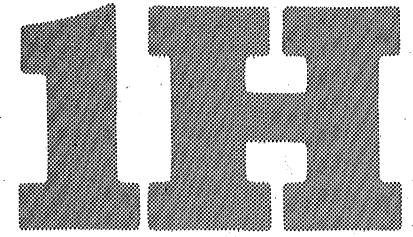


CRUISE COMMAND



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GENERAL

The Jeep six- and eight-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 (5.6 km/h) may be experienced with vehicles having an economy axle ratio or when driving on unusually hilly terrain, or at high altitudes.

To activate the system, slide the control switch to the ON position and accelerate to the desired speed (above 30 mph or 48 km/h). Depress the SET pushbutton on the end of the turn signal switch lever and release. The system will be activated when the SET pushbutton is released.

The driver may regain normal control by sliding the control switch to the OFF position or by lightly depressing the brake pedal (manual and automatic transmission) or clutch pedal (manual transmission). If the brake or clutch method is used to regain control, the previously selected vehicle speed will remain in memory and may be regained by momentarily sliding the control 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 desired 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 pushbutton and release.

A higher speed may also be attained temporarily by sliding the control switch to the RESUME/ACCEL position and holding. The vehicle will accelerate until the switch is released. When released, the vehicle will decelerate until the Cruise Command resumes controlling the throttle at the previously set speed. If the Cruise Command is ON but not set at a cruise speed, when the control switch is released from the RESUME/ACCEL position 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.

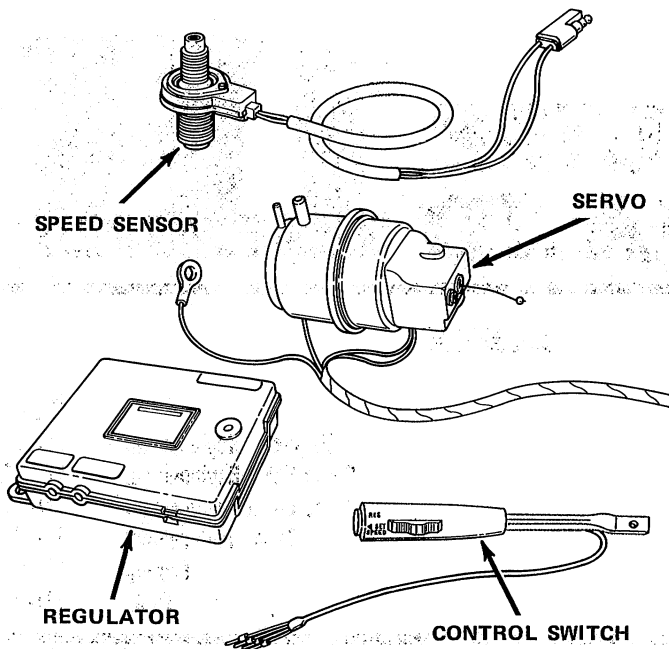
COMPONENTS

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

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.



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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 electronic regulator. Manifold vacuum provides the force for diaphragm motion. A bead-link chain connects the servo cable to the throttle linkage.

Control Switch

The control switch 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 (automatic and manual transmission) or clutch pedal (manual transmission) is depressed. The valves that control vacuum in the servo are electrically controlled by the regulator. When the brake (or clutch pedal with manual transmission) is depressed, ground is removed (by action of the switch) from terminal 13 of the electronic regulator to deactivate the servo. The servo charge valve is closed and the servo vent valve is opened

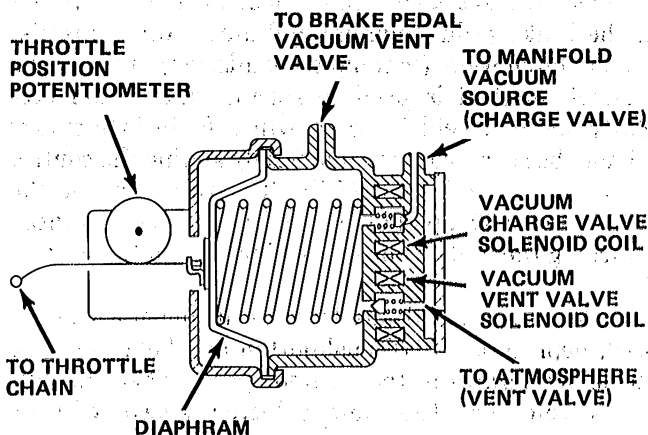
to admit atmospheric pressure. To further ensure immediate servo release, a brake or clutch pedal-activated mechanical vacuum vent valve (operating independently of the electronically controlled valves) admits atmospheric pressure into the servo whenever the brake or clutch pedal is depressed. A hissing 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 solenoid is energized, the valve is opened and manifold vacuum moves the diaphragm to control the throttle position. Throttle position is maintained for any speed above 30 mph (48 km/h) by balancing the amount of vacuum charge and vacuum vent. The control voltage that accomplishes this is provided by the regulator.

NOTE: Air is removed from the vacuum storage can through the one-way (check) valve whenever the engine is operating. As the Cruise Command depletes the vacuum (replaced by air) in the can, the air is removed as needed. The can functions as a storage reservoir and provides a relatively constant vacuum level even when engine manifold vacuum is decreased during engine acceleration.



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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 applied to four circuits in the regulator for further action. The low speed switch circuit 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 voltage amplitude, the engage/resume/accelerate circuit of the system is activated. The vehicle speed DC voltage is also applied to the high and low comparator circuits and to the memory circuit.

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

If the DC voltage amplitude from the DC converter (representing vehicle speed) remains between the reference plus and minus voltage amplitudes, 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 is maintained in a fixed position.

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

Whenever a road incline is encountered, vehicle 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 within the low comparator circuit. 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 solenoid is energized, the valve opens and the diaphragm moves to pull the chain and throttle cable, and the throttle is opened further. As the throttle moves, a throttle-position sensor (potentiometer) inside the servo is activated to provide feedback voltage to both comparator circuits. Without it, the throttle would continue to be opened further than necessary to maintain the set speed. The throttle-position potentiometer feedback voltage eliminates the error voltage by increasing the DC voltage applied to the comparator circuits. When this voltage is increased to an amplitude that is between the high and low reference voltages, the charge valve solenoid is deenergized (valve closed) and the throttle is maintained 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 circuit and vent valve are involved. The high comparator circuit detects the DC voltage amplitude increase (error voltage) from the DC converter and deenergizes the vent valve solenoid (valve open), admitting atmospheric pressure. The throttle begins to close. The throttle closing activates the throttle-position potentiometer and the feedback voltage eliminates the error voltage when the vehicle speed decreases to the set speed and the voltage amplitude to the comparator circuits is again between the two speed reference voltage amplitudes.

The high and low comparator circuits operate only when the engage/resume/accelerate circuit is activated. This is accomplished by depressing the SET pushbutton or by sliding the control switch to the RESUME/ACCEL position. When the SET pushbutton is depressed and released, the memory is updated to store the amplitude of the present vehicle speed voltage. The engage/resume/accelerate circuit is deactivated by depressing the brake (or clutch pedal with manual transmission), or by the vehicle speed voltage decreasing to below the low speed reference voltage (30 mph or 48 km/h).

DIAGNOSIS

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

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

Service Diagnosis

| Condition | Possible Cause | Correction |
|---|--|--|
| SYSTEM DOES NOT ENGAGE IN "ON" POSITION | (1) Restricted vacuum hose or no vacuum. | (1) Locate restriction or air leak and repair. |
| | (2) Control switch defective. | (2) Replace switch. |

Service Diagnosis (Cont'd.)

| Condition | Possible Cause | Correction |
|--|--|---|
| | (3) Regulator defective. | (3) Replace regulator. |
| | (4) Speed sensor defective. | (4) Replace sensor. |
| | (5) Brake lamps defective. | (5) Replace brake lamp bulbs. |
| | (6) Brake light switch defective. | (6) Replace switch. |
| | (7) Brake light switch wire disconnected. | (7) Connect wire to switch. |
| | (8) Open circuit between brake light switch and brake lamps. | (8) Repair open circuit. |
| | (9) Mechanical vent valve position improperly adjusted. | (9) Adjust vent valve position. |
| RESUME FEATURE INOPERATIVE | (1) Defective servo ground connection. | (1) Check servo ground wire connection and repair as necessary. |
| | (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 (OR CLUTCH) PEDAL IS RELEASED | (1) Regulator defective. | (1) Replace regulator. |
| | (2) Mechanical vent valve not opening. | (2) Adjust position or replace valve. |
| | (3) Kink in mechanical vent valve hose. | (3) Reroute hose to remove kink. |
| | (4) Brake light or clutch switch defective. | (4) Adjust or replace switch. |
| CARBURETOR THROTTLE DOES NOT RETURN TO IDLE POSITION | (1) Improper linkage adjustment. | (1) Adjust properly. |
| | (2) Improper chain adjustment. | (2) Adjust chain. |
| ROAD SPEED CHANGES MORE THAN 2 MPH (3.2 km/h) 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 hose connections reversed at servo. | (2) Check connection and correct. |
| | (3) Servo defective. | (3) Replace servo. |
| SYSTEM DISENGAGES ON LEVEL ROAD WITHOUT APPLYING BRAKE (OR CLUTCH) | (1) Loose wire connection. | (1) Repair connection. |
| | (2) Loose vacuum hose connection. | (2) Check vacuum hose connection and repair as necessary. |
| | (3) Servo linkage broken. | (3) Repair linkage. |
| | (4) Defective brake light or clutch switch. | (1) Repair connection. |
| ERRATIC OPERATION | (1) Reverse polarity. | (1) Check position of speed sensor wires at connector. |
| | (2) Servo defective. | (2) Replace servo. |
| | (3) Regulator defective. | (3) Replace regulator. |

Service Diagnosis (Cont'd.)

| Condition | Possible Cause | Correction |
|---|--|--|
| VEHICLE CONTINUES TO ACCELERATE WHEN SET BUTTON IS RELEASED | (1) Servo defective. (2) Regulator defective. | (1) Replace servo. (2) Replace regulator. |
| SYSTEM ENGAGES BUT SLOWLY LOSES SET SPEED | (1) Air leak at vacuum hose connections or in hoses. (2) Air leak at vent valve on brake or clutch pedal. | (1) Check hoses and connections. Repair as necessary. (2) Replace vent valve. |

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TESTING

Perform the following tests as part of the service diagnosis to determine the cause of a 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 as indicated in the Control Switch Test illustration (fig. 1H-3).

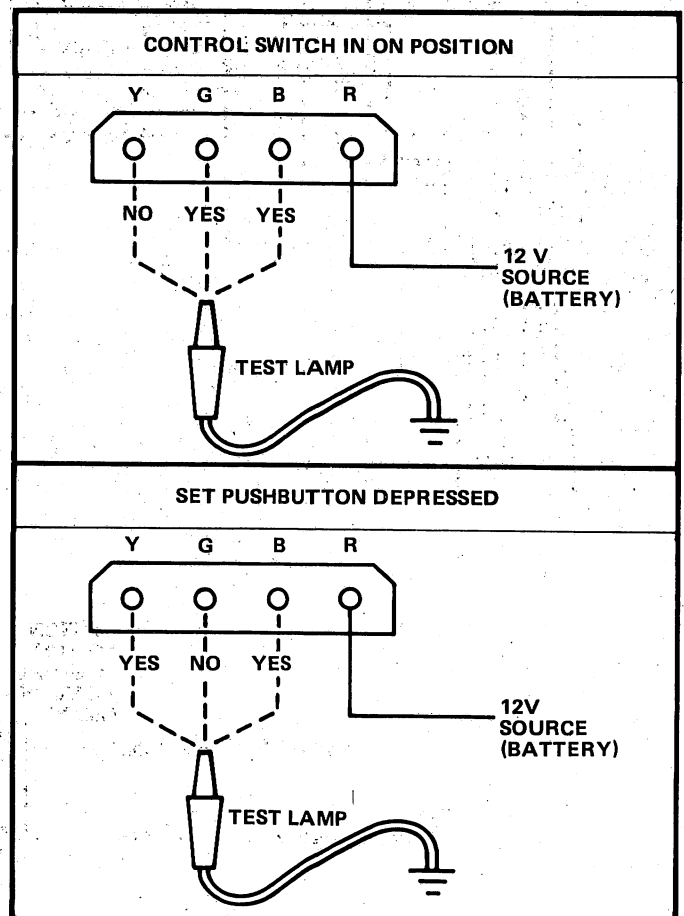
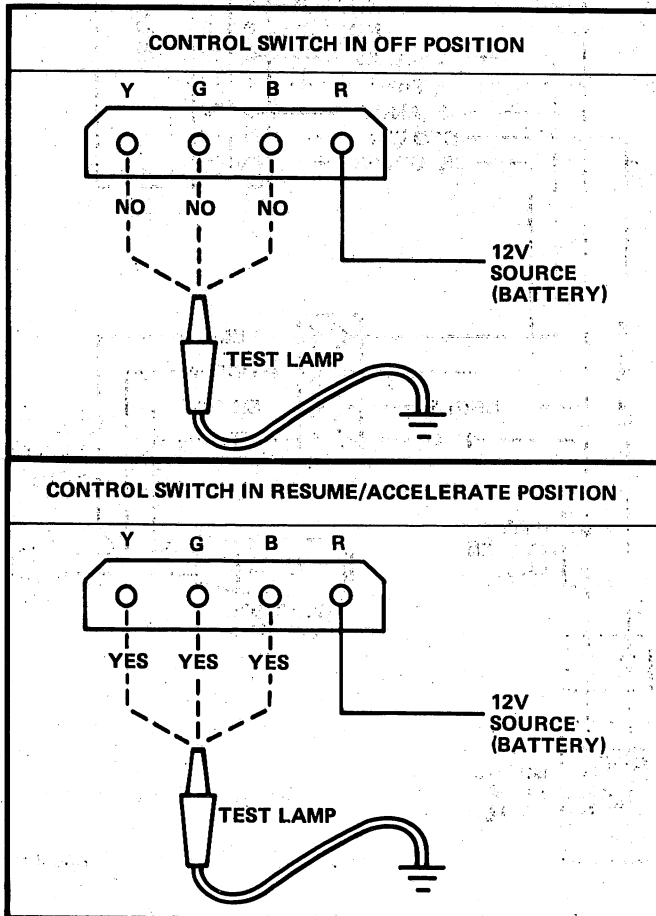
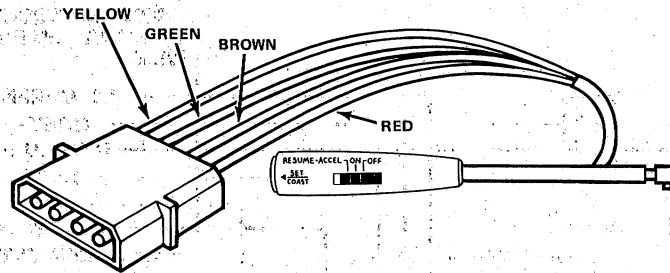


Fig. 1H-3 Control Switch Test

Circuitry Tests

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

Regulator Wire Harness Connector

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

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

Speed Sensor Test

(1) Disconnect speed sensor wire harness connector.

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

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

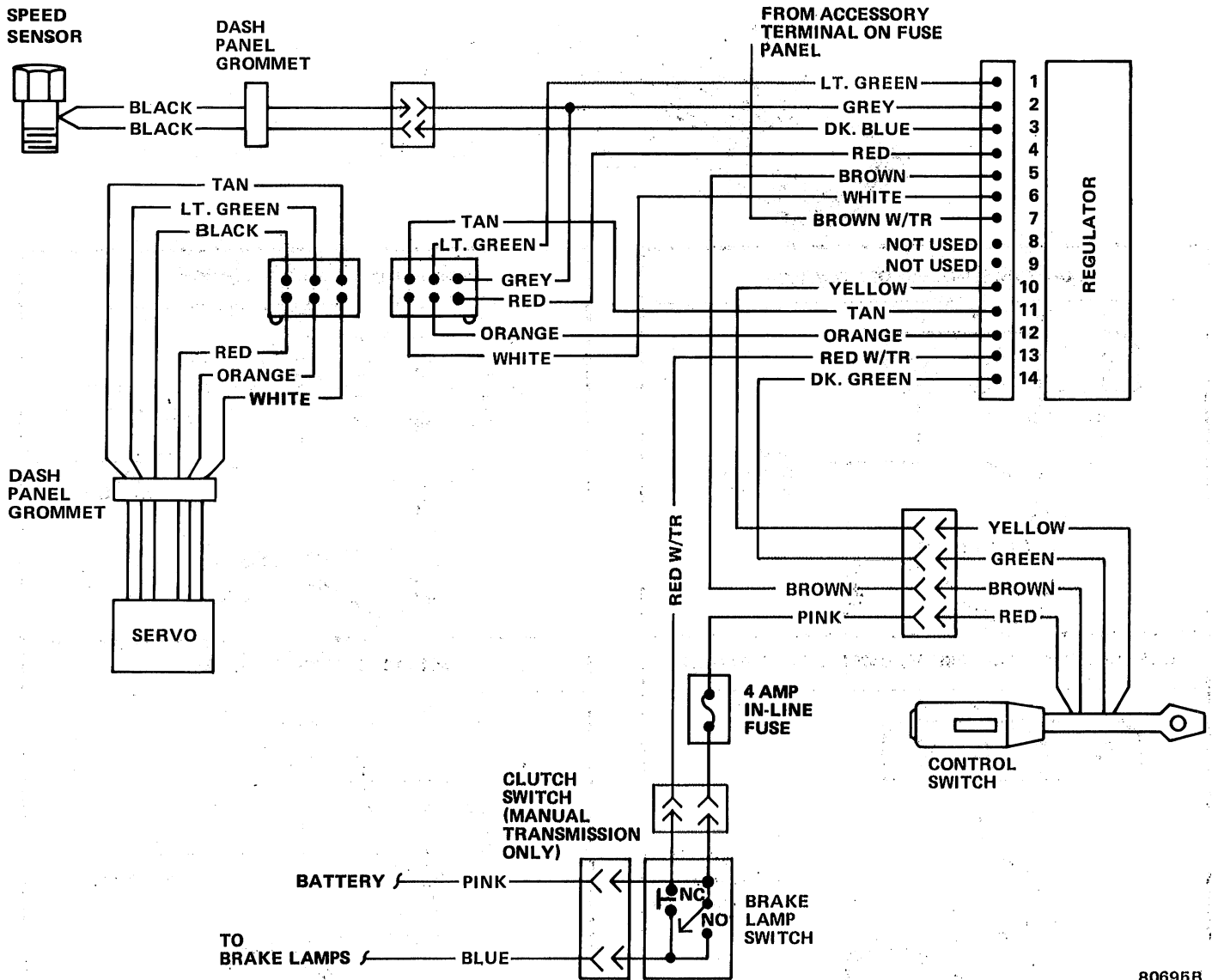
(5) Turn off engine and slowly halt wheels.

(6) Disconnect voltmeter.

(7) Replace speed sensor if defective. Refer to Chapter 3C.

(8) Connect speed sensor wire harness connector.

(9) Remove jack stands and lower vehicle.



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Fig. 1H-4 Cruise Command Wiring Diagram

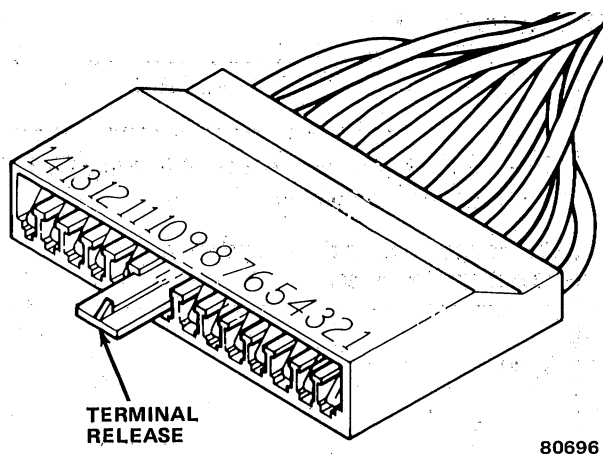


Fig. 1H-5 Harness Connector at Regulator

Cruise Command System Test

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

- (1) Remove wire harness connector from regulator.
- (2) Connect Cruise Command System Tester to wire 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** contacts in control switch.
- Lamp 2—Speed sensor, associated wiring harness and terminals and connectors.
- Lamp 6—Servo charge valve solenoid, **RESUME/ACCEL** contacts in control switch, and associated wiring harness, terminals and connectors.
- Lamp 4—Throttle position potentiometer (feedback voltage), and associated wiring harness, terminals and connectors.
- Lamp 5—Servo vent valve solenoid, **RESUME/ACCEL** contacts in the control switch, and associated wiring harness, terminals and connectors.
- Lamp 3—Brake or clutch pedal switch adjustment, and associated wiring harness, terminals and connectors.

Cruise Command Diagnosis Chart

| TEST AND CONDITIONS | TEST LAMP RESULTS | CHECK—REPAIR |
|--|---|---|
| (1) Test for Correct Power Source Connection Ignition Switch—Off Control Switch—Off | All Lamps Off | None |
| | One or More Lamps On | Remove brown wire (5) at regulator connector from direct source of voltage or repair defective control switch. |
| (2) Test for System Electrical Continuity Ignition Switch—On Control Switch—On | Lamps 1, 2, 3, & 4 On, Lamps 5 & 6 Off | None |
| | Lamp 1 Off | Check for blown fuse in brake light switch to control switch circuit. Check red, brown & green wires at control switch connector for continuity to switch. Check dark green wire (14) at regulator connector for continuity to regulator. |
| | Lamp 2 Off | Check speed sensor for correct output voltage. Check grey & dark blue wire at speed sensor connector for continuity to regulator connector. Check terminals 2, 3, 5 & 7 at regulator connector for proper connection to wires. |
| | Lamp 3 Off | Check brake light (and clutch, if equipped) switch adjustment. Check brown, light blue & dark green wire connections for continuity between connectors. |

Cruise Command Diagnosis Chart (continued)

| TEST AND CONDITIONS | TEST LAMP RESULTS | CHECK—REPAIR |
|---|--|---|
| (3) | Lamp 4 Off | Check for defective connection at terminals 2 & 11 on regulator connector. Check operation of throttle position feedback potentiometer on servo. |
| <p>Test for Servo Charge Valve Solenoid Continuity Ignition Switch—On Control Switch—On</p> <p>Set Speed Switch - Depressed</p> <p>WARNING: If engine is operating, servo will move throttle to wide open position.</p> | <p>Lamp 2, 3, 4, 5 & 6 On Lamp 1 Off</p> <p>Lamp 4 will dim when servo moves throttle to wide open position with engine operating.</p> | 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 control switch to resume/acceleration position. | Check for blown fuse. Check for short circuits in red, pink & brown wire circuits at control switch. Replace defective servo. |
| (4) | <p>Lamps 1, 2 & 4 On</p> <p>Lamps 3, 5 & 6 Off</p> <p>Lamp 3 On when brake or clutch pedal is released.</p> | 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 or clutch pedal is released. | Refer to Test 2, Lamp 3 Off. |

Cruise Command Diagnosis Chart (continued)

| TEST AND CONDITIONS | TEST LAMP RESULTS | CHECK—REPAIR |
|---|--|---------------------------------|
| (5) Test Resume/Acceleration Function of Control Switch Ignition Switch—On Control Switch—On Move control switch to resume/acceleration position. WARNING: If engine is operating, servo will move throttle to wide open position. | All Lamps On | None |
| | Lamp 4 will dim when servo moves throttle to wide open position with engine operating. | |
| | 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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ADJUSTMENTS

Centering Adjustment

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

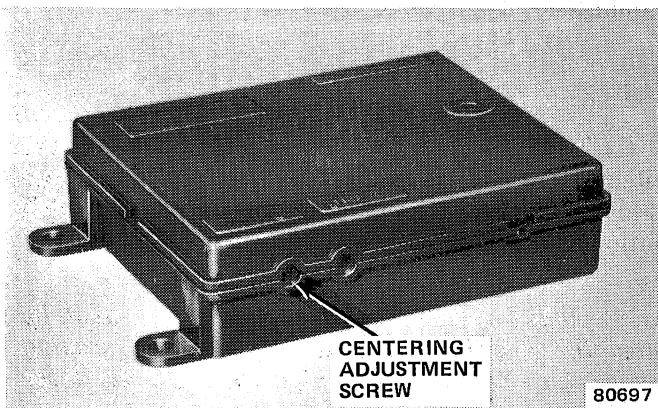


Fig. 1H-6 Centering Adjustment Screw Location

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

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

Vacuum (Mechanical) Vent Valve

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

REGULATOR REPLACEMENT

The regulator is mounted on a bracket under the instrument panel near the headlamp switch. Remove screws and disconnect connector. Insert suitable thin tool to depress tab inside hole on regulator identified by "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 wire harness connector under instrument panel. Carefully maneuver 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) Maneuver wire harness through dash panel and connect connector.
- (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

- (5) Open tabs retaining servo cable.
- (6) Disconnect chain from bellcrank pin. Remove chain.
- (7) Attach replacement chain to servo cable, allowing seven beads outside tabs. Squeeze tabs together.
- (8) Connect replacement chain to 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 lock clip and cable clip.

CONTROL SWITCH REPLACEMENT

The Cruise Command control switch is integral with the turn signal switch lever. The switch is not repairable. The switch and wire 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 wires from plastic connector. Fold back and tape two of four wires to wire harness. Tie or tape string to wire harness.
- (8) *Standard Column*—Tie or tape string to plastic connector.
- (9) Remove lever and wire harness assembly from column.

Installation

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

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

- (2) Remove wires from connector. Fold back and tape two of four wires to wire harness. Tie or tape wire harness to string that was attached to original wire harness before removal.

- (3) Pull replacement wire 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

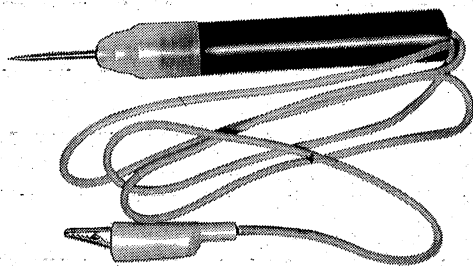
anti-theft cover.

(7) Install steering wheel and horn button insert.

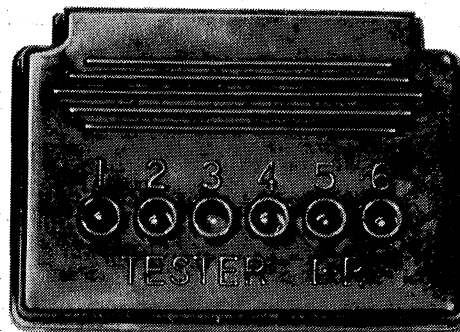
(8) Install trim on steering column.

(9) Test Cruise Command operation.

Tools



**J-21008
CONTINUITY
TEST LAMP**



AM PC-1-R

NOTES

DATE: _____

TOPIC: _____
