

# ENGINE COOLING FAN

## 1991 Chevrolet Camaro

1991 ENGINE COOLING FANS  
General Motors Corp.

Camaro, Firebird

### COOLING FAN APPLICATIONS

#### ELECTRIC COOLING FAN APPLICATIONS TABLE

Application	Engine
"F" Body .....	3.1L, 5.0L & 5.7L

**NOTE:** This article contains test charts that are part of General Motors Computerized Engine Controls. Only those charts required to test electric cooling fans are included. Other diagnostic codes may appear while performing electric cooling fan diagnosis. For complete information on General Motors Computerized Engine Control systems see ENGINE PERFORMANCE section.

### DESCRIPTION

All FWD and some RWD vehicles use an electric cooling fan. The electric cooling fan is used for engine and A/C condenser cooling and operates when A/C is on and if engine overheats.

### OPERATION

All electric cooling fans operate when engine coolant temperature exceeds a certain value. The ECM completes ground path for the cooling fan relay. Relay contacts then close and complete circuit between fusible link and fan motor. When the engine cools, the switch opens and fan stops. If coolant sensor fails, the ECM will command constant fan operation.

A/C-equipped vehicles have a separate signal line to the ECM for fan control. When A/C control switch is on, and A/C system low pressure switch is closed, ECM receives a signal on this line and turns cooling fan on. The compressor clutch does not have to engage for ECM to turn fan on.

On some models, when engine is off, ECM may turn on the fan relay and run fan for up to 7 minutes. This occurs if hot conditions were present while engine was running. Hot conditions are based on Manifold Absolute Temperature (MAT) signal to ECM, coolant temperature and time from start.

### TROUBLE SHOOTING

See trouble shooting charts for cooling fan diagnosis.

#### COOLING FAN CHART INDEX

Application	Figure Nos.
3.1L (VIN T) .....	1-6
5.0L (VIN E) .....	7

### CHART C-12, COOLING FAN (3.1L VIN T)

The ECM controls cooling fan inputs from A/C fan control switch, coolant temperature sensor and vehicle speed sensor. The ECM grounds circuit No. 335 to energize fan control relay. Battery voltage is then supplied to the fan motor.

The ECM grounds circuit No. 335 when A/C has been requested, coolant temperature is greater than 225°F (107°C) or fan control switch opens with high A/C pressure, approximately 240 psi (17 kg/cm<sup>2</sup>). When ECM energizes the fan control relay, it will run for at least 30 seconds or until vehicle speed exceeds 70 MPH. If Code 14 or 15 is present, ECM will run fan continuously. On vehicles without A/C, circuit No. 732 is jumpered to ground so that fan does not run continuously.

NOTE: Test numbers refer to test numbers on diagnostic charts.

1) With system in field service mode, the cooling fan control driver will close and energize the fan control relay.

2) If the A/C fan control switch or circuit is open, cooling fan would run when A/C is requested.

3) With A/C clutch engaged, A/C fan control switch should open when A/C pressure exceeds 200 psi (14 kg/cm<sup>2</sup>). This will cause ECM to energize fan control relay.

### DIAGNOSTIC AIDS

If an overheating condition is suspected, verify if this is due to actual boilover. If gauge or light indicates an overheat condition, and no boilover is in evidence, inspect the gauge/light circuit for malfunction.

If vehicle is overheating and the gauge or light indicates the same, but the cooling fan is not coming on, check coolant sensor temperature using a "Scan" tester. Sensor may have shifted calibration and should be replaced. If engine is overheating and cooling fan is on, check cooling system.

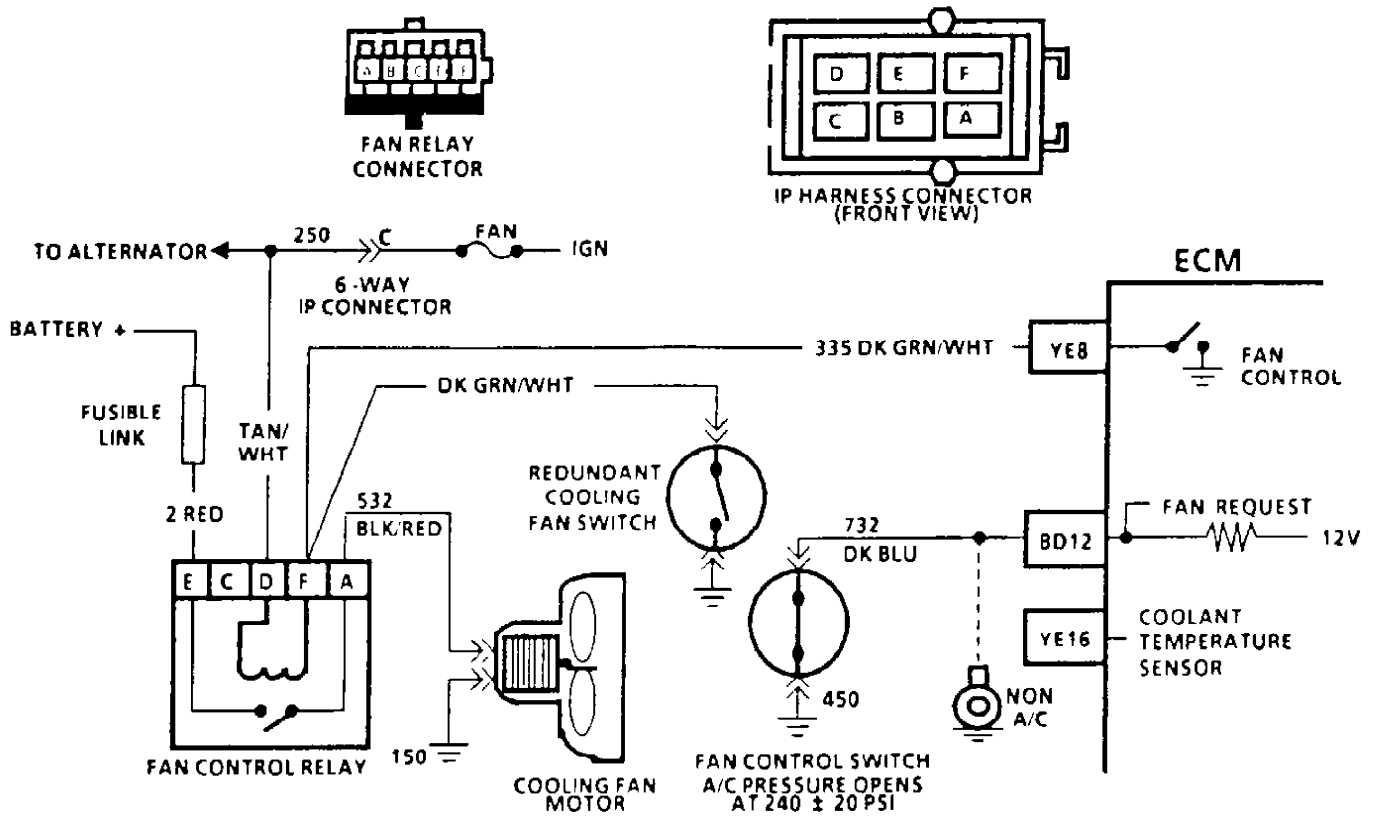


Fig. 1: Chart C-12 Circuit Diagram (3.1L VIN T)  
 Courtesy of General Motors Corp.

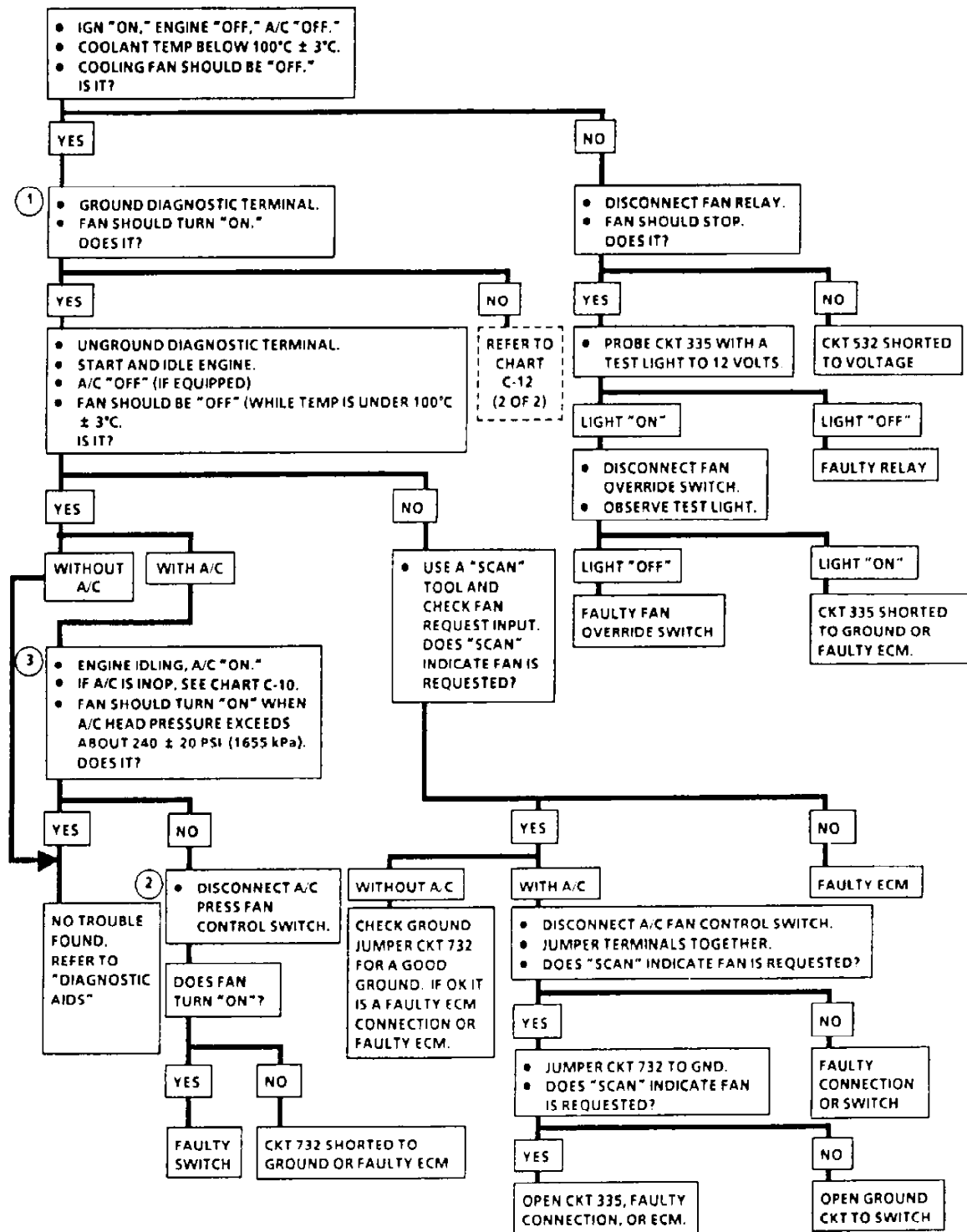


Fig. 2: Chart C-12 Flow Chart (3.1L VIN T) (1 of 2)  
Courtesy of General Motors Corp.

NOTE: Test numbers refer to test numbers on diagnostic charts.

- 1) Battery voltage should be present on both terminals "D" and "E" with ignition on.
- 2) This checks ECM's ability to ground circuit No. 335. The SERVICE ENGINE SOON light should be flashing at this time. If SERVICE ENGINE SOON light is not illuminated, see ENGINE PERFORMANCE section.
- 3) Relay is by-passed by jumpering harness terminals "A" and "E".

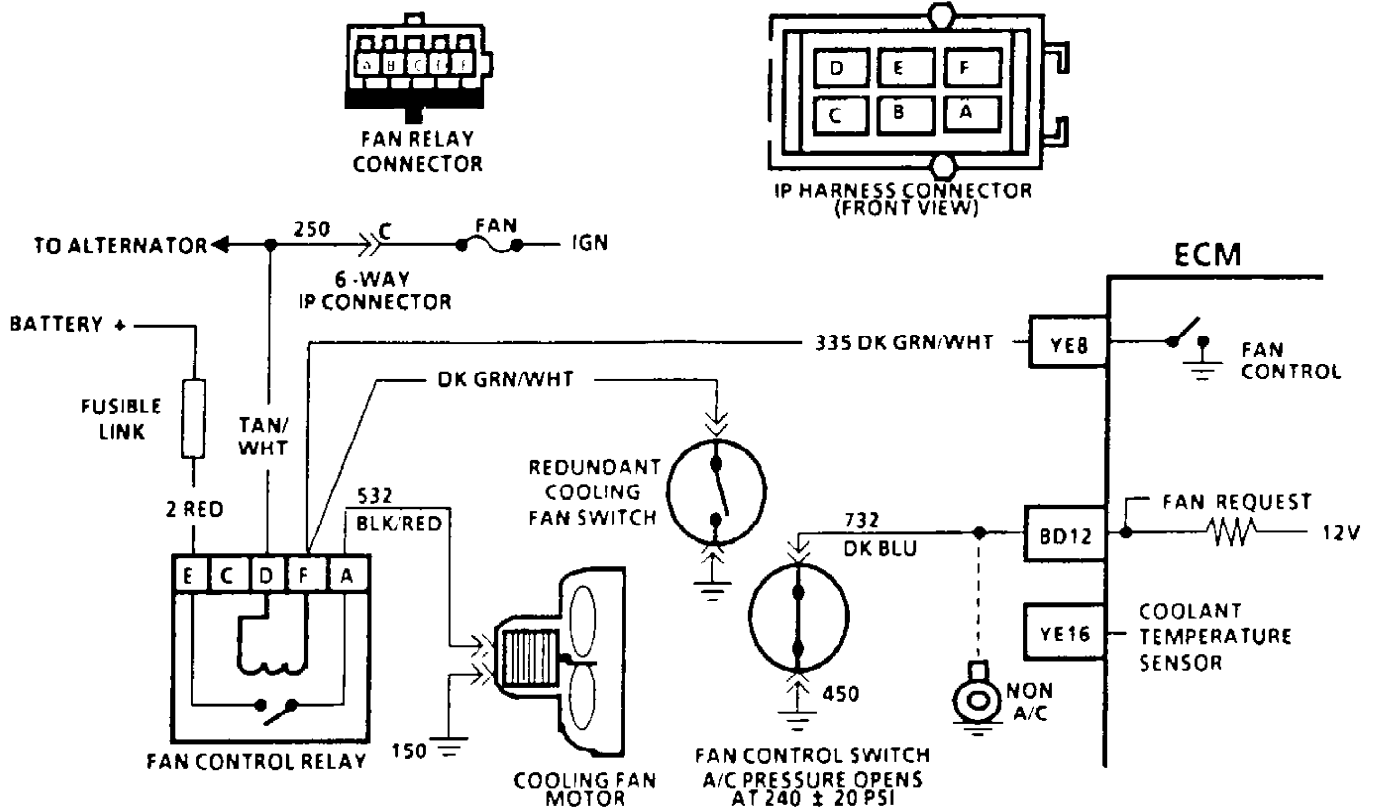


Fig. 3: Chart C-12 Flow Chart (3.1L VIN T) (2 of 2)  
 Courtesy of General Motors Corp.

### CHART C-10, A/C CLUTCH CONTROL (3.1L VIN T)

The A/C clutch control relay is ECM controlled to delay A/C clutch engagement approximately 4/10 of a second after A/C is turned on. This allows the Idle Air Control (IAC) valve to adjust engine RPM before A/C clutch engages.

The ECM will disengage A/C clutch if high power steering pressure is present, engine overheating or WOT. The ECM provides a ground path for the A/C clutch relay through circuit No. 459.

If A/C pressure is less than 40 psi (2.8 kg/cm<sup>2</sup>), the low pressure switch will open. If A/C pressure is greater than 440 psi (31 kg/cm<sup>2</sup>), the high pressure switch will open. The A/C pressure fan switch opens when A/C pressure exceeds 200 psi (14 kg/cm<sup>2</sup>).

NOTE: Test numbers refer to test numbers on diagnostic charts.

- 1) The ECM will only energize A/C relay when engine is running. This will determine if relay or circuit No. 459 is faulty.

- 2) For A/C clutch to engage, low pressure switch must be closed providing 12 volts to the relay. High pressure switch must be closed so A/C request (12 volts) will be present at ECM.
- 3) Determine if A/C control panel request signal is reaching the ECM on circuit No. 366. This signal should only be present when A/C or defrost is selected.
- 4) A blown fuse can be caused by a short to ground in either circuit No. 59, circuit No. 67, A/C request circuit or A/C clutch.
- 5) If ECM sees high power steering pressure, ECM will disengage A/C clutch.
- 6) With engine idling and A/C on, ECM should ground circuit No. 459, which will cause test light to illuminate.

### DIAGNOSTIC AIDS

If complaint was insufficient cooling, problem may be caused by an inoperative cooling fan or A/C pressure fan switch. The engine cooling fan should turn on when A/C pressure exceeds a value to open the switch, which causes the ECM to energize the cooling fan relay.

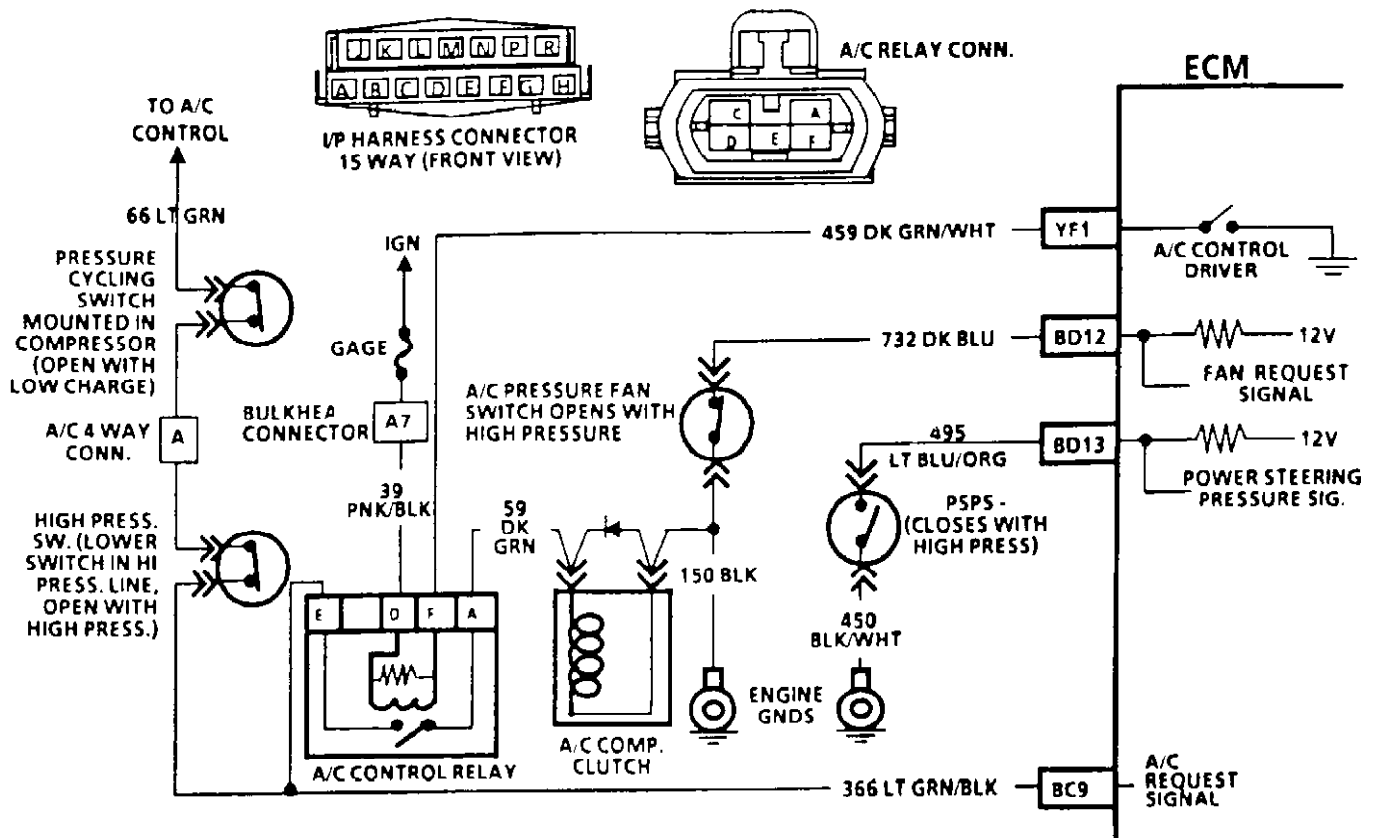


Fig. 4: Chart C-10 Circuit Diagram (3.1L VIN T)  
 Courtesy of General Motors Corp.



The Power Steering Pressure Switch (PSPS) is normally open to ground, and circuit No. 495 should have near battery voltage. Power steering pressure increases as steering wheel is turned. The PSPS will close (less than one volt on circuit No. 495), disengaging A/C compressor clutch and increasing idle air rate.

A PSPS that will NOT close or an open in circuits No. 495 or No. 450, may cause engine to stall when power steering load is high. A PSPS that will NOT OPEN or a short to ground in circuit No. 495, may affect engine idle and will not allow A/C compressor clutch operation.

NOTE: Test numbers refer to test numbers on diagnostic charts.

1) Different makes of "Scan" testers may display the state of PSPS switch in different ways. Refer to operation manual for your particular tester.

2) This step checks if circuit No. 495 is shorted to ground.

3) This step simulates a closed PSPS switch.



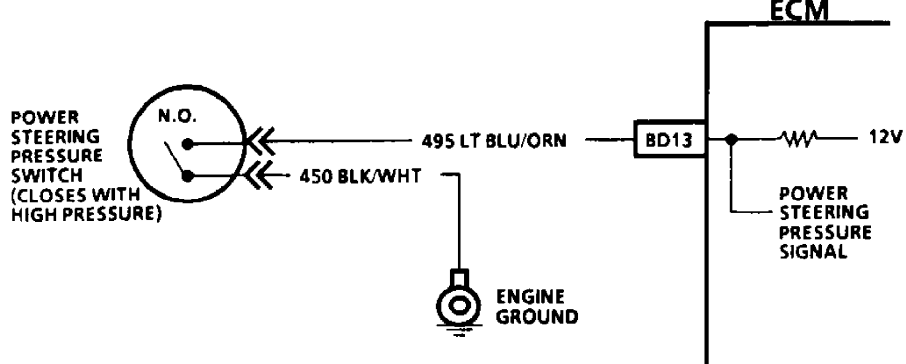
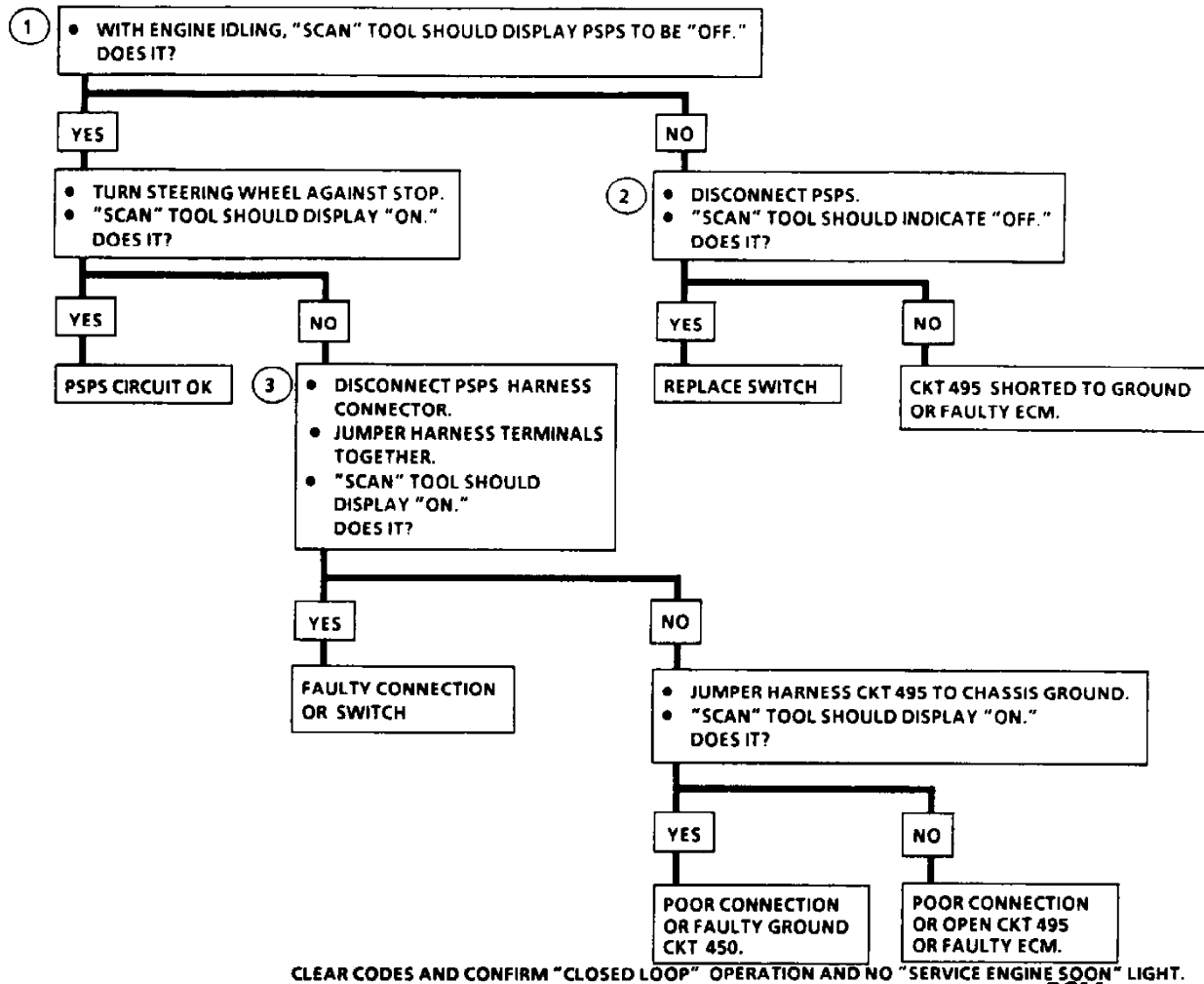


Fig. 6: Chart C-1E Ckt Diag. & Flow Chart (3.1L VIN T)  
Courtesy of General Motors Corp.

## COOLING FAN PROBLEMS (5.0L VIN E)

## SYSTEM OPERATION

Electric cooling fan is activated by cooling fan temperature switch. Switch contacts close when coolant temperature is greater than 238°F (110°C). This grounds the cooling fan relay coil and closes the contacts, providing current to cooling fan. When coolant temperature is less than 214°F (101°C), cooling fan temperature switch opens and fan operation stops.

On models equipped with A/C, the A/C-heater switch control provides ground for the cooling fan relay when A/C is operating. This supplies current to cooling fan for operation.

## SYSTEM DIAGNOSIS

Determine system failure. See SYSTEM DIAGNOSIS table in this article. Perform proper test procedure. See SYSTEM TESTING in this article.

SYSTEM DIAGNOSIS TABLE

Symptom	Diagnosis
Cooling Fan Inoperative .....	Do Test A
Cooling Fan Inoperative With High Engine Temperature .....	Do Test A
Cooling Fan Inoperative With A/C On .....	Do Test B
Cooling Fan Will Not Turn Off .....	Do Test C

### TEST A, COOLING FAN OPEN TEST NO. 1

1) Disconnect cooling fan relay. Relay is located at left rear corner of engine compartment. Relay is located closest to the outside of vehicle and has a 4-wire connector.

2) With ignition on, check for battery voltage at Red wire of connector and ground. If voltage exists, proceed to next step. If voltage did not exist, check for open circuit in Rust colored fusible link or wiring circuit. Fusible link is located at right front corner of engine compartment at the junction block.

3) Check for battery voltage at Brown wire of connector and ground. If voltage does not exist, check for defective FAN FP 20-amp fuse in fuse block or open in wiring circuit.

### TEST A, COOLING FAN OPEN TEST NO. 2

1) Disconnect cooling fan relay. Relay is located at left corner of engine compartment, closest to the outside of vehicle and has a 4-wire connector.

2) Install 20-amp fused jumper wire between Red and Black/Red wires of connector. If cooling fan operates, proceed to TEST A - COOLING FAN OPEN TEST NO. 4 in this article. If cooling fan did not operate, leave jumper wire installed and proceed to TEST A - COOLING FAN OPEN TEST NO. 3 in this article.

### TEST A, COOLING FAN OPEN TEST NO. 3

1) Disconnect cooling fan relay. Relay is located at left rear corner of engine compartment, closes to the outside of vehicle and has a 4-wire connector.

2) Install 20-amp fused jumper wire between Red and Black/Red

wires of connector, if not previously installed. Disconnect cooling fan connector. Check for battery voltage at Black/Red wire of fan connector and ground. If no voltage exists, check for open in Red/Black wire. If voltage exist, proceed to next step.

3) Check for battery voltage between Black/Red and Black wire. If voltage does not exist, check for open in ground circuit.

#### TEST A, COOLING FAN OPEN TEST NO. 4

1) Ensure connector is installed on cooling fan relay. Install jumper wire from cooling fan temperature switch to ground. Cooling fan temperature switch is located at right rear corner of engine, above starter motor.

2) If cooling fan operates, replace cooling fan temperature switch. If cooling fan did not operate, check Dark Green/white wire from cooling fan temperature switch to cooling fan relay for open circuit. If wiring is okay, replace cooling fan relay.

#### TEST B, COOLING FAN A/C OPEN TEST

1) Disconnect A/C-heater switch control connector. Install fused jumper between Dark Green wire at connector and ground. Turn ignition on. If cooling fan operates, proceed to next step. If cooling fan did not operate, check Dark Green/White and Dark Green wire from A/C-heater switch to cooling fan relay for open circuit.

2) Install fused jumper wire between Dark Green and Black wires of A/C-heater switch control connector. If cooling fan operates, replace A/C-heater switch control. If cooling fan did not operate, check for open circuit in Black wire from A/C-heater switch control to cooling fan.

#### TEST C, COOLING FAN WILL NOT SHUT OFF

1) If cooling fan operates with ignition off, replace cooling fan relay.

2) If cooling fan operates all the time with ignition on and A/C off, disconnect cooling fan temperature switch. If fan quits, replace cooling fan temperature switch. If cooling fan continues to operate, check Dark Green/White and Dark Green wires and A/C-heater switch control for short to ground.

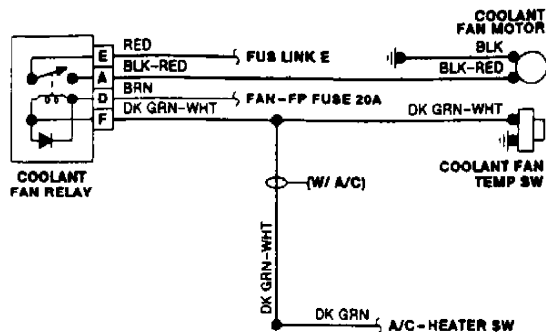


Fig. 7: Cooling Fan Problems Ckt Diagram (5.0L VIN E "F" Body)  
Courtesy of General Motors Corp.

#### CHART C-12, COOLING FAN (5.0L VIN F, 5.7L VIN 8)

Cooling fans are controlled by the ECM based on inputs from the coolant temperature sensor and cooling fan control switch. Cooling fan(s) will run when coolant temperature is more than 223°F (106°C). Battery voltage is supplied to fan relay terminal "E". Ignition voltage is supplied to fan relay terminal "D".

ECM controls ground circuit through circuit No. 335 (relay terminal "F"). Grounding circuit No. 335 will energize relay and supply battery voltage to fan motor. Once fan relay is energized by ECM, cooling fan will remain on for 15 seconds. Cooling fan turns off when vehicle speed is more than 40 MPH, unless engine is overheating.

A/C cooling fan pressure switch, mounted in the A/C high pressure line, will close when head pressure exceeds 233 psi (16.4 kg/cm<sup>2</sup>), and this input will cause ECM to ground circuit No. 335, activating cooling fan(s).

Cooling fan(s) will also turn on when Code 14 or 15 is present or when ECM is in the back-up mode.

### DIAGNOSTIC AIDS

If an overheating condition is suspected, verify if this is due to actual boil-over. If gauge or light indicates an overheat condition, and no boilover is in evidence, inspect the gauge/light circuit for malfunction.

If vehicle is overheating and the gauge or light indicates the same, but the cooling fan is not coming on, check coolant sensor temperature using a "Scan" tester. Sensor may have shifted calibration and should be replaced. If engine is overheating and cooling fan is on, check cooling system.

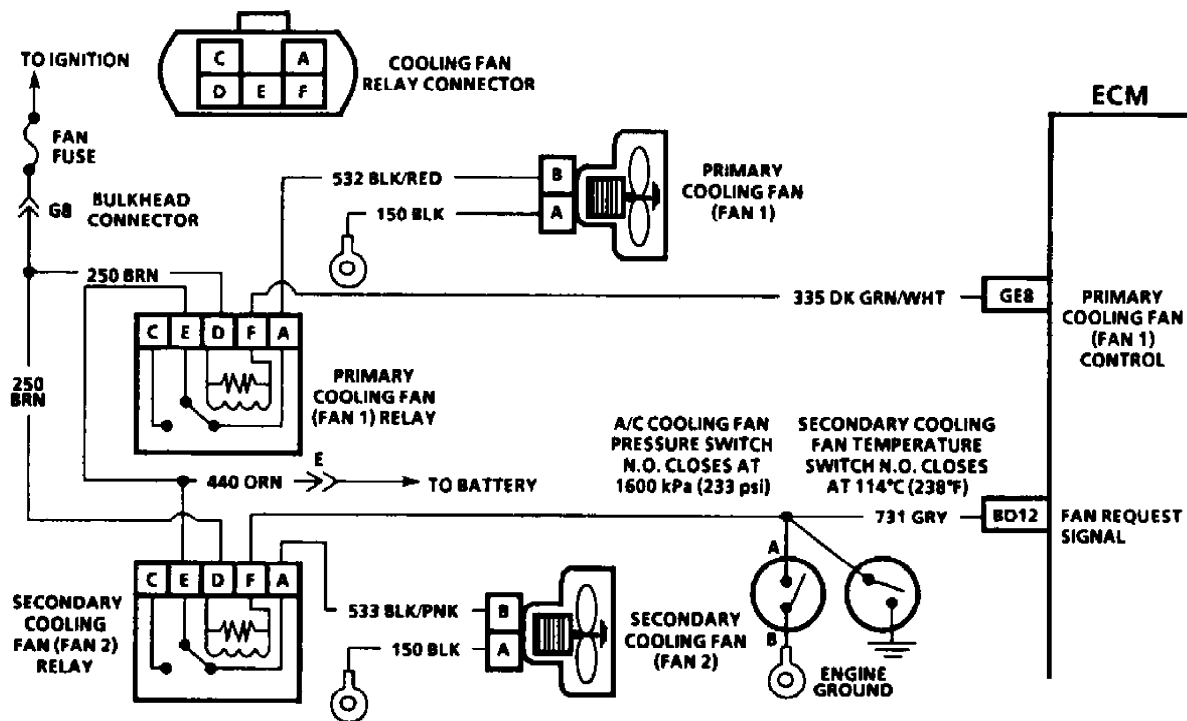


Fig. 8: Chart C-12 Ckt Diagram (5.0L VIN F, 5.7L VIN 8)  
Courtesy of General Motors Corp.

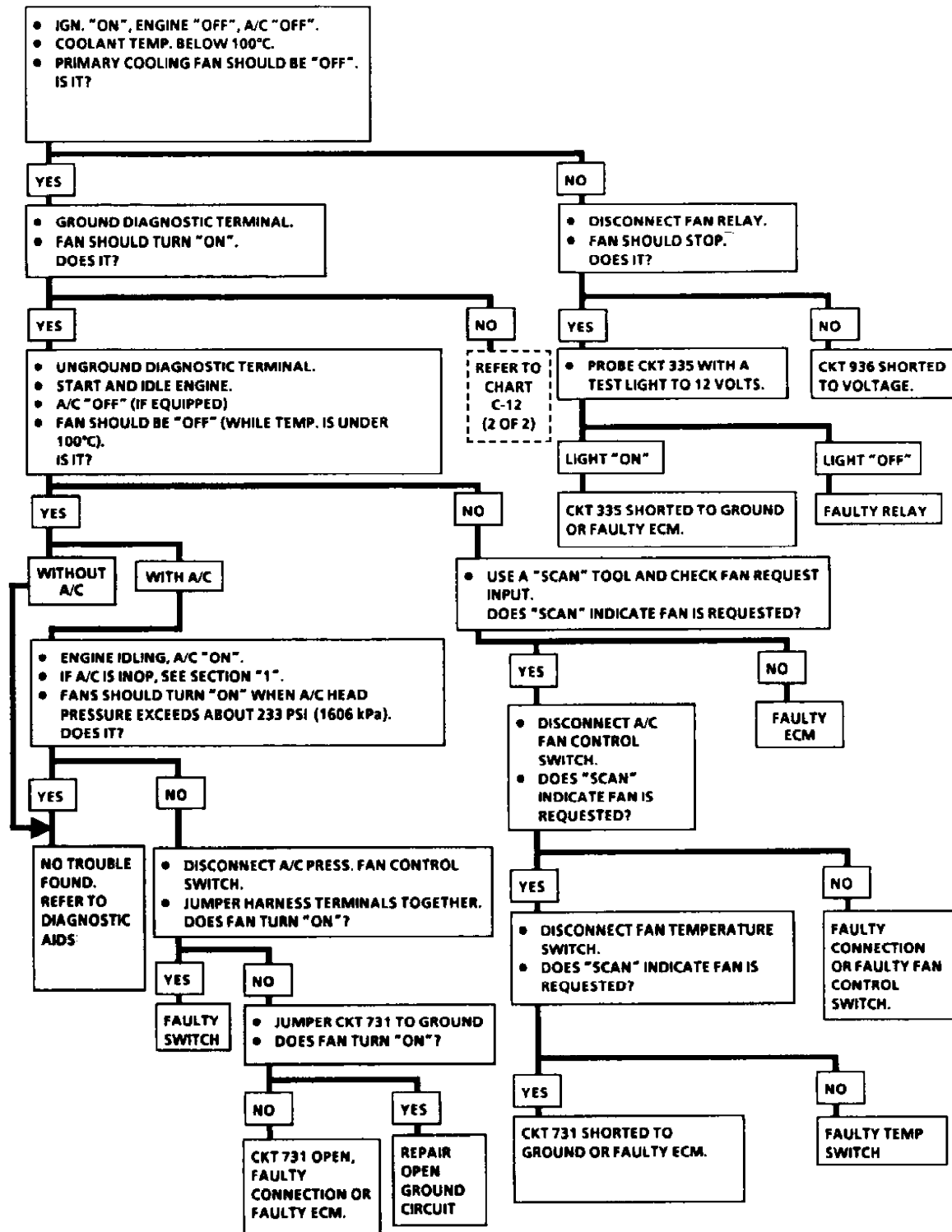


Fig. 9: Chart C-12 Flow Chart (1 of 2) (5.0L VIN F, 5.7L VIN 8)  
Courtesy of General Motors Corp.

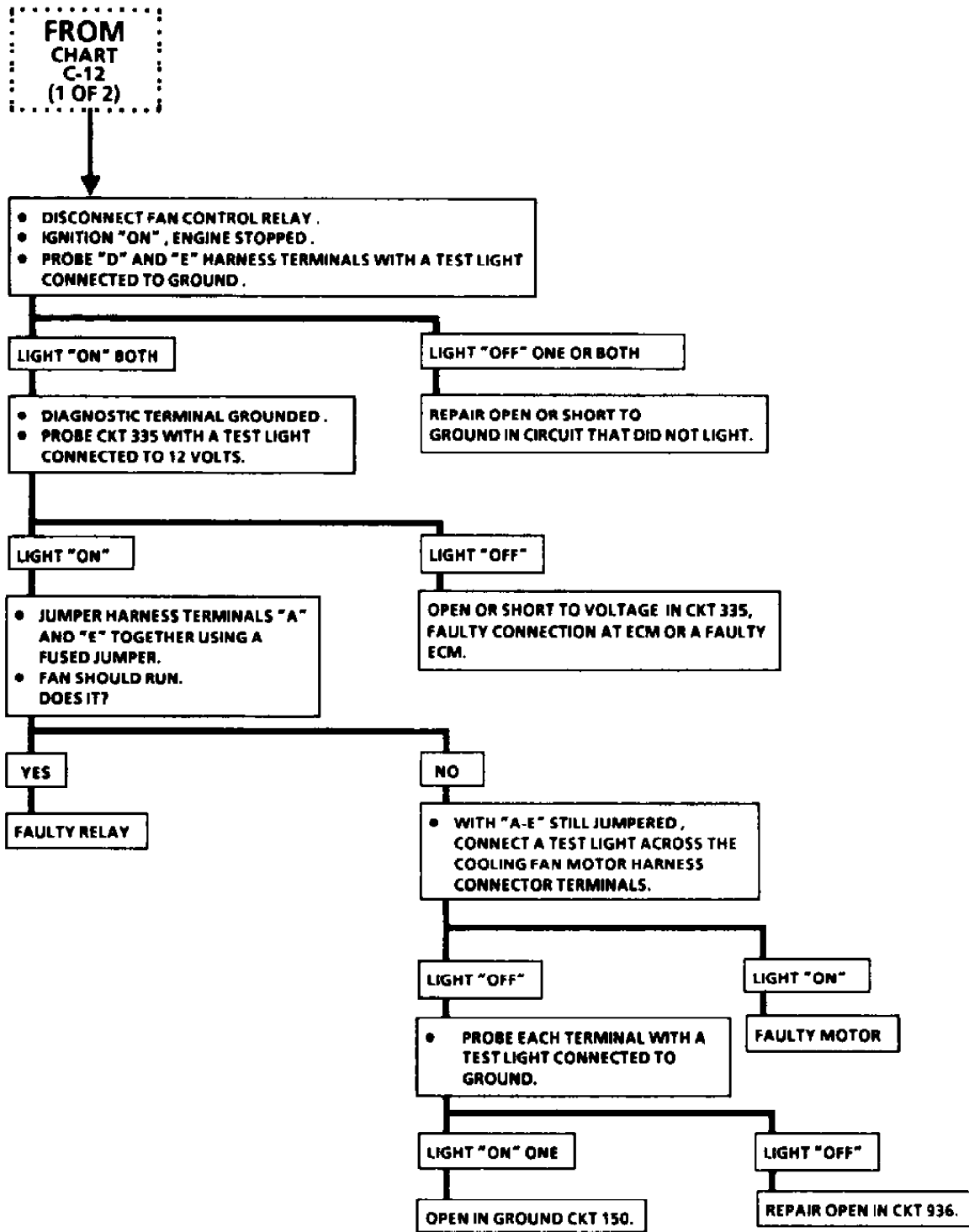


Fig. 10: Chart C-12 Flow Chart (2 of 2) (5.0L VIN F, 5.7L VIN 8)  
Courtesy of General Motors Corp.