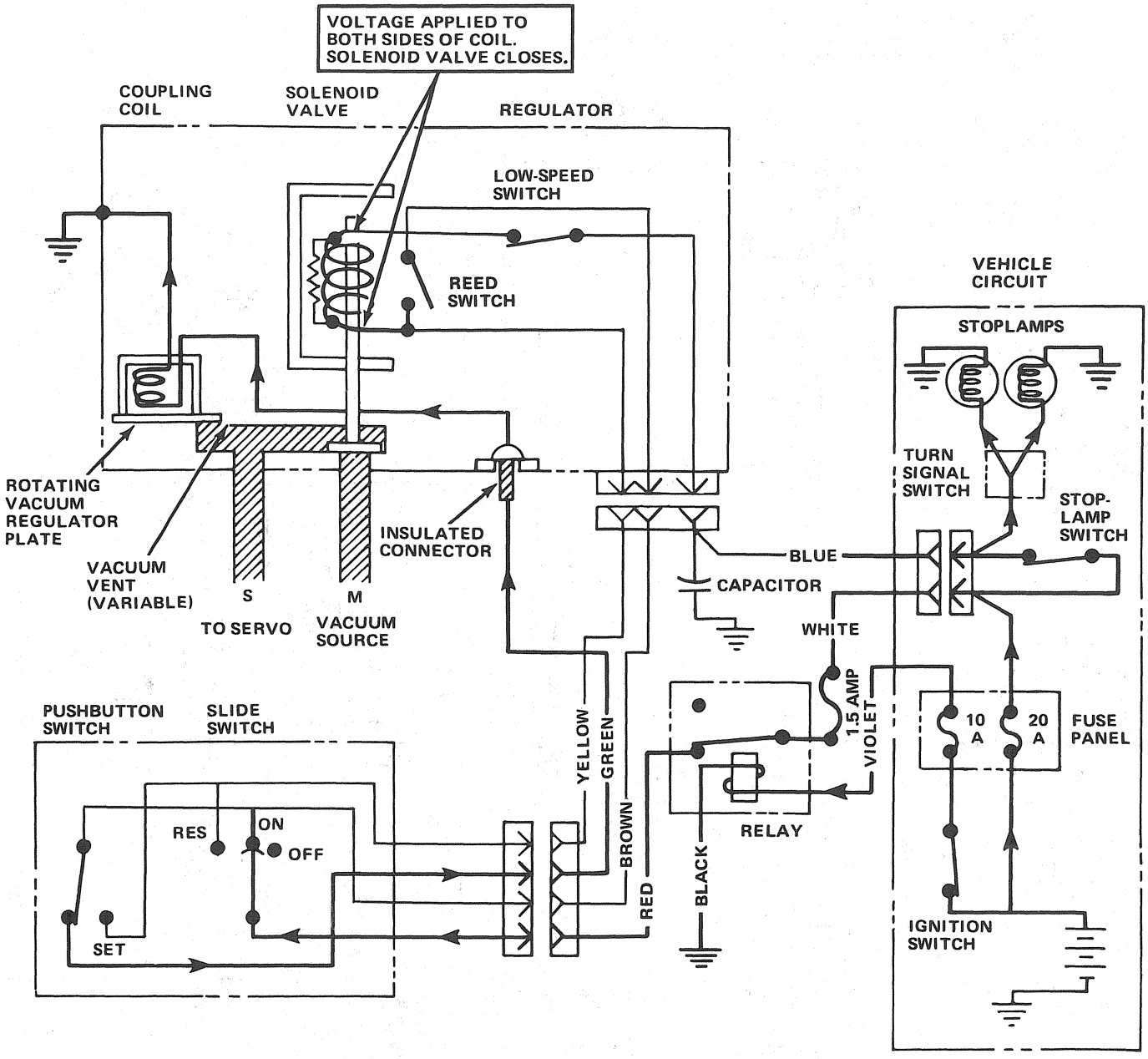

Fig. 1H-14 Current Flow—Stoplamp Switch Closed

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servo to move the throttle to accelerate the engine to attain the previously selected vehicle speed.

NOTE: *A mechanical interlock in the control switch assembly prevents operating the resume function and pushbutton set-speed function at the same time.*

TROUBLESHOOTING

When troubleshooting the Cruise Command automatic speed control system, refer to Testing and the Service Diagnosis charts.

Refer to Chapter 3C for speedometer cable and gear replacement procedures.

TESTING

The following tests should be performed as part of a service diagnosis to determine the cause of the malfunction and the correction required.

Control Switch Assembly Continuity Test

Test the control switch assembly continuity with an ohmmeter or test lamp. Connect the testing device to the wire terminals as indicated in the Control Switch Assembly Continuity Test Chart.

CAUTION: *If an ohmmeter is used for the testing, the ignition switch must be off. Otherwise, the ohmmeter will be internally damaged.*

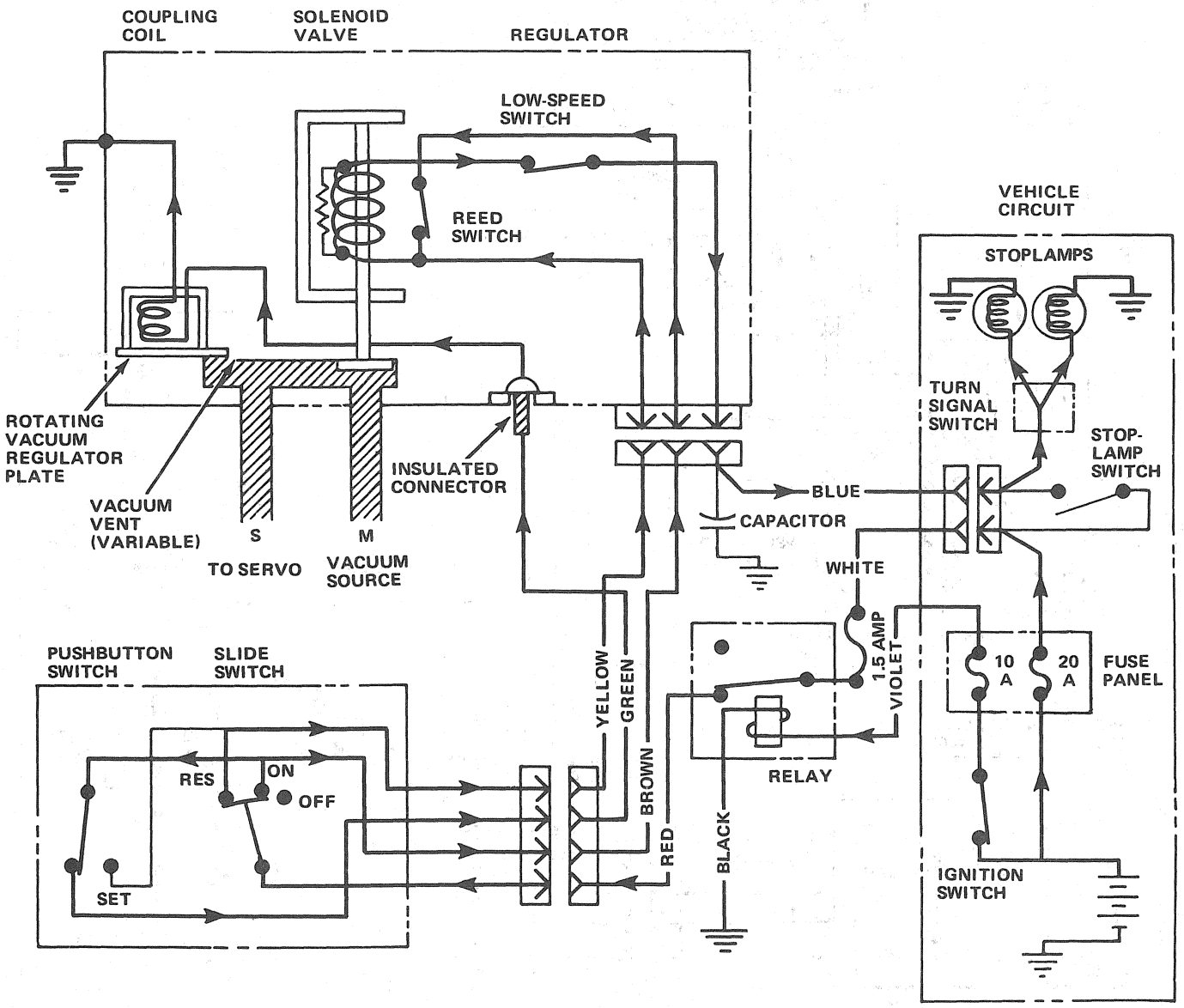

Fig. 1H-15 Current Flow—Resume Slide Switch Operation

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Control Switch Assembly Continuity Test Chart

Switch Wire	Slide Switch Continuity			Pushbutton Depressed Slide Switch On
	Off	On	Resume	
Red to Brown	Open	Closed	Closed	Closed
Red to Green	Open	Closed	Closed	Open
Red to Yellow	Open	Open	Closed	Closed

NOTE: *Pushbutton cannot be depressed with slide switch in resume position*

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Circuit Tests

Refer to figure 1H-16 for wiring diagram.

NOTE: *It is not always necessary to remove the regulator to perform circuit tests.*

(1) Disconnect push-on connectors (single terminal and triple terminal) from regulator.

(2) Turn ignition switch to ACCESSORY position.

(3) Move OFF-ON-RES slide switch to ON position.

(4) Using test lamp, connect one test lamp probe to ground and contact brown wire and then green wire at connector terminals with other probe. Test lamp should light. If test lamp does not light when in contact with either wire, inspect fuse, relay, control switch assembly and connection at power source.

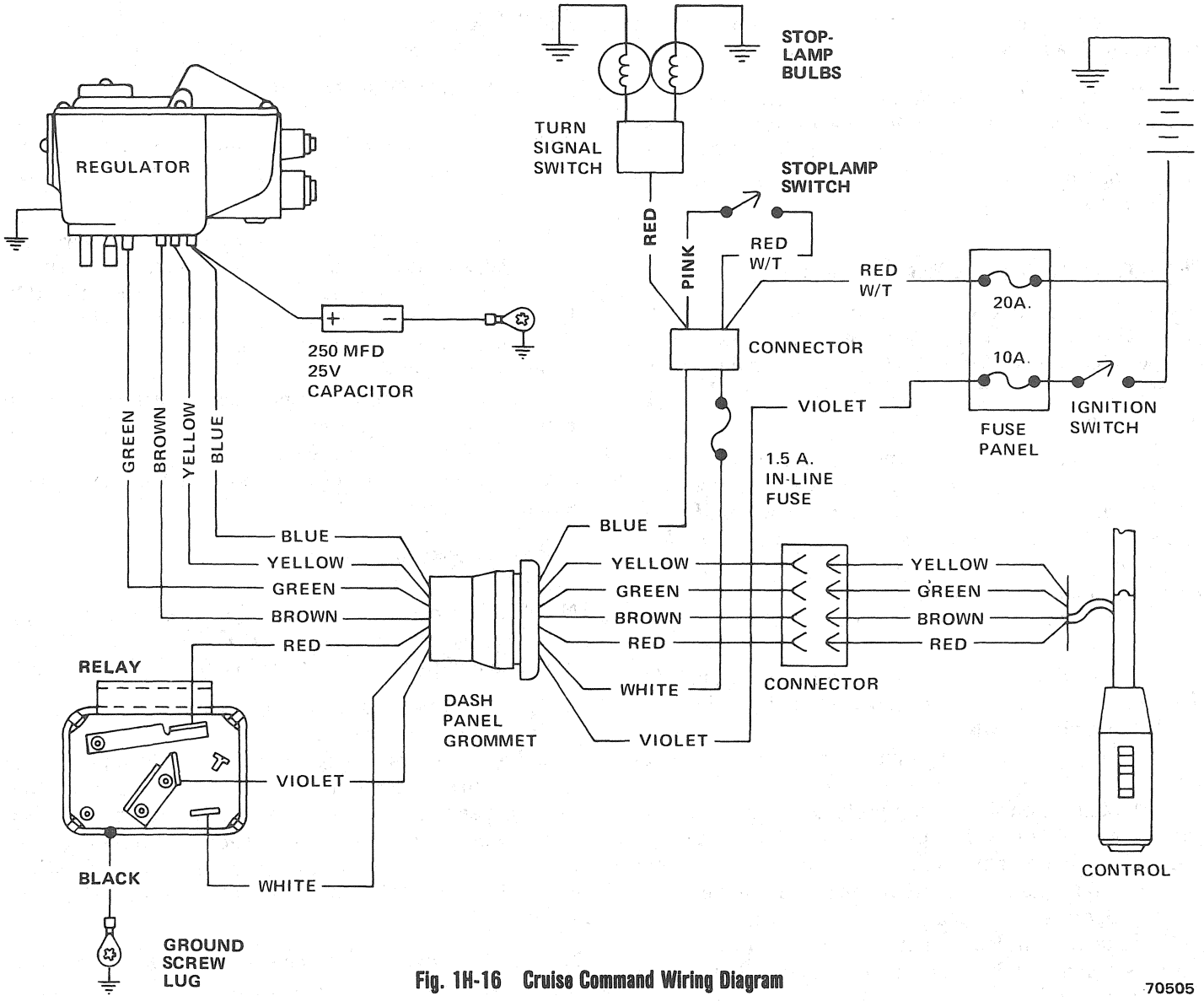

Fig. 1H-16 Cruise Command Wiring Diagram

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(5) Depress SET SPEED pushbutton and hold. Connect one test lamp probe to ground and contact each wire with other probe at connector terminals. Test lamp should light when in contact with brown and yellow wires and should not light when in contact with green or blue wire.

(6) Release SET SPEED pushbutton.

(7) Move OFF-ON-RES slide switch to RES position and hold. Connect one test lamp probe to ground and contact each wire terminal in connector with other probe. Test lamp should light when in contact with any wire except blue wire (blue wire connects to stoplamp bulbs side of stoplamp switch).

To conduct an independent test of the control switch assembly before removal from the vehicle, isolate the other components from the switch by disconnecting the multiple wire connector in passenger compartment. When performing the circuit tests, omit steps (8) through (15) if steps (1) through (7) resulted in locating a fault.

(8) Attach jumper wire from 12-volt power source to red wire terminal in control switch harness connector.

(9) Move OFF-ON-RES slide switch to OFF position.

(10) Using test lamp, connect one test lamp probe to ground and contact, in turn, brown wire, green wire, and yellow wire with other probe. Test lamp should not light when in contact with any of these wires.

(11) Move OFF-ON-RES slide switch to ON position.

(12) Contact brown wire and then green wire with probe. Test lamp should light when in contact with any of these wires. Contact yellow wire with probe. Lamp should not light.

(13) Depress SET SPEED switch pushbutton and hold. Repeat step (12). Test lamp should light when in contact with brown wire and yellow wire. Test lamp should not light when in contact with green wire.

(14) Release SET SPEED switch pushbutton.

(15) Move OFF-ON-RES slide switch to RES position and hold. Contact, in turn, brown wire, yellow wire, and

green wire with probe. Test lamp should light when in contact with any wire.

NOTE: *If steps (1) through (7) do not result in locating a fault and steps (8) through (15) do, replace Cruise Command wire harness. If steps (8) through (15) do not result in locating a fault, replace control switch assembly.*

Stoplamp Switch Disengagement Circuit Test

The disengagement function is integral with the stoplamp switch circuit. To test the stoplamp switch circuit, observe the stoplamps when brake pedal is depressed. Stoplamps should light when the brake pedal is depressed one-quarter inch or more.

NOTE: *If the Cruise Command automatic speed control system is to be disengaged when the brakes are applied, the stoplamp switch circuit must not be shorted to ground. Correct any stoplamp switch circuit problem before proceeding. Inspect for burned out bulbs, improper ground connections, open or grounded wires in the wire harness and defective switch.*

(1) Examine all harness connectors for proper fit. Turn ignition switch to accessory position and OFF-ON-RES slide switch to ON.

(2) Disconnect three-terminal connector from regulator.

(3) Connect one test lamp probe to ground and contact blue wire with other probe. Test lamp should not light. If test lamp lights, blue wire is connected to wrong side of stoplamp switch at stoplamp switch connector.

(4) Depress brake pedal 1/4 inch. Test lamp should light. If test lamp does not light, inspect power source fuses, stoplamp switch, and regulator wire harness to locate malfunction.

Automatic Speed Control System Relay Test

The automatic speed control system relay is located close to the fuse panel under the instrument panel.

NOTE: *Examine all wire connections for security prior to testing.*

(1) Turn ignition switch to accessory position and slide switch to ON position.

(2) Using test lamp, connect one probe to ground and contact each wire terminal at relay with other probe. Test lamp should light when in contact with every wire except ground (black) wire. If test lamp does not light when in contact with red wire but lights when in contact with white and violet wires, replace relay. If test lamp does not light when in contact with white and violet wires, test power source for battery voltage and inspect for open fuse and defective wire harness.

ADJUSTMENTS

Bellows Chain Linkage Adjustment

NOTE: *Before adjusting the bellows chain, the carburetor throttle must be at idle position, ignition off and choke valve fully open.*

Inspect and ensure the bellows bracket screws are tight. Adjust the chain at the bellows hook end, one bead at a time, until a free pin fit is obtained at the throttle lever. When properly adjusted, there should be a slight deflection in the chain without moving either the throttle lever or bellows.

After the chain has been properly adjusted, bend the bellows hook tabs together. The chain must be free in the hook after bending the tabs.

Do not use any type of lubrication on the chain guide and pulley assembly.

Centering Spring Adjustment

NOTE: *The centering spring adjustment is extremely sensitive and the eccentric must never be turned more than one-eighth turn in either direction.*

The adjustment is made by turning the centering spring adjustment eccentric.

If the speed control engages at 2 or more mph (3.2 or more km/h) higher than the selected speed, turn the centering spring adjusting eccentric "C" toward "S" 1/32 inch (0.8 mm) or less. If the engagement speed is below the selected speed, turn the centering spring adjusting eccentric toward "F" 1/32 inch (0.8 mm) or less (fig. 1H-17).

NOTE: *The centering spring is precisely adjusted when the actual vehicle speed corresponds with the selected speed or increases very slightly above it when the automatic speed control is engaged. The centering spring adjustment has no effect on maintaining the selected speed unless the centering spring eccentric is completely out of adjustment.*

COMPONENT REPLACEMENT

Regulator Replacement

(1) Disconnect driven hex cable from regulator.

(2) Disconnect knurled drive cable from regulator.

(3) Disconnect vacuum hoses, wiring harness connectors and ground connector.

(4) Remove regulator and relay.

(5) Install regulator, relay and ground connector.

(6) Connect vacuum hoses and wiring harness connectors.

(7) Connect knurled drive cable.

(8) Connect driven hex cable.

Service Diagnosis

Condition	Possible Cause	Correction
BLOWING STOPLAMP FUSES	(1) 250 mfd capacitor shorted.	(1) Replace capacitor.
BLOWING FUSES	(1) Short or ground in Cruise Command wiring circuit.	(1) Perform electrical checks.
CRUISE COMMAND DOES NOT ENGAGE	(1) Cruise Command harness fuse burned out.	(1) Check for cause. Replace fuse (1.5 amp only).
	(2) Faulty brake lamp switch.	(2) Replace brake lamp switch.
	(3) No current to brown wire.	(3) Check for loose connection or repair wiring harness.
	(4) Vacuum leak.	(4) Repair leak.
	(5) Bad ground at regulator.	(5) Check regulator for ground (use ohmmeter–check from regulator to mounting bracket).
	(6) Bad relay ground.	(6) Check ground wire for loose connection (use ohmmeter — check from relay case to known good ground).
	(7) Faulty connections.	(7) Check connections, repair as necessary.
	(8) Brake lamp fuse burned out.	(8) Check for cause and repair, replace fuse.
	(9) Brake lamp bulb(s) burned out.	(9) Replace bulb(s).
	(10) Control switch inoperative.	(10) See Circuitry Tests–steps (8) through (15).
	(11) Faulty regulator.	(11) Replace regulator.
	(12) Solenoid valve deformed.	(12) Replace regulator.
	(13) Relay inoperative.	(13) Replace relay, check ground, look for open in white wire.
CRUISE COMMAND DISENGAGES WHEN TURN SIGNAL SWITCH IS OPERATED	(1) 250 mfd capacitor open.	(1) Replace capacitor or repair ground.
	(2) Stop/turn lamp burned out on side opposite direction of turn.	(2) Replace bulb.

Service Diagnosis (Continued)

Condition	Possible Cause	Correction
CRUISE COMMAND DOES NOT DISENGAGE WHEN BRAKE IS APPLIED	(1) Defective brake lamp switch (open).	(1) Replace brake lamp switch.
	(2) Collapsed hose from servo to regulator.	(2) Replace hose.
	(3) 250 mfd. capacitor shorted.	(3) Replace capacitor.
RE-ENGAGES WHEN BRAKE IS RELEASED	(1) Faulty control switch.	(1) Replace control switch.
	(2) Check wiring for proper location.	(2) Correct wiring location at regulator or 4-wire connector.
	(3) Solenoid valve deformed.	(3) Replace regulator.
CARBURETOR DOES NOT RETURN TO NORMAL IDLE OR PULSATING ACCELERATOR PEDAL	(1) Improper throttle chain linkage adjustment.	(1) Adjust throttle chain linkage.
	(2) Speedometer cable or drive cable.	(2) Lubricate cable, including tips.
SPEEDOMETER INOPERATIVE AND CRUISE COMMAND OPERATES	(1) Speedometer cable not driving speedometer.	(1) Check for broken cable or loose connections.
	(2) Faulty regulator.	(2) Replace regulator as necessary.
NEITHER SPEEDOMETER NOR CRUISE COMMAND OPERATES	(1) Transmission cable not driving regulator.	(1) Check for broken cable or loose connections.
CRUISE COMMAND ENGAGES ABOVE OR BELOW DESIRED SPEED	(1) Regulator out of adjustment.	(1) Refer to centering spring adjustment.
SYSTEM DISENGAGES ON LEVEL ROAD WITHOUT APPLYING BRAKE	(1) Loose wiring connections or poor ground.	(1) Tighten connection and check ground.
	(2) Loose hoses.	(2) Check hose connections.

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Service Diagnosis (Continued)

Condition	Possible Cause	Correction
SYSTEM DISENGAGES ON LEVEL ROAD WITHOUT APPLYING BRAKE	(3) Servo linkage chain broken or throttle clevis slipped.	(3) Repair chain or install clevis.
	(4) Oversensitive stoplamp switch.	(4) Replace switch or check for binding in brake linkage.
ERRATIC OPERATION OF CRUISE COMMAND	(1) Check vacuum servo or vacuum hose.	(1) Replace servo or vacuum hose.
	(2) Check regulator.	(2) Replace regulator as necessary.
CRUISE COMMAND CONTINUES TO ACCELERATE AFTER ENGAGEMENT	(1) Open circuit in green wire attached to number 4 terminal at regulator.	(1) Repair open circuit in green wire. Check for improper connection at brake switch (crossed wires).
CAR LOSES EXCESSIVE SPEED ON HILLS	(1) Excessive slack in servo chain.	(1) Refer to Adjustments.
	(2) Lack of engine manifold vacuum.	(2) Move vacuum source to center of intake manifold.

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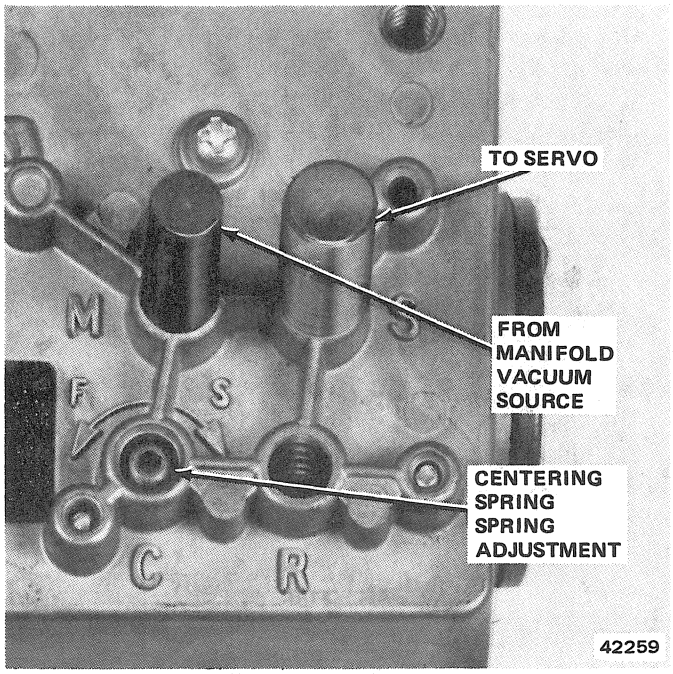


Fig. 1H-17 Centering Spring Adjustment

Relay Replacement

(1) Disconnect wires from relay.
(2) Remove relay.
(3) Install relay.
(4) Connect wires to relay.

Bellows Replacement

(1) Disconnect vacuum hose from bellows.
(2) Count number of beads outside bellows hook tabs. Disconnect chain from bellows.
(3) Remove bellows.
(4) Install replacement bellows.
(5) Connect chain, with same number of beads outside hook tabs as counted in step (2). Bend hook tabs.
(6) Connect vacuum hose.

Bellows Chain Replacement

(1) Count number of chain beads outside bellows hook tabs.
(2) Open hook tabs on bellows.
(3) Disconnect chain from throttle lever. Remove chain and compare length to replacement chain.

(4) Connect chain to bellows, allowing number of beads outside tabs as counted in step (1). Crimp tabs.
(5) Connect chain to throttle lever.

Control Switch Assembly Replacement

The control switch assembly is an integral part of the turn signal switch lever. The switch assembly is not repairable. The switch assembly and harness are serviced only as a unit.

Removal

(1) Remove following items.
(a) Horn button insert
(b) Steering wheel
(c) Anti-theft cover
(d) Locking plate and horn contact
(2) Remove turn signal switch lever (allow handle to hang loose outside steering column).
(3) Remove four-way flasher knob.
(4) Remove holddown screws and turn signal switch.
(5) Remove trim piece from under steering column.
(6) Disconnect four-wire connector.
(7) *Tilt Column*—Remove harness from plastic connector. Tape two of four wires back along harness (to allow a smaller diameter) and tape string to harness.
(8) *Standard Column*—Tie or tape string to plastic connector.
(9) Remove turn signal switch lever and control switch assembly and wire harness from column.

Installation

(1) Test replacement control switch assembly by connecting to wire harness before installing in steering column. Refer to Control Switch Assembly Continuity Test.

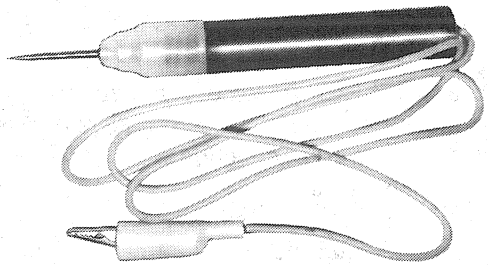
NOTE: *When installing the wire harness, it must be routed through the turn signal lever opening from the outside because the handle will not fit through the opening.*

(2) Tape two of four wires back along harness. Tape harness to string that was attached to original harness before removal.
(3) Pull replacement harness down through steering column. On tilt column, harness must pass through hole on left side of steering shaft.

NOTE: *It may be necessary to loosen steering column mounting screws for easier routing of harness.*

(4) Install turn signal switch and four-way flasher knob.
(5) Install turn signal switch lever and control switch assembly.
(6) Install horn contact, locking plate and lock ring anti-theft cover.
(7) Install steering wheel and horn button insert.
(8) Install trim on steering column.

Tools



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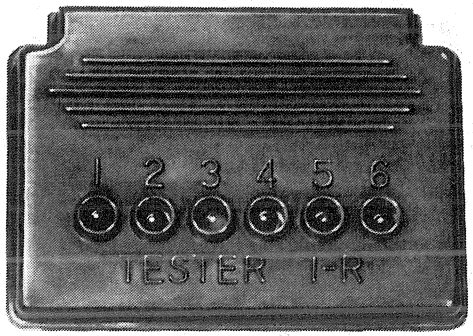
CONTINUITY
TEST LAMP



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