GENERAL MOTORS ELECTRONIC CRUISE CONTROL

Cadillac (Exc. Cimarron)

DESCRIPTION

The Electronic Cruise Control System uses electrical sensors and components to regulate the vacuum operated servo, which in turn controls the carburetor throttle linkage. The system includes the following: an instrument panel control switch; an engagement switch in end of turn signal lever; a speed sensor on the speedometer; two brake release switches (one vacuum and one electrical) on brake pedal bracket; an electronic control module on back of instrument panel; a relay under the instrument panel; a vacuum servo (power unit) near carburetor; a vacuum control valve on servo; a solenoid valve on servo; a throttle control bead chain (DeVille and Fleetwood V6 models), combination chain and cable actuator (DeVille and Fleetwood V8 models) or rod actuator (all other models), and various vacuum hoses and electrical wiring harnesses.

OPERATION

Control Switches – The instrument panel switch must be in the "ON" position for system to operate. An amber light will come on, and the engagement switch on the turn signal lever will cause the vehicle to cruise at a constant speed over 30 mph. A green indicator on the dash will illuminate when vehicle is controlled by cruise system. Applying the brakes disengages the system electrically and releases system vacuum, returning the throttle to idle and manual operation.

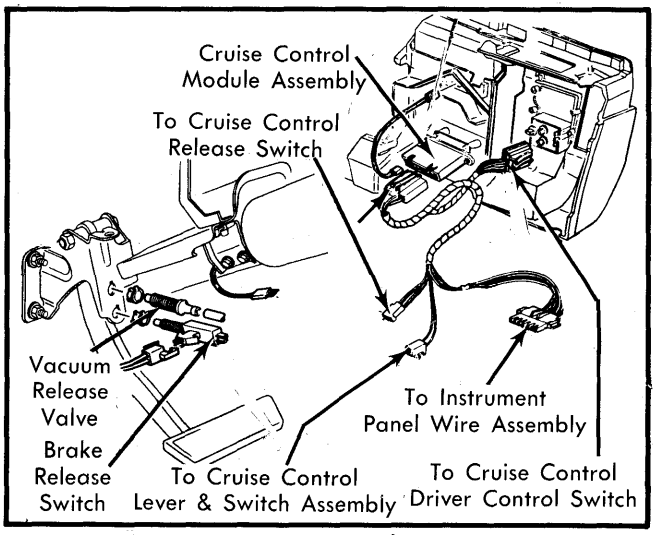

Fig. 1 Electronic Cruise Control Component Location (Cadillac Shown, Eldorado and Seville Similar)

Speed Sensor – A photoelectric sensor on the back of the speedometer provides speed signals to the control module. Signals from the control module operate the servo solenoid, and control vacuum to regulate throttle position.

Electronic Controller – The controller receives signals from the engagement switch, instrument panel switch, brake release switch and speed sensor. It processes this information and sends voltage commands to vacuum and solenoid valves on power unit. On Digital Fuel Injected models, the controller processes cruise control information along with DFI engine control information before passing signals to power unit.

Vacuum Control Valve – The vacuum control valve opens when the system is engaged, and closes when system is off. When valve is open it provides vacuum for power unit.

Power Unit Solenoid Valve – The solenoid valve modulates vacuum to power unit so throttle is always in proper position for desired cruise speed.

Power Unit – Power unit is a vacuum operated variable position diaphragm assembly for throttle positioning. When controlled vacuum is applied, atmospheric pressure moves the diaphragm inward and pulls on throttle linkage, opening throttle.

Brake Release Switches – A vacuum operated and an electronically operated brake release switch are used. When Brake pedal is depressed, electric switch cuts off voltage to controller, disengaging system. Vacuum switch serves as a backup release system by opening a port to atmospheric pressure that vents power unit.

Engagement Switch – Located on turn signal lever, engagement switch controls operation of the system. A slide lever and a pushbutton actuate system at desired speeds.

TESTING

NOTE – *The following testing procedures apply only to vehicles without Digital Fuel Injection. For D.F.I. models, see General Motors D.F.I. article in COMPUTERIZED ENGINE CONTROLS section.*

ROAD TEST

1) With instrument panel control switch in "OFF" position, drive car at 50 MPH. Depress and release engagement button at end of turn signal lever. System should remain inoperative.

2) Place dash switch in the "ON" position. Amber indicator light should come on. Push engagement switch button to center (detent) position and release when vehicle speed is 50 MPH. Green light should come on (on dash switch) and vehicle should maintain 50 MPH with foot off accelerator. Note the amount of cruising speed, if any, above or below the 50 MPH "lock-in" speed.

NOTE – *The "Lock-In" speed can be adjusted as outlined in this article.*

3) Move slide switch in direction of arrow and hold. Vehicle should slowly accelerate. Release switch at 55 mph; speed should remain steady at 55.

4) Depress brake pedal about ½". Green light should go off. If so, electric brake switch is okay. Vehicle speed should decrease. Allow vehicle to slow to about 45 MPH.

5) Move slide switch in direction of arrow and release. Vehicle should automatically accelerate to 55 MPH and green light should come on.

6) Push and hold button all the way in. Green light should go off and vehicle should slow down. Release button to engage system at 50 MPH. Green light should come on and vehicle should maintain the 50 MPH speed.

GENERAL MOTORS ELECTRONIC CRUISE CONTROL (Cont.)

TROUBLE SHOOTING & DIAGNOSIS

CONDITION	CAUSE	CORRECTION
Servo diaphragm retracts to maximum allowable open throttle position. **A.** Position of dash switch has no effect. Vehicle returns to idle with brake application, may duplicate when pedal is released **B.** Condition occurs only when dash switch is in auto position. Condition will cancel when panel switch is turned off.	Servo solenoid valve leaking vacuum	Replace valve
	Manifold vacuum connected directly to power unit vacuum vent port.	Reroute vacuum hose
	Unrequested voltage on solenoid feed.	Defective control module. Replace
Erratic engagement and/or unwanted program acceleration.	Severed engage switch harness in column.	Replace harness.
	Open circuit in yellow wire connector.	Repair wire connector.
Will not cruise at engaged speed.	Leak in servo diaphragm	Replace servo and inspect vacuum system
	Leak in vacuum release valve or hose.	Replace or repair hose or valve.
	Throttle actuating cable, bead chain or rod misadjusted.	Readjust.
	Kinked or damaged speedometer cable	Replace speedometer cable.
	Servo solenoid valve variable orifice misadjusted.	Readjust.
System will not disengage with brake pedal	Brake release switch inoperative or misadjusted.	Replace or adjust brake switch as required.
Cannot engage or adjust cruise speed downward with engage switch.	Inoperative engage switch.	Replace or repair engage switch
System can be engaged below 20 MPH	Defective control module.	Replace module.
Hissing noise when brake pedal disengages system	Vacuum release valve or release switch misadjusted	Readjust or replace valves.
Amber ON" light will not turn on even though system cruises satisfactorily.	Inoperative bulb.	Replace bulb.
	Open printed circuit on dash switch.	Replace printed circuit and/or switch.
"CRUISE" or "AUTO" light will not turn on even though system cruises satisfactorily	Inoperative bulb.	Replace bulb.
	Open printed circuit on dash switch.	Replace printed circuit and/or switch
	Defective control module.	Replace control module.
Cruise speed drops when heavy electrical loads are turned on such as headlights, air conditioning, etc.	Battery voltage in vehicle too low	Correct battery problem.

GENERAL MOTORS ELECTRONIC CRUISE CONTROL (Cont.)

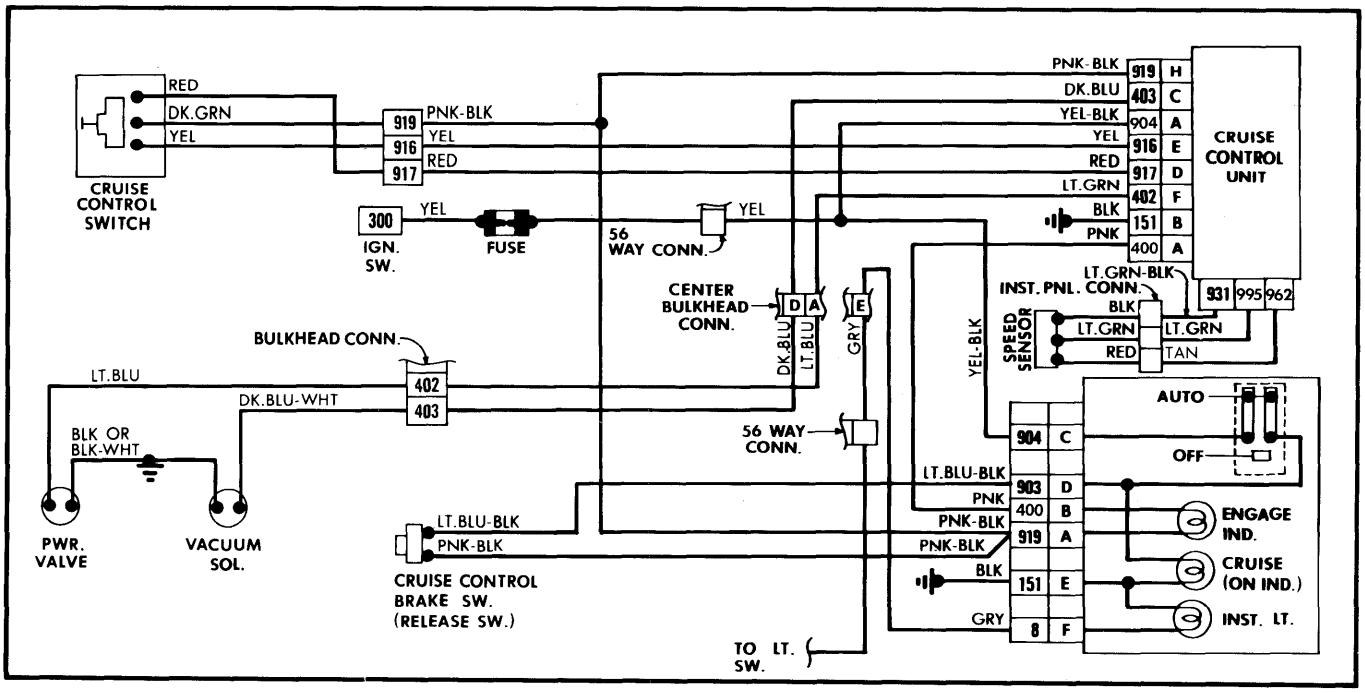

Fig. 2 Wiring Diagram For Eldorado and Seville Diesel Models Electronic Cruise Control

ELECTRIC BRAKE RELEASE SWITCH

1) Turn ignition "ON" and instrument panel switch to "ON". Connect one lead of test light or voltmeter to ground.

2) Probe Pink/Black wire at connector. Lamp should light or meter should read 12 volts indicating switch continuity.

3) Check switch adjustment with probe at Pink/Black lead while depressing brake pedal $\frac{1}{8}$-$\frac{1}{2}$". Light should turn off or meter drop to zero. If not, replace or adjust switch.

4) If lamp did not light in step **3)**, probe wire in adjacent connector cavity. If probe lights, or meter reads 12 volts, replace or adjust switch. If no light or 12 volts, repair wiring to switch.

INSTRUMENT PANEL SWITCH & HARNESS

1) Turn ignition "ON". Disconnect 3-wire connector from turn signal switch to the cruise control harness. Connect one lead of a voltmeter or test light to ground.

2) With the other voltmeter or test lamp lead, probe the three terminals. With cruise panel switch "OFF", no indicators should light. With panel switch "ON", the amber light should come on.

ENGAGEMENT SWITCH & HARNESS

On or Off Vehicle Tests – Disconnect switch from harness and make the following checks using an ohmmeter. If indications are bad, replace switch.

NOTE – *Connect ohmmeter to steering column bracket, then check each terminal. All should show open circuits. If continuity is indicated, a short exists. Replace lever and harness.*

ON OR OFF CAR ENGAGEMENT SWITCH TESTS
Indications Between Terminal No. (Wire Color)

Switch Position	1 to 2 (Yel. to Grn.)	1 to 3 (Yel. to Red)	2 to 3 (Grn. to Red)
Released	Open	Open	Open
Partially Depressed	Closed	Open	Open
Fully Depressed	Open	Open	Closed

VACUUM CONTROL AND SERVO SOLENOID VALVES

Resistance Test (Engine Off) – 1) Disconnect harness at valve to be tested. Connect ohmmeter to terminals on valve.

2) Resistance should be between 37 to 48 ohms on servo solenoid valve, or between 23.5 and 27.5 ohms on vacuum control valve. Replace valve if resistance is not within specification.

Functional Test (Engine Running) – 1) Before starting engine, disconnect bead chain, cable or actuator rod from servo. Disconnect harness connectors at both valves. Start engine and run at idle speed.

2) Install jumper wires from battery positive terminal to 1 terminal on both vacuum control valve and power unit solenoid valve. Ground second terminal on each valve. Servo diaphragm should fully retract.

3) Remove battery jumper wire from servo solenoid. Servo diaphragm should return to full extension. If not, replace power unit solenoid valve.

GENERAL MOTORS ELECTRONIC CRUISE CONTROL (Cont.)

4) Reinstall battery jumper wire to servo solenoid. Remove battery jumper wire from vacuum control valve. Servo diaphragm should return again to full extension. If not, replace vacuum control valve.

CONTROL MODULE CURRENT LEAK

Test At Servo Solenoid Valve Connector (Engine Running) – 1) Disconnect harness at solenoid valve and, using a D.C. voltmeter check voltage between connector terminals.

2) With engine idling, voltage should be less than 1.0 volts D.C. Increase idle speed for several seconds. Reading should still be less than 1.0 volts D.C. Any indication above 1.0 volts D.C. means control unit should be replaced.

CONTROL MODULE

Do not attempt to repair control module. Ensure connectors are tight and fully seated. If all other components of system test out okay, replace control module.

INSTRUMENT PANEL SWITCH INDICATOR LIGHTS

Amber "ON" Light – 1) Turn ignition "ON" and place dash switch in "ON" position. Amber light should come on. If not, check for burned out bulb, open circuit in ground wire, or for inoperative switch or bad printed circuit.

2) Place dash switch in "OFF" position. If amber light comes on, check for shorted leads or inoperative switch.

Green "CRUISE" Light – 1) If system properly controls the car's speed, but the green indicator light does not work correctly, check for burned out bulb or an open circuit in Pink wire between switch connector and control module connector.

2) If green indicator light remains on when system is not controlling the car's speed, check for the following: a short circuit in harness between switch and relay, a malfunctioning relay, or a short in Pink wire between relay and control module connector. If above checks are okay, replace control module.

SPEED SENSOR TESTS

On Vehicle with Engine Off – 1) Partially remove speedometer cluster so access to speed sensor is possible. For cluster removal, see appropriate story in *SWITCHES, GAUGES & SPEEDOMETERS* in this section.

2) Turn ignition and dash control switch "ON". Connect voltmeter between ground and terminal 2 (Black) on speed sensor 3-wire connector. Voltage should be between 9 and 11 volts. If higher or lower, replace control module.

3) Connect voltmeter between ground and terminal 3 (Red) on sensor connector. Voltage should be one to two volts less than at terminal 2. This is the voltage drop through L.E.D.

4) Connect voltmeter between ground and terminal 1 (Green) of sensor connector. Roll car forward (approximately six feet) while checking voltage. Two voltage peaks should occur in the distance the car travels. This is the photo transistor output.

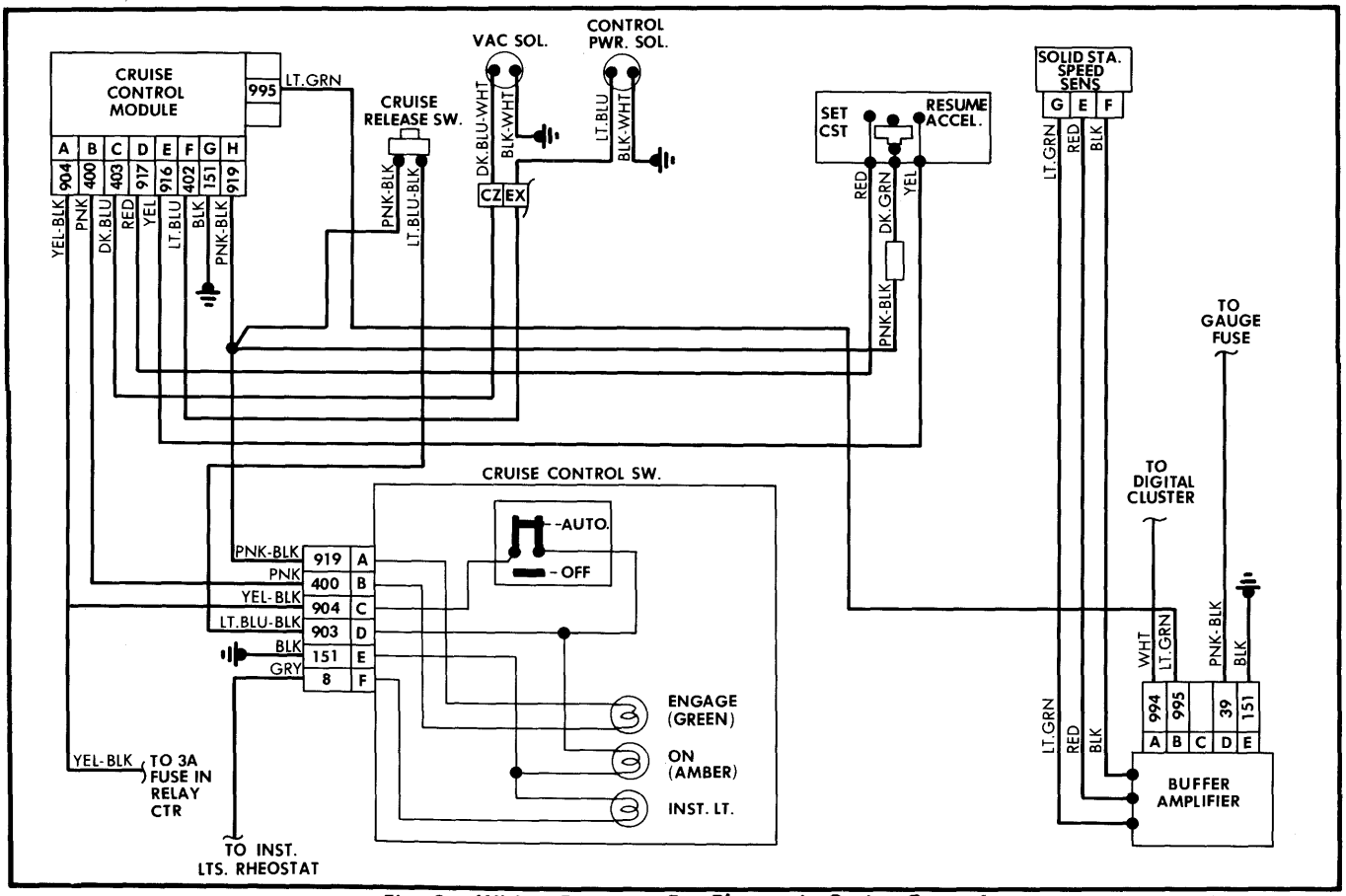

Fig. 3 Wiring Diagram For Electronic Cruise Control on Digital Fuel Injection Models

GENERAL MOTORS ELECTRONIC CRUISE CONTROL (Cont.)

5) If voltages in these two tests do not meet specifications, replace the speed sensor.

VACUUM SYSTEM INSPECTION (VACUUM CIRCUIT FUNCTIONAL TEST)

1) Before starting engine, disconnect bead chain, cable or actuator rod from servo. Disconnect electrical leads at vacuum control and solenoid valves.

2) Actuate vacuum control and solenoid valves by connecting jumper to one terminal of each valve to ground, and a jumper wire from the other terminals to battery.

3) Start and run engine at idle. With brake pedal released, servo diaphragm should pull in to full stroke. Depress brake pedal about 1½" and servo diaphragm should relax to the free position, indicating that vacuum brake release valve and hose are okay.

4) If system will not hold vacuum, remove brake release valve vent hose from servo and plug servo vacuum fitting (manifold vacuum should be open).

5) If servo diaphragm draws in, problem is in brake release vacuum vent system. If servo will not draw in, inspect servo diaphragm and vacuum connectors at all vacuum valves.

ENGAGEMENT SWITCH

Switch can not be adjusted. Replace switch if found defective.

ADJUSTMENTS

ELECTRIC BRAKE RELEASE SWITCH AND VACUUM BRAKE RELEASE VALVE

1) Push switch or valve all the way into the retaining clip. Pull brake pedal up to the stop to automatically adjust the switch or valve.

NOTE – *Be sure free play exists between pedal and switch bodies when pedal is pulled away from released position and before hitting brakes-applied position.*

2) The following brake pedal travel distances can be used to check for proper adjustment of cruise control and stop lamp switch assembly and vacuum release valve assembly.

3) Cruise control switch contacts must open at ⅛-½", measured at centerline of brake pedal pad. Nominal actuation of stop lamp contacts is 3/16" after cruise control contacts open.

4) Vacuum release valve assembly must open at 1 1/16-1 5/16" pedal, measured at centerline of brake pedal pad.

"LOCK-IN" ERROR CORRECTION

Locate screw on solenoid valve. Turn screw toward "S" to reduce the lock-in speed. Turn screw toward "F" to increase lock-in speed.

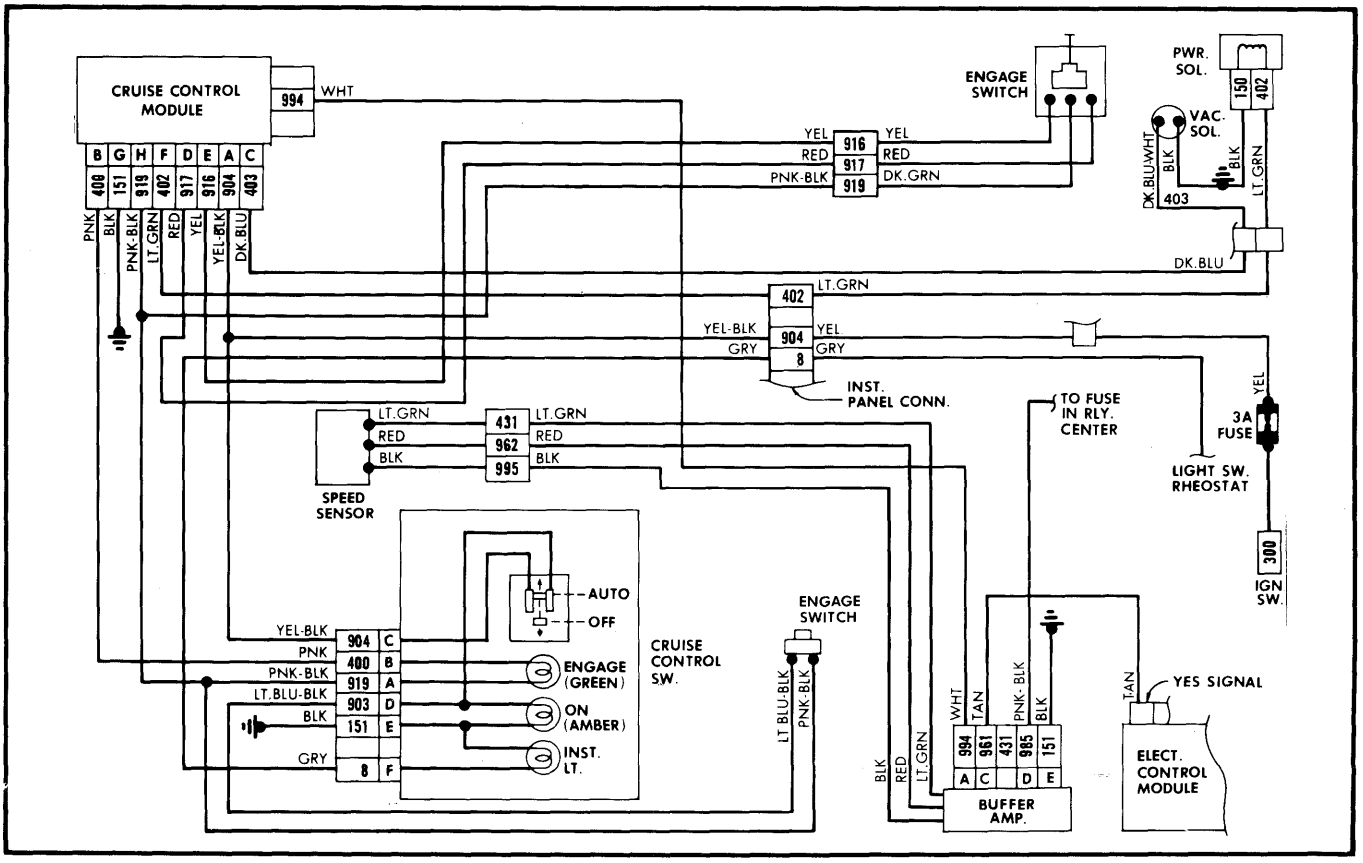

Fig. 4 Wiring Diagram For Electronic Cruise Control on V-6 Models Except Eldorado and Seville