1993 - 1995

2.5L / 4.0L ELECTRONIC FUEL INJECTION (SFI)

(Includes Speed Control / Charging)

FOR: Jeep Cherokee
Jeep Grand Cherokee
Jeep Wagoneer
Jeep Wrangler

POWERTRAIN DIAGNOSTIC PROCEDURES

CHRYSLER CORPORATION

SAFETY NOTICE

CAUTION

ALL SERVICE AND REBUILDING INSTRUCTIONS CONTAINED HEREIN ARE APPLICABLE TO, AND FOR THE CONVENIENCE OF, THE AUTOMOTIVE TRADE ONLY. All test and repair procedures on components or assemblies in non-automotive applications should be repaired in accordance with instructions supplied by the manufacturer of the total product.

Proper service and repair is important to the safe, reliable operation of all motor vehicles. The service procedures recommended and described in this publication were developed for professional service personnel, and are effective methods for performing vehicle repair. Following these procedures will help ensure efficient economical vehicle performance and service reliability. Some service procedures require the use of special tools designed for specific procedures. These special tools should be used as recommended throughout this publication.

Special attention should be exercised when working with spring-or tension-loaded fasteners and devices such as E-Clips, Circlips, Snap rings, etc., since careless removal may cause personal injury. Always wear safety goggles when working on vehicles or vehicle components.

It is important to note that this publication contains various **Cautions** and **Warnings**. These should be read carefully in order to minimize risk of personal injury, or the possibility that improper service methods may damage the vehicle or render it unsafe. It is important to note that these **Cautions** and **Warnings** cover only the situations and procedures Chrysler Corporation has encountered and recommended. Chrysler Corporation cannot possibly know, evaluate, and advise the service trade of all conceivable ways in which service may be performed, or of the possible hazards of each. Consequently, Chrysler Corporation has not undertaken any such broad service review. Accordingly, anyone who uses a service procedure or tool that is not recommended in this publication, must be certain that neither personal safety, nor vehicle safety, will be jeopardized by the service methods they select.

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1.0 INTRODUCTION

The procedures contained in this manual include all the specifications, instructions, and graphics needed to diagnose powertrain control module (PCM) problems; they are no start, diagnostic trouble code, and no trouble code problems for the PCM. The diagnostics in this manual are based on the trouble condition or symptom being present at the time of diagnosis.

When repairs are required, refer to the appropriate volume of the service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added; carryover systems may be enhanced. READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE TROUBLE CODE. It is recommended that you review the entire manual to become familiar with all new and changed diagnostic procedures.

This book reflects many suggested changes from readers of past issues. After using this book, if you have any comments or recommendations, please fill out the form at the back of the book and mail it back to us.

1.1 System Coverage

This diagnostic procedures manual covers all 1993-95 2.5L (gas) and 4.0L Jeep vehicles.

1.2 Six-Step Troubleshooting Procedure

Diagnosis of the powertrain control module (PCM) is done in six basic steps:

- verification of complaint
- verification of any related symptoms
- symptom analysis
- problem isolation
- repair of isolated problem
- verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

The powertrain control module (PCM) monitors and controls the engine, fuel, and ignition systems.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 General Description

The 2.5L and 4.0L MPI engine systems have the latest in technical advances. The on-board diagnostics incorporated with the SBEC are intended to assist the field technician in repairing vehicle problems by the quickest means.

3.2 Functional Operation

3.2.1 On-Board Diagnostics

The PCM has been programmed to monitor many different circuits of the fuel injection system. This monitoring is called "on-board diagnosis."

Certain criteria, or "arming conditions," must be met for a trouble code to be entered into the PCM

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memory. The criteria may be a range of: engine rpm, engine temperature, and/or input voltage to the PCM. If a problem is sensed with a monitored circuit, and all of the criteria or arming conditions are met, a trouble code will be stored in the PCM.

It is possible that a trouble code for a monitored circuit may not be entered into the PCM memory even though a malfunction has occurred. This may happen because one of the trouble code criteria (arming conditions) has not been met.

The PCM compares input signal voltages from each input device with specifications (the established high and low limits of the range) that are programmed into it for that device. If the input voltage is not within specifications and other trouble code criteria (arming conditions) are met, a trouble code will be stored in the PCM memory.

3.2.2 PCM Operating Modes

As input signals to the powertrain control module (PCM) change, the PCM adjusts its response to output devices. For example, the PCM must calculate a different injector pulse width and ignition timing for idle than it does for wide open throttle. There are several different modes of operation that determine how the PCM responds to the various input signals.

There are two types of engine control operation: **open loop** and **closed loop**.

In open loop operation, the PCM receives input signals and responds according to preset programming. Inputs from the heated oxygen sensors are not monitored.

In closed loop operation, the PCM monitors the inputs from the heated oxygen sensor. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio of 14.7 parts air to 1 part fuel. By monitoring the exhaust oxygen content through the oxygen sensor, the PCM can fine tune injector pulse width. Fine tuning injector pulse width allows the PCM to achieve optimum fuel economy combined with low emissions.

The engine start-up (crank), engine warm-up, and wide open throttle modes are open loop modes. Under most operating conditions, the acceleration, deceleration, and cruise modes, with the engine at operating temperature, are closed loop modes.

Ignition Switch On (Engine Off) Mode
When the ignition switch activates the fuel injection system, the following actions occur:

1. The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.

2. The PCM monitors the engine coolant temperature sensor and throttle position sensor input. The PCM modifies fuel strategy based on this input.

3. The PCM pre-positions the idle air control motor.

When the key is in the "on" position and the engine is not running (zero rpm), the auto shutdown relay and fuel pump relay are not energized. Therefore, voltage is not supplied to the fuel pump, ignition coil, and fuel injectors.

Engine Start-Up Mode – This is an open loop mode. The following actions occur when the starter motor is engaged:

1. The auto shutdown and fuel pump relays are energized. If the PCM does not receive the camshaft and crankshaft signals within approximately three seconds, these relays are de-energized.

2. The PCM energizes all fuel injectors until it determines crankshaft position from the camshaft and crankshaft signals. The PCM determines crankshaft position within one engine revolution. After the crankshaft position has been determined, the PCM energizes the fuel injectors in sequence. The PCM adjusts the injector pulse width and synchronizes the fuel injectors by controlling the fuel injectors' ground paths.

3. Once the engine idles within 64 rpm of its target engine speed, the PCM compares the current MAP sensor value with the value received during the ignition switch on (zero rpm) mode. A diagnostic trouble code is written to PCM memory if a minimum difference between the two values is not found.

Once the auto shutdown and fuel pump relays have been energized, the PCM determines the fuel injector pulse width based on the following:

- engine coolant temperature
- manifold absolute pressure
- intake air temperature
- engine revolutions

The PCM determines the spark advance based on the following:

- engine coolant temperature
- crankshaft position
- camshaft position
- intake air temperature
- manifold absolute pressure
- throttle position

Engine Warm-Up Mode – This is an open loop mode. The PCM adjusts injector pulse width and controls injector synchronization by controlling the fuel injectors' ground paths. The PCM adjusts ignition timing and engine idle speed. The PCM adjusts the idle speed by controlling the idle air control motor.

Cruise or Idle Mode - When the engine is at normal operating temperature, this is a closed loop mode. During certain idle conditions, the PCM may enter into a variable idle speed strategy. At this time, the PCM adjusts engine speed based on the following inputs:

- throttle position
- battery voltage
- engine coolant temperature

Acceleration Mode - This is a closed loop mode. The PCM recognizes an increase in throttle position and a decrease in MAP as engine load increases. In response, the PCM increases the injector pulse width to meet the increased load.

Deceleration Mode - This is a closed loop mode. The PCM recognizes a decrease in throttle position and an increase in MAP as engine load decreases. In response, the PCM decreases the injector pulse width to meet the decreased load.

Wide Open Throttle Mode - This is an open loop mode. The throttle position sensor notifies the PCM of a wide open throttle condition. Once a wide open throttle is sensed, the PCM de-energizes the A/C compressor clutch relay. The PCM adjusts injector pulse width to supply a predetermined amount of additional fuel.

3.2.3 Non-Monitored Circuits

The PCM does not monitor the following circuits, systems, and conditions even though they could have malfunctions that result in driveability problems. A diagnostic code may not be displayed for the following conditions. However, problems with these systems may cause a diagnostic code to be displayed for other systems. For example, a fuel pressure problem will not register a diagnostic code directly, but could cause a rich or lean condition. This could cause an oxygen sensor trouble code to be stored in the PCM.

Secondary Ignition - The PCM cannot detect an inoperative ignition coil, fouled or worn spark plug, ignition cross fire, or open spark plug cable.(*)

Engine Timing - The PCM cannot detect an incorrectly indexed timing chain, camshaft sprocket, or crankshaft sprocket. The PCM also cannot detect an incorrectly indexed distributor.(*)

Fuel Pressure - Fuel pressure is controlled by the vacuum-assisted fuel pressure regulator. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line.(*)

Fuel Injectors - The PCM cannot detect if the fuel injector is clogged, the pintle is sticking, or the wrong injectors are installed.(*)

Fuel Requirements - Poor quality gasoline can cause problems such as hard starting, stalling, and stumble. Use of methanol-gasoline blends may result in starting and driveability problems. (See individual symptoms and their definitions in Section 12.0 (Glossary of Terms) at the back of this book.)

PCM Grounds - The PCM cannot detect a poor system ground. However, a diagnostic trouble code may be stored in the PCM as a result of this condition.

Throttle Body Air Flow - The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.(*)

Exhaust System - The PCM cannot detect a plugged, restricted, or leaking exhaust system.(*)

Cylinder Compression - The PCM cannot detect uneven, low, or high engine cylinder compression.(*)

Excessive Oil Consumption - Although the PCM monitors the exhaust stream oxygen content through the oxygen sensor when the system is in a closed loop, it cannot determine excessive oil consumption.

Evaporative System - The PCM cannot detect a restricted, plugged, or loaded evaporative purge canister.(*)

Vacuum Assist - Leaks or restrictions in the vacuum circuits of vacuum-assisted engine control system devices are not monitored by the PCM. These could result in a MAP sensor message being stored in the PCM.(*)

(*)NOTE: Any of these conditions could result in a rich or lean condition causing an oxygen sensor trouble code to be stored in the PCM, or the vehicle may exhibit one or more of the driveability symptoms listed in TEST NTC-1A - No Trouble Code Test Menu.

3.3 Diagnostic Trouble Codes

Each diagnostic trouble code is diagnosed by following a specific testing procedure. The diagnostic test procedures contain step-by-step instructions for determining the cause of trouble codes as well as no trouble code problems. It is not necessary to perform all of the tests in this book to diagnose an individual code.

Always begin by reading the diagnostic trouble codes using the DRB. This procedure begins in TEST TC-1A - Checking the System for Diagnostic Trouble Codes. This will direct you to the specific test(s) that must be performed.

3.3.1 Hard Code

A diagnostic trouble code that comes back within one cycle of the ignition key is a "hard" code. This means that the defect is there every time the powertrain control module checks that circuit or function. Procedures in this manual verify if the trouble code is a hard code at the beginning of each test. When it is not a hard code, an "intermittent" test must be performed.

3.3.2 Intermittent Code

A diagnostic trouble code that is not there every time the powertrain control module checks the circuit is an "intermittent" code. Most intermittent codes are caused by wiring or connector problems. Defects that come and go like this are the most difficult to diagnose; they must be looked for under specific conditions that cause them.

3.3.3 Reset Counter

The reset counter counts the number of times the vehicle has been started since codes were last set, erased, or the battery was disconnected. The reset counter will count up to 255 start counts.

The number of starts helps determine when the trouble code actually happened. This is recorded by the PCM and can be viewed on the DRB as the RESET COUNTER.

When there are no trouble codes stored in memory, the DRB will display "NO TROUBLE CODES FOUND" and the reset counter will show "RESET COUNT = XXX."

G E N E R A L I N F O R M A T I O N

3.3.4 Trouble Code Set Parameters

Name of code: A/C Clutch Relay Control

When monitored: With the ignition on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the A/C clutch relay control circuit.

Theory of operation: The A/C compressor clutch relay controls the 12-volt source for the A/C clutch. The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). When A/C is requested, the PCM will adjust the idle speed to accommodate the A/C compressor load on the engine. The PCM grounds the relay control circuit after the PCM receives an A/C select signal over the CCD bus and adjustment of the idle speed has been implemented.

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Compressor clutch relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

Name of code: Auto Shutdown Relay Control Circuit

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the auto shutdown relay control circuit.

Theory of operation: The automatic shutdown relay (ASD) controls the 12-volt source to the fuel injectors, ignition coils, and the generator. The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). The PCM grounds the relay when the ignition switch is in either the run or crank position and engine RPM is detected. If engine RPM is not detected, the PCM will remove the ASD relay control circuit ground.

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Auto shutdown relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

Name of code: Battery Temp Sensor Volts Out of Limit

When monitored: With the ignition key on.

Set condition: There is a circuit problem in the sensor circuit internal to the PCM.

Theory of operation: The battery temp sensor voltage is used to determine what goal voltage to use for the charging system based on ambient temperature near the battery.

Possible causes:
> PCM failure

Name of code: Charging System Voltage Too High

When monitored: With the ignition key on and the engine running for 3 minutes.

Set condition: When the PCM regulates the generator field and there are no detected field problems but the voltage output does not decrease.

Theory of operation: The PCM tries to maintain a system voltage between 12.9 volts and 15.0 volts. The voltage determined by the PCM as the final goal for the charging system is called "control" voltage. This control voltage is determined from the battery temperature sensor for ambient sensor and the sensed voltage system voltage at PCM cavity 3. The control voltage is compared to the sensed voltage continuously during running. If the sensed voltage is less than the control voltage, the PCM will supply more ground to the field circuit. If the sensed voltage is more than the control voltage, the PCM will supply less ground to the field circuit.

Possible causes:
- > Generator internal short
- > Generator field driver short to ground
- > PCM failure

Name of code: Charging System Voltage Too Low

When monitored: With the ignition key on and the engine running for 3 minutes.

Set condition: When the PCM regulates the generator field and there are no detected field problems but the voltage output does not increase.

Theory of operation: The PCM tries to maintain a system voltage between 12.9 volts and 15.0 volts. The voltage determined by the PCM as the final goal for the charging system is called "control" voltage. This control voltage is determined from the battery temperature sensor for ambient sensor and the sensed voltage system voltage at PCM cavity 3. The control voltage is compared to the sensed voltage continuously during running. If the sensed voltage is less than the control voltage, the PCM will supply more ground to the field circuit. If the sensed voltage is more than the control voltage, the PCM will supply less ground to the field circuit.

Possible causes:
- > Defects in generator drive belt or adjustment
- > High resistance between battery B(+) and generator B(+)
- > High resistance between battery B(-) and generator ground
- > PCM failure

Name of code: ECT Sensor Voltage Too High

When monitored: With the ignition on.

Set condition: The engine coolant temperature sensor circuit voltage at PCM cavity 2 goes above 4.9 volts for more than 3 seconds.

Theory of operation: The engine coolant temperature sensor is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. As coolant temperature increases, resistance decreases and the voltage signal will be low. This allows the sensor to provide an analog voltage signal (0 to 5-volt) to PCM cavity 2.

To make the sensor more accurate at cold and hot temperatures, the 5-volt signal passes through a 10,000 ohm resistor or through a 1,000 ohm resistor connected in parallel with the 10,000 ohm resistor, which has a calculated resistance value of 909 ohms. If the engine is cold (below 125°F), the 5-volt supply to the coolant temperature sensor is fed only through the 10,000 ohm resistor inside the PCM. If the engine is warm (above 125°F), the 5-volt supply to the coolant temperature sensor is fed through both resistors.

Possible causes:
> Sensor signal circuit open
> Sensor internally open
> Sensor ground circuit open
> PCM failure

Name of code: ECT Sensor Voltage Too Low

When monitored: With the ignition on.

Set condition: The engine coolant temperature sensor circuit voltage at PCM cavity 2 goes below .5 volt for more than 3 seconds.

Theory of operation: The engine coolant temperature sensor is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. As coolant temperature increases, resistance decreases and the voltage signal will be low. This allows the sensor to provide an analog voltage signal (0 to 5-volt) to PCM cavity 2.

To make the sensor more accurate at cold and hot temperatures, the 5-volt signal passes through a 10,000 ohm resistor or through a 1,000 ohm resistor connected in parallel with the 10,000 ohm resistor, which has a calculated resistance value of 909 ohms. If the engine is cold (below 125°F), the 5-volt supply to the coolant temperature sensor is fed only through the 10,000 ohm resistor inside the PCM. If the engine is warm (above 125°F), the 5-volt supply to the coolant temperature sensor is fed through both resistors.

Possible causes:
> Sensor signal shorted to ground
> Sensor internally shorted
> PCM failure

Name of code: Engine is Cold Too Long

When monitored: With the engine temperature between -20°F and +212°F at start up, coolant sensor operating, the engine running for at least 12 minutes, and the vehicle speed above 28 mph.

Set condition: All monitoring conditions are met and the engine temperature does not reach 174°F after 20 minutes.

Theory of operation: The engine thermostat is designed to maintain the engine at or near the design temperature to promote maximum efficiency.

Possible causes:
> Extreme cold outside temperature
> Failed thermostat
> Coolant sensor out of calibration

Name of code: Fuel Pump Resistor Bypass Relay Ckt

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the fuel pump resistor bypass relay control circuit.

Theory of operation: The fuel pump resistor bypass relay controls the path the fuel pump relay output current takes as it travels from the relay to the fuel pump. When the bypass relay is de-energized, the fuel pump receives the fuel pump relay output current directly from the relay. Conversely, when the bypass relay is energized, the fuel pump relay output current travels through the ballast resistor before reaching the fuel pump.

The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM).

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Fuel pump resistor bypass relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

Name of code: Generator Field Not Switching Properly

When monitored: With the ignition key on and the engine running.

Set condition: When the PCM tries to regulate the generator field with no result during monitoring.

Theory of operation: The PCM tries to maintain a system voltage between 12.9 volts and 15.0 volts. The voltage determined by the PCM as the final goal for the charging system is called "control" voltage. This control voltage is determined from the battery temperature sensor for ambient sensor and the sensed voltage system voltage at PCM cavity 3. The control voltage is compared to the sensed voltage continuously during running. If the sensed voltage is less than the control voltage, the PCM will supply more ground to the field circuit. If the sensed voltage is more than the control voltage, the PCM will supply less ground to the field circuit.

Possible causes:
> Field driver circuit open or shorted
> Generator internal open or short
> PCM failure

Name of code: High Speed Fan Ctrl Relay Circuit

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the high speed radiator fan relay control circuit.

Theory of operation: The high speed radiator fan relay controls the high speed operation of the radiator fan. The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). The PCM grounds the relay control circuit depending on coolant temperature and/or A/C compressor head pressure. When the A/C is off, the relay will be grounded when the temperature reaches 230°F and it will remove the ground when the temperature goes below 221°F. When the A/C is on, the relay will be grounded when the temperature is above 230°F or the head pressure is above 249 psi, and it will remove the ground when the temperature goes below 221°F or the head pressure goes below 229 psi.

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> High speed radiator fan relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

Name of code: Idle Air Control Motor Circuits

When monitored: With the ignition on, battery voltage greater than 10.0 volts, and the idle air control motor active.

Set condition: The PCM senses a short to ground or battery voltage on any of the four IAC driver circuits for 2.75 seconds while the IAC motor is active.

Theory of operation: The idle air control motor is used by the PCM to help regulate idle speed. The motor controls the amount of air allowed to bypass the throttle blade. The PCM controls the motor using four driver circuits to position the stepper motor. (**NOTE:** The PCM cannot detect an open driver circuit or a stuck motor.)

Possible causes:
> Driver circuit shorted to ground
> Driver circuit shorted to battery
> Driver circuits shorted together
> Failed PCM
> Shorted IAC motor

Name of code: Injector Control Circuit

When monitored: With battery voltage greater than 12 volts, auto shutdown relay energized, injector pulse width less than 10 ms, and engine speed less than 3000 rpm.

Set condition: There is no inductive kick sensed .18 ms after injector turn off with no other injectors on. This code takes .64 to 10.0 seconds to set.

Theory of operation: Fuel injectors are high impedance solenoids controlled by the PCM. Battery voltage is supplied by the ASD relay. The injector on time (pulse width) is controlled by the amount of time the PCM grounds the injector control circuit. By varying this time, more or less fuel is allowed to flow through the injector.

Possible causes:
> Open or shorted injector control circuit
> Open injector
> Open ASD supply at injector
> Failed driver in PCM

Name of code: Intake Air Temp Sensor Voltage High

When monitored: With the ignition on and the engine running.

Set condition: The intake air sensor circuit voltage at PCM cavity 21 goes above 4.9 volts.

Theory of operation: The intake air temperature sensor (IAT) is located in the intake manifold where it measures the temperature of the air that is about to enter the combustion chambers. The IAT is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. At high temperatures, resistance decreases and the voltage will decrease. This allows the sensor to provide an analog voltage signal to PCM cavity 21. The PCM uses this signal to compensate for changes in air density due to temperature.

Possible causes:
> Sensor signal circuit open
> Sensor internally open
> Sensor ground circuit open

Name of code: Intake Air Temp Sensor Voltage Low

When monitored: With the ignition on and the engine running.

Set condition: The intake air sensor circuit voltage at PCM cavity 21 goes below .5 volt.

Theory of operation: The intake air temperature sensor (IAT) is located in the intake manifold where it measures the temperature of the air that is about to enter the combustion chambers. The IAT is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. At high temperatures, resistance decreases and the voltage will decrease. This allows the sensor to provide an analog voltage signal to PCM cavity 21. The PCM uses this signal to compensate for changes in air density due to temperature.

Possible causes:
> Sensor signal circuit shorted to ground
> Sensor internally shorted

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Name of code: Internal Controller Failure

When monitored: With the ignition on.

Set condition: There is an EPROM sum check failure at power down.

Theory of operation: This code indicates the EPROM memory may be corrupt.

Possible causes:
> Failed PCM

Name of code: MAP Sensor Voltage Too High

When monitored: With engine rpm above 400 but less than 1500 and the TP sensor voltage less than 1.0 volt.

Set condition: The MAP sensor signal voltage is greater than 4.6 volts at start or with the engine running for 1.76 seconds.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5-volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP receives a 5-volt supply from PCM cavity 6; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

Possible causes:
> Signal circuit open
> Sensor open internally
> Sensor ground circuit
> Sensor signal circuit shorted to voltage
> Failed PCM

Name of code: MAP Sensor Voltage Too Low

When monitored: With engine rpm above 400 but less than 1500 and the TP sensor voltage less than 1.0 volt.

Set condition: The MAP sensor signal voltage is below 1.2 volts at start, or below .2 volt for 1.76 seconds with engine running.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5-volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP receives a 5-volt supply from PCM cavity 6; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

Possible causes:
> Open 5-volt supply circuit
> Signal circuit shorted to ground
> Failed sensor
> Failed PCM

Name of code: <u>No ASD Relay Output Voltage at PCM</u>

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: No voltage sensed at the powertrain control module when the auto shutdown relay is energized.

Theory of operation: When the ASD relay is energized, the relay's contacts connect the fused B(+) circuit to the relay output circuit. The powertrain control module is connected in parallel with the ASD relay output circuit. This connection provides the PCM with a circuit to monitor the ASD relay output state. Whenever the PCM energizes the ASD relay, it checks the feedback circuit to ensure voltage is present at the ASD relay output. If voltage is not present, a trouble code is set.

Possible causes:
> ASD relay output circuit open
> Fused B(+) circuit open
> ASD relay
> Circuit in powertrain control module

Name of code: <u>No Cam Signal at PCM</u>

When monitored: During engine cranking, after 32 crank position signals.

Set condition: No signal from the cam position sensor is present with crank signal.

Theory of operation: The cam position sensor is a hall effect-type sensor used to detect the camshaft position. The PCM supplies 8 volts from cavity 7 to power up the sensor. Sensor ground is provided by PCM cavity 4. The PCM also supplies a 5-volt pull-up voltage to the sensor, from cavity 44. The sensor signal is created by the slots cut in the camshaft sprocket passing under the sensor. When a slot is under the sensor, the signal is high (5 volts). When the metal between the slots is under the sensor, the signal is low (0.3 volt).

Possible causes:
> Open 8-volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Damaged pulse ring
> Failed sensor
> Failed PCM

Name of code: No Change in MAP From Start to Run

When monitored: With engine rpm above 400 but less than 1500 and the throttle body at closed throttle.

Set condition: Too small a difference is seen between barometric pressure at ignition on and manifold vacuum (engine running) for 1.72 seconds.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5-volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP receives a 5-volt supply from PCM cavity 6; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

Possible causes:
> Restricted or leaking vacuum/pressure to MAP sensor
> Ice in sensor or passage
> Failed sensor
> Failed PCM

Name of code: No Crank Reference Signal at PCM

When monitored: During engine cranking, with battery voltage less than 11.5 volts and manifold vacuum present.

Set condition: No signal from the crank position sensor is present during engine cranking, or the cam position signal is present with no crank signal.

Theory of operation: The crank position sensor is a hall effect-type sensor used to detect the crankshaft speed and position. The PCM supplies 8 volts from cavity 7 to power up the sensor. Sensor ground is provided by PCM cavity 4. The PCM also supplies a 5-volt pull-up voltage to the sensor from cavity 24. The sensor signal is created by the slots cut in the flywheel passing under the sensor. When a slot is under the sensor, the signal is high (5 volts). When the metal between the slots is under the sensor, the signal is low (0.3 volt).

Possible causes:
> Open or shorted 8-volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Excessive clearance between the sensor and flywheel
> Damaged flywheel
> Failed sensor
> Failed PCM

Name of code: No Vehicle Speed Sensor Signal

When monitored: With engine running more than 31 seconds, engine temperature greater than 120°F, transmission not in park or neutral, brakes not applied, engine rpm greater than 1800, and MAP vacuum less than 11".

Set condition: No signal from the vehicle speed sensor for more than 11 seconds.

Theory of operation: The vehicle speed sensor is a hall-effect type sensor used to detect the vehicle speed. The PCM calculates the vehicle speed based on the VSS signal. The PCM supplies 8 volts from cavity 7 to power up the sensor. Sensor ground is supplied by PCM cavity 4. The PCM also supplies a 5.0 volt pull up voltage to the sensor from cavity 47. The VSS signal is created when the sensor alternates the 5.0 volt pull up from high to low.

Possible causes:
> Open or shorted signal circuit
> Speedometer pinion damaged
> Open 8-volt supply circuit
> Open sensor ground circuit
> Failed vehicle speed sensor
> Failed PCM

Name of code: Rad Fan Control Relay Circuit

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the radiator fan relay control circuit.

Theory of operation: The radiator fan relay controls the operation of the radiator fan. The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). The PCM grounds the relay control circuit depending on coolant temperature. When the engine coolant temperature has reached the maximum temperature parameter, the relay will be grounded. Conversely, when the engine coolant temperature has acquired the minimum temperature parameter, the relay will remove the ground.

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Low speed radiator fan relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

Name of code: Slow Change in Idle MAP Sensor Signal

When monitored: With engine rpm above 600 but less than 1500 and the throttle position sensor voltage less than 1.0 volt.

Set condition: The variation in MAP signal is less than .157 volt between firing pulses of the engine.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5 volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP sensor receives a 5-volt supply from PCM cavity 6. Voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

Possible causes:

> Restricted or leaking vacuum/pressure to MAP sensor
> Ice in sensor or passage
> Failed sensor
> Failed PCM

Name of code: Speed Control Solenoid Circuits

When monitored: With the ignition key on, the SET button pressed, and the PCM sees voltage at cavity 23.

Set condition: When the powertrain control module actuates the vacuum and vent solenoids but they do not respond.

Theory of operation: When the "Set" switch is pressed, the vehicle must be moving forward at a speed between 35 - 85 mph, with the transmission gear selector in other than park or neutral. The PCM locks in a set speed. Then the PCM energizes the vacuum solenoid to open the throttle and actuates the vent solenoid to close the throttle. These actuations are dependent on power supplied to the servo from the speed control relay through the brake switch. The system is deactivated by pressing the brake, turning the on/off switch off, or vehicle speed falling below the minimum. Reactivation can be done by repeating the previous steps or pressing resume with the vehicle speed between 35 - 85 mph.

Possible causes:

> Solenoid control circuit open or shorted
> Vacuum or vent solenoid shorted or open
> Open power circuit to solenoids
> PCM failure

Name of code: SPI Communications (PCM Failure)

When monitored: With the ignition on.

Set condition: Serial communications inside the controller fail eight times.

Theory of operation: Communications between microprocessors inside the PCM are needed to operate the total system. If failure occurs, the solenoids and relays may not actuate properly.

Possible causes:
> PCM failure

Name of code: Throttle Position Sensor Voltage High

When monitored: With the ignition on.

Set condition: TP sensor voltage at PCM cavity 22 goes above 4.5 volts for .704 seconds.

Theory of operation: The throttle position sensor contains a potentiometer that is operated by the throttle blade shaft. As the throttle plate rotates, the TP sensor provides a variable 0 to 5-volt signal to PCM cavity 22. The voltage is directly proportional to throttle angle. When the throttle plate is at rest, the voltage is low. When the throttle is fully open, the voltage is high. With this signal, the PCM can determine precise throttle position under all operating conditions. The TP sensor receives a 5-volt supply from PCM cavity 6. The sensor ground is provided by PCM cavity 4.

Possible causes:
> Sensor signal circuit open
> Throttle position sensor failure
> Sensor ground circuit open

Name of code: Throttle Position Sensor Voltage Low

When monitored: With the ignition on.

Set condition: The TP sensor voltage at PCM cavity 22 goes below .2 volt for .704 seconds, or mph is above 20, rpm is above 1500, and vacuum is below 2" with TP sensor voltage less than .5 volt for .704 seconds.

Theory of operation: The throttle position sensor contains a potentiometer that is operated by the throttle blade shaft. As the throttle plate rotates, the TP sensor provides a variable 0 to 5-volt signal to PCM cavity 22. The voltage is directly proportional to throttle angle. When the throttle is fully open, the voltage is high. With this signal, the PCM can determine precise throttle position under all operating conditions. The TP sensor receives a 5-volt supply from PCM cavity 6. The sensor ground is provided by PCM cavity 4.

Possible causes:
> Sensor signal circuit shorted to ground
> Throttle position sensor failure
> Loss of 5-volt supply

3.3.5 Handling No Trouble Code Problems

After reading Section 3.0 (System Description and Functional Operation), you should have a better understanding of the theory and operation of the on-board diagnostics, and how this relates to the diagnosis of a vehicle that may have a driveability-related symptom or complaint.

The "no code" system is broken down into three test methods:

- No Code Complete Test
- No Code Quick Individual Test
- No Code Quick Symptom Test

3.4 Using the DRB

Refer to the DRB user's guide for instructions and assistance with reading trouble codes, erasing trouble codes, and other DRB functions.

3.5 DRBII Error Messages and Blank Screen

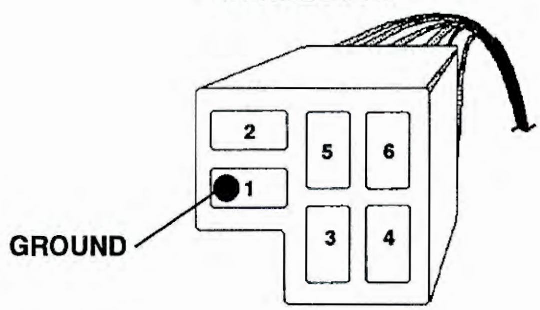
If any of the following error messages appear on the DRB screen, refer to the Vehicle Communications Manual for diagnosis and repair.

- cartridge error
- low battery
- ram test failure
- high battery
- keypad test failure

If the DRB has a blank screen, do the following:

- Ensure there is a good body ground at cavity 1 of the data link connector.
- Use the process of elimination: Sequentially substitute another cable, cartridge, and DRB until the condition is corrected.

DATA LINK CONNECTOR



3.6 DRBIII Error Messages and Blank Screen

Under normal operation, the DRB will display one of only two error messages:
- User-Requested WARM Boot or User-Requested COLD Boot

If the DRB should display any other error message, record the entire display and call the MDS Hotline, or call for information and assistance at 1-800-825-8737. This is a sample of such an error message display:

```
ver: 2.14
date: 26 Jul93
file: key_itf.cc
date: Jul 26 1993
line: 548
err: 0x1
User-Requested COLD Boot

Press MORE to switch between this display
   and the application screen.
Press F4 when done noting information.
```

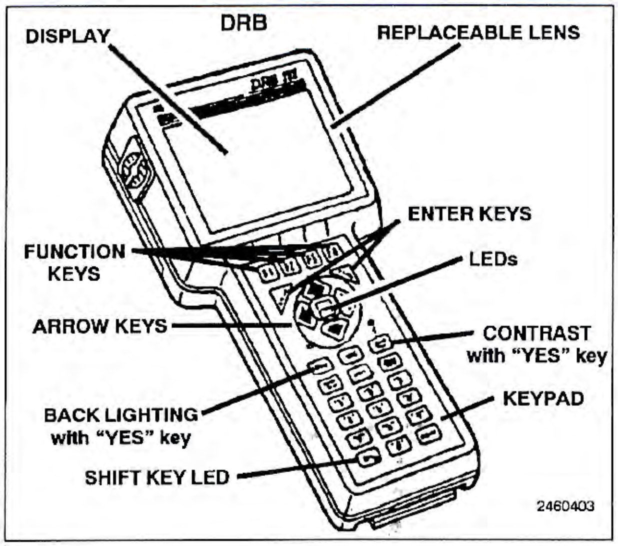
3.6.1 DRBIII Does Not Power Up

If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage. A minimum of 11 volts is required to adequately power the DRB.

If all connections are proper between the DRB and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRB may be the result of faulty cable or vehicle wiring. Perform Test 18A.

3.6.2 Display is Not Visible

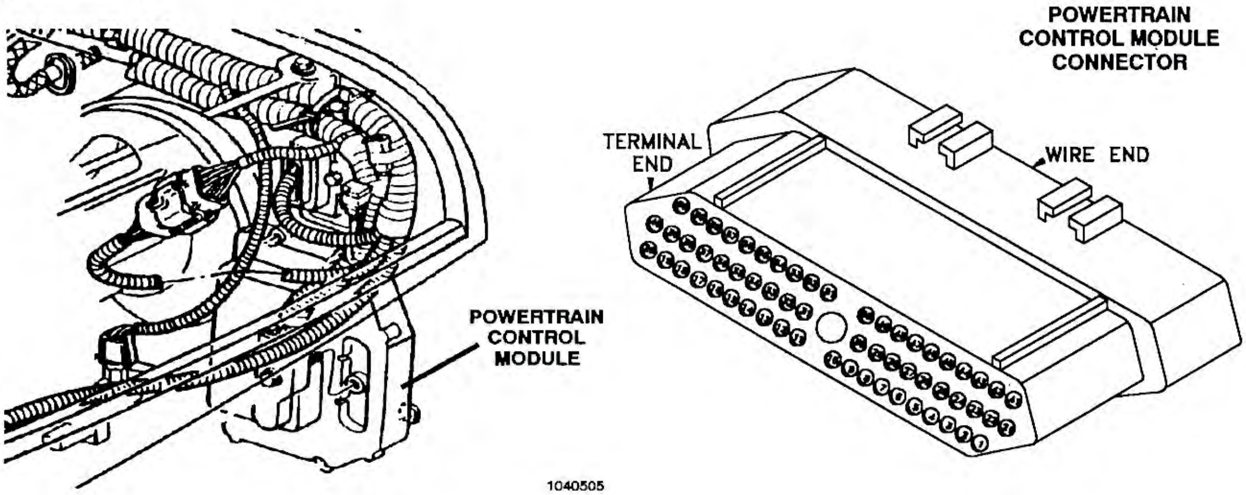
Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.



4.0 SYSTEM COMPONENT LOCATIONS

4.1 Powertrain Control Module

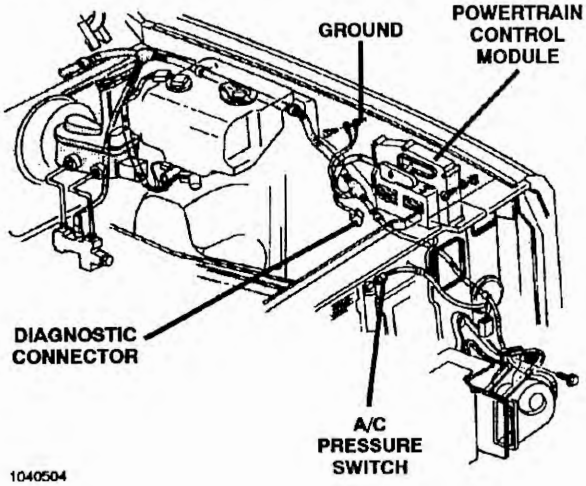
YJ BODY

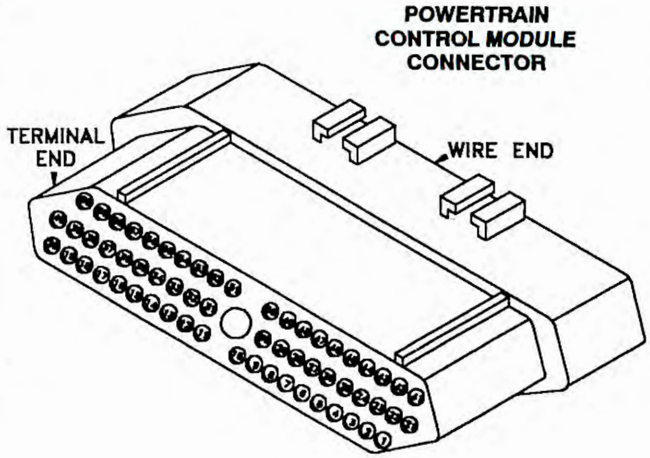


1040505

CAV	CIRCUIT	FUNCTION	CAV	CIRCUIT	FUNCTION
1	K1 DG/RD	MAP Sensor Signal	27	C91 LB	A/C Switch Sense
2	K2 TN/BK	Engine Coolant Temperature	28	C20 BR/RD	A/C Pressure Switch Output
		Sensor Signal	29	V40 WT/PK	Brake Switch Sense
3	A14 RD/WT	Fused B(+)	30	T41 BR/YL	Park/Neutral Switch Sense
4	K4 BK/LB	Sensor Ground	32	G3 BK/PK	Check Engine Lamp
5	Z11 BK/WT	Ground	34	C13 DB/OR	A/C Compressor Clutch Relay
6	K6 VT/WT	5-Volt Supply			Control
7	K7 OR	8-Volt Supply	38	K15 PK/BK	Injector #5 Driver (4.0L)
9	G50 WT/YL	Fused Ignition Switch Output	39	K39 GY/RD	Idle Air Control Motor #3 Driver
10	K10 DB/OR	Power Steering Pressure	40	K40 BR/WT	Idle Air Control Motor #1 Driver
		Switch Sense (2.5L)	41	K41 BK/DG	Oxygen Sensor Signal
11	Z1 BK	Ground	43	G21 GY/LB	Tachometer Signal
12	Z1 BK	Ground	44	K44 TN/YL	Camshaft Position Sensor
13	K14 LB/BR	Injector #4 Driver			Signal
14	K13 YL/WT	Injector #3 Driver	45	D20 LG	SCI Receive
15	K12 TN	Injector #2 Driver	47	G7 WT/OR	Vehicle Speed Sensor Signal
16	K11 WT/DB	Injector #1 Driver	51	K51 DB/YL	Auto Shutdown Relay Control
19	K19 GY	Ignition Coil Driver	54	K54 OR/BK	Torque Converter Clutch
20	K20 DG	Generator Field Driver			Solenoid Control
21	K21 BK/RD	Intake Air Temperature Signal	57	A142 DG/OR	Auto Shutdown Relay Output
22	K22 OR/DB	Throttle Position Sensor Signal	58	K16 LG/BK	Injector #6 Driver (4.0L)
24	K24 GY/BK	Crank Position Sensor Signal	59	K59 VT/BK	Idle Air Control Motor #4 Driver
25	D21 PK	SCI Transmit	60	K60 YL/BK	Idle Air Control Motor #2 Driver

XJ BODY

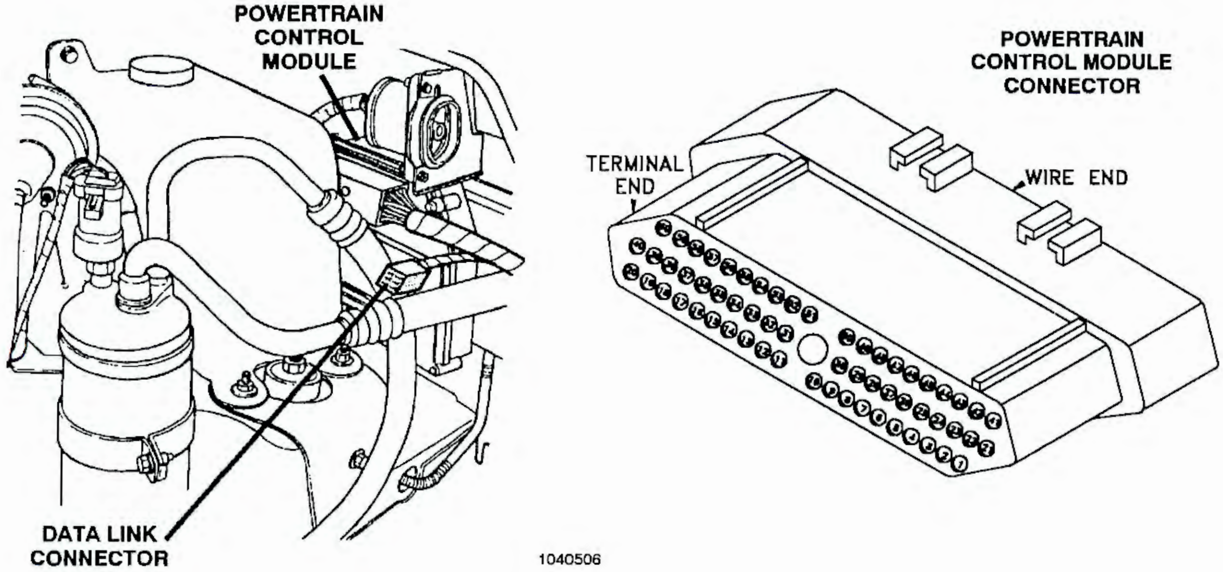




CAV	CIRCUIT	FUNCTION	CAV	CIRCUIT	FUNCTION
1	K1 DG/RD	MAP Sensor Signal	30	T41 BR/YL	Park/Neutral Switch Sense
2	K2 TN/BK	Engine Coolant Temperature Sensor Signal	31	C27 DB/PK	Radiator Fan Relay Control
3	A14 RD	Fused B(+)	32	G3 BK/PK	Check Engine Lamp
4	K4 BK/LB	Sensor Ground	33	V36 TN/RD	S/C Vacuum Solenoid Control
5	Z11 BK/WT	Ground	34	C13 DB/OR	A/C Compressor Clutch Relay Control
6	K6 VT/WT	5-Volt Supply	36	G12 DG/YL	Generator Lamp Driver
7	K7 OR	8-Volt Supply	38	K15 PK/BK	Injector #5 Driver (4.0L)
9	A21 DB	Fused Ignition Switch Output	39	K39 GY/RD	Idle Air Control Motor #3 Driver
10	K10 VT	Extended Idle (4.0L) 1995	40	K40 BR/WT	Idle Air Control Motor #1 Driver
10	K10 DB/WT	Power Steering Pressure Sense (2.5L) 1995	41	K41 BK/DG	Oxygen Sensor Signal
11	Z12 BK/TN	Ground	43	G21 GY/LB	Tachometer Signal
12	Z12 BK/TN	Ground	44	K44 TN/YL	Camshaft Position Sensor Sig
13	K14 LB/BR	Injector #4 Driver	45	D20 LG	SCI Receive
14	K13 YL/WT	Injector #3 Driver	46	D2 WT/BK	CCD Bus (-)
15	K12 TN	Injector #2 Driver	47	G7 WT/OR	Vehicle Speed Sensor Signal
16	K11 WT/DB	Injector #1 Driver	48	V31 BR/RD	S/C Coast/Set Switch Sense
19	K19 GY	Ignition Coil Driver	49	V32 YL/RD	S/C On/Off Switch Sense
20	K20 DG	Generator Field Driver	50	V33 WT/LG	S/C Resume Switch
21	K21 BK/RD	Intake Air Temperature Signal	51	K51 DB/YL	Auto Shutdown Relay Control
22	K22 OR/DB	Throttle Position Sensor Signal	53	V35 LG/RD	S/C Vent Solenoid Control
24	K24 GY/BK	Crank Position Sensor Signal	54	K54 OR/BK	Torque Converter Clutch Solenoid Control
25	D21 PK	SCI Transmit	57	A142 DG/OR	Auto Shutdown Relay Output
26	D1 VT/BR	CCD Bus (+)	58	K16 LG/BK	Injector #6 Driver (4.0L)
27	C91 LB	A/C Switch Sense	59	K59 VT/BK	Idle Air Control Motor #4 Driver
28	C90 LG	A/C Pressure Switch Output	60	K60 YL/BK	Idle Air Control Motor #2 Driver
29	K29 WT/PK	Brake Switch Sense			

4.1 Powertrain Control Module (continued)

ZJ BODY

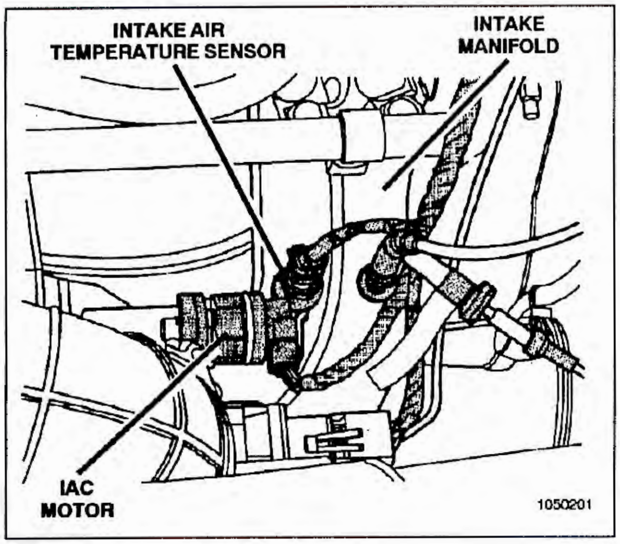


CAV	CIRCUIT	FUNCTION
1	K70 RD/WT	MAP Sensor Signal
2	K2 TN/BK	Engine Coolant Temperature Sensor Signal
3	A5 RD	Fused B(+)
4	K4 BK/LB	Sensor Ground
5	Z12 BK/TN	Ground
6	K6 VT/WT	5-Volt Supply
7	K25 WT/BK	8-Volt Supply
9	F86 LB/RD	Fused Ignition Switch Output
11	Z12 BK/TN	Ground
12	Z12 BK/TN	Ground
13	K14 LB/BR	Injector #4 Driver
14	K13 YL/WT	Injector #3 Driver
15	K12 TN	Injector #2 Driver
16	K11 WT/DB	Injector #1 Driver
19	K19 GY/WT	Ignition Coil Driver
20	K20 DG	Generator Field Driver
21	K21 BK/RD	Intake Air Temperature Signal
22	K22 OR/DB	Throttle Position Sensor Signal
24	K27 RD/LG	Crank Position Sensor Signal
25	D84 BK	SCI Transmit
26	D1 VT/BR	CCD Bus (+)
27	C21 DB/OR	A/C Switch Sense
28	C90 LG	A/C Pressure Switch Output
29	L53 BR	Brake Switch Sense
30	T41 BK/WT	Park/Neutral Switch Sense
32	G3 BK/PK	Check Engine Lamp

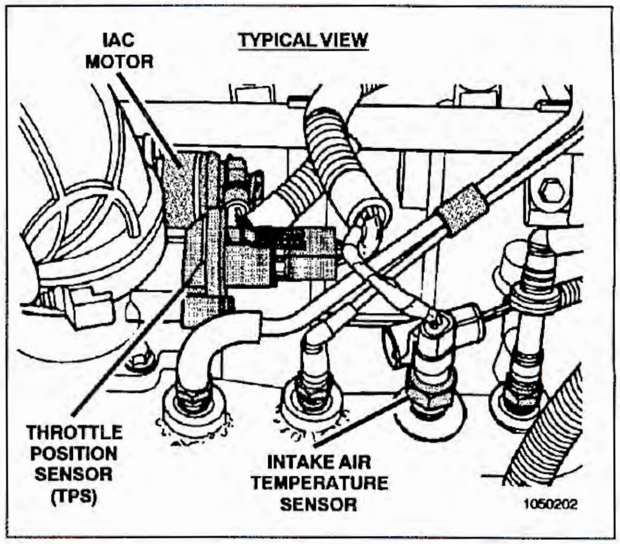
CAV	CIRCUIT	FUNCTION
33	V36 TN/RD	S/C Vacuum Solenoid Control
34	C13 DB/RD	A/C Compressor Clutch Relay Control
38	K38 GY	Injector #5 Driver
39	K60 YL/BK	Idle Air Control Motor #3 Driver
40	K40 BR/WT	Idle Air Control Motor #1 Driver
41	K41 BK/OR	Oxygen Sensor Signal
43	G21 GY/LB	Tachometer Signal
44	K24 GY/BK	Camshaft Position Sensor Signal
45	D83 BK/YL	SCI Receive
46	D2 WT/GY	CCD Bus (-)
47	G7 WT/OR	Vehicle Speed Sensor Signal
48	V31 BR/RD	S/C Coast/Set Switch Sense
49	V32 YL/RD	S/C On/Off Switch Sense
50	V33 WT/LG	S/C Resume Switch Sense
51	K81 PK	Auto Shutdown Relay Control
52	K52 PK/BK	Evap Emission Solenoid Control
53	V35 LG/RD	S/C Vent Solenoid Control
54	K54 OR/BK	Shift Indicator Lamp Driver (manual only)
57	A61 DG/BK	Auto Shutdown Relay Output
58	K58 BR/YL	Injector #6 Driver
59	K39 GY/RD	Idle Air Control Motor #4 Driver
60	K59 VT/BK	Idle Air Control Motor #2 Driver

4.2 Controls and Solenoids

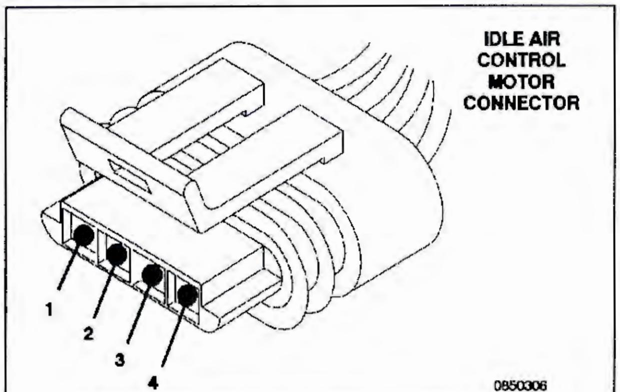
2.5L ENGINE



4.0L ENGINE

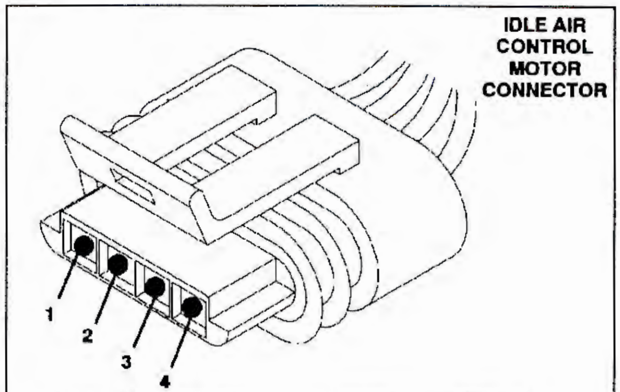


XJ AND YJ BODIES



CAV	COLOR	FUNCTION
1	GY/RD	IDLE AIR CONTROL #3 DRIVER
2	YL/BK	IDLE AIR CONTROL #2 DRIVER
3	BR/WT	IDLE AIR CONTROL #1 DRIVER
4	VT/BK	IDLE AIR CONTROL #4 DRIVER

ZJ BODY

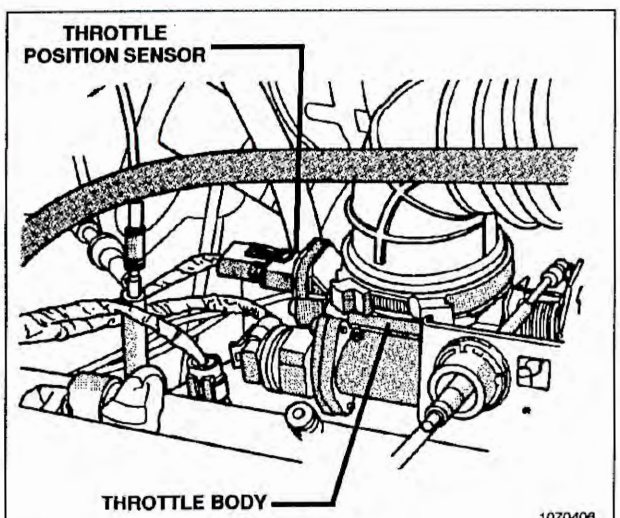


CAV	COLOR	FUNCTION
1	YL/BK	IDLE AIR CONTROL #3 DRIVER
2	VT/BK	IDLE AIR CONTROL #2 DRIVER
3	BR/WT	IDLE AIR CONTROL #1 DRIVER
4	GY/RD	IDLE AIR CONTROL #4 DRIVER

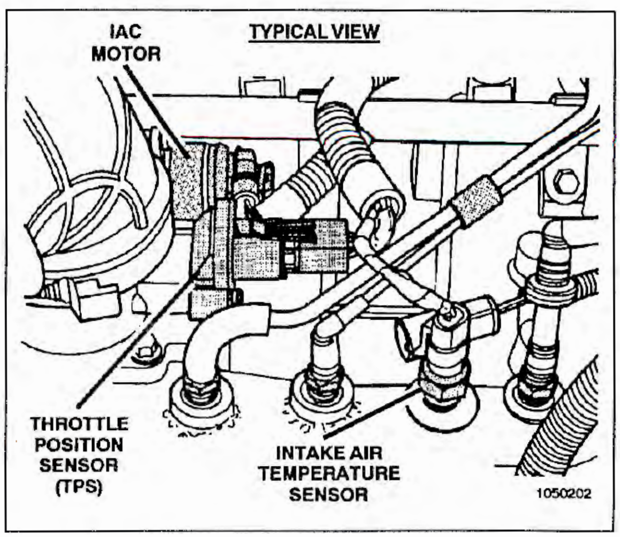
1090606

4.3 Engine Sensors

2.5L ENGINE

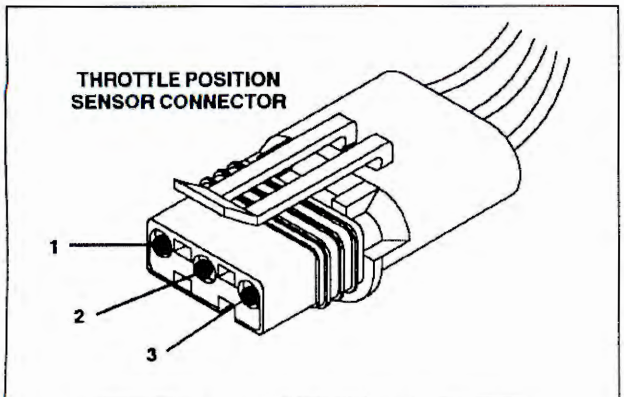


4.0L ENGINE



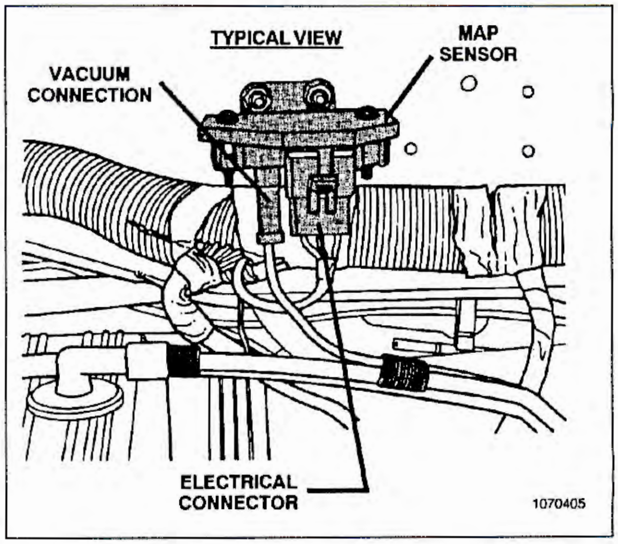
GENERAL INFORMATION

4.3 Engine Sensors (continued)

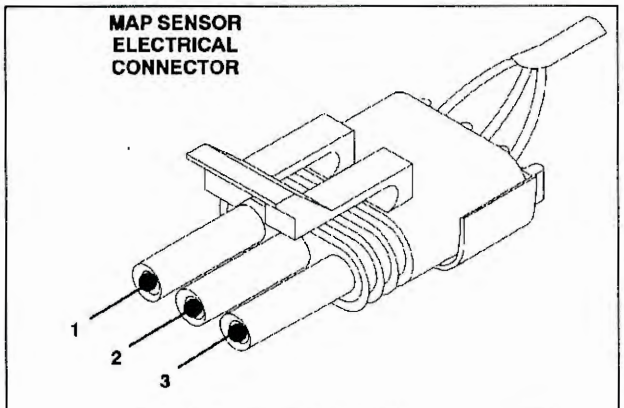


CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	VT/WT	5 VOLT SUPPLY

0790302



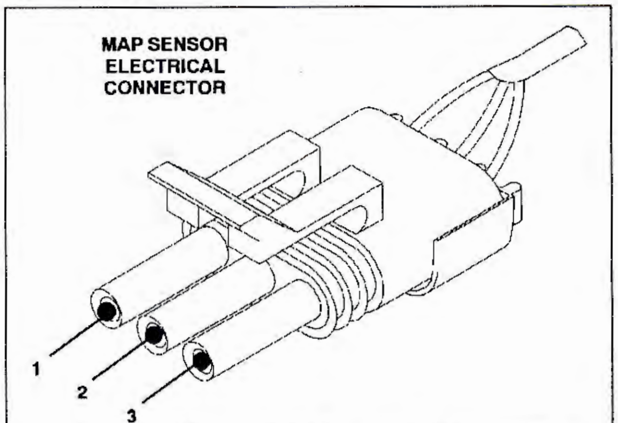
XJ AND YJ BODIES



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	DG/RD	MAP SENSOR SIGNAL
3	VT/WT	5-VOLT SUPPLY

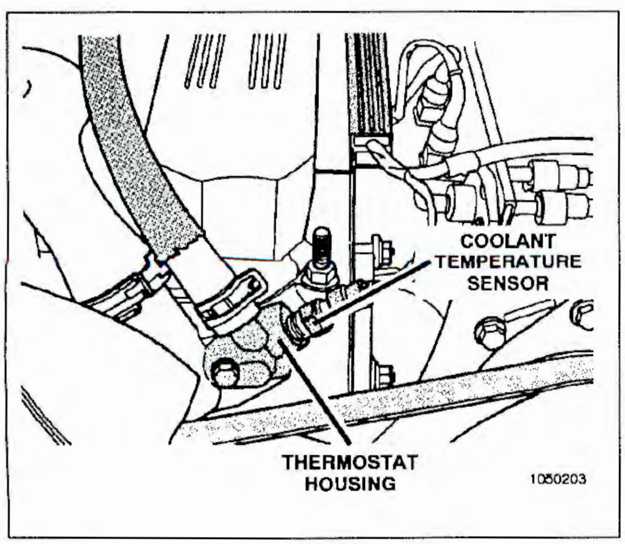
1160501

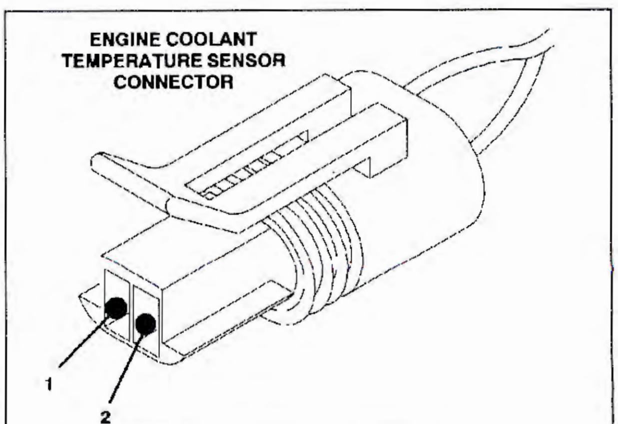
ZJ BODY



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	5-VOLT SUPPLY

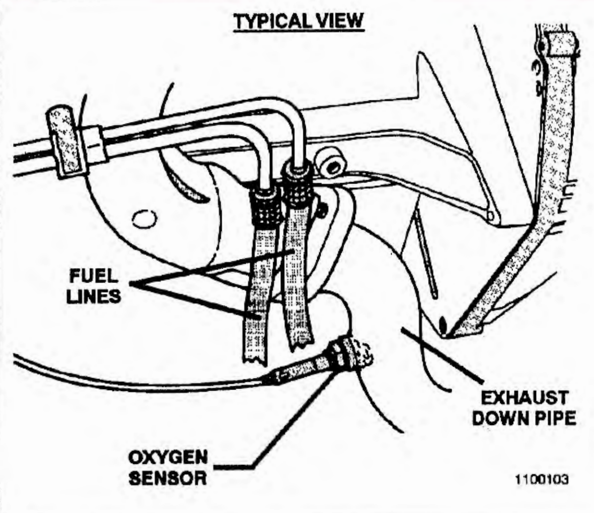
1080408





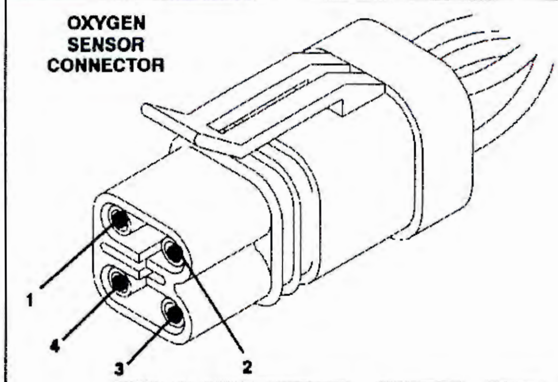
CAV	COLOR	FUNCTION
1	TN/BK	ECT SENSOR SIGNAL
2	BK/LB	SENSOR GROUND

0970305



1100103

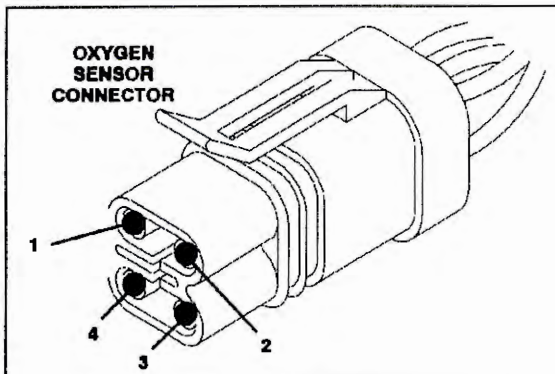
XJ BODY



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	BK/DG	SENSOR SIGNAL
3	BK/TN	HEATER GROUND
4	DG/*	FUEL PUMP RELAY OUTPUT

1060504

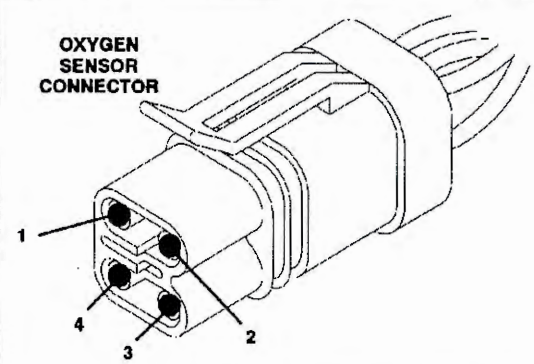
YJ BODY



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	BK/DG	SENSOR SIGNAL
3	BK	HEATER GROUND
4	DG/OR	FUEL PUMP RELAY OUTPUT

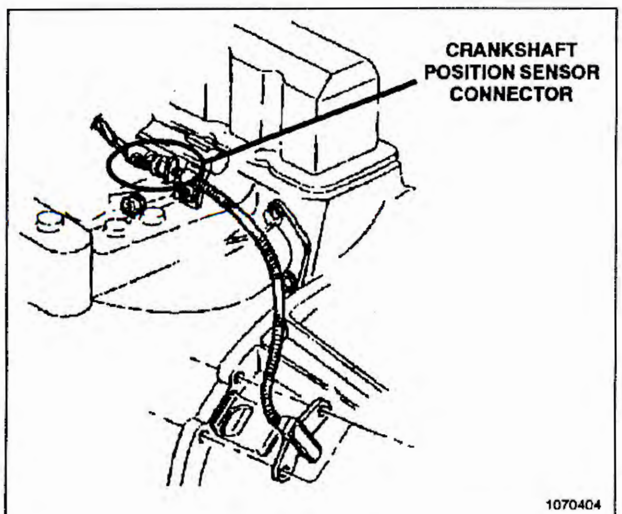
1090604

ZJ BODY



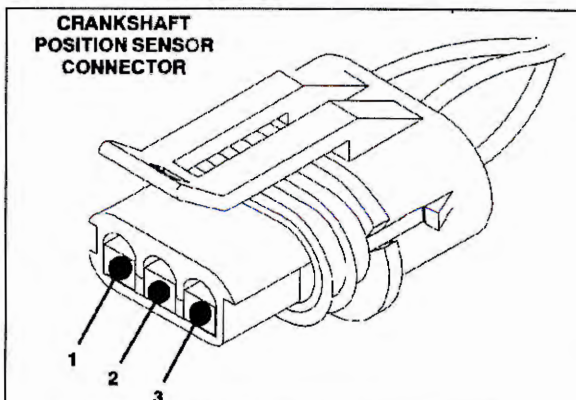
CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	BK/OR	SENSOR SIGNAL
3	BK/TN	HEATER GROUND
4	OR/DB	FUEL PUMP RELAY OUTPUT

1090605



1070404

XJ AND YJ BODIES

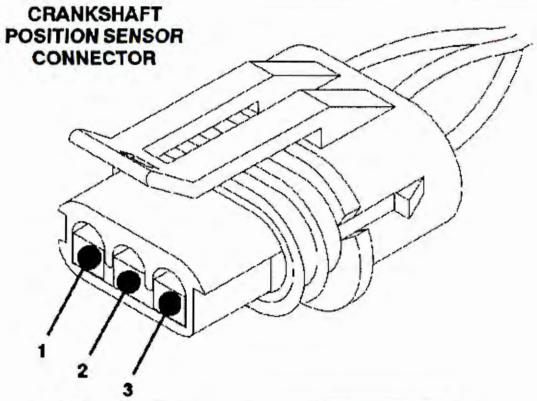


CAV	COLOR	FUNCTION
1	GY/BK	CKP SENSOR SIGNAL
2	BK/LB	SENSOR GROUND
3	OR	8-VOLT SUPPLY

1070201

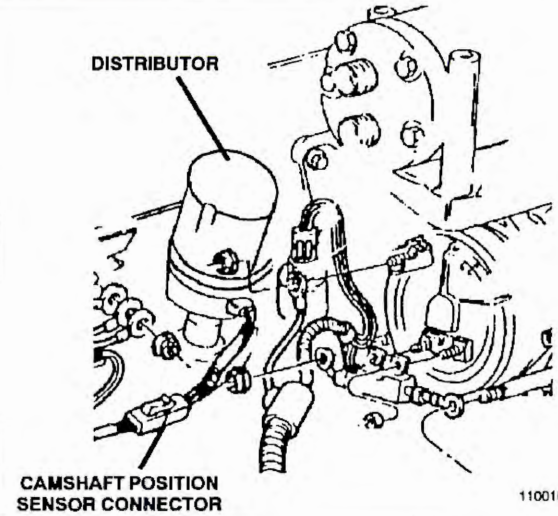
4.3 Engine Sensors (continued)

ZJ BODY



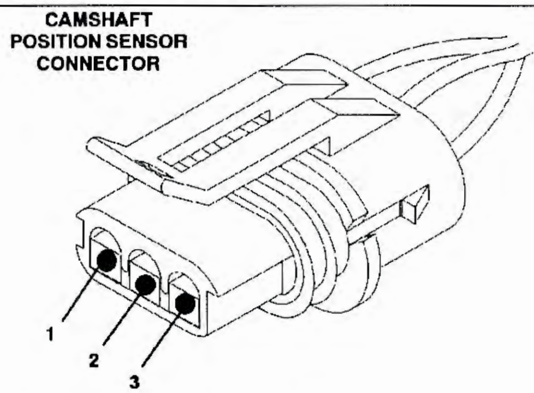
CAV	COLOR	FUNCTION
1	RD/LG	CKP SENSOR SIGNAL
2	BK/LB	SENSOR GROUND
3	WT/BK	8-VOLT SUPPLY

1070202



1100106

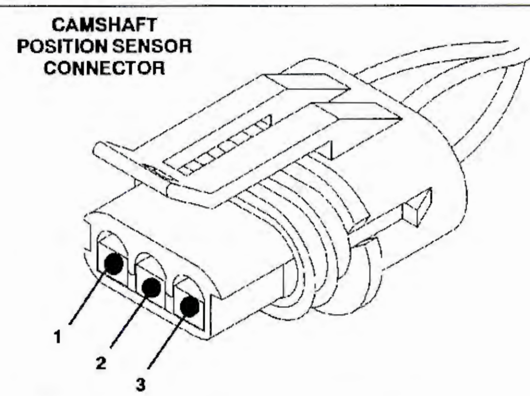
XJ AND YJ BODIES



CAV	COLOR	FUNCTION
1	TN/YL	CMP SENSOR SIGNAL
2	BK/LB	SENSOR GROUND
3	OR	8-VOLT SUPPLY

1070605

ZJ BODY

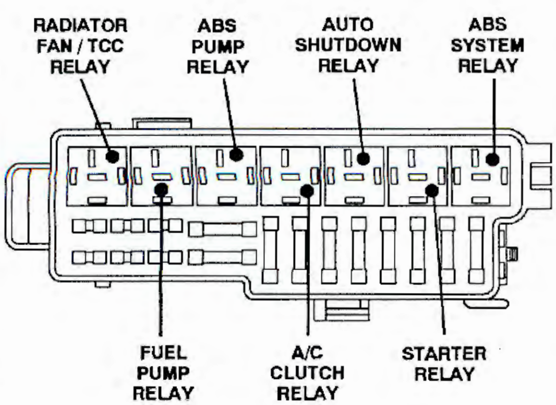


CAV	COLOR	FUNCTION
1	GY/BK	CMP SIGNAL
2	BK/LB	SENSOR GROUND
3	WT/BK	8-VOLT SUPPLY

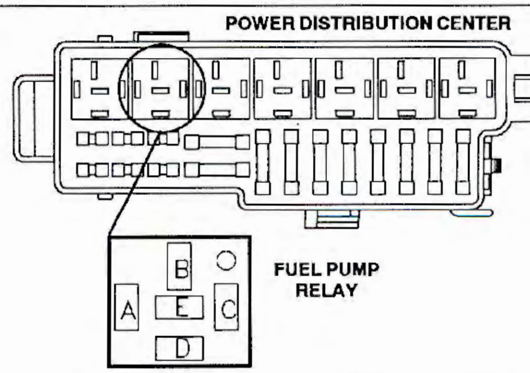
1070606

4.4 Relays

XJ BODY



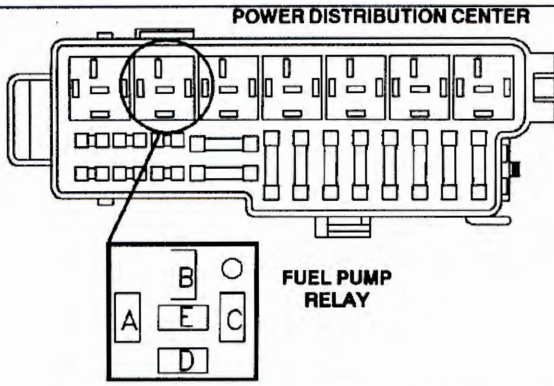
1040404



1100203

CAV	COLOR	FUNCTION
A	DB	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/*	FUEL PUMP RELAY OUTPUT

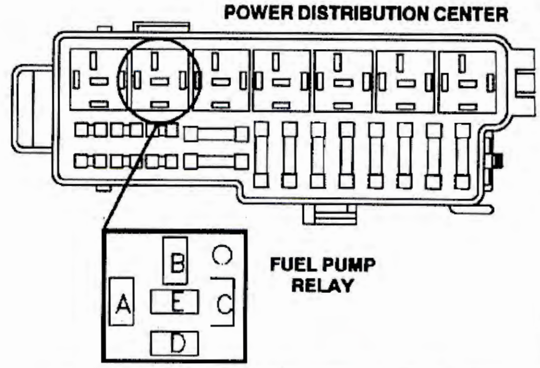
YJ BODY



CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/BK	FUEL PUMP RELAY OUTPUT

1100204

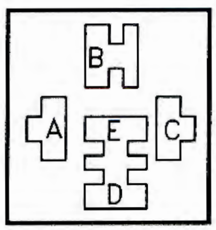
ZJ BODY



CAV	COLOR	FUNCTION
A	LB/RD	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	PK	ASD RELAY CONTROL
D	OR/DB	FUEL PUMP RELAY OUTPUT

1100205

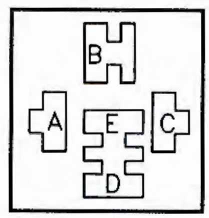
XJ BODY



AUTO SHUTDOWN RELAY

CAV	COLOR	FUNCTION
A	DB	FUSED IGNITION SW OUTPUT
B	RD/BK	B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/OR	ASD RELAY OUTPUT

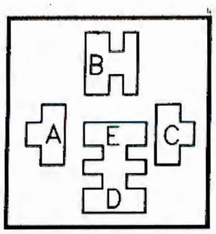
YJ BODY



AUTO SHUTDOWN RELAY

CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGNITION SW OUTPUT
B	RD/WT	B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/OR	ASD RELAY OUTPUT

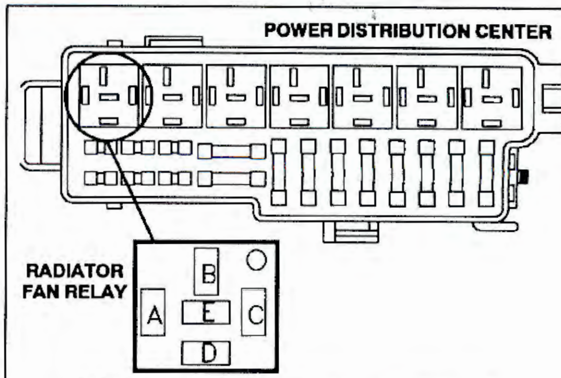
ZJ BODY



AUTO SHUTDOWN RELAY

CAV	COLOR	FUNCTION
A	LB/RD	FUSED IGNITION SW OUTPUT
B	RD	B(+)
C	PK	ASD RELAY CONTROL

XJ BODY

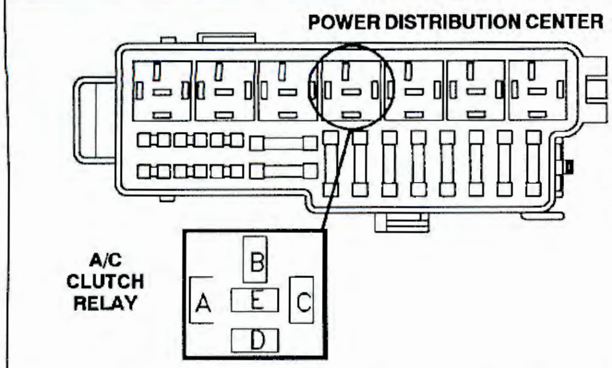


CAV	COLOR	FUNCTION
A	DB/WT	FUSED IGN SW OUTPUT
B	LG/RD	FUSED B(+)
C	DB/PK	RAD FAN RELAY CONTROL
D	LG	RAD FAN RELAY OUTPUT

1040403

4.4 Relays (continued)

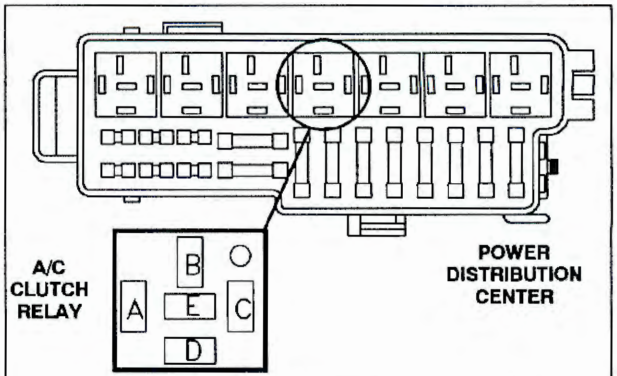
XJ BODY



CAV	COLOR	FUNCTION
A	DB/WT	FUSED IGN SW OUTPUT
B	LG	A/C PRESSURE SWITCH OUTPUT
C	DB/OR	A/C CMP CLUTCH RLY CTRL
D	DB/BK	A/C CLUTCH RLY OUTPUT

1040305

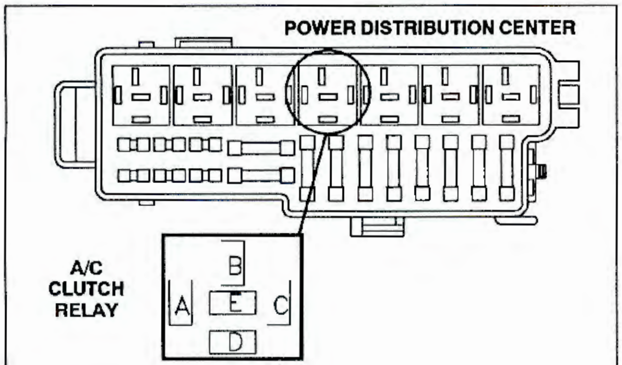
YJ BODY



CAV	COLOR	FUNCTION
A	DB/OR	A/C CMP CLUTCH RLY CTRL
B	DB/BK	A/C CLUTCH RLY OUTPUT
C	DB/WT	FUSED IGN SW OUTPUT
D	BR/RD	A/C PRESS SW OUTPUT
E	BK	GROUND

1070106

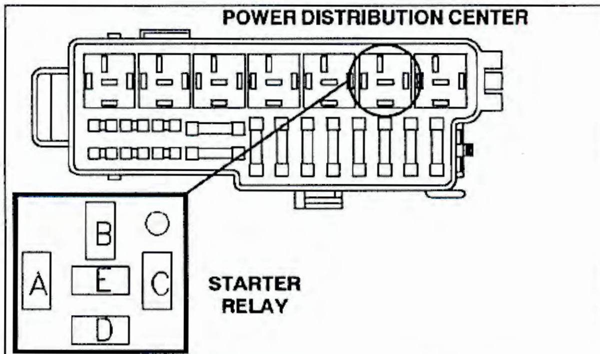
ZJ BODY



CAV	COLOR	FUNCTION
A	YL/DG	FUSED IGN SW OUTPUT
B	DB/OR	A/C SWITCH SENSE
C	DB/RD	A/C CMP CLUTCH RLY CTRL
D	DB/YL	A/C CLUTCH RLY OUTPUT

1040306

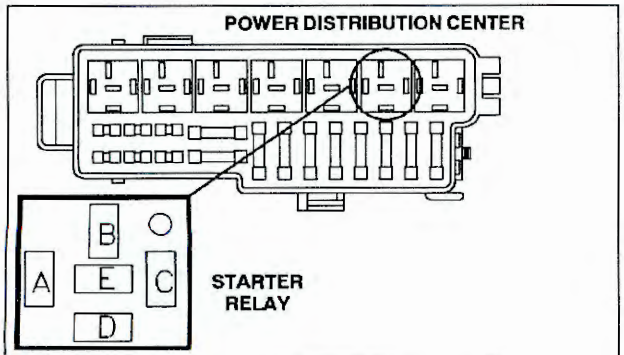
XJ BODY



CAV	COLOR	FUNCTION
A	YL	IGN SW OUTPUT (START)
B	BK/RD	FUSED B(+)
C	BR/YL	PNP SWITCH SENSE (AUTO)
C	BK/TN	GROUND (MANUAL)
D	BR	STARTER RELAY OUTPUT

2260505

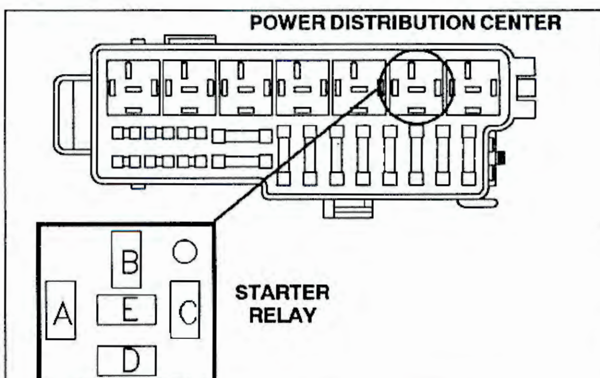
YJ BODY



CAV	COLOR	FUNCTION
A	YL	IGN SW OUTPUT (START)
B	RD	FUSED B(+)
C	BR/YL	PNP SWITCH SENSE (AUTO)
C	BK/OR	GROUND (MANUAL)
D	BR	STARTER RELAY OUTPUT

2260504

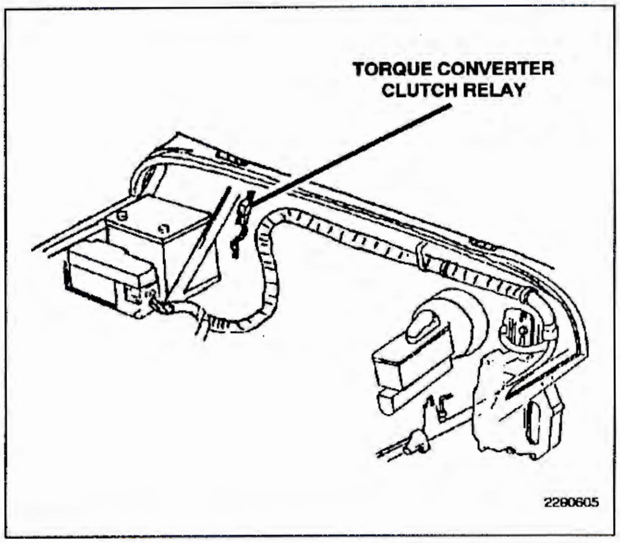
ZJ BODY



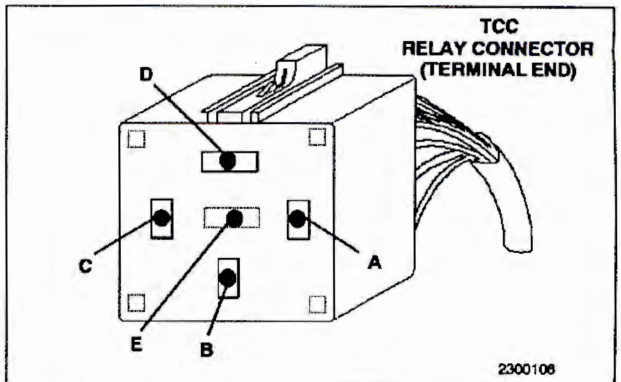
CAV	COLOR	FUNCTION
A	YL/DB	IGN SW OUTPUT (START)
B	RD/WT	FUSED B(+)
C	BK/WT	PARK/NEUTRAL SWITCH SENSE
D	LG/BK	STARTER RELAY OUTPUT

2260503

YJ BODY

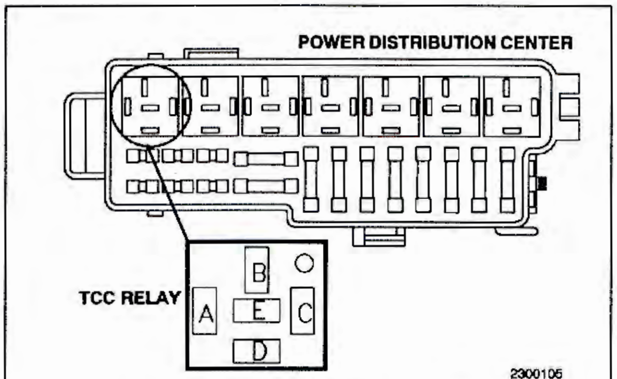


YJ BODY



CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	B(+)
C	OR/BK	TCC SOLENOID/RELAY CONTROL
D	DB/TN	TCC RLY OUTPUT

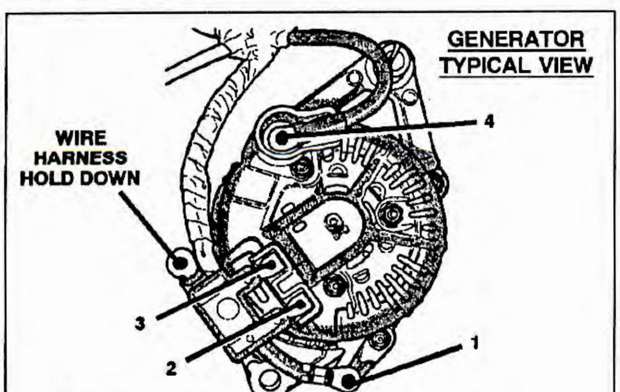
XJ BODY



CAV	COLOR	FUNCTION
A	YL	FUSED IGN SW OUTPUT
B	YL	FUSED IGN SW OUTPUT
C	OR/BK	TCC SOLENOID/RELAY CONTROL
D	DB/WT	TCC RELAY OUTPUT

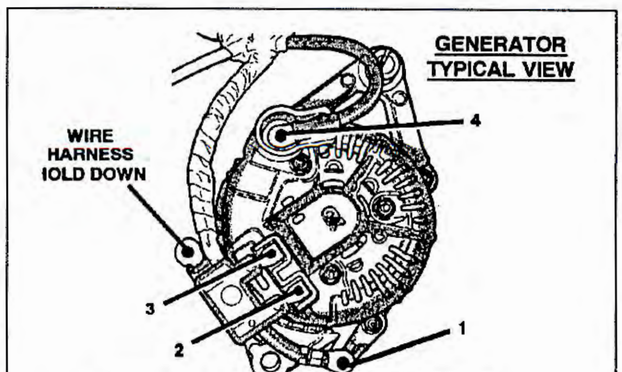
4.5 Charging System

XJ BODY



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/OR	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	BK/WT	B(+)

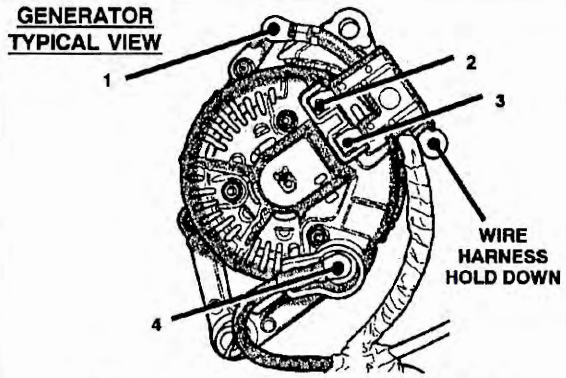
YJ BODY



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG	GENERATOR FIELD DRIVER
3	DG/OR	ASD RELAY OUTPUT
4	BK/GY	B(+)

4.5 Charging (continued)

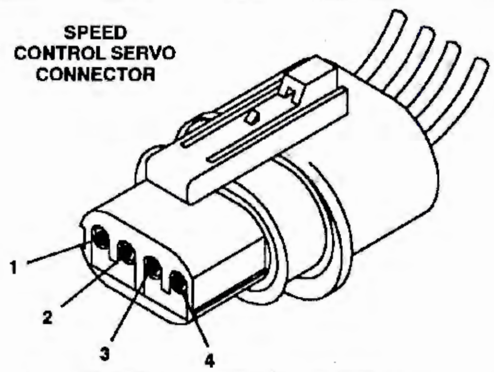
ZJ BODY



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/BK	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	RD	B(+)

1320406

4.6 Speed Control



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/*	SC BRAKE SWITCH OUTPUT
3	LG/RD	SC VENT SOLENOID CONTROL
4	TN/RD	SC VACUUM SOLENOID CONTROL

1260602

5.0 DISCLAIMERS, SAFETY, WARNINGS

5.1 Disclaimers

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

5.2 Safety

5.2.1 Technician Safety Information

DANGER!!! Engines produce carbon monoxide that is odorless, causes slower reaction time, and can lead to serious injury. When the engine is operating, keep service areas WELL VENTILATED or attach the vehicle exhaust system to the shop exhaust removal system.

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-wheel drive vehicles; the praking brake does not hold the drive wheels.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing a powertrain system problem, it is important to follow approved procedures where applicable. These procedures can be found in General Information Section 9.0 (Specifications) or in service manual procedures. Following these procedures is very important to the safety of individuals performing diagnostic tests.

5.2.2 Vehicle Preparation for Testing

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic codes or error messages may occur.

5.2.3 Servicing Sub-Assemblies

Some components of the powertrain system are intended to be serviced in assembly only. Attempting to remove or repair certain system sub-components may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

5.2.4 DRBIII Safety Information

WARNING: Exceeding the limits of the DRB multimeter is dangerous. It can expose you to serious or possibly fatal injury. Carefully read and understand the cautions and the specification limits.

- Follow the vehicle manufacturer's service specifications at all times.
- Do not use the DRB if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips, or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.
- Do not exceed the limits shown in the table below:

FUNCTION	INPUT LIMIT
Volts	0 - 500 peak volts AC 0 - 500 volts DC
Ohms (resistance)*	0 - 1.12 megohms
Frequency Measured Frequency Generated	0 - 10 kHz
Temperature	-58 - 1100° F -50 - 600° C

* Ohms cannot be measured if voltage is present. Ohms can be measured only in a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- The circuit being tested must be protected by a 10A fuse or circuit breaker.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with the load.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the meter function, keep the DRB away from spark plug or coil wires to avoid measuring error from outside interference.

5.3 Warnings

5.3.1 Vehicle Damage Warnings

Before disconnecting any control module, make sure the ignition is "off." Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal side (not the wire end) of the connector. Do not probe a wire through the insulation; this will damage it and eventually cause it to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second code could be set, making diagnosis of the original problem more difficult.

5.3.2 Road Testing a Complaint Vehicle

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not try to read the DRB screen while in motion. Do not hang the DRB from the rear view mirror or operate it yourself. Have an assistant available to operate the DRB.

7.1 GENERAL TROUBLESHOOTING

TROUBLE CODE TESTS

TEST TC-1A	CHECKING THE SYSTEM FOR DIAGNOSTIC TROUBLE CODES (DTCs)

NOTE: The battery must be fully charged for any test in this manual.

1. Attempt to start the engine. Crank for up to 10 seconds if necessary.

2. Connect the DRB to the engine diagnostic connector. Write down the trouble codes that are displayed.

3. If the DRB screen displays "No Response", go to **TEST NS-6A.**

4. If the DRB screen is blank or has a DRB error message, go to **General Information Section 3.5 or 3.6** in this manual.

5. If **trouble code messages** are displayed, refer to the trouble code list below and on the next page for the appropriate test.

6. If there are **no trouble codes** displayed, refer to one of the following:
   For Driveability problems NTC-1A
   For No Start problems NS-1A
   For Speed Control problems SC-1A
   For Charging problems CH-1A

DIAGNOSTIC TROUBLE CODE (DTC) DISPLAYED	DIAGNOSTIC TEST
NO CRANK REFERENCE SIGNAL AT PCM	TC- 2A
NO CAM SIGNAL AT PCM	TC- 3A
SLOW CHANGE IN IDLE MAP SENSOR SIGNAL	TC- 4A
NO CHANGE IN MAP FROM START TO RUN	TC- 4A
MAP SENSOR VOLTAGE TOO LOW	TC- 5A
MAP SENSOR VOLTAGE TOO HIGH	TC- 6A
NO VEHICLE SPEED SENSOR SIGNAL	TC- 7A
O2S STAYS AT CENTER	TC- 8A
O2S SHORTED TO VOLTAGE	TC- 9A
O2S STAYS ABOVE CENTER (RICH)	TC-10A
O2S STAYS BELOW CENTER (LEAN)	TC-11A
ECT SENSOR VOLTAGE TOO HIGH	TC-12A
ECT SENSOR VOLTAGE TOO LOW	TC-13A
INTAKE AIR TEMP SENSOR VOLTAGE LOW	TC-14A
INTAKE AIR TEMP SENSOR VOLTAGE HIGH	TC-15A
THROTTLE POSITION SENSOR VOLTAGE HIGH	TC-16A
THROTTLE POSITION SENSOR VOLTAGE LOW	TC-17A
IDLE AIR CONTROL MOTOR CIRCUITS	TC-18A
INJECTOR CONTROL CIRCUIT	TC-19A
A/C CLUTCH RELAY CIRCUIT	TC-25A
RAD FAN CONTROL RELAY CIRCUIT	TC-26A
AUTO SHUTDOWN RELAY CONTROL CIRCUIT	TC-27A
NO ASD RELAY OUTPUT VOLTAGE AT PCM	TC-28A
PCM FAILURE SRI MILE NOT STORED	TC-29A
PCM FAILURE EEPROM WRITE DENIED	TC-30A
FUEL PUMP RESISTOR BYPASS RELAY CKT	TC-31A
SPEED CONTROL SOLENOID CIRCUITS	TC-32A
GENERATOR FIELD NOT SWITCHING PROPERLY	TC-33A

TEST TC-1A	CHECKING THE SYSTEM FOR DIAGNOSTIC TROUBLE CODES (DTCs)

DIAGNOSTIC TROUBLE CODE (DTC) DISPLAYED	DIAGNOSTIC TEST
BATTERY TEMP SENSOR VOLTS OUT OF LIMIT	TC-34A
CHARGING SYSTEM VOLTAGE TOO LOW	TC-35A
CHARGING SYSTEM VOLTAGE TOO HIGH	TC-36A
TORQUE CONVERTER CLUTCH SOLENOID CKT	TC-37A
EVAP SOLENOID CIRCUIT	TC-38A

For an ENGINE IS COLD TOO LONG trouble code, the engine does not warm to 176°F while driving for 20 minutes after start. See the service manual for cooling system repair (thermostat).

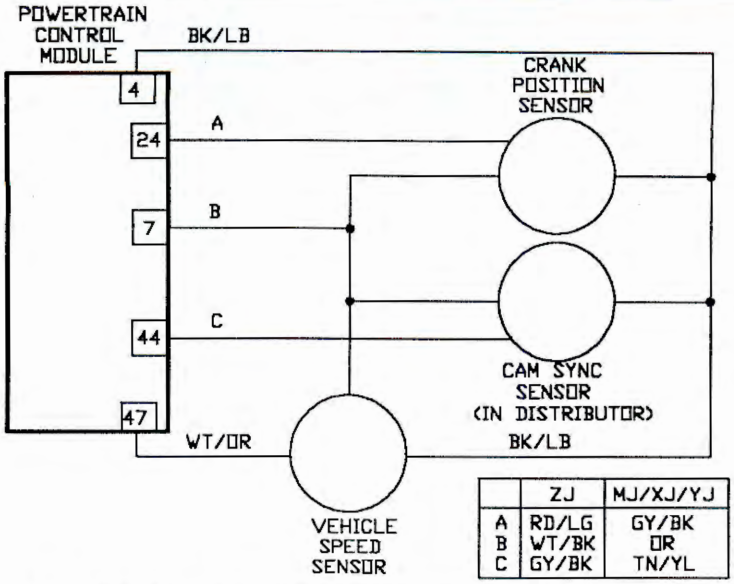
For an INTERNAL CONTROLLER FAILURE trouble code, replace the powertrain control module and go to **Verification TEST VER-2A.**

For a PCM FAILURE SPI COMMUNICATIONS trouble code, replace the powertrain control module and go to **Verification TEST VER-2A.**

TROUBLE CODE TESTS

TEST TC-2A | REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST TC-1A Before Proceeding



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

1500203

Name of code: No Crank Reference Signal at PCM

When monitored: During engine cranking, with battery voltage less than 11.5V and manifold vacuum present.

Set condition: No signal from the crank position sensor is present during engine cranking, or the cam position signal is present with no crank signal.

Theory of operation: The crank position sensor is a hall effect-type sensor used to detect the crankshaft speed and position. The PCM supplies 8 volts from cavity 7 to power up the sensor. Sensor ground is provided by PCM cavity 4. The PCM also supplies a 5-volt pull-up voltage to the sensor from cavity 24. The sensor signal is created by the slots cut in the flywheel passing under the sensor. When a slot is under the sensor, the signal is high (5V). When the metal between the slots is under the sensor, the signal is low (0.3V).

Possible causes:
> Open or shorted 8-volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Excessive clearance between the sensor and flywheel
> Damaged flywheel
> Failed sensor
> Failed PCM

0860601

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

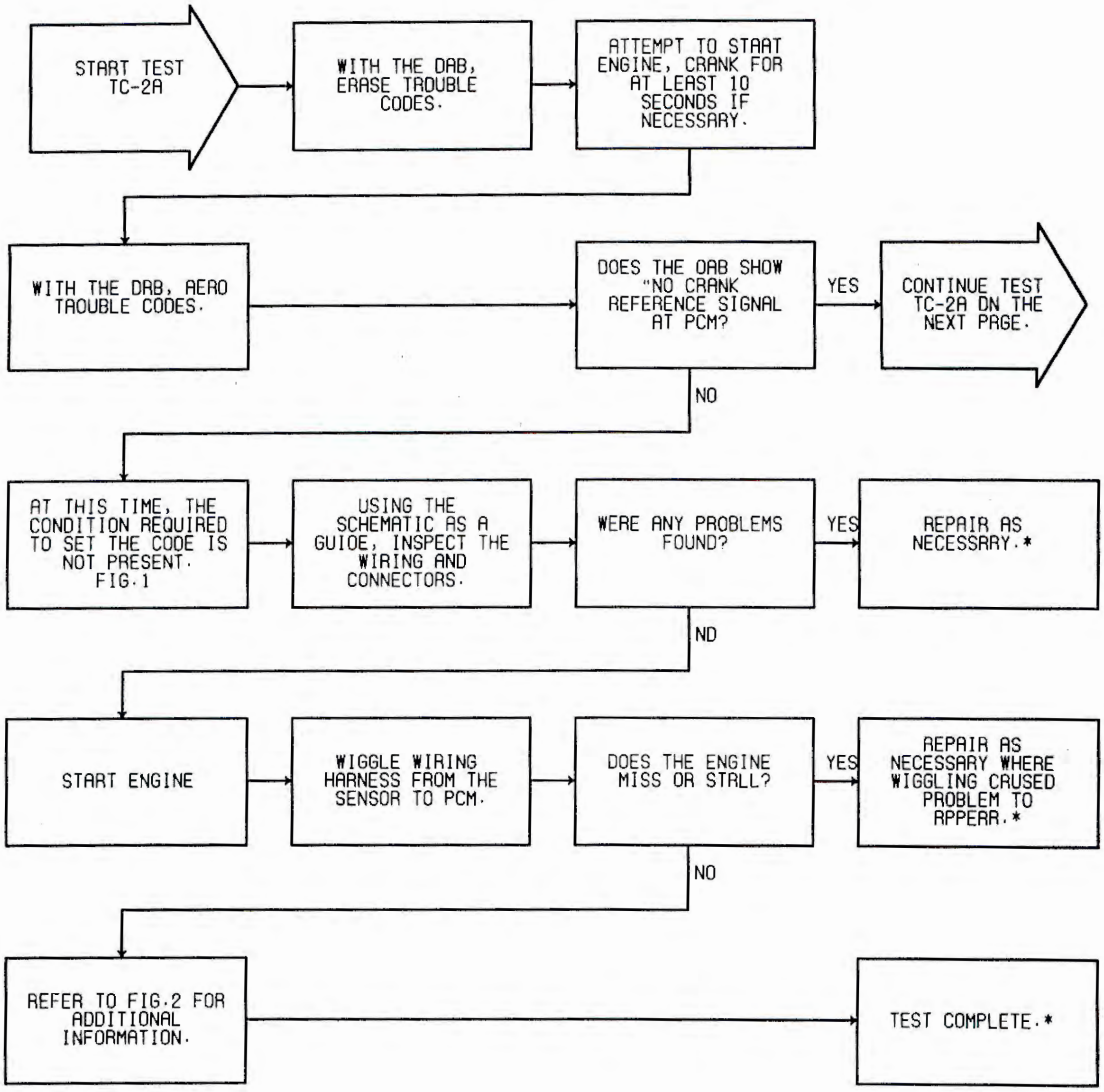
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

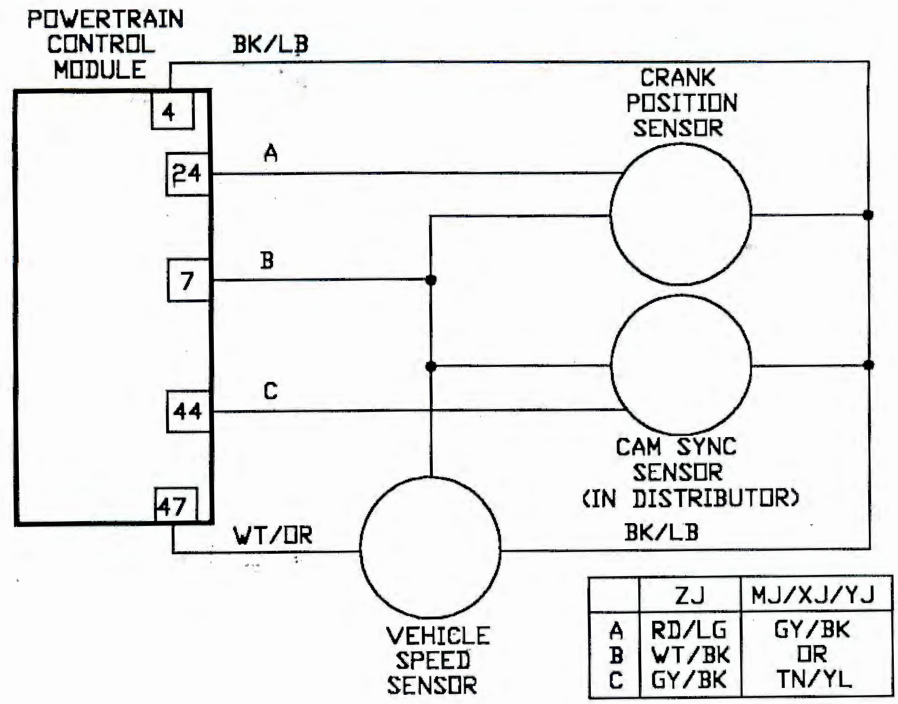
TEST TC-2A REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST TC-1A Before Proceeding

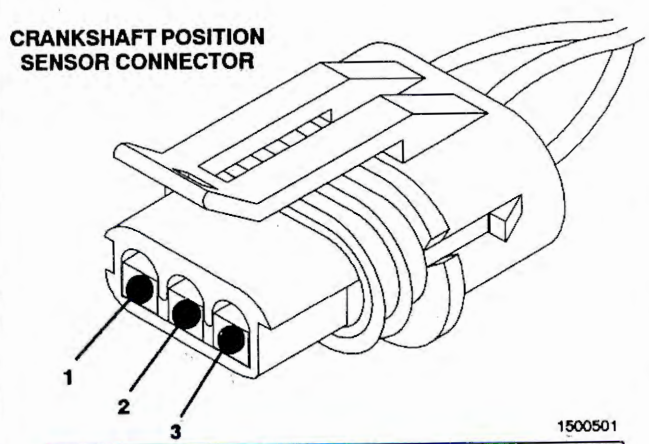


****Perform Verification TEST VER-2A.***	*****Check connectors – Clean / repair as necessary.***

TEST TC-2A CONTINUED - REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM



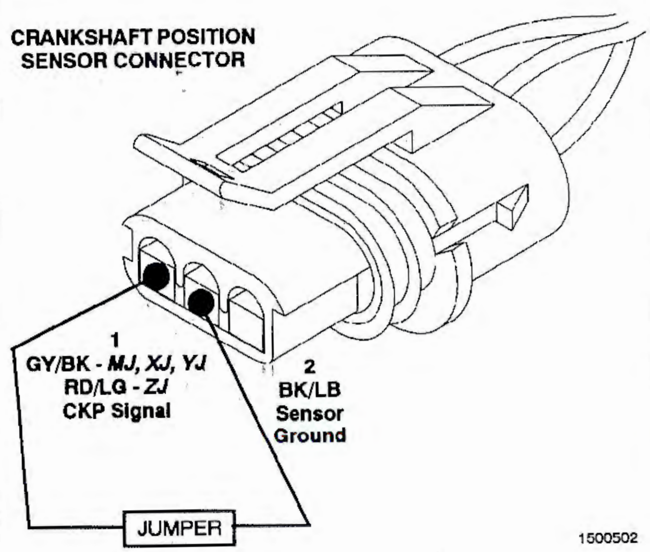
1500203



1500501

CAV	MJ, XJ, YJ	ZJ	FUNCTION
1	GY/BK	RD/LG	CKP SIGNAL
2	BK/LB	BK/LB	SENSOR GROUND
3	OR	WT/BK	8-VOLT SUPPLY

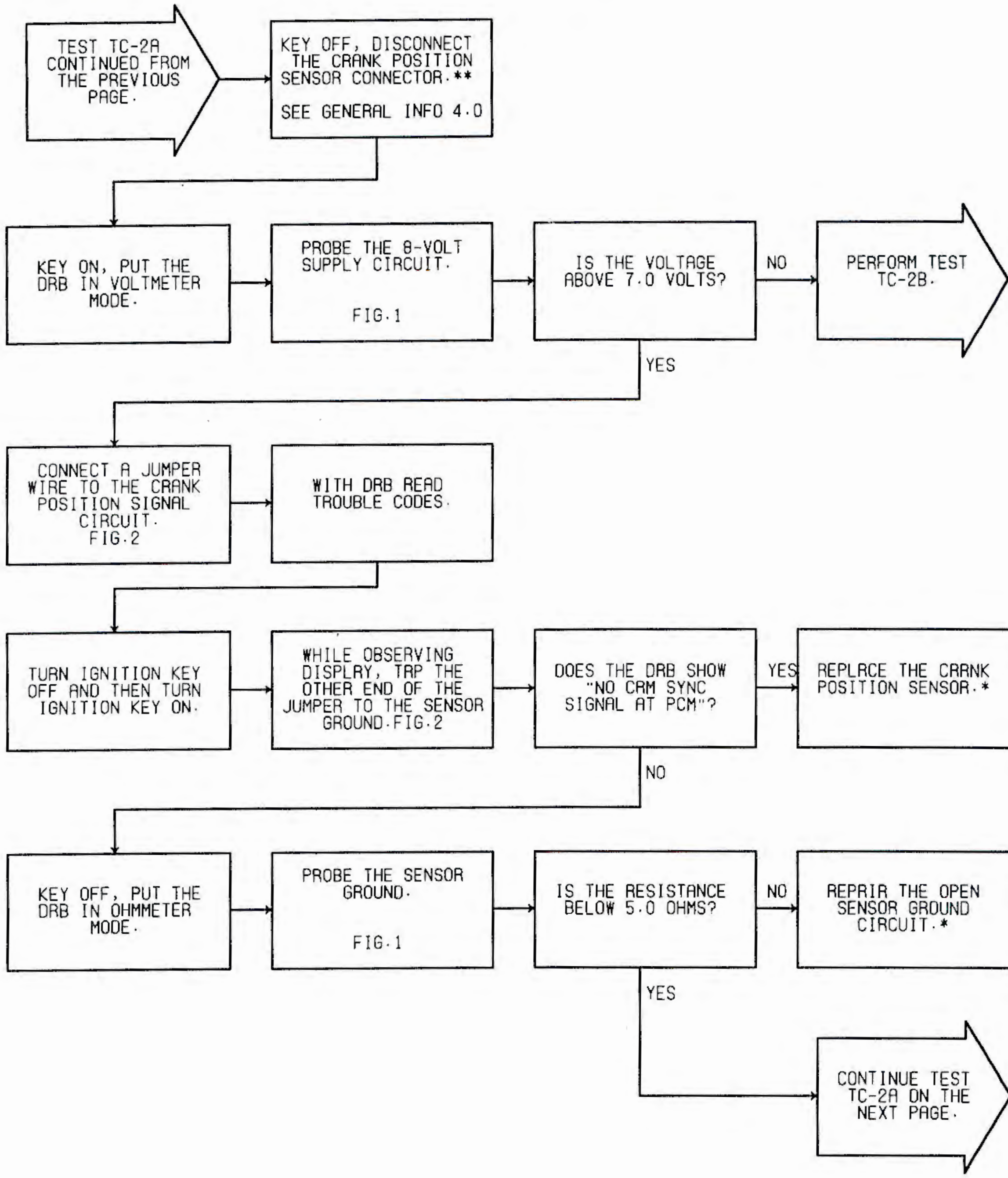
FIG. 1



1500502

FIG. 2

TEST TC-2A — CONTINUED - REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM



Perform Verification TEST VER-2A. | ****Check connectors – Clean / repair as necessary.***

TEST TC-2A CONTINUED - REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

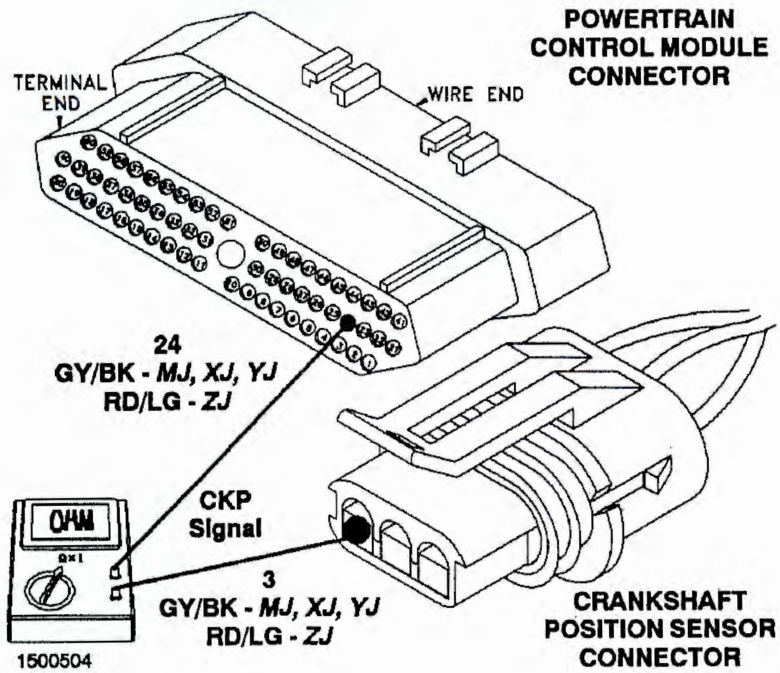


FIG. 1

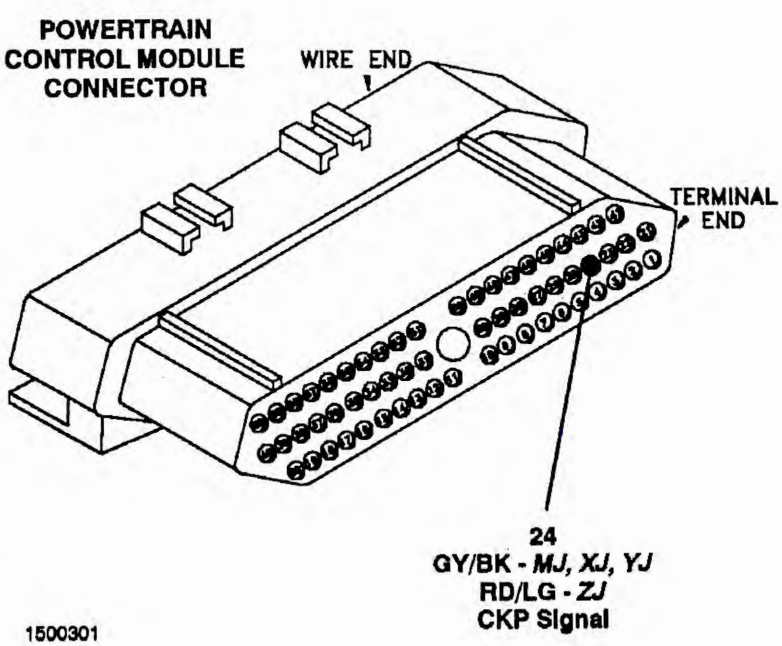
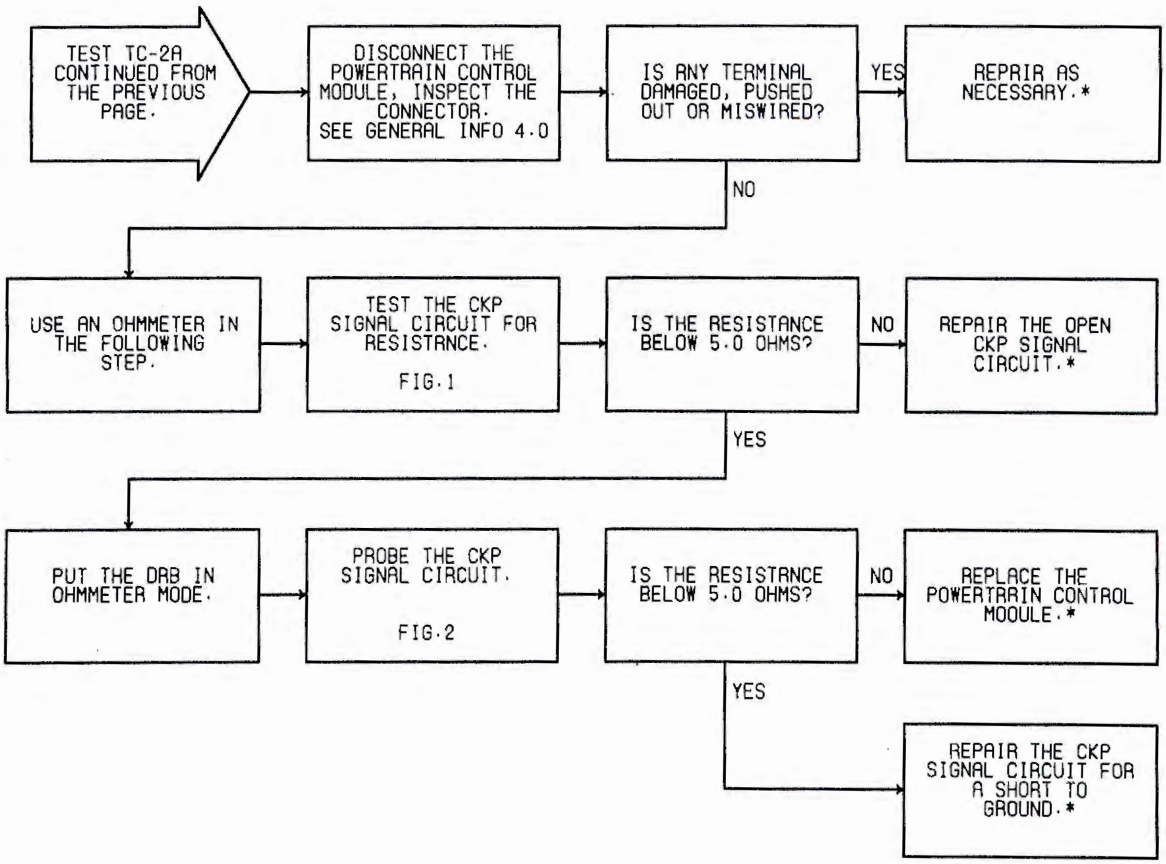


FIG. 2

TEST TC-2A CONTINUED - REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

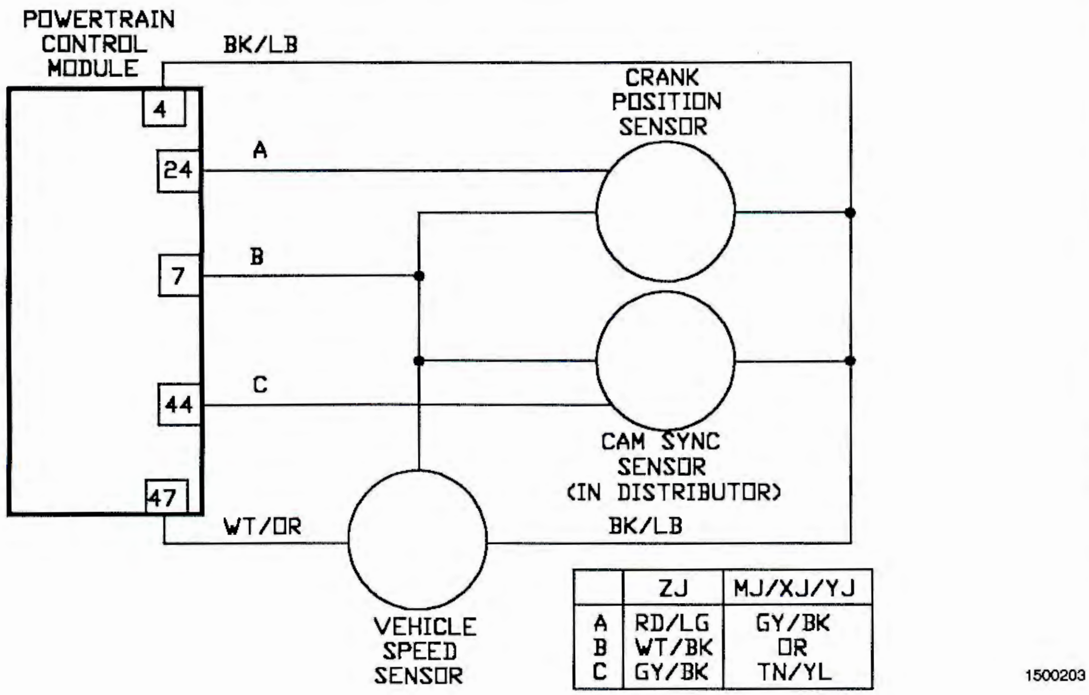


*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

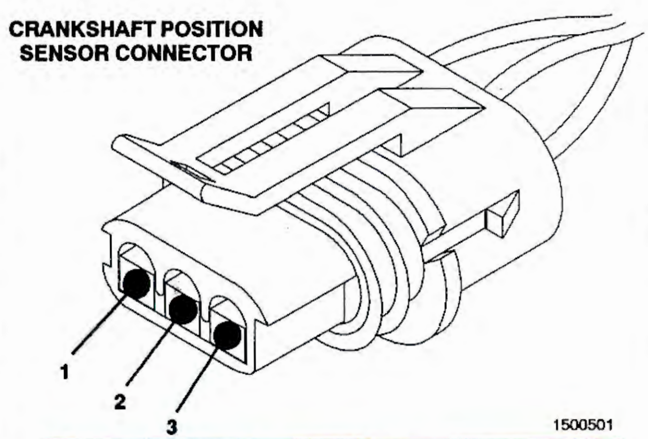
T R O U B L E   C O D E   T E S T S

TEST TC-2B | REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST TC-2A Before Proceeding



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL



CAV	MJ, XJ, YJ	ZJ	FUNCTION
1	GY/BK	RD/LG	CKP SIGNAL
2	BK/LB	BK/LB	SENSOR GROUND
3	OR	WT/BK	8-VOLT SUPPLY

FIG. 1

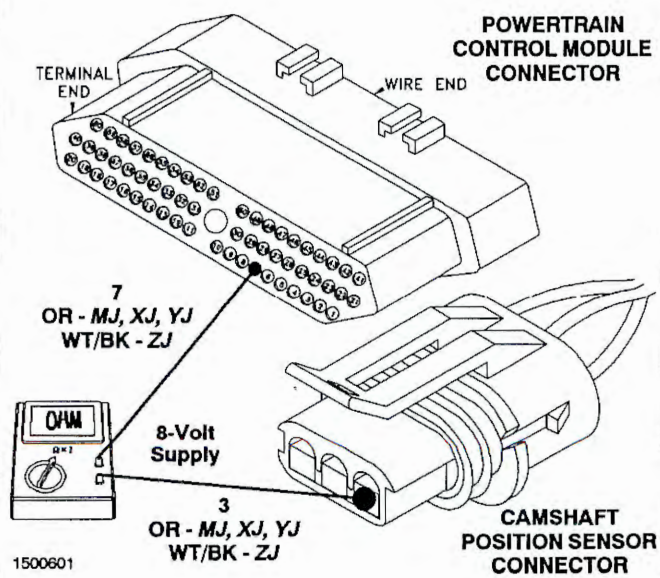
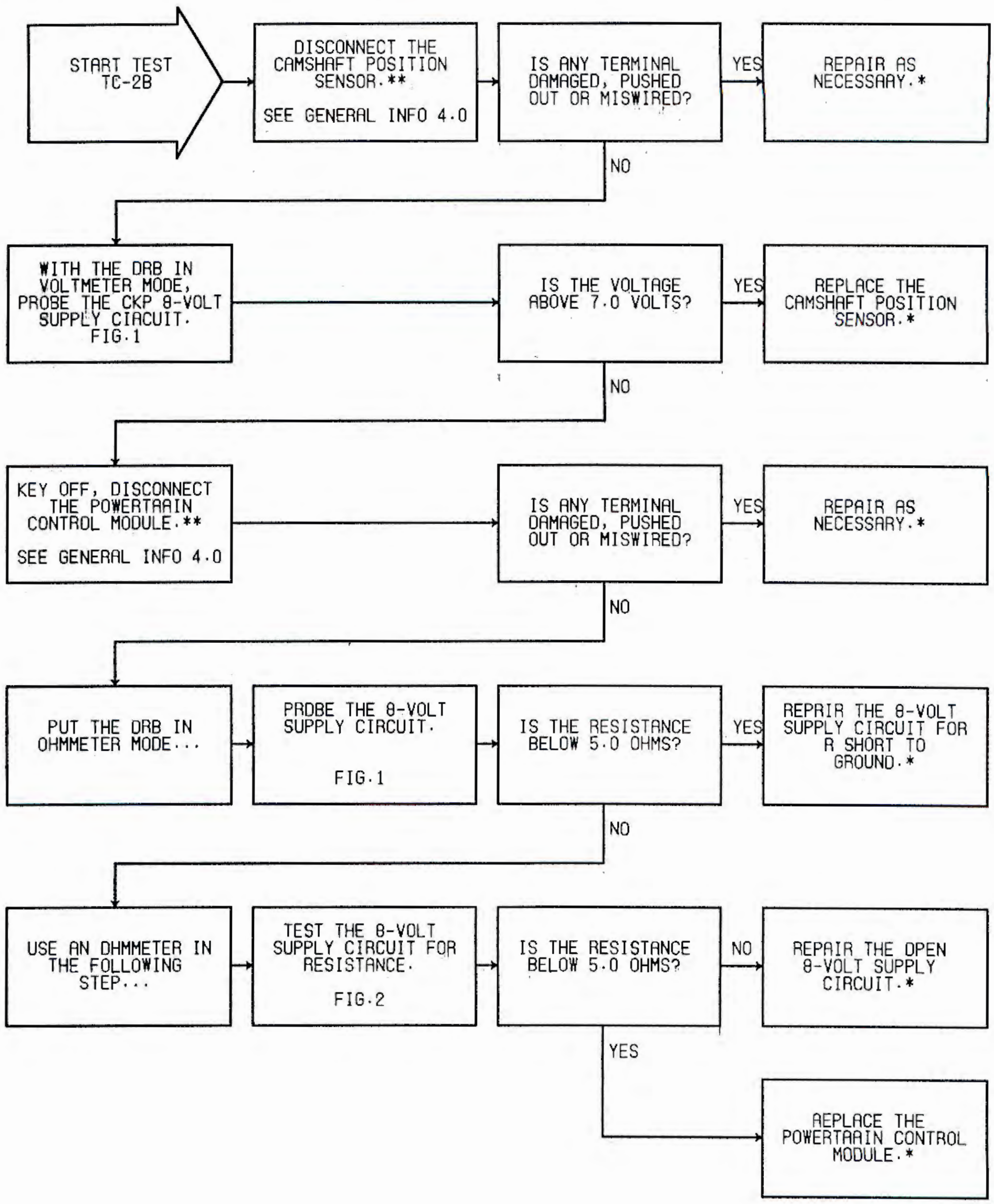


FIG. 2

TEST TC-2B — REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

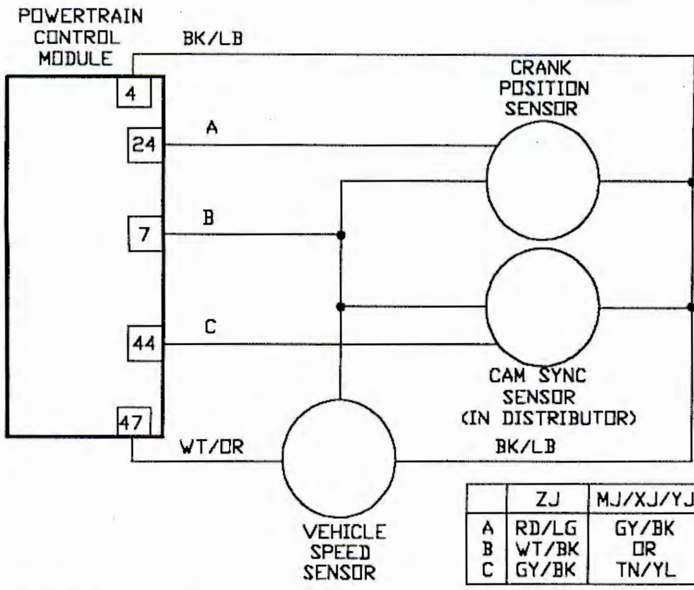
Perform TEST TC-2A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-3A | REPAIRING - NO CAM SIGNAL AT PCM

Perform TEST TC-1A Before Proceeding



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

1500203

Name of code: <u>No Cam Signal at PCM</u>

When monitored: During engine cranking, after 32 crank position signals.

Set condition: If no signal from the cam position sensor is present with crank signal, the code will set.

Theory of operation: The cam position sensor is a hall effect-type sensor used to detect the camshaft position. The PCM supplies 8 volts from cavity 7 to power up the sensor. Sensor ground is provided by the PCM cavity 4. The PCM also supplies a 5.0 volt pull up voltage to the sensor, from cavity 44. The sensor signal is created by the pulse ring in the distributor passing through the sensor. When the leading edge of the ring is in the sensor the signal is high (5.0v); when the trailing edge is clear of the sensor, the signal is low (0.3v).

Possible causes:
> Open 8-volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Damaged pulse ring
> Failed sensor
> Failed PCM

1170202

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

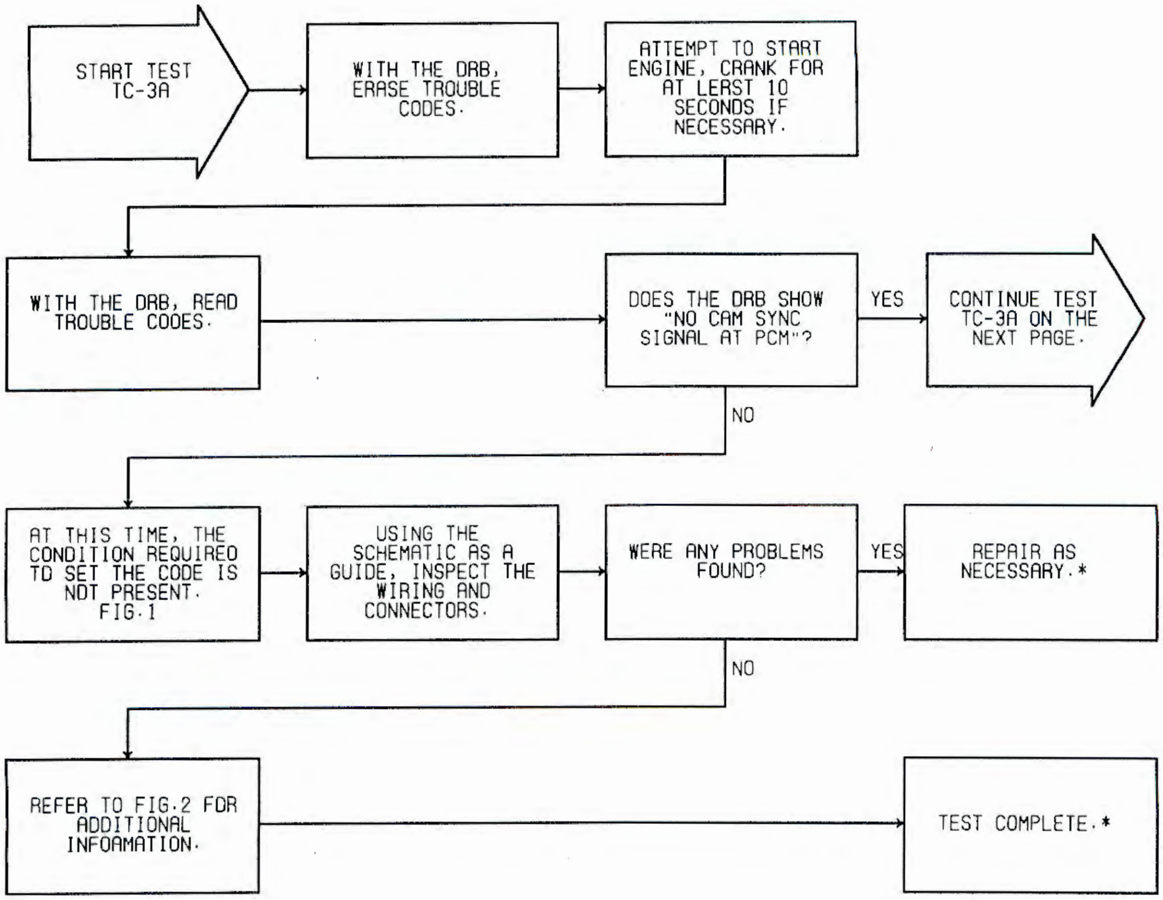
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

TEST TC-3A REPAIRING - NO CAM SIGNAL AT PCM

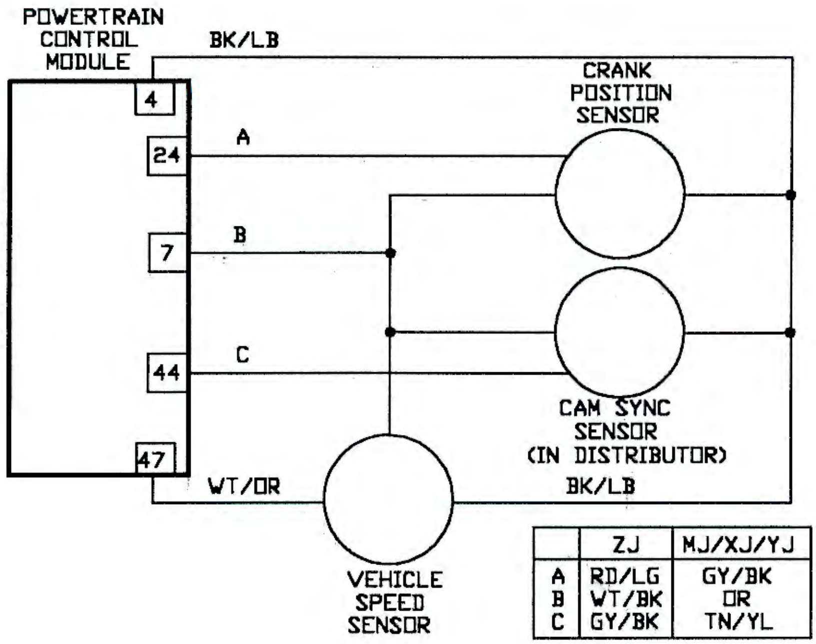
Perform TEST TC-1A Before Proceeding



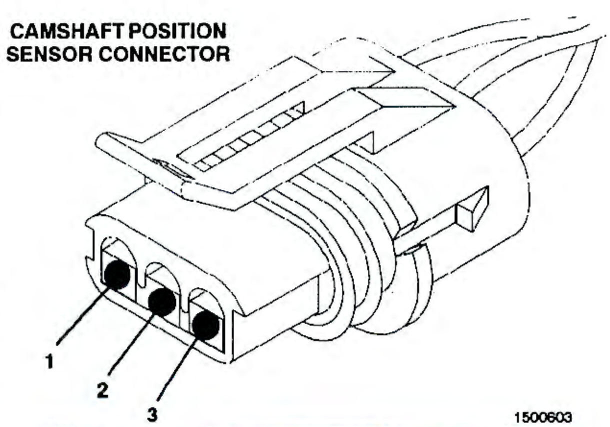
*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TROUBLE CODE TESTS

TEST TC-3A CONTINUED - REPAIRING - NO CAM SIGNAL AT PCM

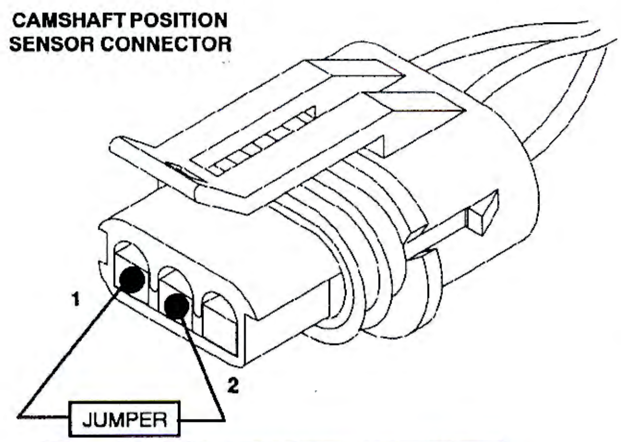


	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL



CAV	MJ, XJ, YJ	ZJ	FUNCTION
1	TN/YL	GY/BK	CMP SIGNAL
2	BK/LB	BK/LB	SENSOR GROUND
3	OR	WT/BK	8-VOLT SUPPLY

FIG. 1

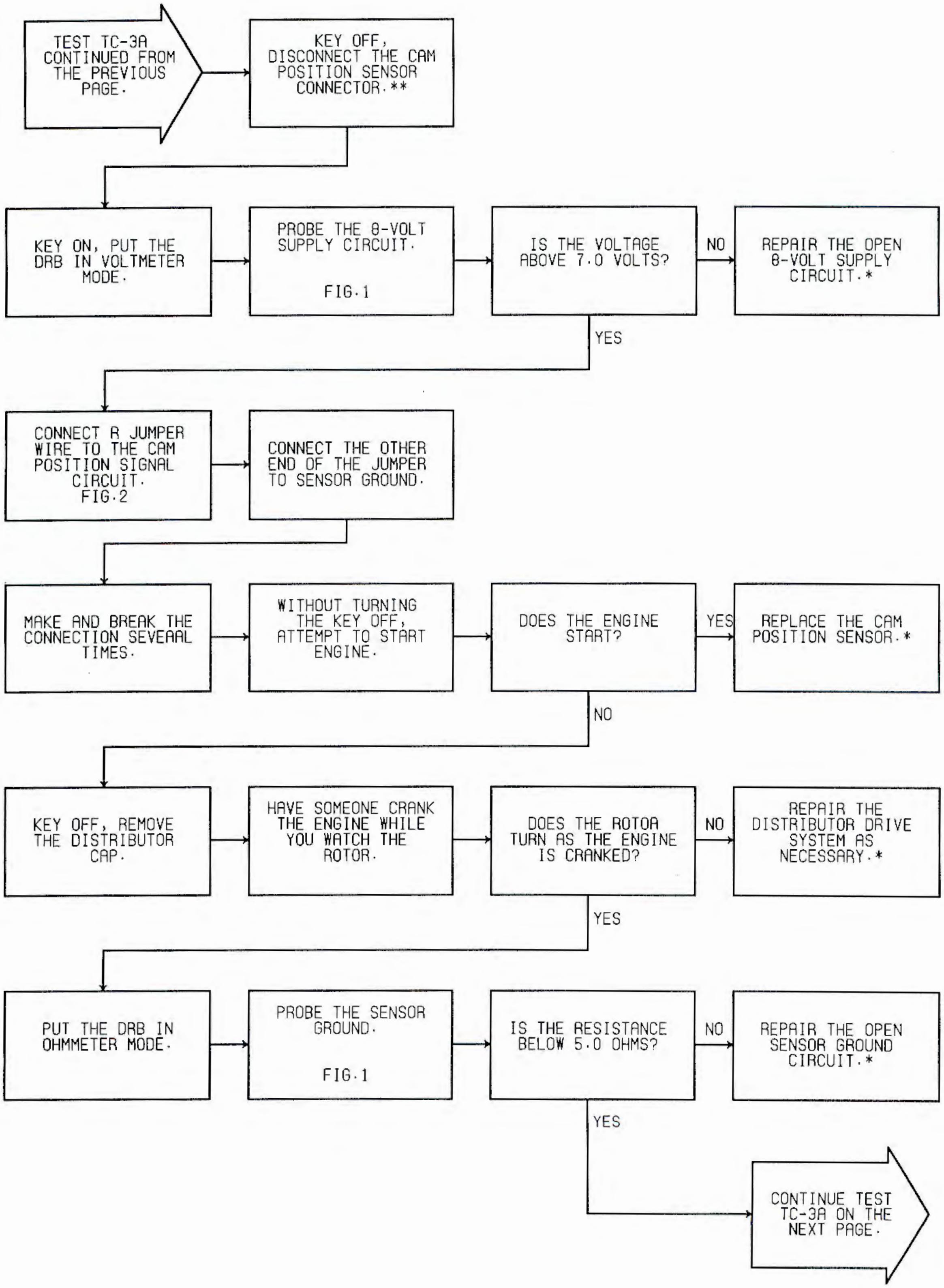


CAV	COLOR	BODY	FUNCTION
1	TN/YL	MJ/XJ/YJ	CMP SIGNAL
1	GY/BK	ZJ	CMP SIGNAL
2	BK/LB	ALL	SENSOR GROUND

1500506

FIG. 2

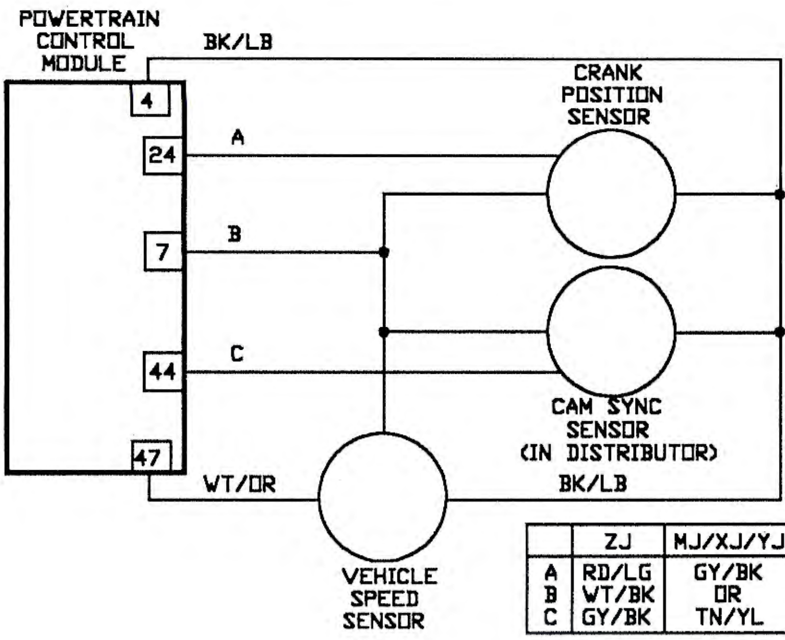
TEST TC-3A CONTINUED - REPAIRING - NO CAM SIGNAL AT PCM



***Perform Verification TEST VER-2A.**

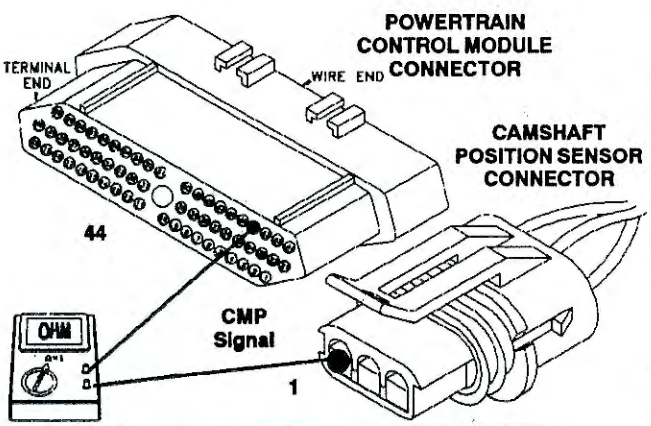
****Check connectors – Clean / repair as necessary.**

TEST TC-3A CONTINUED - REPAIRING - NO CAM SIGNAL AT PCM



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

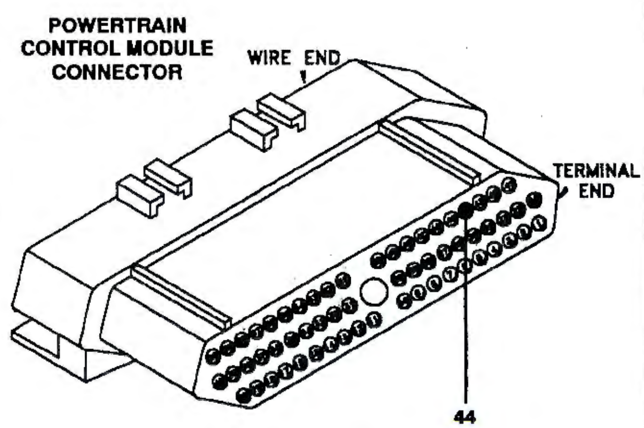
1500203



CAV	COLOR	BODY	FUNCTION
PCM 44	TN/YL	MJ/XJ/YJ	CMP SIGNAL
PCM 44	GY/BK	ZJ	CMP SIGNAL
CMP 1	TN/YL	MJ/XJ/YJ	CMP SIGNAL
CMP 1	GY/BK	ZJ	CMP SIGNAL

1500602

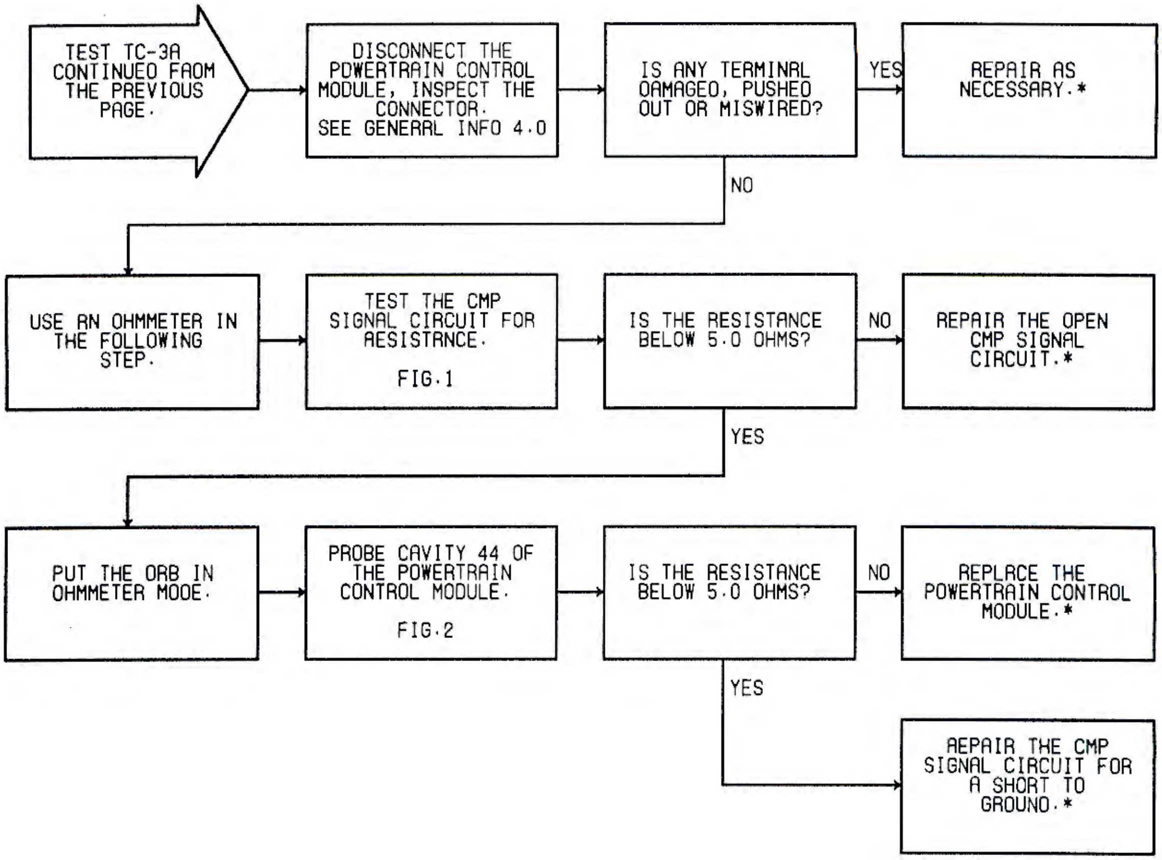
FIG. 1



CAV	COLOR	BODY	FUNCTION
44	TN/YL	MJ/XJ/YJ	CMP SIGNAL
44	GY/BK	ZJ	CMP SIGNAL

1500303

FIG. 2

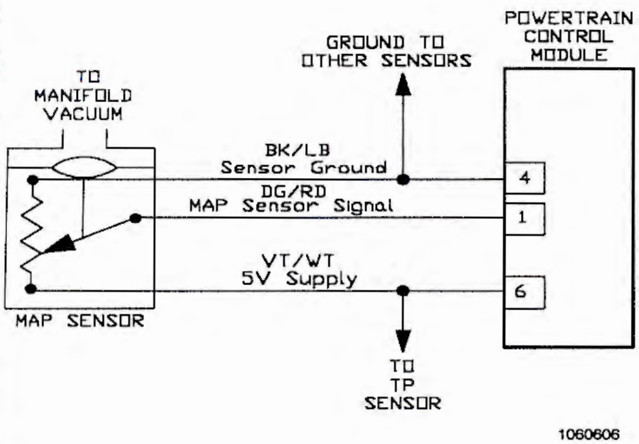


Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

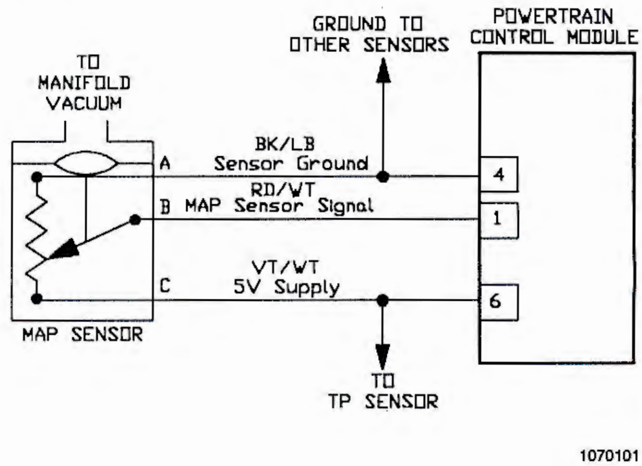
TEST TC-4A REPAIRING - SLOW CHANGE IN IDLE MAP SENSOR SIGNAL AND NO CHANGE IN MAP FROM START TO RUN

Perform TEST TC-1A Before Proceeding

MJ/XJ AND YJ BODIES



ZJ BODY



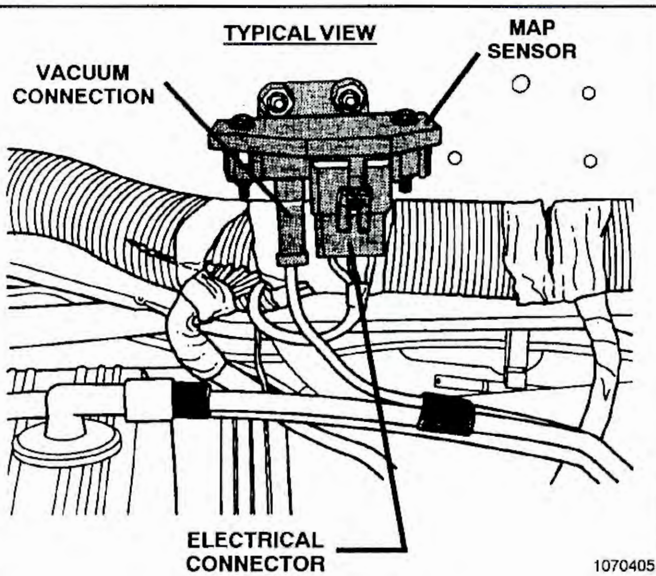


FIG. 1

Name of code: Slow Change in Idle MAP Sensor Signal

When monitored: With engine rpm above 600 but less than 1500 and the throttle position sensor voltage less than 1.0 volt.

Set condition: The variation in MAP signal is less than .157 volt between firing pulses of the engine.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5 volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP sensor receives a 5-volt supply from PCM cavity 6. Voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

Possible causes:
> Restricted or leaking vacuum/pressure to MAP sensor
> Ice in sensor or passage
> Failed sensor
> Failed PCM

0870306

FIG. 2

Name of code: No Change in MAP From Start to Run

When monitored: With engine rpm above 400 but less than 1500 and the throttle body at closed throttle.

Set condition: Too small a difference is seen between barometric pressure at ignition on and manifold vacuum (engine running) for 1.72 seconds.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5-volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP receives a 5-volt supply from PCM cavity 6; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

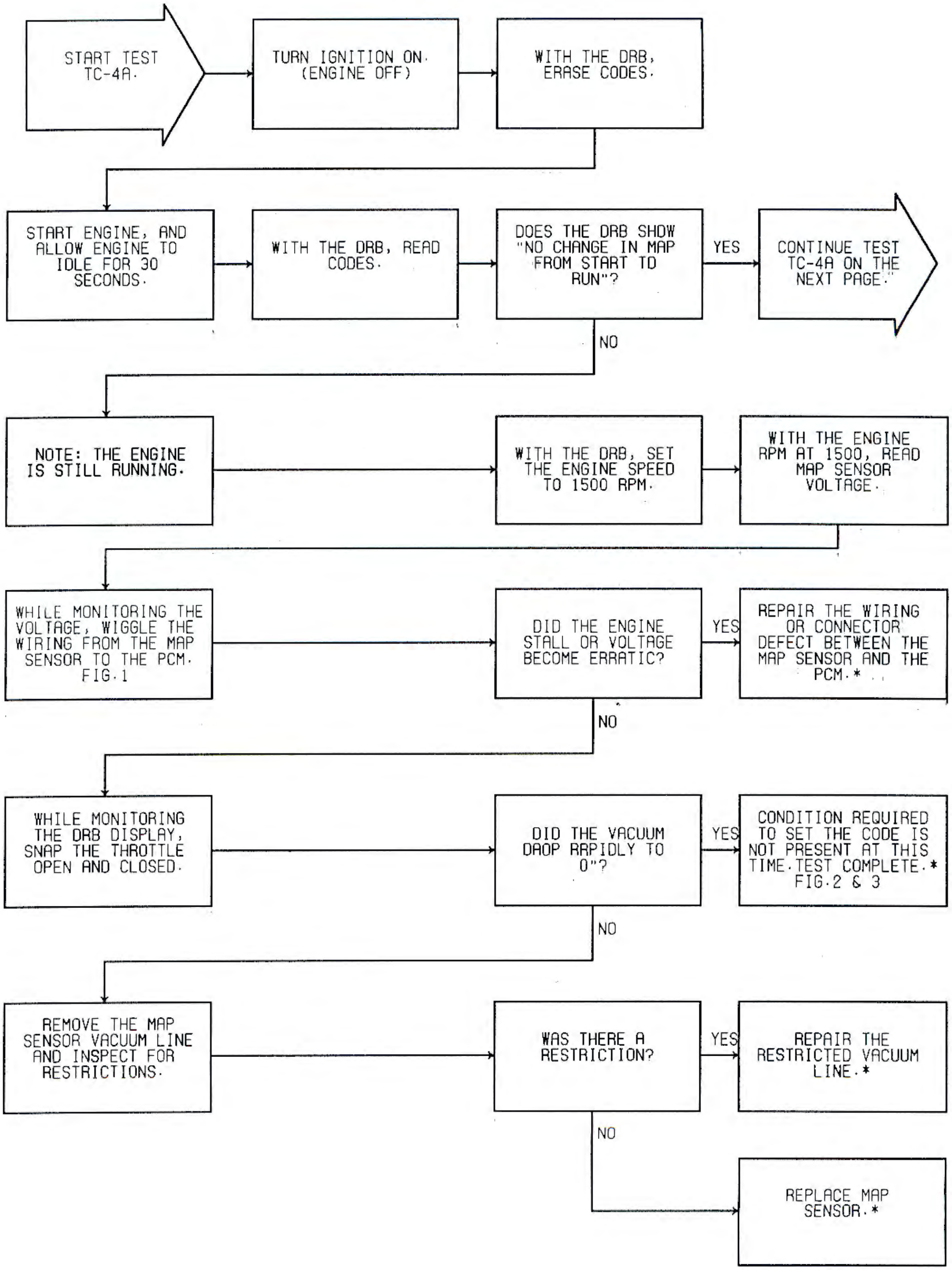
Possible causes:
> Restricted or leaking vacuum/pressure to MAP sensor
> Ice in sensor or passage
> Failed sensor
> Failed PCM

0870305

FIG. 3

TEST TC-4A REPAIRING - SLOW CHANGE IN IDLE MAP SENSOR SIGNAL AND NO CHANGE IN MAP FROM START TO RUN

Perform TEST TC-1A Before Proceeding



***Perform Verification TEST VER-2A.**	****Check connectors – Clean / repair as necessary.**

TEST TC-4A CONTINUED - REPAIRING - SLOW CHANGE IN IDLE MAP SENSOR SIGNAL AND NO CHANGE IN MAP FROM START TO RUN

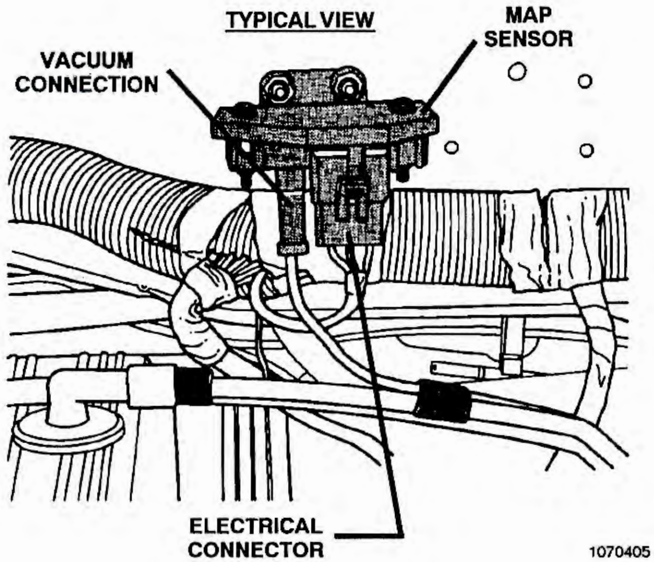
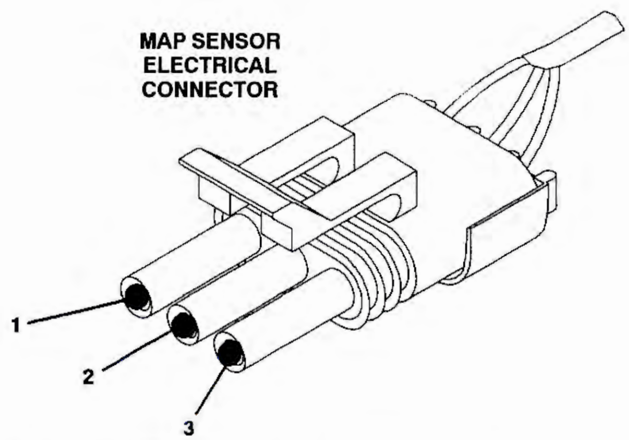


FIG. 1

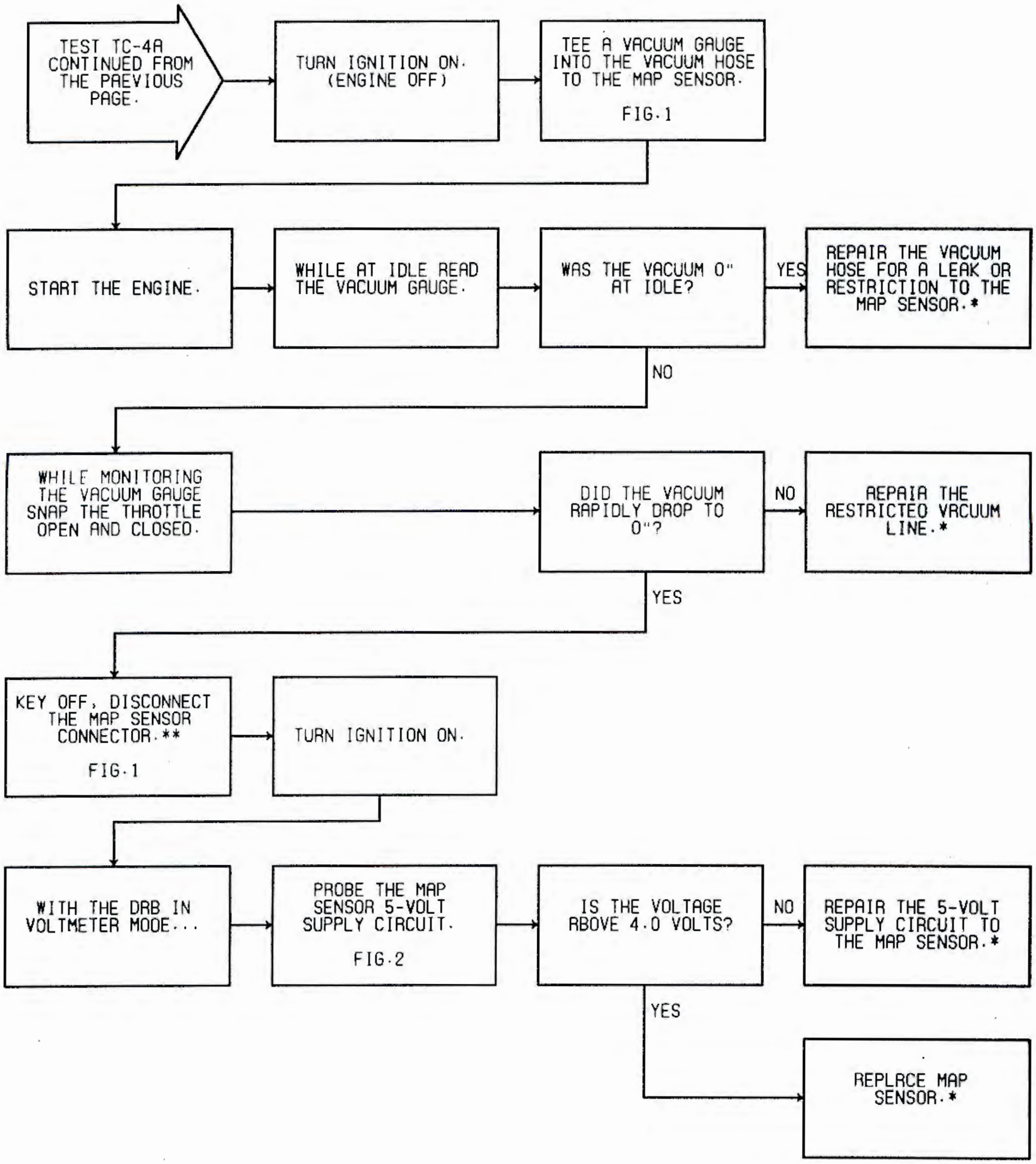


CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	SENSOR GROUND
2	DG/RD	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	VT/WT	5-VOLT SUPPLY

1510201

FIG. 2

TEST TC-4A CONTINUED - REPAIRING - SLOW CHANGE IN IDLE MAP SENSOR SIGNAL AND NO CHANGE IN MAP FROM START TO RUN

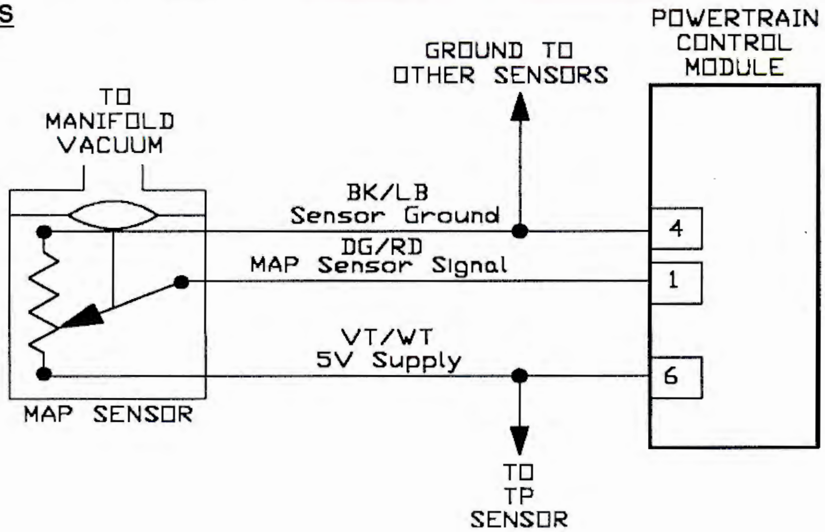


Perform Verification TEST VER-2A.	***Check connectors – Clean / repair as necessary.*

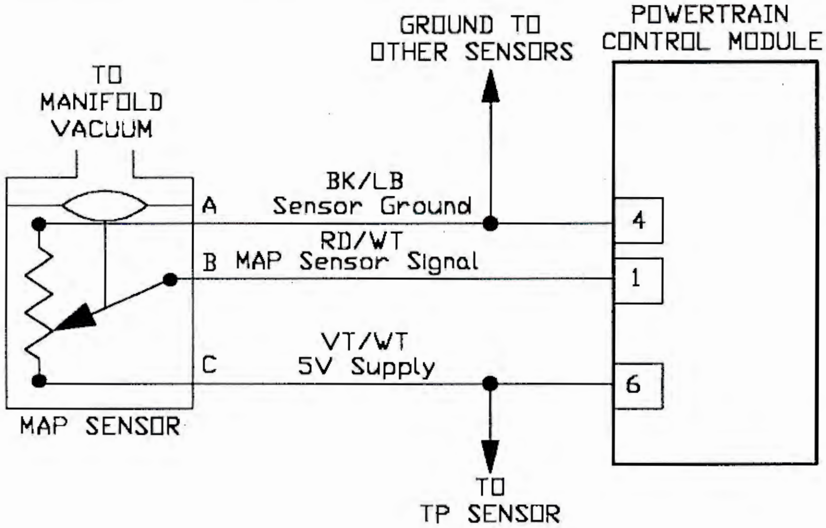
TEST TC-5A REPAIRING - MAP SENSOR VOLTAGE TOO LOW

Perform TEST TC-1A Before Proceeding

MJ/XJ AND YJ BODIES



ZJ BODY



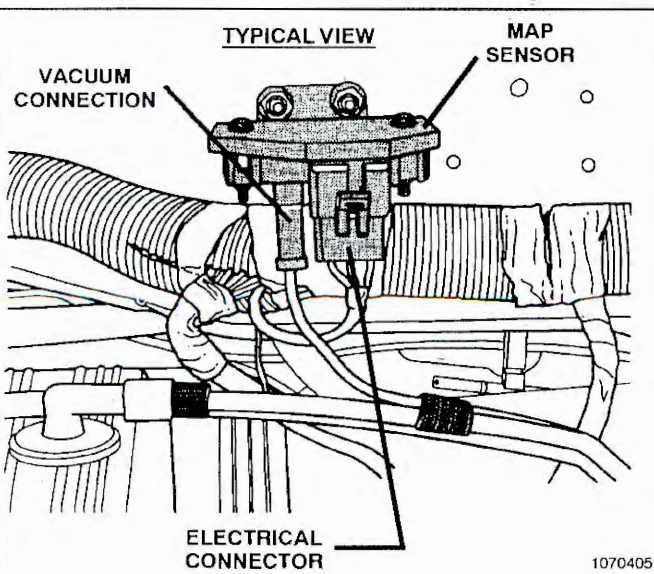


FIG. 1

Name of code: MAP Sensor Voltage Too Low

When monitored: With engine rpm above 400 but less than 1500 and the TP sensor voltage less than 1.0 volt.

Set condition: The MAP sensor signal voltage is below 1.2 volts at start, or below .02 volt for 1.76 seconds with engine running.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5-volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high; and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP receives a 5-volt supply from PCM cavity 6; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

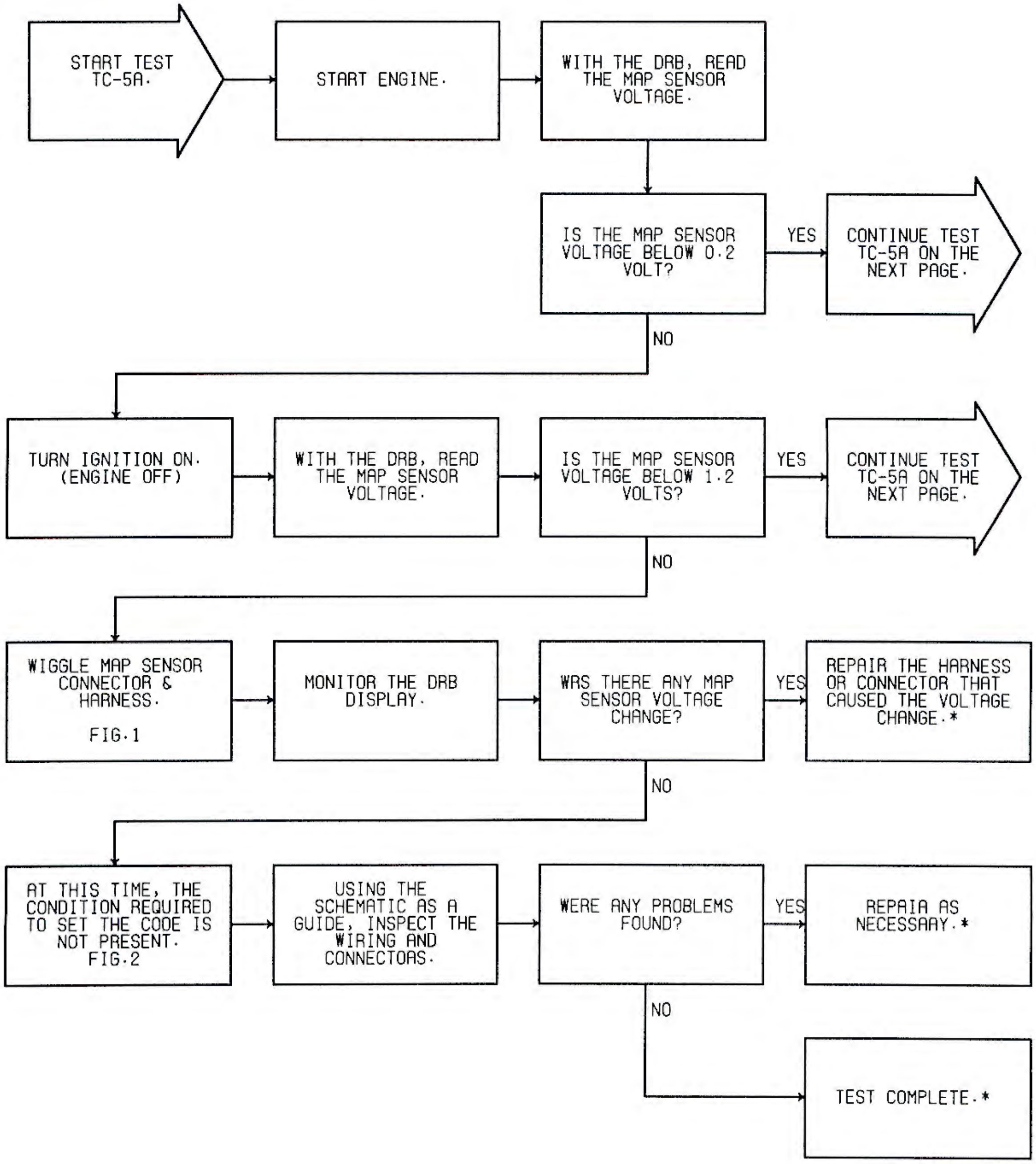
Possible causes:
> Open 5-volt supply circuit
> Signal circuit shorted to ground
> Failed sensor
> Failed PCM

0870303

FIG. 2

TEST TC-5A REPAIRING - MAP SENSOR VOLTAGE TOO LOW

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-5A | CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO LOW

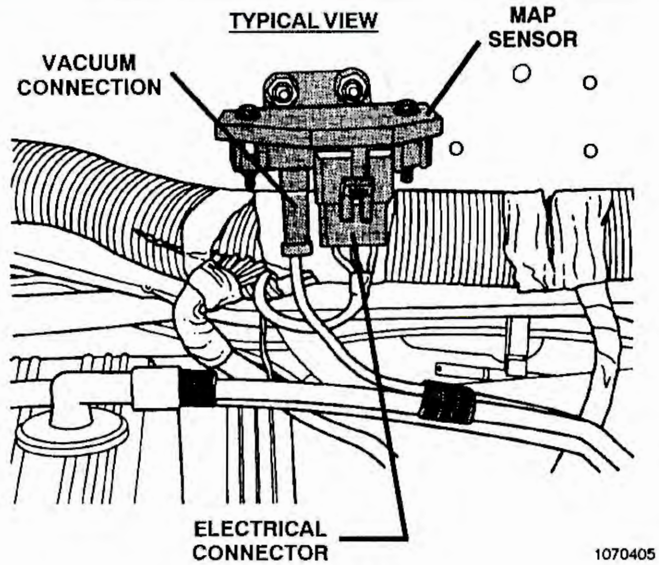


FIG. 1

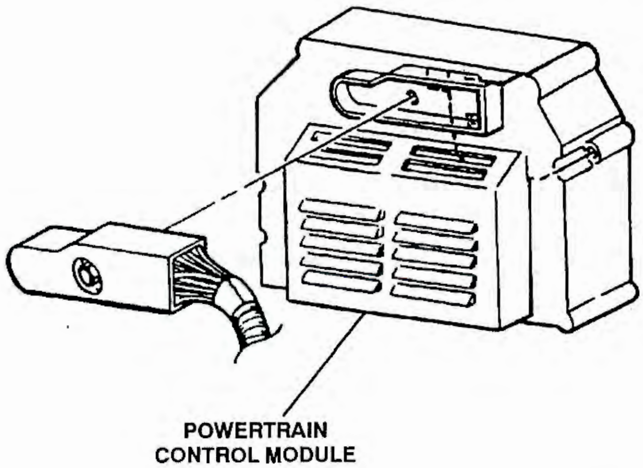
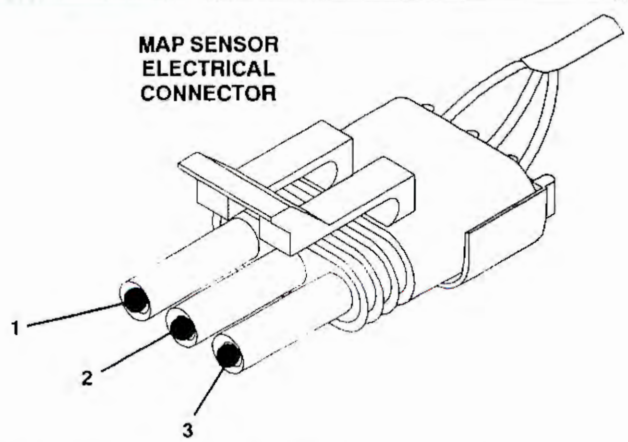


FIG. 2

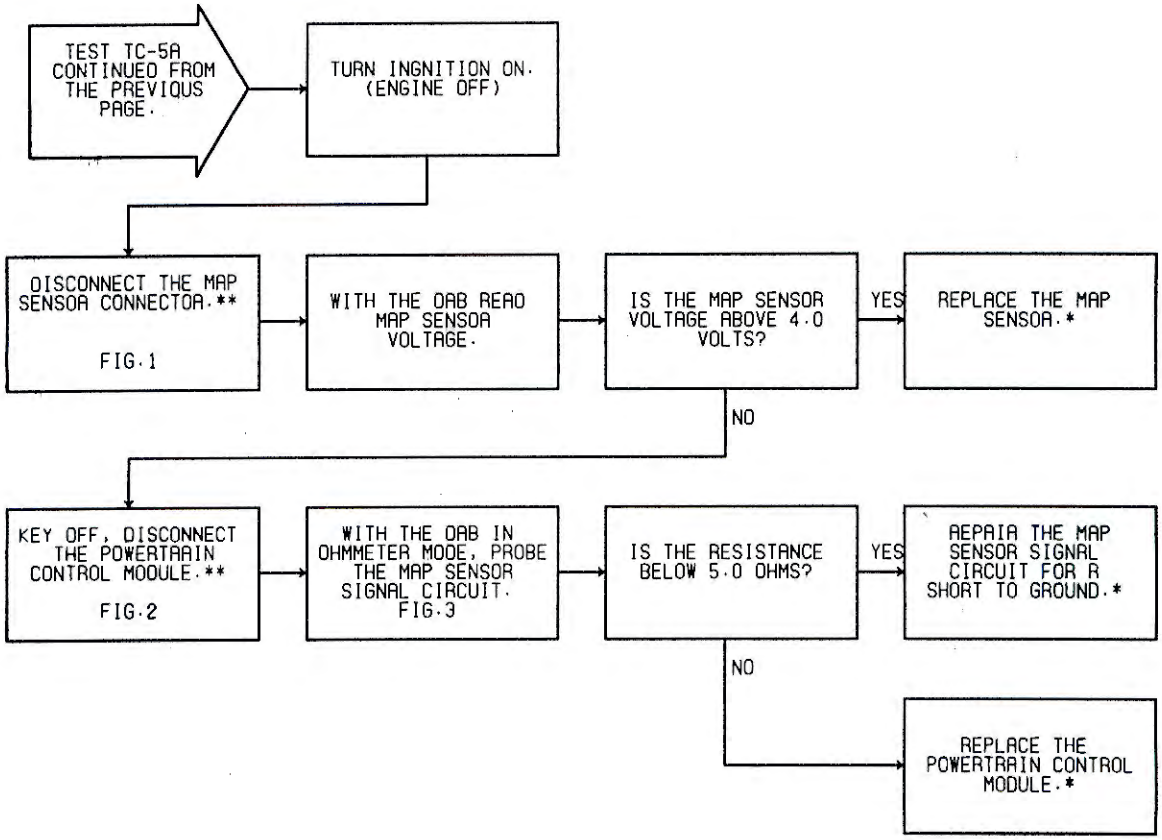


CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	SENSOR GROUND
2	DG/RD	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	VT/WT	5-VOLT SUPPLY

1510201

FIG. 3

TEST TC-5A | CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO LOW



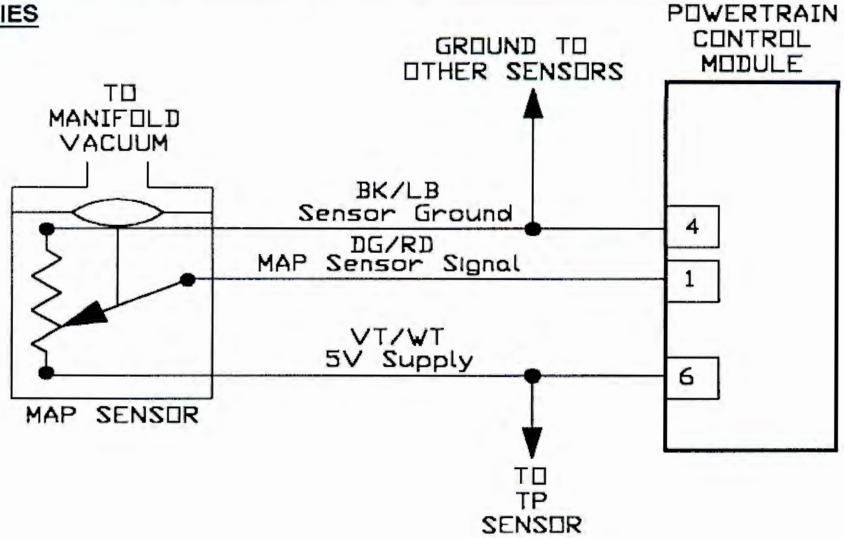
*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TROUBLE CODE TESTS

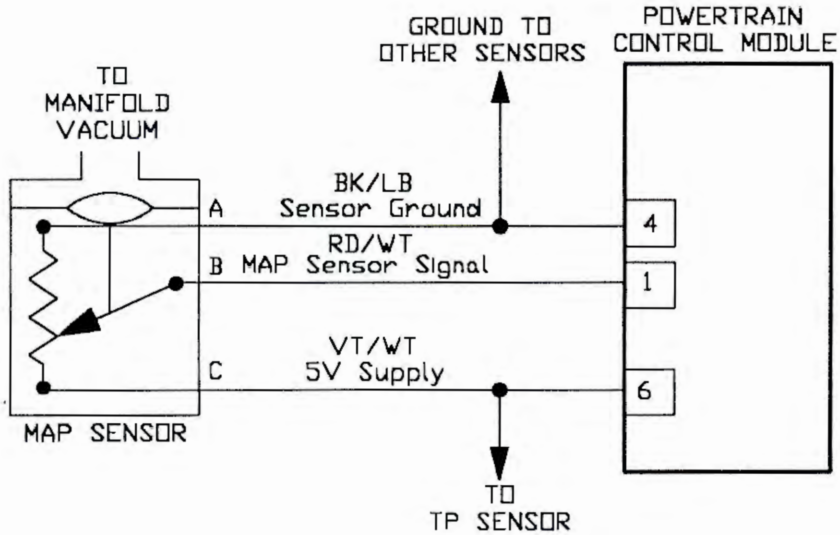
TEST TC-6A — REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

Perform TEST TC-1A Before Proceeding

MJ/XJ AND YJ BODIES



ZJ BODY



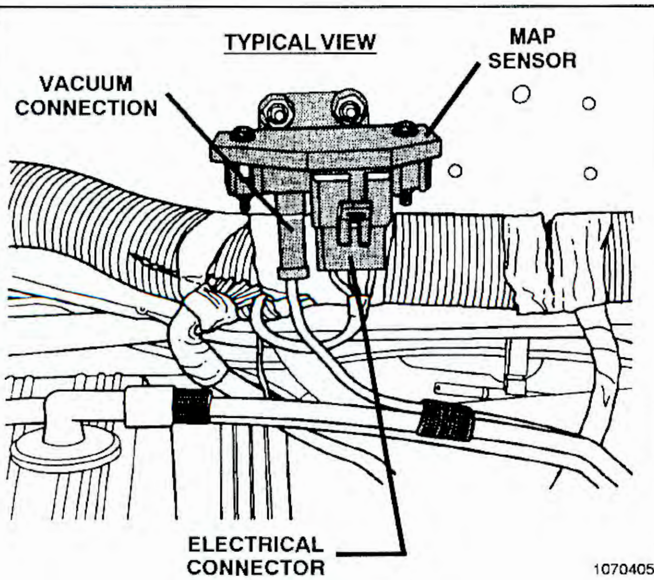


FIG. 1

Name of code: MAP Sensor Voltage Too High

When monitored: With engine rpm above 400 but less than 1500 and the TP sensor voltage less than 1.0 volt.

Set condition: The MAP sensor signal voltage is greater than 4.6 volts at start or with the engine running for 1.76 seconds.

Theory of operation: This sensor measures manifold absolute pressure and ambient barometric pressure within the manifold. It provides a 0 to 5-volt signal to PCM cavity 1. The MAP sensor puts out a low voltage signal (0.5 to 1.8 volts) at idle when the manifold vacuum is high, and a higher voltage signal (3.9 to 4.8 volts) at deep throttle when the manifold vacuum is low. The MAP receives a 5-volt supply from PCM cavity 6; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity 4.

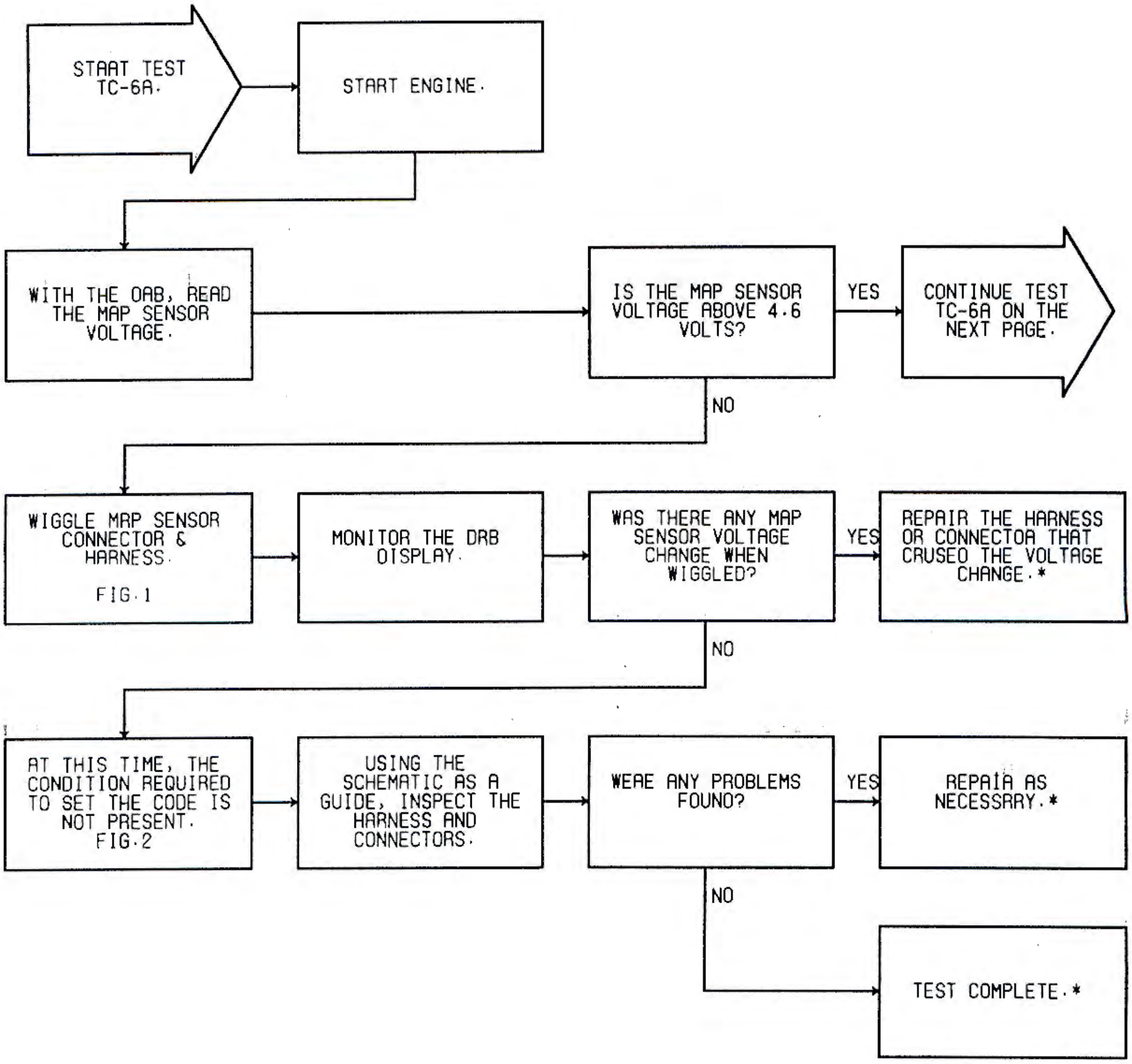
Possible causes:
> Signal circuit open
> Sensor open internally
> Sensor ground circuit
> Sensor signal circuit shorted to voltage
> Failed PCM

0870304

FIG. 2

TEST TC-6A REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

Perform TEST TC-1A Before Proceeding



**Perform Verification TEST VER-2A.* | ***Check connectors – Clean / repair as necessary.*

TEST TC-6A CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

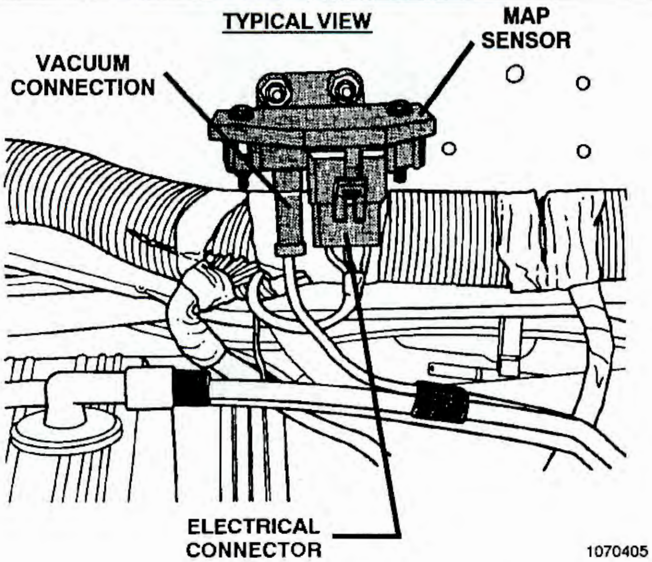
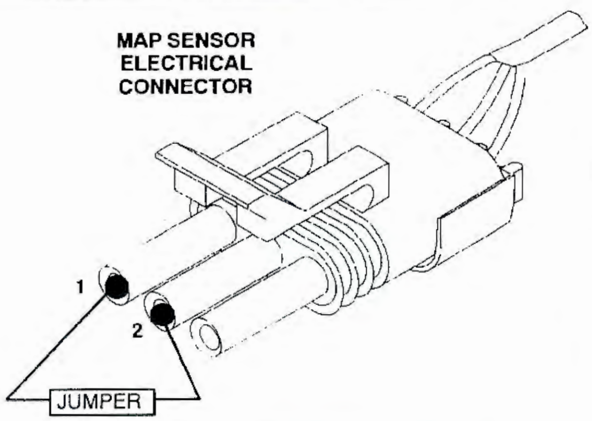


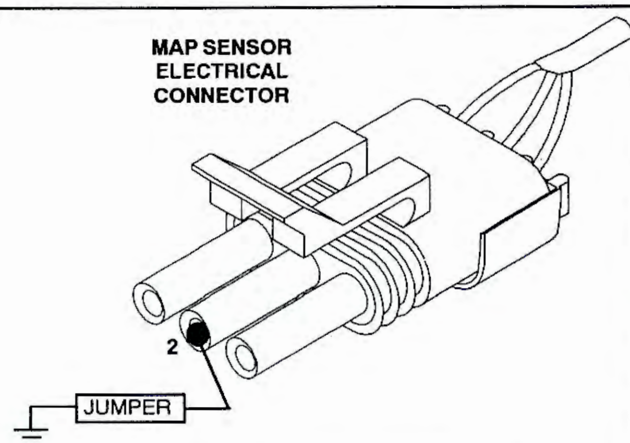
FIG. 1



CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	SENSOR GROUND
2	DG/RD	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	VT/WT	5-VOLT SUPPLY

1510202

FIG. 2



CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	SENSOR GROUND
2	DG/RD	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	VT/WT	5-VOLT SUPPLY

1510203

FIG. 3

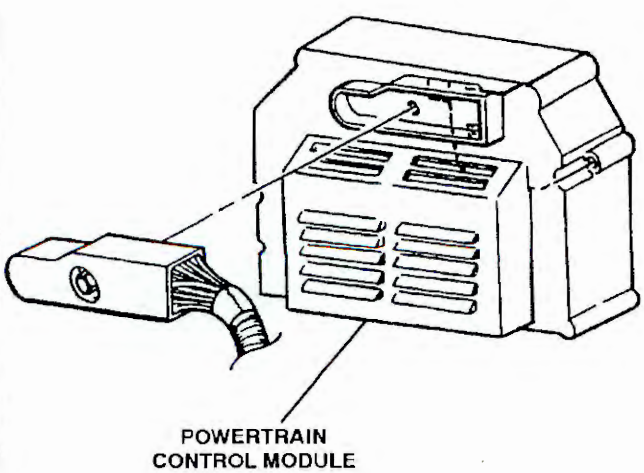
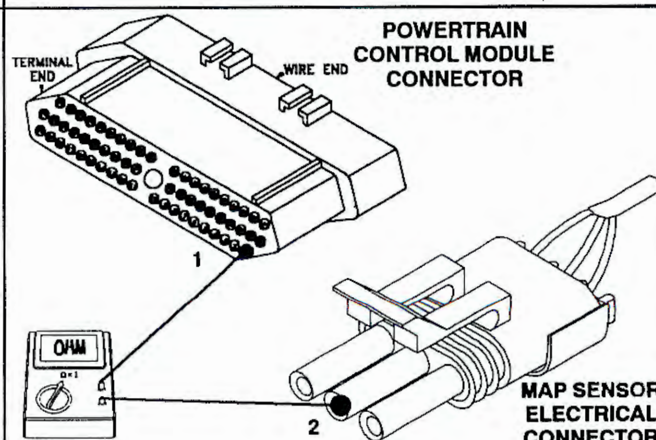


FIG. 4

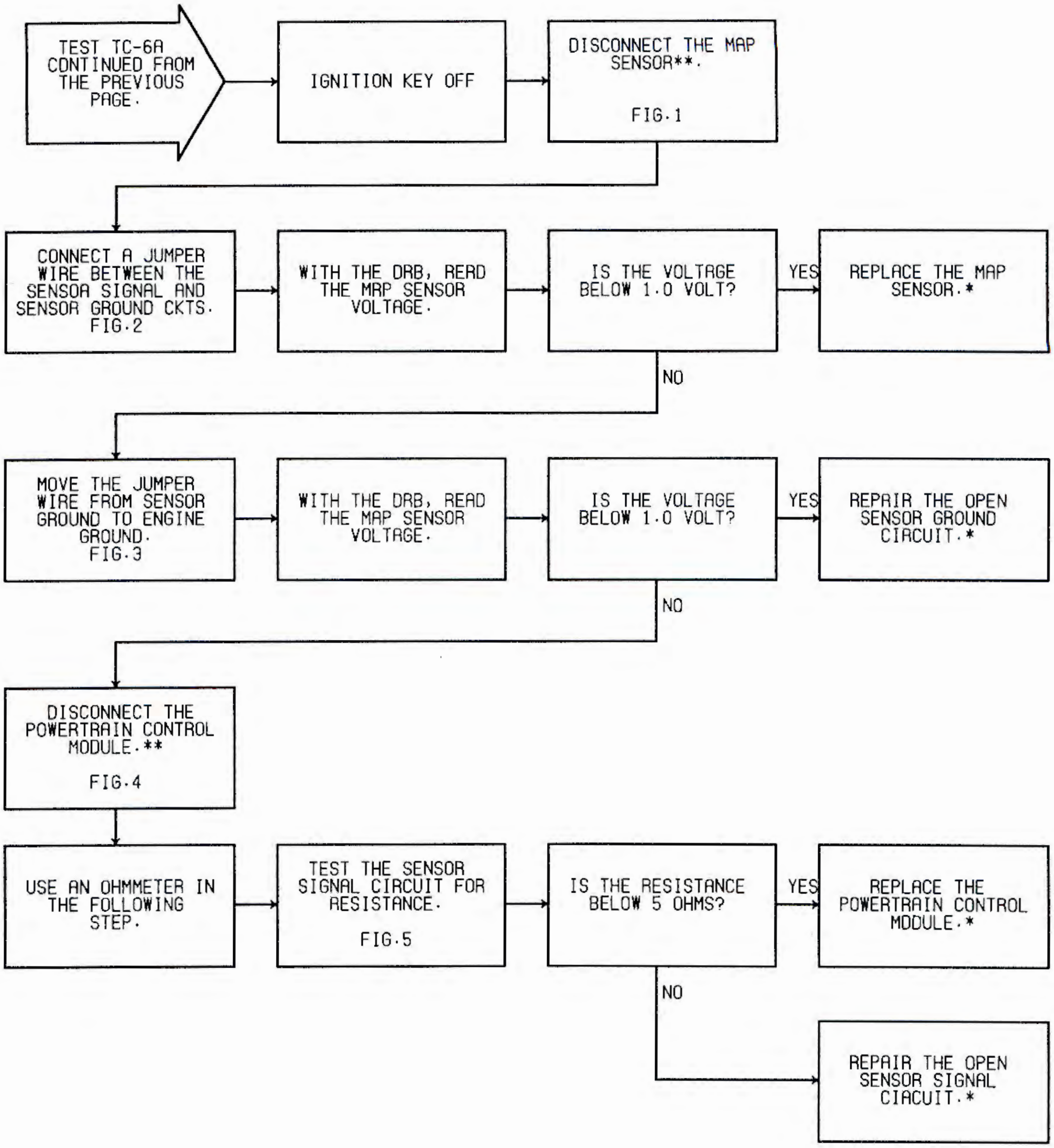


CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	SENSOR GROUND
2	DG/RD	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	VT/WT	5-VOLT SUPPLY

1510204

FIG. 5

TEST TC-6A CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

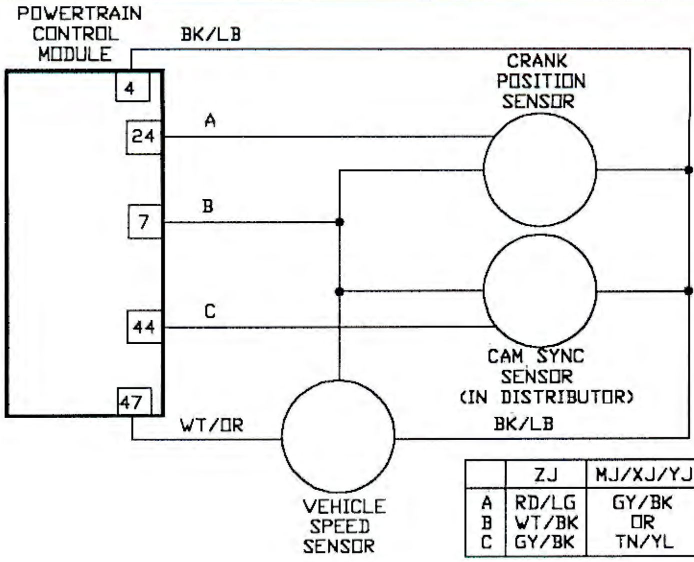


***Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.**

T R O U B L E C O D E T E S T S

TEST TC-7A | REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-1A Before Proceeding



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

1500203

Name of code: No Vehicle Speed Sensor Signal

When monitored: With engine running more than 31 seconds, engine temperature greater than 120°F, transmission not in park or neutral, brakes not applied, engine rpm greater than 1800, and MAP vacuum less than 11".

Set condition: No signal from the vehicle speed sensor for more than 11 seconds.

Theory of operation: The vehicle speed sensor is a hall-effect type sensor used to detect the vehicle speed. The PCM calculates the vehicle speed based on the VSS signal. The PCM supplies 8 volts from cavity 7 to power up the sensor. Sensor ground is supplied by PCM cavity 4. The PCM also supplies a 5.0 volt pull up voltage to the sensor from cavity 47. The VSS signal is created when the sensor alternates the 5.0 volt pull up from high to low.

Possible causes:
> Open or shorted signal circuit
> Speedometer pinion damaged
> Open 8-volt supply circuit
> Open sensor ground circuit
> Failed vehicle speed sensor
> Failed PCM

1100401

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

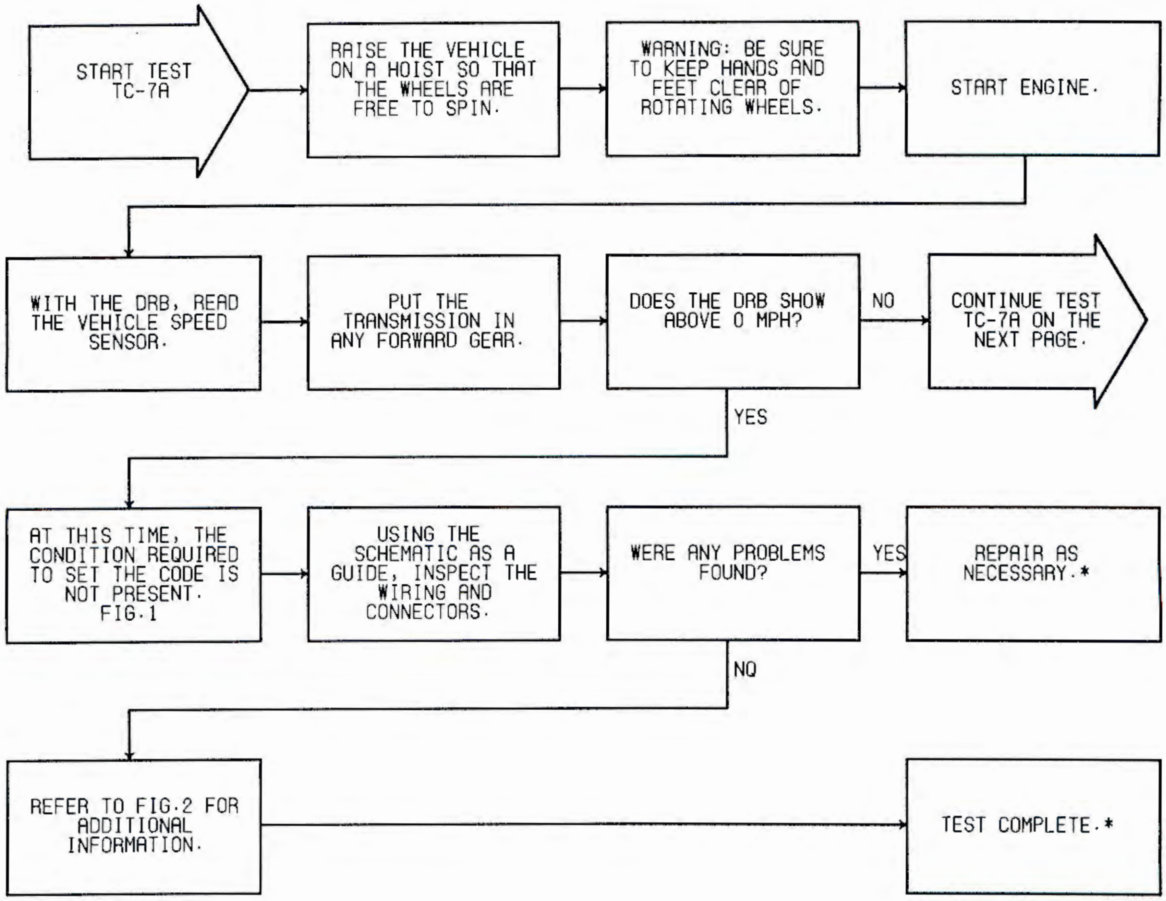
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

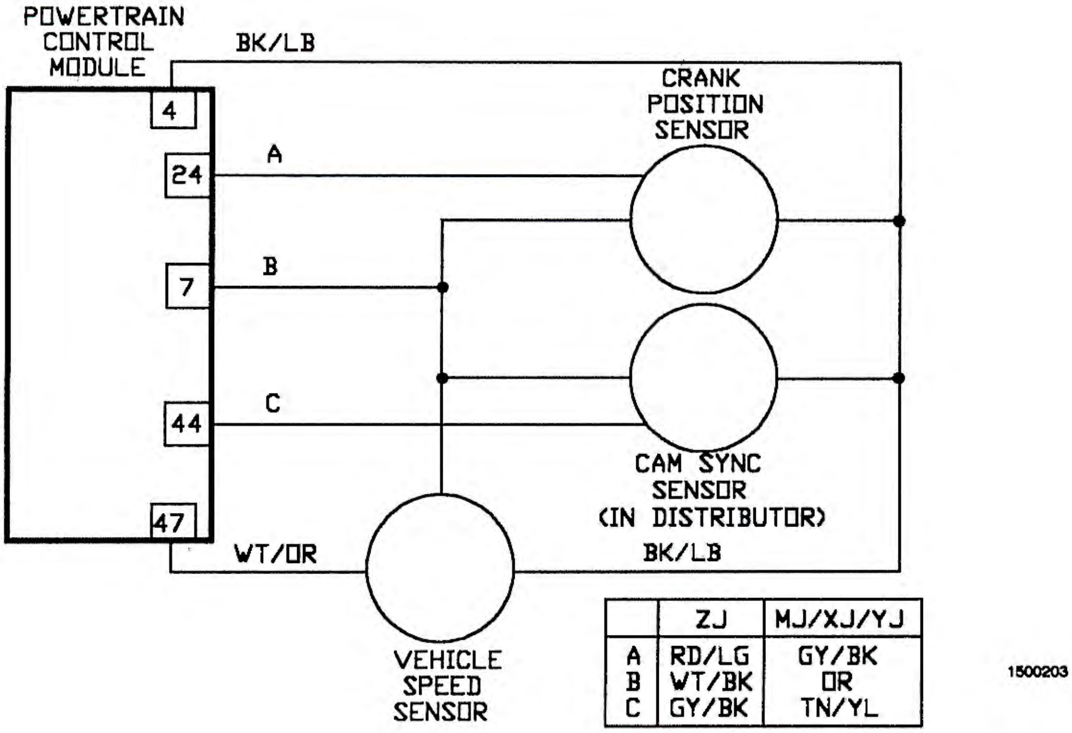
TEST TC-7A REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-1A Before Proceeding

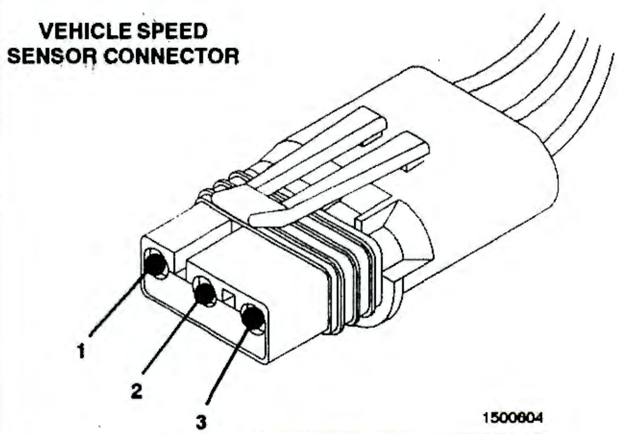


*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-7A CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL



CAV	COLOR	FUNCTION
1	WT/OR	VSS SIGNAL
2	BK/LB	SENSOR GROUND
3	OR	8-VOLT SUPPLY (MJ, XJ, YJ)
	WT/BK	8-VOLT SUPPLY (ZJ)

FIG. 1

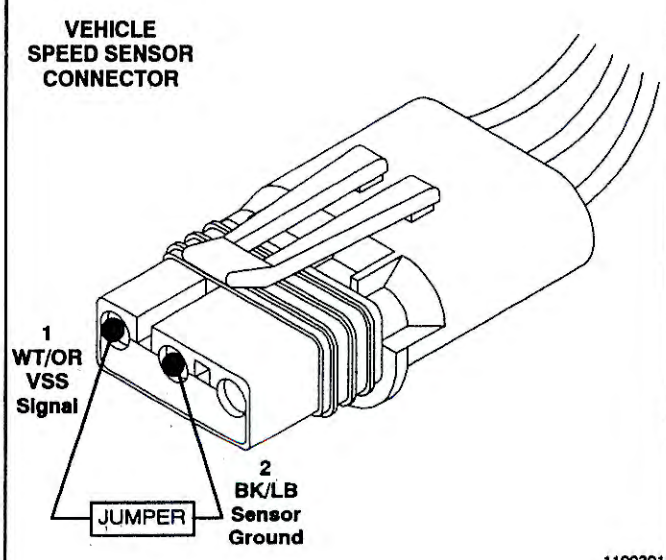
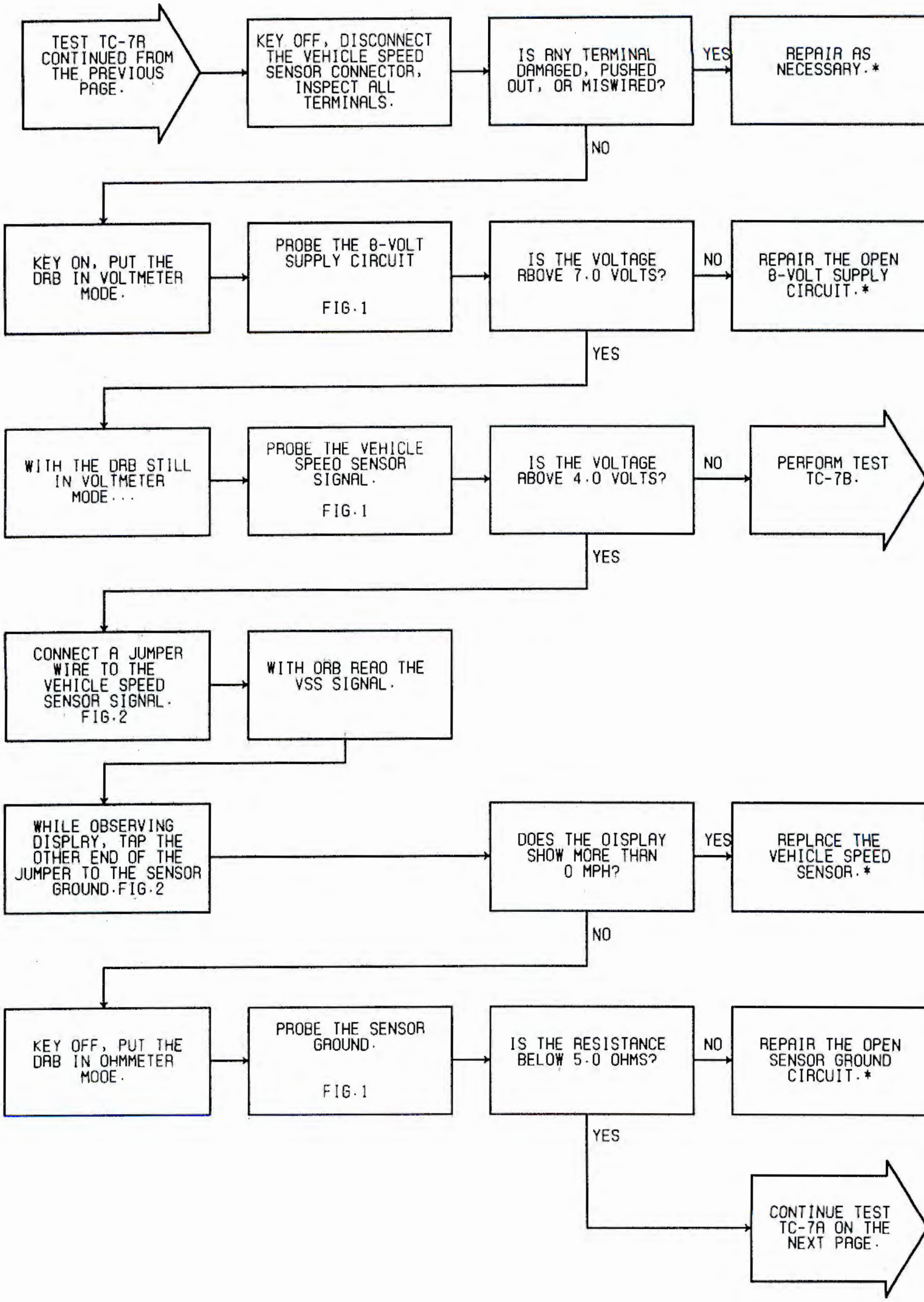


FIG. 2

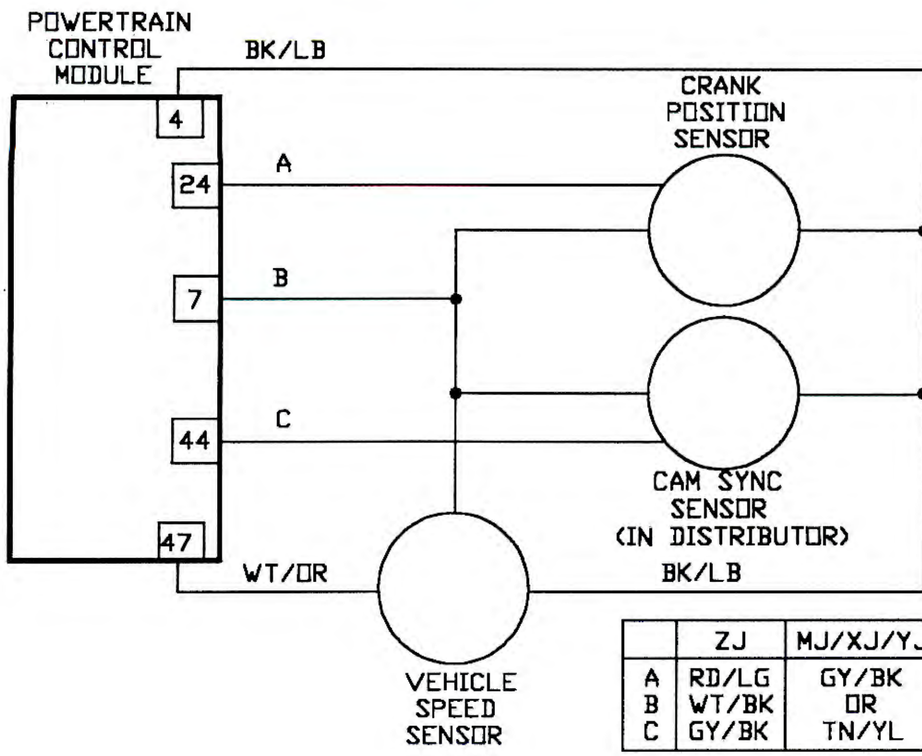
TEST TC-7A CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL



*Perform Verification TEST VER-2A.

**Check connectors – Clean / repair as necessary.

TEST TC-7A CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

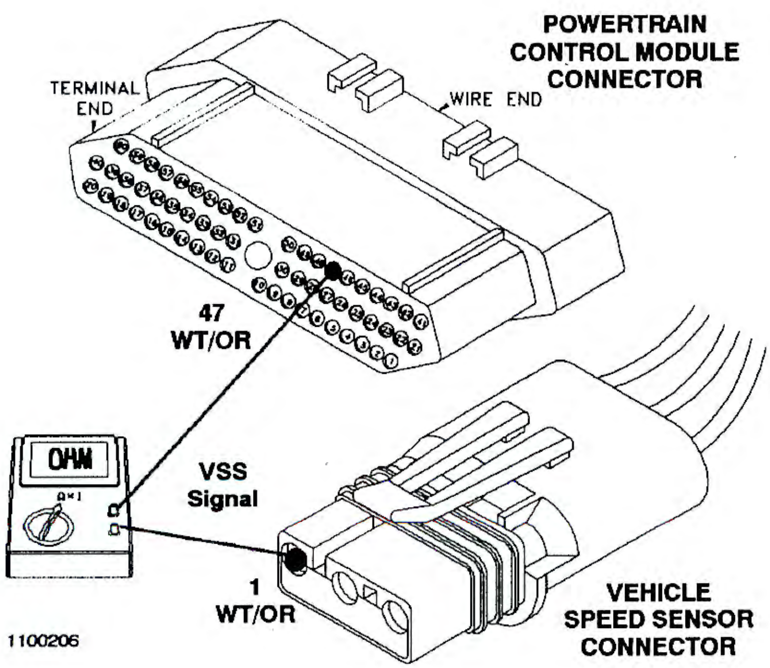
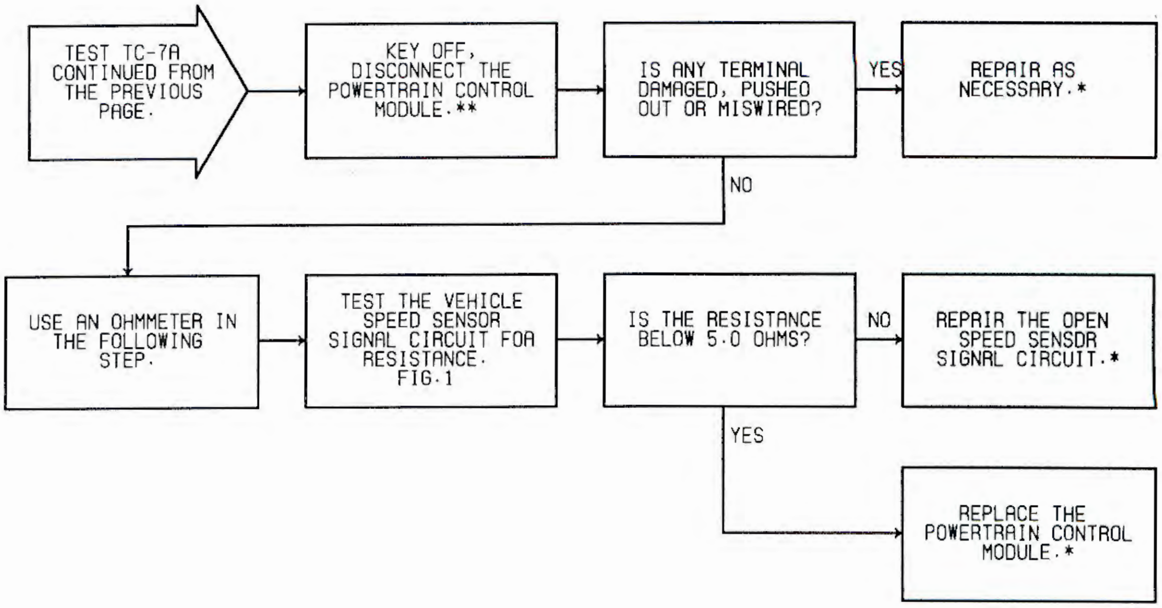


FIG. 1

TEST TC-7A | CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

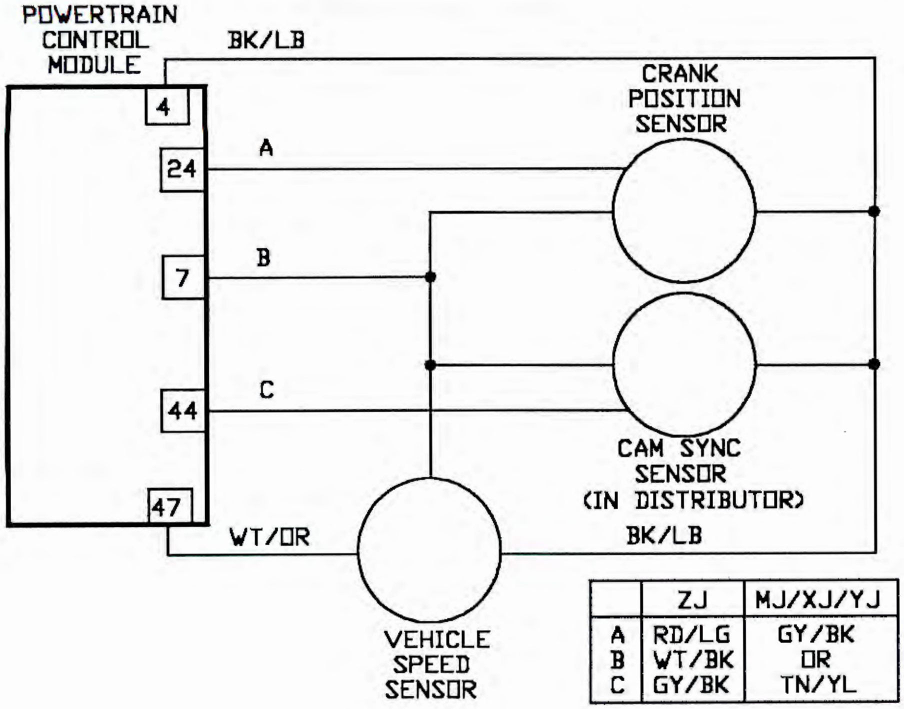


Perform Verification TEST VER-2A.

***Check connectors – Clean / repair as necessary.*

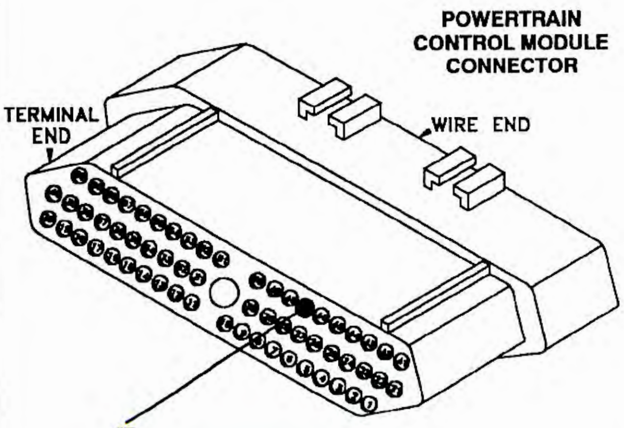
TEST TC-7B | REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-7A Before Proceeding



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

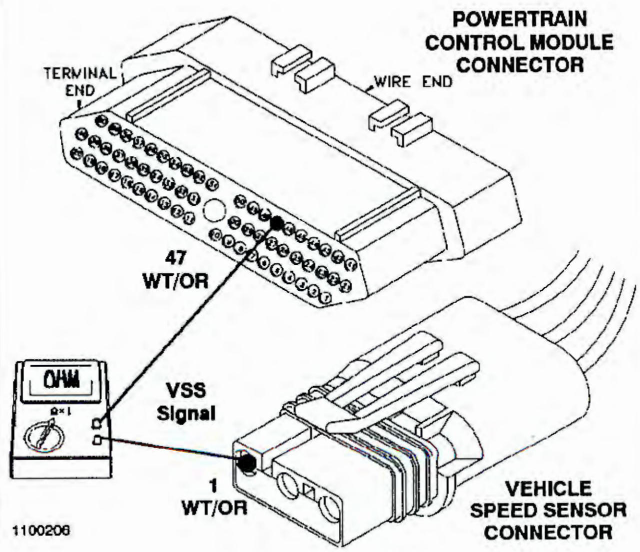
1500203



CAV	COLOR	FUNCTION
47	WT/OR	VSS SIGNAL

0830104

FIG. 1

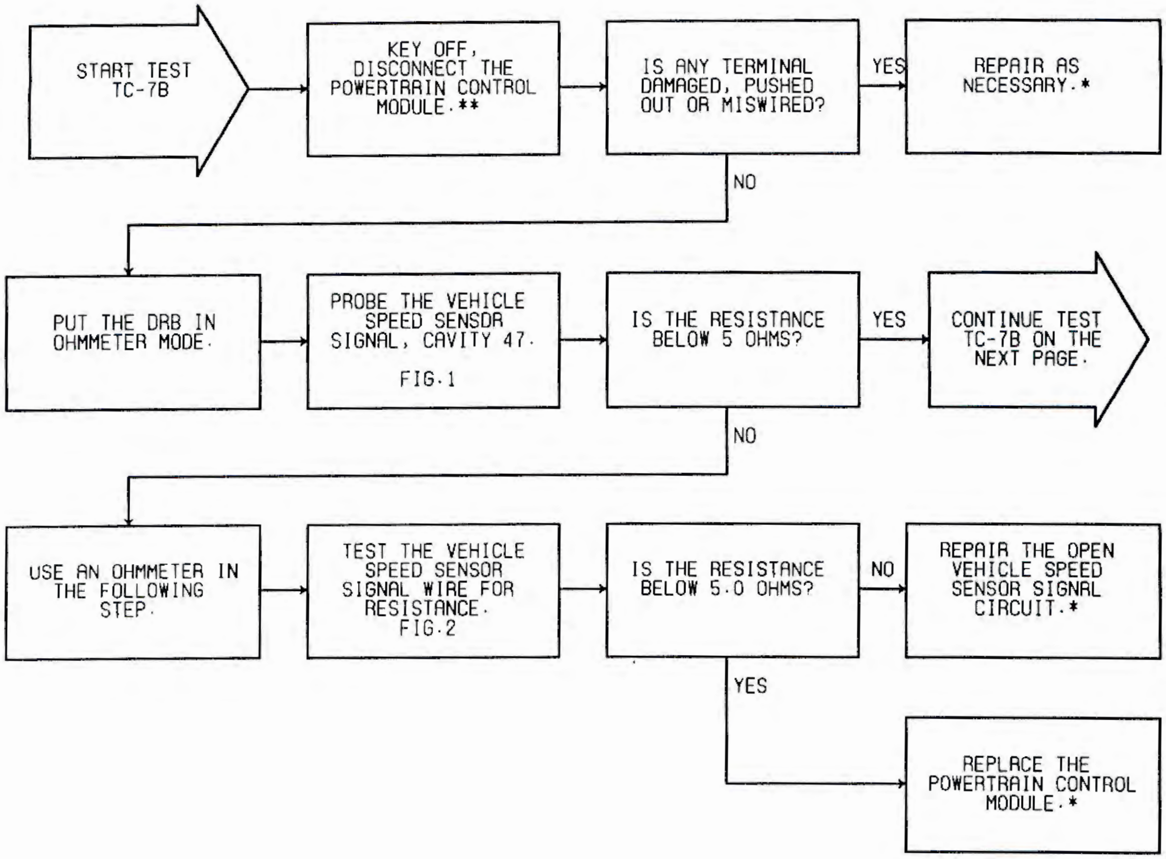


1100206

FIG. 2

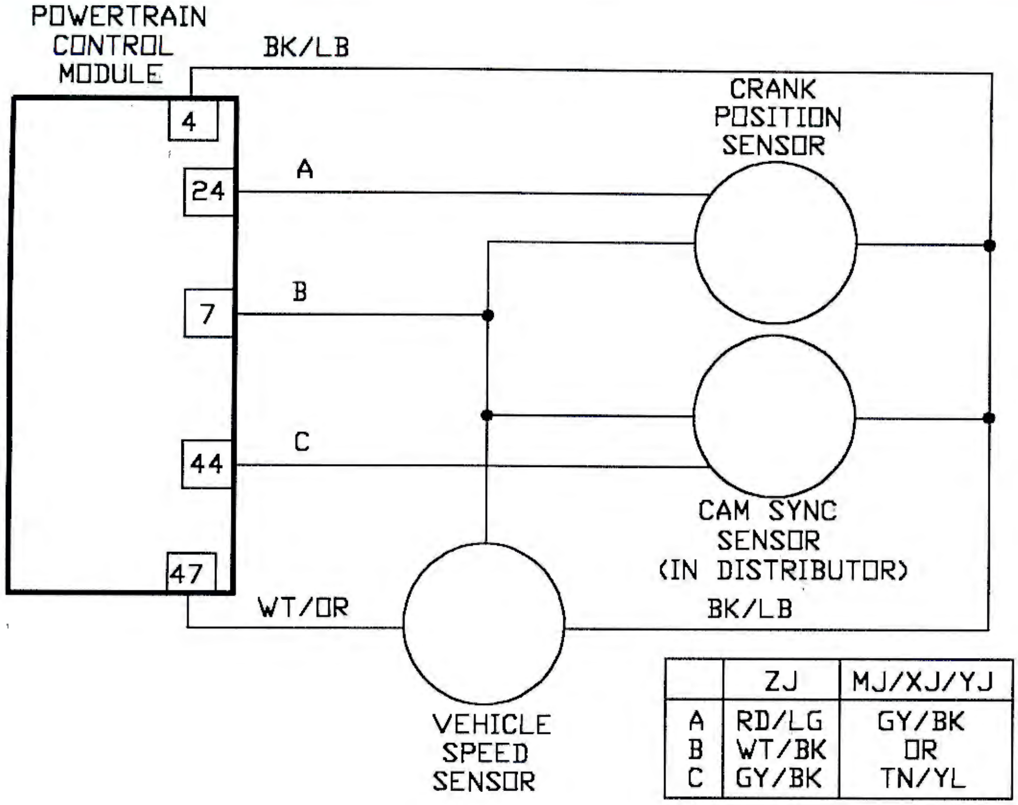
TEST TC-7B REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-7A Before Proceeding

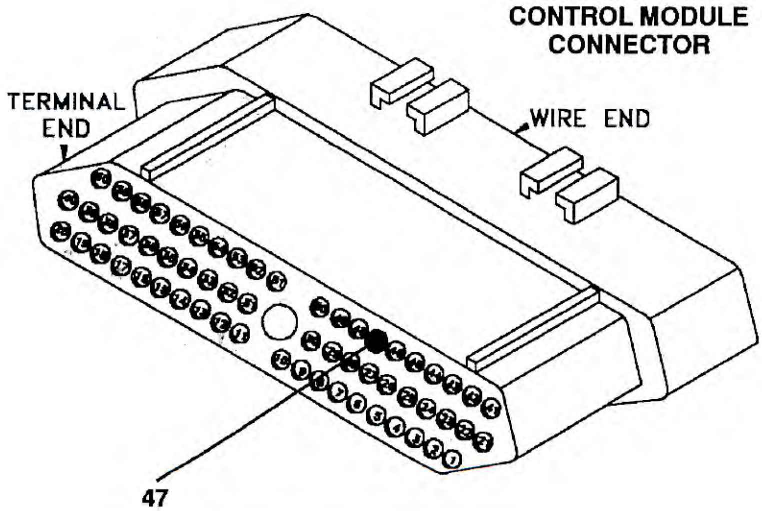


Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-7B — CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL



	ZJ	MJ/XJ/YJ
A	RD/LG	GY/BK
B	WT/BK	OR
C	GY/BK	TN/YL

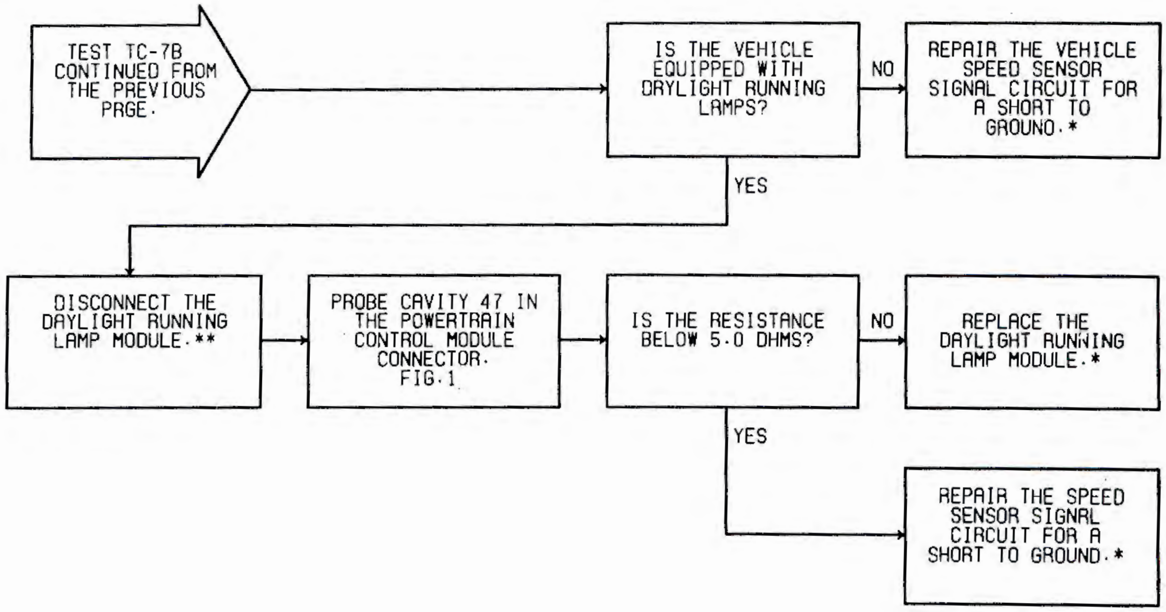


CAV	COLOR	FUNCTION
47	WT/OR	VSS SIGNAL

0830104

FIG. 1

TEST TC-7B CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL



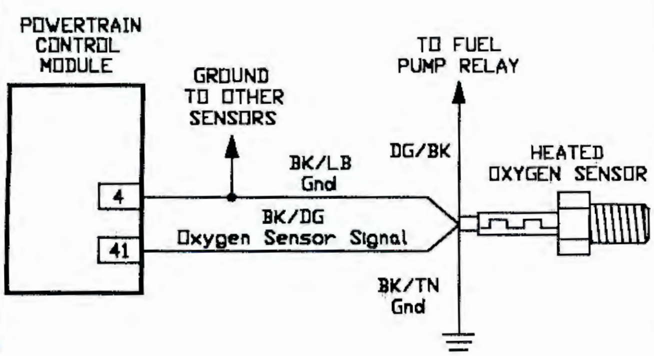
*Perform Verification TEST VER-2A.

**Check connectors – Clean / repair as necessary.

TEST TC-8A | REPAIRING - O2S STAYS AT CENTER

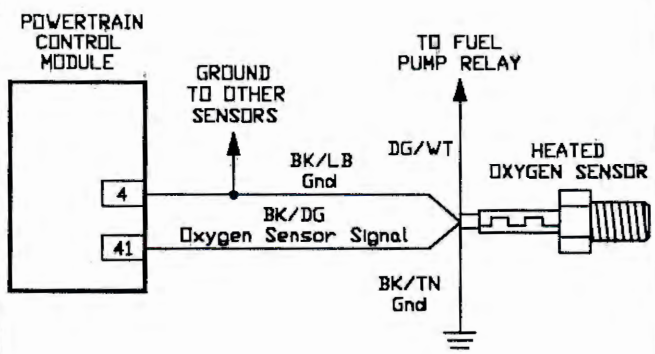
Perform TEST TC-1A Before Proceeding

1993 MJ AND 1993-94 XJ BODIES



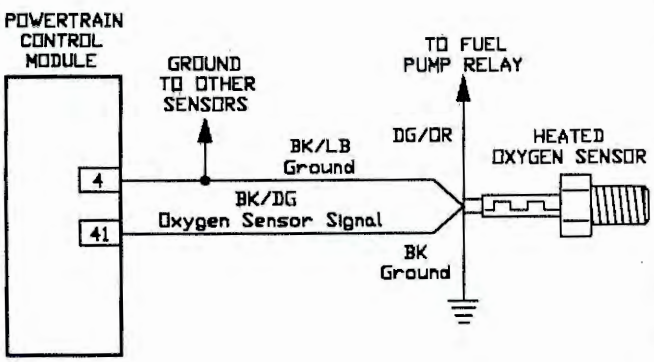
1160601

1995 XJ BODY



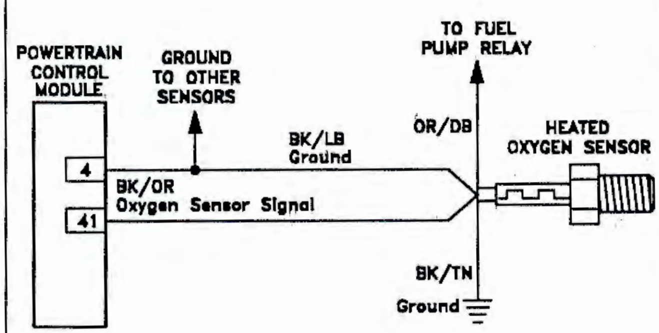
2580302

YJ BODY



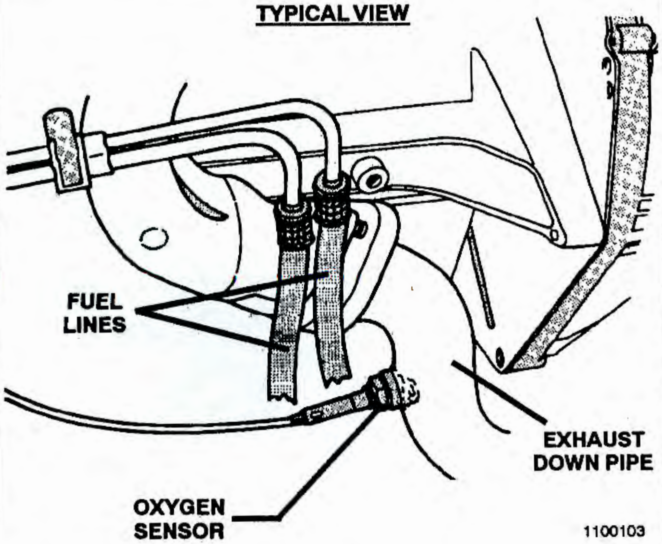
1070103

ZJ BODY



1020105

TYPICAL VIEW



1100103

FIG. 1

Name of code: O2S Stays at Center

When monitored: With the engine running for more than 2 minutes and engine temperature greater than 170°F.

Set conditions: The oxygen sensor signal voltage is .5 volts for 1.5 minutes.

Theory of operation: The oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from the O2 sensor. The sensor detects exhaust gas content by a galvanic reaction within the sensor that produces a voltage. After measuring the amount of oxygen in the exhaust gases, the oxygen sensor can tell the PCM how well its output signals are controlling the air/fuel ratio. Variations in the signals from the O2 sensor serve as air/fuel ratio indicators. Changes in the sensor signals occur because the air/fuel ratio is constantly changing. When oxygen content is low (rich mixture), the voltage signal will be approximately 1 volt. With a lean mixture (high oxygen content), the voltage signal will be low, approximately 0.1 volt.

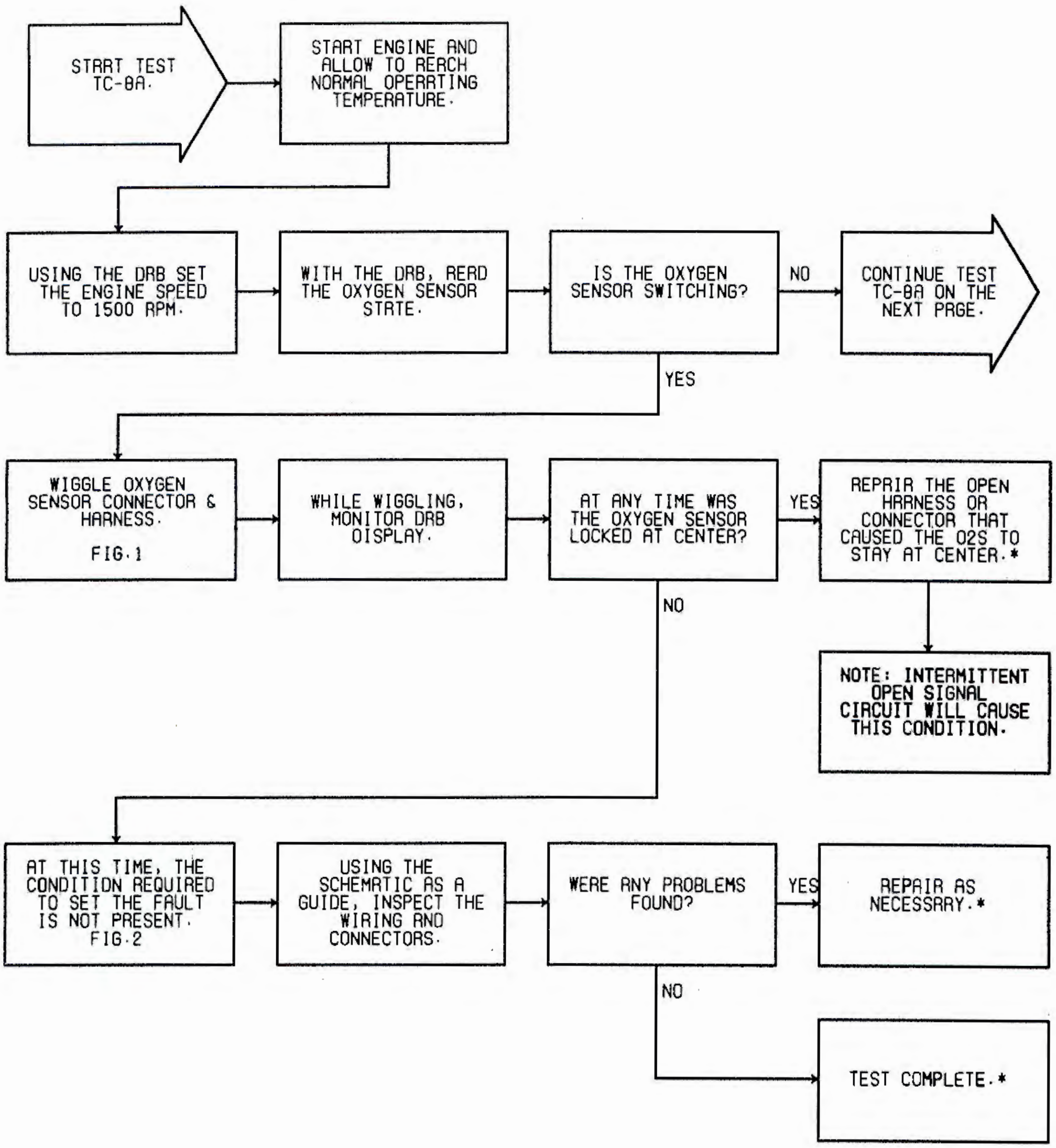
Possible causes:
- Sensor output wire open
- O2 sensor failure

0980301

FIG. 2

TEST TC-8A | REPAIRING - O2S STAYS AT CENTER

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-8A CONTINUED - REPAIRING - O2S STAYS AT CENTER

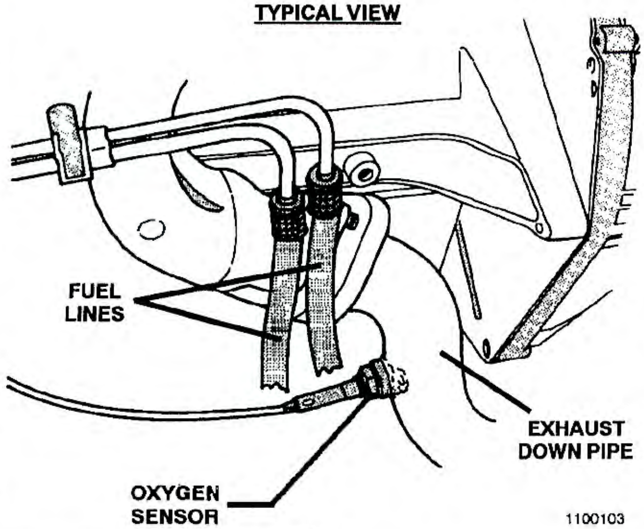
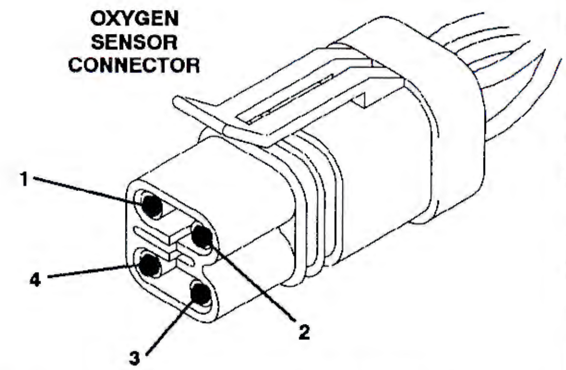


FIG. 1



CAV	MJ/XJ	YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	BK/LB	SENSOR GROUND
2	BK/DG	BK/DG	BK/OR	OXYGEN SENSOR SIGNAL
3	BK/TN	BK	BK/TN	GROUND (HEATER)
4	DG/*	DG/OR	OR/DB	FUSED IGN SW OUTPUT

1510205

FIG. 2

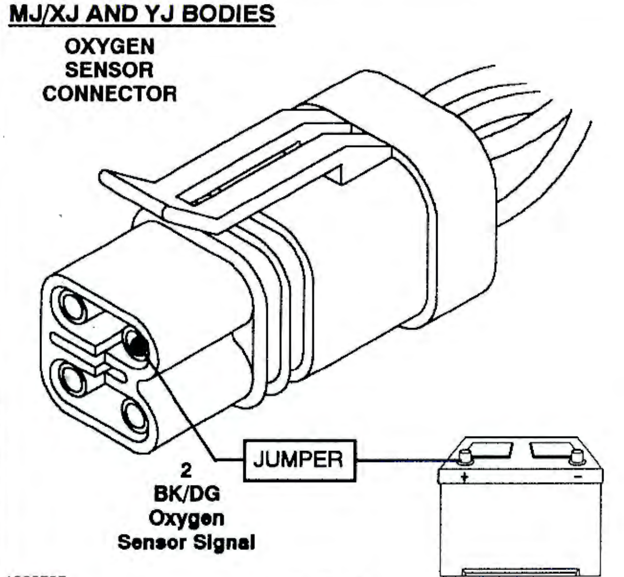


FIG. 3

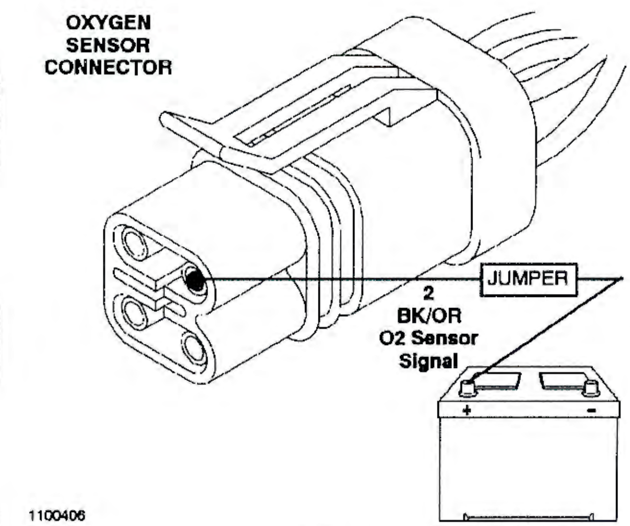


FIG. 4

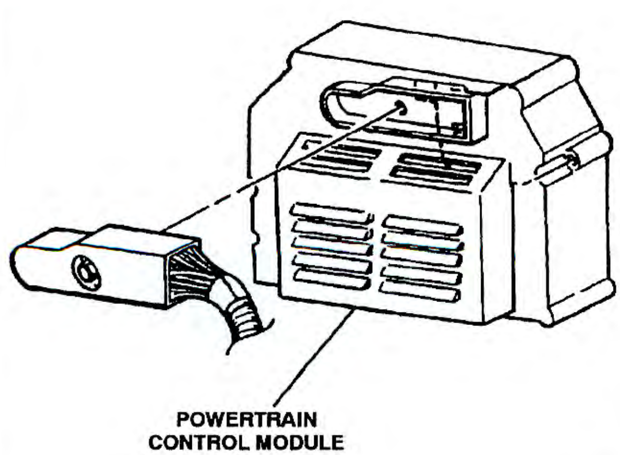
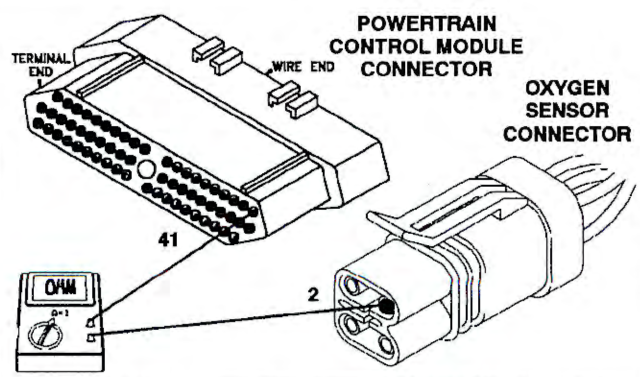


FIG. 5

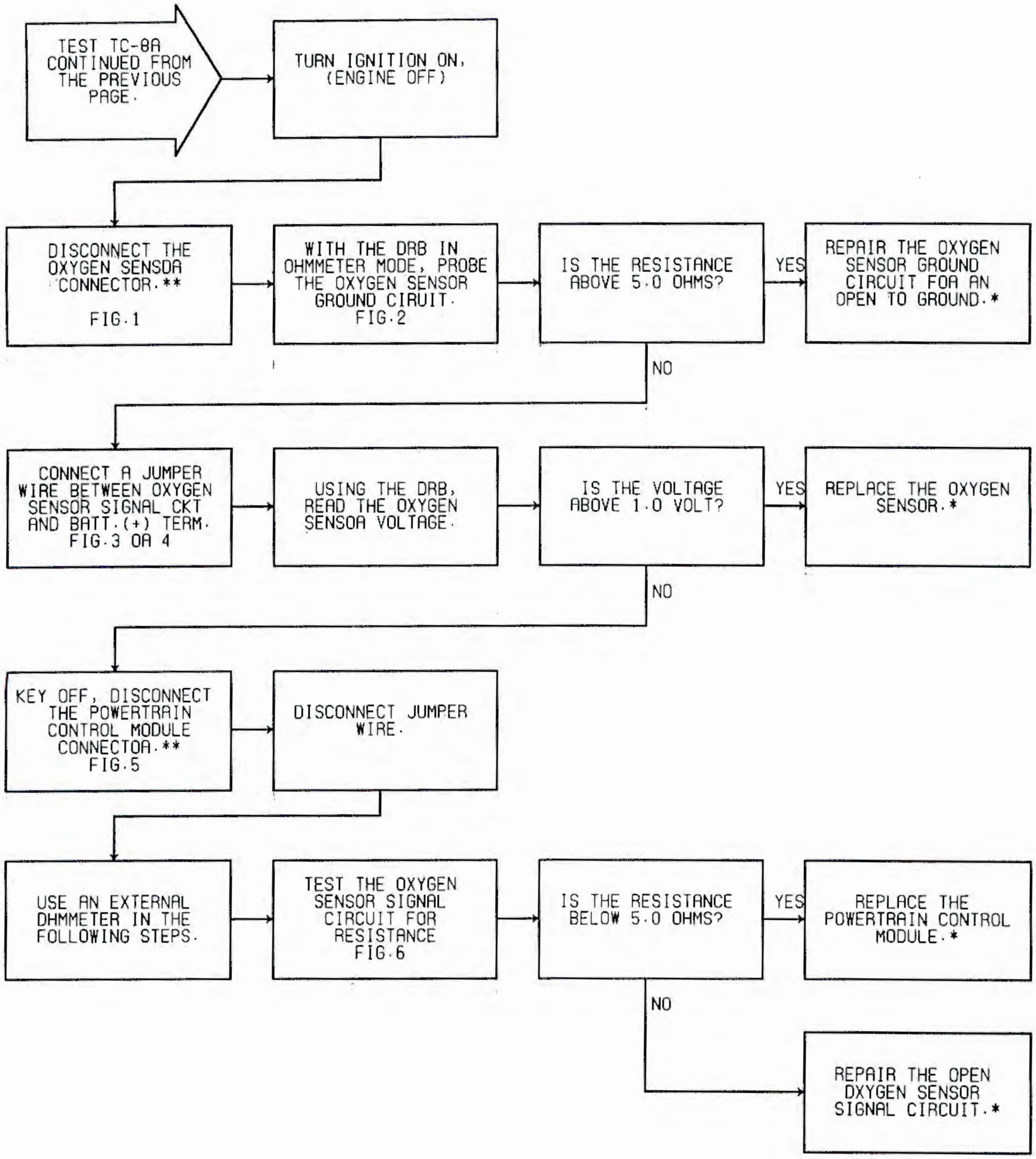


CAV	MJ/XJ	YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	BK/LB	SENSOR GROUND
2	BK/DG	BK/DG	BK/OR	OXYGEN SENSOR SIGNAL
3	BK/TN	BK	BK/TN	GROUND (HEATER)
4	DG/*	DG/OR	OR/DB	FUSED IGN SW OUTPUT

1510206

FIG. 6

TEST TC-8A CONTINUED - REPAIRING - O2S STAYS AT CENTER

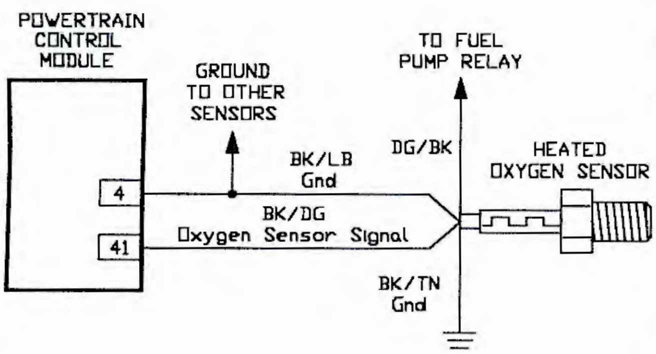


Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-9A | REPAIRING - O2S SHORTED TO VOLTAGE

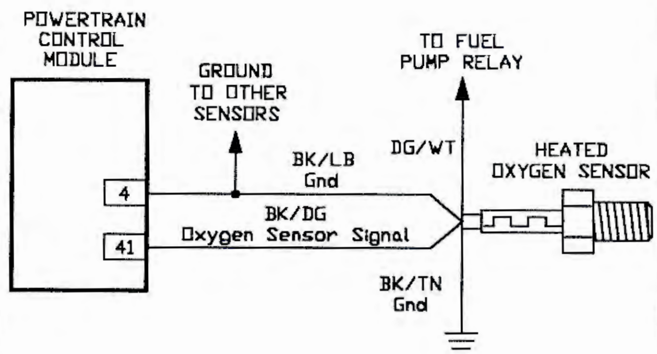
Perform TEST TC-1A Before Proceeding

1993 MJ AND 1993-94 XJ BODIES



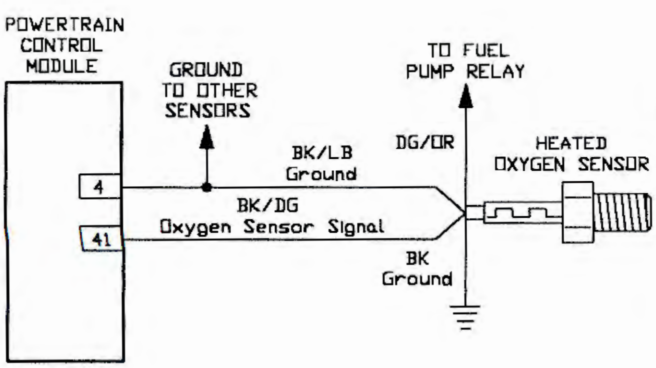
1160601

1995 XJ BODY



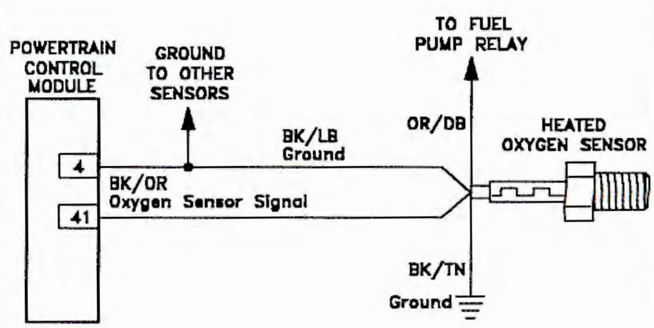
2580302

YJ BODY



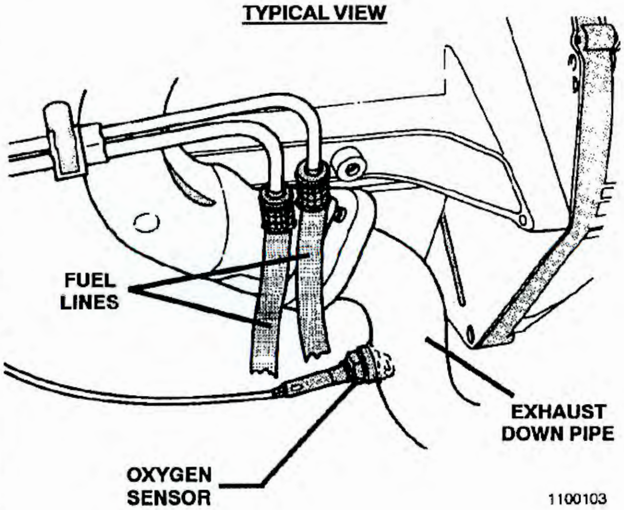
1070103

ZJ BODY



1020105

TYPICAL VIEW



1100103

FIG. 1

Name of code: O2S Shorted To Voltage

When monitored: With the ignition key on.

Set conditions: The oxygen sensor signal voltage is above 1.2 volts.

Theory of operation: The oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from the O2 sensor. The sensor detects exhaust gas content by a galvanic reaction within the sensor that produces a voltage. After measuring the amount of oxygen in the exhaust gases, the oxygen sensor tells the PCM how well its output signals are controlling the air/fuel ratio. Variations in the signals from the O2 sensor serve as air/fuel ratio indicators. Changes in the sensor signal occur because the air/fuel ratio is constantly changing. When oxygen content is low (rich mixture), the voltage signal will be approximately 1 volt. When oxygen content is high (lean mixture), the voltage signal will be low, approximately 0.1 volt.

Possible causes:

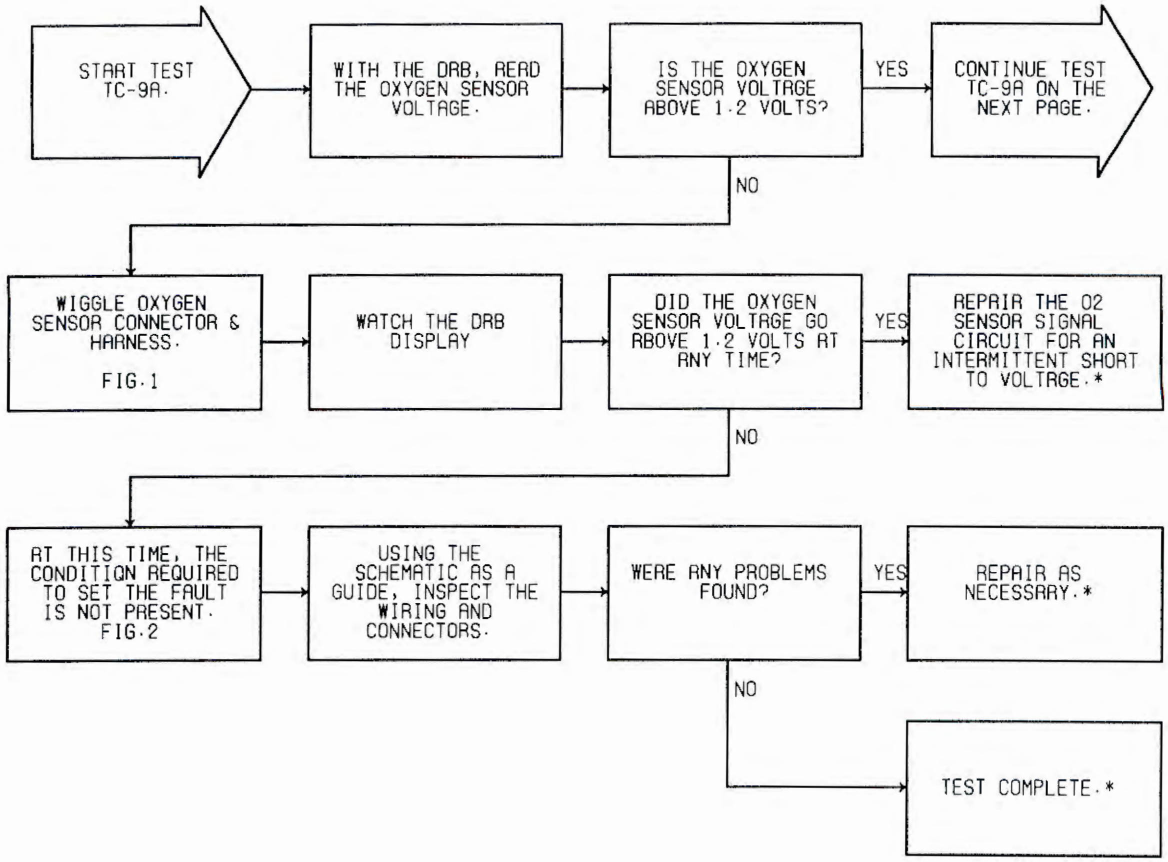
> Sensor output wire shorted to another circuit
> Dirty/wet connection causing voltage tracking in connector
> O2 sensor failure

0980206

FIG. 2

TEST TC-9A | REPAIRING - O2S SHORTED TO VOLTAGE

Perform TEST TC-1A Before Proceeding



***Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.**

TEST TC-9A — CONTINUED - REPAIRING - O2S SHORTED TO VOLTAGE

TYPICAL VIEW

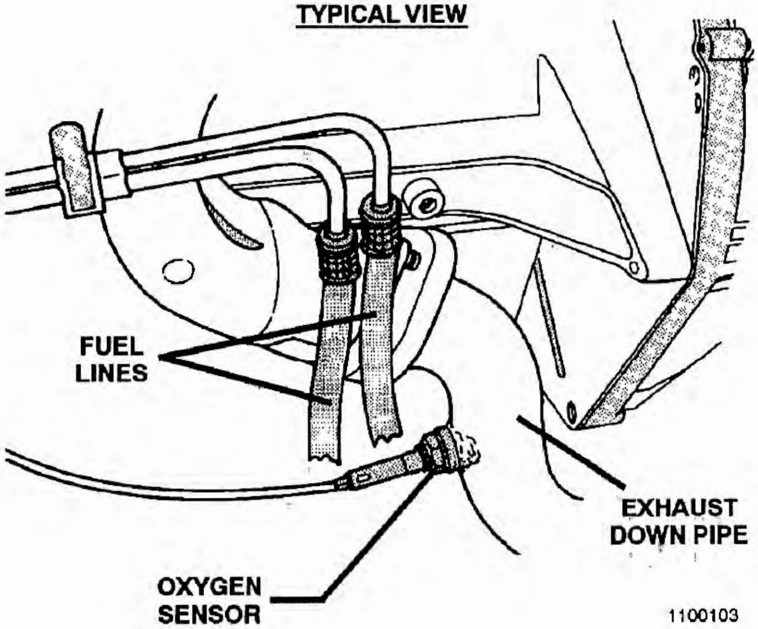
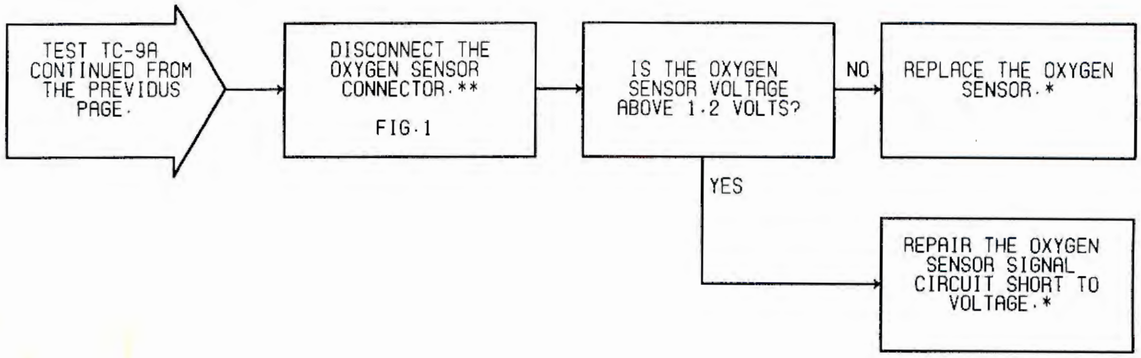


FIG. 1

TEST TC-9A | CONTINUED - REPAIRING - O2S SHORTED TO VOLTAGE

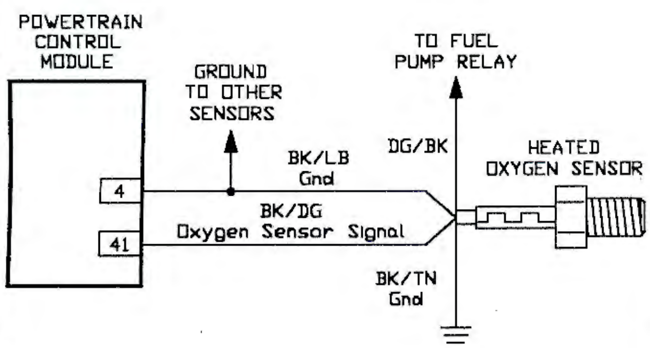


*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-10A REPAIRING - O2S STAYS ABOVE CENTER (RICH)

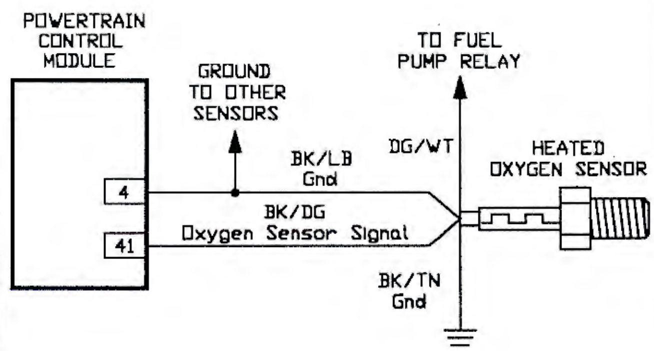
Perform TEST TC-1A Before Proceeding

1993 MJ AND 1993-94 XJ BODIES



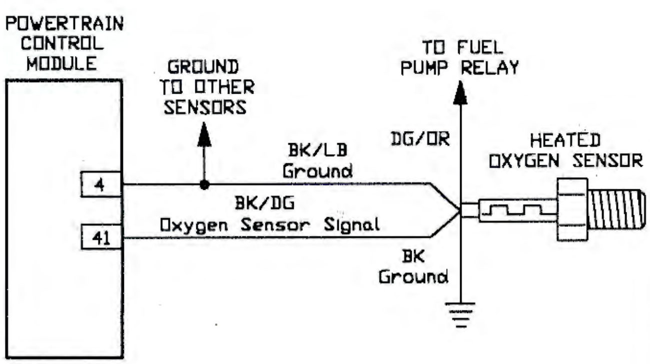
1160601

1995 XJ BODY



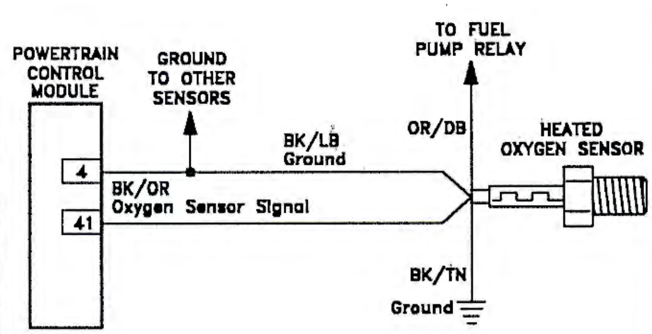
2580302

ZJ BODY



1070103

YJ BODY



1020105

Name of code: O2S Stays Above Center (Rich)

When monitored: With the engine running in closed loop and the coolant temperature above 170°F.

Set conditions: The oxygen sensor signal voltage stays above .5 volts but less than 1.2 volts without toggling for at least 8 minutes.

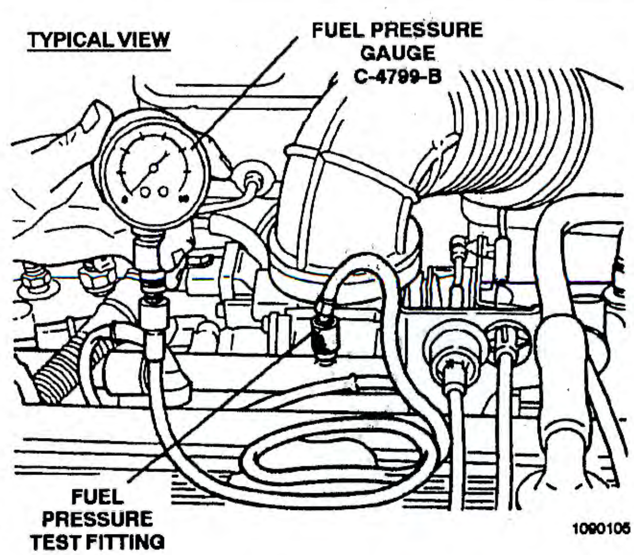
Theory of operation: The oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from the O2 sensor. The sensor detects exhaust gas content by a galvanic reaction within the sensor that produces a voltage. After measuring the amount of oxygen in the exhaust gases, the oxygen sensor tells the PCM how well its output signal is controlling the air/fuel ratio. Variations in the signals from the O2 sensor serve as air/fuel ratio indicators. Changes in the sensor signal occur because the air/fuel ratio is constantly changing. When oxygen content is low (rich mixture), the voltage signal will be approximately 1 volt. When oxygen content is high (lean mixture), the voltage signal will be low, approximately 0.1 volt.

Possible causes:
> High fuel pressure
> Other engine sensor calibrations
> Ignition system failure
> O2 sensor failure
> Mechanical engine problem

1000205

FIG. 1

TYPICAL VIEW

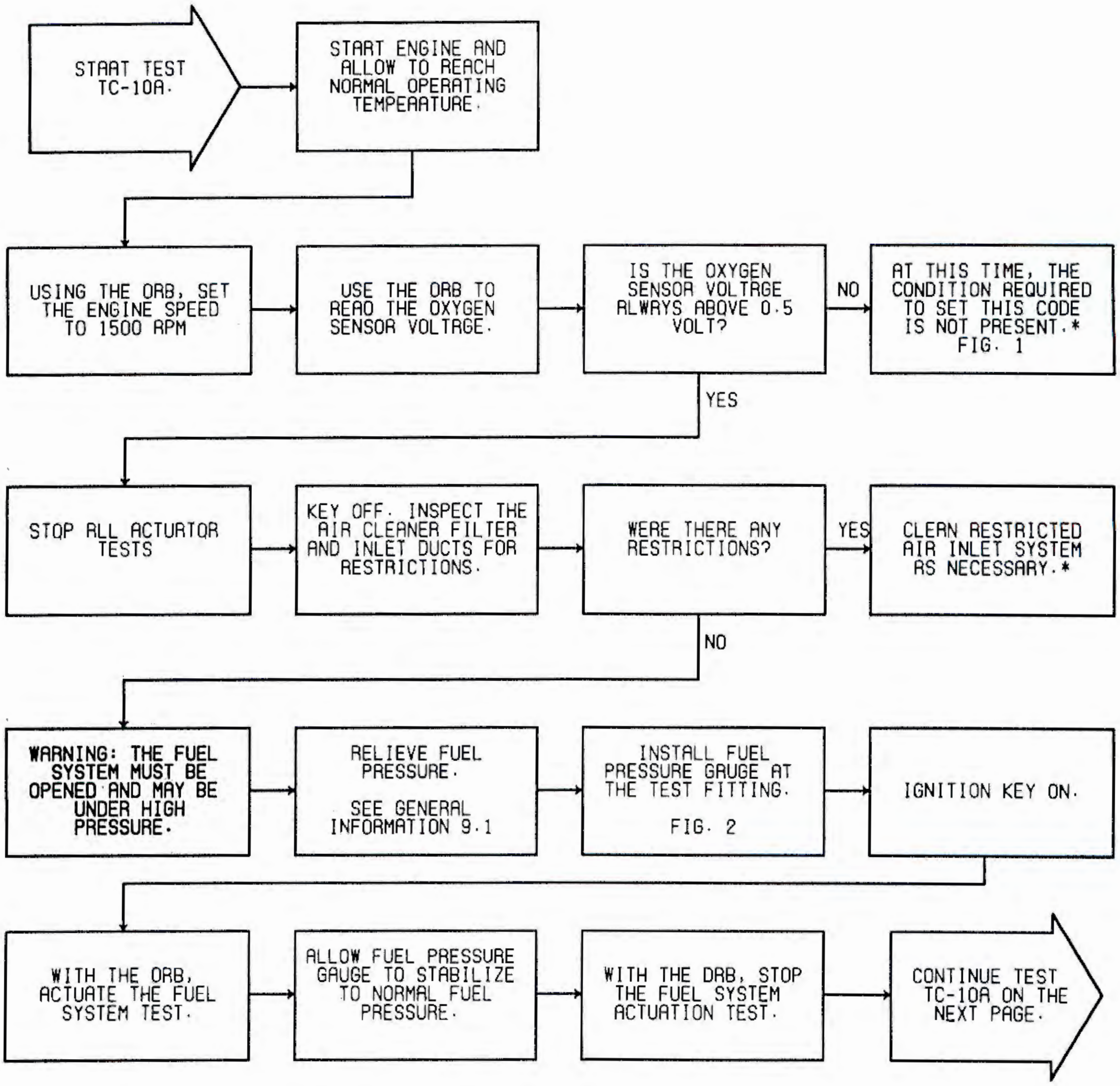


1090105

FIG. 2

TEST TC-10A | REPAIRING - O2S STAYS ABOVE CENTER (RICH)

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-10A CONTINUED - REPAIRING - O2S STAYS ABOVE CENTER (RICH)

Name of code: O2S Stays Above Center (Rich)

When monitored: With the engine running in closed loop and the coolant temperature above 170°F.

Set conditions: The oxygen sensor signal voltage stays above .5 volts but less than 1.2 volts without toggling for at least 8 minutes.

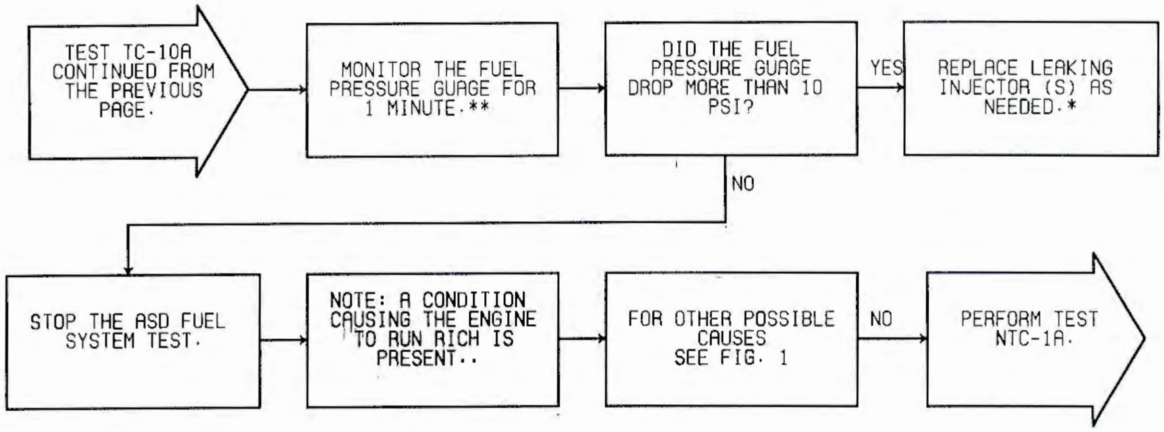
Theory of operation: The oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from the O2 sensor. The sensor detects exhaust gas content by a galvanic reaction within the sensor that produces a voltage. After measuring the amount of oxygen in the exhaust gases, the oxygen sensor tells the PCM how well its output signal is controlling the air/fuel ratio. Variations in the signals from the O2 sensor serve as air/fuel ratio indicators. Changes in the sensor signal occur because the air/fuel ratio is constantly changing. When oxygen content is low (rich mixture), the voltage signal will be approximately 1 volt. When oxygen content is high (lean mixture), the voltage signal will be low, approximately 0.1 volt.

Possible causes:
> High fuel pressure
> Other engine sensor calibrations
> Ignition system failure
> O2 sensor failure
> Mechanical engine problem

1000205

FIG. 1

TEST TC-10A CONTINUED - REPAIRING - O2S STAYS ABOVE CENTER (RICH)

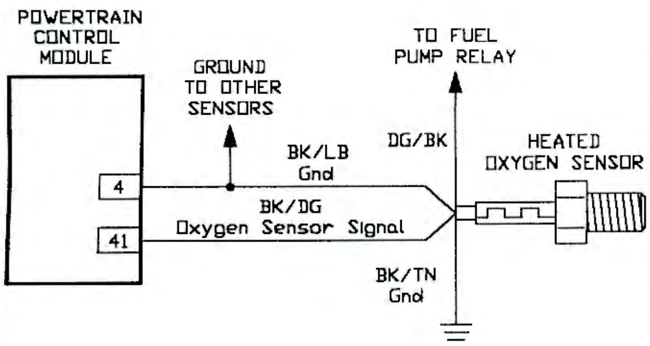


Perform Verification TEST VER-2A.	*****Check connectors – Clean / repair as necessary.***

TEST TC-11A REPAIRING - O2S STAYS BELOW CENTER (LEAN)

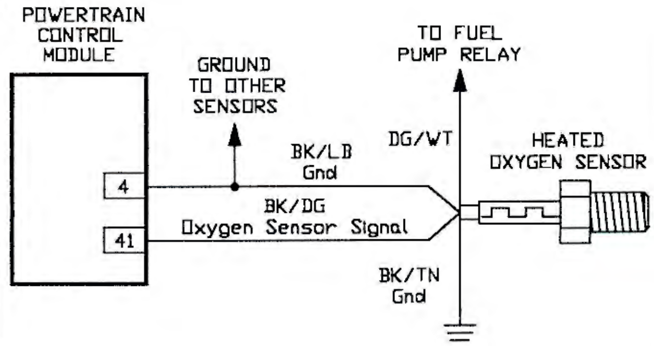
Perform TEST TC-1A Before Proceeding

1993 MJ AND 1993-94 XJ BODIES



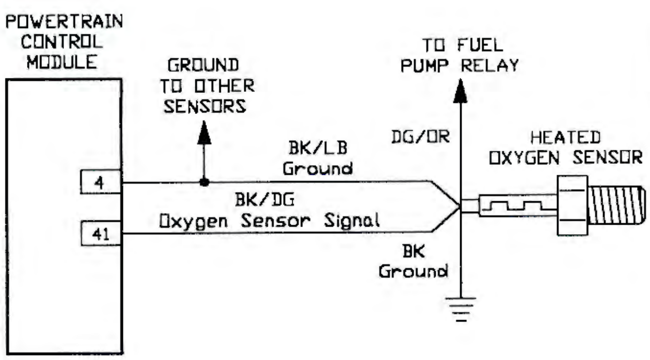
1160601

1995 XJ BODY



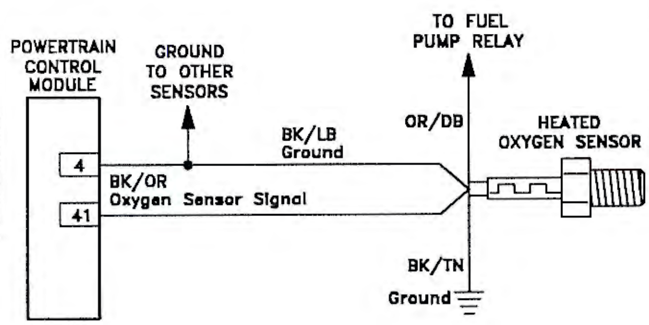
2580302

ZJ BODY



1070103

YJ BODY



1020105

Name of code: O2S Stays Below Center (Lean)

When monitored: With the engine running in closed loop and the coolant temperature above 170°F.

Set conditions: The oxygen sensor signal voltage stays below .5 volts without toggling for at least 8 minutes.

Theory of operation: The oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from the O2 sensor. The sensor detects exhaust gas content by a galvanic reaction within the sensor that produces a voltage. After measuring the amount of oxygen in the exhaust gases, the oxygen sensor tells the PCM how well its output signal is controlling the air/fuel ratio. Variations in the signal from the O2 sensor serve as air/fuel ratio indicators. Changes in the sensor signal occur because the air/fuel ratio is constantly changing. When oxygen content is low (rich mixture), the voltage signal will be approximately 1 volt. When oxygen content is high (lean mixture), the voltage signal will be low, approximately 0.1 volt.

Possible causes:
> Low fuel pressure
> Vacuum leak
> Other engine sensor calibrations
> Ignition system failure
> O2 sensor failure
> Mechanical engine problem

1000206

FIG. 1

TYPICAL VIEW

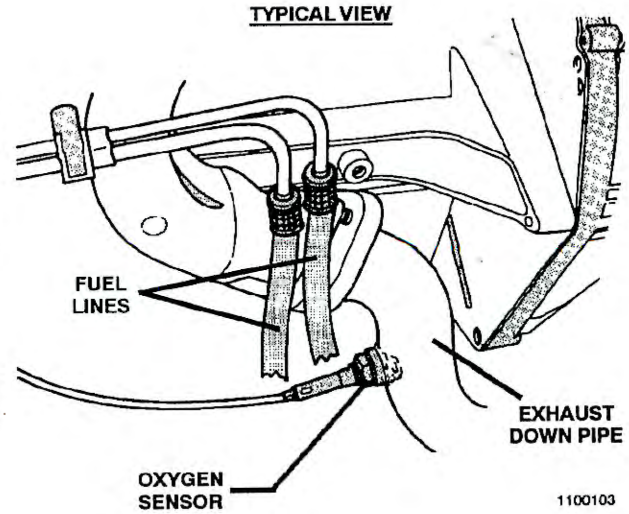
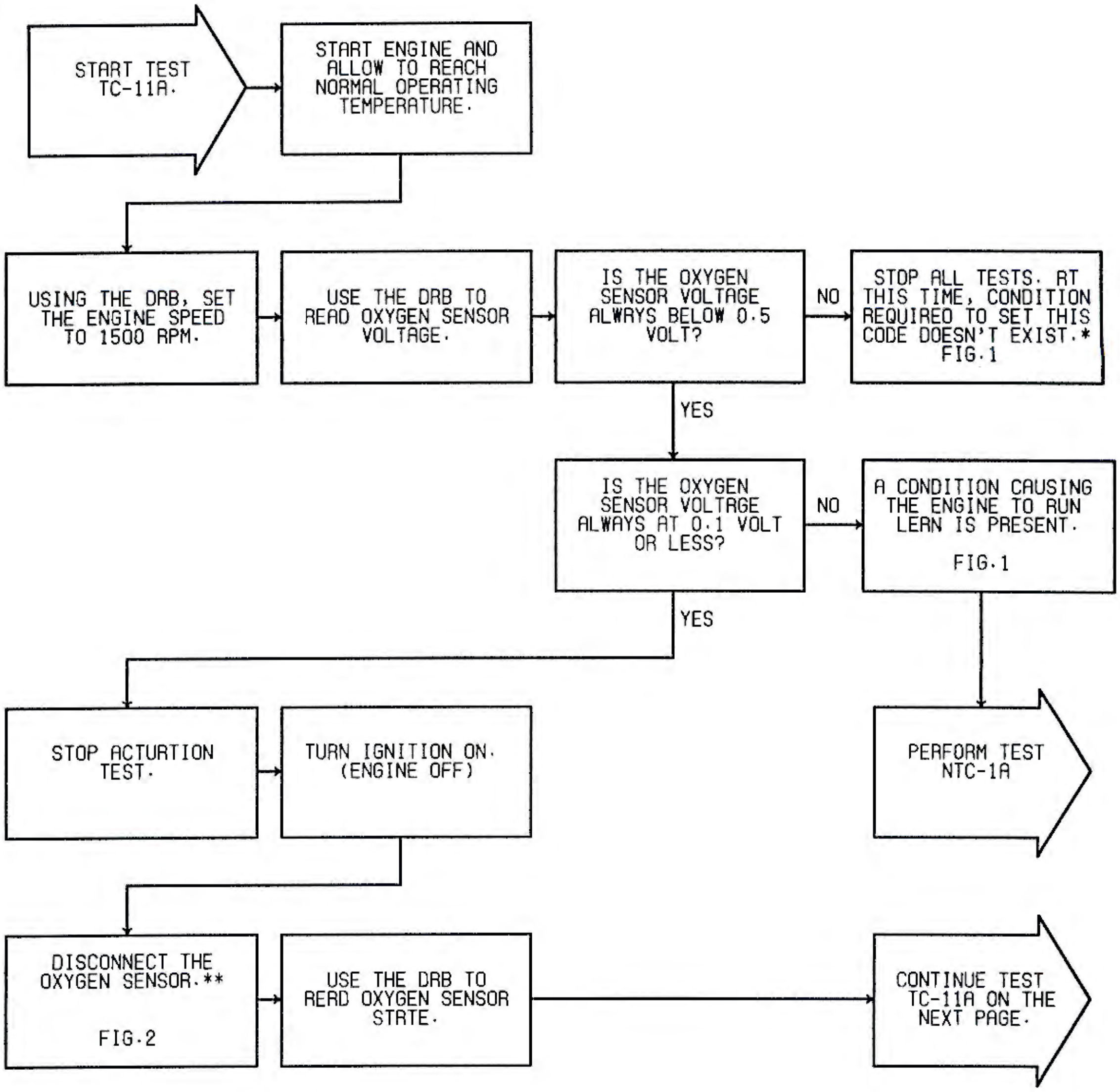


FIG. 2

TEST TC-11A | REPAIRING - O2S STAYS BELOW CENTER (LEAN)

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-11A CONTINUED - REPAIRING - O2S STAYS BELOW CENTER (LEAN)

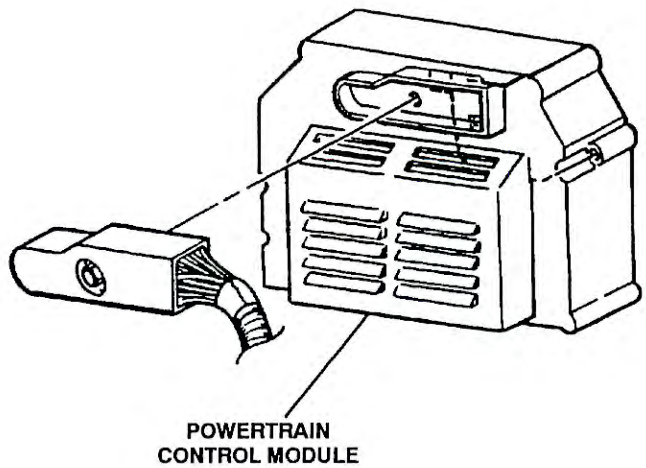
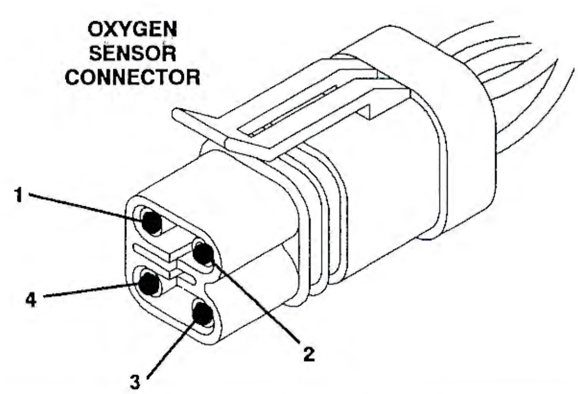


FIG. 1

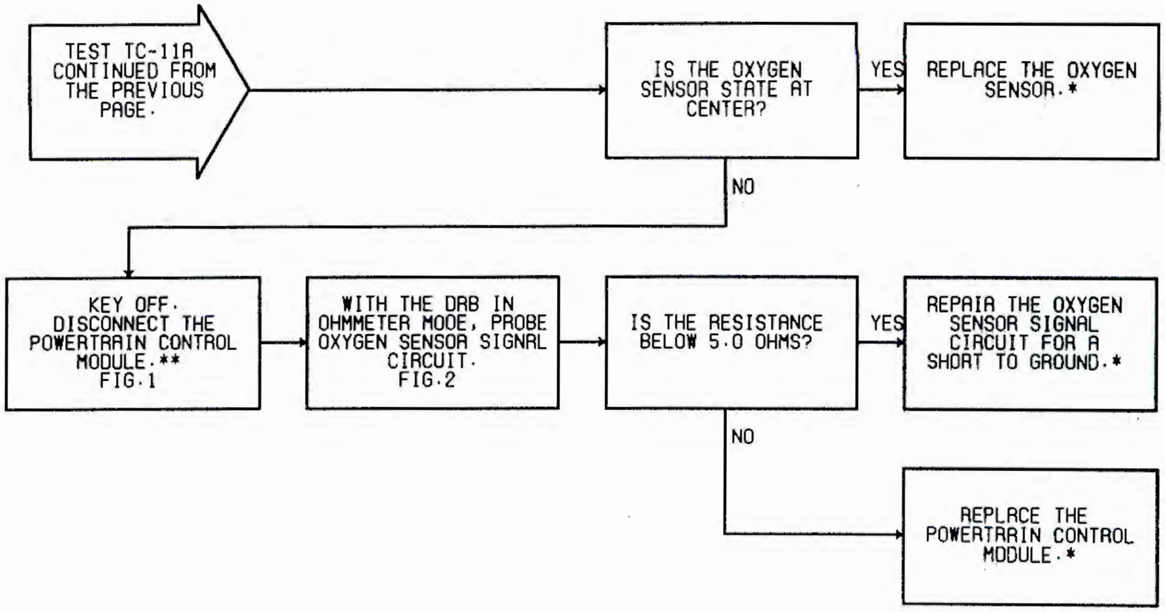


CAV	MJ/XJ	YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	BK/LB	SENSOR GROUND
2	BK/DG	BK/DG	BK/OR	OXYGEN SENSOR SIGNAL
3	BK/TN	BK	BK/TN	GROUND (HEATER)
4	DG/*	DG/OR	OR/DB	FUSED IGN SW OUTPUT

1510205

FIG. 2

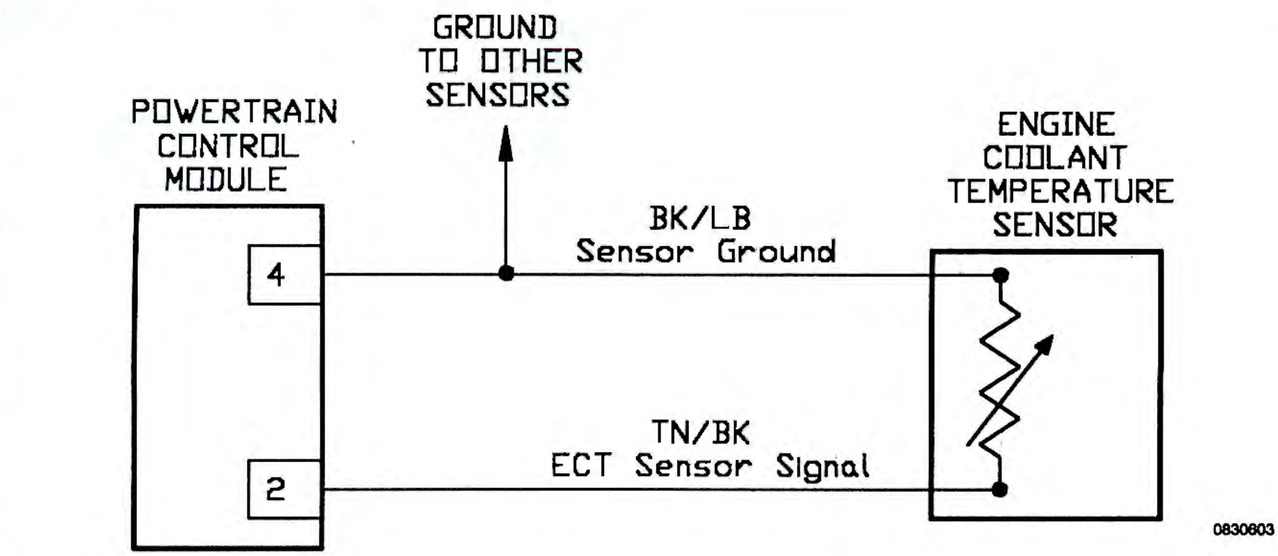
CONTINUED - REPAIRING - O2S STAYS BELOW CENTER (LEAN)



Perform Verification TEST VER-2A.	***Check connectors – Clean / repair as necessary.*

TEST TC-12A REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

Perform TEST TC-1A Before Proceeding



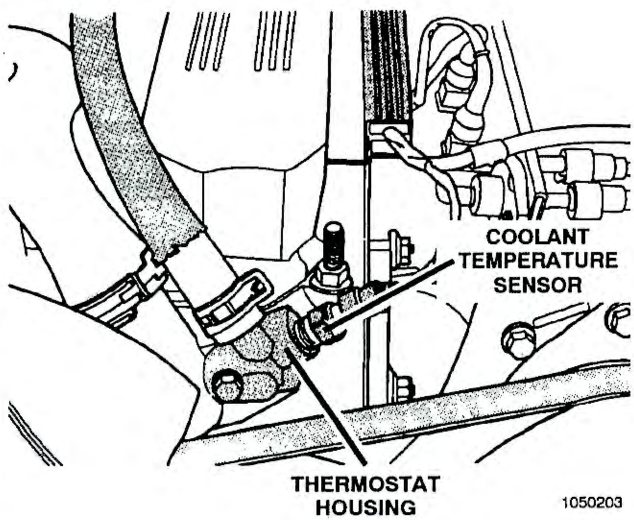


FIG. 1

Name of code: ECT Sensor Voltage Too High

When monitored: With the ignition on.

Set condition: The engine coolant temperature sensor circuit voltage at PCM cavity 2 goes above 4.9 volts for more than 3 seconds.

Theory of operation: The engine coolant temperatura sensor is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. As coolant temperature increases, resistance decreases and the voltage will be low. This allows the sensor to provide an analog voltage signal (0 to 5-volt) to PCM cavity 2.

To make the sensor more accurate at cold and hot temperatures, the 5-volt signal passes through a 10,000 ohm resistor or through a 1,000 ohm resistor connected in parallel with the 10,000 ohm resistor, which has a calculated resistance value of 909 ohms. If the engine is cold (below 125°F), the 5-volt supply to the engine coolant temperature sensor is fed only through the 10,000 ohm resistor inside the PCM. If the engine is warm (above 125°F), the 5-volt supply to the engine coolant temperature sensor is fed through both resistors.

Possible causes:
> Sensor signal circuit open
> Sensor internally open
> Sensor ground circuit open
> PCM failure

0870206

FIG. 2

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

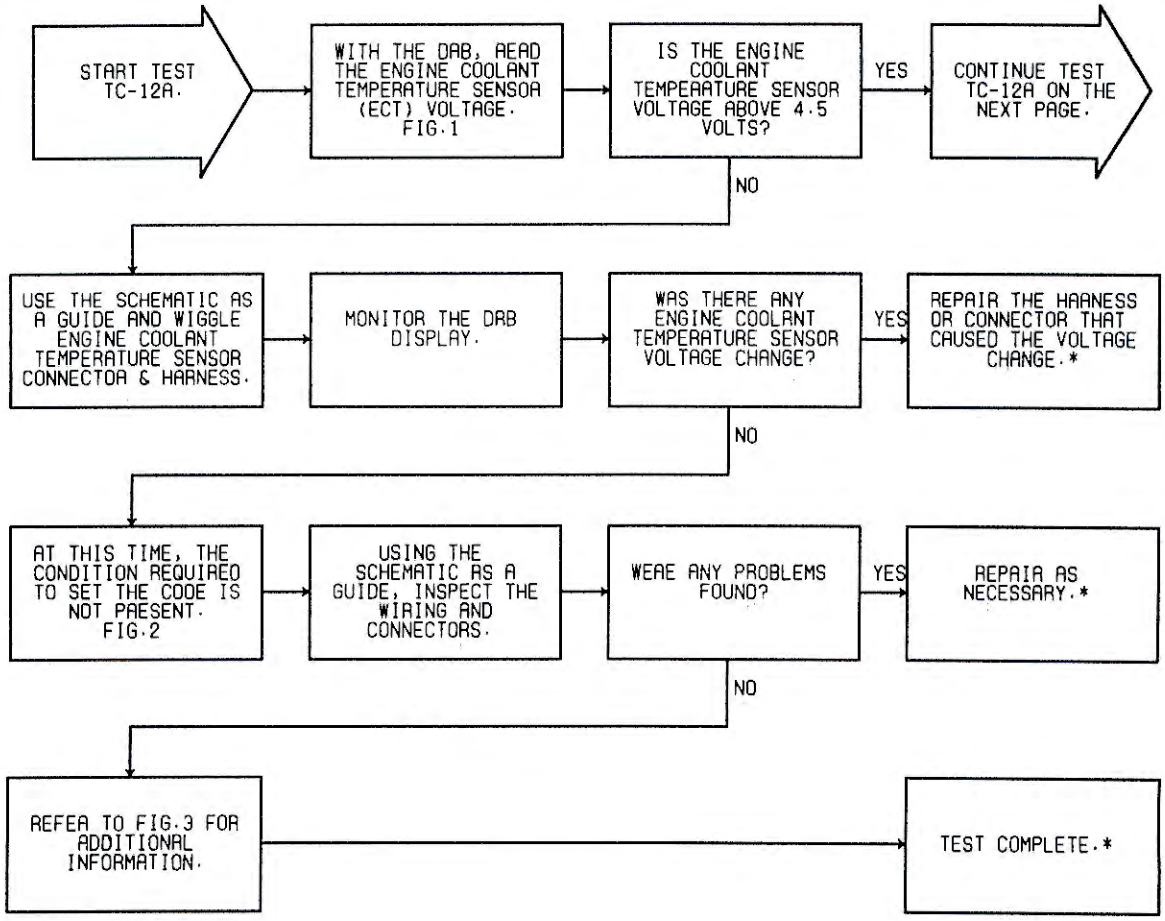
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 3

TEST TC-12A REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A. | ***Check connectors – Clean / repair as necessary.***

TEST TC-12A CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

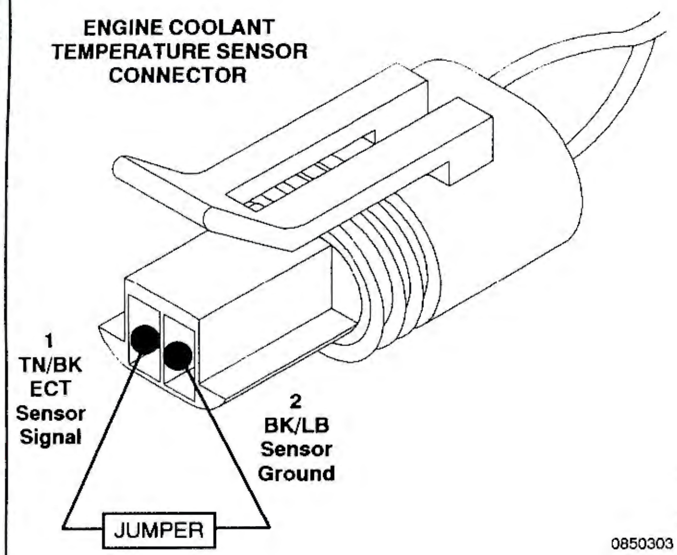


FIG. 1

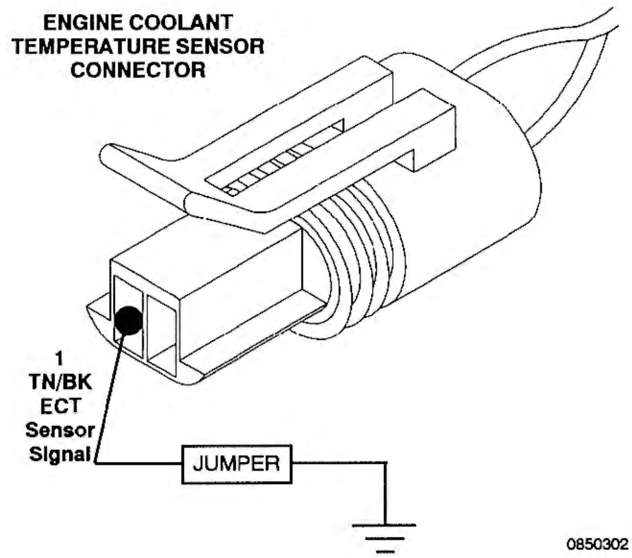


FIG. 2

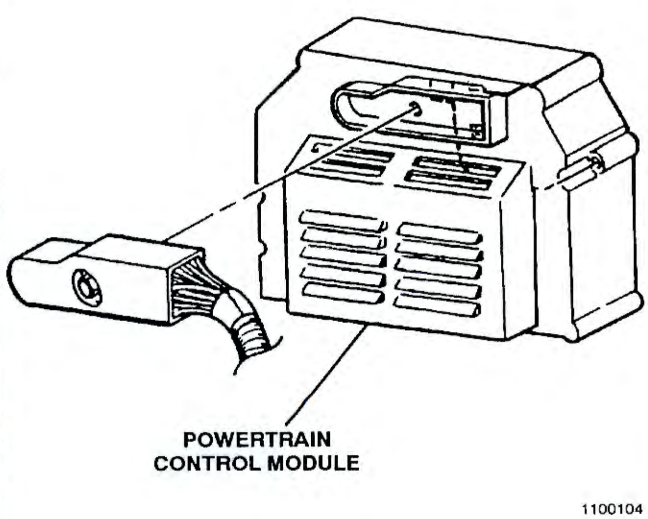


FIG. 3

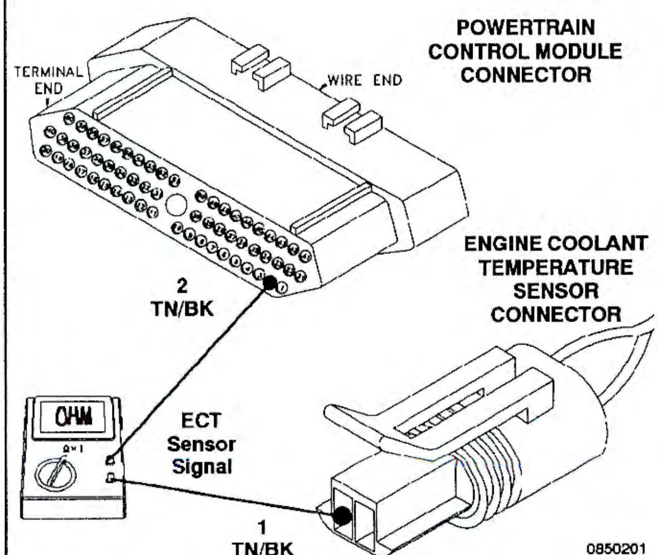
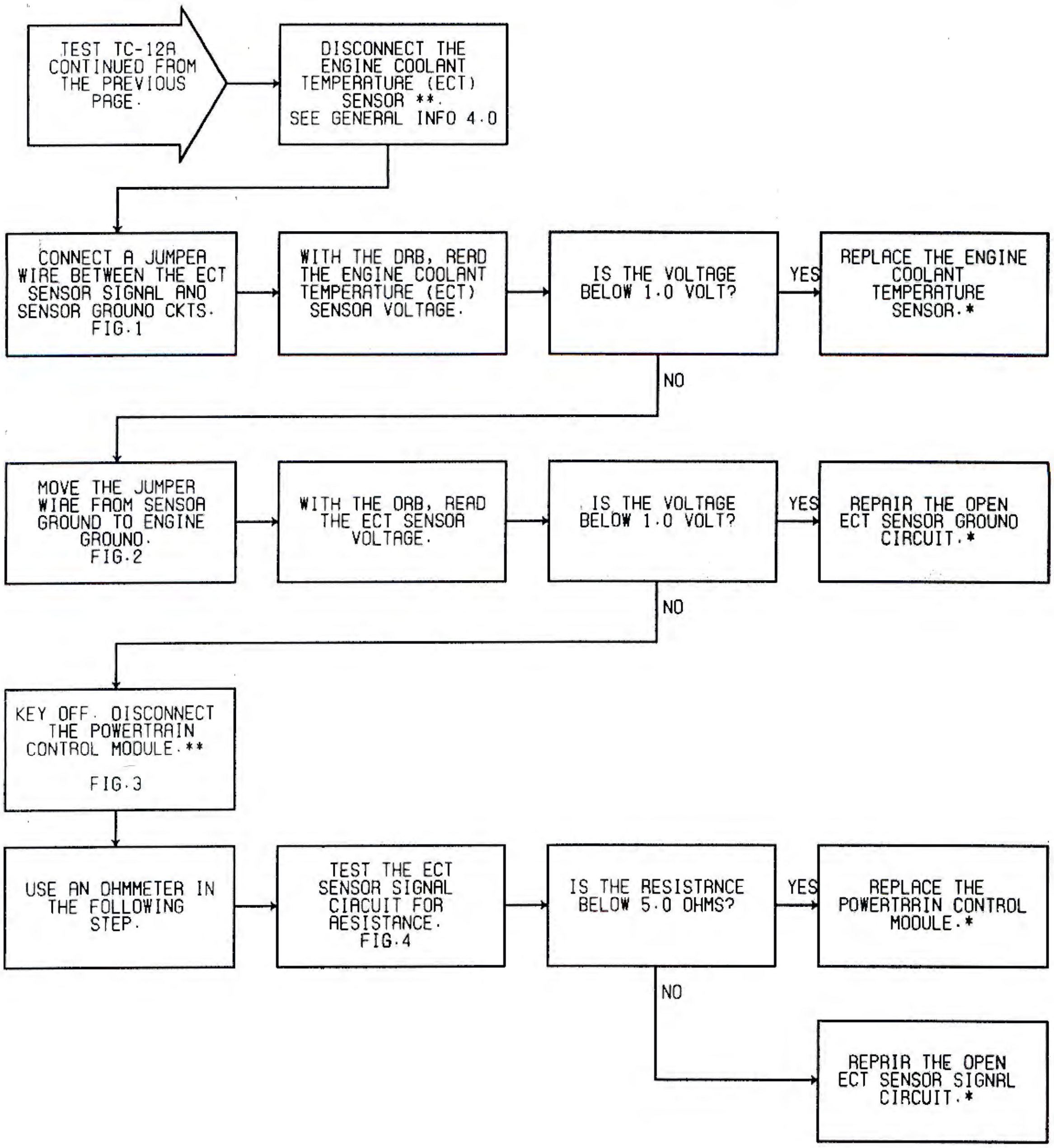


FIG. 4

TEST TC-12A CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

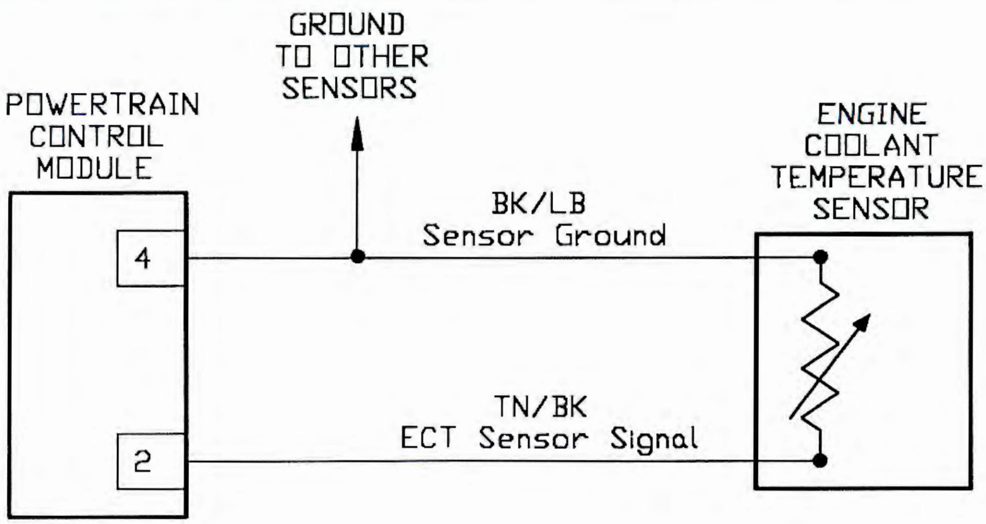


Perform Verification TEST VER-2A. | ****Check connectors – Clean / repair as necessary.***

TROUBLE CODE TESTS

TEST TC-13A | REPAIRING - ECT SENSOR VOLTAGE TOO LOW

Perform TEST TC-1A Before Proceeding



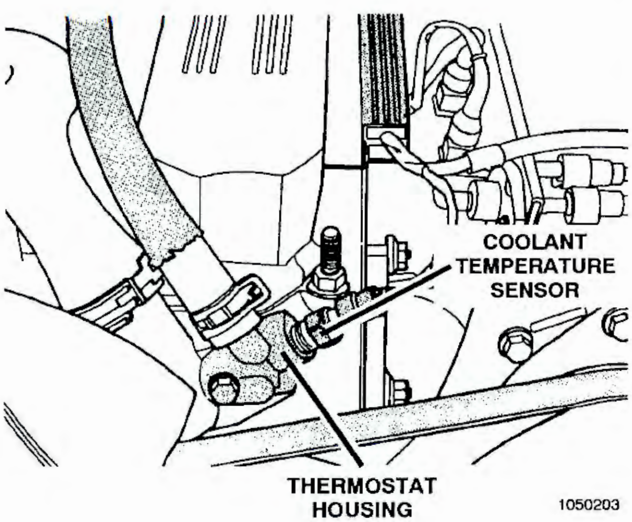


FIG. 1

Name of code: ECT Sensor Voltage Too Low

When monitored: With the ignition on.

Set condition: The engine coolant temperature sensor circuit voltage at PCM cavity 2 goes below .5 volt for more than 3 seconds.

Theory of operation: The engine coolant temperature sensor is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. As coolant temperature increases, resistance decreases and the voltage will be low. This allows the sensor to provide an analog voltage signal (0 to 5-volt) to PCM cavity 2.
To make the sensor more accurate at cold and hot temperatures, the 5-volt signal passes through a 10,000 ohm resistor or through a 1,000 ohm resistor connected in parallel with the 10,000 ohm resistor, which has a calculated resistance value of 909 ohms. If the engine is cold (below 125°F), the 5-volt supply to the engine coolant temperature sensor is fed only through the 10,000 ohm resistor inside the PCM. If the engine is warm (above 125°F), the 5-volt supply to the engine coolant temperature sensor is fed through both resistors.

Possible causes:
> Sensor signal shorted to ground
> Sensor internally shorted
> PCM failure

0870301

FIG. 2

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

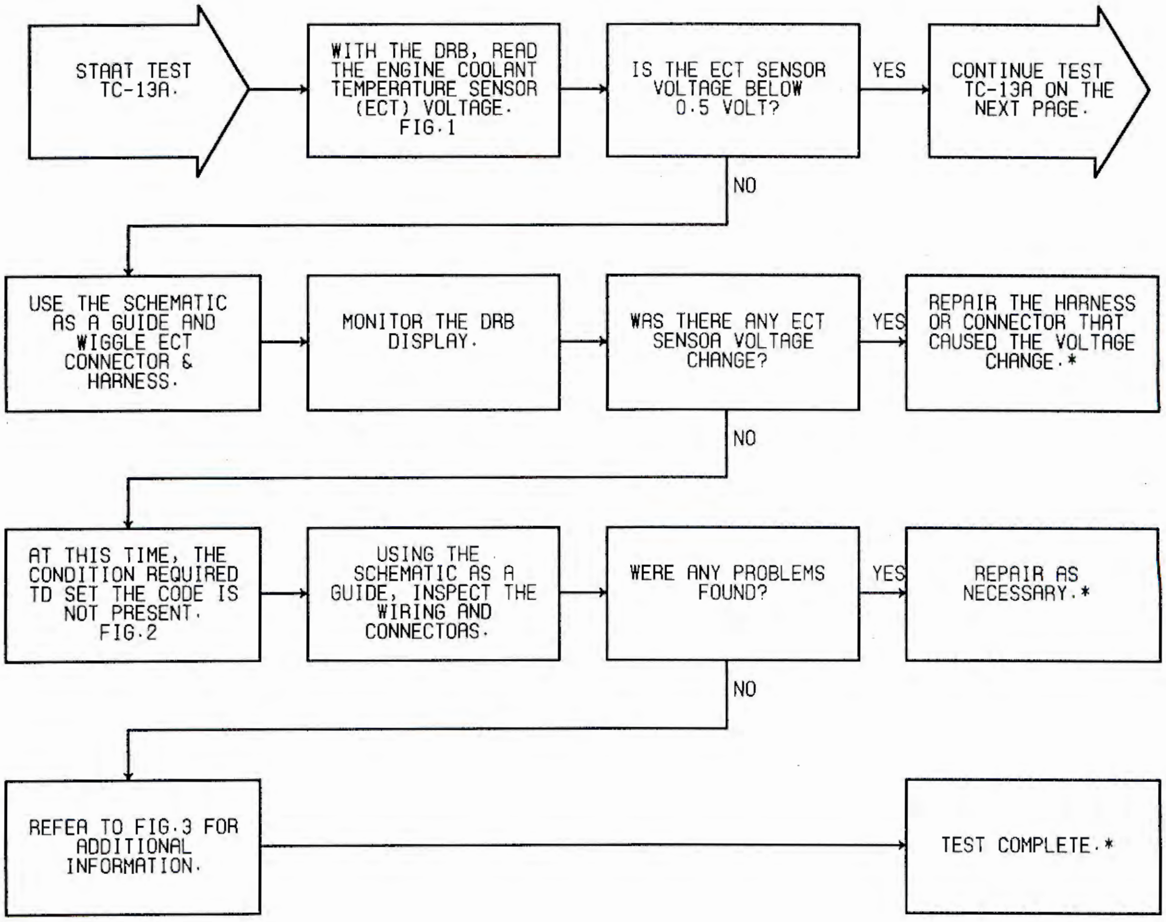
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 3

TEST TC-13A REPAIRING - ECT SENSOR VOLTAGE TOO LOW

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A. | **Check connectors – Clean / repair as necessary.

TROUBLE CODE TESTS

TEST TC-13A CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO LOW

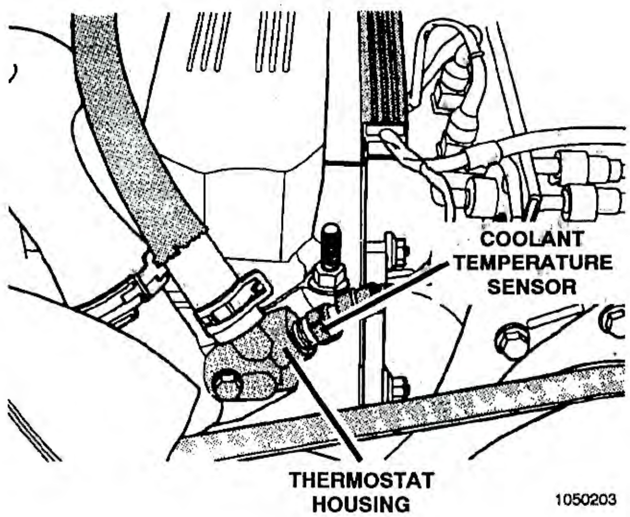


FIG. 1

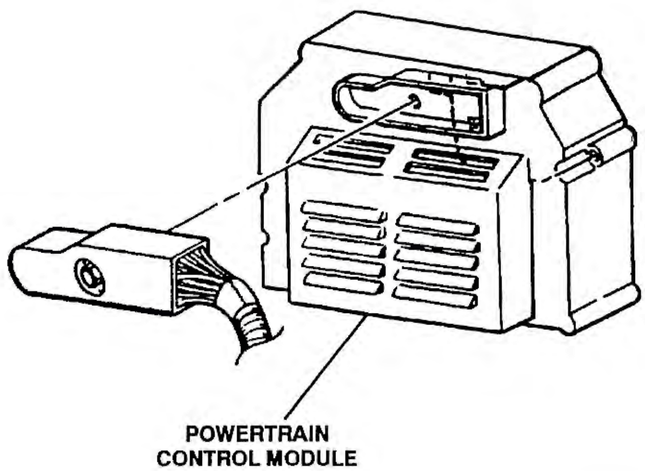
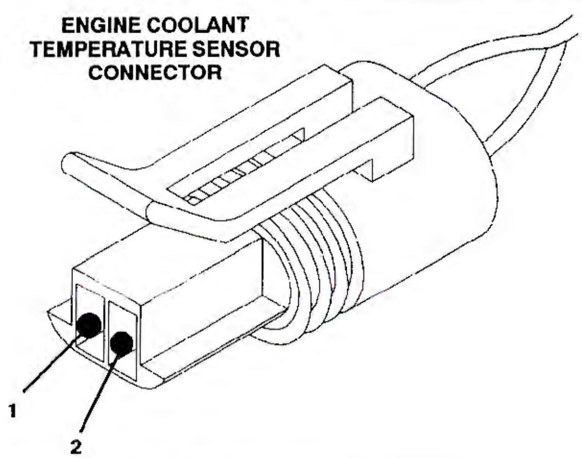


FIG. 2

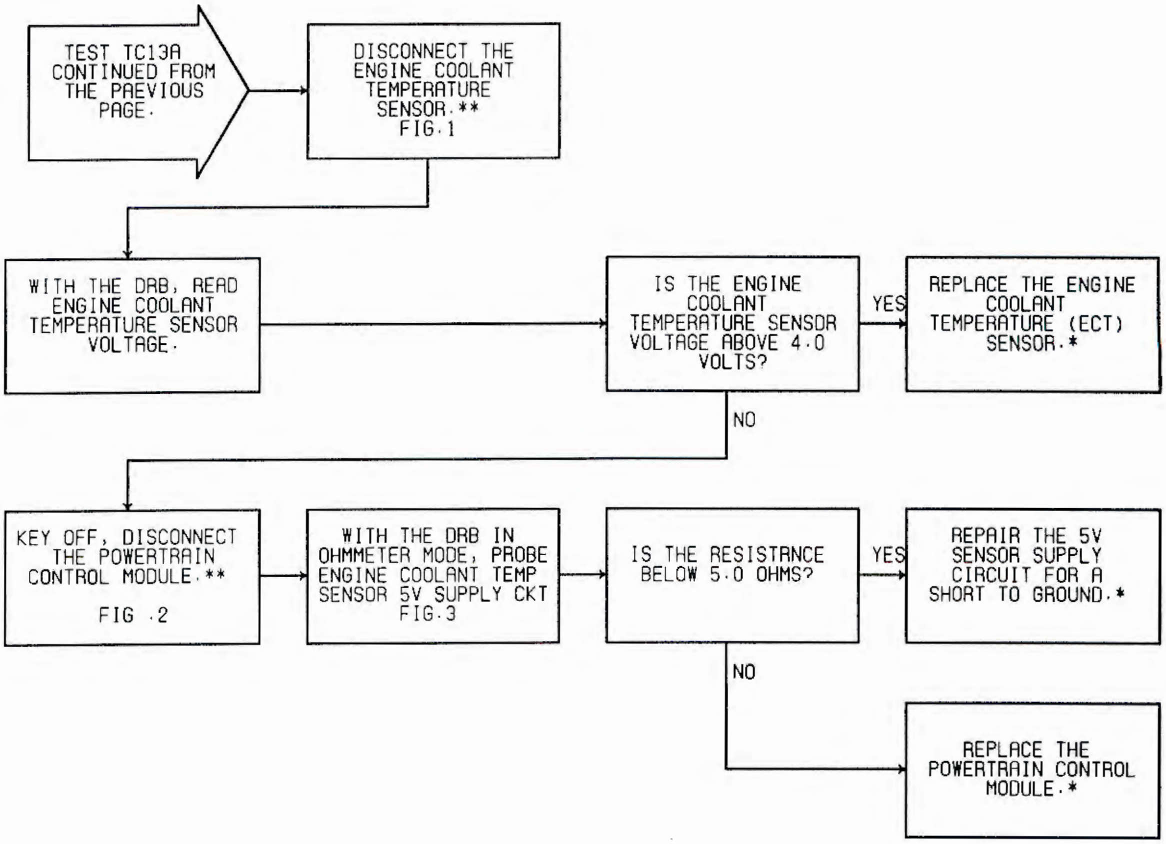


CAV	COLOR	FUNCTION
1	TN/BK	ECT SENSOR SIGNAL
2	BK/LB	SENSOR GROUND

0970305

FIG. 3

TEST TC-13A CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO LOW

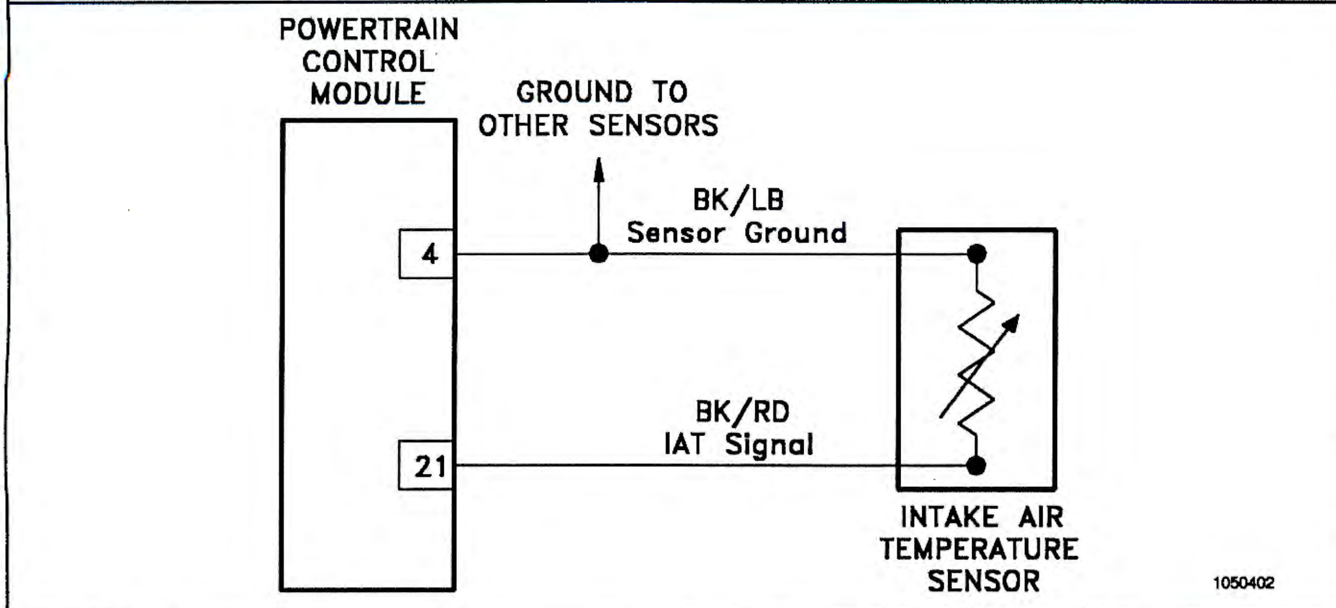


Perform Verification TEST VER-2A. | ****Check connectors – Clean / repair as necessary.***

TROUBLE CODE TESTS

TEST TC-14A REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW

Perform TEST TC-1A Before Proceeding



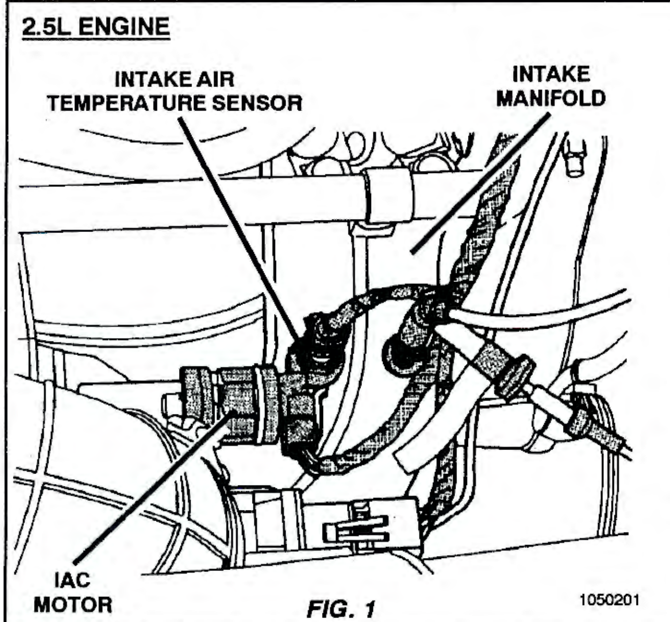


FIG. 1

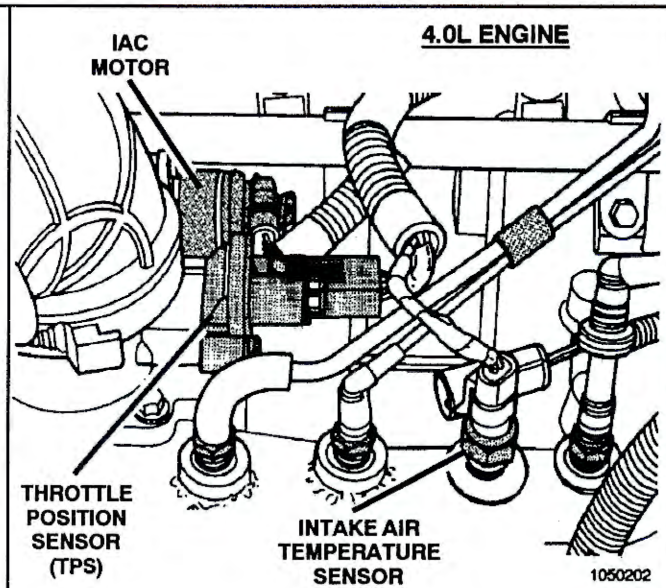


FIG. 2

Name of code: Intake Air Temp Sensor Voltage Low

When monitored: With the ignition on and the engine running.

Set condition: The intake air sensor circuit voltage at PCM cavity 21 goes below .5 volt.

Theory of operation: The intake air temperature sensor (IAT) is located in the intake manifold where it measures the temperature of the air that is about to enter the combustion chambers. The IAT is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. At high temperatures, resistance decreases and the voltage signal will decrease. This allows the sensor to provide an analog voltage signal to PCM cavity 21. The PCM uses this signal to compensate for changes in air density due to temperature.

Possible causes:
> Sensor signal circuit shorted to ground
> Sensor internally shorted

1050106

FIG. 3

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

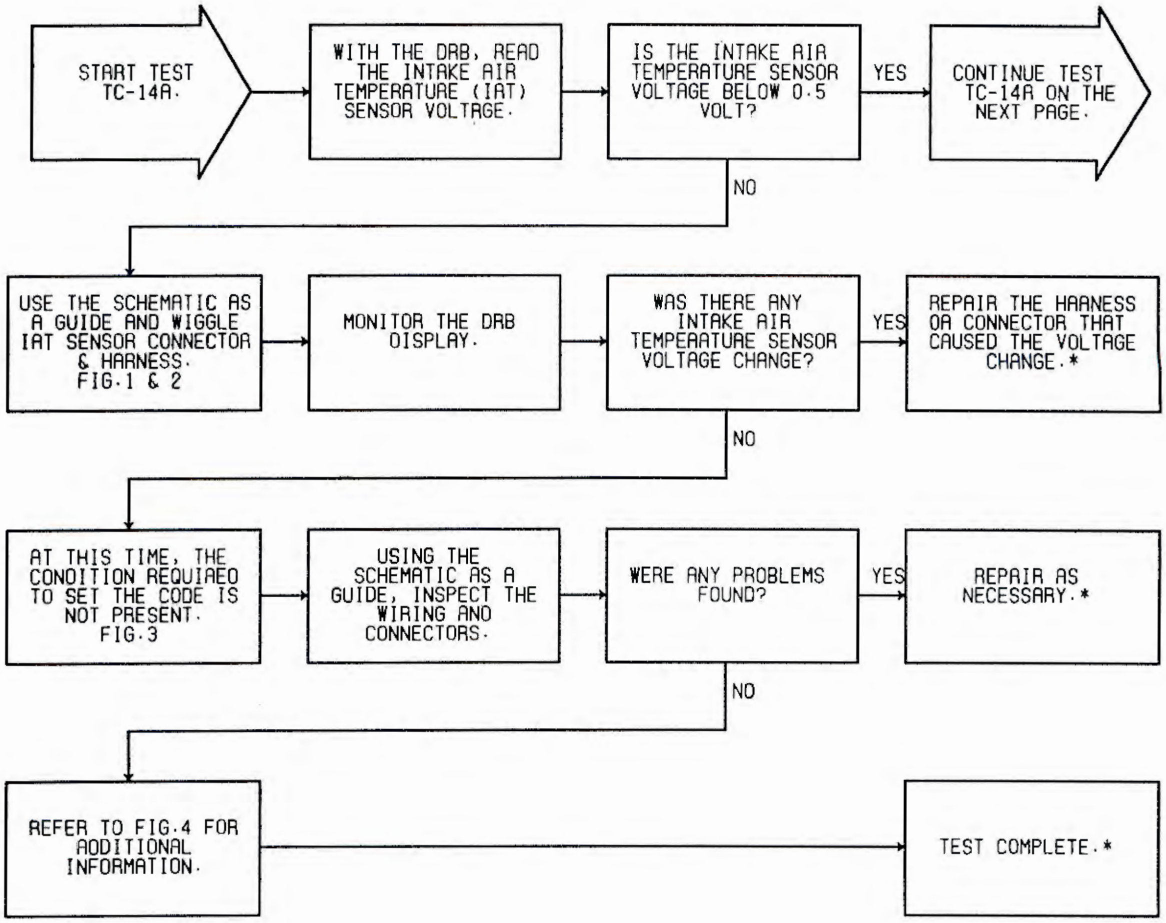
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 4

TEST TC-14A REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-14A CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW

2.5L ENGINE

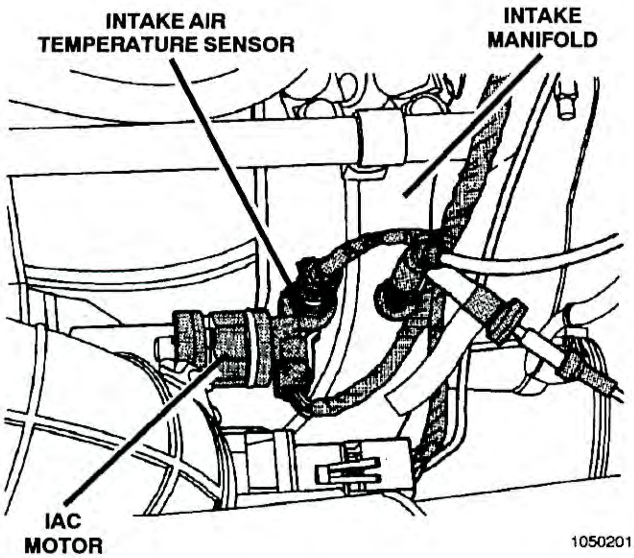


FIG. 1

4.0L ENGINE

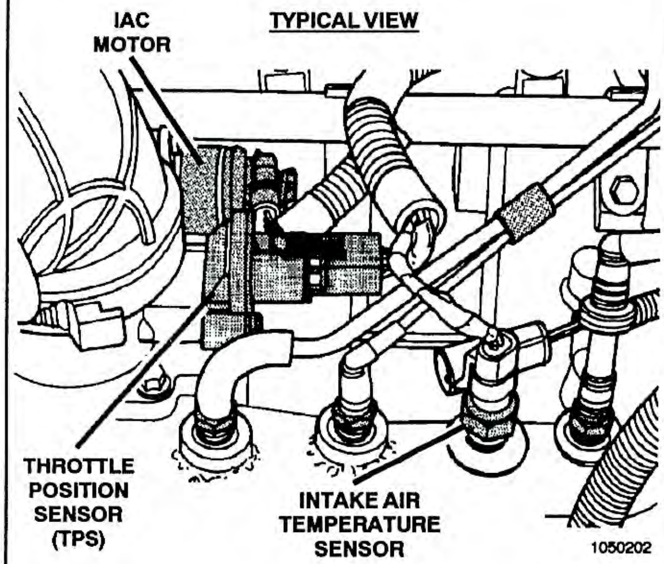


FIG. 2

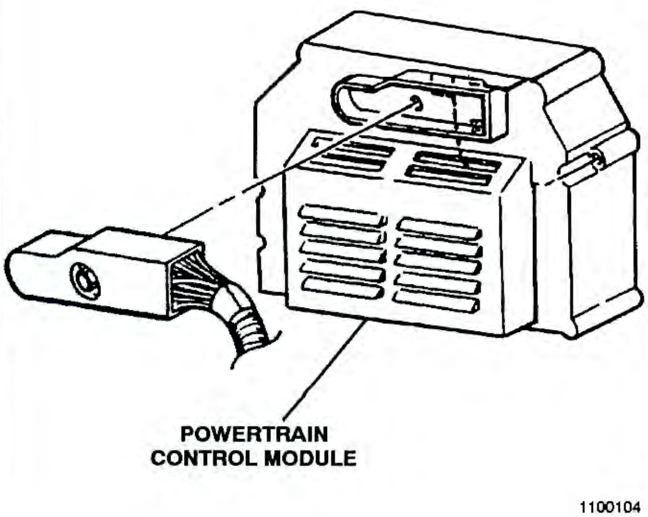
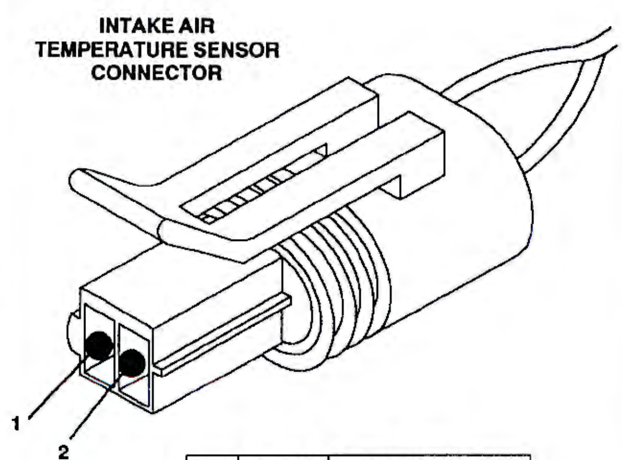


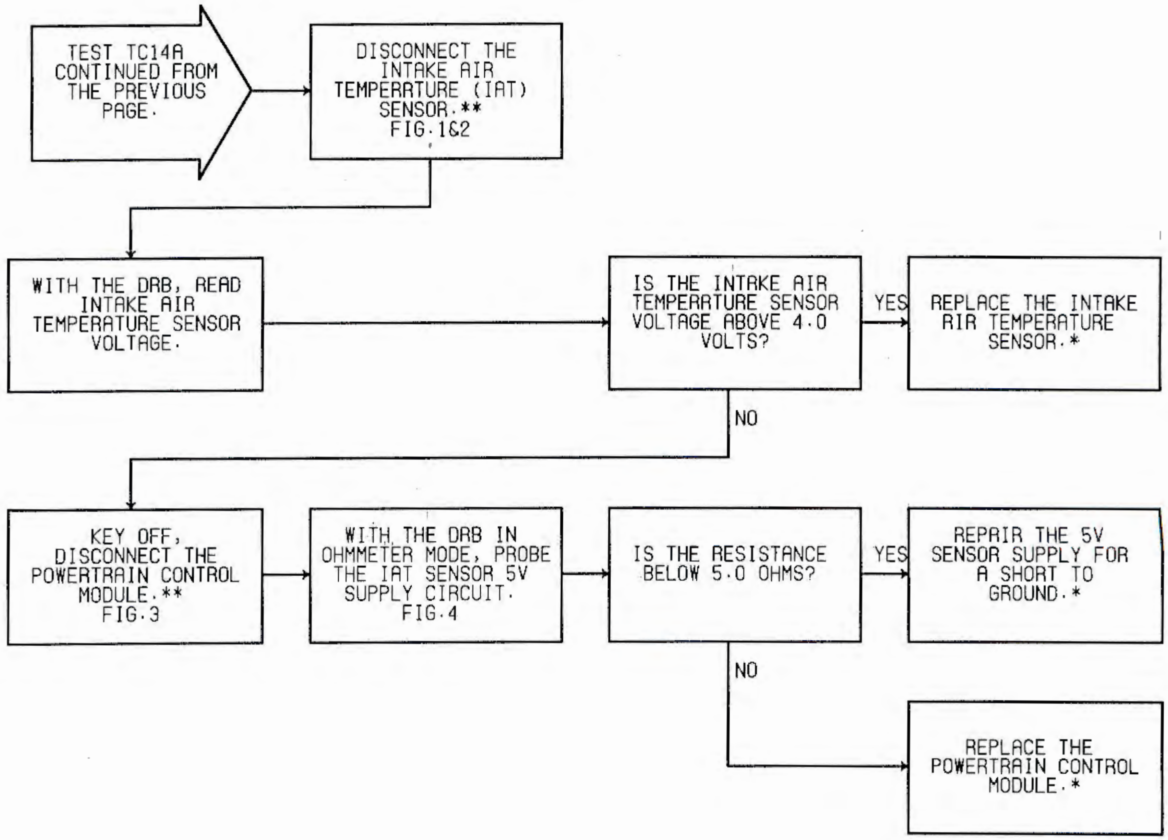
FIG. 3



CAV	COLOR	FUNCTION
1	BK/RD	IAT SIGNAL
2	BK/LB	SENSOR GROUND

FIG. 4

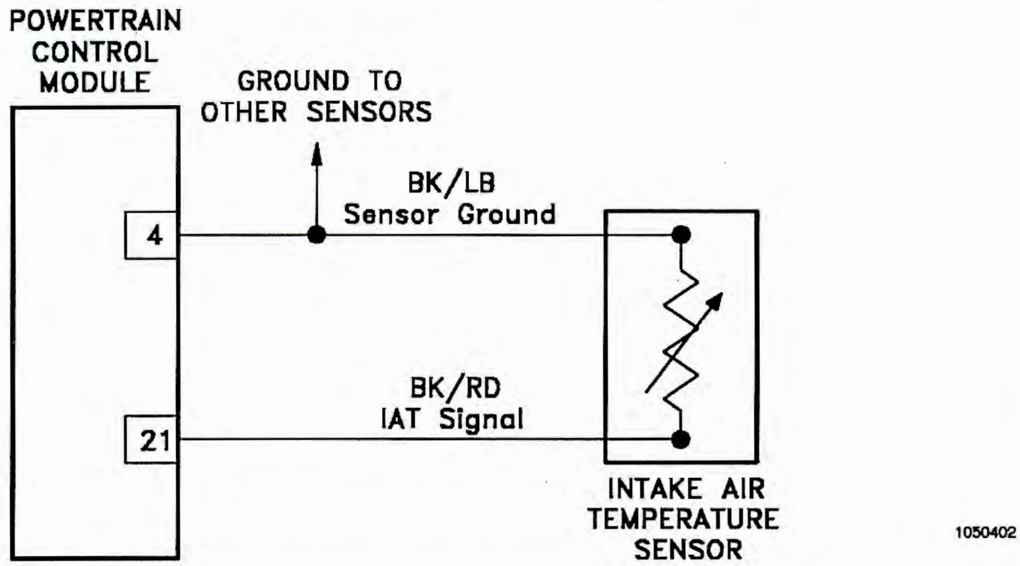
TEST TC-14A CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-15A | REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

Perform TEST TC-1A Before Proceeding



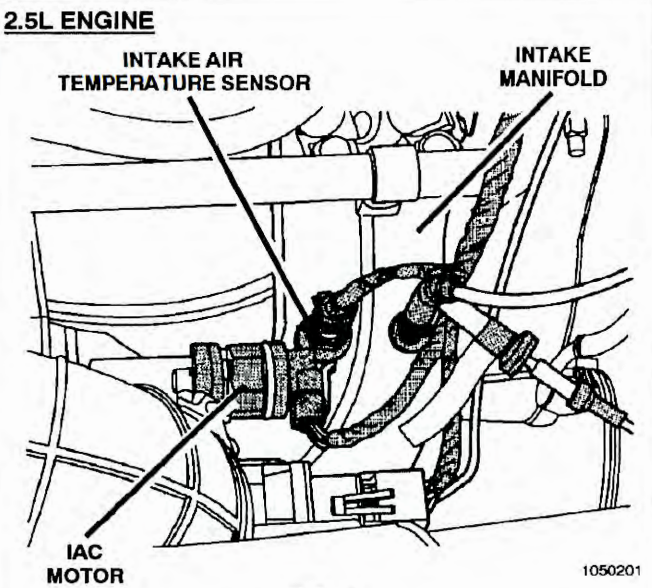


FIG. 1

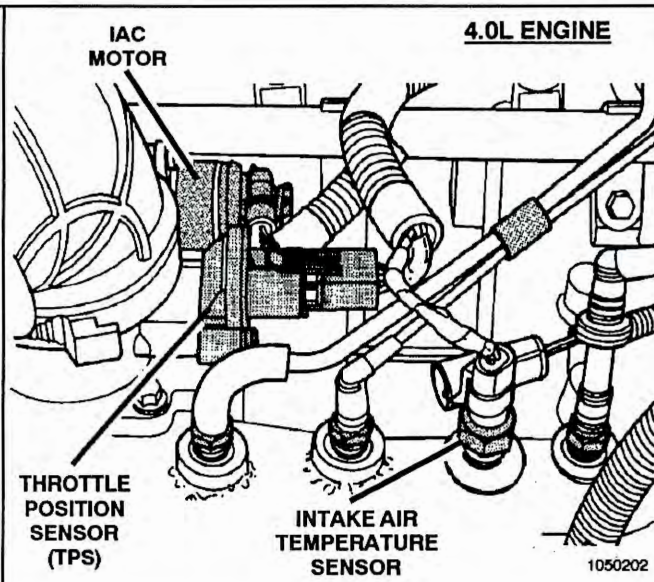


FIG. 2

Name of code: Intake Air Temp Sensor Voltage High

When monitored: With the ignition on and the engine running.

Set condition: The intake air sensor circuit voltage at PCM cavity 21 goes above 4.9 volts.

Theory of operation: The intake air temperature sensor (IAT) is located in the intake manifold where it measures the temperature of the air that is about to enter the combustion chambers. The IAT is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). This means at cold temperatures its resistance is high so the voltage signal will be high. At high temperatures, resistance decreases and the voltage signal will decrease. This allows the sensor to provide an analog voltage signal to PCM cavity 21. The PCM uses this signal to compensate for changes in air density due to temperature.

Possible causes:
> Sensor signal circuit open
> Sensor internally open
> Sensor ground circuit open

1050105

FIG. 3

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

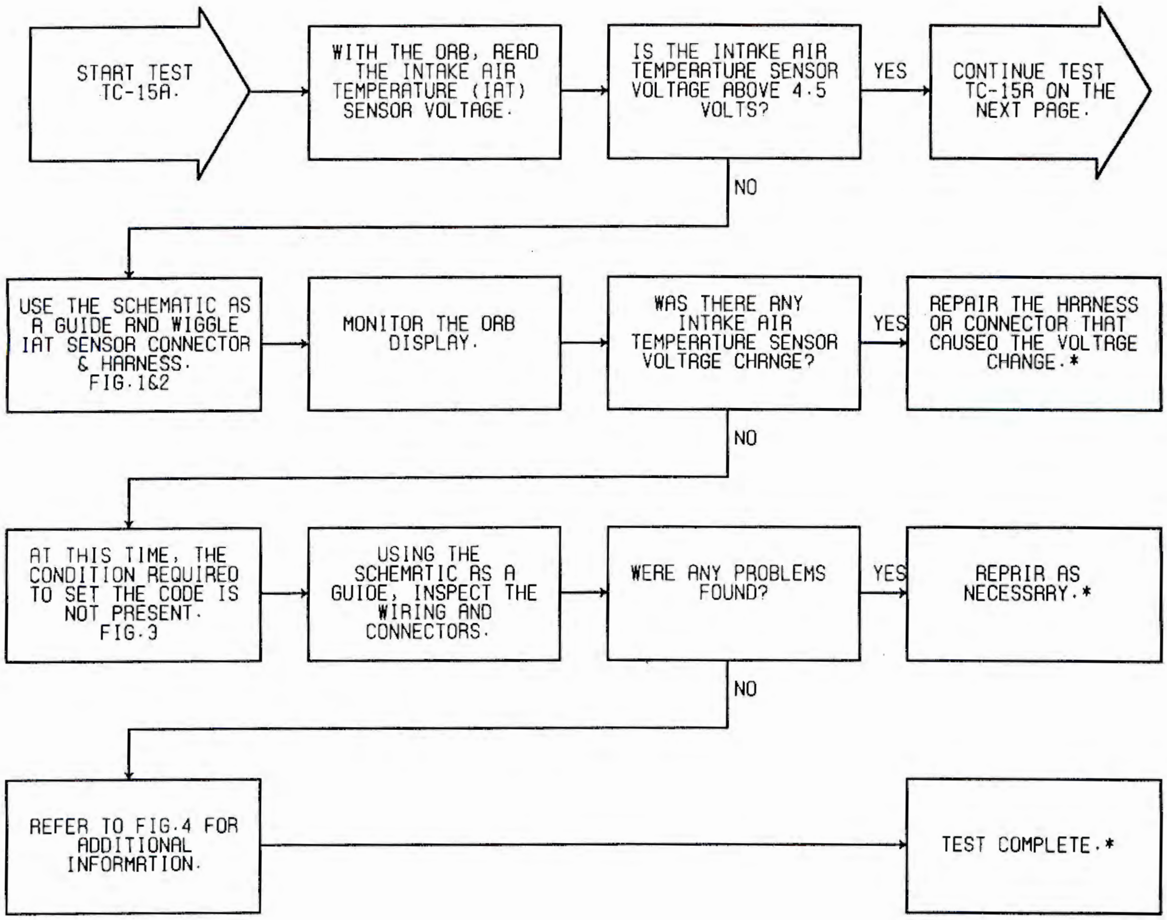
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 4

TEST TC-15A | REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-15A CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

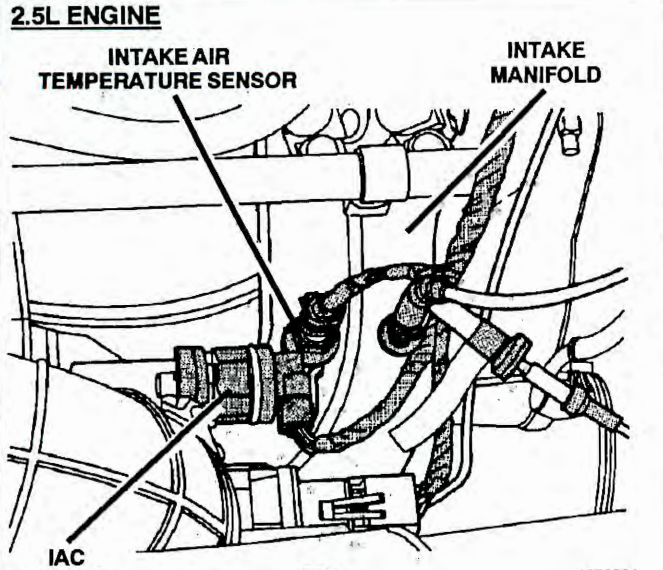


FIG. 1

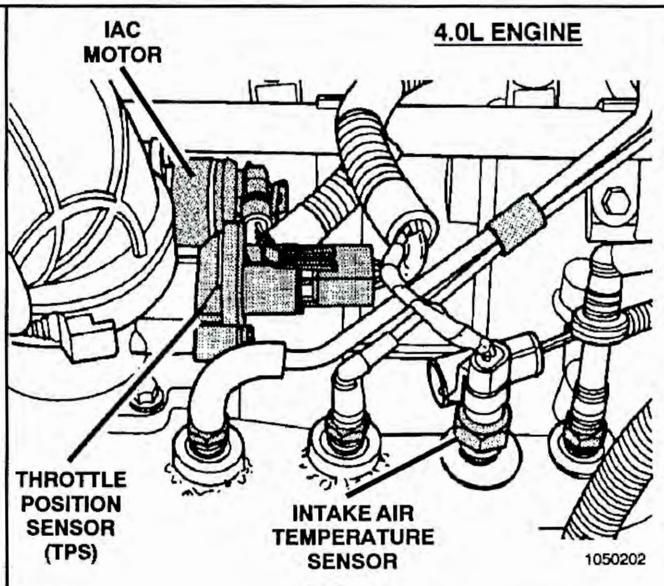


FIG. 2

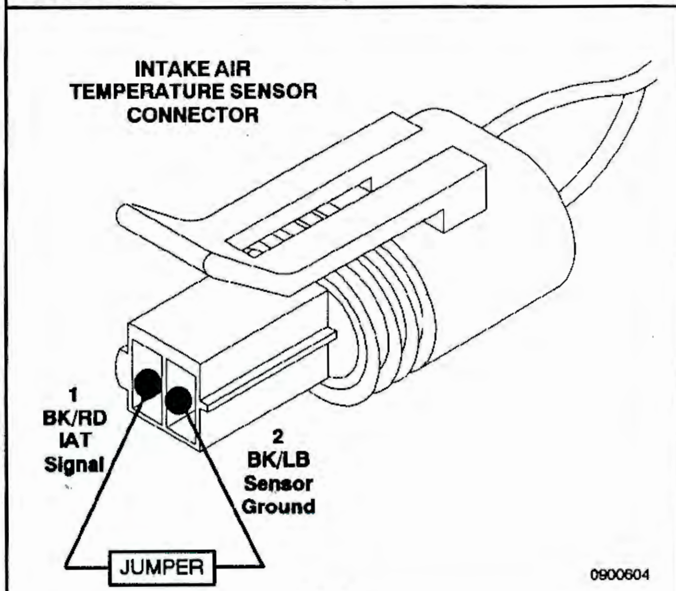


FIG. 3

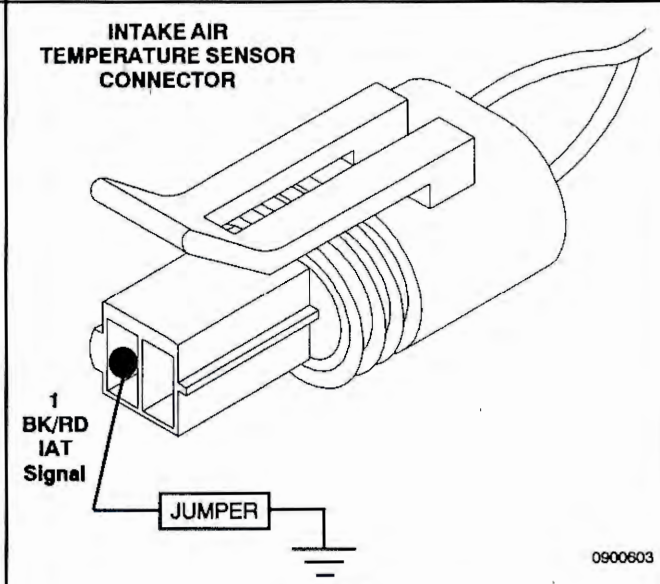


FIG. 4

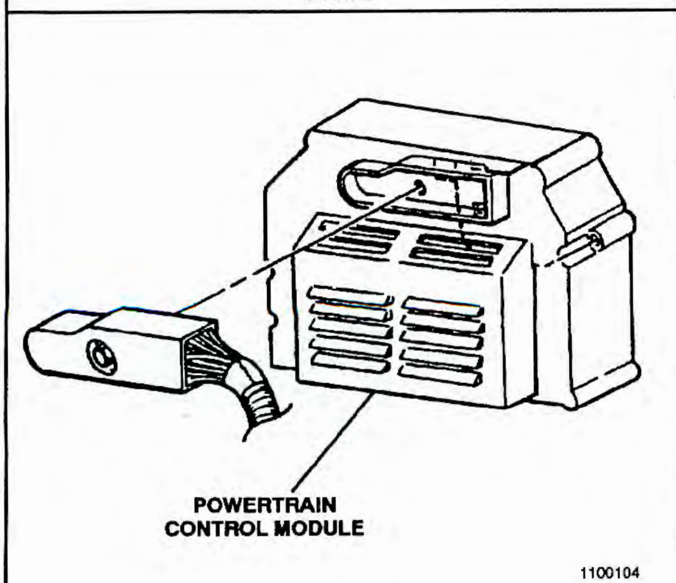


FIG. 5

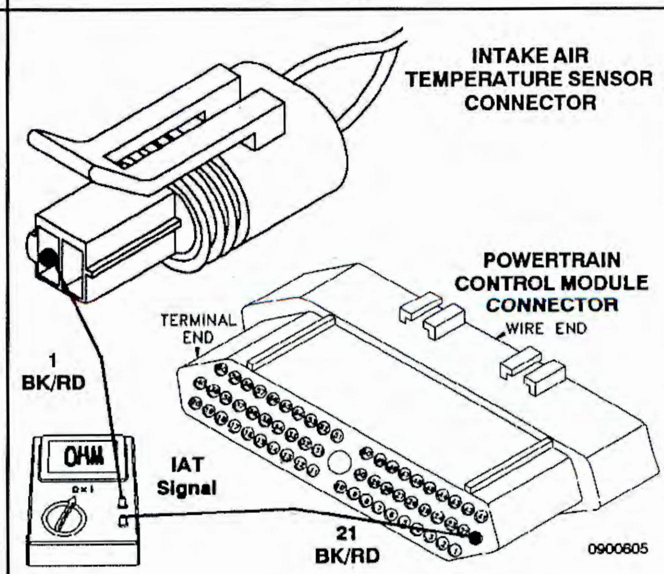
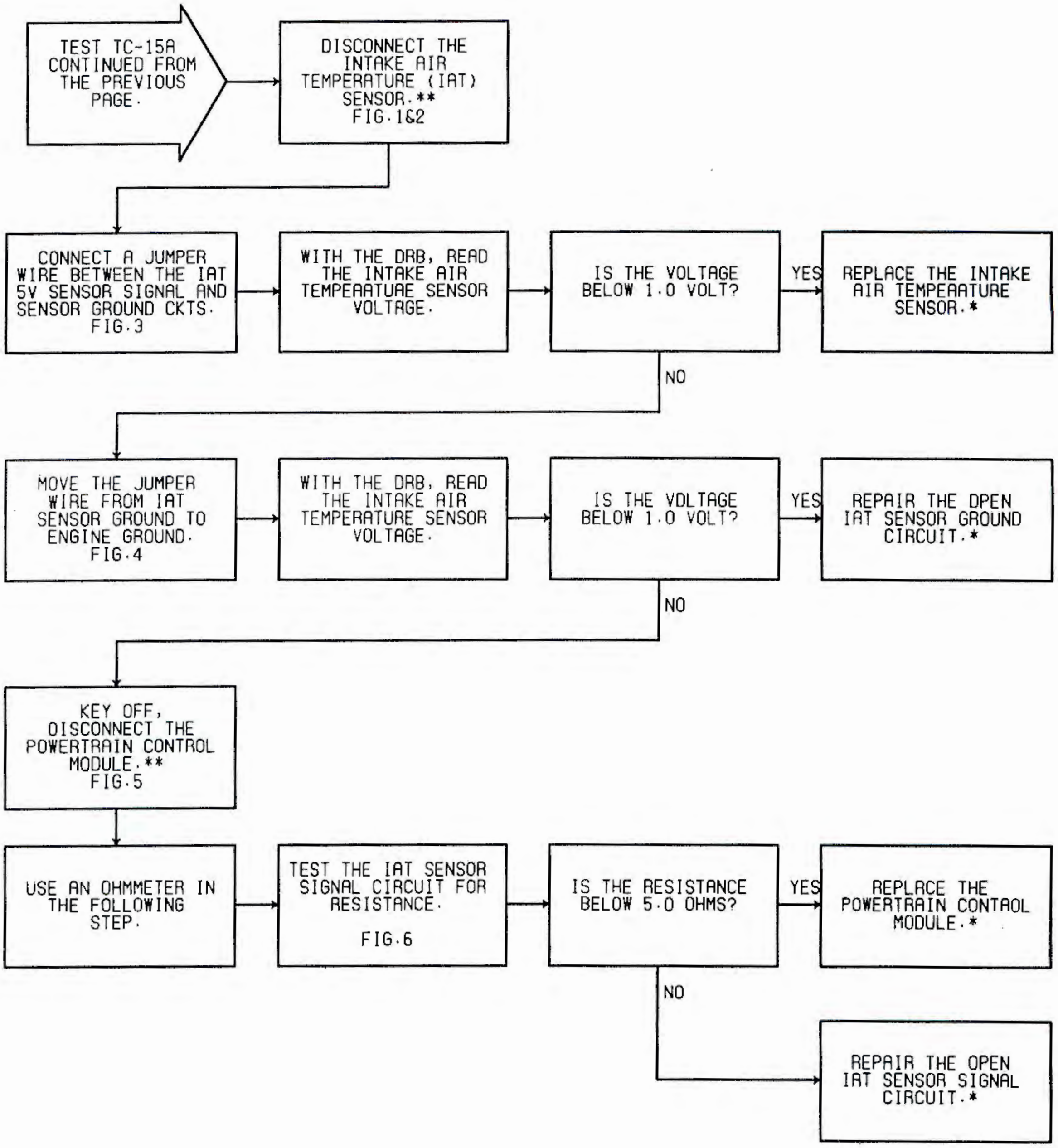


FIG. 6

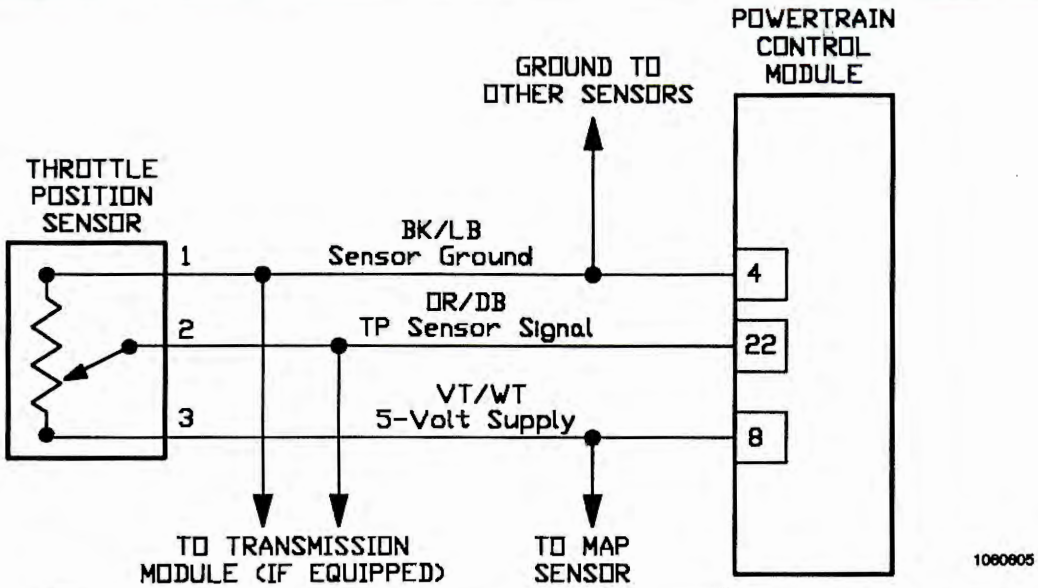
TEST TC-15A CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-16A | REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

Perform TEST TC-1A Before Proceeding



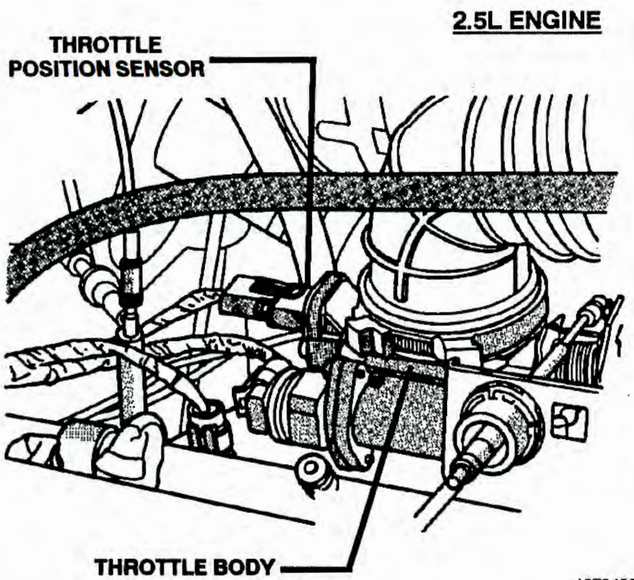


FIG. 1

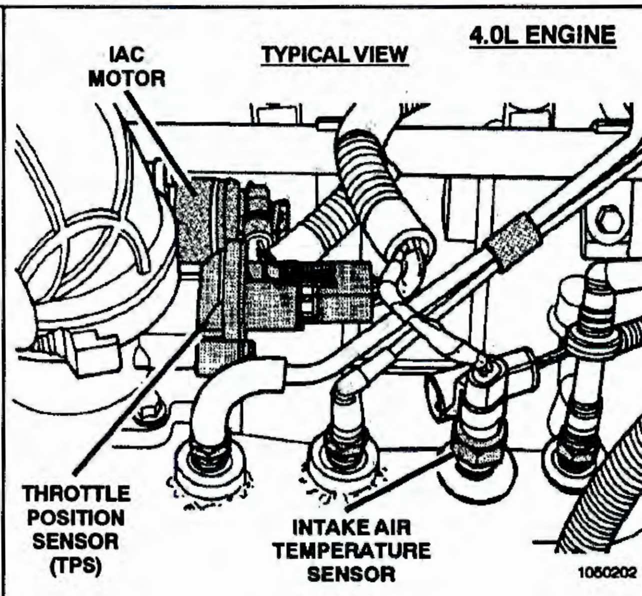


FIG. 2

Name of code: Throttle Position Sensor Voltage High

When monitored: With the ignition on.

Set condition: TP sensor voltage at PCM cavity 22 goes above 4.5 volts for .704 seconds.

Theory of operation: The throttle position sensor contains a potentiometer that is operated by the throttle blade shaft. As the throttle plate rotates, the TP sensor provides a variable 0 to 5-volt signal to PCM cavity 22. The voltage is directly proportional to throttle angle. When the throttle plate is at rest, the voltage is low. When the throttle is fully open, the voltage is high. With this signal, the PCM can determine precise throttle position under all operating conditions. The TP sensor receives a 5-volt supply from PCM cavity 6. The sensor ground is provided by PCM cavity 4.

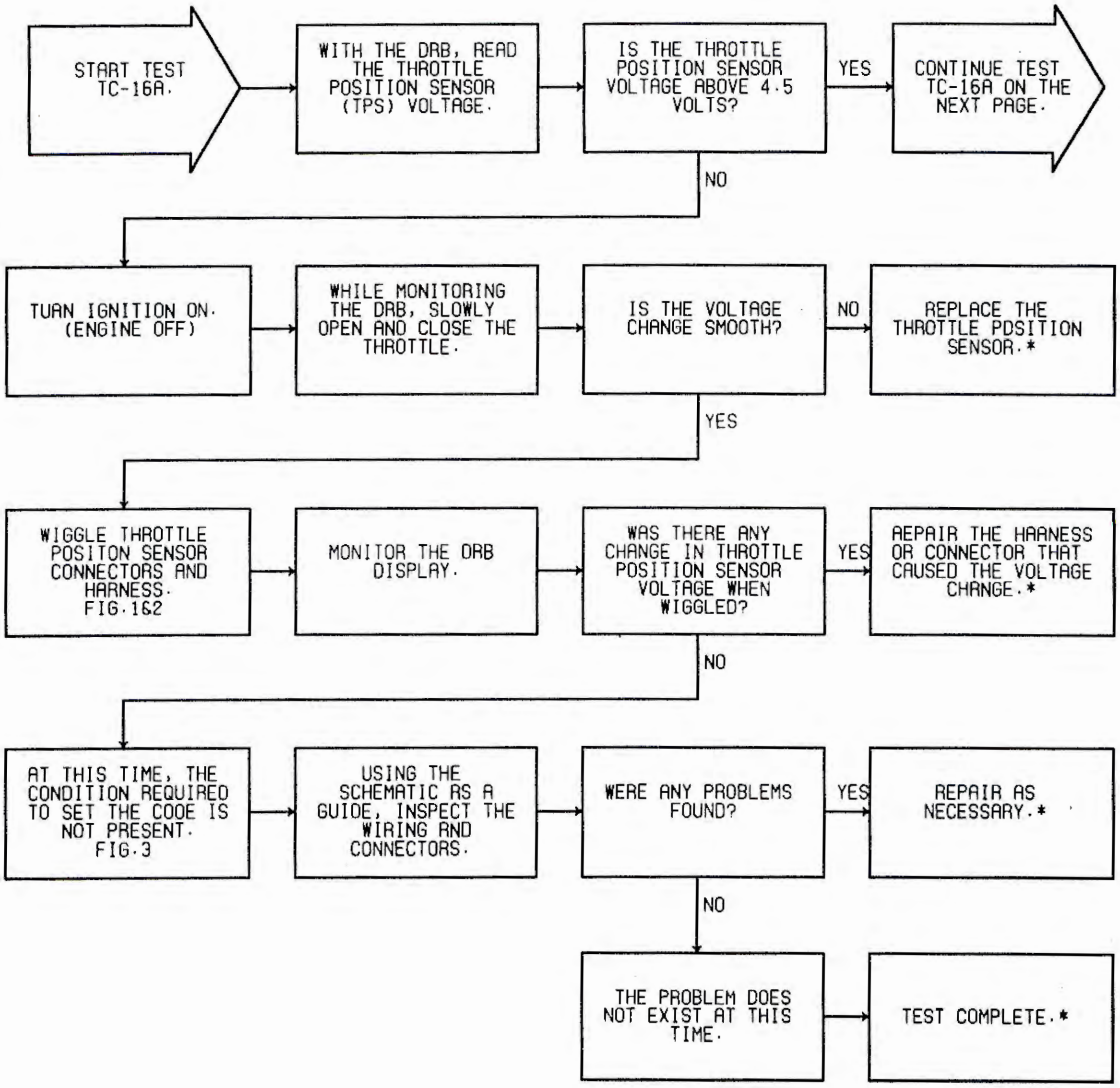
Possible causes:
> Sensor signal circuit open
> Throttle position sensor failure
> Sensor ground circuit open

0870204

FIG. 3

TEST TC-16A REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-16A CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

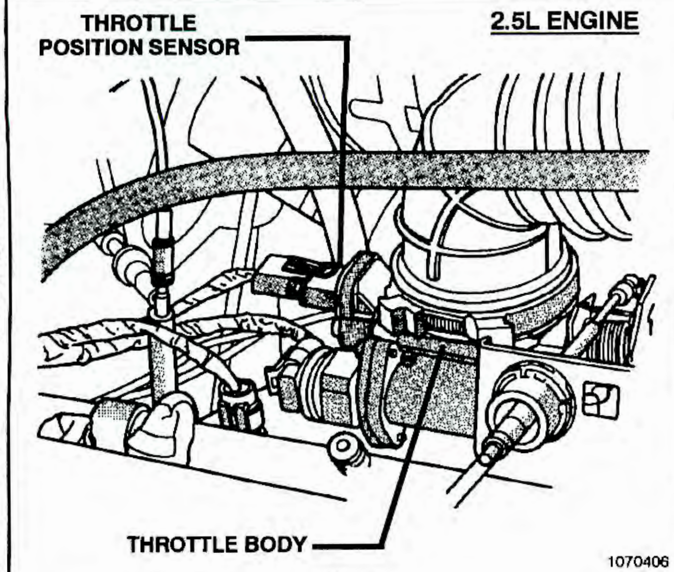


FIG. 1

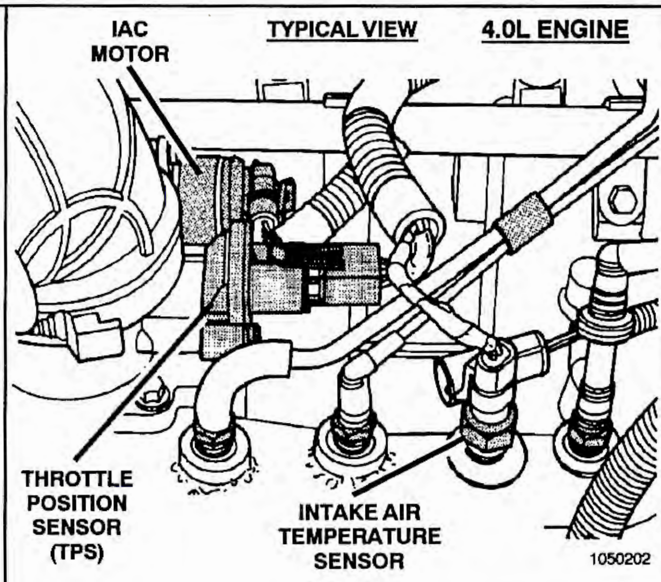


FIG. 2

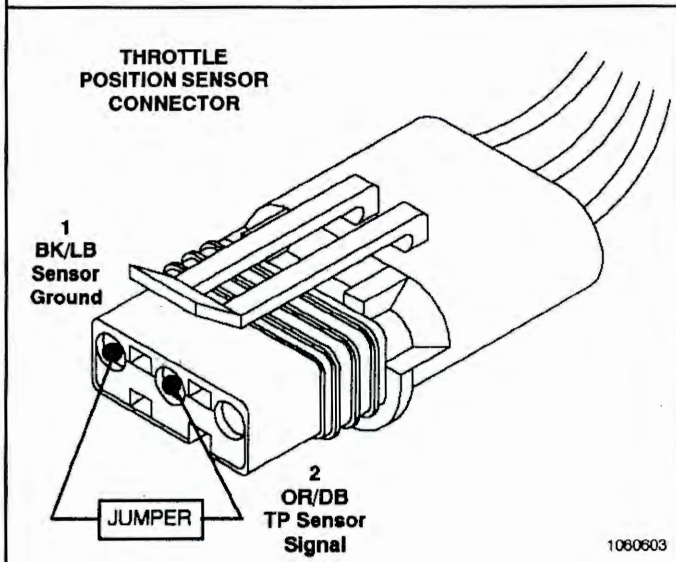


FIG. 3

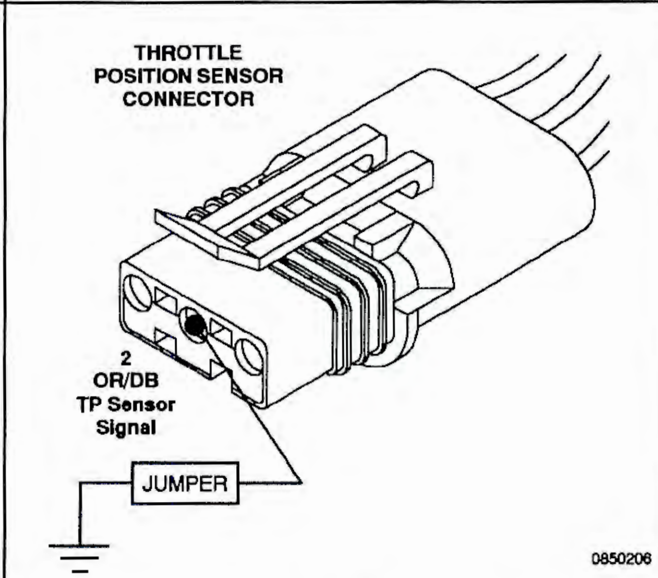


FIG. 4

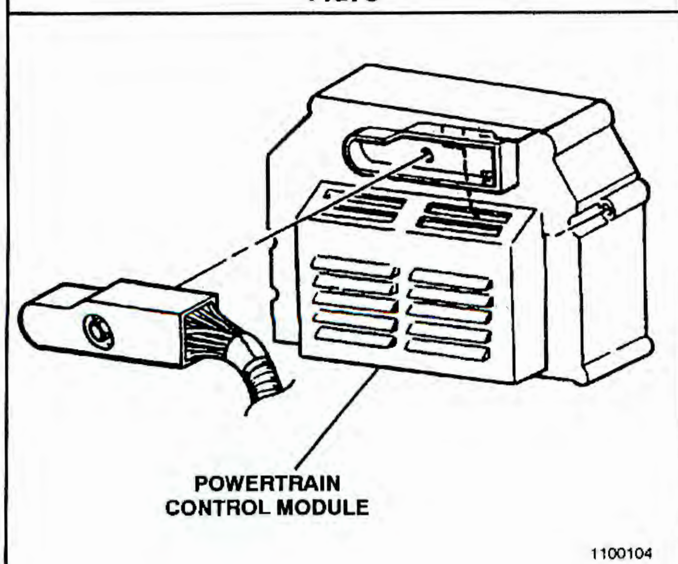


FIG. 5

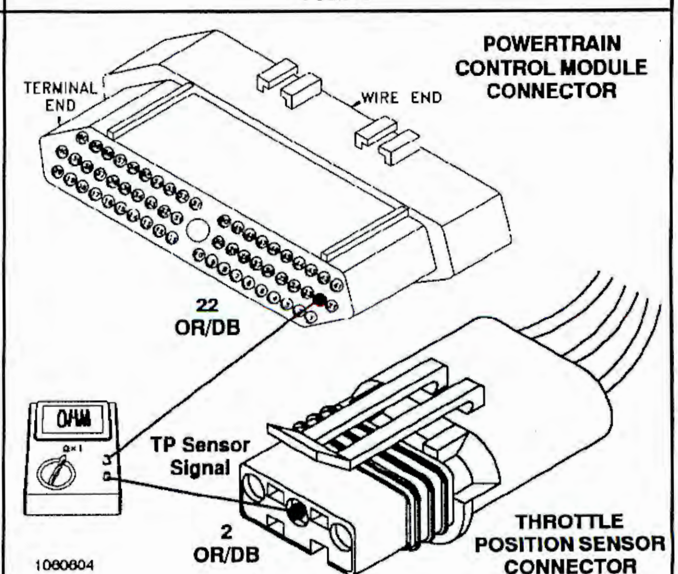
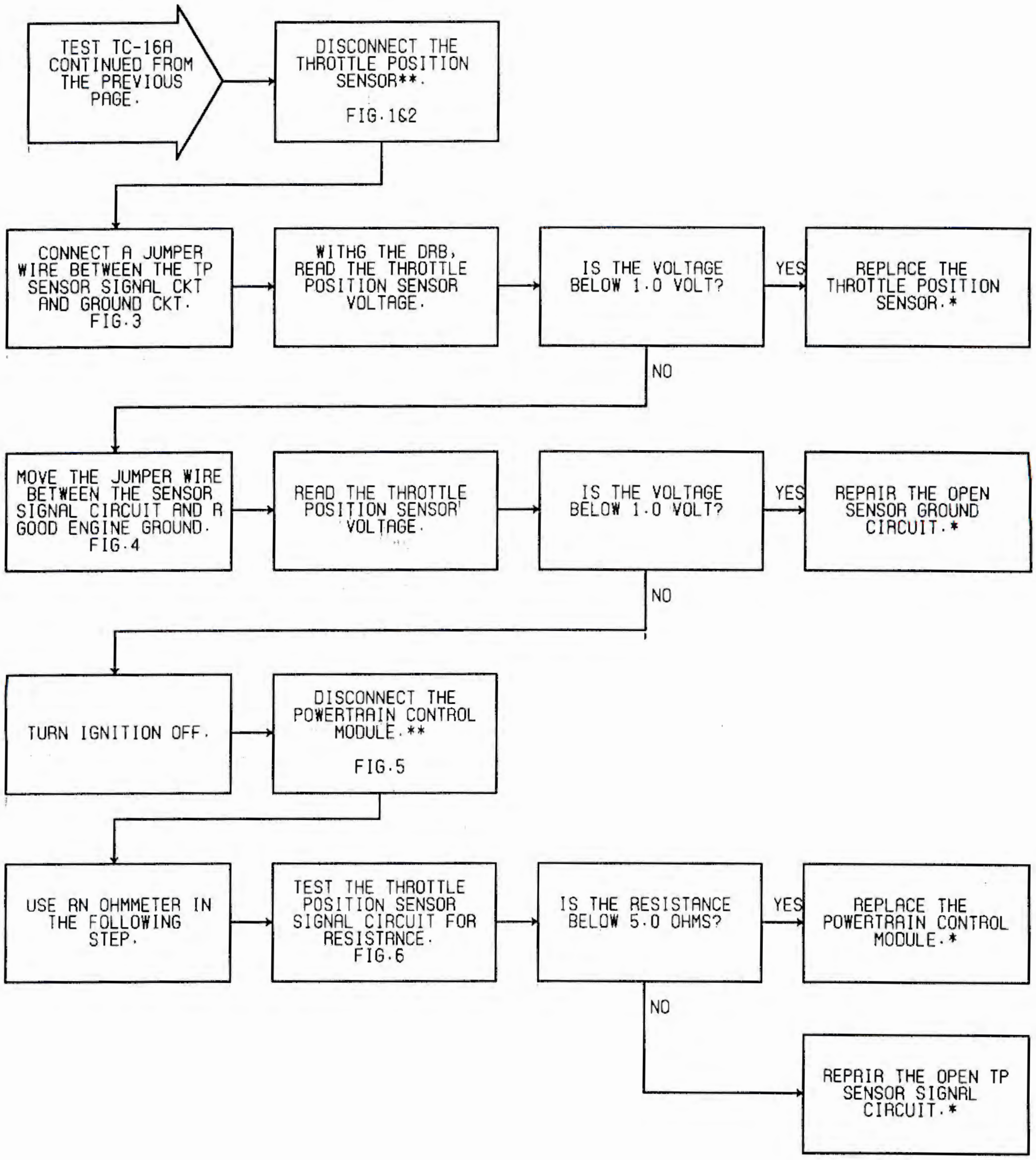


FIG. 6

TEST TC-16A CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

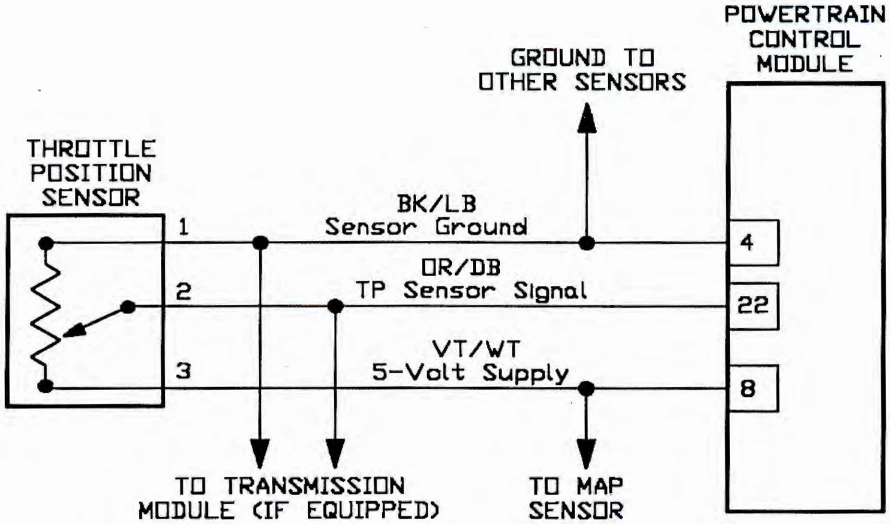


Perform Verification TEST VER-2A.

*****Check connectors – Clean / repair as necessary.***

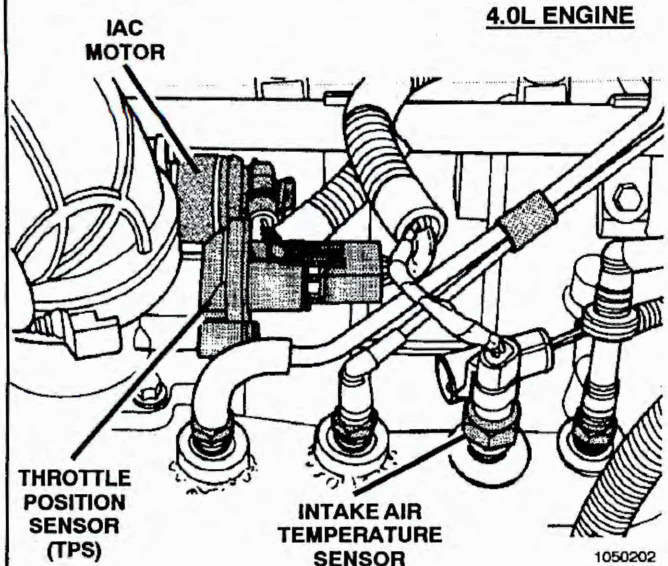
TEST TC-17A | REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW

Perform TEST TC-1A Before Proceeding



1060605

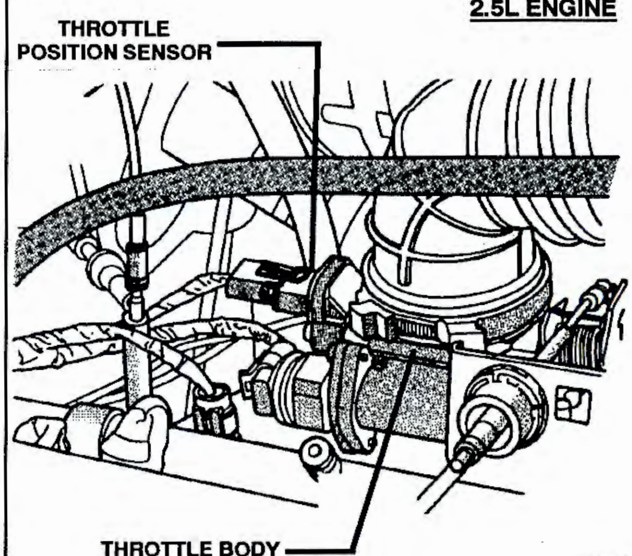
4.0L ENGINE



1050202

FIG. 1

2.5L ENGINE



1070406

FIG. 2

Name of code: Throttle Position Sensor Voltage Low

When monitored: With the ignition on.

Set condition: The TP sensor voltage at PCM cavity 22 goes below .2 volt for .704 seconds, or mph is above 20, rpm is above 1500, and vacuum is below 2" with TP sensor voltage less than .5 volt for .704 seconds.

Theory of operation: The throttle position sensor contains a potentiometer that is operated by the throttle blade shaft. As the throttle plate rotates, the TP sensor provides a variable 0 to 5-volt signal to PCM cavity 22. The voltage is directly proportional to throttle angle. When the throttle plate is at rest, the voltage is low. When the throttle is fully open, the voltage is high. With this signal, the PCM can determine precise throttle position under all operating conditions. The TP sensor receives a 5-volt supply from PCM cavity 6. The sensor ground is provided by PCM cavity 4.

Possible causes:
- > Sensor signal circuit shorted to ground
- > Throttle position sensor failure
- > Loss of 5-volt supply

0870203

FIG. 3

TEST TC-17A CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW

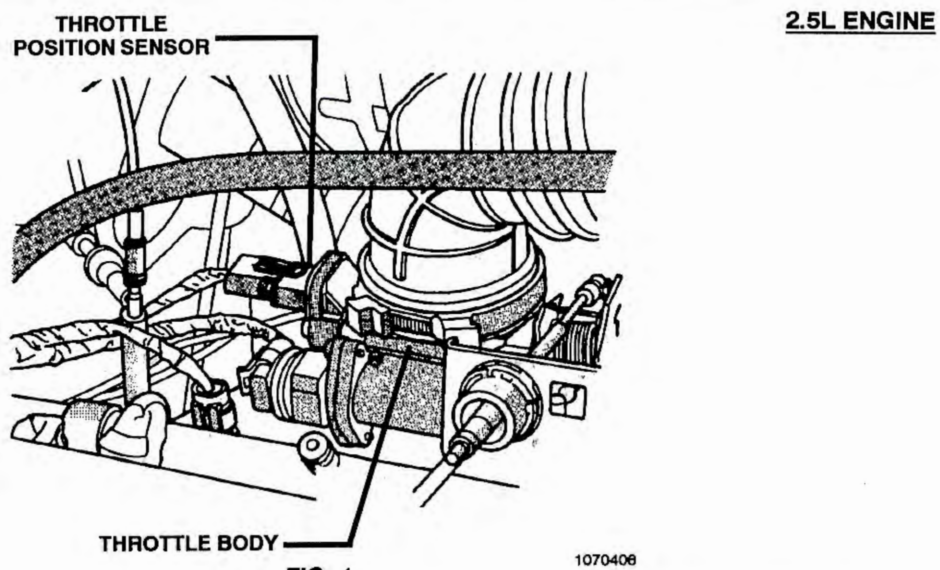


FIG. 1

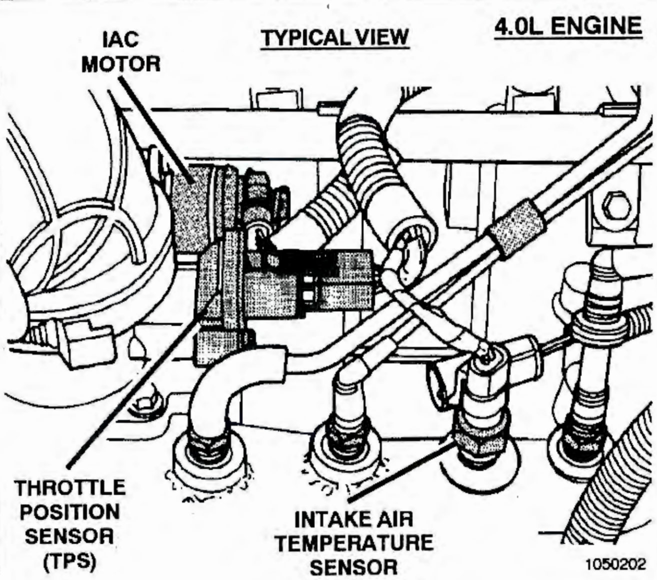


FIG. 2

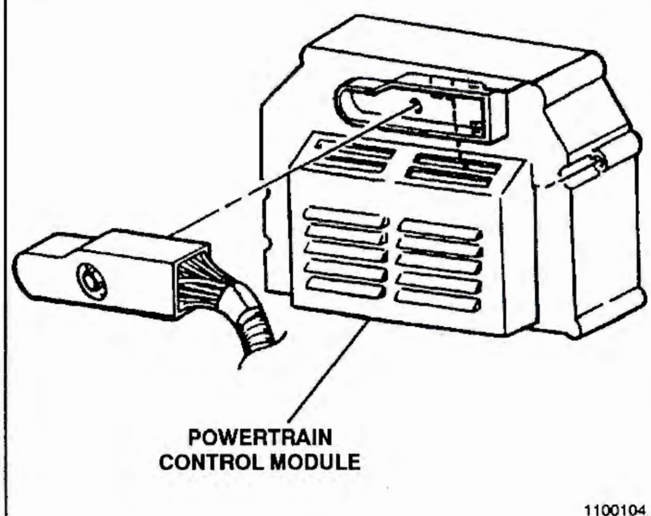
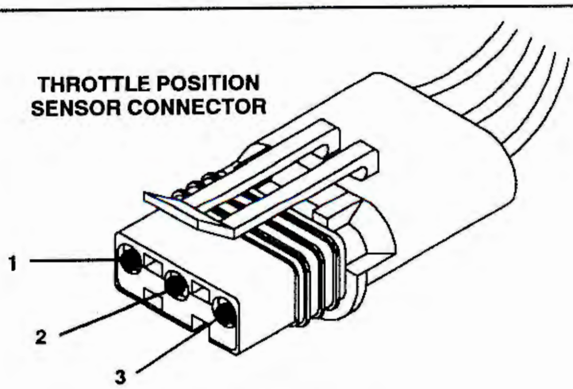


FIG. 3



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	VT/WT	5 VOLT SUPPLY

0790302

FIG. 4

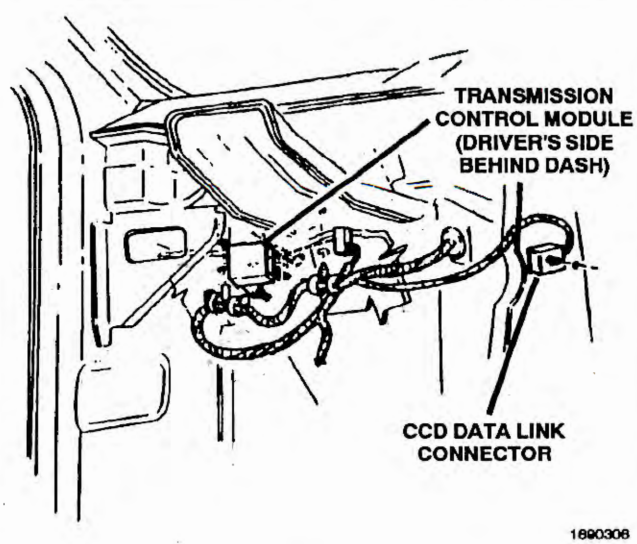
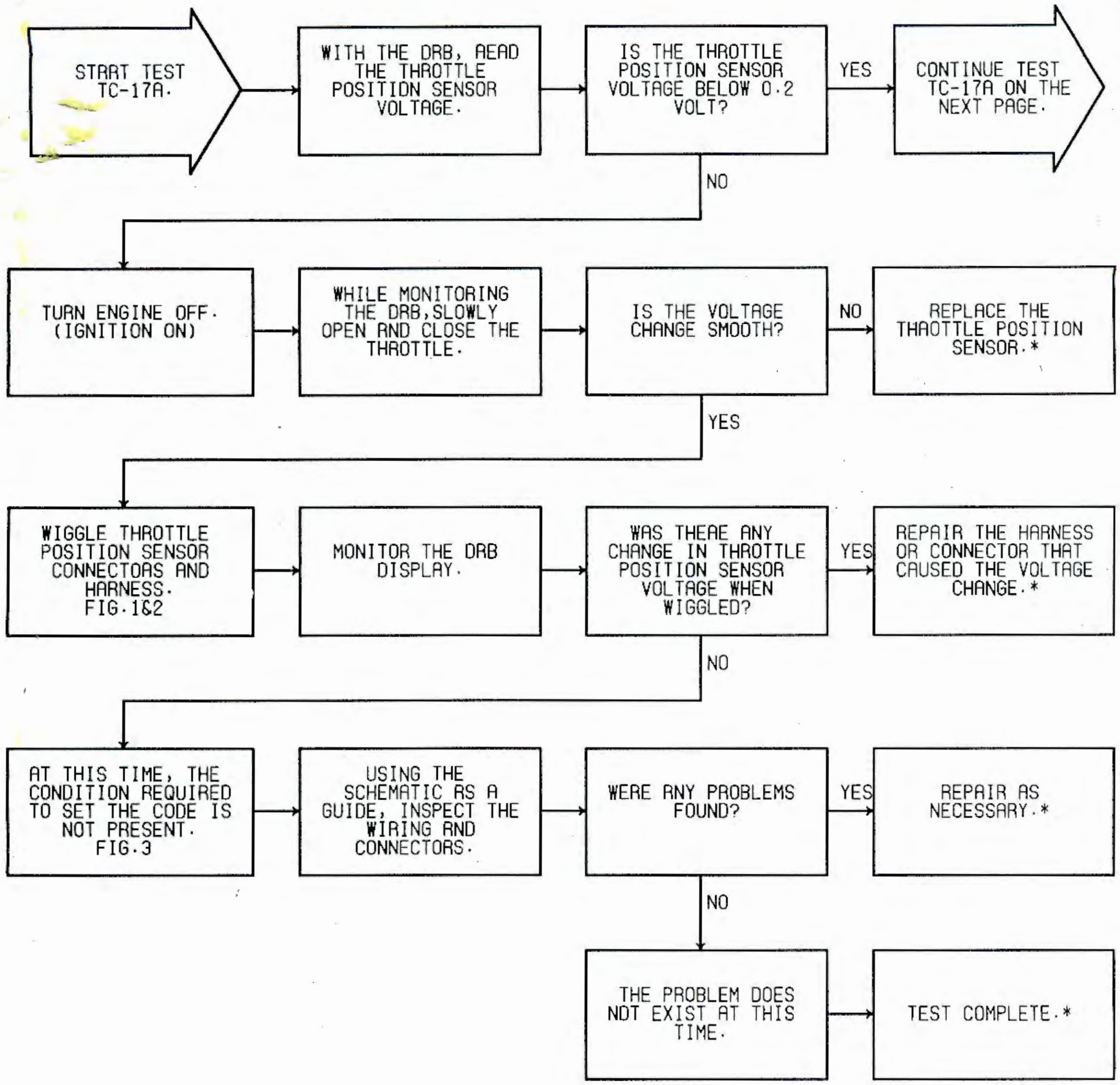


FIG. 5

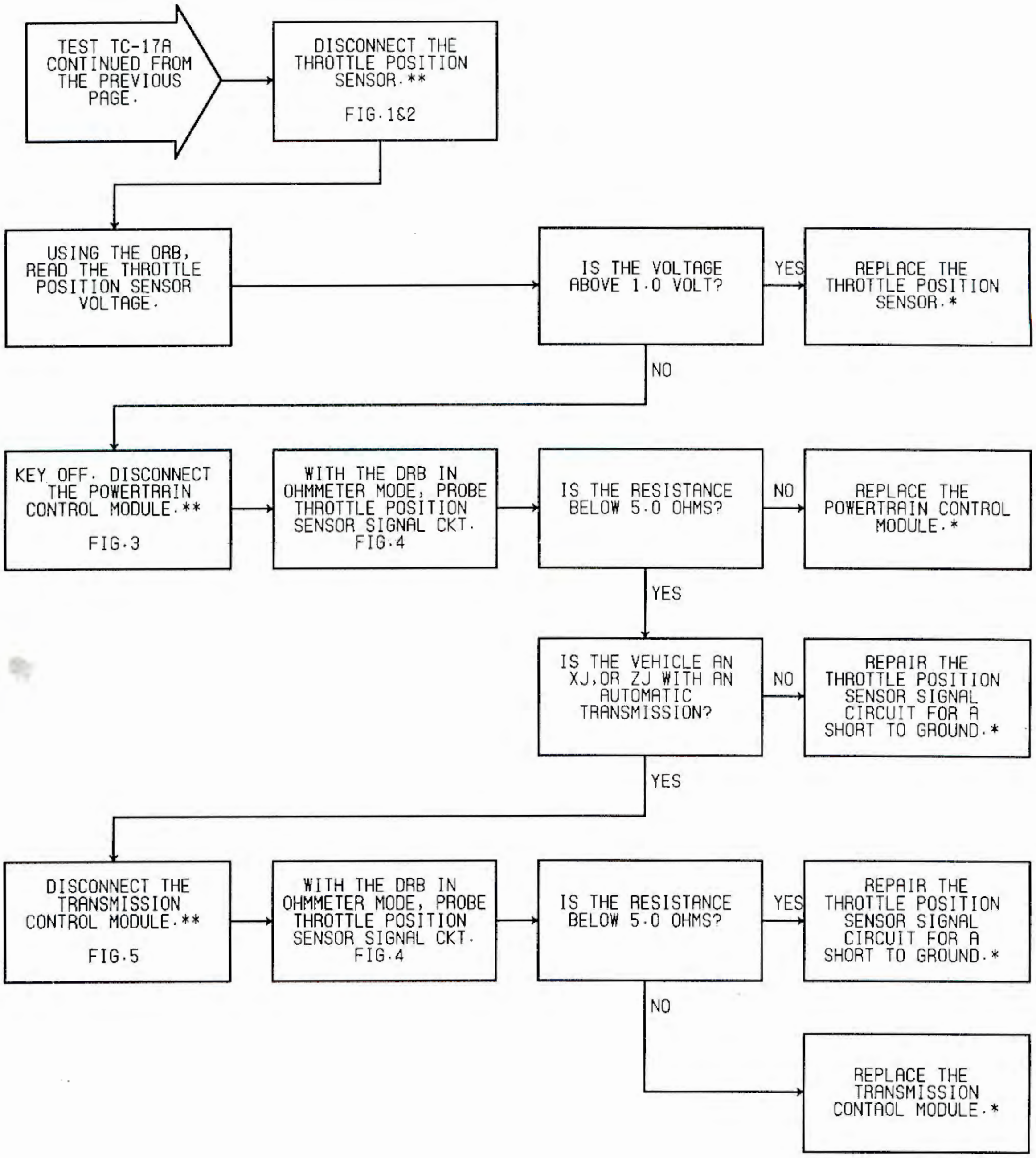
TEST TC-17A | REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-17A | **CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW**

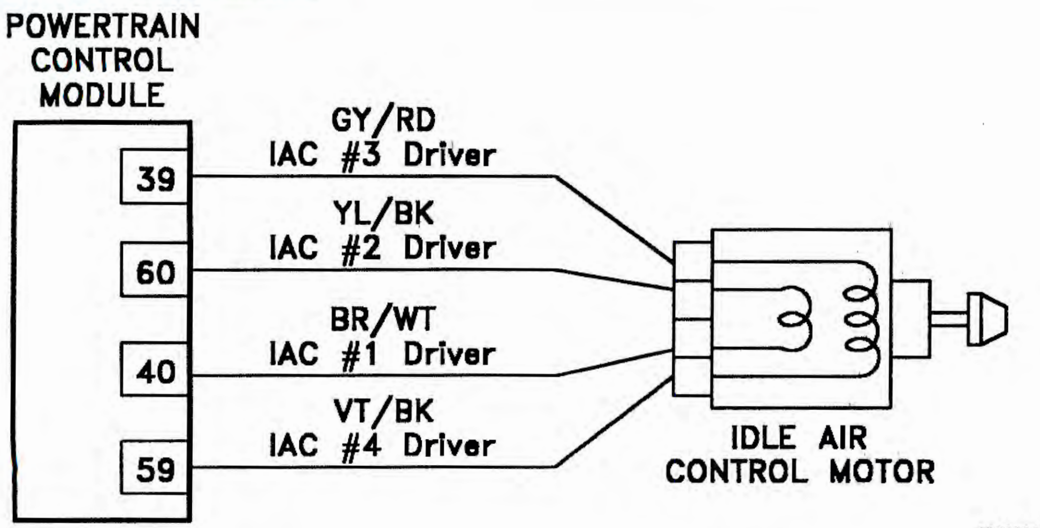


***Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.**

TEST TC-18A REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

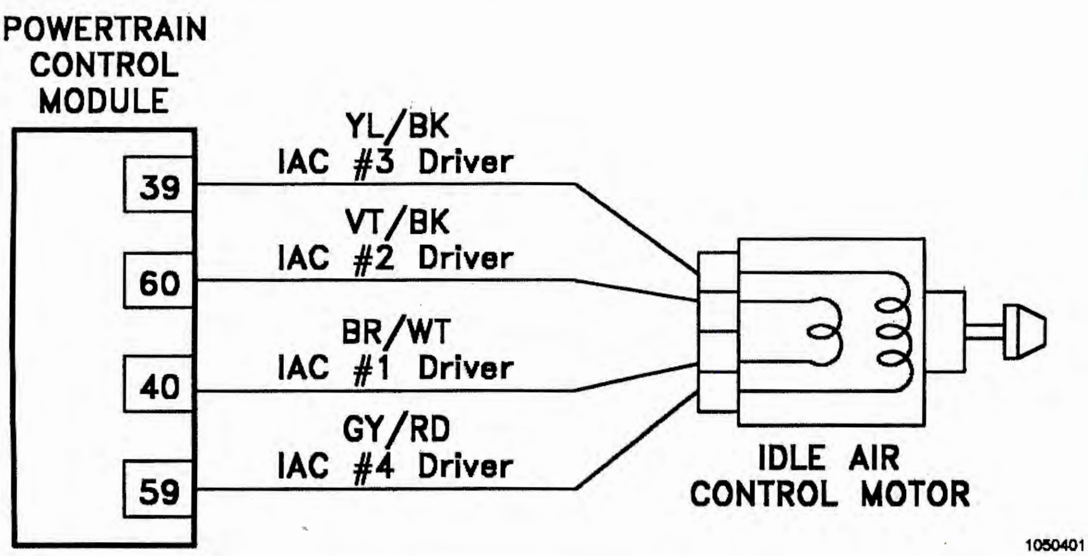
Perform TEST TC-1A Before Proceeding

1993 MJ AND 1993-94 YJ AND XJ BODIES



0830606

ZJ BODY



1050401

Name of code: Idle Air Control Motor Circuits

When monitored: With the ignition on, battery voltage greater than 10.0 volts, and the idle air control motor active.

Set condition: The PCM senses a short to ground or battery voltage on any of the four IAC driver circuits for 2.75 seconds while the IAC motor is active.

Theory of operation: The idle air control motor is used by the PCM to help regulate idle speed. The motor controls the amount of air allowed to bypass the throttle blade. The PCM controls the motor using four driver circuits to position the stepper motor.

Possible causes:
> Driver circuit shorted to ground
> Driver circuit shorted to battery
> Driver circuits shorted together
> Failed PCM
> Shorted IAC motor
> Connector terminals
> Connector wires

0870202

(**NOTE:** The PCM cannot detect an open driver circuit or a stuck motor.)

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

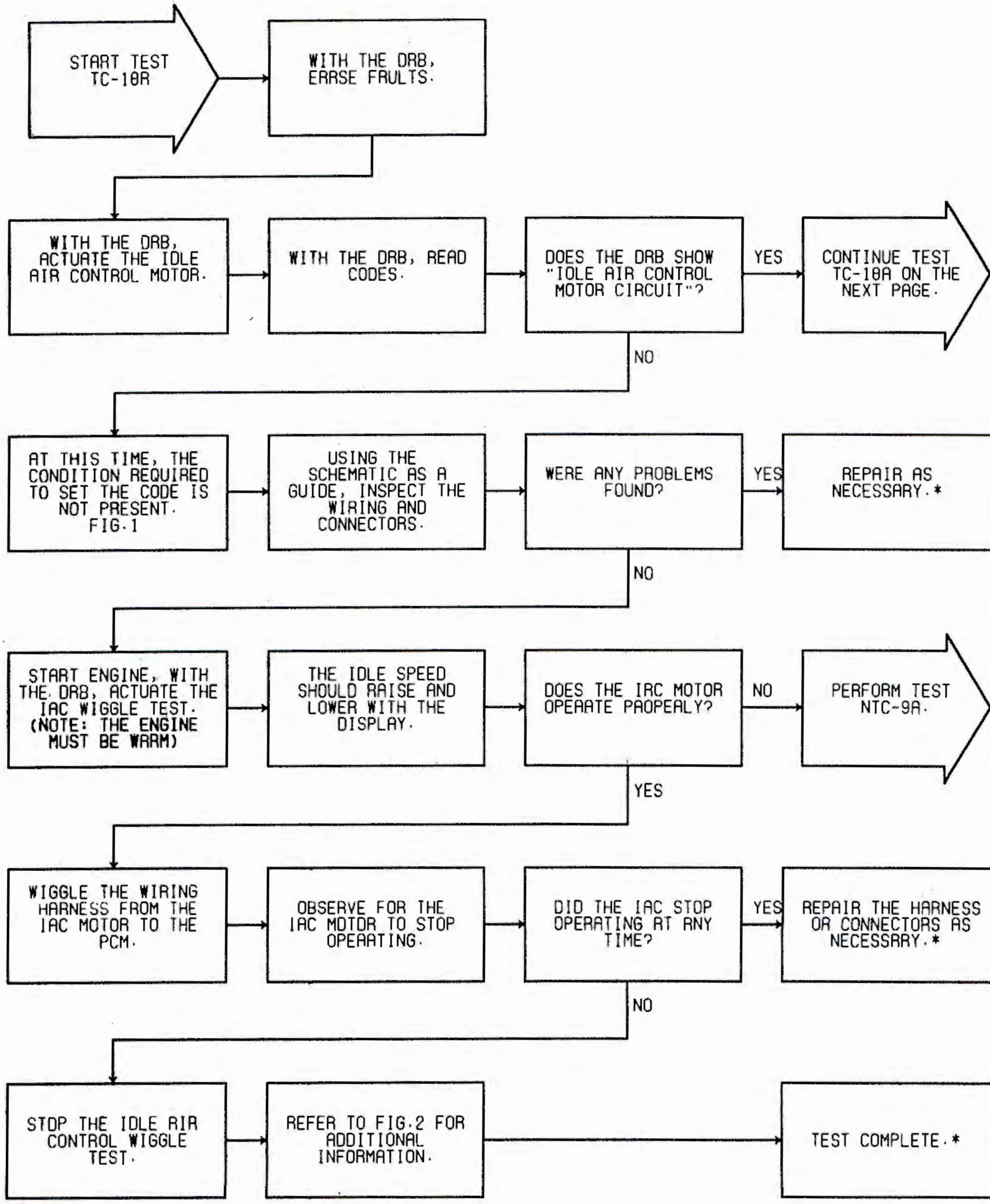
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

TEST TC-18A | REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

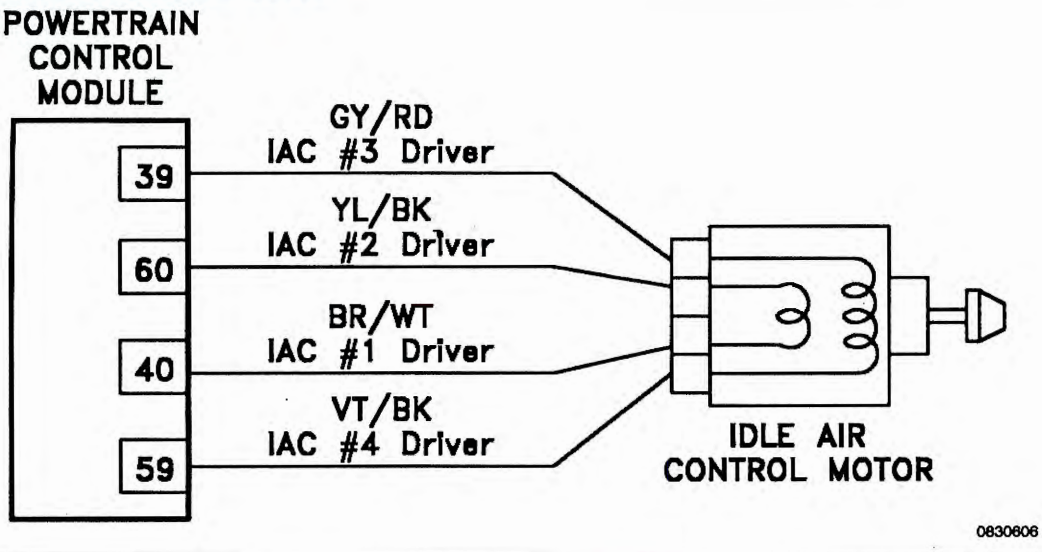
Perform TEST TC-1A Before Proceeding



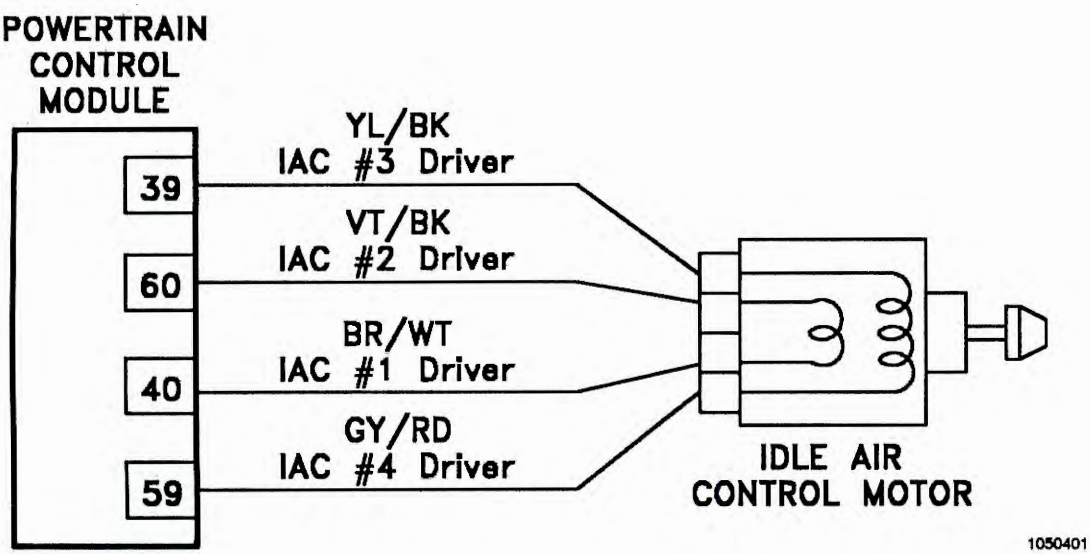
*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

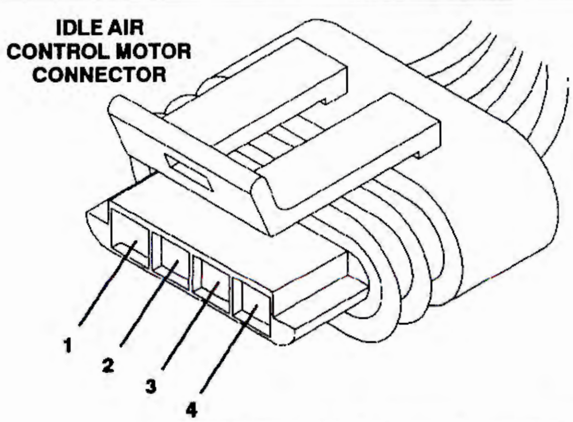
TEST TC-18A CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

1993 MJ AND 1993-94 YJ AND XJ BODIES



ZJ BODY





CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	GY/RD	YL/BK	IAC #3 DRIVER
2	YL/BK	VT/BK	IAC #2 DRIVER
3	BR/WT	BR/WT	IAC #1 DRIVER
4	VT/BK	GY/RD	IAC #4 DRIVER

FIG. 1

TEST TC-18A CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

TEST TC-18A CONTINUED FROM THE PREVIOUS PAGE.

→ KEY OFF. DISCONNECT THE IAC MOTOR CONNECTOR.*
SEE GENERAL INFO 4.0

→ IS ANY TERMINAL DAMAGED, PUSHED OUT OR MISWIRED?
- YES → REPAIR AS NECESSARY.*
- NO ↓

TURN IGNITION ON. (ENGINE OFF) WITH THE DRB, ERASE CODES.

→ WITH THE DRB, ACTUATE THE IAC MOTOR AND READ CODES.

→ DOES THE DRB SHOW "IDLE AIR CONTROL MOTOR CIRCUIT"?
- NO → REPLACE THE IDLE AIR CONTROL MOTOR.*
- YES ↓

WITH THE DRB IN VOLTMETER MODE, PROBE THE IAC #1 DRIVER CKT. FIG.1

→ NOTE: THE VOLTAGE MAY SWITCH OR REMAIN CONSTANT DURING THIS TEST.

→ WAS THE VOLTAGE OVER 10.0 VOLTS AT ANY TIME?
- NO → PERFORM TEST TC-18B
- YES ↓

WITH THE DRB IN VOLTMETER MODE, PROBE THE IAC #2 DRIVER CKT. FIG.1

→ WAS THE VOLTAGE OVER 10.0 VOLTS AT ANY TIME?
- NO → PERFORM TEST TC-18C
- YES ↓

WITH THE DRB IN VOLTMETER MODE, PROBE THE IAC #3 DRIVER CKT. FIG.1

→ WAS THE VOLTAGE OVER 10.0 VOLTS AT ANY TIME?
- NO → PERFORM TEST TC-18D
- YES ↓

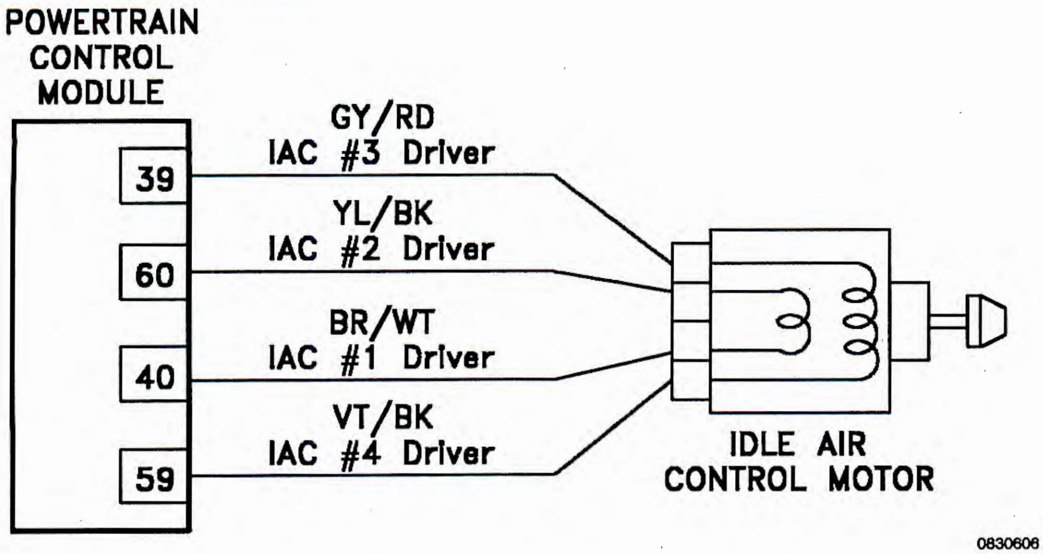
WITH THE DRB IN VOLTMETER MODE, PROBE THE IAC #4 DRIVER CKT. FIG.1

→ WAS THE VOLTAGE OVER 10.0 VOLTS AT ANY TIME?
- NO → PERFORM TEST TC-18E
- YES → CONTINUE TEST TC-18A ON THE NEXT PAGE.

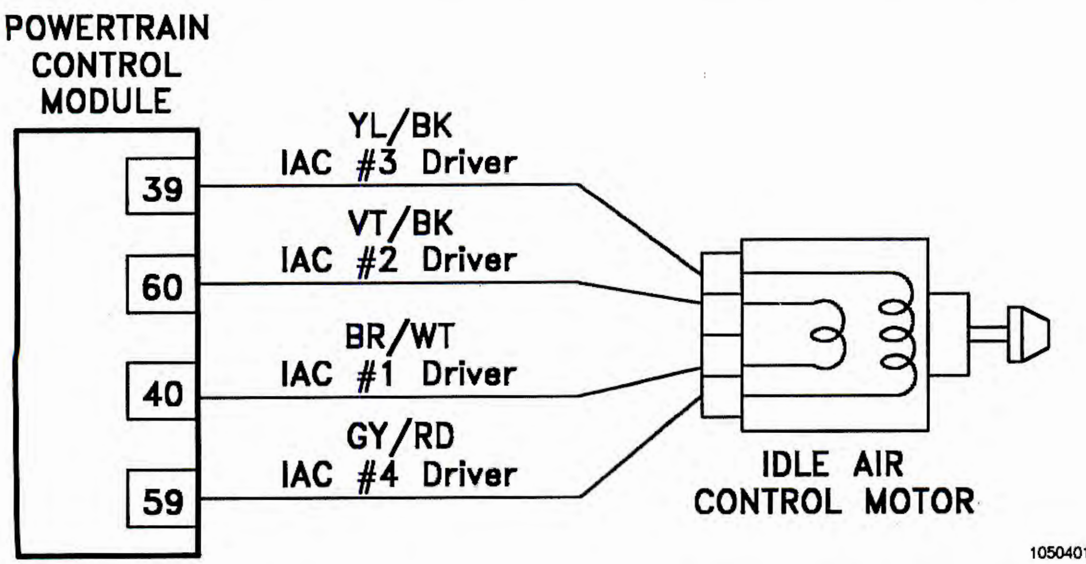
Perform Verification TEST VER-2A. | ****Check connectors – Clean / repair as necessary.***

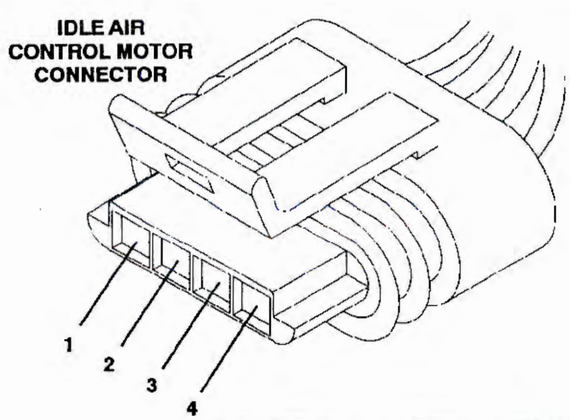
TEST TC-18A CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

1993 MJ AND 1993-94 YJ AND XJ BODIES



ZJ BODY





CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	GY/RD	YL/BK	IAC #3 DRIVER
2	YL/BK	VT/BK	IAC #2 DRIVER
3	BR/WT	BR/WT	IAC #1 DRIVER
4	VT/BK	GY/RD	IAC #4 DRIVER

1510105

FIG. 1

TEST TC-18A CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

TROUBLE CODE TESTS

TEST TC-18A CONTINUED FROM THE PREVIOUS PAGE.

KEY OFF, DISCONNECT THE POWERTRAIN CONTROL MODULE.**

SEE GENERAL INFO 4.0

IS ANY TERMINAL DAMAGED, PUSHED OUT OR MISWIRED?

YES — REPAIR AS NECESSARY.*

NO

THE FOLLOWING STEPS ARE CHECKING FOR A SHORT BETWEEN THE DRIVER CIRCUITS...

USING AN OHMMETER, MEASURE THE RESISTANCE BETWEEN THE ...

IAC #1 DRIVER AND #2,#3,#4 DRIVERS.

FIG.1

IS THE RESISTANCE BELOW 5.0 OHMS ON ANY OF THE DRIVERS?

YES — REPAIR THE IAC DRIVER CIRCUITS, SHORTED TOGETHER.*

NO

USING AN OHMMETER, MEASURE THE RESISTANCE BETWEEN THE ...

IAC #2 DRIVER AND #3,#4 DRIVERS.

FIG.1

IS THE RESISTANCE BELOW 5.0 OHMS ON ANY OF THE DRIVERS?

YES — REPAIR THE IAC DRIVER CIRCUITS, SHORTED TOGETHER.*

NO

USING AN OHMMETER, MEASURE THE RESISTANCE BETWEEN THE ...

IAC #3 DRIVER AND #4 DRIVER.

FIG.1

IS THE RESISTANCE BELOW 5.0 OHMS?

YES — REPAIR THE IAC DRIVER CIRCUITS, SHORTED TOGETHER.*

NO — REPLACE THE POWERTRAIN CONTROL MODULE.*

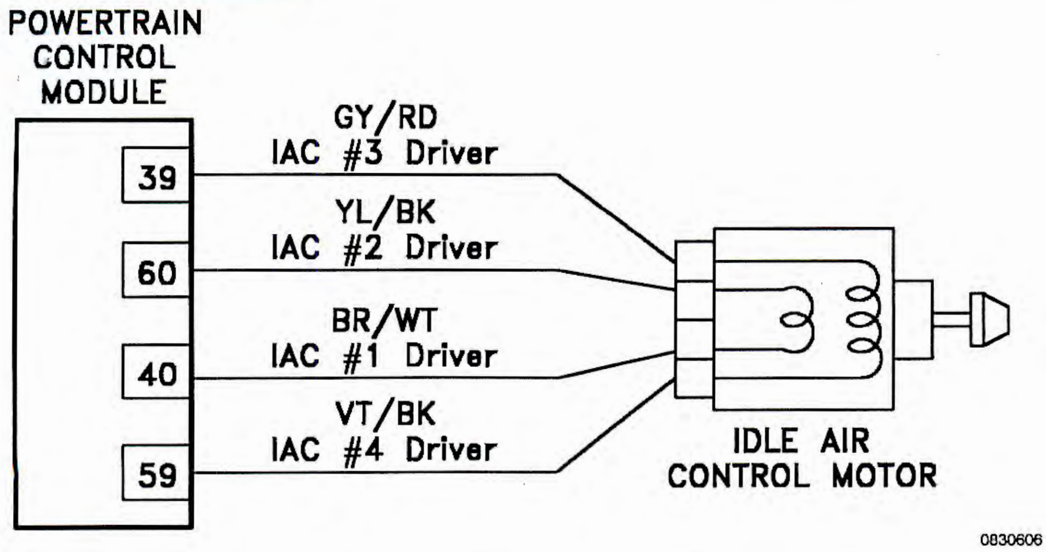
Perform Verification TEST VER-2A.

*****Check connectors – Clean / repair as necessary.***

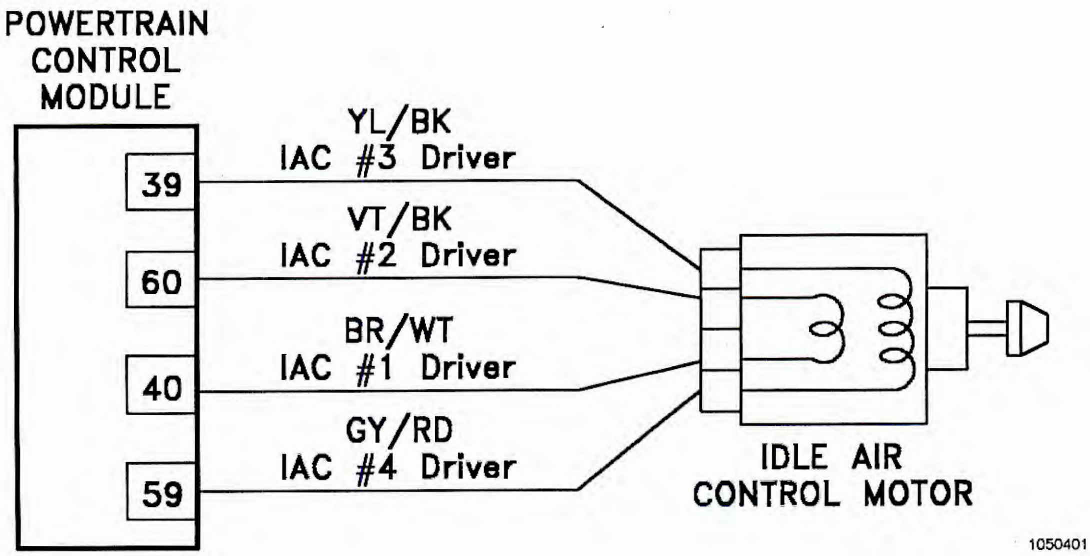
TEST TC-18B — REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

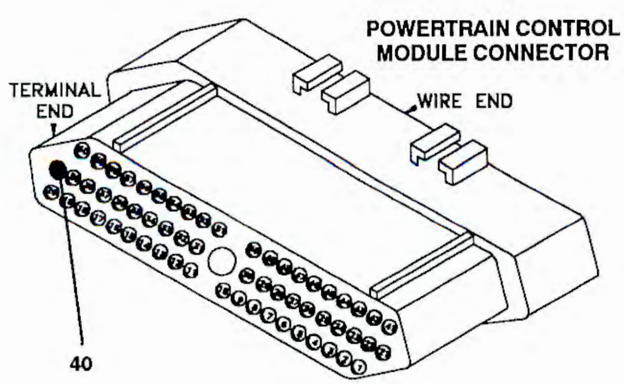
Perform TEST TC-18A Before Proceeding

1993 MJ AND 1993-94 YJ AND XJ BODIES



ZJ BODY





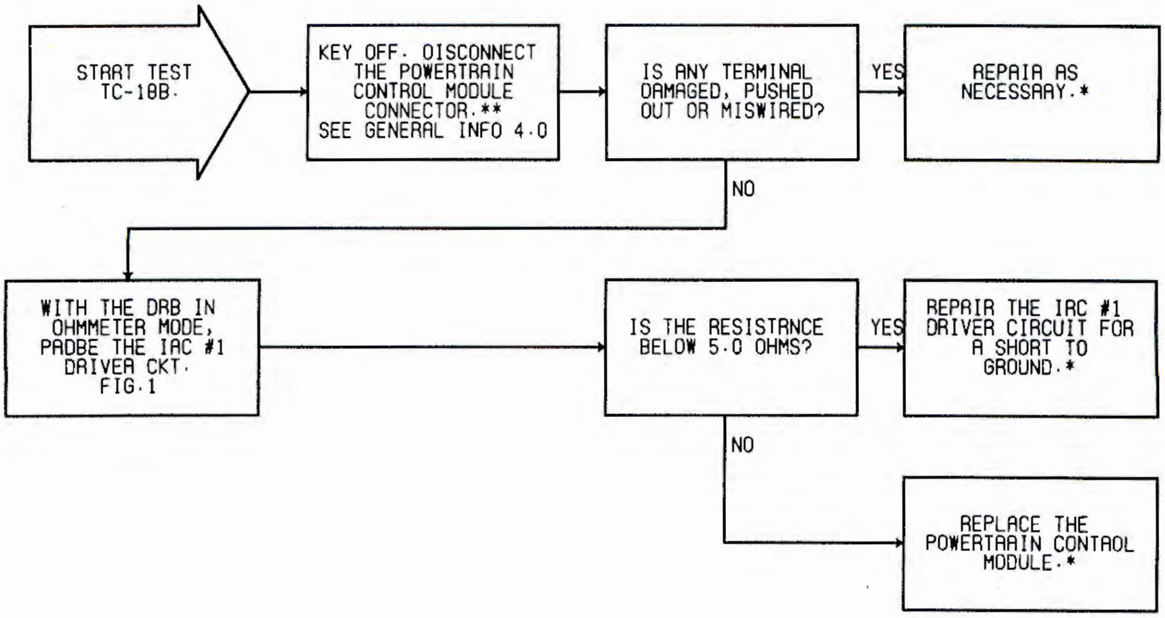
CAV	COLOR	FUNCTION
40	BR/WT	IAC MOTOR #1 DRIVER

1050406

FIG. 1

TEST TC-18B	REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-18A Before Proceeding



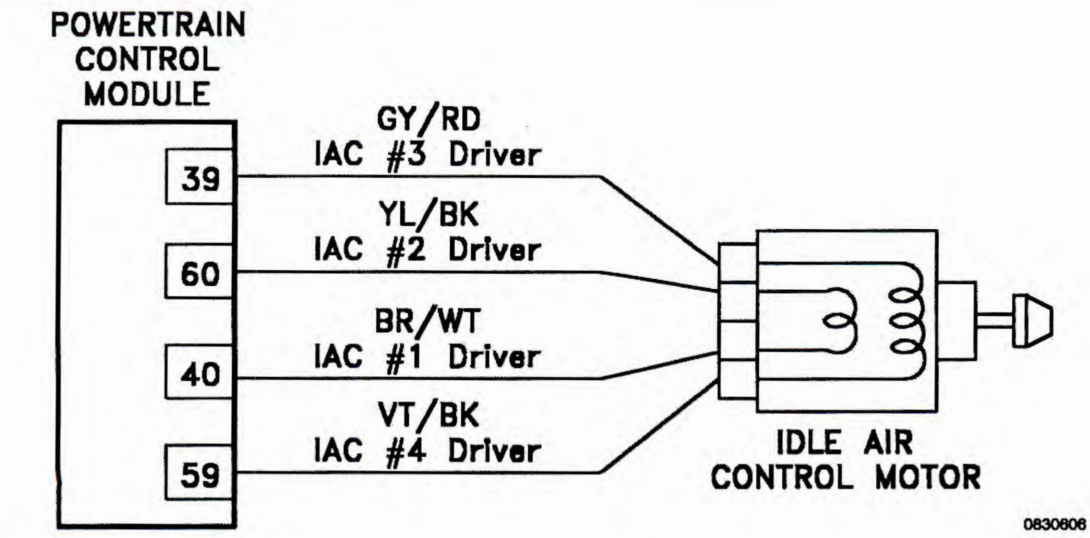
*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

T R O U B L E C O D E T E S T S

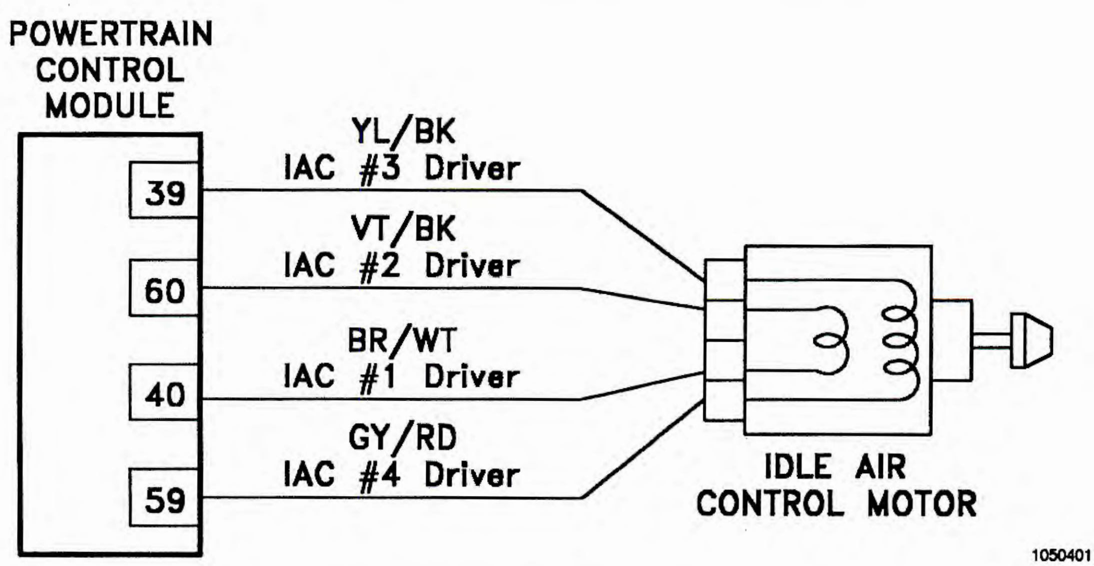
TEST TC-18C REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-18A Before Proceeding

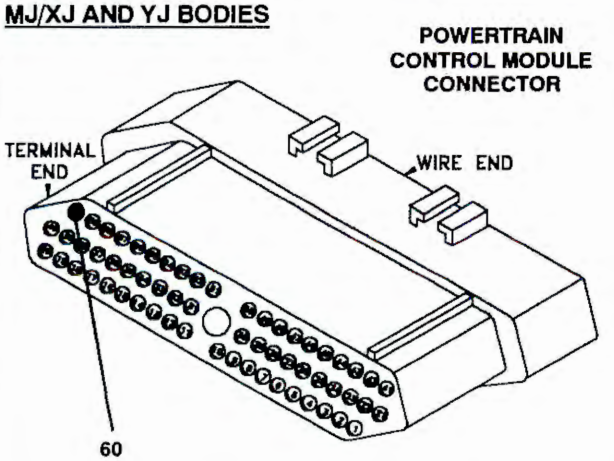
1993 MJ AND 1993-94 YJ AND XJ BODIES



ZJ BODY



MJ/XJ AND YJ BODIES

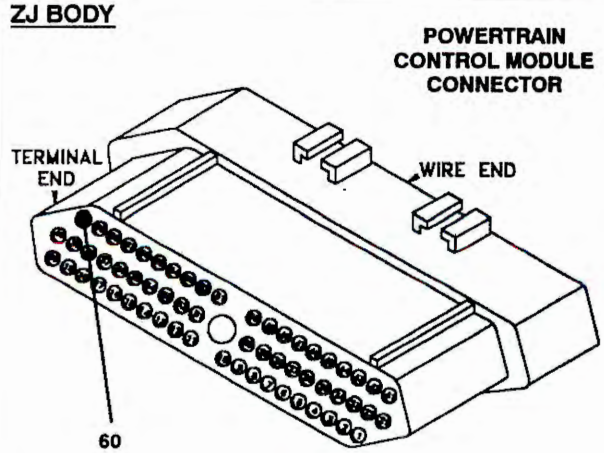


CAV	COLOR	FUNCTION
60	YL/BK	IAC #2 DRIVER

1050505

FIG. 1

ZJ BODY



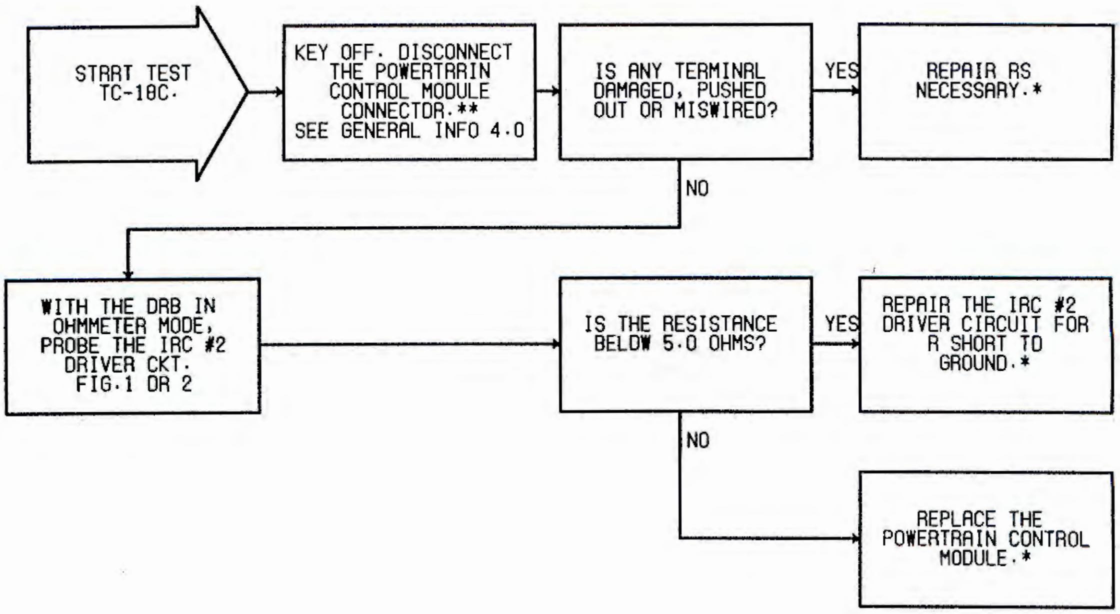
CAV	COLOR	FUNCTION
60	VT/BK	IAC #2 DRIVER

1050506

FIG. 2

TEST TC-18C | REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-18A Before Proceeding

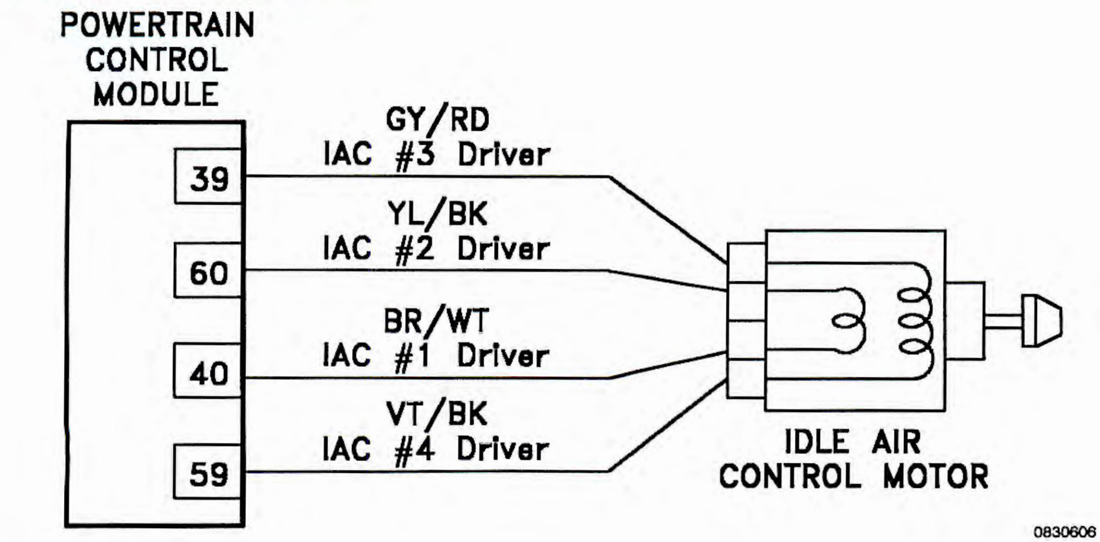


Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

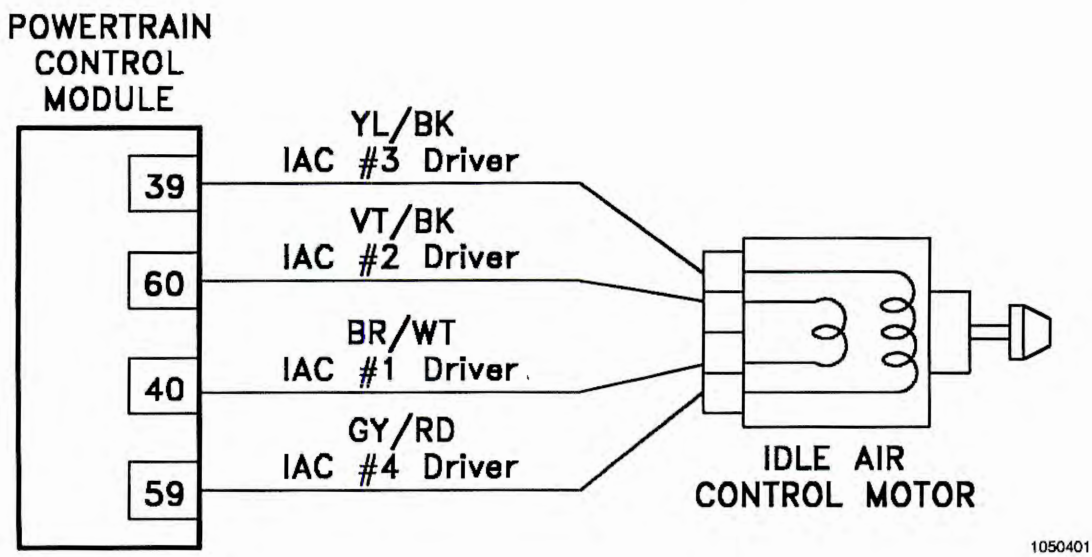
TEST TC-18D REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-18A Before Proceeding

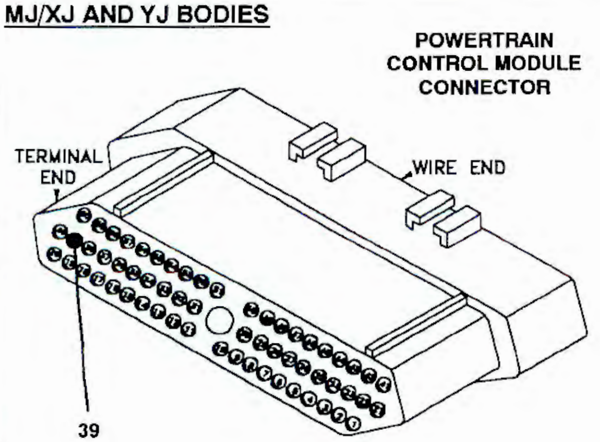
1993 MJ AND 1993-94 YJ AND XJ BODIES



ZJ BODY



MJ/XJ AND YJ BODIES

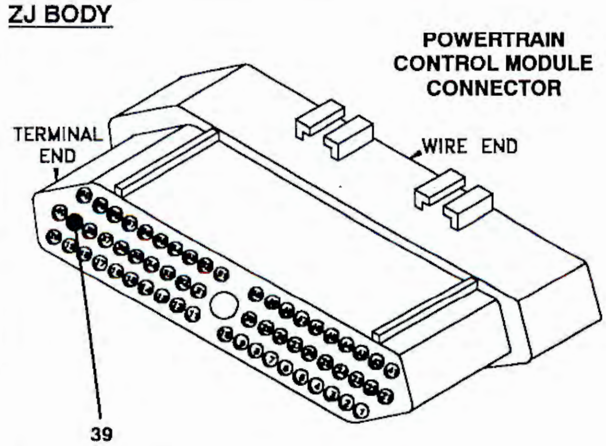


CAV	COLOR	FUNCTION
39	GY/RD	IAC #3 DRIVER

1050501

FIG. 1

ZJ BODY



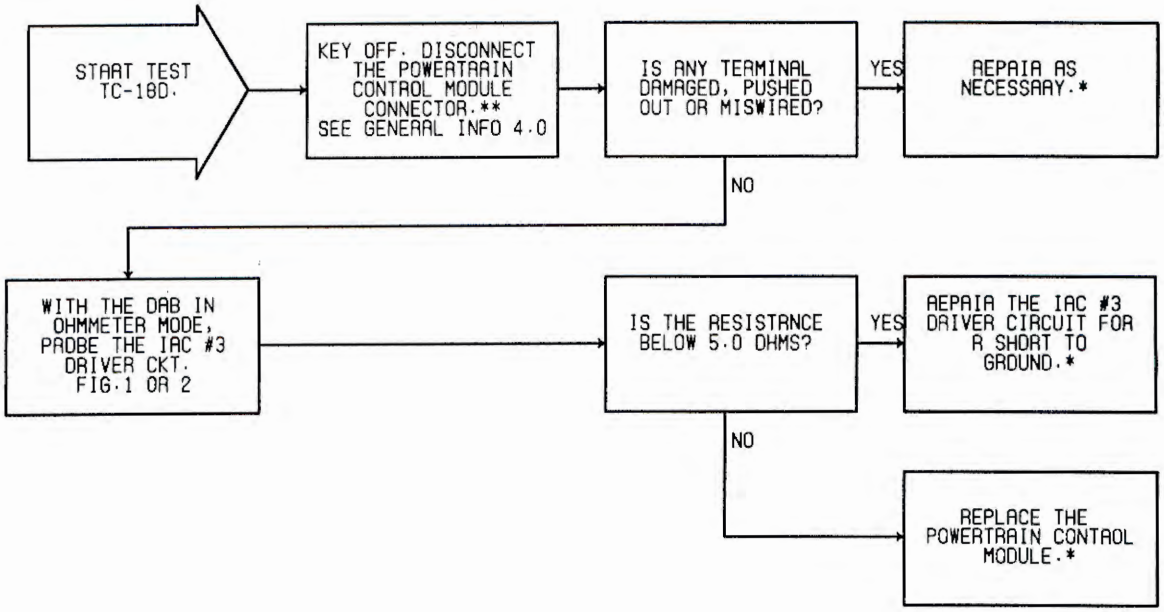
CAV	COLOR	FUNCTION
39	YL/BK	IAC #3 DRIVER

1050502

FIG. 2

TEST TC-18D REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-18A Before Proceeding



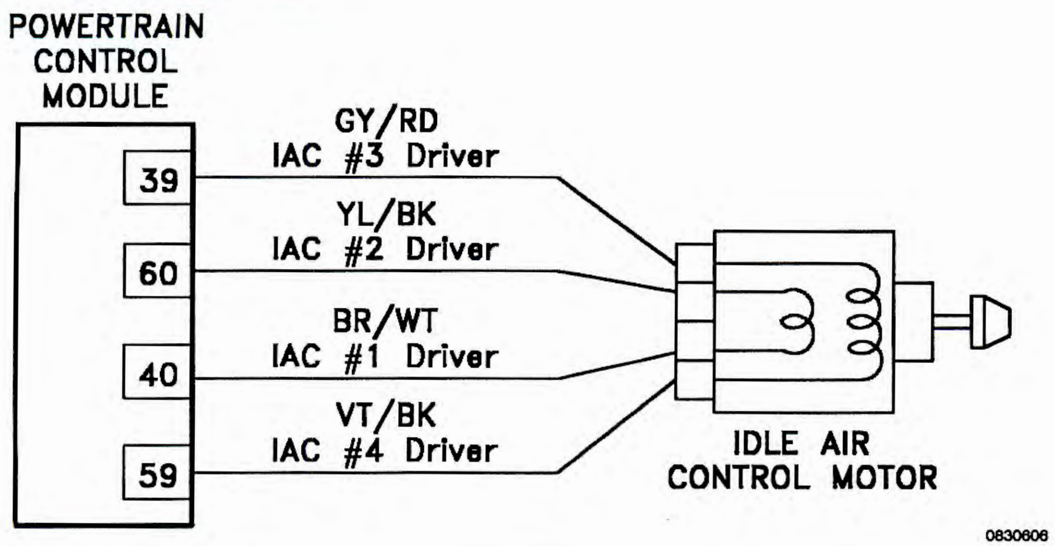
**Perform Verification TEST VER-2A.*

***Check connectors – Clean / repair as necessary.*

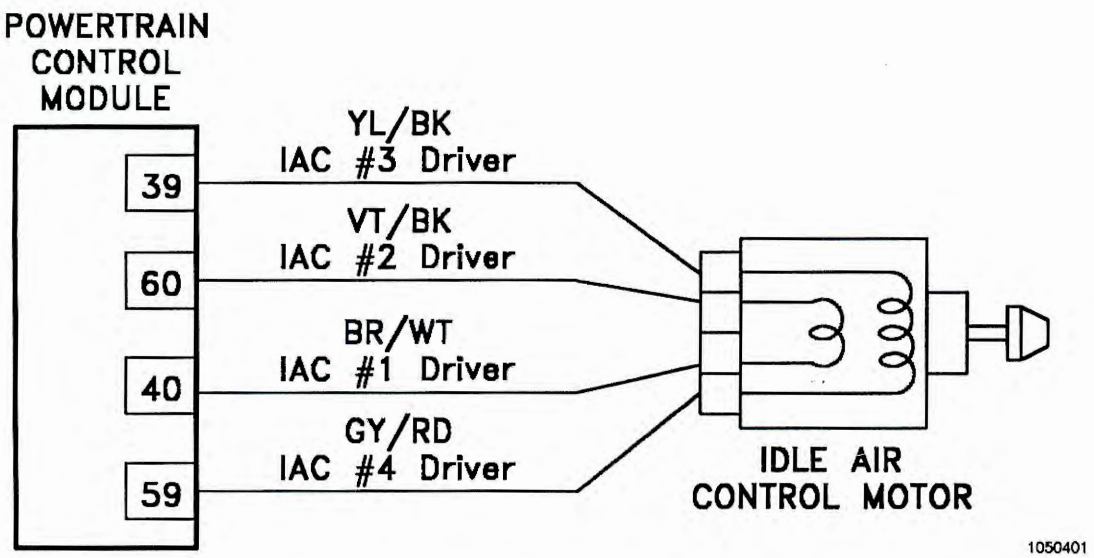
TEST TC-18E | REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-18A Before Proceeding

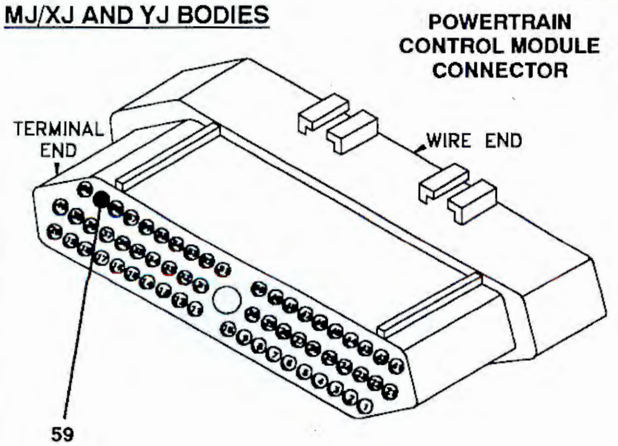
1993 MJ AND 1993-94 YJ AND XJ BODIES



ZJ BODY



MJ/XJ AND YJ BODIES

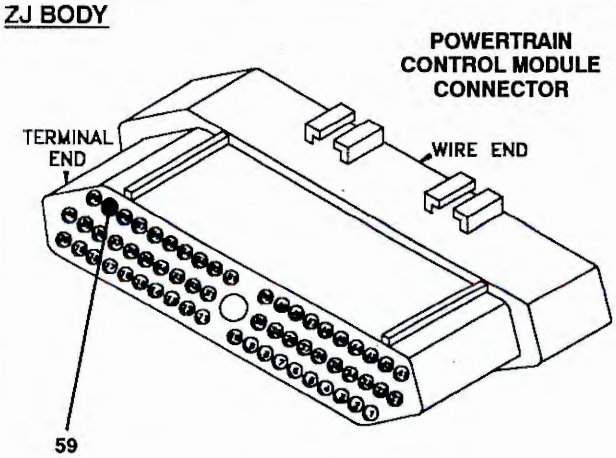


CAV	COLOR	FUNCTION
59	VT/BK	IAC #4 DRIVER

1050503

FIG. 1

ZJ BODY



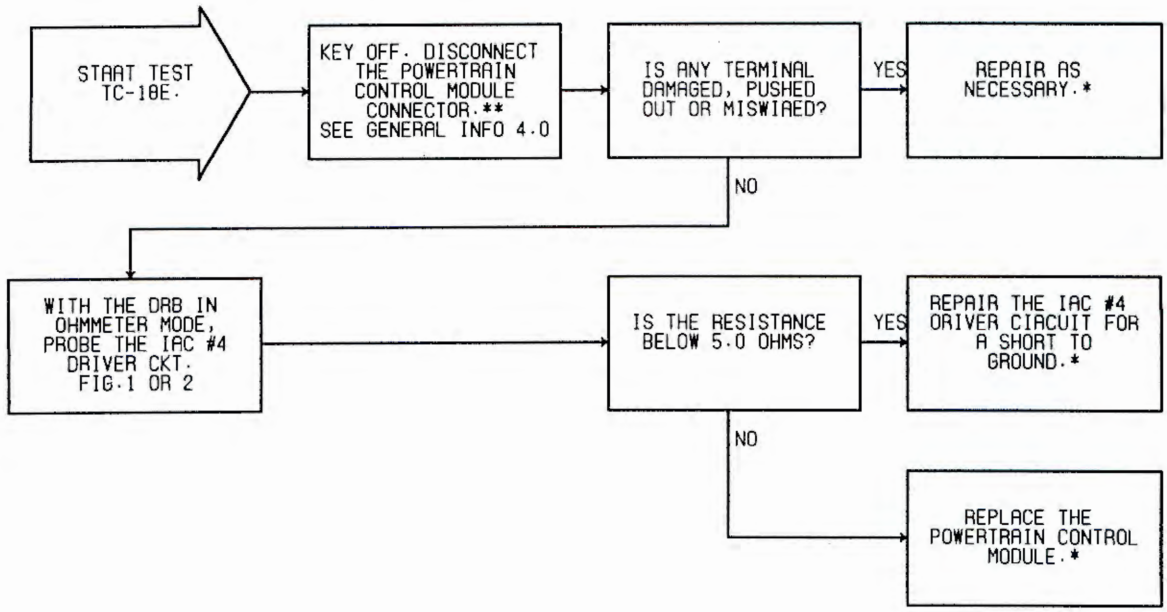
CAV	COLOR	FUNCTION
59	GY/RD	IAC #4 DRIVER

1050504

FIG. 2

TEST TC-18E REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

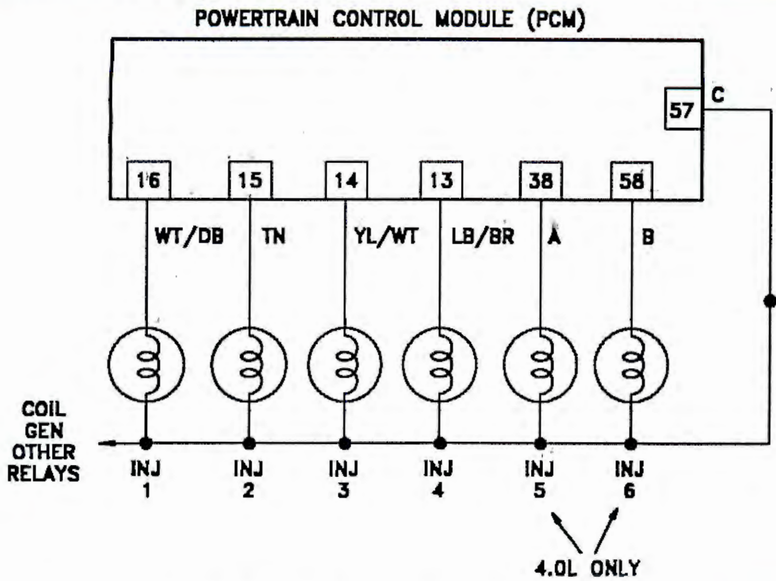
Perform TEST TC-18A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-19A REPAIRING - INJECTOR CONTROL CIRCUIT

Perform TEST TC-1A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

Name of code: Injector Control Circuit

When monitored: With battery voltage greater than 12 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

Theory of operation: Fuel injectors are high-impedance solenoids controlled by the PCM. Battery voltage is supplied by the ASD relay. The injector on time (pulse width) is controlled by the amount of time the PCM grounds the injector control circuit. By varying this time, more or less fuel is allowed to flow through the injector.

Possible causes:
> Open or shorted injector driver circuit
> Open injector
> Open ASD supply at injector
> PCM failure
> Connector terminals
> Connector wires

0880305

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

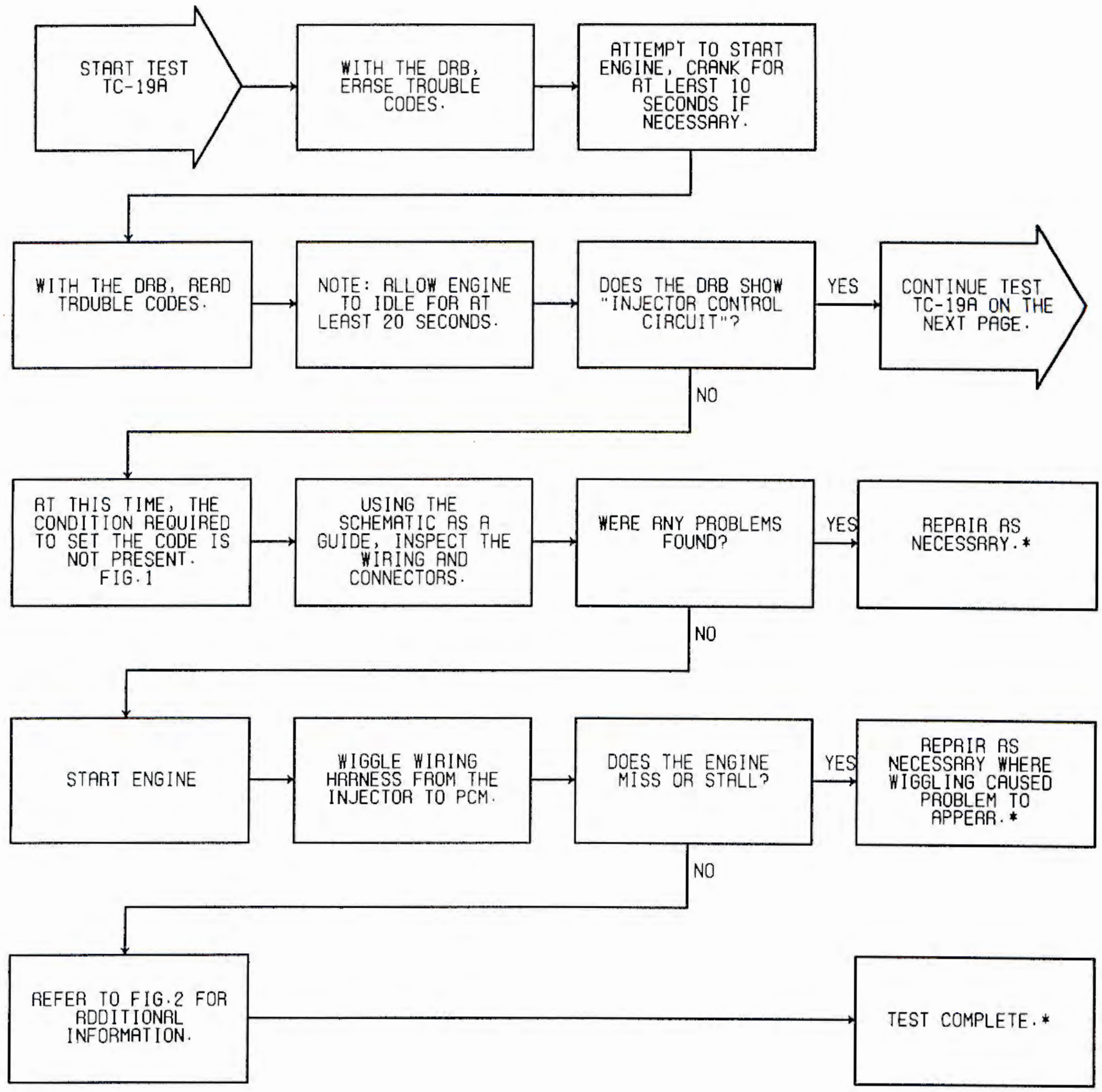
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

TEST TC-19A REPAIRING - INJECTOR CONTROL CIRCUIT

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A.

**Check connectors – Clean / repair as necessary.

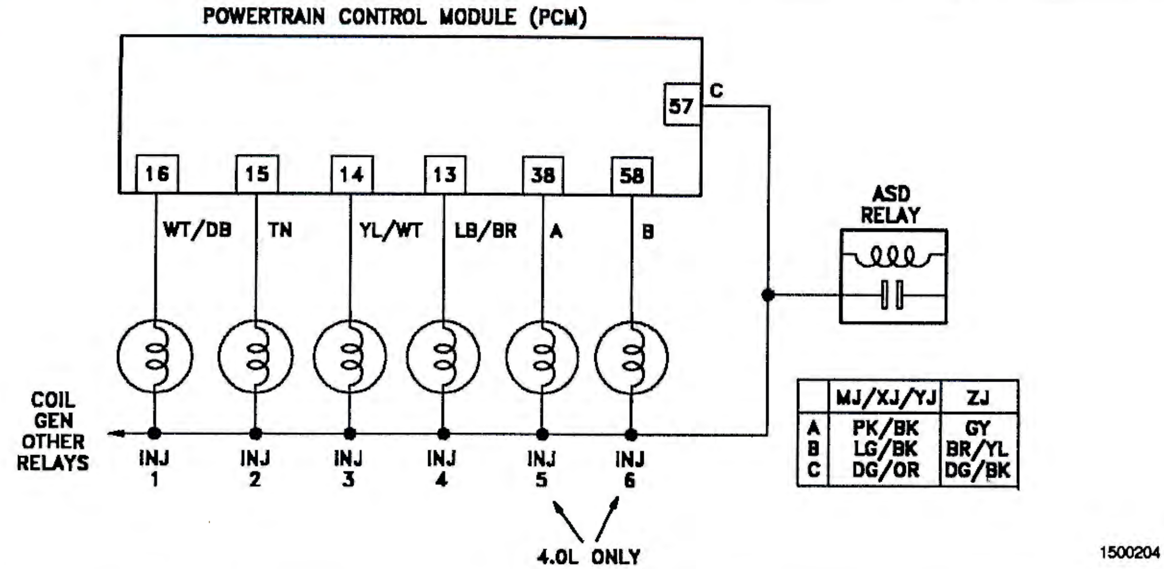
NOTES

Refer to the chart below and perform the diagnostic test that corresponds to the trouble code displayed on the DRB.

TROUBLE CODE	DIAGNOSTIC TEST
INJECTOR #1 CONTROL CIRCUIT	TC-19B
INJECTOR #2 CONTROL CIRCUIT	TC-20A
INJECTOR #3 CONTROL CIRCUIT	TC-21A
INJECTOR #4 CONTROL CIRCUIT	TC-22A
INJECTOR #5 CONTROL CIRCUIT	TC-23A
INJECTOR #6 CONTROL CIRCUIT	TC-24A

TEST TC-19B | REPAIRING - INJECTOR #1 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

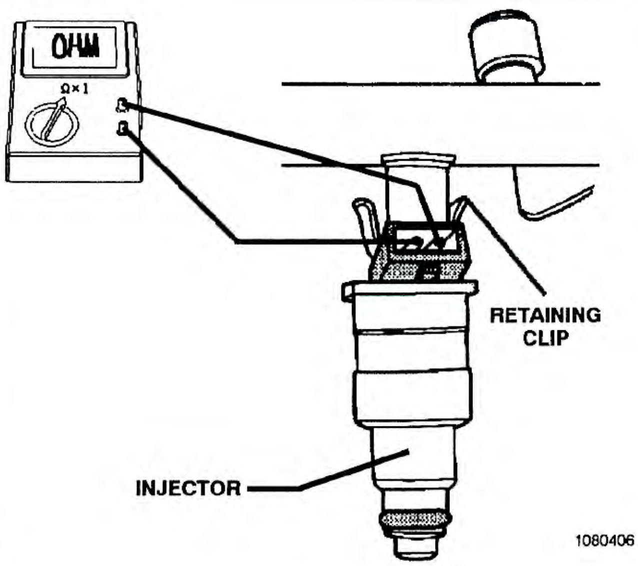
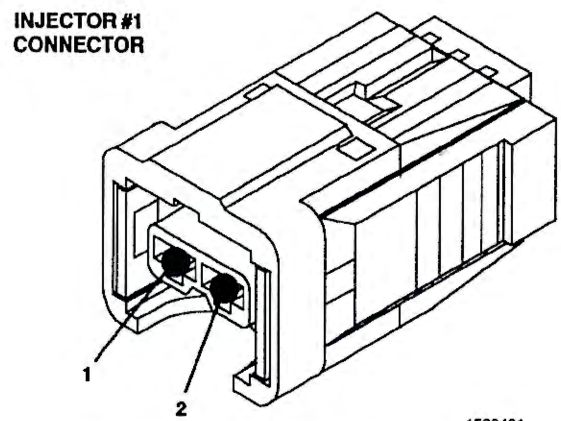


FIG. 1



CAV	COLOR	FUNCTION
1	WT/DB	INJECTOR #1 DRIVER
2	DG/*	ASD RELAY OUTPUT

FIG. 2

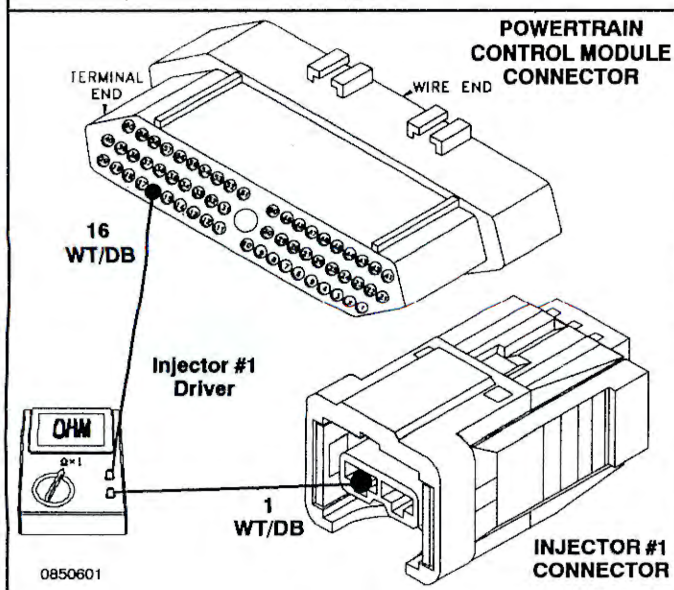
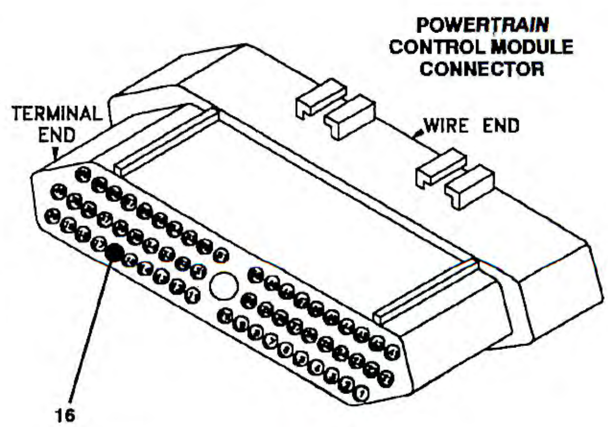


FIG. 3

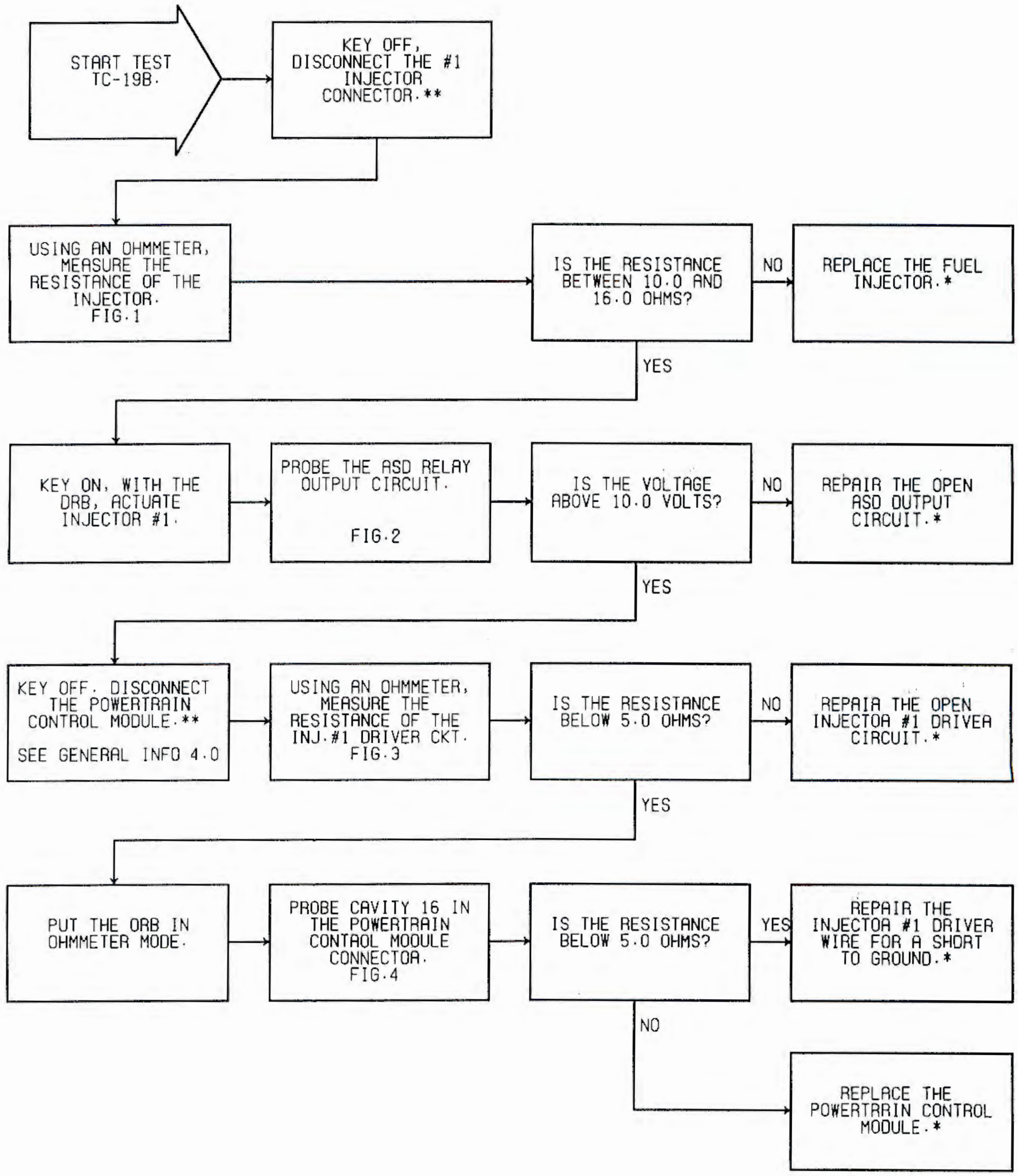


CAV	COLOR	FUNCTION
16	WT/DB	INJECTOR #1 DRIVER

FIG. 4

TEST TC-19B REPAIRING - INJECTOR #1 CONTROL CIRCUIT

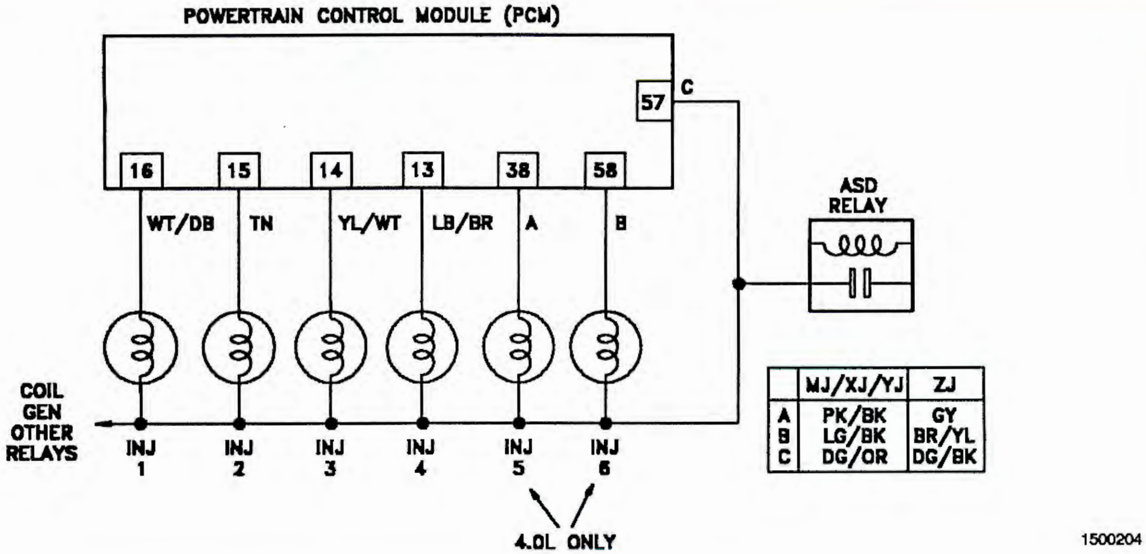
Perform TEST TC-19A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-20A | REPAIRING - INJECTOR #2 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

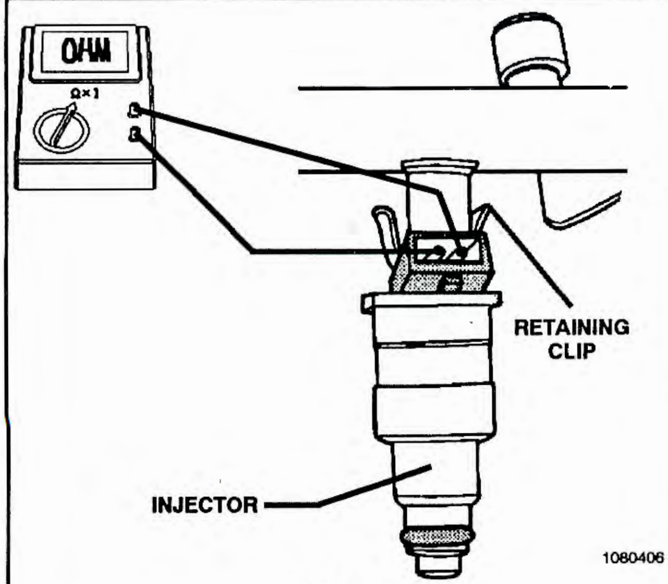
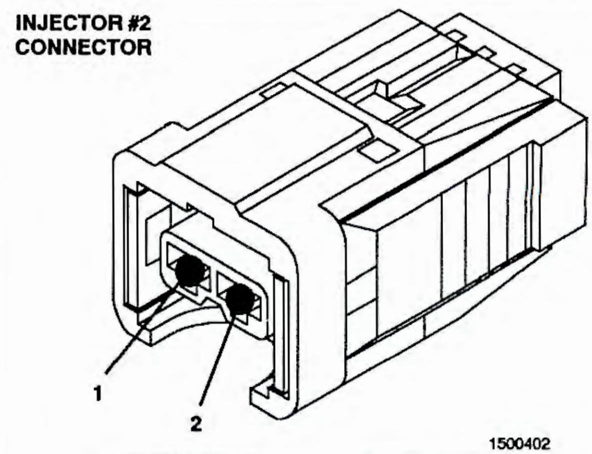


FIG. 1



CAV	COLOR	FUNCTION
1	TN	INJECTOR #2 DRIVER
2	DG/*	ASD RELAY OUTPUT

FIG. 2

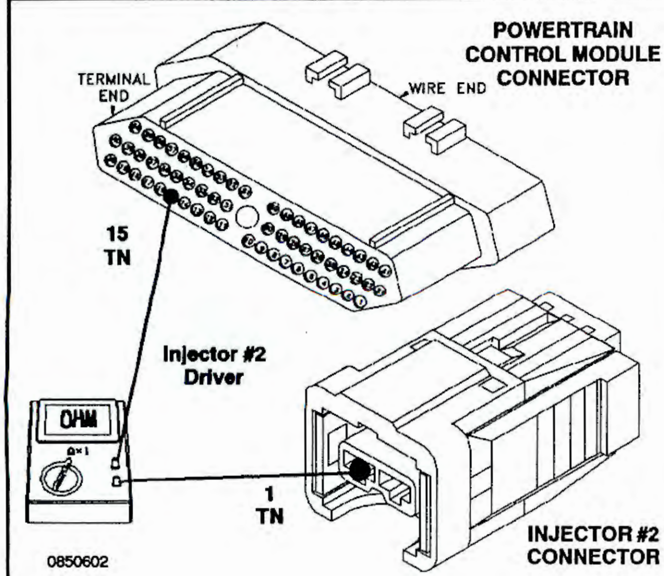
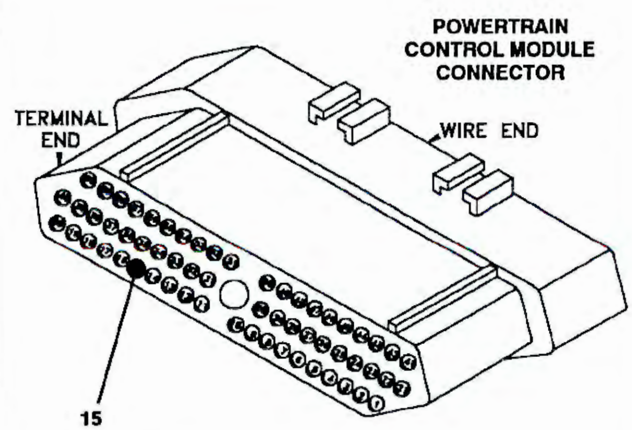


FIG. 3



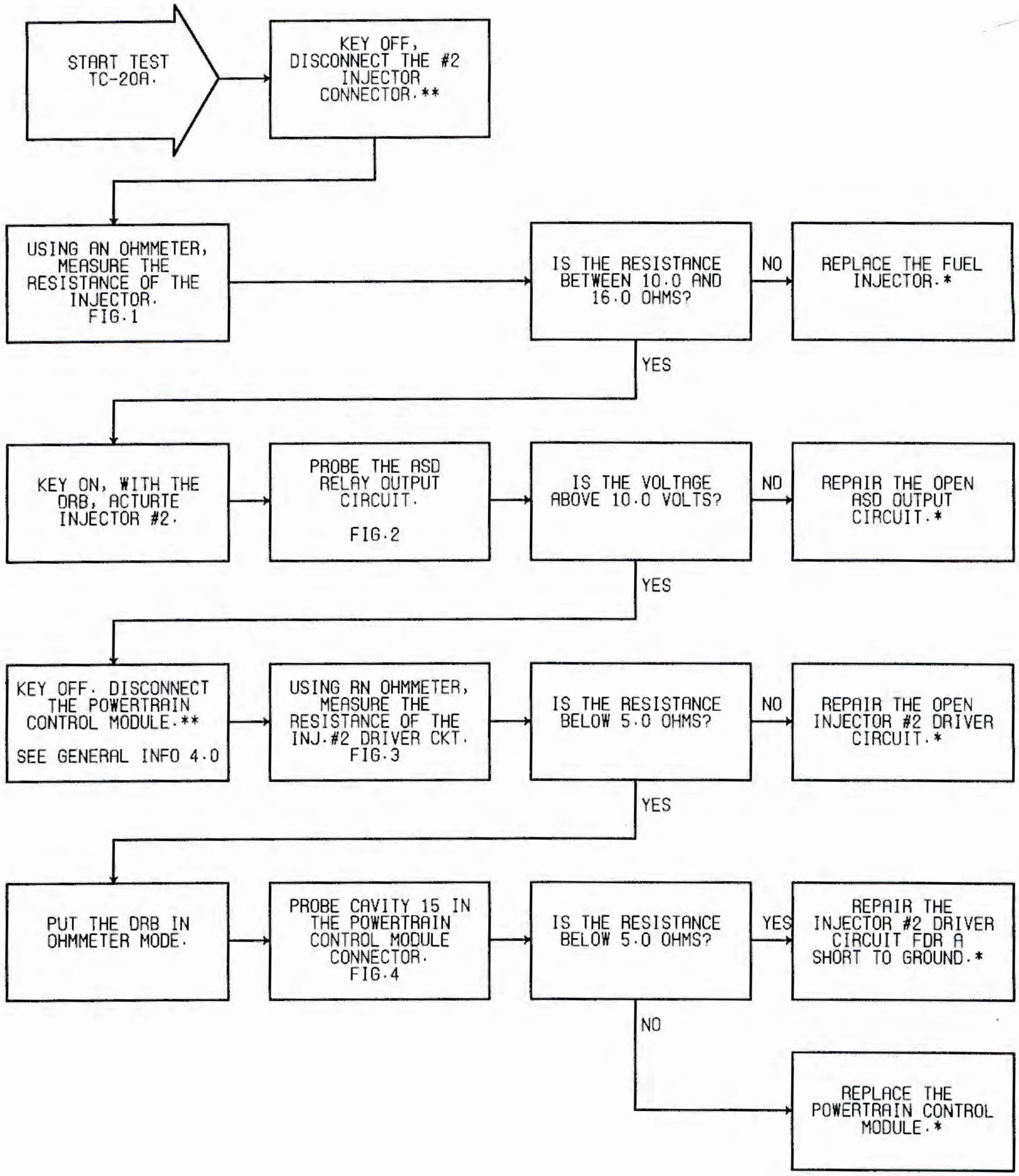
CAV	COLOR	FUNCTION
15	TN	INJECTOR #2 DRIVER

0790604

FIG. 4

TEST TC-20A REPAIRING - INJECTOR #2 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding

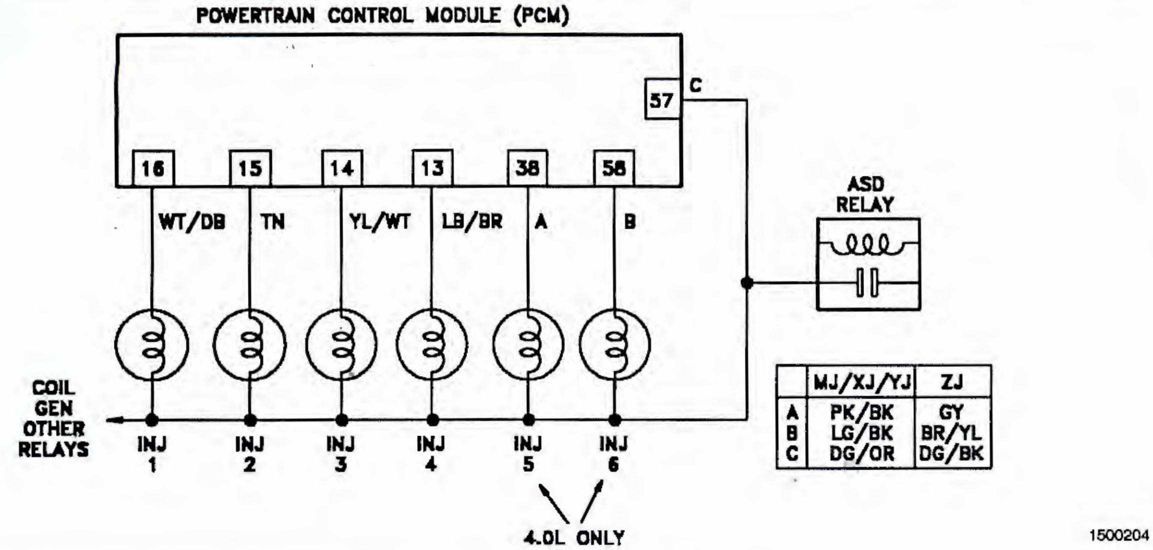


***Perform Verification TEST VER-2A.**

****Check connectors – Clean / repair as necessary.**

TEST TC-21A REPAIRING - INJECTOR #3 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

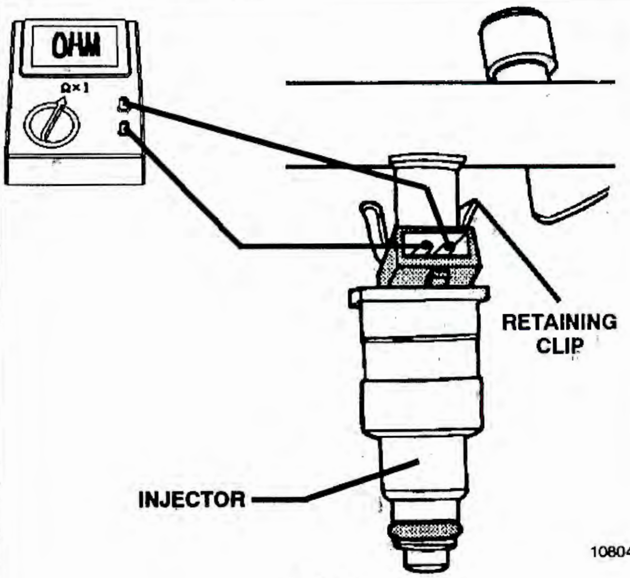
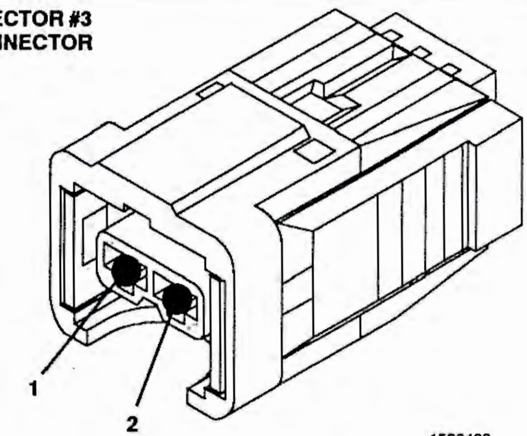


FIG. 1



CAV	COLOR	FUNCTION
1	YL/WT	INJECTOR #3 DRIVER
2	DG/*	ASD RELAY OUTPUT

FIG. 2

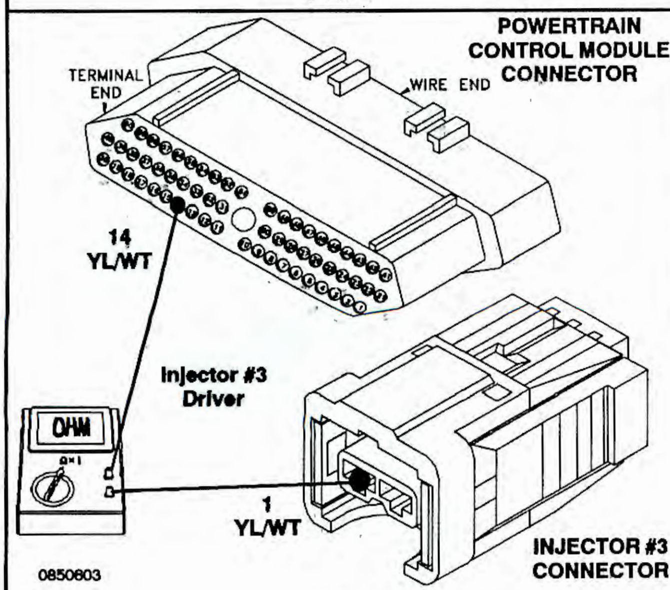
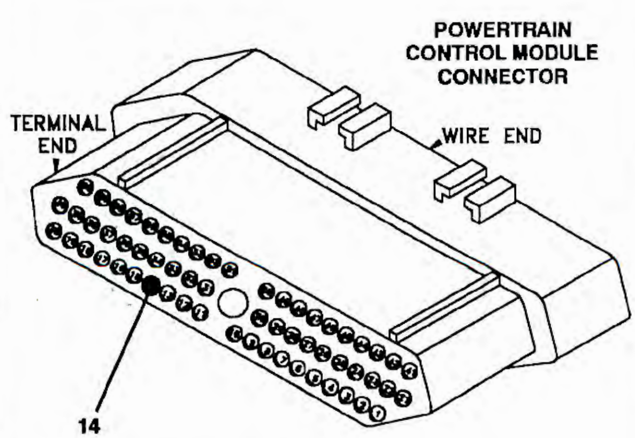


FIG. 3



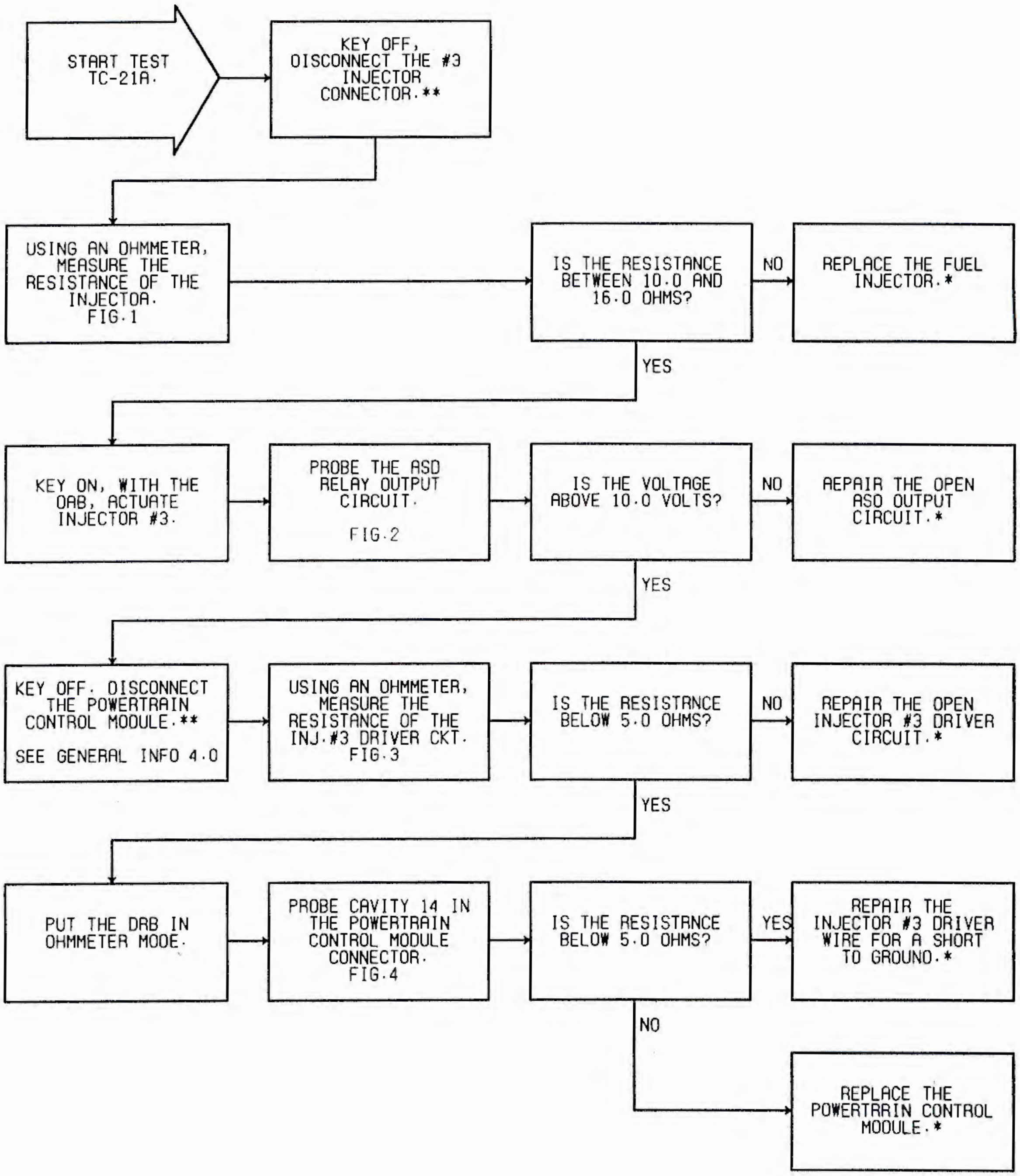
CAV	COLOR	FUNCTION
14	YL/WT	INJECTOR #3 DRIVER

0790603

FIG. 4

TEST TC-21A REPAIRING - INJECTOR #3 CONTROL CIRCUIT

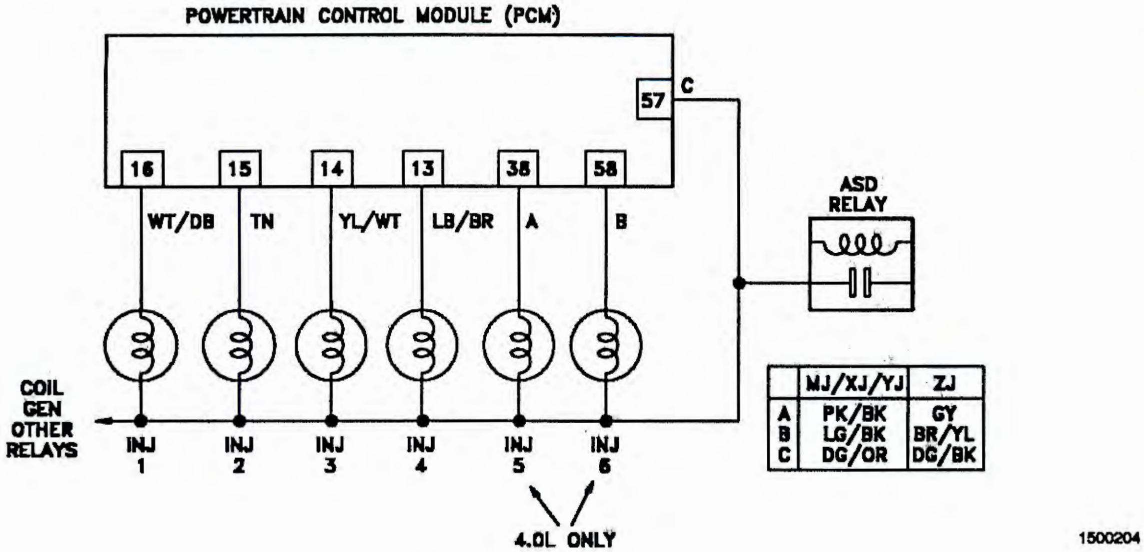
Perform TEST TC-19A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-22A | REPAIRING - INJECTOR #4 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

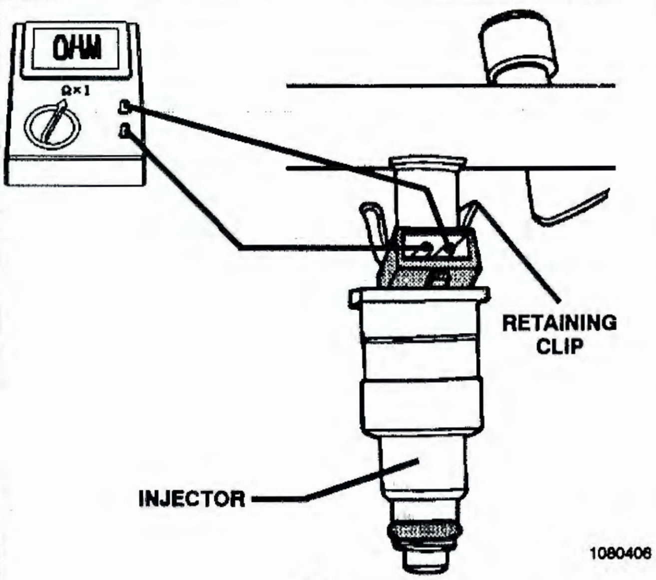
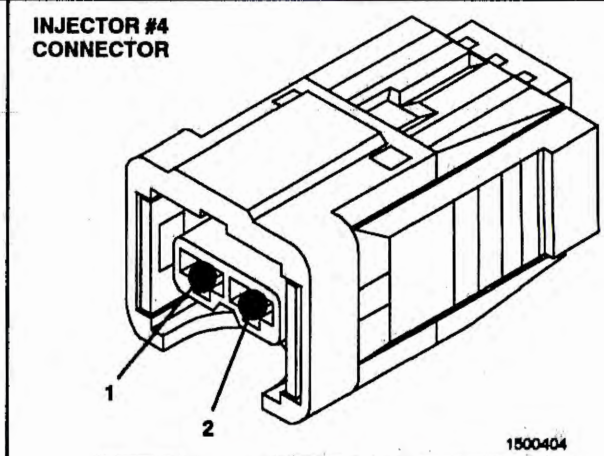


FIG. 1



CAV	COLOR	FUNCTION
1	LB/BR	INJECTOR #4 DRIVER
2	DG/*	ASD RELAY OUTPUT

FIG. 2

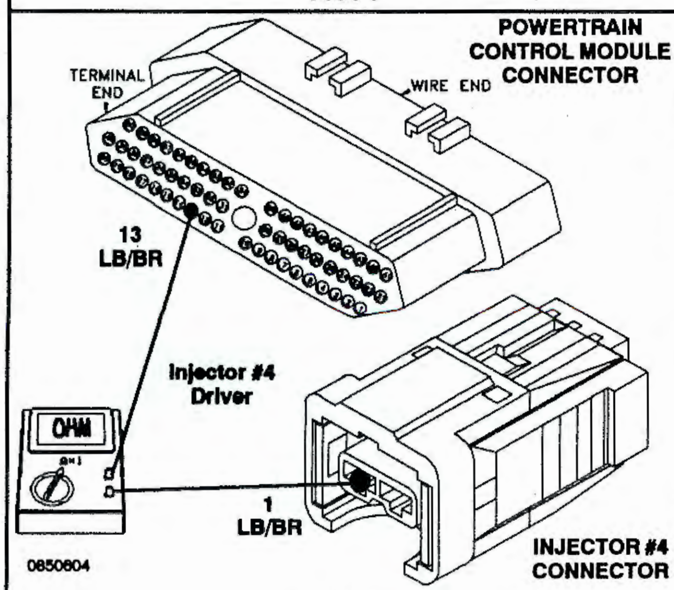
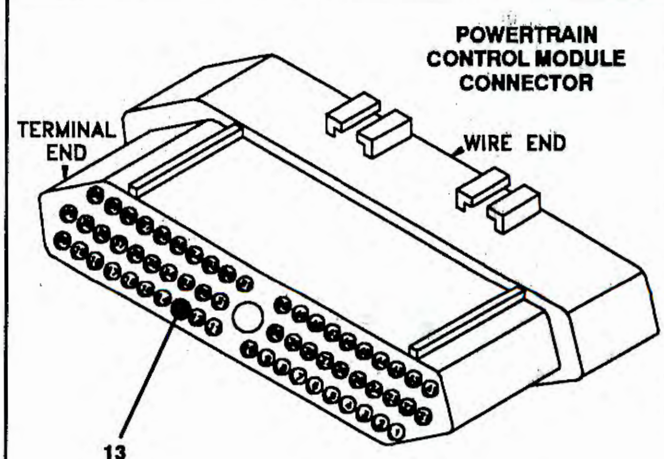


FIG. 3



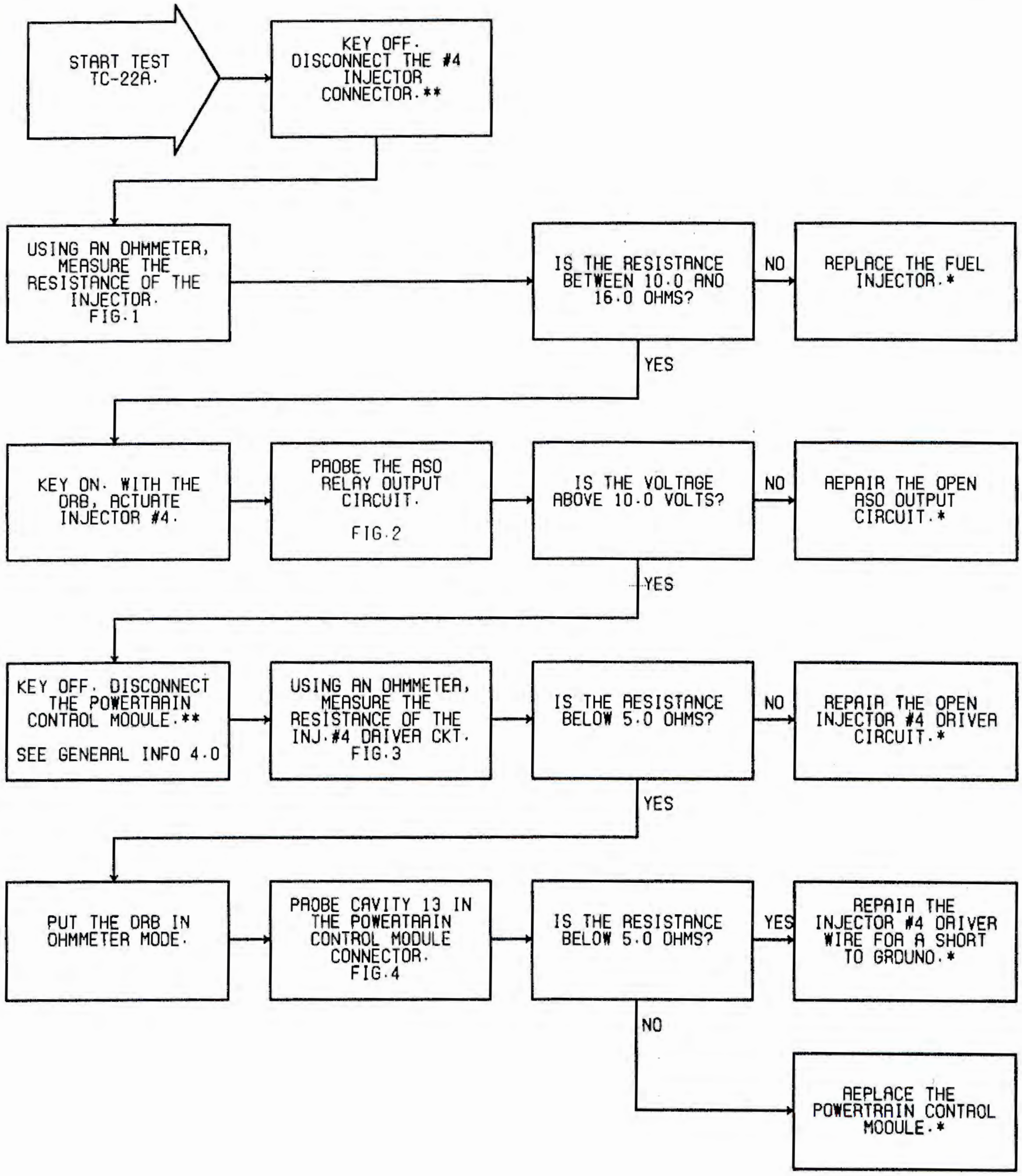
CAV	COLOR	FUNCTION
13	LB/BR	INJECTOR #4 DRIVER

0790802

FIG. 4

TEST TC-22A | REPAIRING - INJECTOR #4 CONTROL CIRCUIT

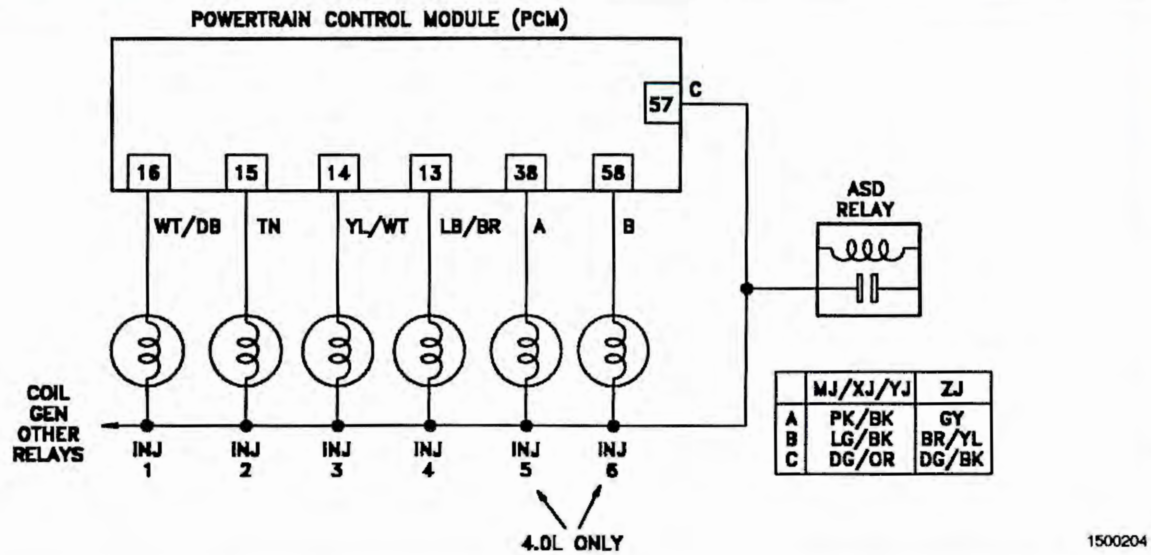
Perform TEST TC-19A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-23A | REPAIRING - INJECTOR #5 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

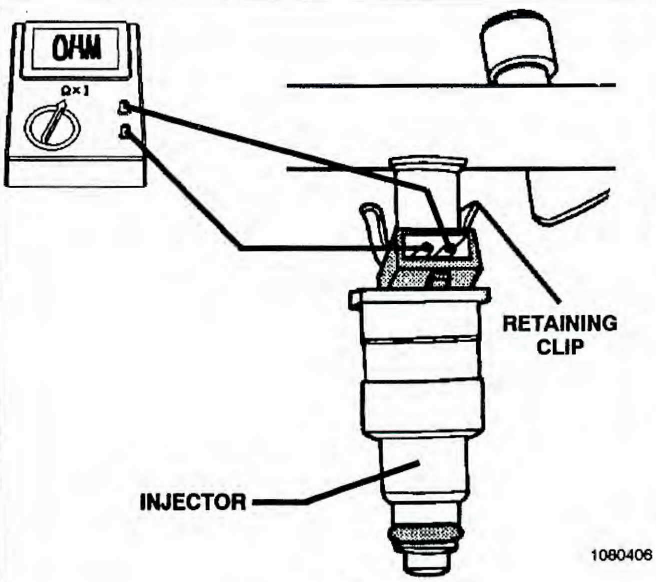
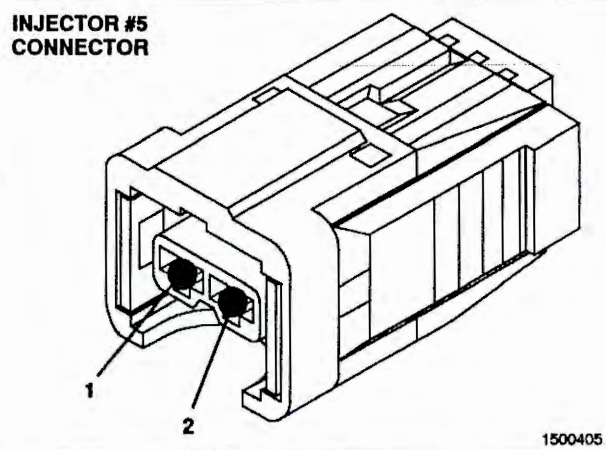


FIG. 1



CAV	MJ, XJ, YJ	ZJ	FUNCTION
1	PK/BK	GY	INJECTOR #5 DRIVER
2	DG/OR	DG/BK	ASD RELAY OUTPUT

FIG. 2

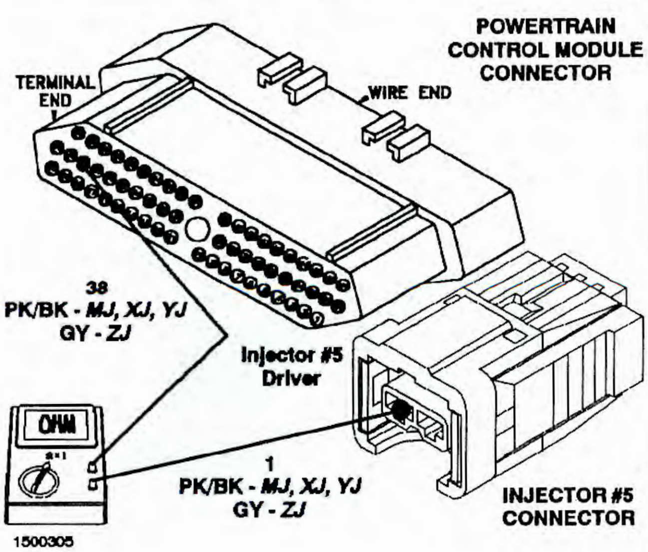
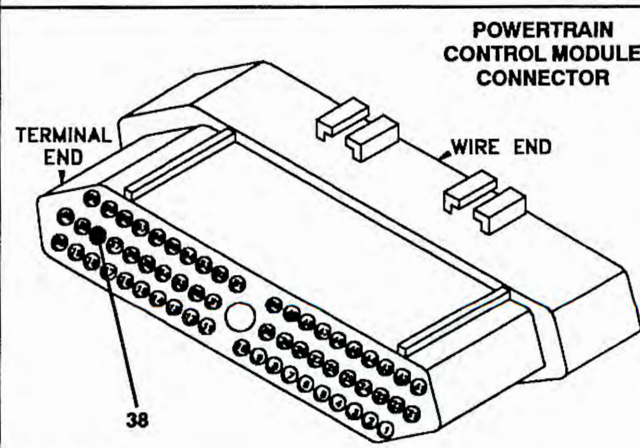


FIG. 3



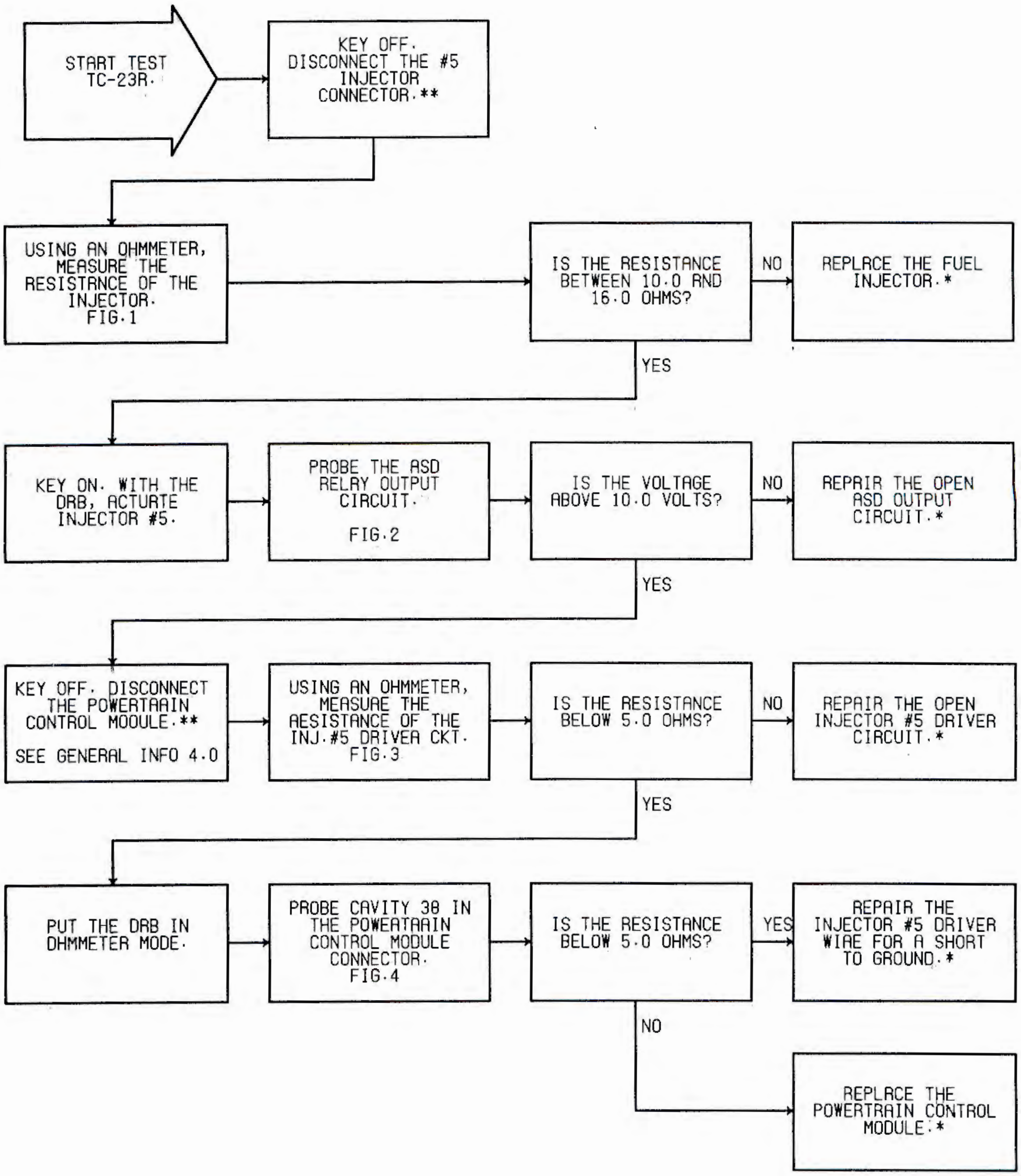
CAV	BODY	COLOR	FUNCTION
38	MJ, XJ, YJ	PK/BK	INJECTOR #5 DRIVER
38	ZJ	GY	INJECTOR #5 DRIVER

1500302

FIG. 4

TEST TC-23A REPAIRING - INJECTOR #5 CONTROL CIRCUIT

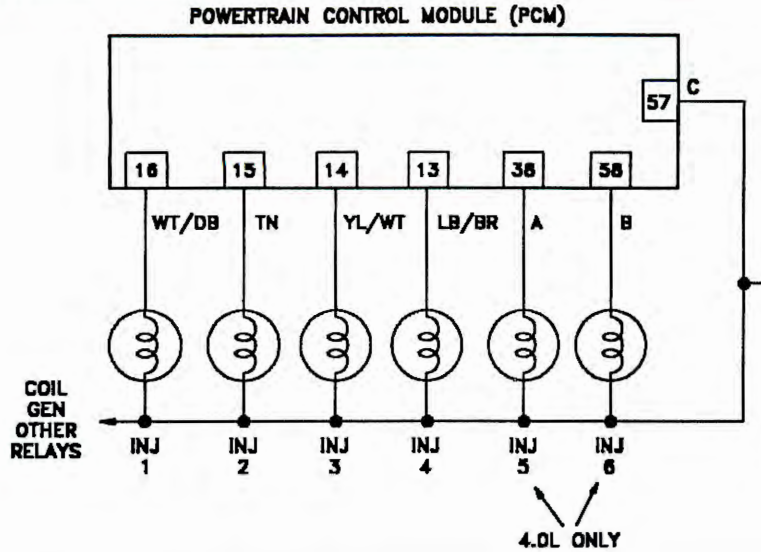
Perform TEST TC-19A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-24A REPAIRING - INJECTOR #6 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding



	MJ/XJ/YJ	ZJ
A	PK/BK	GY
B	LG/BK	BR/YL
C	DG/OR	DG/BK

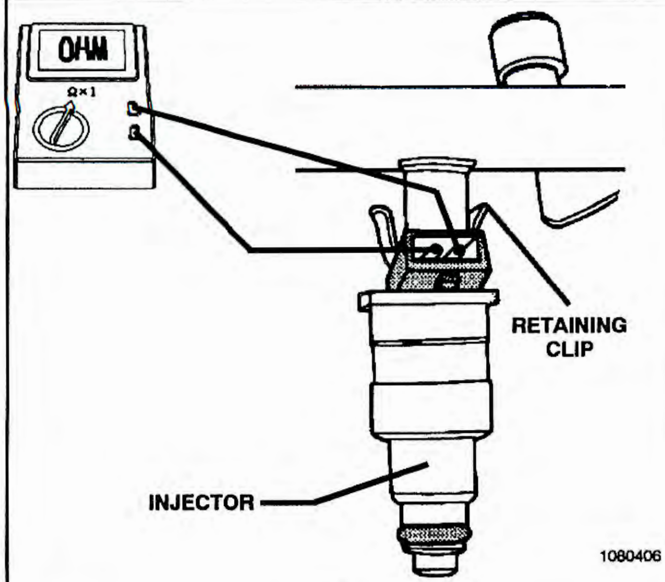
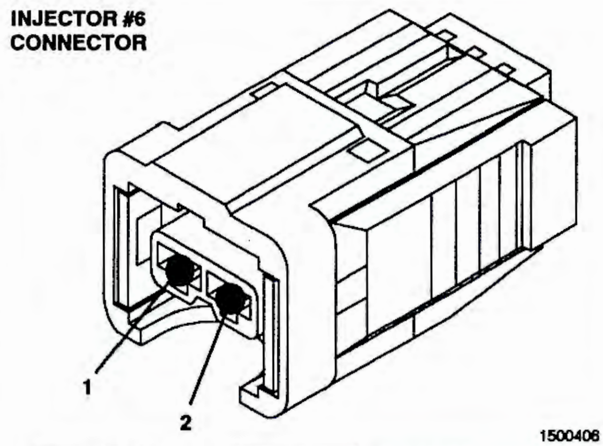


FIG. 1



CAV	MJ, XJ, YJ	ZJ	FUNCTION
1	LG/BK	BR/YL	INJECTOR #6 DRIVER
2	DG/OR	DG/BK	ASD RELAY OUTPUT

FIG. 2

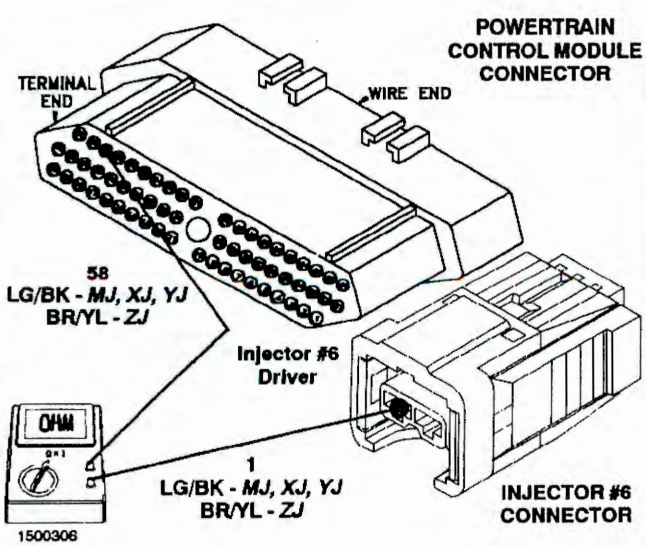
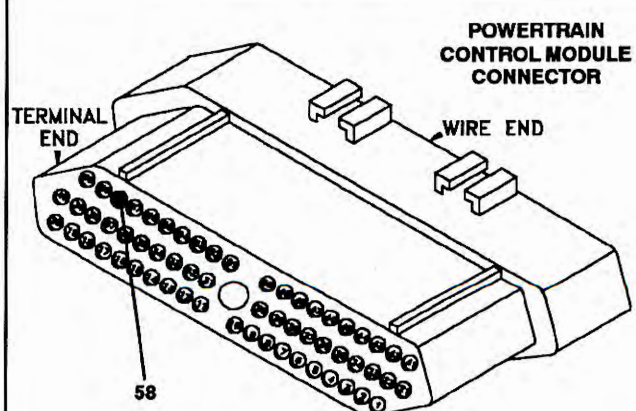


FIG. 3



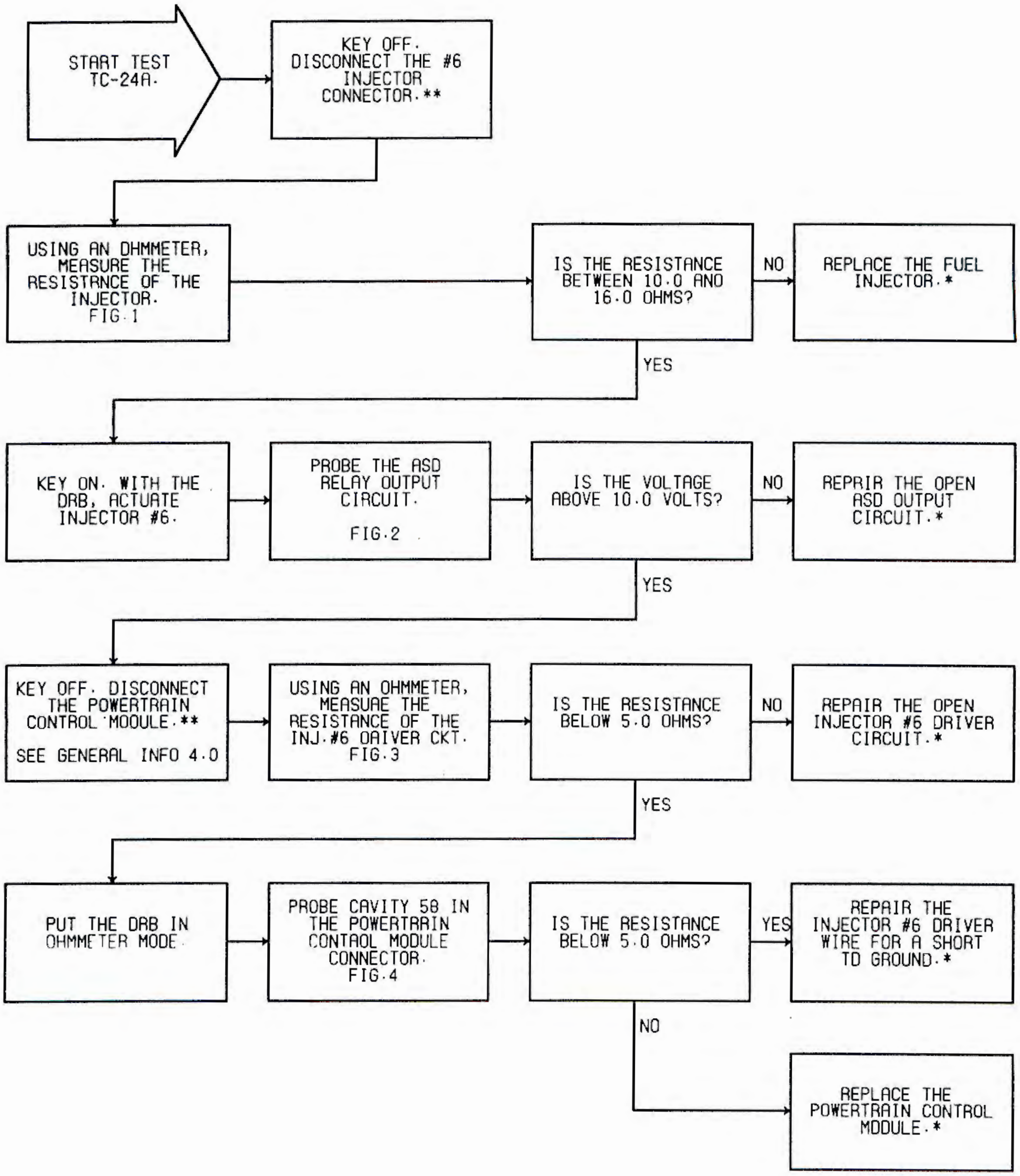
CAV	BODY	COLOR	FUNCTION
58	MJ, XJ, YJ	LG/BK	INJECTOR #6 DRIVER
58	ZJ	BR/YL	INJECTOR #6 DRIVER

1500304

FIG. 4

TEST TC-24A REPAIRING - INJECTOR #6 CONTROL CIRCUIT

Perform TEST TC-19A Before Proceeding

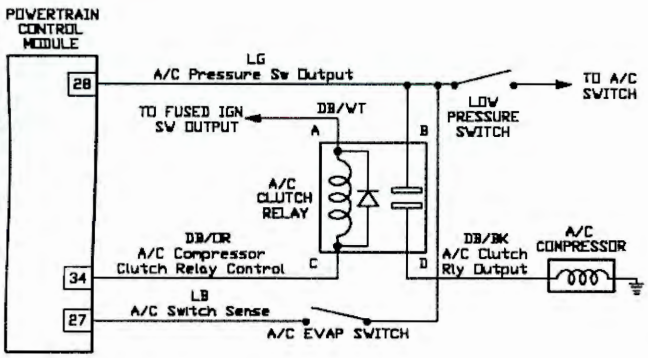


Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-25A REPAIRING - A/C CLUTCH RELAY CIRCUIT

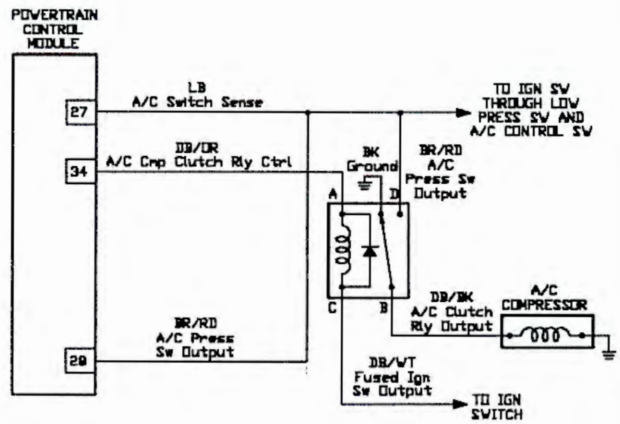
Perform TEST TC-1A Before Proceeding

MJ/XJ BODY



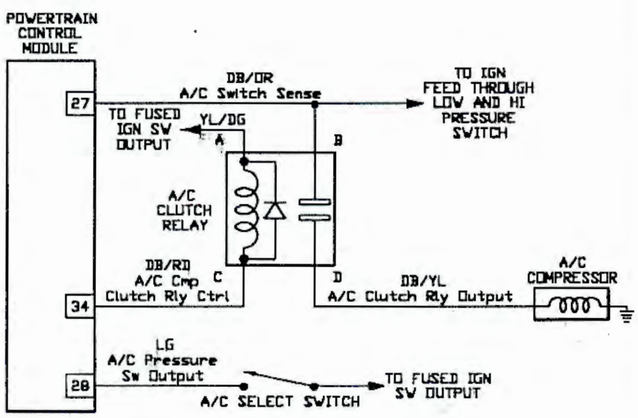
1050303

YJ BODY

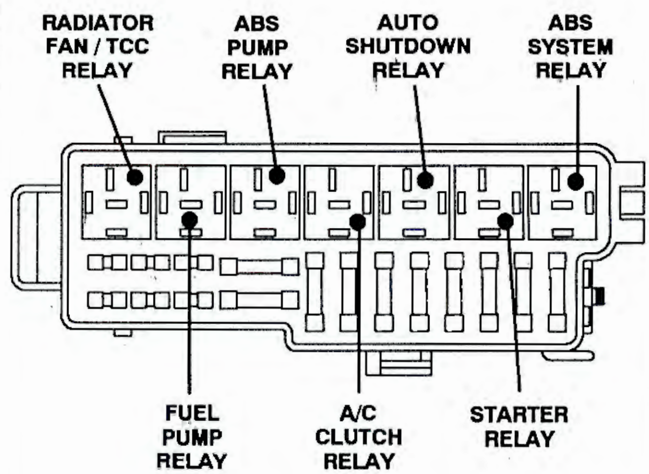


1080603

ZJ BODY



1050304



1040404

FIG. 1

Name of code: A/C Clutch Relay Circuit

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the A/C clutch relay control circuit.

Theory of operation: The A/C compressor clutch relay controls the 12-volt source for the A/C clutch. If the vehicle is equipped with a power distribution center (PDC), the relay will be located in the PDC. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). When A/C is requested, the PCM will adjust the idle air control motor to accommodate the A/C compressor load on the engine. The PCM grounds the relay control circuit after the PCM receives an A/C select signal and adjustment of the idle speed has been implemented.

Possible causes:

> Relay coil open or shorted
> Fused ignition switch output circuit open
> Compressor clutch relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module
> Connector terminals
> Connector wires

0870201

FIG. 2

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

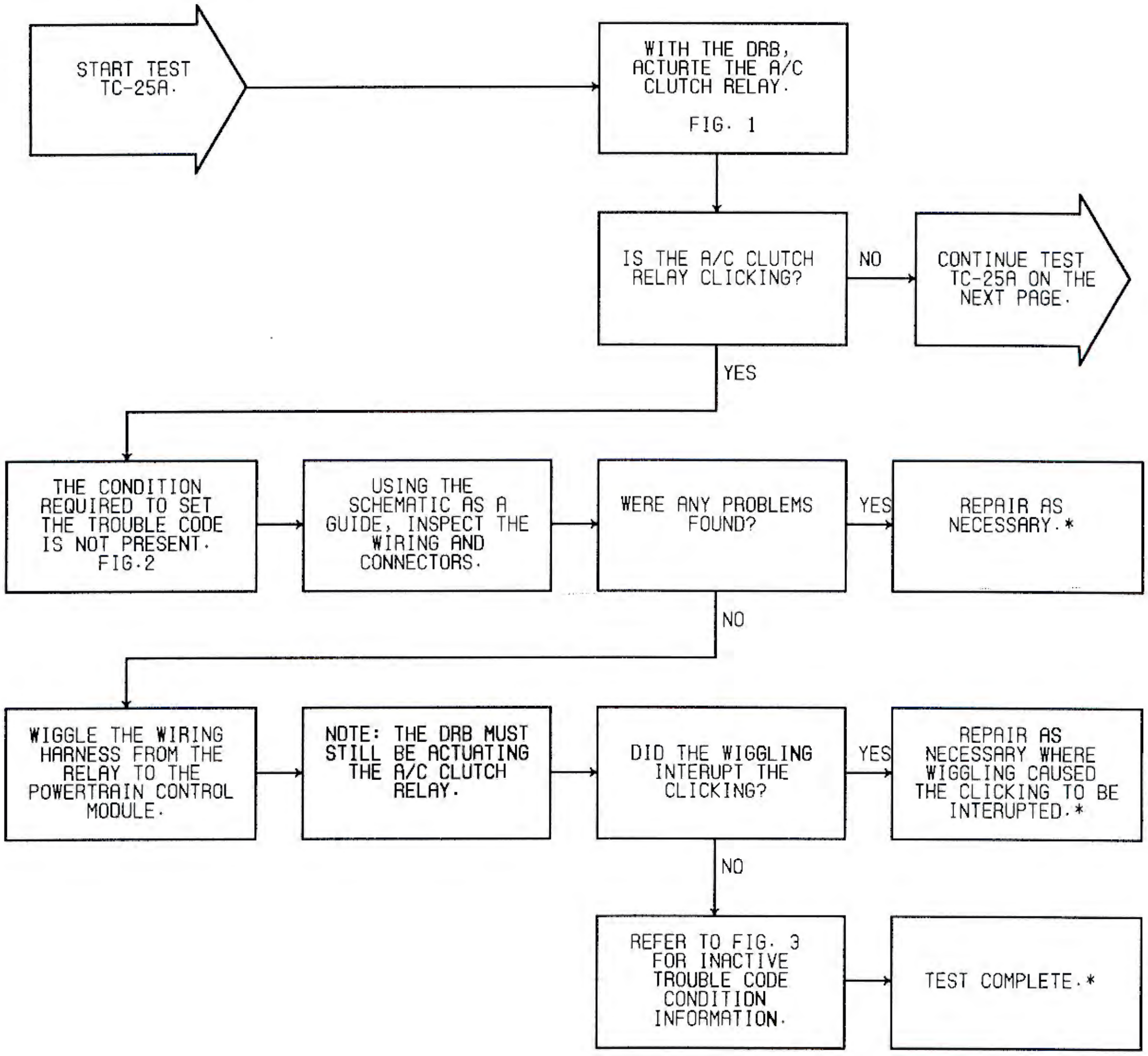
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 3

TEST TC-25A REPAIRING - A/C CLUTCH RELAY CIRCUIT

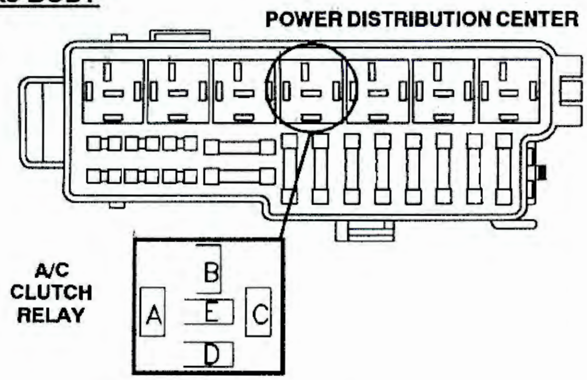
Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-25A CONTINUED - REPAIRING - A/C CLUTCH RELAY CIRCUIT

MJ/XJ BODY

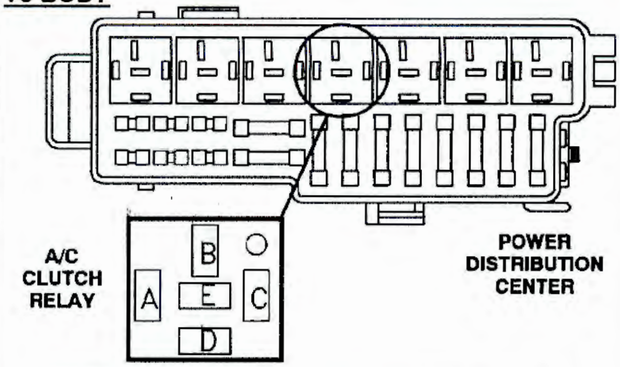


CAV	COLOR	FUNCTION
A	DB/WT	FUSED IGN SW OUTPUT
B	LG	A/C PRESSURE SWITCH OUTPUT
C	DB/OR	A/C CMP CLUTCH RLY CTRL
D	DB/BK	A/C CLUTCH RLY OUTPUT

1040305

FIG. 1

YJ BODY

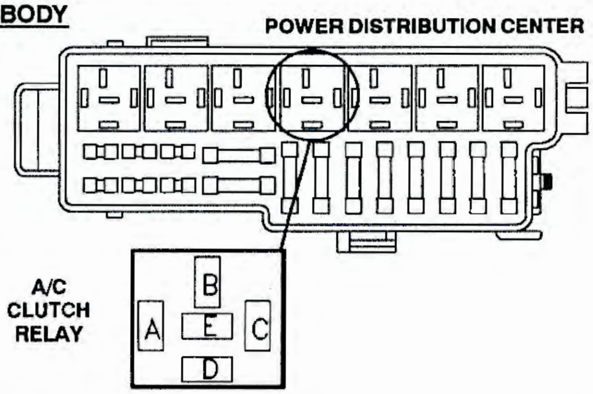


CAV	COLOR	FUNCTION
A	DB/OR	A/C CMP CLUTCH RLY CTRL
B	DB/BK	A/C CLUTCH RLY OUTPUT
C	DB/WT	FUSED IGN SW OUTPUT
D	BR/RD	A/C PRESS SW OUTPUT
E	BK	GROUND

1070106

FIG. 2

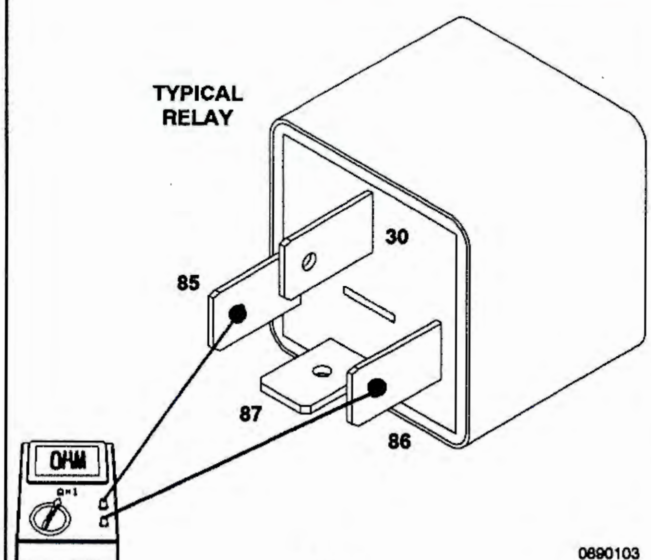
ZJ BODY



CAV	COLOR	FUNCTION
A	YL/DG	FUSED IGN SW OUTPUT
B	DB/OR	A/C SWITCH SENSE
C	DB/RD	A/C CMP CLUTCH RLY CTRL
D	DB/YL	A/C CLUTCH RLY OUTPUT

1040306

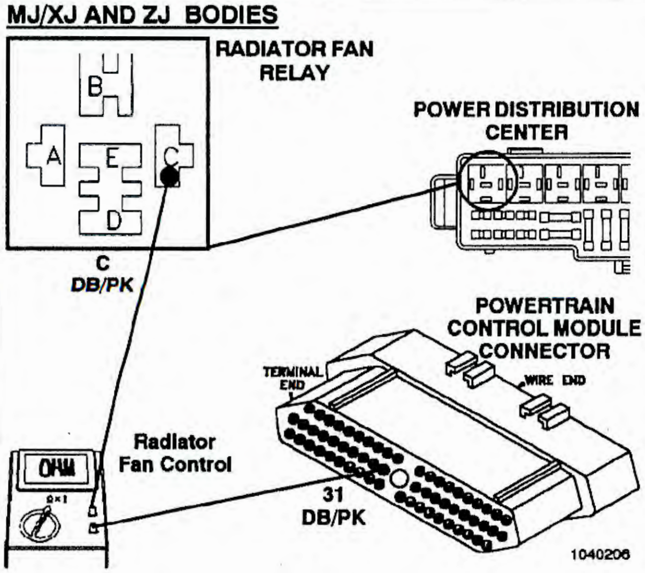
FIG. 3



0890103

FIG. 4

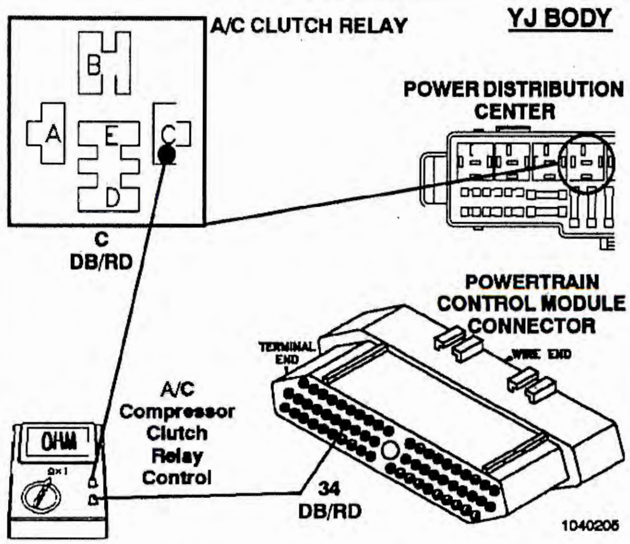
MJ/XJ AND ZJ BODIES



1040206

FIG. 5

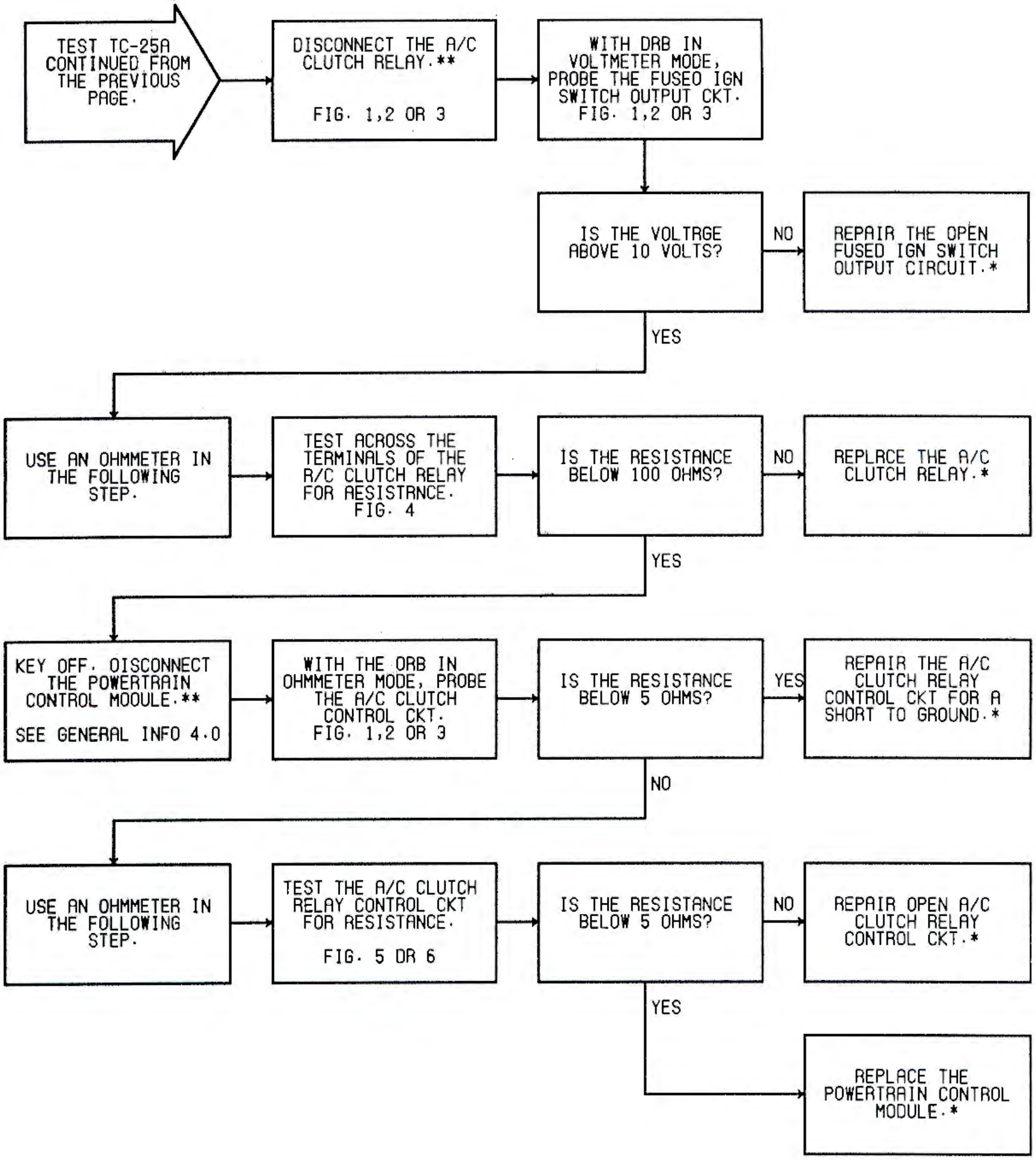
YJ BODY



1040205

FIG. 6

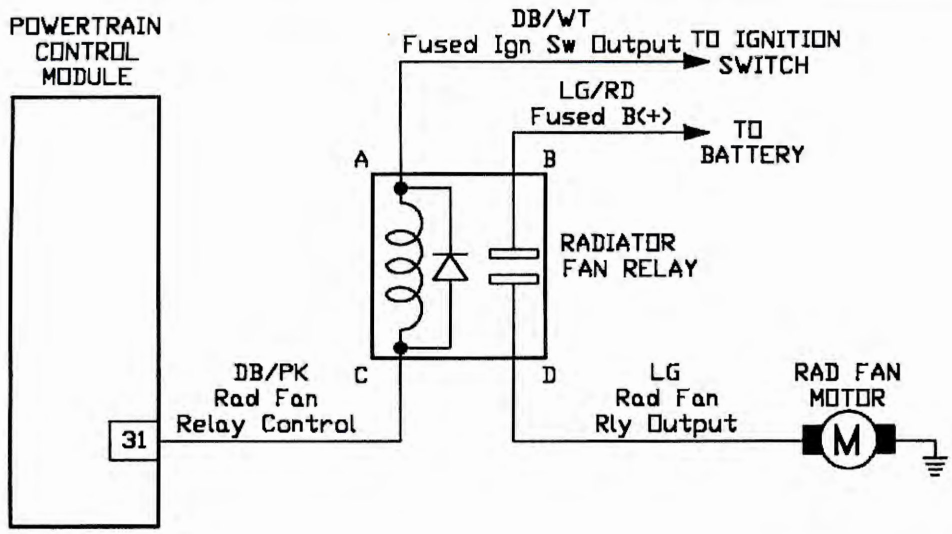
TEST TC-25A CONTINUED - REPAIRING - A/C CLUTCH RELAY CIRCUIT



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-26A | REPAIRING - RAD FAN CONTROL RELAY CIRCUIT

Perform TEST TC-1A Before Proceeding



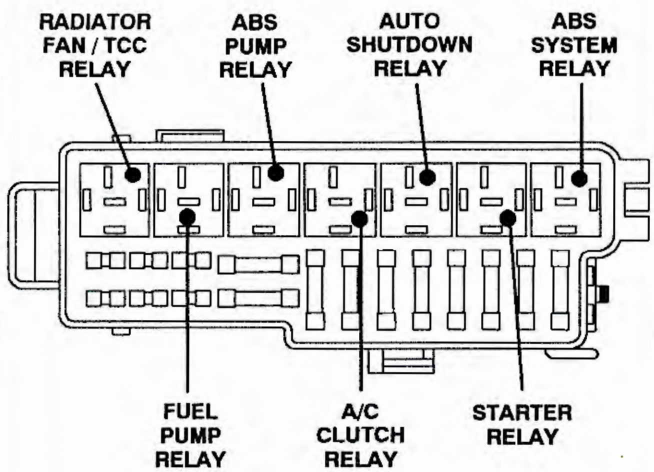


FIG. 1

Name of code: Rad Fan Control Relay Circuit

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the radiator fan relay control circuit.

Theory of operation: The radiator fan relay controls the operation of the radiator fan. The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). The PCM grounds the relay control circuit depending on coolant temperature. When the engine coolant temperature has reached the maximum temperature parameter, the relay will be grounded. Conversely, when the engine coolant temperature has acquired the minimum temperature parameter, the relay will remove the ground.

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Low speed radiator fan relay control circuit open or shorted
> PCM failure
> Connector terminals
> Connector wires

1000403

FIG. 2

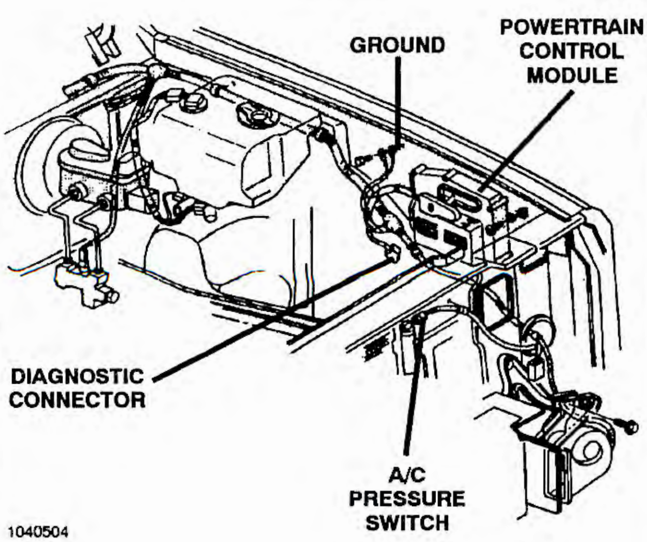


FIG. 3

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

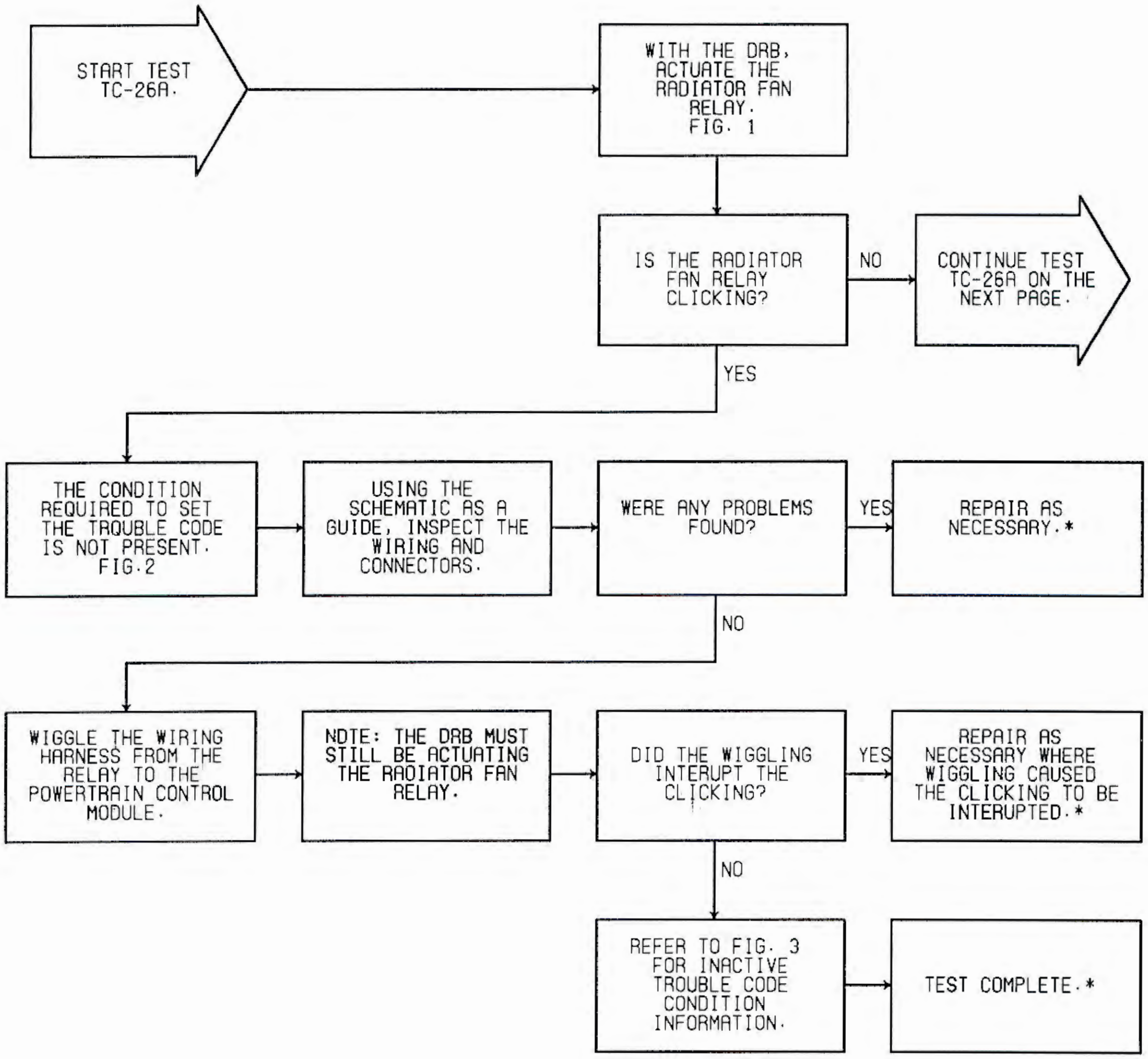
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 4

TEST TC-26A | REPAIRING - RAD FAN CONTROL RELAY CIRCUIT

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-26A CONTINUED - REPAIRING - RAD FAN CONTROL RELAY CIRCUIT

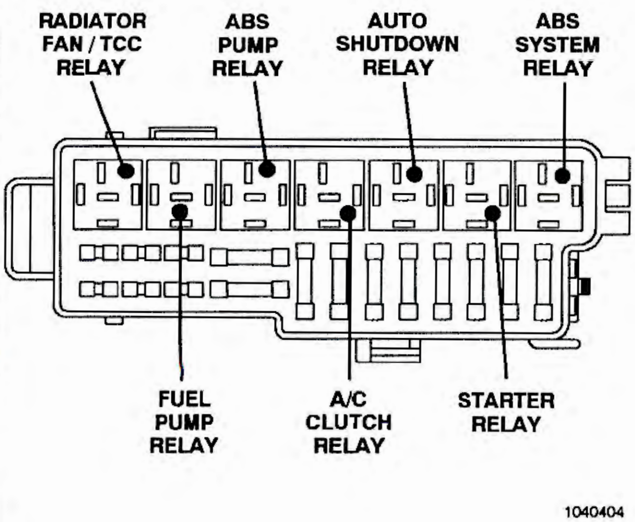
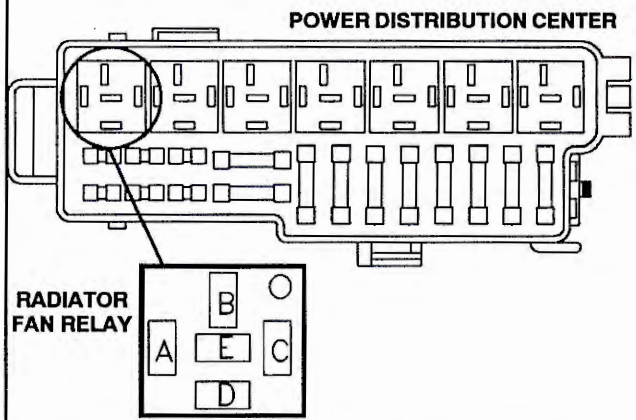


FIG. 1



CAV	COLOR	FUNCTION
A	DB/WT	FUSED IGN SW OUTPUT
B	LG/RD	FUSED B(+)
C	DB/PK	RAD FAN RELAY CONTROL
D	LG	RAD FAN RELAY OUTPUT

1040403

FIG. 2

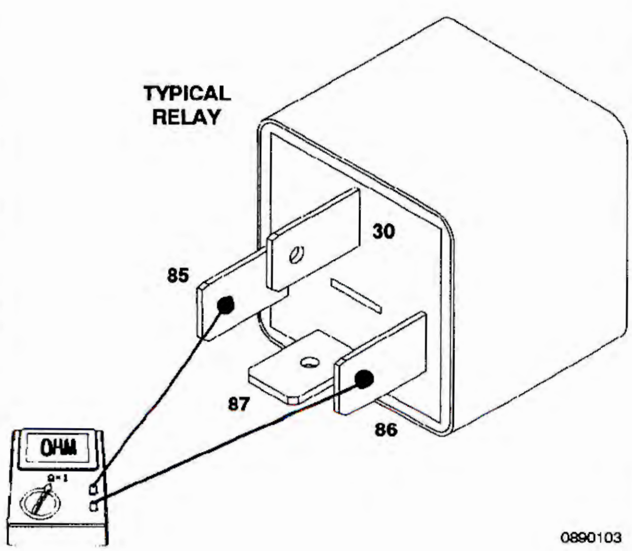


FIG. 3

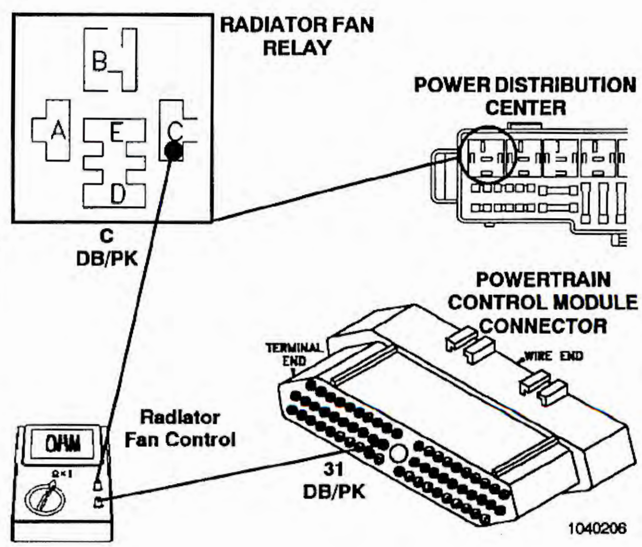
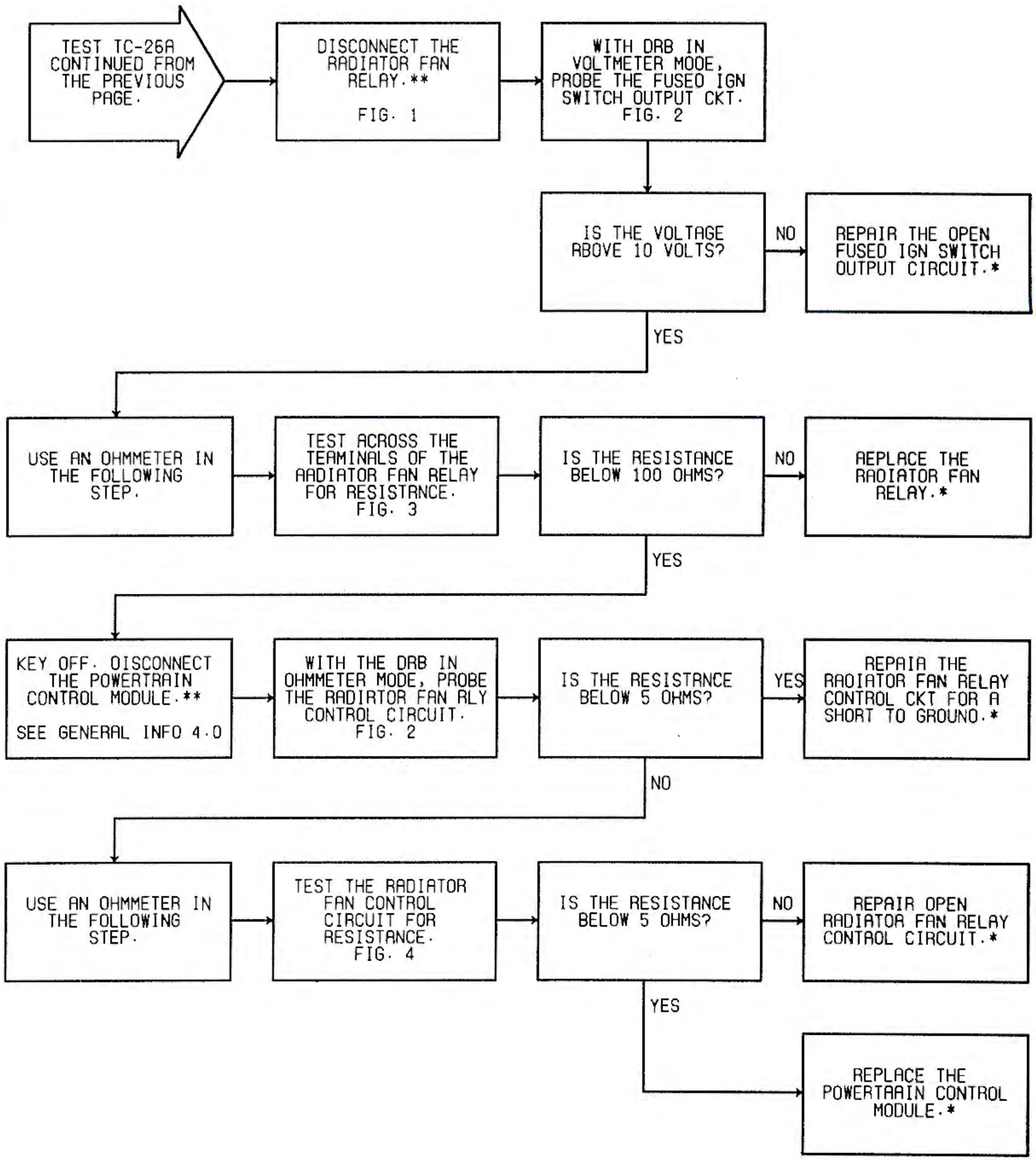


FIG. 4



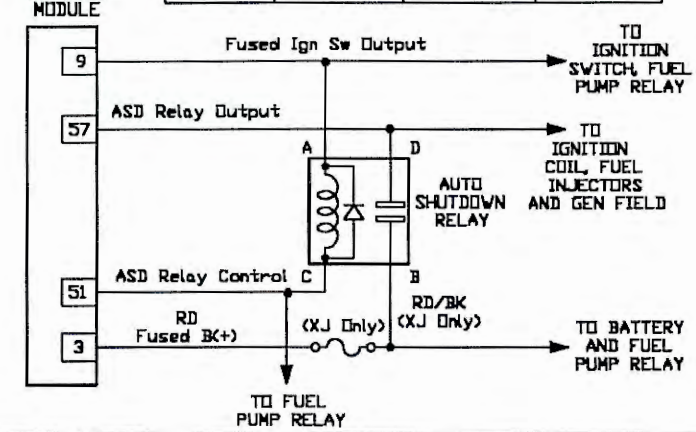
Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TROUBLE CODE TESTS

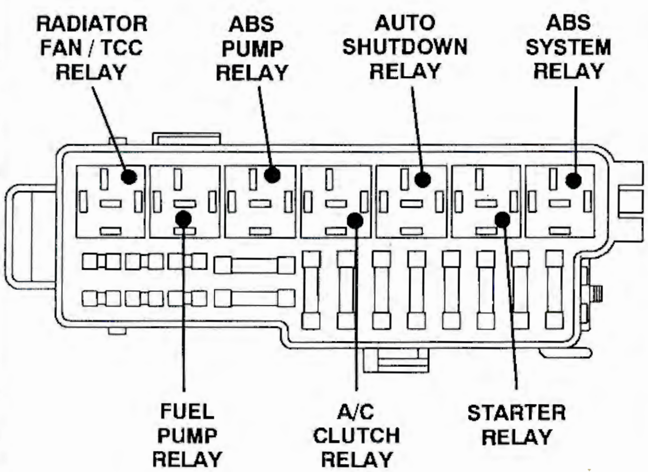
TEST TC-27A REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

Perform TEST TC-1A Before Proceeding

CAV	MJ/XJ	YJ	ZJ
9	DB	WT/YL	LB/RD
57	DG/OR	DG/OR	DG/BK
51	DB/YL	DB/YL	PK
3	RD	RD/WT	RD



1400501



1040404

FIG. 1

Name of code: Auto Shutdown Relay Control Circuit

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the auto shutdown relay control circuit.

Theory of operation: The automatic shutdown relay (ASD) controls the 12-volt source to the fuel injectors, ignition coils, and the generator. If the vehicle is equipped with a power distribution center (PDC), the relay will be located in the PDC. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM). The PCM grounds the relay when the ignition switch is in either the run or crank position and engine RPM is detected. If engine RPM is not detected, the PCM will remove the ASD relay control circuit ground.

Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Auto shutdown relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module
> PCM failure
> Connector terminals
> Connector wires

0870106

FIG. 2

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

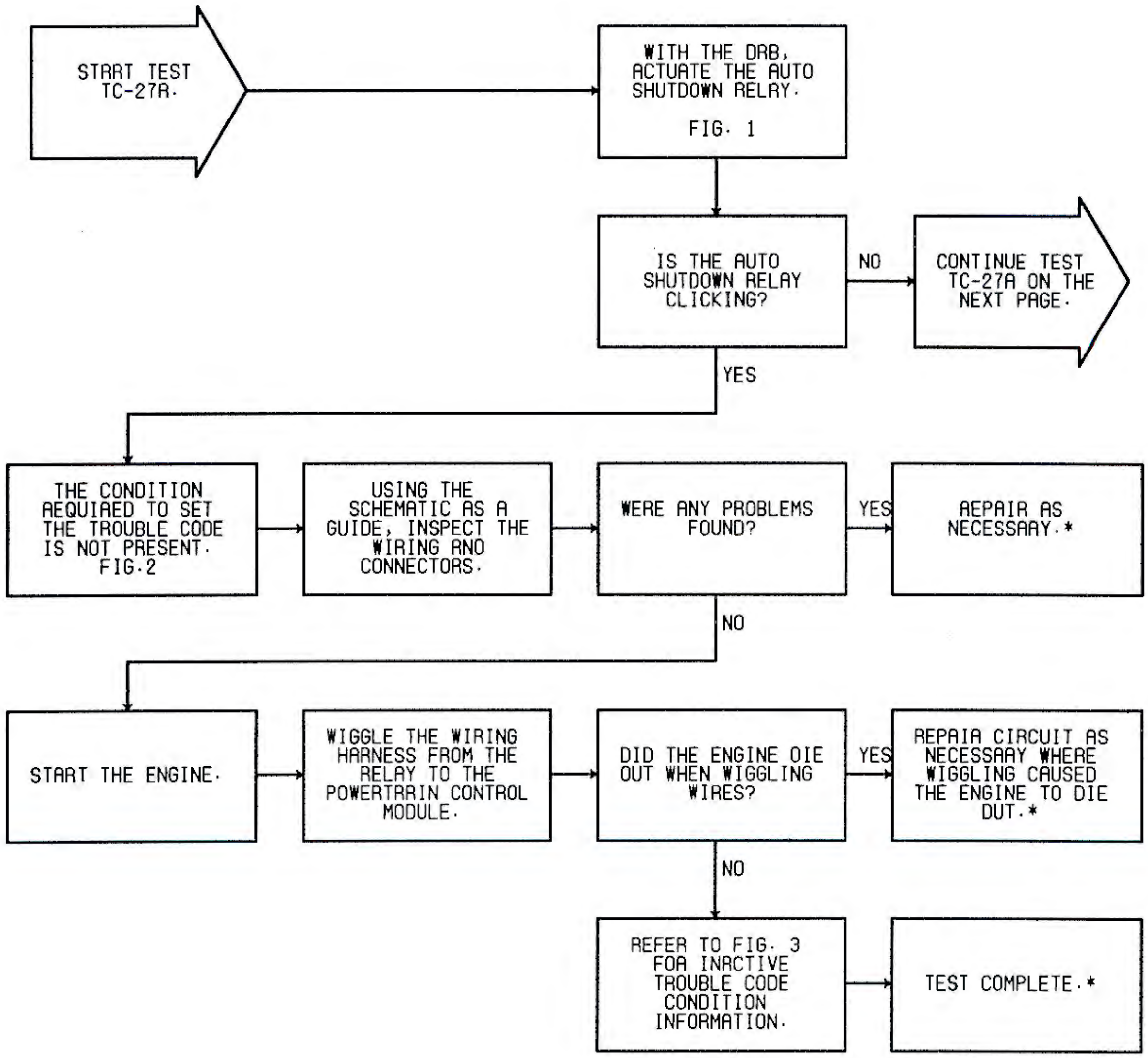
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 3

TEST TC-27A	REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-27A CONTINUED - REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

CAV	COLOR	FUNCTION
A	DB	FUSED IGN SW OUTPUT
B	RD/BK	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/OR	ASD RELAY OUTPUT

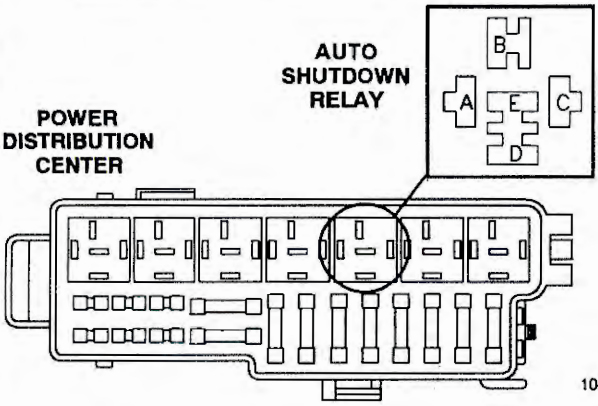


FIG. 1

CAV	COLOR XJ	COLOR YJ	COLOR ZJ	FUNCTION
A	DB	WT/YL	LB/RD	FUSED IGN SW OUTPUT
B	RD/BK	RD/WT	RD	FUSED B(+)
C	DB/YL	DB/YL	PK	ASD RELAY CONTROL
D	DG/OR	DG/OR	DG/BK	ASD RELAY OUTPUT

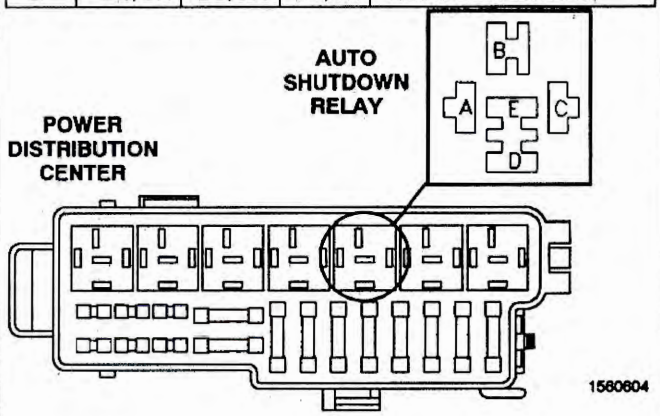


FIG. 2

MJ/XJ AND YJ BODIES

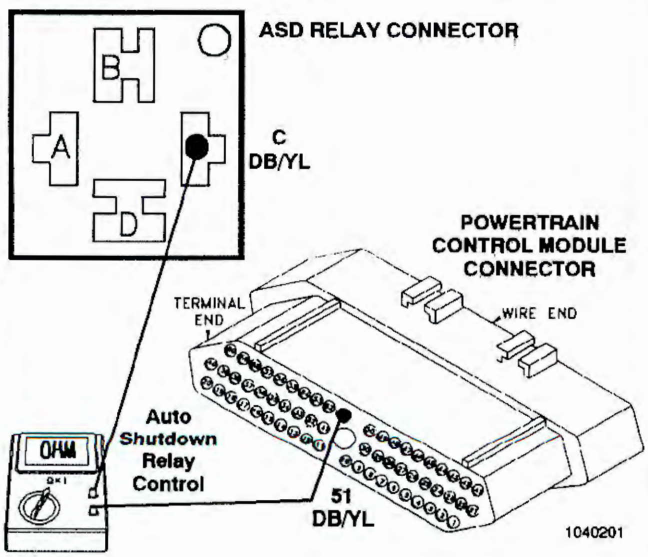


FIG. 3

ZJ BODY

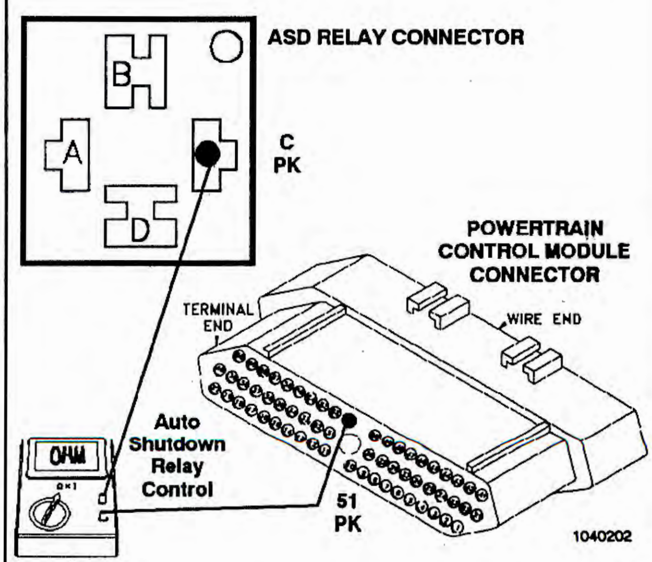
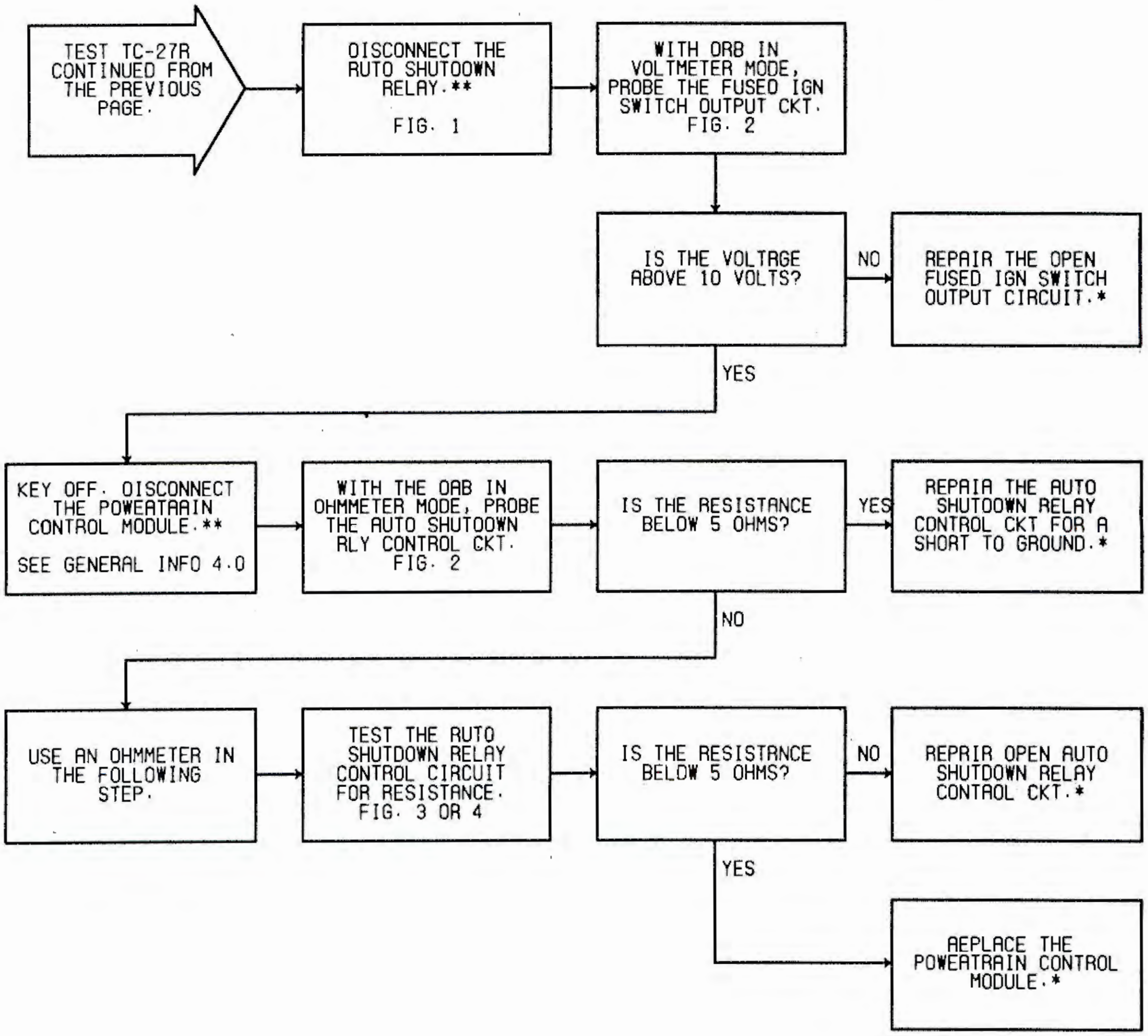


FIG. 4

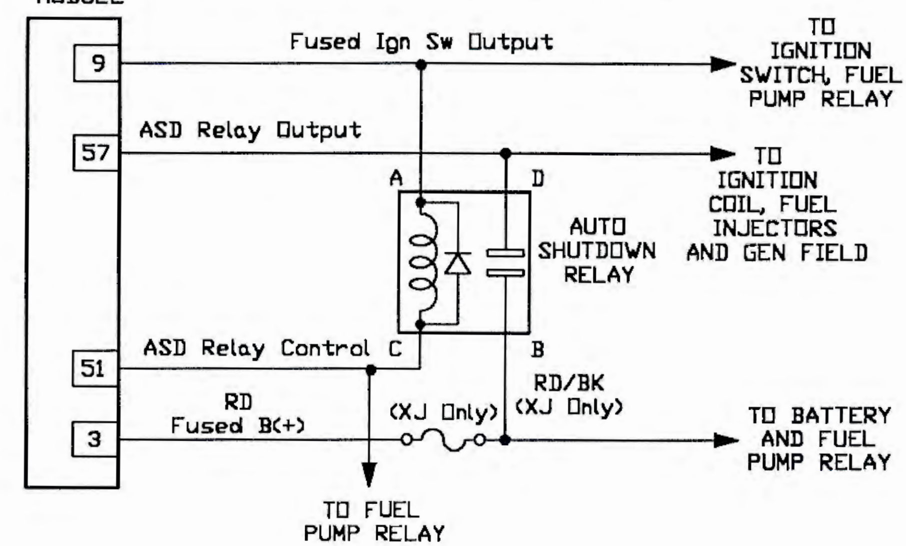


Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-28A REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

Perform TEST TC-1A Before Proceeding

CAV	MJ/XJ	YJ	ZJ
9	DB	WT/YL	LB/RD
57	DG/OR	DG/OR	DG/BK
51	DB/YL	DB/YL	PK
3	RD	RD/WT	RD



1400501

Name of code: <u>No ASD Relay Output Voltage At PCM</u>

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: No voltage sensed at the powertrain control module when the auto shutdown relay is energized.

Theory of operation: When the ASD relay is energized, the relay's contacts connect the fused B(+) circuit to the relay output circuit. The powertrain control module is connected in parallel with the ASD relay output circuit. This connection provides the PCM with a circuit to monitor the ASD relay output state. Whenever the PCM energizes the ASD relay, it checks the feedback circuit to ensure voltage is present at the ASD relay output. If voltage is not present, a trouble code is set.

Possible causes:
- > ASD relay output circuit open
- > Fused B(+) circuit open
- > ASD relay
- > Failed PCM
- > Connector terminals
- > Connector wires

1080606

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

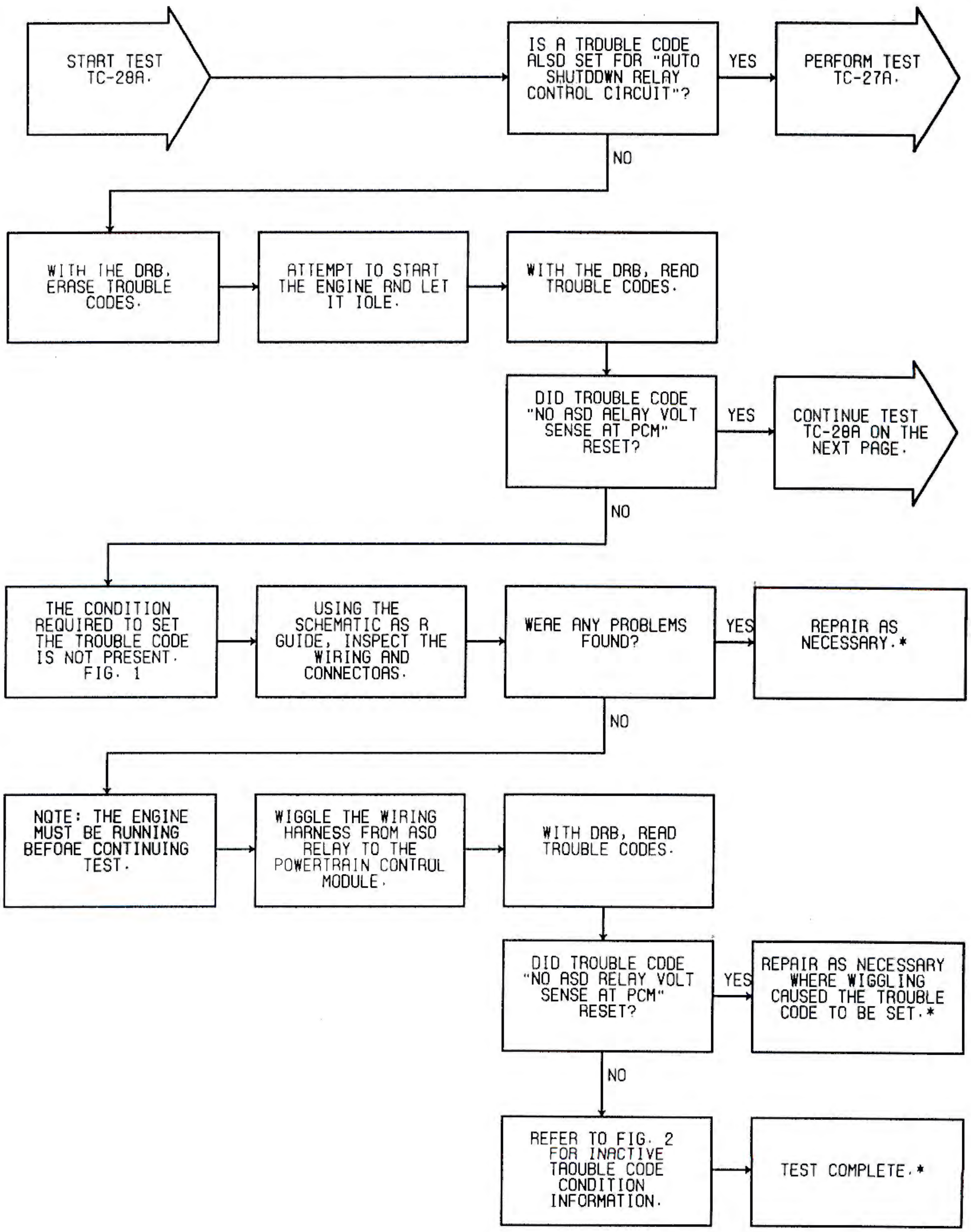
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

TEST TC-28A REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

Perform TEST TC-1A Before Proceeding



***Perform Verification TEST VER-2A.**	****Check connectors – Clean / repair as necessary.**

TEST TC-28A CONTINUED - REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

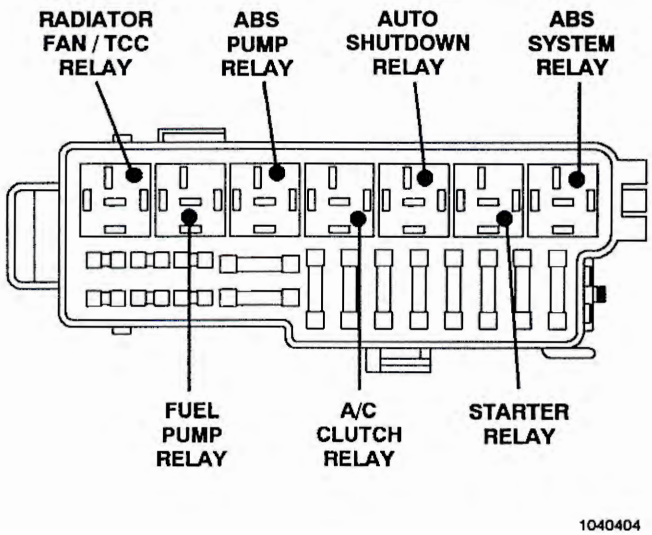


FIG. 1

CAV	COLOR XJ	YJ	ZJ	FUNCTION
A	DB	WT/YL	LB/RD	FUSED IGN SW OUTPUT
B	RD/BK	RD/WT	RD	FUSED B(+)
C	DB/YL	DB/YL	PK	ASD RELAY CONTROL
D	DG/OR	DG/OR	DG/BK	ASD RELAY OUTPUT

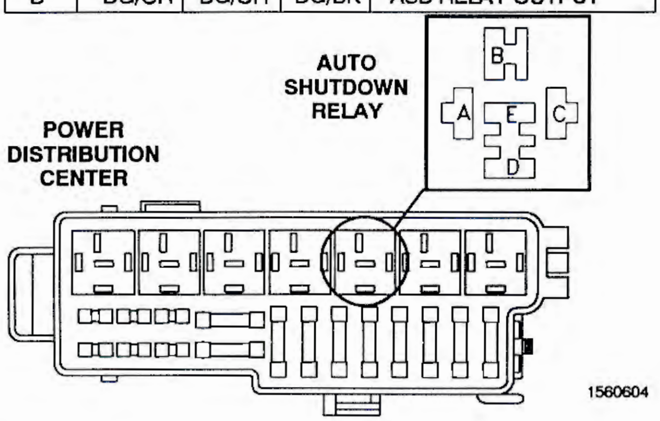


FIG. 2

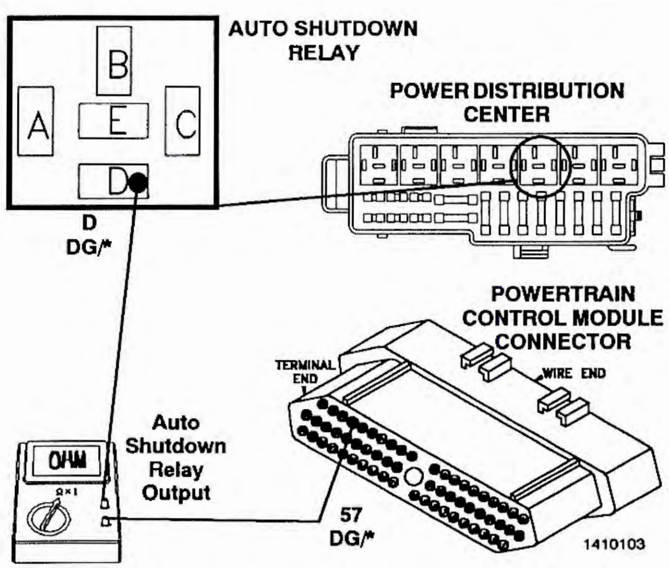
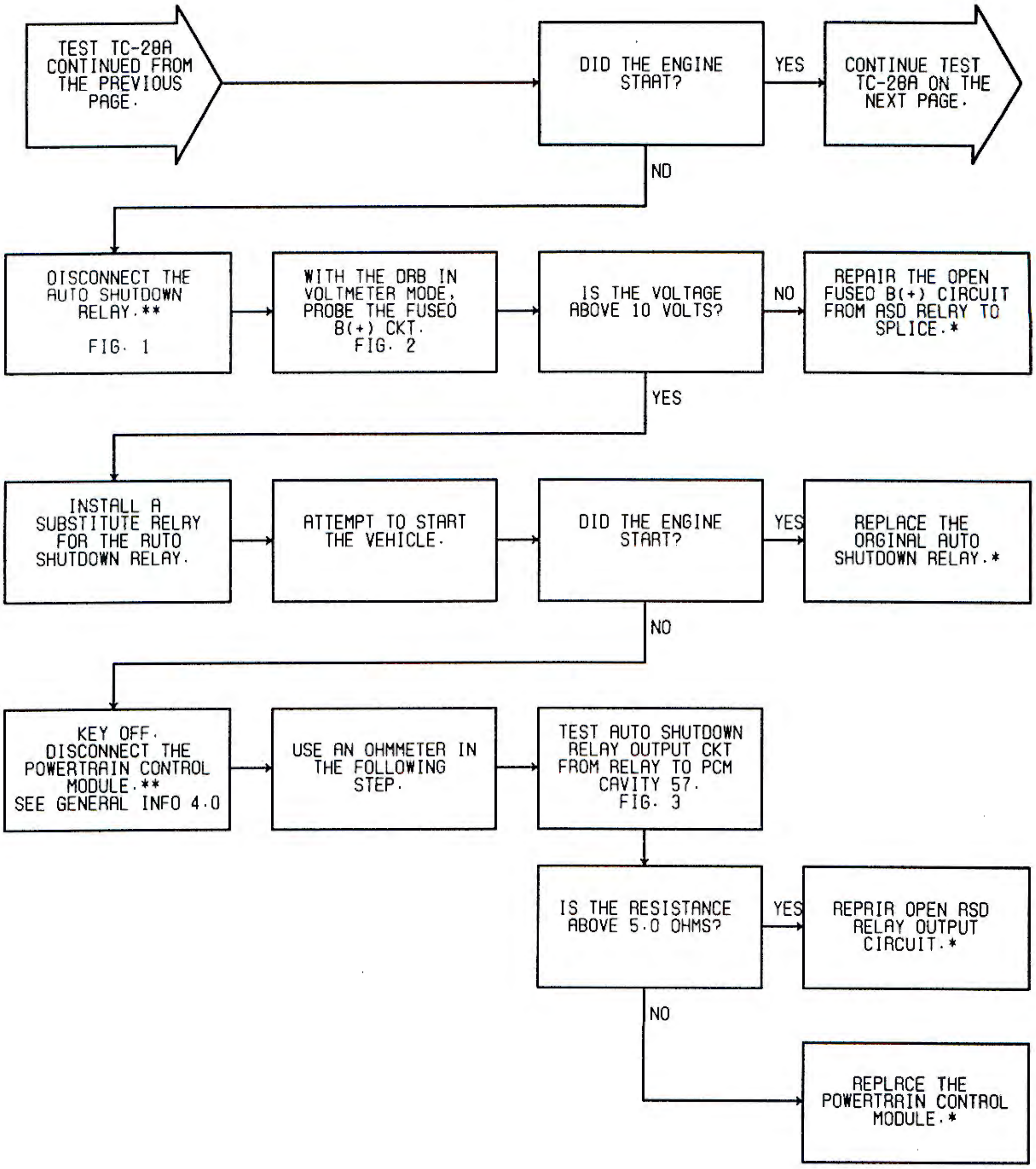


FIG. 3

TEST TC-28A CONTINUED - REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TROUBLE CODE TESTS

TEST TC-28A CONTINUED - REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

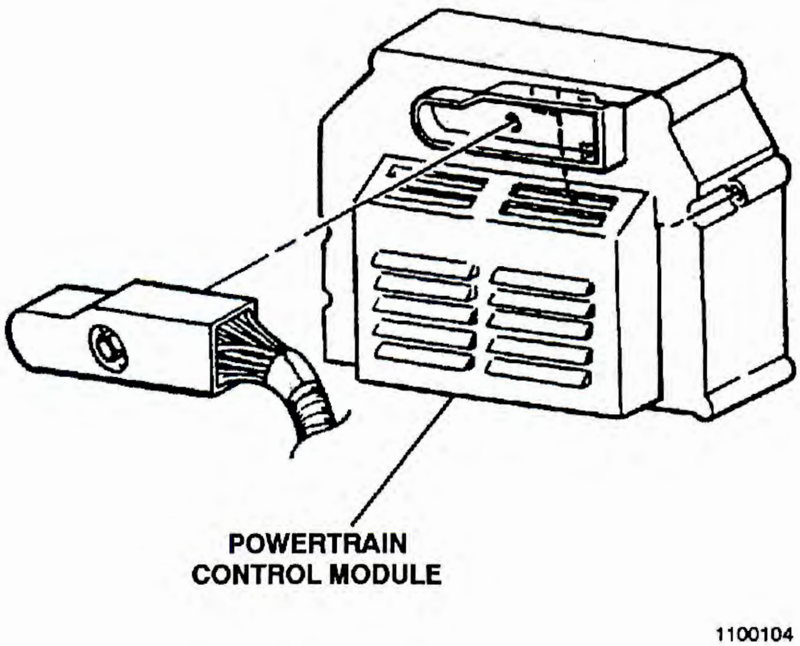


FIG. 1

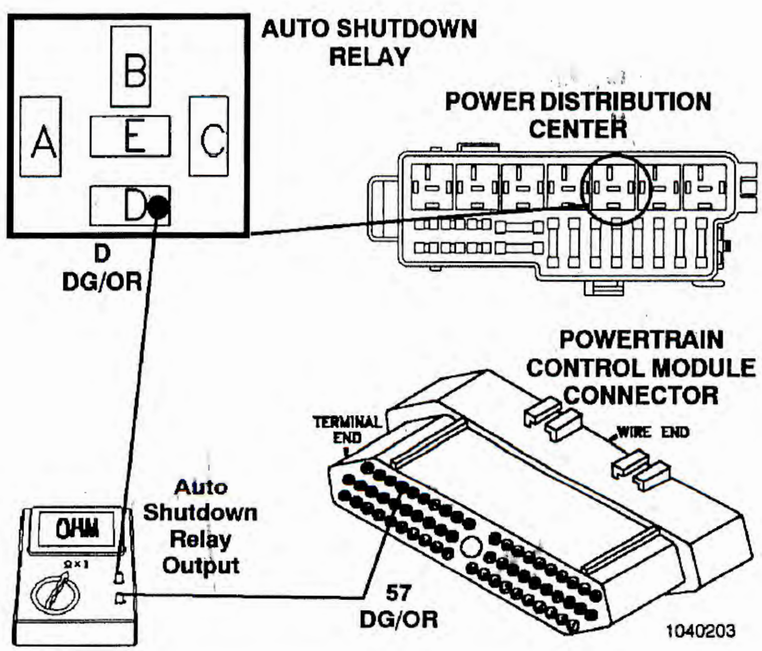
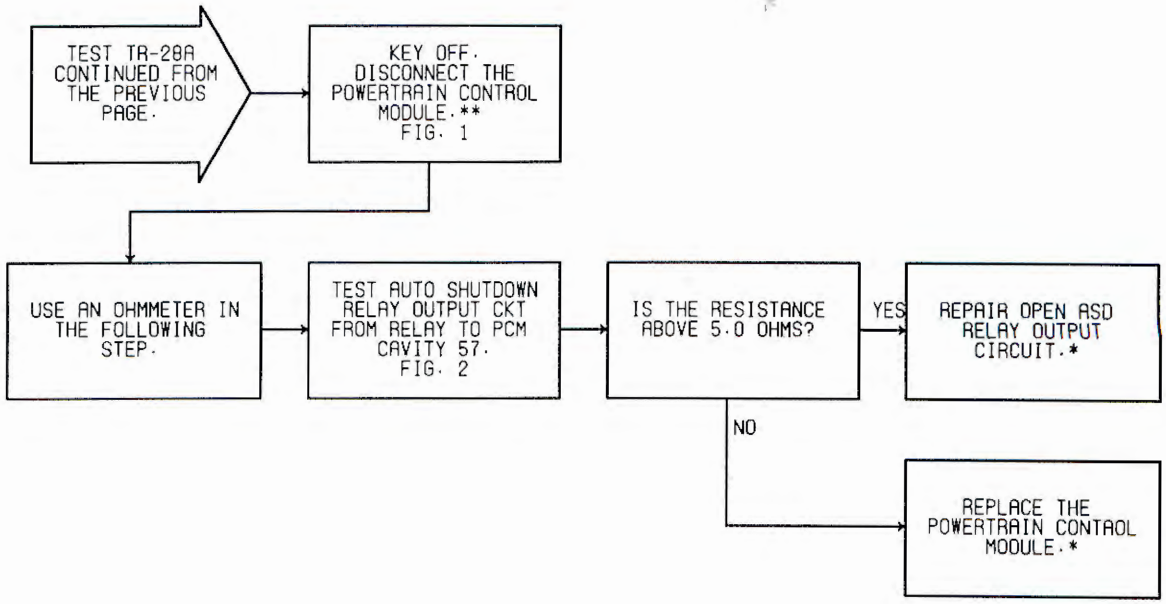


FIG. 2

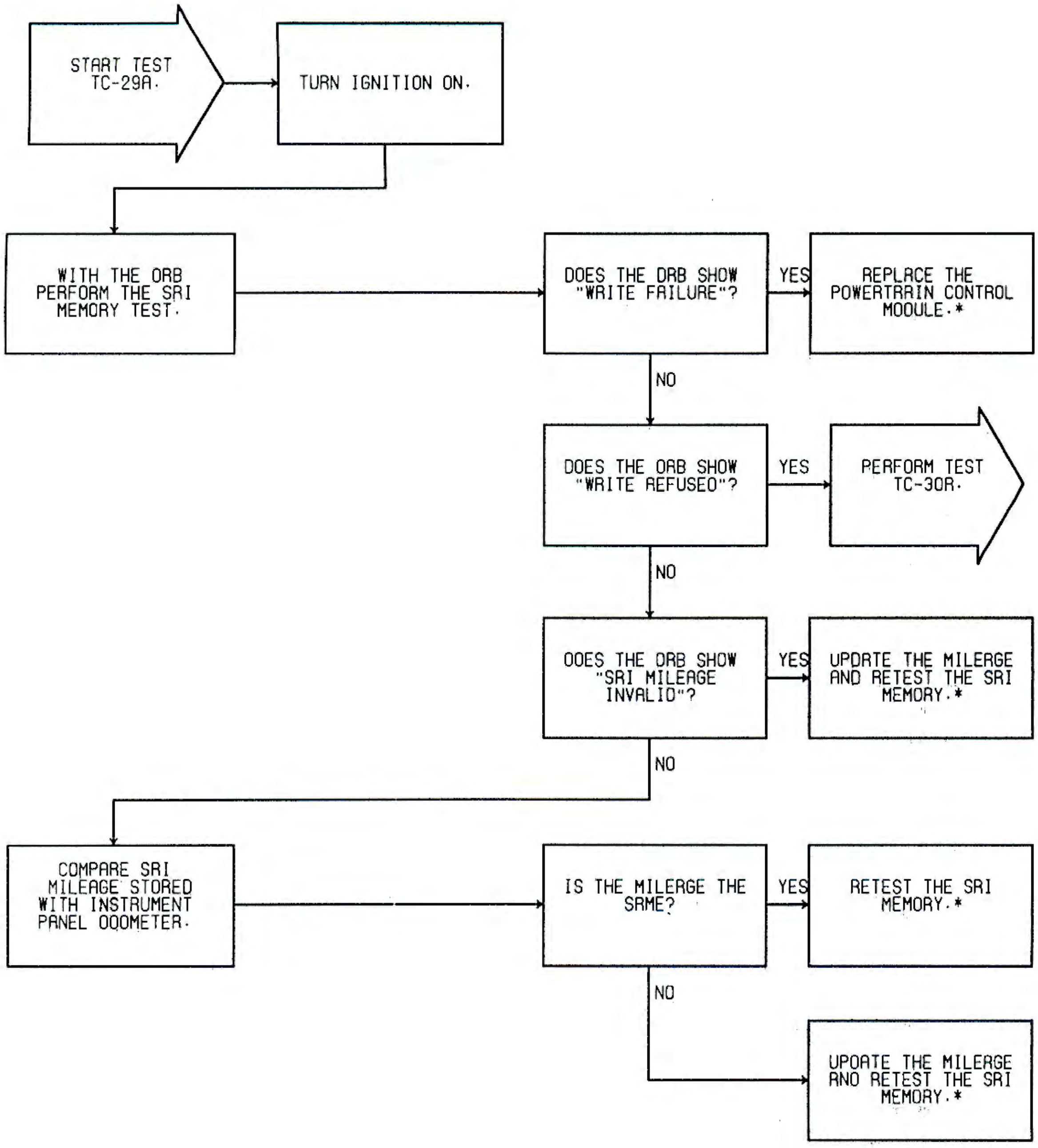
TEST TC-28A CONTINUED - REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM



Perform Verification TEST VER-2A. | ***Check connectors – Clean / repair as necessary.***

TEST TC-29A | REPAIRING - PCM FAILURE SRI MILE NOT STORED

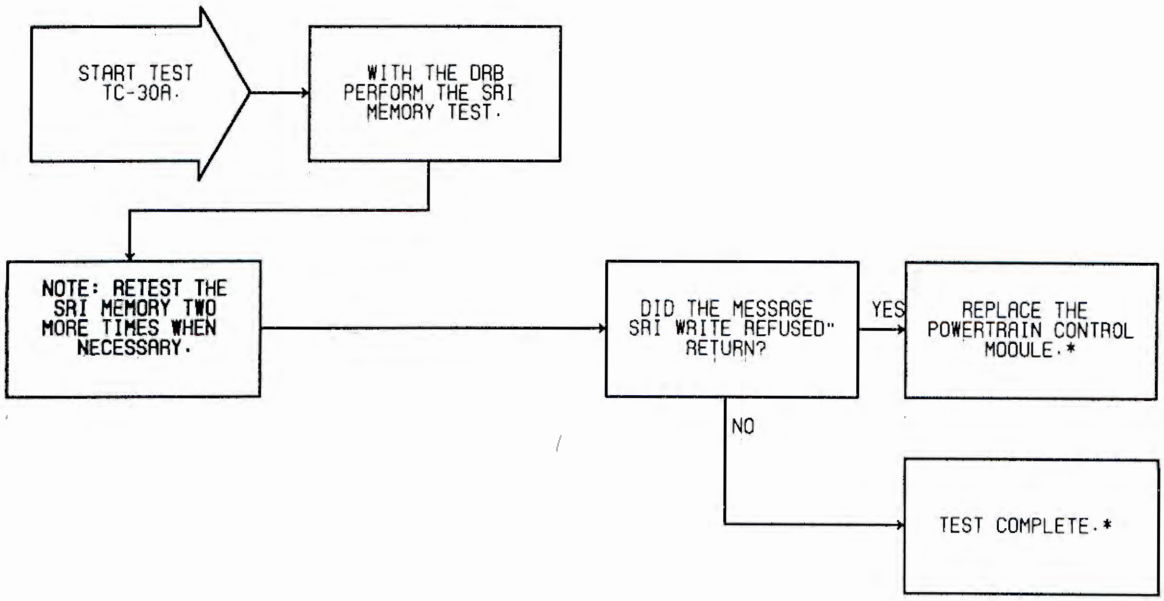
Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-30A REPAIRING - PCM FAILURE EEPROM WRITE DENIED

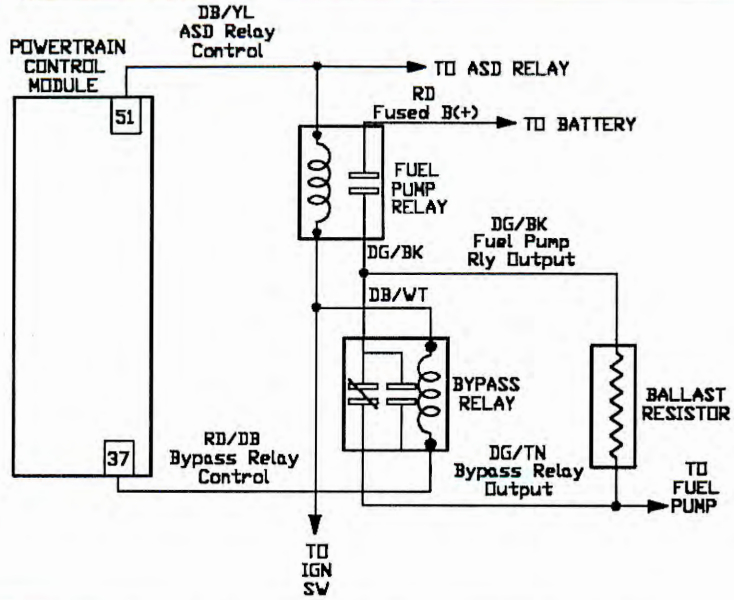
Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-31A REPAIRING - FUEL PUMP RESISTOR BYPASS RELAY CKT

Perform TEST TC-1A Before Proceeding



1050306

Name of code: Fuel Pump Resistor Bypass Relay Ckt

When monitored: With the ignition key on and battery voltage greater than 10 volts.

Set condition: An open or shorted condition is detected in the fuel pump resistor bypass relay control circuit.

Theory of operation: The fuel pump resistor bypass relay controls the path the fuel pump relay output current takes as it travels from the relay to the fuel pump. When the bypass relay is de-energized, the fuel pump receives the fuel pump relay output current directly from the relay. Conversely, when the bypass relay is energized, the fuel pump relay output current travels through the ballast resistor before reaching the fuel pump.

The relay is located in the power distribution center. One side of the relay control coil is supplied with 12 volts when the ignition switch is turned to the "run" position. The circuit is completed when the other side of the relay coil is grounded by the powertrain control module (PCM).

Possible causes:

> Relay coil open or shorted
> Fused ignition switch output circuit open
> Fuel pump resistor bypass relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

1100403

FIG. 1

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

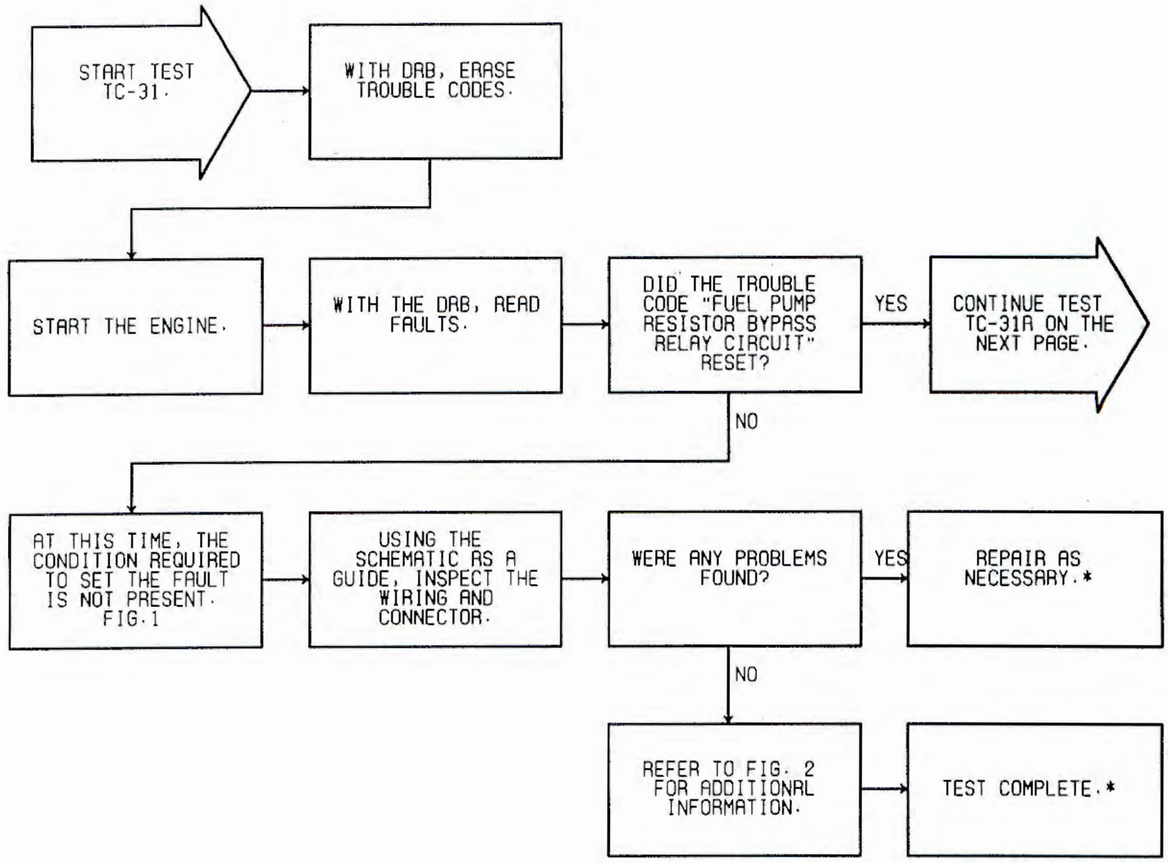
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 2

TEST TC-31A	REPAIRING - FUEL PUMP RESISTOR BYPASS RELAY CKT

Perform TEST TC-1A Before Proceeding



TROUBLE CODE TESTS

****Perform Verification TEST VER-2A.***	*****Check connectors – Clean / repair as necessary.***

TEST TC-31A CONTINUED - REPAIRING - FUEL PUMP RESISTOR BYPASS RELAY CKT

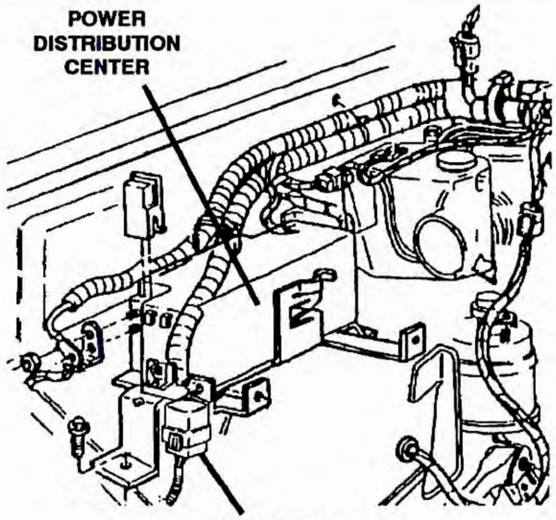


FIG. 1

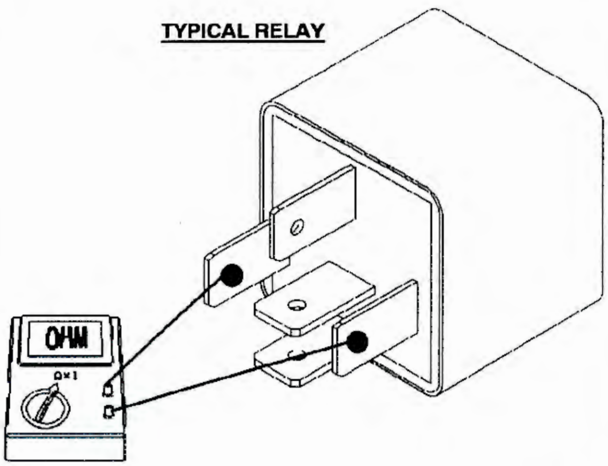
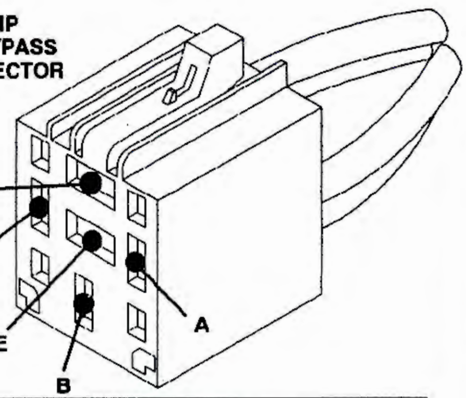


FIG. 2



CAV	COLOR	FUNCTION
A	DB/WT	FUSED IGN SW OUTPUT
B	DG/BK	FUEL PUMP RELAY OUTPUT
C	RD/DB	BYPASS RELAY CONTROL
E	DG/TN	BYPASS RELAY OUTPUT

FIG. 3

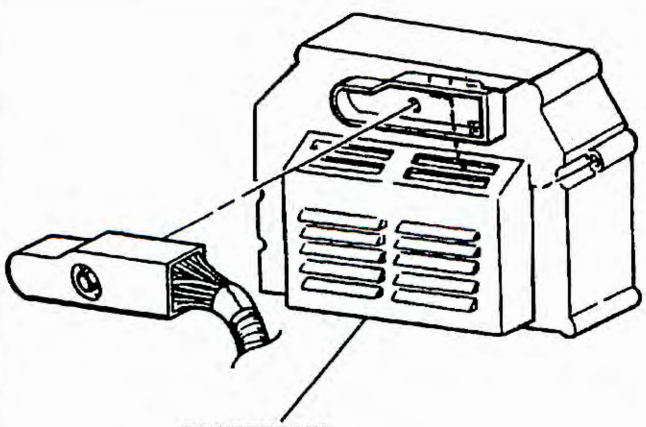


FIG. 4

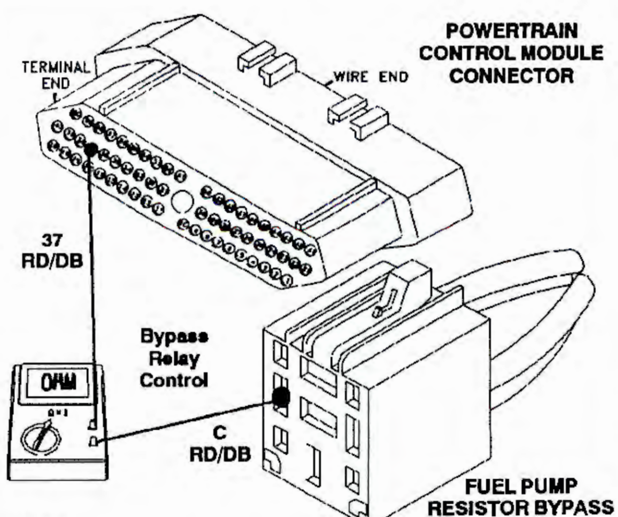


FIG. 5

TEST TC-31A CONTINUED - REPAIRING - FUEL PUMP RESISTOR BYPASS RELAY CKT

TEST TC-31A CONTINUED FROM THE PREVIOUS PAGE.

KEY OFF. DISCONNECT THE FUEL PUMP RESISTOR BYPASS RELAY.** FIG. 1

USE AN OHMMETER IN THE FOLLOWING STEP.

TEST THE BYPASS RELAY COIL FOR RESISTANCE. FIG. 2

IS THE RESISTANCE BELOW 80 OHMS?

YES → REPLACE THE FUEL PUMP RESISTOR BYPASS RELAY.*

NO → TURN IGNITION ON.

WITH THE DRB IN VOLTMETER MODE, PROBE THE FUSED IGN SW OUTPUT CIRCUIT. FIG. 3

IS THE VOLTAGE ABOVE 10 VOLTS?

NO → REPAIR THE OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT.*

YES → KEY OFF. DISCONNECT THE POWERTRAIN CONTROL MODULE CONNECTOR.** FIG. 4

WITH THE DRB IN OHMMETER MODE, PROBE PCM CAVITY 37. FIG. 3

IS THE RESISTANCE BELOW 5 OHMS?

YES → REPAIR THE FUEL PUMP RESISTOR BYPASS RELAY CONTROL CIRCUIT FOR SHORT TO GND.*

NO → USE AN OHMMETER IN THE FOLLOWING STEP.

TEST THE FUEL PUMP RESISTOR BYPASS RELAY CONTROL CKT FOR RESISTANCE. FIG. 5

IS THE RESISTANCE BELOW 5 OHMS?

NO → REPAIR THE OPEN FUEL PUMP RESISTOR BYPASS RELAY CONTROL CIRCUIT.*

YES → REPLACE THE POWERTRAIN CONTROL MODULE.*

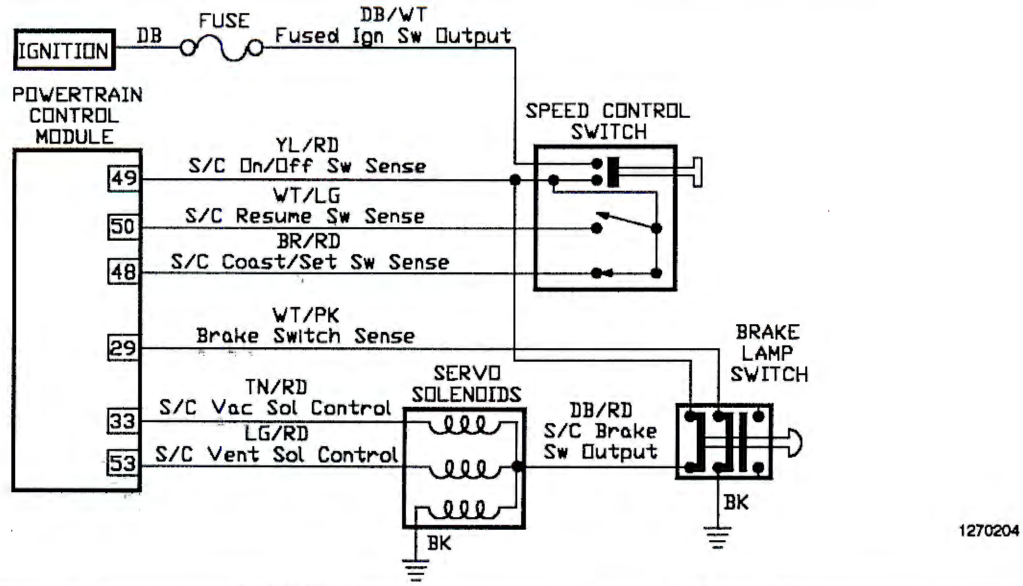
Perform Verification TEST VER-2A.

*****Check connectors – Clean / repair as necessary.***

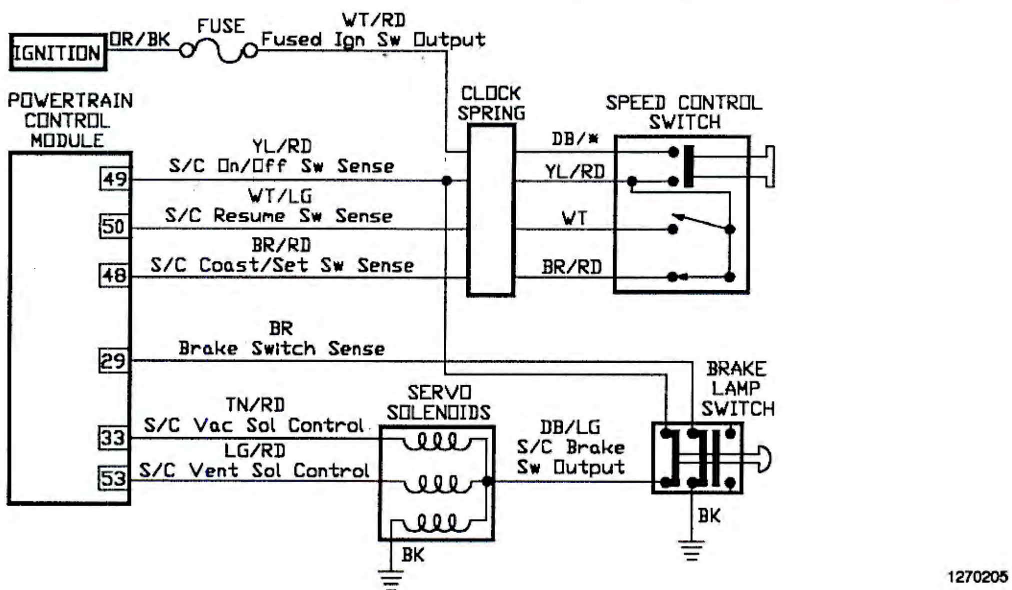
TEST TC-32A REPAIRING - SPEED CONTROL SOLENOID CIRCUITS

Perform TEST TC-1A Before Proceeding

MJ/XJ BODY



ZJ BODY



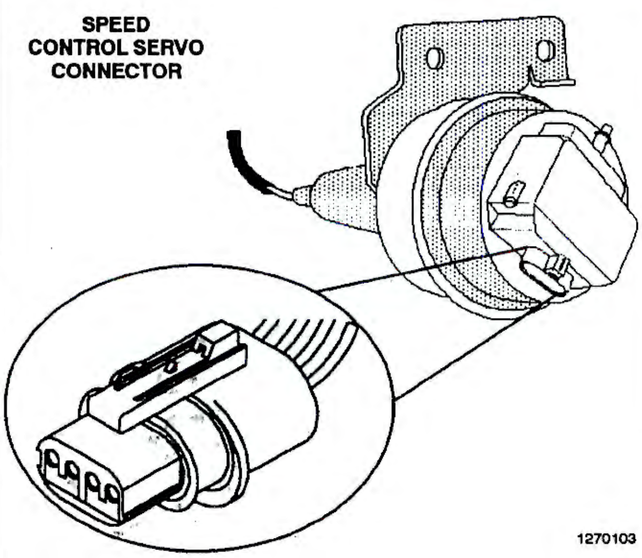
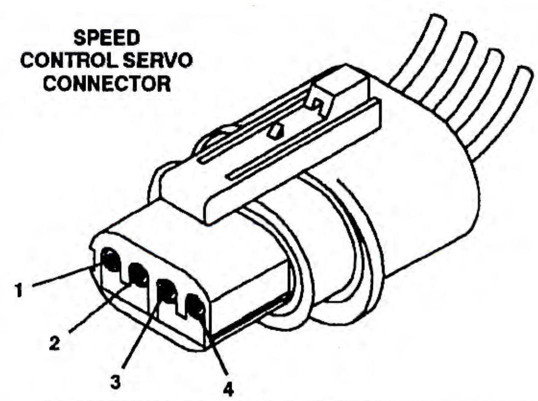


FIG. 1



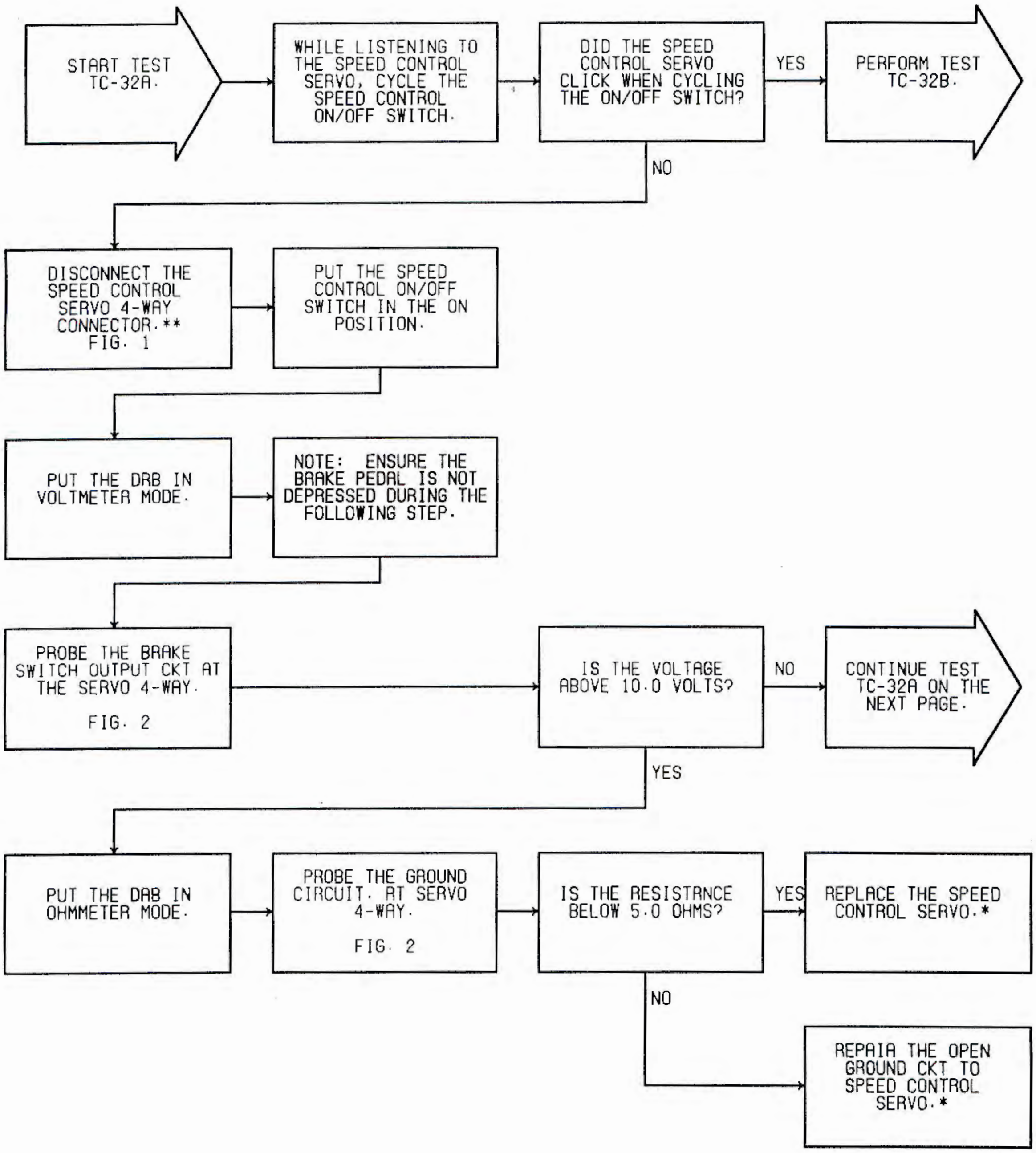
1260602

CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/*	SC BRAKE SWITCH OUTPUT
3	LG/RD	SC VENT SOLENOID CONTROL
4	TN/RD	SC VACUUM SOLENOID CONTROL

FIG. 2

TEST TC-32A REPAIRING - SPEED CONTROL SOLENOID CIRCUITS

Perform TEST TC-1A Before Proceeding



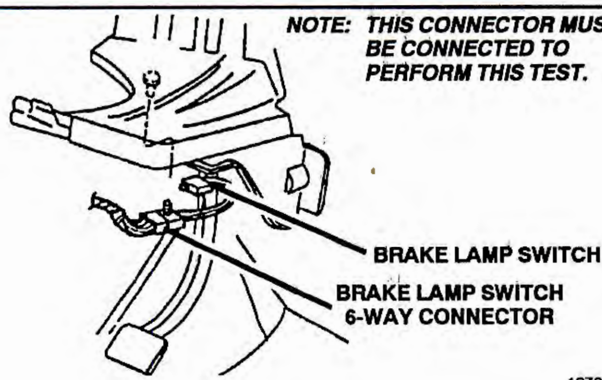
***Perform Verification TEST VER-4A.**

****Check connectors – Clean / repair as necessary.**

TEST TC-32A CONTINUED - REPAIRING - SPEED CONTROL SOLENOID CIRCUITS

ZJ BODY

NOTE: THIS CONNECTOR MUST BE CONNECTED TO PERFORM THIS TEST.

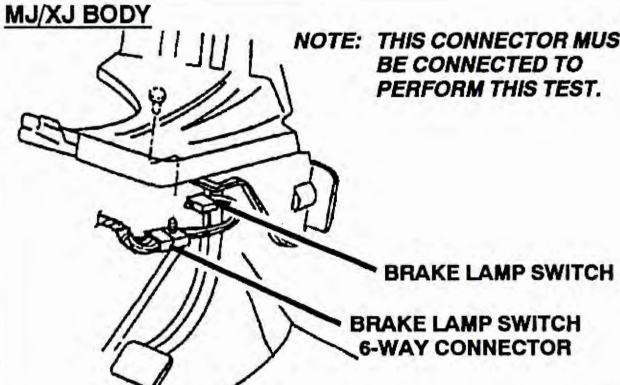


CAV	COLOR	FUNCTION
1	YL/RD	S/C ON/OFF SWITCH SENSE
3	BR	BRAKE SWITCH SENSE
4	DB/LG	S/C BRAKE SWITCH OUTPUT
6	BK	GROUND

FIG. 1

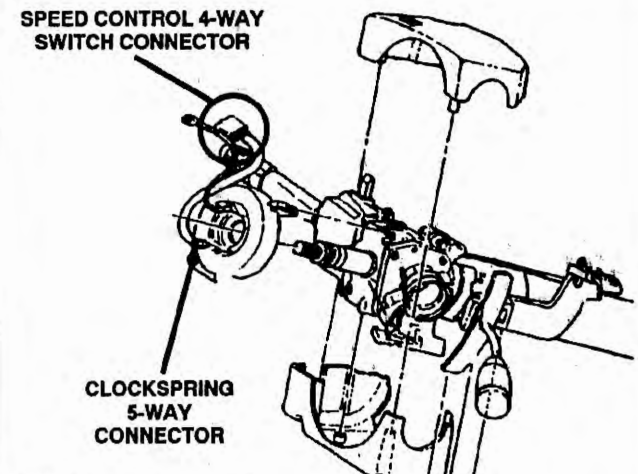
MJ/XJ BODY

NOTE: THIS CONNECTOR MUST BE CONNECTED TO PERFORM THIS TEST.



CAV	COLOR	FUNCTION
1	YL/RD	S/C ON/OFF SWITCH SENSE
3	WT/PK	BRAKE SWITCH SENSE
4	DB/RD	S/C BRAKE SWITCH OUTPUT
6	BK	GROUND

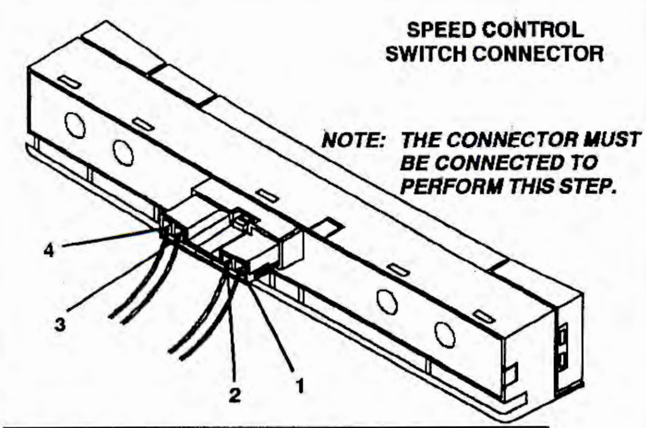
FIG. 2



NOTE: STEERING WHEEL REMOVAL NOT REQUIRED TO ACCESS CONNECTORS.

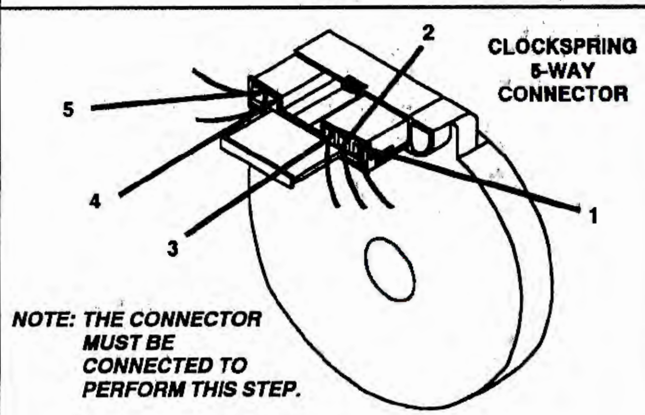
FIG. 3

NOTE: THE CONNECTOR MUST BE CONNECTED TO PERFORM THIS STEP.



CAV	COLOR	FUNCTION
1	YL/RD	S/C ON/OFF SWITCH SENSE
2	DB/*	FUSED IGNITION SW OUTPUT
3	WT	S/C RESUME SWITCH SENSE
4	BR/RD	S/C COAST/SET SWITCH SENSE

FIG. 4



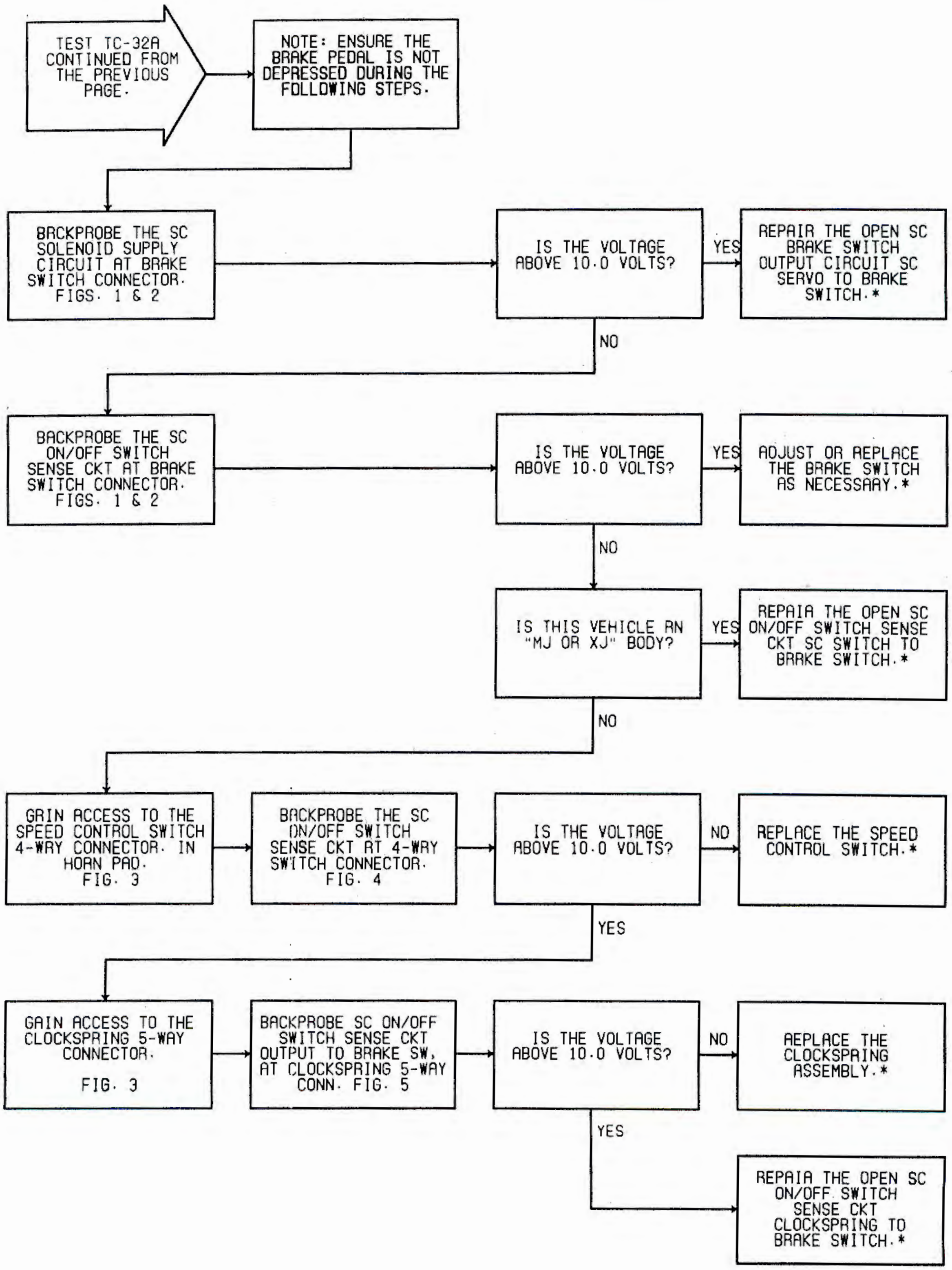
NOTE: THE CONNECTOR MUST BE CONNECTED TO PERFORM THIS STEP.

CAV	COLOR	FUNCTION
2	WT/LG	S/C RESUME SW SENSE
3	WT/RD	FUSED IGN SW OUTPUT
4	BR/RD	S/C COAST/SET SW SENSE
5	YL/RD	S/C ON/OFF SW SENSE

1220104

FIG. 5

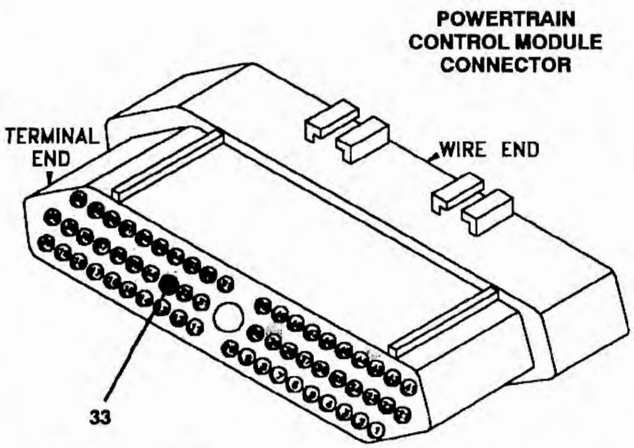
TEST TC-32A CONTINUED - REPAIRING - SPEED CONTROL SOLENOID CIRCUITS



Perform Verification TEST VER-4A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-32B | REPAIRING - SPEED CONTROL VACUUM SOLENOID CIRCUIT

Perform TEST TC-32A Before Proceeding



CAV	COLOR	FUNCTION
33	TN/RD	SC VACUUM SOL CONTROL

0800302

FIG. 1

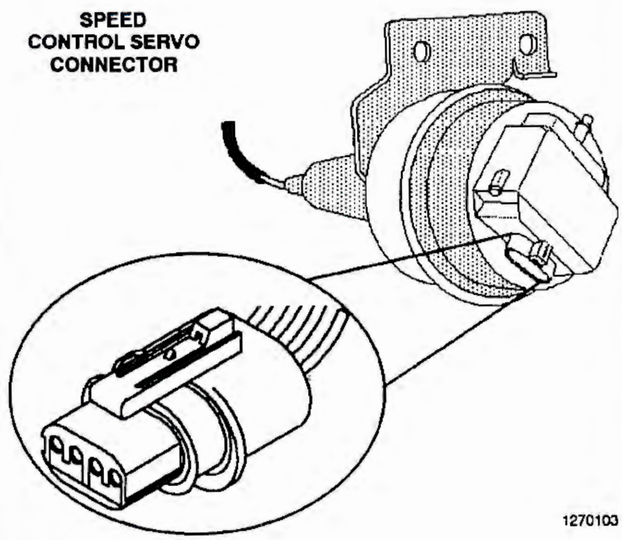
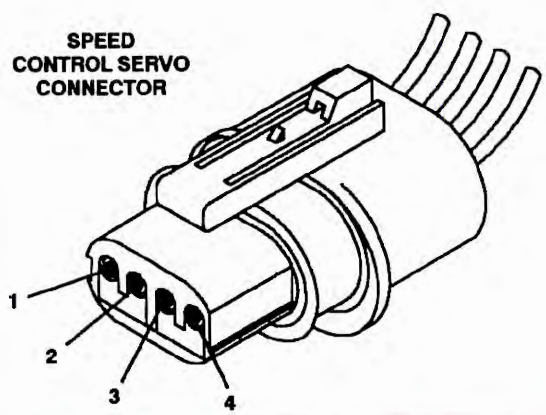


FIG. 2



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/*	SC BRAKE SWITCH OUTPUT
3	LG/RD	SC VENT SOLENOID CONTROL
4	TN/RD	SC VACUUM SOLENOID CONTROL

1260602

FIG. 3

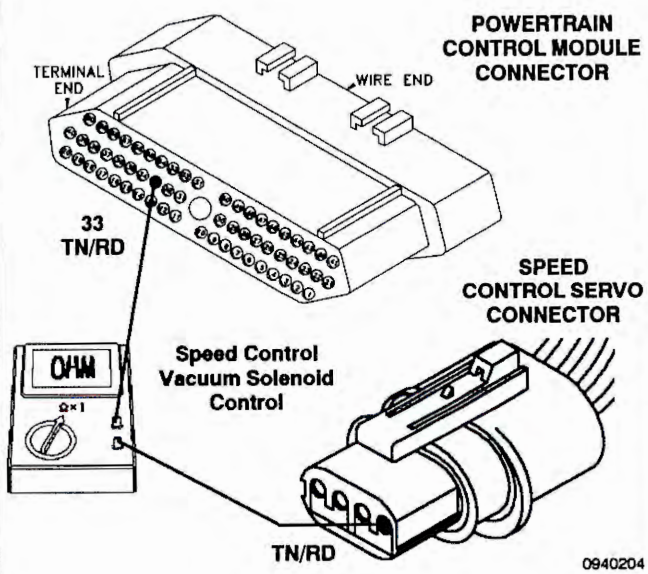
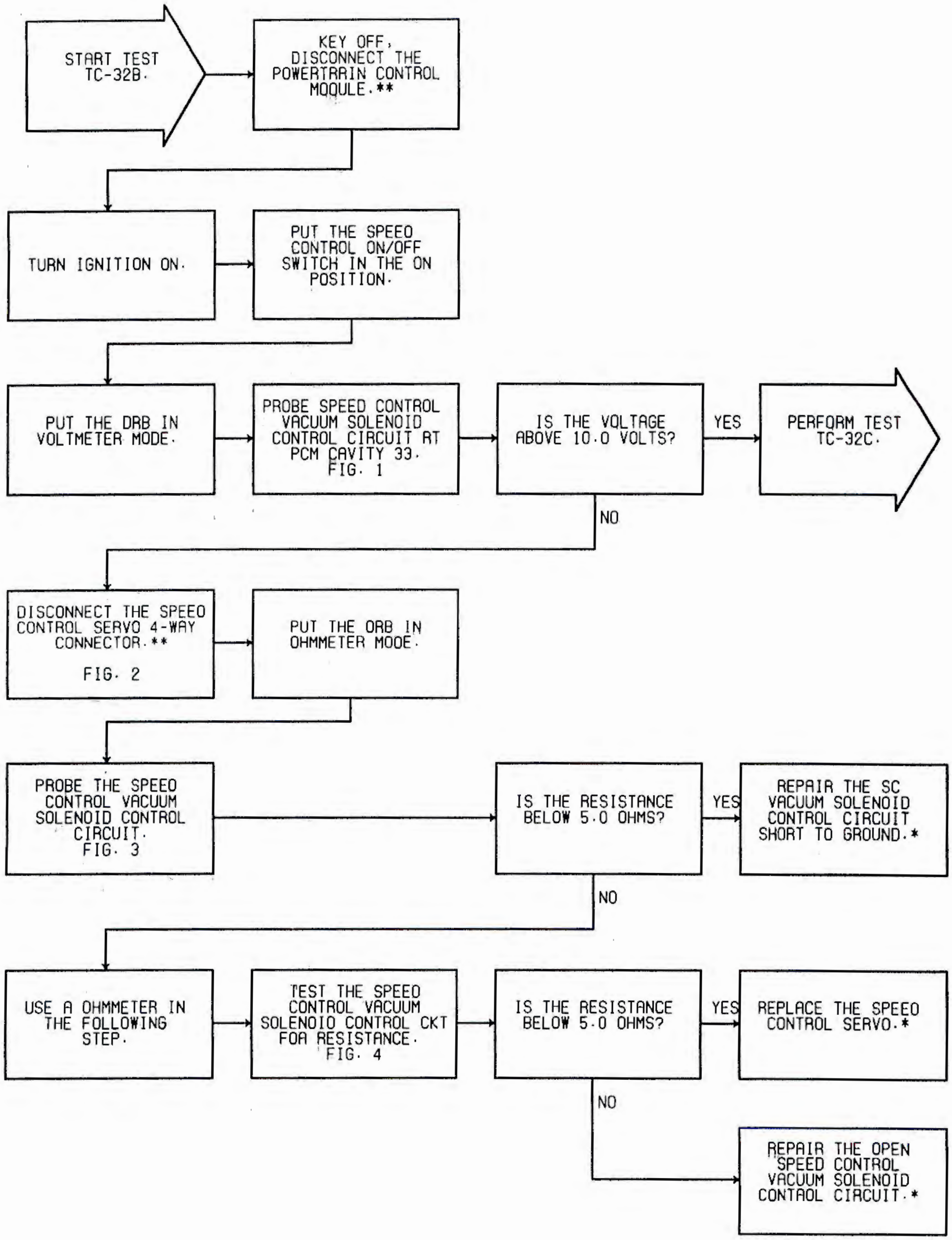


FIG. 4

TEST TC-32B | **REPAIRING - SPEED CONTROL VACUUM SOLENOID CIRCUIT**

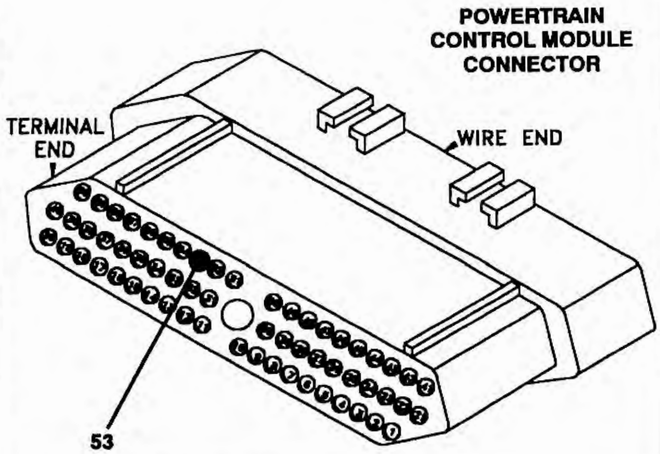
Perform TEST TC-32A Before Proceeding



Perform Verification TEST VER-4A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-32C REPAIRING - SPEED CONTROL VENT SOLENOID CIRCUIT

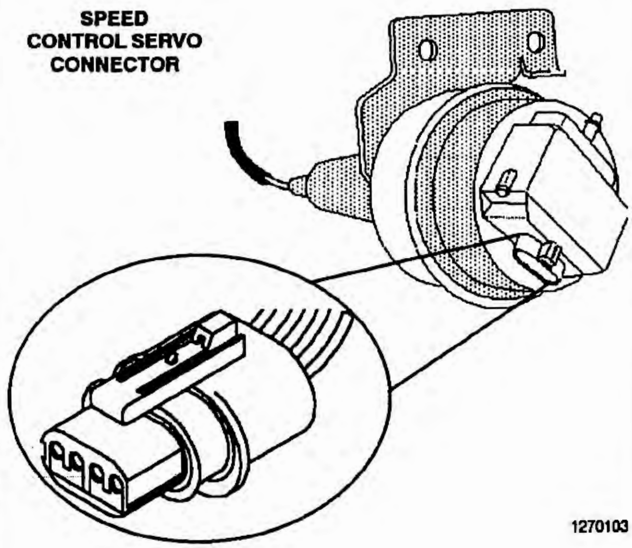
Perform TEST TC-32B Before Proceeding



CAV	COLOR	FUNCTION
53	LG/RD	SC VENT SOL CONTROL

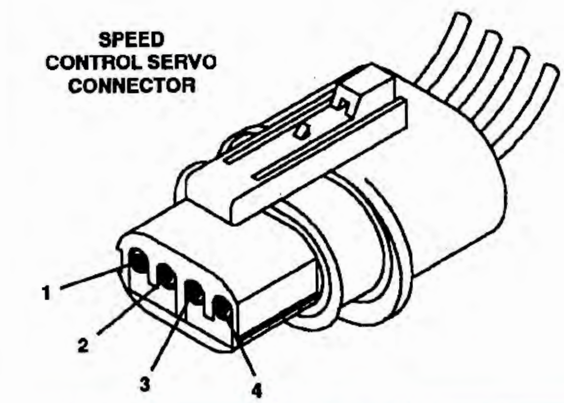
0800601

FIG. 1



1270103

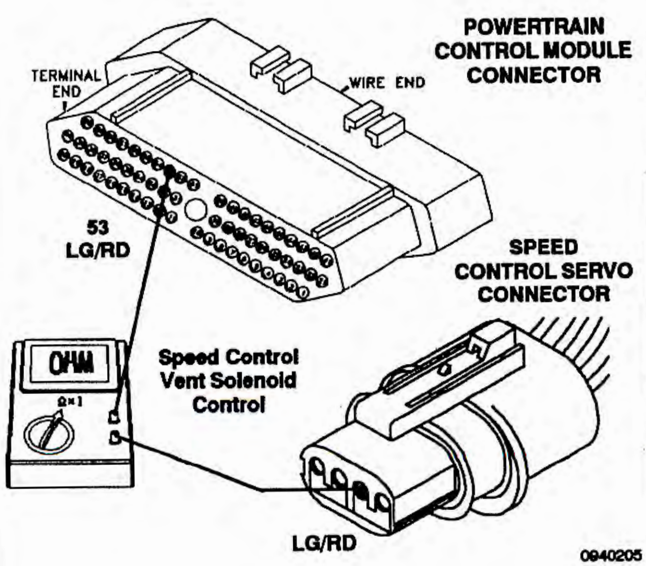
FIG. 2



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/*	SC BRAKE SWITCH OUTPUT
3	LG/RD	SC VENT SOLENOID CONTROL
4	TN/RD	SC VACUUM SOLENOID CONTROL

1260602

FIG. 3

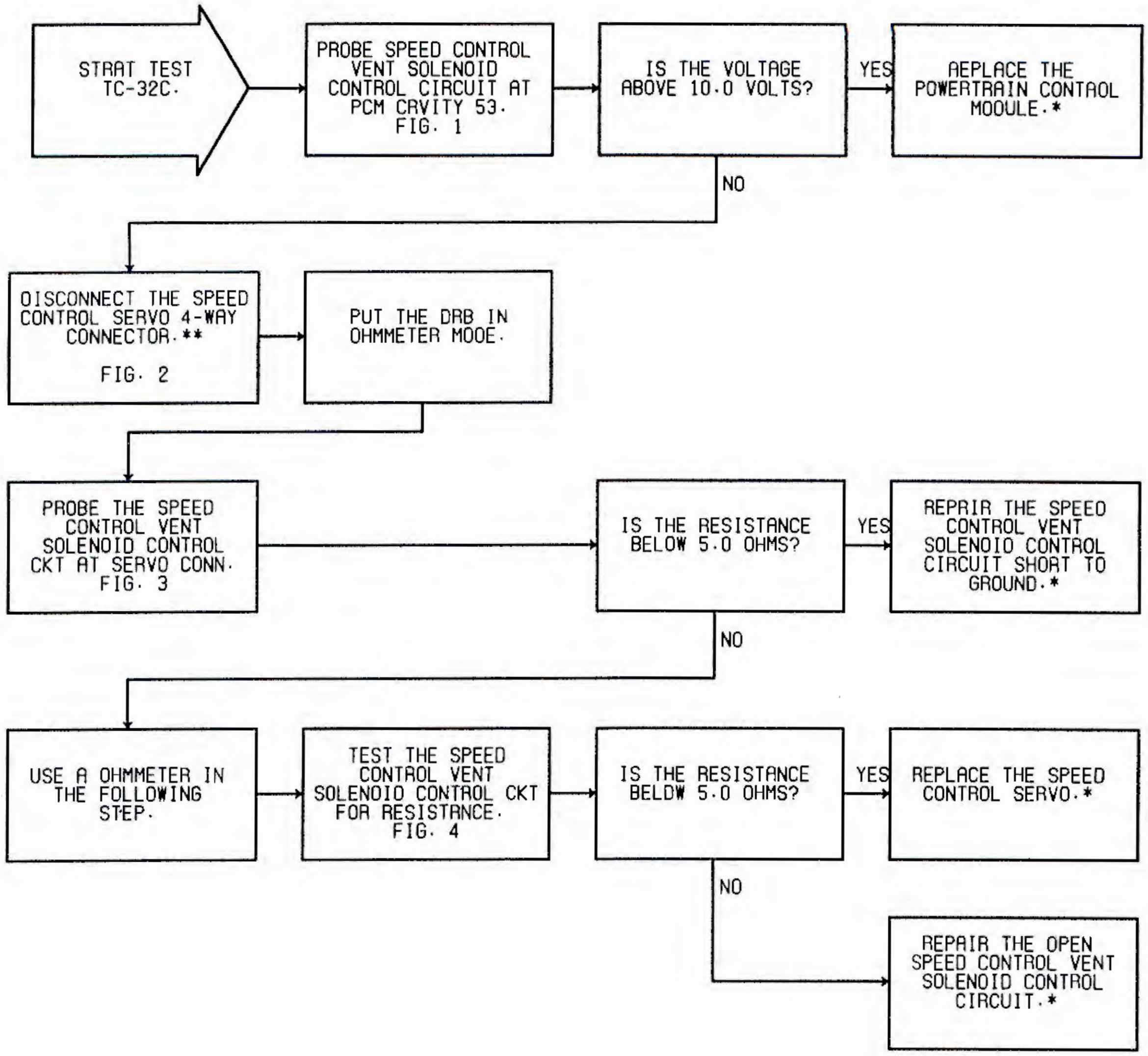


0940205

FIG. 4

TEST TC-32C	REPAIRING - SPEED CONTROL VENT SOLENOID CIRCUIT

Perform TEST TC-32B Before Proceeding

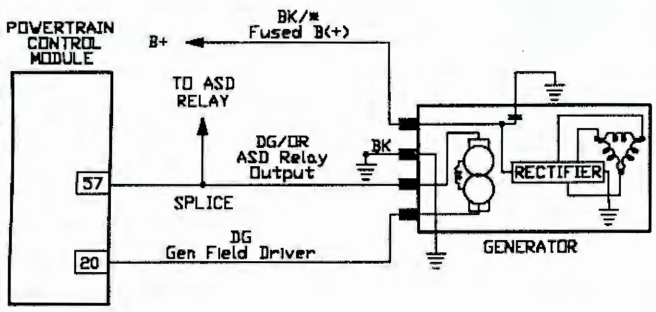


*Perform Verification TEST VER-4A.	**Check connectors – Clean / repair as necessary.

TEST TC-33A | REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

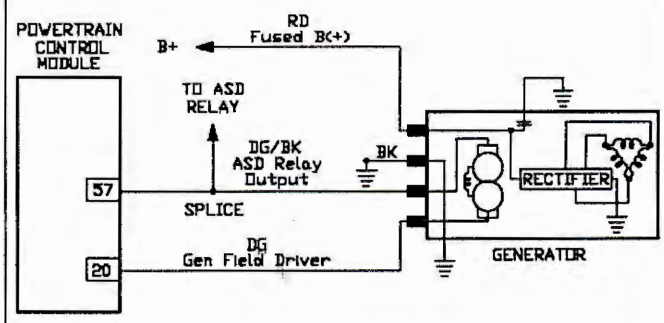
Perform TEST TC-1A Before Proceeding

MJ/XJ AND YJ BODIES



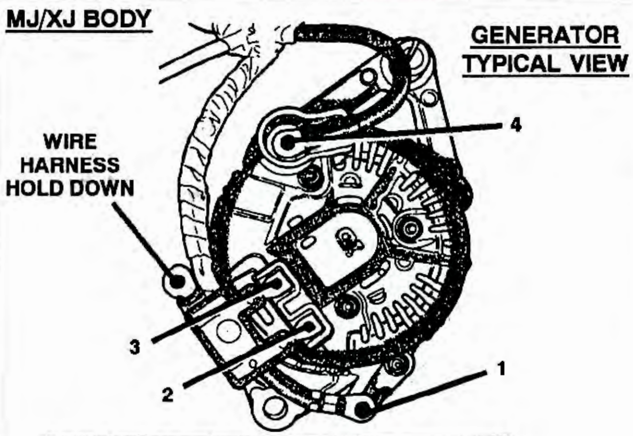
1330403

ZJ BODY



1330406

MJ/XJ BODY

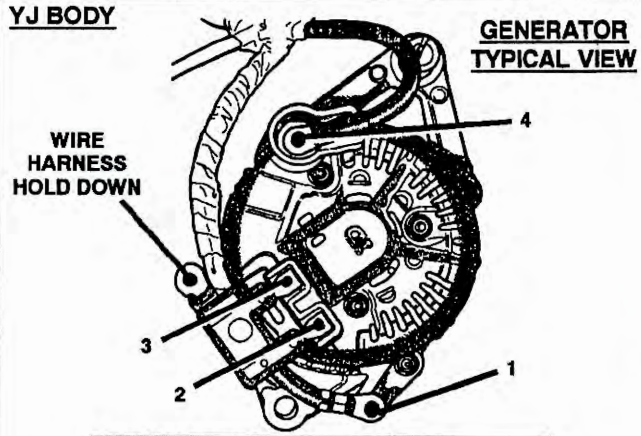


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/OR	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	BK/WT	B(+)

1320404

FIG. 1

YJ BODY

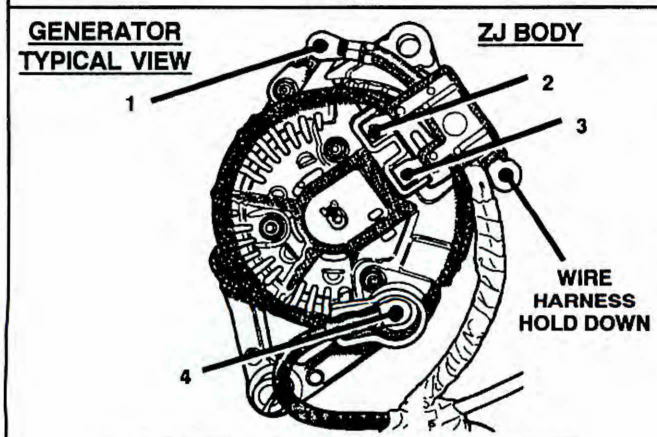


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG	GENERATOR FIELD DRIVER
3	DG/OR	ASD RELAY OUTPUT
4	BK/GY	B(+)

1320405

FIG. 2

GENERATOR TYPICAL VIEW — ZJ BODY

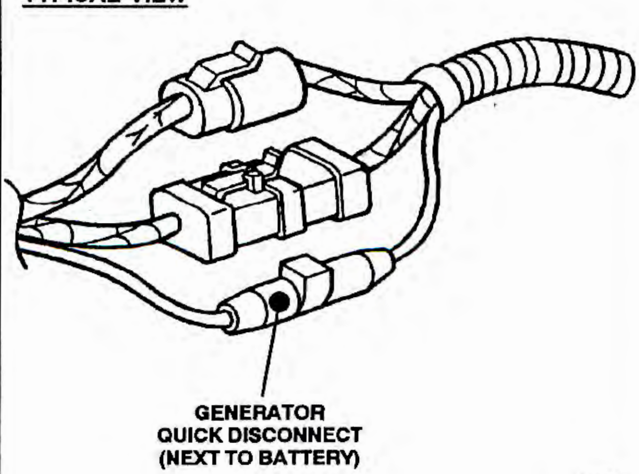


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/BK	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	RD	B(+)

1320406

FIG. 3

TYPICAL VIEW

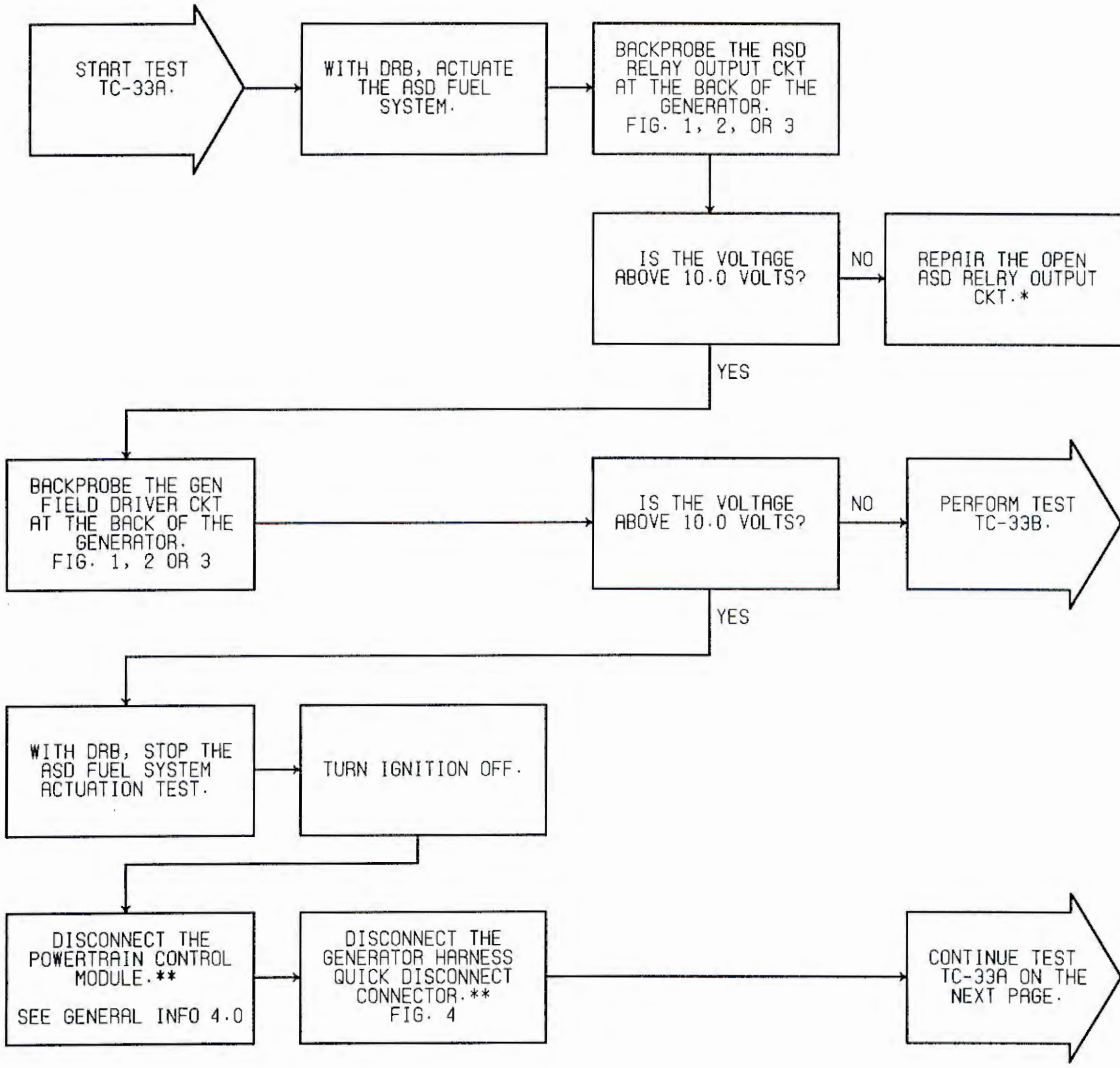


1320504

FIG. 4

TEST TC-33A REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

Perform TEST TC-1A Before Proceeding



****Perform Verification TEST VER-3A.***

***Check connectors – Clean / repair as necessary.*

TEST TC-33A CONTINUED - REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

TYPICAL VIEW

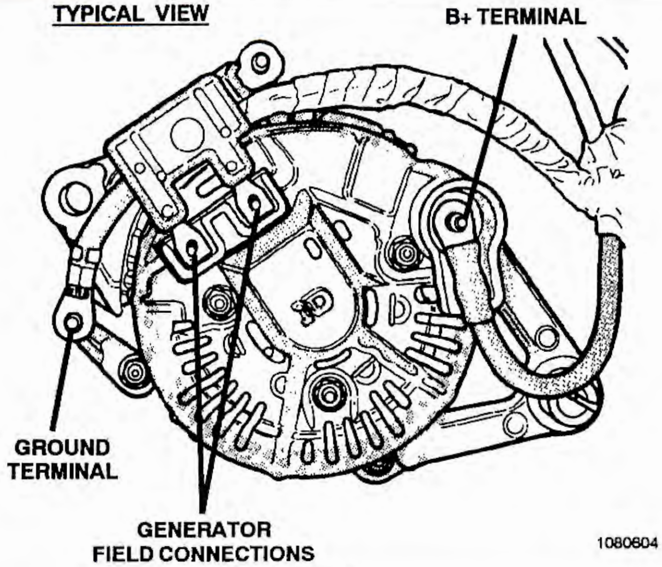


FIG. 1

MJ/XJ AND ZJ BODIES

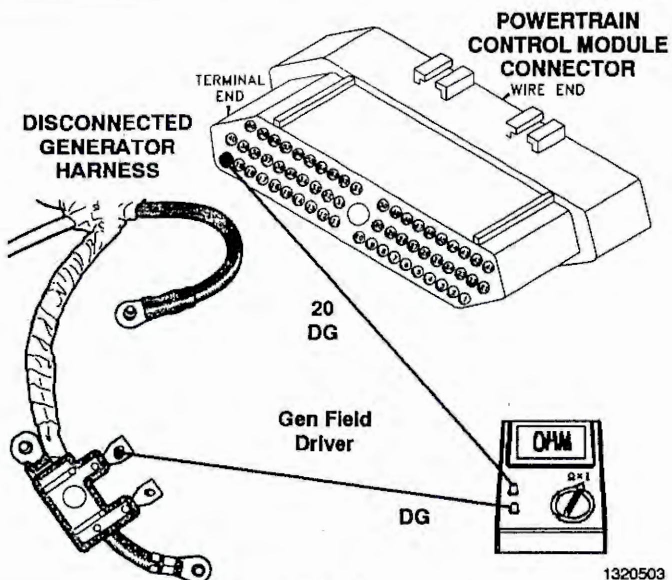


FIG. 2

YJ BODY

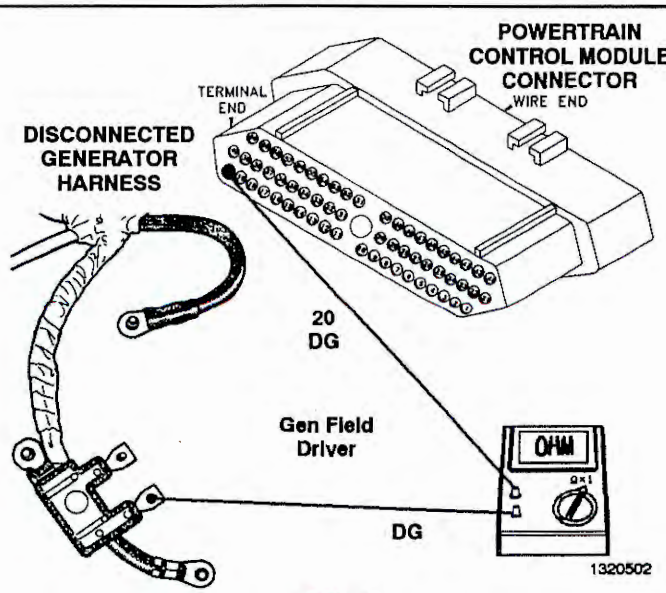
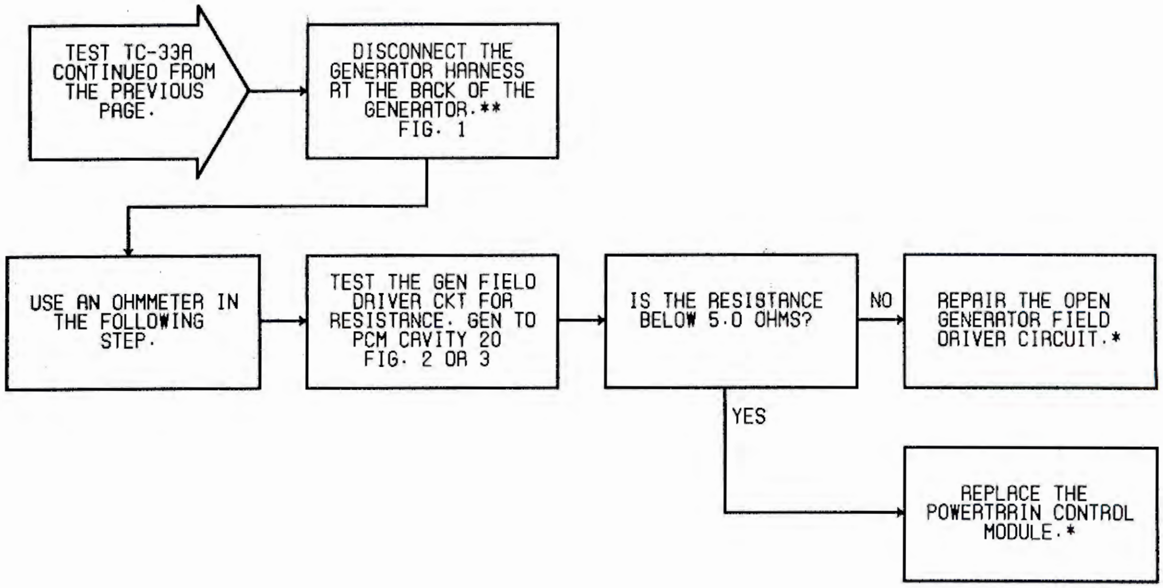


FIG. 3



***Perform Verification TEST VER-3A.**

****Check connectors – Clean / repair as necessary.**

T R O U B L E   C O D E   T E S T S

TEST TC-33B | REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

Perform TEST TC-33A Before Proceeding

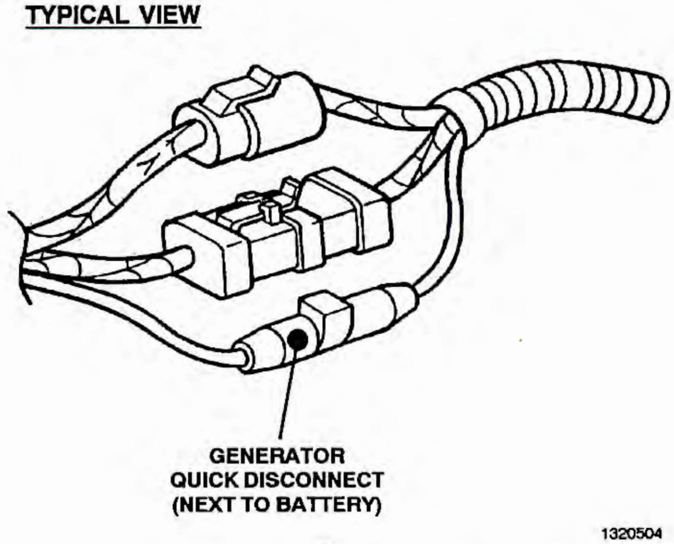


FIG. 1

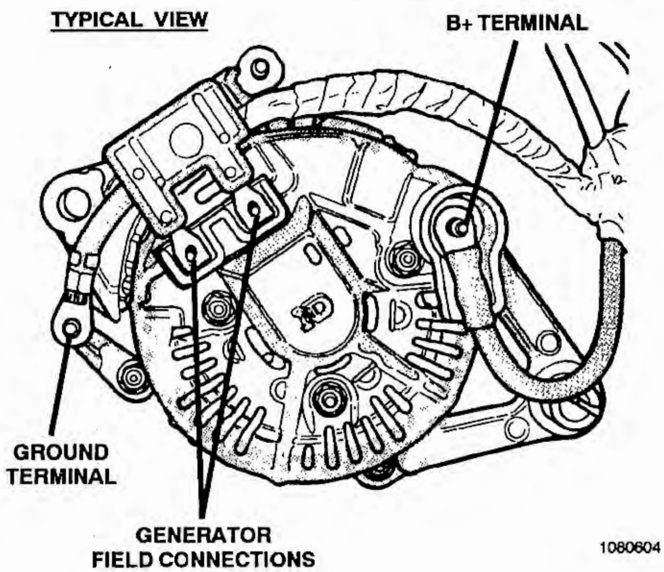


FIG. 2

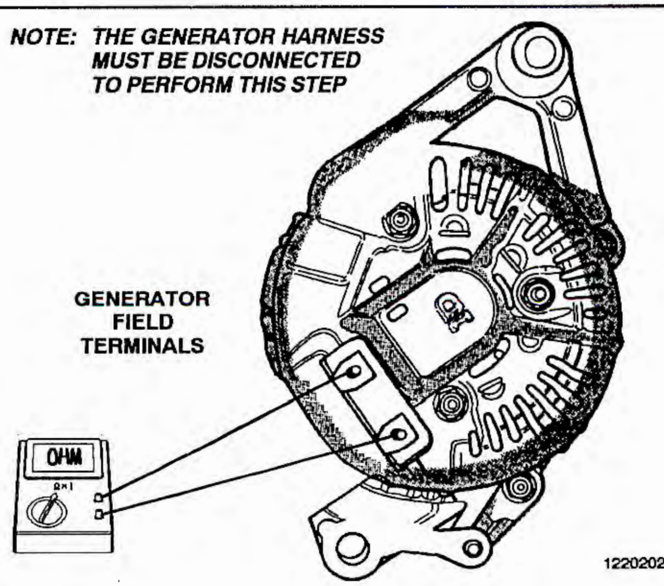
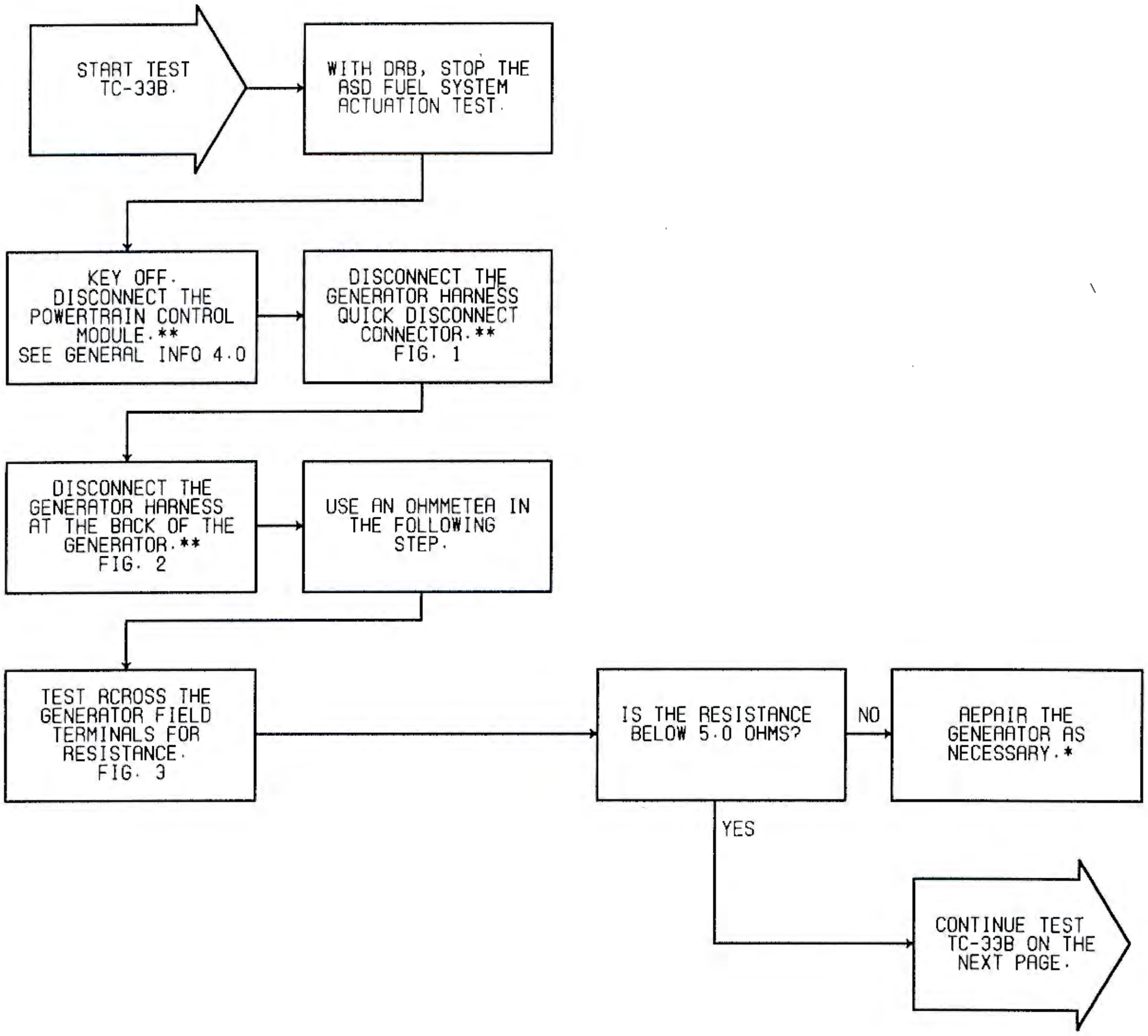


FIG. 3

TEST TC-33B REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

Perform TEST TC-33A Before Proceeding



***Perform Verification TEST VER-3A.**

*****Check connectors – Clean / repair as necessary.***

TEST TC-33B CONTINUED - REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

MJ/XJ BODY

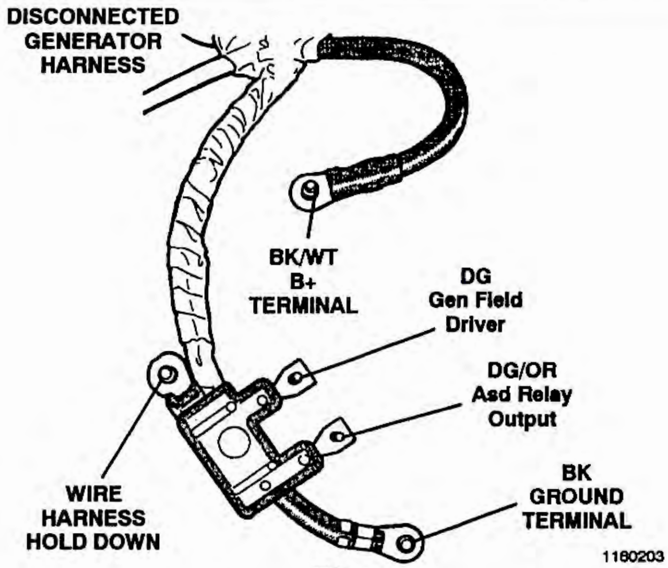


FIG. 1

YJ BODY

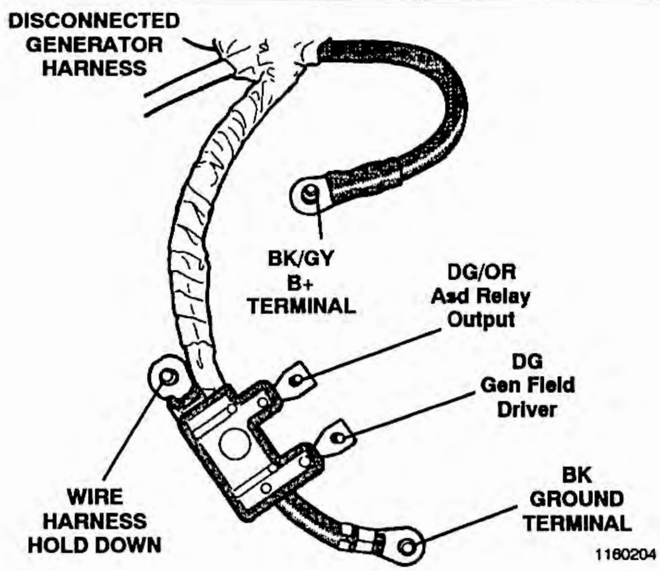


FIG. 2

ZJ BODY

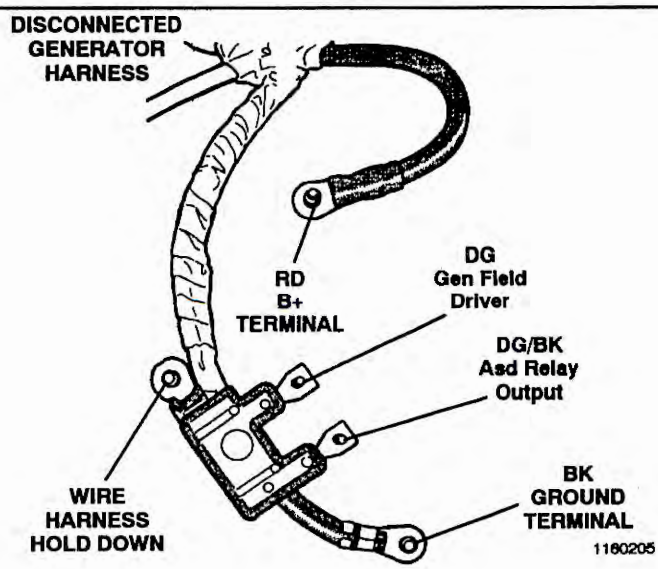
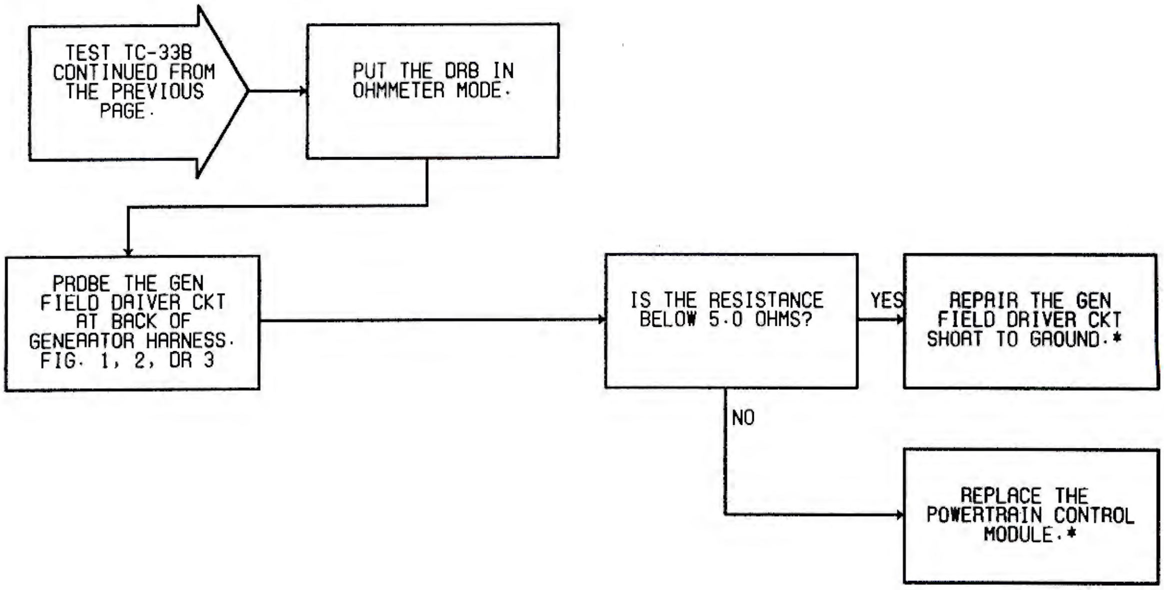


FIG. 3

TEST TC-33B CONTINUED - REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY



*Perform Verification TEST VER-3A.	**Check connectors – Clean / repair as necessary.

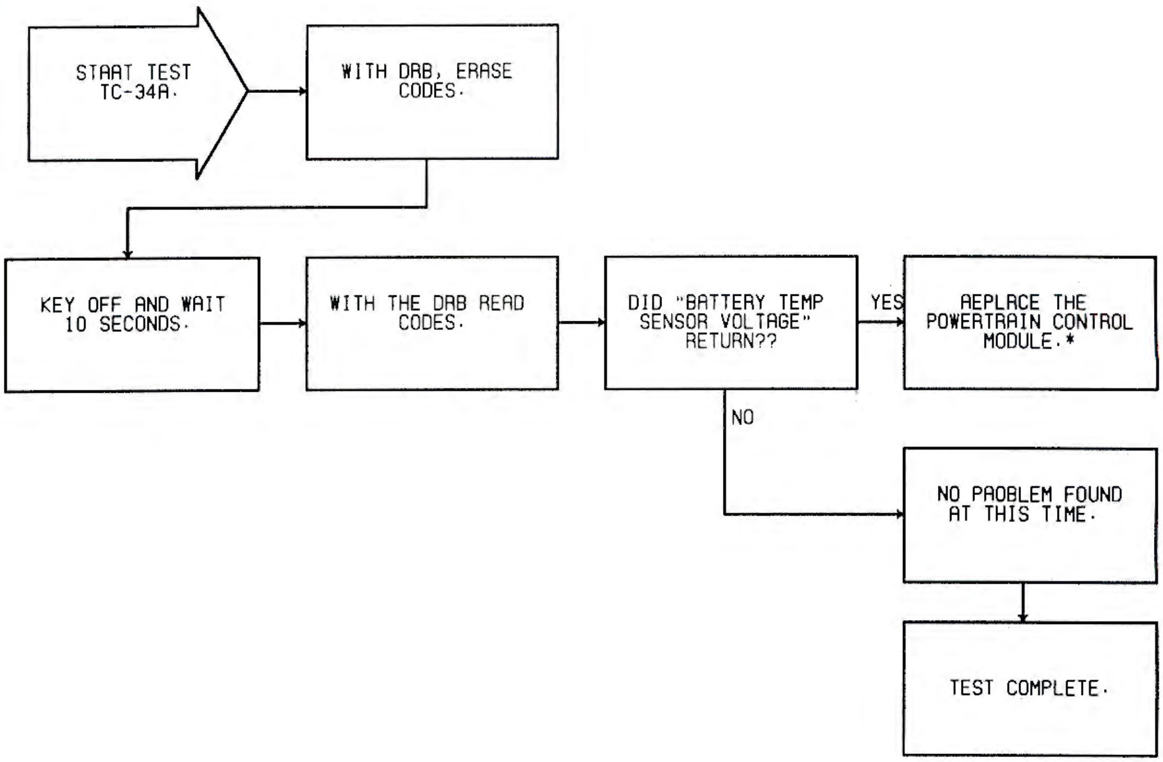
TEST TC-34A REPAIRING - BATTERY TEMP SENSOR VOLTS OUT OF LIMIT

Perform TEST TC-1A Before Proceeding

NOTES

TEST TC-34A	REPAIRING - BATTERY TEMP SENSOR VOLTS OUT OF LIMIT

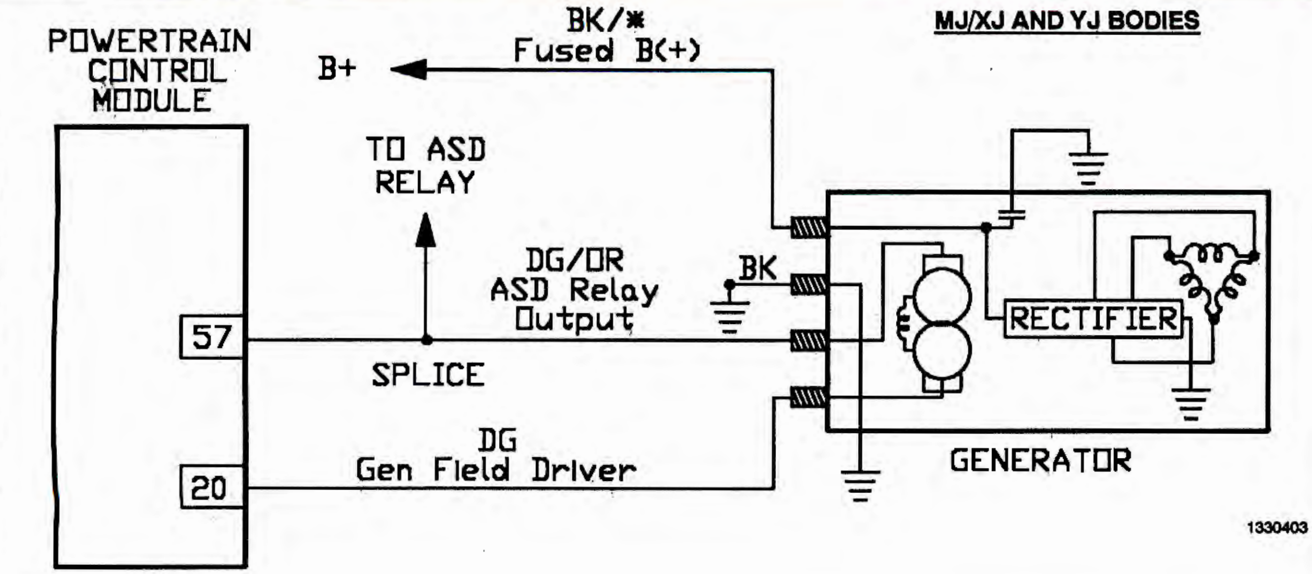
Perform TEST TC-1A Before Proceeding

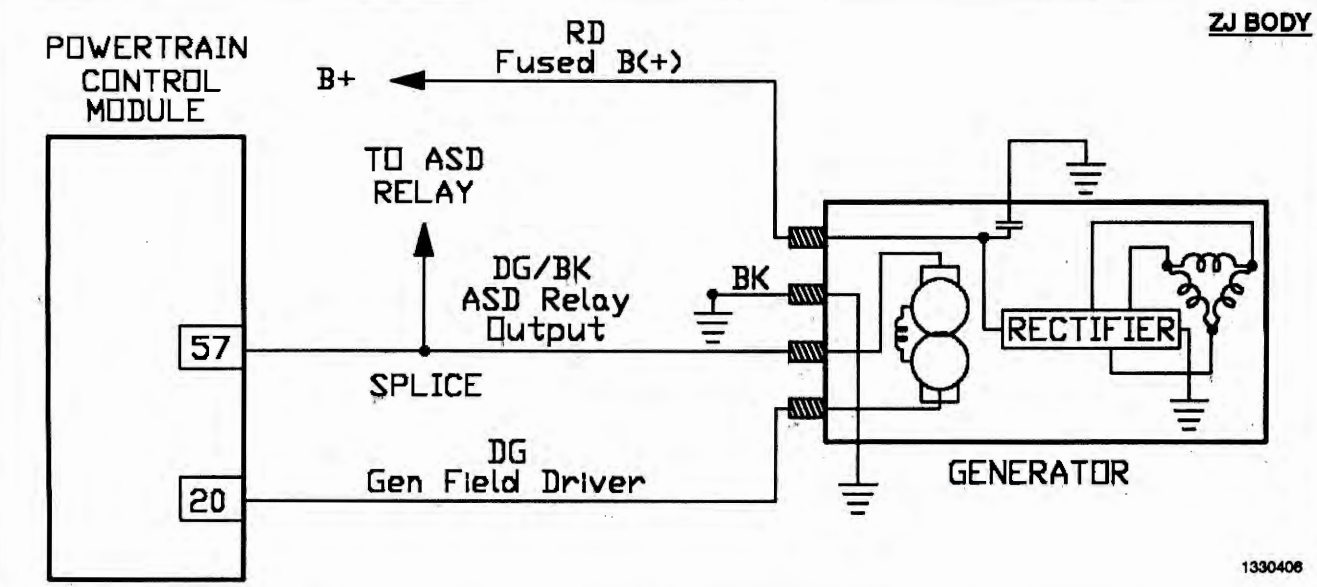


*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST TC-35A REPAIRING - CHARGING SYSTEM VOLTAGE TOO LOW

Perform TEST TC-1A Before Proceeding





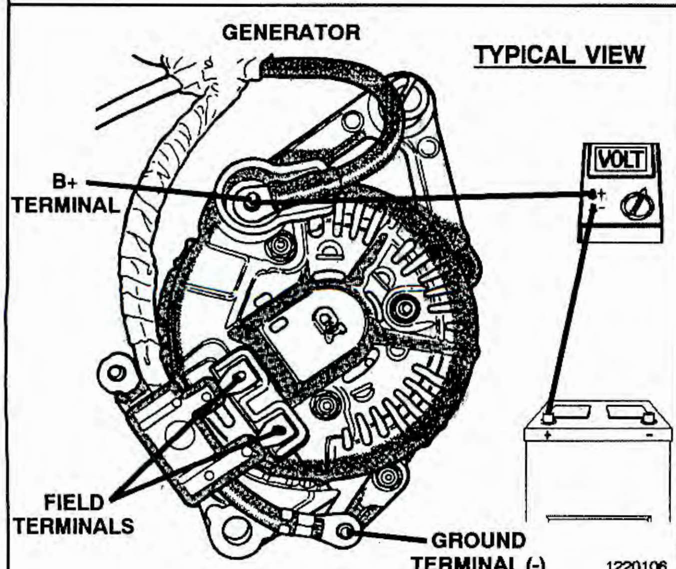


FIG. 1

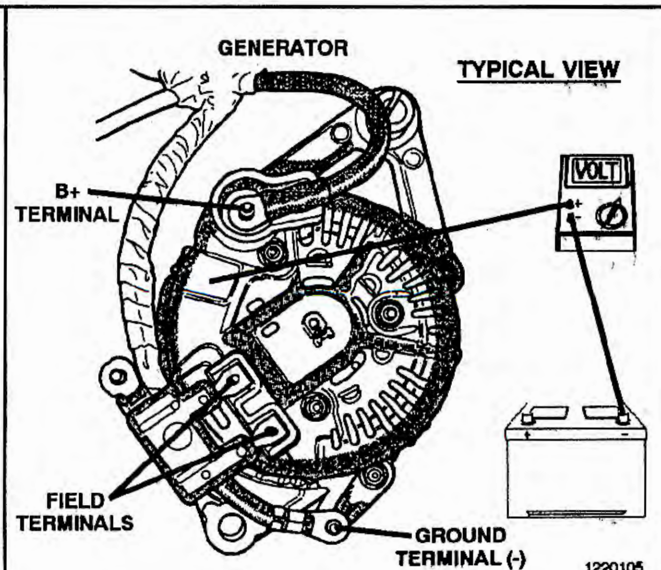


FIG. 2

TEST TC-35A | REPAIRING - CHARGING SYSTEM VOLTAGE TOO LOW

Perform TEST TC-1A Before Proceeding

START TEST TC-35A.

WITH DRB, READ THE VOLTAGE GOAL.

IS THE VOLTAGE GOAL ABOVE 15.1 VOLTS?

YES → REPLACE THE POWERTRAIN CONTROL MODULE.*

NO

USE A VOLTMETER IN THE FOLLOWING STEP.

TEST BETWEEN THE GENERATOR B+ TERMINAL AND BATTERY (+). FIG. 1

CAUTION: ENSURE ALL WIRES ARE CLEAR OF THE ENGINE'S MOVING PARTS.

START THE ENGINE.

IS THE VOLTAGE ABOVE 0.4 VOLT?

YES → REPAIR THE B (+) CIRCUIT FOR HIGH RESISTANCE BETWEEN THE GENERATOR AND THE BATTERY.*

NO

KEY OFF.

USE AN EXTERNAL VOLTMETER IN THE FOLLOWING STEP.

TEST BETWEEN THE GENERATOR CASE AND BATTERY (-).

FIG. 2

CAUTION: ENSURE ALL WIRES ARE CLEAR OF THE ENGINE'S MOVING PARTS.

START THE ENGINE.

IS THE VOLTAGE ABOVE 0.1 VOLT?

YES → REPAIR GENERATOR GROUND FOR HIGH RESISTANCE BETWEEN CASE & BATT (-).*

NO

MANUALLY SET ENGINE SPEED TO 1600 RPM. WITH DRB, READ THE VOLTAGE AND VOLTAGE GOAL.

COMPARE THE TWO READINGS.

IS THERE MORE THAN A 1.0 VOLT DIFFERENCE?

YES → REPAIR OR REPLACE THE GENERATOR AS NECESSARY.*

NO

ALLOW THE ENGINE TO RETURN TO IDLE SPEED.

TURN ENGINE OFF. (IGNITION KEY ON.)

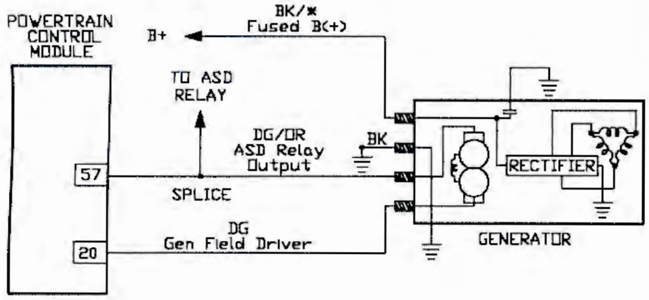
PERFORM TEST CH-1A.

*Perform Verification TEST VER-3A.	**Check connectors – Clean / repair as necessary.

TEST TC-36A REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

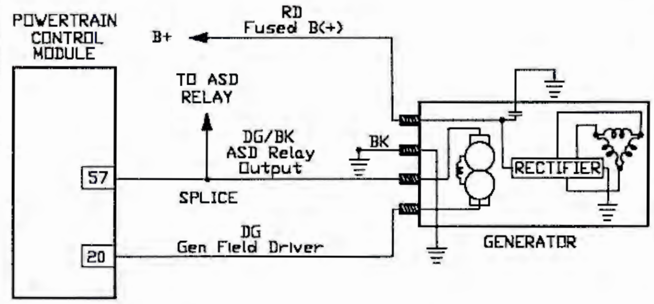
Perform TEST TC-1A Before Proceeding

MJ/XJ AND YJ BODIES



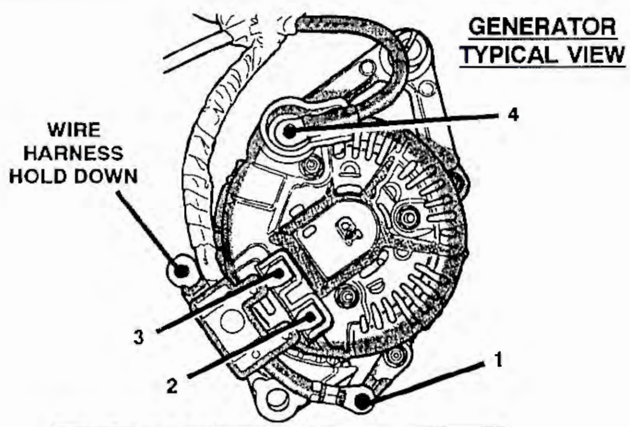
1330403

ZJ BODY



1330406

MJ/XJ BODY

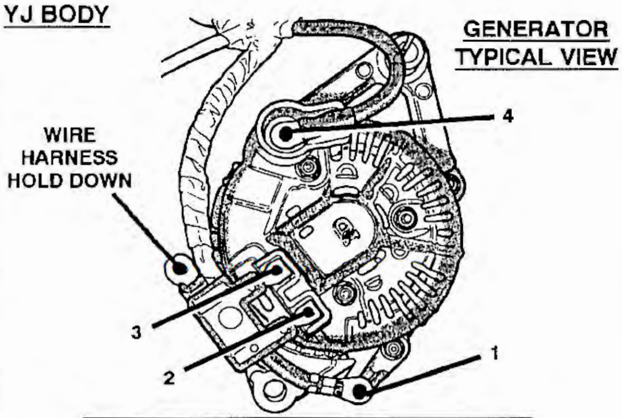


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/OR	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	BK/WT	B(+)

1320404

FIG. 1

YJ BODY

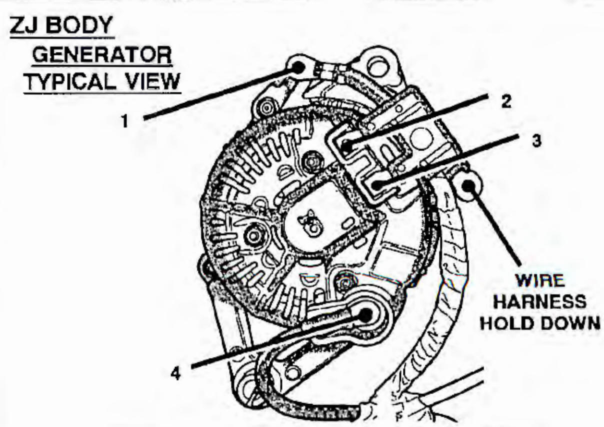


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG	GENERATOR FIELD DRIVER
3	DG/OR	ASD RELAY OUTPUT
4	BK/GY	B(+)

1320405

FIG. 2

ZJ BODY



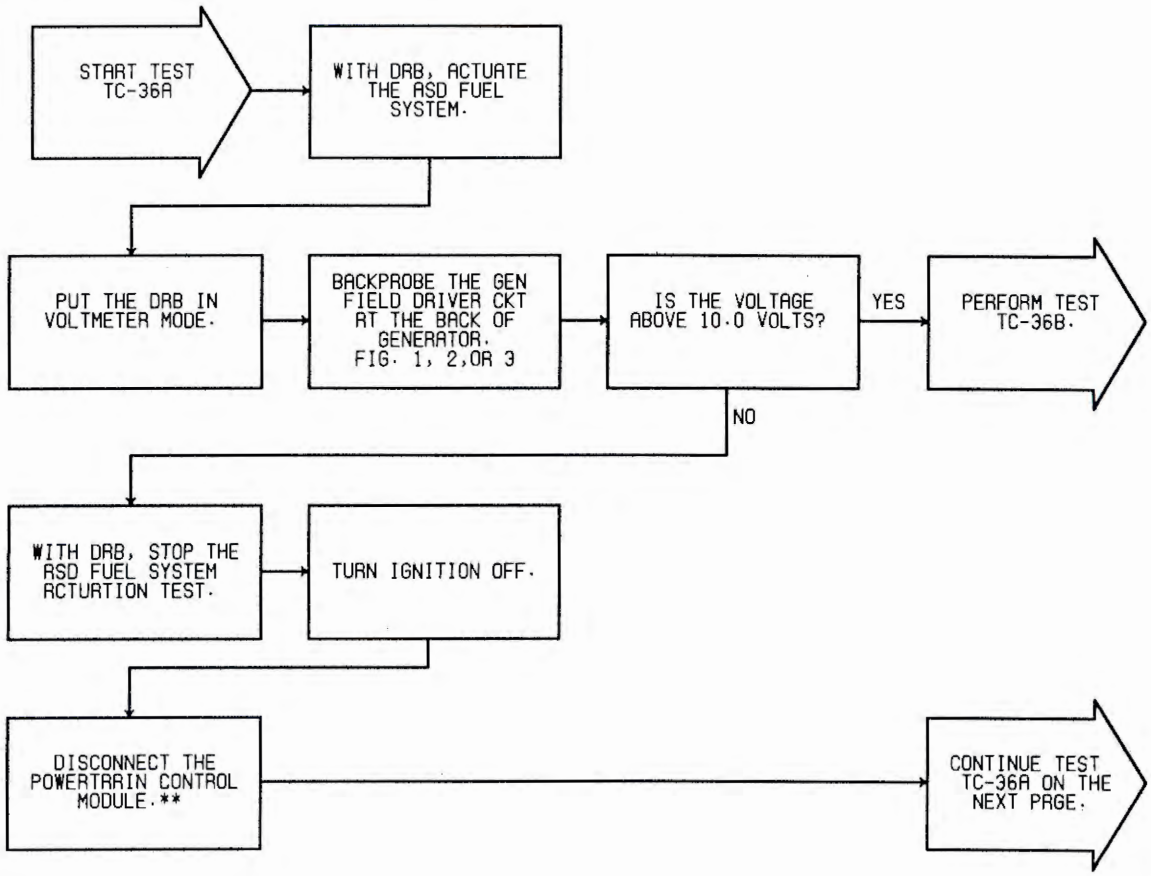
CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/BK	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	RD	B(+)

1320406

FIG. 3

TEST TC-36A | REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-3A.	**Check connectors – Clean / repair as necessary.

TEST TC-36A CONTINUED - REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

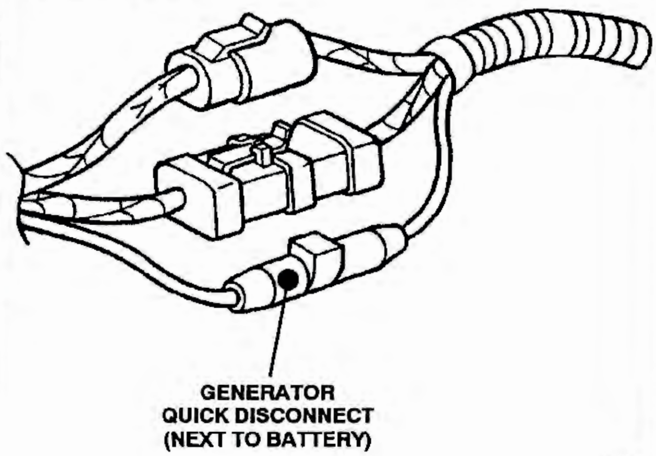


FIG. 1

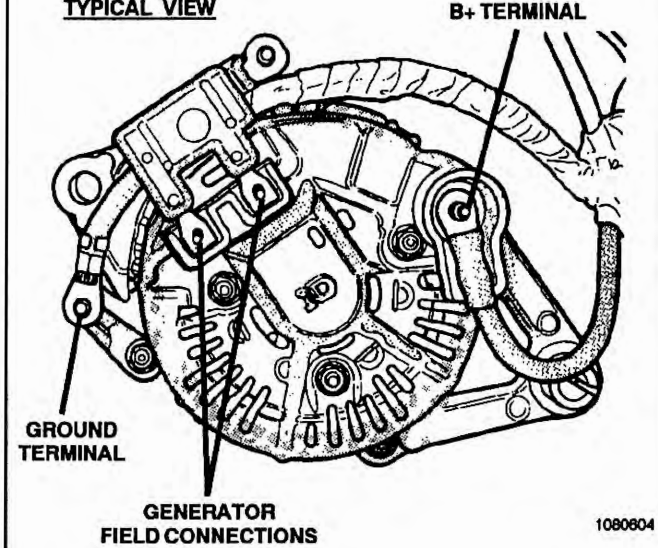
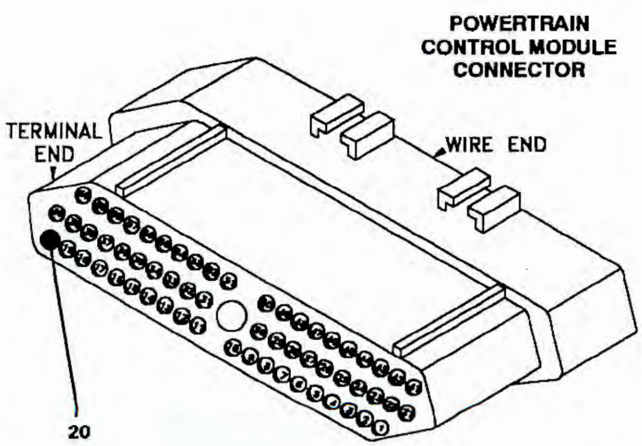


FIG. 2



CAV	COLOR	FUNCTION
20	DG	GENERATOR FIELD DRIVER

0800103

FIG. 3

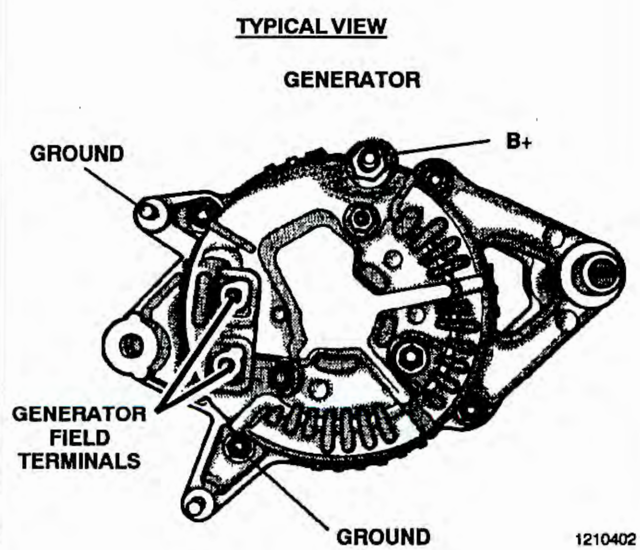
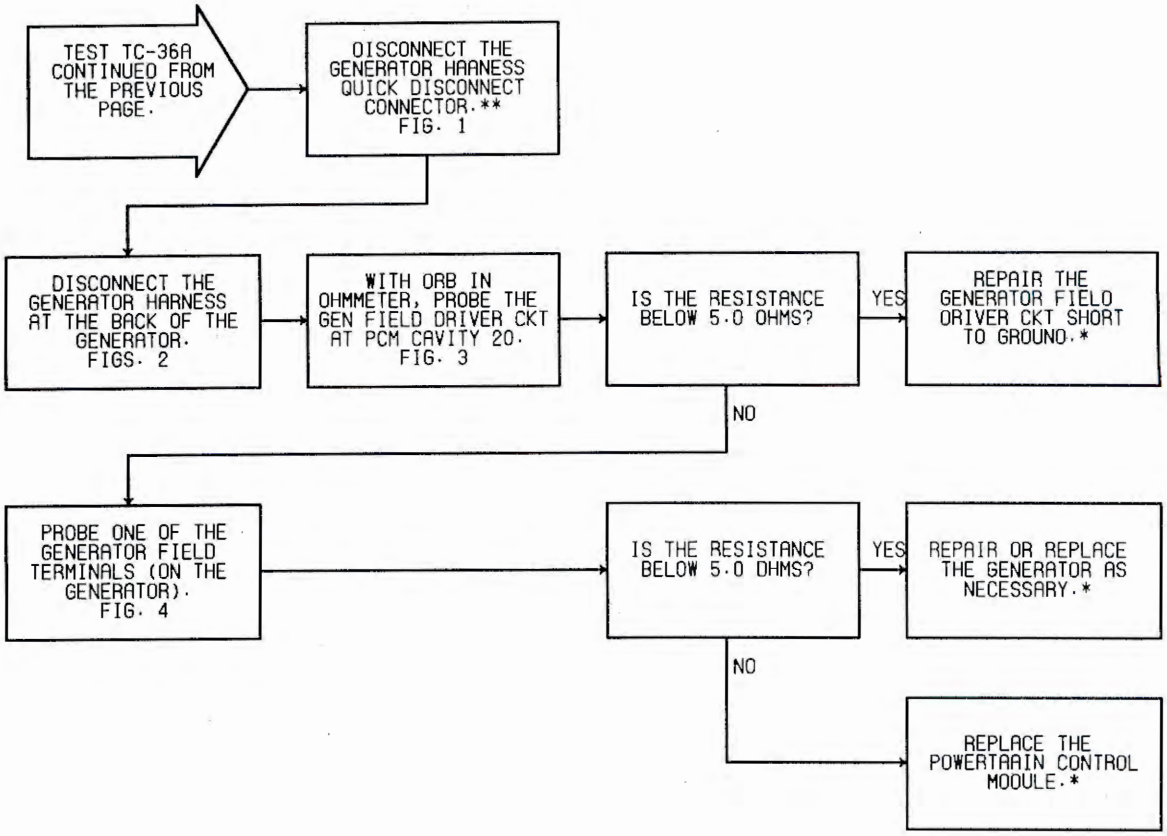


FIG. 4

TEST TC-36A CONTINUED - REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH



Perform Verification TEST VER-3A.

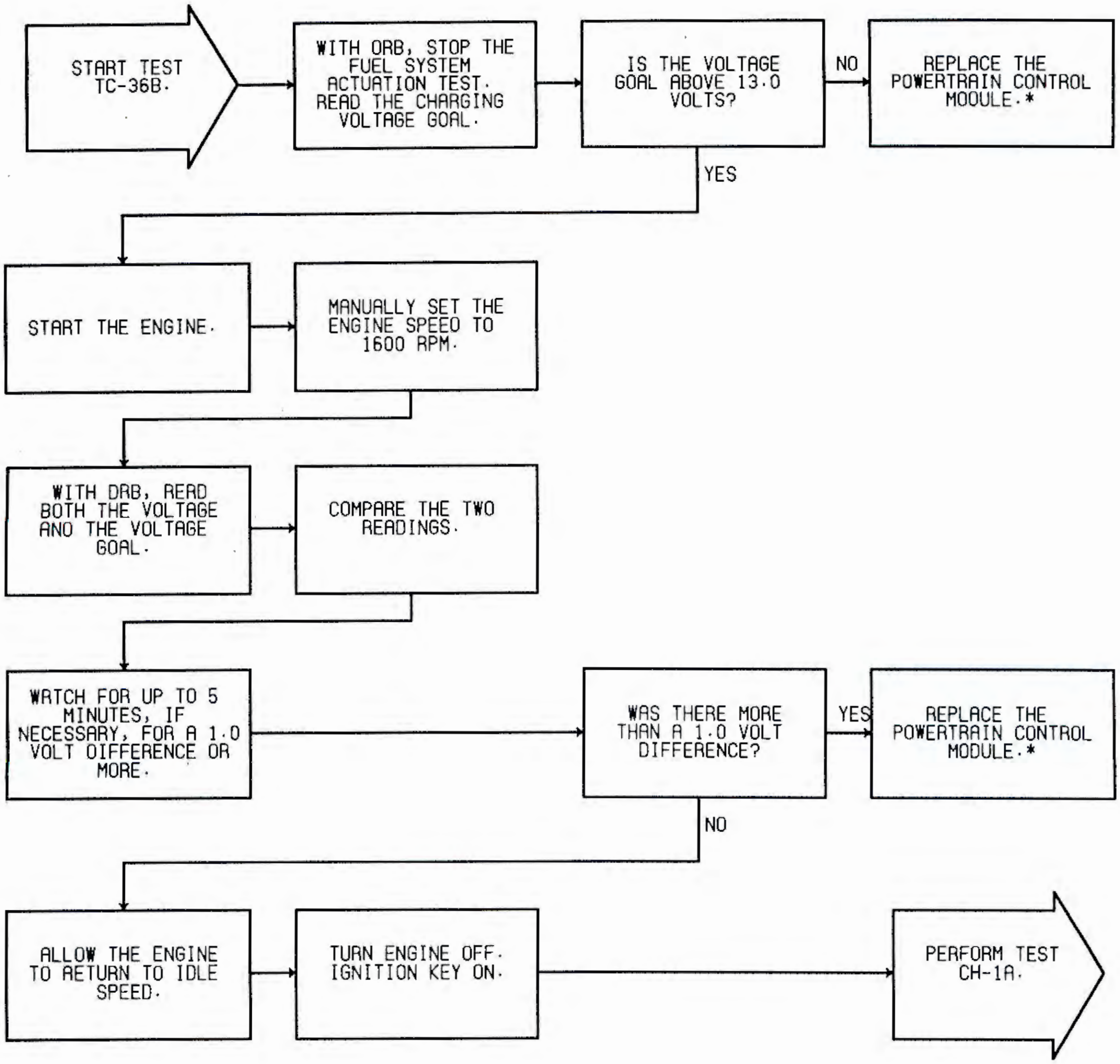
****Check connectors – Clean / repair as necessary.***

Perform TEST TC-36A Before Proceeding

NOTES

TEST TC-36B REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

Perform TEST TC-36A Before Proceeding

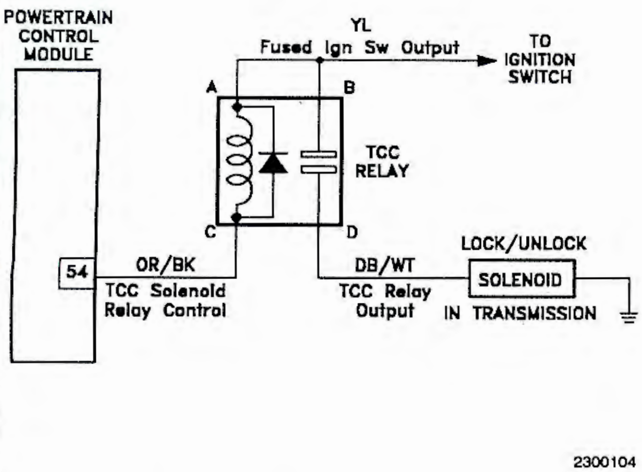


*Perform Verification TEST VER-3A.	**Check connectors – Clean / repair as necessary.

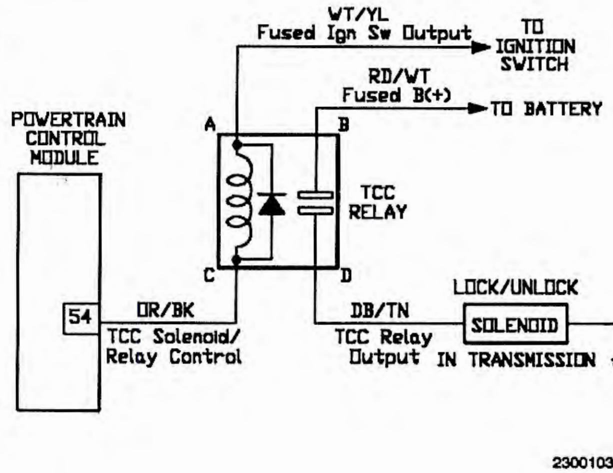
TEST TC-37A REPAIRING - TORQUE CONVERTER CLUTCH SOLENOID CKT

Perform TEST TC-1A Before Proceeding

MJ/XJ BODY



YJ BODY



MJ/XJ BODY

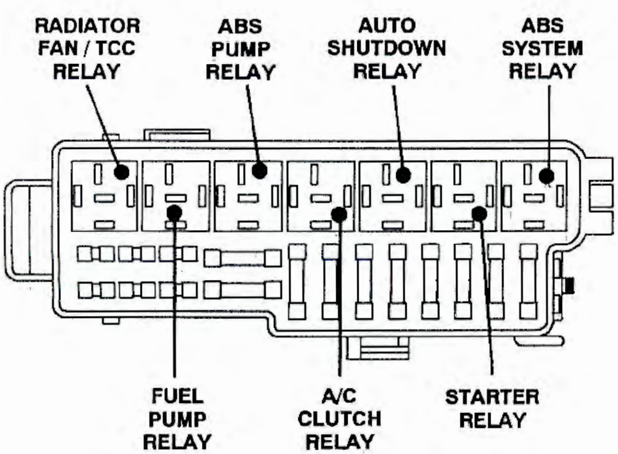


FIG. 1

YJ BODY

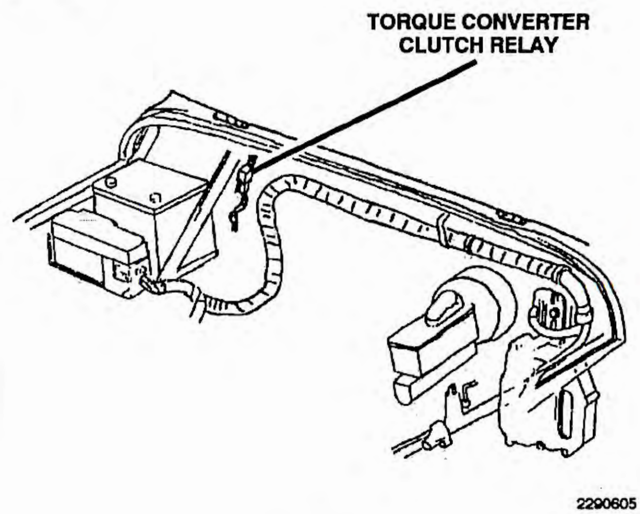


FIG. 2

Name of code: Torque Converter Clutch Solenoid Ckt

When monitored: With the ignition key on.

Set condition: An open or shorted condition is detected in the torque converter clutch solenoid control circuit.

Theory of operation: The solenoid controls the operation of the converter clutch. A small current continuously senses the state of this circuit when the ignition key is turned on.

Possible causes:
> Solenoid coil open or shorted
> Fused ignition switch output circuit open
> Solenoid control circuit open or shorted to ground

1230501

FIG. 3

INACTIVE TROUBLE CODE CONDITION

You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem:

— Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

— Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.

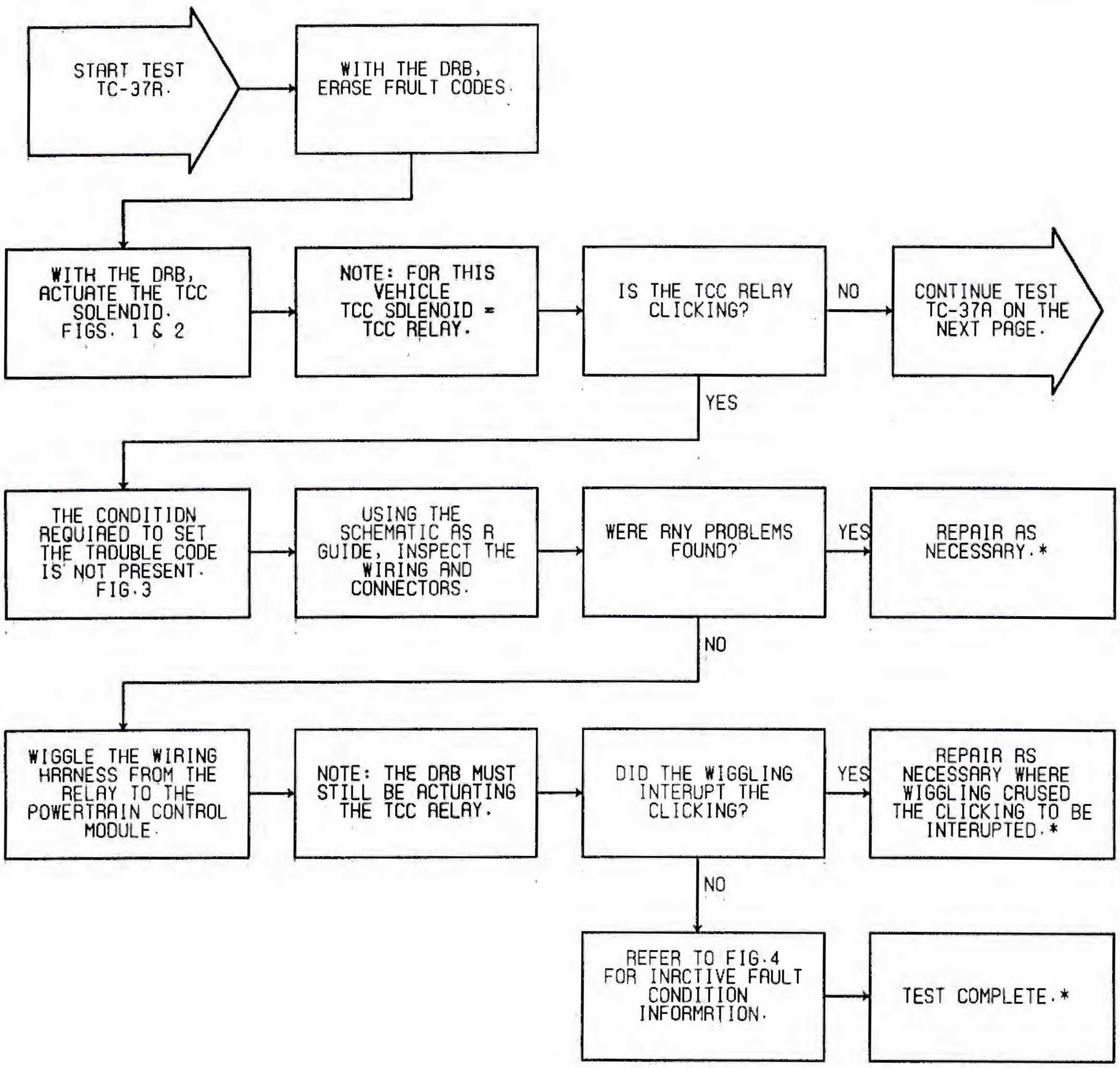
— Refer to any hotlines or technical service bulletins that may apply.

0750604

FIG. 4

TEST TC-37A | REPAIRING - TORQUE CONVERTER CLUTCH SOLENOID CKT

Perform TEST TC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST TC-37A CONTINUED - REPAIRING TORQUE CONVERTER CLUTCH SOLENOID CKT

MJ/XJ BODY

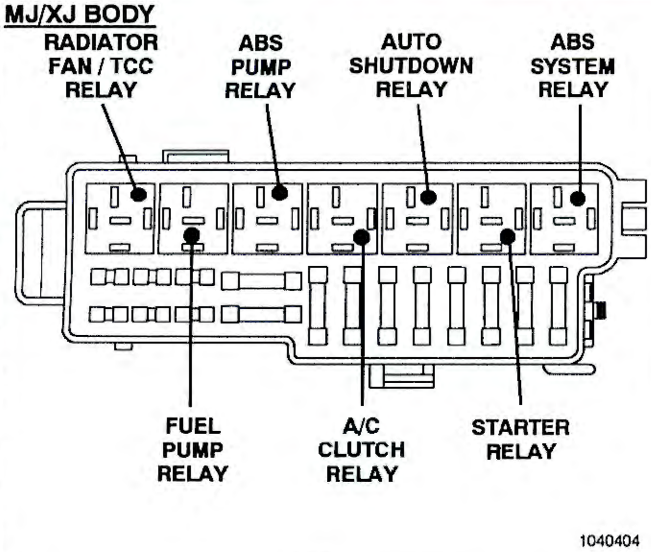


FIG. 1

YJ BODY

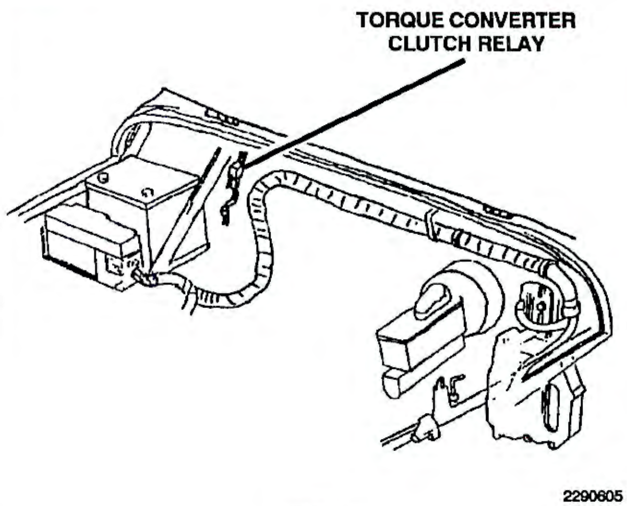
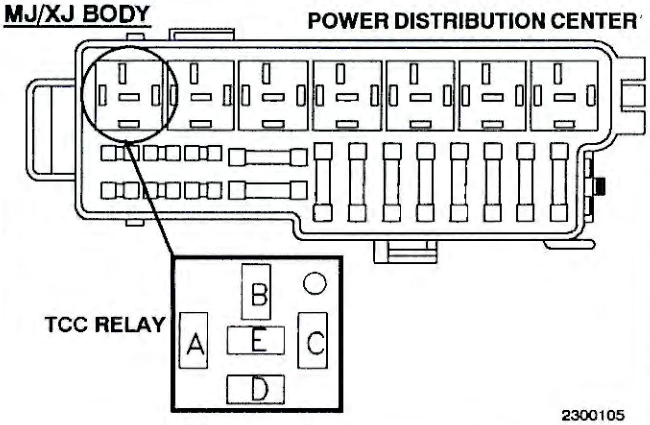


FIG. 2

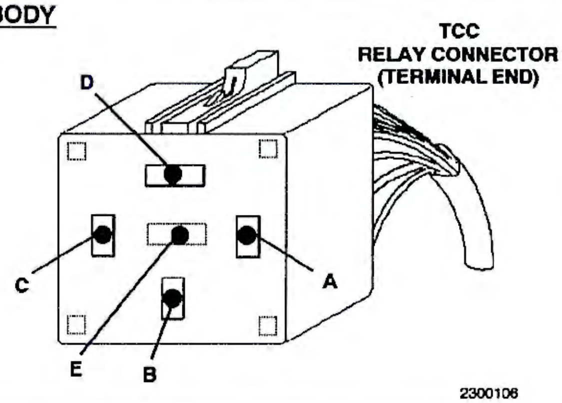
MJ/XJ BODY



CAV	COLOR	FUNCTION
A	YL	FUSED IGN SW OUTPUT
B	YL	FUSED IGN SW OUTPUT
C	OR/BK	TCC SOLENOID/RELAY CONTROL
D	DB/WT	TCC RELAY OUTPUT

FIG. 3

YJ BODY



CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	B(+)
C	OR/BK	TCC SOLENOID/RELAY CONTROL
D	DB/TN	TCC RLY OUTPUT

FIG. 4

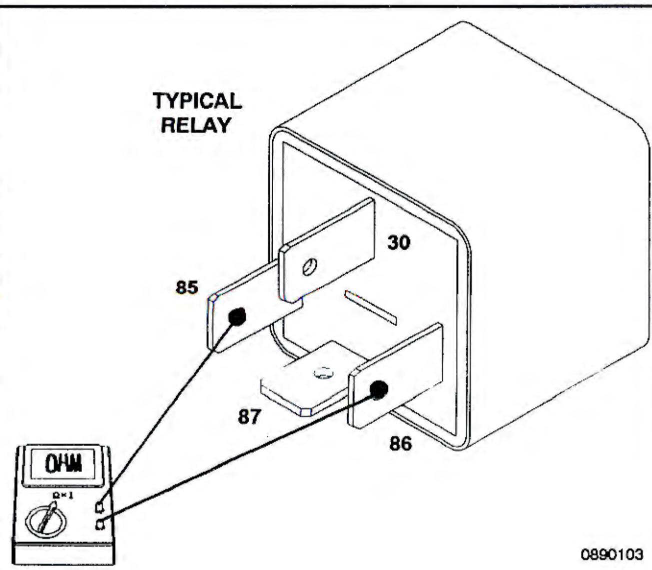


FIG. 5

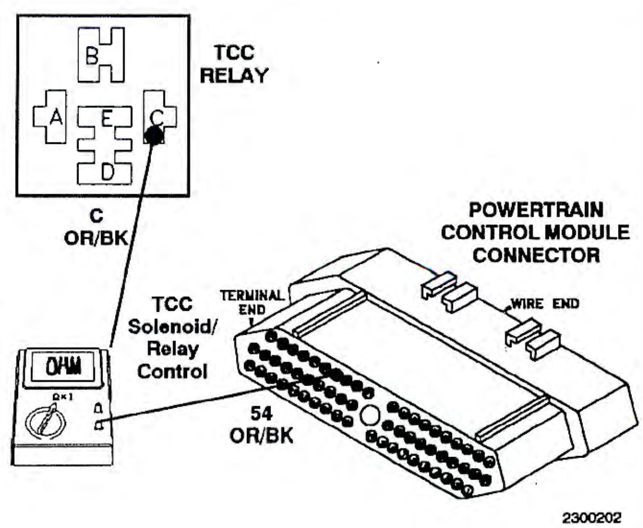
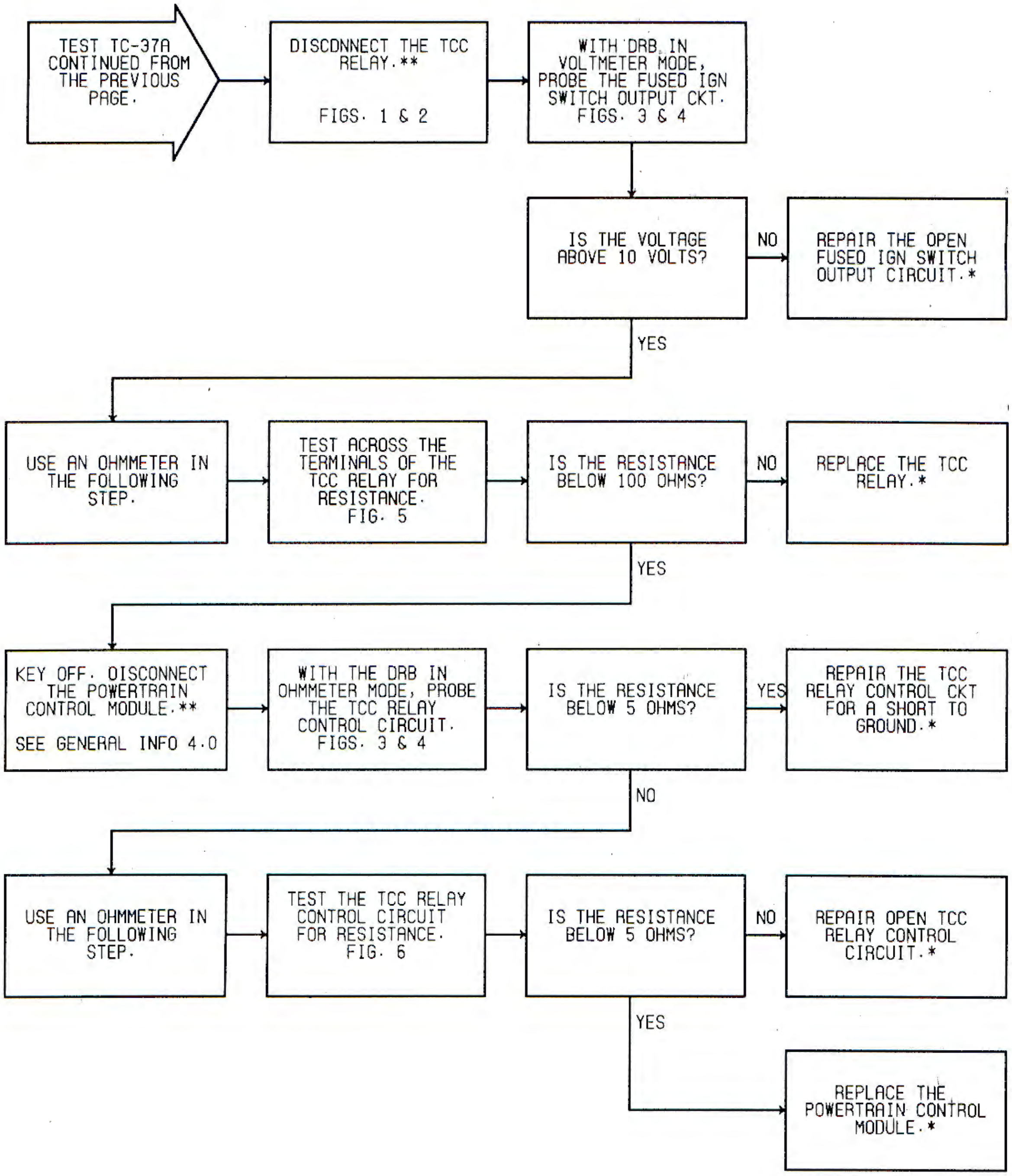


FIG. 6

TEST TC-37A CONTINUED - REPAIRING TORQUE CONVERTER CLUTCH SOLENOID CKT



*Perform Verification TEST VER-2A. | **Check connectors – Clean / repair as necessary.

N O T R O U B L E C O D E T E S T S

TEST NTC-1A | NO TROUBLE CODE TEST MENU

Perform TEST TC-1A, TC-10A, or TC-12A Before Proceeding

First, check all Technical Service Bulletins and Hotline Newsletters that relate to this driveability problem. Perform corrective actions if indicated; otherwise continue.

1. **NO TROUBLE CODE COMPLETE TEST** (non-monitored & monitored circuits)

Perform **TESTS NTC-2A** through **NTC-13A** in sequence until the driveability problem is found.

NO TROUBLE CODE MENU

CHECKING SECONDARY IGNITION AND TIMING NTC-2A
CHECKING THE FUEL PRESSURE NTC-3A
CHECKING COOLANT SENSOR CALIBRATION NTC-4A
CHECKING THROTTLE POSITION SENSOR CALIBRATION NTC-5A
CHECKING MAP SENSOR CALIBRATION NTC-6A
CHECKING FOR OXYGEN SENSOR SWITCHING NTC-7A
CHECKING THE OXYGEN SENSOR HEATER NTC-8A
CHECKING THE IDLE AIR CONTROL MOTOR NTC-9A
CHECKING THE PARK/NEUTRAL POSITION SWITCH NTC-10A
CHECKING THE PCM POWER AND GROUND CIRCUITS NTC-11A
CHECKING THE ENGINE VACUUM NTC-12A
CHECKING THE ENGINE MECHANICAL SYSTEMS NTC-13A

2. **NO TROUBLE CODE QUICK INDIVIDUAL TEST** (individual test only)

If you suspect any of the above items to be the cause of the vehicle's driveability problem, perform the associated test(s) individually. **Return to No Trouble Code Menu if driveability problem still exists, or perform No Trouble Code Complete Test.**

3. **NO TROUBLE CODE QUICK SYMPTOM TEST** (symptom test only)

Symptom checks cannot be used properly unless the driveability problem characteristic actually happens while the vehicle is being tested. To reduce diagnostic time, ensure that TC-1A and appropriate GENERAL INFORMATION sections have been reviewed before attempting to diagnose a symptom.

Select the symptom that most accurately describes the vehicle's driveability problem and then perform the test routine that pertains to this symptom. Perform each routine test in sequence until the problem is found. For definitions, see Section 12.0 in the GENERAL INFORMATION section in this manual.

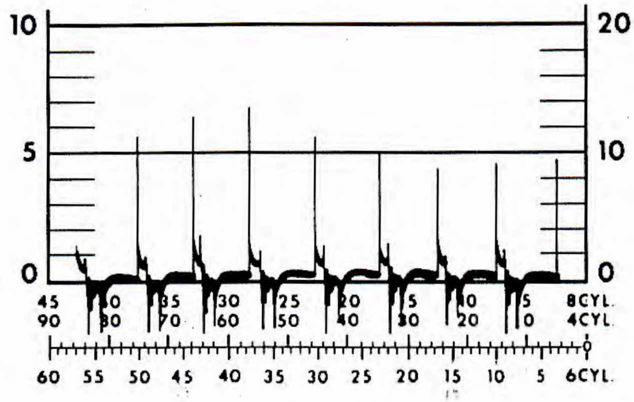
SYMPTOM	DIAGNOSTIC TEST ROUTINE
HARD START	NTC-2A, 3A, 4A, 5A, 6A, 7A, 9A, 11A, 12A, 13A
START AND STALL	NTC-2A, 3A, 4A, 5A, 6A, 9A, 11A, 13A
HESITATION/SAG/STUMBLE	NO TROUBLE CODE COMPLETE TEST (STEP 1)
SURGE	NTC-2A, 3A, 4A, 5A, 6A, 7A, 9A, 11A, 13A
LACK OF POWER/SLUGGISH	NTC-2A, 3A, 4A, 5A, 6A, 9A, 11A, 12A, 13A
SPARK KNOCK/DETONATION	NTC-2A, 3A, 4A, 5A, 6A, 7A, 8A, 9A, 11A, 12A, 15A
CUTS OUT/MISSES	NTC-2A, 3A, 7A, 11A, 12A, 13A
BACKFIRE/POPBACK	NTC-2A, 3A, 6A, 7A, 11A, 12A, 13A
RUNS ROUGH/UNSTABLE/ERRATIC IDLE	NO TROUBLE CODE COMPLETE TEST (STEP 1)
POOR FUEL ECONOMY	NO TROUBLE CODE COMPLETE TEST (STEP 1)

Perform TEST TC-1A, TC-10A, or TC-12A Before Proceeding

NOTES

TEST NTC-2A CHECKING SECONDARY IGNITION AND TIMING

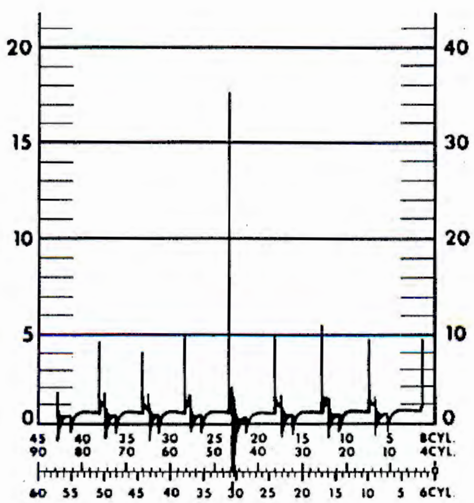
Perform TEST NTC-1A Before Proceeding



TYPICAL SCOPE PATTERN

0830204

FIG. 1



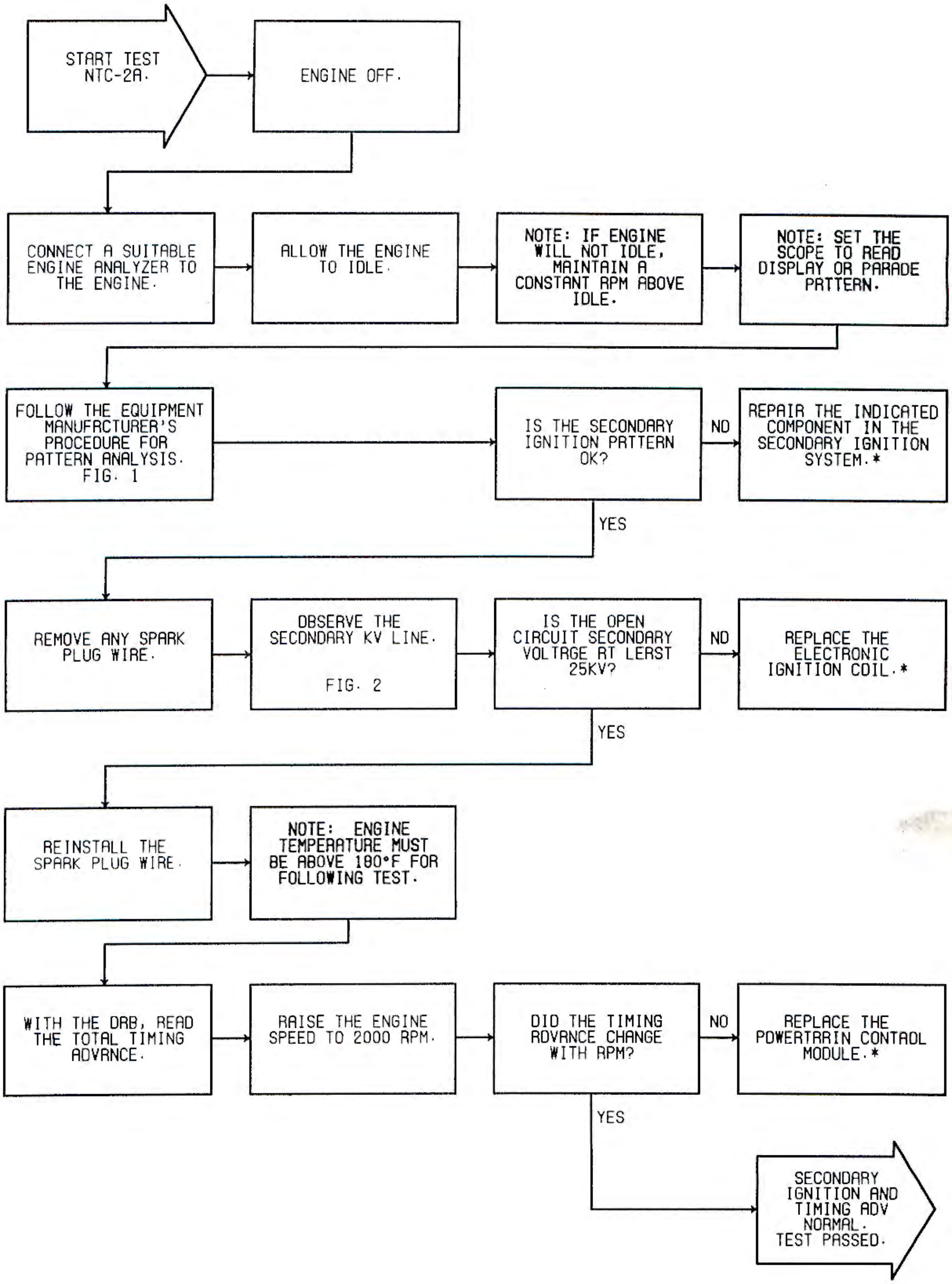
TYPICAL SCOPE PATTERN

0830205

FIG. 2

TEST NTC-2A CHECKING SECONDARY IGNITION AND TIMING

Perform TEST NTC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

NO TROUBLE CODE TESTS

TEST NTC-3A	CHECKING THE FUEL PRESSURE

Perform TEST NTC-1A Before Proceeding

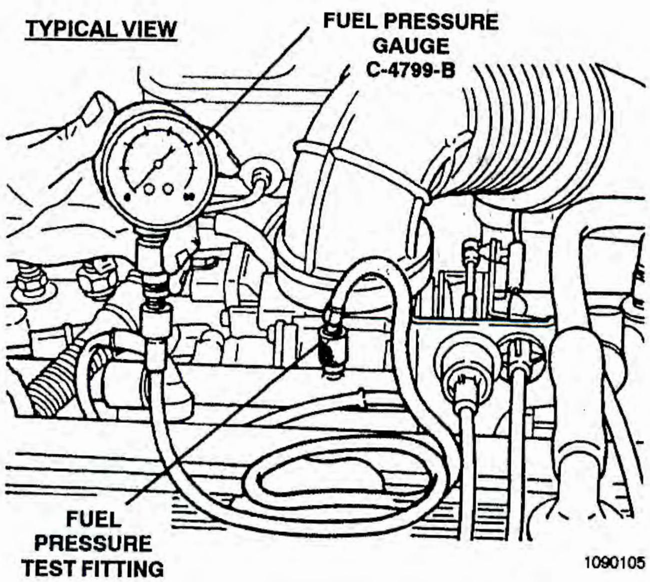
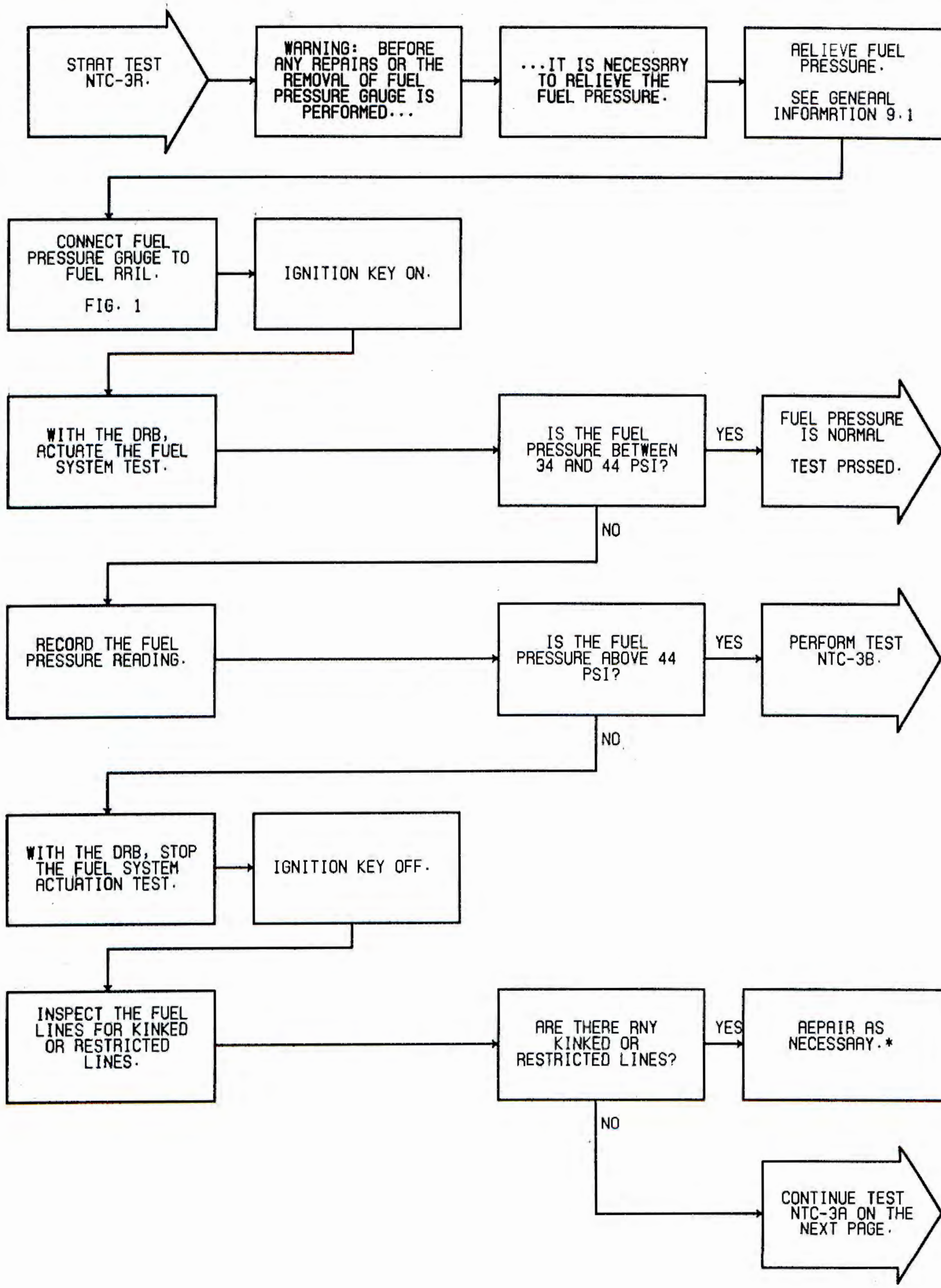


FIG. 1

TEST NTC-3A CHECKING THE FUEL PRESSURE

Perform TEST NTC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST NTC-3A CONTINUED - CHECKING THE FUEL PRESSURE

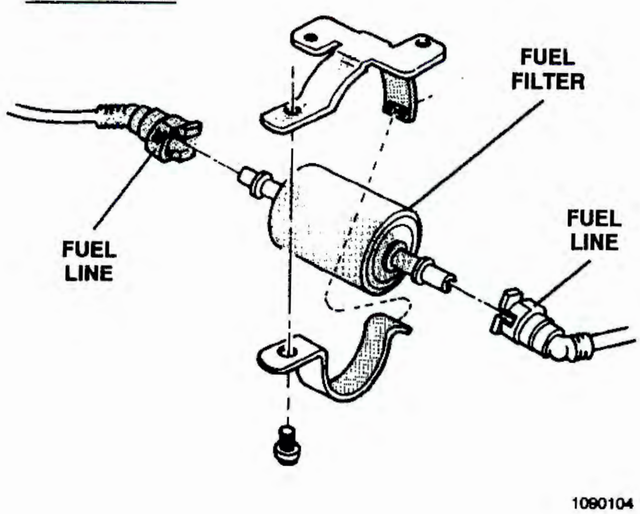
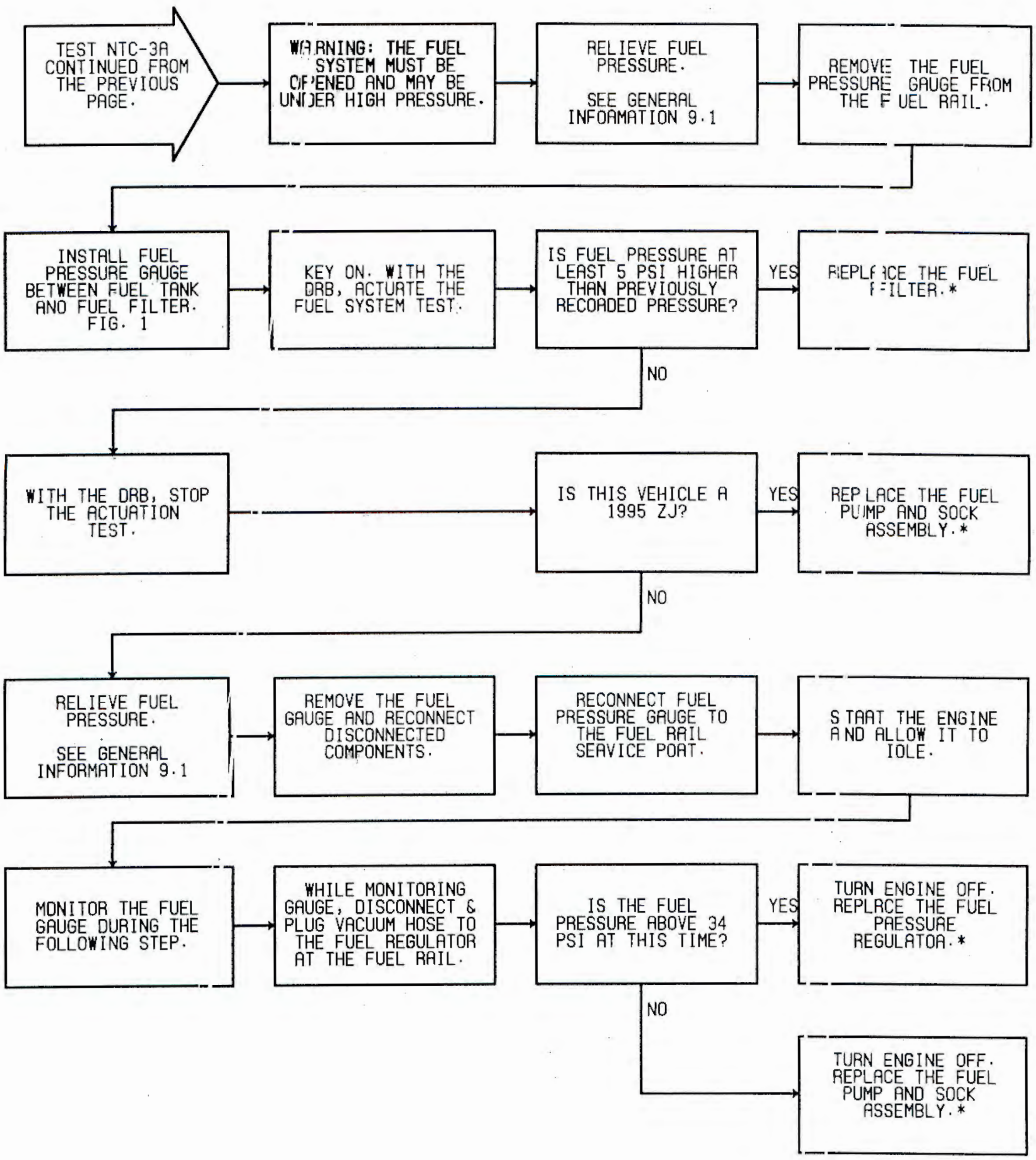


FIG. 1

TEST NTC-3A CONTINUED - CHECKING THE FUEL PRESSURE



***Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.**

TEST NTC-3B CHECKING THE FUEL PRESSURE

Perform TEST NTC-3A Before Proceeding

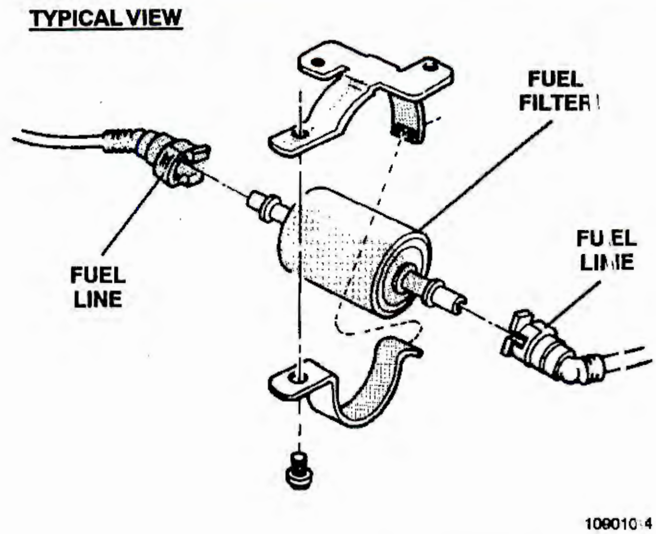


FIG. 1

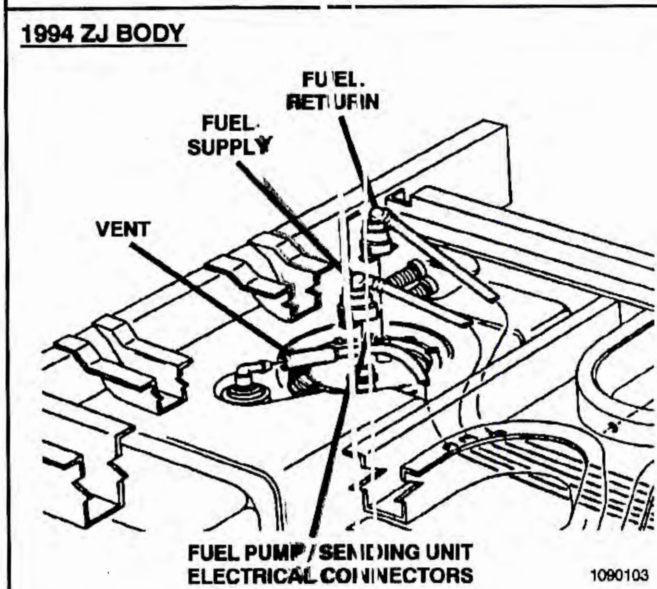


FIG. 2

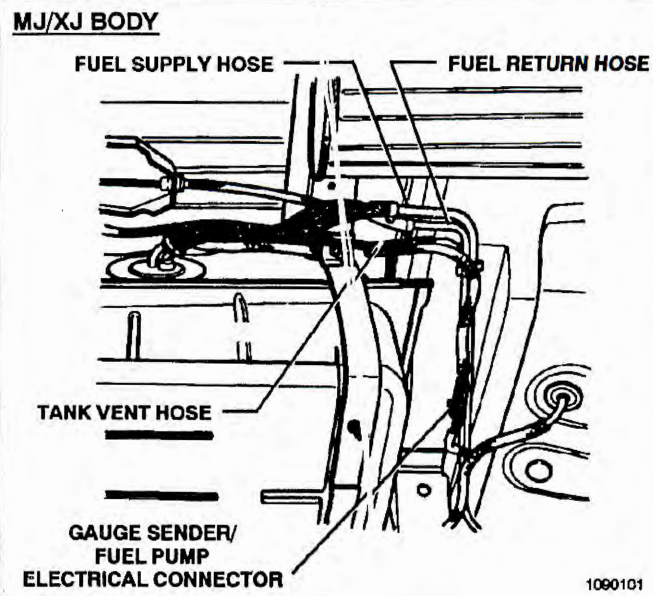


FIG. 3

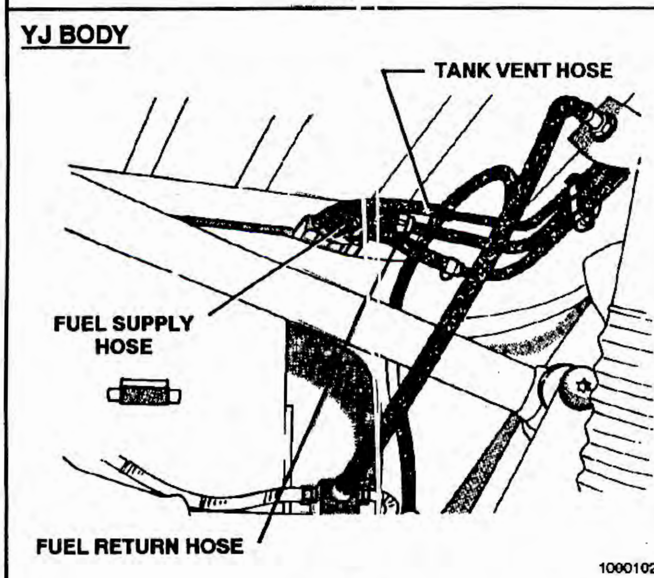


FIG. 4

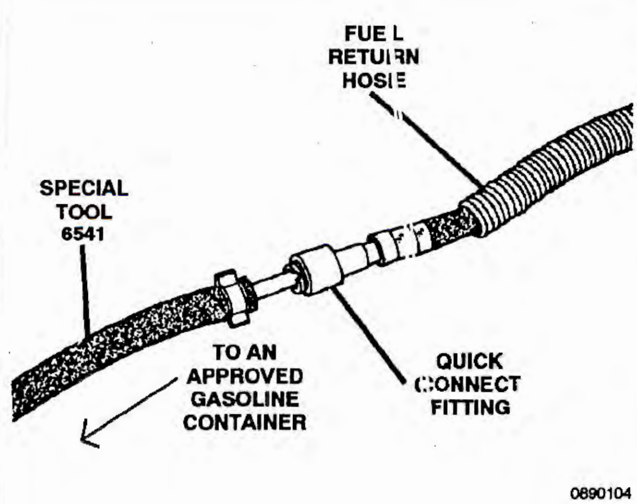
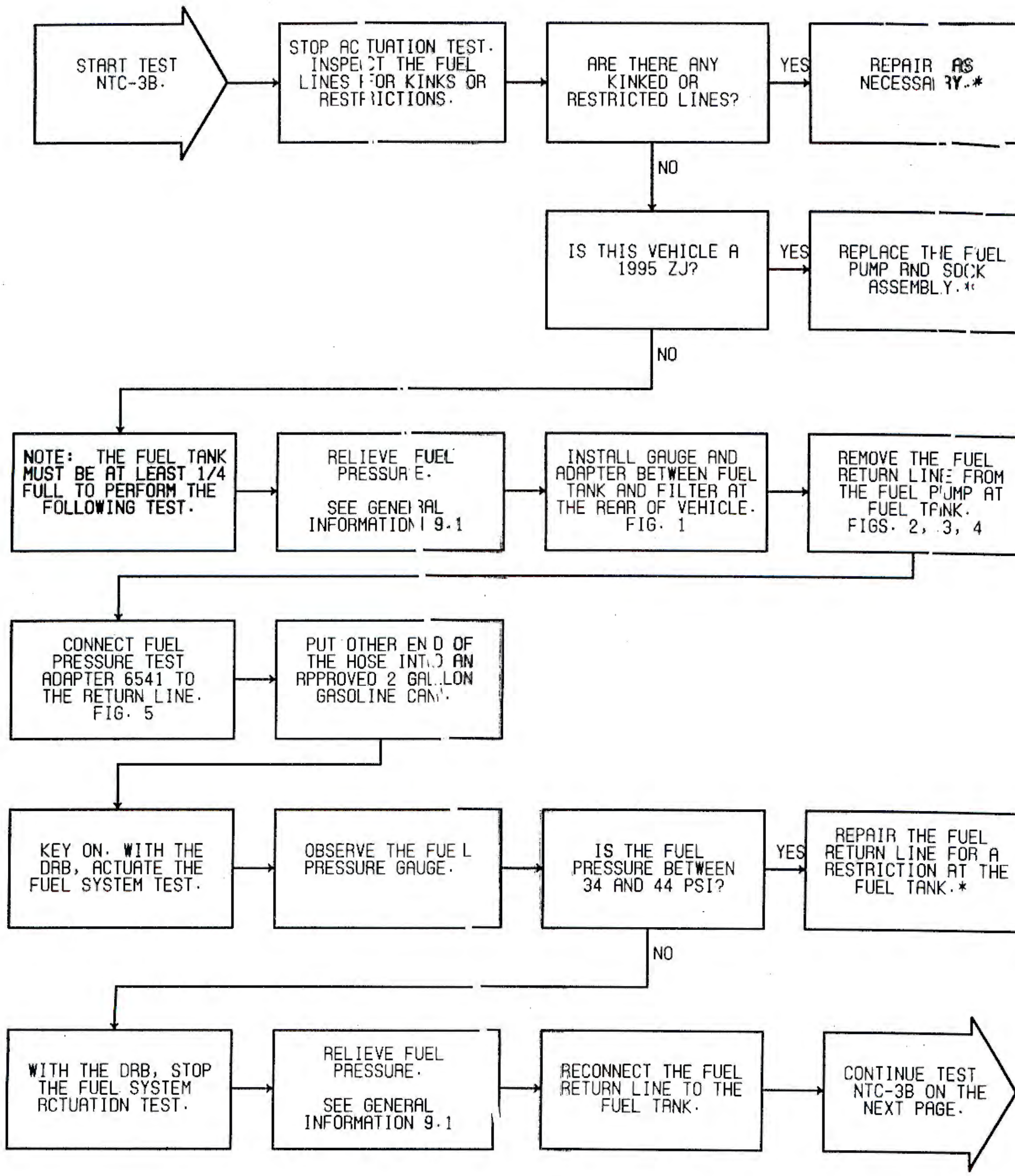


FIG. 5

TEST NTC-3B **CHECKING THE FUEL PRESSURE**

Perform TEST NTC-3A Before Proceeding



*Perform Verification TEST VER-2A.

**Check connectors – Clean / repair as necessary.

TEST NTC-3B CONTINUED - CHECKING THE FUEL PRESSURE

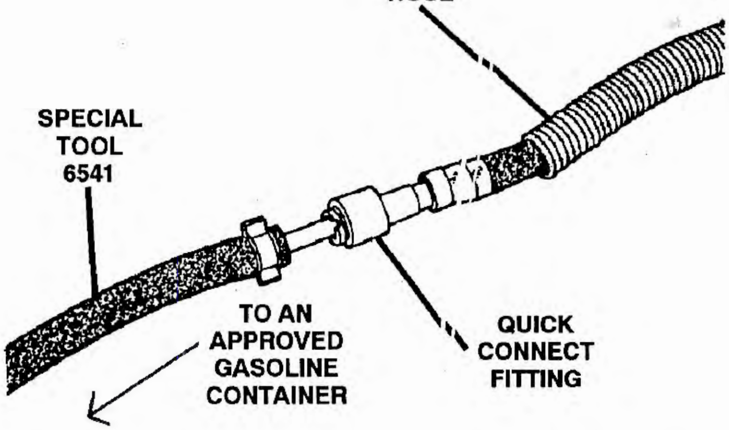
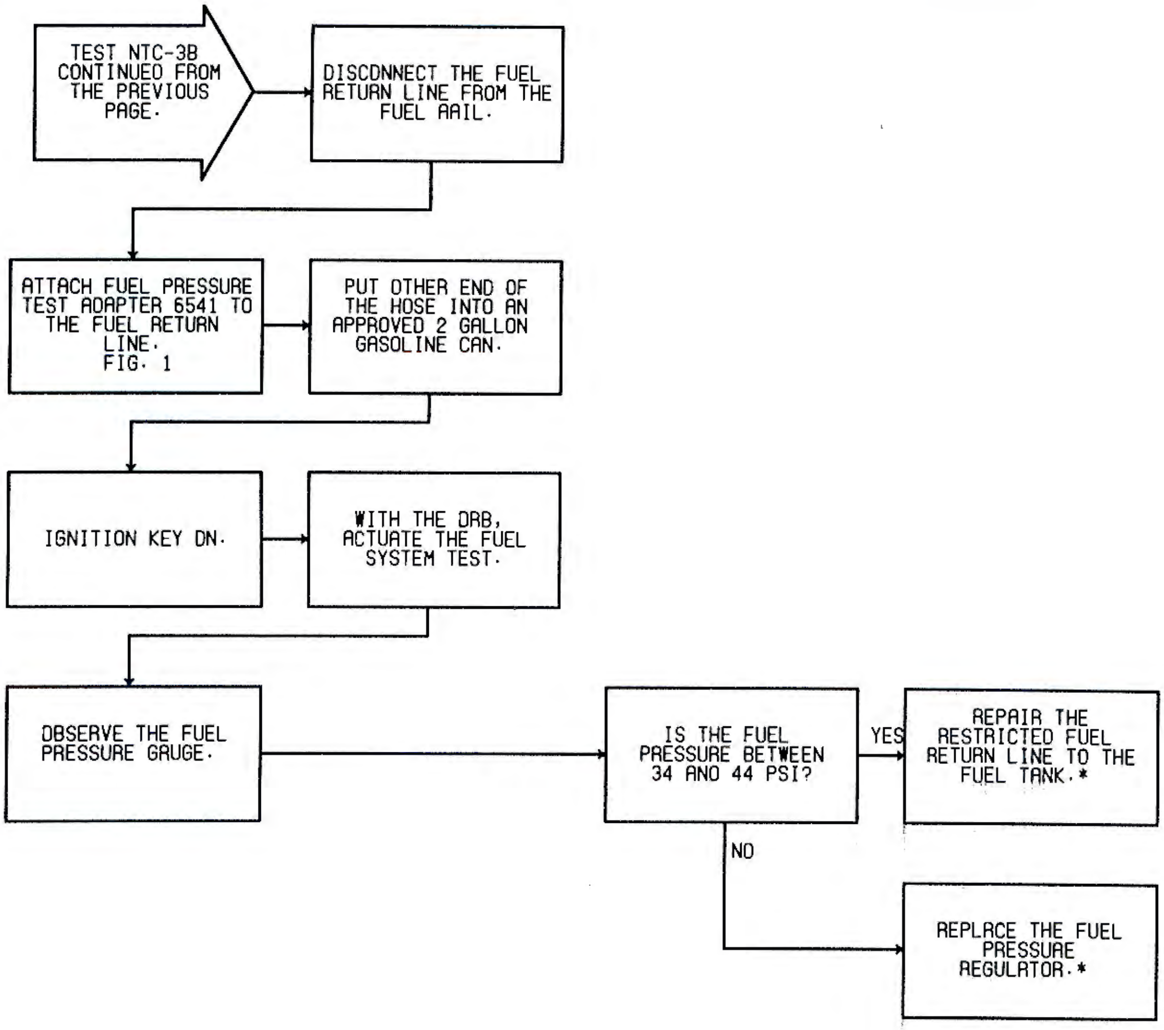


FIG. 1

TEST NTC-3B CONTINUED - CHECKING THE FUEL PRESSURE



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST NTC-4A | CHECKING COOLANT SENSOR CALIBRATION

Perform TEST NTC-1A Before Proceeding

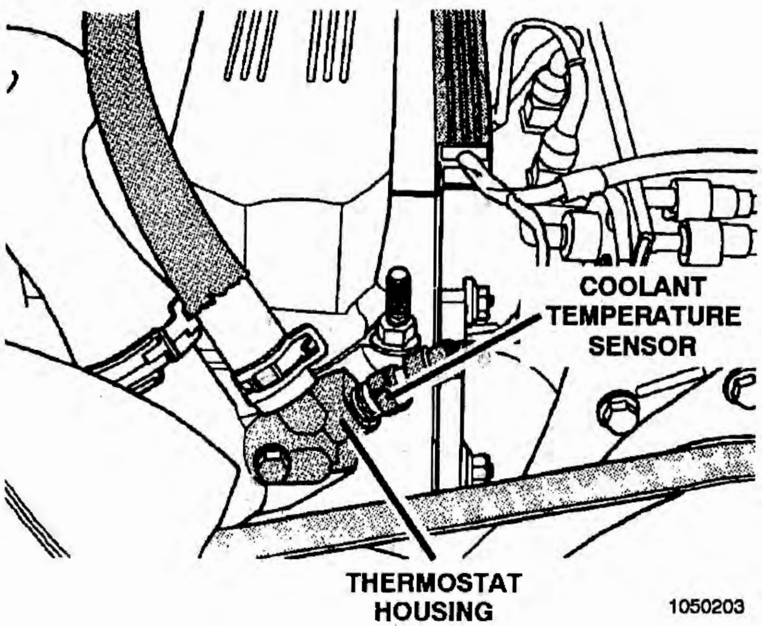
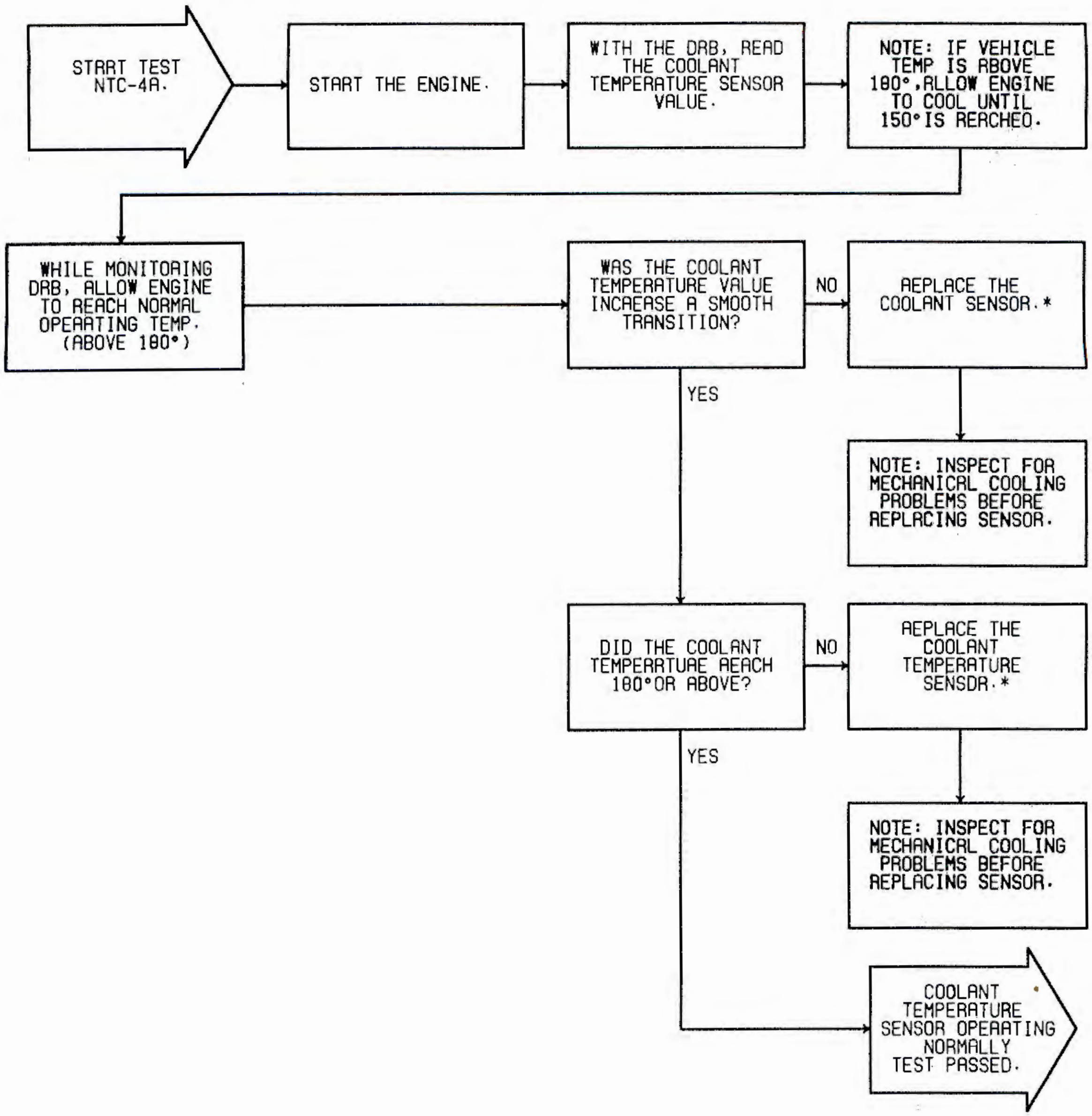


FIG. 1

TEST NTC-4A CHECKING COOLANT SENSOR CALIBRATION

Perform TEST NTC-1A Before Proceeding



***Perform Verification TEST VER-2A.**

****Check connectors – Clean / repair as necessary.**

NO TROUBLE CODE TESTS

TEST NTC-5A CHECKING THROTTLE POSITION SENSOR CALIBRATION

Perform TEST NTC-1A Before Proceeding

2.5L ENGINE

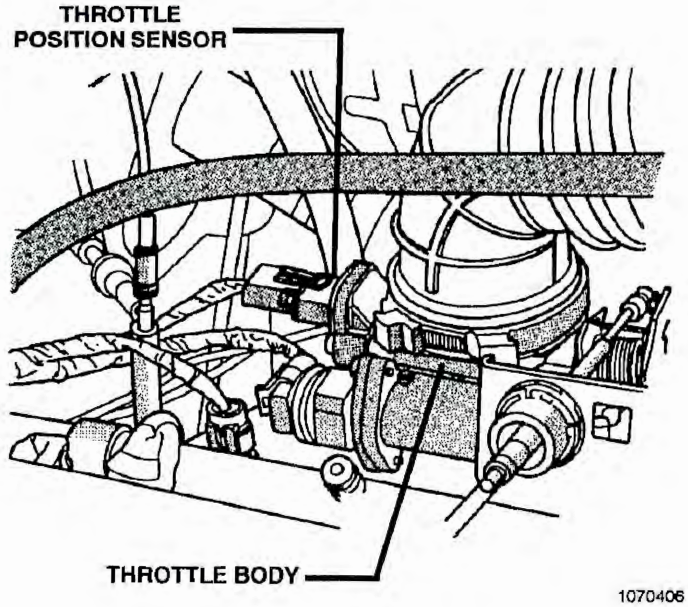


FIG. 1

4.0L ENGINE

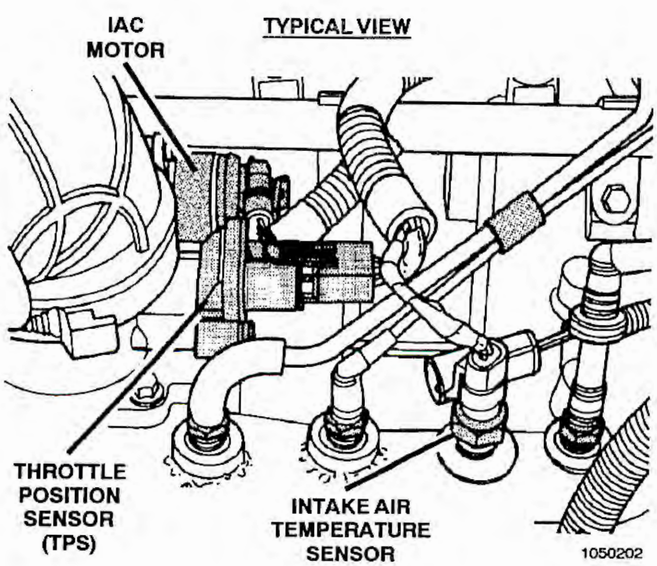
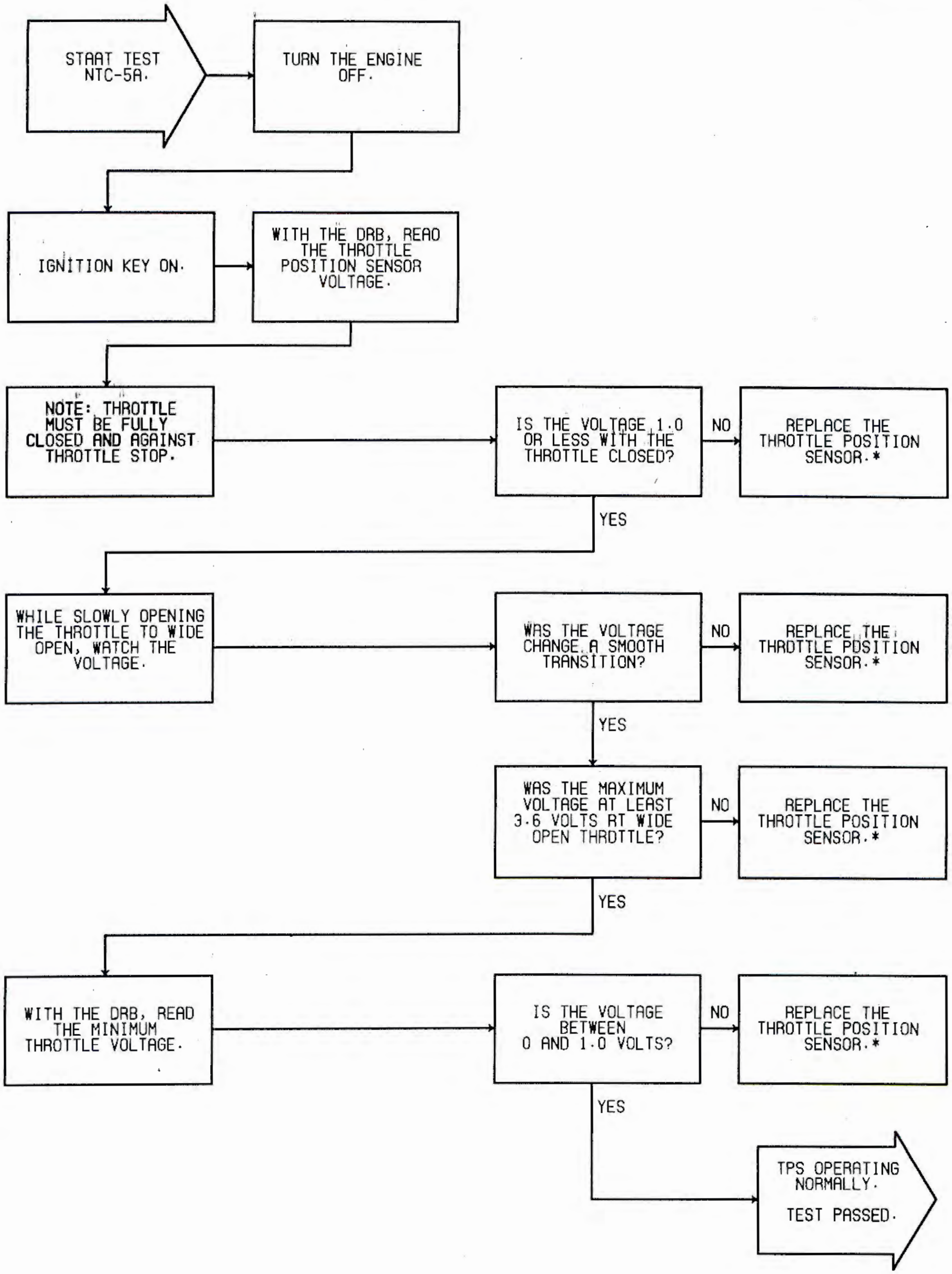


FIG. 2

TEST NTC-5A CHECKING THROTTLE POSITION SENSOR CALIBRATION

Perform TEST NTC-1A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST NTC-6A | CHECKING MAP SENSOR CALIBRATION

Perform TEST NTC-1A Before Proceeding

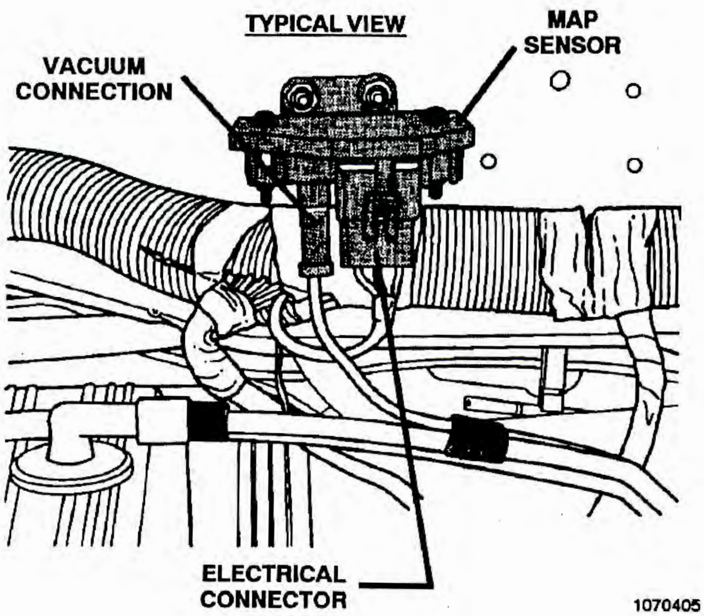
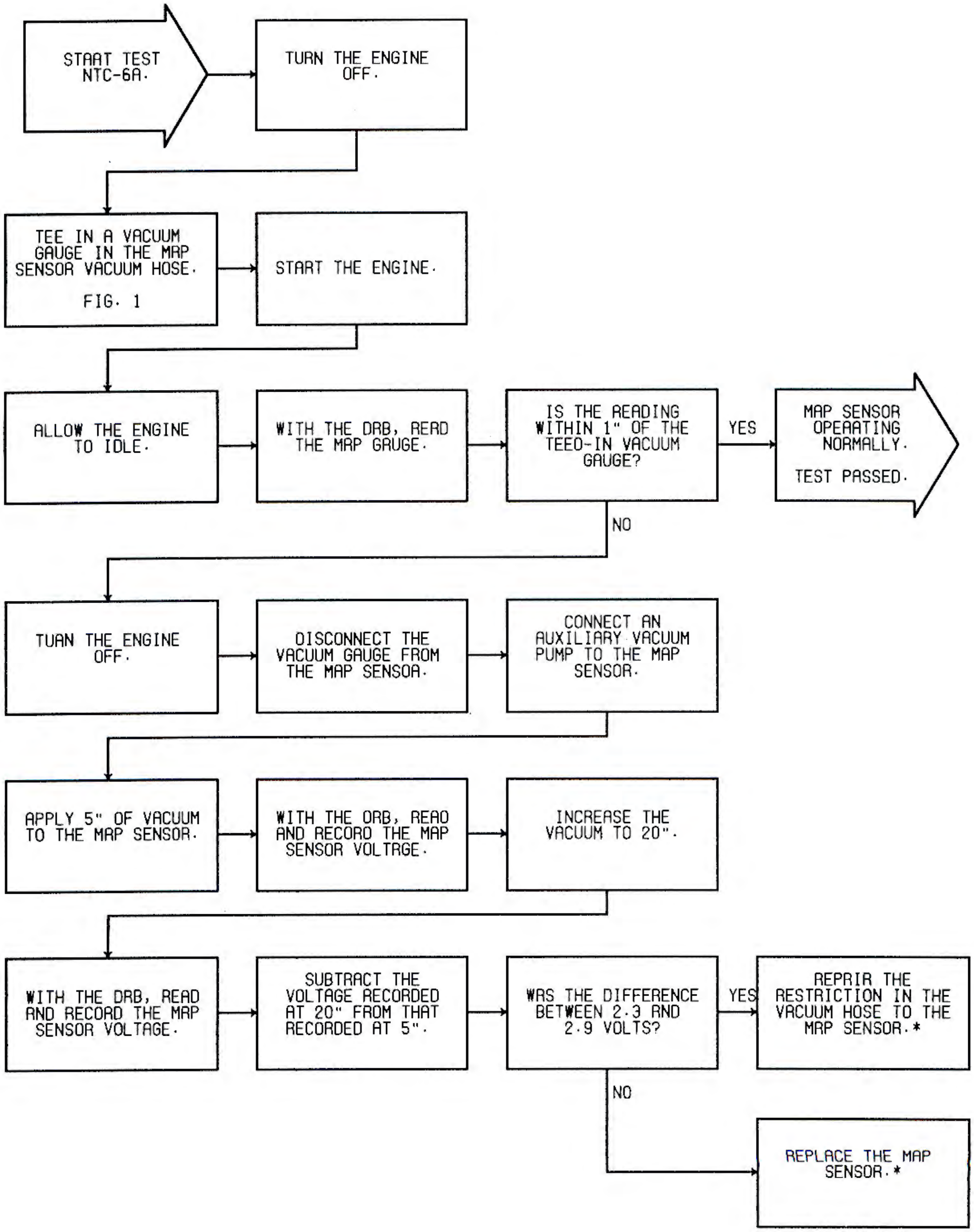


FIG. 1

TEST NTC-6A CHECKING MAP SENSOR CALIBRATION

Perform TEST NTC-1A Before Proceeding



***Perform Verification TEST VER-2A.**

****Check connectors – Clean / repair as necessary.**

NO TROUBLE CODE TESTS

TEST NTC-7A CHECKING FOR OXYGEN SENSOR SWITCHING

Perform TEST NTC-1A Before Proceeding

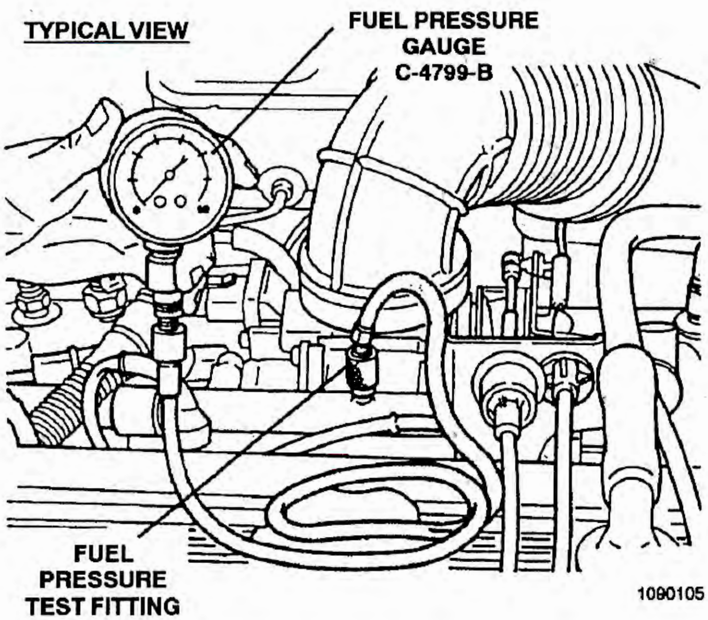
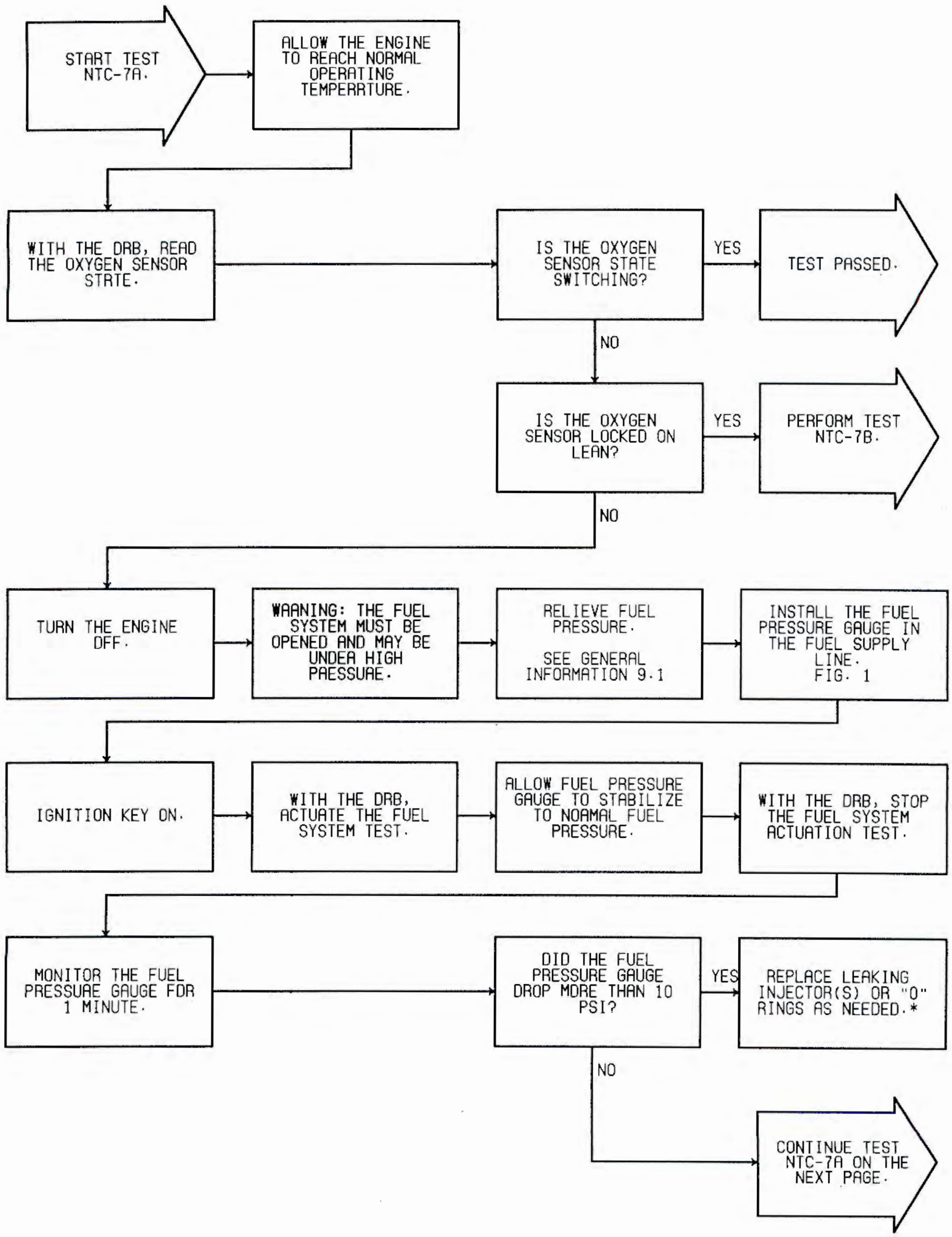


FIG. 1

TEST NTC-7A CHECKING FOR OXYGEN SENSOR SWITCHING

Perform TEST NTC-1A Before Proceeding

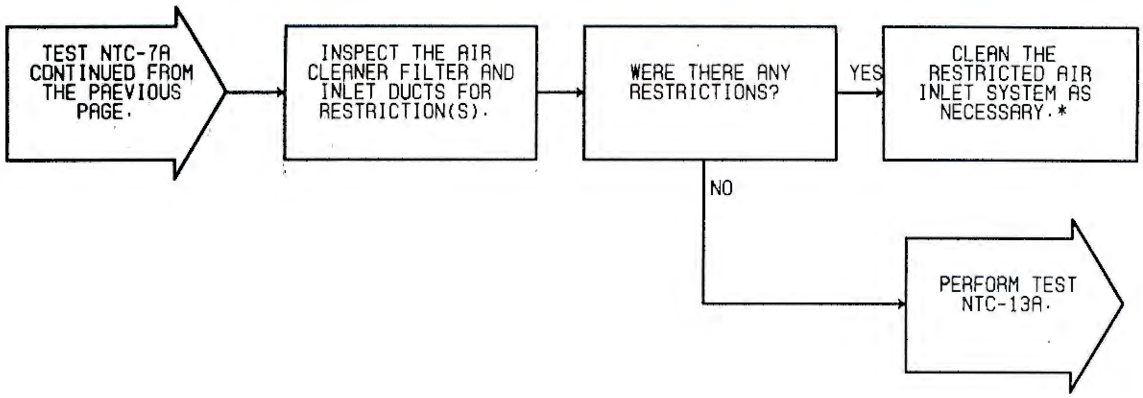


*Perform Verification TEST VER-2A.

**Check connectors – Clean / repair as necessary.

NOTES

TEST NTC-7A CONTINUED - CHECKING FOR OXYGEN SENSOR SWITCHING



***Perform Verification TEST VER-2A.**

****Check connectors – Clean / repair as necessary.**

TEST NTC-7B CHECKING FOR OXYGEN SENSOR SWITCHING

Perform TEST NTC-7A Before Proceeding

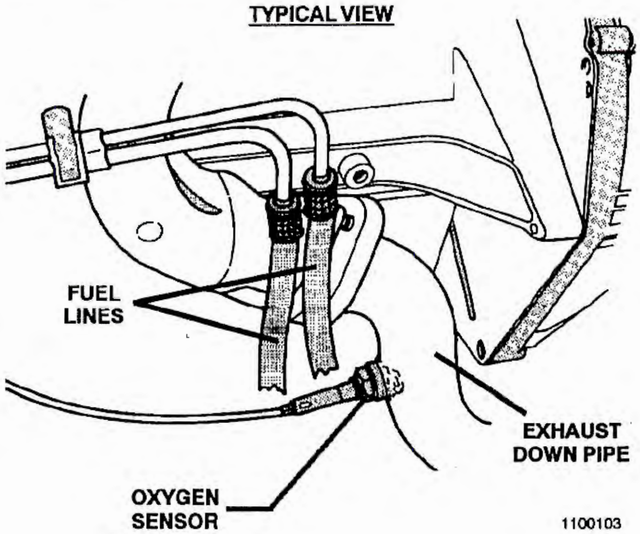


FIG. 1

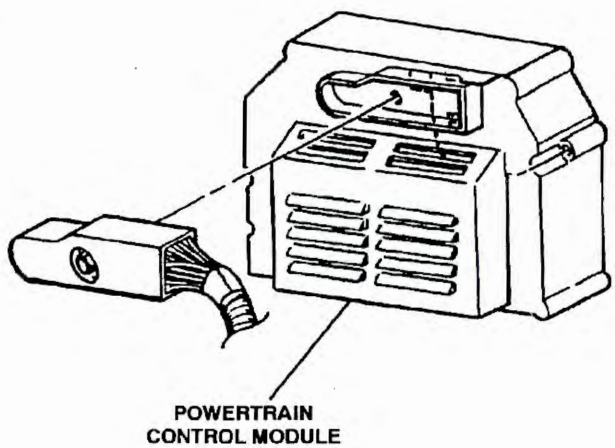
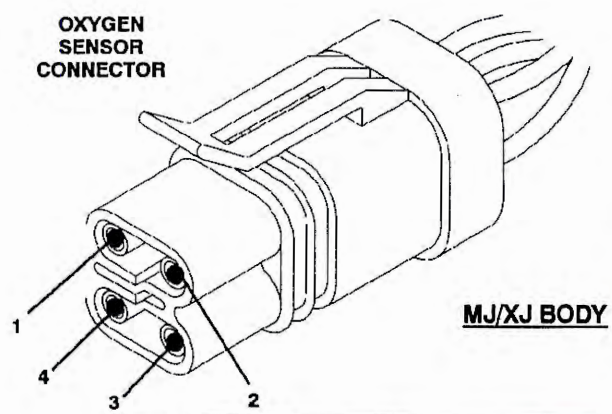
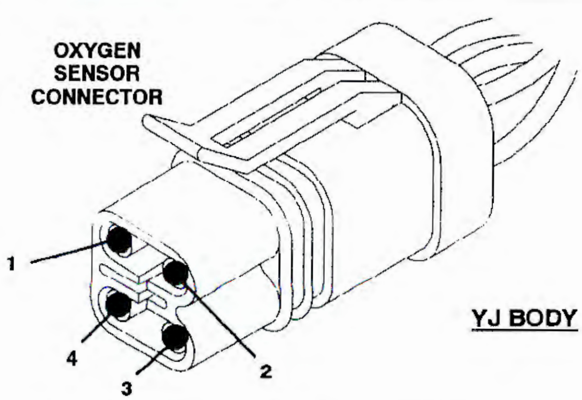


FIG. 2



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	BK/DG	SENSOR SIGNAL
3	BK/TN	HEATER GROUND
4	DG/*	FUEL PUMP RELAY OUTPUT

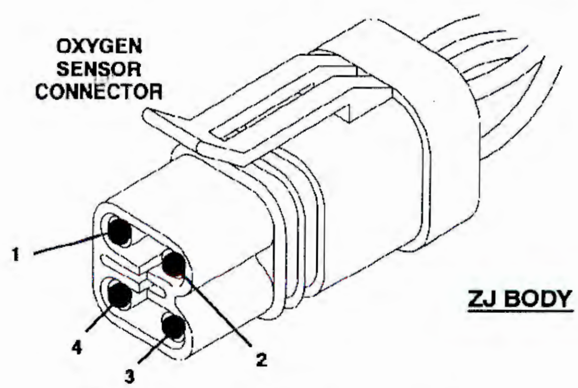
FIG. 3



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	BK/DG	SENSOR SIGNAL
3	BK	HEATER GROUND
4	DG/OR	FUEL PUMP RELAY OUTPUT

1090604

FIG. 4



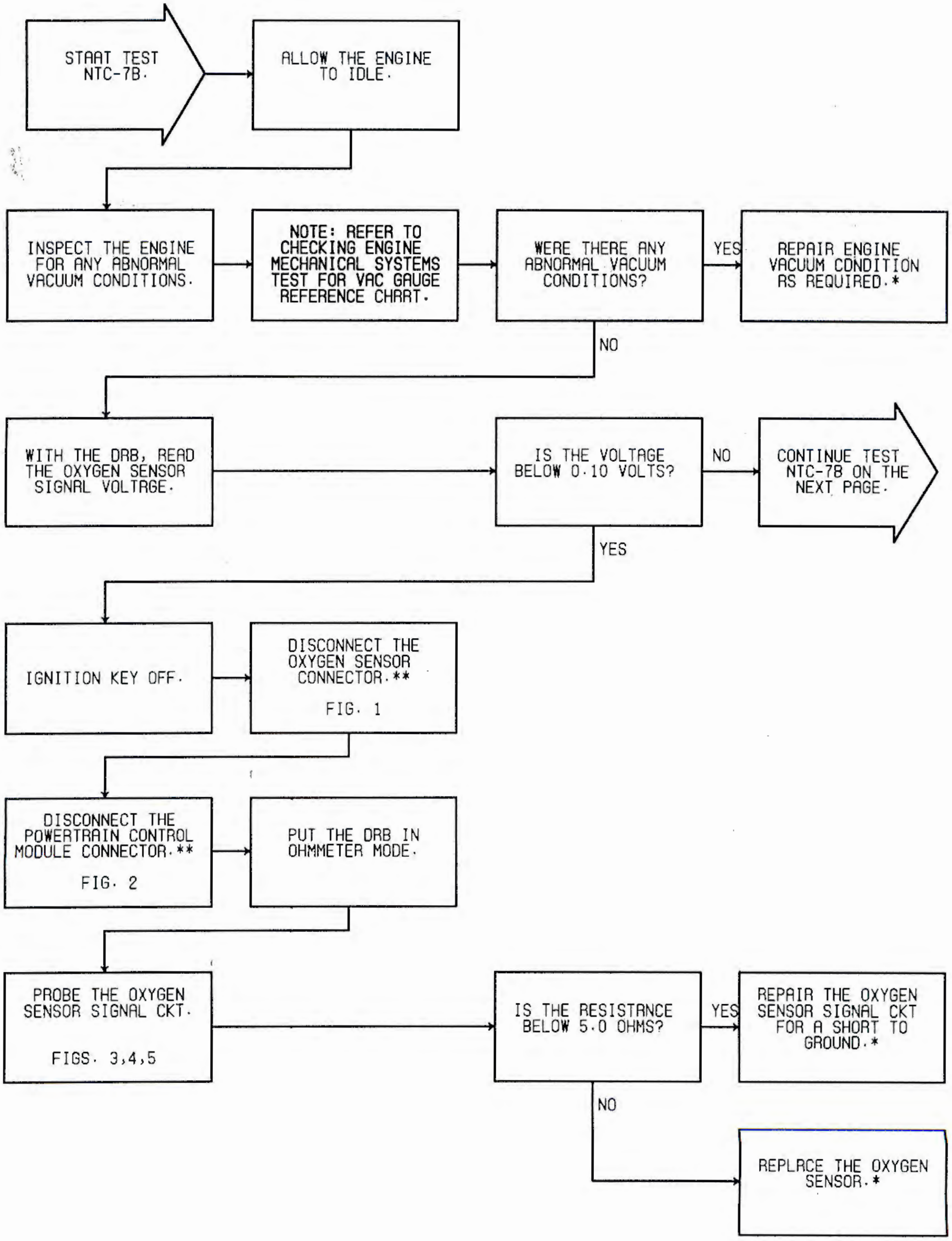
CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	BK/OR	SENSOR SIGNAL
3	BK/TN	HEATER GROUND
4	OR/DB	FUEL PUMP RELAY OUTPUT

1090605

FIG. 5

TEST NTC-7B CHECKING FOR OXYGEN SENSOR SWITCHING

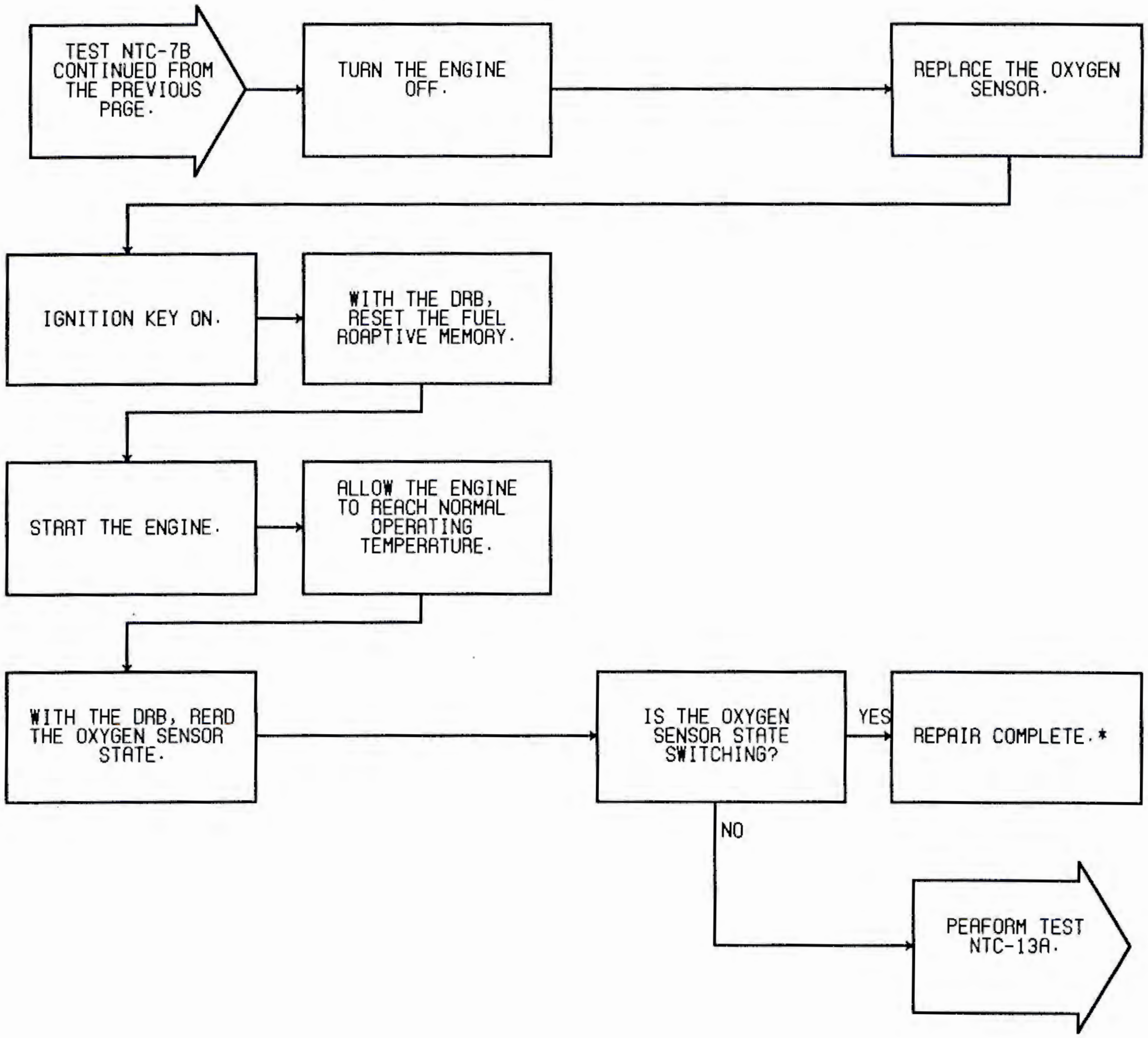
Perform TEST NTC-7A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

NOTES

TEST NTC-7B CONTINUED - CHECKING FOR OXYGEN SENSOR SWITCHING

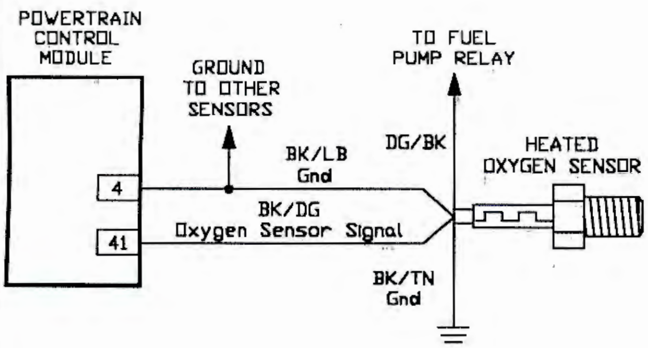


Perform Verification TEST VER-2A. | ***Check connectors – Clean / repair as necessary.*

TEST NTC-8A CHECKING THE OXYGEN SENSOR HEATER

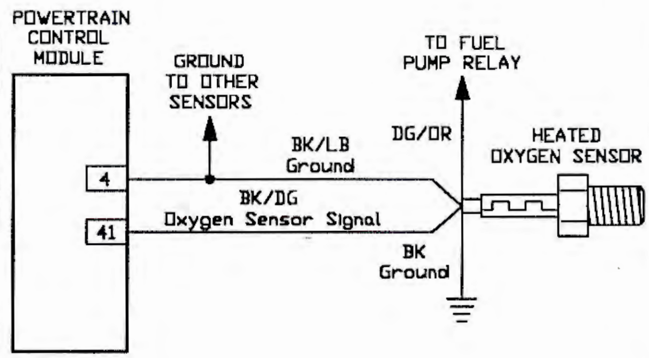
Perform TEST NTC-1A Before Proceeding

1993 MJ AND 1993-94 XJ BODIES



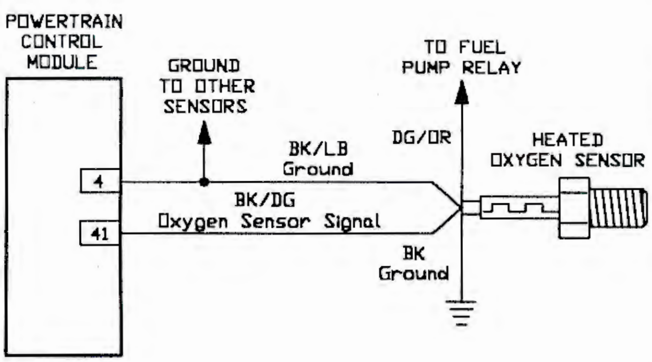
1160601

1995 XJ BODY



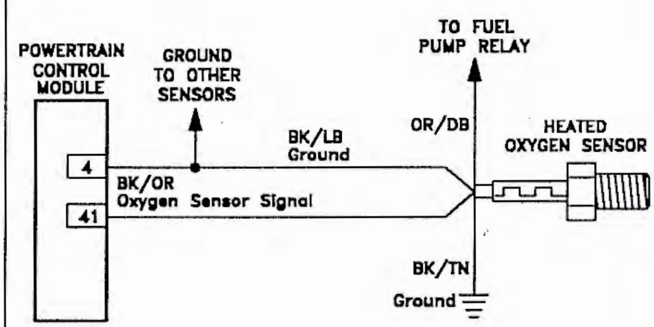
2580302

YJ BODY



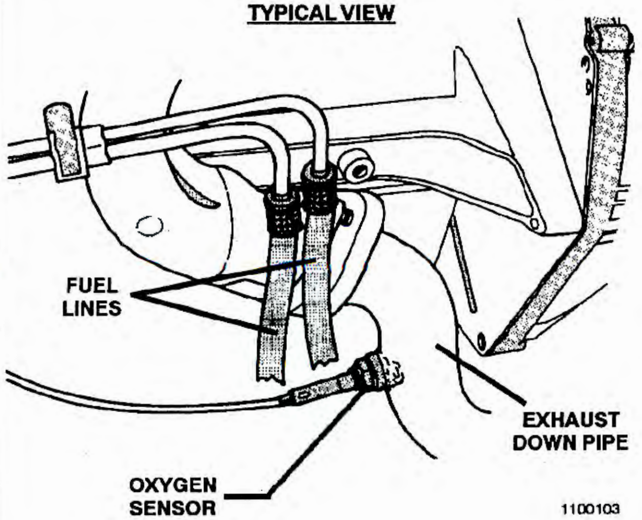
1070103

ZJ BODY



1020105

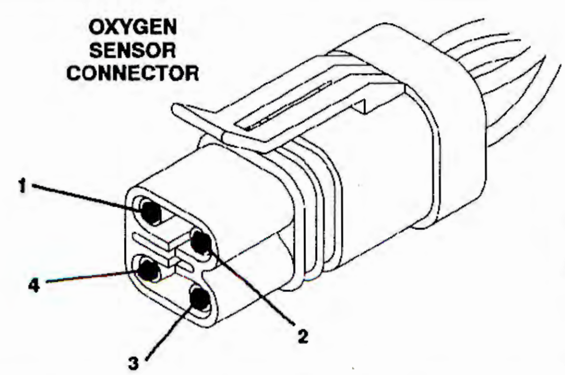
TYPICAL VIEW



1100103

FIG. 1

OXYGEN SENSOR CONNECTOR



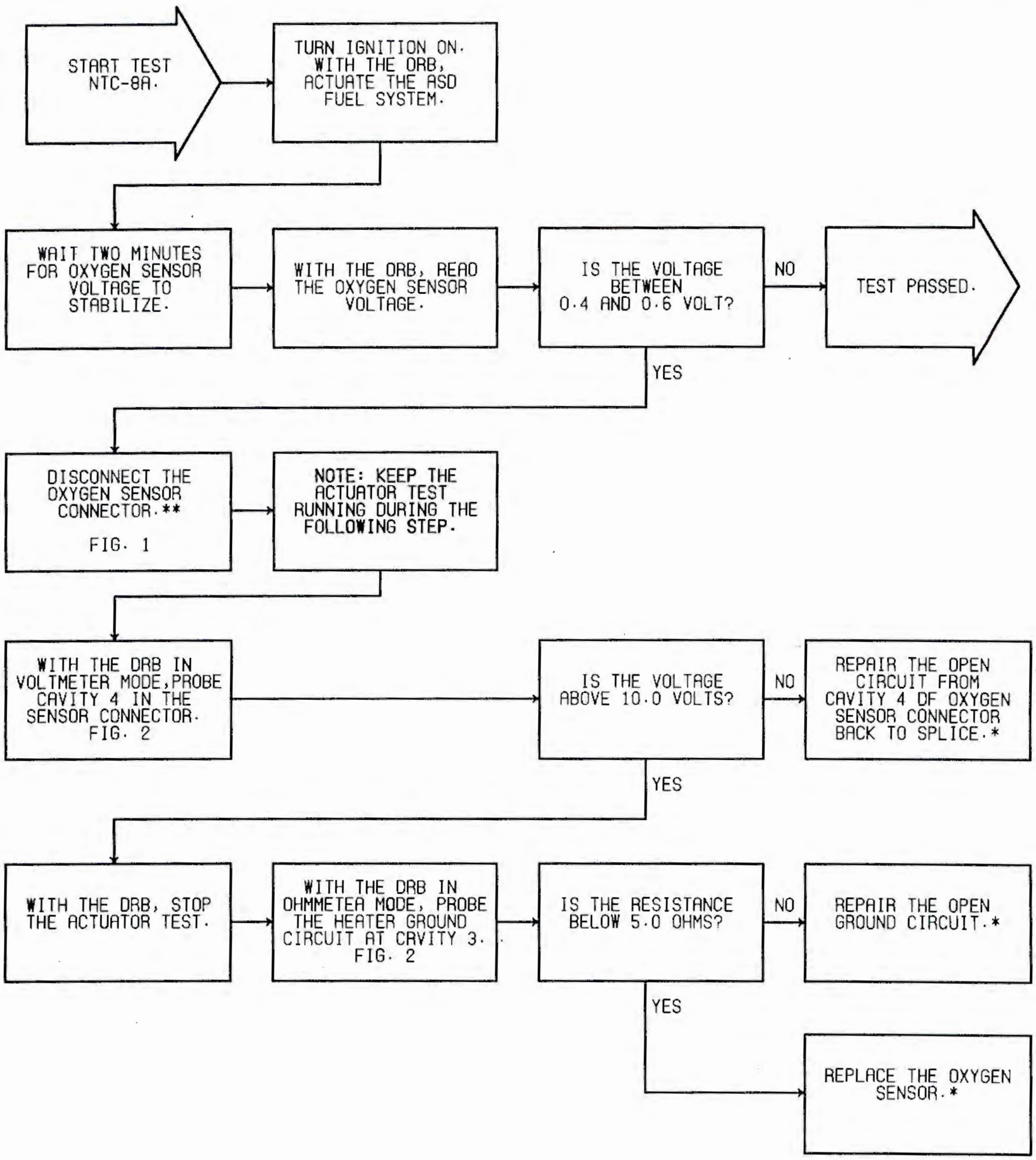
CAV	MJ/XJ	YJ	ZJ	FUNCTION
1	BK/LB	BK/LB	BK/LB	SENSOR GROUND
2	BK/DG	BK/DG	BK/OR	OXYGEN SENSOR SIGNAL
3	BK/TN	BK	BK/TN	GROUND (HEATER)
4	DG/*	DG/OR	OR/DB	FUSED IGN SW OUTPUT

1510205

FIG. 2

TEST NTC-8A CHECKING THE OXYGEN SENSOR HEATER

Perform TEST NTC-1A Before Proceeding



*Perform Verification TEST VER-2A. | **Check connectors – Clean / repair as necessary.

TEST NTC-9A CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NTC-1A or TC-18A Before Proceeding

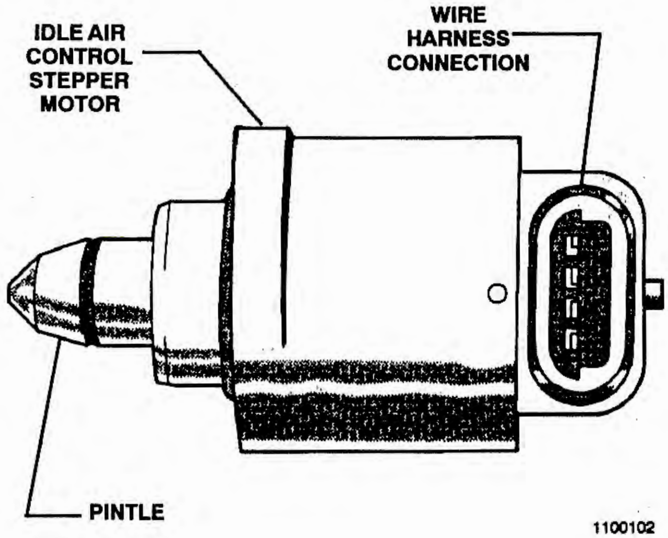
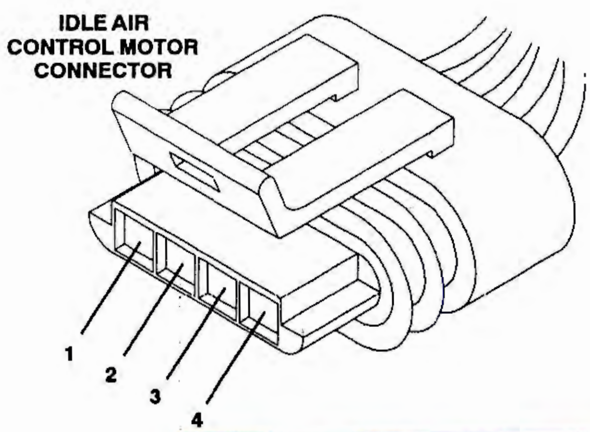


FIG. 1



CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	GY/RD	YL/BK	IAC #3 DRIVER
2	YL/BK	VT/BK	IAC #2 DRIVER
3	BR/WT	BR/WT	IAC #1 DRIVER
4	VT/BK	GY/RD	IAC #4 DRIVER

FIG. 2

TEST NTC-9A CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NTC-1A or TC-18A Before Proceeding

START TEST NTC-9A.

WITH THE DRB, SET ENGINE SPEED TO 1100 RPM.

DID THE ENGINE SPEED SET AT 1100 RPM ±50 RPM?
- YES → IDLE AIR CONTROL MOTOR OPERATING NORMALLY. TEST PASSED.
- NO → RETURN THE ENGINE TO NORMAL IDLE SPEED.

DISCONNECT THE IDLE AIR CONTROL MOTOR CONNECTOR.** FIG. 1

PUT THE DRB IN VOLTMETER MODE.

WHILE PROBING THE IAC #1 DRIVER CKT, MOMENTARILY OPEN AND CLOSE THE THROTTLE. FIG. 2

DID THE VOLTAGE STAY BELOW 1.0 VOLT?
- YES → PERFORM TEST NTC-9B.
- NO → WHILE PROBING THE IAC #2 DRIVER CKT, MOMENTARILY OPEN AND CLOSE THE THROTTLE. FIG. 2

DID THE VOLTAGE STAY BELOW 1.0 VOLT?
- YES → PERFORM TEST NTC-9B.
- NO → WHILE PROBING THE IAC #3 DRIVER CKT, MOMENTARILY OPEN AND CLOSE THE THROTTLE. FIG. 2

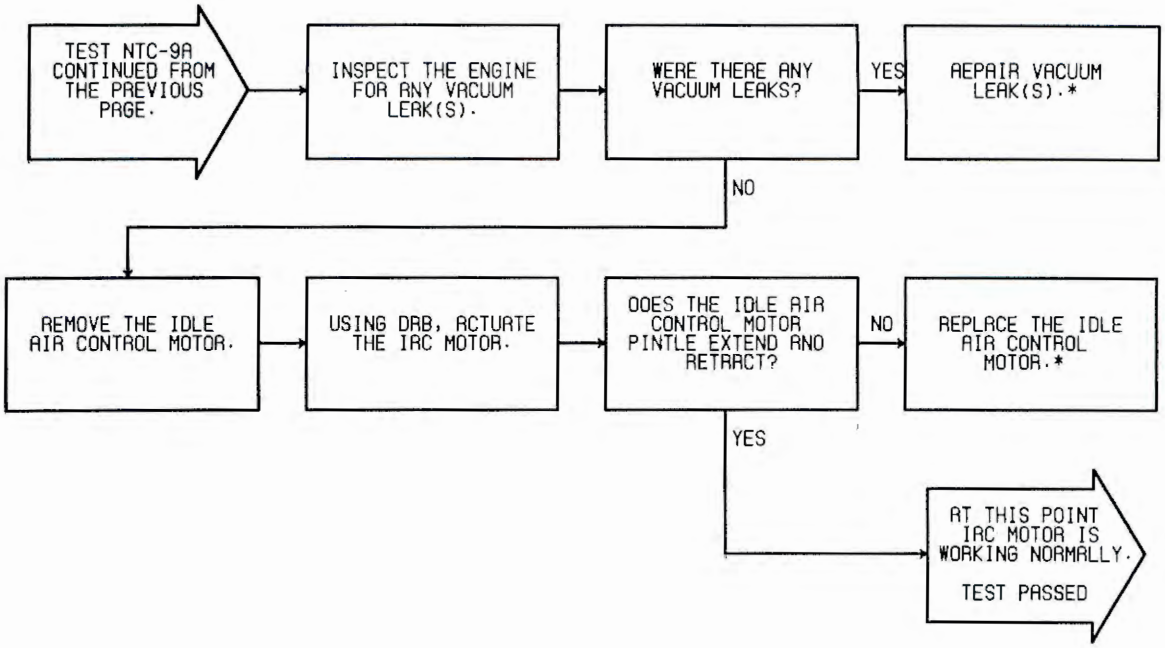
DID THE VOLTAGE STAY BELOW 1.0 VOLT?
- YES → PERFORM TEST NTC-9B.
- NO → WHILE PROBING THE IAC #4 DRIVER CKT, MOMENTARILY OPEN AND CLOSE THE THROTTLE. FIG. 2

DID THE VOLTAGE STAY BELOW 1.0 VOLT?
- YES → PERFORM TEST NTC-9B.
- NO → CONTINUE TEST NTC-9A ON THE NEXT PAGE.

Perform Verification TEST VER-2A. | ****Check connectors – Clean / repair as necessary.***

NOTES

TEST NTC-9A CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR

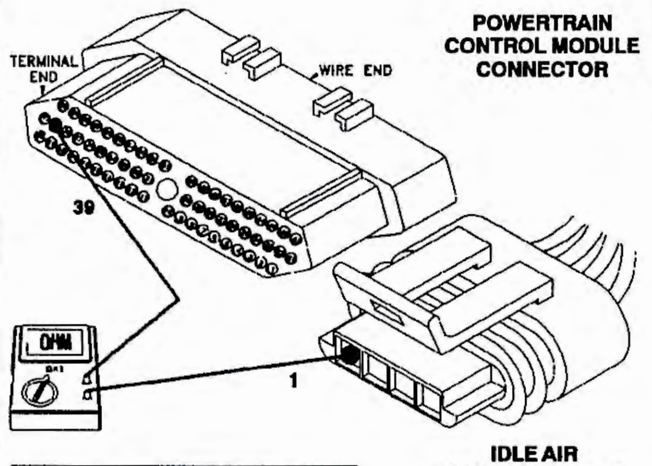


***Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.**

NO TROUBLE CODE TESTS

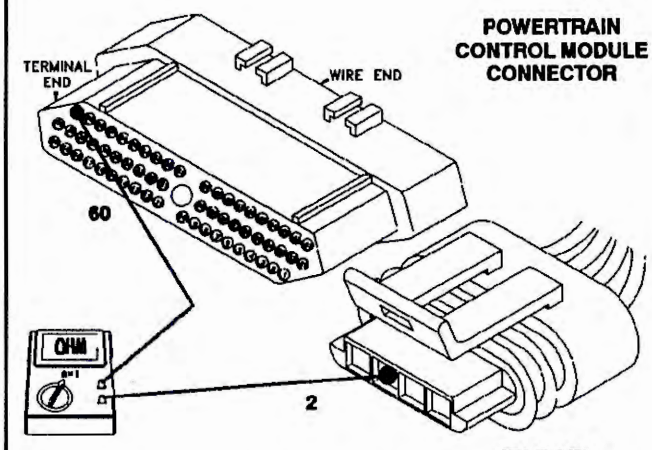
TEST NTC-9B CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NTC-9A Before Proceeding



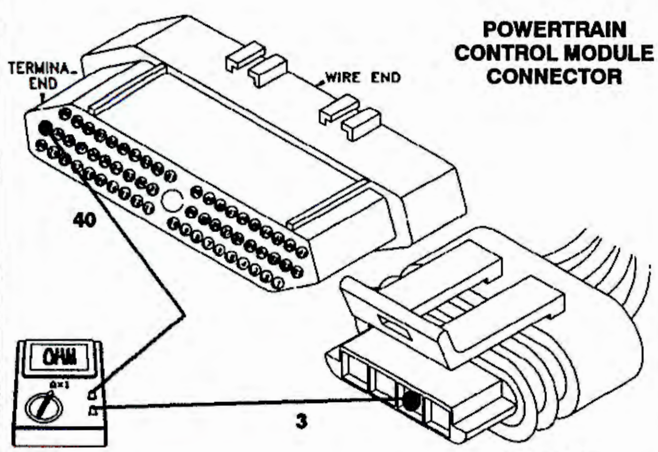
CAV	AB, AD, AN, BR	ZJ
1, 39	GY/RD	YL/BK

FIG. 1



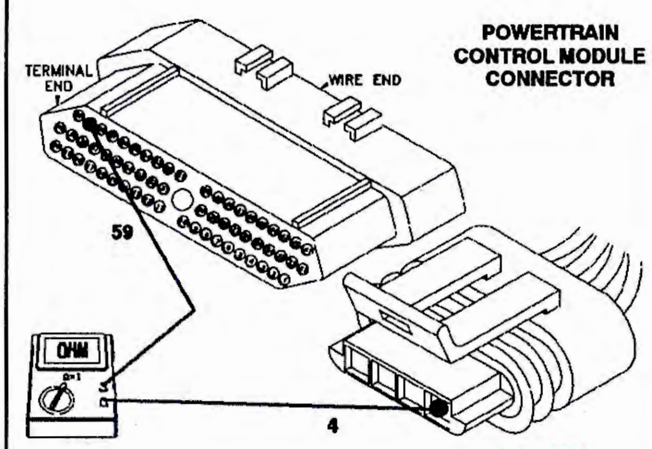
CAV	AB, AD, AN, BR	ZJ
2, 60	YL/BK	VT/BK

FIG. 2



CAV	AB, AD, AN, BR	ZJ
3, 40	BR/WT	BR/WT

FIG. 3

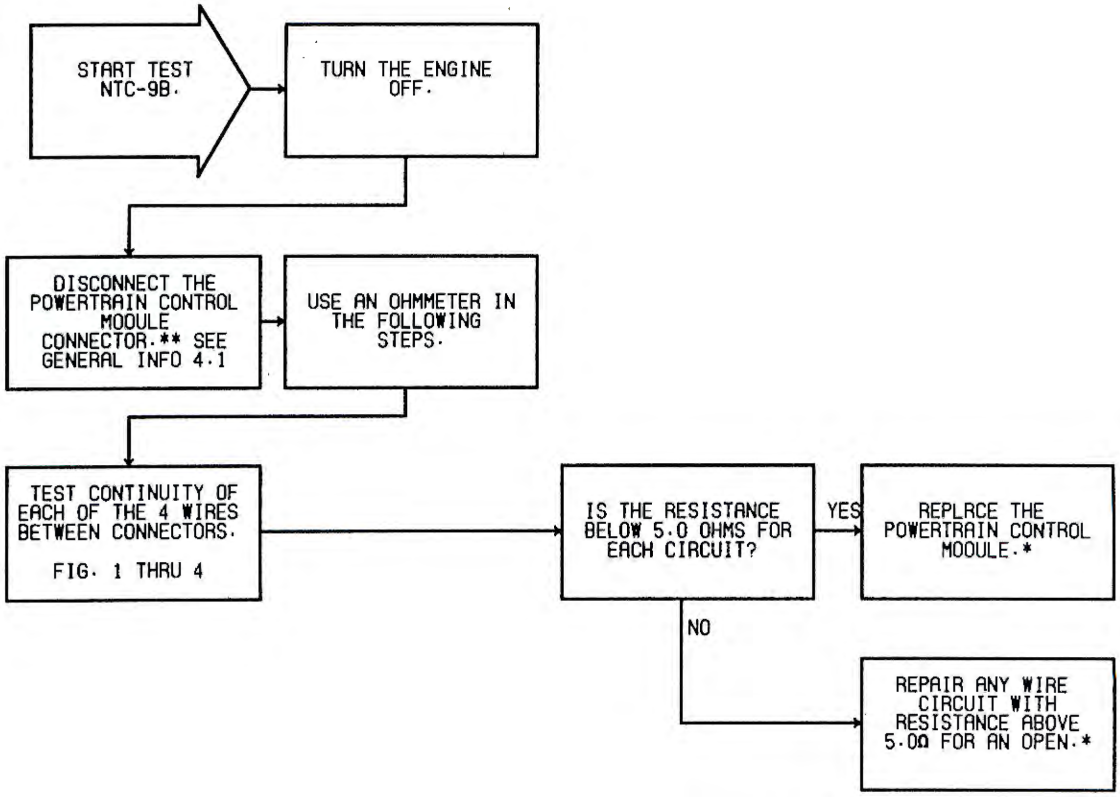


CAV	AB, AD, AN, BR	ZJ
4, 59	VT/BK	GY/RD

FIG. 4

TEST NTC-9B | CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NTC-9A Before Proceeding



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST NTC-10A CHECKING THE PARK/NEUTRAL POSITION SWITCH

Perform TEST NTC-1A Before Proceeding

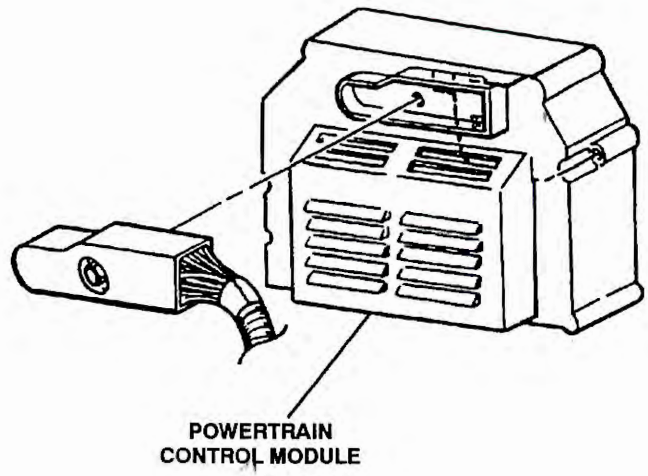
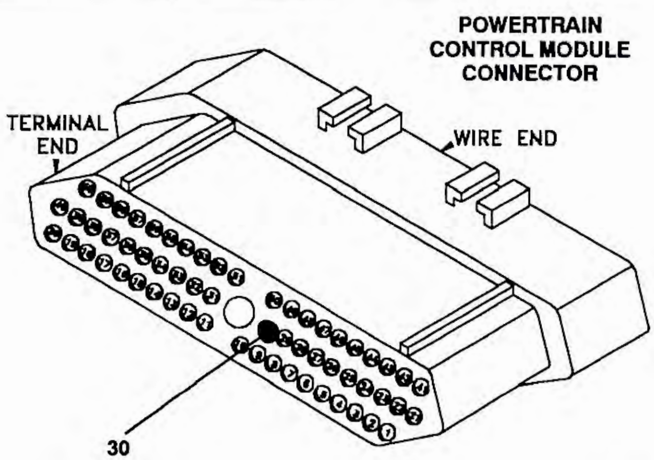


FIG. 1



CAV	COLOR	FUNCTION
30	BR/*	PARK/NEUTRAL POSITION SW SENSE

FIG. 2

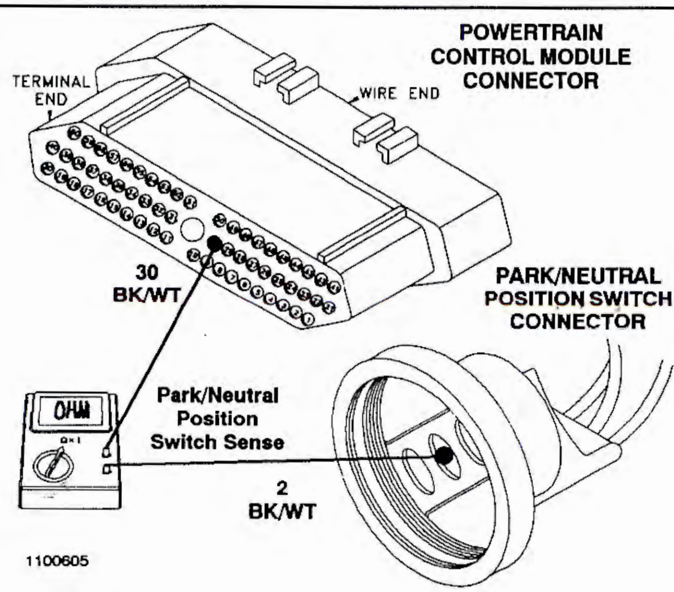
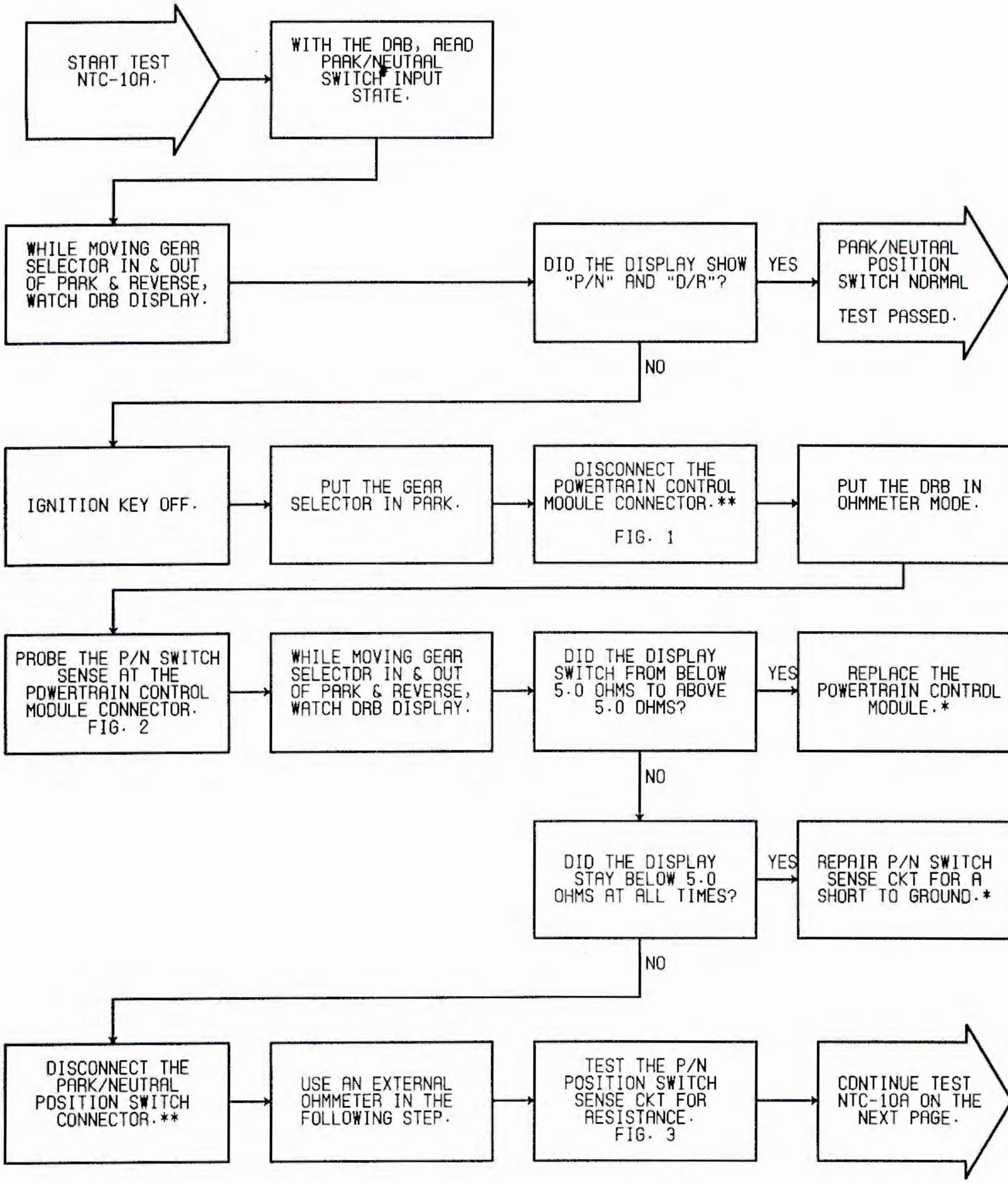


FIG. 3

TEST NTC-10A CHECKING THE PARK/NEUTRAL POSITION SWITCH

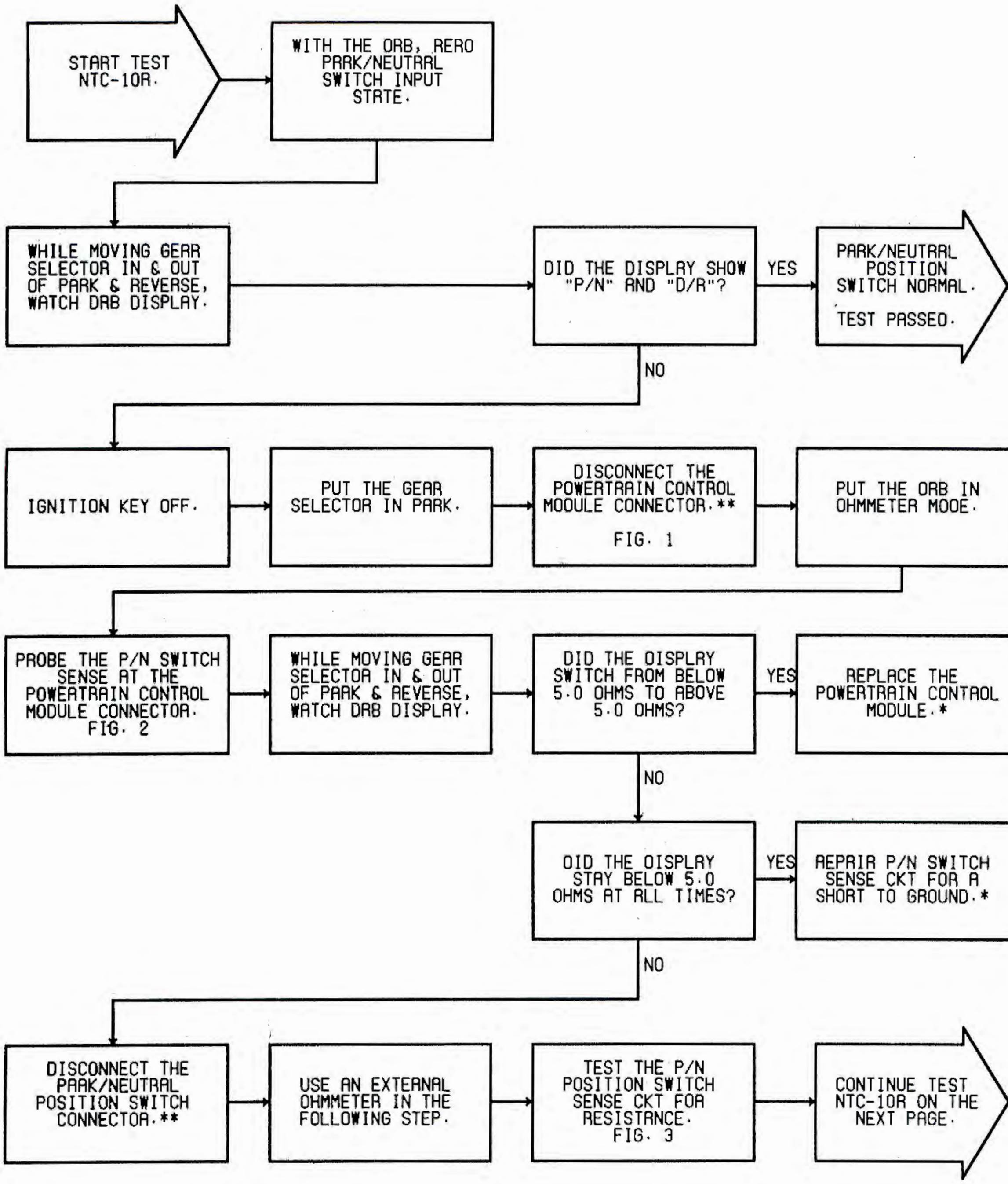
Perform TEST NTC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

NOTES

TEST NTC-10A | CONTINUED - CHECKING THE PARK/NEUTRAL POSITION SWITCH



Perform Verification TEST VER-2A.** | ****Check connectors – Clean / repair as necessary.

TEST NTC-11A | CHECKING THE PCM POWER AND GROUND CIRCUITS

Perform TEST NTC-1A Before Proceeding

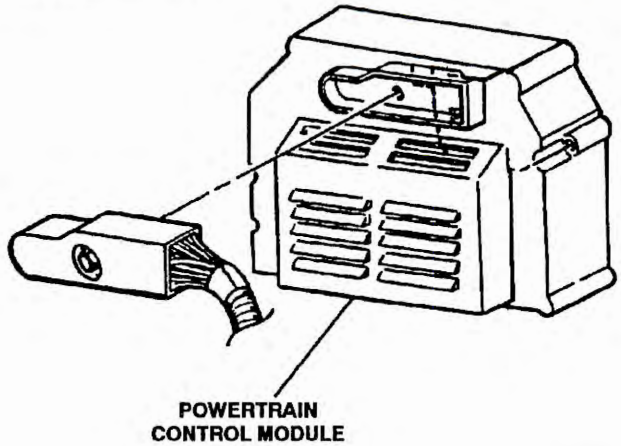
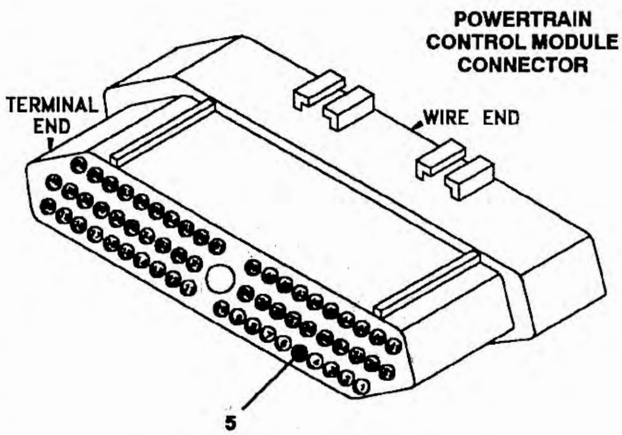


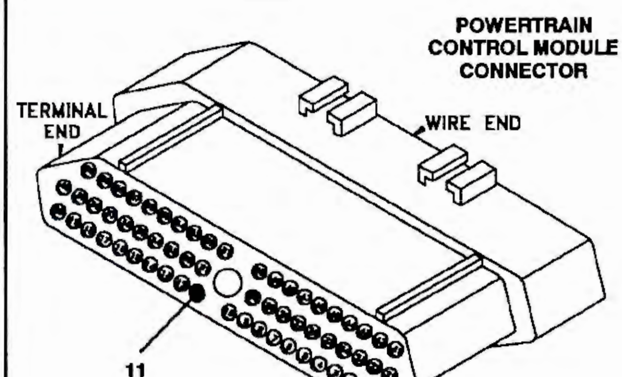
FIG. 1



CAV	MJ/XJ	YJ	ZJ
5	BK/WT	BK/WT	BK/TN

1500606

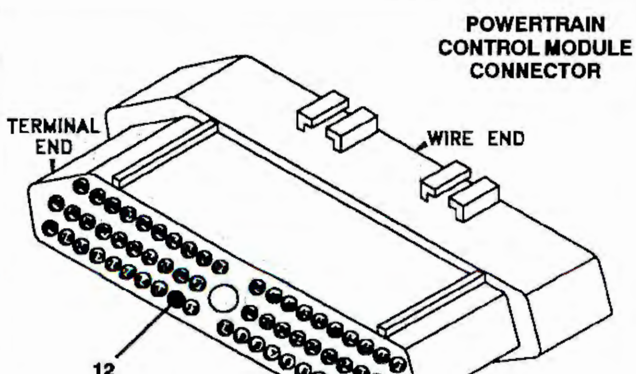
FIG. 2



CAV	MJ/XJ	YJ	ZJ
11	BK/TN	BK	BK/TN

1510301

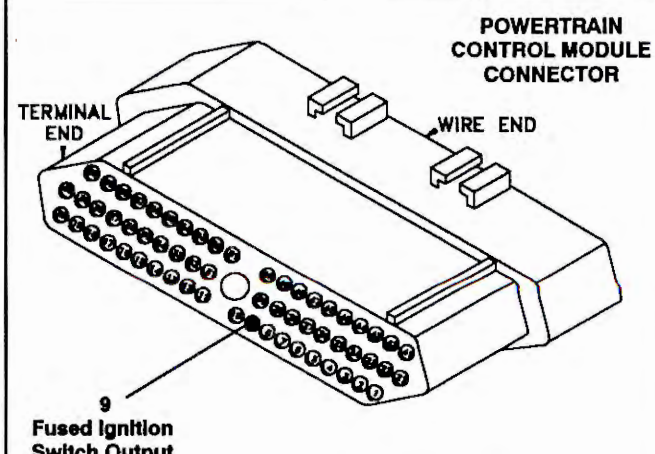
FIG. 3



CAV	MJ/XJ	YJ	ZJ
12	BK/TN	BK	BK/TN

1510302

FIG. 4



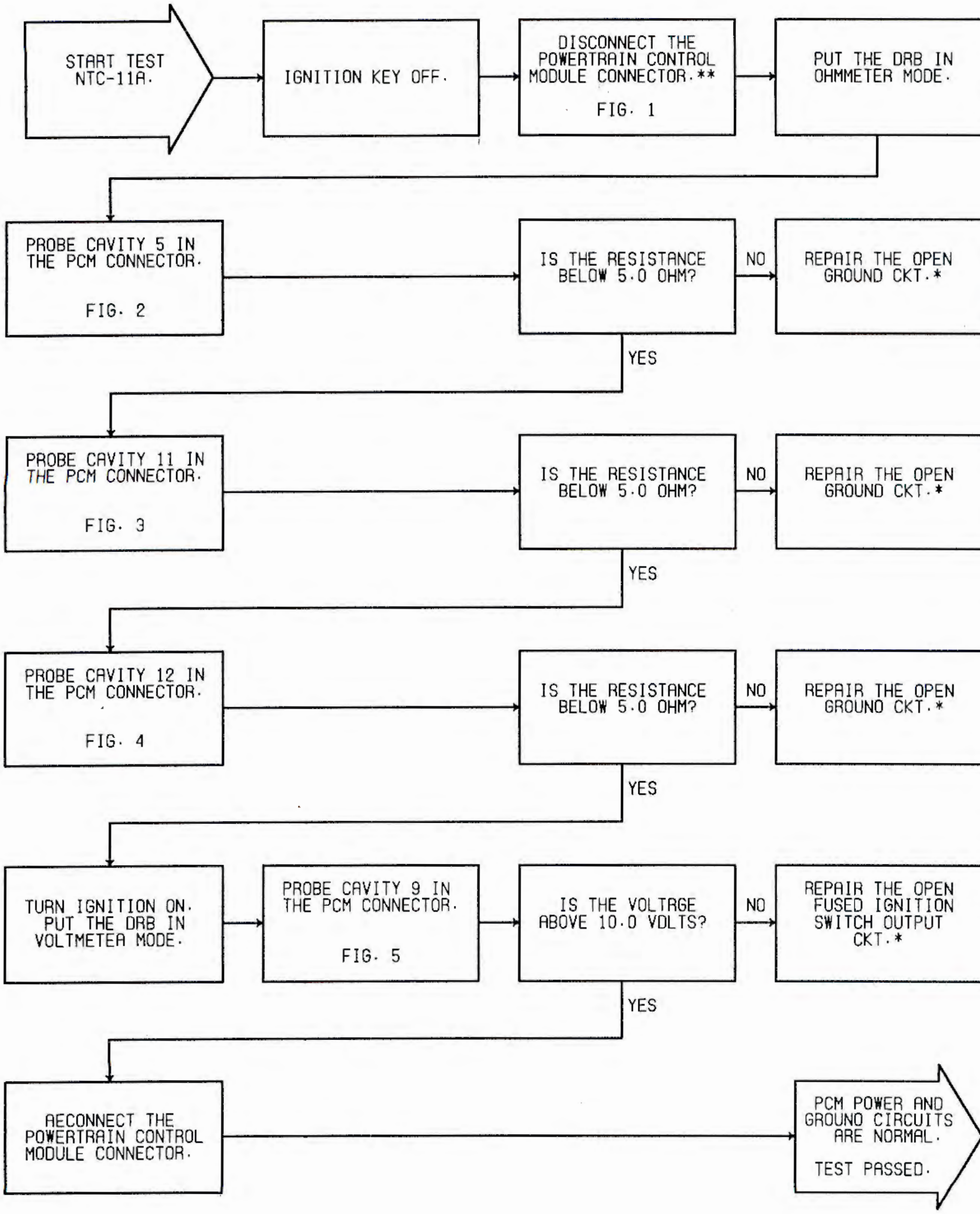
CAV	MJ/XJ	YJ	ZJ
9	DB	WT/YL	LB/RD

1510401

FIG. 5

TEST NTC-11A CHECKING THE PCM POWER AND GROUND CIRCUITS

Perform TEST NTC-1A Before Proceeding



**Perform Verification TEST VER-2A.* | ***Check connectors – Clean / repair as necessary.*

TEST NTC-12A | CHECKING THE ENGINE VACUUM

Perform TEST NTC-1A Before Proceeding

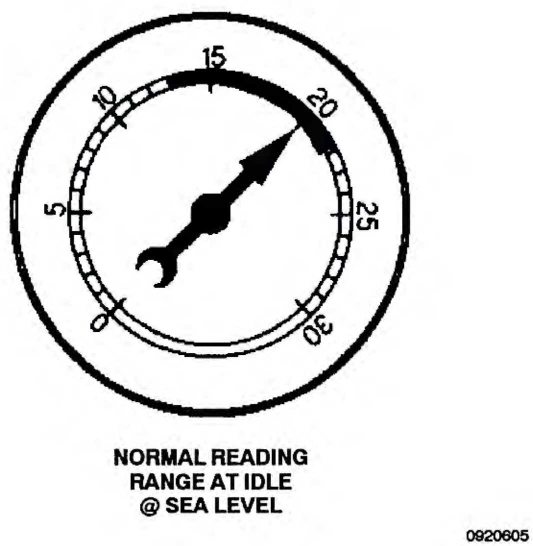
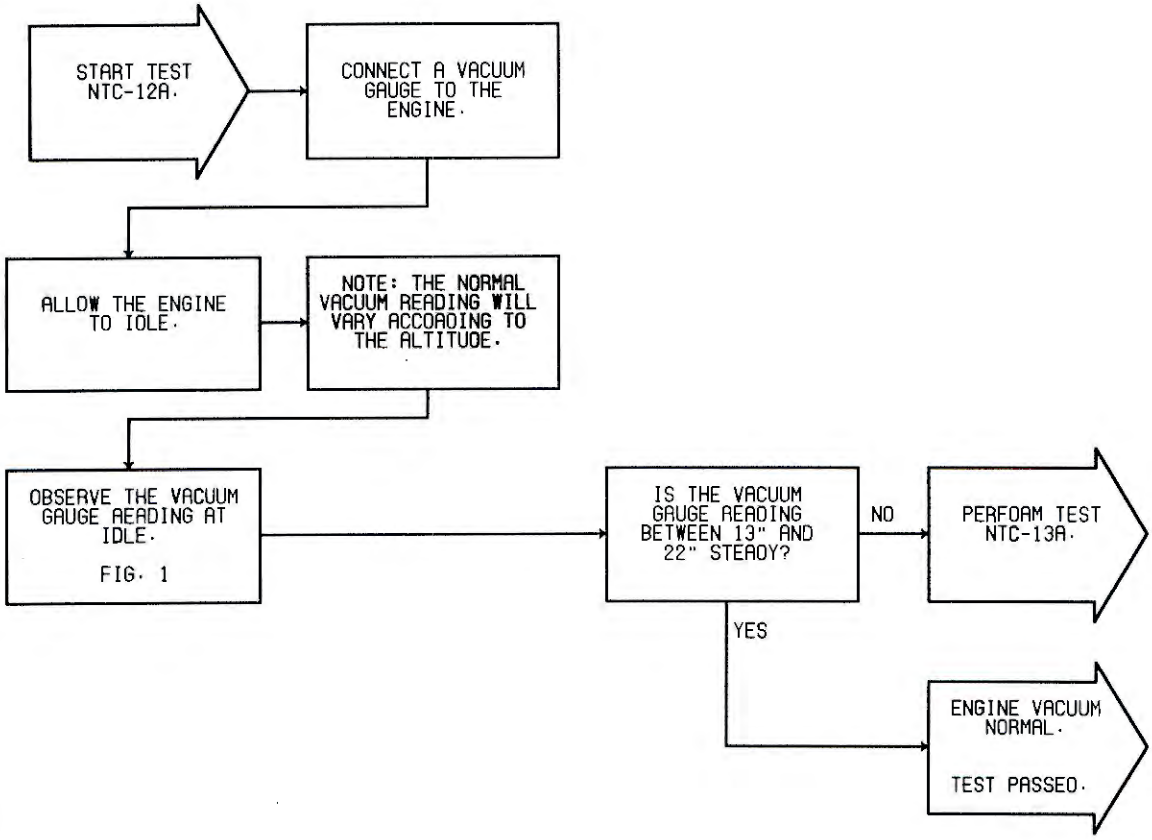


FIG. 1

TEST NTC-12A	CHECKING THE ENGINE VACUUM

Perform TEST NTC-1A Before Proceeding



*Perform Verification TEST VER-2A.	**Check connectors – Clean / repair as necessary.

TEST NTC-13A | CHECKING THE ENGINE MECHANICAL SYSTEMS

Perform TEST NTC-1A, NTC-7A, NTC-7B, or NTC-12A Before Proceeding

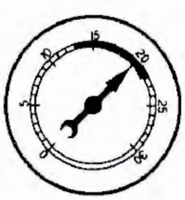
At this point in the diagnostic test procedure, you have determined that all of the **engine electrical systems** are operating as designed; therefore, they **are not the cause of the driveability problem.** The following additional items should be checked as possible mechanical causes of the problem:

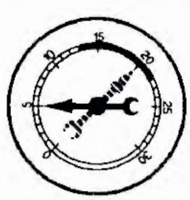
1. **ENGINE VACUUM** - must be at least 13 inches in neutral *(see below)* †
2. **ENGINE VALVE TIMING** - must be within specifications
3. **ENGINE COMPRESSION** - must be within specifications
4. **ENGINE EXHAUST SYSTEM** - must be free of any restrictions
5. **ENGINE PCV SYSTEM** - must flow freely
6. **ENGINE DRIVE SPROCKET** - must be properly positioned
7. **TORQUE CONVERTER STALL SPEED** - must be within specifications
8. **POWER BRAKE BOOSTER** - no internal vacuum leaks
9. **FUEL** - must be free of contamination
10. **FUEL INJECTOR** - plugged or restricted injector; control wire not connected to correct injector

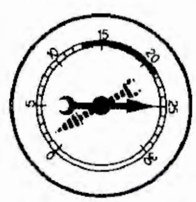
NOTE: If you came to this test from the oxygen sensor, and the rich or lean condition is not caused by one of the first items above, replace the powertrain control module and perform TEST VER-2A (Road Test Verification).

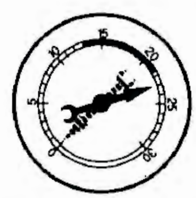
Always look for any Technical Service Bulletins that may relate to the problem.

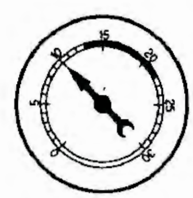
† The readings below are only indicators of possible mechanical engine problems.


NORMAL READING RANGE AT IDLE


BLOWN HEAD GASKET AT IDLE


NORMAL READING (RAPID ACCELERATION/ DECELERATION)


WORN RINGS OR DILUTED OIL RAPID ACCELERATION/ DECELERATION


LATE VALVE TIMING, VACUUM LEAK AT IDLE


RESTRICTED EXHAUST (DROPS TOWARDS ZERO AS ENGINE RPM INCREASES)


POOR VALVE SEATING AT IDLE


STICKING VALVE AT IDLE


WORN VALVE GUIDES (STEADIES AS ENGINE SPEED INCREASES)

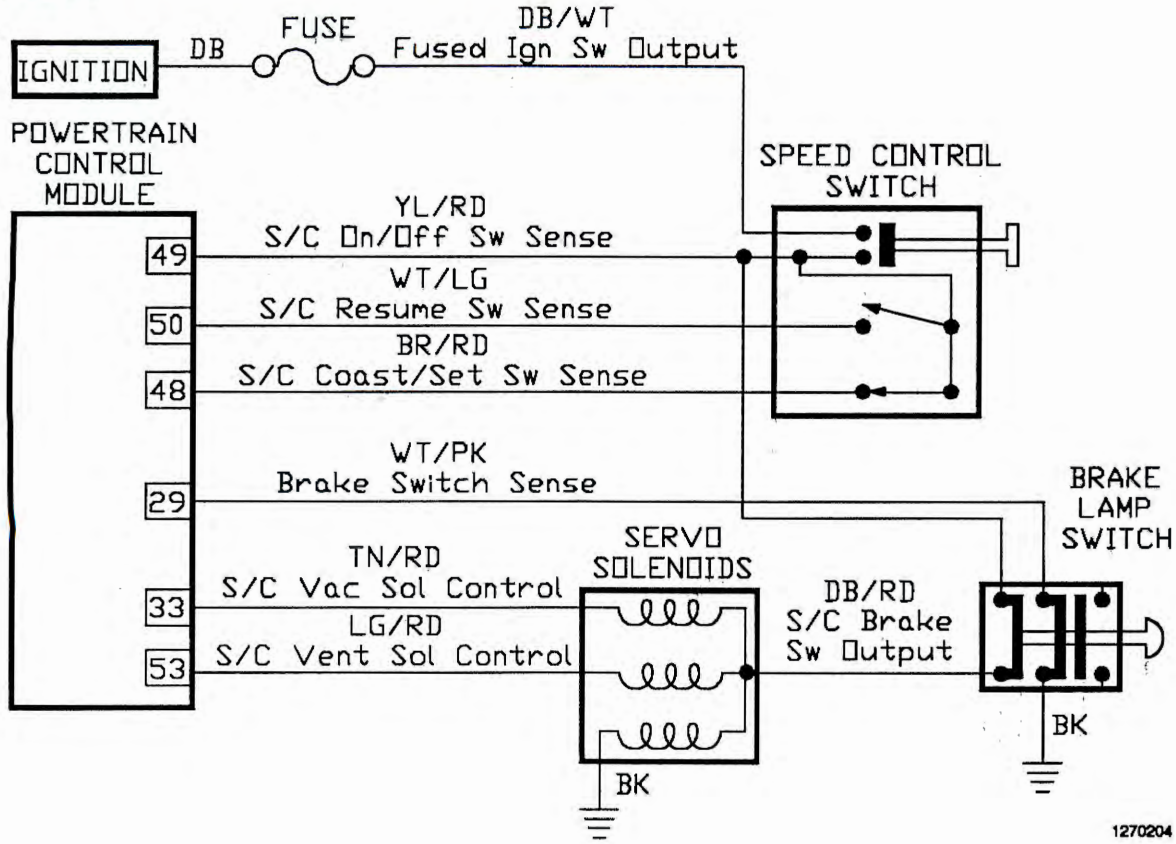

WORN VALVE SPRINGS (MORE PRONOUNCED AS ENGINE SPEED INCREASES)

NOTES

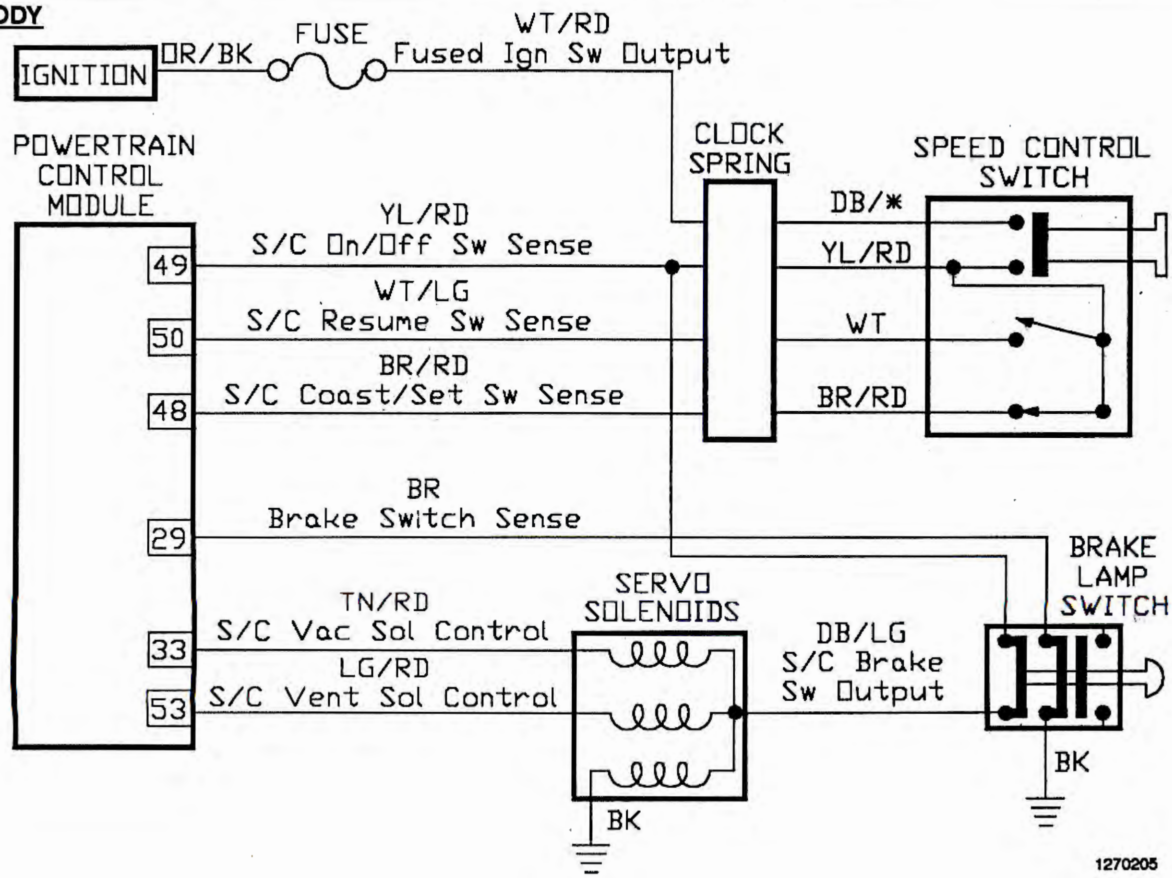
TEST SC-1A | CHECKING SPEED CONTROL OPERATION

Perform TEST TC-1A Before Proceeding

MJ/XJ BODY

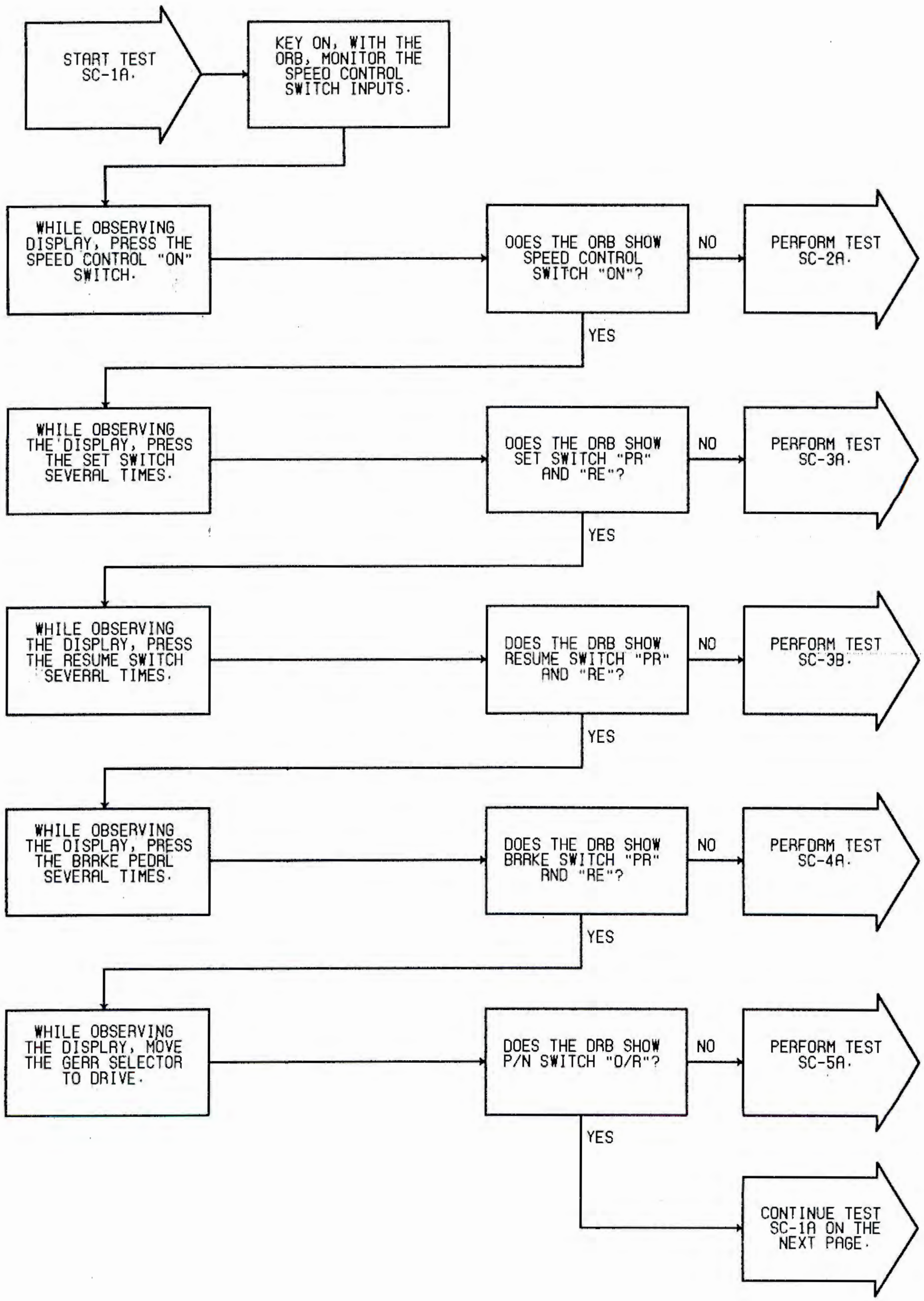


ZJ BODY



TEST SC-1A | **CHECKING SPEED CONTROL OPERATION**

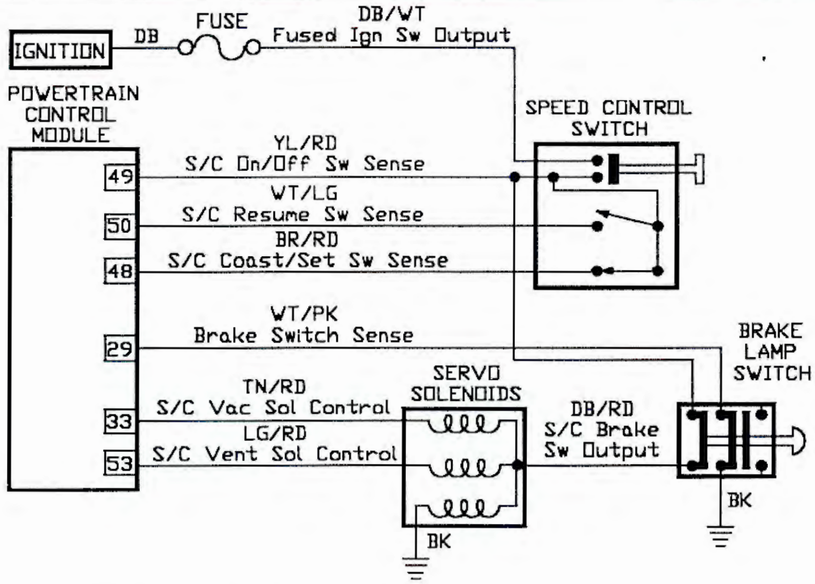
Perform TEST TC-1A Before Proceeding



***Perform Verification TEST VER-4A.** | ****Check connectors – Clean / repair as necessary.**

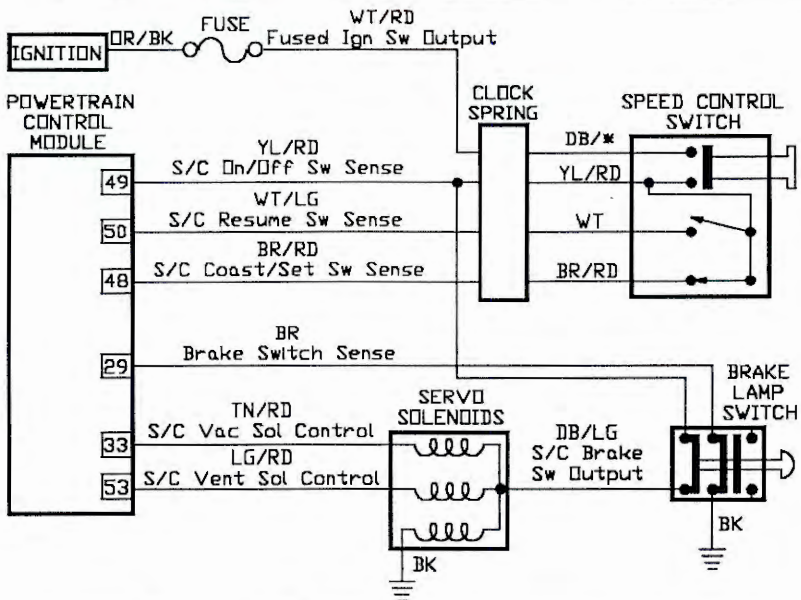
TEST SC-1A | CONTINUED - CHECKING SPEED CONTROL OPERATION

MJ/XJ BODY



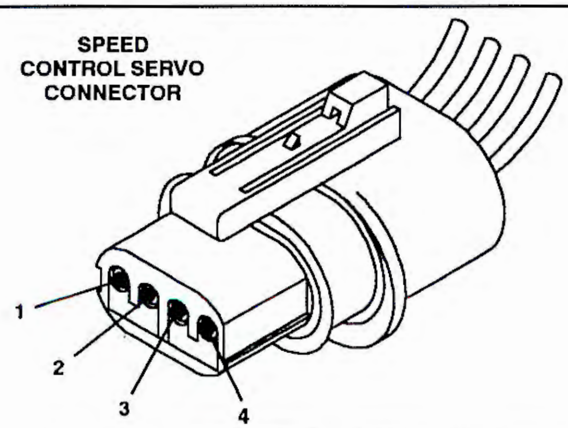
1270204

ZJ BODY



1270205

SPEED CONTROL SERVO CONNECTOR

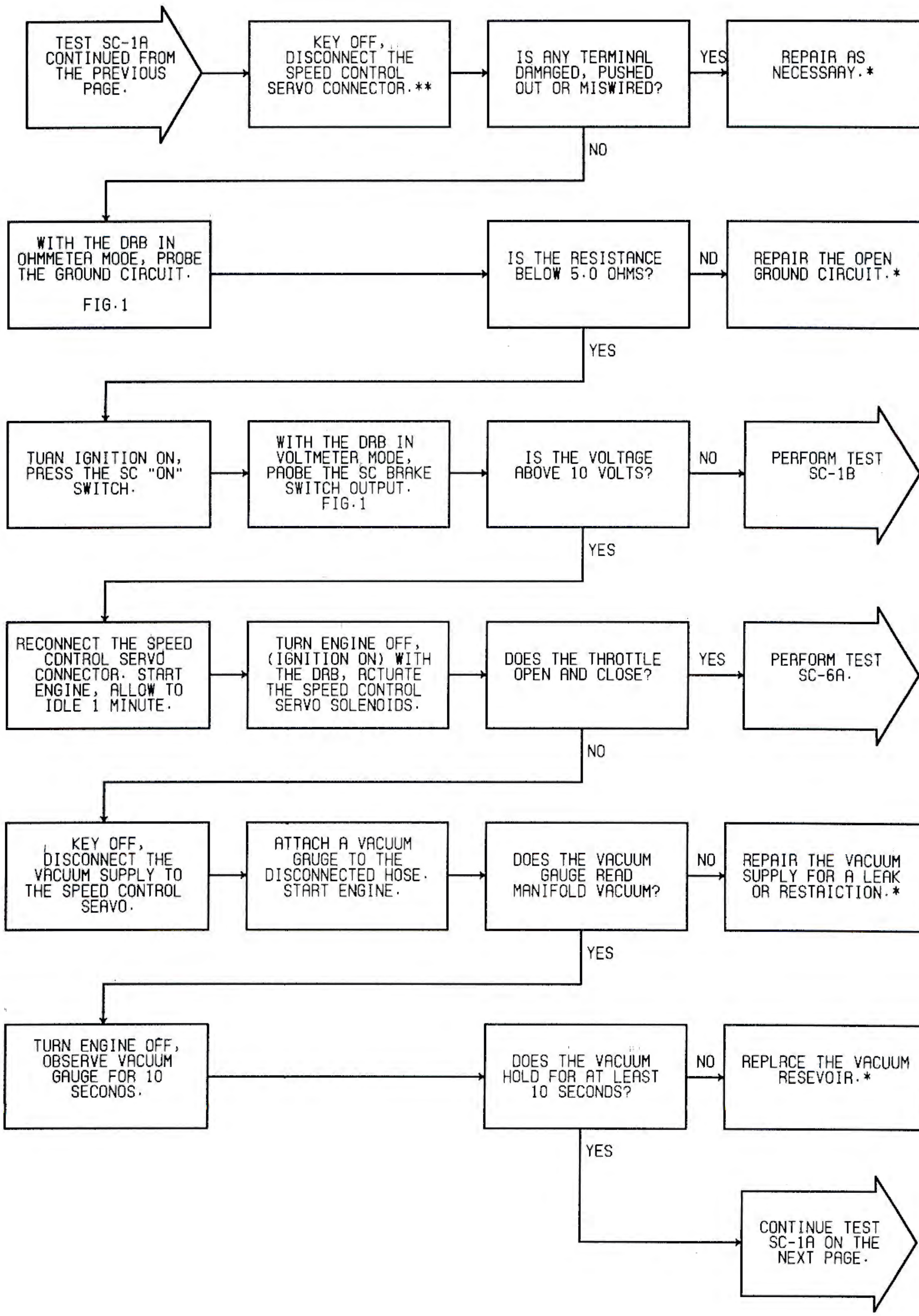


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/*	SC BRAKE SWITCH OUTPUT
3	LG/RD	SC VENT SOLENOID CONTROL
4	TN/RD	SC VACUUM SOLENOID CONTROL

1260602

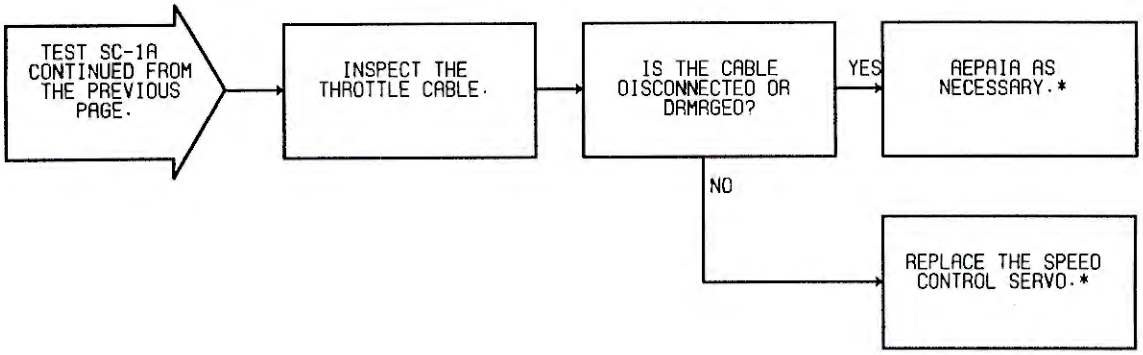
FIG. 1

TEST SC-1A | CONTINUED - CHECKING SPEED CONTROL OPERATION



Perform Verification TEST VER-4A.** | ****Check connectors – Clean / repair as necessary.

NOTES



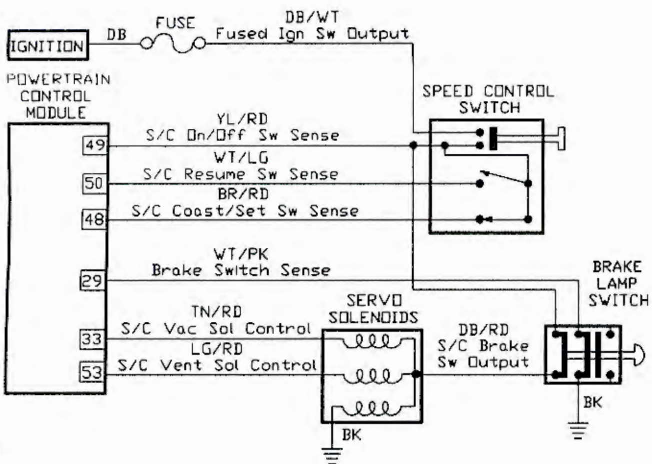
*Perform Verification TEST VER-4A.

**Check connectors – Clean / repair as necessary.

TEST SC-1B | CHECKING SPEED CONTROL OPERATION

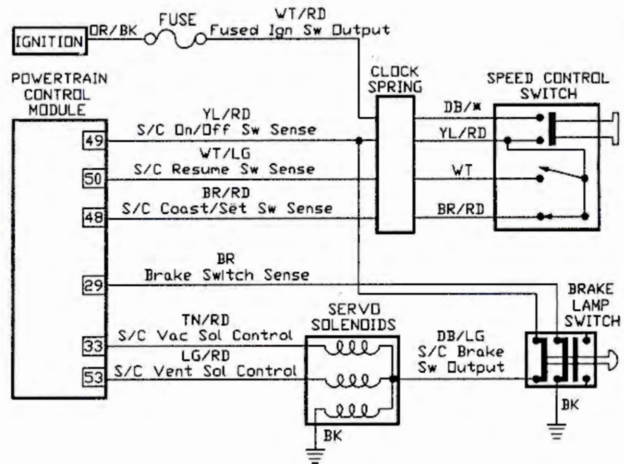
Perform TEST SC-1A Before Proceeding

MJ/XJ BODY



1270204

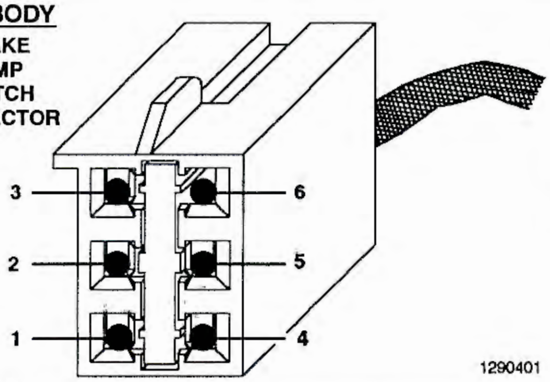
ZJ BODY



1270205

MJ/XJ BODY

BRAKE LAMP SWITCH CONNECTOR



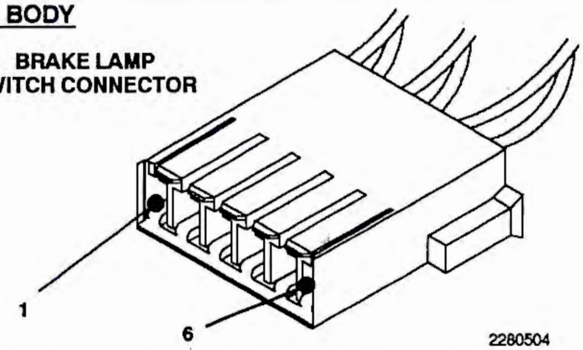
1290401

CAV	COLOR	FUNCTION
1	YL/RD	SPEED CONTROL ON/OFF SWITCH SENSE
2	WT/TN	BRAKE LAMP SWITCH OUTPUT
3	WT/PK	BRAKE SWITCH SENSE
4	DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
5	PK/*	FUSED B(+)
6	BK	GROUND

FIG. 1

ZJ BODY

BRAKE LAMP SWITCH CONNECTOR

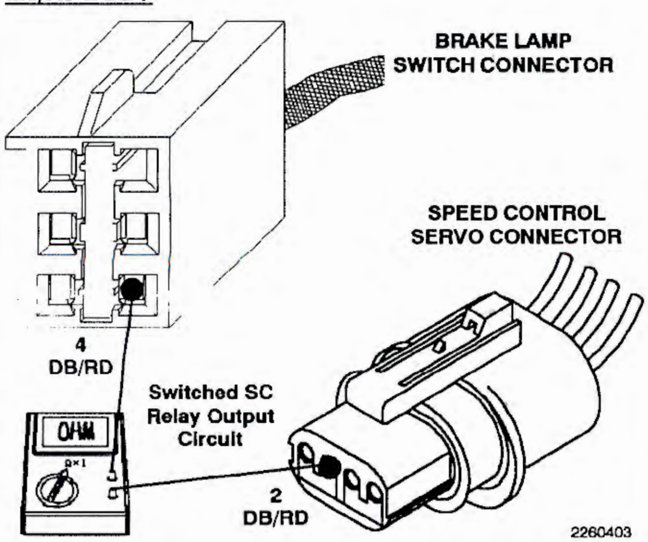


2280504

CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	S/C ON/OFF SWITCH OUTPUT
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

FIG. 2

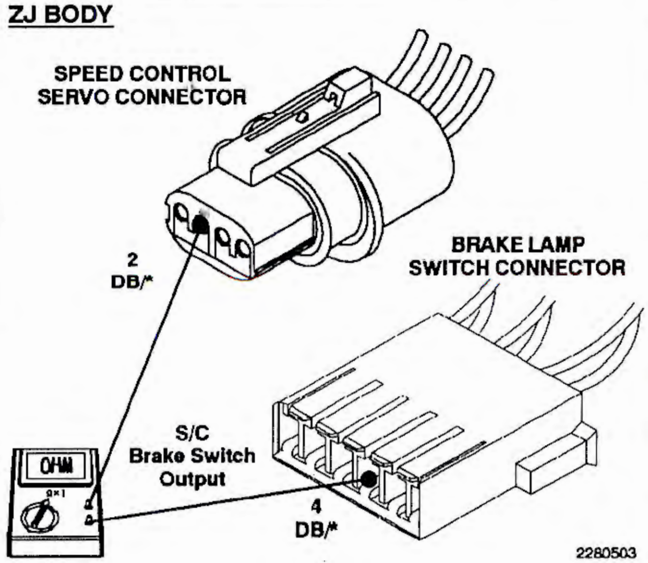
MJ/XJ BODY



2260403

FIG. 3

ZJ BODY

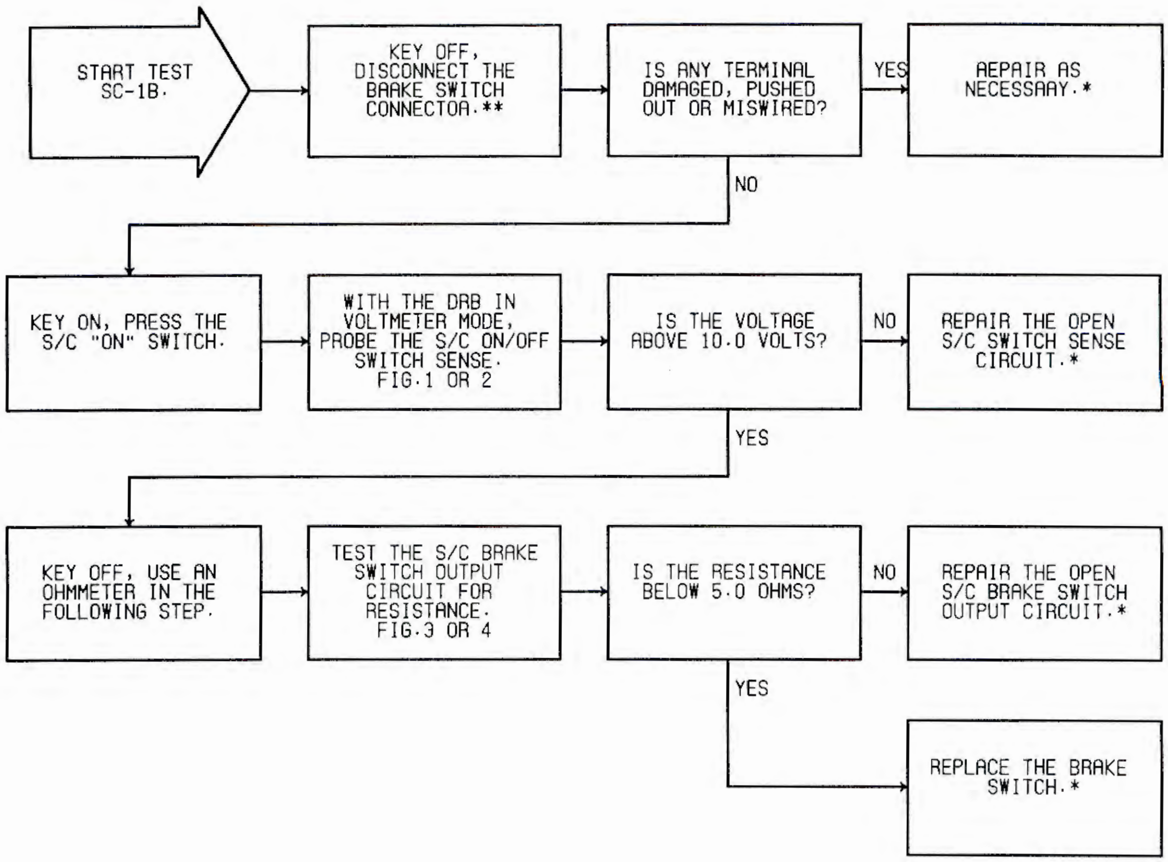


2280503

FIG. 4

TEST SC-1B | CHECKING SPEED CONTROL OPERATION

Perform TEST SC-1A Before Proceeding

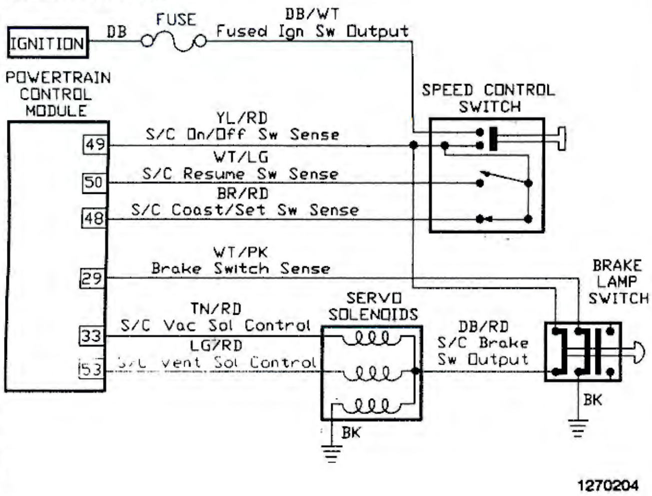


Perform Verification TEST VER-4A.	***Check connectors – Clean / repair as necessary.*

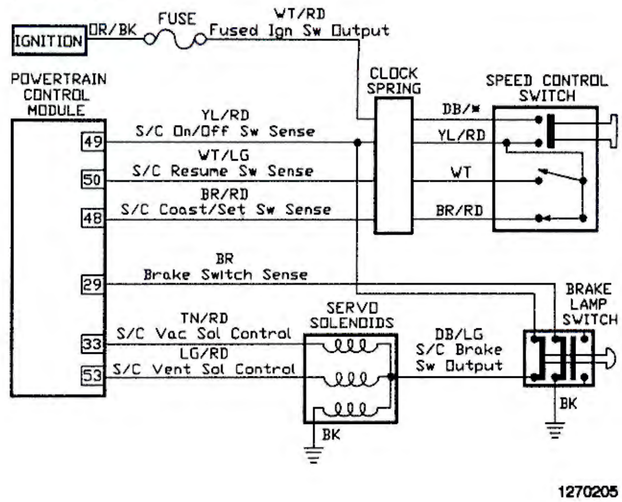
TEST SC-2A CHECKING THE SPEED CONTROL ON/OFF SWITCH

Perform TEST SC-1A Before Proceeding

MJ/XJ BODY

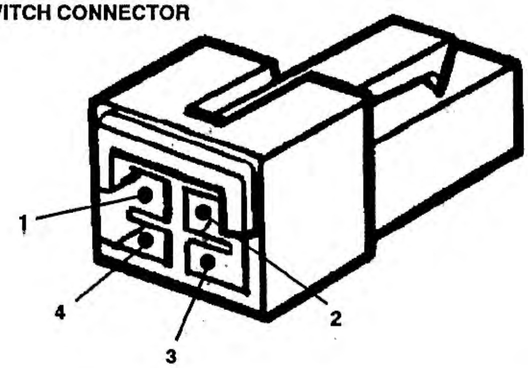


ZJ BODY



MJ/XJ BODY

SPEED CONTROL SWITCH CONNECTOR



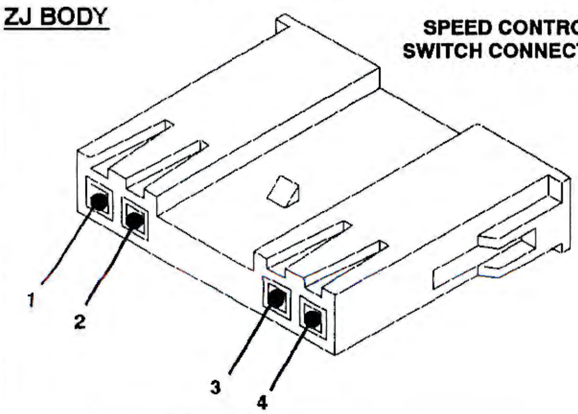
1260605

CAV	COLOR	FUNCTION
1	YL/RD	SC ON/OFF SWITCH SENSE
2	WT/LG	SC RESUME SWITCH SENSE
3	BR/RD	SC COAST/SET SW SENSE
4	DB/WT	FUSED IGN SW OUTPUT

FIG. 1

ZJ BODY

SPEED CONTROL SWITCH CONNECTOR

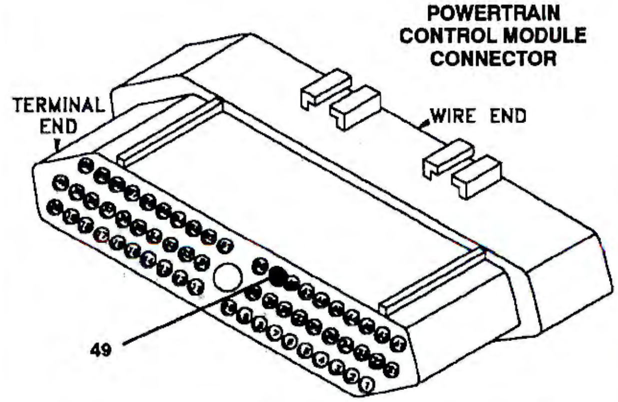


CAV	COLOR	FUNCTION
1	YL/RD	S/C ON/OFF SWITCH SENSE
2	DB/*	FUSED IGN SWITCH OUTPUT
3	WT	S/C RESUME SWITCH SENSE
4	BR/RD	S/C COAST SET SWITCH SENSE

1220301

FIG. 2

POWERTRAIN CONTROL MODULE CONNECTOR



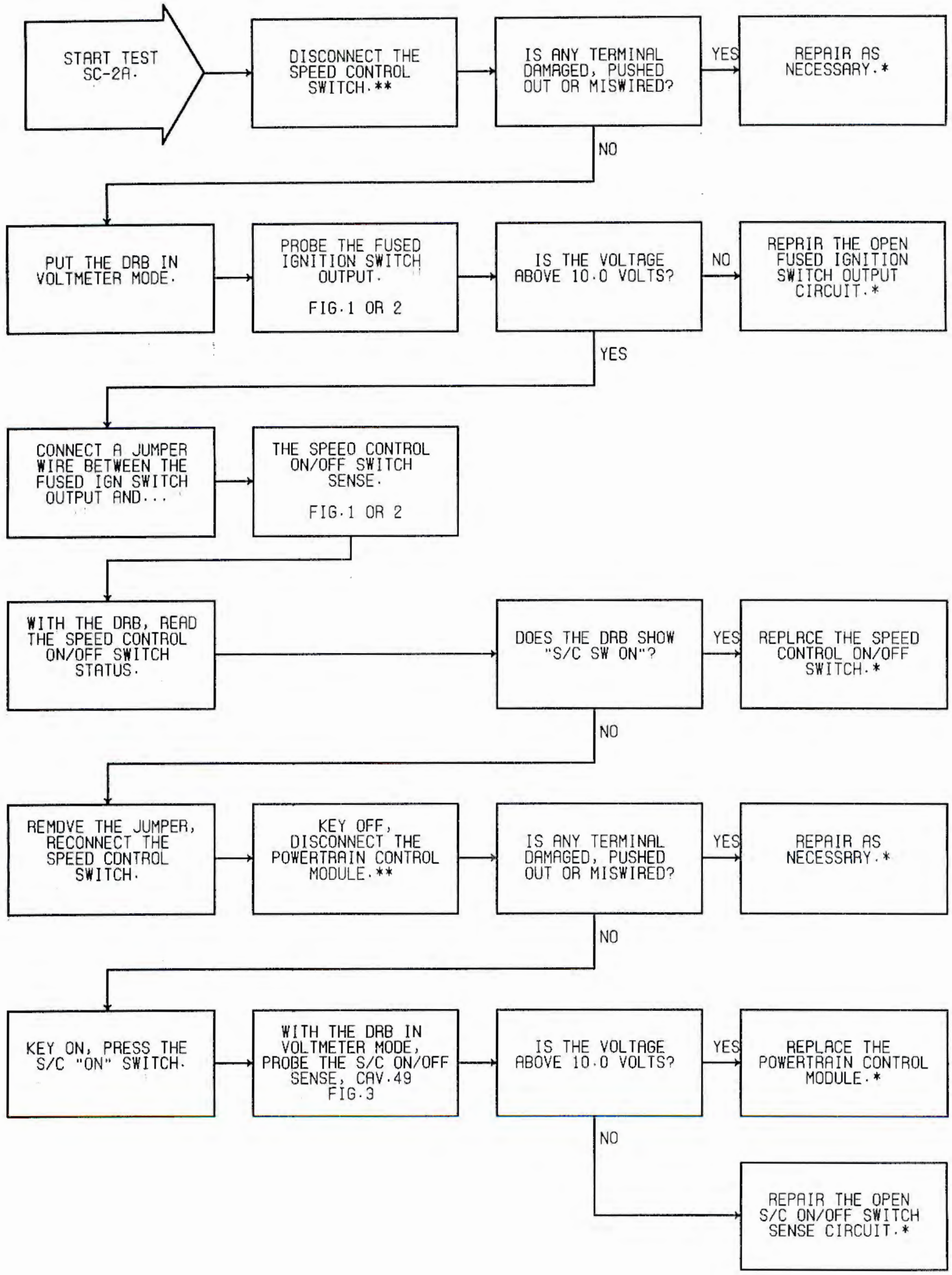
CAV	COLOR	FUNCTION
49	YL/RD	SPEED CONTROL ON/OFF SWITCH SENSE

1060306

FIG. 3

TEST SC-2A | CHECKING THE SPEED CONTROL ON/OFF SWITCH

Perform TEST SC-1A Before Proceeding

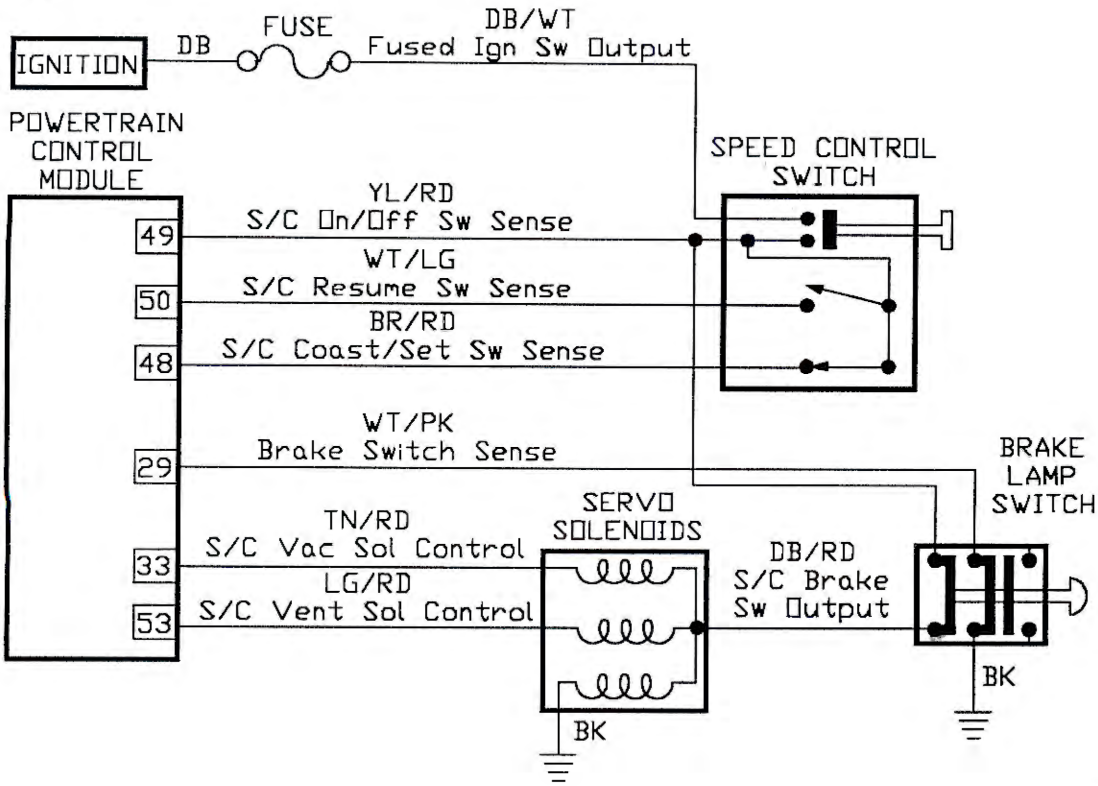


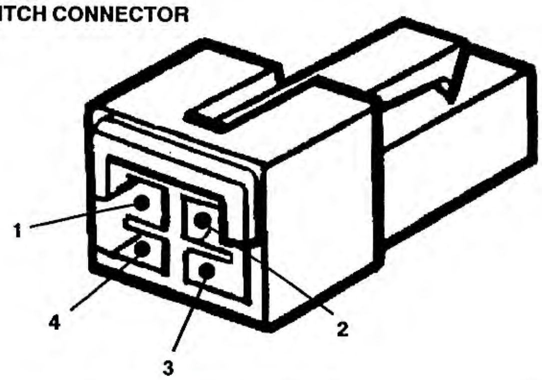
*Perform Verification TEST VER-4A.	**Check connectors – Clean / repair as necessary.

TEST SC-3A | CHECKING THE SPEED CONTROL SET/RESUME SWITCH

Perform TEST SC-1A Before Proceeding

MJ/XJ BODY

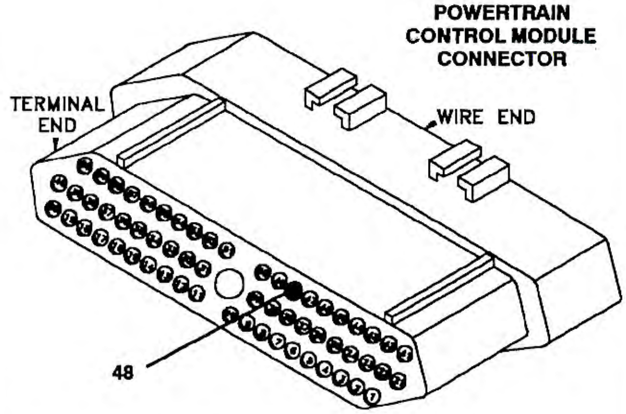




CAV	COLOR	FUNCTION
1	YL/RD	SC ON/OFF SWITCH SENSE
2	WT/LG	SC RESUME SWITCH SENSE
3	BR/RD	SC COAST/SET SW SENSE
4	DB/WT	FUSED IGN SW OUTPUT

1260605

FIG. 1



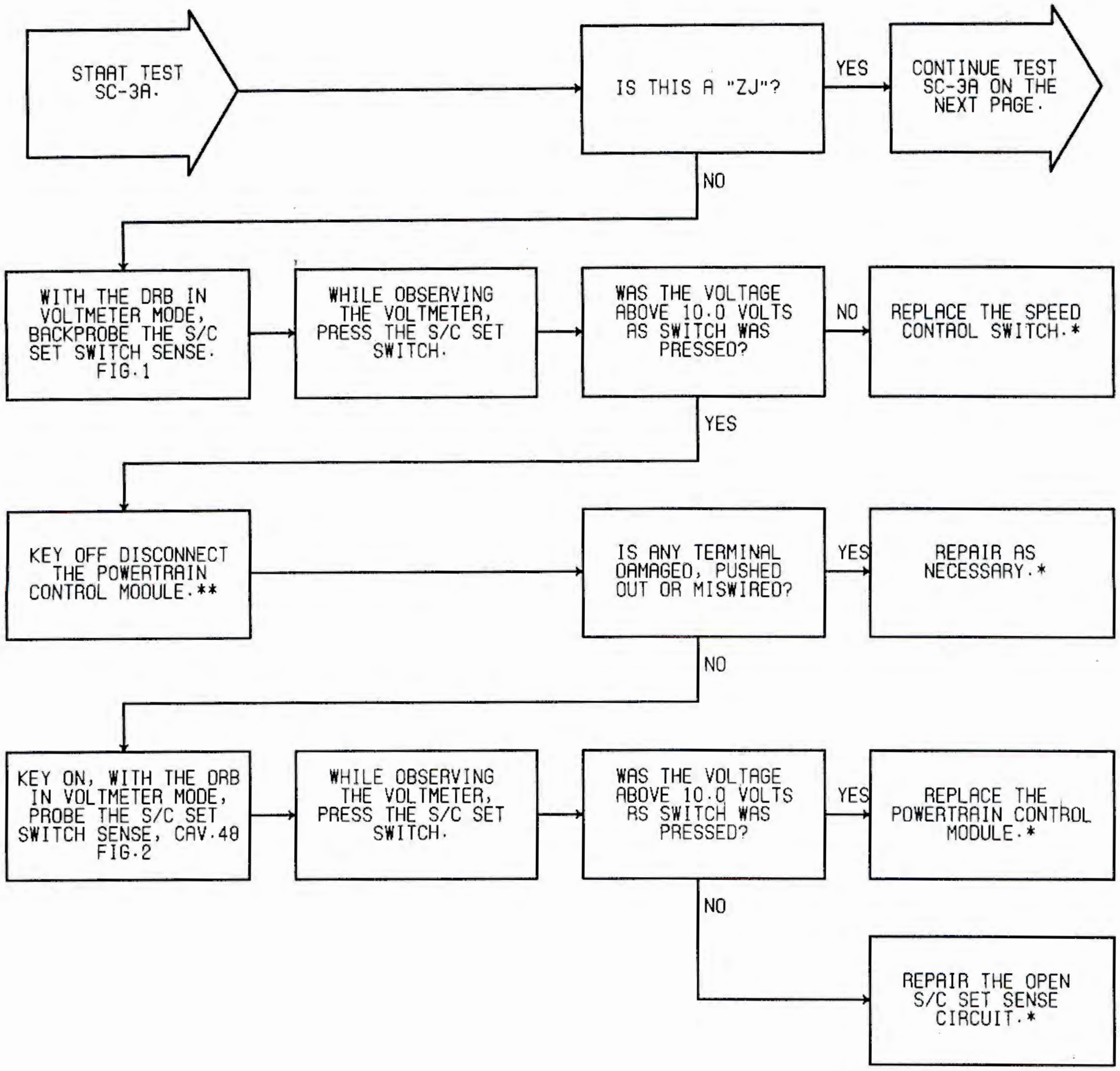
CAV	COLOR	FUNCTION
48	BR/RD	SPEED CONTROL COAST SET SWITCH SENSE

1060305

FIG. 2

TEST SC-3A — CHECKING THE SPEED CONTROL SET/RESUME SWITCH

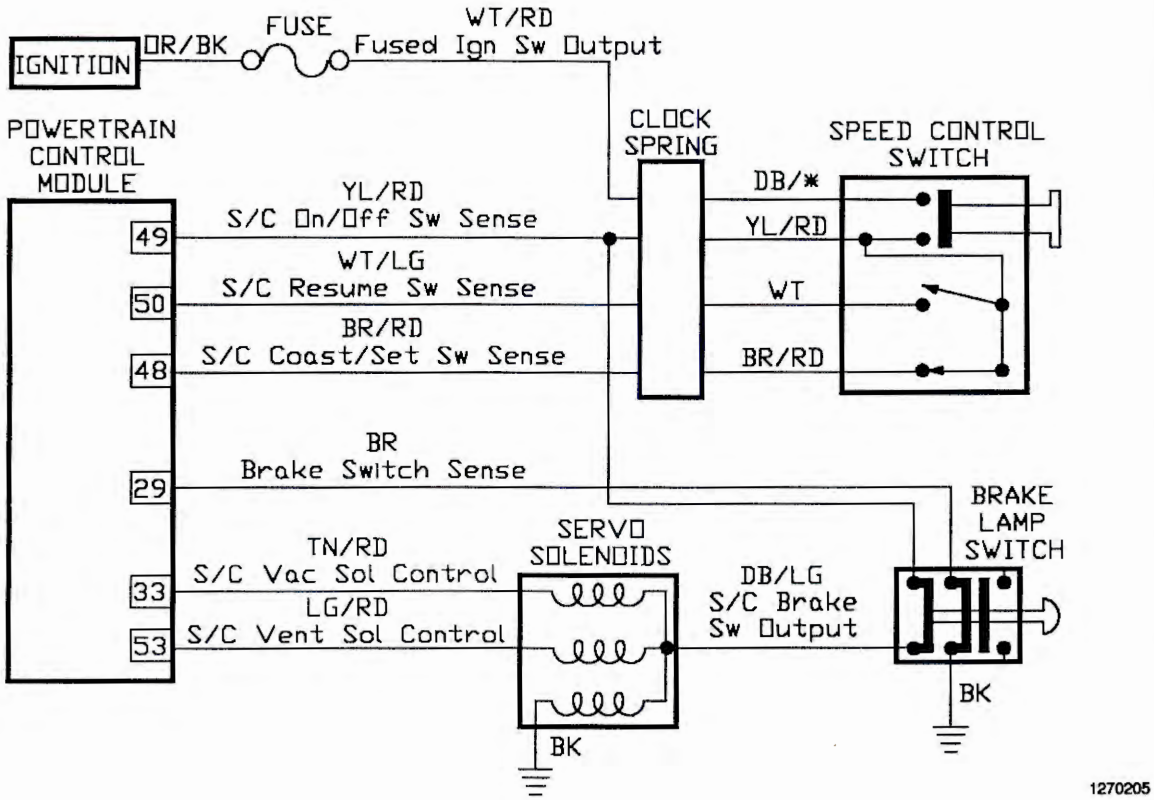
Perform TEST SC-1A Before Proceeding

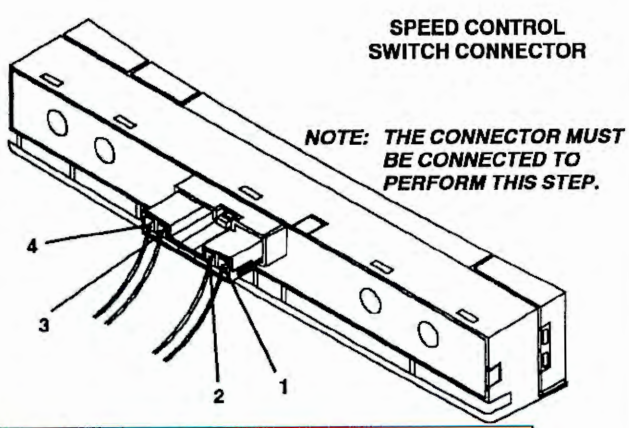


***Perform Verification TEST VER-4A.**	****Check connectors – Clean / repair as necessary.**

TEST SC-3A — CONTINUED - CHECKING THE SPEED CONTROL SET/RESUME SWITCH

ZJ BODY

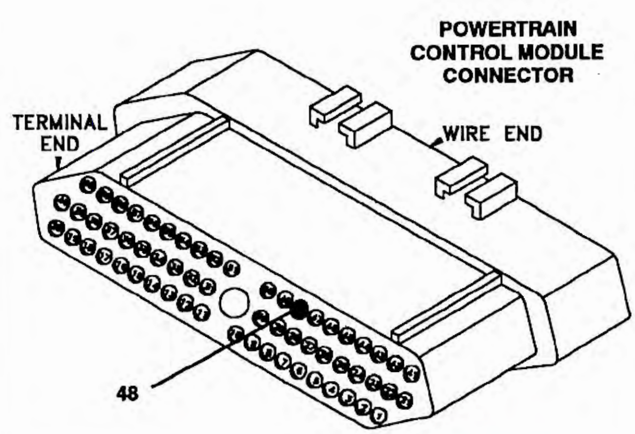




CAV	COLOR	FUNCTION
1	YL/RD	S/C ON/OFF SWITCH SENSE
2	DB/*	FUSED IGNITION SW OUTPUT
3	WT	S/C RESUME SWITCH SENSE
4	BR/RD	S/C COAST/SET SWITCH SENSE

1260401

FIG. 1

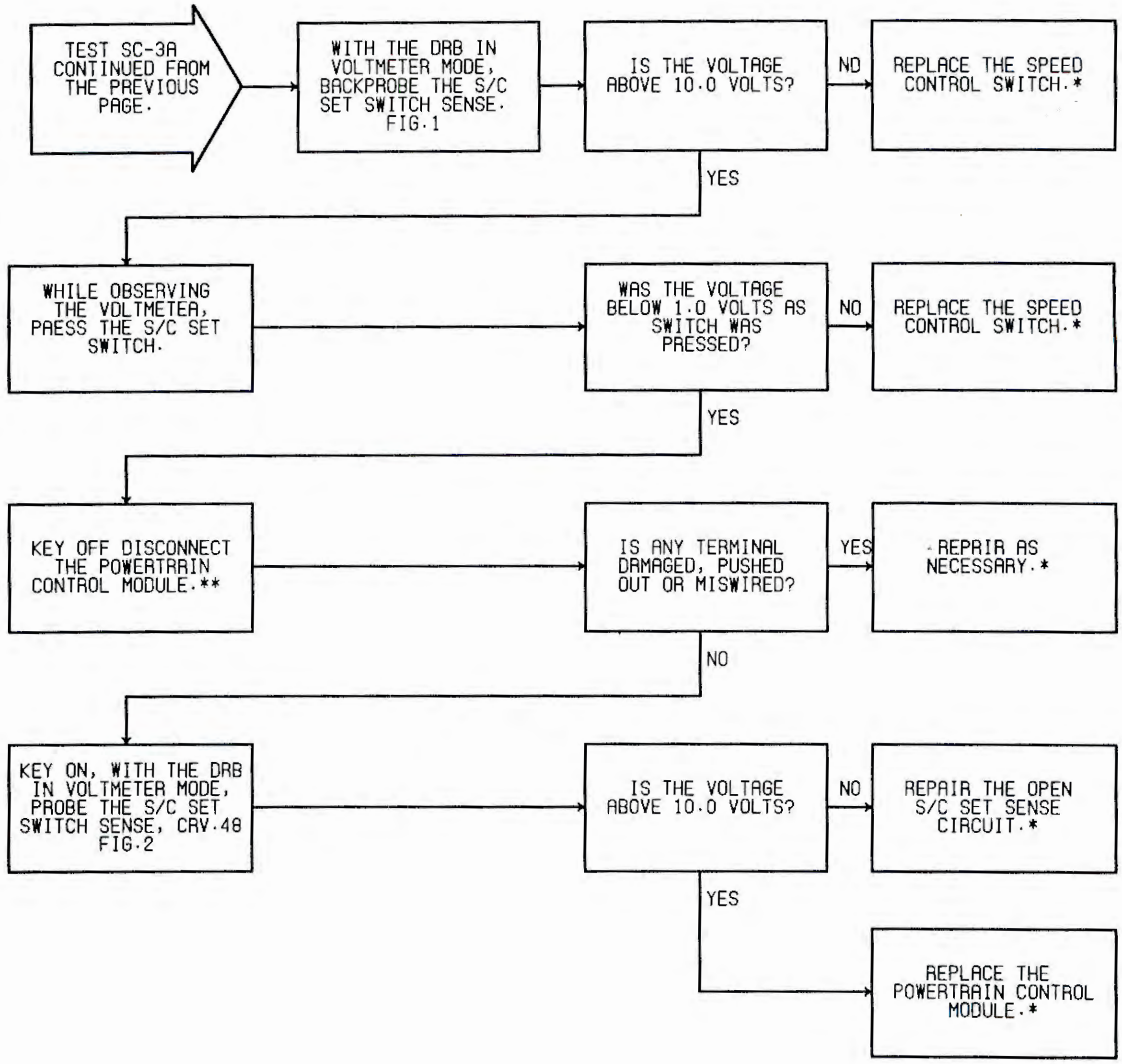


CAV	COLOR	FUNCTION
48	BR/RD	SPEED CONTROL COAST SET SWITCH SENSE

1060305

FIG. 2

TEST SC-3A CONTINUED - CHECKING THE SPEED CONTROL SET/RESUME SWITCH



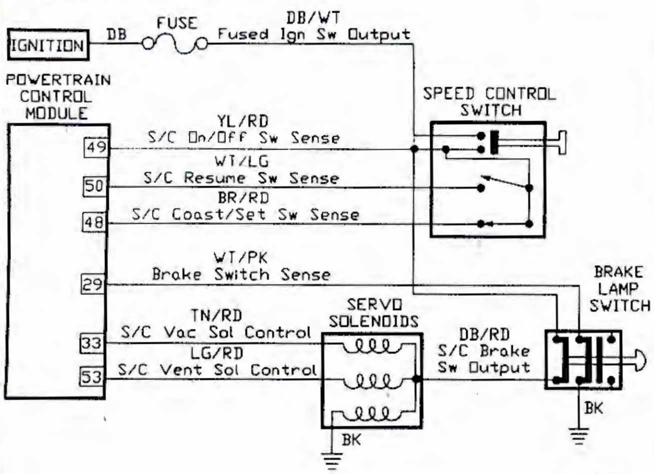
***Perform Verification TEST VER-4A.**

****Check connectors – Clean / repair as necessary.**

TEST SC-3B | CHECKING THE SPEED CONTROL SET/RESUME SWITCH

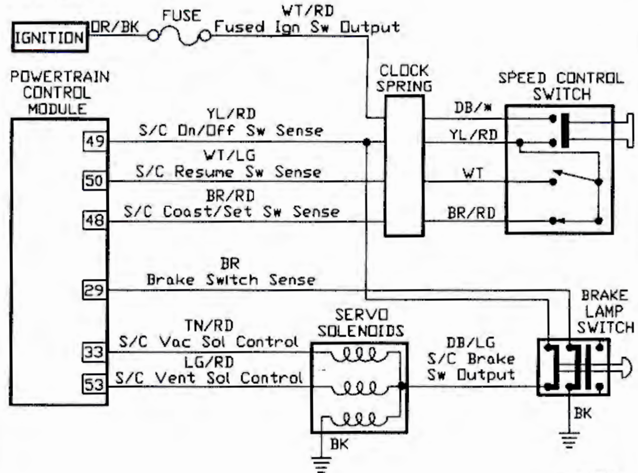
Perform TEST SC-1A Before Proceeding

MJ/XJ BODY



1270204

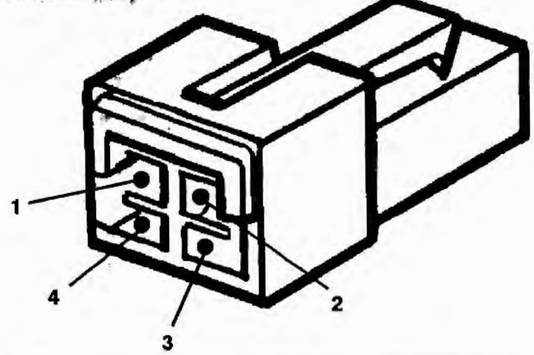
ZJ BODY



1270205

MJ/XJ BODY

SPEED CONTROL SWITCH CONNECTOR



1260605

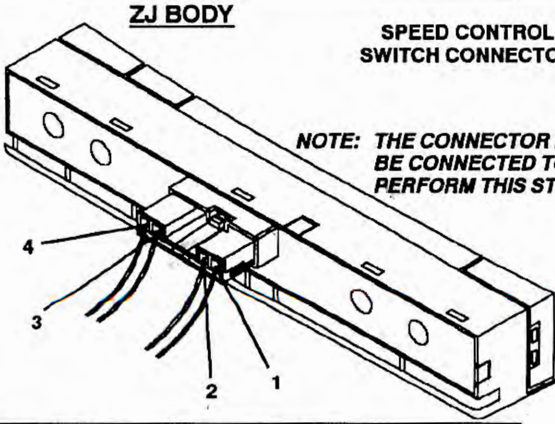
CAV	COLOR	FUNCTION
1	YL/RD	SC ON/OFF SWITCH SENSE
2	WT/LG	SC RESUME SWITCH SENSE
3	BR/RD	SC COAST/SET SW SENSE
4	DB/WT	FUSED IGN SW OUTPUT

FIG. 1

ZJ BODY

SPEED CONTROL SWITCH CONNECTOR

NOTE: THE CONNECTOR MUST BE CONNECTED TO PERFORM THIS STEP.

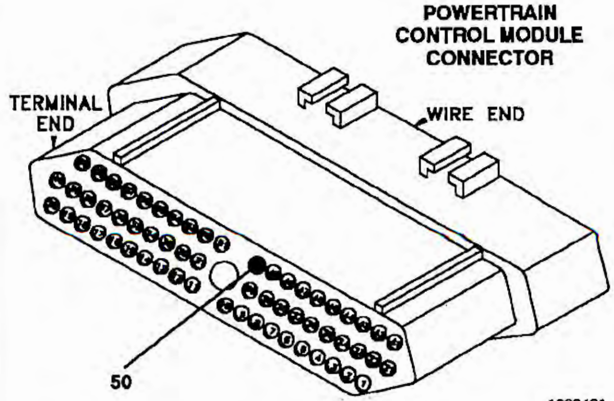


CAV	COLOR	FUNCTION
1	YL/RD	S/C ON/OFF SWITCH SENSE
2	DB/*	FUSED IGNITION SW OUTPUT
3	WT	S/C RESUME SWITCH SENSE
4	BR/RD	S/C COAST/SET SWITCH SENSE

1260401

FIG. 2

POWERTRAIN CONTROL MODULE CONNECTOR



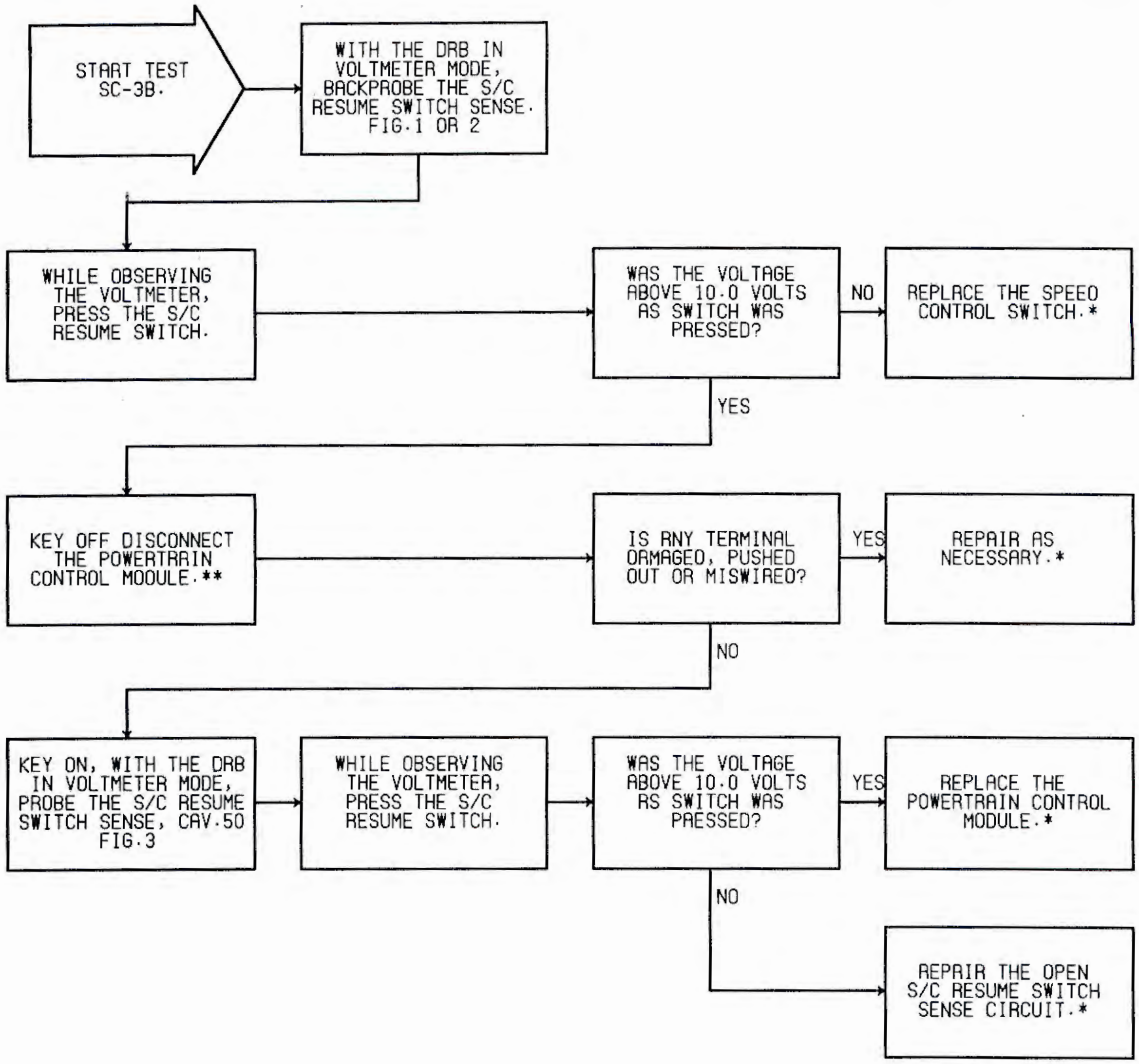
1060401

CAV	COLOR	FUNCTION
50	WT/LG	SPEED CONTROL RESUME SWITCH SENSE

FIG. 3

TEST SC-3B CHECKING THE SPEED CONTROL SET/RESUME SWITCH

Perform TEST SC-1A Before Proceeding

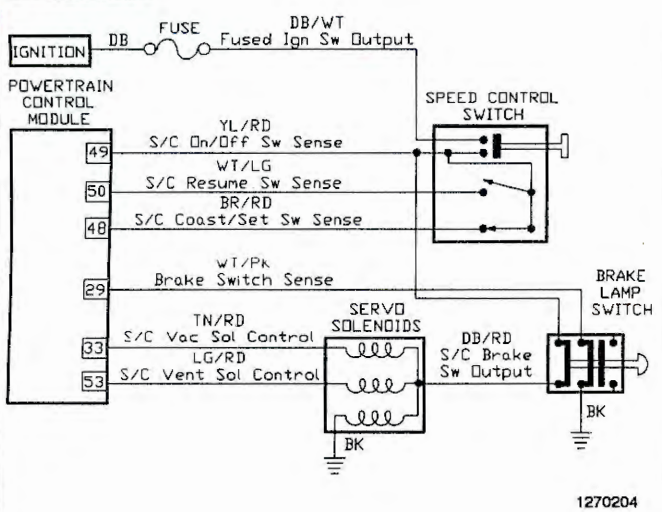


Perform Verification TEST VER-4A.** | ****Check connectors – Clean / repair as necessary.

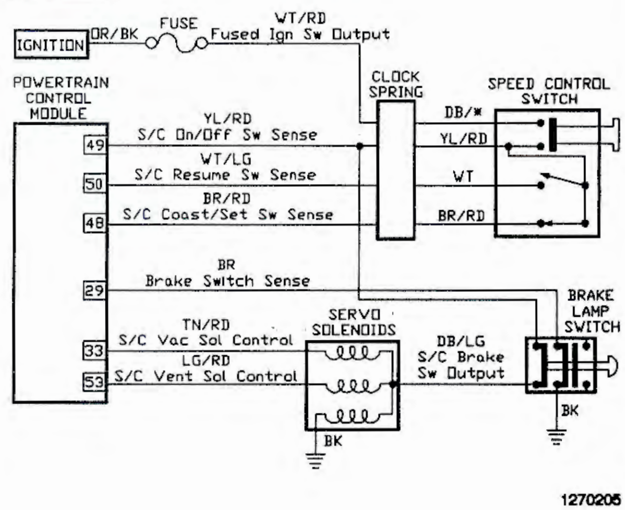
TEST SC-4A CHECKING THE BRAKE SWITCH SENSE

Perform TEST SC-1A Before Proceeding

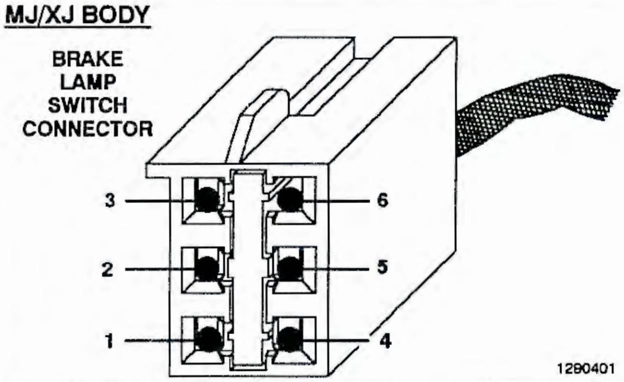
MJ/XJ BODY



ZJ BODY



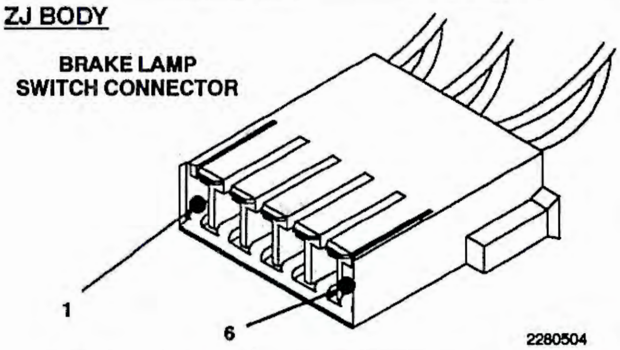
MJ/XJ BODY



CAV	COLOR	FUNCTION
1	YL/RD	SPEED CONTROL ON/OFF SWITCH SENSE
2	WT/TN	BRAKE LAMP SWITCH OUTPUT
3	WT/PK	BRAKE SWITCH SENSE
4	DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
5	PK/*	FUSED B(+)
6	BK	GROUND

FIG. 1

ZJ BODY



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	S/C ON/OFF SWITCH OUTPUT
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

FIG. 2

MJ/XJ BODY

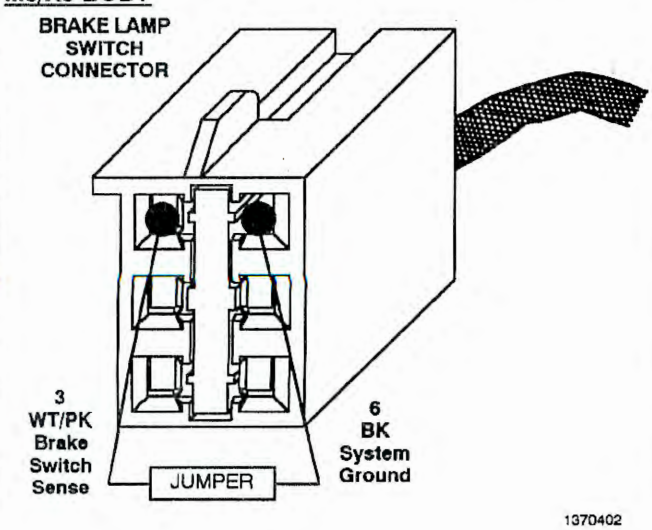


FIG. 3

ZJ BODY

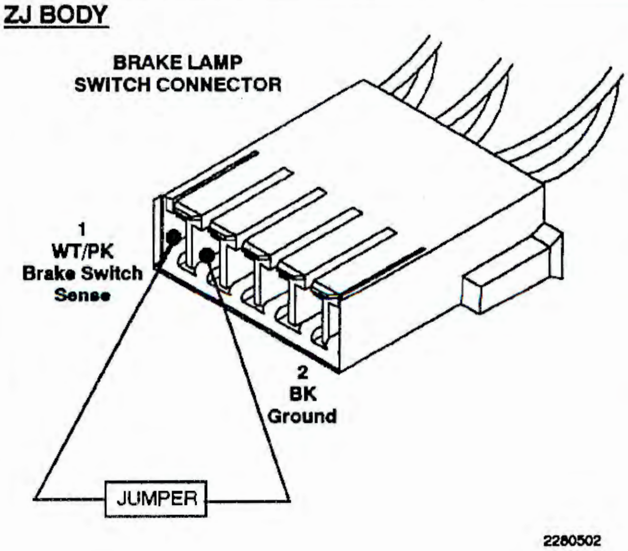
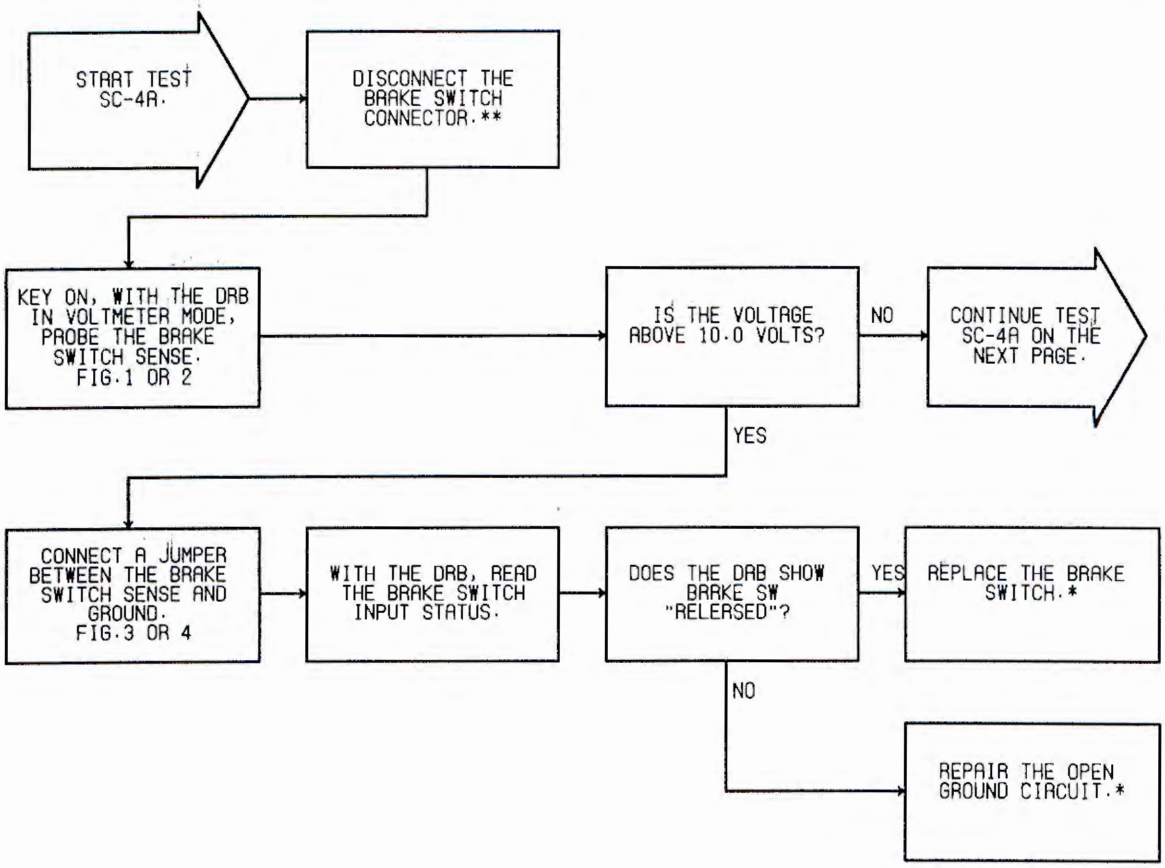


FIG. 4

TEST SC-4A CHECKING THE BRAKE SWITCH SENSE

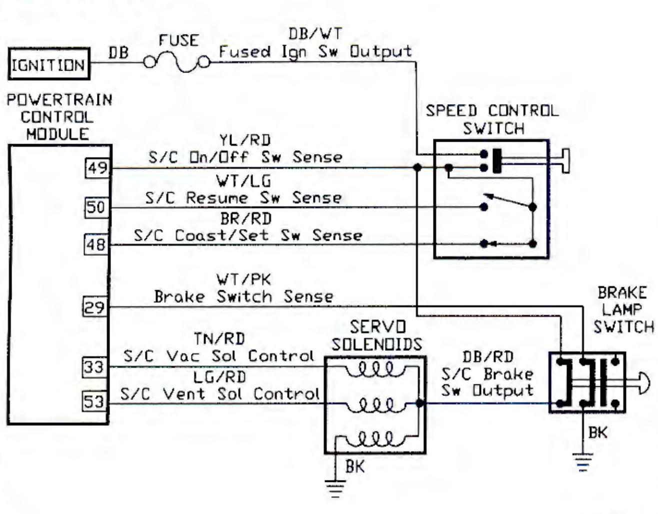
Perform TEST SC-1A Before Proceeding



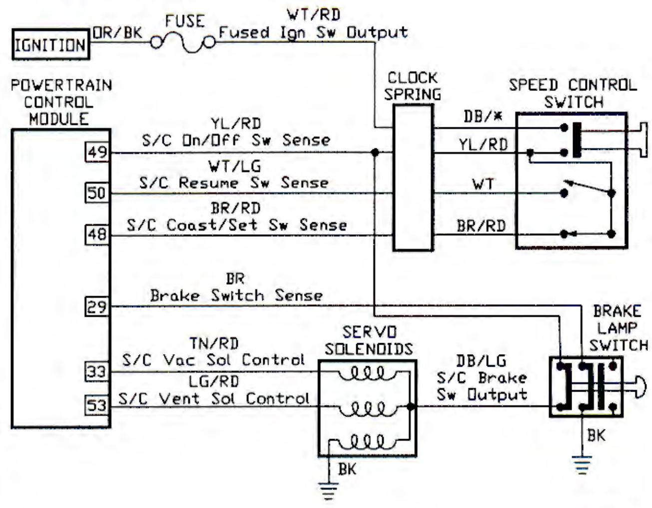
***Perform Verification TEST VER-4A.**	****Check connectors – Clean / repair as necessary.**

TEST SC-4A CONTINUED - CHECKING THE BRAKE SWITCH SENSE

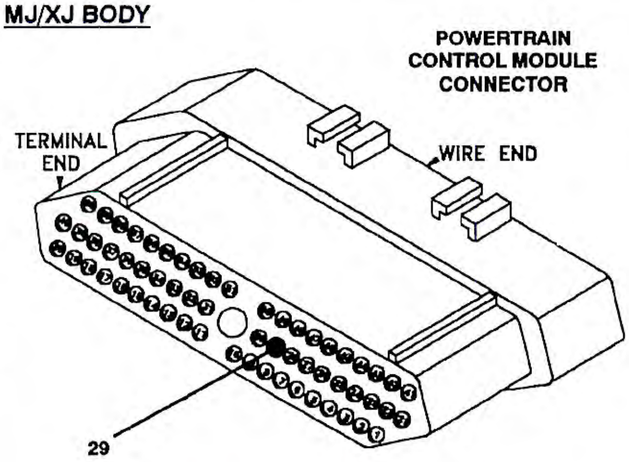
MJ/XJ BODY



ZJ BODY



MJ/XJ BODY

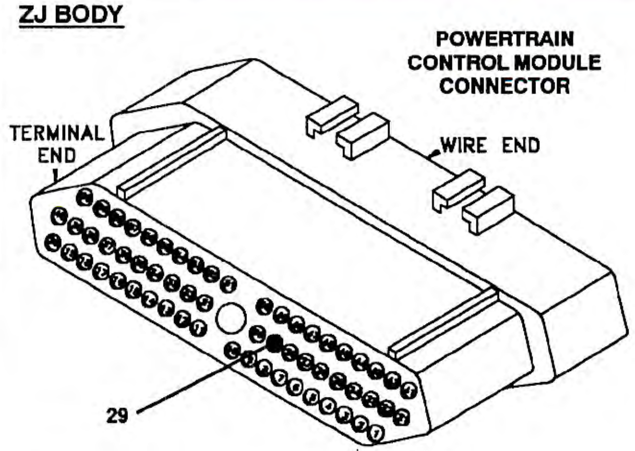


CAV	COLOR	FUNCTION
29	WT/PK	BRAKE SWITCH SENSE

0800204

FIG. 1

ZJ BODY



CAV	COLOR	FUNCTION
29	BR	BRAKE SWITCH SENSE

1060106

FIG. 2

1994-95 ZJ BODIES

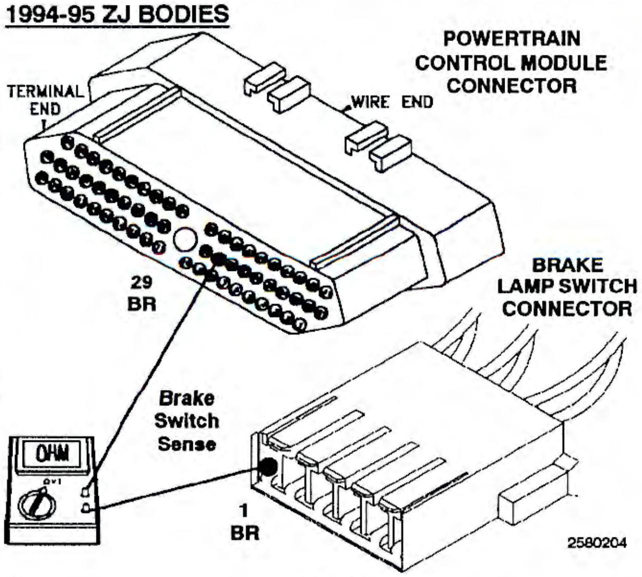


FIG. 3

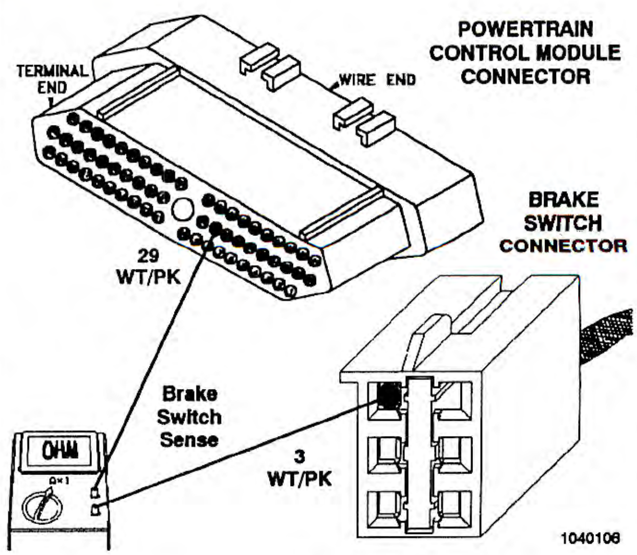
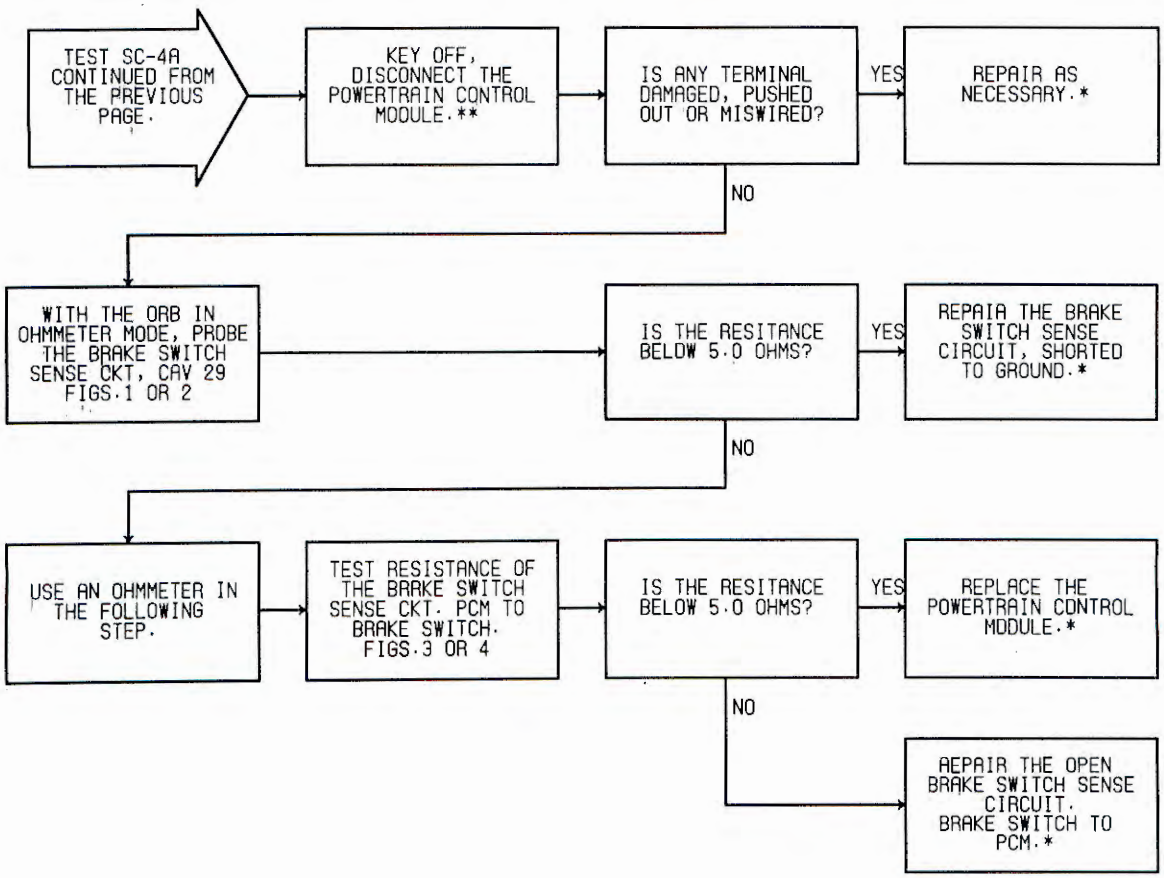


FIG. 4

TEST SC-4A CONTINUED - CHECKING THE BRAKE SWITCH SENSE



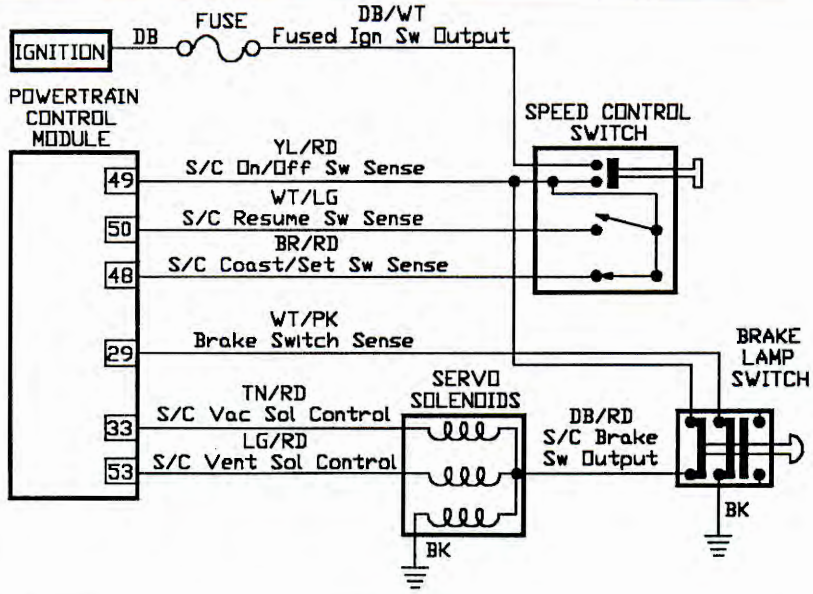
***Perform Verification TEST VER-4A.**

****Check connectors – Clean / repair as necessary.**

TEST SC-5A | CHECKING THE PARK/NEUTRAL POSITION SWITCH

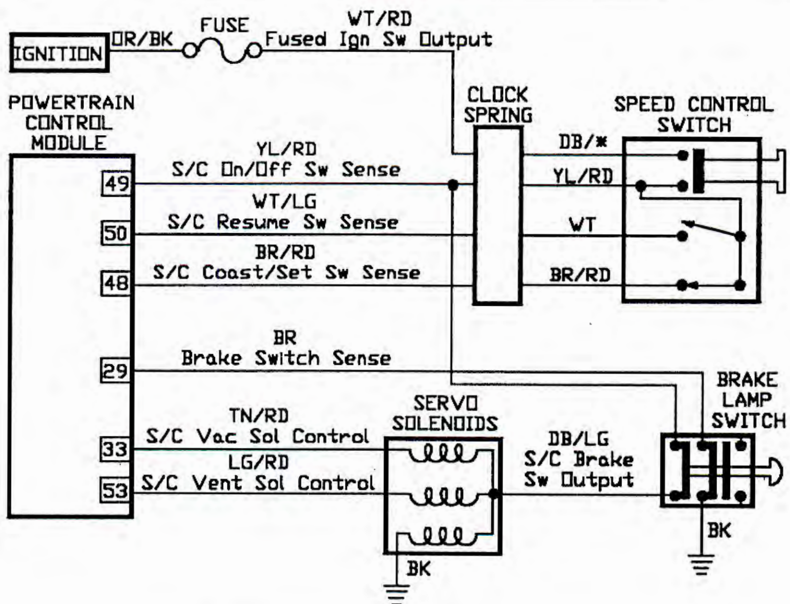
Perform TEST SC-1A Before Proceeding

MJ/XJ BODY



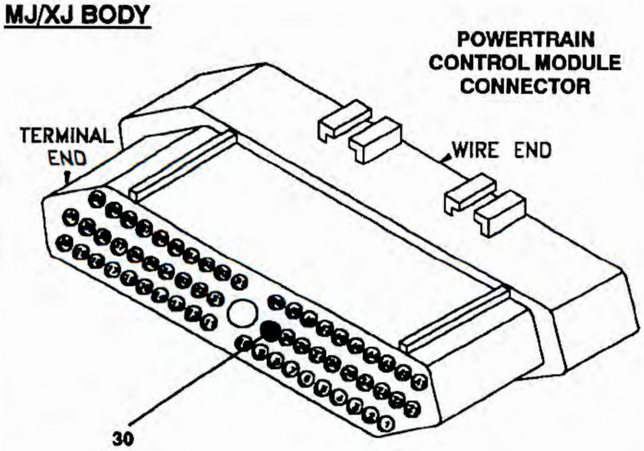
1270204

ZJ BODY



1270205

MJ/XJ BODY

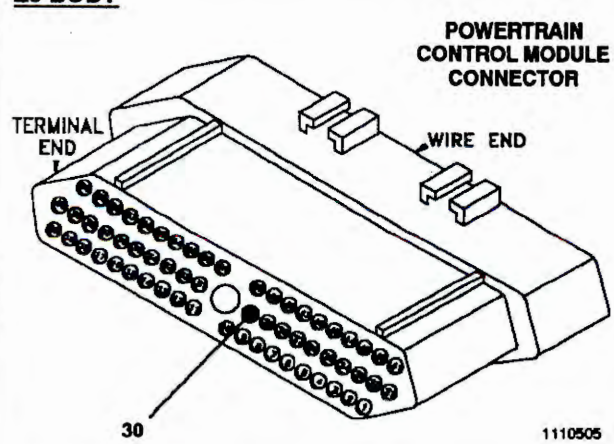


0970602

CAV	COLOR	FUNCTION
30	BR/*	PARK/NEUTRAL POSITION SW SENSE

FIG. 1

ZJ BODY



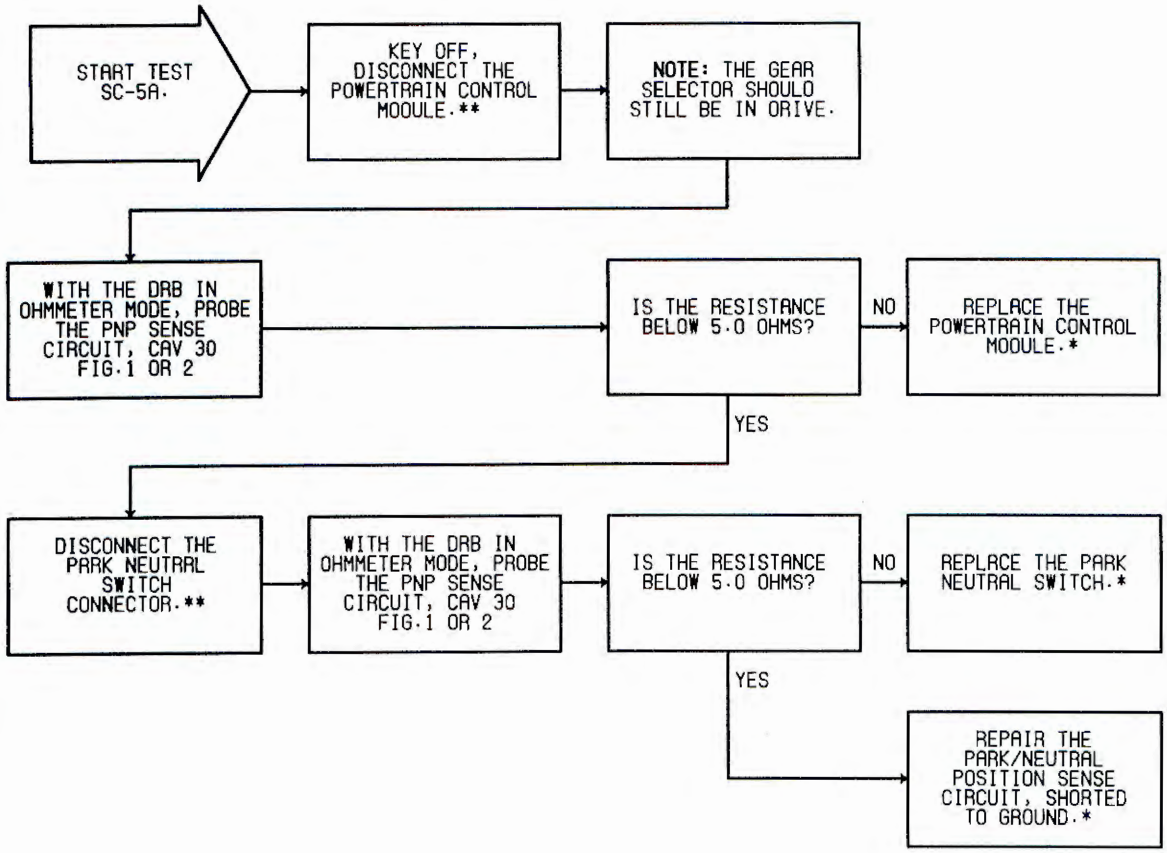
1110505

CAV	COLOR	FUNCTION
30	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE

FIG. 2

TEST SC-5A CHECKING THE PARK/NEUTRAL POSITION SWITCH

Perform TEST SC-1A Before Proceeding

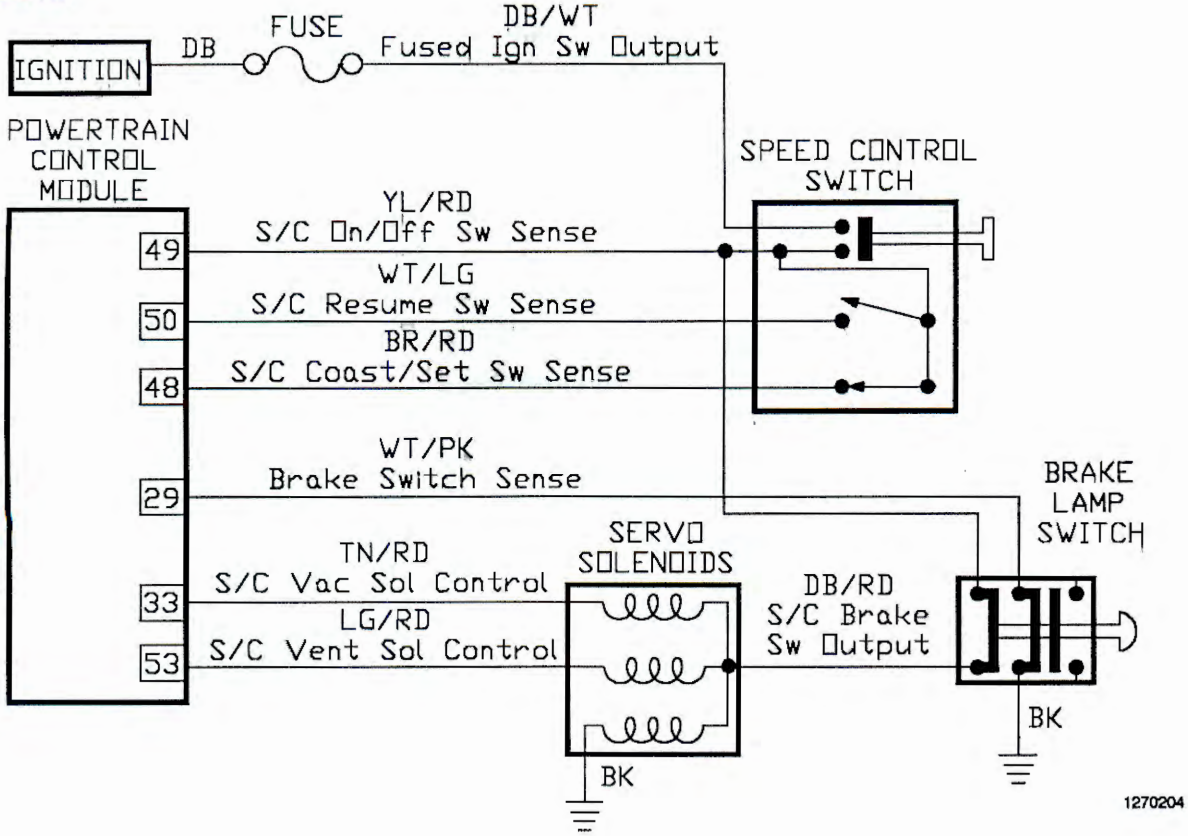


Perform Verification TEST VER-4A.** | ****Check connectors – Clean / repair as necessary.

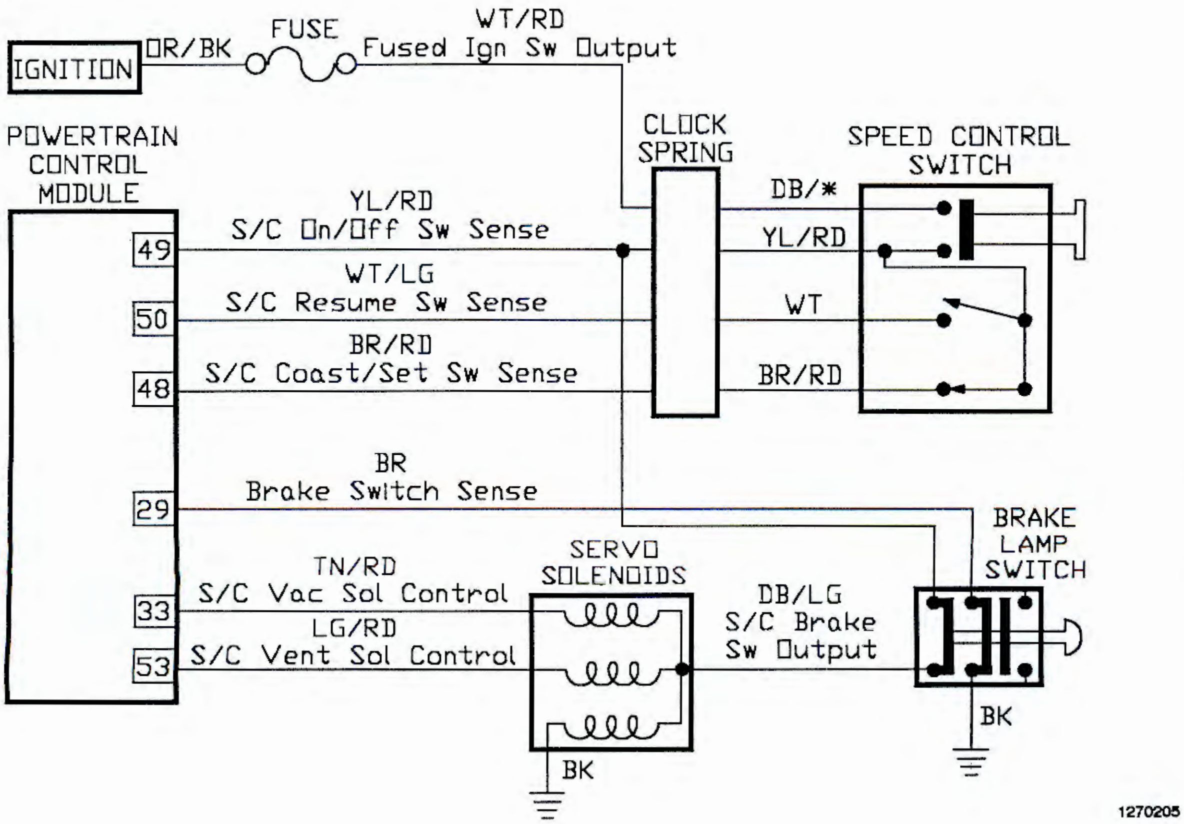
TEST SC-6A CHECKING FOR A SPEED CONTROL DENIED MESSAGE

Perform TEST SC-1A Before Proceeding

MJ/XJ BODY



ZJ BODY



TEST SC-6A	CHECKING FOR A SPEED CONTROL DENIED MESSAGE

Perform TEST SC-1A Before Proceeding

At this time the speed control switch and servo functions appear to operate properly. Using the DRB, monitor the speed control "cutout" status. Road test the vehicle at speeds over 35 mph and attempt to set the speed control. The following items will not allow the speed control to set. The last or most recent cause for speed control not to set is indicated by the "Denied" status.

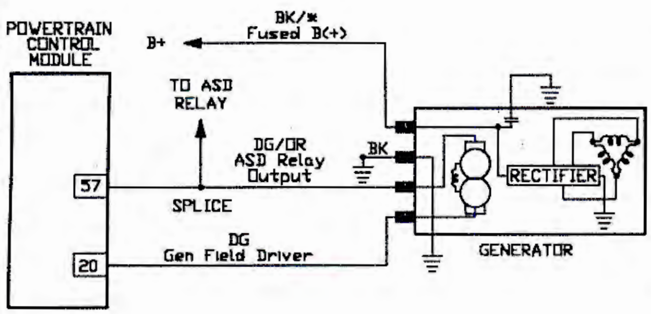
Denied Message

ON/OFF	The powertrain control module does not see an "ON" signal from the switch at cavity 49.
SPEED	The vehicle speed as seen by the powertrain control module at cavity 47 is not greater than 36 mph.
RPM	The engine rpm is excessively high.
BRAKE	The brake switch sense circuit is open indicating to the powertrain control module that the brakes are applied. The sense circuit, cavity 29 of the PCM, is grounded through the brake pedal switch when the brakes are released.
P/N	The park/neutral switch sense circuit is grounded indicating to the powertrain control module that the transmission is not in gear. The sense circuit, cavity 30 of the PCM, is grounded through the park/neutral switch when the transmission is in park or neutral.
RPM/SPD	The PCM senses excessive engine rpm for a given vehicle speed.
SOL FLT	The powertrain control module senses a servo solenoid circuit trouble code that is maturing or set in memory.

TEST CH-1A | CHARGING SYSTEM NO CODE TEST

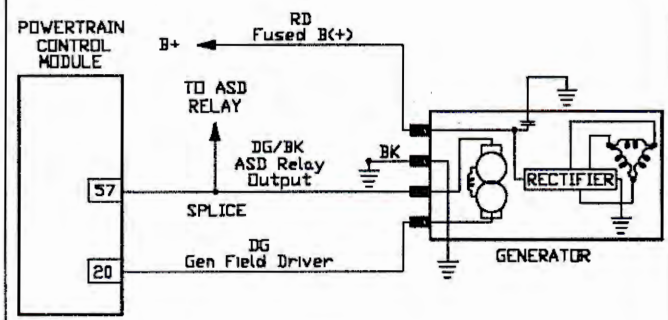
Perform TEST TC-35A or TC-36B Before Proceeding

MJ/XJ AND YJ BODIES



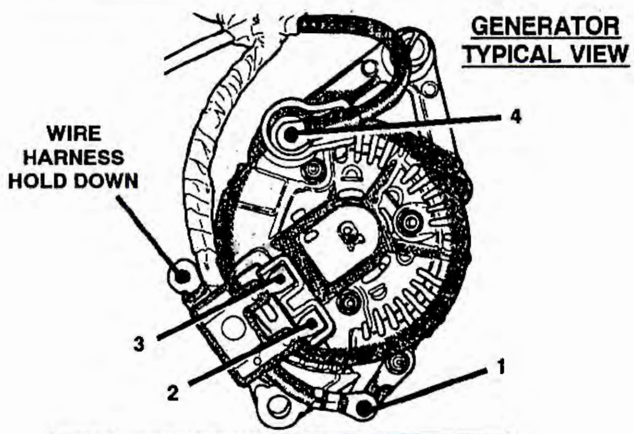
1330403

ZJ BODY



1330406

MJ/XJ BODY

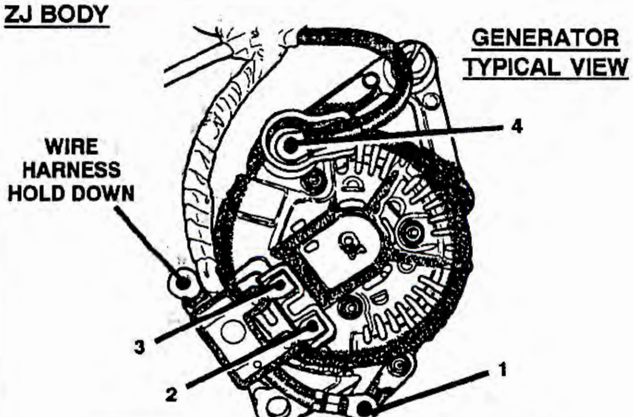


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/OR	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	BK/WT	B(+)

1320404

FIG. 1

ZJ BODY

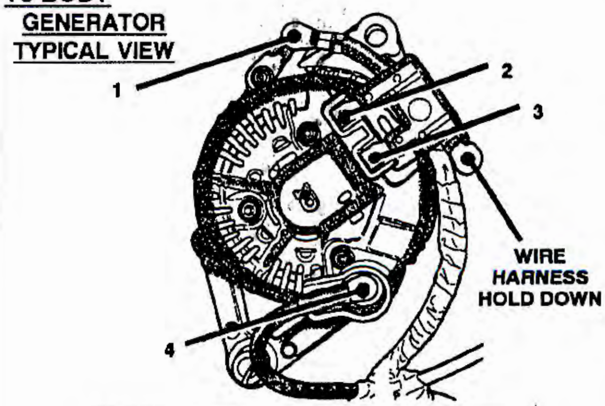


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG	GENERATOR FIELD DRIVER
3	DG/OR	ASD RELAY OUTPUT
4	BK/GY	B(+)

1320405

FIG. 2

YJ BODY



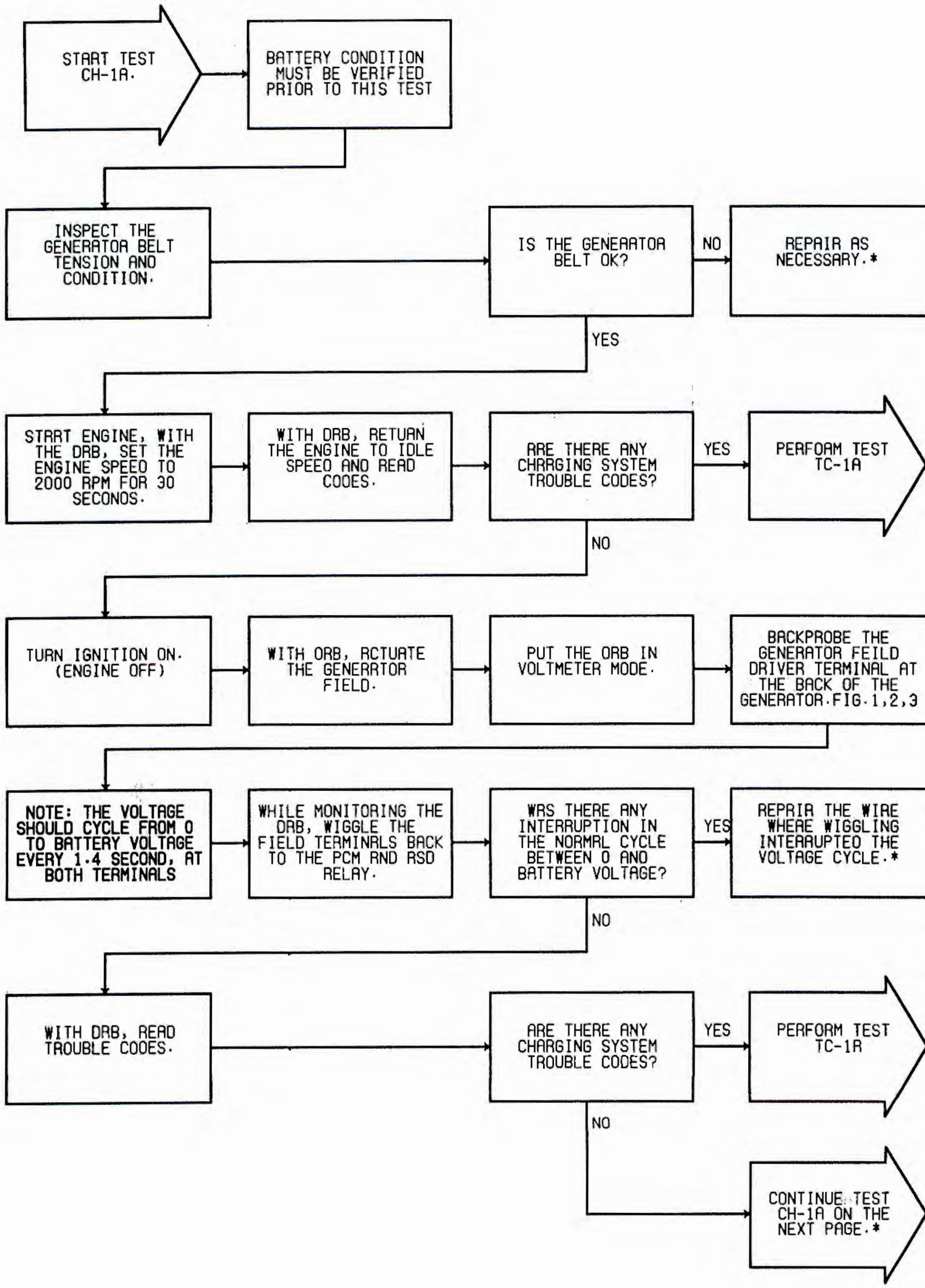
CAV	COLOR	FUNCTION
1	BK	GROUND
2	DG/BK	ASD RELAY OUTPUT
3	DG	GENERATOR FIELD DRIVER
4	RD	B(+)

1320406

FIG. 3

TEST CH-1A | CHARGING SYSTEM NO CODE TEST

Perform TEST TC-35A or TC-36B Before Proceeding



Perform Verification TEST VER-3A.** | ****Check connectors – Clean / repair as necessary.

TEST CH-1A CONTINUED - CHARGING SYSTEM NO CODE TEST

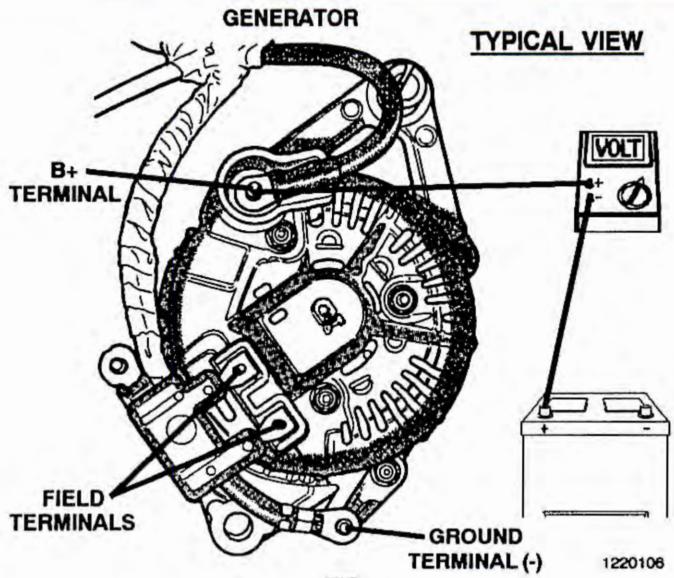


FIG. 1

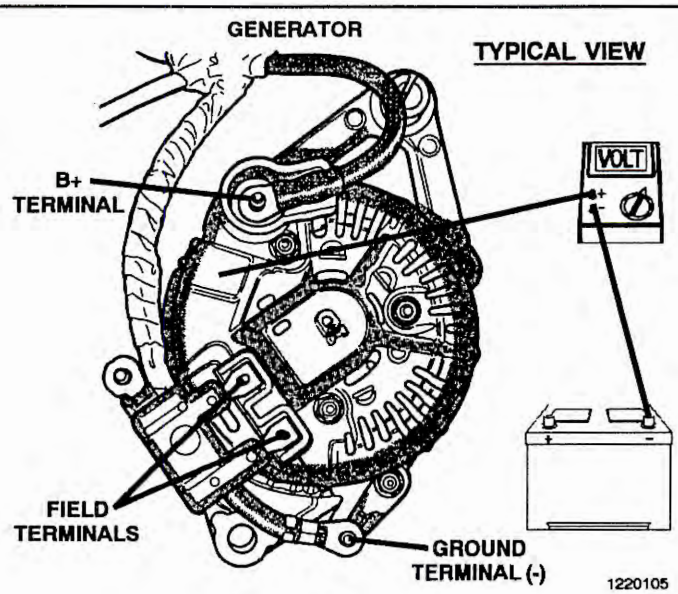


FIG. 2

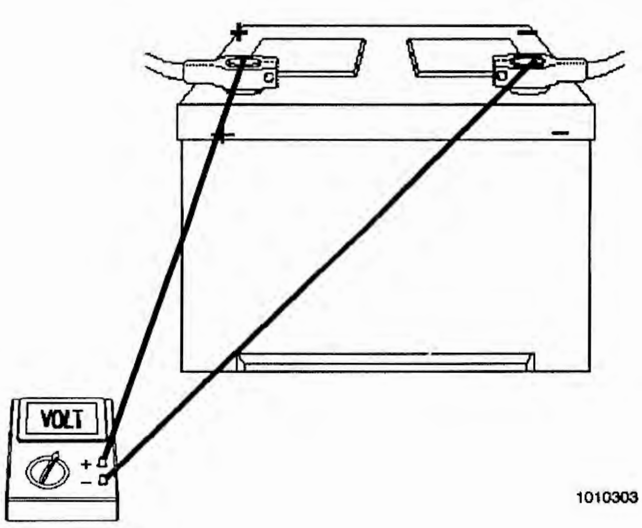


FIG. 3

TEST CH-1A CONTINUED FROM THE PREVIOUS PAGE.

USE A VOLTMETER IN THE FOLLOWING STEP.

TEST BETWEEN THE GENERATOR (12V) B+ TERMINAL AND THE BATTERY (+) SIDE. FIG. 1

CAUTION: ENSURE ALL WIRES ARE CLEAR OF THE ENGINE'S MOVING PARTS.

START THE ENGINE.

IS THE VOLTAGE ABOVE 0.4 VOLT?

- YES → REPAIR THE B (+) CIRCUIT FOR HIGH RESISTANCE BETWEEN THE GENERATOR AND THE BATTERY.*
- NO ↓

IGNITION KEY OFF. USE A VOLTMETER IN THE FOLLOWING STEP.

TEST BETWEEN THE GENERATOR CASE AND BATTERY (-) SIDE.

FIG. 2

CAUTION: ENSURE ALL WIRES ARE CLEAR OF THE ENGINE'S MOVING PARTS.

START THE ENGINE.

IS THE VOLTAGE ABOVE 0.1 VOLT?

- YES → REPAIR GENERATOR GROUND HIGH RESISTANCE GENERATOR CASE TO BATTERY (-) SIDE.*
- NO ↓

WITH DRB READ BATTERY VOLTAGE AND RECORD.

USE A VOLTMETER, READ BATTERY VOLTAGE B(+) TO B(-) TERMINAL. FIG.3

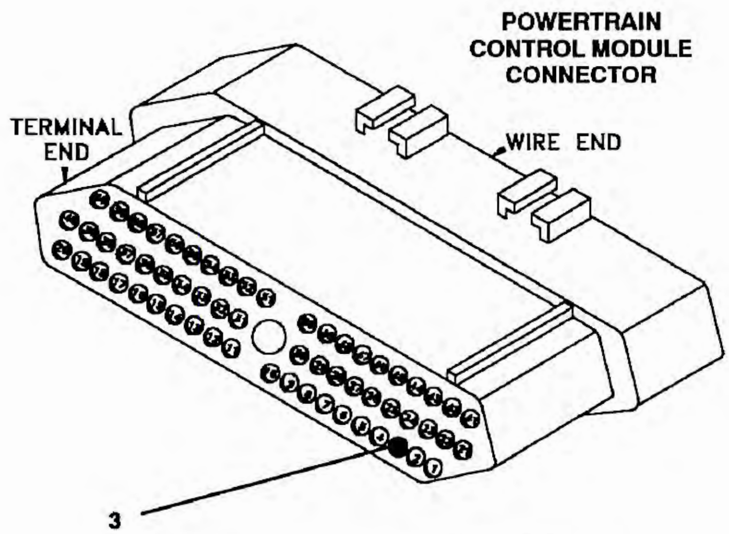
RECORD SECOND VOLTAGE READING. COMPARE THE TWO VOLTAGE READINGS.

IS VOLTAGE DIFFERENCE LESS THAN ONE VOLT?

- YES → TEST COMPLETE.*
- NO → CONTINUE TEST CH-1A ON THE NEXT PAGE.*

TEST CH-1A | CONTINUED - CHARGING SYSTEM NO CODE TEST

MJ/XJ AND ZJ BODIES

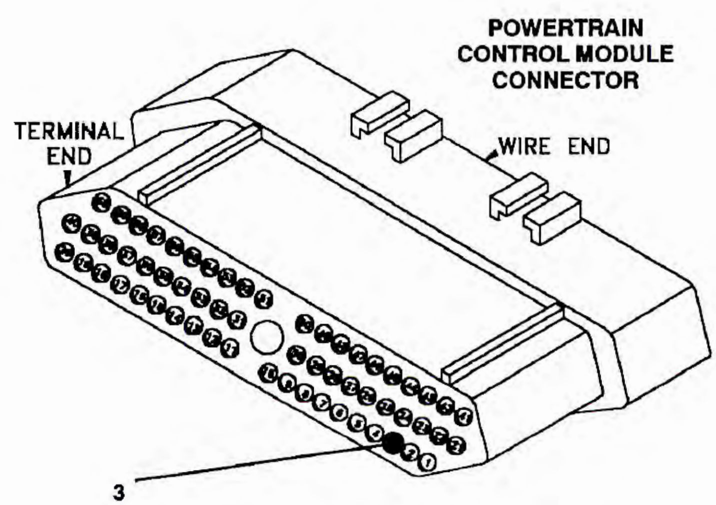


CAV	COLOR	FUNCTION
3	RD	FUSED B(+)

1050601

FIG. 1

YJ BODY

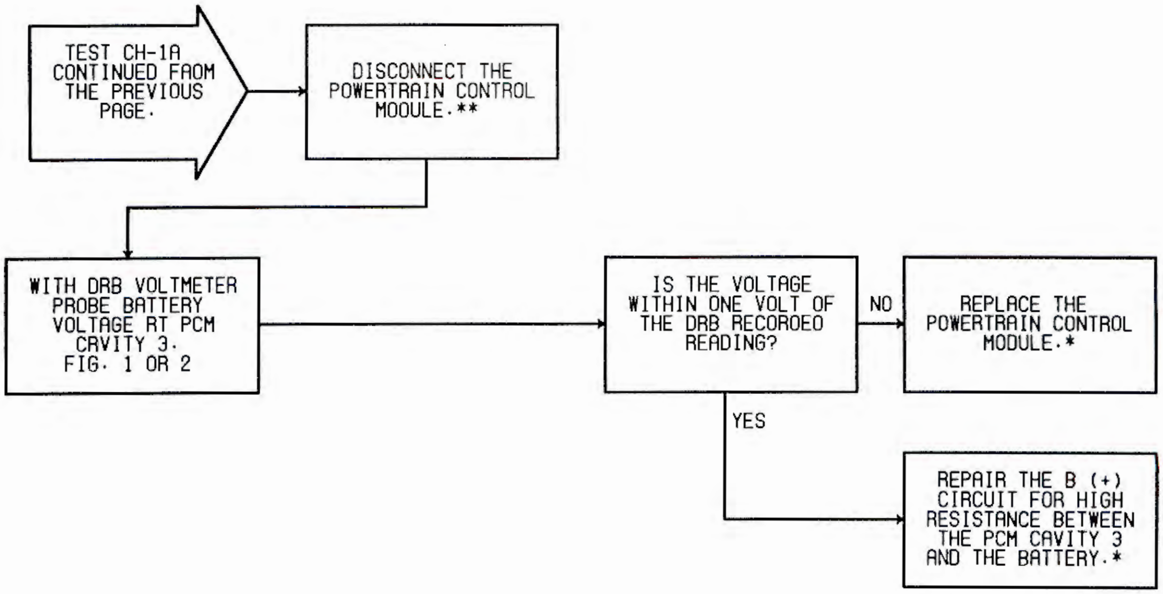


CAV	COLOR	FUNCTION
3	RD/WT	FUSED B(+)

0790404

FIG. 2

TEST CH-1A CONTINUED - CHARGING SYSTEM NO CODE TEST



*Perform Verification TEST VER-3A.	**Check connectors – Clean / repair as necessary.

NO START TESTS

TEST NS-1A QUALIFYING A NO START CONDITION

Perform A Visual Inspection Before Proceeding

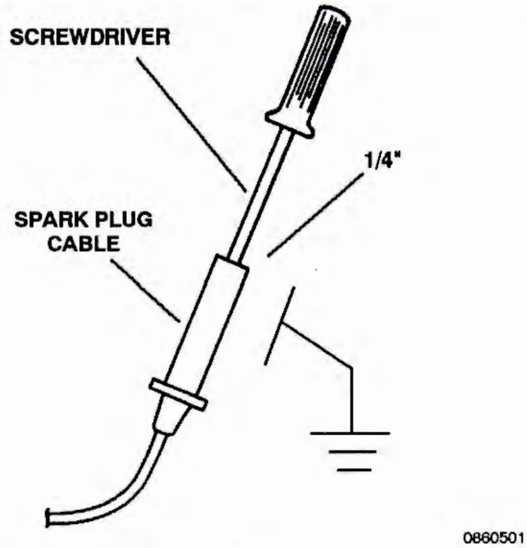


FIG. 1

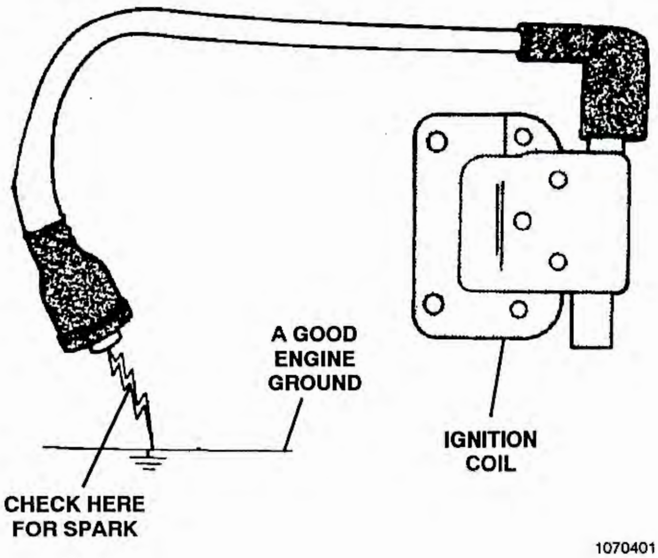


FIG. 2

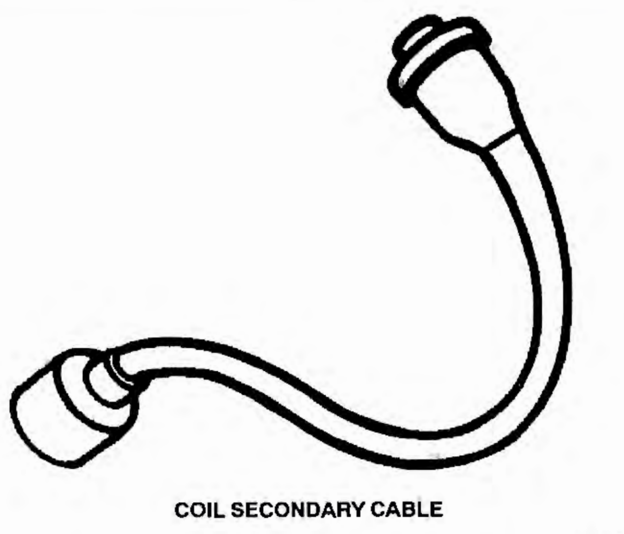
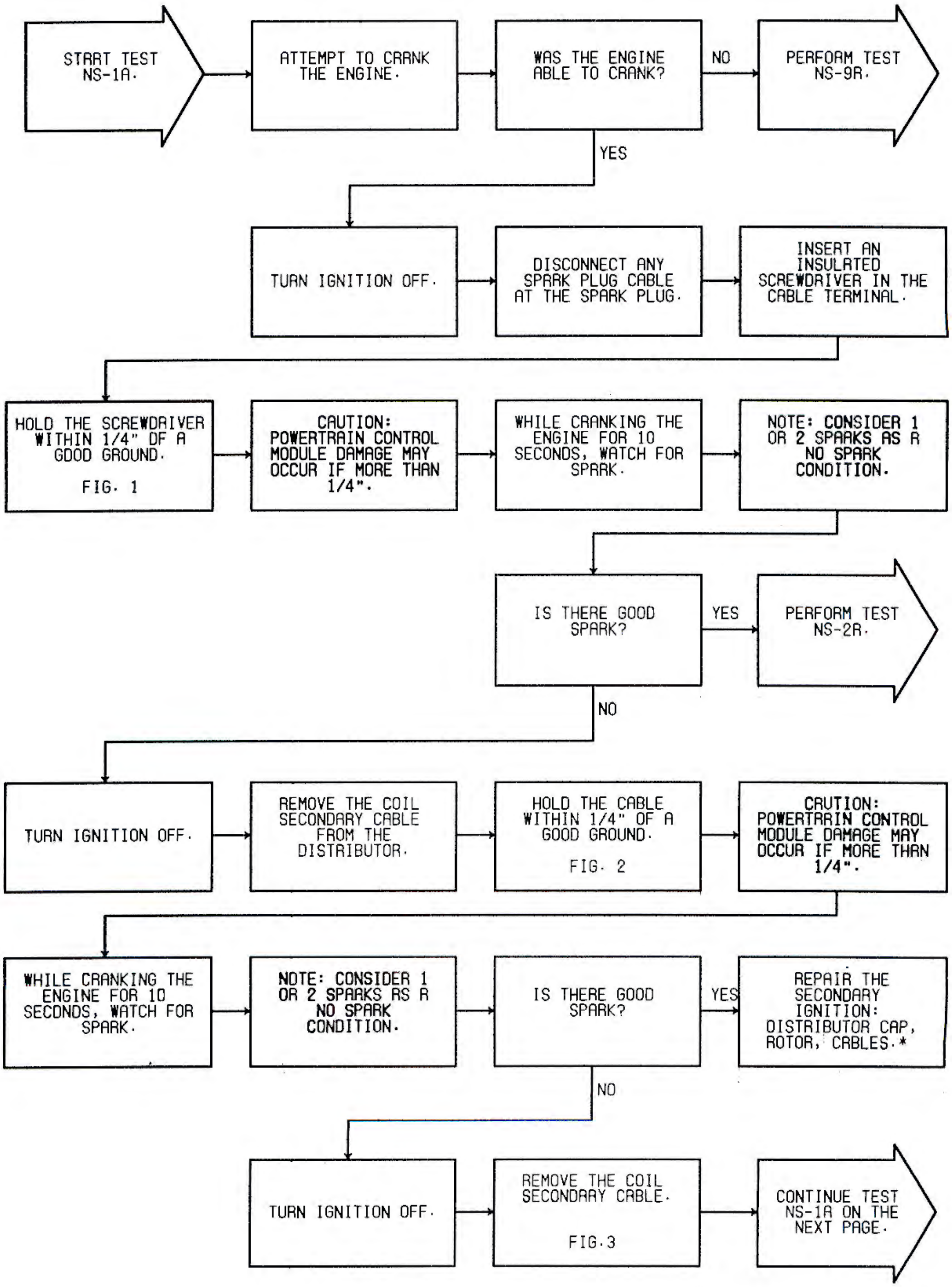


FIG. 3

TEST NS-1A QUALIFYING A NO START CONDITION

Perform A Visual Inspection Before Proceeding



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

N O S T A R T T E S T S

TEST NS-1A | CONTINUED - QUALIFYING A NO START CONDITION

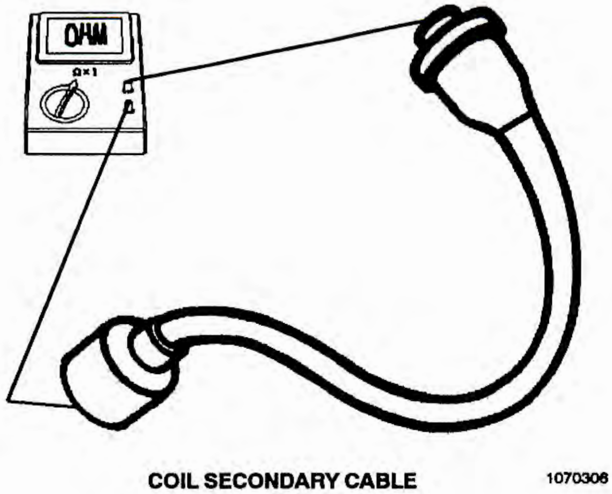


FIG. 1

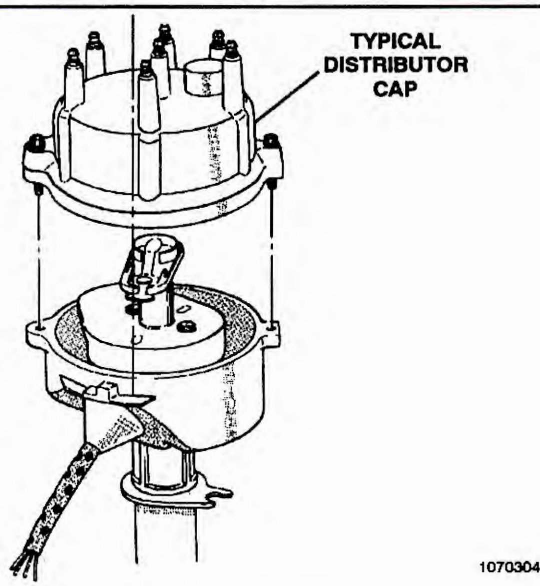


FIG. 2

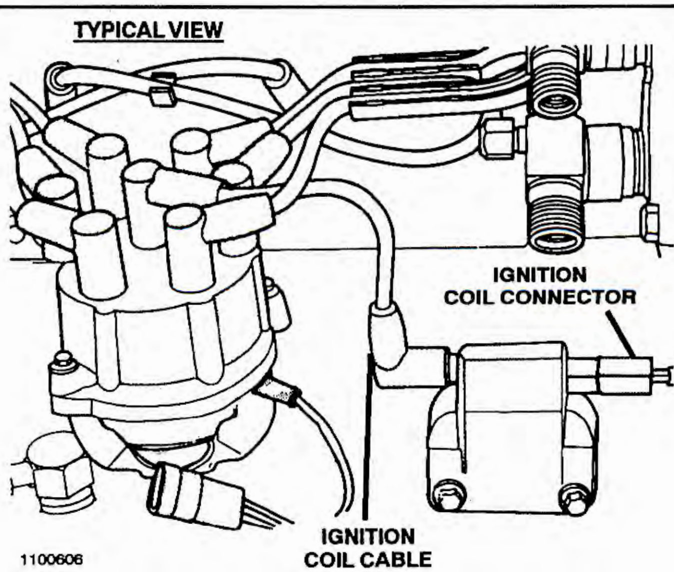
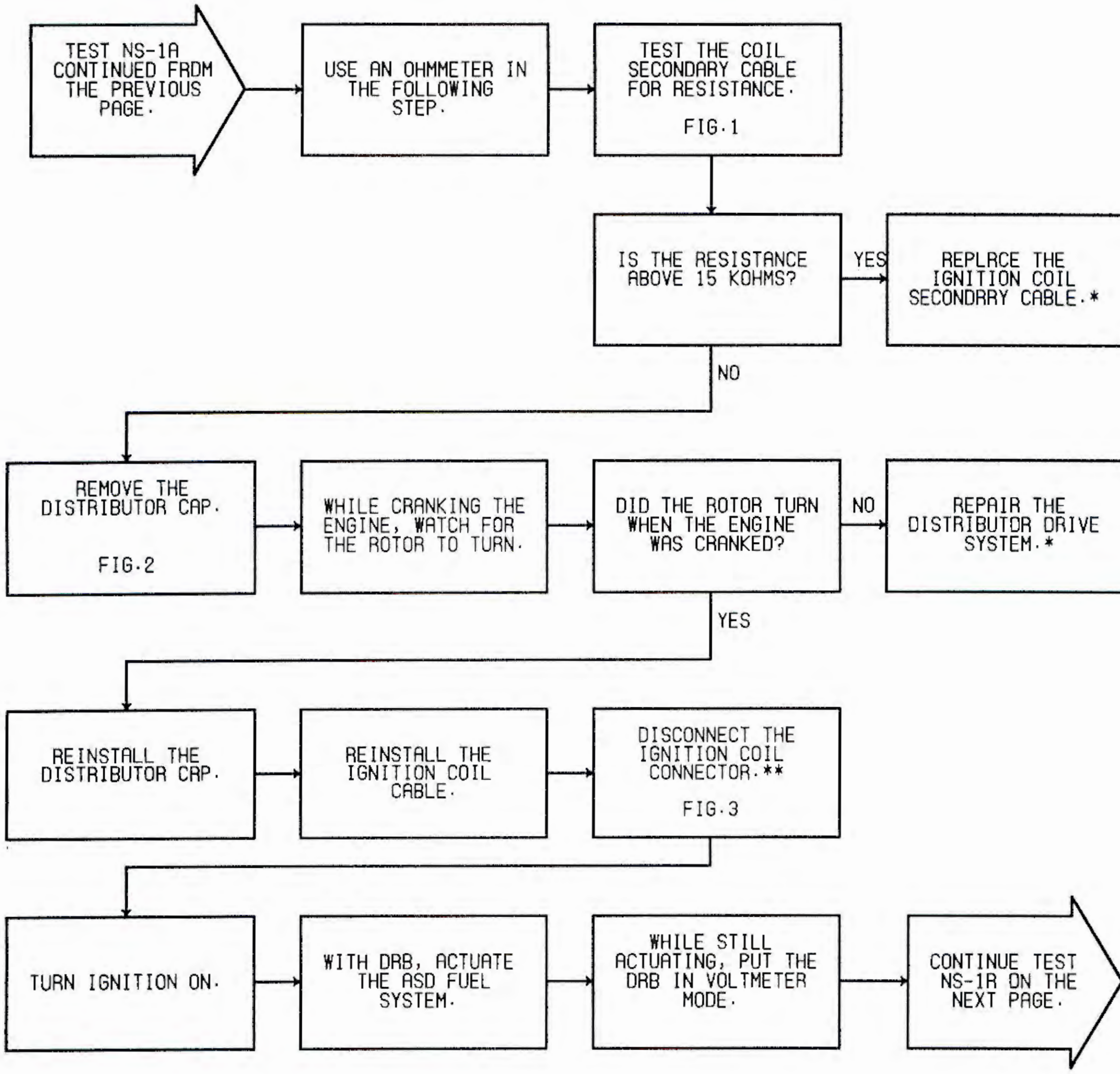


FIG. 3

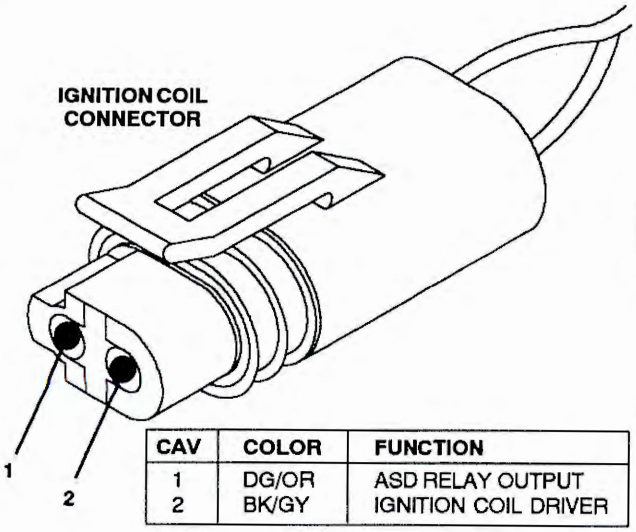
TEST NS-1A CONTINUED - QUALIFYING A NO START CONDITION



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

TEST NS-1A CONTINUED - QUALIFYING A NO START CONDITION

MJ/XJ BODY

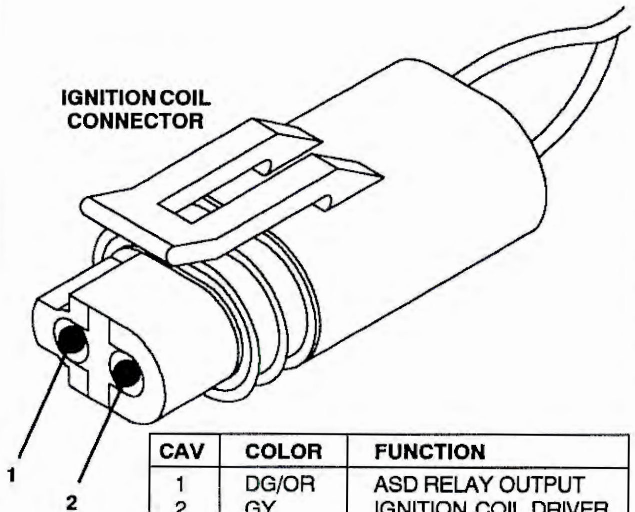


CAV	COLOR	FUNCTION
1	DG/OR	ASD RELAY OUTPUT
2	BK/GY	IGNITION COIL DRIVER

1040604

FIG. 1

YJ BODY

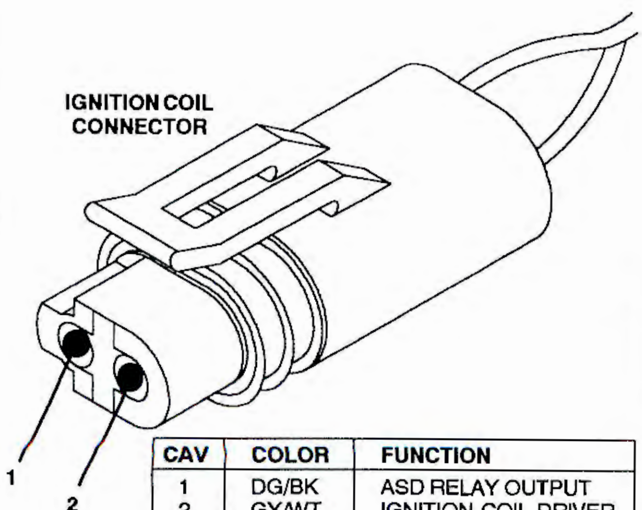


CAV	COLOR	FUNCTION
1	DG/OR	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

1040605

FIG. 2

ZJ BODY



CAV	COLOR	FUNCTION
1	DG/BK	ASD RELAY OUTPUT
2	GY/WT	IGNITION COIL DRIVER

1040606

FIG. 3

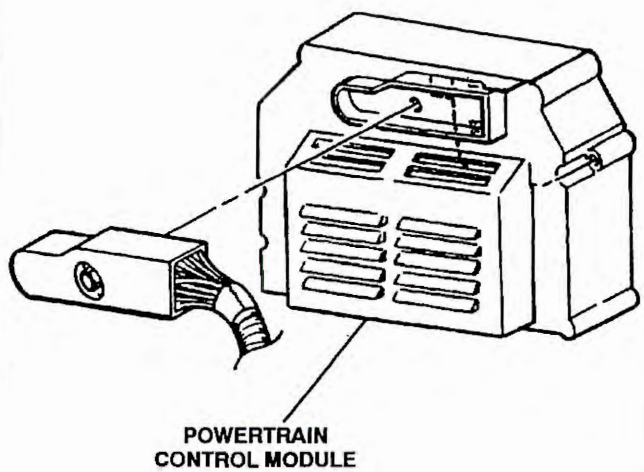
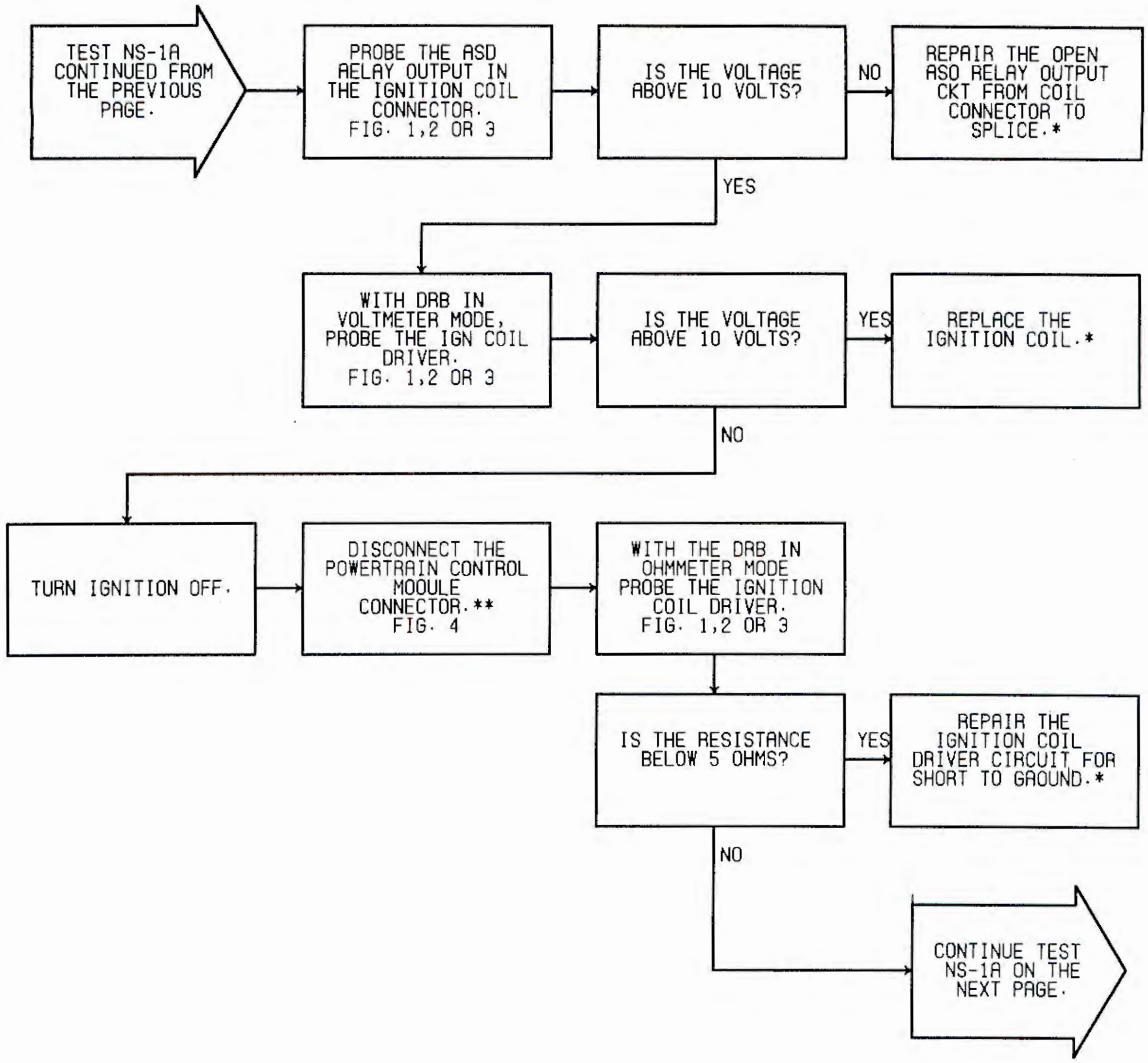


FIG. 4

TEST NS-1A — CONTINUED - QUALIFYING A NO START CONDITION



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-1A | CONTINUED - QUALIFYING A NO START CONDITION

MJ/XJ BODY

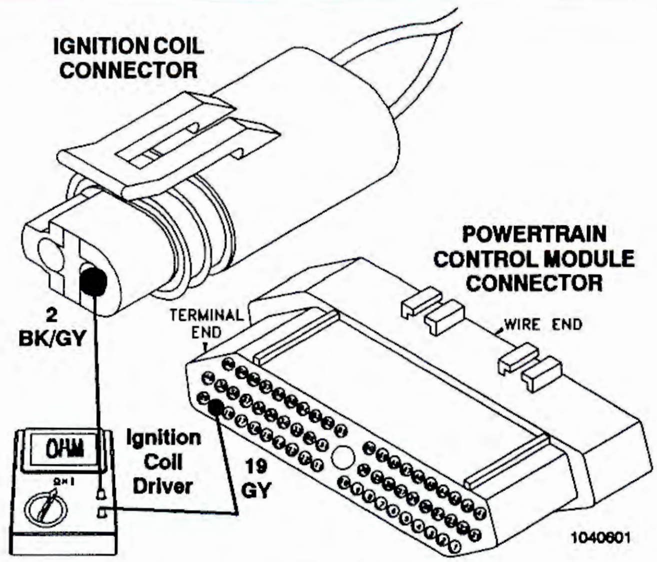


FIG. 1

YJ BODY

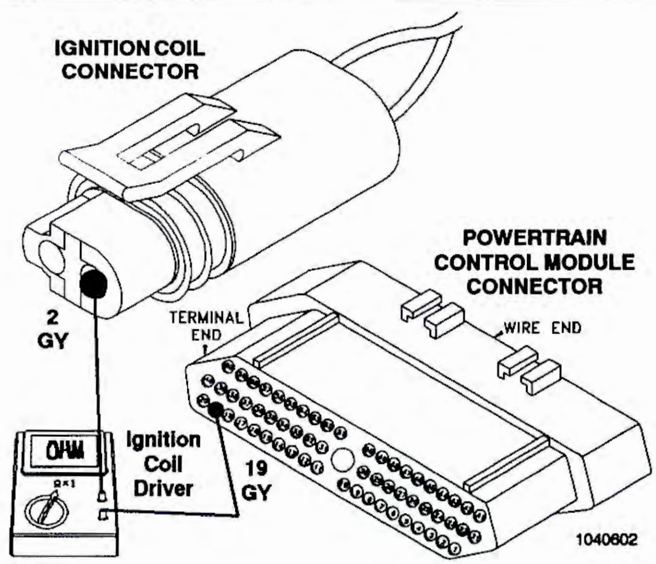


FIG. 2

ZJ BODY

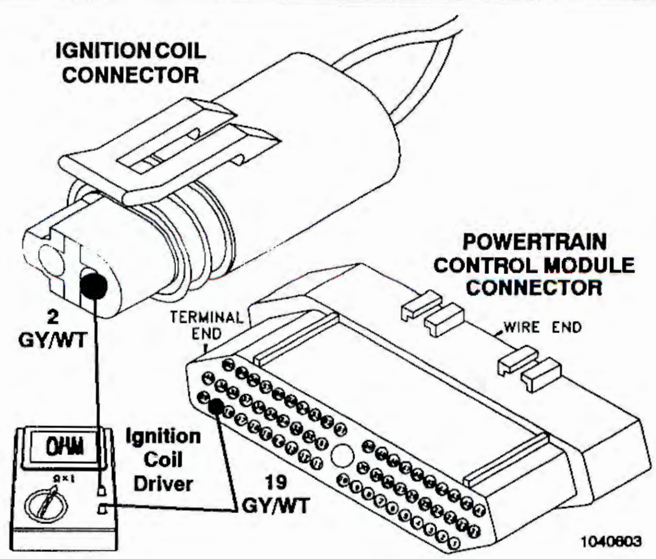


FIG. 3

TEST NS-1A CONTINUED - QUALIFYING A NO START CONDITION

TEST NS-1A CONTINUED FROM THE PREVIOUS PAGE.

USE AN OHMMETER IN THE FOLLOWING STEP.

TEST THE IGNITION COIL DRIVER CKT FROM PCM CAVITY 19 TO COIL CONN. FIG. 1,2, OR 3

IS THE RESISTANCE ABOVE 5 OHMS?

YES → REPAIR OPEN IGNITION COIL DRIVER CKT FROM PCM TO COIL CONNECTOR.*

NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

*Perform Verification TEST VER-1A.

**Check connectors – Clean / repair as necessary.

TEST NS-2A CHECKING THE FUEL SYSTEM

Perform TEST NS-1A Before Proceeding

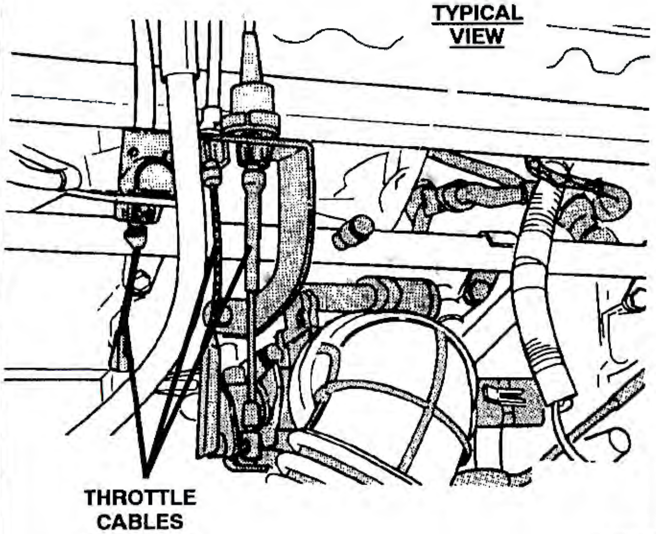


FIG. 1

4.0L ENGINE

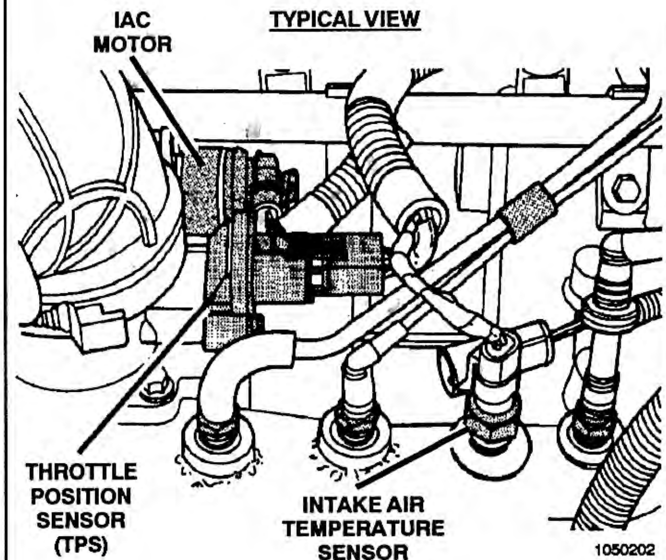


FIG. 2

2.5L ENGINE

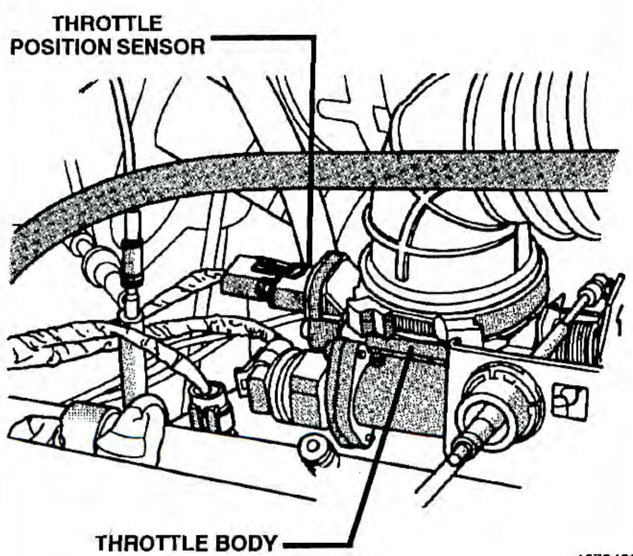
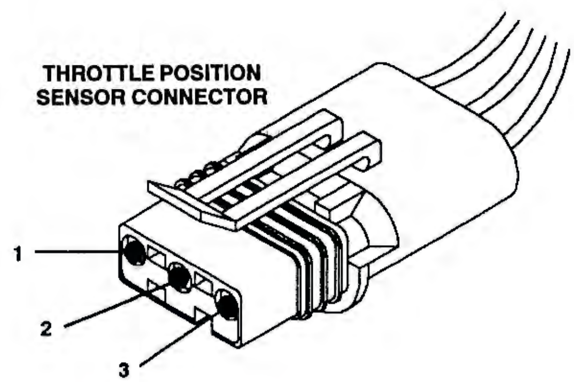


FIG. 3



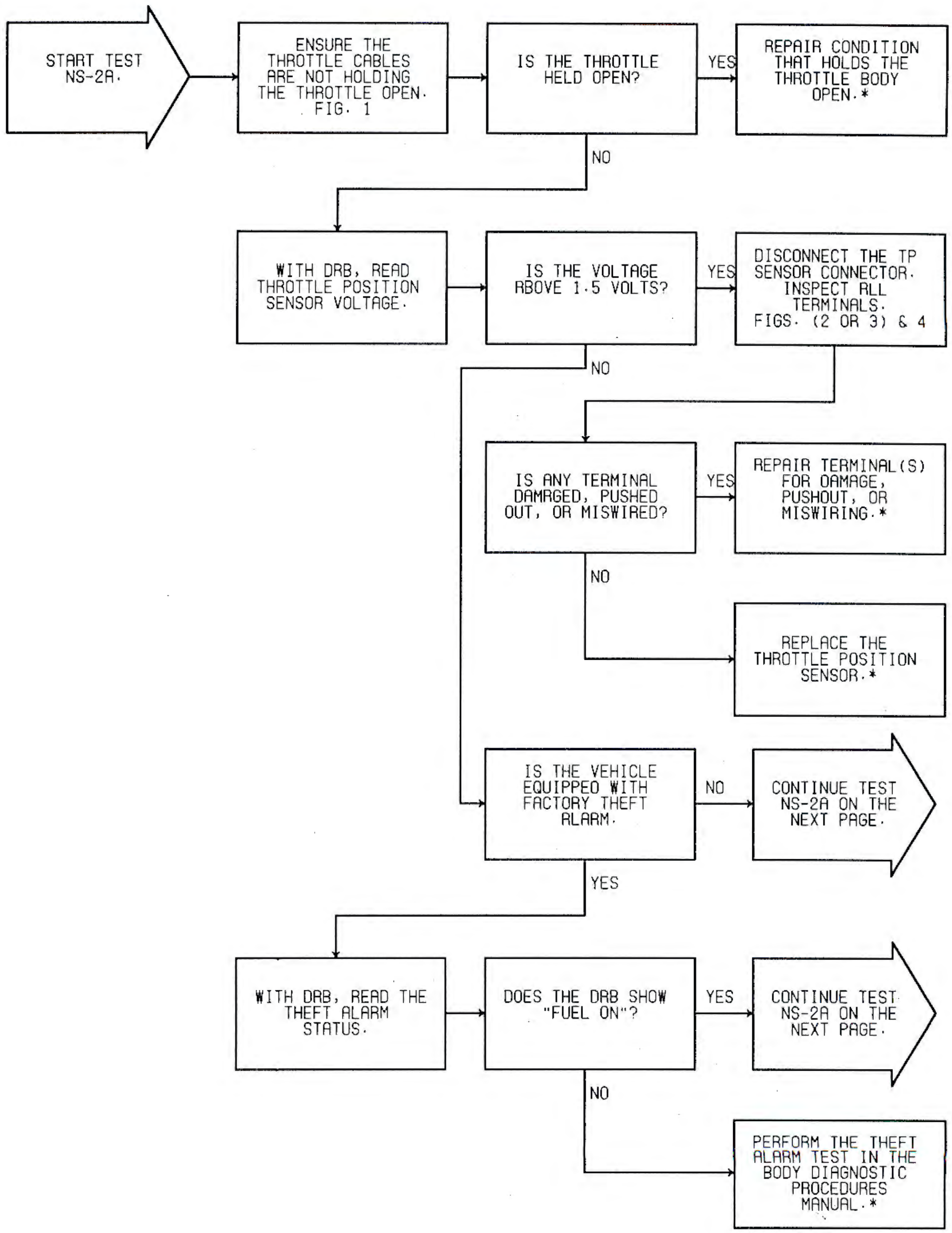
CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	VT/WT	5 VOLT SUPPLY

0790302

FIG. 4

TEST NS-2A CHECKING THE FUEL SYSTEM

Perform TEST NS-1A Before Proceeding



***Perform Verification TEST VER-1A.**	****Check connectors – Clean / repair as necessary.**

TEST NS-2A | CONTINUED - CHECKING THE FUEL SYSTEM

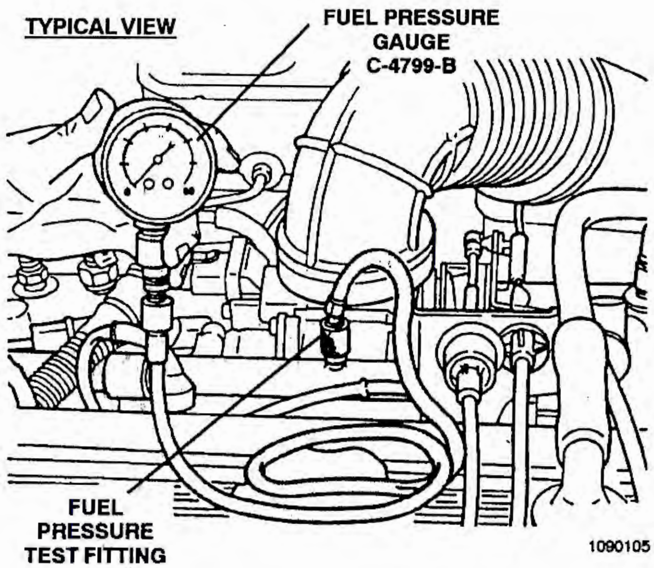
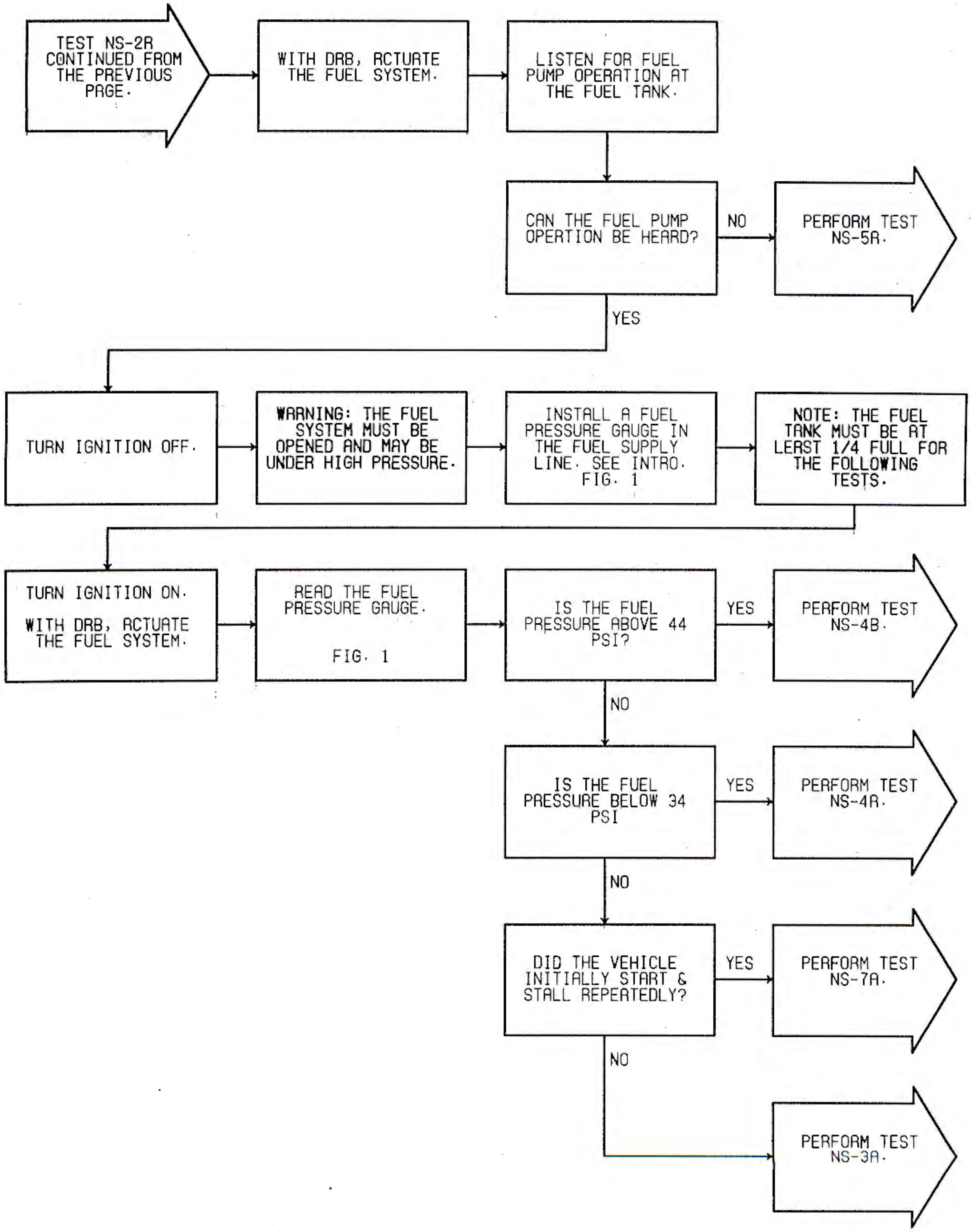


FIG. 1


TEST NS-2A CONTINUED FROM THE PREVIOUS PAGE.
WITH DRB, ACTUATE THE FUEL SYSTEM.
LISTEN FOR FUEL PUMP OPERATION AT THE FUEL TANK.
CAN THE FUEL PUMP OPERTION BE HEARD?
NO
PERFORM TEST NS-5A.
YES
TURN IGNITION OFF.
WARNING: THE FUEL SYSTEM MUST BE OPENED AND MAY BE UNDER HIGH PRESSURE.
INSTALL A FUEL PRESSURE GAUGE IN THE FUEL SUPPLY LINE. SEE INTRO. FIG. 1
NOTE: THE FUEL TANK MUST BE AT LEAST 1/4 FULL FOR THE FOLLOWING TESTS.
TURN IGNITION ON.
WITH DRB, ACTUATE THE FUEL SYSTEM.
READ THE FUEL PRESSURE GAUGE.
FIG. 1
IS THE FUEL PRESSURE ABOVE 44 PSI?
YES
PERFORM TEST NS-4B.
NO
IS THE FUEL PRESSURE BELOW 34 PSI
YES
PERFORM TEST NS-4A.
NO
DID THE VEHICLE INITIALLY START & STALL REPEATEDLY?
YES
PERFORM TEST NS-7A.
NO
PERFORM TEST NS-3A.

TEST NS-3A — CHECKING THE ENGINE MECHANICAL SYSTEMS

Perform TEST NS-2A Before Proceeding

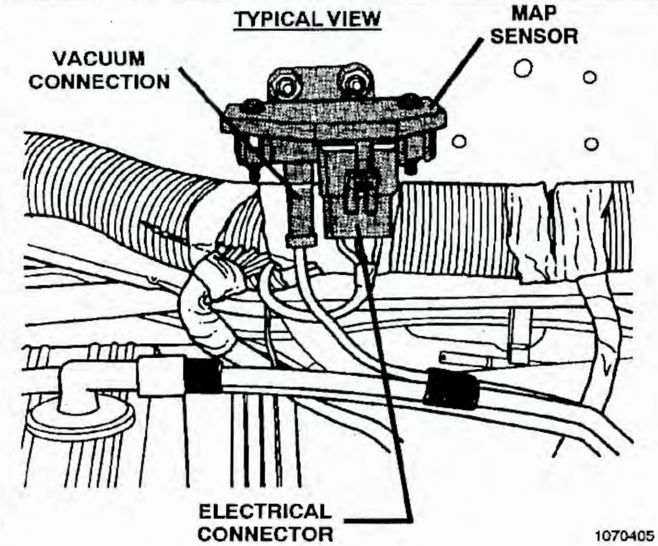
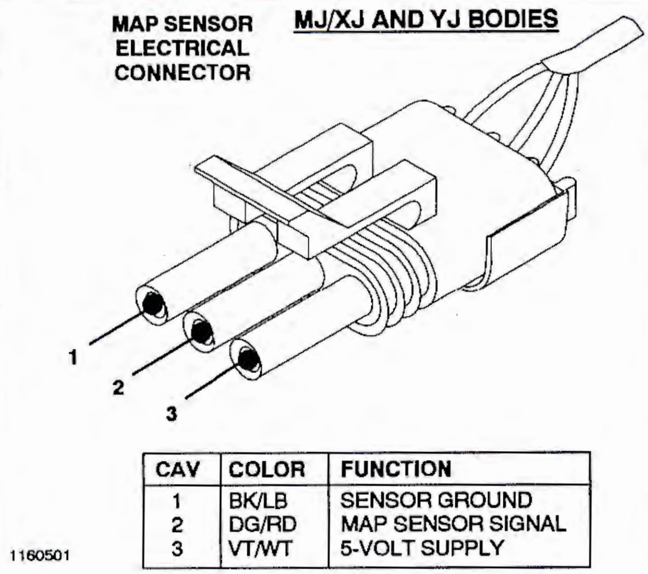


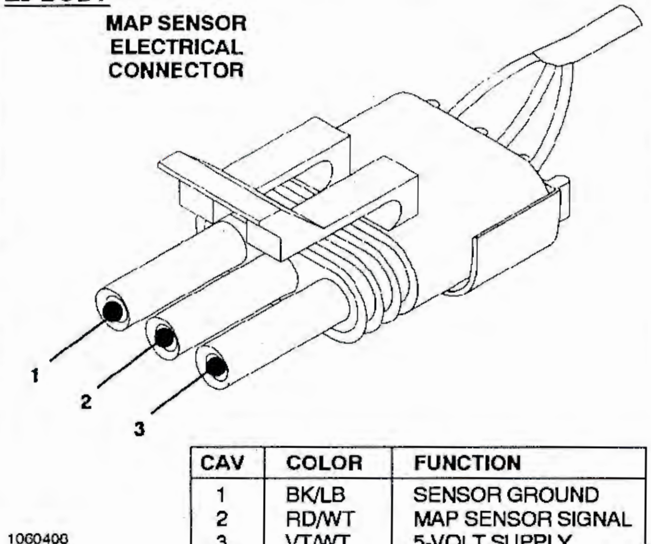
FIG. 1



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	DG/RD	MAP SENSOR SIGNAL
3	VT/WT	5-VOLT SUPPLY

FIG. 2

ZJ BODY



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	5-VOLT SUPPLY

FIG. 3

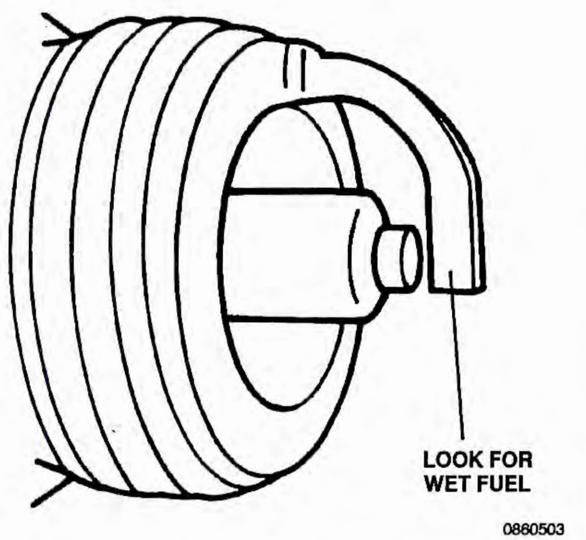


FIG. 4

4.0L ENGINE

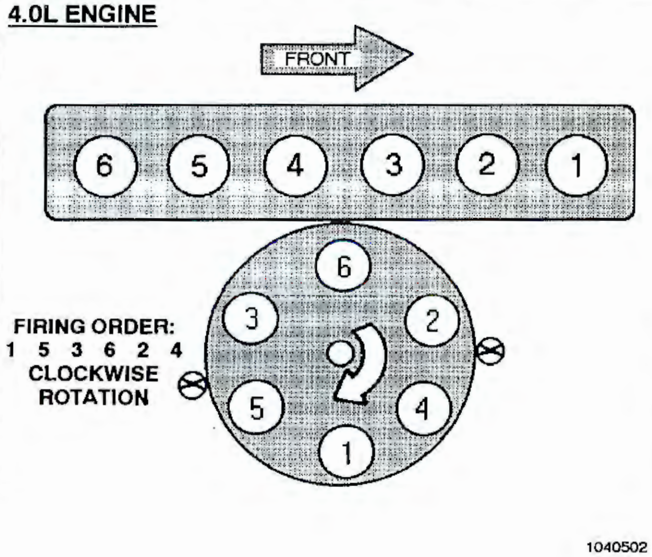


FIG. 5

2.5L ENGINE

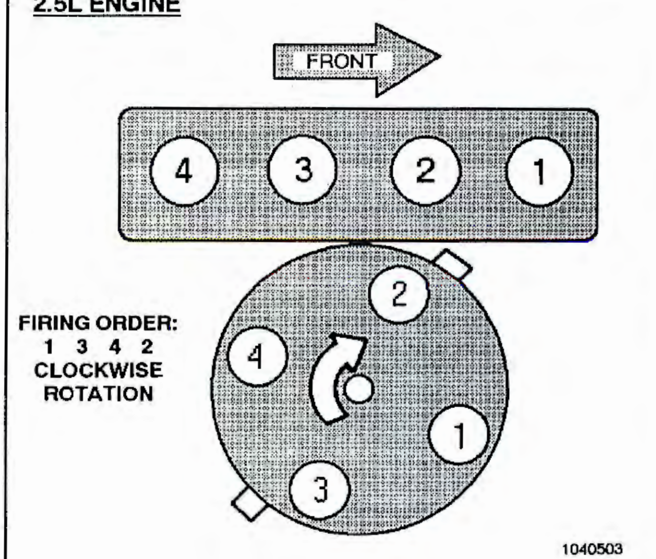
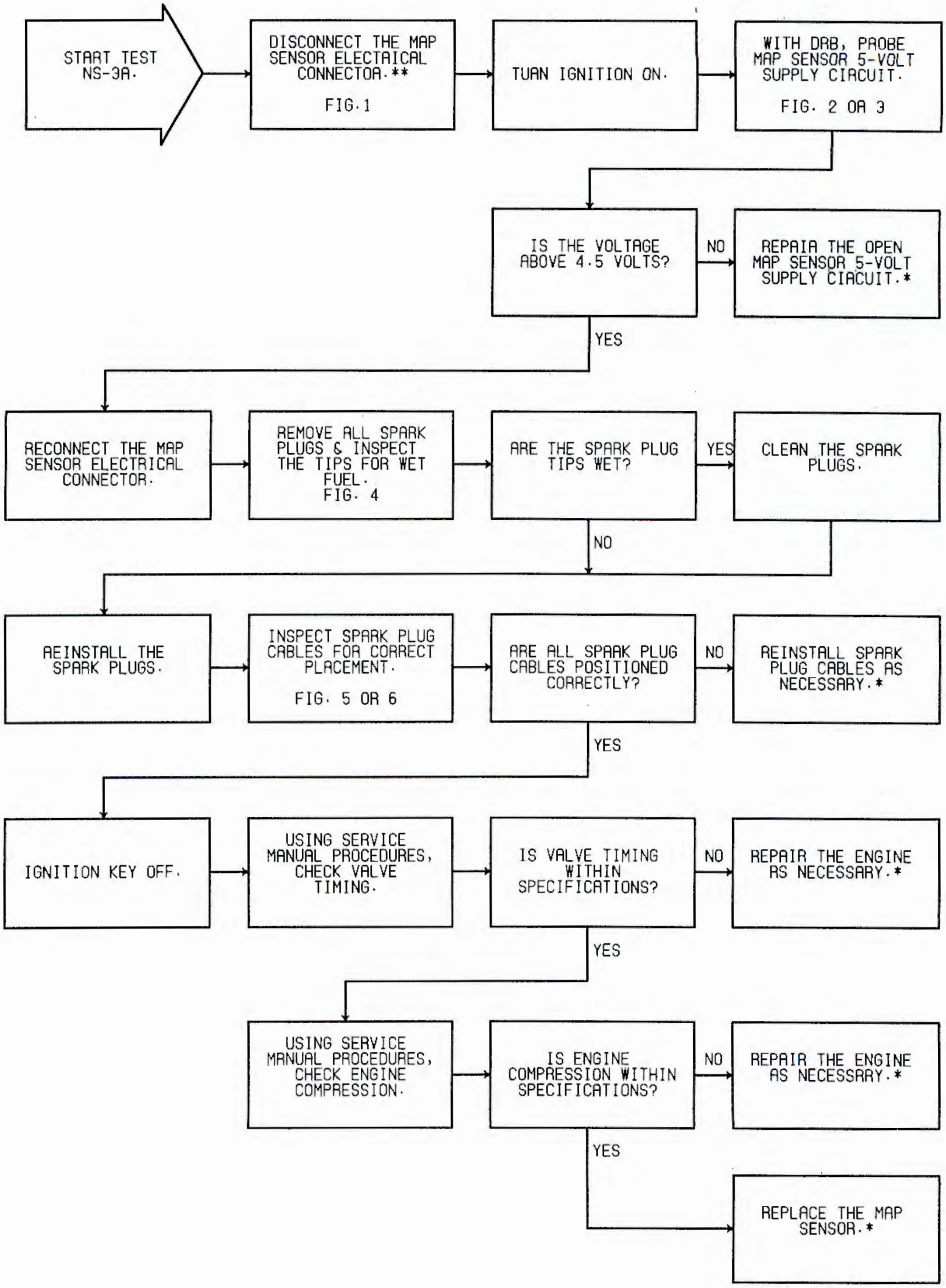


FIG. 6

TEST NS-3A CHECKING THE ENGINE MECHANICAL SYSTEMS

Perform TEST NS-2A Before Proceeding



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

TEST NS-4A | REPAIRING LOW FUEL PRESSURE

Perform TEST NS-2A Before Proceeding

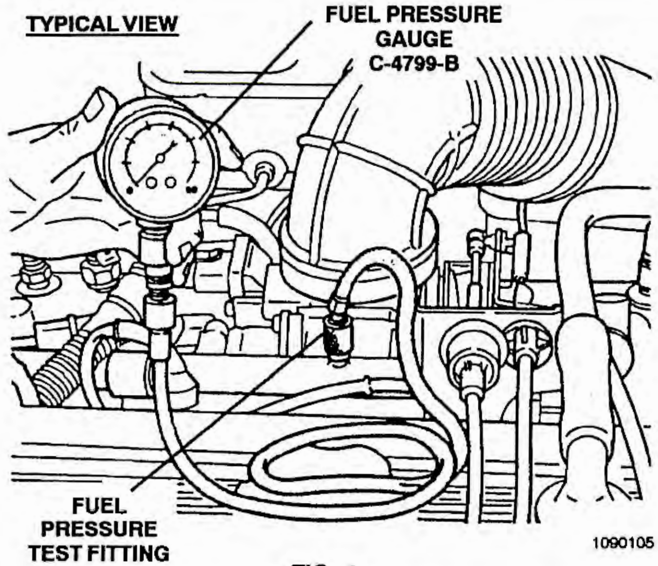


FIG. 1

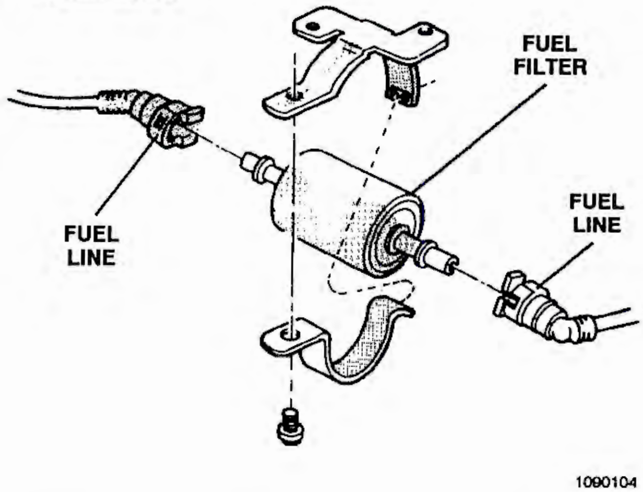


FIG. 2

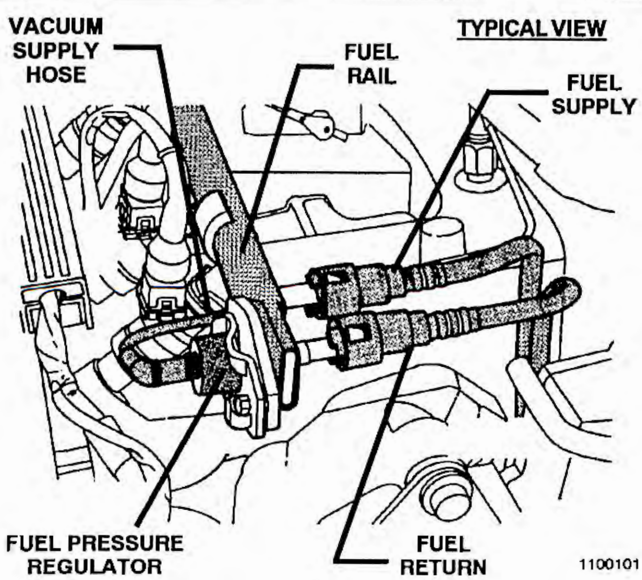
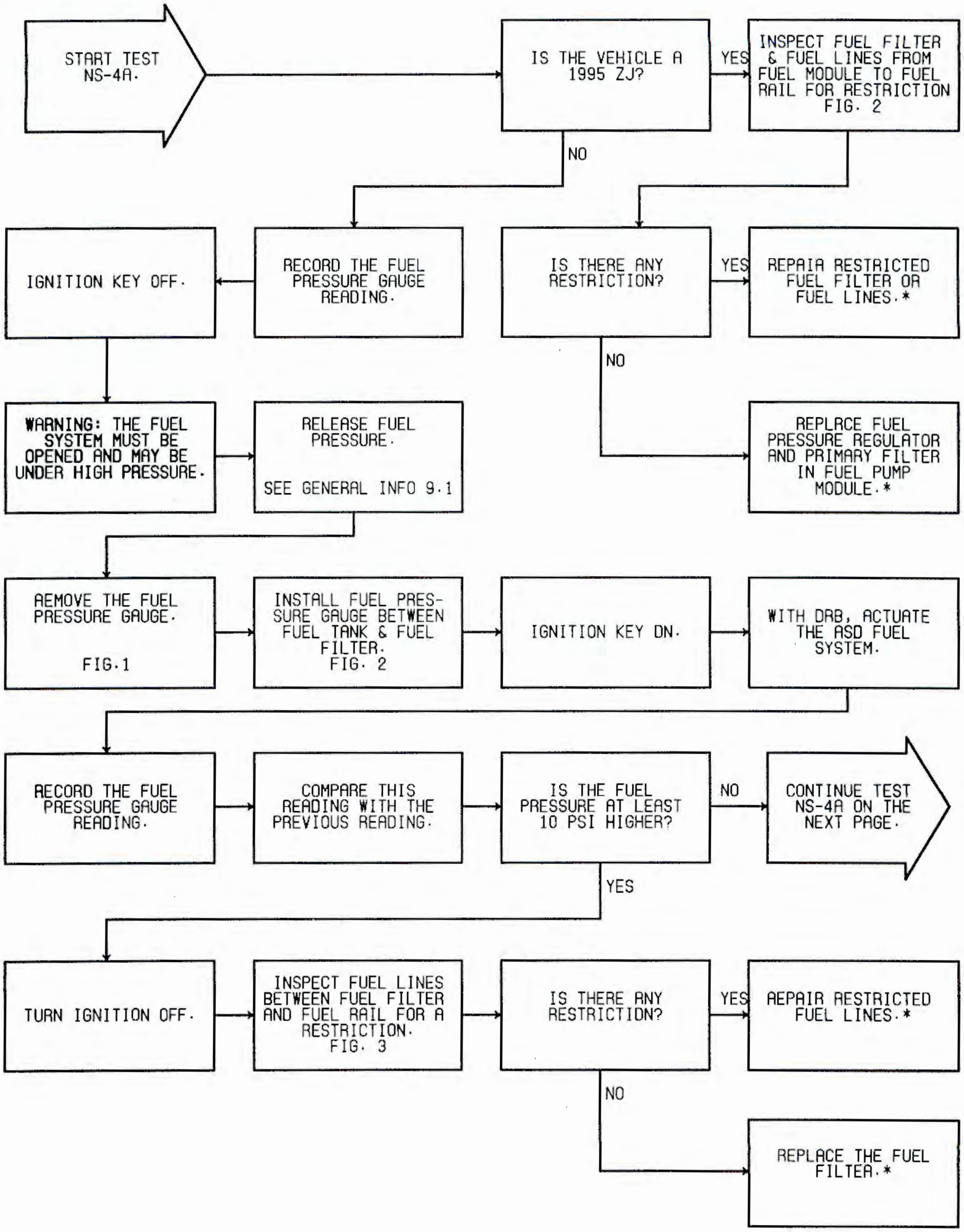


FIG. 3

TEST NS-4A REPAIRING LOW FUEL PRESSURE

Perform TEST NS-2A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-4A | CONTINUED - REPAIRING LOW FUEL PRESSURE

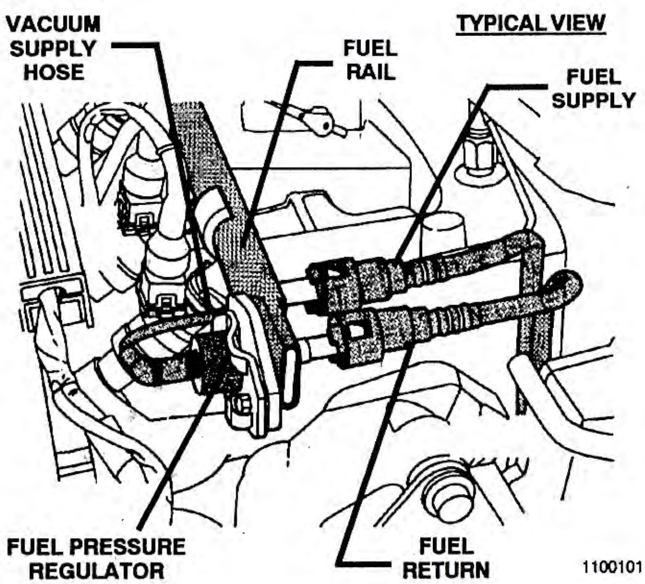
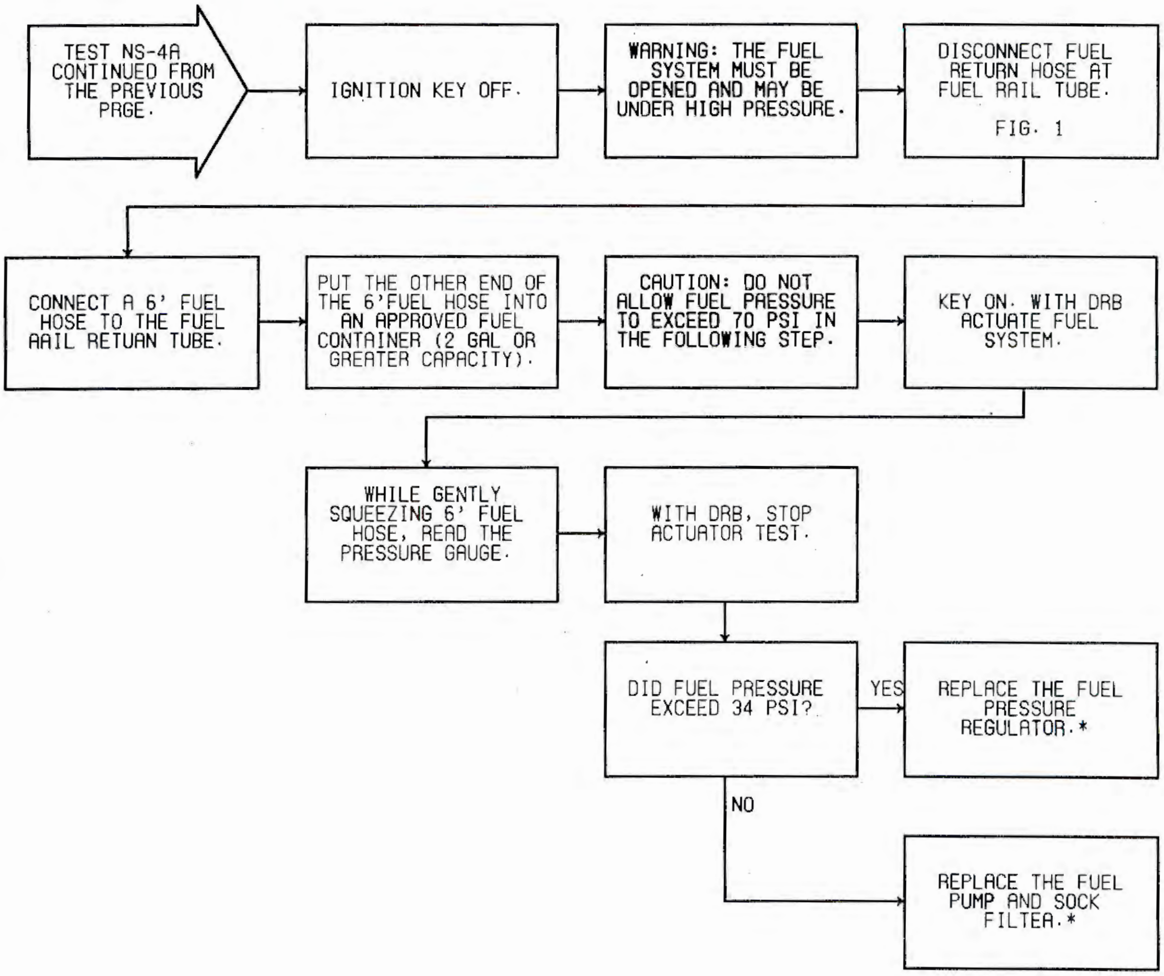


FIG. 1

TEST NS-4A | CONTINUED - REPAIRING LOW FUEL PRESSURE



*Perform Verification TEST VER-1A.

**Check connectors – Clean / repair as necessary.

N O S T A R T T E S T S

TEST NS-4B	REPAIRING LOW FUEL PRESSURE

Perform TEST NS-2A Before Proceeding

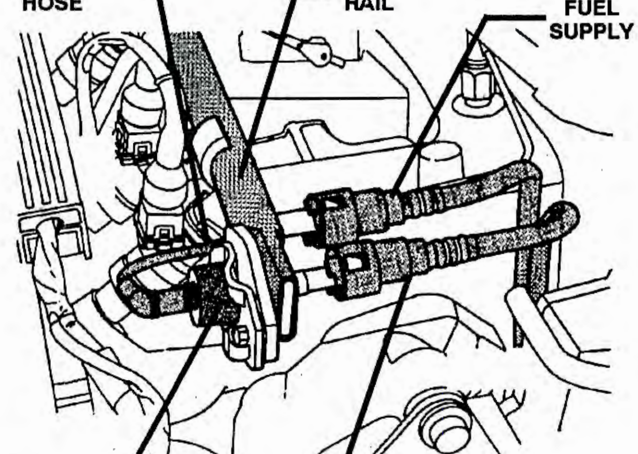
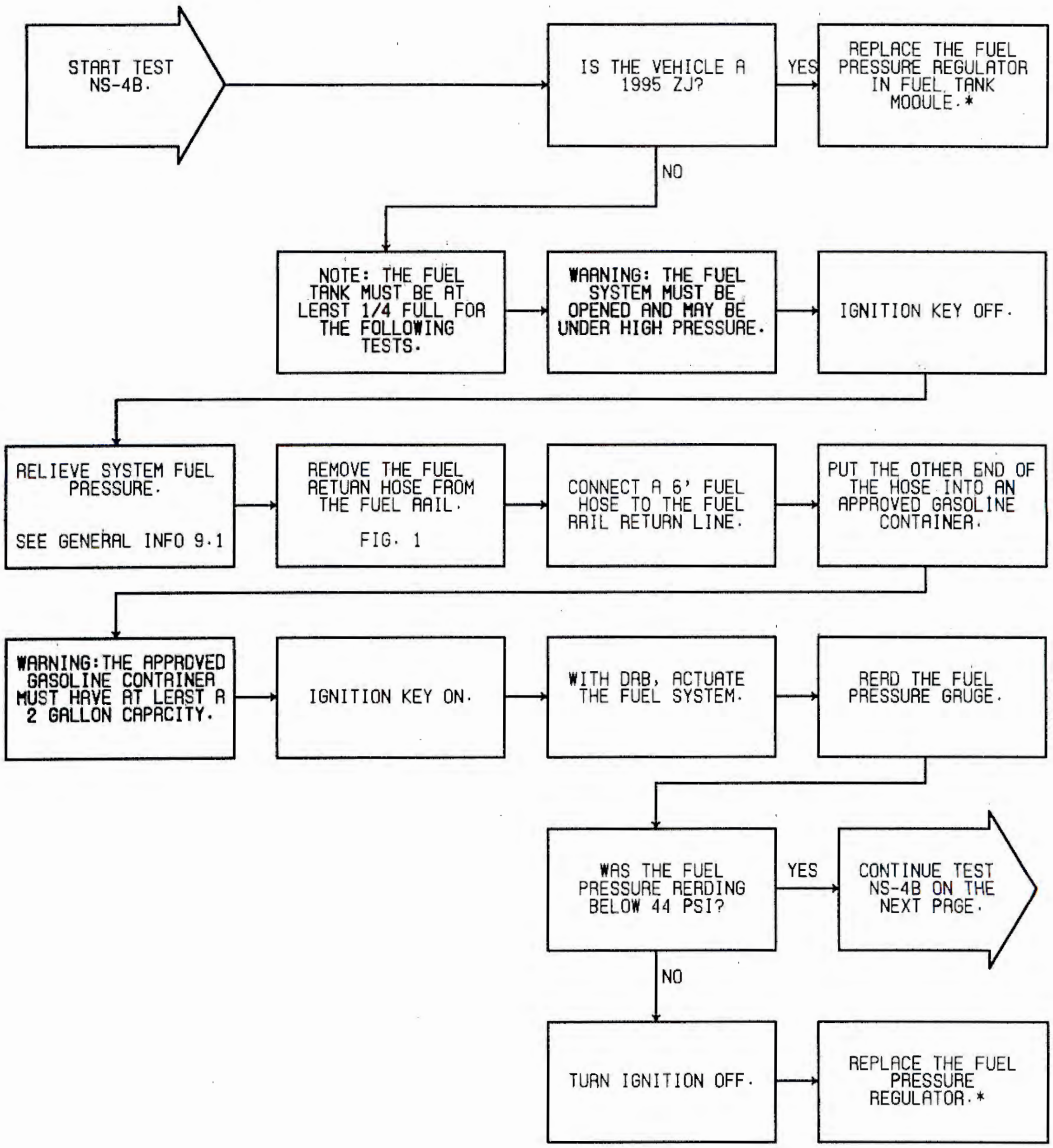


FIG. 1

TEST NS-4B REPAIRING LOW FUEL PRESSURE

Perform TEST NS-2A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-4B | CONTINUED - REPAIRING LOW FUEL PRESSURE

MJ/XJ BODY

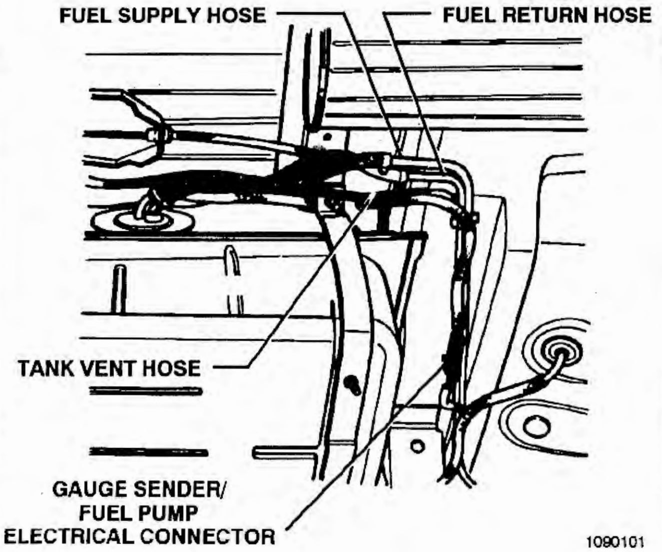


FIG. 1

YJ BODY

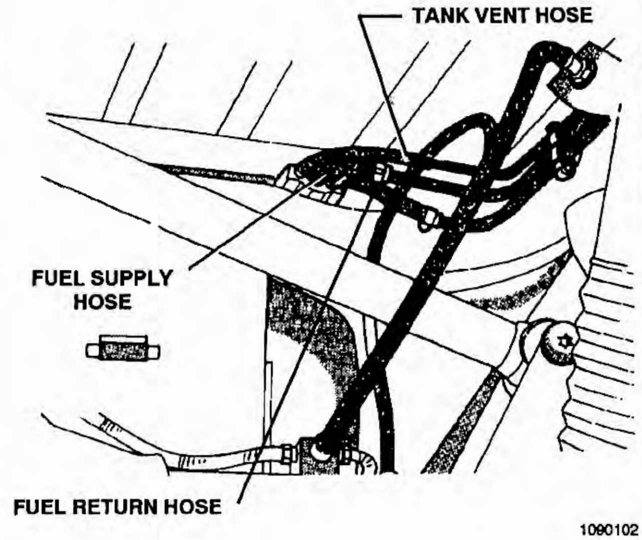


FIG. 2

ZJ BODY

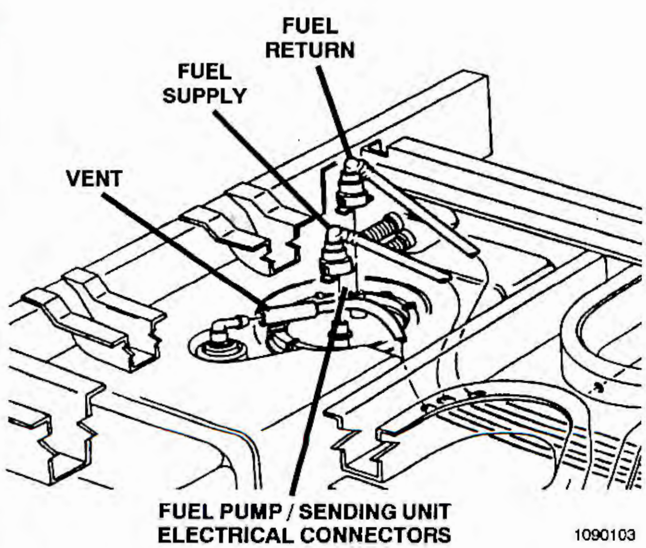


FIG. 3

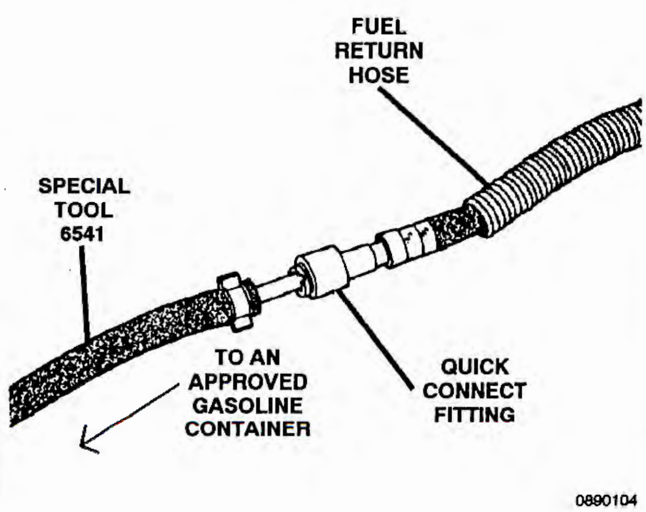


FIG. 4

TEST NS-4B CONTINUED FROM THE PREVIOUS PAGE.

IGNITION KEY OFF.

IGNITION KEY OFF. RECONNECT THE FUEL RETURN HOSE.

REMOVE THE FUEL RETURN HOSE FROM THE FUEL TANK.

FIG. 1,2 OR 3

CONNECT SPECIAL TOOL C-6541 TO THE DISCONNECTED RETURN HOSE. FIG. 4

PUT THE OTHER END OF THE HOSE INTO AN APPROVED GASOLINE CONTAINER.

WARNING: THE APPROVED GASOLINE CONTAINER MUST HAVE AT LEAST A 2 GALLON CAPACITY.

IGNITION KEY ON.

WITH DRB, ACTUATE THE FUEL SYSTEM.

READ THE FUEL PRESSURE GAUGE.

WITH DRB, STOP ACTUATION TEST.

IS THE FUEL PRESSURE BELOW 44 PSI?

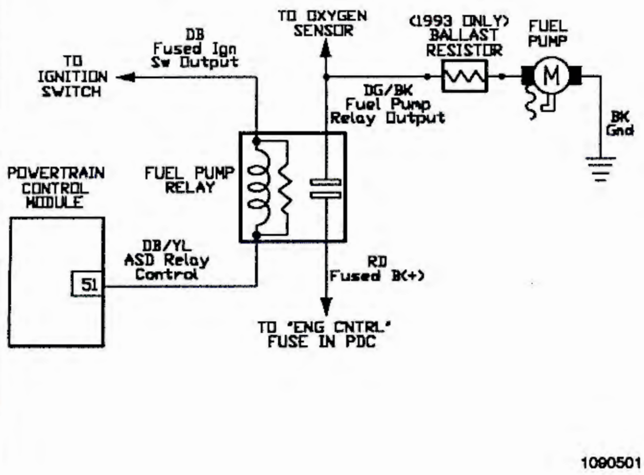
YES → REPAIR THE RESTRICTED FUEL PUMP MODULE.*

NO → REPAIR RESTRICTED FUEL RETURN LINE BETWEEN FUEL RAIL AND FUEL TANK.*

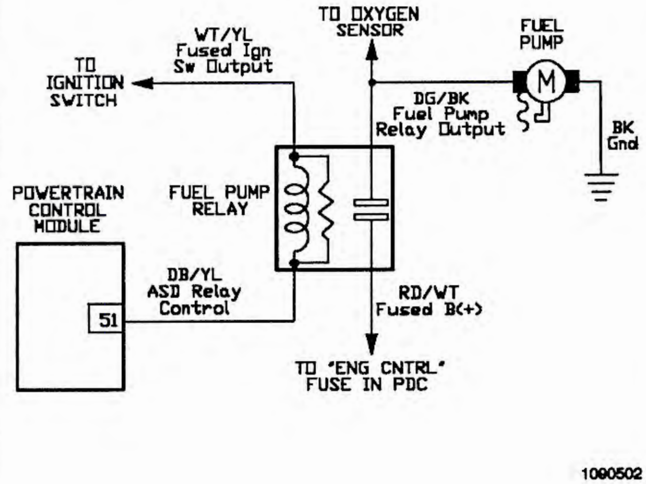
TEST NS-5A | CHECKING THE FUEL PUMP

Perform TEST NS-2A Before Proceeding

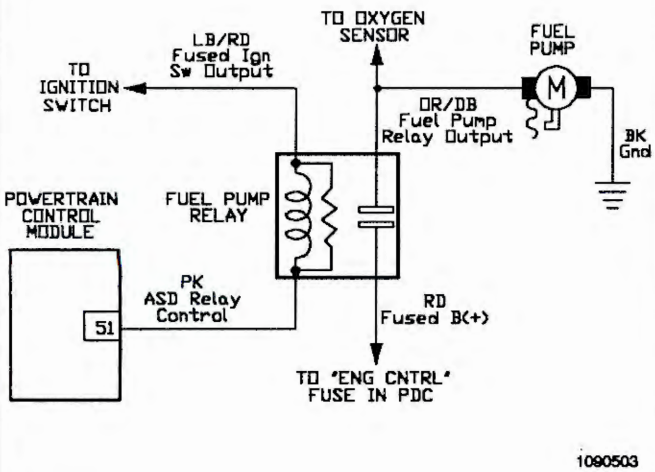
MJ/XJ BODY



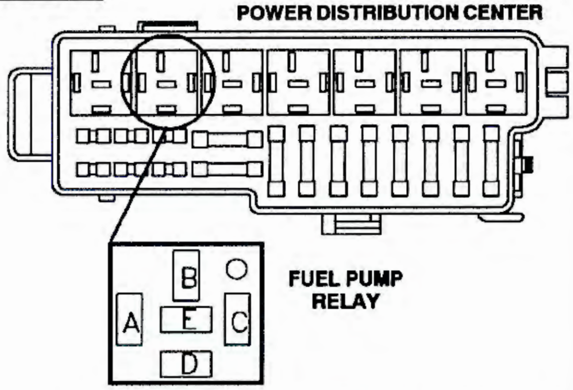
YJ BODY



ZJ BODY



MJ/XJ BODY

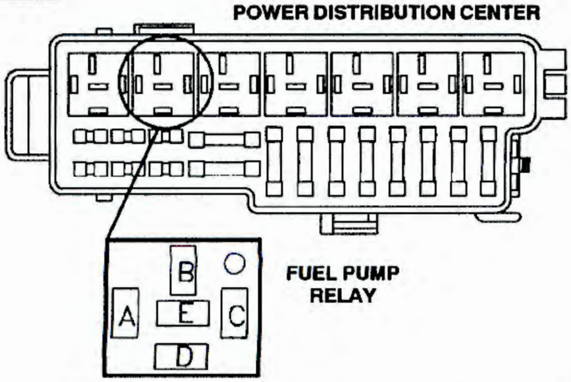


CAV	COLOR	FUNCTION
A	DB	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/*	FUEL PUMP RELAY OUTPUT

1100203

FIG. 1

YJ BODY

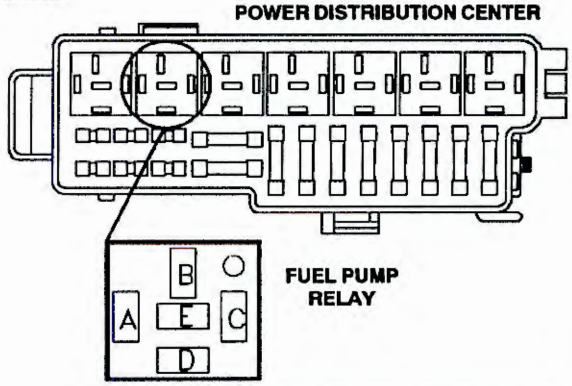


CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/BK	FUEL PUMP RELAY OUTPUT

1100204

FIG. 2

ZJ BODY



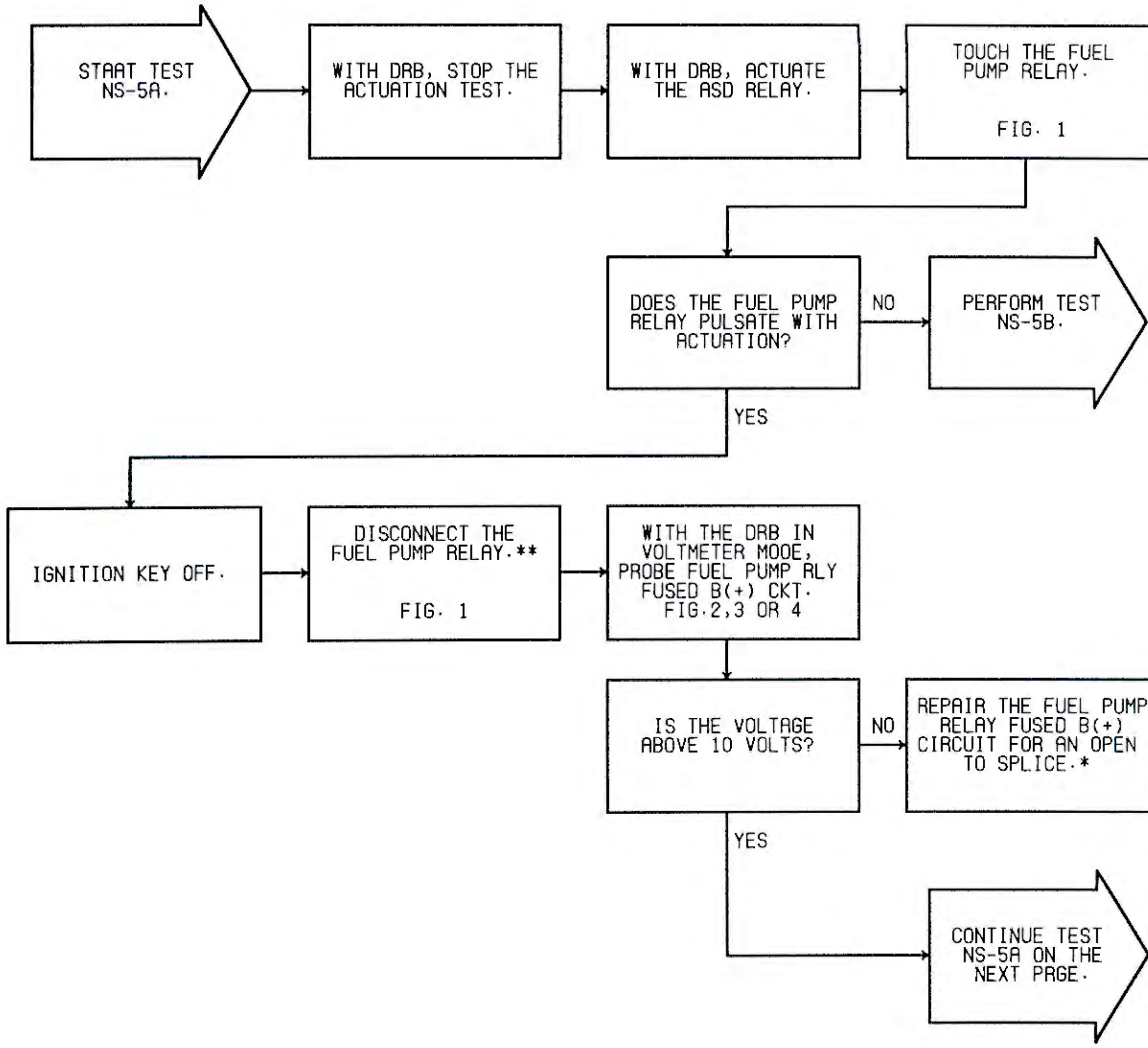
CAV	COLOR	FUNCTION
A	LB/RD	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	PK	ASD RELAY CONTROL
D	OR/DB	FUEL PUMP RELAY OUTPUT

1100205

FIG. 3

TEST NS-5A | CHECKING THE FUEL PUMP

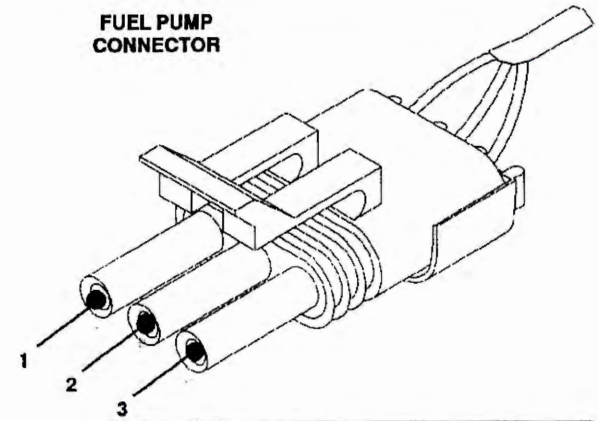
Perform TEST NS-2A Before Proceeding



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

TEST NS-5A CONTINUED - CHECKING THE FUEL PUMP

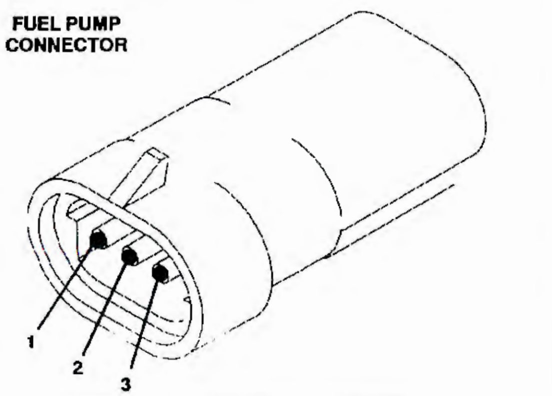
MJ/XJ BODY



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB	FUEL LEVEL SENSE
3	DG/OR	FUEL PUMP RELAY OUTPUT

FIG. 1

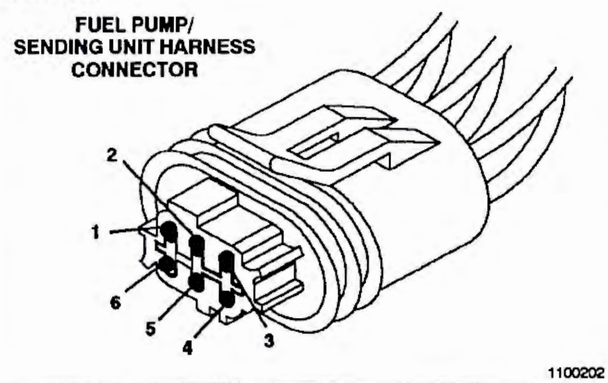
YJ BODY



CAV	COLOR	FUNCTION
1	BK/OR	GROUND
2	DB	FUEL LEVEL SENSE
3	DG/BK	FUEL PUMP RELAY

FIG. 2

ZJ BODY



CAV	COLOR	FUNCTION
2	BK/OR	GROUND
3	PK/BK	FUEL LEVEL SENSOR SIGNAL (CLUSTER)
4	OR/BK	FUEL PUMP RELAY OUTPUT
5	BK	GROUND
6	VT/WT	FUEL LEVEL SENSOR SIGNAL

FIG. 3

MJ/XJ AND YJ BODIES

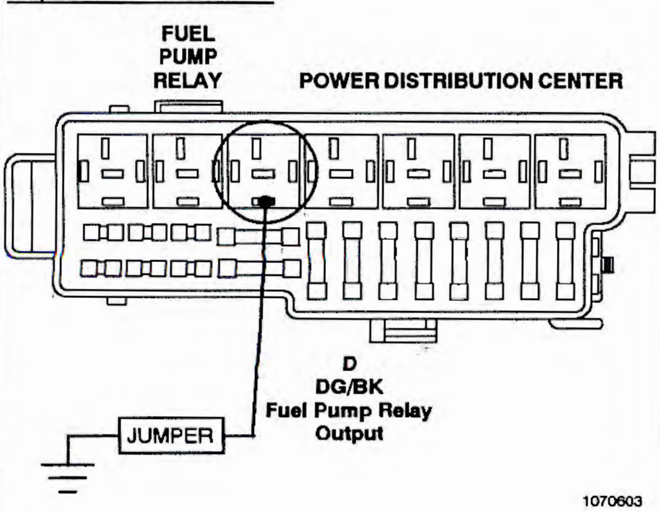


FIG. 4

ZJ BODY

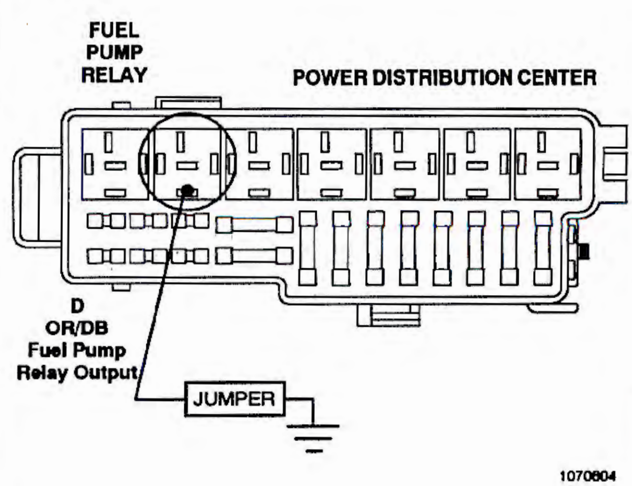
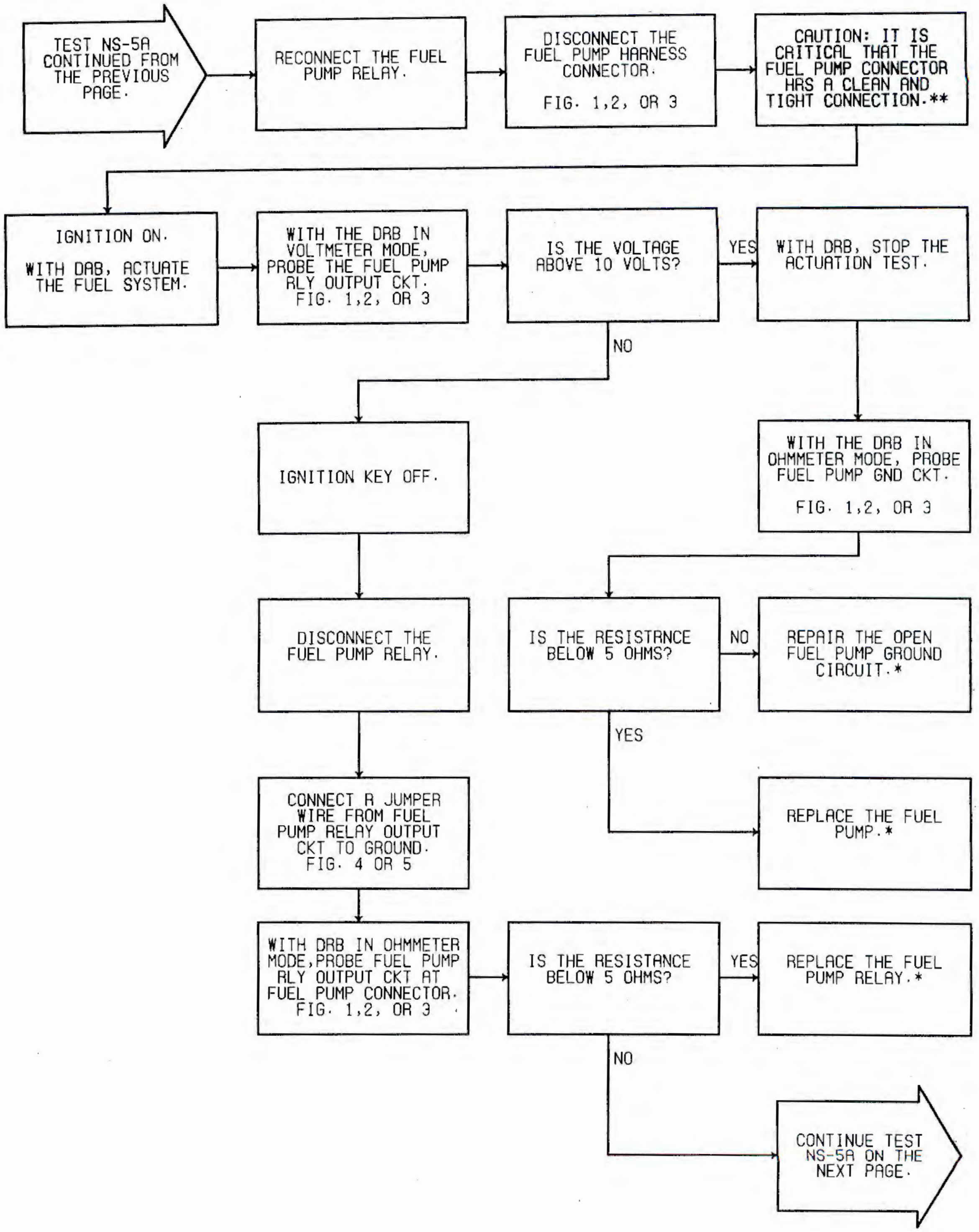


FIG. 5

TEST NS-5A CONTINUED - CHECKING THE FUEL PUMP



***Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.**

TEST NS-5A CONTINUED - CHECKING THE FUEL PUMP

MJ/XJ BODY

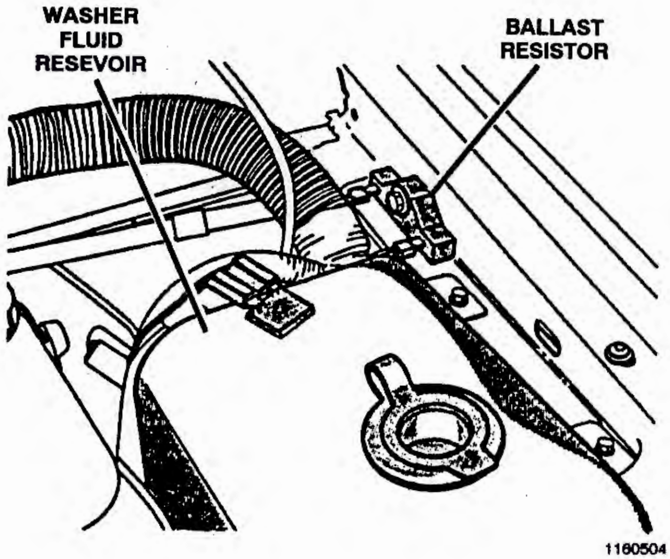


FIG. 1

MJ/XJ BODY

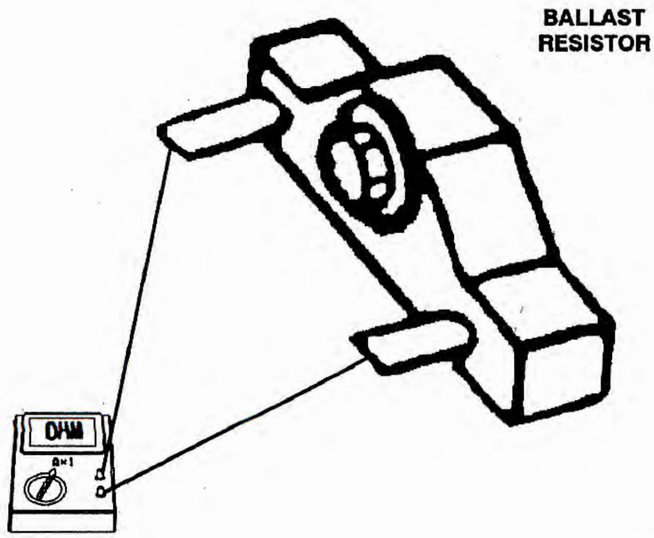
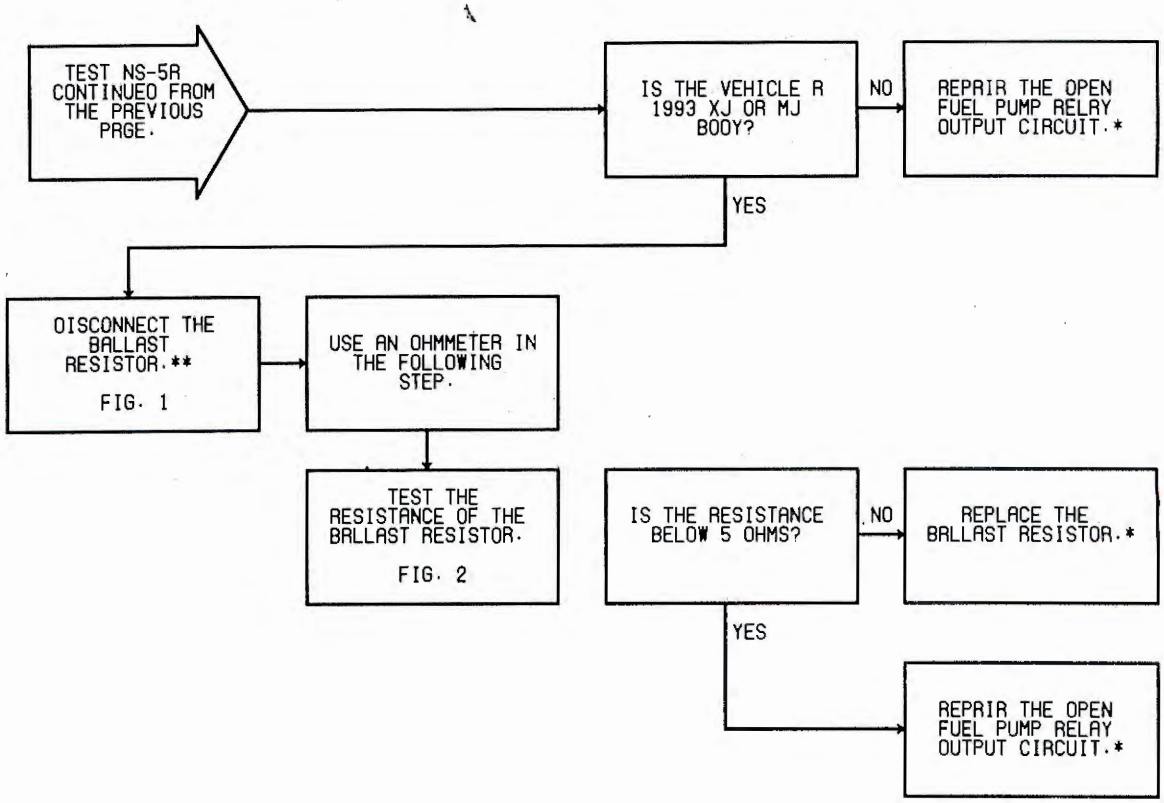


FIG. 2

TEST NS-5A CONTINUED - CHECKING THE FUEL PUMP



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

TEST NS-5B | CHECKING THE FUEL PUMP

Perform TEST NS-5A Before Proceeding

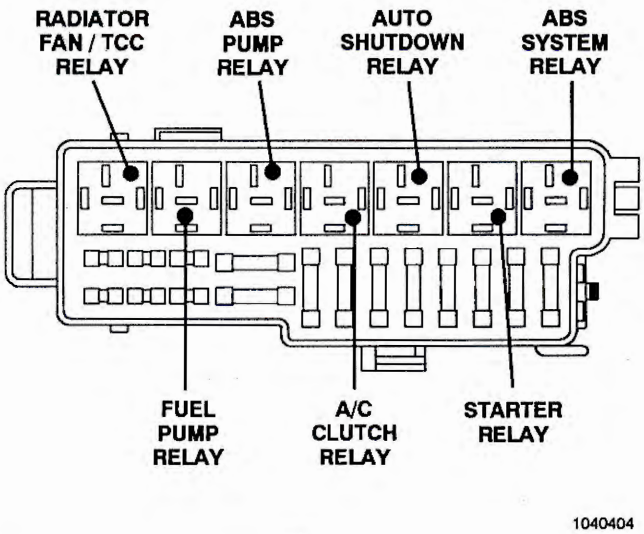
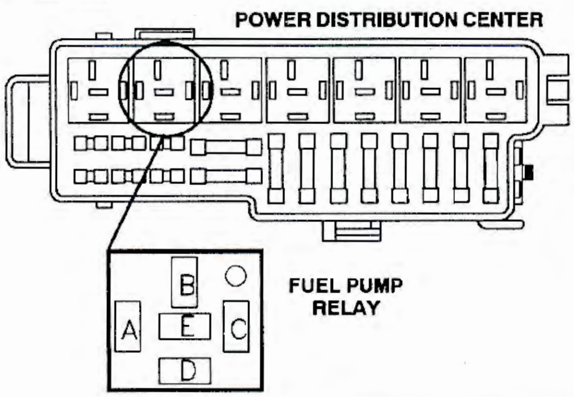


FIG. 1

MJ/XJ BODY

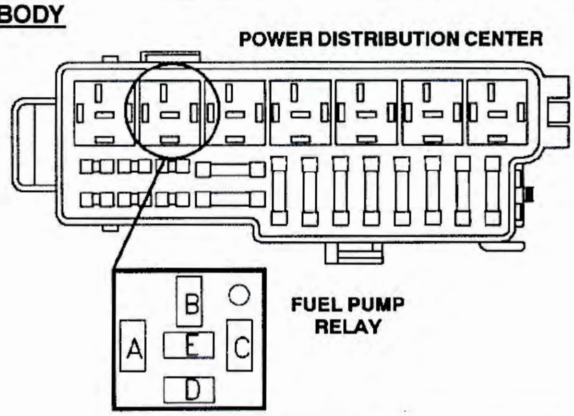


CAV	COLOR	FUNCTION
A	DB	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/*	FUEL PUMP RELAY OUTPUT

1100203

FIG. 2

YJ BODY

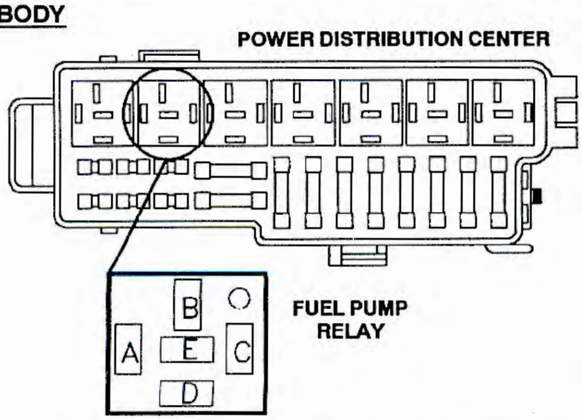


CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/BK	FUEL PUMP RELAY OUTPUT

1100204

FIG. 3

ZJ BODY



CAV	COLOR	FUNCTION
A	LB/RD	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	PK	ASD RELAY CONTROL
D	OR/DB	FUEL PUMP RELAY OUTPUT

1100205

FIG. 4

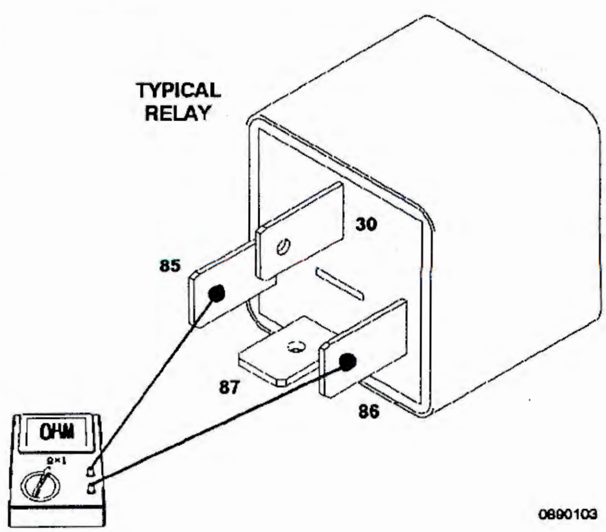
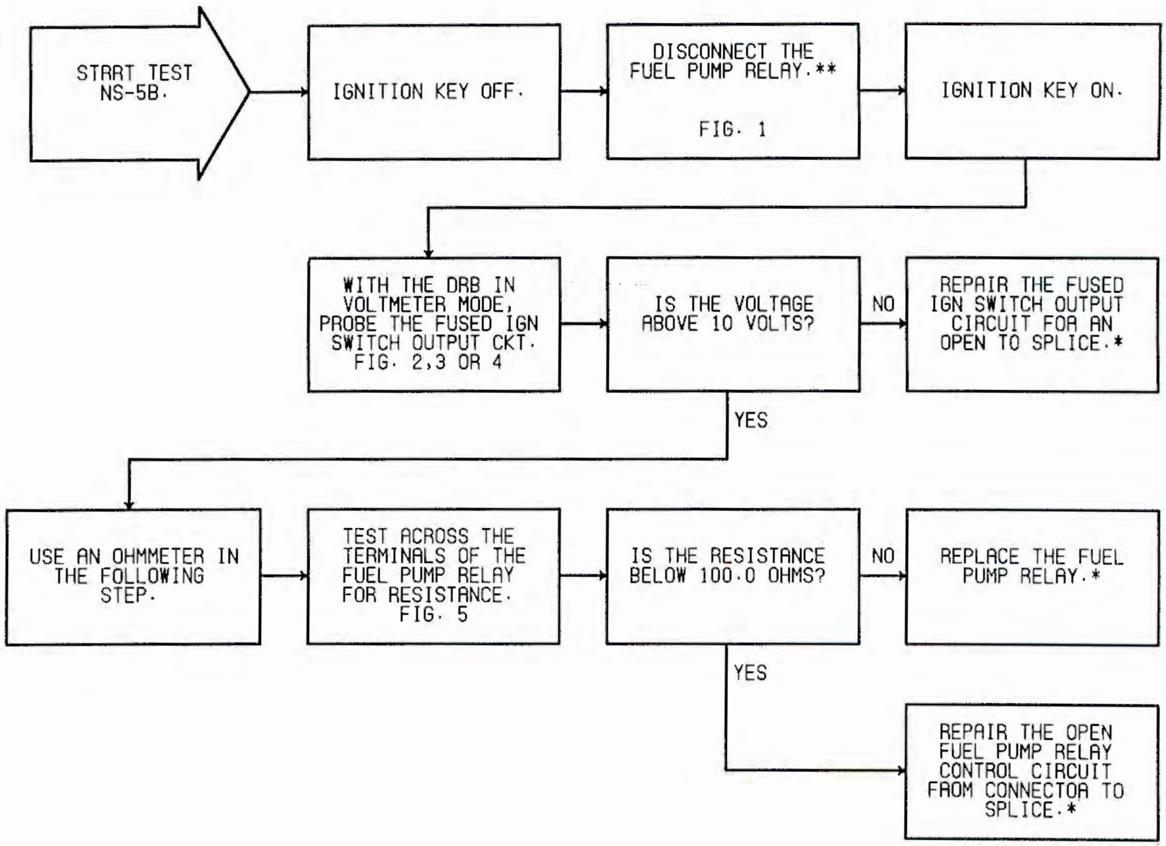


FIG. 5

TEST NS-5B CHECKING THE FUEL PUMP

Perform TEST NS-5A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-6A CORRECTING A "NO RESPONSE" CONDITION

Perform TEST TC-1A Before Proceeding

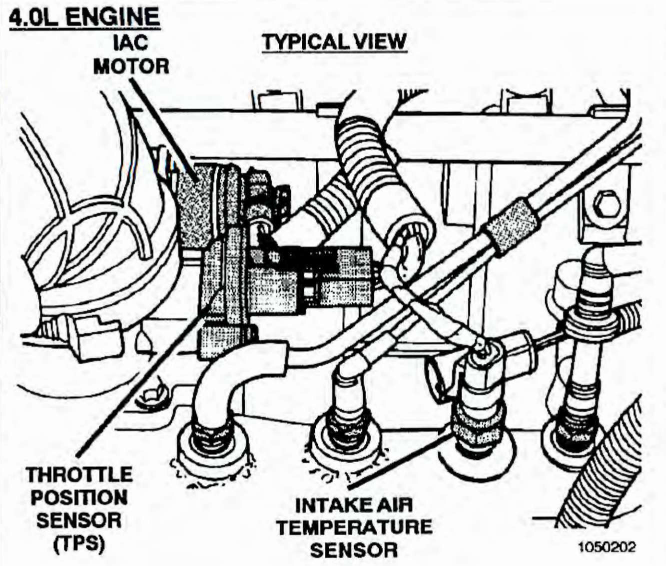


FIG. 1

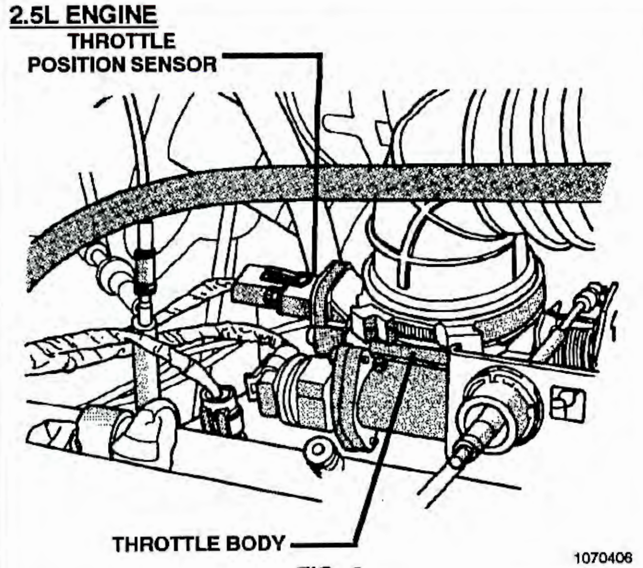
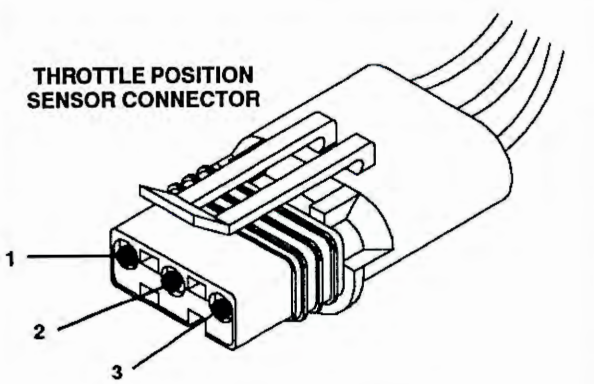


FIG. 2



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	VT/WT	5 VOLT SUPPLY

0790302

FIG. 3

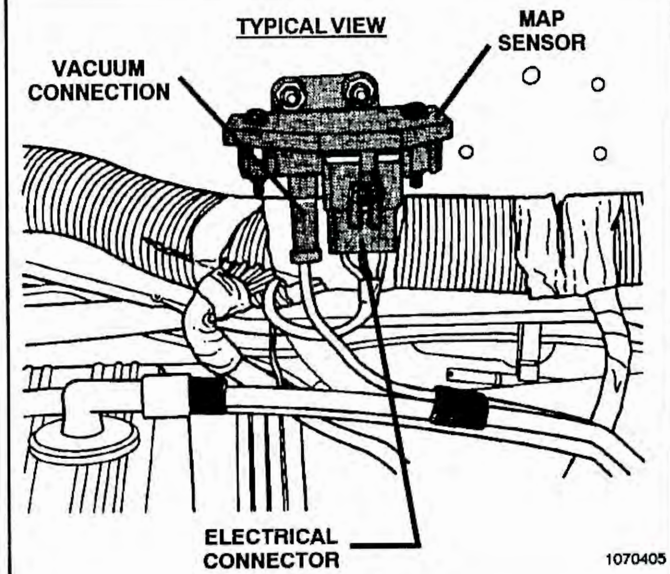
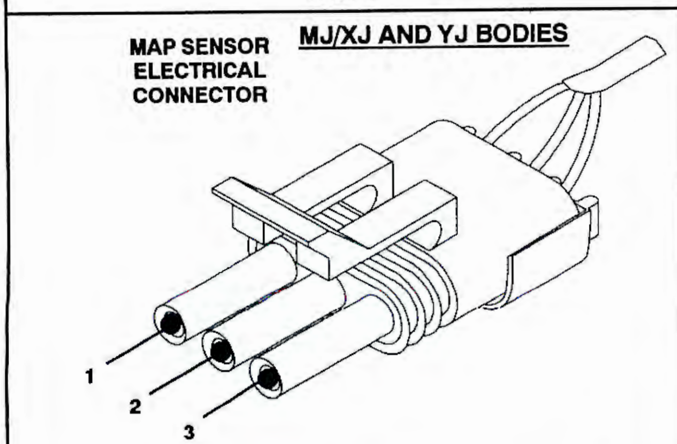


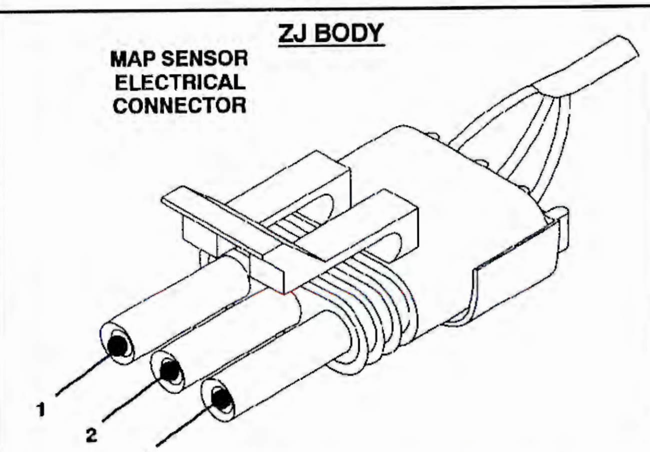
FIG. 4



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	DG/RD	MAP SENSOR SIGNAL
3	VT/WT	5-VOLT SUPPLY

1160501

FIG. 5



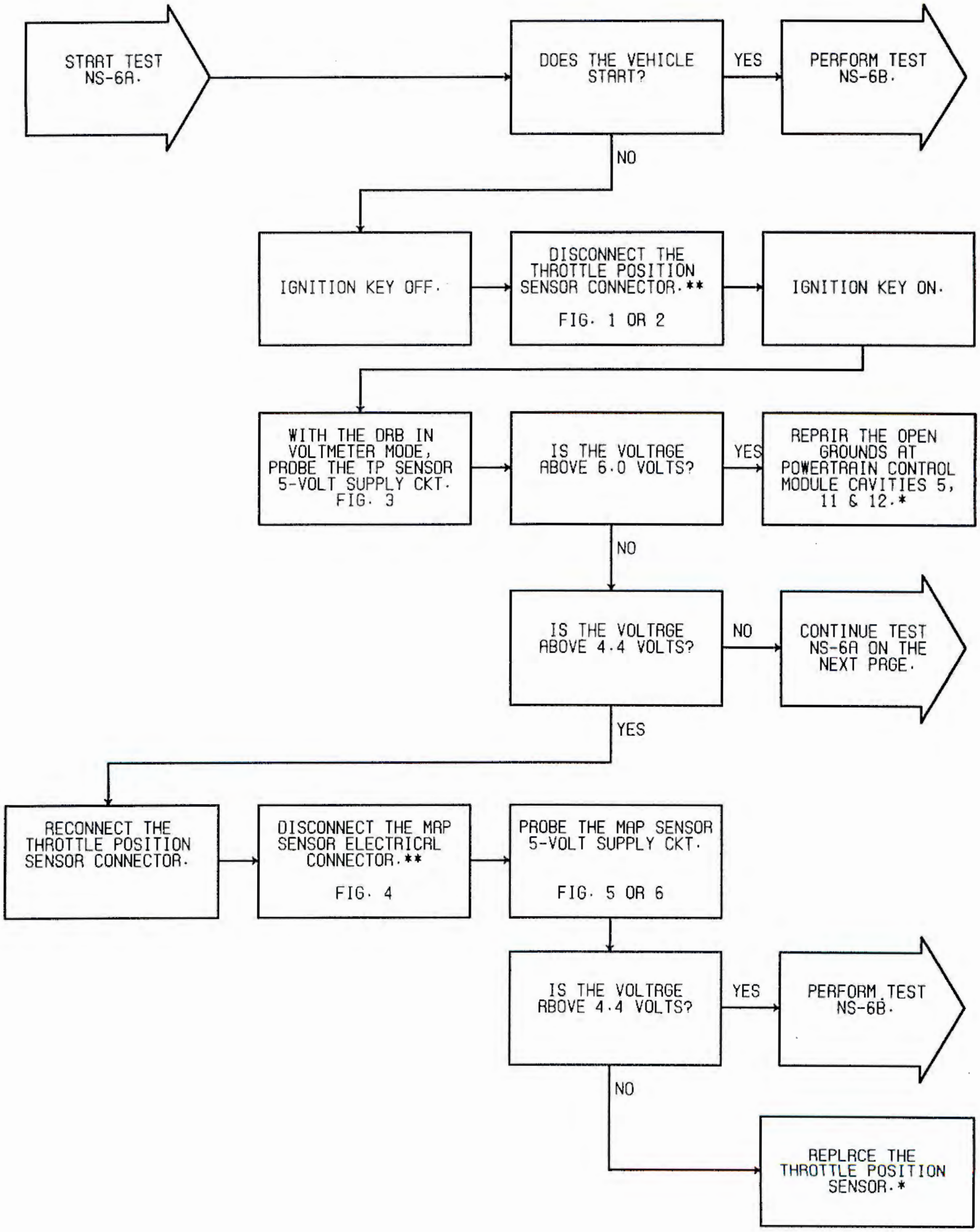
CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	RD/WT	MAP SENSOR SIGNAL
3	VT/WT	5-VOLT SUPPLY

1060406

FIG. 6

TEST NS-6A | CORRECTING A "NO RESPONSE" CONDITION

Perform TEST TC-1A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-6A CONTINUED - CORRECTING A "NO RESPONSE" CONDITION

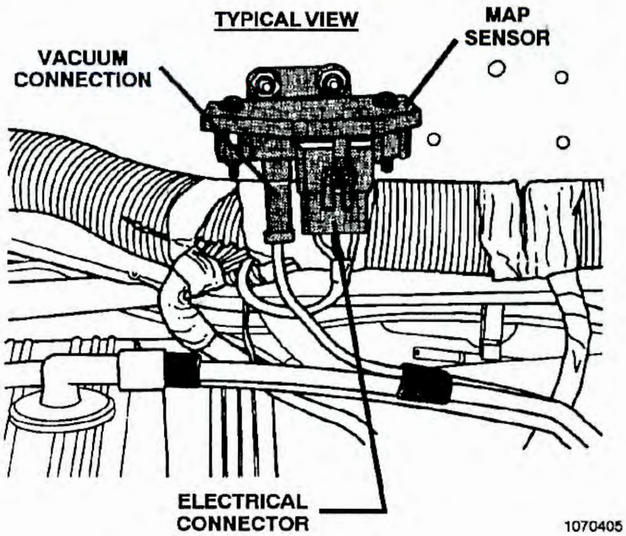
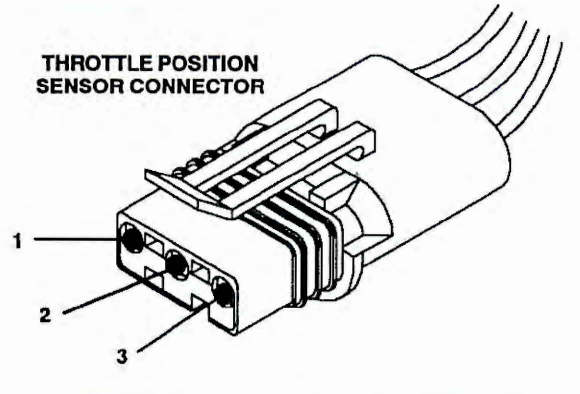


FIG. 1



CAV	COLOR	FUNCTION
1	BK/LB	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	VT/WT	5 VOLT SUPPLY

FIG. 2

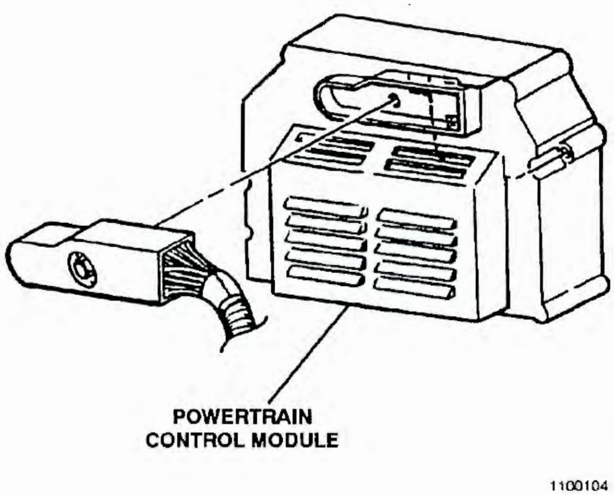
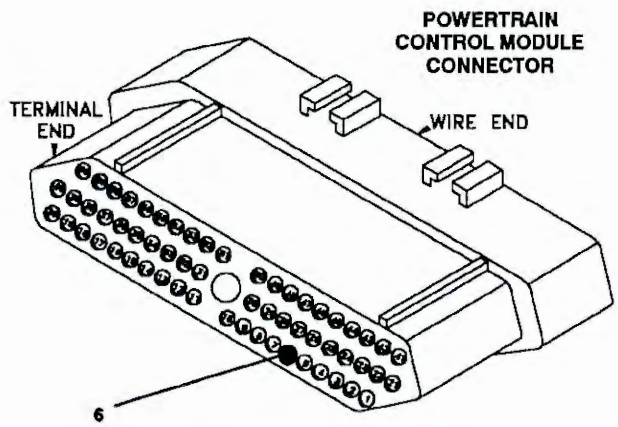


FIG. 3



CAV	COLOR	FUNCTION
6	VT/WT	5-VOLT SUPPLY

FIG. 4

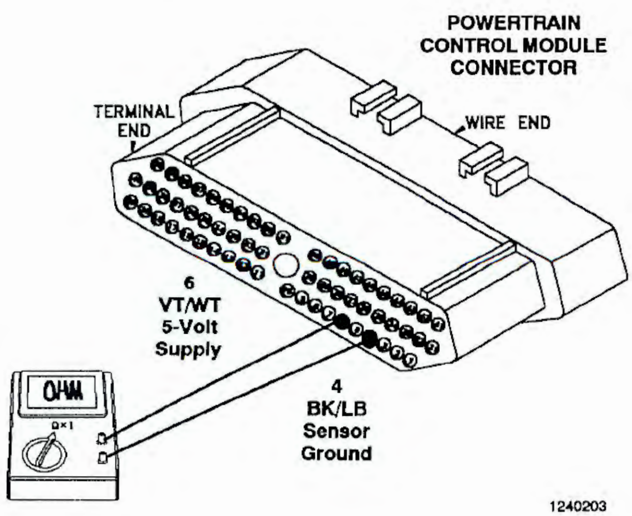
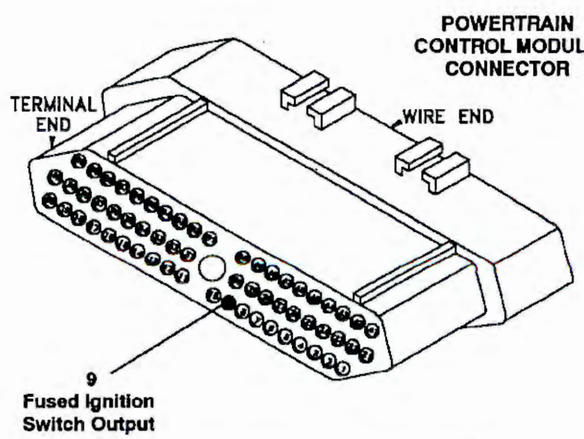


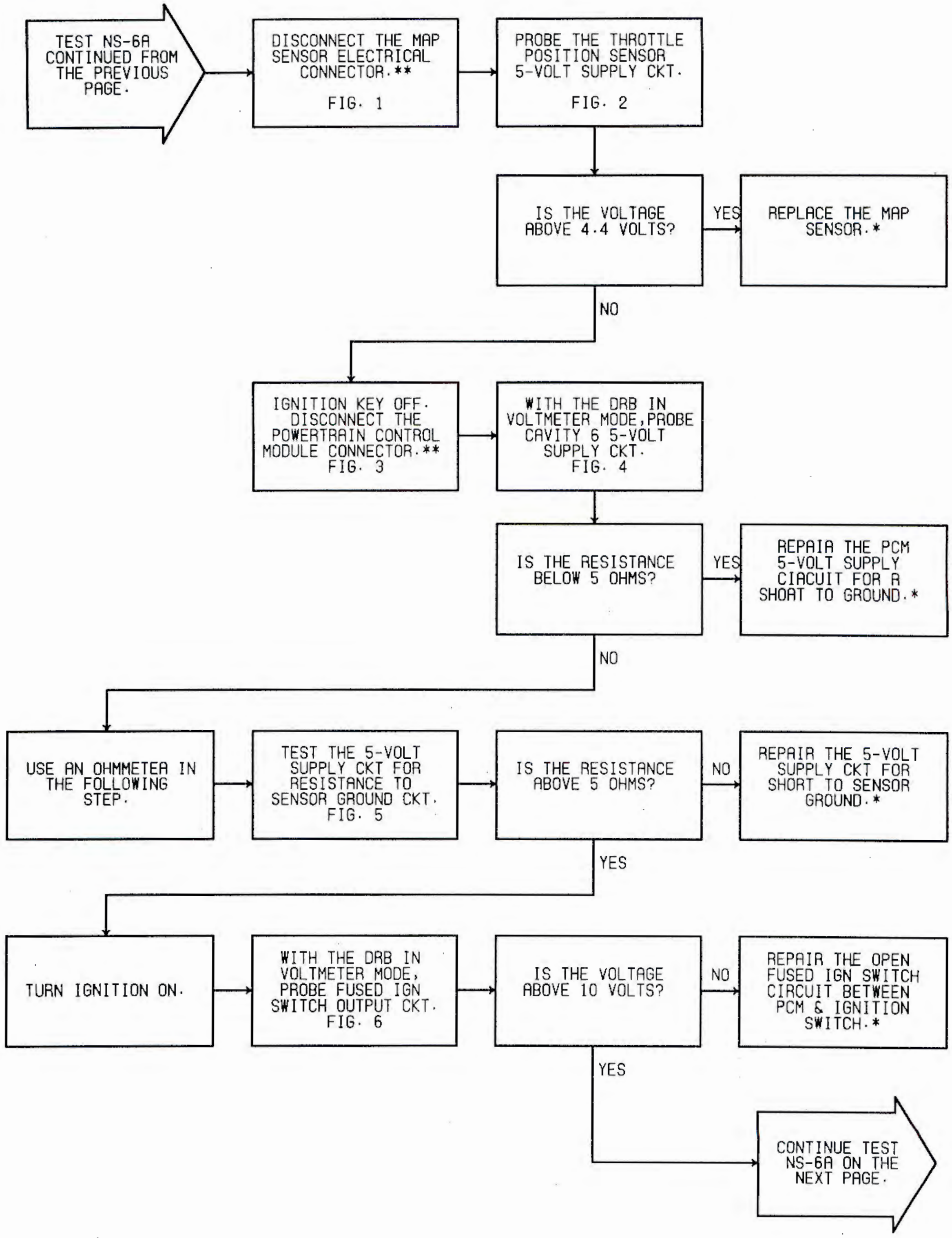
FIG. 5



CAV	MJ/XJ	YJ	ZJ
9	DB	WT/YL	LB/RD

FIG. 6

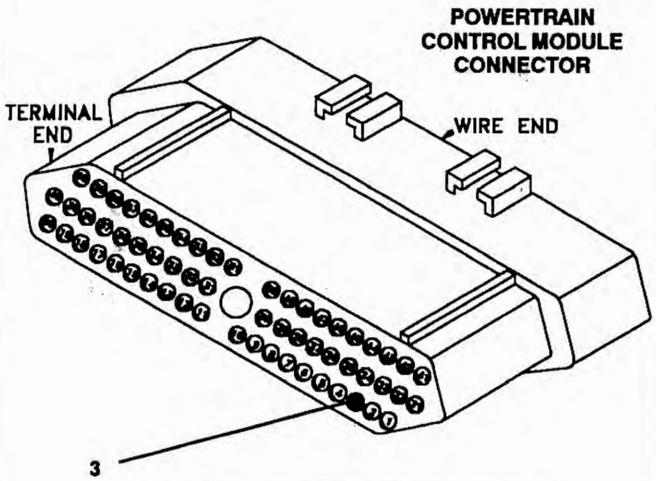
TEST NS-6A | CONTINUED - CORRECTING A “NO RESPONSE” CONDITION



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

TEST NS-6A CONTINUED - CORRECTING A "NO RESPONSE" CONDITION

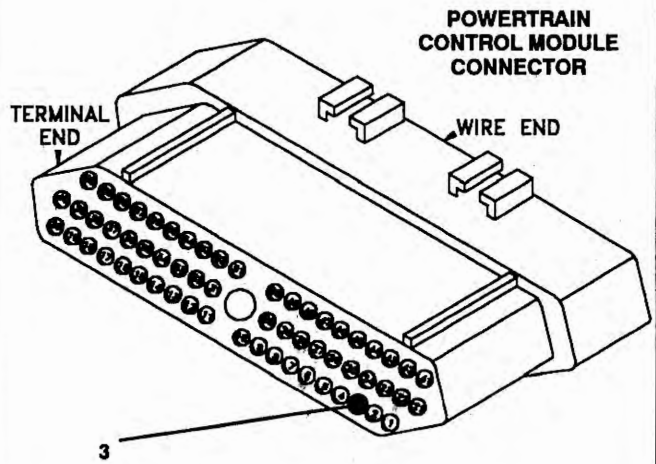
MJ/XJ AND ZJ BODIES



CAV	COLOR	FUNCTION
3	RD	FUSED B(+)

FIG. 1

YJ BODY



CAV	COLOR	FUNCTION
3	RD/WT	FUSED B(+)

FIG. 2

MJ/XJ AND ZJ BODIES

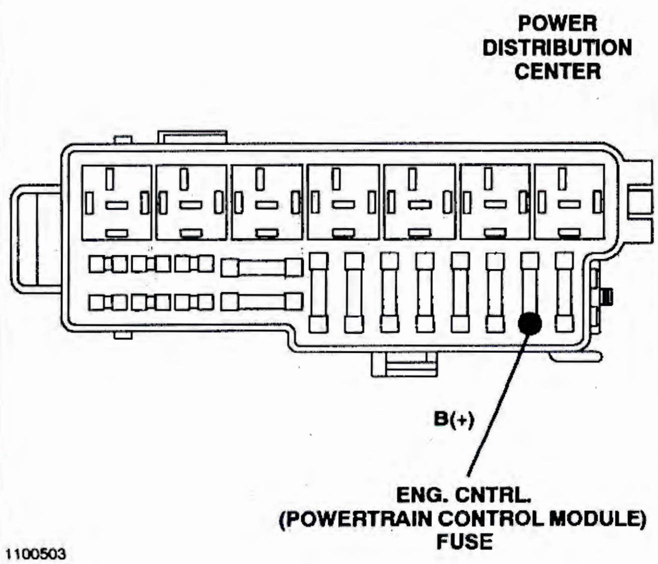


FIG. 3

YJ BODY

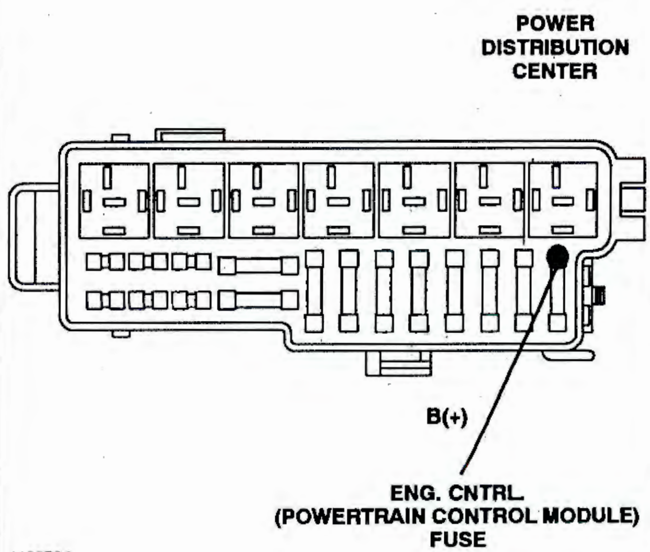
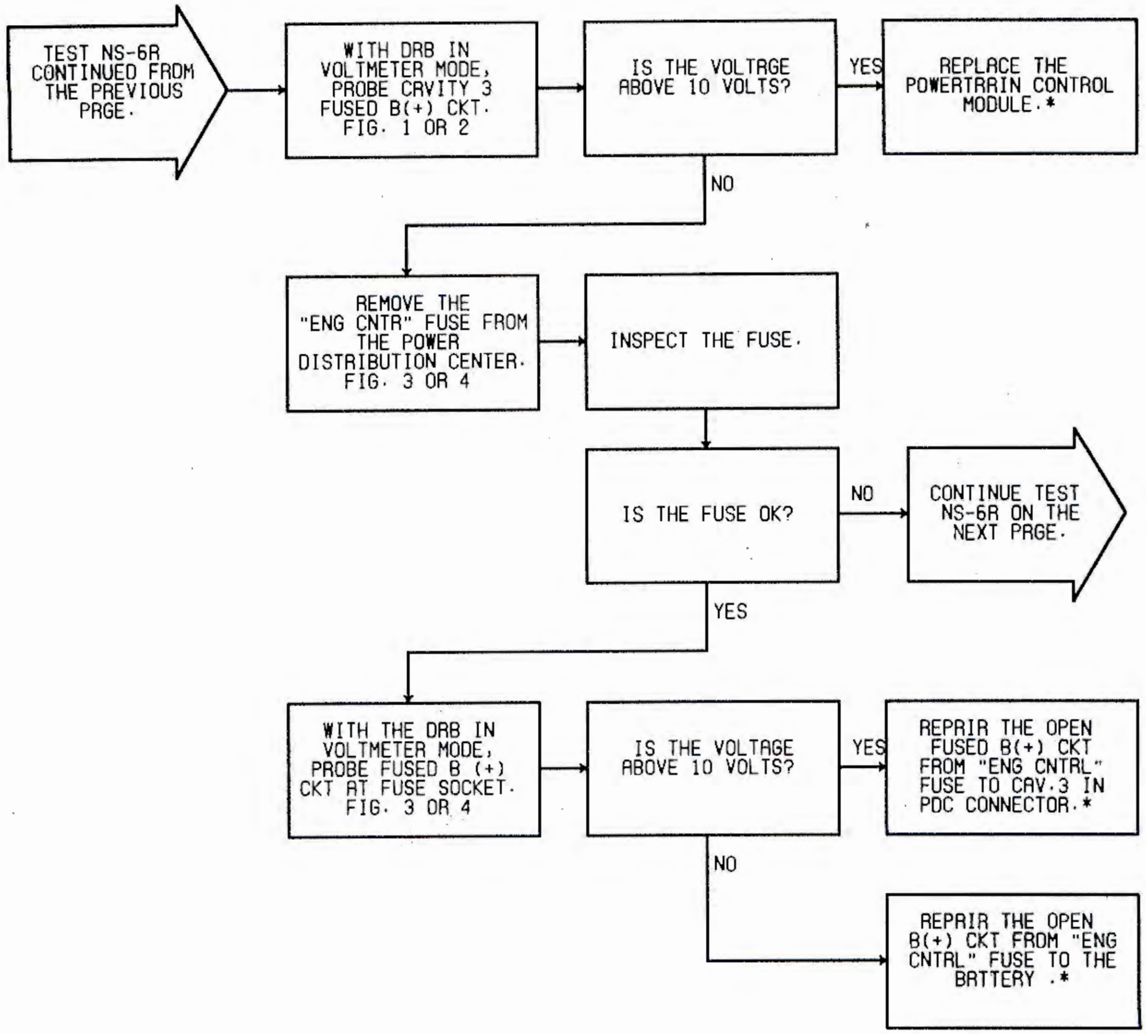


FIG. 4

TEST NS-6A CONTINUED - CORRECTING A "NO RESPONSE" CONDITION



*Perform Verification TEST VER-1A. | **Check connectors – Clean / repair as necessary.

TEST NS-6A CONTINUED - CORRECTING A "NO RESPONSE" CONDITION

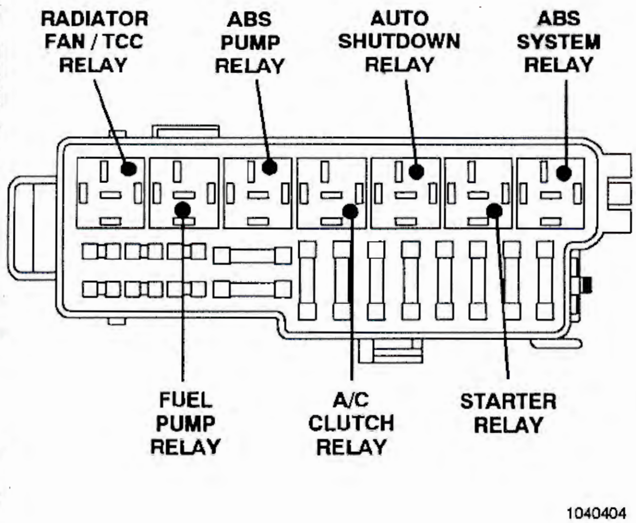
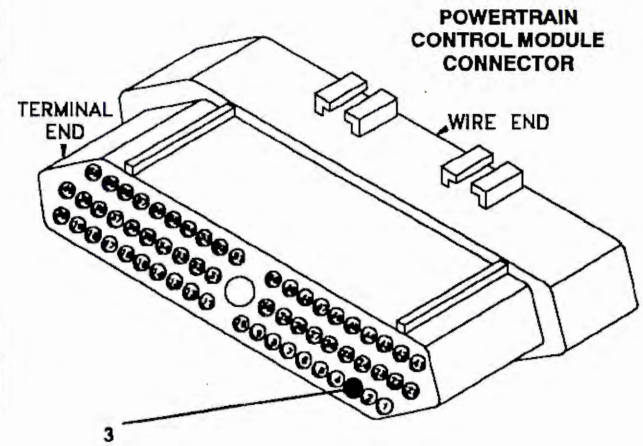


FIG. 1

YJ BODY

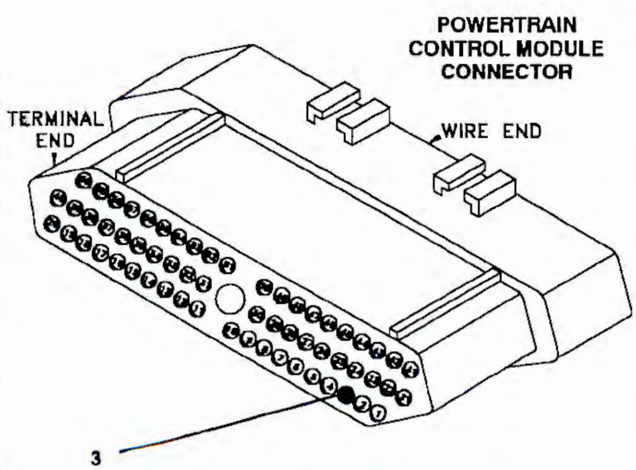


CAV	COLOR	FUNCTION
3	RD/WT	FUSED B(+)

0790404

FIG. 2

MJ/XJ AND ZJ BODIES



CAV	COLOR	FUNCTION
3	RD	FUSED B(+)

1050601

FIG. 3

CAV	COLOR XJ	COLOR YJ	COLOR ZJ	FUNCTION
A	DB	WT/YL	LB/RD	FUSED IGN SW OUTPUT
B	RD/BK	RD/WT	RD	FUSED B(+)
C	DB/YL	DB/YL	PK	ASD RELAY CONTROL
D	DG/OR	DG/OR	DG/BK	ASD RELAY OUTPUT

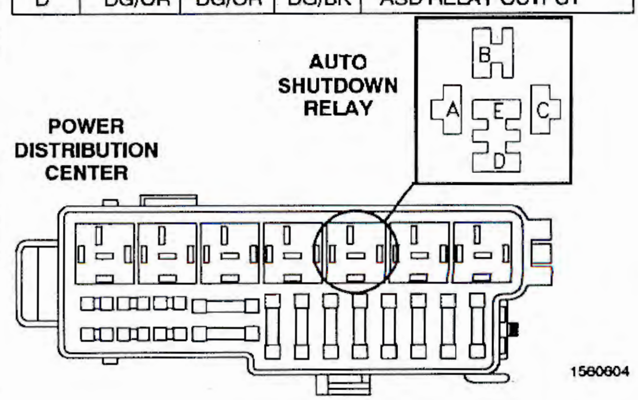
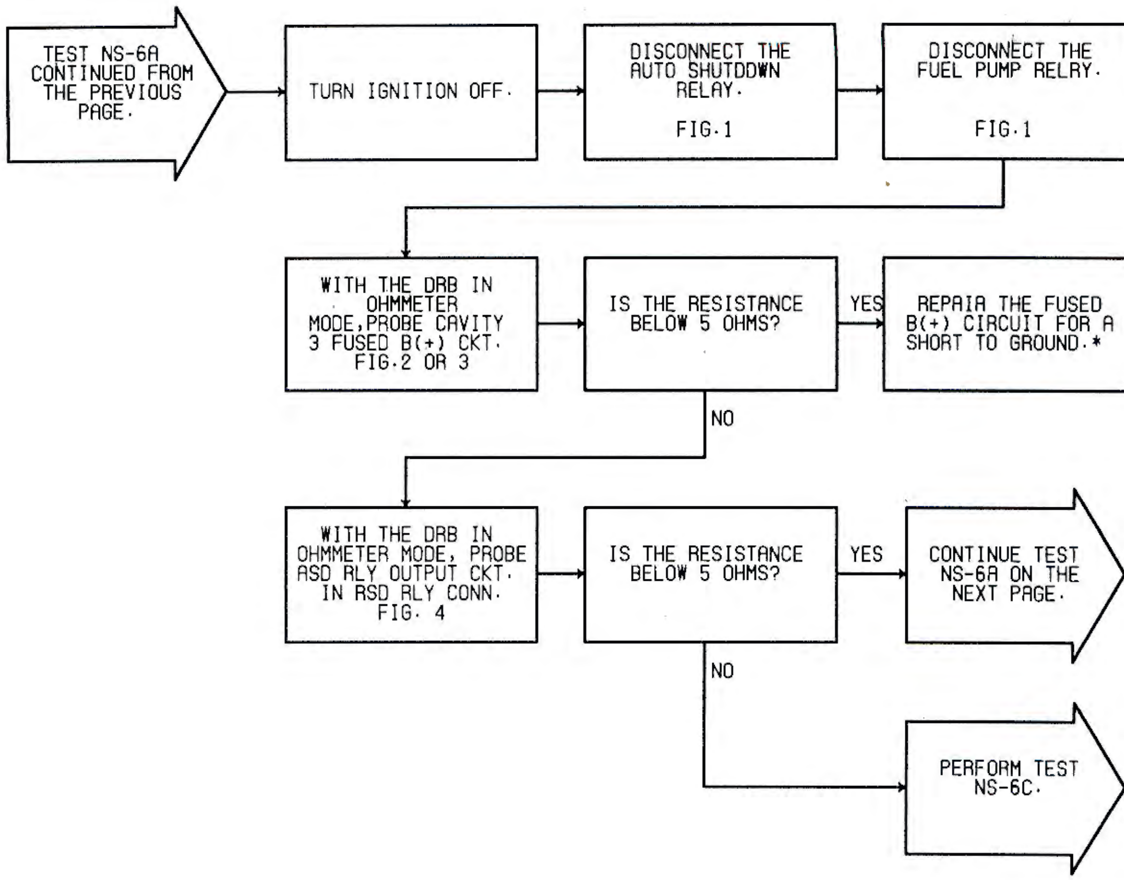


FIG. 4

TEST NS-6A CONTINUED - CORRECTING A "NO RESPONSE" CONDITION



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-6A | CONTINUED - CORRECTING A "NO RESPONSE" CONDITION

TYPICAL VIEW

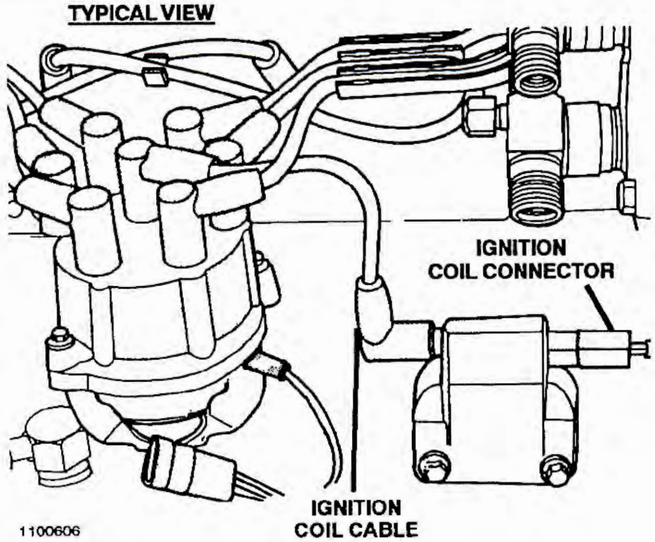


FIG. 1

CAV	COLOR XJ	COLOR YJ	COLOR ZJ	FUNCTION
A	DB	WT/YL	LB/RD	FUSED IGN SW OUTPUT
B	RD/BK	RD/WT	RD	FUSED B(+)
C	DB/YL	DB/YL	PK	ASD RELAY CONTROL
D	DG/OR	DG/OR	DG/BK	ASD RELAY OUTPUT

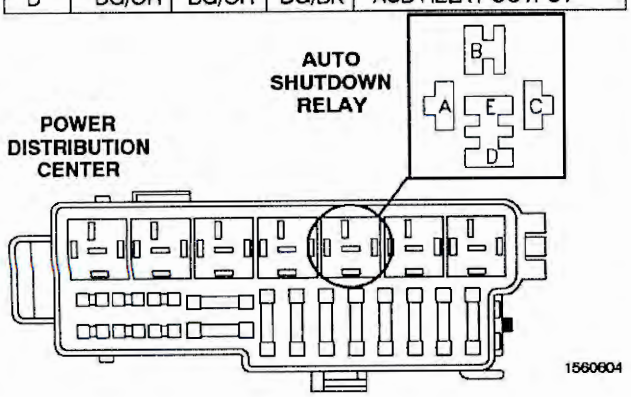


FIG. 2

TYPICAL VIEW

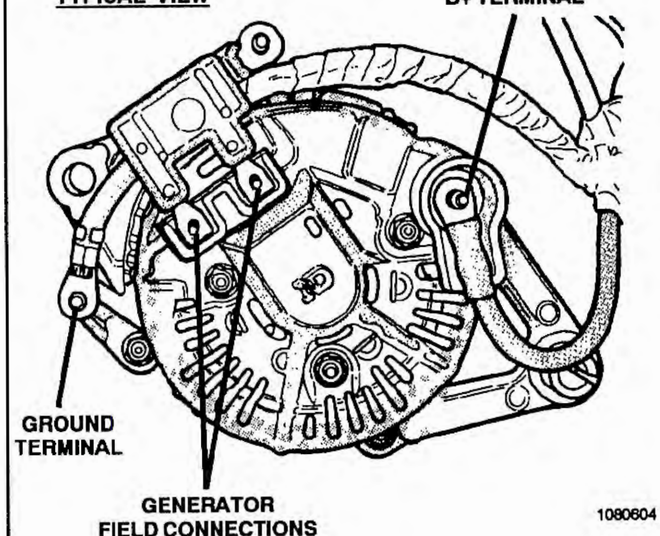


FIG. 3

4.0L ENGINE

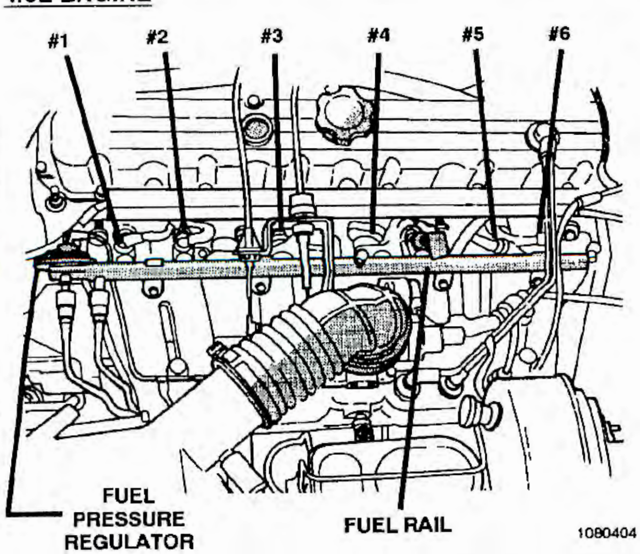


FIG. 4

2.5L ENGINE

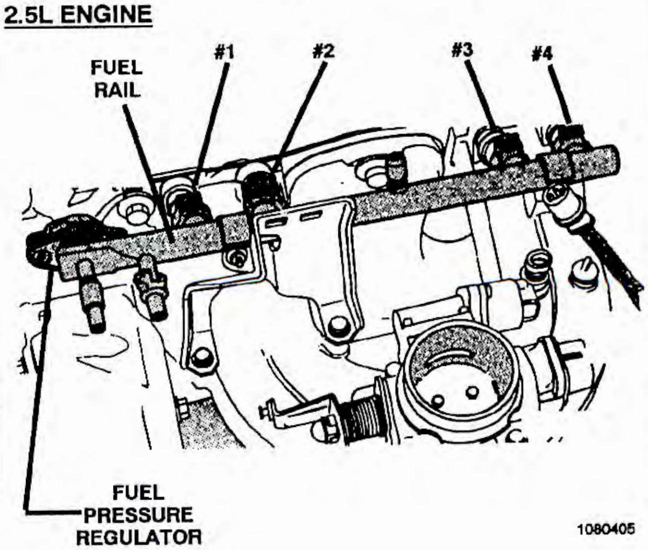
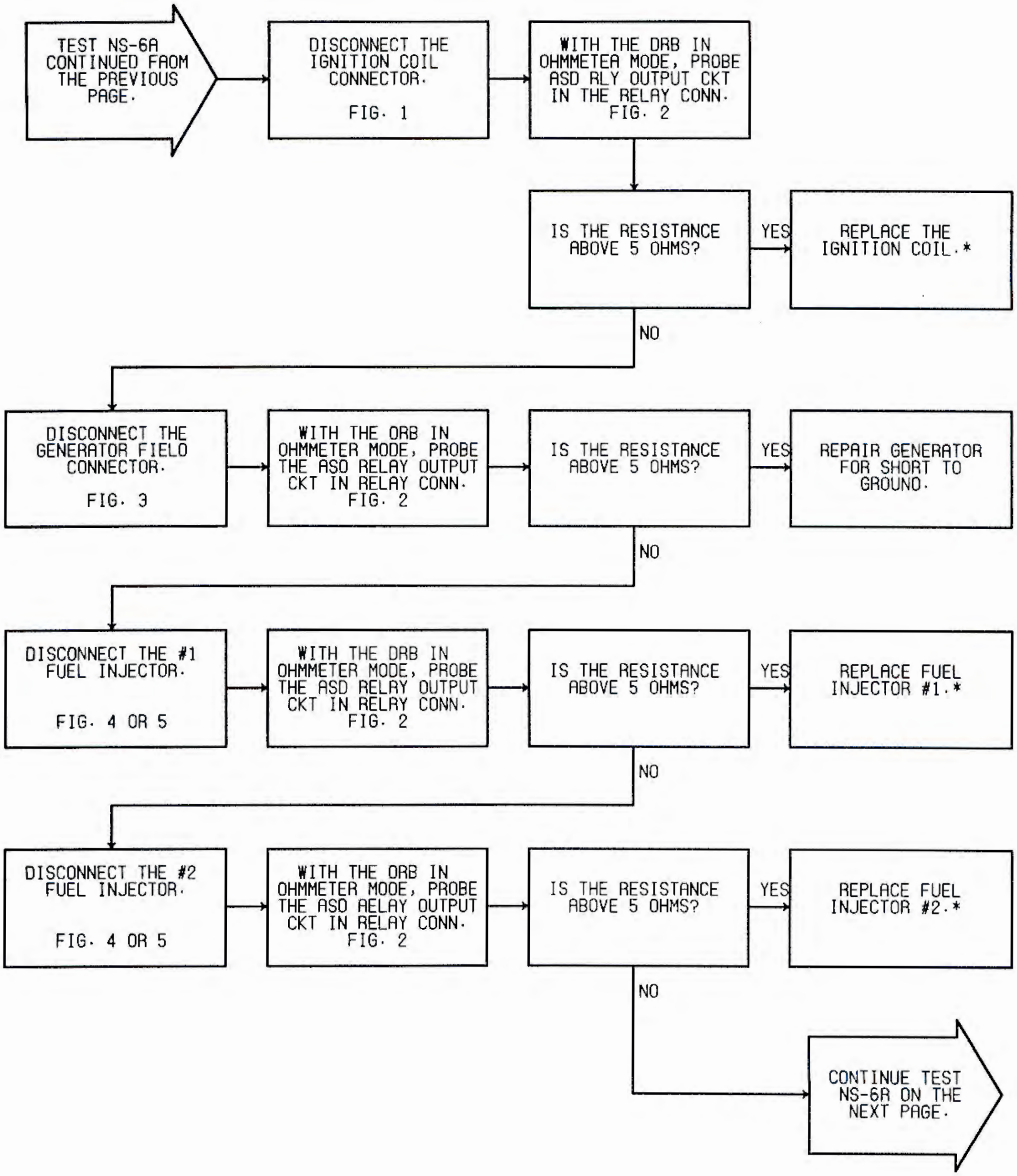


FIG. 5

TEST NS-6A | CONTINUED - CORRECTING A "NO RESPONSE" CONDITION



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

TEST NS-6A CONTINUED - CORRECTING A "NO RESPONSE" CONDITION

4.0L ENGINE

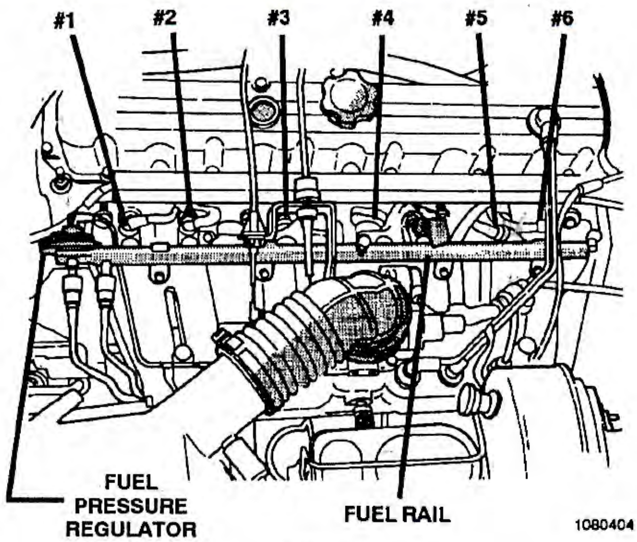


FIG. 1

2.5L ENGINE

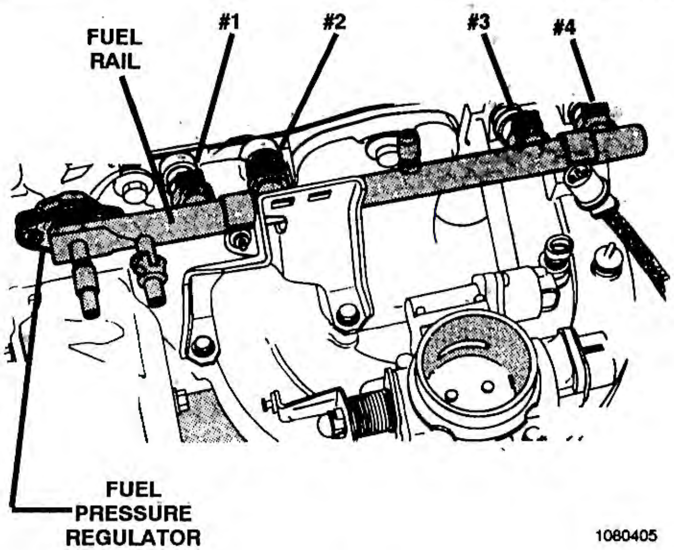


FIG. 2

CAV	COLOR XJ	YJ	ZJ	FUNCTION
A	DB	WT/YL	LB/RD	FUSED IGN SW OUTPUT
B	RD/BK	RD/WT	RD	FUSED B(+)
C	DB/YL	DB/YL	PK	ASD RELAY CONTROL
D	DG/OR	DG/OR	DG/BK	ASD RELAY OUTPUT

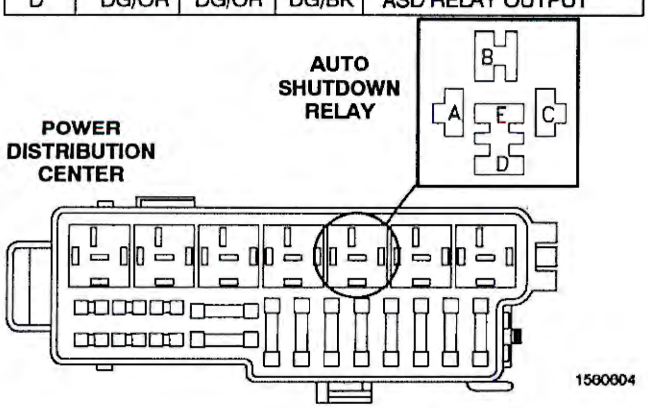
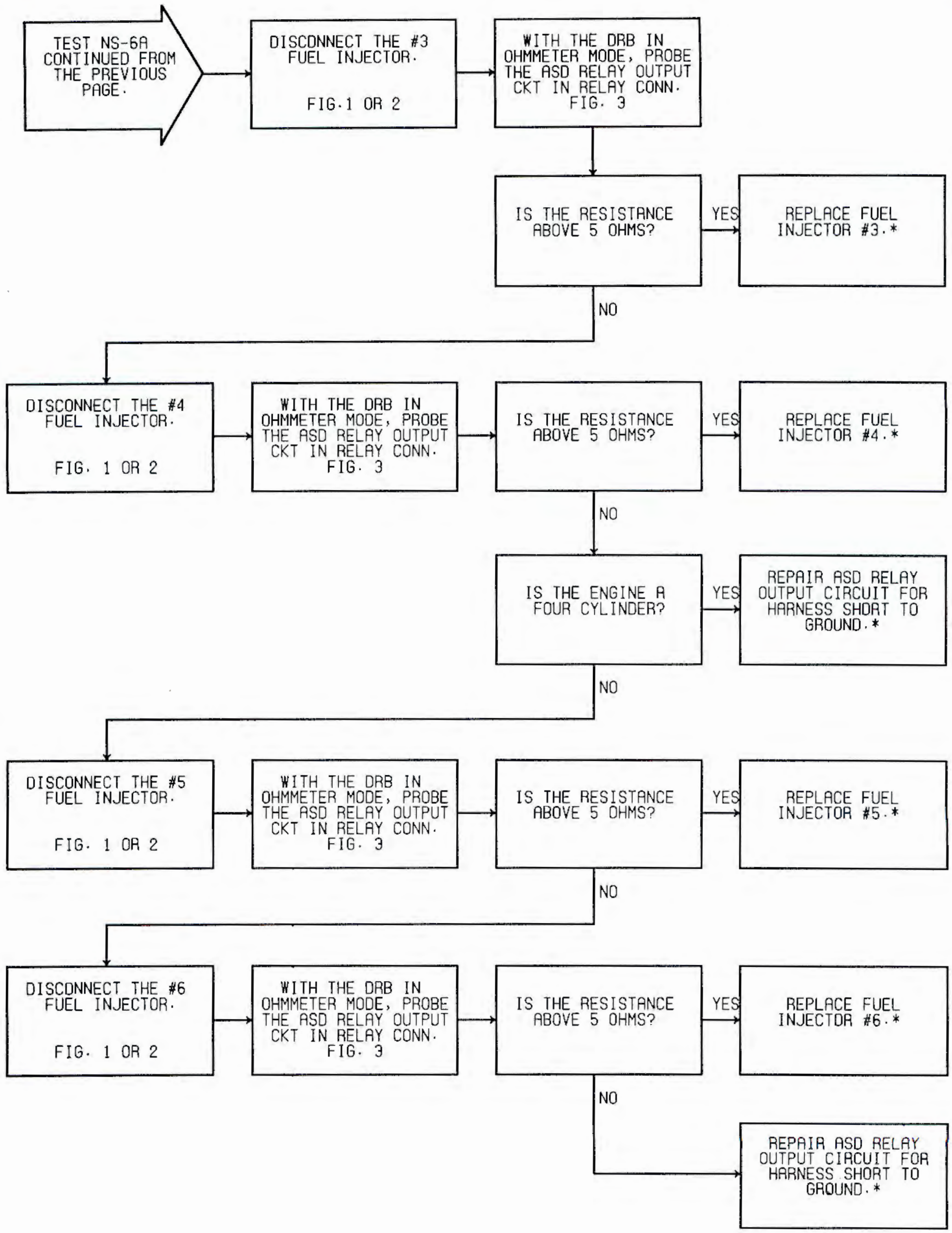


FIG. 3



**Perform Verification TEST VER-1A.* | ***Check connectors – Clean / repair as necessary.*

TEST NS-6B | CORRECTING A “NO RESPONSE” CONDITION

Perform TEST NS-6A Before Proceeding

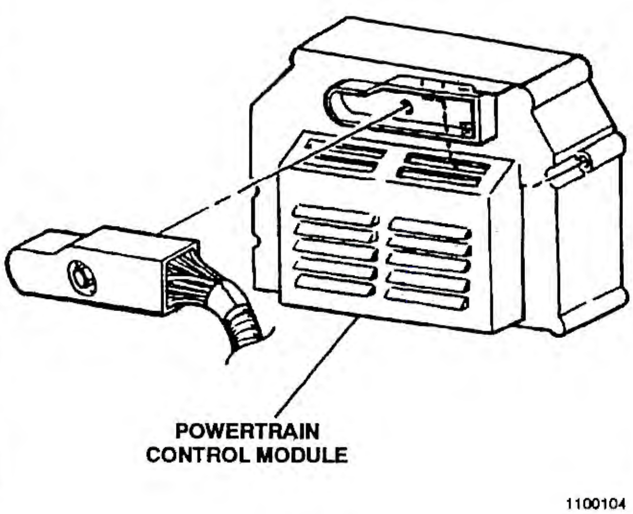
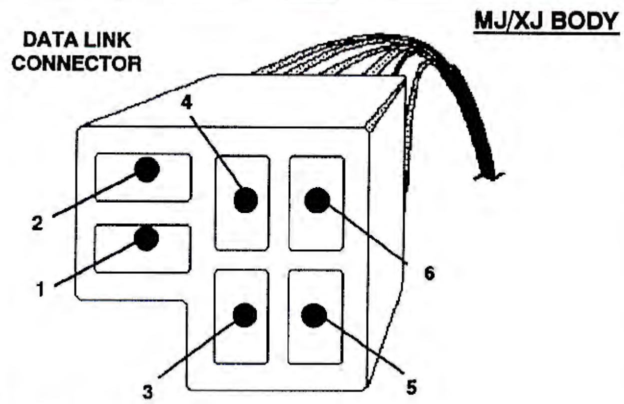


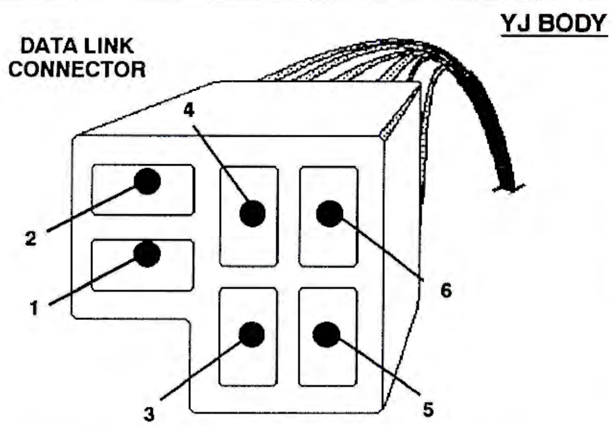
FIG. 1



CAV	COLOR	FUNCTION
1	BK/WT	GROUND
3	PK	SCI TRANSMIT
4	LG	SCI RECEIVE
5	DB/WT	FUSED IGNITION SW OUTPUT

1080304

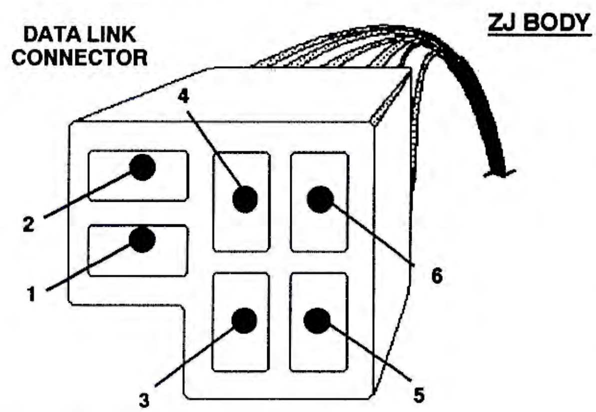
FIG. 2



CAV	COLOR	FUNCTION
1	BK/WT	GROUND
3	PK	SCI TRANSMIT
4	LG	SCI RECEIVE
5	WT/YL	FUSED IGNITION SW OUTPUT

1080305

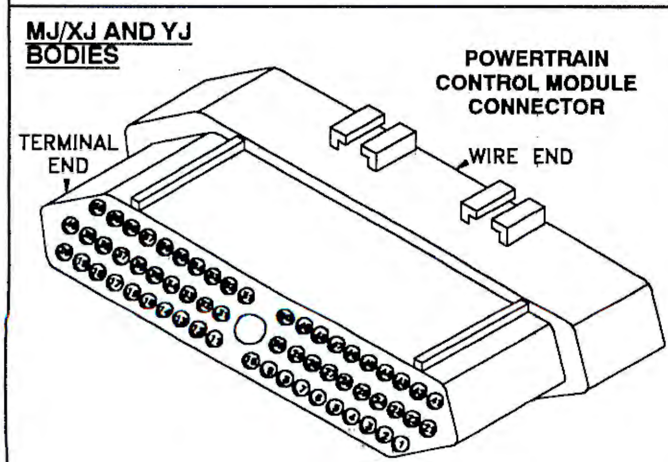
FIG. 3



CAV	COLOR	FUNCTION
1	BK/TN	GROUND
3	BK	SCI TRANSMIT
4	BK/YL	SCI RECEIVE
5	LB/RD	FUSED IGNITION SW OUTPUT

1080306

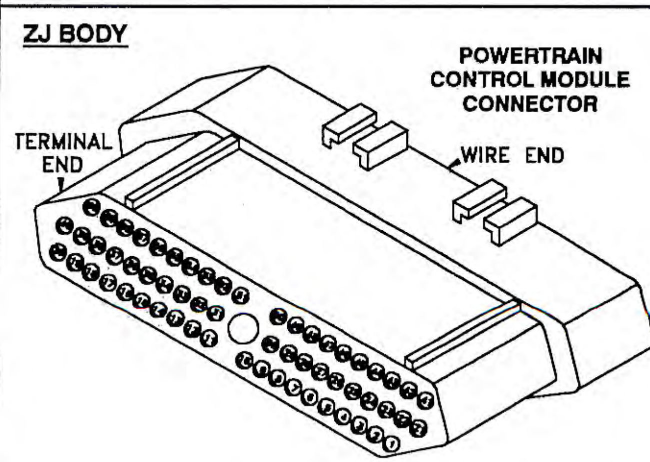
FIG. 4



CAV	COLOR	FUNCTION
25	PK	SCI TRANSMIT
45	LG	SCI RECEIVE

1400404

FIG. 5



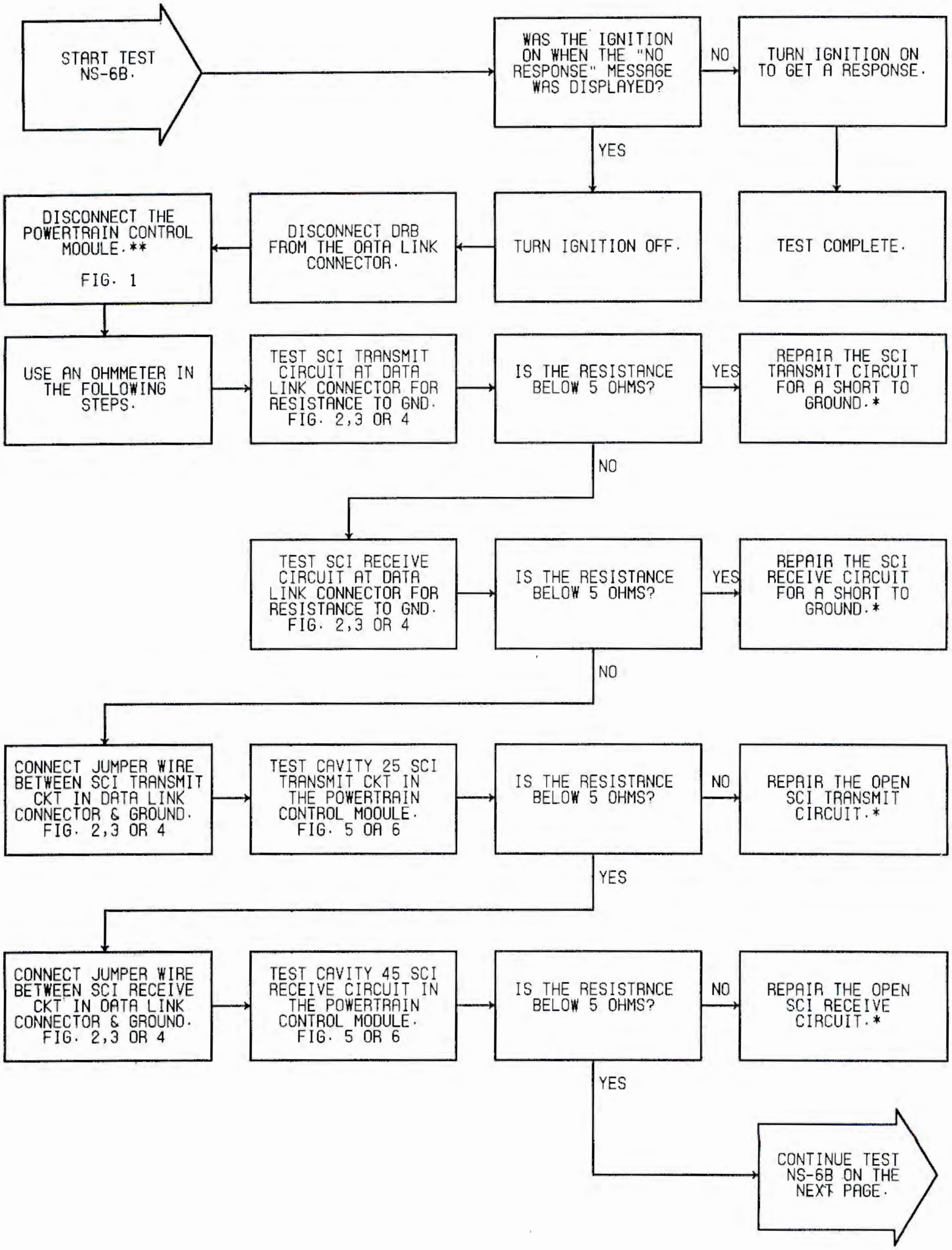
CAV	COLOR	FUNCTION
25	BK	SCI TRANSMIT
45	BK/YL	SCI RECEIVE

1400405

FIG. 6

TEST NS-6B | CORRECTING A "NO RESPONSE" CONDITION

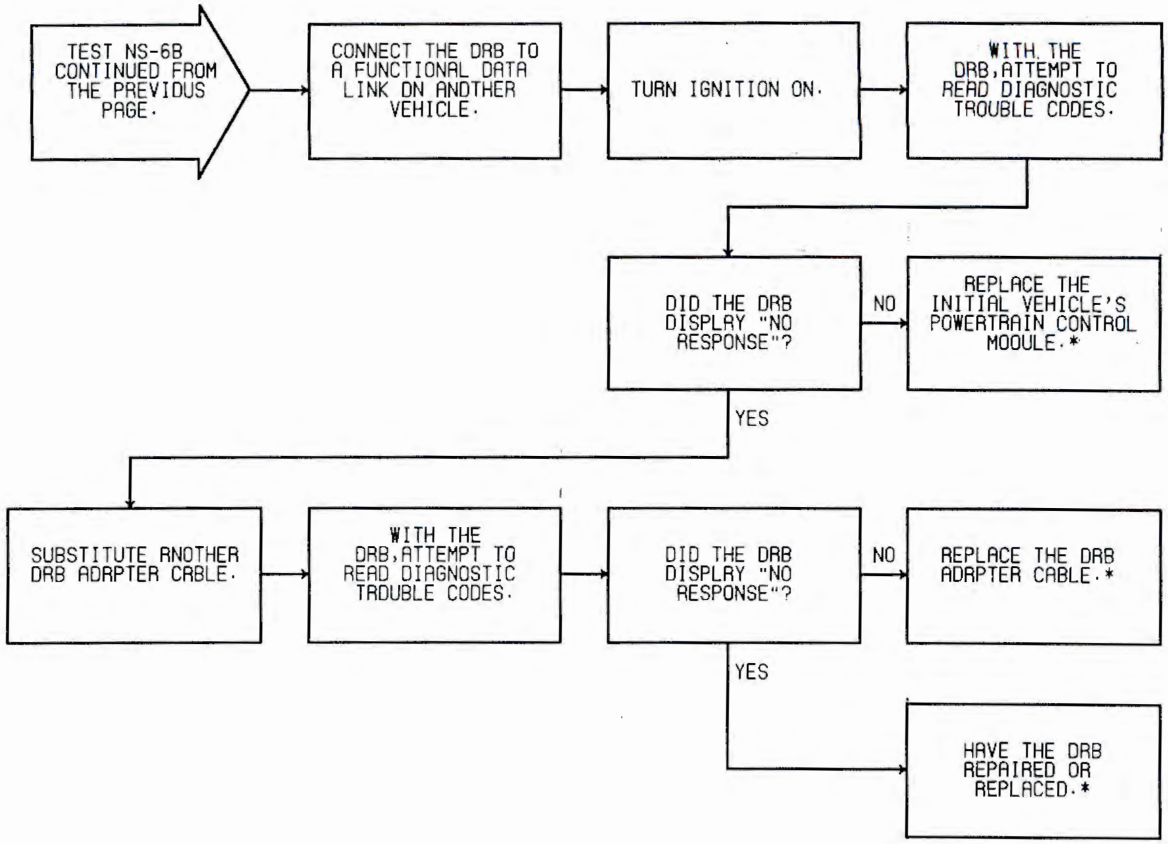
Perform TEST NS-6A Before Proceeding



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

NOTES

TEST NS-6B CONTINUED - CORRECTING A "NO RESPONSE" CONDITION



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-6C | CORRECTING A "NO RESPONSE" CONDITION

Perform TEST NS-6A Before Proceeding

TYPICAL VIEW

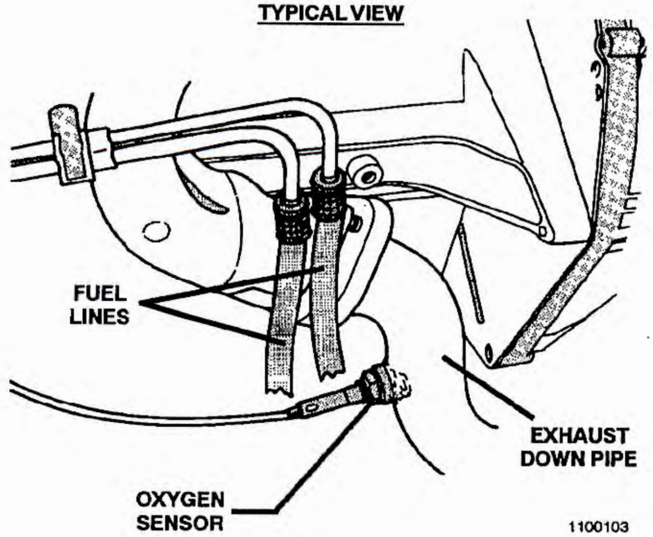
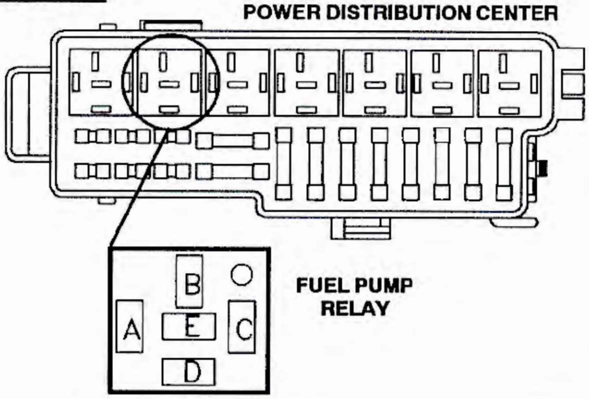


FIG. 1

MJ/XJ BODY

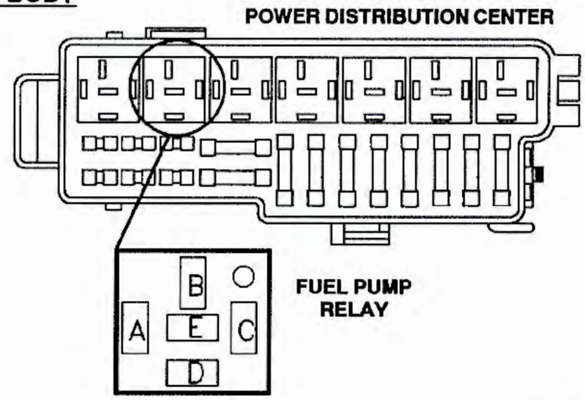


CAV	COLOR	FUNCTION
A	DB	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/*	FUEL PUMP RELAY OUTPUT

1100203

FIG. 2

YJ BODY

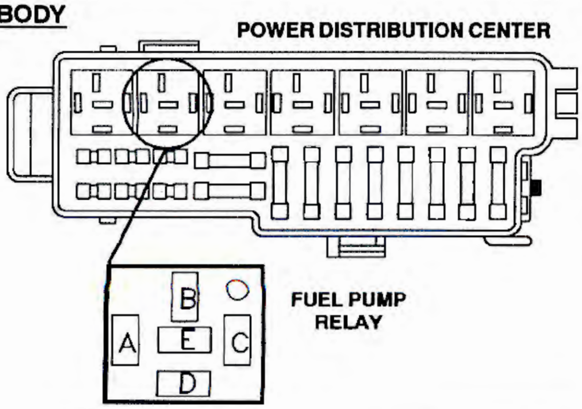


CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/BK	FUEL PUMP RELAY OUTPUT

1100204

FIG. 3

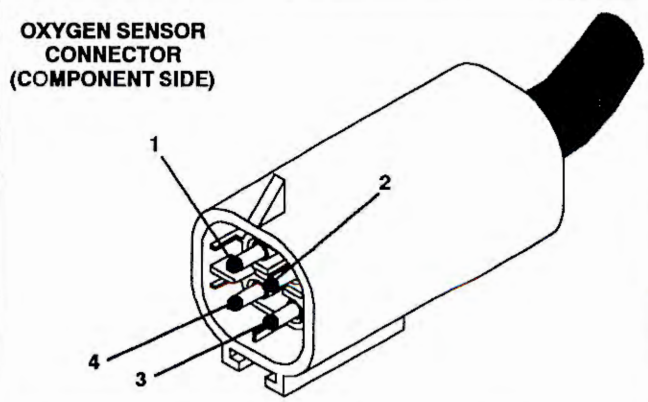
ZJ BODY



CAV	COLOR	FUNCTION
A	LB/RD	FUSED IGN SW OUTPUT
B	RD	FUSED B(+)
C	PK	ASD RELAY CONTROL
D	OR/DB	FUEL PUMP RELAY OUTPUT

1100205

FIG. 4



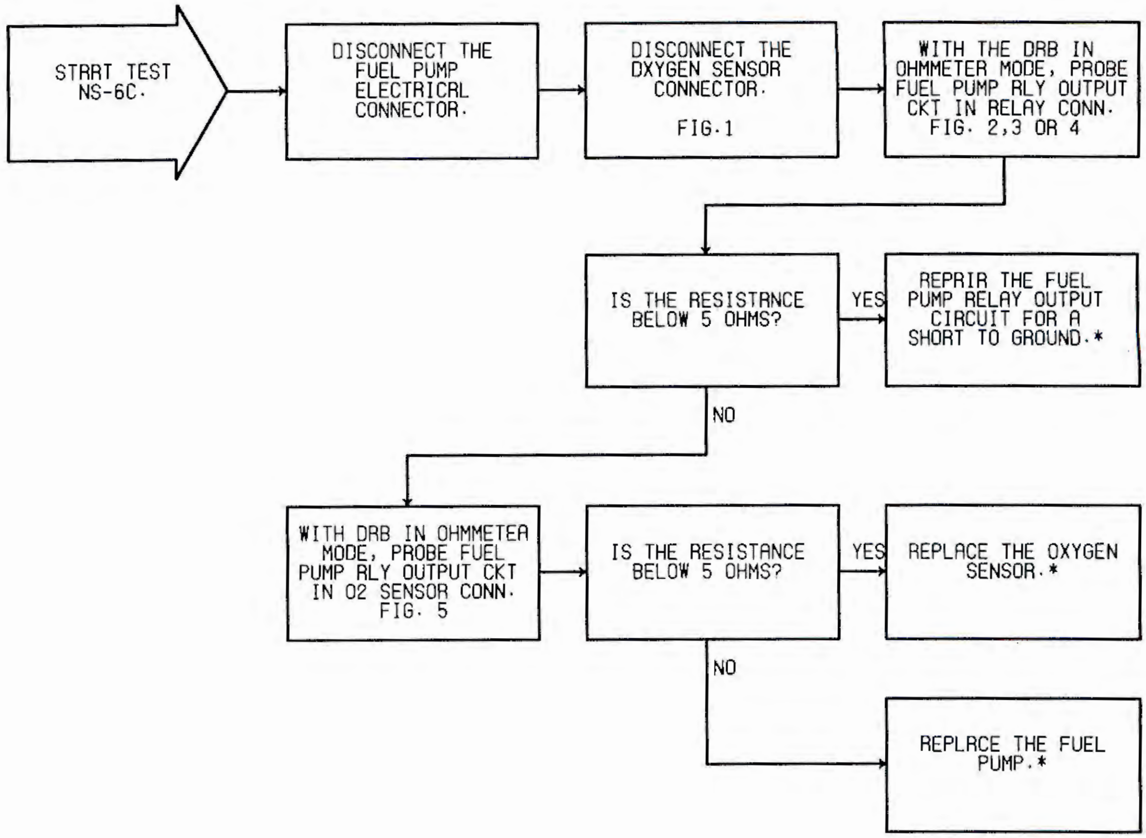
CAV	COLOR	FUNCTION
1	BK	OXYGEN SENSOR SIGNAL
2	GY	SENSOR GROUND
3	WT	HEATER GROUND
4	WT	RELAY OUTPUT

1030504

FIG. 5

TEST NS-6C — CORRECTING A "NO RESPONSE" CONDITION

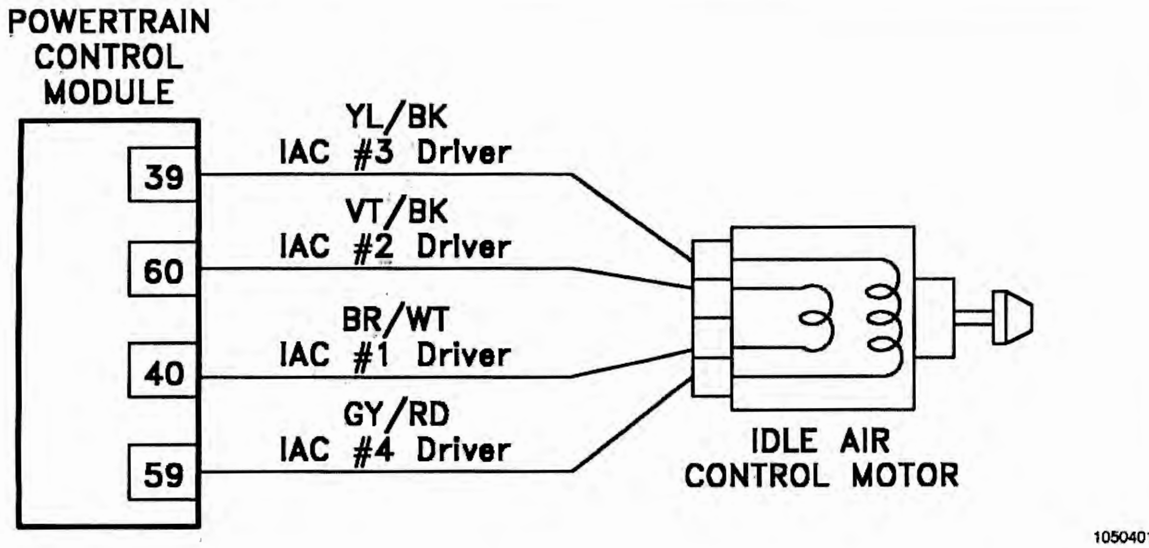
Perform TEST NS-6A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-7A | CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-2A Before Proceeding



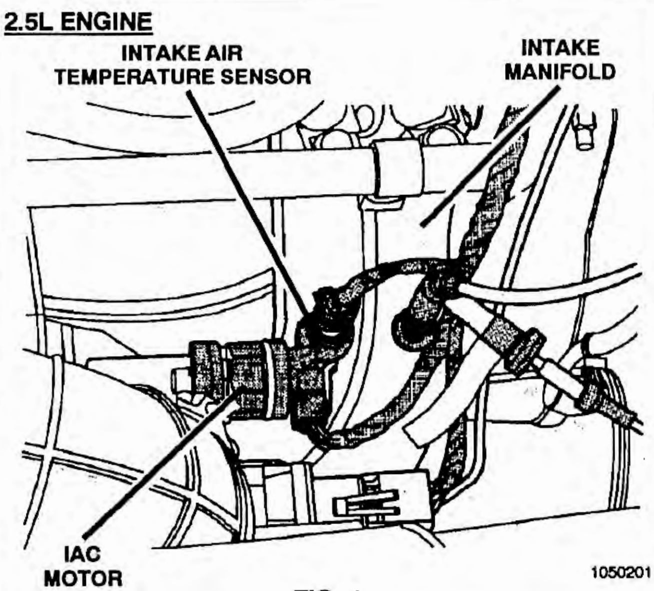


FIG. 1

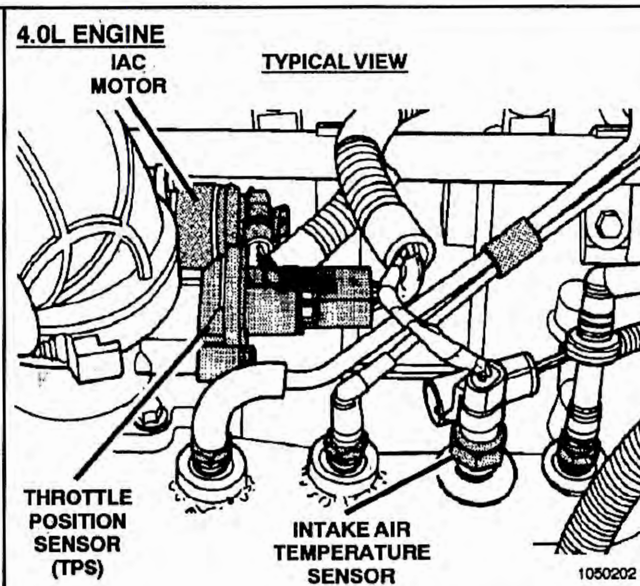
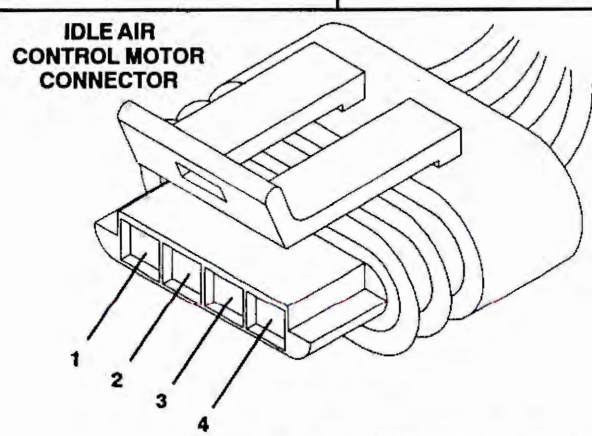


FIG. 2

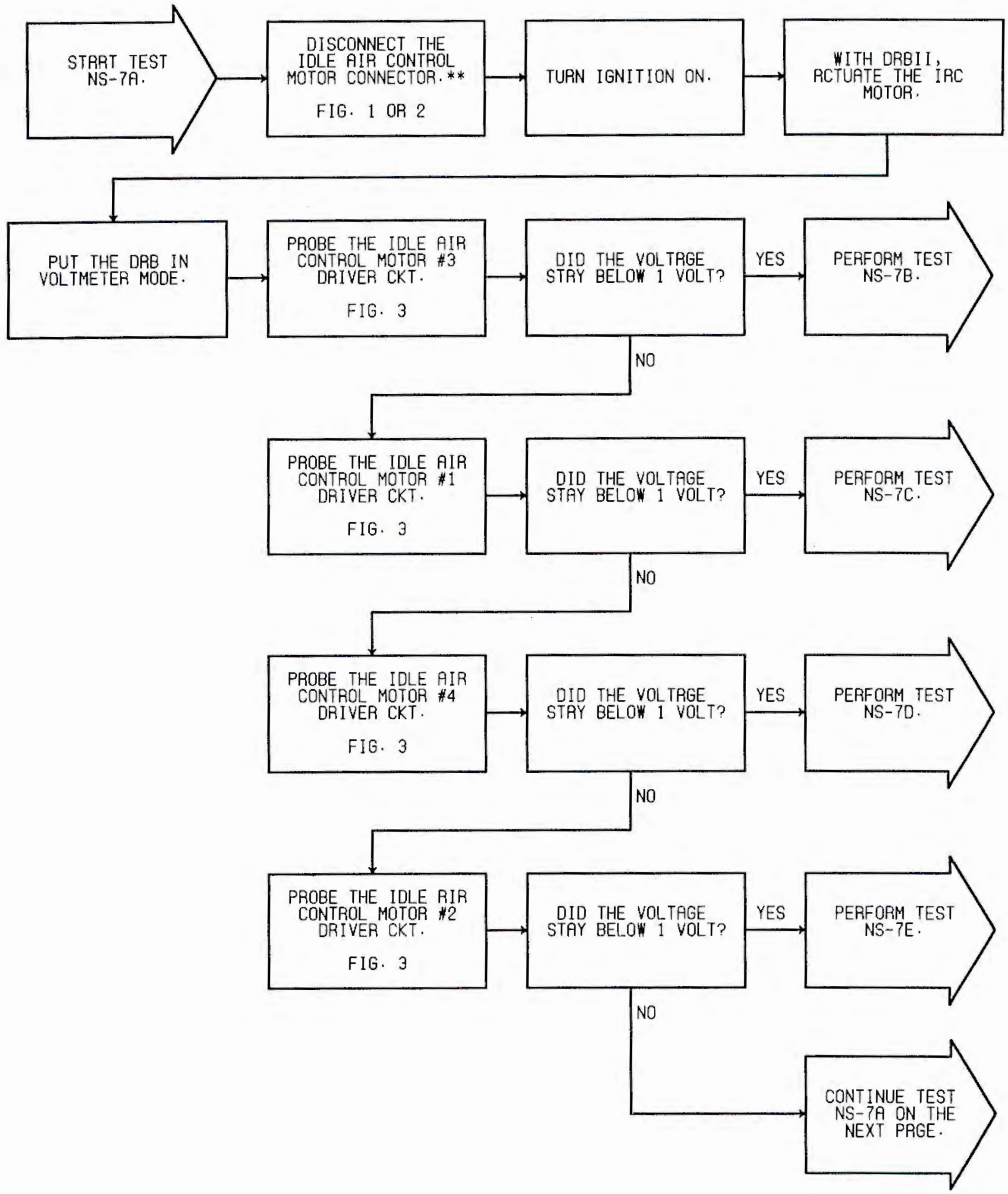


CAV	MJ/XJ/YJ	ZJ	FUNCTION
1	GY/RD	YL/BK	IAC #3 DRIVER
2	YL/BK	VT/BK	IAC #2 DRIVER
3	BR/WT	BR/WT	IAC #1 DRIVER
4	VT/BK	GY/RD	IAC #4 DRIVER

FIG. 3

TEST NS-7A CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-2A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

TEST NS-7A CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR

2.5L ENGINE

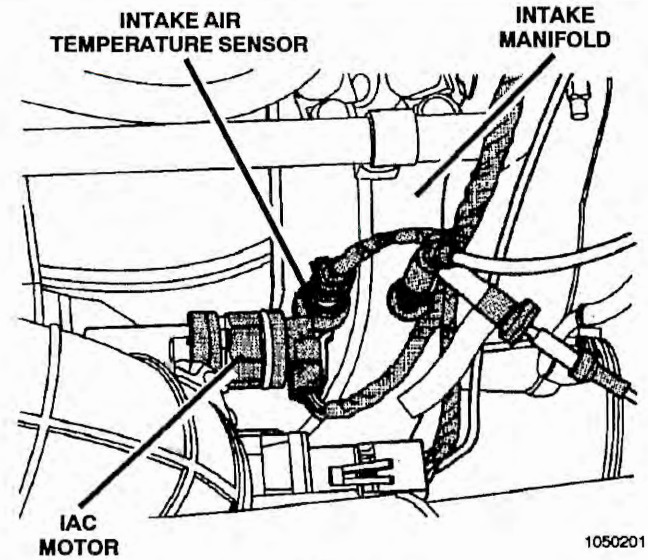


FIG. 1

4.0L ENGINE

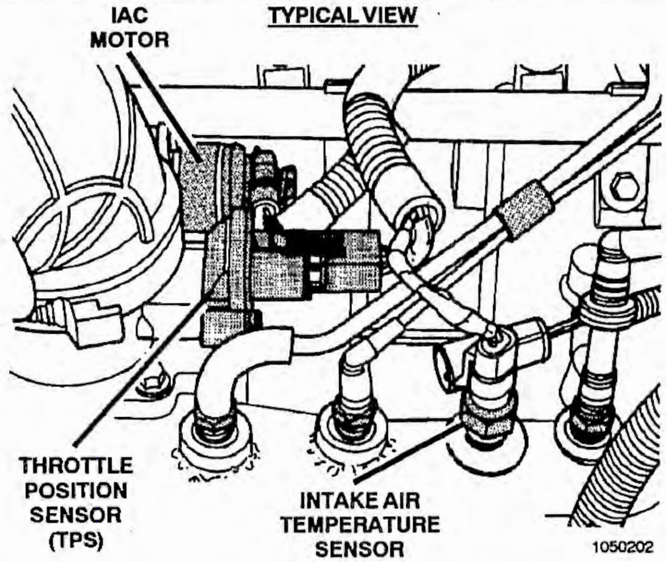


FIG. 2

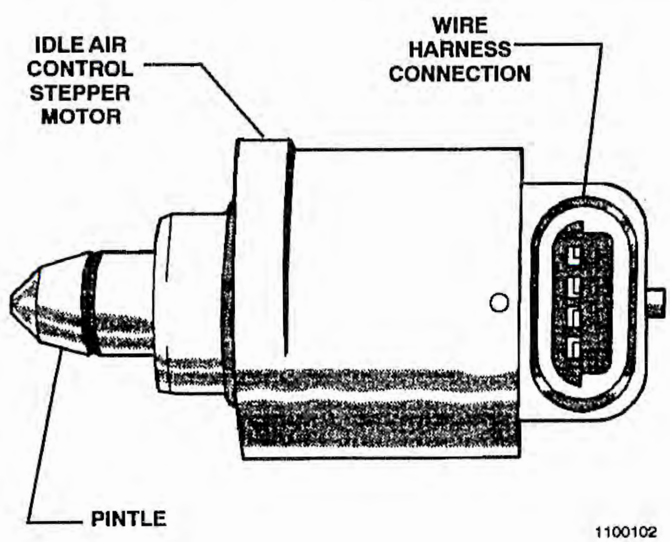
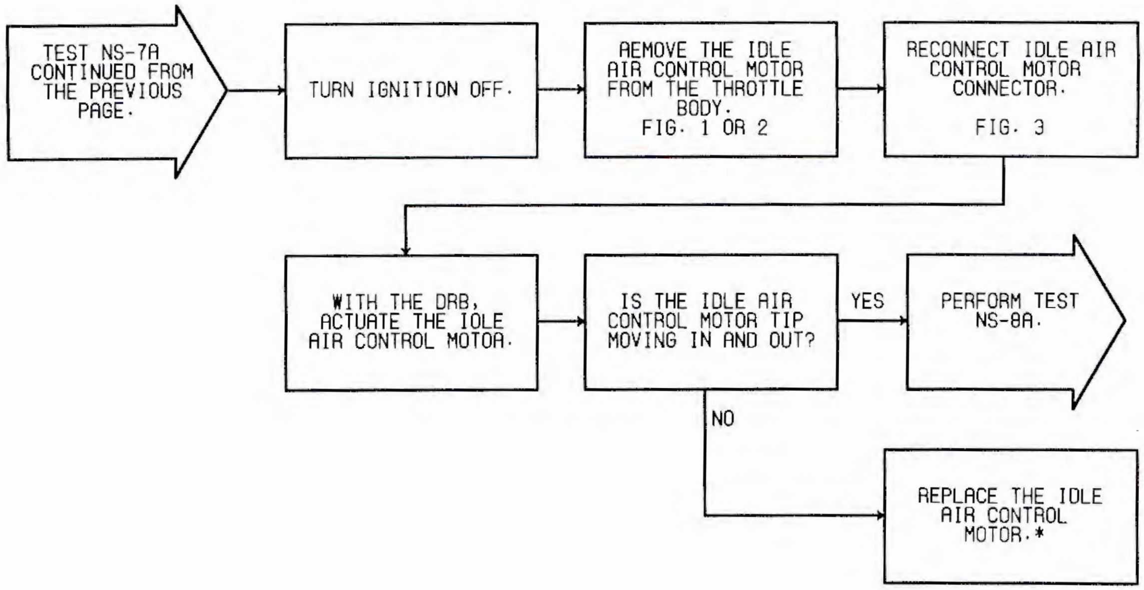


FIG. 3

TEST NS-7A CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

NO START TESTS

TEST NS-7B CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding

MJ/XJ BODY

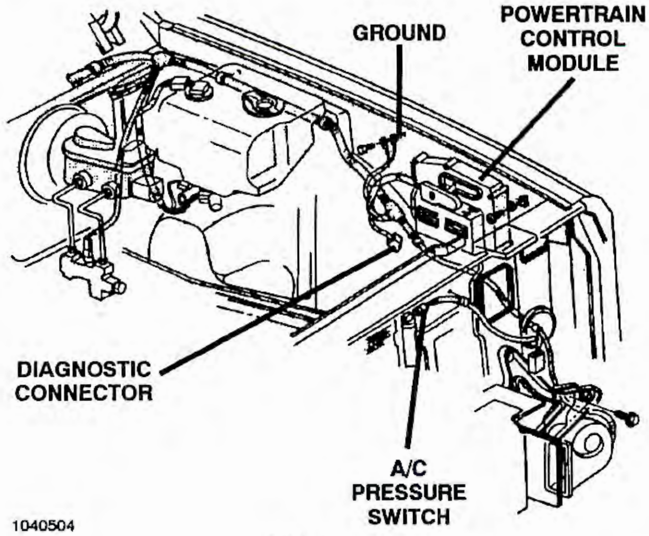


FIG. 1

YJ BODY

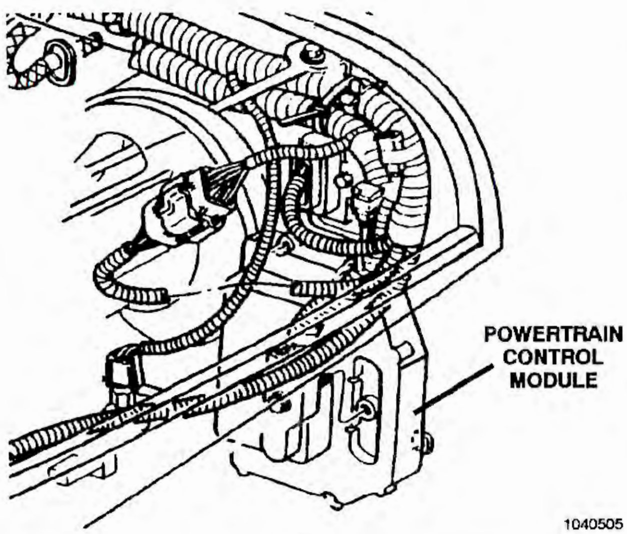


FIG. 2

ZJ BODY

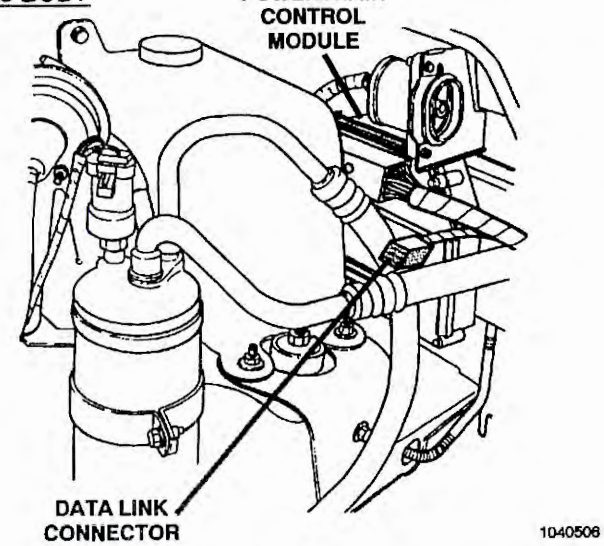


FIG. 3

MJ/XJ AND YJ BODIES

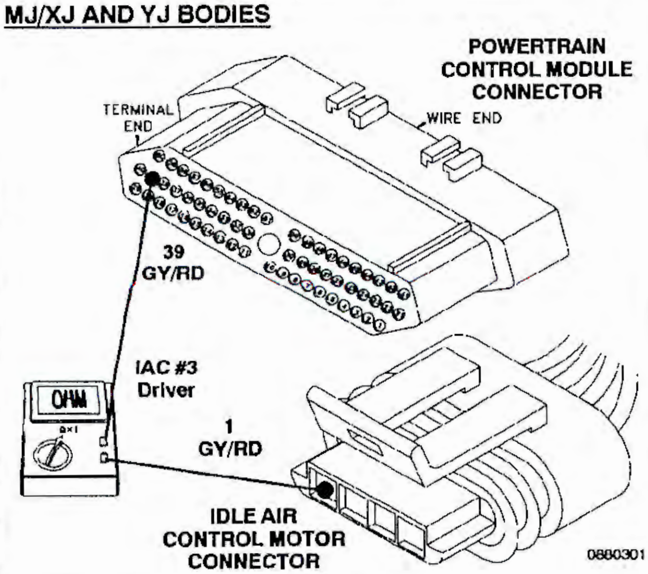


FIG. 4

ZJ BODY

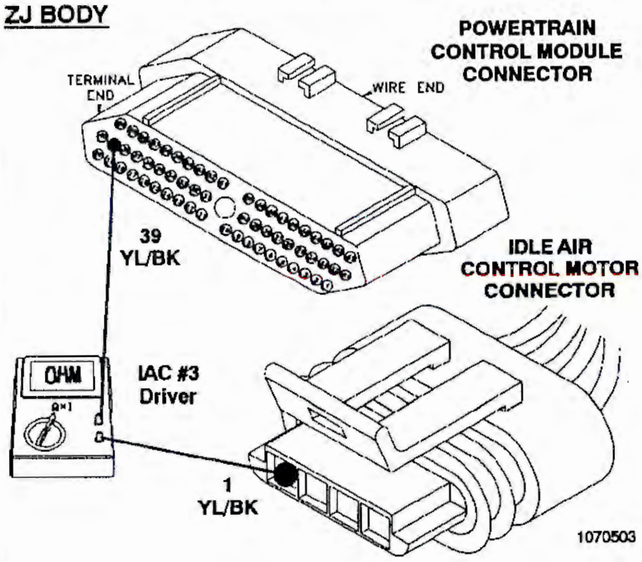
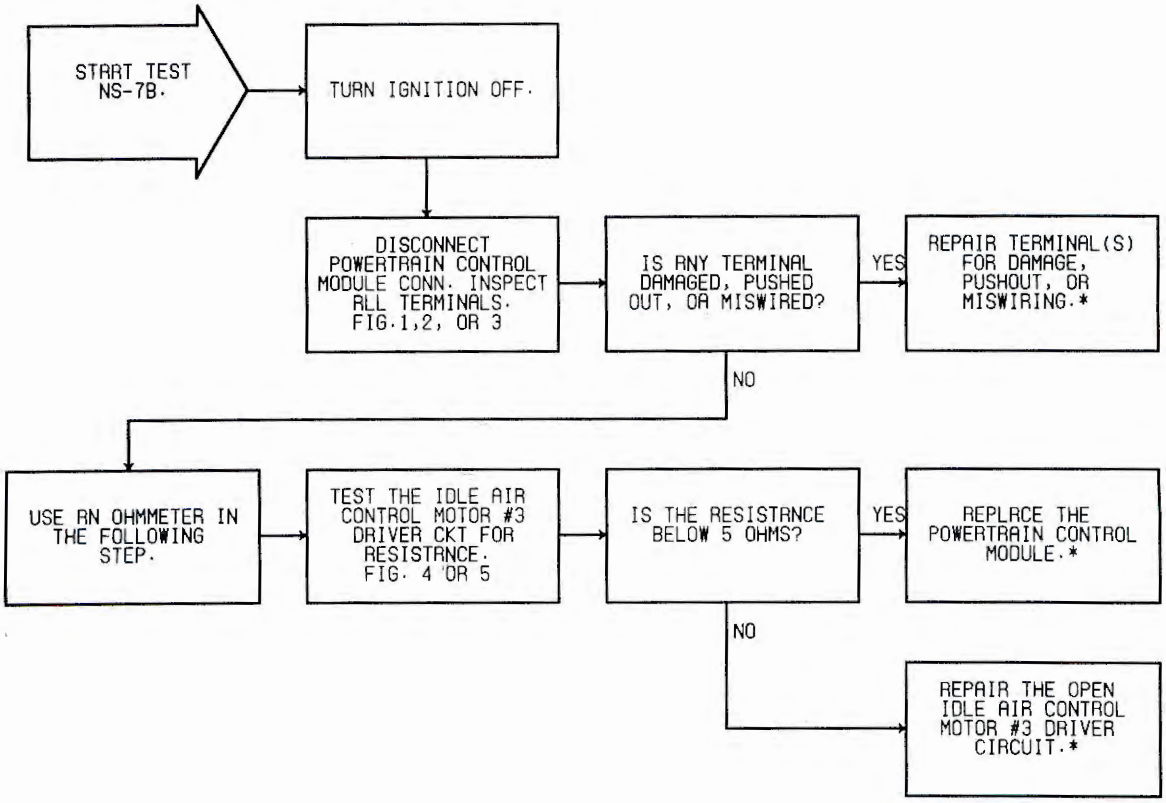


FIG. 5

TEST NS-7B | CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding



Perform Verification TEST VER-1A.** | ****Check connectors – Clean / repair as necessary.

NO START TESTS

TEST NS-7C CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding

MJ/XJ BODY

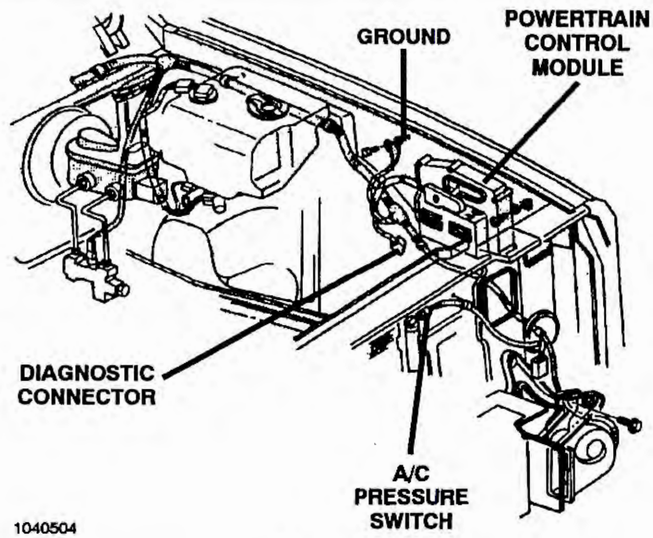


FIG. 1

YJ BODY

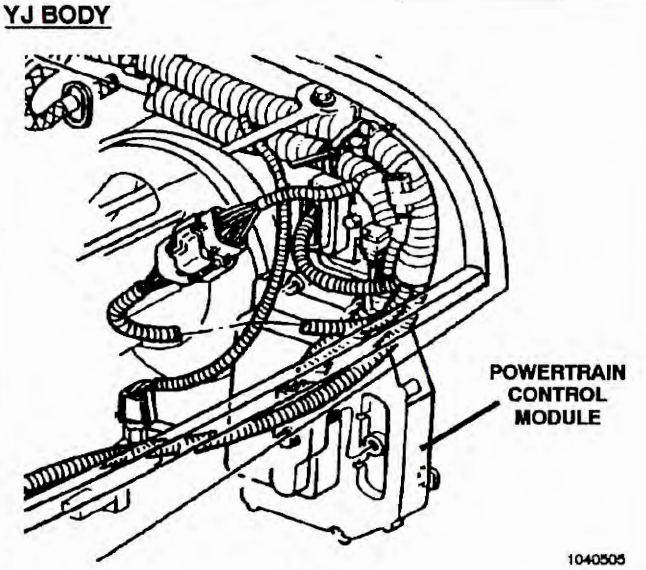


FIG. 2

ZJ BODY

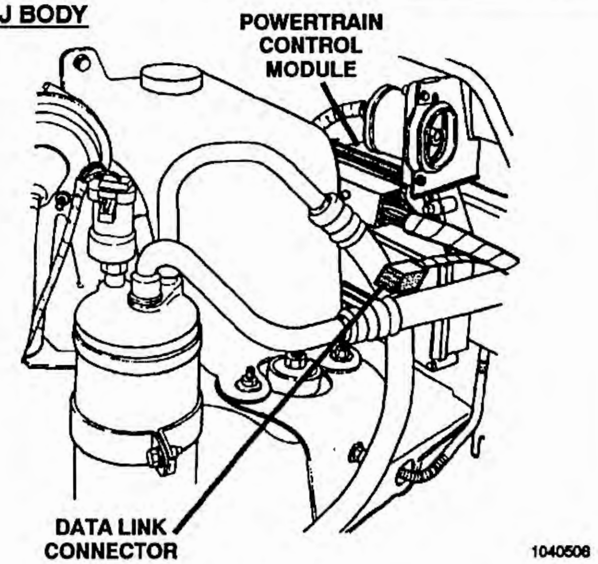


FIG. 3

MJ/XJ AND YJ BODIES

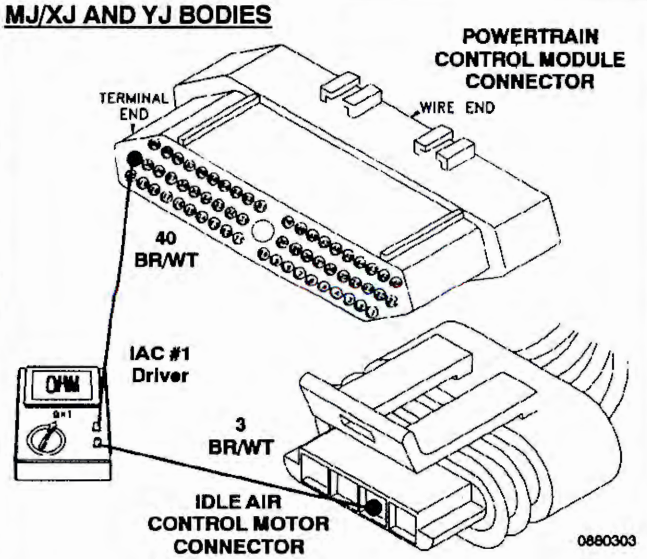


FIG. 4

ZJ BODY

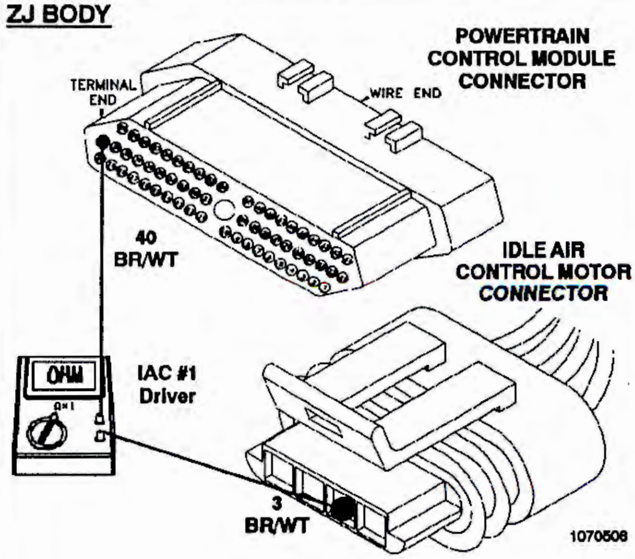
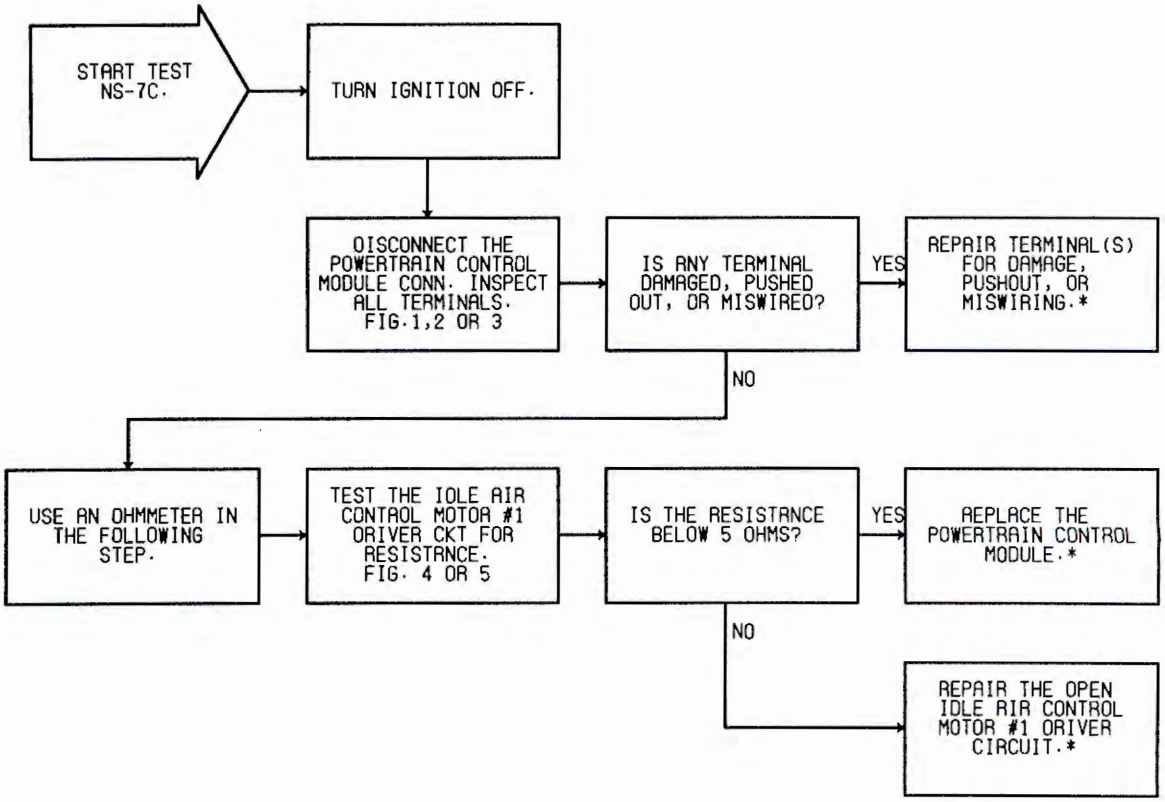


FIG. 5

TEST NS-7C CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding



*Perform Verification TEST VER-1A.

**Check connectors – Clean / repair as necessary.

N O S T A R T T E S T S

TEST NS-7D CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding

MJ/XJ BODY

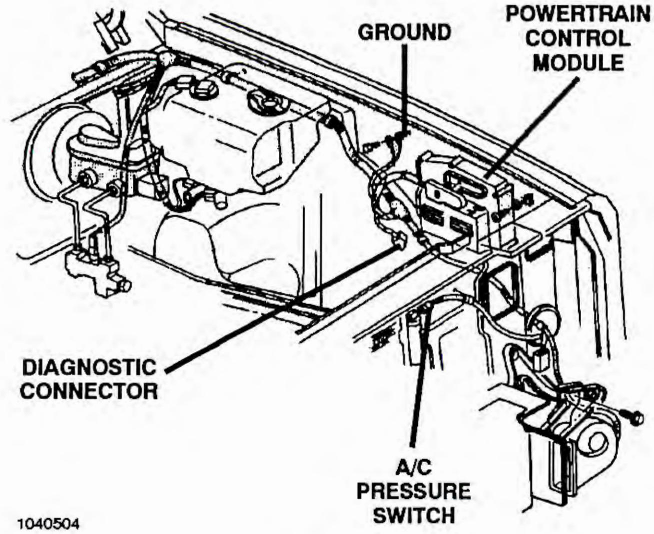


FIG. 1

YJ BODY

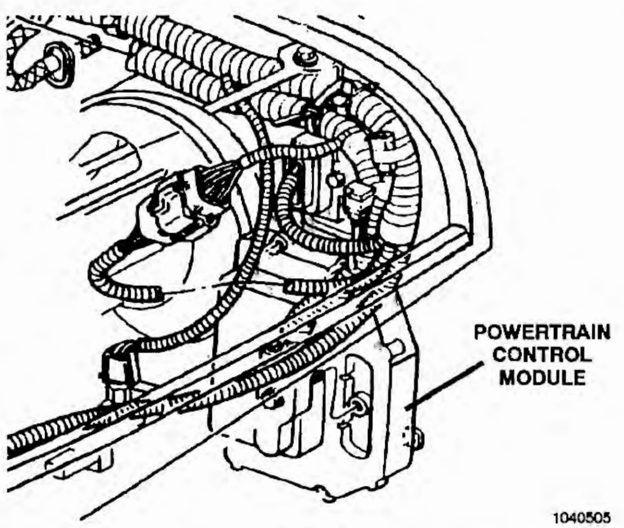


FIG. 2

ZJ BODY

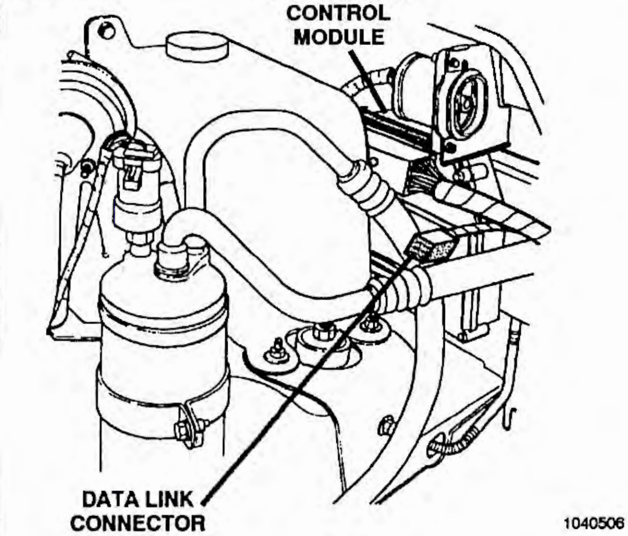


FIG. 3

MJ/XJ AND YJ BODIES

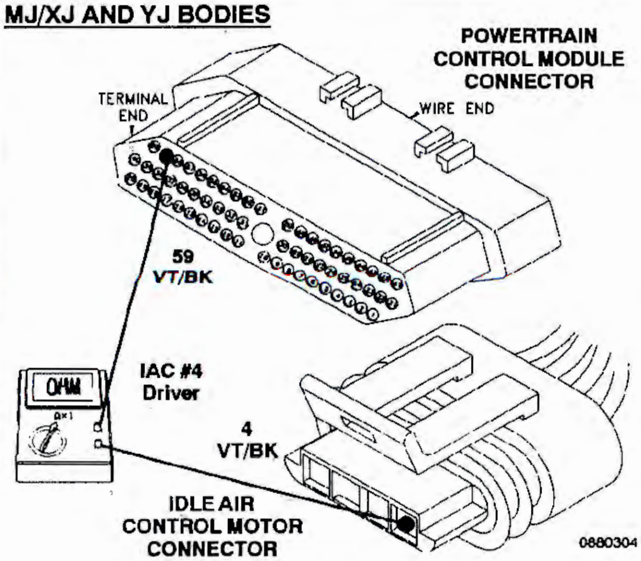


FIG. 4

ZJ BODY

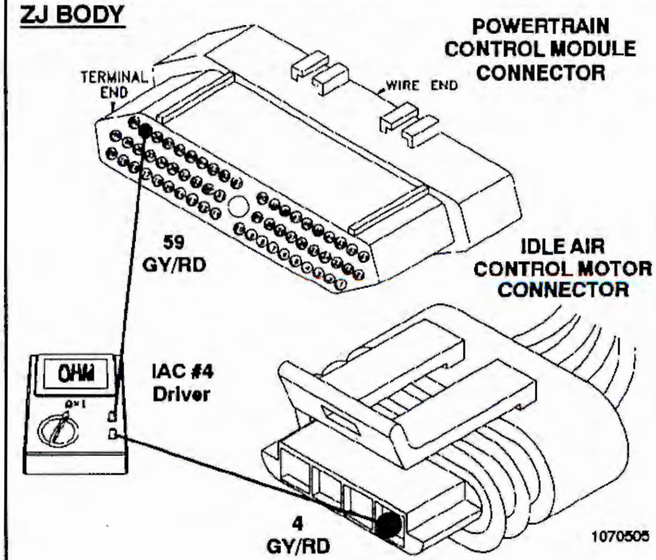
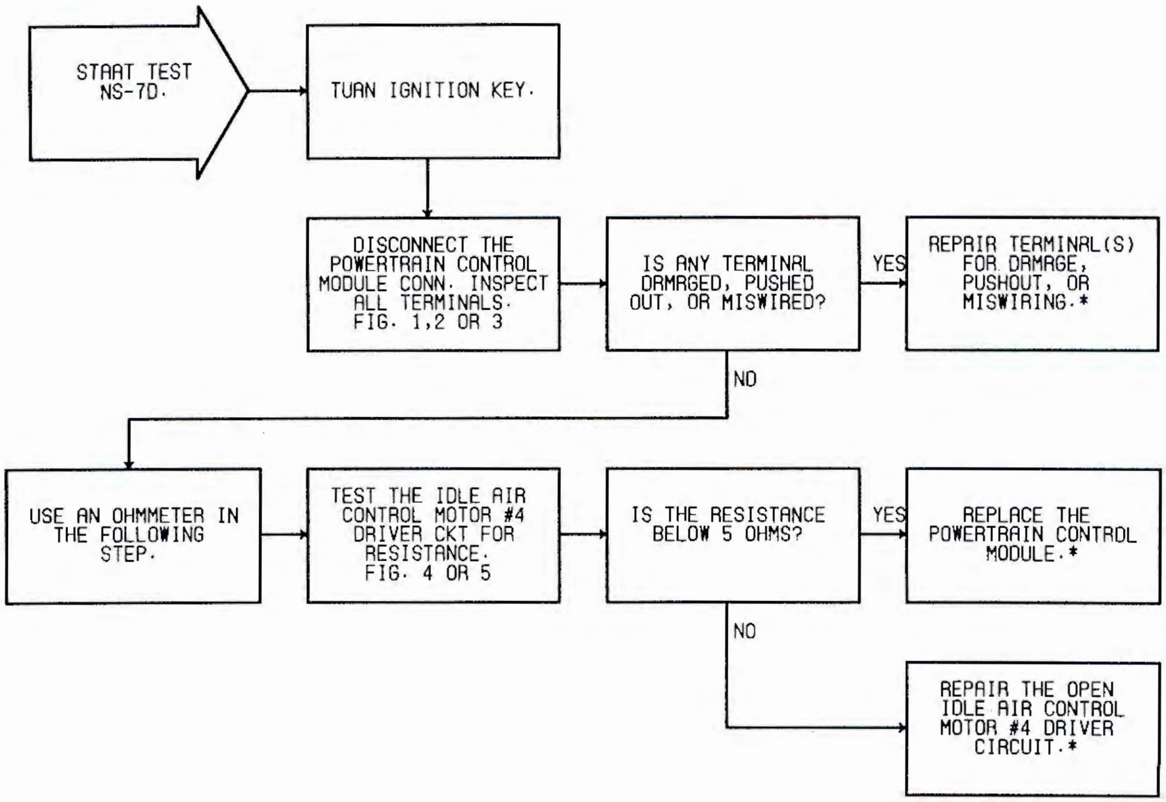


FIG. 5

TEST NS-7D | CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding



Perform Verification TEST VER-1A.* | *****Check connectors – Clean / repair as necessary.*

NO START TESTS

TEST NS-7E CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding

MJ/XJ BODY

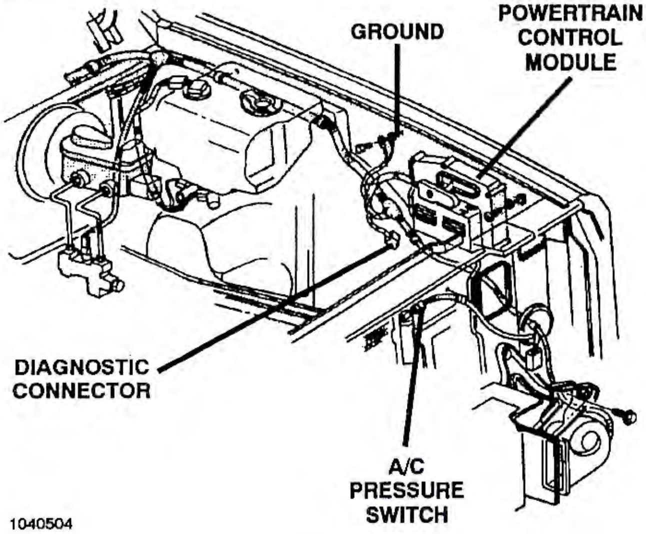


FIG. 1

YJ BODY

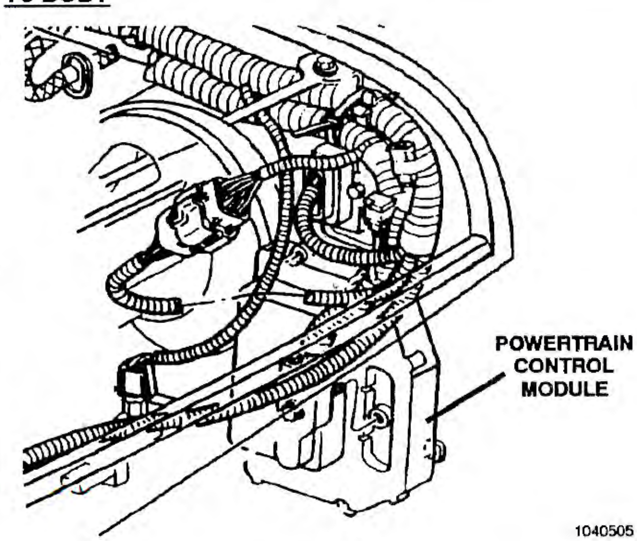


FIG. 2

ZJ BODY

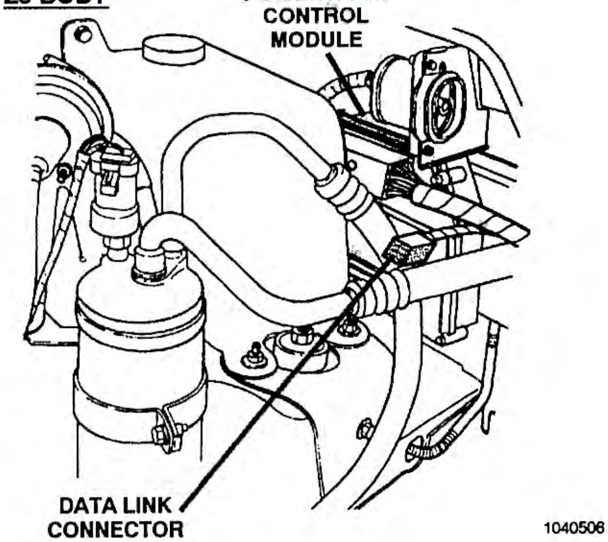


FIG. 3

MJ/XJ AND YJ BODIES

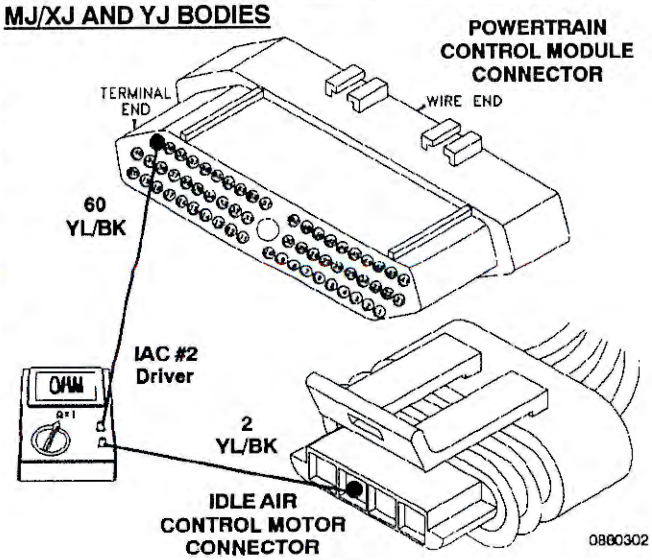


FIG. 4

ZJ BODY

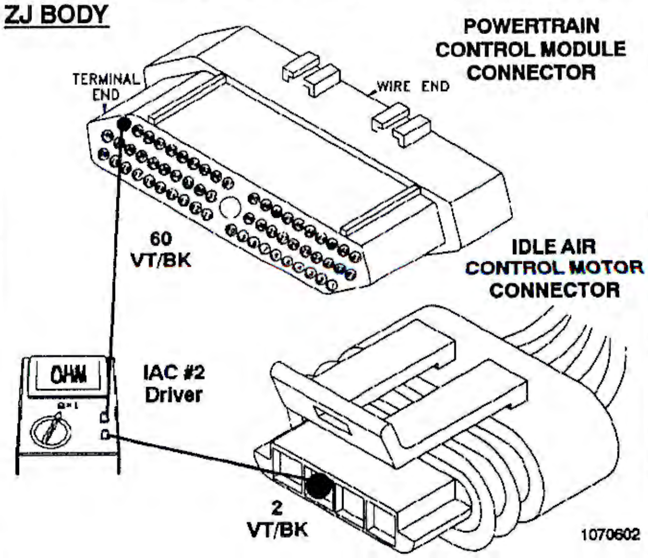
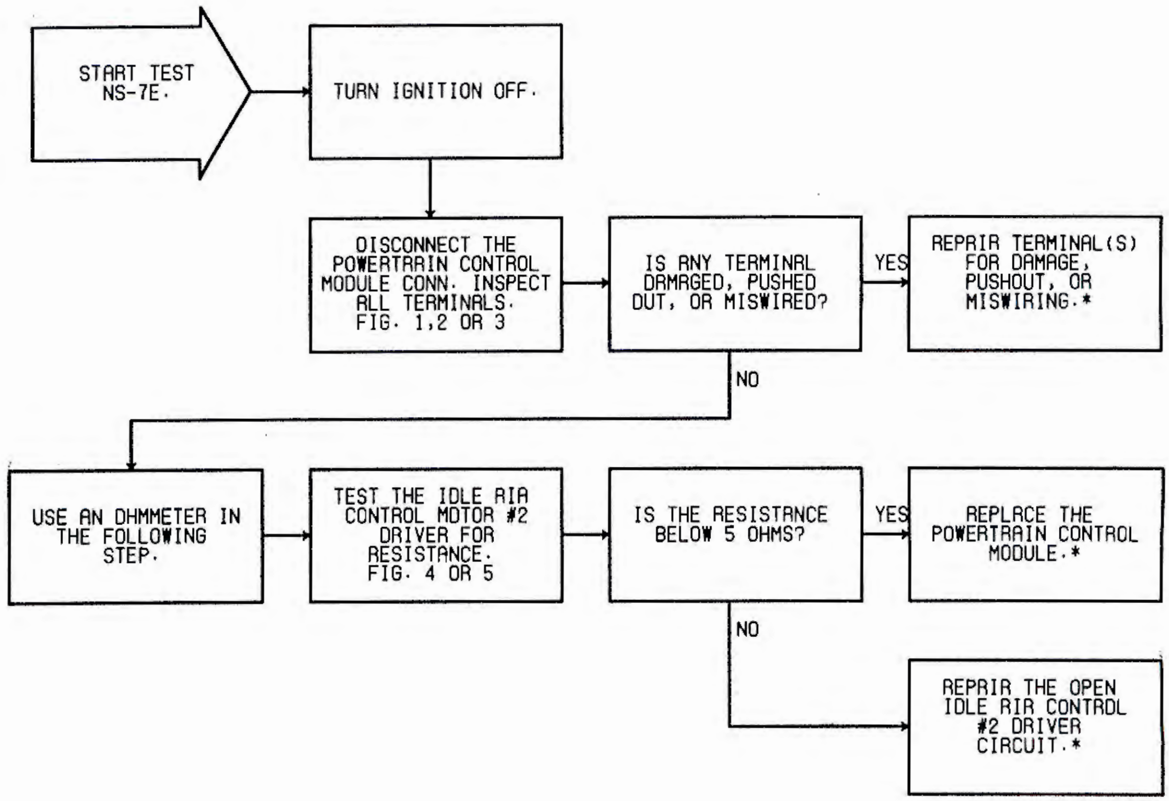


FIG. 5

TEST NS-7E CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-7A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

NOTES

TEST NS-8A	REPAIRING A START AND STALL CONDITION
Perform TEST NS-7A Before Proceeding	

At this point in the diagnostic test procedure, you have determined that all of the **engine electrical systems** are operating as designed; therefore, they are **not the cause of the start and stall problem.** The following additional items should be checked as possible mechanical causes of the no start condition. Any one or more of these items can produce a no start condition; none can be overlooked as a possible cause.

1. **ENGINE VALVE TIMING -** must be within specifications

2. **ENGINE COMPRESSION -** must be within specifications

3. **ENGINE EXHAUST SYSTEM -** must be free of any restrictions

4. **ENGINE PCV SYSTEM -** must flow freely

5. **FUEL -** must be free of contamination

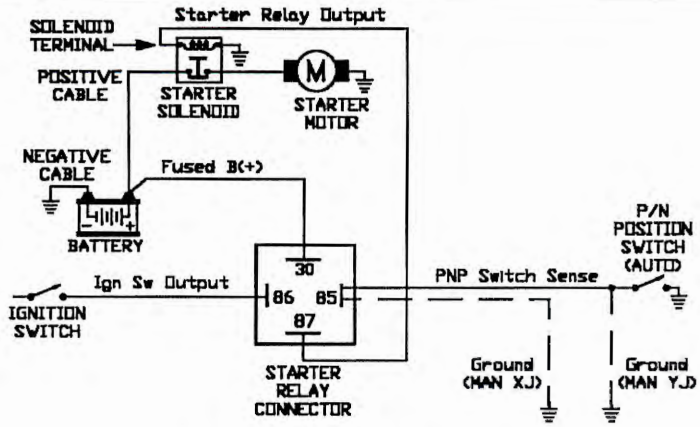
6. **ENGINE SECONDARY IGNITION CHECK -** must exhibit a normal scope pattern

Always look for any Technical Service Bulletins that may relate to this condition.

*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

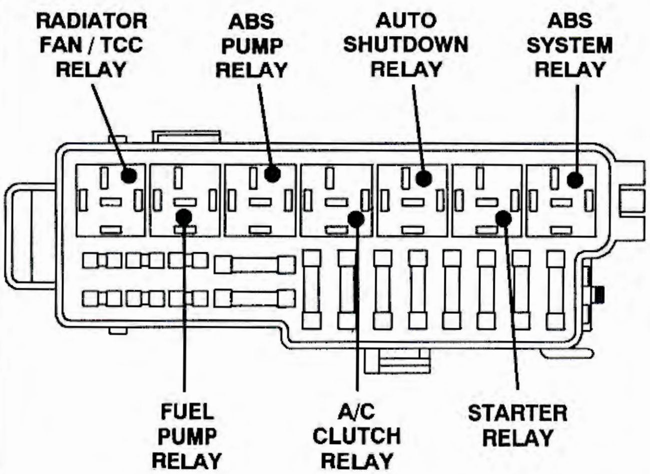
TEST NS-9A | REPAIRING A NO CRANK CONDITION

Perform TEST NS-1A Before Proceeding



XJ	YJ	ZJ	FUNCTION
BR	BR	LG/BK	STARTER RELAY OUTPUT
BK/RD	RD	RD/WT	FUSED B(+)
YL	YL	YL/DB	IGNITION SWITCH OUTPUT
BR/YL	BR/YL	BK/WT	PNP SWITCH SENSE
BK/TN	BK/OR	--	GROUND

1560605

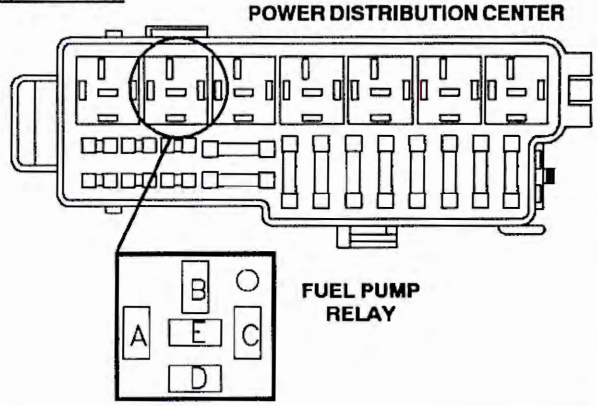


1040404

FIG. 1

MJ/XJ BODY

POWER DISTRIBUTION CENTER



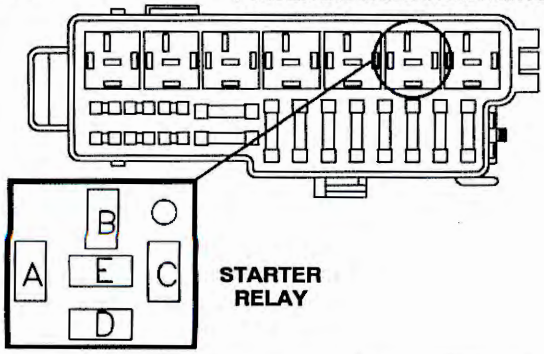
1100204

CAV	COLOR	FUNCTION
A	WT/YL	FUSED IGN SW OUTPUT
B	RD/WT	FUSED B(+)
C	DB/YL	ASD RELAY CONTROL
D	DG/BK	FUEL PUMP RELAY OUTPUT

FIG. 2

YJ BODY

POWER DISTRIBUTION CENTER



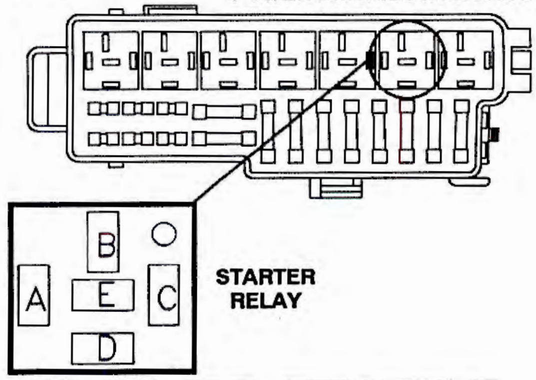
CAV	COLOR	FUNCTION
A	YL	IGN SW OUTPUT (START)
B	RD	FUSED B(+)
C	BR/YL	PNP SWITCH SENSE (AUTO)
C	BK/OR	GROUND (MANUAL)
D	BR	STARTER RELAY OUTPUT

2260504

FIG. 3

ZJ BODY

POWER DISTRIBUTION CENTER



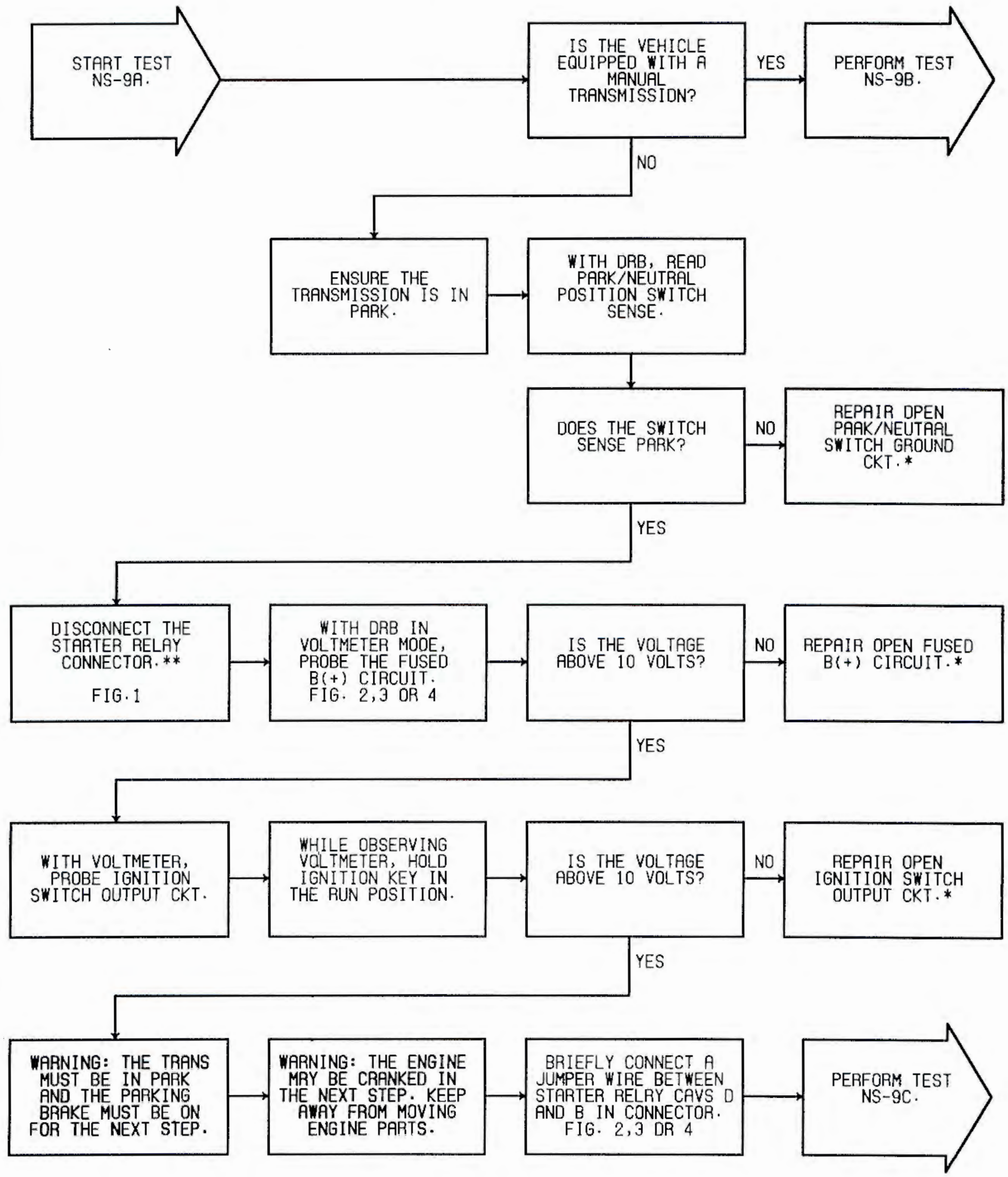
CAV	COLOR	FUNCTION
A	YL/DB	IGN SW OUTPUT (START)
B	RD/WT	FUSED B(+)
C	BK/WT	PARK/NEUTRAL SWITCH SENSE
D	LG/BK	STARTER RELAY OUTPUT

2260503

FIG. 4

TEST NS-9A | REPAIRING A NO CRANK CONDITION

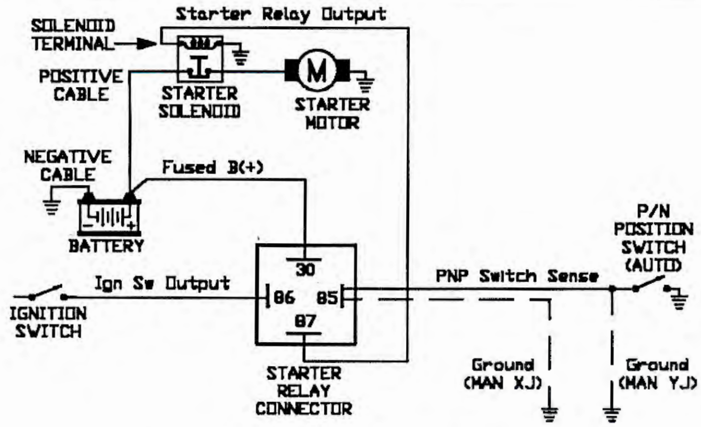
Perform TEST NS-1A Before Proceeding



*Perform Verification TEST VER-1A.	**Check connectors – Clean / repair as necessary.

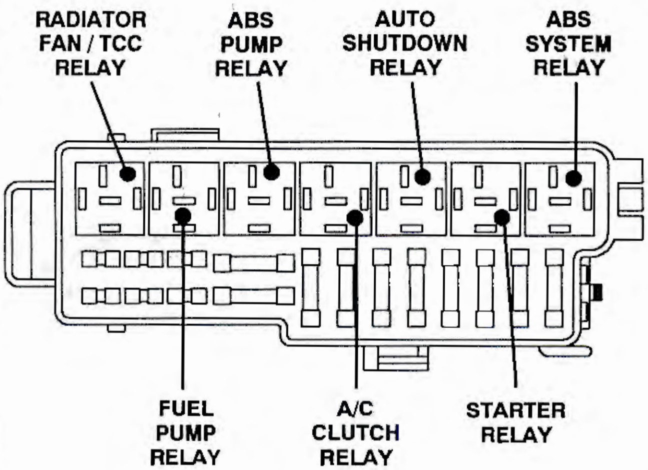
TEST NS-9B | REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A Before Proceeding



XJ	YJ	ZJ	FUNCTION
BR	BR	LG/BK	STARTER RELAY OUTPUT
BK/RD	RD	RD/WT	FUSED B(+)
YL	YL	YL/DB	IGNITION SWITCH OUTPUT
BR/YL	BR/YL	BK/WT	PNP SWITCH SENSE
BK/TN	BK/OR	---	GROUND

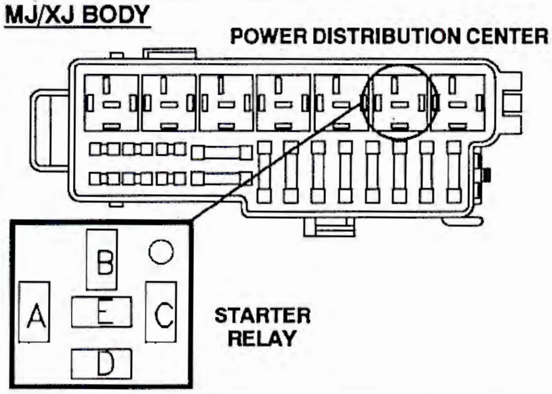
1560605



1040404

FIG. 1

MJ/XJ BODY

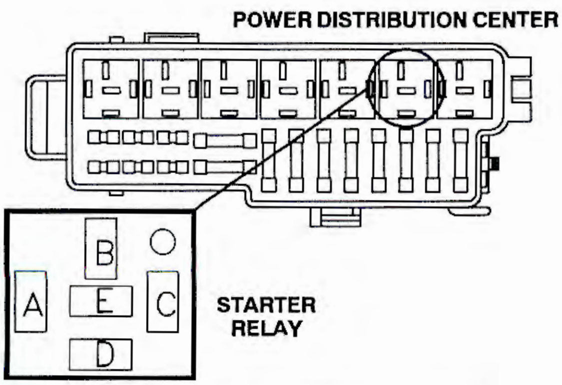


CAV	COLOR	FUNCTION
A	YL	IGN SW OUTPUT (START)
B	BK/RD	FUSED B(+)
C	BR/YL	PNP SWITCH SENSE (AUTO)
C	BK/TN	GROUND (MANUAL)
D	BR	STARTER RELAY OUTPUT

2260505

FIG. 2

YJ BODY



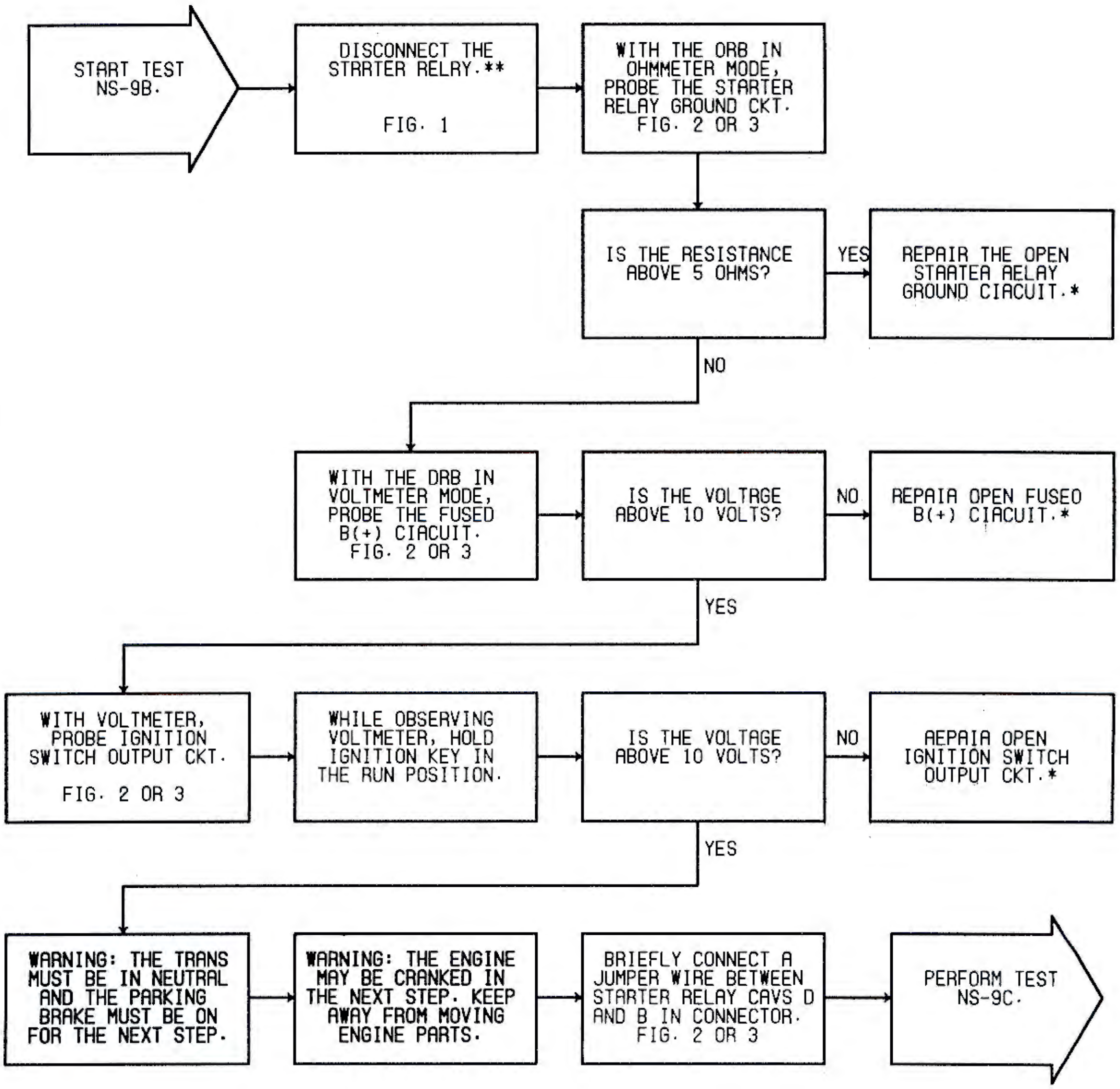
CAV	COLOR	FUNCTION
A	YL	IGN SW OUTPUT (START)
B	RD	FUSED B(+)
C	BR/YL	PNP SWITCH SENSE (AUTO)
C	BK/OR	GROUND (MANUAL)
D	BR	STARTER RELAY OUTPUT

2260504

FIG. 3

TEST NS-9B REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A Before Proceeding



Perform Verification TEST VER-1A.	*****Check connectors – Clean / repair as necessary.***

TEST NS-9C REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A or NS-9B Before Proceeding

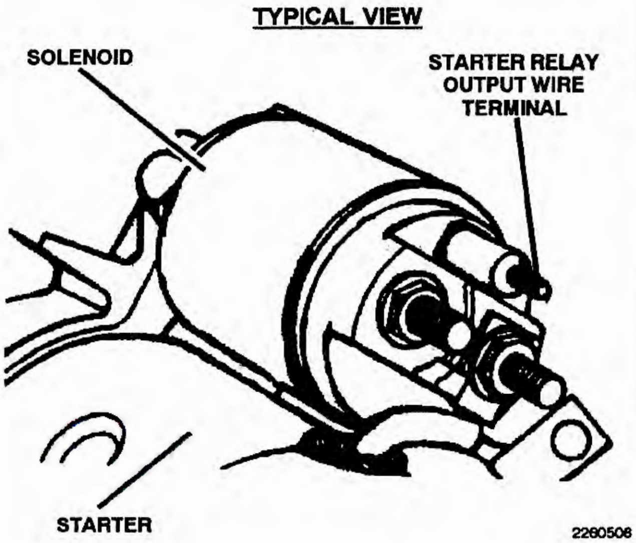


FIG. 1

MJ/XJ AND YJ BODIES

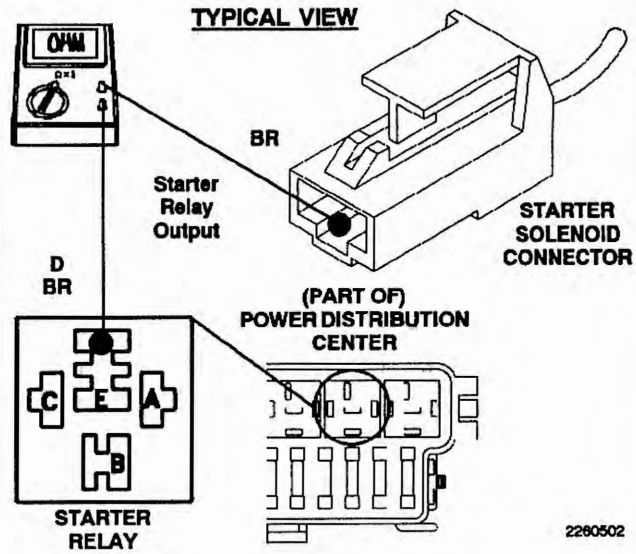


FIG. 2

ZJ BODY

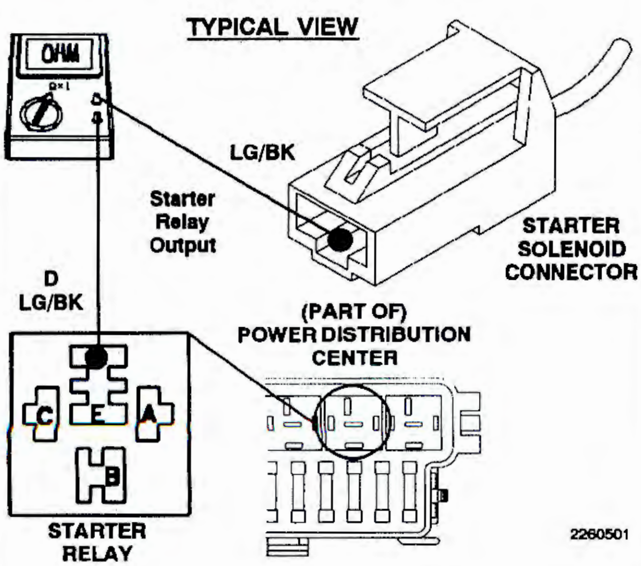


FIG. 3

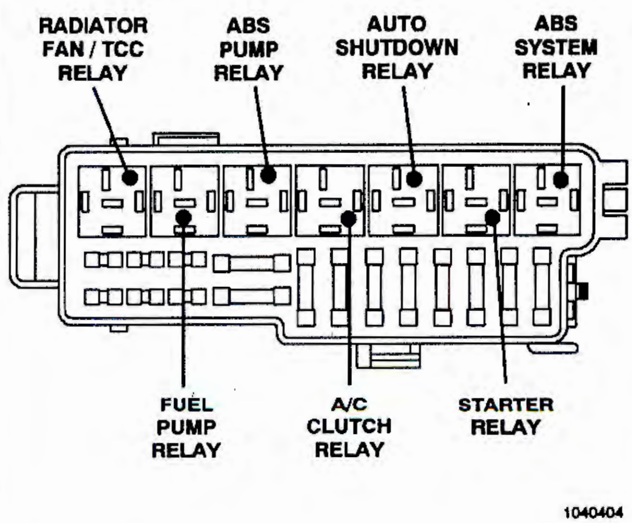
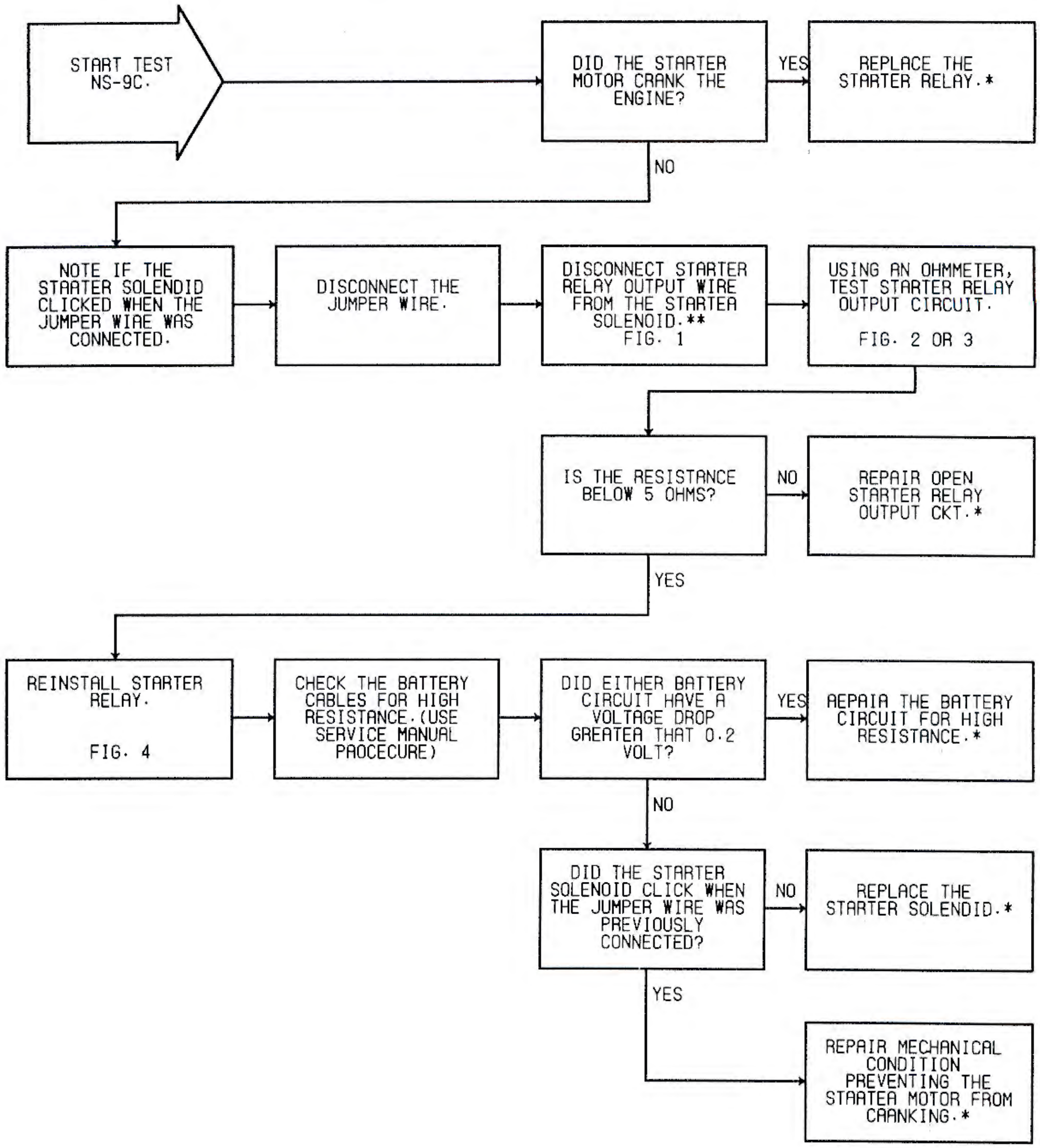


FIG. 4

TEST NS-9C REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A or NS-9B Before Proceeding



Perform Verification TEST VER-1A.

***Check connectors – Clean / repair as necessary.*

TEST VER-1A	NO START VERIFICATION

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect components as necessary.

Inspect the engine for contamination. If it is contaminated, change the oil and filter.

Attempt to start the engine.

If the engine is **unable** to start, check all pertinent Technical Service Bulletins, and return to **TEST TC-1A** if necessary.

If the engine is **able** to start, and the powertrain control module **has been changed**, connect the DRB to the PCM data link connector and erase trouble codes. The repair is now complete.

TEST VER-2A	ROAD TEST VERIFICATION

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect components as necessary.

If this verification procedure is being performed subsequent to a NO TROUBLE CODE test, do the following:

1. Check to see if the initial symptom still exists.
2. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins and return to **TEST NTC-1A** if necessary.

If this verification procedure is being performed subsequent to a TROUBLE CODE test, do the following:

For previously read trouble codes that have not been dealt with, return to **TEST TC-1A** and follow the path specified by the other code. Otherwise, continue.

If the powertrain control module has not been changed:

> Connect the DRB to the PCM data link connector and erase trouble codes.

> With the DRB, reset all values in the adaptive memory.

> Disconnect the DRB.

Ensure no other trouble code remains by doing the following:

1. If the vehicle is equipped with air conditioning, turn on the air conditioning and blower.
2. Drive the vehicle for at least five minutes and at some point attain a speed of 40 mph. Ensure the transmission shifts through all gears. Upon completion of the road test, turn the engine off.
3. Start the engine. Allow the engine to idle for at least two minutes.
4. Turn the engine off.
5. Connect the DRB to the PCM data link connector, and with the DRB, read all trouble codes.

If the repaired code has reset, the repair is not complete. Check all pertinent Technical Service Bulletins and return to **TEST TC-1A** if necessary.

If another trouble code has set, return to **TEST TC-1A** and follow the path specified by the other trouble code.

If there are no trouble codes, the repair is now complete.

VERIFICATION TESTS

TEST VER-3A | CHARGING VERIFICATION

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect components as necessary.

If the powertrain control module has been changed, do the following:

1. If the vehicle is equipped with a factory theft alarm, start the vehicle at least 20 times so that the alarm system may be activated when desired.

Connect the DRB to the PCM data link connector and erase the codes.

Ensure no other charging system problems remain by doing the following:

1. Start the engine.
2. Raise the engine speed to 2000 rpm for at least 30 seconds.
3. Allow the engine to idle.
4. Turn the engine off.
5. Turn the ignition key on.
6. With the DRB, read trouble code messages.

If the repaired code has reset, or another one has set, check all pertinent Technical Service Bulletins and return to **TEST TC-1A** if necessary.

If there are no codes, the repair is now complete.

TEST VER-4A | SPEED CONTROL VERIFICATION

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect all components as necessary.

If the powertrain control module has been changed, do the following:

1. If the vehicle is equipped with a factory theft alarm, start the vehicle at least 20 times so that the alarm system may be activated when desired.

Connect the DRB to the PCM data link connector and erase the codes.

Ensure no other speed control problems remain by doing the following:

1. Road test the vehicle at a speed above 35 mph.
2. Turn the speed control ON/OFF switch to the ON position.
3. Depress and release the SET switch. If the speed control did not engage, the repair is not complete.*
4. For stalk switch equipped vehicles, quickly depress and release the SET switch. For steering wheel switch equipped vehicles, quickly depress and release the RESUME/ACCEL switch. If the vehicle speed did not increase by 2 mph, the repair is not complete.*
5. Using caution, depress and release the brake pedal. If the speed control did not disengage, the repair is not complete.*
6. Bring the vehicle speed back up to 35 mph.
7. Depress the RESUME/ACCEL switch. If the speed control did not resume the previously set speed, the repair is not complete.*
8. Hold down the SET switch. If the vehicle did not decelerate, the repair is not complete.*
9. Ensure the vehicle speed is greater than 35 mph and release the SET switch. If the vehicle did not adjust and set a new vehicle speed, the repair is not complete.*
10. Turn on the ON/OFF switch to the OFF position. If the speed control did not disengage, the repair is not complete.*

If the vehicle successfully passed all of the previous tests, the speed control system is now functioning as designed. The repair is now complete.

*Check for Technical Service Bulletins that pertain to this speed control problem and then, if necessary, return to **TEST TC-1A.**

8.0 MAINTENANCE AND SERVICE INFORMATION

There is no specific maintenance or service information in this manual. Refer to the appropriate service manual for information about repair and replacement procedures.

When replacing a blown fuse, it is important to use only a fuse having the correct amperage rating. The use of a fuse with a rating other than indicated may result in a dangerous electrical system overload. If a properly rated fuse continues to blow, it indicates a problem in the circuit that must be corrected.

9.0 SPECIFICATIONS

9.1 Fuel System Release Procedure

1. Loosen the fuel filler cap.
2. Ensure the ignition key is off.
3. Remove the protective cap from the fuel pressure test port.
4. Place the open end of the fuel pressure release hose, tool number *C-4799-1, into an approved gasoline container. Connect the other end of the C-4799-1 hose to the fuel pressure test port. The fuel pressure will bleed off through the hose into the gasoline container.

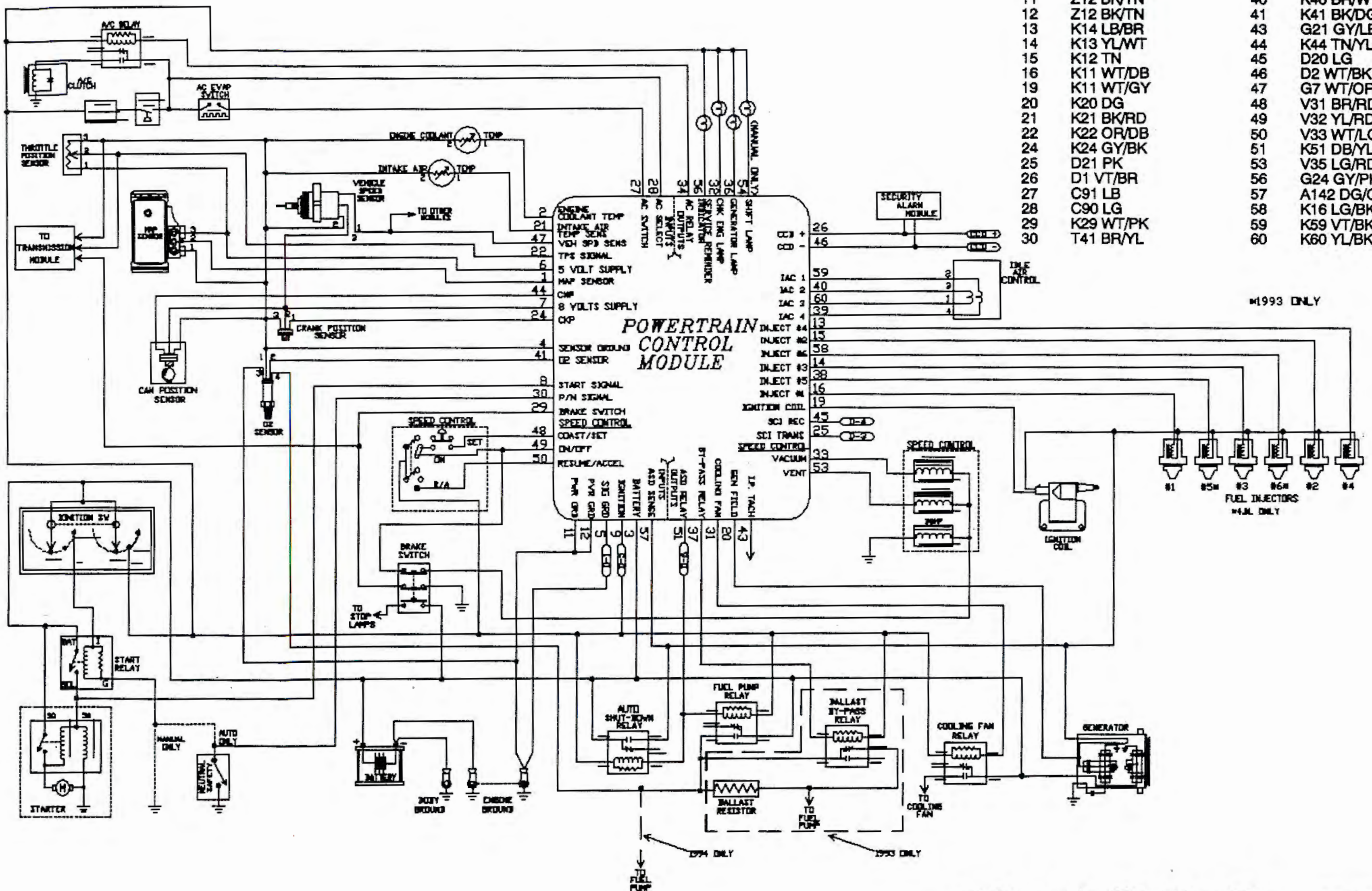
   *Fuel gauge C-4799-A contains hose C-4799-1.

10.0 SCHEMATIC DIAGRAMS

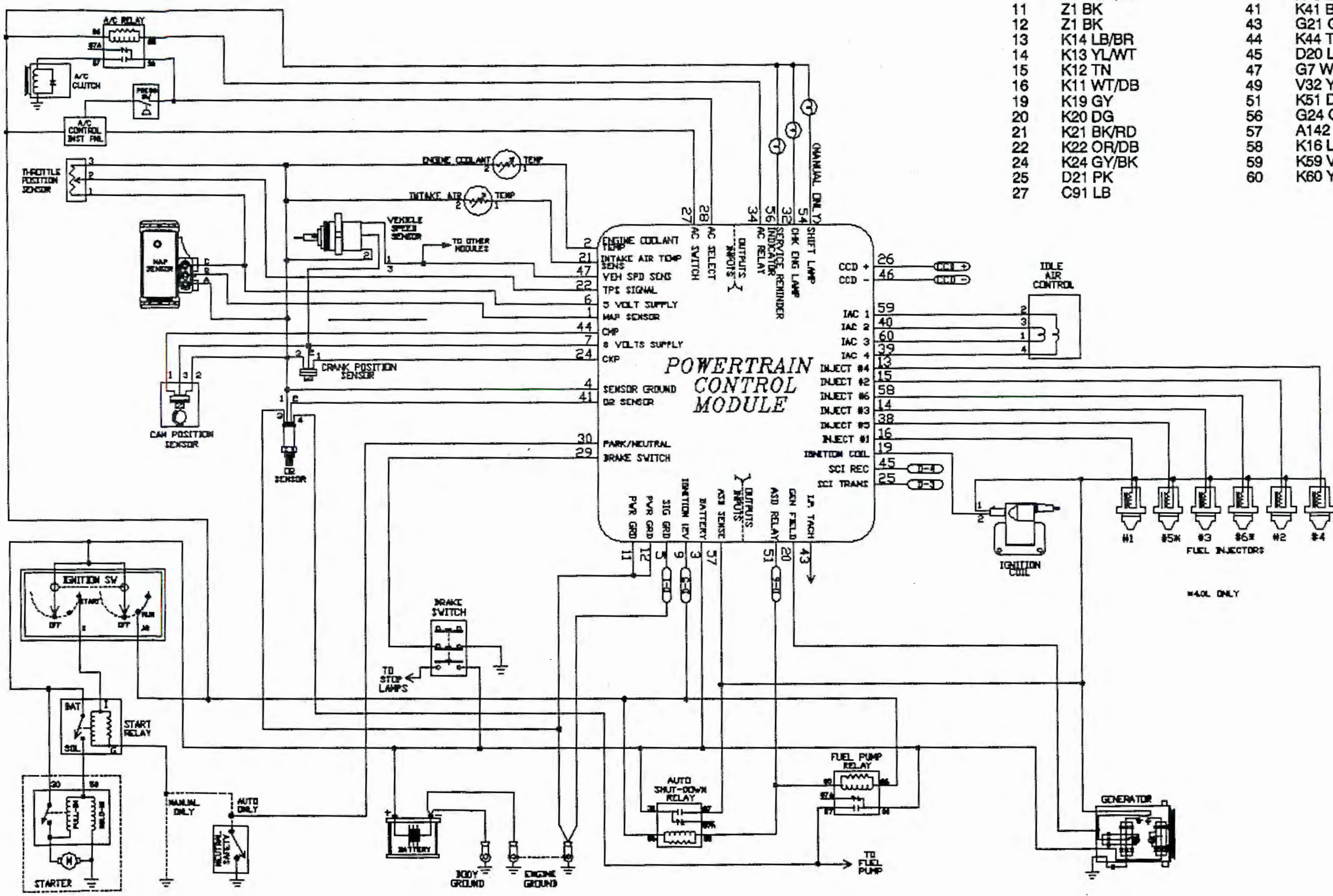
10.1 XJ Body

CAVITY	CIRCUIT/COLOR	CAVITY	CIRCUIT/COLOR
1	K1 DG/RD	31	C27 DB/PK
2	K2 TN/BK	32	G3 BK/PK
3	A14 RD	33	V36 TN/RD
4	K4 BK/LB	34	C13 DB/OR
5	Z11 BK/WT	36	G12 DG/YL
6	K6 VT/WT	*37	K37 RD/DB
7	K7 OR	38	K15 PK/BK
9	A21 DB	39	K39 GY/RD
11	Z12 BK/TN	40	K40 BR/WT
12	Z12 BK/TN	41	K41 BK/DG
13	K14 LB/BR	43	G21 GY/LB
14	K13 YL/WT	44	K44 TN/YL
15	K12 TN	45	D20 LG
16	K11 WT/DB	46	D2 WT/BK
19	K11 WT/GY	47	G7 WT/OR
20	K20 DG	48	V31 BR/RD
21	K21 BK/RD	49	V32 YL/RD
22	K22 OR/DB	50	V33 WT/LG
24	K24 GY/BK	51	K51 DB/YL
25	D21 PK	53	V35 LG/RD
26	D1 VT/BR	56	G24 GY/PK
27	C91 LB	57	A142 DG/OR
28	C90 LG	58	K16 LG/BK
29	K29 WT/PK	59	K59 VT/BK
30	T41 BR/YL	60	K60 YL/BK

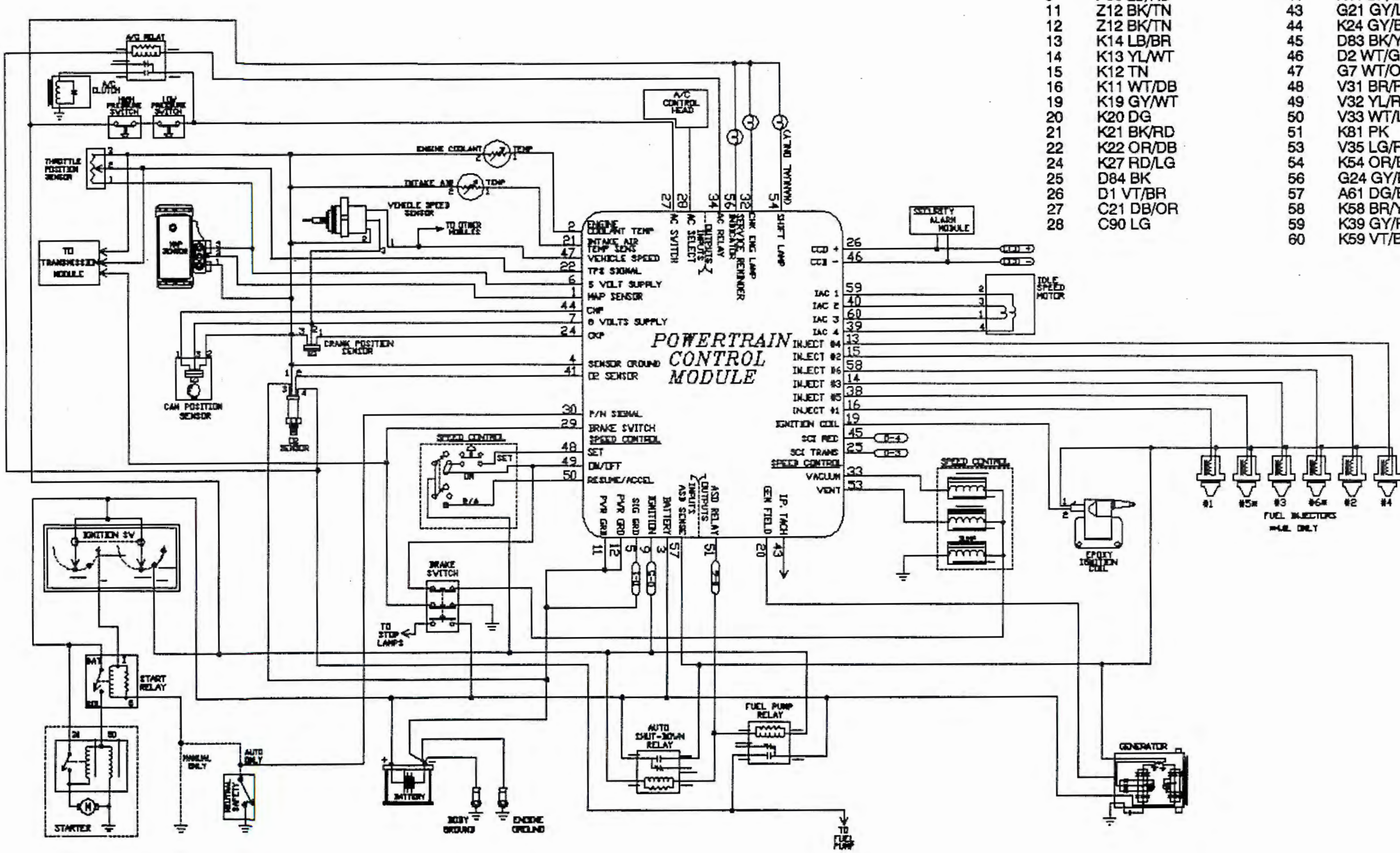
*1993 ONLY



CAVITY	CIRCUIT/COLOR	CAVITY	CIRCUIT/COLOR
1	K1 DG/RD	28	C20 BR/RD
2	K2 TN/BK	29	V40 WT/PK
3	A14 RD/WT	30	T41 BR/YL
4	K4 BK/LB	32	G3 BK/PK
5	Z11 BK/WT	34	C13 DB/OR
6	K6 VT/WT	38	K15 PK/BK
7	K7 OR	39	K15 PK/BK
9	G50 WT/YL	40	K40 BR/WT
11	Z1 BK	41	K41 BK/DG
12	Z1 BK	43	G21 GY/LB
13	K14 LB/BR	44	K44 TN/YL
14	K13 YL/WT	45	D20 LG
15	K12 TN	47	G7 WT/OR
16	K11 WT/DB	49	V32 YL/RD
19	K19 GY	51	K51 DB/YL
20	K20 DG	56	G24 GY/PK
21	K21 BK/RD	57	A142 DG/OR
22	K22 OR/DB	58	K16 LG/BK
24	K24 GY/BK	59	K59 VT/BK
25	D21 PK	60	K60 YL/BK
27	C91 LB		



CAVITY	CIRCUIT/COLOR	CAVITY	CIRCUIT/COLOR
1	K70 RD/WT	29	L53 BR
2	K2 TN/BK	32	G3 BK/PK
3	A5 RD	33	V36 TN/RD
4	K4 BK/LB	34	C13 DB/RD
5	Z12 BK/TN	38	K38 GY
6	K6 VT/WT	39	K60 YL/BK
7	K25 WT/BK	40	K40 BR/WT
9	F86 LB/RD	41	K41 BK/OR
11	Z12 BK/TN	43	G21 GY/LB
12	Z12 BK/TN	44	K24 GY/BK
13	K14 LB/BR	45	D83 BK/YL
14	K13 YL/WT	46	D2 WT/GY
15	K12 TN	47	G7 WT/OR
16	K11 WT/DB	48	V31 BR/RD
19	K19 GY/WT	49	V32 YL/RD
20	K20 DG	50	V33 WT/LG
21	K21 BK/RD	51	K81 PK
22	K22 OR/DB	53	V35 LG/RD
24	K27 RD/LG	54	K54 OR/BK
25	D84 BK	56	G24 GY/PK
26	D1 VT/BR	57	A61 DG/BK
27	C21 DB/OR	58	K58 BR/YL
28	C90 LG	59	K39 GY/RD
		60	K59 VT/BK



11.0 REQUIRED TOOLS AND EQUIPMENT

DRB (diagnostic read-out box)
– for DRBII, use the most current diagnostic program cartridge
fuel line tool (C-6541)
fuel pressure gauge (C-4799-B)
fuel release hose (C-4799-1)
jumper wires
ohmmeter
oscilloscope
vacuum gauge
voltmeter
pressure gauge (0-300 psi)

12.0 GLOSSARY OF TERMS

backfire, popback - Fuel ignites in either the intake or the exhaust system.

CKP - crank position sensor

CMP - camshaft position sensor

cuts out, misses - a steady pulsation or the inability of the engine to maintain a consistent rpm

DLC - data link connector (previously called "engine diagnostic connector")

detonation, spark knock - a mild to severe ping, especially under loaded engine conditions

ECT - engine coolant temperature sensor

EGR - exhaust gas recirculation valve and system

generator - previously called "alternator"

hard start - The engine takes longer than usual to start, even though it is able to crank normally.

hesitation, sag, stumble - There is a momentary lack of response when the throttle is opened. This can occur at all vehicle speeds. If it is severe enough, the engine may stall.

IAT - intake air temperature sensor

IAC - idle air control valve

lack of power, sluggish - The engine has less than expected power, with little or no increase in vehicle speed when the throttle is opened.

MAP - manifold absolute pressure sensor

MTV - manifold tuning valve

MVLPS - manual valve lever position switch (previously called "park/neutral switch")

O2S - oxygen sensor (left oxygen sensor when there are two sensors)

O2SR - right oxygen sensor

PCM - powertrain control module

PCV - positive crankcase ventilation

poor fuel economy - There is significantly less fuel mileage than other vehicles of the same design and configuration.

rough, unstable, or erratic idle stalling - The engine runs unevenly at idle and causes the engine to shake if it is severe enough. The engine idle rpm may vary (called "hunting"). This condition may cause stalling if it is severe enough.

start & stall - The engine starts but immediately dies.

SPI-O - Serial Peripheral Interface-Output

surge - engine rpm fluctuation without corresponding change in throttle position sensor

TPS - throttle position sensor

VSS - vehicle speed sensor

12.1 Body Codes Defined

CARS

AA	Chrysler LeBaron (4-door) Dodge Spirit Plymouth Acclaim
AC	Chrysler New Yorker Salon Dodge Dynasty
AG	Dodge Daytona
AJ	Chrysler LeBaron (2-door)
AP	Dodge Shadow Plymouth Sundance
AS	Chrysler Town and Country Dodge Caravan and Grand Caravan Plymouth Voyager and Grand Voyager
AY	Chrysler Imperial Chrysler Fifth Avenue
FJ22	Chrysler Sebring Dodge Avenger
FJ24	Eagle Talon
JA	Chrysler Cirrus Plymouth Cirrus Dodge Stratus
LH	Chrysler Concorde Chrysler LHS Chrysler New Yorker Dodge Intrepid Eagle Vision
PL	Dodge Neon Plymouth Neon
SR	Dodge Viper

TRUCKS

AB	Dodge Ram (Van / Wagon) 150, 250, 350
AD	Dodge Ram (Pickup) 150, 250, 350 Dodge Ramcharger
AN	Dodge Dakota
BR	Dodge Ram (Pickup) 1500, 2500, 3500
BT	Dodge Ram (Cab) 1500, 2500, 3500
ES	Chrysler Grand Voyager Chrysler Ram Van
MJ	Jeep Comanche
XJ	Jeep Cherokee
YJ	Jeep Wrangler
ZJ	Jeep Grand Cherokee

NOTES