SURGES AND/OR CHUGGLES

Definition: Engine power variation, under steady throttle or cruise. Feels like the vehicle speeds up and slows down, with no change in the accelerator pedal.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.
- Be sure driver understands air conditioning compressor operation in owner's manual.
- Use a Tech 1 "Scan" tool to make sure reading of vehicle speed sensor matches vehicle speedometer.

FUEL SYSTEM

- CHECK: Fuel pressure while condition exists, use CHART A-7.
- CHECK: In-line fuel filter. Replace if dirty or plugged.

IGNITION SYSTEM

- CHECK: For proper ignition system voltage output using spark tester J 26792 (ST-125).
- CHECK: Spark plugs. Remove spark plugs, check for wet plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. Repair or replace as necessary.
- CHECK: For misfire under load. Use CHART C-4C.

ADDITIONAL CHECKS

- CHECK: Electronic control module grounds for being clean, tight, and in their proper locations. These ground wires secure to the engine block on the direct ignition system bracket uppermost bolt. This bolt was previously used to retain the distributor on a carbureted engine.
- CHECK: Alternator output voltage. Repair if less than 9 or more than 16.9 volts.
- CHECK: Vacuum lines for kinks or leaks.

LACK OF POWER, SLUGGISH, OR SPONGY

(Page 1 of 2)

Definition: Engine delivers less than expected power. Little or no increase in speed, when accelerator pedal is pushed down part way.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.
- Compare customer's vehicle to similar unit. Make sure the customer has an actual problem.
- Remove air filter and check air filter for dirt, or for being plugged, replace as necessary.

FUEL SYSTEM

- **CHECK:** For contaminated fuel.
- **CHECK:** For restricted fuel filter, or improper fuel pressure, use CHART A-7.

IGNITION SYSTEM

- **CHECK:** Proper ignition system voltage output with spark tester J 26792 (ST-125).
- **CHECK:** Ignition timing.
- **CHECK:** Proper operation of electronic spark timing.

EXHAUST SYSTEM

- **CHECK:** Exhaust system for possible restriction: Use CHART B-1.

SENSORS

- **CHECK:** Manifold absolute pressure sensor. Use CHART C-1D. Vacuum hose between engine and manifold absolute pressure sensor for kinks or leaks.

LACK OF POWER, SLUGGISH, OR SPONGY

(Page 2 of 2)

Definition: Engine delivers less than expected power. Little or no increase in speed, when accelerator pedal is pushed down part way.

ENGINE MECHANICAL

- **CHECK:** Engine compression. Refer to Engine Manual.
- **CHECK:** Engine valve timing. Refer to Engine Manual.
- **CHECK:** Engine for proper or worn camshaft. Refer to Engine Manual.

ADDITIONAL CHECKS

- **CHECK:** Electronic control module grounds for being clean, tight, and in their proper location. These ground wires secure to the engine block on the direct ignition system bracket uppermost bolt.
- **CHECK:** Air conditioning operation. Air conditioning clutch should cut out at wide open throttle.
- **CHECK:** Alternator output voltage. Repair if less than 9 or more than 16.9 volts.

DETONATION/SPARK KNOCK

(Page 1 of 2)

Definition: A mild to severe ping, usually worse under acceleration. The engine makes sharp metallic knocks that change with throttle opening.

PRELIMINARY CHECKS

- Perform the careful physical/visual checks as described at start of "Symptoms," in this section.
- Make sure the customer has an actual problem.
- Remove air filter and check air filter for dirt, or for being plugged, replace as necessary.

COOLING SYSTEM

- **CHECK:** For obvious overheating problems.
- **CHECK:** Low engine coolant.
- **CHECK:** Loose water pump belt.
- **CHECK:** Restricted air flow to radiator, or restricted water flow thru radiator.
- **CHECK:** Faulty or incorrect thermostat.
- **CHECK:** Correct coolant solution.

SENSOR

- **CHECK:** Coolant temperature sensor, which may have shifted in value.
  Compare coolant temperature sensor resistance to the "Diagnostic Aids" chart on Code 14 or Code 15 chart.

FUEL SYSTEM

- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** For poor fuel quality, proper octane rating.

NOTICE: If Tech 1 "Scan" tool readings are normal (see TECH 1 "SCAN" TOOL TYPICAL DATA VALUE list) and there are no engine mechanical faults, fill fuel tank with a fresh and proper fuel for vehicle and evaluate vehicle performance.

OCTANE ADJUSTMENT POTENTIOMETER

- As built at the factory this adjustment was initially set for premium octane fuel. If low octane fuel is to be used on a regular basis, it is advisable to readjust the octane adjustment potentiometer. Use CHART C-15.

THERMOSTATIC AIR CLEANER

- Ensure that the thermostatic air cleaner functions properly. Check that the temperature actuated damper moves away from "HOT AIR" position after the engine is fully warmed up. Use the Tech 1 "Scan" tool to observe intake air temperature after the engine is fully warmed up. At road speeds the intake air temperature should be close to ambient air temperature.

DETONATION/SPARK KNOCK

(Page 2 of 2)

Definition: A mild to severe ping, usually worse under acceleration. The engine makes sharp metallic knocks that change with throttle opening.

IGNITION SYSTEM

- **CHECK:** Spark plugs for proper heat range.

ENGINE MECHANICAL

- **CHECK:** For carbon buildup.
- **CHECK:** For incorrect basic engine parts such as cam, heads, pistons, etc.
- **CHECK:** For excessive oil entering combustion chamber.

ADDITIONAL CHECKS

- **CHECK:** For correct engine calibrator (see Service Bulletins).
- **CHECK:** For intake manifold electric heater should be "OFF" with the engine fully warmed up. Use Tech 1 to display "MANIFOLD HEATER" "ON/OFF" status.

HESITATION, SAG, STUMBLE

Definition: Momentary lack of response as the accelerator is pushed down. Can occur at all vehicle speeds. Usually most severe when first trying to make the vehicle move, as from a stop sign. May cause the engine to stall if severe enough.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.

SENSORS

- **CHECK:** Throttle position sensor. Use CHART C-1H.
- **CHECK:** Manifold absolute pressure sensor response and accuracy. Use CHART C-1D.
- **CHECK:** For kinked or leaking vacuum hose between engine and manifold absolute pressure sensor.

IGNITION SYSTEM

- **CHECK:** Spark plug wires for being faulty.
- **CHECK:** Spark plugs for being fouled.
- **CHECK:** Open ignition system ground, reference low circuit.

EVAPORATIVE EMISSIONS

- **CHECK:** Evaporative emissions storage canister system. Use CHART C-3.

FUEL SYSTEM

- **CHECK:** For restricted fuel filter or improper fuel pressure. Use CHART A-7.

ADDITIONAL CHECKS

- **CHECK:** For correct engine calibrator (see Service Bulletins).
- **CHECK:** Alternator output voltage. Repair, if less than 9 or more than 16.9 volts.

CUTS OUT, MISSES

Definition: Steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases. The exhaust has a steady spitting sound at idle or low speed.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.

IGNITION SYSTEM

- CHECK: For cylinder miss by:
  1. Start engine, allow engine to stabilize then disconnect idle air control motor. Remove one spark plug wire at a time, using insulated pliers.
  2. If there is a revolutions per minute drop, on all cylinders (equal to within 50 revolutions per minute), go to "Rough, Unstable Or Incorrect Idle, Stalling" symptom. Reconnect idle air control motor.
  3. If there is no revolutions per minute drop on one or more cylinders, or excessive variation in drop, check for spark, on the suspected cylinder(s) with J 26792 (ST-125) Spark Tester. If no spark, use CHART C-4. If there is spark, remove spark plug(s) in these cylinder(s) and check for:
     - Insulation Cracks
     - Wear
     - Improper Gap
     - Burned Electrodes
     - Heavy Deposits
- CHECK: For excessive spark plug wire resistance.

NOTICE: If the previous checks did not find the problem:

- Visually inspect ignition system for moisture, dust, cracks, burns, etc. With engine running spray plug wires with fine water mist to check for shorts.

FUEL SYSTEM

- CHECK: For contaminated fuel or restricted fuel filter or incorrect fuel pressure. Use CHART A-7.

ENGINE MECHANICAL

- CHECK: For proper valve timing. Remove rocker cover. Check for worn rocker arms, broken or weak valve springs, worn camshaft lobes. Repair as necessary. Refer to Engine Manual.
- CHECK: Low compression. Perform compression check. Refer to Engine Manual.
- CHECK: Intake and exhaust manifold passages for casting flash.

POOR FUEL ECONOMY

Definition: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.
- Check air cleaner element (filter) for dirt or being plugged.
- Visually (physically) check: Vacuum hoses for splits, kinks, and proper connections.
- Perform "Diagnostic Circuit Check."
  - Is air conditioning "ON" full time?
  - Are tires at correct pressure?
  - Are excessively heavy loads being carried?
  - Is acceleration too much, too often?

NOTICE: Suggest owner fill fuel tank and recheck fuel economy.

IGNITION SYSTEM

- CHECK: Spark plugs. Remove spark plugs, check for wet plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. Repair or replace as necessary.
- CHECK: Ignition wires for cracking, hardness, and proper connections.

FUEL SYSTEM

- CHECK: Fuel pressure, use CHART A-7.

COOLING SYSTEM

- CHECK: Engine coolant level.
- CHECK: Engine thermostat for faulty part (always open) or for wrong heat range. Observe Tech 1 "Coolant Temp" with engine fully warm at road speed.

ADDITIONAL CHECKS

- CHECK: For correct engine calibrator installed in electronic control module. Observe Tech 1 "Calibration ID."
- CHECK: For proper calibration of speedometer.
- CHECK: For dragging brakes.

OCTANE ADJUSTMENT POTENTIOMETER

If premium octane fuel is being used, use Tech 1 to observe "Octane Adjust." With premium octane fuel the "Octane Adjust" value displayed on Tech 1 should be 0°. Use CHART C-15.

SENSORS

- CHECK: Coolant temperature sensor or air temperature sensor which may have shifted in value. Compare coolant temperature sensor resistance to the "Diagnostic Aids" chart on Code 14 or Code 15 chart.
- CHECK: Manifold absolute pressure sensor. Use CHART C-1D.

ROUGH, UNSTABLE OR INCORRECT IDLE, STALLING

(Page 1 of 2)

Definition: The engine runs unevenly at idle. If bad enough, the vehicle may shake. Also, the engine idle speed may vary (called "hunting"). Either condition may be severe enough to cause stalling. Engine idles at incorrect speed.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.

SENSORS

- CHECK: Throttle position sensor - Use CHART C-1H.
- CHECK: Coolant temperature sensor - Using a Tech 1 "Scan" tool, compare coolant temperature with ambient temperature on a cold engine.
  - If coolant temperature reading 2°C greater than or less than ambient air temperature. Check for high resistance in coolant temperature sensor circuit or sensor itself. Compare resistance value to "Diagnostic Aids" on Code 14 and Code 15 chart.
- CHECK: Manifold absolute pressure sensor response and accuracy, manifold absolute pressure sensor vacuum hose, use CHART C-1D.

FUEL SYSTEM

- CHECK: Evaporative Emission Control System. Use CHART C-3.
- CHECK: Injector for leaking. Energize fuel system by either turning the ignition key to the "ON" position which will pressurize the fuel system for 2 seconds or by applying battery voltage to the fuel pump test terminal. (Assembly line data link terminal "G".) Applying battery voltage will force the fuel pump to run until the battery voltage is removed. Visually check injector and throttle body injection assembly for fuel leakage. Refer to CHART A-7 "Fuel System Diagnosis."
- CHECK: Fuel pressure, use CHART A-7.

IGNITION SYSTEM

- CHECK: Ignition system for:
  - Proper ignition voltage output with spark tester J 26792 (ST-125).
  - Spark plugs, wet plugs, cracks, wear, improper gap, burned electrodes or heavy deposits.
  - Spark plug leads/wires for excessive resistance.
  - Bare and shorted wires.
  - Crankshaft sensor resistance and connections.
  - Loose ignition coil connections.
- CHECK: For misfire at idle. Use CHART C-4B.

ROUGH, UNSTABLE OR INCORRECT IDLE, STALLING

(Page 2 of 2)

Definition: The engine runs unevenly at idle. If bad enough, the vehicle may shake. Also, the engine idle speed may vary (called "hunting"). Either condition may be severe enough to cause stalling. Engine idles at incorrect speed.

ADDITIONAL CHECKS

- **CHECK:** Vacuum leaks can cause higher than normal idle speeds.
- **CHECK:** Idle air control operation, use CHART C-2C.
- **CHECK:** Electronic control module grounds for clean, tight, and in their proper location. These ground wires secure to the engine block on the direct ignition system bracket uppermost bolt. This bolt was previously used to retain the distributor on a carbureted engine.

NOTICE: Use Tech 1 "Scan" tool to determine if electronic control module is receiving air conditioning request signal. If problem exists only with air conditioning "ON," check air conditioning system for overcharge or undercharge of R12 refrigerant system.

- **CHECK:** Battery cables and ground straps should be clean and secure. Erratic voltage will cause idle air control to change its position, resulting in poor idle quality.
- **CHECK:** Idle air control valve will not move, if system voltage is below 9 or greater than 16.9 volts.
- **CHECK:** Crankcase ventilation system for proper operation (see: CHART C-13).

ENGINE MECHANICAL

- **CHECK:** For broken motor mounts.
- **CHECK:** Perform a compression check. Refer to Engine Manual.

EXCESSIVE EXHAUST EMISSIONS OR ODORS

Definition: Vehicle fails an emission test. Excessive odors do not necessarily indicate excessive emissions.

PRELIMINARY CHECKS

- Perform "Diagnostic Circuit Check."
- If EMISSION TEST shows excessive carbon monoxide and hydro carbons check items which cause vehicle to run RICH. Make sure engine is at normal operating temperature.
- If EMISSION TEST shows excessive oxides of nitrogen check items which cause car to run LEAN or too hot.

SENSORS

- **CHECK:** Manifold absolute pressure sensor - Use CHART C-1D to check the manifold absolute pressure sensor.

NOTICE: If the Tech 1 "Scan" tool indicates a very high coolant temperature and the system is running LEAN:

Check the cooling system and cooling fan for proper operation.

FUEL SYSTEM

- **CHECK:** For proper fuel cap.
- **CHECK:** Fuel pressure, use CHART A-7.

NOTICE: If test shows excessive oxides of nitrogen, check items which cause vehicle to run LEAN or too hot.

- **CHECK:** Canister for fuel loading. Refer to CHART C-3.

IGNITION SYSTEM

- **CHECK:** Ignition system for:
  - Proper ignition voltage output with spark tester J 26792 (ST-125).
  - Spark plugs, wet plugs, cracks, wear, improper gap, burned electrodes or heavy deposits.
  - Spark plug leads/wires for excessive resistance.
  - Bare and shorted wires.
  - Crankshaft sensor resistance and connections.
  - Loose ignition coil connections.

ADDITIONAL CHECKS

- **CHECK:** For vacuum leaks.
- **CHECK:** Carbon build-up in combustion chambers.
- **CHECK:** Crankcase ventilation system for proper operation (see: CHART C-13).

DIESELING, RUN-ON

Definition: Engine continues to run after key is turned "off," but runs very roughly. If engine runs smoothly, check ignition switch and adjustment, and short to voltage on ignition switch voltage input circuit.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.

FUEL SYSTEM

- **CHECK:** Injector for leaking. Energize fuel system by either turning the ignition key to the "ON" position which will pressurize the fuel system for 2 seconds or by applying battery voltage to the fuel pump test terminal. (Assembly line data link terminal "G".) Applying battery voltage will force the fuel pump to run until the battery voltage is removed. Visually check injector and throttle body injection assembly for fuel leakage. Refer to CHART A-7 "Fuel System Diagnosis."

BACKFIRE

Definition: Fuel ignites in intake manifold, or in exhaust system, making a loud popping noise.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.

IGNITION SYSTEM

- **CHECK:** Proper ignition coil output voltage with spark tester J 26792 (ST-125).
- **CHECK:** Spark plugs. Remove spark plugs, check for wet plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits, repair or replace as necessary.
- **CHECK:** For defective insulation on the spark plug wires or boots. This would allow high voltage arching to engine parts, mostly noticeable during acceleration.
- **CHECK:** For excessive spark plug wire resistance.
- **CHECK:** For crossfire between spark plug wires (proper routing of plug wires). Refer to Engine Manual.

ENGINE MECHANICAL

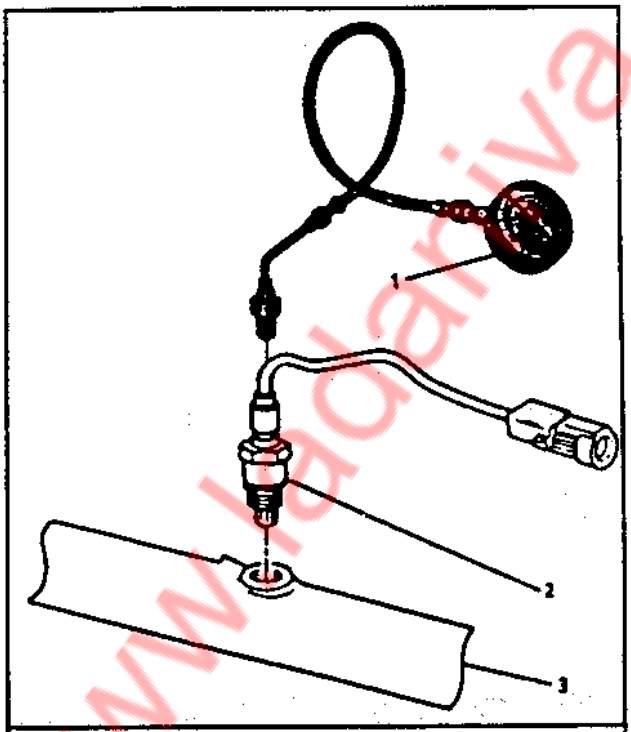
- **CHECK:** Perform a compression check. Refer to Engine Manual.
- **CHECK:** Valve timing. Remove rocker cover. Check for worn rocker arms, broken or weak valve springs, worn camshaft lobes or misadjusted valve clearances.
- **CHECK:** Intake manifold gasket for vacuum leaks.
- **CHECK:** Intake and exhaust manifolds for casting flash.

CHART B-1

RESTRICTED EXHAUST SYSTEM CHECK

CHECK AT OXYGEN SENSOR:

1. Carefully remove oxygen sensor.
2. Install exhaust backpressure tester (BT-8515-V) or equivalent in place of oxygen sensor (see illustration).
3. After completing test described below, be sure to coat threads of oxygen sensor with anti-seize compound or equivalent prior to re-installation.



1 BACK PRESSURE GAGE
2 OXYGEN SENSOR (O2S)
3 EXHAUST MANIFOLD
7S 3338-6E

DIAGNOSIS:

1. With the engine at normal operating temperature and running at 2500 revolutions per minute, observe the exhaust system backpressure reading on the gauge.
2. If the pressure exceeds 1 1/4 psi (8.62 kPa), a restricted exhaust system is indicated.
3. Inspect the entire exhaust system for a collapsed pipe, heat distress, or possible internal muffler failure.
4. If there are no obvious reasons for the excessive backpressure, a restricted catalytic converter should be suspected, and replaced using current recommended procedures.

4-26-93
NS 14689

ELECTRONIC CONTROL MODULE PIN CONNECTOR "A" SYMPTOMS CHART

24-PIN A-B CONNECTOR

This electronic control module symptoms chart is for use with a digital voltmeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

BACKPROBE CONNECTORS *ONLY*!

THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:

- Engine at operating temperature
- Engine idling (For "Engine Run" column)
- Diagnostic "test" terminal not grounded
- Tech 1 "Scan" tool not installed
- Air conditioning "OFF"
- Digital voltmeter "—" (negative) lead connected to a good clean ground point.

PIN FUNCTION	WIRE COLOR	COMPONENT/ CONNECTOR CAVITY	NORMAL VOLTAGE		CODES AFFECT.	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
			IGN "ON"	ENG. RUN		
A1 FUEL SYSTEM RELAY CONTROL	GREEN/ WHITE	FUEL PUMP RELAY "2"	(1) 0**	B+	NONE	NO START, SEE CHART A-7. PUMP RUNS ALL THE TIME (11)
A2 NO CONNECTION						
A3 PULSE WIDTH MODULATOR CANISTER CONTROL	GREEN/ YELLOW	CANISTER "B"	0*	0*	NONE	FUEL LOSS OR FUEL VAPOR ODOR, POOR IDLE, STALLING, POOR DRIVEABILITY.
A4 NO CONNECTION						
A5 "CHECK ENGINE" LIGHT CONTROL	BLACK/ WHITE	INSTRUMENT PANEL CLUSTER	0*	B+	NONE	NO CHECK ENGINE LIGHT (8), LIGHT "ON" ALL THE TIME, DOES NOT FLASH CODES (10). SEE "DIAGNOSTIC CIRCUIT CHECK."
A6 IGNITION SWITCH VOLTAGE INPUT SIGNAL	PINK/ BLACK	DIRECT IGNITION SYSTEM MODULE 2 CONNECTOR PIN "B" AND 6 CONNECTOR PIN "B"	B+	B+	53	NO START, NO CHECK ENGINE LIGHT, NO SERIAL DATA (8), FUSE BLOWN (10). SEE "DIAGNOSTIC CIRCUIT CHECK." ENGINE WILL NOT STOP RUNNING. (11).
A7 NO CONNECTION						
A8 SERIAL DATA COMMUNICATIONS	ORANGE	ASSEMBLY LINE DATA LINK "M"	2-5 VARYING	2-5 VARYING	NONE	NO ASSEMBLY LINE DATA LINK OR WILL NOT FLASH CODE 12 (9). SEE "DIAGNOSTIC CIRCUIT CHECK."
A9 DIAGNOSTIC "TEST" TERMINAL INPUT SIGNAL	BLACK/ WHITE	ASSEMBLY LINE DATA LINK "B"	5	5	NONE	NO ASSEMBLY LINE DATA LINK OR WILL NOT FLASH CODE 12 (8). FLASHES CODES, HIGH-SPEED FAN IS ON. (10). SEE "DIAGNOSTIC CIRCUIT CHECK."
A10 VEHICLE SPEED INPUT SIGNAL	GREEN	VEHICLE SPEED SENSOR "2"	VARIES	VARIES	24	ENGINE MAY STALL AT COASTDOWN, TECH 1 SCAN VEHICLE SPEED DOES NOT MATCH SPEEDOMETER (9,11).
A11 COOLANT TEMPERATURE AND THROTTLE POSITION SENSOR GROUND	PINK/ BLACK	COOLANT TEMPERATURE SENSOR "A" THROTTLE POSITION SENSOR "B"	0**	0**	15 21 (8)	HIGH IDLE, ROUGH IDLE, HARD TO START, POOR PERFORMANCE, EXCESSIVE EXHAUST EMISSIONS (8).
A12 ELECTRONIC CONTROL MODULE GROUND	BROWN	ASSEMBLY LINE DATA LINK "A"	0**	0**	NONE	"A12" AND "D1" OPEN - NO START (8). POOR GROUNDS - POOR PERFORMANCE. SEE "DIAGNOSTIC CIRCUIT CHECK."

1 Battery voltage for first two seconds, after ignition is turned "ON" without cranking the engine.
2 When vehicle is stopped, voltage will be either less than 1 volt or greater than 10 volts; depending upon position of drive wheels. When vehicle is moving, voltage will vary depending upon vehicle speed.
3 Varies with temperature.
4 Varies. With ignition "ON" reads barometric pressure. With engine running, reads engine load.
5 Voltage will vary with engine revolutions per minute.
6 Depending on octane adjust potentiometer trim.
7 Battery voltage (B +) with engine warm.
8 Open.
9 Open/Grounded circuit.
10 Grounded circuit.
11 Short to +12 volts.
* Less than 0,50 volts.
** Less than 0,10 volts.
**** Air Conditioning Vehicles Only
B+ Should equal battery voltage.

9-17-92
NS 14374

ELECTRONIC CONTROL MODULE PIN CONNECTOR "B" SYMPTOMS CHART

24-PIN A-B CONNECTOR

This electronic control module symptoms chart is for use with a digital voltmeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

BACKPROBE CONNECTORS *ONLY*!

THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:

- Engine at operating temperature
- Engine idling (For "Engine Run" column)
- Diagnostic "test" terminal not grounded
- Tech 1 "Scan" tool not installed
- Air conditioning "OFF"
- Digital voltmeter "—" (negative) lead connected to a good clean ground point.

PIN FUNCTION	WIRE COLOR	COMPONENT/ CONNECTOR/ CAVITY	NORMAL VOLTAGE		CODES AFFECT.	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
			IGN. "ON"	ENG. RUNNING		
B1 BATTERY + (POWER SUPPLY)	RED	ELECTRONIC CONTROL MODULE "B1"	B+	B+	NONE	FUSIBLE LINK BLOWN, NO START (10), IF "C16" AND "B1" OPEN, NO START SEE "DIAGNOSTIC CIRCUIT CHECK."
B2 NO CONNECTION						
B3 CRANKSHAFT REFERENCE LOW	BLACK/ RED	6-PIN CONNECTOR "F"	0**	0**	NONE	MAY HAVE POOR PERFORMANCE, FLICKERING CHECK ENGINE LIGHT (9), NO START, POSSIBLE IGNITION MODULE DAMAGE (11).
B4 NO CONNECTION						
B5 CRANKSHAFT REFERENCE INPUT SIGNAL	PURPLE/ WHITE	6-PIN CONNECTOR "E"	0*	1,0 (6)	NONE	NO START (9). SEE "DIAGNOSTIC CIRCUIT CHECK.".
B6 NO CONNECTION						
B7 NO CONNECTION						
B8 AIR CONDITIONING REQUEST INPUT SIGNAL	GREEN	HIGH-SIDE HIGH-PRESSURE SWITCH	"OFF" 0* "ON" 0*	0* B+	NONE	NO AIR CONDITIONING (9). SEE CHART C10 AIR CONDITIONING RUNS CONTINUOUSLY (11).
B9 NO CONNECTION						
B10 NO CONNECTION						
B11 NO CONNECTION						
B12 OCTANE ADJUST INPUT SIGNAL	GREEN	OCTANE ADJUST PIN "1"			54	SPARK KNOCK

1 Battery voltage for first two seconds, after ignition is turned "ON" without cranking the engine.

2 When vehicle is stopped, voltage will be either less than 1 volt or greater than 10 volts; depending upon position of drive wheels. When vehicle is moving, voltage will vary depending upon vehicle speed.

3 Varies with temperature.

4 Varies. With ignition "ON" reads barometric pressure. With engine running, reads engine load.

5 Voltage will vary with engine revolutions per minute.

6 Depending on octane adjust potentiometer trim.

7 Battery voltage (B +) with engine warm.

8 Open.

9 Open/Grounded circuit.

10 Grounded circuit.

11 Short to +12 volts.

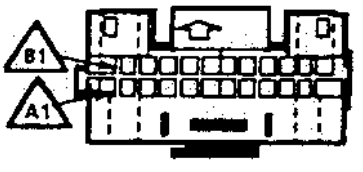
* Less than 0,50 volts.

** Less than 0,10 volts.

**** Air Conditioning Vehicles Only

B+ Should equal battery voltage.

24-PIN A-B CONNECTOR



BACK VIEW OF CONNECTOR

5-27-92
NS 14375

ELECTRONIC CONTROL MODULE PIN CONNECTOR "C" SYMPTOMS CHART

32-PIN C-D CONNECTOR

This electronic control module symptoms chart is for use with a digital voltmeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

BACKPROBE CONNECTORS *ONLY*!

THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:

- Engine at operating temperature
- Engine idling (For "Engine Run" column)
- Diagnostic "test" terminal not grounded
- Tech 1 "Scan" tool not installed
- Air conditioning "OFF"
- Digital voltmeter "—" (negative) lead connected to a good clean ground point.

	PIN FUNCTION	WIRE COLOR	COMPONENT/ CONNECTOR CAVITY	NORMAL VOLTAGE IGN "ON"	NORMAL VOLTAGE ENG. RUN	CODES AFFECT.	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
C1	NO CONNECTION						
C2	INTAKE MANIFOLD ELECTRIC HEATER RELAY CONTROL	PINK/ BLACK	INTAKE MANIFOLD HEATER RELAY CONNECTOR "4"	B+ (8)	B+	NONE	COLD DRIVEABILITY COMPLAINTS.
C3	IDLE AIR CONTROL COIL "B" LOW	GREEN/ BLACK	IDLE AIR CONTROL VALVE "A"	NOT	USEABLE	35	STALLING, ROUGH, UNSTABLE OR INCORRECT IDLE (9). SEE CHART C-2C.
C4	IDLE AIR CONTROL COIL "B" HIGH	GREEN/ WHITE	IDLE AIR CONTROL VALVE "B"	NOT	USEABLE	35	STALLING, ROUGH, UNSTABLE OR INCORRECT IDLE (9). SEE CHART C-2C.
C5	IDLE AIR CONTROL COIL "A" LOW	BLUE/ BLACK	IDLE AIR CONTROL VALVE "C"	NOT	USEABLE	35	STALLING, ROUGH, UNSTABLE OR INCORRECT IDLE (9). SEE CHART C-2C.
C6	IDLE AIR CONTROL COIL "A" HIGH	BLUE/ WHITE	IDLE AIR CONTROL VALVE "D"	NOT	USEABLE	35	STALLING, ROUGH, UNSTABLE OR INCORRECT IDLE (9). SEE CHART C-2C.
C7	NO CONNECTION						
C8	NO CONNECTION						
C9	NO CONNECTION						
C10	COOLANT TEMPERATURE INPUT SIGNAL	YELLOW	COOLANT TEMPERATURE SENSOR "B"	(4) 1 – 2	1 – 2	14, 15	HARD TO START, HIGH EXHAUST EMISSIONS (9).
C11	MANIFOLD ABSOLUTE PRESSURE INPUT SIGNAL	GREEN	MANIFOLD ABSOLUTE PRESSURE SENSOR "B"	3,5 – 5,0 (5)	0,9 – 1,5	33, 34	POOR PERFORMANCE, ROUGH IDLE, STALLING (9). SEE CHART C-1D
C12	INTAKE AIR TEMPERATURE INPUT SIGNAL	WHITE	INTAKE AIR TEMPERATURE SENSOR "B"	1,3	1,3	23, 25	POSSIBLE STRONG EXHAUST. TECH 1 READS -30°C (-36°F) (9). TECH 1 READS 179°C (354°F) (9).
C13	THROTTLE POSITION INPUT SIGNAL	BLUE	THROTTLE POSITION SENSOR "C"	0,3 – 0,7	0,3 – 0,7	21, 22	POOR PERFORMANCE, HIGH IDLE (9) SEE CHART C-1H. HARD TO START WHEN COLD (11).
C14	+5 VOLTS REFERENCE OUTPUT	GRAY	THROTTLE POSITION SENSOR "A", MANIFOLD ABSOLUTE PRESSURE SENSOR "C"	5	5	21, 22, 33, 34	SURGE, RUNS ROUGH, HIGH IDLE, HARD TO START, EXCESSIVE EXHAUST EMISSIONS OR ODORS, POOR PERFORMANCE, ROUGH IDLE (9).
C15	NO CONNECTION						
C16	(POWER SUPPLY) BATTERY +	RED	ELECTRONIC CONTROL MODULE "C-16"	B+	B+	NONE	FUSIBLE LINK BLOWN, NO START (10). IF "C16" AND "B1" OPEN, NO START. SEE "DIAGNOSTIC CIRCUIT CHECK."

1 Battery voltage for first two seconds, after ignition is turned "ON" without cranking the engine.
2 When vehicle is stopped, voltage will be either less than 1 volt or greater than 10 volts, depending upon position of drive wheels. When vehicle is moving, voltage will vary depending upon vehicle speed.
3 Varies with temperature.
4 Varies. With ignition "ON" reads barometric pressure. With engine running, reads engine load.
5 Voltage will vary with engine revolutions per minute.
6 Depending on octane adjust potentiometer trim.
7 Battery voltage (B +) with engine warm.
8 Open.
9 Open/Grounded circuit.
10 Grounded circuit.
11 Short to +12 volts.
* Less than 0,50 volts.
** Less than 0,10 volts.
**** Air Conditioning Vehicles Only
B+ Should equal battery voltage.

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NS 14376

ELECTRONIC CONTROL MODULE PIN CONNECTOR "D" SYMPTOMS CHART

32-PIN C-D CONNECTOR

This electronic control module symptoms chart is for use with a digital voltmeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

BACKPROBE CONNECTORS *ONLY*!

THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:

- Engine at operating temperature
- Engine idling (For "Engine Run" column)
- Diagnostic "test" terminal not grounded
- Tech 1 "Scan" tool not installed
- Air conditioning "OFF"
- Digital voltmeter "—" (negative) lead connected to a good clean ground point.

PIN FUNCTION	WIRE COLOR	COMPONENT/ CONNECTOR CAVITY	NORMAL VOLTAGE		CODES AFFECT.	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
			IGN "ON"	ENG. RUN		
D1 ELECTRONIC CONTROL MODULE GROUND	BROWN	ENGINE GROUND	0**	0**	NONE	"A-12" AND "D-1" OPEN, NO START. SEE "DIAGNOSTIC CIRCUIT CHECK," SEE TERMINAL "A12"
D2 OCTANE ADJUST POTENTIOMETER, MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR GROUND	BLACK	OCTANE ADJUST "3" MANIFOLD ABSOLUTE PRESSURE "A" MANIFOLD AIR TEMPERATURE "A"	0**	0**	54, 33, 23	ROUGH OR UNSTABLE IDLE, MAY STALL, POOR PERFORMANCE (8) SEE CHART C-1D.
D3 NO CONNECTION						
D4 ELECTRONIC SPARK TIMNG OUTPUT	GREEN/ WHITE	6-PIN CONNECTOR "C"	(5) 0*	1,12	42	HARD TO START, STALLS, WILL RESTART IN BYPASS MODE. SEE CHART C-4 (9). STALLS, POOR IDLE, MAY SET CODE 42 (11).
D5 IGNITION MODULE BYPASS CONTROL	BLACK/ WHITE	6-PIN CONNECTOR "D"	0	4, 6	42	LACK OF POWER, POOR PERFORMANCE (9, 11) BY-PASS MODE, SEE CHART C-4.
D6 OXYGEN SENSOR GROUND	BROWN	ENGINE GROUND	0**	0*	13	OPEN LOOP, TECH 1 READS FIXED 400-500 mV (9).
D7 OXYGEN SENSOR INPUT SIGNAL	PINK	OXYGEN SENSOR	.45mV	.1 – .9mV	13	OPEN LOOP, STRONG EXHAUST ODOR (9).
D8 NO CONNECTION						
D9 INJECTOR CIRCUIT CURRENT LIMITED JUMPER	BLACK	ELECTRONIC CONTROL MODULE "D10"	0**	0**	NONE	NO START (8,11). MAY DAMAGE ELECTRONIC CONTROL MODULE OR INJECTOR (10).
D10 INJECTOR CIRCUIT CURRENT LIMITED JUMPER	BLACK	ELECTRONIC CONTROL MODULE "D9"	0**	0**	NONE	NO START (8,11). MAY DAMAGE ELECTRONIC CONTROL MODULE OR INJECTOR (10).
D11 NO CONNECTION						
D12 AIR CONDITIONING COMPRESSOR CLUTCH RELAY CONTROL	BLUE	AIR CONDITIONING RELAY #2	0*	0*	NONE	NO AIR CONDITIONING (8, 11). AIR CONDITIONING RUNS ALL THE TIME (10).
D13 NO CONNECTION						
D14 NO CONNECTION						
D15 NO CONNECTION						
D16 FUEL INJECTOR CONTROL	BLUE	ELECTRONIC CONTROL MODULE "D16"	B+	B+	NONE	IF "D16" IS OPEN, NO START. SEE CHART A-3. FLOOD ENGINE. FAIL ELECTRONIC CONTROL MODULE OR INJECTOR (10). NO START (11).

5 Voltage will vary with engine revolutions per minute.

6 Depending on octane adjust potentiometer trim.

7 Battery voltage (B +) with engine warm.

8 Open.

9 Open/Grounded circuit.

10 Grounded circuit.

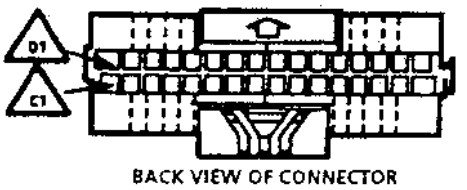
11 Short to +12 volts.

* Less than 0,50 volts.

** Less than 0,10 volts.

B+ Should equal battery voltage.

32-PIN C-D CONNECTOR



BACK VIEW OF CONNECTOR

6-2-92
NS 14377

SECTION 2.9C

COMPONENT SYSTEM CHARTS

CONTENTS

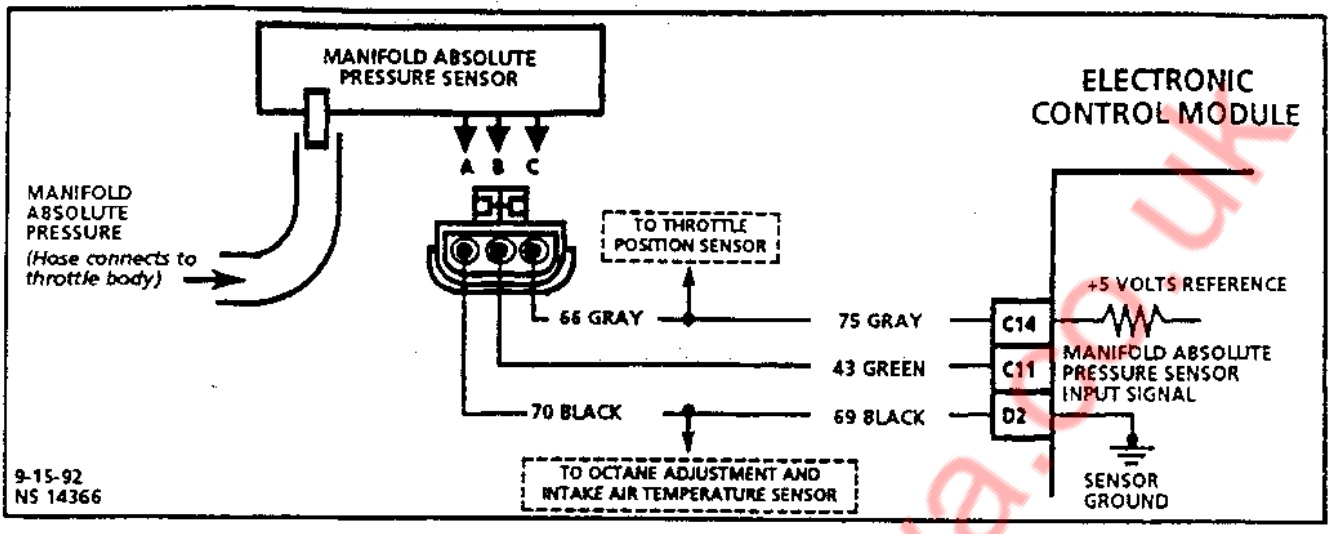


CHART C-1D

MANIFOLD ABSOLUTE PRESSURE OUTPUT CHECK 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The manifold absolute pressure sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and revolutions per minute changes; and converts these into a voltage output. The electronic control module sends a 5 volt reference voltage to the manifold absolute pressure sensor. As the manifold pressure changes, the output voltage of the sensor also changes. By monitoring the sensor output voltage, the electronic control module knows the manifold pressure. A lower pressure (low voltage) output will be about 1-2 volts at idle. While higher pressure (high voltage) output will be about 4-4.8 at wide open throttle. The manifold absolute pressure sensor is also used, under certain conditions, to measure barometric pressure, allowing the electronic control module to make adjustments for different altitudes. The electronic control module uses the manifold absolute pressure sensor to control fuel delivery and ignition timing.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

Important

- Be sure to use the same diagnostic test equipment for all measurements.

1. Checks manifold absolute pressure sensor output voltage to the electronic control module. This voltage, without engine running, represents a barometer reading to the electronic control module. Comparison of this barometric reading on the same day with a known good vehicle is a good way to check accuracy of a "suspect" sensor. Readings should be the same ±0.2 volt.
2. Allowing 0.34 BAR (10" Hg) vacuum to the manifold absolute pressure sensor should cause the voltage to be at least 1.2 volts less than the voltage at Step 1. Upon applying vacuum to the sensor, the change in voltage should be instantaneous. A slow voltage change indicates a faulty sensor.
3. Check vacuum hose to sensor for leaking or restriction. Be sure no other vacuum devices are connected to the manifold absolute pressure sensor hose.

   NOTICE: The engine must be running in this step or the Tech 1 will not indicate a change in voltage. It is normal for the "Check Engine" light to come "ON" and for the system to set a Code 33 during this step. Make sure the code is cleared when this test is completed.

4. Disconnect sensor from bracket and twist sensor (BY HAND ONLY) to check for intermittent connection. Output changes greater than 0.1 volt indicate a faulty connector or connection. If OK, replace sensor.

CHART C-1D
MANIFOLD ABSOLUTE PRESSURE OUTPUT CHECK 1.7L THROTTLE BODY INJECTION NIVA

NOTE: THIS CHART APPLIES ONLY TO MAP SENSORS HAVING GREEN OR BLACK COLOR KEY INSERT (SEE BELOW).

1
- IGNITION "ON," ENGINE NOT RUNNING.
- CONNECT TECH 1 "SCAN" TOOL.
- SELECT "F0: DATA LIST."
- TECH 1 SHOULD INDICATE A MANIFOLD ABSOLUTE PRESSURE SENSOR VOLTAGE.
- COMPARE THIS READING WITH THE READING OF A KNOWN GOOD VEHICLE. SEE FACING PAGE TEST DESCRIPTION, STEP 1.
- VOLTAGE READING SHOULD BE WITHIN ±0.2 VOLT.

IS IT?

YES → **2**

NO → REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR.

2
- DISCONNECT AND PLUG VACUUM SOURCE TO MANIFOLD ABSOLUTE PRESSURE SENSOR.
- CONNECT A HAND VACUUM PUMP TO MANIFOLD ABSOLUTE PRESSURE SENSOR.
- START ENGINE.
- NOTE MANIFOLD ABSOLUTE PRESSURE SENSOR VOLTAGE.
- APPLY 0.34 BAR (10" Hg) OF VACUUM AND NOTE VOLTAGE CHANGE. SUBTRACT SECOND READING FROM THE FIRST. VOLTAGE DIFFERENCE VALUE SHOULD BE GREATER THAN 1.5 VOLTS.

IS IT?

YES → **3** NO TROUBLE FOUND. CHECK SENSOR VACUUM SOURCE FOR LEAKAGE OR RESTRICTION. BE SURE THIS SOURCE SUPPLIES VACUUM TO MANIFOLD ABSOLUTE PRESSURE SENSOR ONLY.

NO → **4** CHECK SENSOR CONNECTION. IF OK, REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR.

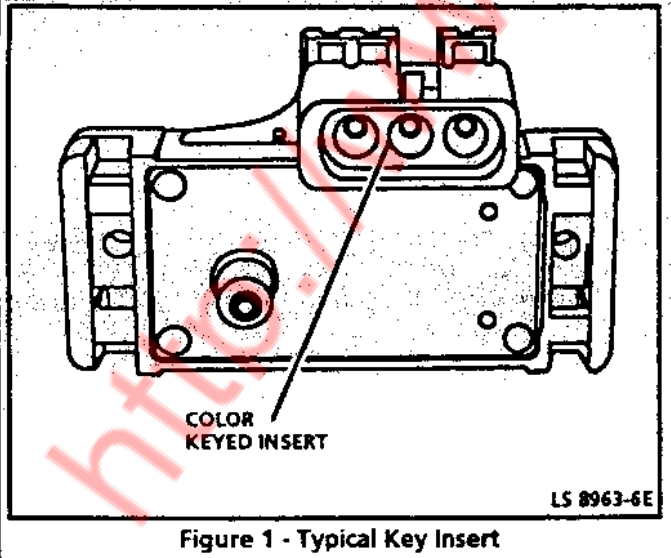


Figure 1 - Typical Key Insert

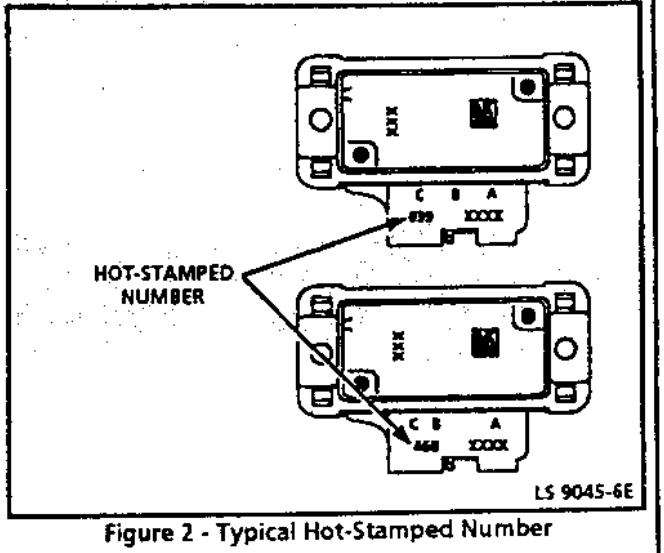


Figure 2 - Typical Hot-Stamped Number

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

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NS 14379

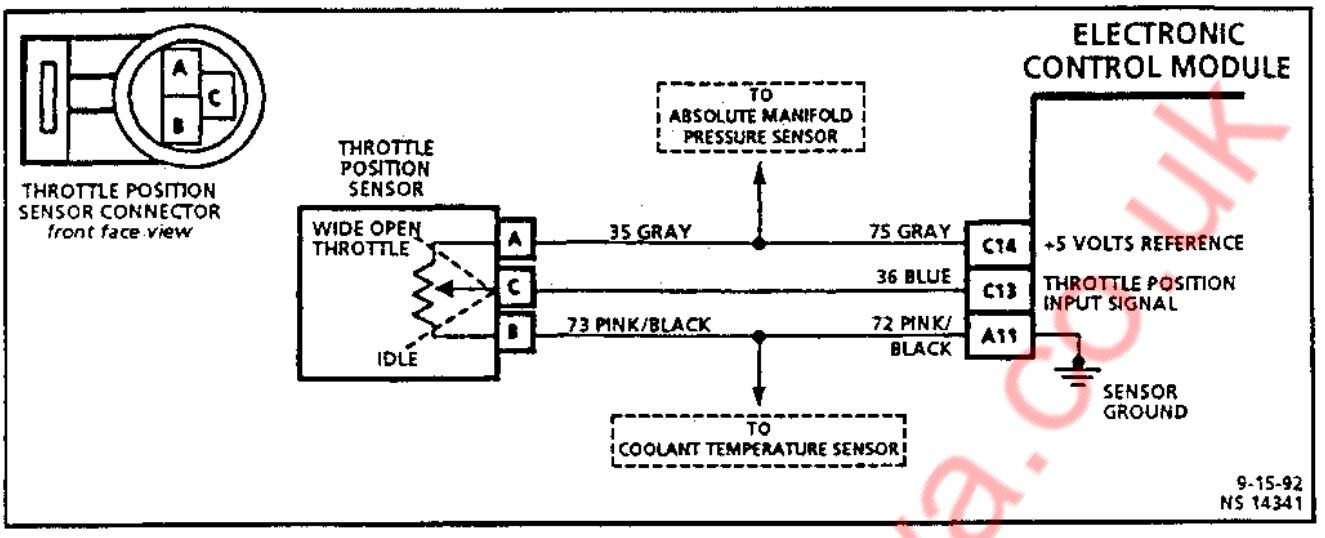


CHART C-1H

THROTTLE POSITION SENSOR OUTPUT CHECK 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The throttle position sensor is attached to the throttle body, and is internally rotated by the throttle body shaft. It is a potentiometer with one end connected to 5 volts from the electronic control module and the other to electronic control module ground. A third wire is connected to the electronic control module, allowing it to measure the variable output voltage from the throttle position sensor.

As the throttle valve angle is changed (accelerator pedal moved), the throttle position sensor output voltage also changes in proportion. At a closed throttle position, the output voltage is usually below 1.0 volt. As the throttle valve opens, the output increases so that, at wide open throttle, the output should be above 4.0 volts. By monitoring the output voltage from the throttle position sensor, the electronic control module can determine fuel needs based on throttle opening (driver demand).

A broken or loose throttle position sensor, or one that has an unstable output, can cause intermittent bursts of fuel because the electronic control module thinks the throttle is moving. Results could include engine surge or poor idle quality. If the electronic control module interprets a high voltage when engine revolutions per minute is less than 420, hard starting could be the result ("clear-flood" mode). A problem in any of the throttle position sensor circuits will set either a Code 21 or 22 after the engine is started. Once a code is set, the electronic control module will use an artificial default value for throttle position sensor based on engine revolutions per minute to enable the vehicle to be driven, although performance could be less than normal.

The throttle position sensor is not adjustable. The electronic control module uses the reading at idle as "0% throttle," so no adjustment is necessary.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This is a check of the voltage at the idle position. It is usually less than 1.0 volt.
2. The voltage should increase at the same steady rate at which the throttle is opened with the throttle valve.
3. With the throttle valve wide open, the throttle position sensor output needs to be above 4 volts, allowing the electronic control module to interpret a wide open throttle position.
4. If the closed-throttle voltage is over 2.5 volts, hard starting may be encountered (worse cold) due to "clear-flood" mode. This mode occurs when engine revolutions per minute is less than 420, and throttle position sensor input indicates the throttle is more than 80% open. Possible causes: short to voltage on throttle position sensor input signal circuit (Blue wire from throttle position sensor terminal "C" to electronic control module terminal "C13"), open ground circuit (Pink/Black wire from throttle position sensor terminal "B" to electronic control module terminal "A11"), or a faulty sensor.

CHART C-1H

THROTTLE POSITION SENSOR OUTPUT CHECK 1.7L THROTTLE BODY INJECTION NIVA

IF A CODE 21 OR 22 IS PRESENT, FOLLOW THAT CHART FIRST.

1
- CONNECT TECH 1 "SCAN" TOOL.
- SELECT "F0: DATA LIST."
- THROTTLE CLOSED.
- IGNITION "ON," ENGINE NOT RUNNING.

WHAT IS THE THROTTLE POSITION VOLTAGE READING ON THE TECH 1?

- 0,25 - 1,25 → **2**
- OVER 1,25 → **4**

2
- WITH THE TECH 1 "SCAN" TOOL STILL CONNECTED, MONITOR THE THROTTLE POSITION VOLTAGE AS THE THROTTLE IS SLOWLY AND STEADILY OPENED TO A WIDE-OPEN POSITION.
- VOLTAGE SHOULD INCREASE AT A STEADY RATE, WITH NO SUDDEN CHANGES.
- IF VOLTAGE DOES NOT IMMEDIATELY FOLLOW THROTTLE MOVEMENT, SENSOR IS FAULTY.

- OK → **3**
- NOT OK → REPLACE THROTTLE POSITION SENSOR.

3
- CHECK VOLTAGE AT THE WIDE OPEN THROTTLE POSITION.
- HAVE A HELPER CHECK THAT THE THROTTLE VALVE IS FULLY OPEN WHEN ACCELERATOR PEDAL IS FULLY DEPRESSED. (IF THROTTLE VALVE DOES NOT FULLY OPEN WHEN PEDAL IS DEPRESSED, CHECK FOR EXTRA FLOOR MATS OR CARPET UNDER ACCELERATOR PEDAL.)
- ADJUST THROTTLE CABLE TO ASSURE FULL TRAVEL AND A SLIGHT SLACK AT CLOSED THROTTLE (IDLE).

- ABOVE 4 VOLTS → NO TROUBLE FOUND.
- BELOW 4 VOLTS → REPLACE THROTTLE POSITION SENSOR.

4
- DISCONNECT THROTTLE POSITION SENSOR, AND RECHECK TECH 1 "THROTTLE POSITION VOLTAGE" AS LISTED IN STEP 1.

- UNDER 1 VOLT → CHECK FOR OPEN THROTTLE POSITION SENSOR GROUND (PINK/BLACK WIRE FROM THROTTLE POSITION SENSOR TERMINAL "B" TO ELECTRONIC CONTROL MODULE TERMINAL "A11"). IF OK, REPLACE THROTTLE POSITION SENSOR.
- OVER 1 VOLT → REPAIR SHORT TO VOLTAGE ON THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT (BLUE WIRE FROM THROTTLE POSITION SENSOR TERMINAL "C" TO ELECTRONIC CONTROL MODULE TERMINAL "C13").

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

9-17-92
NS 14381

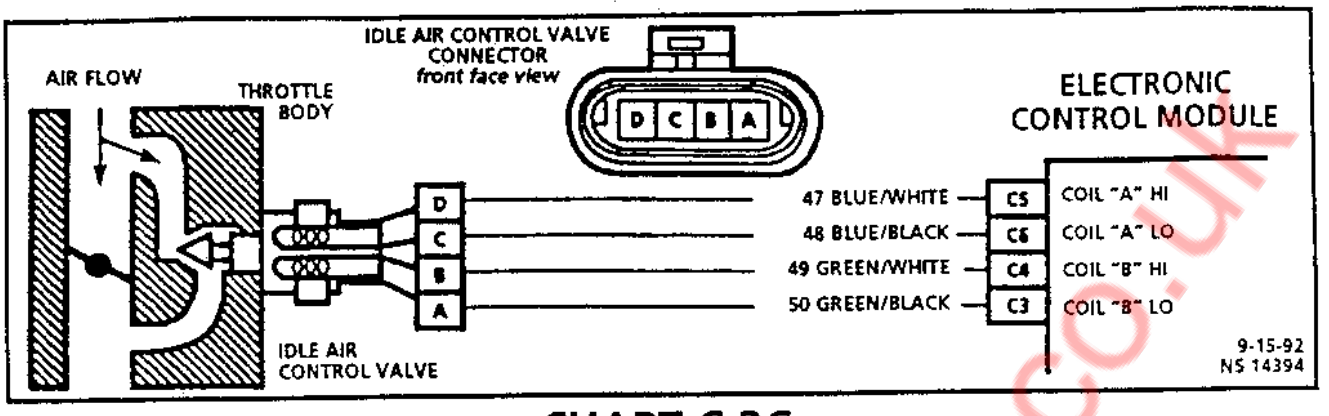


CHART C-2C

IDLE AIR CONTROL CIRCUIT CHECK 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The electronic control module controls idle revolutions per minute with the idle air control valve. To increase idle revolutions per minute, the electronic control module moves the idle air control valve out allowing more air to pass around the throttle plate. To decrease revolutions per minute, it moves the idle air control valve in, reducing air flow around the throttle plate. A Tech 1 "Scan" tool will read the electronic control module commands to the idle air control valve in counts.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The Tech 1 revolutions per minute control mode is used to extend and retract the idle air control valve. The valve should move smoothly within the specified range. If the idle speed is commanded (idle air control extended) too low (below 750 revolutions per minute), the engine may stall. This may be normal and would not indicate a problem. Retracting the idle air control beyond its controlled range (above 1800 revolutions per minute) will cause a delay before the revolutions per minute start dropping. This too is normal.
2. This test uses the Tech 1 to command the idle air control controlled idle speed. The electronic control module issues commands to obtain commanded idle speed. The node lights each should flash red and green to indicate a good circuit as the electronic control module issues commands. While the sequence of color is not important if either light is "OFF" or does not flash red and green, check the circuits for faults, beginning with poor terminal contacts. Engine speed will not actually change, since the idle air control is disconnected.

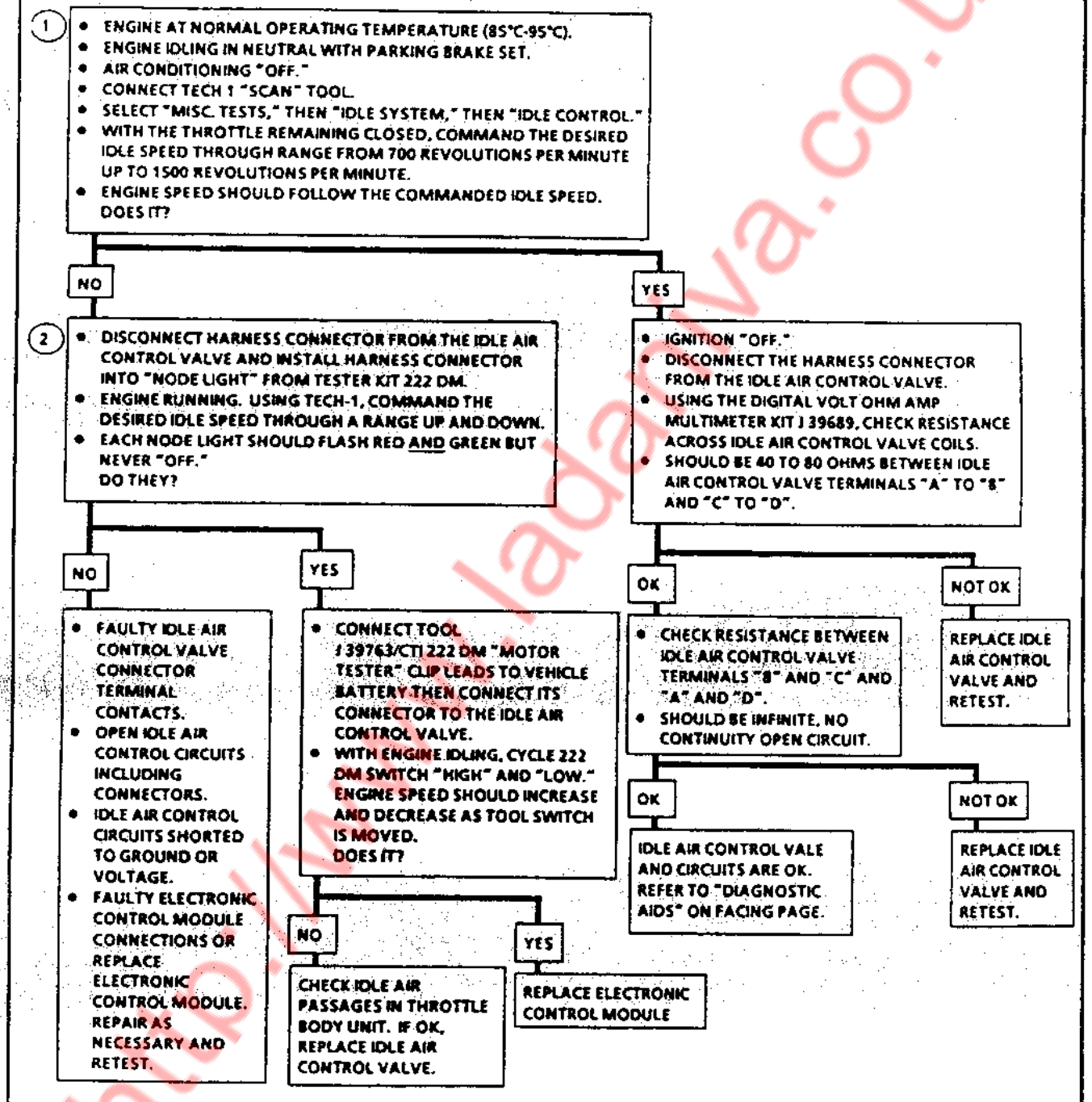
Diagnostic Aids:

A slow, unstable, or fast idle may be caused by a non-idle air control system problem that cannot be overcome by the idle air control valve. Out of control range idle air control Tech 1 tool "idle air control" counts will be above 60 if idle is too low and zero counts if idle is too high. The following checks should be made to repair a non-idle air control system problem:

- **Vacuum Leak (High Idle).** If idle is too high, stop the engine. Fully extend (seat) idle air control using 222 DM idle air control "Motor Tester" in the A "Low Switch Position." Start engine. If idle speed is above 1000 revolutions per minute, locate and correct vacuum leak including Crankcase Ventilation System. Also check for binding of throttle blade or linkage.
- **Fuel System too lean (High Air/Fuel Ratio).** The idle speed may be too high or too low. Engine speed may vary up and down, and disconnecting the idle air control valve does not help. Check for low regulated fuel pressure, water in the fuel or a restricted injector.
- **Fuel System too rich (Low Air/Fuel Ratio).** The idle speed will be too low. "Scan" tool idle air control counts will usually be above 80. System would be obviously rich and may exhibit black smoke in exhaust. Check for high fuel pressure, leaking or sticking injector.
- **Throttle Body.** Remove idle air control valve and inspect bore and idle air passages for foreign material.
- **Idle Air Control Valve Electrical Connections.** Idle air control valve connections should be carefully checked for proper contact.
- **Crankcase Ventilation System.** A faulty system may result in an incorrect idle speed.
- Refer to "Rough, Unstable, Incorrect Idle or Stalling," in "Symptoms," Section "2.9B".
- If intermittent poor driveability or idle symptoms are resolved by disconnecting the idle air control, carefully recheck idle air control connections and terminal resistance.

CHART C-2C

IDLE AIR CONTROL CIRCUIT CHECK 1.7L THROTTLE BODY INJECTION NIVA



AFTER ALL IDLE AIR CONTROL TESTING IS COMPLETE, RESET THE IDLE AIR CONTROL VALVE. CONNECT TECH 1 "SCAN" TOOL. SELECT "MISC TEST," THEN "IDLE SYSTEM," THEN "IDLE RESET."

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

3-9-93
NS 14395

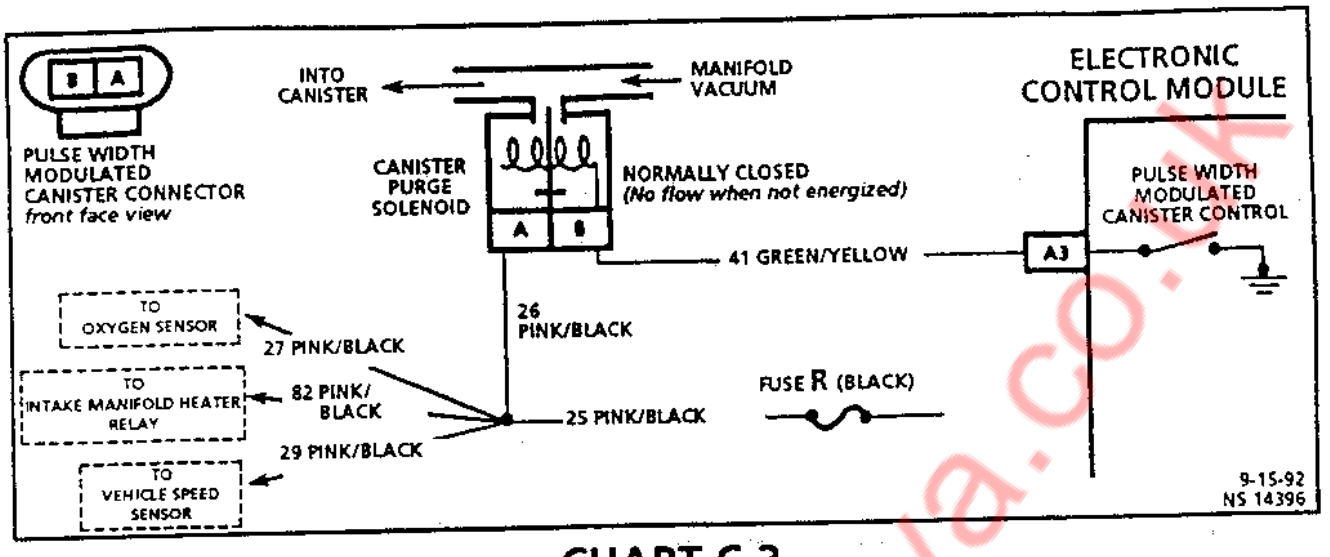


CHART C-3

CANISTER PURGE VALVE CHECK
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

Canister purge is controlled by a solenoid that allows manifold vacuum to purge the canister when energized. The electronic control module supplies a ground to energize the solenoid (purge "ON"). The purge solenoid controlled by the electronic control module is pulse width modulated (turned "ON" and "OFF" several times a second). The duty cycle (pulse width) is calculated based on the current value of the "Closed Loop" fuel adjustment.

The duty cycle is calculated by the electronic control module and the output commanded when the following conditions have been met:

- Battery voltage is less than 16.9 volts.
- Coolant temperature above 80°C.
- Vehicle speed above 21 kilometers per hour.
- Throttle position has exceeded 2%.

Also, if the diagnostic "test" terminal is grounded, with the engine stopped, the purge solenoid is energized (purge "ON").

NOTICE: Once enabled it will remain enabled except during a wide open throttle condition.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

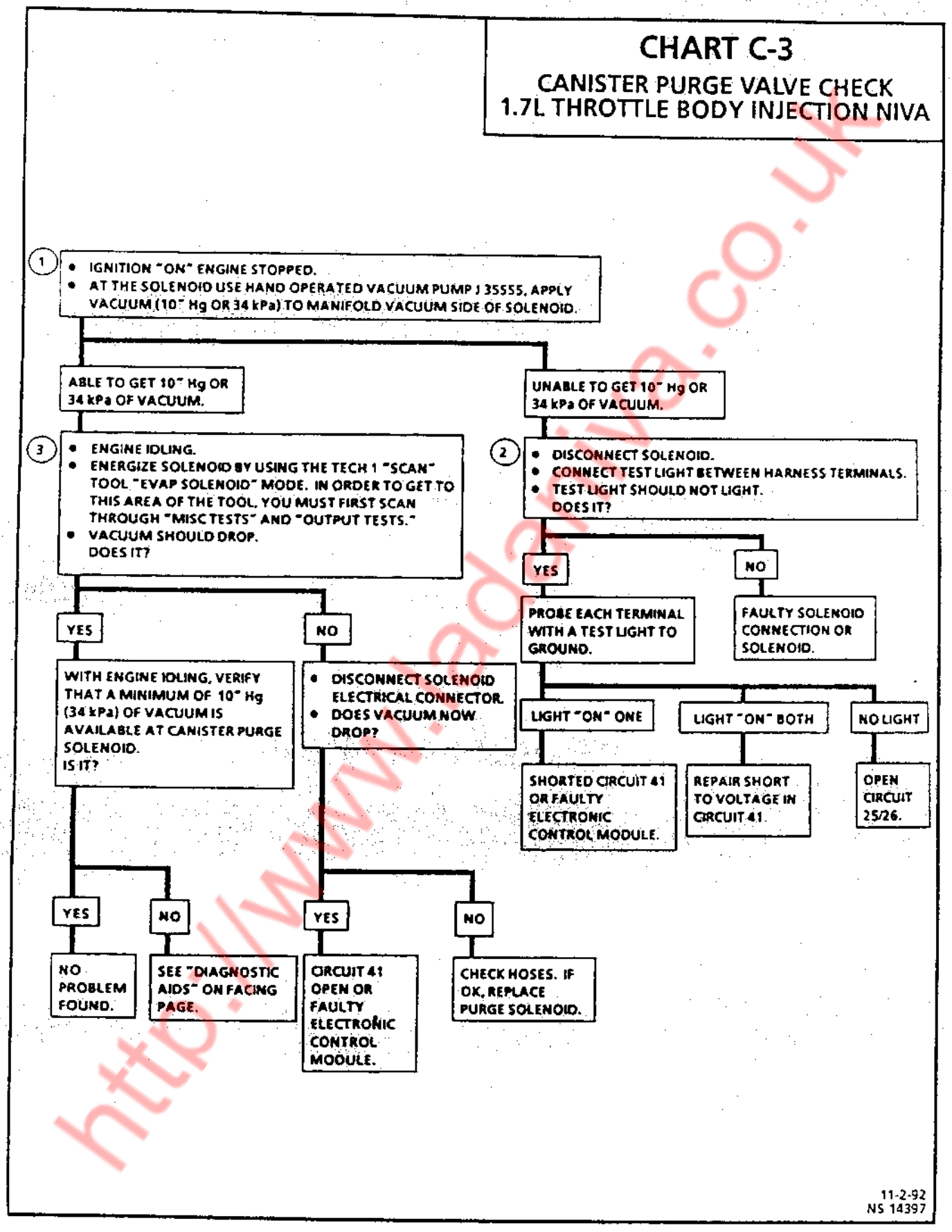
1. Checks to see if the solenoid is opened or closed. The solenoid is normally de-energized in this step; so it should be closed.
2. Checks for a complete circuit. Normally, there is ignition voltage on Circuit 25 and the electronic control module provides a ground on Circuit 41.
3. Completes functional check by grounding "test" terminal. This should normally de-energize the solenoid opening the valve which should allow the vacuum to drop (purge "ON").

Diagnostic Aids:

- If 10" Hg (34 kPa) of vacuum is not available at the solenoid check for:
  - Split or cracked hoses.
  - Pinched or plugged hoses.
  - Ensure hoses are installed correctly.
- When using the Tech 1 "Scan" tool to energize the solenoid, remember that this is an "OFF" and "ON" control only. The Tech 1 "Scan" tool is not capable of adjusting the pulse width.

CHART C-3

CANISTER PURGE VALVE CHECK 1.7L THROTTLE BODY INJECTION NIVA



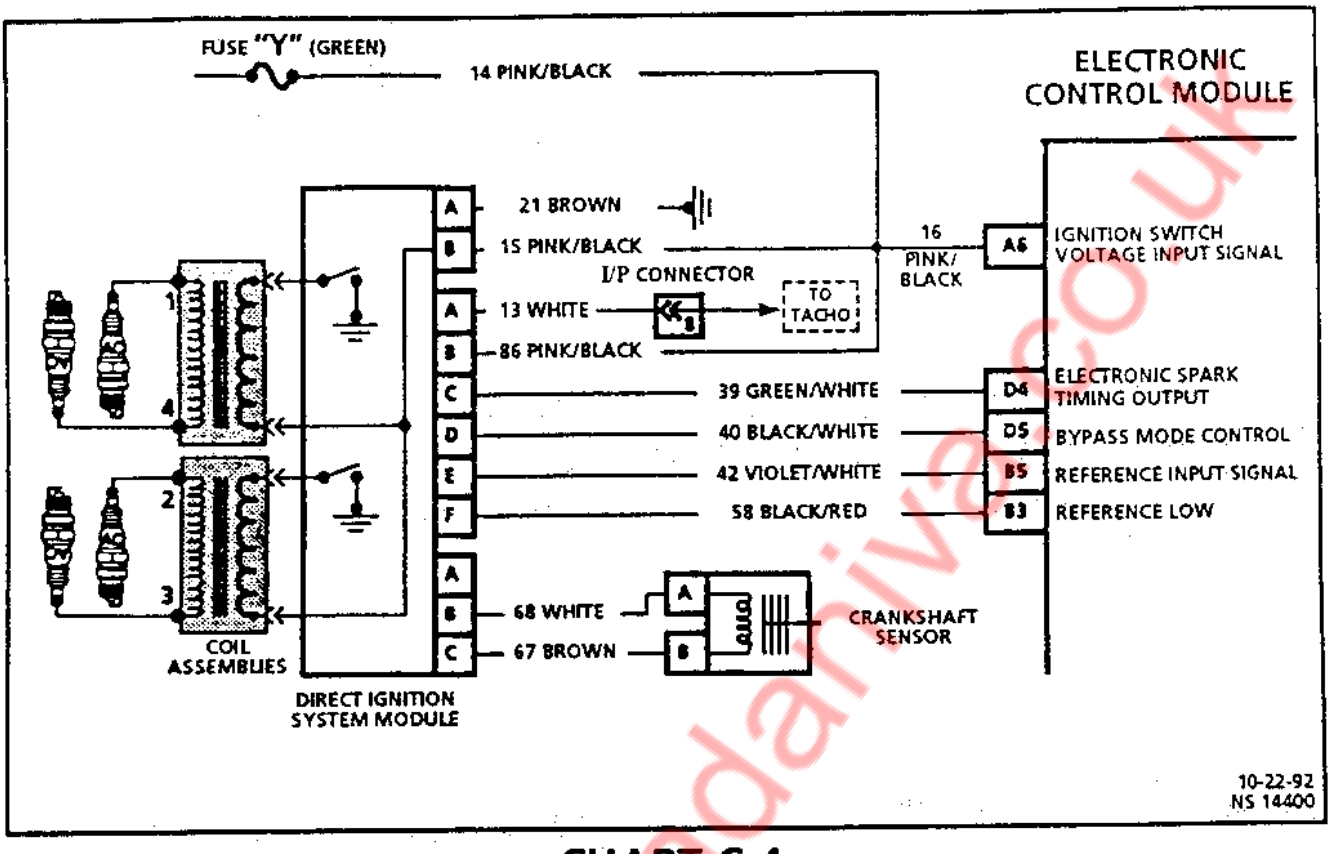


CHART C-4

(Page 1 of 2)
IGNITION SYSTEM CHECK
(NO SPARK)
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The direct ignition system uses a waste spark method of distribution. In this type of system, the ignition module triggers the correct ignition coil, based on signals from the crankshaft sensor. Each ignition coil provides the high secondary voltage required to fire two spark plugs at the same time on "companion" cylinders, i.e., cylinders with pistons at the top of their stroke top dead center at the same time. One of these pistons would be at the top of its compression stroke, the other piston would be at the top of its exhaust stroke.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Becasue the direct ignition system uses two plugs and wires to complete the circuit of each coil, the opposite spark plug cable should be connected to ground.
2. This test will determine if + battery voltage is available at the ignition module.
3. This test will determine if a good ground is available at the ignition module.
4. Checks for continuity of the crankshaft position sensor and connections.
5. Voltage will vary in this test depending on cranking speed of engine.

NOTE: THIS CHART ASSUMES THAT THE TECHNICIAN HAS PERFORMED DIAGNOSTIC CIRCUIT CHECK CHART A.

CHART C-4
(Page 1 of 2)
IGNITION SYSTEM CHECK
(NO SPARK)
1.7L THROTTLE BODY INJECTION NIVA

1. • USING SECONDARY IGNITION VOLTAGE IGNITION TESTER J 26792 ST-125 CHECK FOR SPARK.
   • CHECK ONE CABLE AT A TIME.
   • USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER THE IGNITION COIL COMPANION CABLE CONNECTED TO GROUND WHILE CRANKING.
   • CHECK FOR SPARK ON CABLES 1, 2, 3 AND 4.
   IS THERE SPARK ON AT LEAST ONE CABLE?
   - YES → SEE CHART C-4 PAGE 2 OF 2
   - NO →

2. • IGNITION "OFF."
   • DISCONNECT DIRECT IGNITION SYSTEM MODULE 2 PIN AND 6 PIN CONNECTOR.
   • IGNITION "ON."
   • CONNECT TEST LIGHT J 34142-B BETWEEN GROUND AND DIRECT IGNITION SYSTEM MODULE 2 PIN CONNECTOR HARNESS TERMINAL "B" AND CONNECT TEST LIGHT TO 6 PIN CONNECTOR HARNESS TERMINAL "B".
   IS TEST LIGHT "ON" FOR EACH CIRCUIT?
   - NO → FAULTY CONNECTION OR OPEN CIRCUIT 15/86 PINK/BLACK WIRE.
   - YES →

3. • CONNECT TEST LIGHT TO + BATTERY VOLTAGE AND DIRECT IGNITION SYSTEM MODULE 2 PIN CONNECTOR HARNESS TERMINAL "A".
   IS TEST LIGHT "ON"?
   - NO → FAULTY CONNECTION OR OPEN CIRCUIT 21 BROWN WIRE.
   - YES →

4. • DISCONNECT 3-WAY CONNECTOR FROM DIRECT IGNITION SYSTEM MODULE.
   • WITH OHMMETER PROBE HARNESS TERMINALS "B AND C" OF 3-WAY HARNESS CONNECTOR. SHOULD READ BETWEEN 500-700 OHMS.
   - NOT OK →
     - LESS THAN 500 OHMS → SENSOR LEADS SHORTED TOGETHER OR FAULTY CRANKSHAFT POSITION SENSOR.
     - GREATER THAN 700 OHMS → OPEN SENSOR CIRCUIT 67 BROWN WIRE OR CIRCUIT 68 WHITE WIRE OR FAULTY CONNECTION OR FAULTY CRANKSHAFT POSITION SENSOR.
   - OK →

5. • SET DIGITAL VOLTMETER J 39689 ON AC VOLTAGE POSITION. LEAVE METER LEADS CONNECTED TO 3-WAY HARNESS CONNECTOR, AS IN STEP 4.
   • CRANK ENGINE AND OBSERVE VOLTAGE READING. READING SHOULD BE GREATER THAN 0.3 VOLT (300 mV).
   IS IT?
   - YES → FAULTY CONNECTION OR FAULTY DIRECT IGNITION SYSTEM MODULE.
   - NO → FAULTY CONNECTION OR FAULTY CRANKSHAFT POSITION SENSOR.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

2-8-93
NS 14979

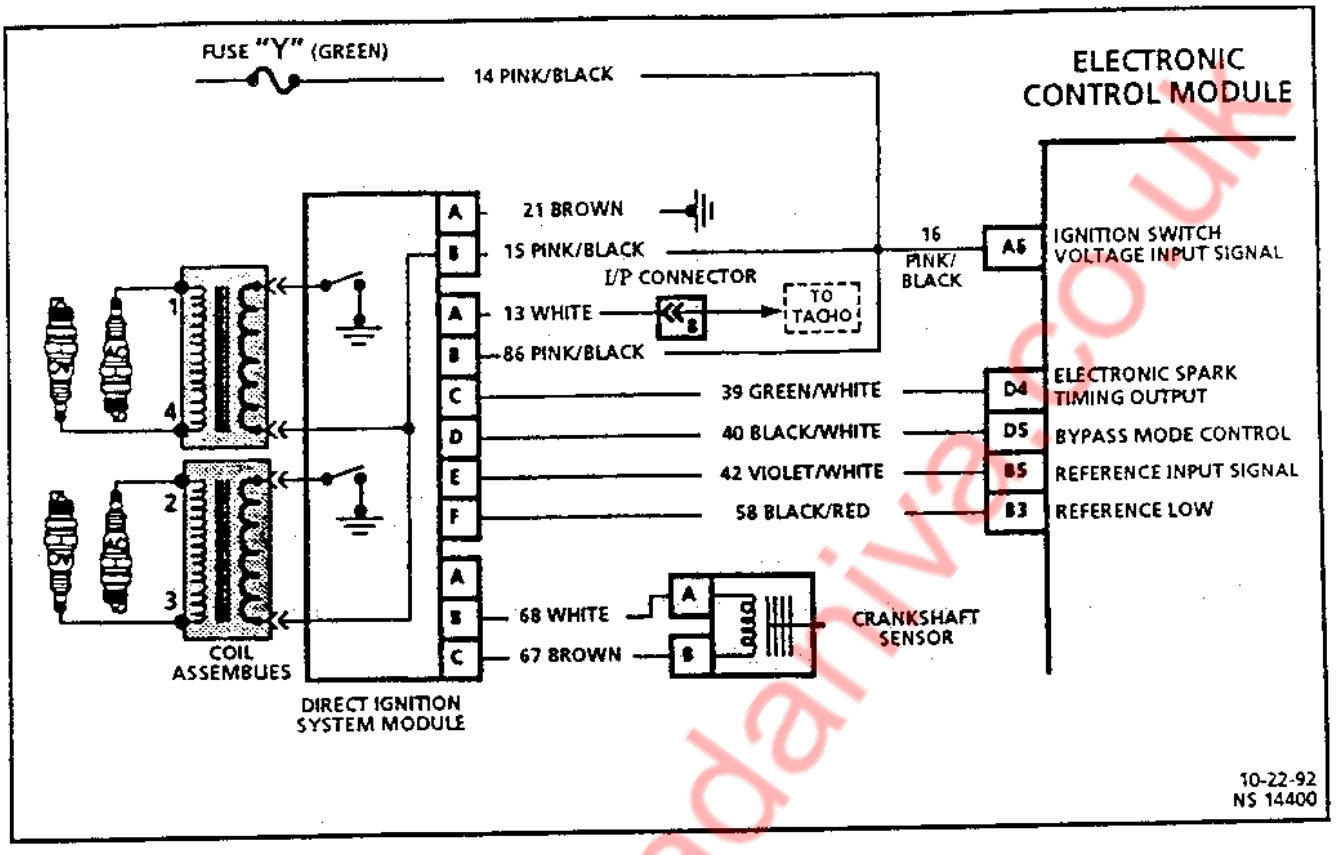


CHART C-4

(Page 2 of 2)
IGNITION SYSTEM CHECK
(NO SPARK)
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The direct ignition system uses a waste spark method of distribution. In this type of system, the ignition module triggers the correct ignition coil, based on signals from the crankshaft sensor. Each ignition coil provides the high secondary voltage required to fire two spark plugs at the same time on "companion" cylinders, i.e., cylinders with pistons at the top of their stroke top dead center at the same time. One of these pistons would be at the top of its compression stroke, the other piston would be at the top of its exhaust stroke.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

6. If carbon tracking is evident, replace coil and be sure plug wires relating to that coil are clean and tight. Excessive wire resistance or faulty connections could have caused the coil to be damaged.
7. This test will determine if the ignition module is not triggering the problem coil or if the tested coil is at fault. This test could also be performed by using another known good coil.

CHART C-4

(Page 2 of 2)
IGNITION SYSTEM CHECK
(NO SPARK)
1.7L THROTTLE BODY INJECTION NIVA

FROM CHART C-4
PAGE 1 OF 2

- USING DIGITAL VOLT OHM AMP MULTIMETER KIT J 39689 TO CHECK THE RESISTANCE OF EACH PLUG CABLE OF THE COIL WHICH DID NOT FIRE THE SPARK TESTER.
- CABLE RESISTANCE SHOULD BE LESS THAN 15,000 OHMS EACH AND WIRES SHOULD NOT BE GROUNDED.

ARE CABLES OK?

YES

- MEASURE SECONDARY RESISTANCE OF IGNITION COIL BY CONNECTING EACH MULTIMETER LEAD ON EACH COIL TOWER TERMINAL.

IS RESISTANCE BETWEEN 5000 AND 7000 OHMS?

YES

6

- REMOVE COIL RETAINING NUTS AND REMOVE COIL.
- COIL SHOULD BE FREE OF CARBON TRACKING.

ARE THEY?

YES

- MEASURE PRIMARY RESISTANCE OF IGNITION COIL BY CONNECTING EACH MULTIMETER LEAD ON EACH FEMALE TERMINAL ON BOTTOM OF IGNITION COIL.

IS RESISTANCE BETWEEN 0.3Ω AND 1.5Ω?

YES

7

- USE TEST LIGHT J 34142-B AND CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER TEST LIGHT ACROSS IGNITION MODULE TERMINALS WHICH CONNECT TO IGNITION COIL PRIMARY TERMINALS.
- CRANK THE ENGINE WHILE OBSERVING TEST LIGHT.

DOES TEST LIGHT BLINK?

YES

FAULTY IGNITION COIL TERMINAL CONNECTIONS
OR
FAULTY IGNITION COIL.

NO

FAULTY IGNITION MODULE.

NO

FAULTY CONNECTION
OR
FAULTY IGNITION COIL.

NO

REPLACE IGNITION COIL. ALSO CHECK FOR FAULTY SPARK PLUG CABLE CONNECTION(S) AND WIRE NIPPLE(S) FOR CARBON TRACKING.

NO

FAULTY IGNITION COIL.

NO

REPLACE FAULTY CABLE(S).

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

4-27-93
NS 15201

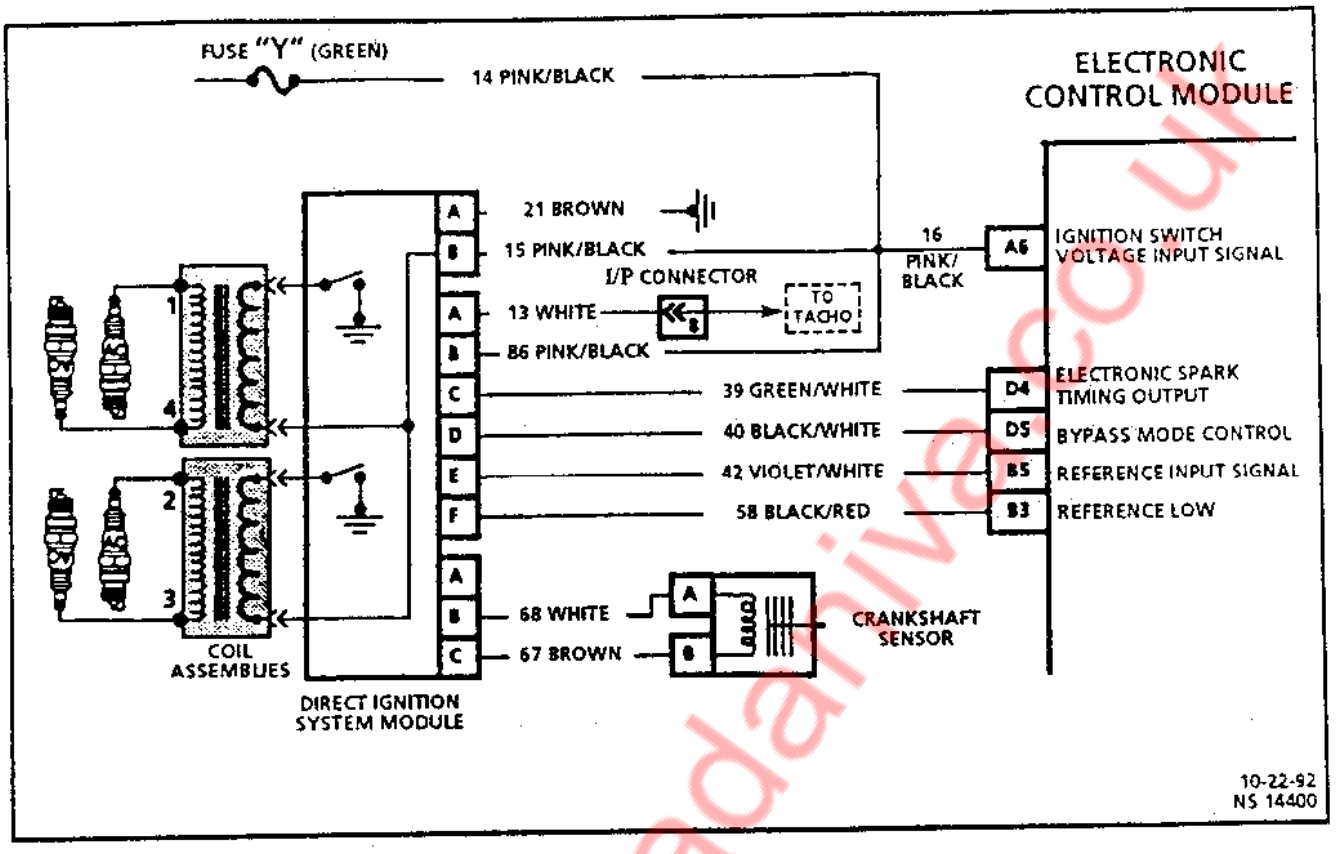


CHART C-4B

(Page 1 of 2)

DIRECT IGNITION SYSTEM MISFIRE AT IDLE 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The direct ignition system uses a waste spark method of distribution. In this type of system, the ignition module triggers the #1/4 coil pair resulting in both #1 and #4 spark plugs firing at the same time. #1 cylinder is on the compression stroke at the same time #4 is on the exhaust stroke, resulting in a lower energy requirement to fire #4 spark plug. This leaves the remainder of the high voltage to be used to fire #1 spark plug. On this application, the crankshaft position sensor is mounted to the engine block and protrudes to within approximately 1 mm of the crankshaft reluctor. Since the reluctor is a machined portion of the crankshaft pulley and the crank sensor is mounted in a fixed position on the block, timing adjustments are not possible or necessary.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If the "Misfire" complaint exists *under load only*, diagnostic CHART C-4C must be used. Engine rpm should drop approximately equally on all plug leads.
2. A secondary ignition voltage ignition tester J 26792 (ST-125) must be used because it is essential to verify adequate available secondary voltage at the spark plug (25,000 volts).
3. If the spark jumps the test gap after grounding the opposite plug wire, it indicates excessive resistance in the plug which was bypassed. A faulty or poor connection at that plug could also result in the miss condition. Also check for carbon deposits inside the spark plug boot.

CHART C-4B

(Page 1 of 2)
DIRECT IGNITION SYSTEM
MISFIRE AT IDLE
1.7L THROTTLE BODY
INJECTION NIVA

1

- IF ENGINE MISFIRES UNDER LOAD ONLY, SEE CHART C-4C.
- IGNITION "OFF."
- DISCONNECT EACH SPARK PLUG CABLE FROM SPARK PLUG.
- INSTALL HIGH CARBON CONTENT VACUUM HOSE APPROXIMATELY 5 CM LONG ON SPARK PLUG AND CONNECT SPARK PLUG LEAD TO OTHER END OF VACUUM HOSE (VACUUM HOSE PIECES FOUND IN TERMINAL TEST ADAPTER KIT J 35616.)
- CONNECT TECH 1. SELECT "FØ: DATA LIST."
- ENGINE IDLING AT NORMAL OPERATING TEMPERATURE, DISCONNECT IDLE AIR CONTROL VALVE.
- WITH TEST LIGHT J 34142-B CONNECTED TO GROUND MOMENTARILY TOUCH EACH VACUUM HOSE, WHILE OBSERVING "ENGINE SPEED" ON TECH 1. SEE CAUTION★.
- WHEN THE TEST LIGHT CONTACTS EACH VACUUM HOSE IT SHOULD RESULT IN AN ENGINE SPEED DROP.

DID THEY?

YES → SEE "ROUGH, UNSTABLE OR INCORRECT IDLE OR STALLING" IN "SYMPTOMS" SECTION "B".

NO

2

- WITH IGNITION "OFF," INSTALL SECONDARY IGNITION VOLTAGE IGNITION TESTER J 26792 (ST-125) ON PLUG CABLE(S) WHOSE SHORT TO GROUND THROUGH TEST LIGHT DID NOT RESULT IN ENGINE SPEED DROP.
- SPARK SHOULD JUMP SECONDARY IGNITION VOLTAGE IGNITION TESTER GAP WHILE CRANKING ENGINE.

DOES IT?

YES → CHECK FOR:
- FAULTY, WORN OR CRACKED SPARK PLUG(S).
- PLUG FOULING DUE TO ENGINE MECHANICAL FAULT.

IF SPARK PLUGS CHECK OUT OK, SEE "CUTS OUT, MISSES" IN "SYMPTOMS" SECTION "2".

NO

3

- WITH IGNITION "OFF," USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 GROUND THE OPPOSITE PLUG CABLE OF THE AFFECTED COIL AT SPARK PLUG.
- SPARK SHOULD JUMP SECONDARY IGNITION VOLTAGE IGNITION TESTER GAP WHILE CRANKING ENGINE.

DOES IT?

YES → REPLACE THE SPARK PLUG FOR THE CABLE WHICH WAS JUMPERED TO GROUND. IF MISFIRE IS STILL PRESENT, START MISFIRE TEST AGAIN AT STEP #1.

NO → CONTINUE TO PAGE 2 OF 2

★ CAUTION: When handling secondary spark plug cables with engine running, insulated pliers must be used and care exercised to prevent a possible electrical shock.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

4-27-93
NS 15804

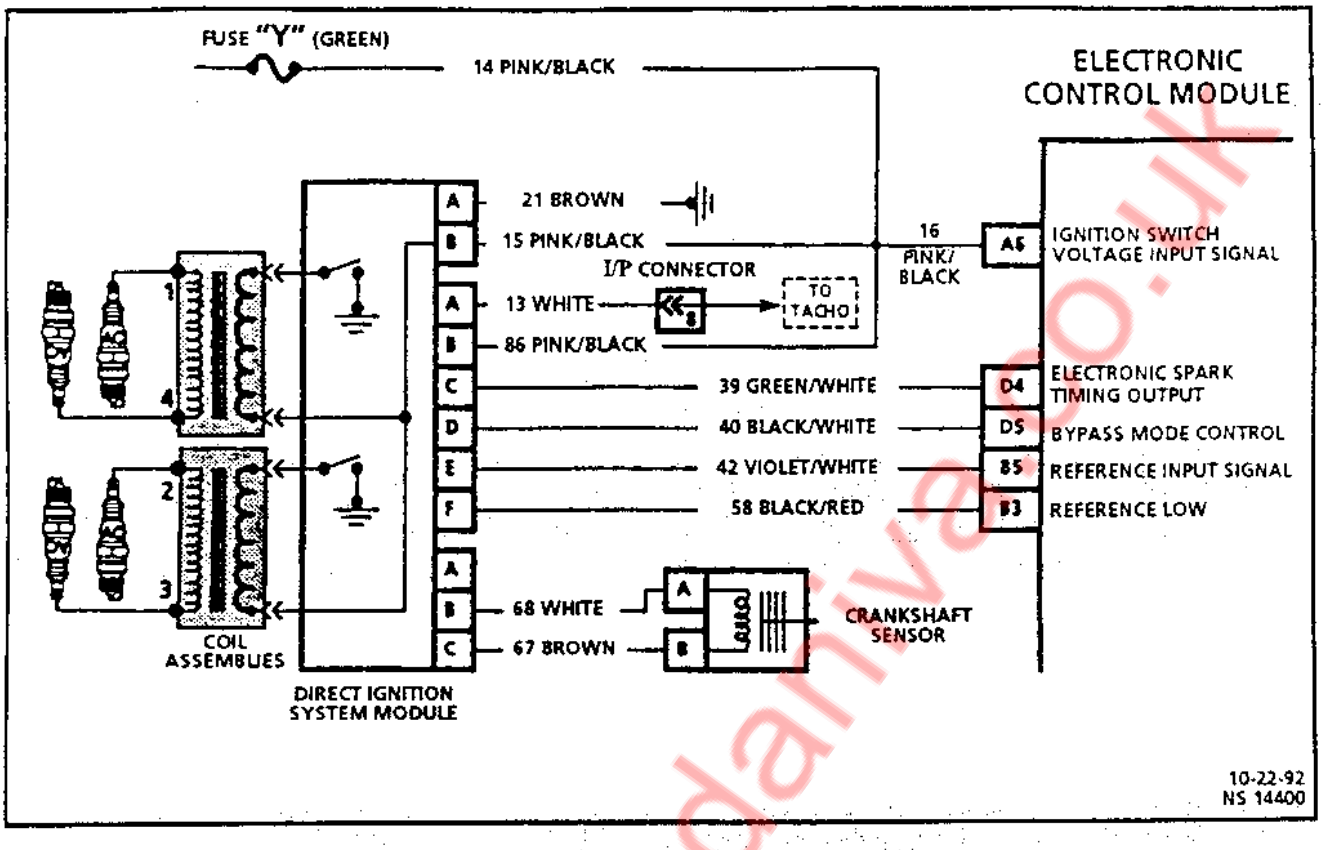


CHART C-4B

(Page 2 of 2)

DIRECT IGNITION SYSTEM MISFIRE AT IDLE
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The direct ignition system uses a waste spark method of distribution. In this type of system, the ignition module triggers the #1/4 coil pair resulting in both #1 and #4 spark plugs firing at the same time. #1 cylinder is on the compression stroke at the same time #4 is on the exhaust stroke, resulting in a lower energy requirement to fire #4 spark plug. This leaves the remainder of the high voltage to be used to fire #1 spark plug. On this application, the crankshaft position sensor is mounted to the engine block and protrudes to within approximately .050" of the crankshaft reluctor. Since the reluctor is a machined portion of the crankshaft pulley and the crank sensor is mounted in a fixed position on the block, timing adjustments are not possible or necessary.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

4. To check the spark plug cable, use the digital multimeter J 39689 on the ohms scale. Disconnect the suspect spark plug cable from both ends and connect one of the multimeter probes to each end of the plug cable.
5. If carbon tracking is evident, replace coil and be sure plug cables relating to that coil are clean and tight. Excessive cable resistance or faulty connections could have caused the coil to be damaged.
6. If the "no spark" condition follows the suspected coil, that coil is faulty. Otherwise, the ignition module is the cause of no spark. This test could also be performed by substituting a known good coil for the one causing the "no spark" condition.

CHART C-4B

(Page 2 of 2)
DIRECT IGNITION SYSTEM
MISFIRE AT IDLE
1.7L THROTTLE BODY
INJECTION NIVA

FROM PAGE 1 OF 2

4
- CHECK THE RESISTANCE OF EACH PLUG CABLE OF THE COIL WHICH DID NOT FIRE THE SECONDARY IGNITION VOLTAGE IGNITION TESTER.
- CABLE RESISTANCE SHOULD BE LESS THAN 15,000 OHMS EACH AND CABLES SHOULD NOT BE GROUNDED.

ARE CABLES OK?

YES

5
- REMOVE COIL RETAINING NUTS AND REMOVE COILS.
- COILS SHOULD BE FREE OF CARBON TRACKING.

ARE THEY?

YES

6
- SWITCH A NORMALLY OPERATING COIL WITH THE COIL FROM PROBLEM CYLINDER.
- SPARK SHOULD JUMP SECONDARY IGNITION VOLTAGE IGNITION TESTER GAP AT PROBLEM CYLINDER WHILE CRANKING ENGINE.

DID IT?

YES

ORIGINAL IGNITION COIL IS FAULTY.

NO

REPLACE ELECTRONIC IGNITION MODULE.

NO

REPLACE IGNITION COIL. ALSO CHECK FOR FAULTY PLUG CABLE CONNECTION(S) AND CABLE NIPPLE(S) FOR CARBON TRACKING.

NO

REPLACE FAULTY CABLE(S).

★ CAUTION: When handling secondary spark plug cables with engine running, insulated pliers must be used and care exercised to prevent a possible electrical shock.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

4-27-93
NS 14450

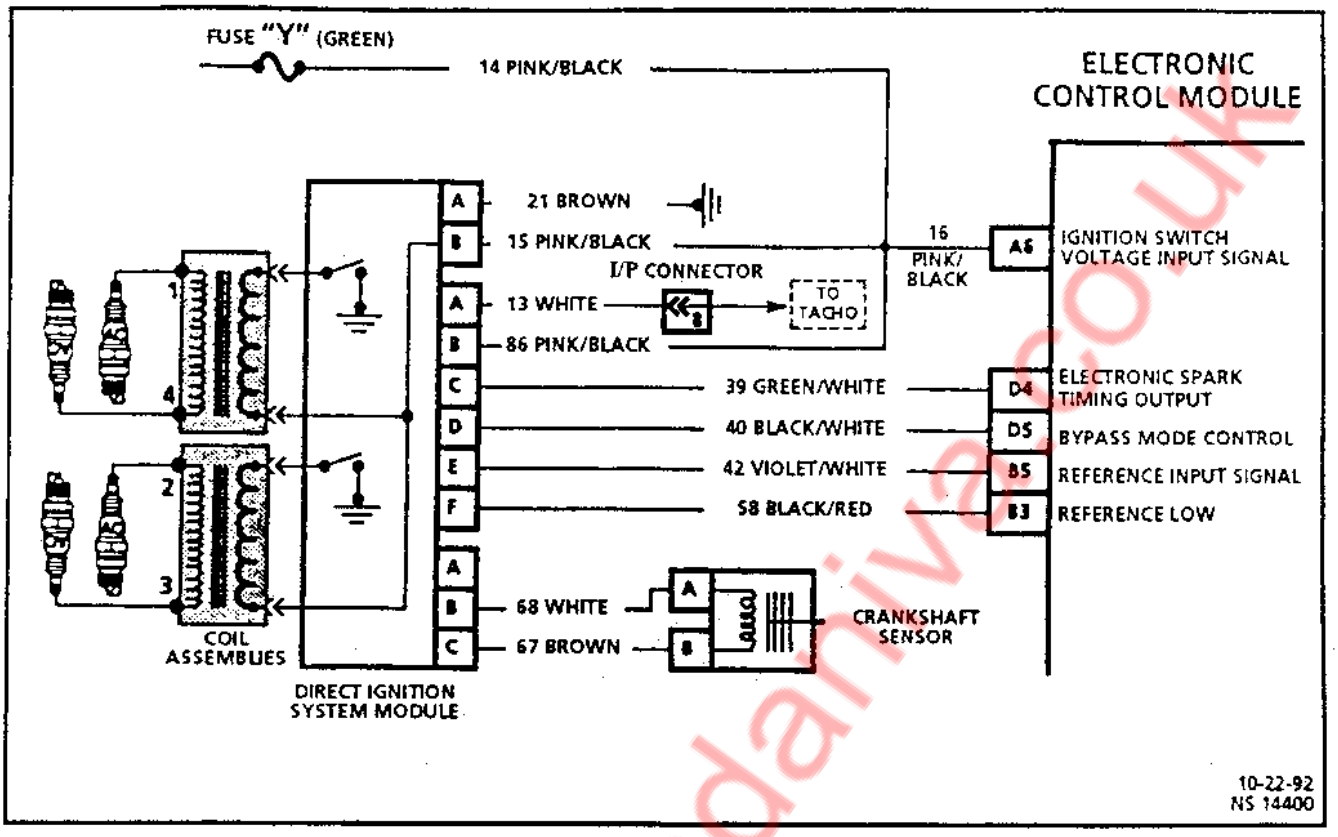


CHART C-4C

DIRECT IGNITION SYSTEM MISFIRE UNDER LOAD
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

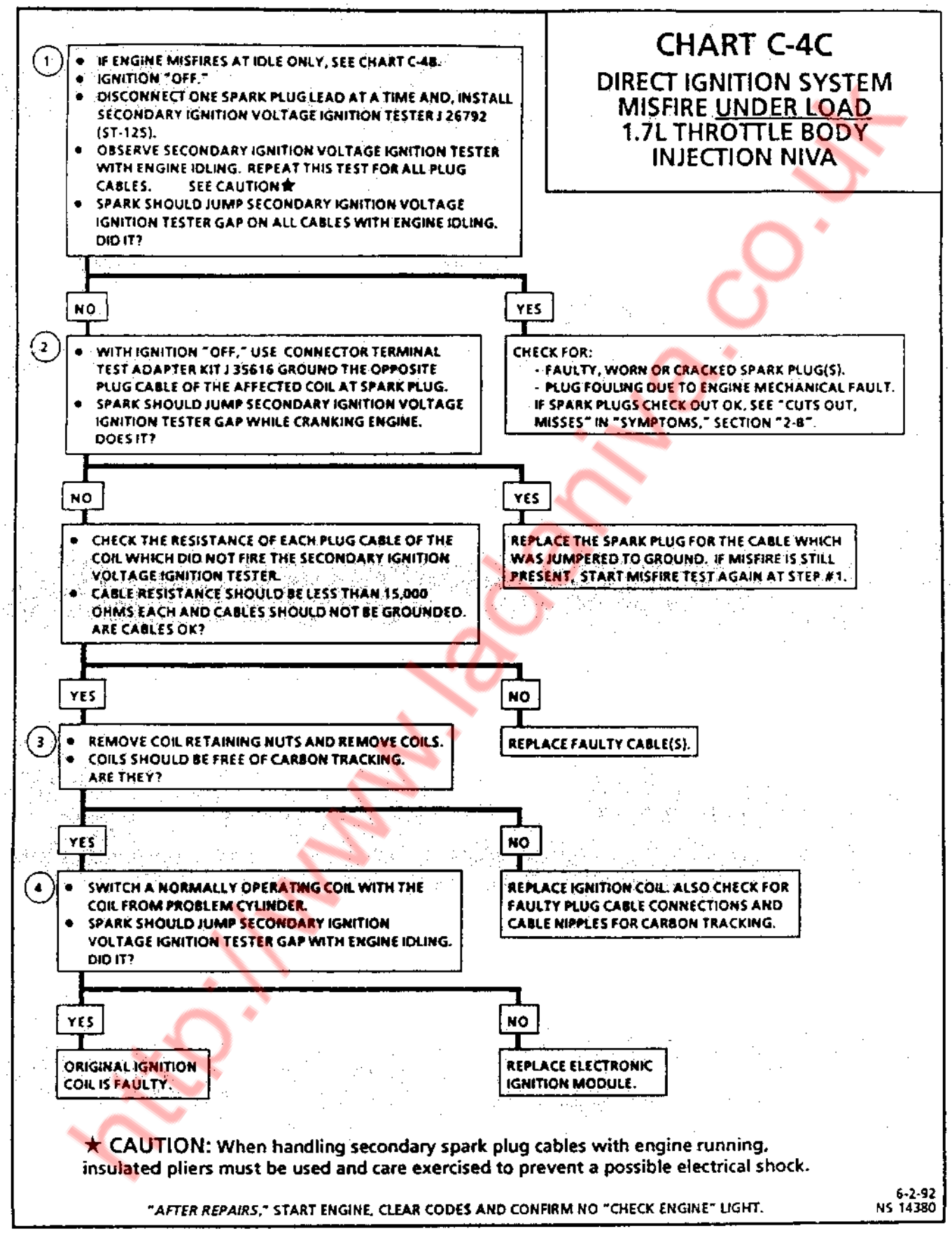
The direct ignition system uses a waste spark method of distribution. In this type of system, the ignition module triggers the #1/4 coil pair resulting in both #1 and #4 spark plugs firing at the same time. #1 cylinder is on the compression stroke at the same time #4 is on the exhaust stroke, resulting in a lower energy requirement to fire #4 spark plug. This leaves the remainder of the high voltage to be used to fire #1 spark plug. On this application the crankshaft position sensor is mounted to the engine block and protrudes to within approximately .050" of the crankshaft reluctor. Since the reluctor is a machined portion of the crankshaft and the crankshaft sensor is mounted in a fixed position on the block, timing adjustments are not possible or necessary.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If the "Misfire" complaint exists *at idle only*, diagnostic CHART C-4B must be used. A secondary ignition voltage ignition tester J 26792 (ST-125) must be used because it is essential to verify adequate available secondary voltage at the spark plug (25,000 volts). Spark should jump the test gap on all 4 leads. This simulates a "load" condition.
2. If the spark jumps secondary ignition voltage ignition tester J 26792 (ST-125) gap after grounding the opposite plug wire, it indicates excessive resistance in the plug which was bypassed. A faulty or poor connection at that plug could also result in the miss condition. Also check for carbon deposits inside the spark plug boot.
3. If carbon tracing is evident, replace coil and be sure plug wires relating to that coil are clean and tight. Excessive wire resistance or faulty connections could have caused the coil to be damaged.
4. If the no spark condition follows the suspected coil, that coil is faulty. Otherwise, the ignition module is the cause of no spark. This test could also be performed by substituting a known good coil for the one causing the no spark condition.

CHART C-4C

DIRECT IGNITION SYSTEM MISFIRE UNDER LOAD 1.7L THROTTLE BODY INJECTION NIVA



★ CAUTION: When handling secondary spark plug cables with engine running, insulated pliers must be used and care exercised to prevent a possible electrical shock.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

6-2-92
NS 14380

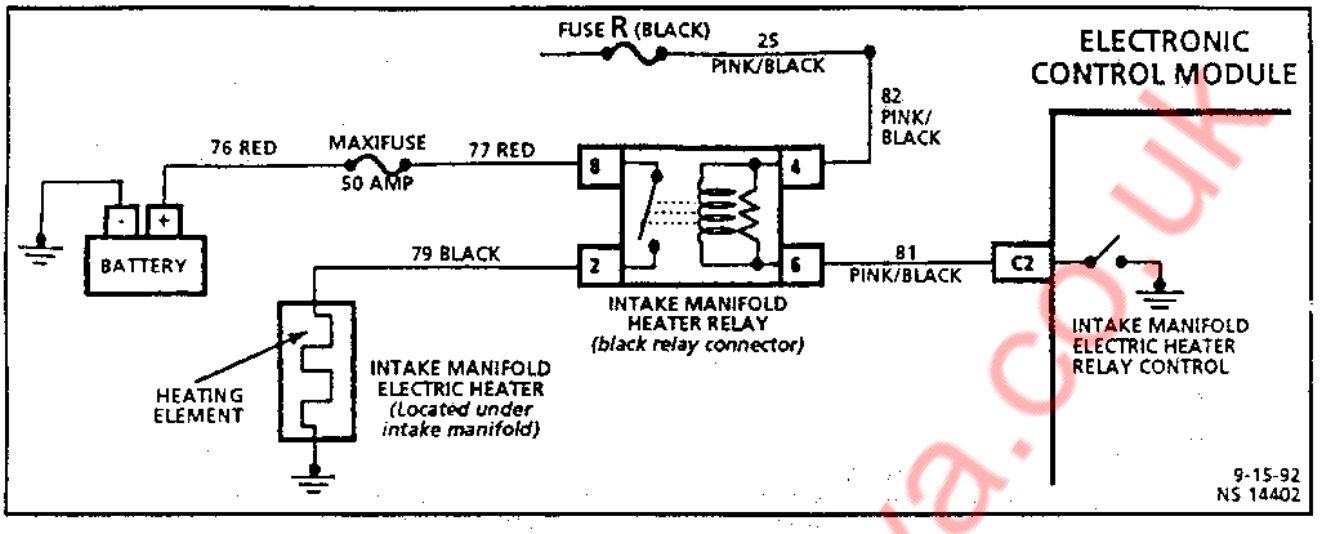


CHART C-9

(Page 1 of 2)
INTAKE MANIFOLD ELECTRIC HEATER
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

To assist in cold driveability, the electronic control module controls a positive temperature coefficient heater. This electric heating element is turned "ON" by the electronic control module by supplying a ground to a control relay at the electronic control module's terminal "C2". The relay completes the circuit and supplies voltage from a 50 amp maxi fuse to the heater.

The heating element is self-current limiting, as its temperature increases its resistance increases, preventing thermal overheat and possible resultant short to ground.

The electronic control module switches "ON" the heater based upon various inputs and conditions:

- Coolant temperature sensor is less than 63°C.
- Engine is running.
- Intake air temperature is less than 80°C.
- Battery voltage is greater than 8 volts.

Once the heater has been "ON" the electronic control module will turn it "OFF," if the following conditions exist:

- Battery voltage is less than 6 volts. (Heavy electrical accessory load.)
- Coolant temperature sensor input is greater than 65°C.

Test Description: Numbers below refer to circled numbers on the diagnostic chart.

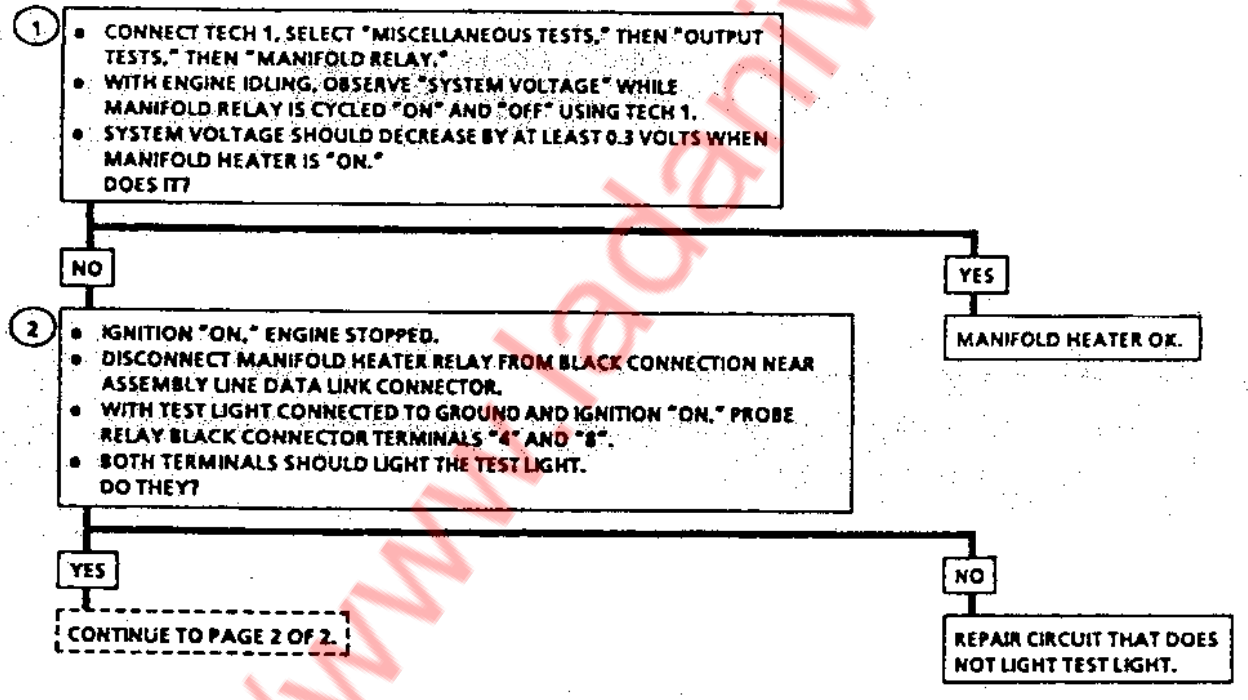
1. By using the Tech 1 "Scan" tool this quick check of the intake manifold heater can be performed. (See Diagnostic Aids.)
2. This step checks for power on relay control and load circuits.

Diagnostic Aids:

With ignition "ON," engine running, use Tech 1 "OUTPUT TEST" to turn "ON" heater. Observe "System Voltage" on Tech 1. System voltage should drop at least 0.3 volts with heater "ON." Engine must be idling for this Tech 1 command to take effect.

CHART C-9

(Page 1 of 2)
INTAKE MANIFOLD ELECTRIC HEATER
1.7L THROTTLE BODY INJECTION NIVA



9-25-92
NS 15805

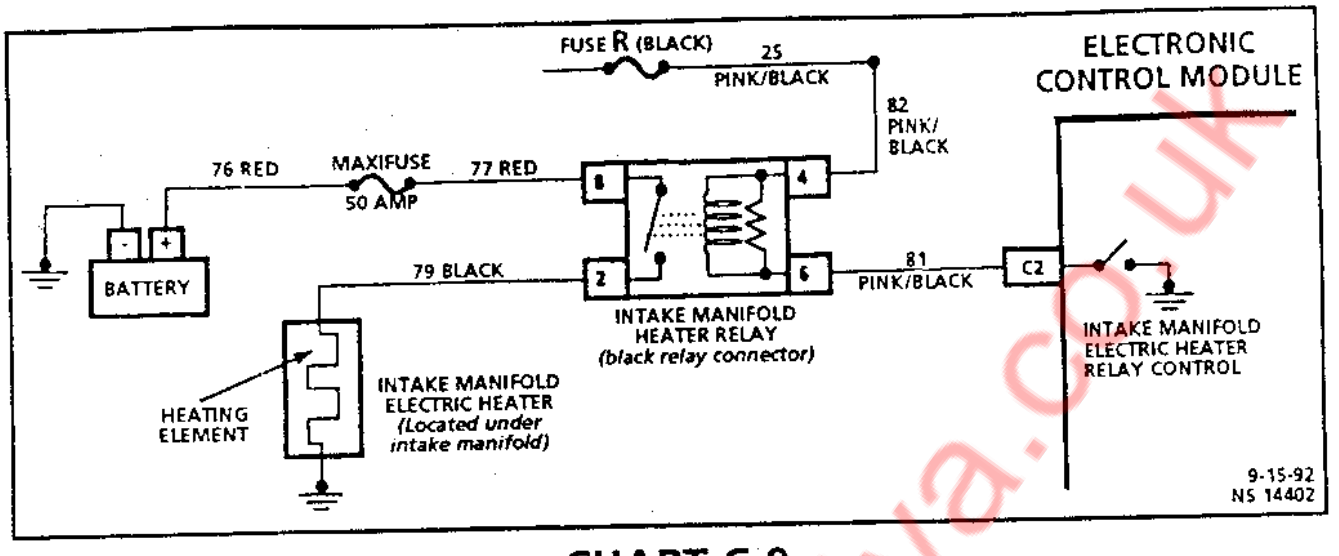


CHART C-9

(Page 2 of 2)
INTAKE MANIFOLD ELECTRIC HEATER
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

To assist in cold driveability, the electronic control module controls a positive temperature coefficient heater. This electric heating element is turned "ON" by the electronic control module by supplying a ground to a control relay at the electronic control module's terminal "C2". The relay completes the circuit and supplies voltage from a 50 amp maxi fuse to the heater.

The heating element is self-current limiting, as its temperature increases its resistance increases, preventing thermal overheat and possible resultant short to ground.

The electronic control module switches "ON" the heater based upon various inputs and conditions:

- Coolant temperature sensor is less than 63°C.
- Engine is running.
- Intake air temperature is less than 80°C.
- Battery voltage is greater than 8 volts.

Once the heater has been "ON" the electronic control module will turn it "OFF," if the following conditions exist:

- Battery voltage is less than 6 volts. (Heavy electrical accessory load.)
- Coolant temperature sensor input is greater than 65°C.

Test Description: Numbers below refer to circled numbers on the diagnostic chart.

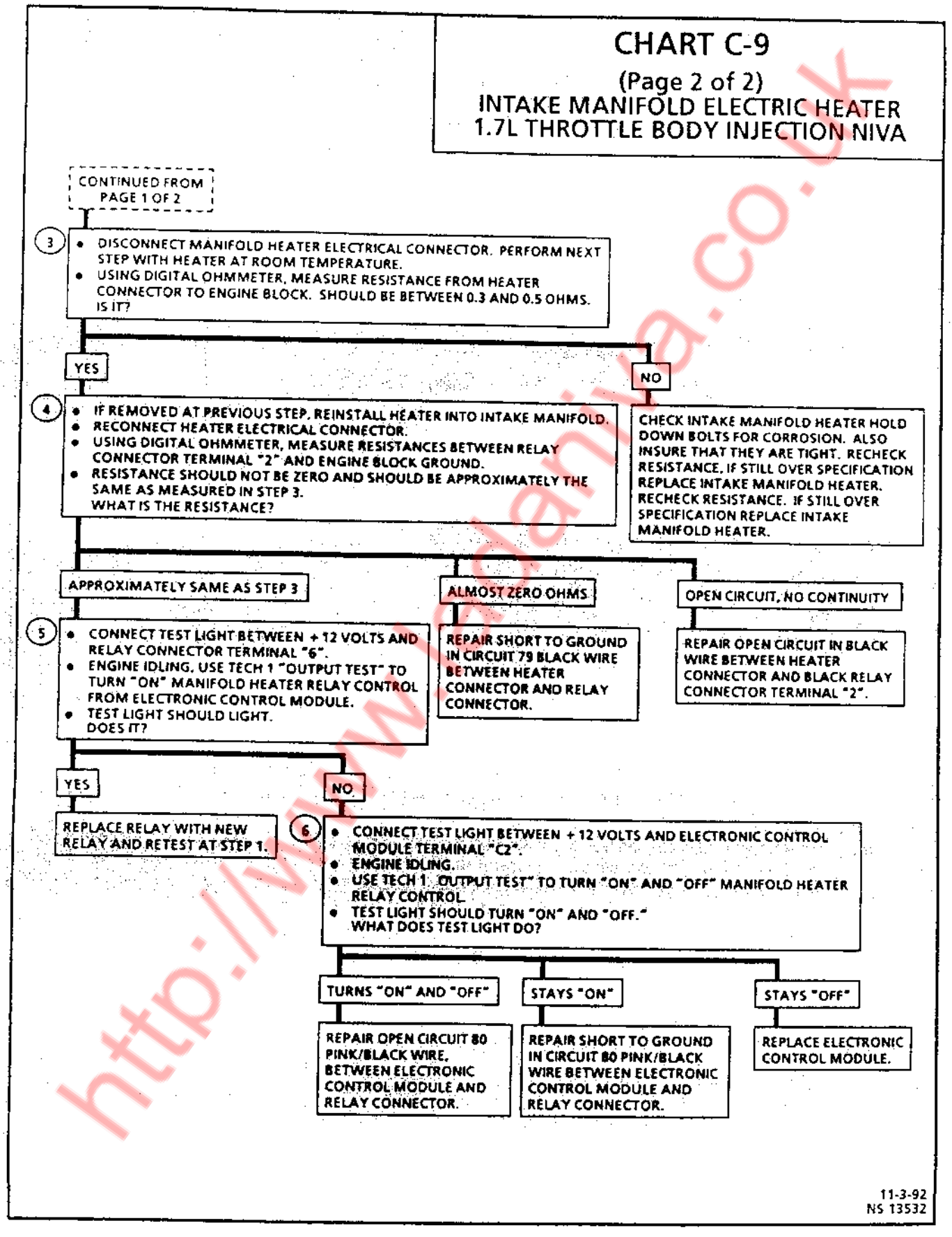
3. Heater must be tested at or about 27°C. As the heater warms from 27°C its resistance increases. If necessary, remove and cool the heater. The heater's resistance at 27°C should be less than 0.3 ohms.
4. This step checks Circuit 79 wire.
5. This step simulates electronic control module control of relay.
6. This step will determine if the electronic control module is defective or if Circuit 81 is faulty.

Diagnostic Aids:

With ignition "ON," engine running, use Tech 1 "OUTPUT TEST" to turn "ON" heater. Observe "System Voltage" on Tech 1. System voltage should drop at least 0.3 volts with heater "ON." Engine must be idling for this Tech 1 command to take effect.

CHART C-9

(Page 2 of 2)
INTAKE MANIFOLD ELECTRIC HEATER
1.7L THROTTLE BODY INJECTION NIVA



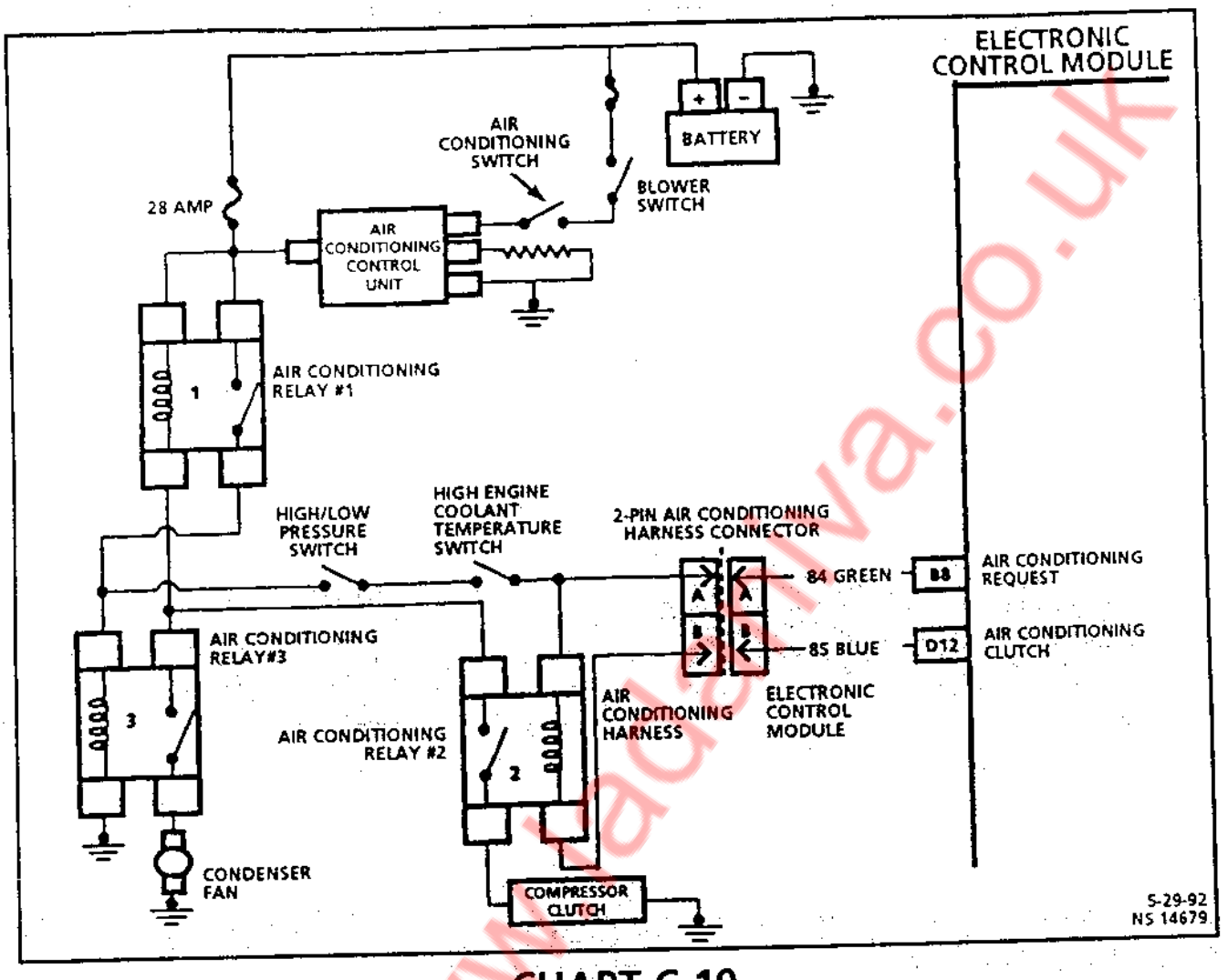


CHART C-10

AIR CONDITIONING COMPRESSOR CLUTCH CONTROL 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

A request for air conditioning is sensed by the electronic control module. When it has + 12 volts applied to terminal "B8". When the electronic control module senses the air conditioning is requested, it will energize the air conditioning Compressor Clutch Control relay by providing a ground path for the coil part of the relay. The relay contacts will close, and current will flow from the relay and engage the air conditioning Compressor Clutch.

The electronic control module de-energizes the relay under the following conditions:

- If the throttle position sensor is greater than about 95%.
- No air conditioning requested.
- Coolant temperature is above about 112°C.
- Engine speed is above about 6375 revolutions per minute.
- Vehicle speed less than 7 km/h and throttle position greater than 50%.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The air conditioning compressor clutch should not engage until about 0.3 second after the output test is enabled.
2. With engine idling and air conditioning dash switch "ON," the electronic control module should be grounding the relay control circuit causing the test light to be "ON."

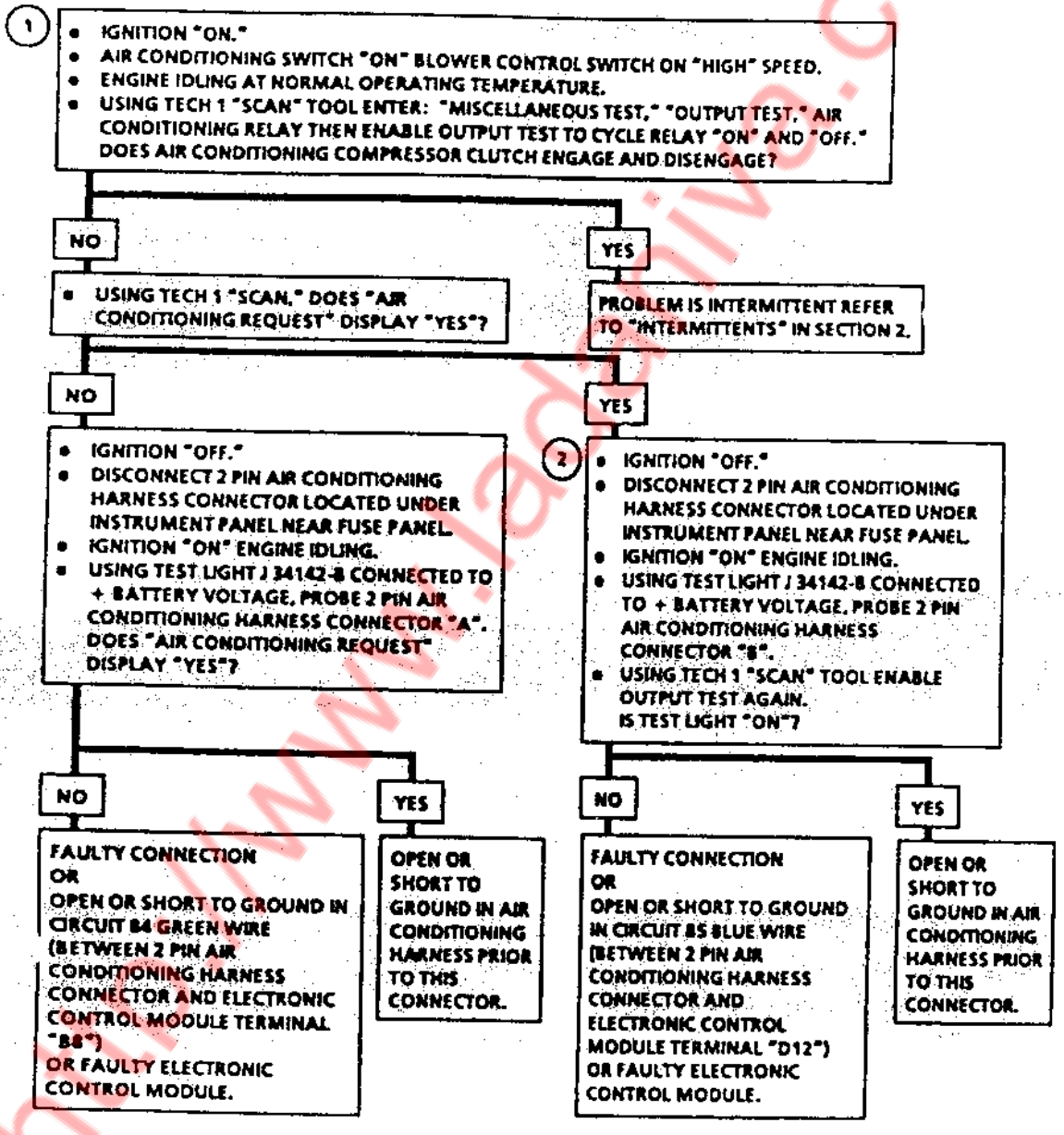
Diagnostic Aids:

The Tech 1 "Scan" tool displays air conditioning request signal voltage at the electronic control module "B8".

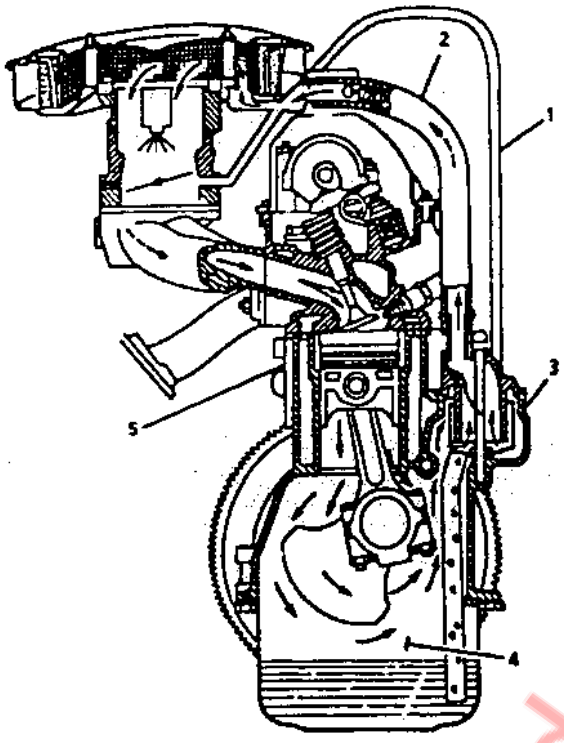
A short to voltage on Circuit 84 Green wire to electronic control module terminal "B8" will display air conditioning request "Yes" in all positions of dash switch.

THIS CHART ASSUMES THE AIR CONDITIONING SYSTEM IS FULLY CHARGED AND IS IN PROPER WORKING CONDITION

CHART C-10
AIR CONDITIONING COMPRESSOR CLUTCH CONTROL 1.7L THROTTLE BODY INJECTION NIVA



5-28-92
NS 14451



1 PRIMARY CIRCUIT
2 SECONDARY CIRCUIT
3 OIL SEPARATOR
4 CRANKCASE VAPORS
5 COMBUSTION CHAMBER
NS 14680

CHART C-13

CRANKCASE VENTILATION SYSTEM CHECK 1.7L THROTTLE BODY INJECTION NIVA

System Description:

The crankcase ventilation system has 2 circuits. In both circuits crankcase vapors are returned to the combustion chamber through an oil separator located on the engine block near the ignition module. The primary circuit consists of a calibrated orifice fitted into the intake manifold just below the throttle body injection unit. A small hose runs from this orifice to the oil separator. A larger secondary circuit hose runs from the air cleaner to the oil separator.

At idle, all crankcase vapors are directed through the primary circuit orifice (small hose), which will be experiencing high vacuum. Under heavy load or wide open throttle conditions a small amount of crankcase vapors are passed through the primary system orifice. However, most vapors pass through the secondary system (large hose), into the air cleaner, through the throttle body injection and are burned in the combustion chamber.

RESULTS OF INCORRECT OPERATION:

A plugged hose may cause:

- Higher than normal idle air control steps.
- Oil leaks.
- Oil in air cleaner.
- Sludge in engine.

CHART C-13

CRANKCASE VENTILATION SYSTEM CHECK 1.7L THROTTLE BODY INJECTION NIVA

DIAGNOSIS

FUNCTIONAL CHECK OR VENTILATION SYSTEM

There are no moving parts in the ventilation system. Maintenance consists of inspecting the hoses to make sure they are clear and in good operating condition. The vacuum orifice in the manifold should be inspected on a regular basis to be sure it is not plugged, and cleaned if necessary.

Proper operation of the ventilation system is dependent upon a sealed engine. If oil sludging or dilution is noted, and the ventilation system is functioning properly, check engine for possible cause and correct to ensure that system will function as intended.

11-5-91
MS 11545

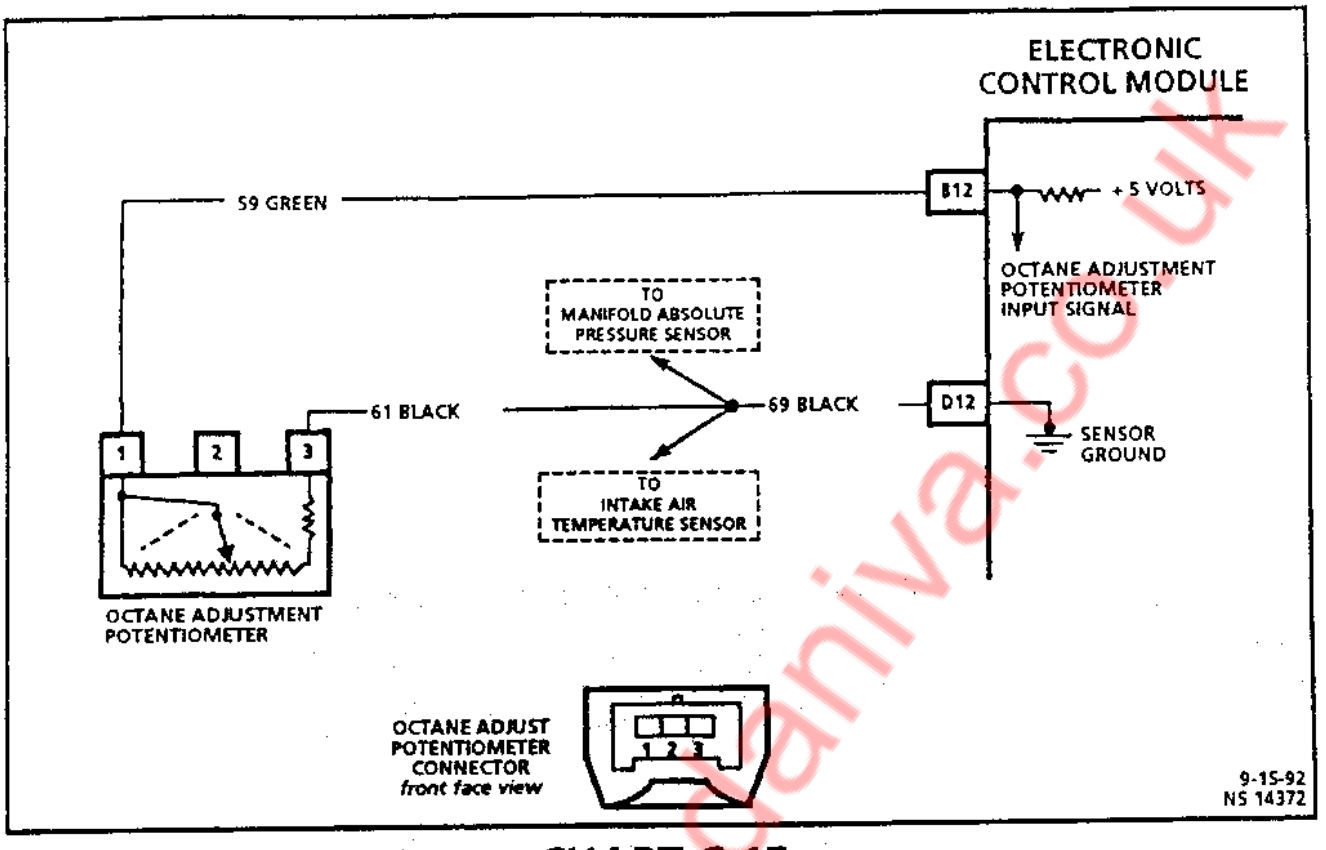


CHART C-15

OCTANE ADJUSTMENT POTENTIOMETER CHECK 1.7L THROTTLE BODY INJECTION NIVA

System Description:

The octane adjustment potentiometer is a dealer only adjustment that compensates for the use of low octane fuel. The potentiometer is adjustable from about 1 to 4.5 volts and 0 to 8 degrees of retard. Any voltage adjustments that are made at the potentiometer provide a corresponding change in degrees of retard at the ignition system, provided the Tech 1 "Scan" tool is installed and in the "Octane Adjust" mode. Abnormally High (more than 4.9 volts) or abnormally low (less than 0.50 volts) voltage readings will cause a Code 54. While the Code 54 problem is present the "Check Engine" light will remain "ON" when the engine is running. At the same time, the electronic control module will use a substitute (value of "degrees of retard") until the problem is corrected.

No attempts at adjusting the Octane Adjust potentiometer should be made if a Code 54 is present.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to make sure a possible Code 54 is not set.
2. Checks operation of the potentiometer.
3. Describes adjustment procedures and precautions.

NOTE: The electronic control module monitors the voltage from the potentiometer any time the ignition is "ON." This can be observed using Tech 1 in the "FØ: DATA LIST" mode when the engine is running.

However, changes to the amount of spark retard based on the potentiometer input signal will only take effect when the Tech 1 tool is used in the "Miscellaneous Tests-Octane Adjustment" mode.

CHART C-15

OCTANE ADJUSTMENT POTENTIOMETER CHECK 1.7L THROTTLE BODY INJECTION NIVA

IF CODE 54 IS DETECTED, REPAIR THE PROBLEM THAT CAUSED THE CODE 54 BEFORE USING THIS PROCEDURE.

NOTICE: THE OCTANE ADJUST POTENTIOMETER IS PRESET AT THE FACTORY FOR THE USE OF HIGH OCTANE FUEL. IN MOST CASES IT WILL NOT NEED TO BE ADJUSTED DURING THE LIFE OF THE VEHICLE. THERE ARE ONLY TWO TIMES WHEN AN ADJUSTMENT SHOULD BE MADE:

1. IF THE CUSTOMER HAS COMPLAINED OF DETONATION.
2. IF THE CUSTOMER HAS REQUESTED AN ADJUSTMENT TO COMPENSATE FOR THE ANTICIPATED USE OF LOW OCTANE FUEL.

IF AN ADJUSTMENT IS BEING MADE FOR REASONS OTHER THAN THOSE LISTED ABOVE THEN THE ADJUSTMENT IS NOT NECESSARY AND YOU SHOULD NOT PROCEED WITH THIS CHART.

(1)
- ENGINE IDLING.
- CONNECT TECH-1 "SCAN" TOOL.
- SELECT FØ DATA LIST.
- DOES TECH 1 DISPLAY "OCTANE ADJUST" VOLTS BETWEEN 1.0 AND 4.7, AND "DEGREES OF RETARD" BETWEEN 0 AND 87

YES

(2)
- WHILE OBSERVING TECH 1 SLOWLY TURN OCTANE ADJUST POTENTIOMETER ADJUSTMENT SCREW. DOES VOLTAGE DISPLAYED ON TECH 1 RESPOND TO THE ADJUSTMENT SCREW MOVEMENT?

YES

(3)
- THE POTENTIOMETER IS SET AT THE FACTORY AT ABOUT 1 VOLT (NO RETARD ON SYSTEM).
- ENGINE IDLING. ON TECH 1 SELECT "MISC TESTS" THEN SELECT "OCTANE ADJUST."
- BEFORE YOU PROCEED YOU MUST GET TO THE "OCTANE ADJUST" MODE IN THE TECH 1. TO DO THIS YOU MUST, PRESS THE EXIT BUTTON, SELECT "MISC" TEST AND THEN "OUTPUT" TESTS. NOW SELECT "OCTANE ADJUST" AND PROCEED.
- TURN ADJUSTMENT SCREW UNTIL DESIRED VOLTAGE/AMOUNT OF RETARD IS REACHED.
- TOO MUCH RETARD CAN RESULT IN POOR PERFORMANCE AND FUEL ECONOMY. IT IS BECAUSE OF THIS THAT ONLY SMALL ADJUSTMENTS SHOULD BE MADE AT ANY ONE TIME TO THE POTENTIOMETER. MAKING SMALL ADJUSTMENTS AND RETURNING THE VEHICLE TO THE OWNER ALLOWS IT TO BE TEST DRIVEN IN A VARIETY OF SITUATIONS. IF THE VEHICLE IS RETURNED FOR A SIMILAR COMPLAINT READJUST THE POTENTIOMETER AGAIN MAKING SURE NOT TO "OVER ADJUST."

NO → CHECK FOR CODE 54 USING TECH 1 BEFORE PROCEEDING.

NO → CHECK FOR CODE 54 DIAGNOSTIC CHART FOR ADDITION INFORMATION.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

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NS 15202