DESCRIPTION & OPERATION

A/C COMPRESSOR CLUTCH CONTROLS

To provide improved idle quality, improved Wide Open Throttle (WOT) performance and A/C system protection, the compressor clutch is controlled by PCM.

For proper control of cooling fans, compressor clutch and Idle Air Control (IAC) valve, a refrigerant pressure sensor is used. PCM uses signal provided by sensor to monitor high and low side refrigerant pressures. If PCM detects a fault in refrigerant pressure circuit, compressor clutch will be disabled.

The A/C clutch relay is controlled by PCM. This allows PCM to raise idle speed before engaging compressor clutch, or disable compressor clutch during WOT, high engine RPM, high power steering loads and hot engine restarts. PCM also disables compressor clutch if coolant temperature becomes excessive.

NOTE: This article ONLY contains those testing procedures required to test A/C compressor clutch control circuit. Other diagnostic information may be referenced while performing A/C compressor clutch control diagnosis. For complete information on General Motors Computerized Engine Control systems, see ENGINE PERFORMANCE section.

When fan control relay energizes, battery voltage is supplied to auxiliary cooling fan No. 1 and through the normally open contacts of fan control relay (K52), to auxiliary cooling fan No. 2. If coolant temperature reaches 248°F (120°C), secondary temperature switch contacts will open and the compressor clutch coil is disengaged, causing A/C system to turn off. Secondary temperature switch will not allow A/C system to turn back on until coolant temperature has dropped to 239°F (115°C) or less.

Compressor clutch coil can also be turned off by refrigerant pressure switches (low pressure switch or high pressure switch). Low pressure switch will turn compressor clutch off as soon as refrigerant pressure falls to about 26 psi (1.8 kg/cm^2). This is done by opening the low pressure switch contacts and not allowing battery voltage to pass through A/C clutch relay (K60) to compressor clutch coil. Low pressure switch activates the compressor clutch when refrigerant pressure increases to about 36.3 psi (2.6 kg/cm^2).

High pressure switch will turn compressor clutch off as soon as refrigerant pressure exceeds about 435 psi (30.6 kg/cm^2). This is done by opening the high pressure switch contacts in refrigerant pressure switch and not allowing battery voltage to pass through A/C clutch relay (K60) to compressor clutch. High pressure switch activates compressor clutch when refrigerant pressure drops less than about 290 psi (19.3 kg/cm^2).

When refrigerant pressure exceeds about 159.4 psi (11.2 kg/cm^2),A/C control switch contacts will close and engine idle speed will increase to compensate for RPM drop that occurs when A/C system is switched on. A/C control switch is installed in high pressure line, between A/C compressor and condenser. When refrigerant

pressure drops less than about 130. 5 psi (9.2 kg/cm^2), A/C control switch contacts will close and allow engine idle speed to return to normal.

A/C CLUTCH RELAY LOCATION

Application	Location
Corvette	In Underhood Electrical Center, In Front Of Battery

A/C CLUTCH CIRCUIT DIAGNOSIS

To help save diagnostic time, ALWAYS check for blown fuses or fusible links before proceeding with any testing. If fuses are blown, locate and repair short circuit before replacing fuses.

Ensure all related relay and wire harness connections are clean and tight. Repair as necessary. See **WIRING DIAGRAMS** .

WARNING: Vehicles may be equipped with a PCM using an Electronically Erasable Programmable Read Only Memory (EEPROM). When replacing PCM, the new PCM must be programmed.

NOTE: The following diagnostic procedures apply to manual A/C-heater systems only. For automatic A/C systems, see procedures in A/C-HEATER SYSTEM - AUTOMATIC .

Description

A/C clutch relay is PCM controlled to delay compressor clutch engagement after A/C is turned on. This allows PCM to adjust engine RPM before compressor clutch engages. PCM will engage compressor clutch any time A/C has been requested unless coolant temperature is high, A/C system pressure is low, A/C system pressure is high, during wide open throttle or high engine RPM.

When A/C-heater control panel is placed in A/C mode, a 12-volt signal is sent to PCM. When PCM receives this signal, PCM will ground A/C clutch relay control circuit to energize A/C clutch relay. This is shown on scan tool as A/C REQUEST YES.

When an A/C request has been detected by PCM, PCM will ground A/C clutch relay control circuit. As a result, relay contacts close, allowing current to flow through relay to compressor clutch. When A/C REQUEST has been detected by PCM, cooling fans will turn on when the A/C system pressure is greater than a predetermined value.

NOTE: The following test applies only to A/C request circuit. If A/C request circuit tests okay and no DTCs are set, but compressor clutch will not engage, further diagnosis is necessary. See A/C-HEATER SYSTEM - MANUAL article.

A/C Request Circuit Diagnosis

1. If On-Board Diagnostic (OBD) System Check has not been performed, see OBD SYSTEM CHECK in TESTS W/CODES article in ENGINE PERFORMANCE. If OBD SYSTEM CHECK has been performed, go to next step.
2. Check if any DTCs are set. If any DTCs are set, perform diagnosis for DTCs first. See TESTS W/CODES article in ENGINE PERFORMANCE. If no DTCs are set, go to next step.
3. Install scan tool. Start engine and let idle. Ensure A/C is off. Using scan tool, view A/C REQUEST on display. If scan tool displays YES, go to step 8). If scan tool does not display YES, go to next step.
4. Turn A/C on. If scan tool displays YES, system is okay at this time. If scan tool does not display YES, go to next step.
5. Turn ignition off. Disconnect PCM harness connector C1. Turn ignition on, engine off. Using a DVOM, measure voltage between ground and PCM harness connector C1, terminal No. 47 (Dark Green/White wire). Turn A/C on. If reading is near battery voltage, go to step 10). If reading is not as specified, go to next step.
6. Turn ignition off. Disconnect HVAC programmer harness connector. Using a DVOM, check for continuity in Dark Green/White wire between HVAC programmer harness connector and PCM harness connector C1, terminal No. 47. If continuity is present, go to next step. If continuity is not present, go to step 11).
7. Using a test light connected to battery voltage, probe A/C request circuit (Dark Green/White wire) at PCM harness connector C1, terminal No. 47. If test light illuminates, go to step 12). If test light does not illuminate, go to step 9).
8. Check A/C request circuit (Dark Green/White wire) for a short to power. Repair as necessary. If no problem is found, go to next step.
9. Replace HVAC programmer. Verify system operation.
10. Check for poor PCM harness connections. Repair as necessary. If no problem is found, go to step 13).
11. Repair open in A/C request circuit (Dark Green/White wire) between HVAC programmer and PCM. Verify system operation.
12. Repair short to ground in A/C request circuit (Dark Green/White wire) between HVAC programmer and PCM. Verify system operation.
13. Replace PCM. Verify system operation.

WIRING DIAGRAMS

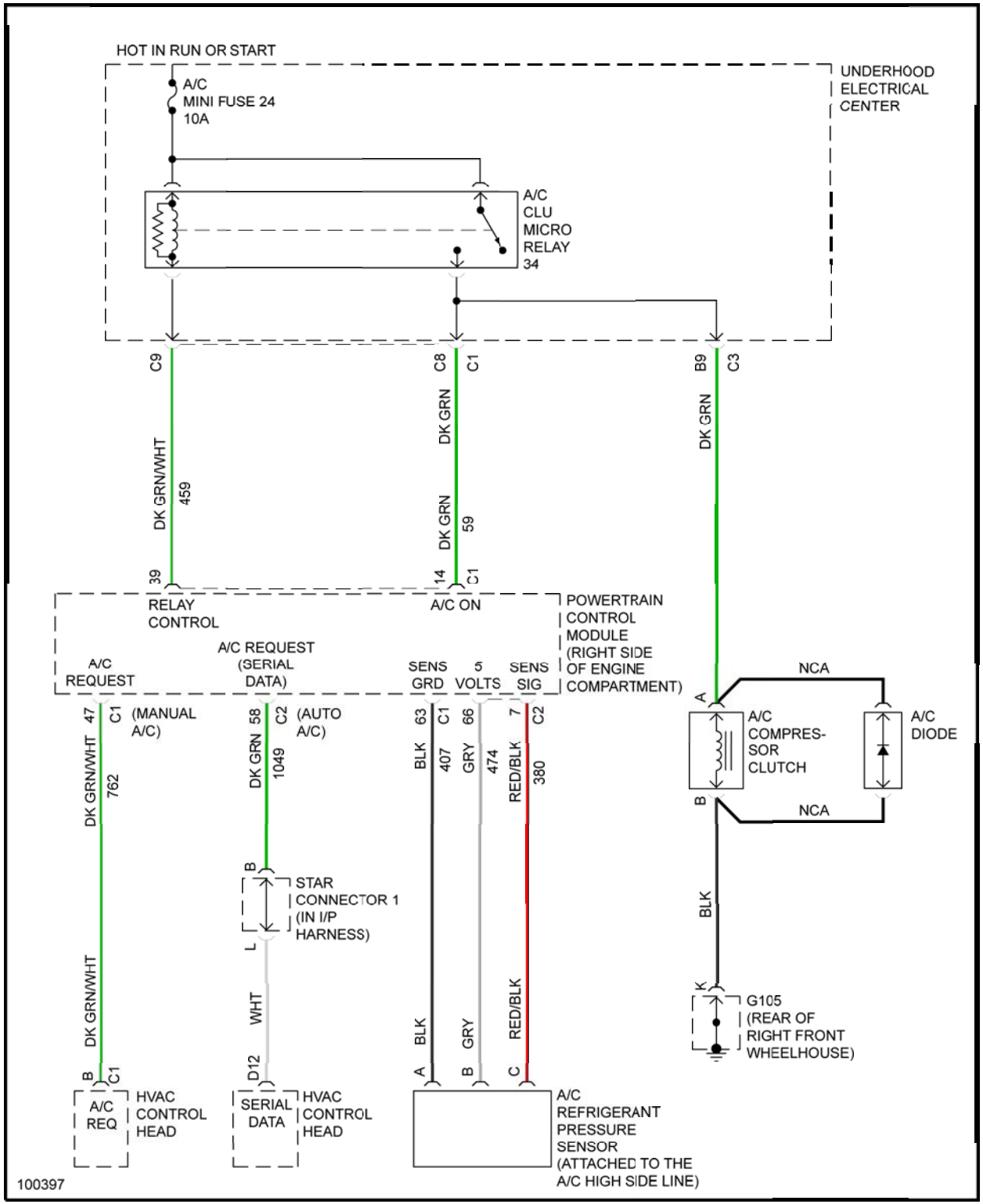
HOT IN RUN OR START
A/C
MINI FUSE 24
10A
UNDERHOOD
ELECTRICAL
CENTER
A/C
CLU
MICRO
RELAY
34
C9
C8
C1
B9
C3
DK GRN/WHT
459
DK GRN
59
DK GRN
39
14
C1
RELAY
CONTROL
A/C ON
POWERTRAIN
CONTROL
MODULE
(RIGHT SIDE
OF ENGINE
COMPARTMENT)
A/C REQUEST (SERIAL DATA)
A/C
REQUEST
SENS
GRD
5
VOLTS
SENS
SIG
47
C1
(MANUAL
A/C)
DK GRN/WHT
762
58
C2
(AUTO
A/C)
DK GRN
1049
63
C1
66
7
C2
BLK
407
GRY
474
RED/BLK
380
NCA
A
A/C
COMPRES-
SOR
CLUTCH
A/C
DIODE
B
NCA
B
STAR
CONNECTOR 1
(IN I/P
HARNESS)
L
WHT
BLK
K
G105
(REAR OF
RIGHT FRONT
WHEELHOUSE)
B
C1
D12
A
B
C
BLK
GRY
RED/BLK
A/C
REQ
HVAC
CONTROL
HEAD
SERIAL
DATA
HVAC
CONTROL
HEAD
A/C
REFRIGERANT
PRESSURE
SENSOR
(ATTACHED TO THE
A/C HIGH SIDE LINE)
100397

Fig. 1: A/C Compressor Clutch Control Circuit Wiring Diagram