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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 failure condition or symptom being present at the time of diagnosis.

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

Diagnostic procedures change every year. New diagnostic systems may be added; carryover systems may be enhanced. READ THE GENERAL INFORMATION SECTIONS IN 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 1999 TJ and XJ vehicles equipped with a JTEC PLUS engine controller.

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 system, ignition system, and automatic transmission.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 General Description

The Jeep engine and Auto Transmission systems have the latest in technical advances. The on-board diagnostics incorporated with the PCM controller are intended to assist the field technician in repairing vehicle problems by the quickest means.

3.2 JTEC + Controller and Operating Modes

3.2.1 Overview

The JTEC + PCM features a multi-processor environment (one 16 bit microcomputer, two 8 bit microcomputer) allowing parallel processing of time critical operations. Dedication of one 8 bit processor (K4) to spark control and the other 8 bit processor (D3) to fuel control allows increases in throughput and reduced software complexity in the 16 bit microcomputer (Z2). The result is increased capability in the Z2 to handle overall strategy implementation, and other computation-intensive processes.

3.2.2 Hardware Architecture

The design of the PCM can be broken up into about eight major sections. The main microcontroller, a Motorola MC68HC16Z2, is attached to a 256k byte memory device (flash memory) which is programmed after manufacture of the module. (This memory can be reprogrammed at the factory or at a dealership. The MC68HC11D3 and MC68HC11K4 microcomputers have memories which are permanently programmed during their manufacture, and therefore cannot be reprogrammed.)

The microcomputers communicate over a bus which allows for rapid transmission of high priority messages. The Z2 executes the primary powertrain control strategy; transmits fuel and spark requirements to the D3 and K4; communicates with outside devices; and processes 14 analog inputs and about half of the one bit inputs and outputs. The D3 microcomputer controls fuel injector timing pulses and a small number of one bit inputs and outputs. The K4 controls spark timing pulses, processes 8 analog inputs and a number of one bit inputs and outputs.

Other major sections of the PCM design include the power supply, input conditioning circuits, output driver circuits, serial communication interface circuits, and a device which controls ignition coil currents.

3.2.3 Software Architecture

The 68HC16Z2 microcontroller is the main computing unit of the PCM. The 68HC11D3 and K4 microcontrollers control fuel and spark respectively. They handle the critical timing requirements of their tasks, communicating with the Z2 using high level commands.

The Z2 operating system is the heart of the software and was written expressly for this PCM. Every 500 microseconds the Z2 interrupts what it is doing to perform periodic tasks such as updating sensor inputs values and checking for the occurrence of a crank position pulse. If this pulse is observed, a program known as the decision maker is executed and performs high priority tasks such as fuel and spark calculations, and RPM processing. Low priority tasks (SCI and CCD communications) are executed during the time between crank pulses.

The Z2 software is divided into a main oeprating strategy and three separate calibration areas. The main strategy contains information specific to the various engines and transmissions supported by this PCM. Once installed, the information contained in this area is fixed for a given engine and transmission. Changes to this data, if required, can be performed only by computer programming personnel. The calibration areas (engine and transmission) contain information relating to emissions, fuel economy and driveability and can be altered directly by calibration personnel.

3.2.4 Spark Control

The K4 microcomputer controls the generation and timing of spark pulses. The spark advance and dwell characteristics are determined by: engine speed, throttle position, MAP, coolant temperature, barometric air pressure, air temperature, and vehicle speed.

3.2.5 Fuel Control

The PCM controls the air/fuel ratio of the enigne by varying fuel injector on time. Mass air flow is calculated using the speed density method using engine speed, manifold absolute pressure, and air charge temperature.

Different fuel calculation strategies are used dependent on the operational state of the engine. During crank mode, a prime shot fuel pulse is delivered followed by fuel pulses determined by a crank time strategy. Cold engine operation is determined via an open loop strategy until O2 sensors have reached operating temperature. At this point, the strategy enters a closed loop mode where fuel requirements are based upon the state of the O2 sensors, engine speed, MAP, throttle position, air temperature, battery voltage, and coolant temperature.

Additional factors can influence fuel pulse width. Asynchronous acceleration enrichment is a technique whereby the duration of injector “on” time can be increased for injectors already firing, providing improved acceleration response.

The D3 microcomputer controls fuel injector timing in response to high level commands from the Z2 microcomputer. Injector timing, with respect to engine position, is determined by the D3 and is transparent to the Z2.

3.2.6 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 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.

3.2.7 Transmission Control (4.0L - XJ Body Only)

Control of the transmission on this vehicle is done by a separate Transmission Control Module (TCM). The TCM is also called an AW4 TCM. Diagnostics for this TCM are found in another diagnostic manual called, the AW4 Powertrain Diagnostic Manual.

3.2.8 Other Controls

Cruise Control
The PCM controls vehicle speed by operation of the speed control servo vacuum and vent solenoids. Energizing the vacuum solenoid applies vacuum to the servo to increase throttle position. Operation of the vent solenoid slowly releases the vacuum allowing throttle position to decrease. A special dump solenoid allows immediate release of throttle position caused by braking, cruise control turned off, or ignition key off.

Fuel Vapor Recovery System (Duty Cycle Purge Control)
Duty Cycle Purge is a system that feeds fuel gases from the purge canister and gasoline tank into the throttle body for mixing with incoming air. Metering of the gases is performed by duty cycling the purge solenoid by the PCM.

The system is disabled during wide open throttle conditions and while the engine is below a specified coolant temperature. When engine temperature becomes greater than a calibrated parameter, duty cycle purge is delayed for a calibrated time. Once purge delay is over, purge will be ramped into soften the effect of dumping additional fuel into the engine.

The PCM provides a modulated 5 hz signal (at closed throttle) or 10 hz signal (at open throttle) to control this sytem. Modulation of the signal is based upon a calculated air flow (based upon known fuel flow through the injector at a given pulsewidth and RPM) and is adjusted to compensate for changes in flow due to varying engine vacuum.

3.2.9 PCM Operating Modes

As input signals to the 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 sensors. 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.

When the Ignition 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 one second, 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 sequences. The PCM adjusts the injector pulse width and synchronizes the fuel injectors by controlling the fuel injectors’ ground paths.

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
- throttle position

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 Manifold Vacuum 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 Manifold Vacuum 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. The PCM adjusts injector pulse width to supply a predetermined amount of additional fuel.

3.2.10 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, fuel system, or misfire monitor trouble code to be stored in the PCM.

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 fuel pressure regulator. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply. (*)

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.

(*)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.

3.2.11 SKIS OVERVIEW

The Sentry Key Immobilizer System (SKIS) is an immobilizer system designed to prevent unauthorized vehicle operation. The system consists of a Sentry Key Immobilizer Module (SKIM), ignition key(s) equipped with a transponder chip and powertrain controller. When the ignition switch is turned on, the SKIM interrogates the ignition key. If the ignition key is “Valid” the SKIM sends a CCD Bus message to the powertrain controller indicating the presence of a valid ignition key. With a valid key presence, the PCM allows the engine to continue to operate.

3.2.12 SKIS OPERATION

When ignition power is supplied to the SKIM, the SKIM performs an internal self-test. After the self-test is completed, the SKIM energizes the antenna (this activates the transponder chip) and sends a challenge to the transponder chip. The transponder chip responds to the challenge by generating an encrypted response message using the following:

Secret Key — This is an electronically stored value (identification number) that is unique to each SKIS. The secret key is stored in the SKIM, PCM and all ignition key transponders.

Challenge —This is a random number that is generated by the SKIM at each ignition key cycle.

The secret key and challenge are plugged into an algorithm that produces the encrypted response message. The transponder uses the crypto algorithm to receive, decode and respond to the message sent by SKIM. After responding to the coded message, the transponder sends a transponder ID message to the SKIM. The SKIM compares the transponder ID to the available valid key codes in SKIM memory (8 key maximum). After validating the key the SKIM sends a CCD Bus message called a “Seed Request” to the powertrain controller then waits for a powertrain controller response. If the powertrain controller does not respond, the SKIM will send the seed request again. After three failed attempts the SKIM will stop sending the seed request and store a trouble code. If the powertrain controller sends a seed response, the SKIM sends a valid/invalid key message to the powertrain controller. This is an encrypted message that is generated using the following:

VIN — Vehicle Identification Number

Seed —This is a random number that is generated by the PCM at each ignition key cycle.

The VIN and seed are plugged into a rolling code algorithm that encrypts the “valid/invalid key” message. The powertrain controller uses the rolling code algorithm to receive, decode and respond to the valid/invalid key message sent by SKIM. After sending the valid/invalid key message the SKIM waits 3.5 seconds for an EMS status message from the powertrain controller. If the PCM does not respond with a valid key message to the SKIM, a fault is detected and a trouble code stored.

The SKIS incorporates a yellow warning lamp located in the instrument cluster. The lamp is illuminated when the SKIM sends a CCD Bus message to the instrument cluster requesting the lamp on. The SKIM will request lamp operation for the following:

- bulb check at ignition on
- to alert the vehicle operator to a SKIS malfunction

For all faults except transponder faults and VIN mismatch, the lamp remains on steady. In the event of a transponder fault the light flashes at the rate of 1Hz (once per second). If a fault is present the lamp will remain on or flashing for the complete ignition cycle.

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 the DTC TEST Section 7.1 — 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 returns within one cycle of the required parameters 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. The following 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.

3.3.3 Reset Counter

The reset counter counts the number or 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."

3.3.4 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 two test methods:

- No Code Complete Test
- No Code Quick Individual Test

3.4 Using the DRBIII®

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

3.5 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

This is a sample of such an error message display:

```
ver: 2.14
date: 26 Jul93
file: key_itf.cc
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.
```

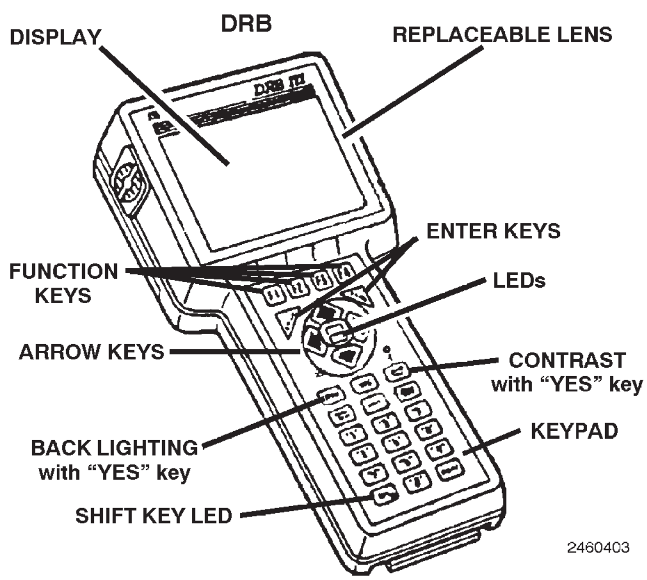
3.5.1 DRBIII® Does Not Power Up

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 (data link connector cavity 16). 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. For a blank screen, refer to the appropriate body diagnostics manual.

3.5.2 Display Is Not Visible

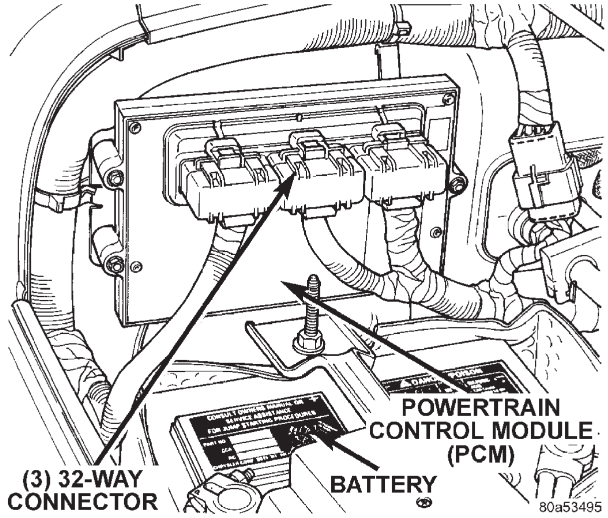
Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.

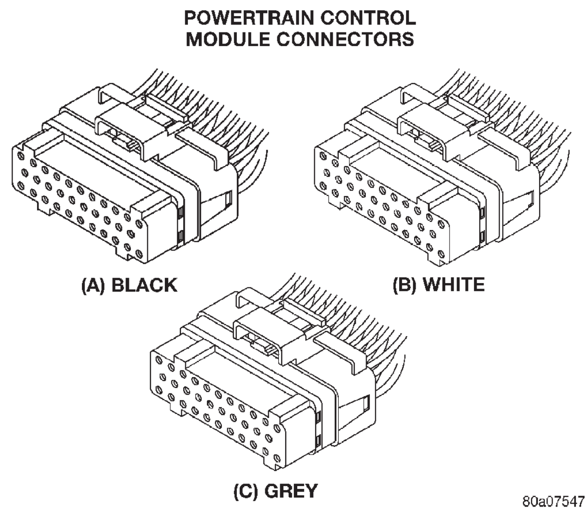


4.0 SYSTEM COMPONENT LOCATIONS

4.1 Powertrain Control Module

TJ BODY



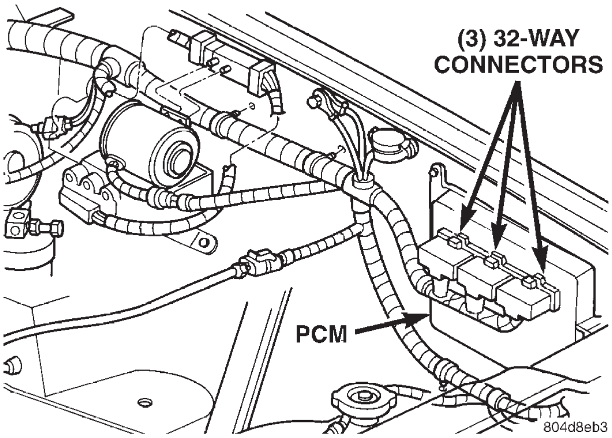


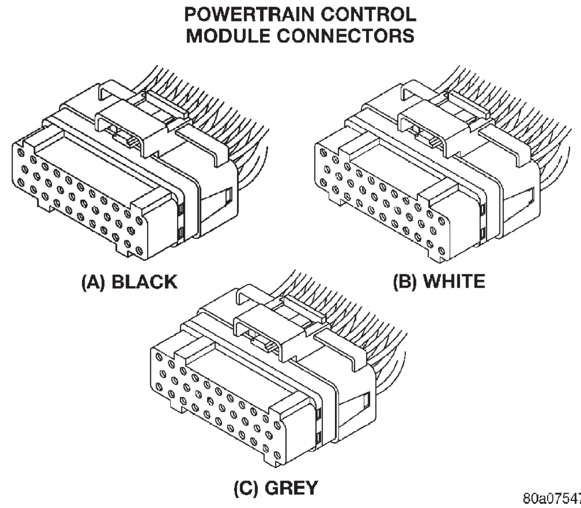
CAV	CKT/COLOR	FUNCTION
A2	F12 DB	Fused Ignition Switch Output
A4	K167 BR/YL	Sensor Ground
A6	T41 BR/LB	P/N Position Switch Sense
A7	K19 GY	Ignition Coil Driver
A8	K24 GY/BK	Crank Position Sensor Signal
A10	K60 YL/BK	Idle Air Control #3 Driver
A11	K40 BR/WT	Idle Air Control #2 Driver
A12	K10 DB/BR	Power Steering Pressure Switch Sense (2.5L)
A15	K21 BK/RD	Intake Air Temp Sensor Signal
A16	K2 TN/BK	ECT Sensor Signal
A17	K7 OR	5-Volt Supply (Primary)
A18	K44 TN/YL	Camshaft Position Sensor Signal
A19	K39 GY/RD	Idle Air Control #4 Driver
A20	K59 VT/ BK	Idle Air Control #1 Driver
A22	A14 RD/WT	Fused B(+)
A23	K22 OR/DB	Throttle Position Sensor Signal
A24	K41 BK/DG	Upstream O2 Sensor Signal 1/1
A25	K141 TN/WT	Downstream O2 Sensor Signal 1/2
A27	K1 DG/RD	MAP Sensor Signal
A31	Z12 BK/TN	Ground
A32	Z12 BK/TN	Ground
B4	K11 WT/DB	Injector #1 Driver
B5	K13 YL/WT	Injector #3 Driver
B6	K15 PK/BK	Injector #5 Driver
B10	K20 DG	Generator Field Driver (-)

CAV	CKT/COLOR	FUNCTION
B11	T23 OR/LG	TCC Solenoid Control (ATX ONLY)
B12	K16 LG/BK	Injector #6 Driver
B15	K12 TN	Injector #2 Driver
B16	K14 LB/BR	Injector #4 Driver
B23	G60 GY/YL	Oil Pressure Sensor Signal
B27	G7 WT/OR	Vehicle Speed Sensor Signal
B31	K6 VT/OR	5-Volt Supply (Secondary)
C1	C13 DB/OR	A/C Comp Clutch Relay Control
C3	K51 DB/YL	Auto Shutdown Relay Control
C4	V36 TN/RD	Speed Control Vacuum Sol Control
C5	V35 LG/RD	Speed Control Vent Sol Control
C11	V32 YL/RD	S/C 12-Volt Supply
C12	A142 DG/PK	Auto Shutdown Relay Output
C15	K118 PK/YL	Battery Temp Sensor Signal
C19	K31 BR	Fuel Pump Relay Control
C20	K52 PK/BK	Evap Emission Solenoid Control
C22	C22 DB/WT	A/C Switch Sense
C23	C90 LG	A/C Switch Output
C24	K29 WT/PK	Brake Switch Sense
C25	K72 DG/OR	Generator Field Source (+)
C26	K226 DB/LG	Fuel Level Sensor Signal
C27	D21 PK	SCI Transmit
C28	D2 WT/BK	CCD Bus (-)
C29	D20 LG	SCI Receive
C30	D1 VT/BR	CCD Bus (+)
C32	V37 RD/LG	S/C Switch Signal

4.1 Powertrain Control Module (Continued)

XJ BODY

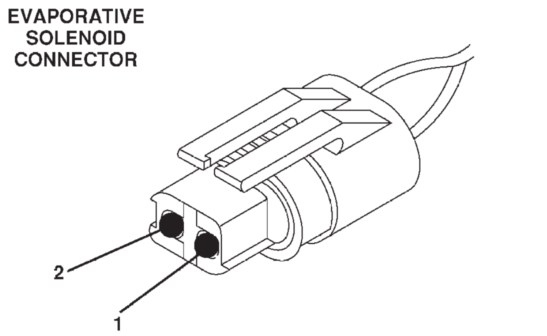




CAV	CKT/COLOR	FUNCTION
A2	F12 DB/WT	Fused Ignition Switch Output
A4	K167 BR/YL	Sensor Ground
A6	T41 BR/LB	PNP Switch Sense (2.5L A/T)
A6	Z1 BK	Ground (2.5L M/T)
A6	T41 BK/WT	Transmission Range Switch Sense (4.0L A/T)
A7	K19 GY	Ign Coil Driver
A8	K24 GY/BK	CKP Sensor Signal
A10	K60 YL/BK	Idle Air Control #3 Driver
A11	K40 BR/WT	Idle Air Control #2 Driver
A12	K10 DB/BR	Power Steering Pressure Switch (2.5L)
A15	K21 BK/RD	IAT Signal
A16	K2 TN/BK	ECT Sensor Signal
A17	K7 OR	5-Volt Supply (Primary)
A18	K44 TN/YL	CMP Sensor Signal
A19	K39 GY/RD	Idle Air Control #4 Driver
A20	K59 VT/BK	Idle Air Control #1 Driver
A22	A61 DG/BK	Fused B(+)
A23	K22 OR/DB	TP Sensor Signal
A24	K41 BK/DG	O2 Sensor 1/1 Signal
A25	K141 TN/WT	O2 Sensor 1/2 Signal
A27	K1 DG/RD	MAP Sensor Signal
A31	Z12 BK/TN	Ground
A32	Z12 BK/TN	Ground
B4	K11 WT/DB	Injector #1 Driver
B5	K13 YL/WT	Injector #3 Driver
B6	K15 PK/BK	Injector #5 Driver
B10	K20 DG	Generator Field Driver (-)
B11	K54 OR/BK	TCC Solenoid Control (2.5L A/T)
B12	K16 LG/BK	Injector #6 Driver
B15	K12 TN	Injector #2 Driver
B16	K14 LB/BR	Injector #4 Driver
B23	G60 GY/YL	Oil Press Sensor Signal
B27	G7 WT/OR	Vehicle Speed Sensor Signal
B31	K6 VT/OR	5-Volt Supply (Secondary)
C1	C13 DB/OR	A/C Comp Clutch Relay Control
C2	C27 DB/PK	Rad Fan Relay Control
C3	K51 DB/YL	ASD Relay Control
C4	V36 TN/RD	S/C Vacuum Solenoid Control
C5	V35 LG/RD	S/C Vent Solenoid Control
C11	V32 YL/RD	S/C 12-Volt Supply
C12	A142 DG/OR	ASD Relay Output
C15	K118 PK/YL	Batt Temp Sensor Signal
C19	K31 BR	Fuel Pump Rly Ctrl
C20	K52 PK/BK	EVAP Sol Control
C22	C22 DB/WT	A/C Pressure Switch Output
C23	C90 LG	A/C Select Input
C24	K29 WT/PK	Brake Switch Sense
C25	K72 DG/OR	Generator Field Source (+)
C26	K226 DB/LG	Fuel Level Sensor
C27	D21 PK	SCI Transmit
C28	D2 WT/BK	CCD Bus (-)
C29	D20 LG/BK	SCI Receive
C30	D1 VT/BR	CCD Bus (+)
C32	V37 RD/LG	S/C SW Signal

4.2 Controls & Solenoids

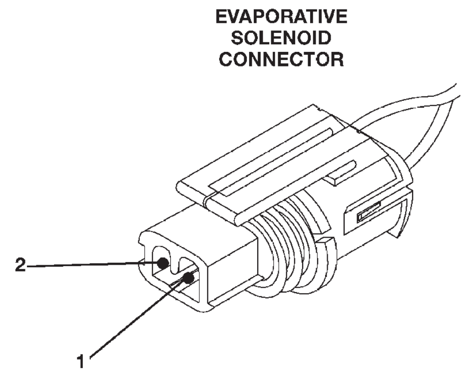
TJ BODY



CAV	COLOR	FUNCTION
1	PK/BK	EVAP SOLENOID CONTROL
2	RD/LG	FUSED IGNITION SWITCH OUTPUT

80b6f0e2

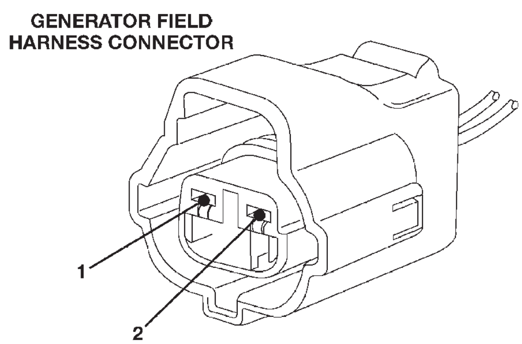
XJ BODY



CAV	COLOR	FUNCTION
1	PK/BK	EVAP SOLENOID CONTROL
2	WT	FUSE IGNITION SWITCH OUTPUT

80b6f0da

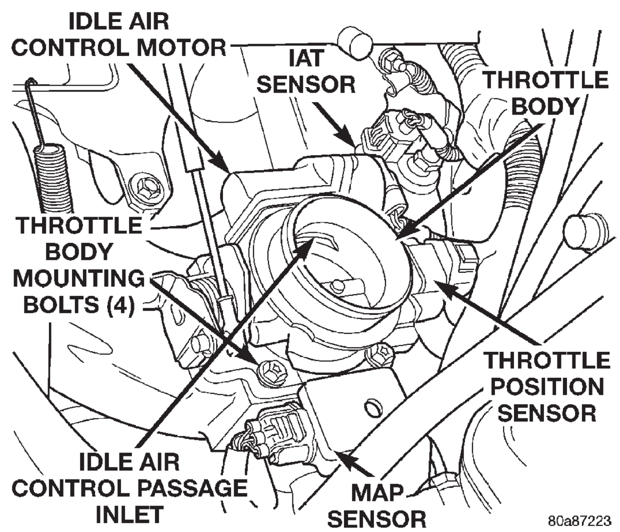
TJ/XJ BODY



CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD

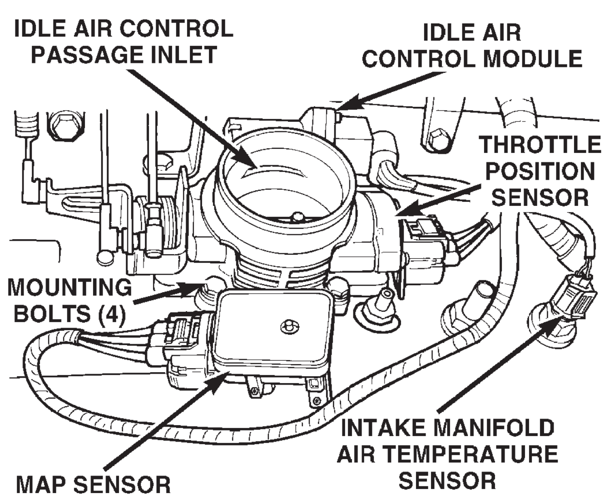
80b6b12e

TJ/XJ 2.5L



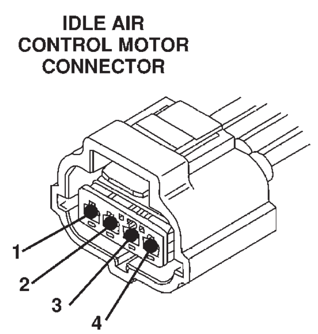
80a87223

TJ/XJ 4.0L



80aac28d

TJ/XJ BODY

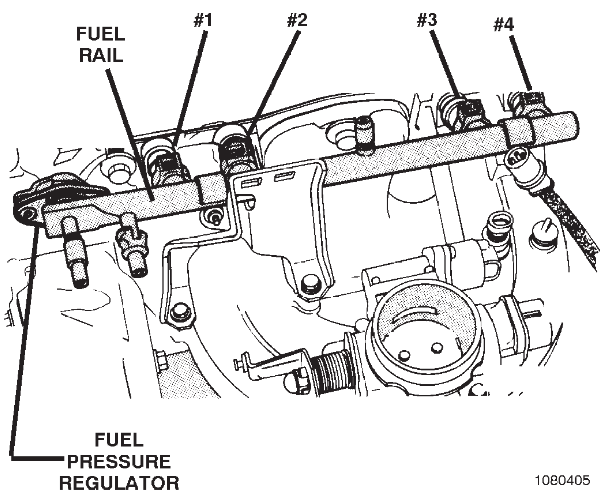


CAV	COLOR	FUNCTION
1	VT/BK	IDLE AIR CONTROL #1 DRIVER
2	BR/WT	IDLE AIR CONTROL #2 DRIVER
3	YL/BK	IDLE AIR CONTROL #3 DRIVER
4	GY/RD	IDLE AIR CONTROL #4 DRIVER

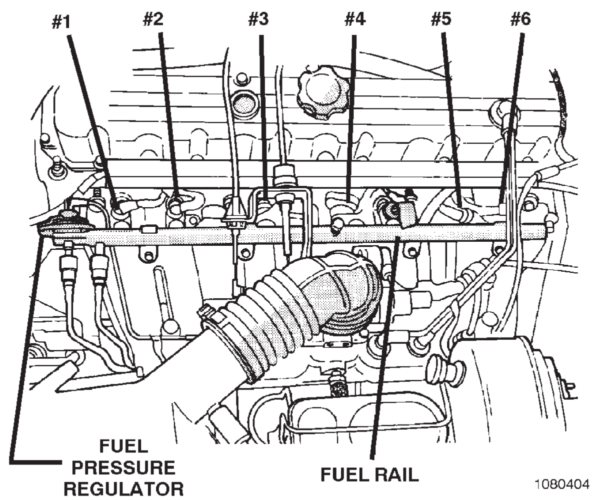
80b898b2

4.2 Controls & Solenoids (Continued)

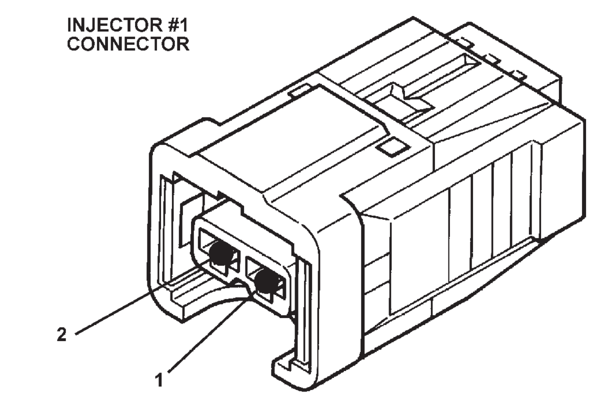
TJ/XJ 2.5L BODY



TJ/XJ 4.0L



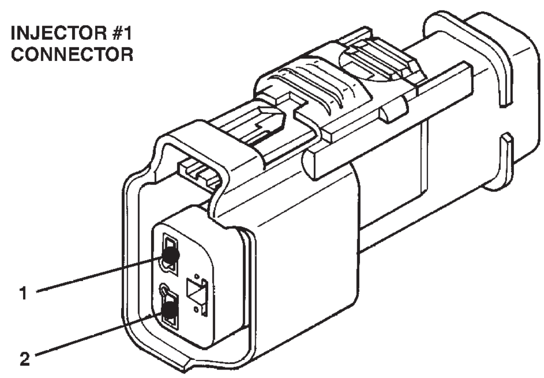
TJ/XJ 2.5L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	WT/DB	INJECTOR #1 DRIVER

80b76e62

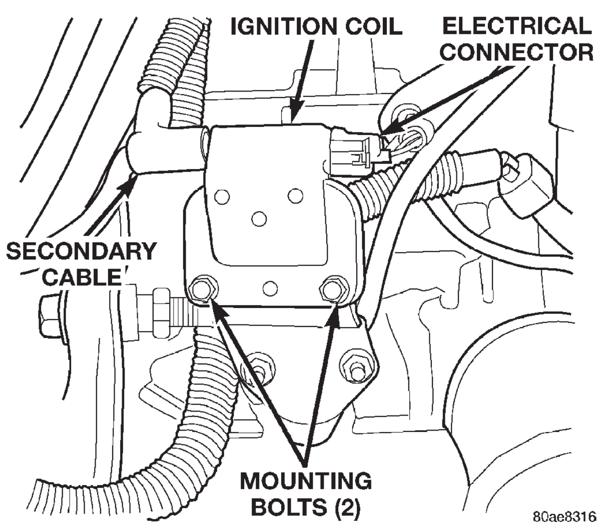
TJ/XJ 4.0L



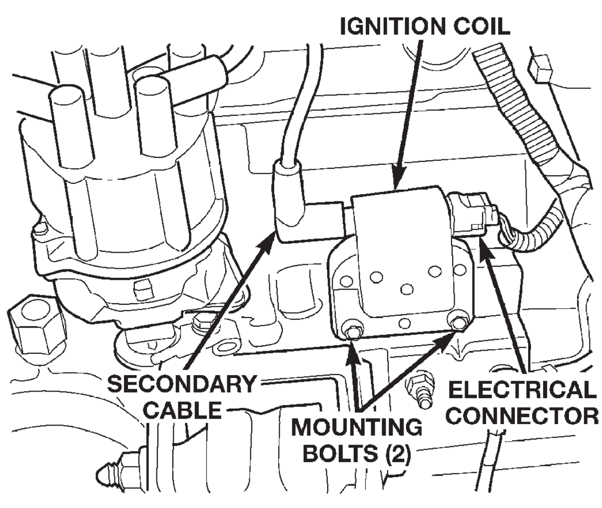
CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	WT/DG	INJECTOR #1 DRIVER

80b76e67

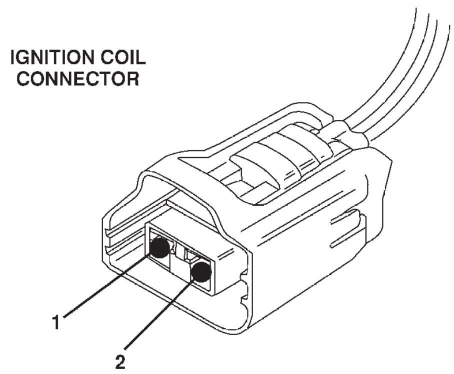
TJ/XJ 2.5L



TJ/XJ 4.0L



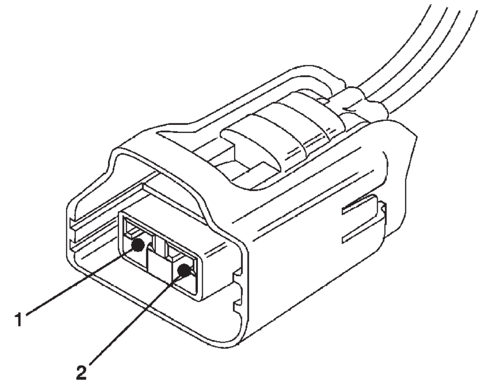
TJ BODY



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

80b6f0e3

XJ BODY

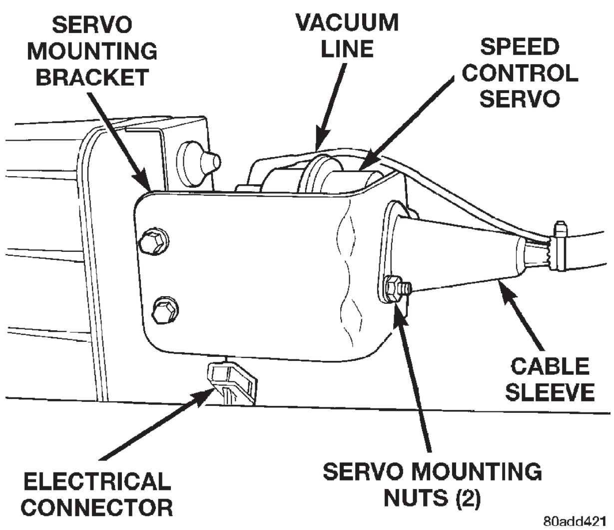


CAV	COLOR	FUNCTION
1	DG/OR	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

NOTE: WIRES CAN BE IN EITHER CAVITY

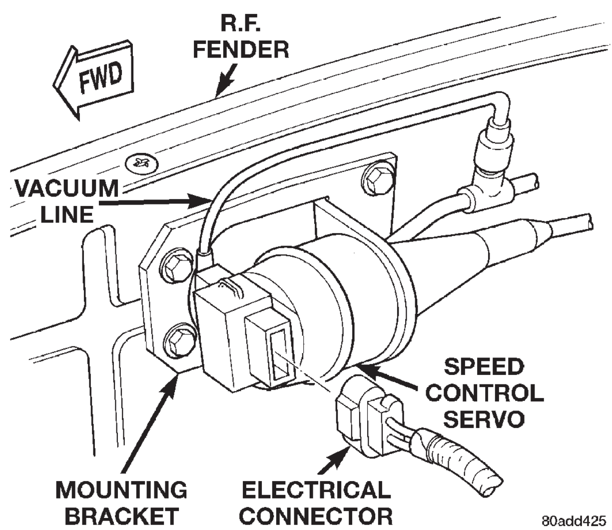
80afb691

TJ BODY



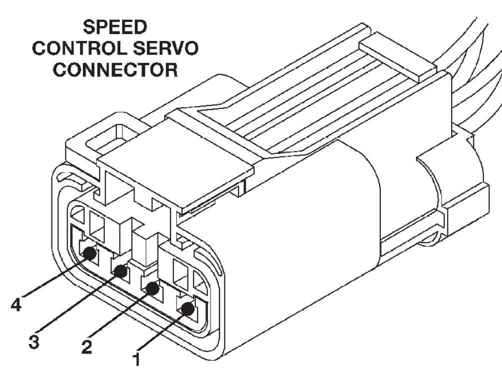
80add421

XJ BODY



80add425

TJ/XJ BODY

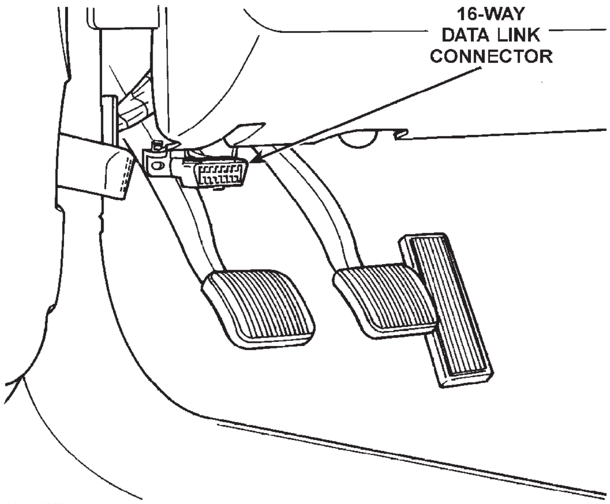


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b04fe4

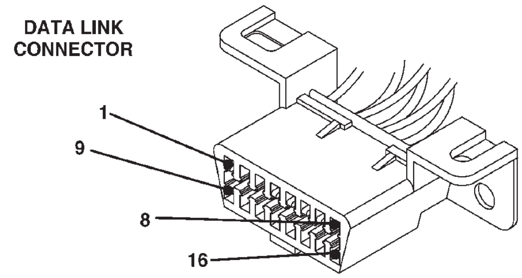
4.3 Data Link Connector

TJ BODY



80a4835f

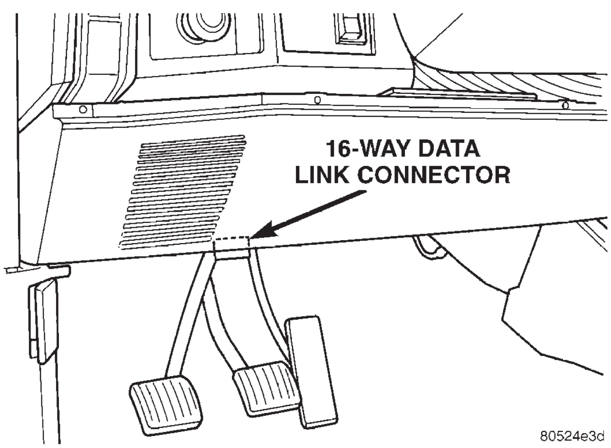
TJ BODY



CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK/LB	GROUND
5	BK/TN	GROUND
6	LG	SCI RECEIVE
7	PK	SCI TRANSMIT/ISO 9141K
11	WT/BK	CCD BUS (-)
16	PK/WT	FUSED B(+)

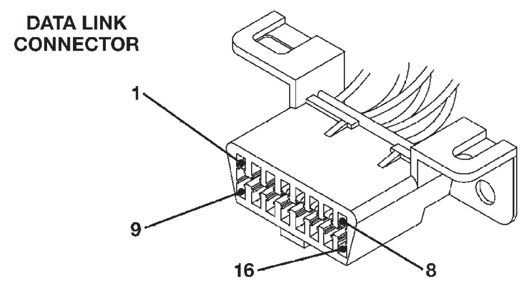
80a4508e

XJ BODY



80524e3d

XJ BODY

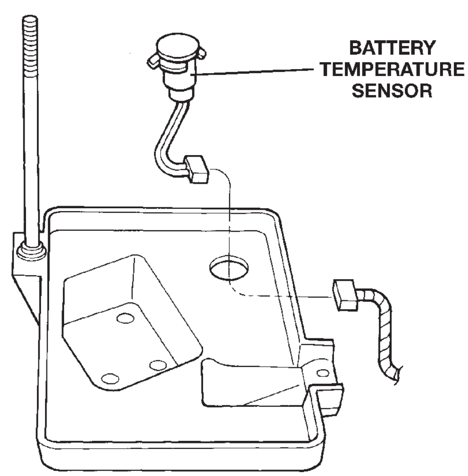


CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK	GROUND
5	BK/TN	POWER GROUND
6	LG/BK	SCI RECEIVE
7	PK	SCI TRANSMIT
11	WT/BK	CCD BUS (-)
16	TN/BK	FUSED B (+)

80afb698

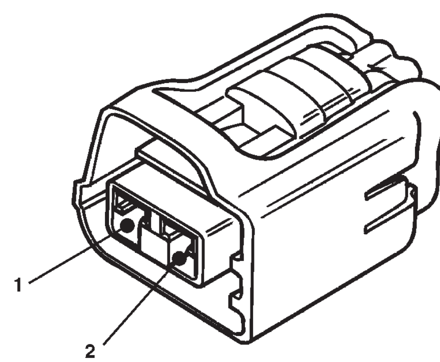
4.4 Sensors

TJ/XJ BODY



805005a9

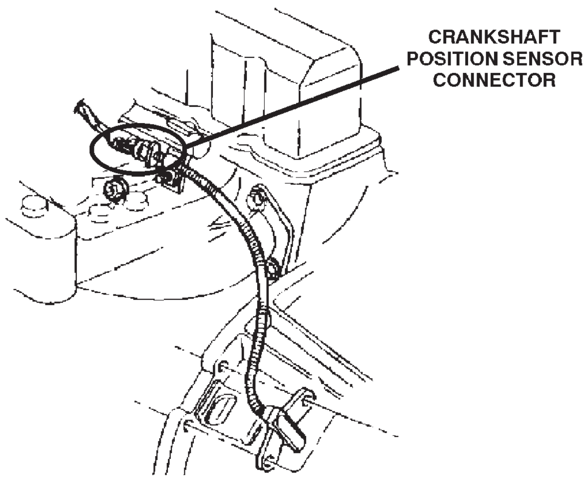
TJ/XJ BODY



CAV	COLOR	FUNCTION
1	PK/YL	BATTERY TEMP SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

80a5348d

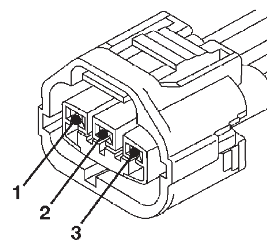
TJ/XJ BODY



1070404

TJ/XJ BODY

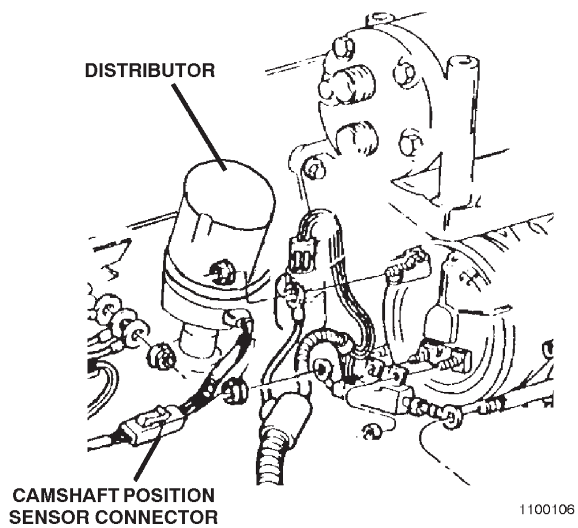
CRANKSHAFT POSITION SENSOR CONNECTOR



CAV	COLOR	FUNCTION
1	GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

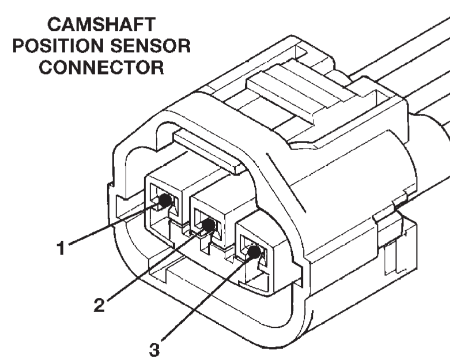
80b0995b

TJ/XJ 2.5L & 4.0L



1100106

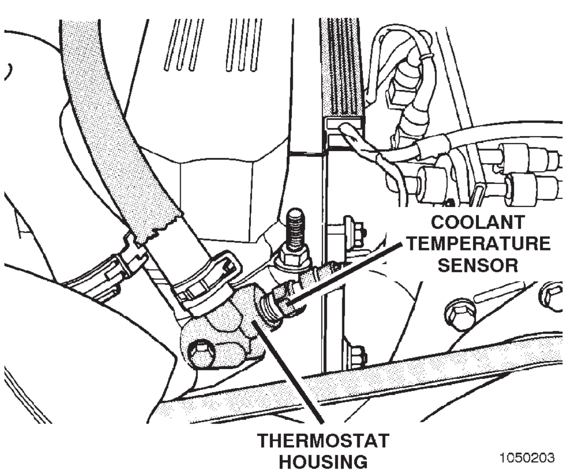
TJ/XJ BODY



CAV	COLOR	FUNCTION
1	TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

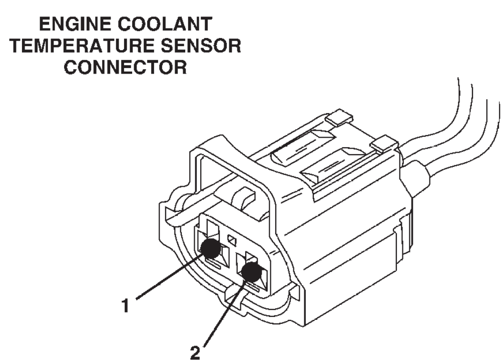
80afb5cc

TJ/XJ 2.5L & 4.0L



1050203

TJ BODY

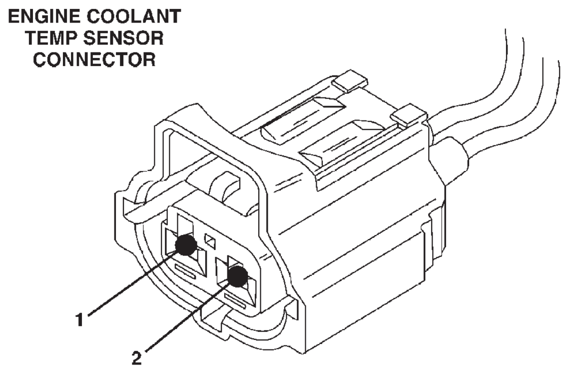


CAV	COLOR	FUNCTION
1	TN/BK	ECT SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

80aff5a0

4.4 Sensors (Continued)

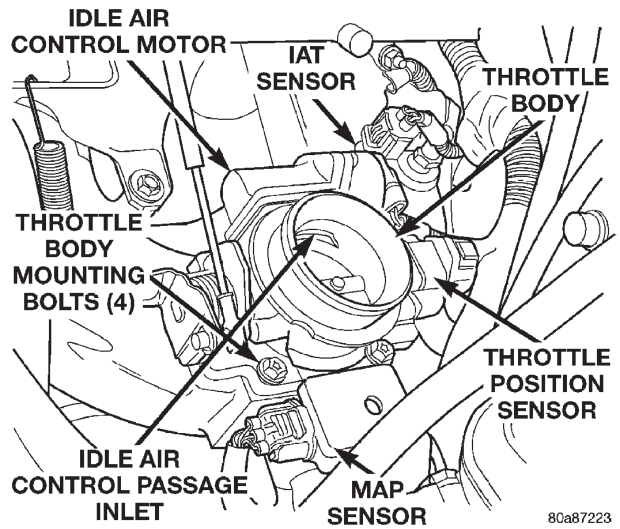
XJ BODY



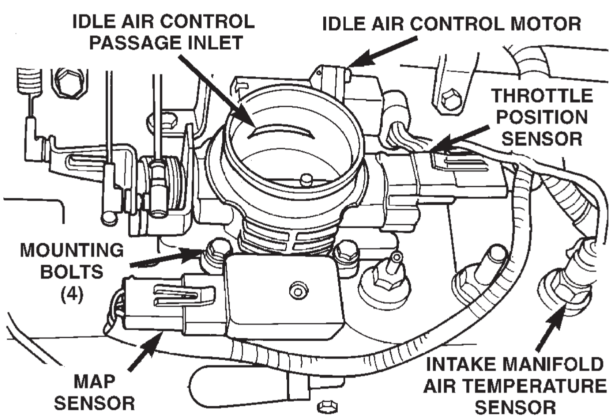
CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	TN/BK	ECT SENSOR SIGNAL

80b098a7

TJ/XJ 2.5L

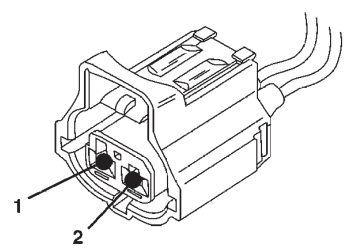


TJ/XJ 4.0L



TJ BODY

INTAKE AIR TEMPERATURE SENSOR CONNECTOR

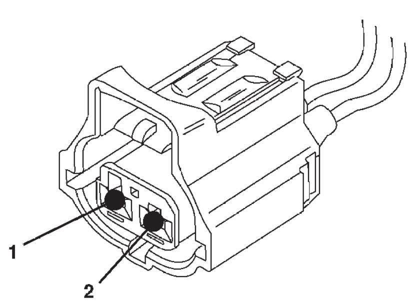


CAV	COLOR	FUNCTION
1	BK/RD	IAT SIGNAL
2	BR/YL	SENSOR GROUND

80aff501

XJ BODY

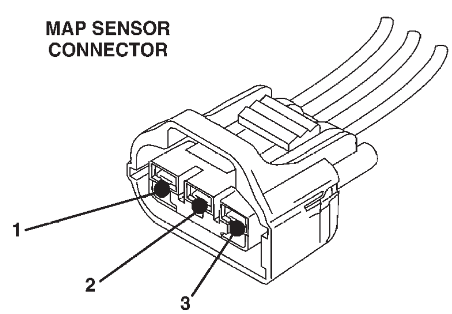
INTAKE AIR TEMPERATURE SENSOR CONNECTOR



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

80b099c6

TJ/XJ BODY



CAV	COLOR	FUNCTION
3	OR	5-VOLT SUPPLY
2	DG/RD	MAP SENSOR SIGNAL
1	BR/YL	SENSOR GROUND

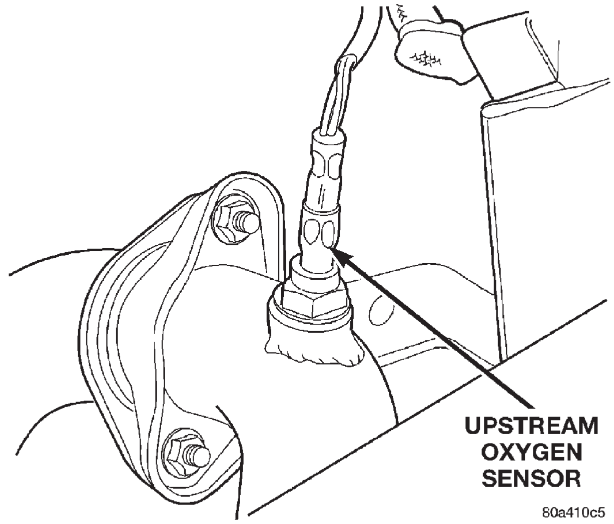
80afa155

JTEC 02 SENSOR CONFIGURATION

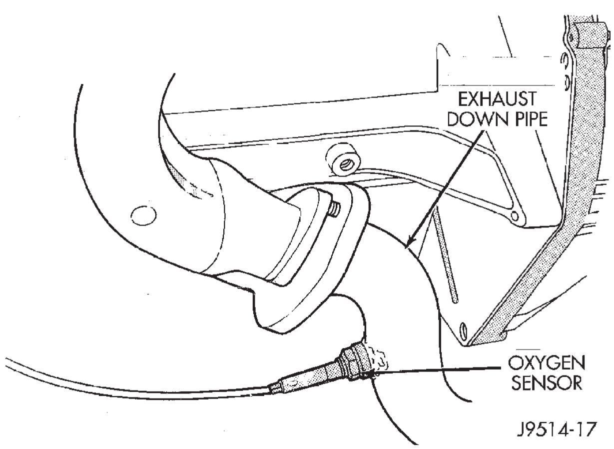
TJ2.5L	1/1	UPSTREAM	XJ2.5L	1/1	UPSTREAM
TJ2.5L	1/2	DOWNSTREAM	XJ2.5L	1/2	DOWNSTREAM
TJ4.0L	1/1	UPSTREAM	XJ4.0L	1/1	UPSTREAM
TJ4.0L	1/2	DOWNSTREAM	XJ4.0L	1/2	DOWNSTREAM

80b76ec3

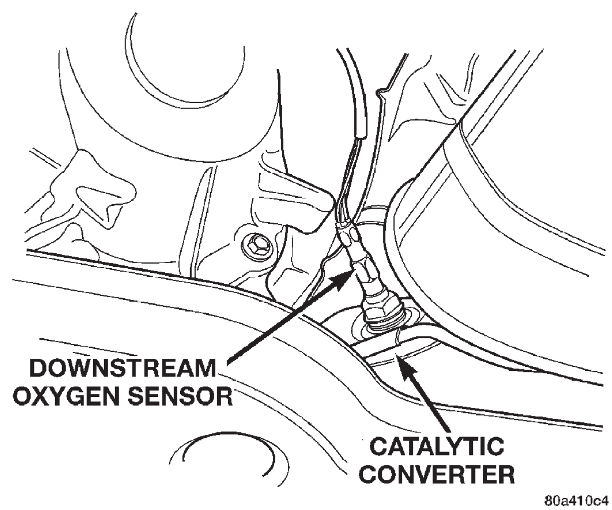
TJ 2.5L & 4.0L 1/1



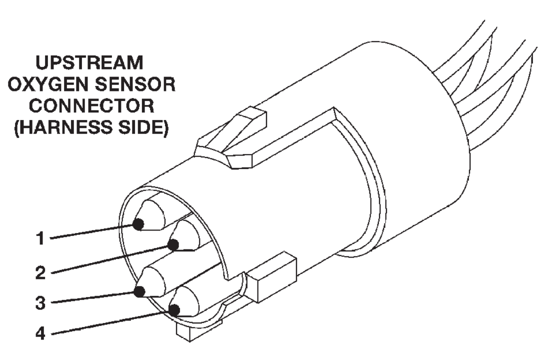
XJ 2.5L & 4.0L 1/1



TJ 2.5L & 4.0L 1/2



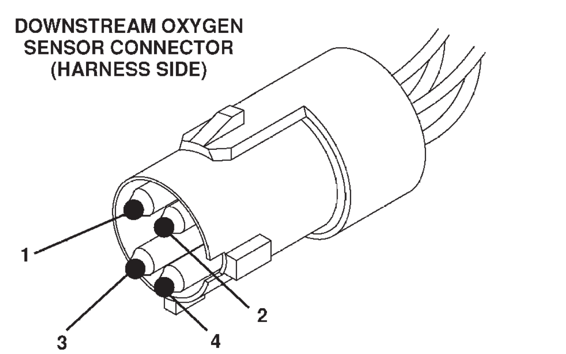
TJ BODY 1/1



CAV	COLOR	FUNCTION
1	OR/DG	ASD Relay Output
2	BK	Ground (Heater)
3	BR/YL	Sensor Ground
4	BK/DG	Oxygen Sensor Signal

80b6f0e5

TJ BODY 1/2

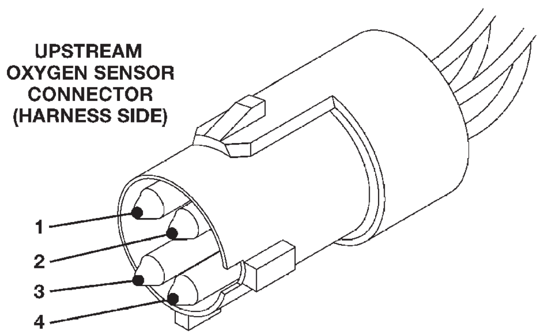


CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	OXYGEN SENSOR SIGNAL

80b6f0e6

4.4 Sensors (Continued)

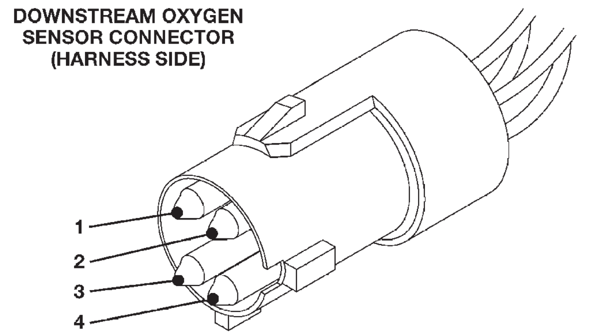
XJ BODY 1/1



CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

80b6f0db

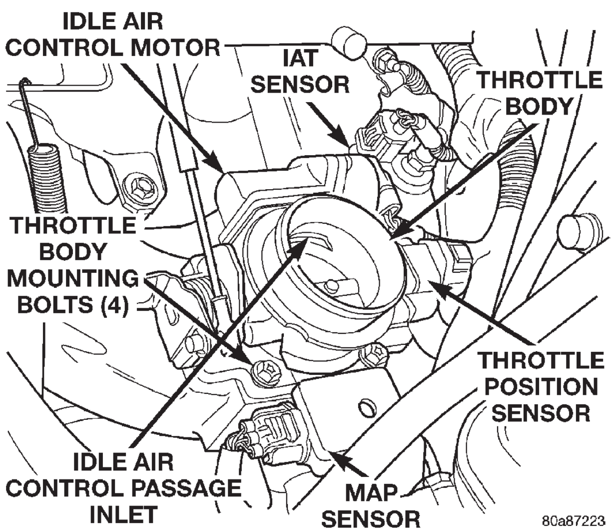
XJ BODY 1/2



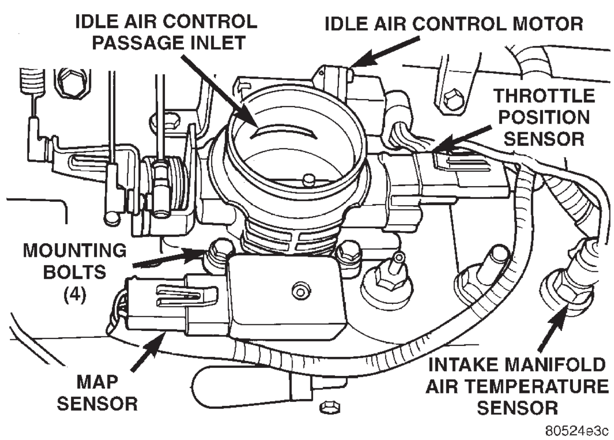
CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	OXYGEN SENSOR SIGNAL

80b6f0dc

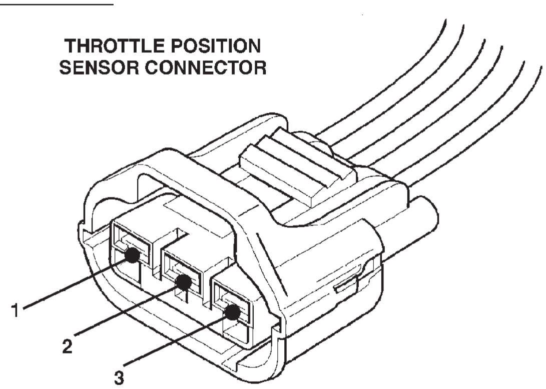
TJ/XJ 2.5L



TJ/XJ 4.0L



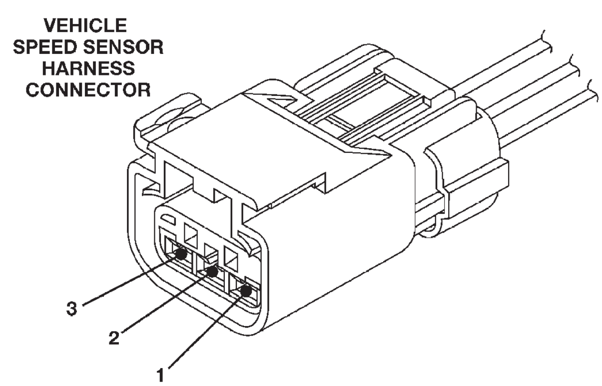
TJ/XJ BODY



CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b6f0e7

TJ/XJ BODY

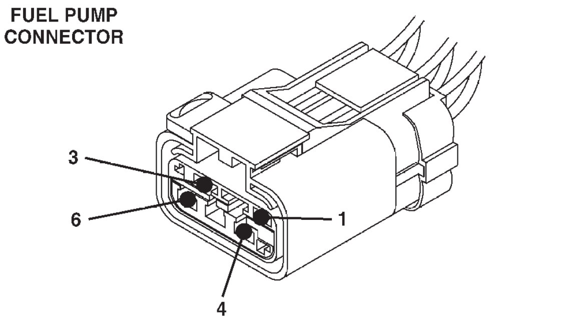


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY
2	BR/YL	SENSOR GROUND
3	WT/OR	VEHICLE SPEED SENSOR SIGNAL

80b0d63c

4.5 Fuel System

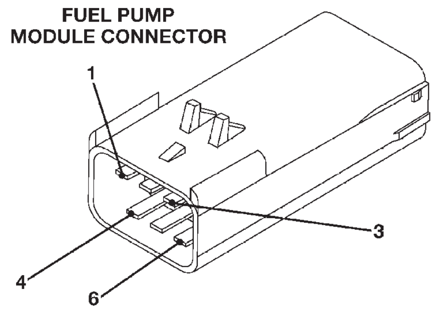
TJ BODY



CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (OBD II)
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80b099c8

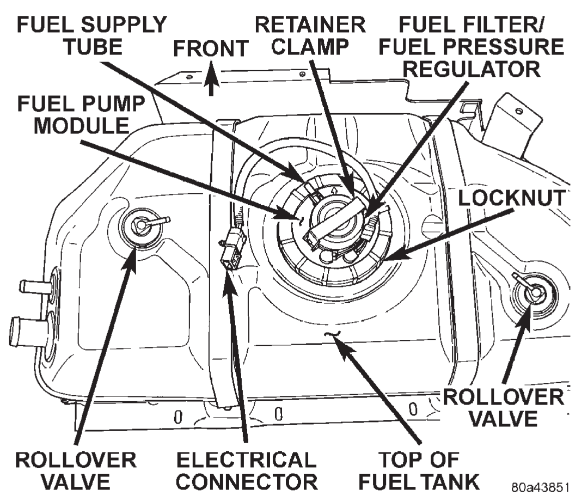
XJ BODY



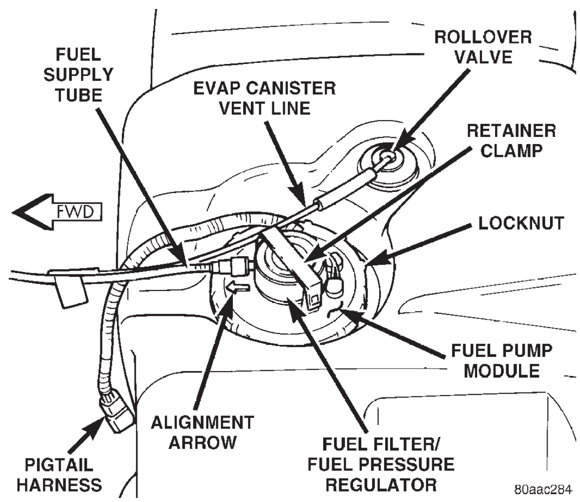
CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80aafa16

TJ BODY

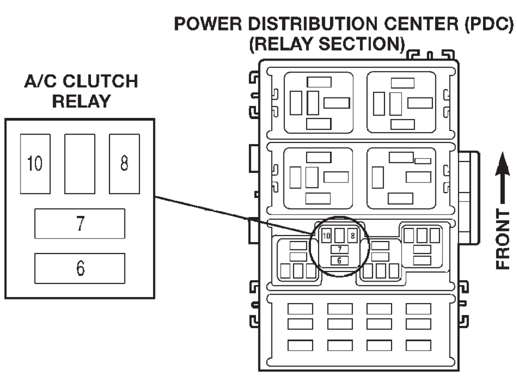


XJ BODY



4.6 Relays

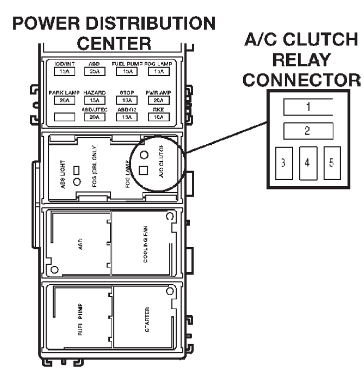
TJ BODY



CAV	COLOR	FUNCTION
6(30)	RD/GY	FUSED B(+)
7(87)	DB/BK	A/C CMP CLUTCH RELAY OUTPUT
8(86)	VT/WT	FUSED IGNITION SWITCH OUTPUT
10(85)	DB/OR	A/C CMP CLUTCH RELAY CONTROL

80b6f108

XJ BODY

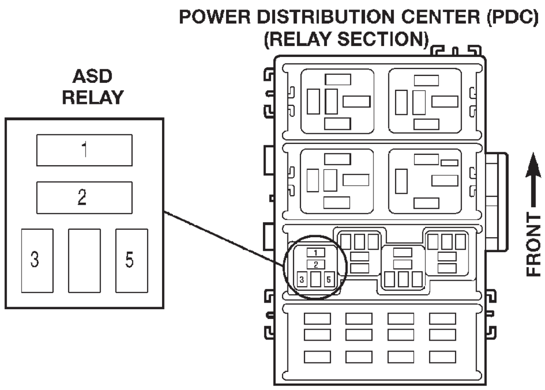


CAV	COLOR	FUNCTION
1 (30)	RD/BK	FUSED B(+)
2 (87)	DB/BK	A/C CLUTCH RELAY OUTPUT
3 (85)	DB/OR	A/C CLUTCH RELAY CONTROL
5 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT

80b6f0de

4.6 Relays (Continued)

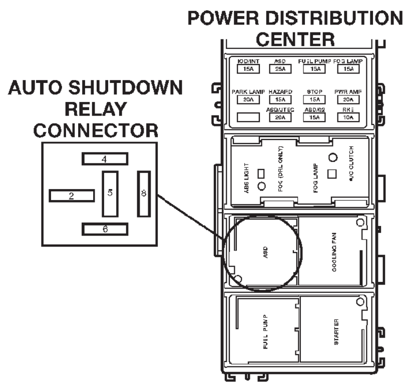
TJ BODY



CAV	COLOR	FUNCTION
1(30)	RD/WT	FUSED B(+)
2(87)	DG/PK	AUTO SHUTDOWN RELAY OUTPUT
3(86)	DB	IGNITION SWITCH OUTPUT
5(85)	DB/YL	AUTO SHUTDOWN RELAY CONTROL

80b6f109

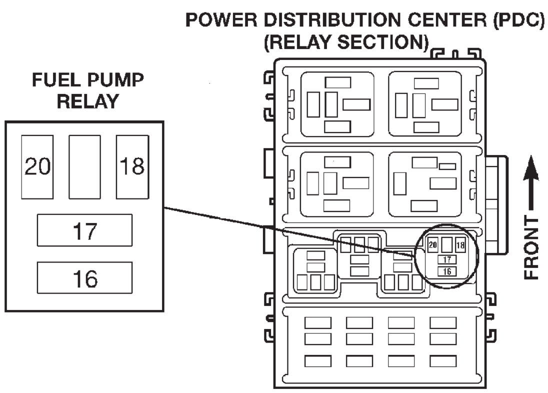
XJ BODY



CAV	COLOR	FUNCTION
2 (30)	RD/LG	FUSED B(+)
4 (85)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (86)	DB/YL	ASD RELAY CONTROL
8 (87)	RD	ASD RELAY OUTPUT

80b6f0df

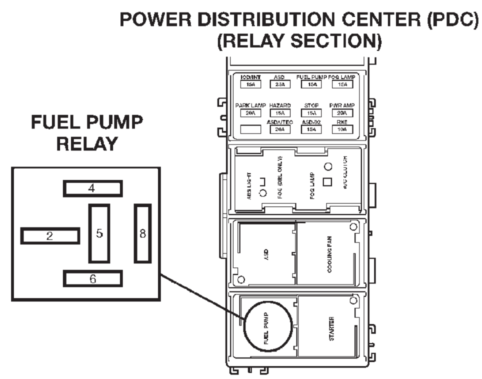
TJ BODY



CAV	COLOR	FUNCTION
16(30)	DG/BK	FUSED B(+)
17(87)	DG/WT	FUEL PUMP RELAY OUTPUT
18(86)	DB	FUSED IGNITION SWITCH OUTPUT
20(85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e9

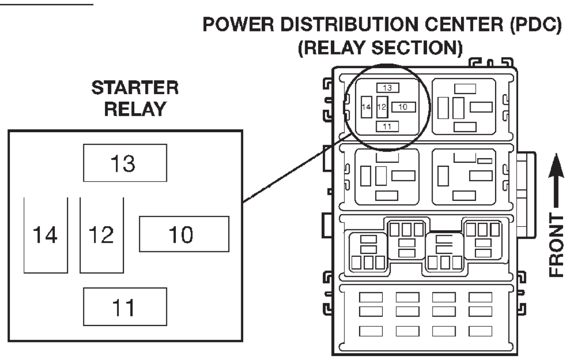
XJ BODY



CAV	COLOR	FUNCTION
2 (30)	DG/BK	FUSED B(+)
8 (87)	DG/WT	FUEL PUMP RELAY OUTPUT
4 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e0

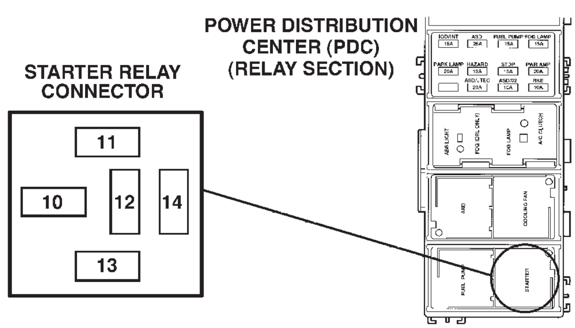
TJ BODY



CAV	COLOR	FUNCTION
10(30)	PK/BK	FUSED B(+)
11(85)	YL/RD	IGNITION SWITCH OUTPUT
13(86)	BR/LB	PARK NEUTRAL SWITCH SENSE (AUTO TRANS) GROUND (MANUAL TRANS)
14(87)	BR	STARTER RELAY OUTPUT

80b6f107

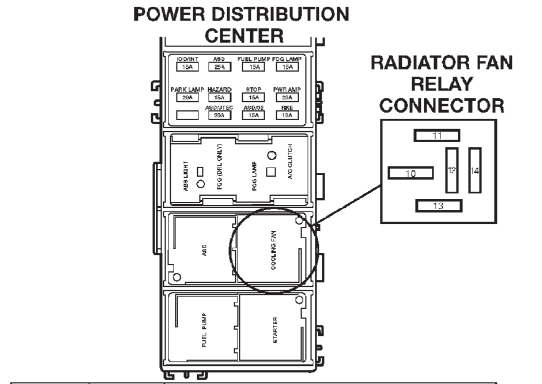
XJ BODY



CAV	COLOR	FUNCTION
10 (30)	YL	FUSED B(+)
11 (85)	BK/WT	P/N POSITION SWITCH SENSE (AUTO TRANSMISSION)
11 (85)	BK	GROUND (MANUAL TRANSMISSION)
13 (86)	YL	FUSED IGNITION SWITCH OUTPUT
14 (87)	BR	STARTER RELAY OUTPUT

80b6f0e1

XJ BODY

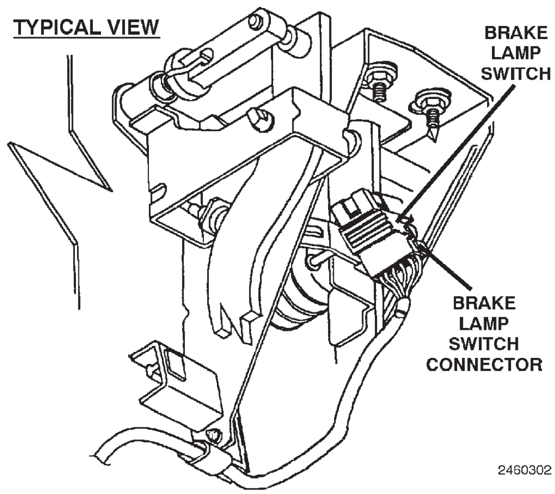


CAV	COLOR	FUNCTION
10 (30)	LG/RD	FUSED B(+)
11 (86)	WT	FUSED IGNITION SWITCH OUTPUT
13 (85)	DB/PK	RAD FAN RELAY CONTROL
14 (87)	LB	RAD FAN RELAY OUTPUT

80b76e94

4.7 Switches

TJ/XJ BODY



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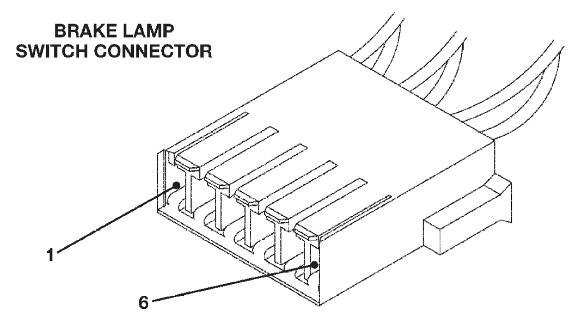
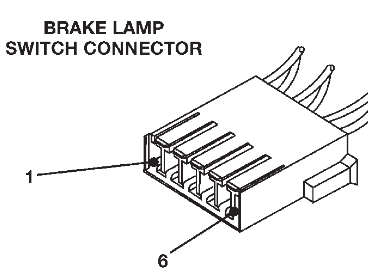
TJ BODY



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

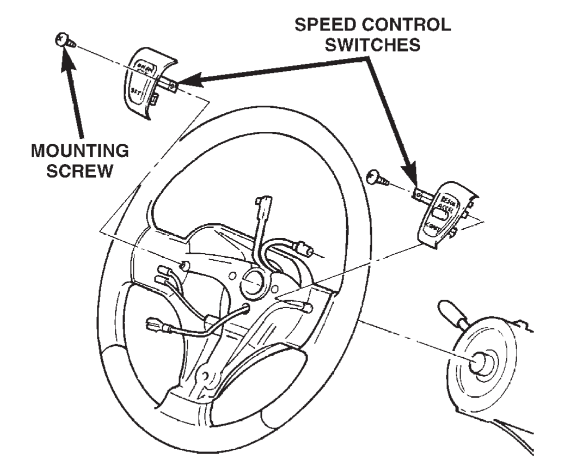
XJ BODY



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80b04fe6

TJ/XJ BODY



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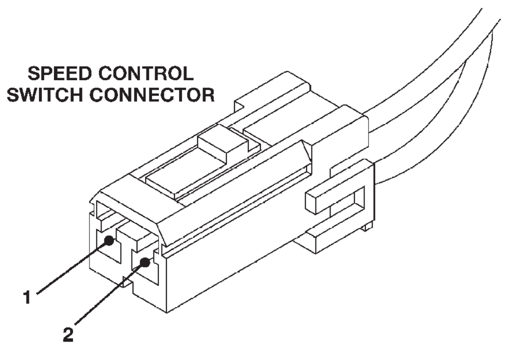
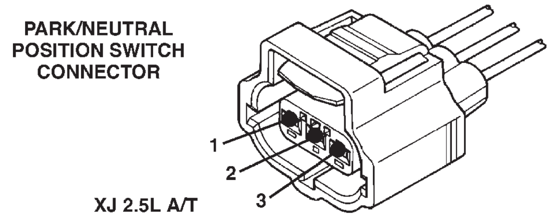
4.7 Switches (Continued)

TJ/XJ



CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

80ab3724



XJ 2.5L A/T

CAV	COLOR	FUNCTION
1	WT	FUSED IGNITION SWITCH OUTPUT
2	BK/WT	PARK/NEUTRAL POSITION SW SENSE
3	BR/LG	BACK-UP LAMPS FEED

TJ 2.5L AND 4.0L A/T

CAV	COLOR	FUNCTION
1	VT/WT	FUSED IGNITION SWITCH OUTPUT
2	BR/LB	PARK/NEUTRAL POSITION SW SENSE
3	VT/BK	BACK-UP LAMPS FEED

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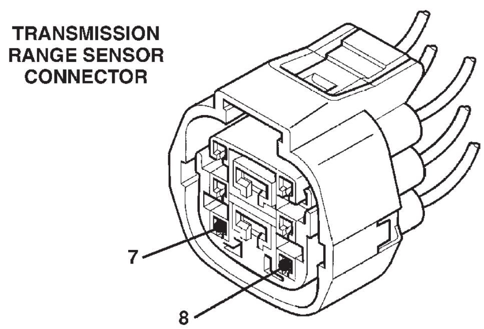
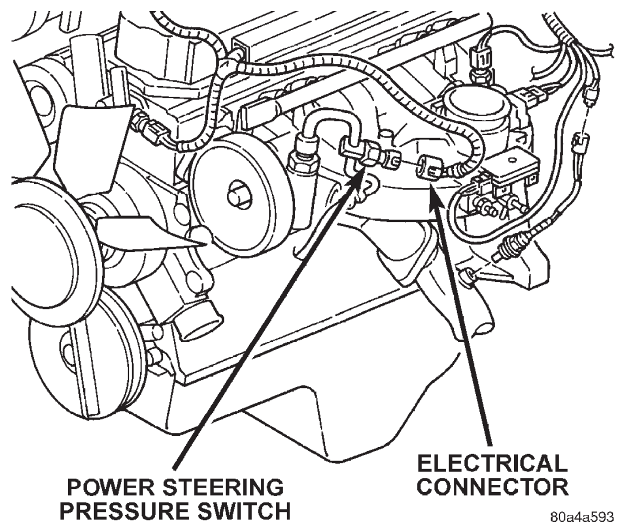
XJ BODY 4.0L



CAV	COLOR	FUNCTION
7	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
8	BK	GROUND

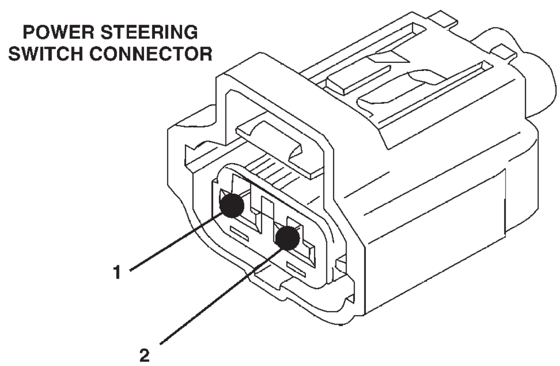
80b76f2a

TJ/XJ 2.5L



80a4a593

TJ/XJ 2.5L



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/BR	POWER STEERING PRESSURE SW SENSE (2.5L TJ/XJ)

80b76f27

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 and Warnings

5.2.1 Technician Safety Information

WARNING: 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.

WARNING: Before performing any secondary ignition testing with open sparks, insure there are no fuel leaks or vapors present in the immediate area.

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 parking 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 body 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 DRBIII® 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 and Cautions

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 the powertrain 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 DRBIII® 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 DRBIII®.

7.1 GENERAL TROUBLESHOOTING

TROUBLE CODE TESTS

DTC TEST	CHECKING THE SYSTEM FOR DIAGNOSTIC TROUBLE CODES

NOTE: For all component locations, REFER TO GENERAL INFORMATION sections 4.0 in this manual.

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 the **TEST NS-SEL.**
4. If the DRB screen is blank or has a DRB message, go to **General Information Section 3.5** 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 SKIS problems SK-1A
For Driveability problems NTC-1A
For No Start problems . . . . .NS-SEL
For Speed Control problems SC-1A
For Charging problems. CH-1A

NOTE: The decimal test numbers for these trouble codes were derived from the hexadecimal codes as set in the PCM. Therefore, some test numbers will be missing because all codes are not applicable to the vehicles covered in this manual.

TROUBLE CODE DESCRIPTION	TEST #	DTC HEX	SCAN TOOL
A/C CLUTCH RELAY CIRCUIT	TC-16	10	N/A
AISIN AW4 TRANS (TCM) DTC PRESENT	**	89	P 0700
AUTO SHUTDOWN RELAY CONTROL CIRCUIT	TC-10	0A	N/A
BATTERY TEMP SENSOR VOLTAGE TOO HIGH	TC-153	9A	P 1492
BATTERY TEMP SENSOR VOLTAGE TOO LOW	TC-153	99	P 1493
CHARGING SYSTEM VOLTAGE TOO HIGH	TC-6	06	N/A
CHARGING SYSTEM VOLTAGE TOO LOW	TC-5	05	N/A
1/2 02S VOLTS SHORTED TO GND	TC-156	9C	P 0137
1/2 02S SHORTED TO VOLTAGE	TC-126	7E	P 0138
ECT SENSOR VOLTAGE TOO HIGH	TC-31	1F	P 0118
ECT SENSOR VOLTAGE TOO LOW	TC-30	1E	P 0117
ENGINE IS COLD TOO LONG	**	21	P 1281
EVAP PURGE SOLENOID CIRCUIT	TC-18	12	P 0443
FUEL LEVEL SENDING UNIT NO CHANGE OVER TIME	TC-151	F4	P 0461
FUEL LEVEL SENDING UNIT VOLTS TOO HIGH	TC-150	96	N/A
FUEL LEVEL SENDING UNIT VOLTS TOO LOW	TC-149	95	N/A
FUEL PUMP RELAY CONTROL CIRCUIT	TC-101	65	N/A
FUEL SYSTEM LEAN 1/1 LEAN	TC-119	77	P 0171
FUEL SYSTEM RICH 1/1 RICH	TC-118	76	P 0172
GENERATOR FIELD NOT SWITCHING PROPERLY	TC-11	0B	N/A
IDLE AIR CONTROL MOTOR CIRCUIT	TC-25	19	P 0505
IGNITION COIL #1 PRIMARY CIRCUIT	TC-43	2B	P 0351
INJECTOR #1 CONTROL CIRCUIT	TC-21	15	P 0201
INJECTOR #2 CONTROL CIRCUIT	TC-21	14	P 0202
INJECTOR #3 CONTROL CIRCUIT	TC-21	13	P 0203
INJECTOR #4 CONTROL CIRCUIT	TC-21	3D	P 0204
INJECTOR #5 CONTROL CIRCUIT	TC-21	45	P 0205
INJECTOR #6 CONTROL CIRCUIT	TC-21	46	P 0206

DTC TEST	CONTINUED - CHECKING THE SYSTEM FOR DIAGNOSTIC TROUBLE CODES

TROUBLE CODE DESCRIPTION	TEST #	DTC HEX	SCAN TOOL
INTAKE AIR TEMP SENSOR VOLTAGE HIGH	TC-58	3A	P 0113
INTAKE AIR TEMP SENSOR VOLTAGE LOW	TC-57	39	P 0112
INTERMITTENT LOSS OF CMP OR CKP	TC-157	9D	P 1391
INTERNAL CONTROLLER FAILURE	**	02	P 0601
*MAP SENSOR VOLTAGE TOO HIGH	TC-37	25	P 0108
*MAP SENSOR VOLTAGE TOO LOW	TC-36	24	P 0107
NO 5 VOLTS TO MAP SENSOR	TC-36	87	P 1296
NO ASD RELAY OUTPUT VOLTAGE AT PCM	TC-44	2C	P 1389
NO CAM SIGNAL AT PCM	TC-1	01	P 0340
NO CCD BUS MESSAGE RECEIVED FROM TCM	**	60	P 1698
NO CCD BUS MESSAGE RECEIVED FROM MIC	TC-225	E1	P 1687
NO CCD BUS MESSAGE RECEIVED FROM SKIM	TC-226	E2	P 1686
NO CHANGE IN MAP FROM START TO RUN	TC-39	27	P 1297
NO CRANK REFERENCE SIGNAL AT PCM	TC-40	28	P 0320
NO VEHICLE SPEED SENSOR SIGNAL	TC-35	23	P 0500
OIL PRESSURE SENSOR LOW EXCEEDED	TC-235	EB	P 0522
OIL PRESSURE SENSOR HIGH EXCEEDED	TC-236	EC	P 0523
P/N SWITCH STUCK IN PARK OR IN GEAR	TC-114	72	P 1899
PCM FAILURE EEPROM WRITE DENIED	TC-49	31	P 1696
PCM FAILURE SPI COMMUNICATIONS	**	44	P 0600
POWER STEERING SWITCH FAILURE	TC-115	73	P 0551
RADIATOR FAN CONTROL RELAY CIRCUIT	TC-14	OE	P 1491
SPEED CONTROL POWER RELAY OR S/C 12V DRIVER CKT	TC-82	52	N/A
SPEED CONTROL SOLENOIDS CIRCUITS	TC-15	OF	N/A
SPEED CONTROL SWITCH ALWAYS HIGH	TC-86	56	P 1596
SPEED CONTROL SWITCH ALWAYS LOW	TC-87	57	N/A
*THROTTLE POSITION SENSOR VOLTAGE HIGH	TC-27	1B	P 0123
*THROTTLE POSITION SENSOR VOLTAGE LOW	TC-26	1A	P 0122
TORQ CONV CLU, NO RPM DROP AT LOCKUP	TC-148	94	P 0740
TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CKT	TC-12	0C	P 0743
*TPS VOLTAGE DOES NOT AGREE WITH MAP	TC-132	84	P 0121
1/1 O2S VOLTAGE SHORTED TO GROUND	TC-155	9B	P 0131
1/1 O2 SENSOR SHORTED TO VOLTAGE	TC-62	3E	P 0132
WRONG OR INVALID KEY MSG RECEIVED FROM SKIM	TC-232	E8	P 1685

* = These DTC's can be set by Low Fuel Level, add fuel to 1/4 tank and test for DTC to set again.
** = Trouble code information on last page of DTC test.

For an AISIN TRANS (TCM) DTC PRESENT trouble code, use the appropriate Transmission diagnostic manual, with the DRB read transmission DTC's.

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

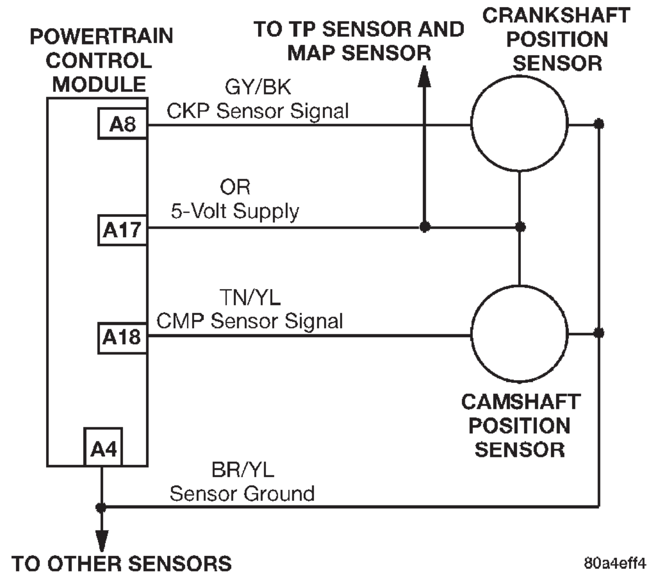
For an INTERNAL CONTROLLER FAILURE, replace the Powertrain control module and perform **Verification TEST VER-2A.**

For a NO CCD/PCI BUS MESSAGE FROM TCM trouble code, use the appropriate trans diagnostic manual for testing and repair.

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

TEST TC-1A	REPAIRING - NO CAM SIGNAL AT PCM

Perform TEST DTC Before Proceeding



Name of Code: No Cam Signal at PCM

When monitored: Ignition ON.

Set condition: If 96 crank signals are counted and no signal from the cam position sensor is present 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 5 volts and a ground to power up the sensor. The PCM also supplies a 5-volt pull-up voltage. 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 sensor is high (5.0V); when the trailing edge is clear of the sensor, the signal is low (0.3V).

Possible causes:
- Open 5-volt supply circuit
- Open sensor ground
- Open or shorted signal circuit
- Damaged pulse ring
- Failed sensor
- Failed PCM

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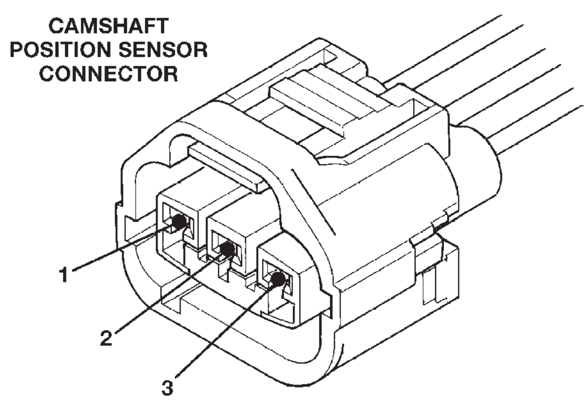
TJ/XJ BODY



CAV	COLOR	FUNCTION
1	TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

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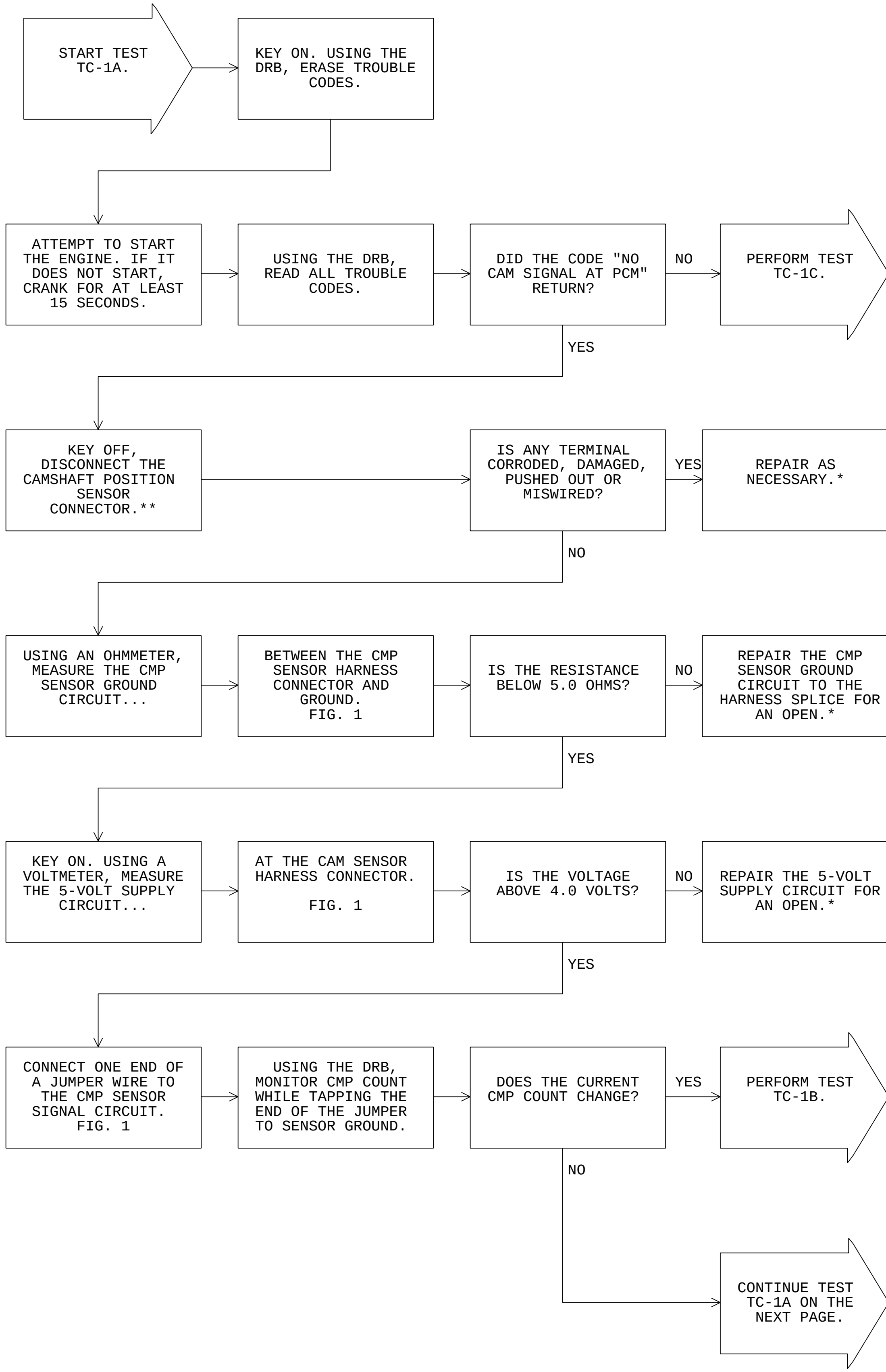
FIG. 1

TEST TC-1A — REPAIRING - NO CAM SIGNAL AT PCM

Perform TEST DTC Before Proceeding

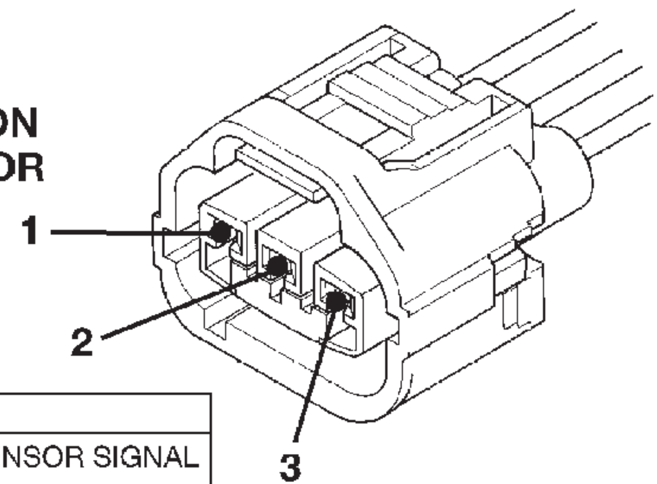


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

TEST TC-1A	CONTINUED - REPAIRING - NO CAM SIGNAL AT PCM

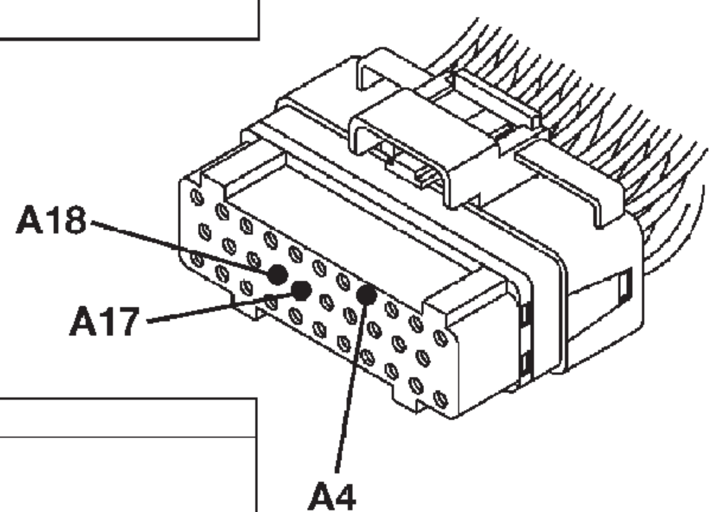
TJ/XJ BODY

CAMSHAFT POSITION SENSOR CONNECTOR



CAV	COLOR	FUNCTION
1	TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
A18	TN/YL	CAMSHAFT POSITION SENSOR SIGNAL

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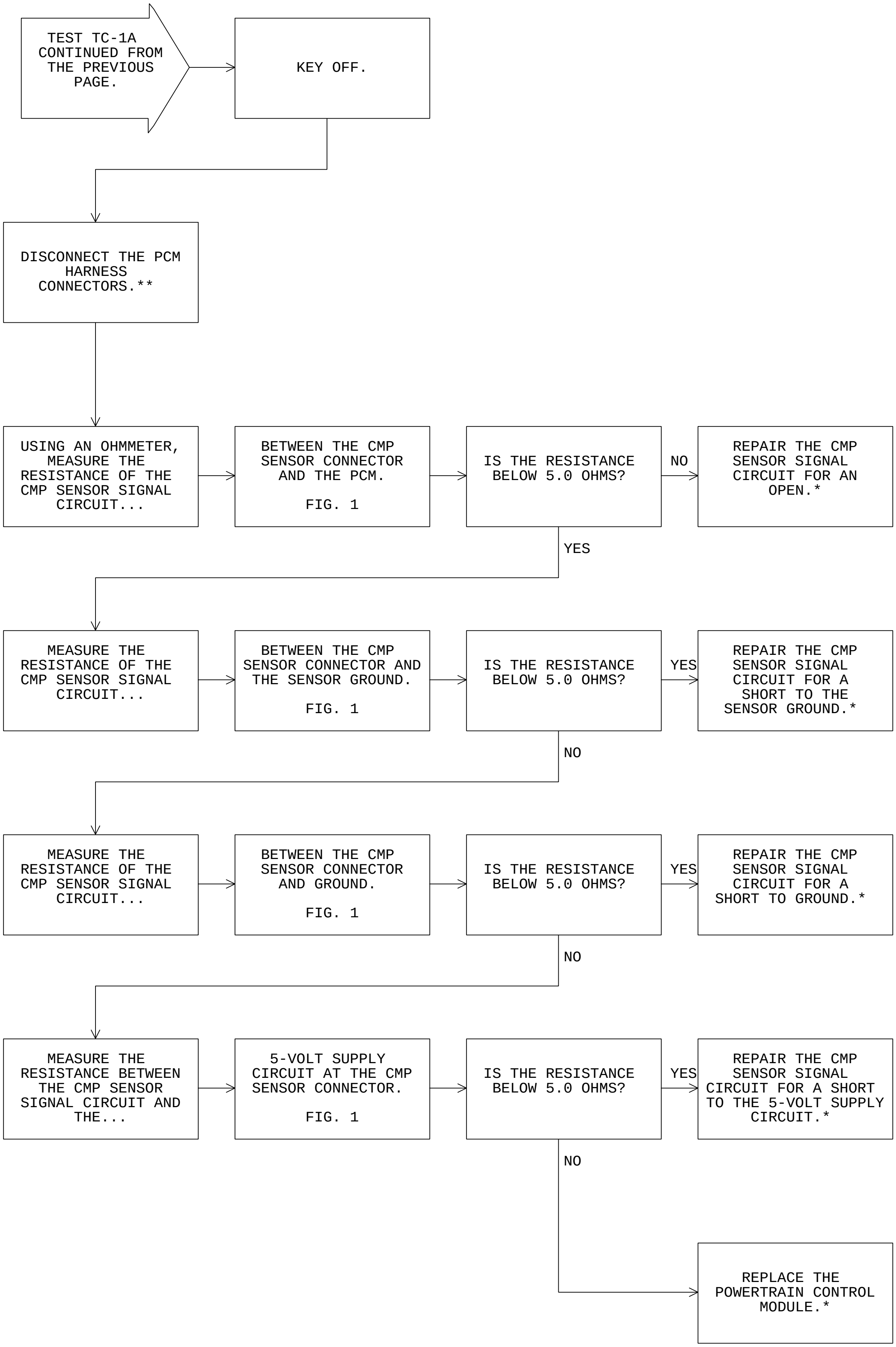
FIG. 1

TEST TC-1A CONTINUED - REPAIRING - NO CAM SIGNAL AT PCM



Perform Verification TEST VER-2A.

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

TEST TC-1B | REPAIRING - NO CAM SIGNAL AT PCM

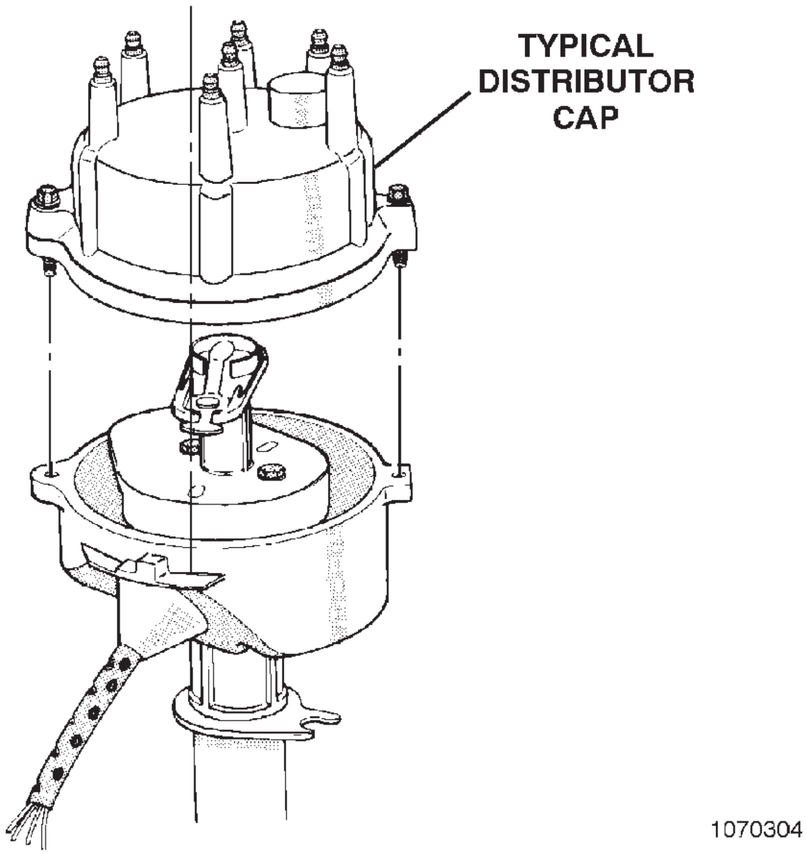


FIG. 1

Name of Code: No Cam Signal at PCM

When monitored: Ignition ON.

Set condition: If 96 crank signals are counted and no signal from the cam position sensor is present 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 5 volts and a ground to power up the sensor. The PCM also supplies a 5-volt pull-up voltage. 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 sensor is high (5.0V); when the trailing edge is clear of the sensor, the signal is low (0.3V).

Possible causes:
- Open 5-volt supply circuit
- Open sensor ground
- Open or shorted signal circuit
- Damaged pulse ring
- Failed sensor
- Failed PCM

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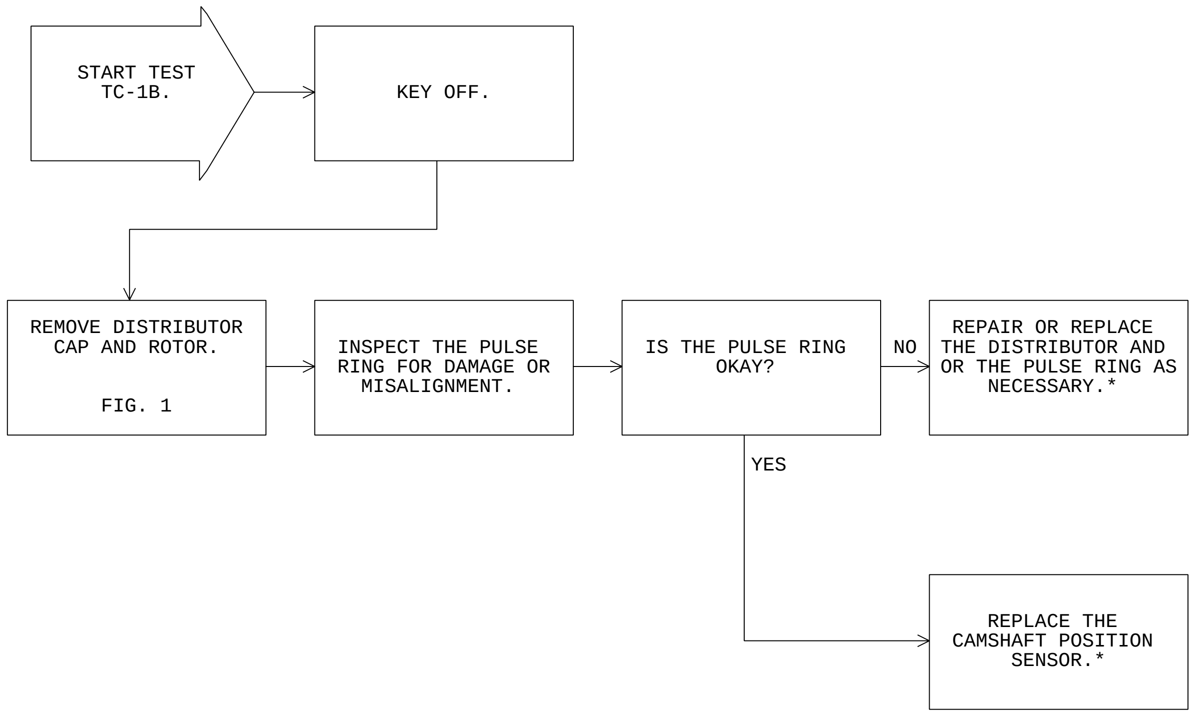
TEST TC-1B REPAIRING - NO CAM SIGNAL AT PCM



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

TEST TC-1C | **REPAIRING - NO CAM SIGNAL AT PCM**

Name of Code: No Cam Signal at PCM

When monitored: Ignition ON.

Set condition: If 96 crank signals are counted and no signal from the cam position sensor is present 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 5 volts and a ground to power up the sensor. The PCM also supplies a 5-volt pull-up voltage. 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 sensor is high (5.0V); when the trailing edge is clear of the sensor, the signal is low (0.3V).

Possible causes:
- Open 5-volt supply circuit
- Open sensor ground
- Open or shorted signal circuit
- Damaged pulse ring
- Failed sensor
- Failed PCM

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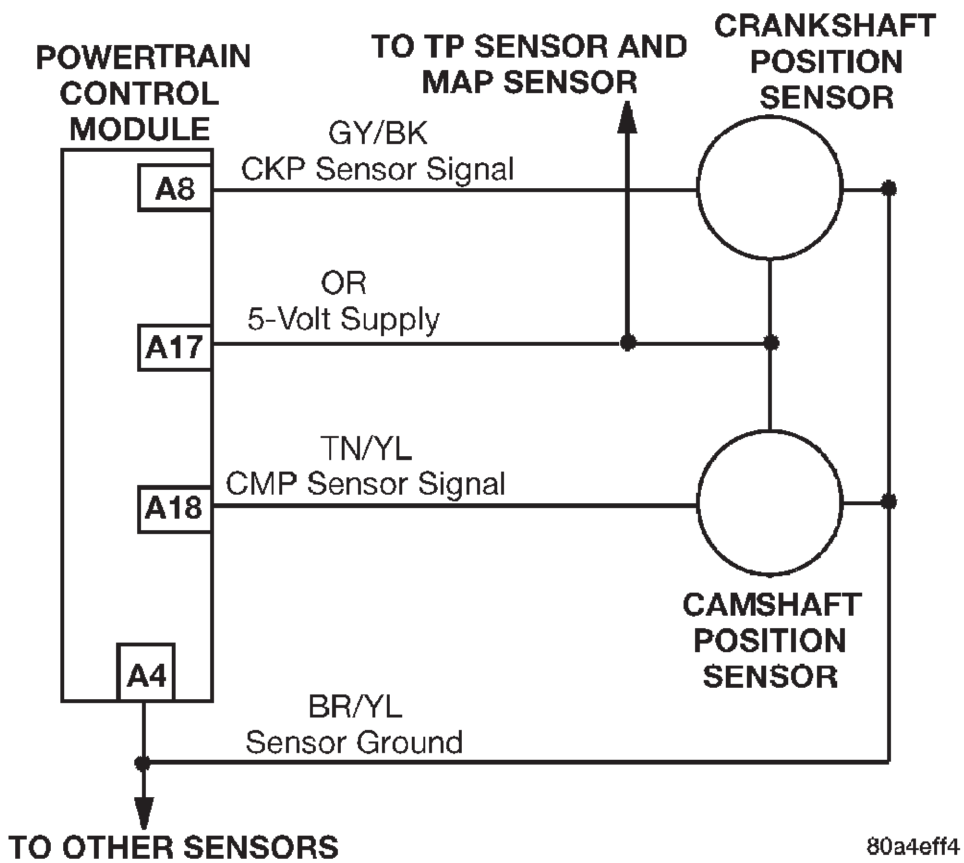
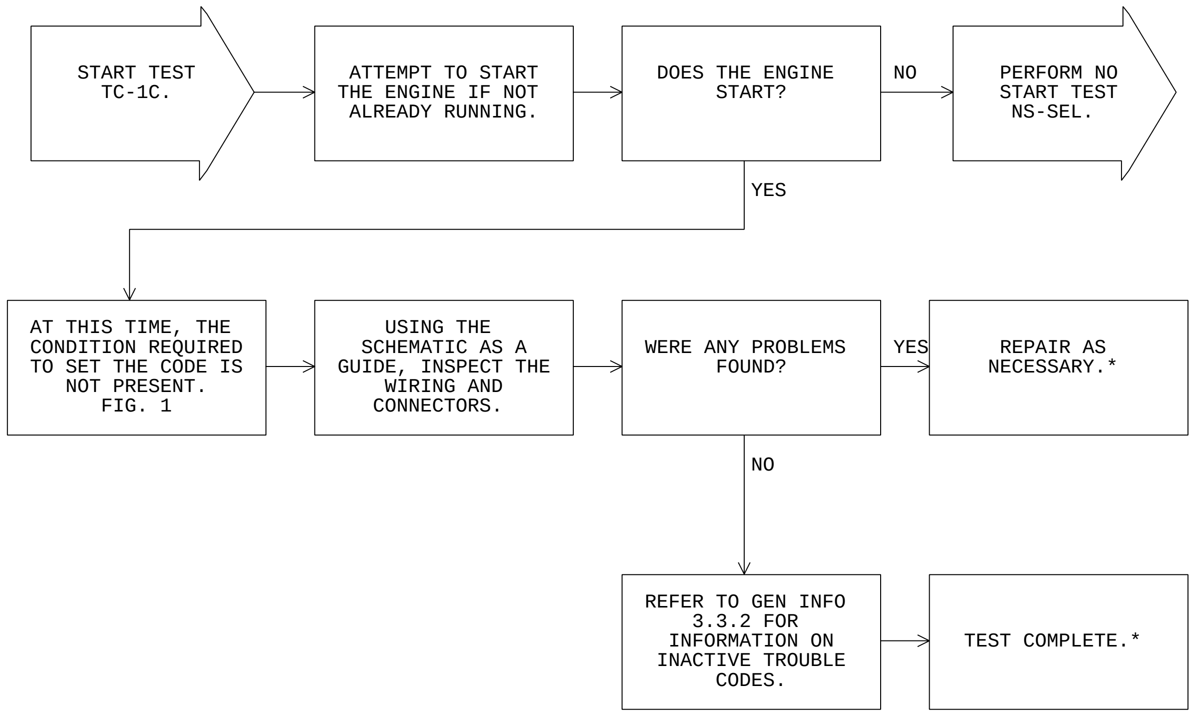
FIG. 1

TJ/XJ BODY



TEST TC-1C | REPAIRING - NO CAM SIGNAL AT PCM



**Perform Verification TEST VER-2A.*

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

TROUBLE CODE TESTS

TEST TC-5A	REPAIRING - CHARGING SYSTEM VOLTAGE TOO LOW

Perform TEST DTC Before Proceeding

Name of code: Charging System Voltage Too Low

When monitored: With the ignition key on and the engine running over 1500 RPM after 25 seconds.

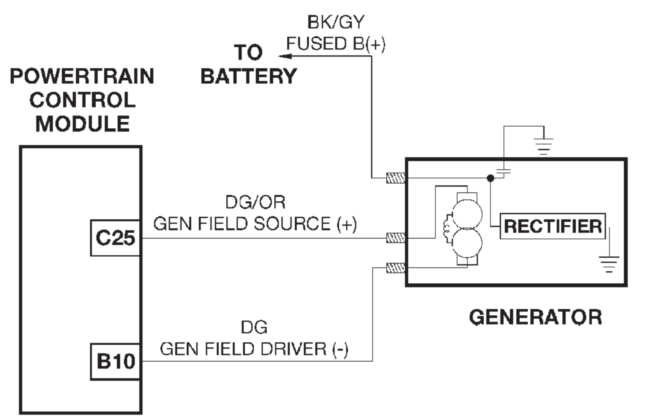
Set condition: When the PCM regulates the generator field and there are no detected field problems but the voltage output does not increase.

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 temp sensor (ambient sensor). The control voltage is compared to the sensed voltage continuously during running. The PCM controls battery voltage by energizing and de-energizing the alternator field winding. When the battery voltage falls below a setpoint voltage, the generator field winding is energized until the battery voltage exceeds a setpoint voltage.

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

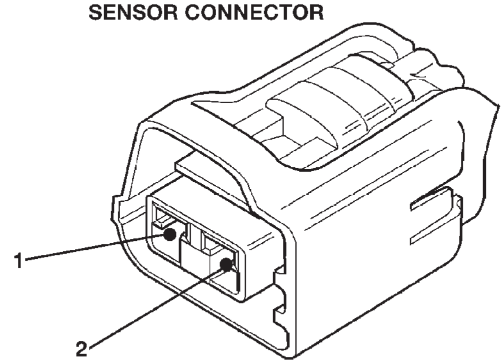
80aa0ff4

TJ/XJ BODY



80b6f0cd

TJ/XJ BODY



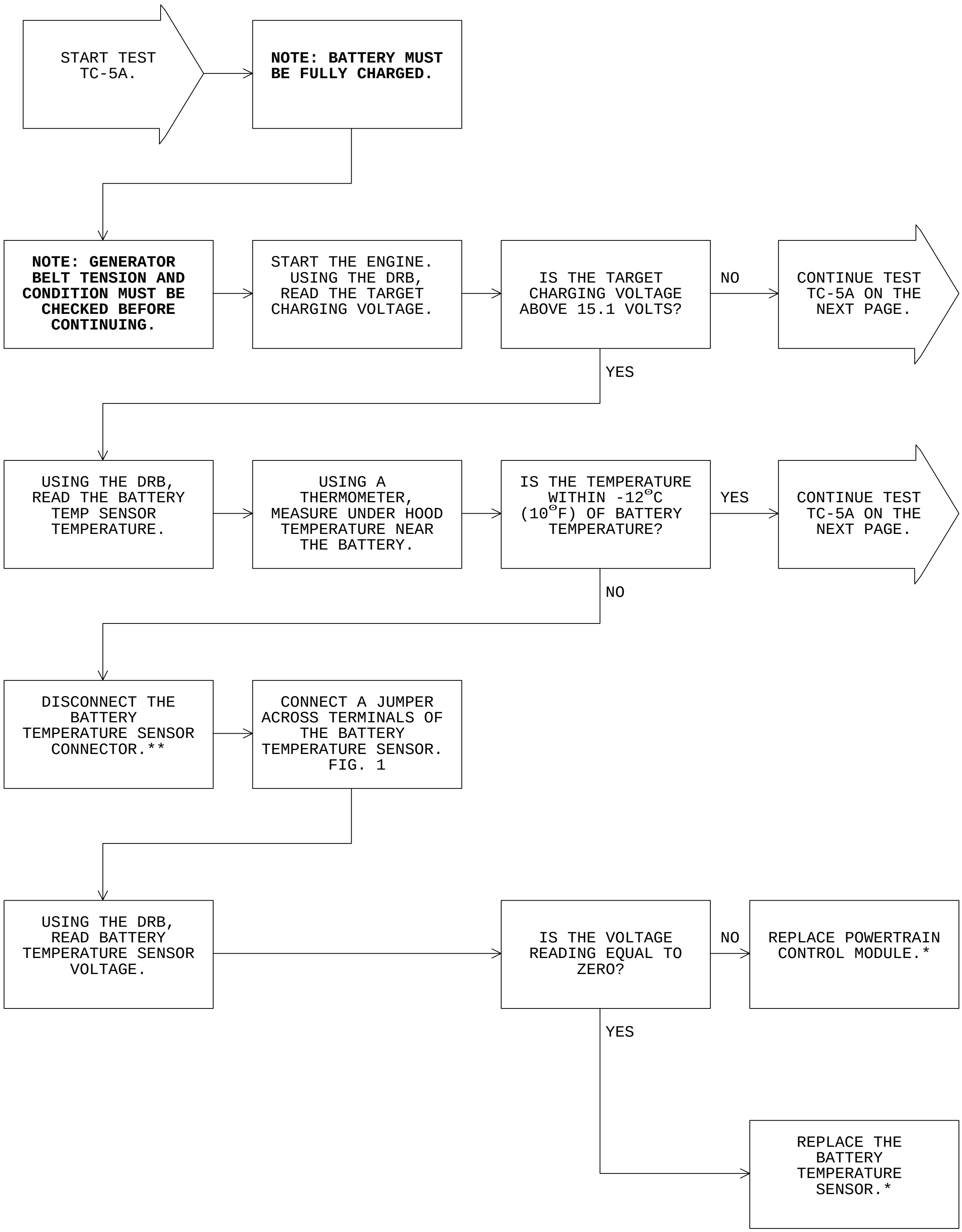
CAV	COLOR	FUNCTION
1	PK/YL	BATTERY TEMP SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

FIG. 1

80aaf127

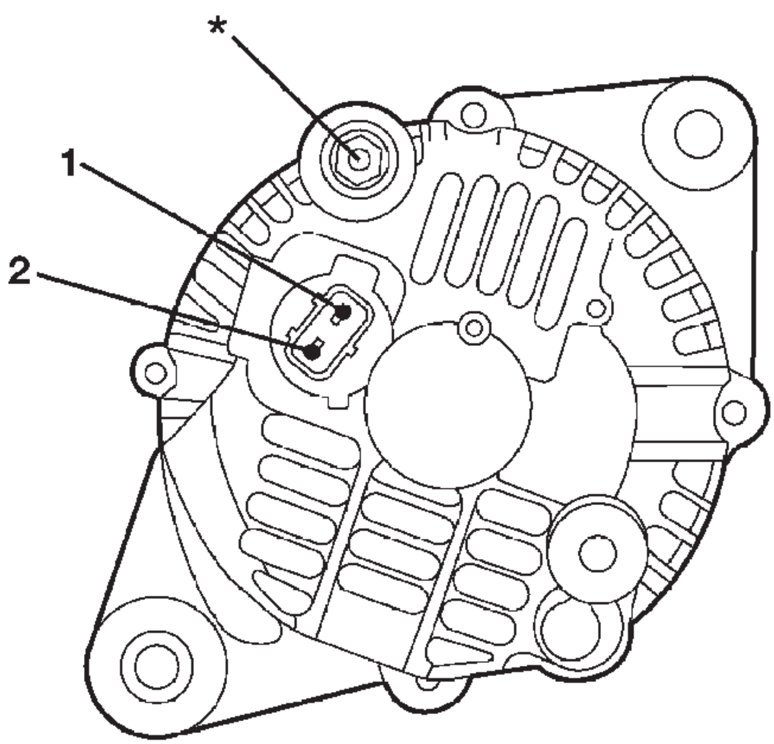
TEST TC-5A	REPAIRING - CHARGING SYSTEM VOLTAGE TOO LOW

Perform TEST DTC Before Proceeding



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

TEST TC-5A	CONTINUED - REPAIRING - CHARGING VOLTAGE TOO LOW



CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD
*	BK/GY	B(+)

80b6b36c

FIG. 1

TEST TC-5A — CONTINUED - REPAIRING - CHARGING VOLTAGE TOO LOW

TEST TC-5A CONTINUED FROM THE PREVIOUS PAGE. → USE A VOLTMETER IN THE FOLLOWING STEP.

MEASURE 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. → MEASURE BETWEEN THE GENERATOR CASE AND BATTERY (-) SIDE. FIG. 1

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 GENERATOR CASE TO BATTERY (-) SIDE.*
- NO ↓

MANUALLY SET ENGINE SPEED TO 1600 RPM. WITH DRB, READ TARGET CHARGING AND VOLTAGE SENSE. → COMPARE THE TWO READINGS. → IS THERE MORE THAN A 1.0 VOLT DIFFERENCE?

- YES → CONTINUE TEST TC-5B ON THE NEXT PAGE.
- NO ↓

ALLOW THE ENGINE TO RETURN TO IDLE SPEED. → TURN ENGINE OFF. (IGNITION KEY ON.) → ERASE TROUBLE CODES. → PERFORM TEST CH-1A.

Perform Verification TEST VER-3A.

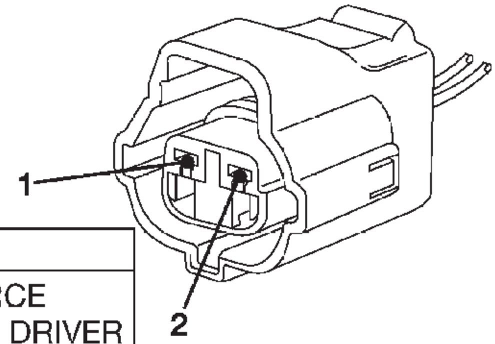
***Check connectors - Clean / repair as necessary.*

TEST TC-5B	REPAIRING - CHARGING SYSTEM VOLTAGE TOO LOW

Perform TEST TC-5A Before Proceeding

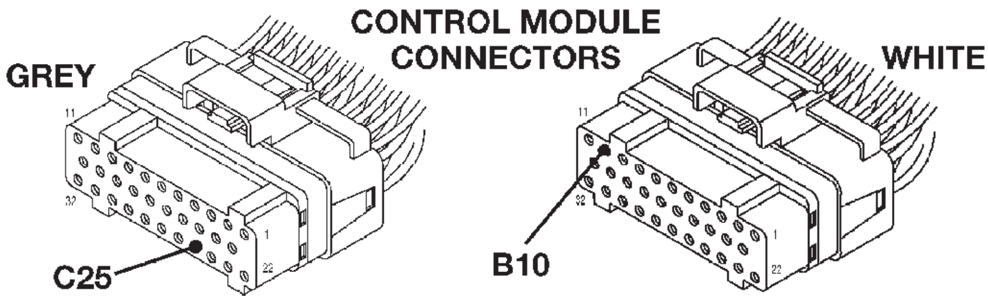
TJ/XJ BODY

GENERATOR FIELD HARNESS CONNECTOR



CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD DRIVER

POWERTRAIN CONTROL MODULE CONNECTORS



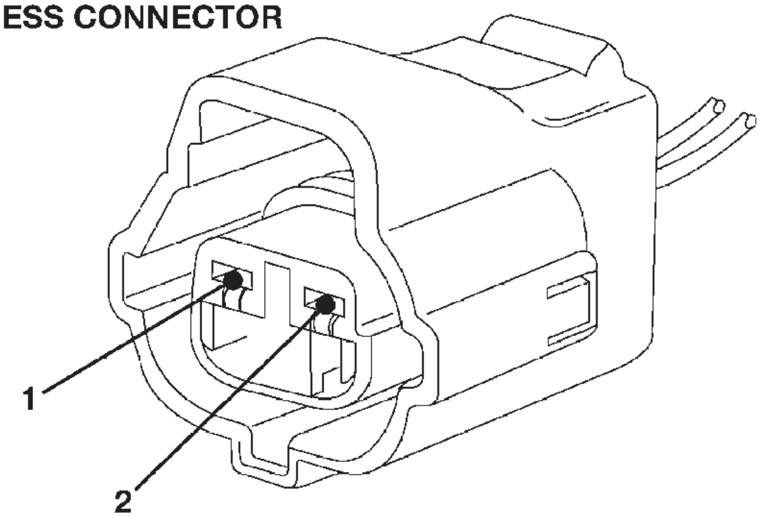
CAV	COLOR	FUNCTION
B10	DG	GENERATOR FIELD DRIVER
C25	DG/OR	GENERATOR FIELD SOURCE

80b6b37b

FIG. 1

TJ/XJ BODY

GENERATOR FIELD HARNESS CONNECTOR



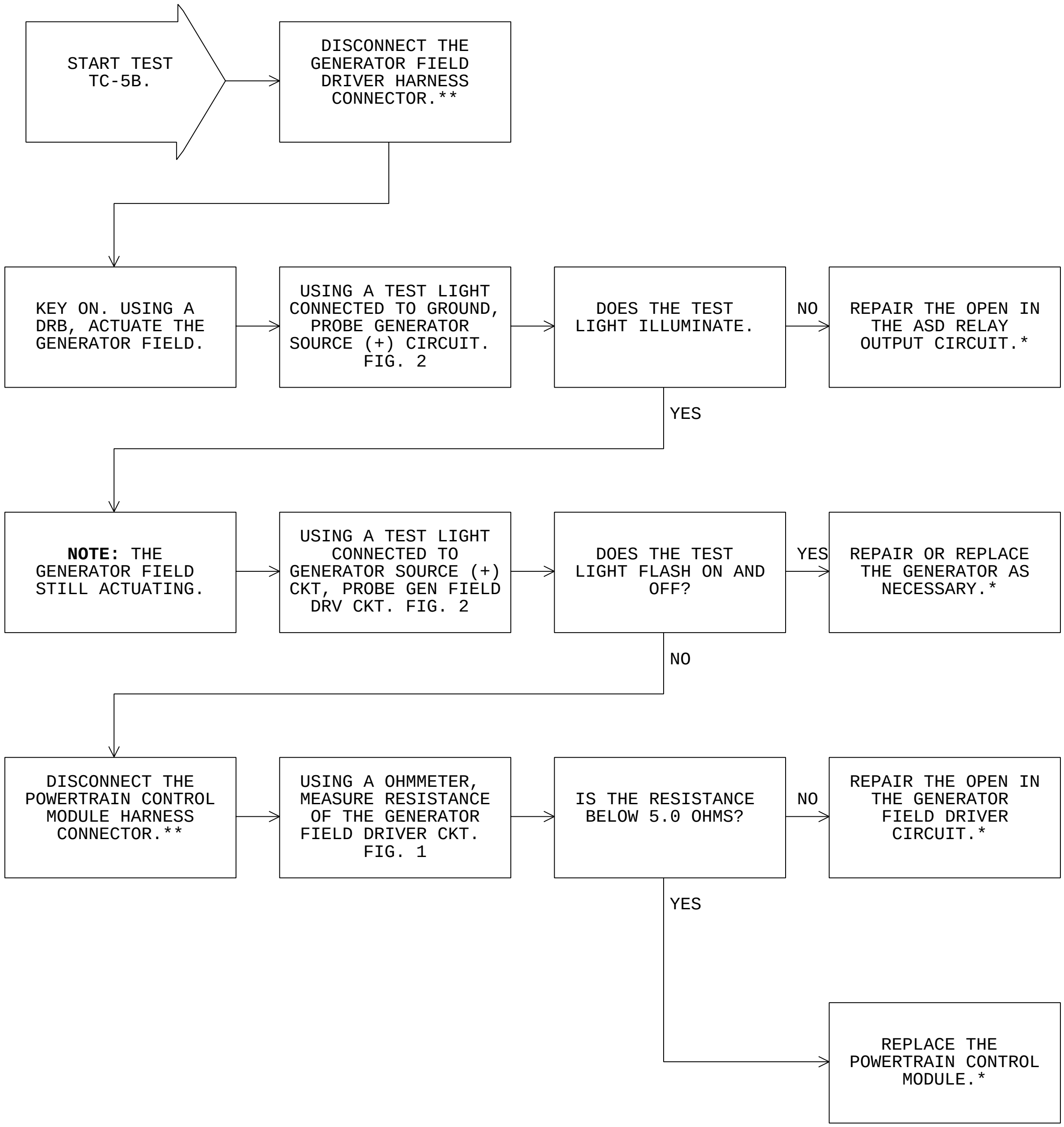
CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD

80b6b12e

FIG. 2

TEST TC-5B — REPAIRING - CHARGING SYSTEM VOLTAGE TOO LOW

Perform TEST TC-5A Before Proceeding



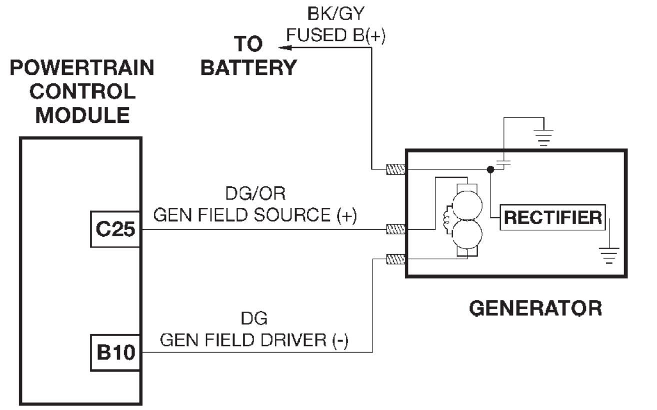
**Perform Verification TEST VER-3A.*

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

TEST TC-6A | REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

Perform TEST DTC Before Proceeding

TJ/XJ BODY



80b6f0cd

Name of code: Charging System Voltage Too High

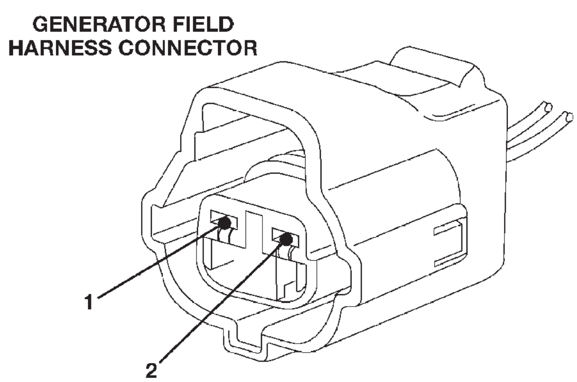
When monitored: With the ignition key on and the engine speed greater than 0 RPM.

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 temp sensor (ambient sensor). The control voltage is compared to the sensed voltage continuously during running. The PCM controls battery voltage by energizing and de-energizing the alternator field winding. When the battery voltage falls below a setpoint voltage, the generator field winding is energized until the battery voltage exceeds a setpoint voltage.

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

80aa0ff2



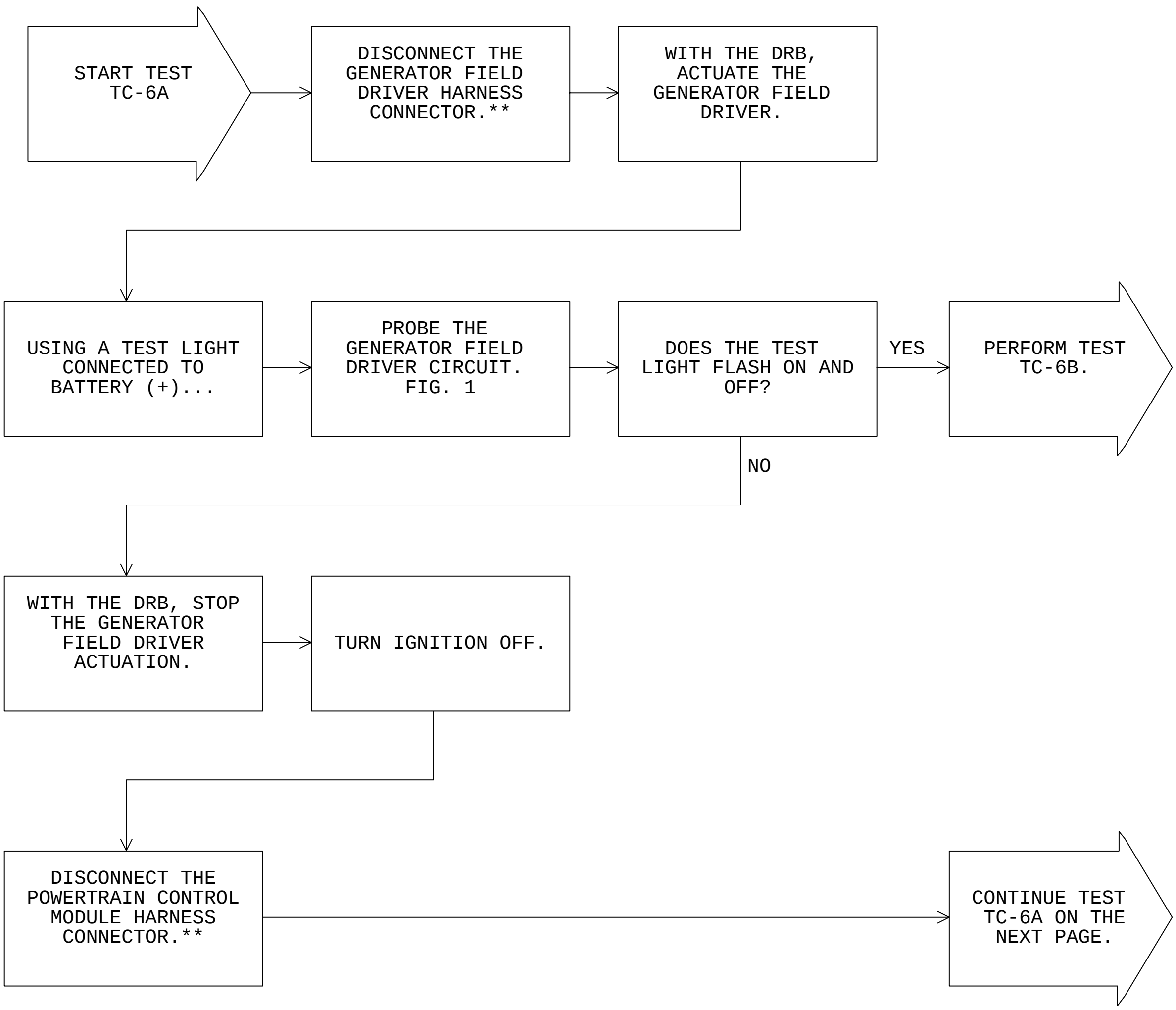
CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD

FIG. 1

80b6b12e

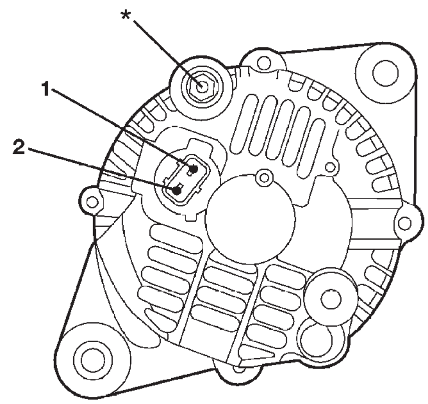
TEST TC-6A REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

Perform TEST DTC Before Proceeding



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

TEST TC-6A — CONTINUED - REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

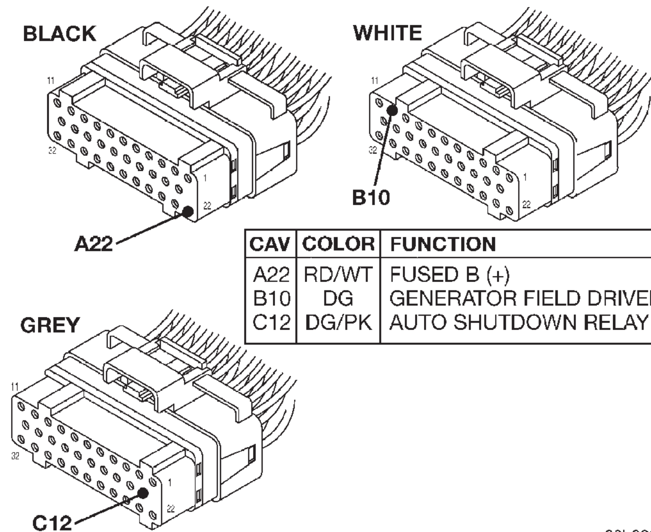


CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD
*	BK/GY	B(+)

FIG. 1

TJ BODY

POWERTRAIN CONTROL MODULE CONNECTORS

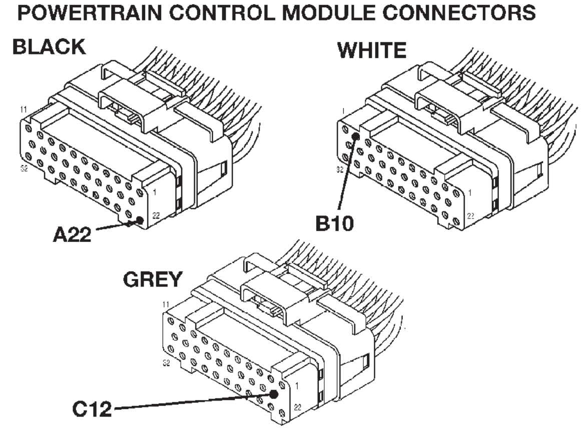


CAV	COLOR	FUNCTION
A22	RD/WT	FUSED B (+)
B10	DG	GENERATOR FIELD DRIVER
C12	DG/PK	AUTO SHUTDOWN RELAY

FIG. 2

XJ BODY

POWERTRAIN CONTROL MODULE CONNECTORS



CAV	COLOR	FUNCTION
A22	DG/BK	FUSED B(+)
B10	DG	GENERATOR FIELD DRIVER
C12	DG/OR	AUTO SHUTDOWN RELAY

FIG. 3

TEST TC-6A — CONTINUED - REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

TEST TC-6A CONTINUED FROM THE PREVIOUS PAGE.

USING AN OHMMETER, MEASURE GEN FIELD DRIVER CKT FROM PCM HARNESS CONN TO GND. FIG. 2 OR 3

IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR THE GENERATOR FIELD DRIVER CIRCUIT SHORTED TO GROUND.*

NO → MEASURE THE RESISTANCE BETWEEN THE FIELD DRIVER OR GEN SOURCE (+) TERMINALS...

AND THE GENERATOR CASE.

FIG. 1

IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR OR REPLACE THE SHORTED GENERATOR AS NECESSARY.*

NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

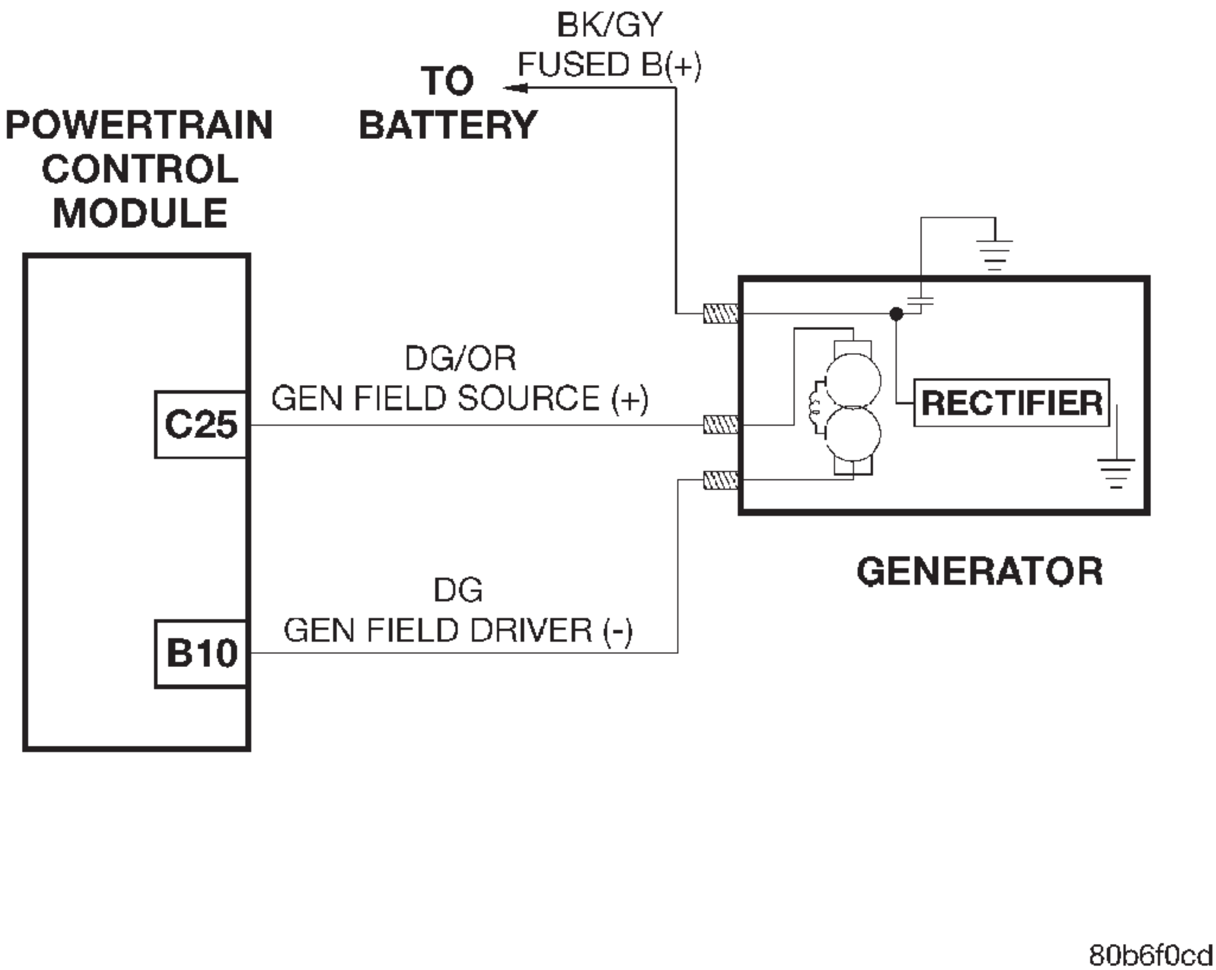
Perform Verification TEST VER-3A.

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

TEST TC-6B	REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

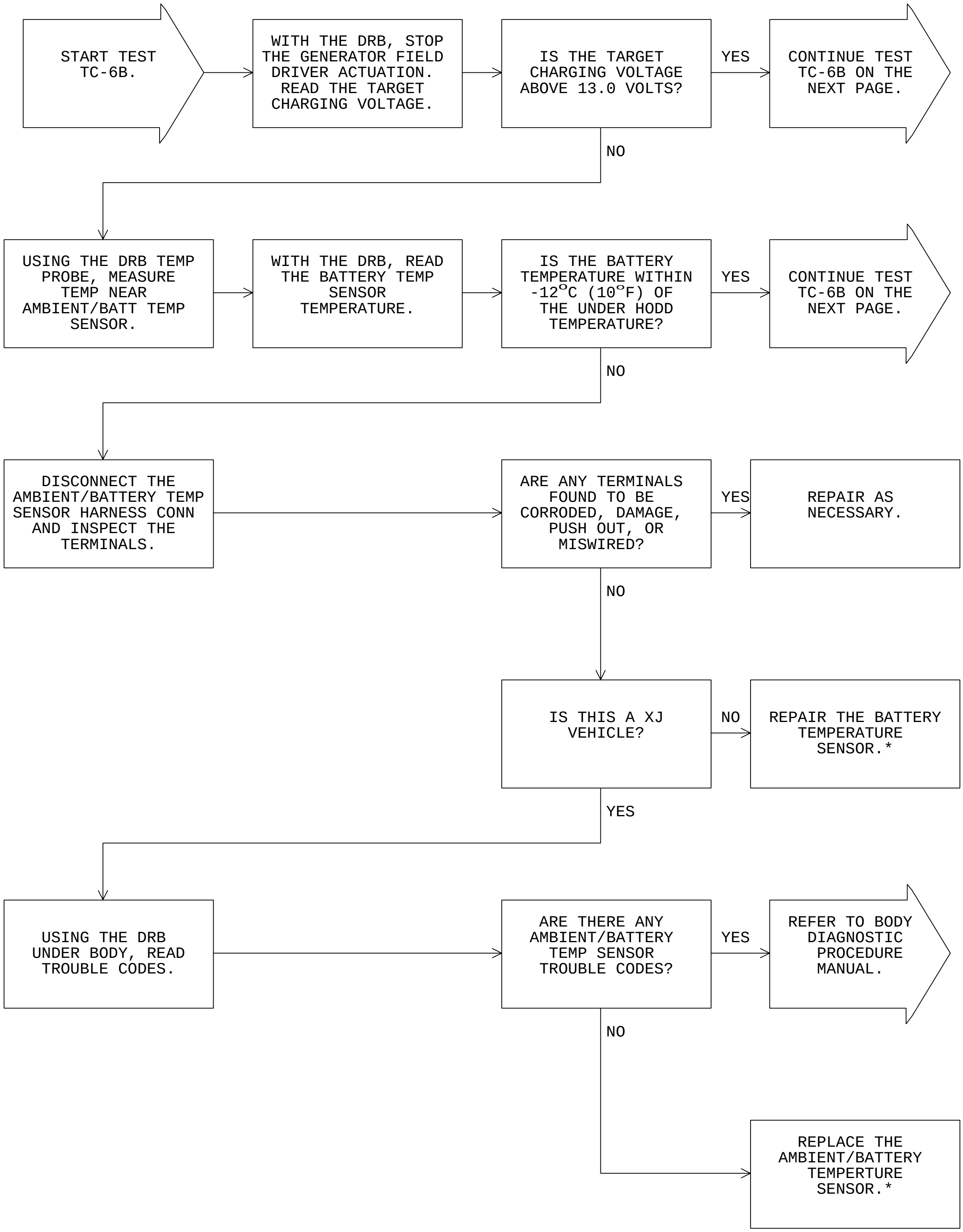
Perform TEST TC-6A Before Proceeding

TJ/XJ BODY



TEST TC-6B REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH

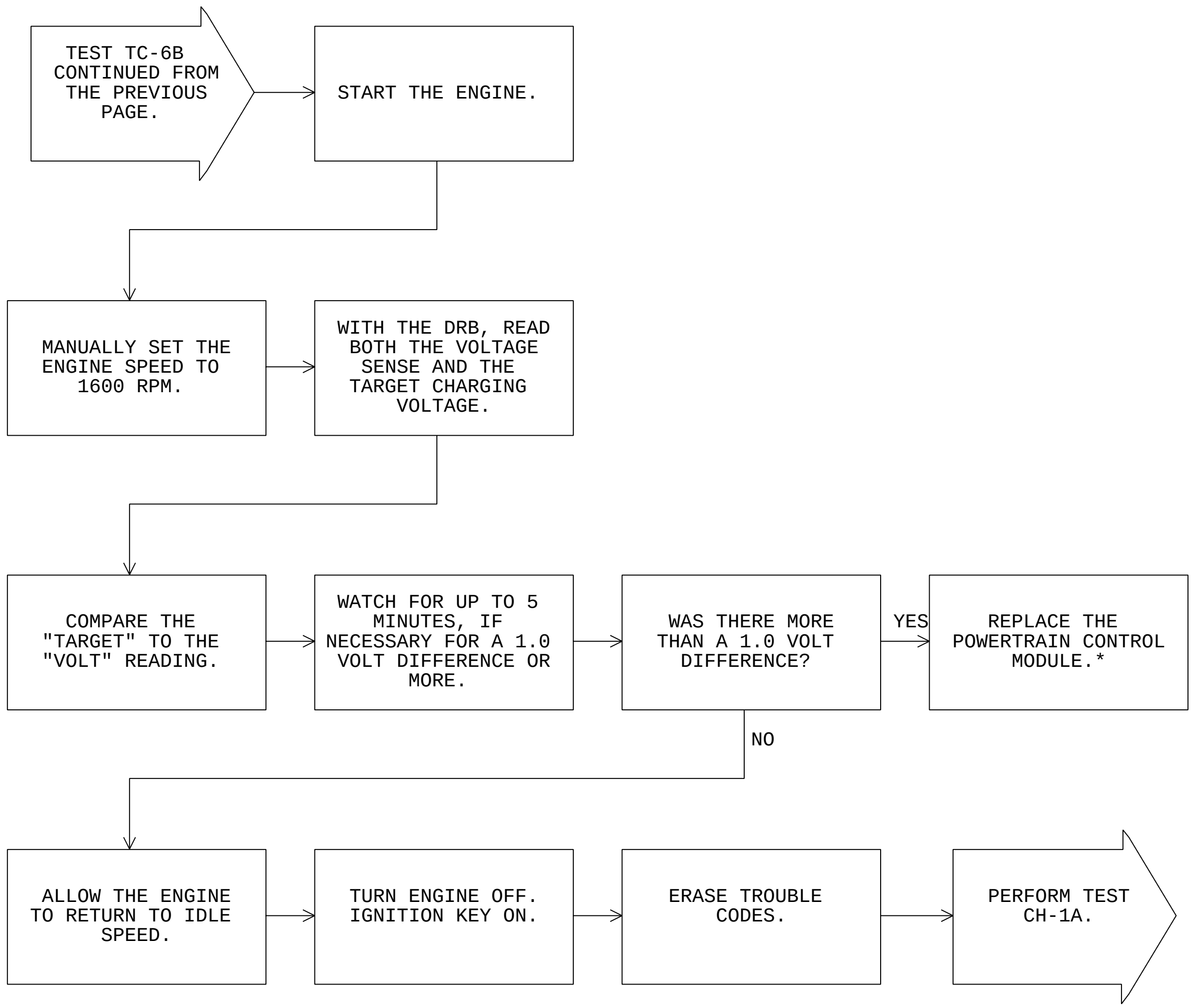
Perform TEST TC-6A Before Proceeding



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

NOTES

TEST TC-6B | **CONTINUED - REPAIRING - CHARGING SYSTEM VOLTAGE TOO HIGH**



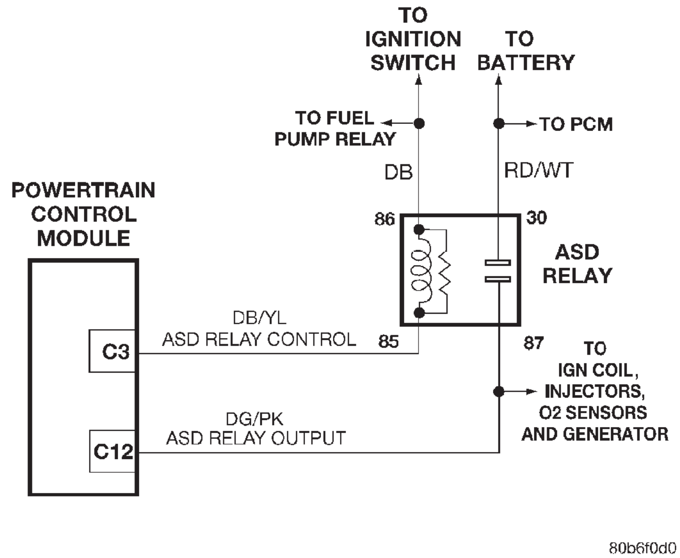
Perform Verification TEST VER-3A. | ***Check connectors - Clean / repair as necessary.**

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

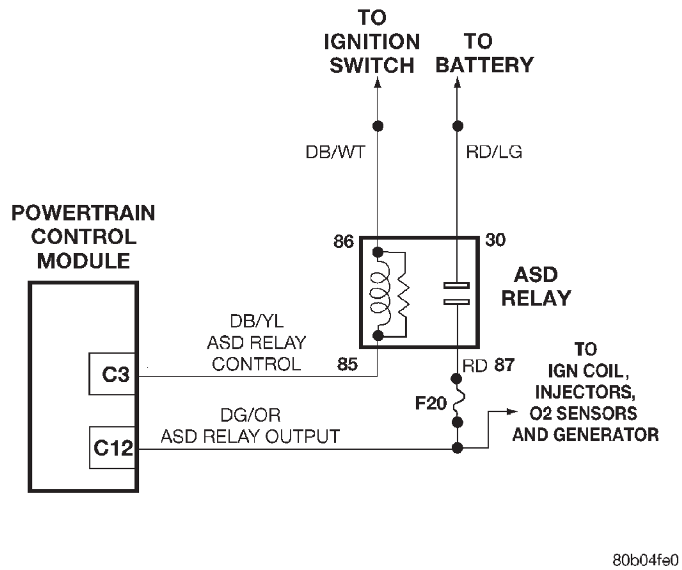
TEST TC-10A — REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



Name of code: Auto Shutdown Relay Control Circuit

When monitored: With ignition key on and battery voltage greater than 10.4 volts.

Theory of operation: The Automatic Shutdown Relay (ASD) controls the 12-volt source to the fuel injectors, ignition coil(s), and the oxygen heaters. (And low pressure shutoff solenoid on CNG). The relay is located in the Power Distribution Center (PDC). One side of the relay control coil is supplied with battery voltage when the ignition switch is in the start or 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 control circuit when the ignition switch is in the start or run position and engine RPM is detected. If engine RPM is not detected, the PCM will remove the ASD relay control circuit ground.

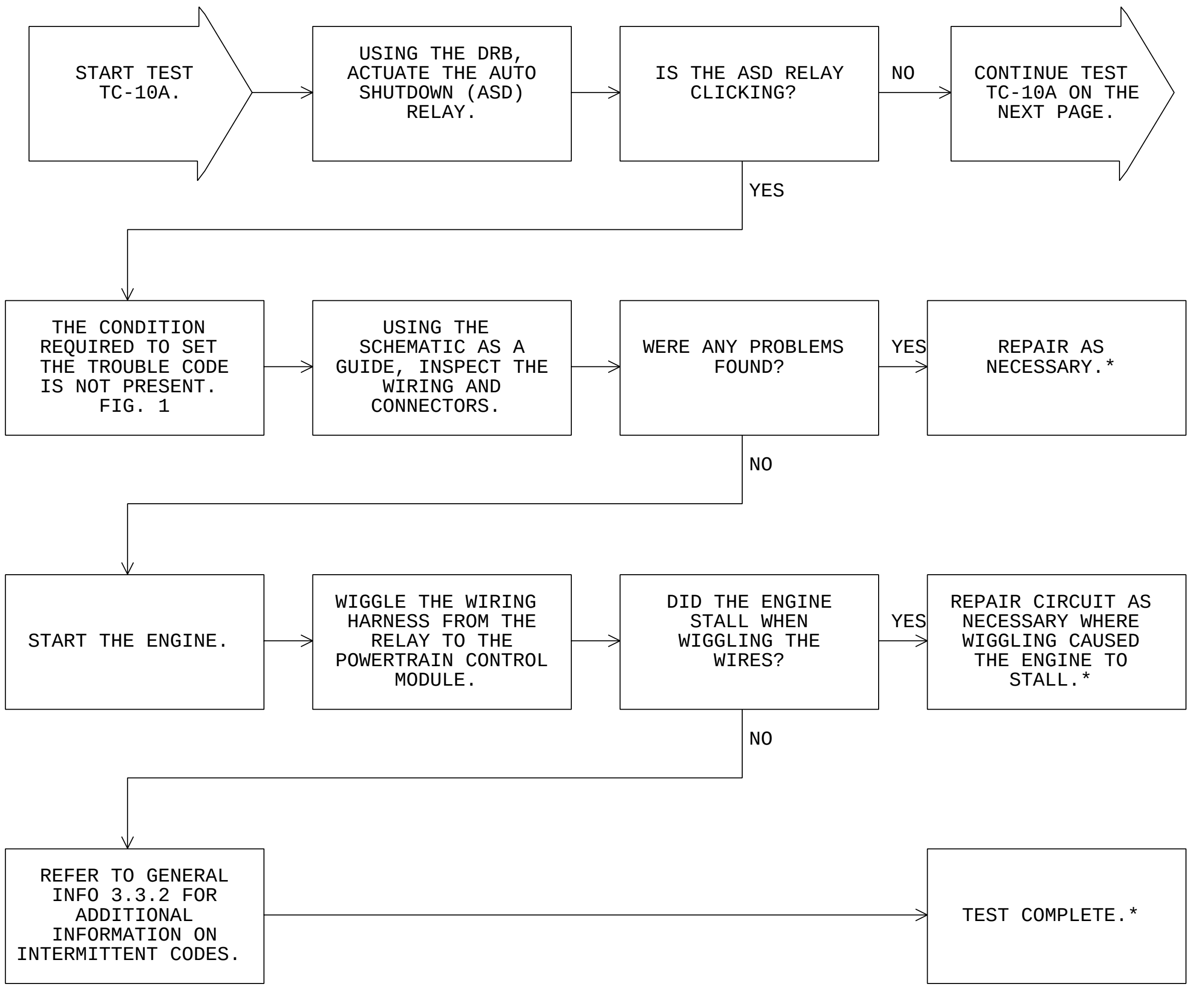
Possible causes:
- > Relay coil open or shorted.
- > Fused ignition switch output circuit open.
- > Auto shutdown relay control circuit open or shorted.
- > Inoperative circuit driver in PCM (PCM Failure)
- > Connector terminals

80a9b324

FIG. 1

TEST TC-10A — REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

Perform TEST DTC Before Proceeding



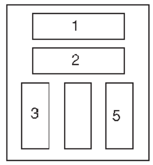
Perform Verification TEST VER-2A.	***Check connectors - Clean / repair as necessary.*

TEST TC-10A — CONTINUED - REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

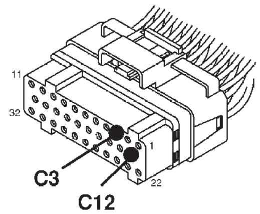
TJ BODY

AUTO SHUTDOWN RELAY CONNECTOR (IN PDC)

CAV	COLOR	FUNCTION
1 (30)	RD/WT	FUSED B+
2 (87)	DG/PK	AUTO SHUTDOWN RELAY OUTPUT
3 (86)	DB	IGNITION SWITCH OUTPUT
5 (85)	DB/YL	AUTO SHUTDOWN RELAY CONTROL



POWERTRAIN CONTROL MODULE GREY CONNECTOR



CAV	COLOR	FUNCTION
C3	DB/YL	AUTO SHUTDOWN RELAY CONTROL
C12	DG/PK	AUTO SHUTDOWN RELAY OUTPUT

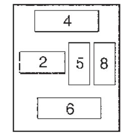
80b76e90

FIG. 1

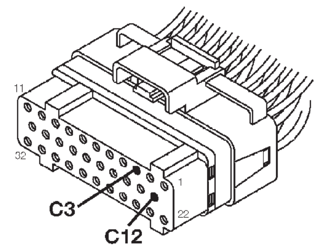
XJ BODY

AUTO SHUTDOWN RELAY CONNECTOR (IN PDC)

CAV	COLOR	FUNCTION
2 (30)	RD/LG	FUSED B(+)
4 (85)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (86)	DB/YL	ASD RELAY CONTROL
8 (87)	RD	ASD RELAY OUTPUT



POWERTRAIN CONTROL MODULE GREY CONNECTOR

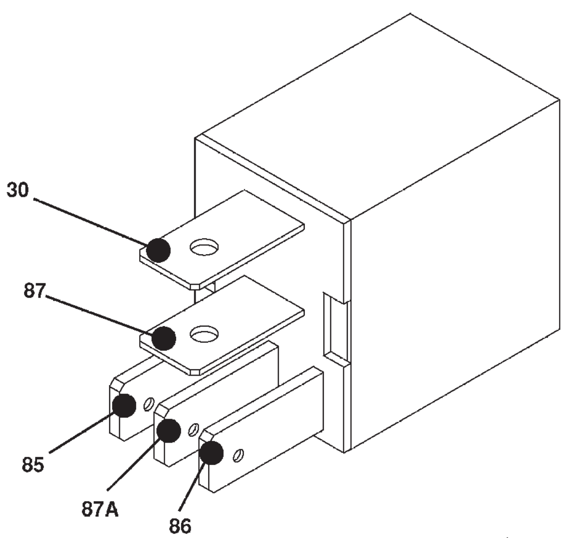


CAV	COLOR	FUNCTION
C3	DB/YL	AUTO SHUTDOWN RELAY CONTROL
C12	DG/OR	AUTO SHUTDOWN RELAY OUTPUT

80b76e93

FIG. 2

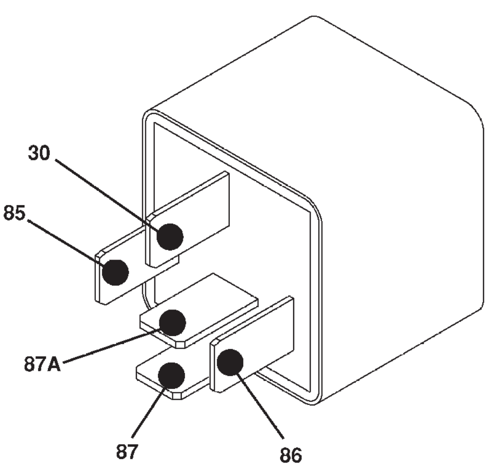
TJ BODY



80b76e97

FIG. 3

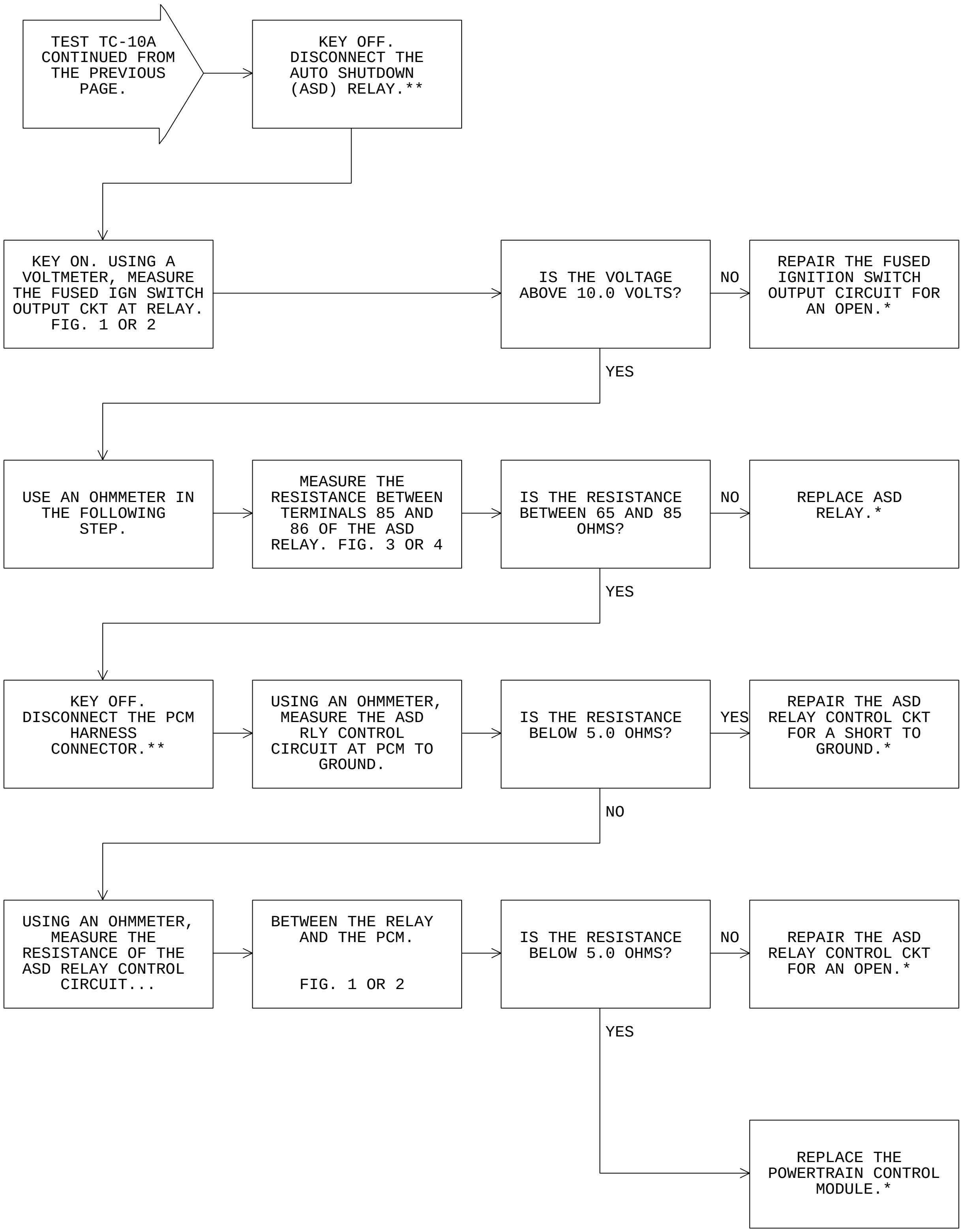
XJ BODY



80b76e98

FIG. 4

TEST TC-10A | CONTINUED - REPAIRING - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

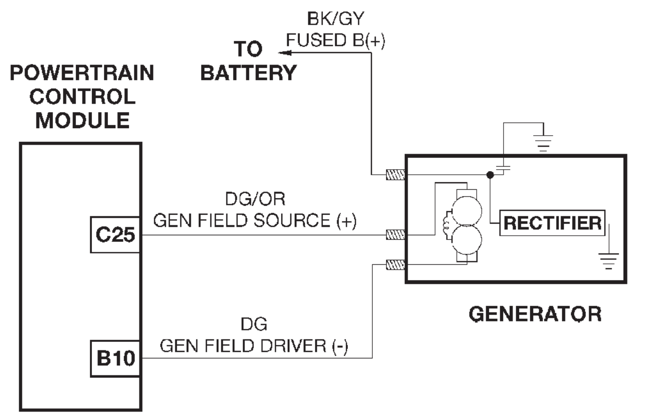


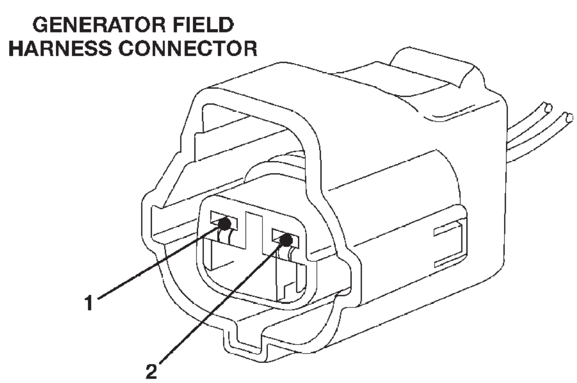
***Perform Verification TEST VER-2A.** | ****Check connectors - Clean / repair as necessary.**

TEST TC-11A — REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

Perform TEST DTC Before Proceeding

TJXJ BODY





CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD

80b6b12e

FIG. 1

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 temp sensor (ambient sensor). 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.

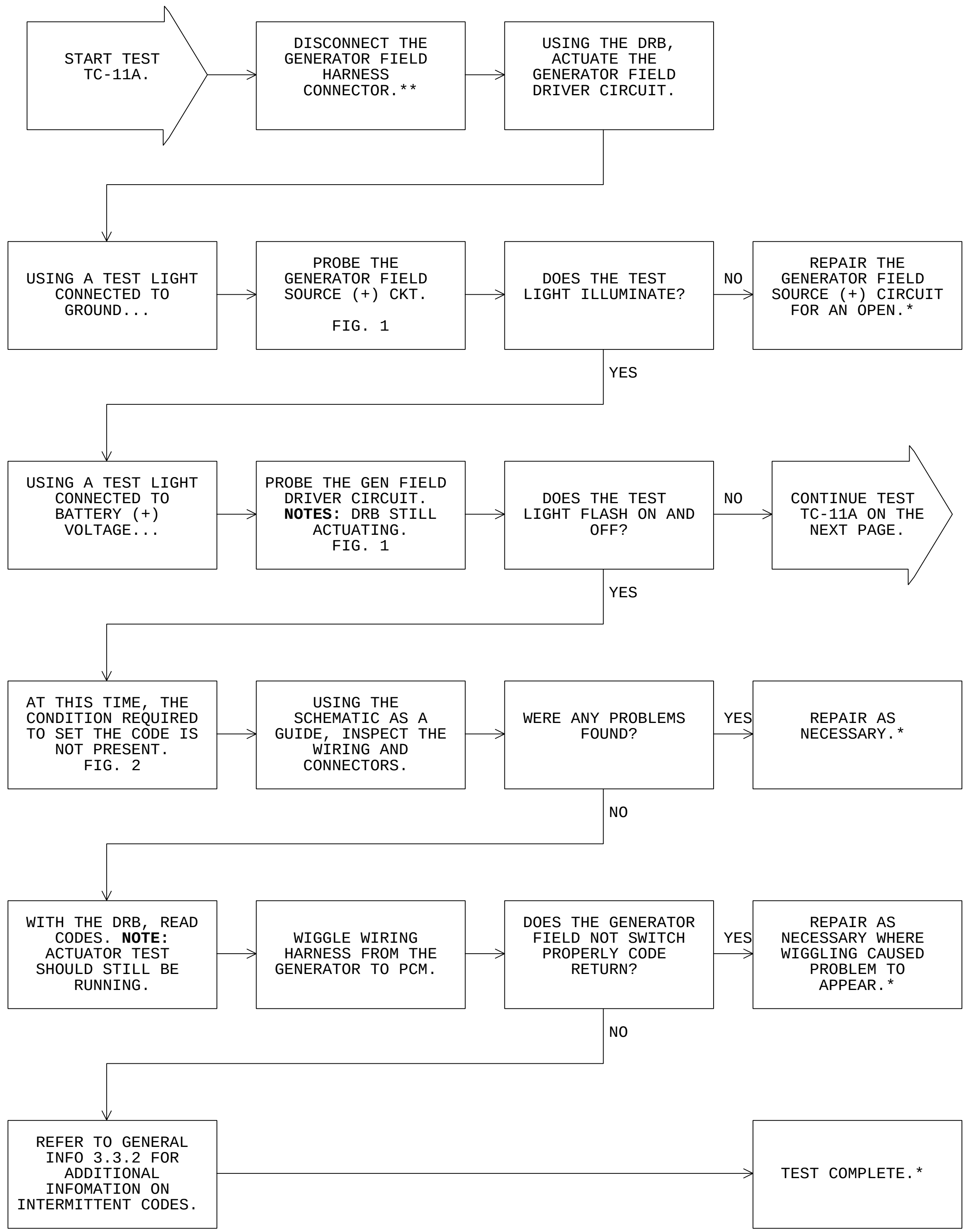
Possible causes:
> Field driver circuit open or shorted
> Generator internal open or short
> PCM failed

2360602

FIG. 2

TEST TC-11A	REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

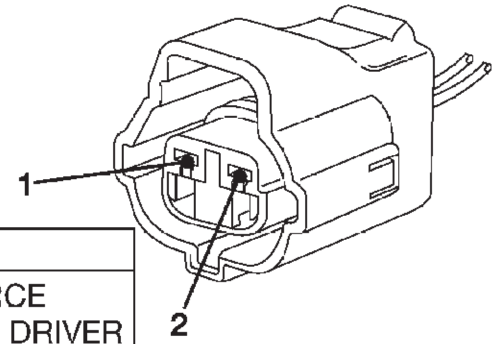
Perform TEST DTC Before Proceeding



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

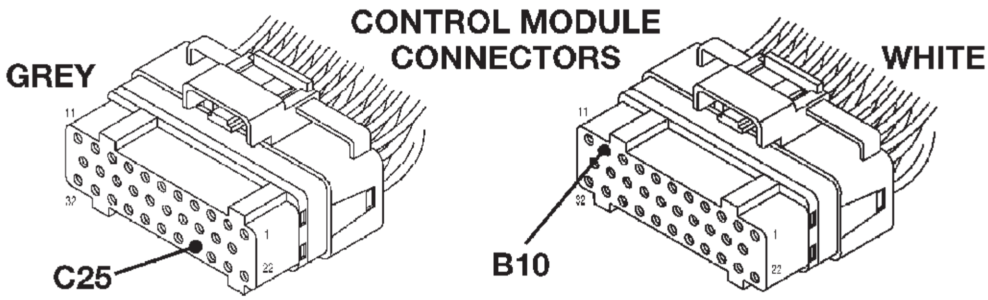
TEST TC-11A	CONTINUED - REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

GENERATOR FIELD HARNESS CONNECTOR



CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD DRIVER

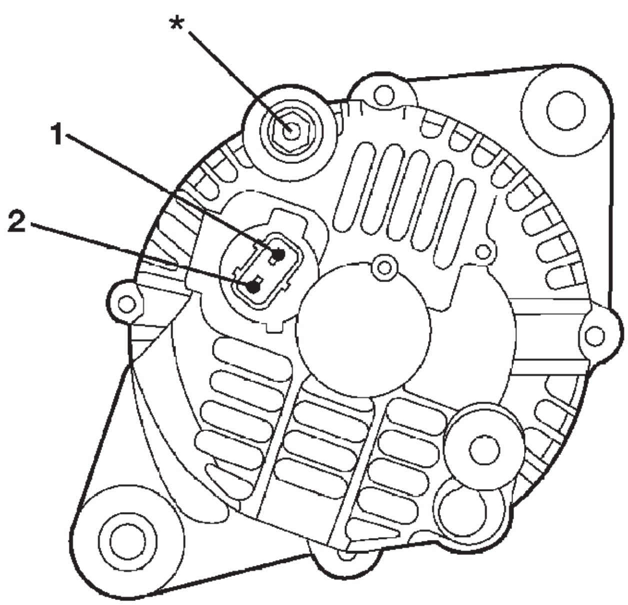
POWERTRAIN CONTROL MODULE CONNECTORS



CAV	COLOR	FUNCTION
B10	DG	GENERATOR FIELD DRIVER
C25	DG/OR	GENERATOR FIELD SOURCE

80b6b37b

FIG. 1



CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD
*	BK/GY	B(+)

80b6b36c

FIG. 2

TEST TC-11A — CONTINUED - REPAIRING - GENERATOR FIELD NOT SWITCHING PROPERLY

TEST TC-11A CONTINUED FROM THE PREVIOUS PAGE.

→ USING THE DRB, STOP THE GENERATOR FIELD DRIVER ACTUATION.

→ KEY OFF. DISCONNECT THE POWERTRAIN CONTROL MODULE.**

→ USE A OHMMETER IN THE FOLLOWING STEPS.

→ MEASURE RESISTANCE OF THE GEN FIELD DRIVER CKT, BETWEEN GEN FIELD CONN TO PCM CONN. FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?

- NO → REPAIR GENERATOR FIELD DRIVER CIRCUIT FOR AN OPEN.*
- YES → MEASURE RESISTANCE ACROSS THE GENERATOR FIELD TERMINALS AT GENERATOR. FIG. 2

→ IS THE RESISTANCE BELOW 5.0 OHMS?

- NO → REPAIR OR REPLACE THE GENERATOR AS NECESSARY.*
- YES → MEASURE THE GEN FIELD DRIVER CIRCUIT AT GENERATOR HARNESS CONN TO GROUND. FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?

- YES → REPAIR THE GENERATOR FIELD DRIVER CIRCUIT FOR A SHORT TO GROUND.*
- NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

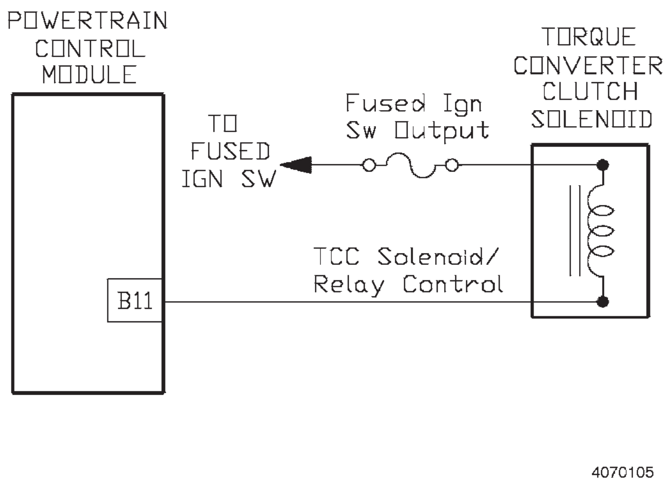
**Perform Verification TEST VER-3A.*

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

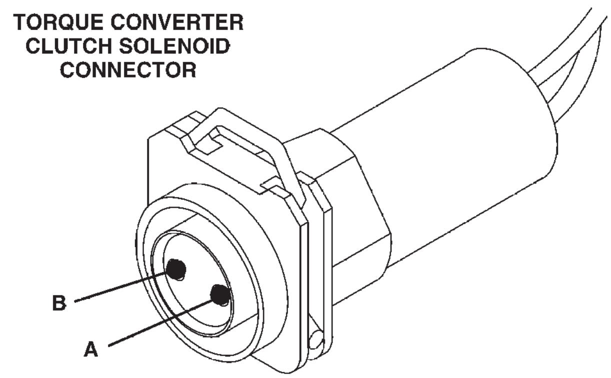
TEST TC-12A	REPAIRING TORQUE CONVERTER CLUTCH/TRANS RELAY CKT (TJ/XJ BODY WITH 3SPD AUTO TRANS)

Perform TEST DTC Before Proceeding

TJ/XJ BODY WITH 3 SPD AUTO TRANS



TJ/XJ BODY WITH 3 SPD AUTO TRANS

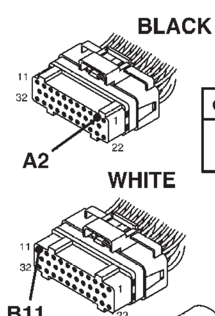


CAV	COLOR	FUNCTION
A	RD/LG	FUSED IGNITION SWITCH OUTPUT (TJ ALL A/T)
A	WT	FUSED IGNITION SWITCH OUTPUT (XJ 2.5L A/T)
B	OR/LG	TCC SOLENOID CONTROL (TJ ALL A/T)
B	OR/BK	TCC SOLENOID CONTROL (XJ 2.5L A/T)

80b76f2b

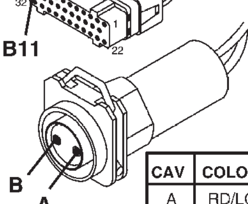
FIG. 1

TJ/XJ BODY WITH 3 SPD AUTO TRANS



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
B11	OR/LG	TCC SOLENOID CONTROL (TJ ALL A/T)
B11	OR/BK	TCC SOLENOID CONTROL (XJ 2.5L A/T)



TORQUE CONVERTER CLUTCH SOLENOID CONNECTOR

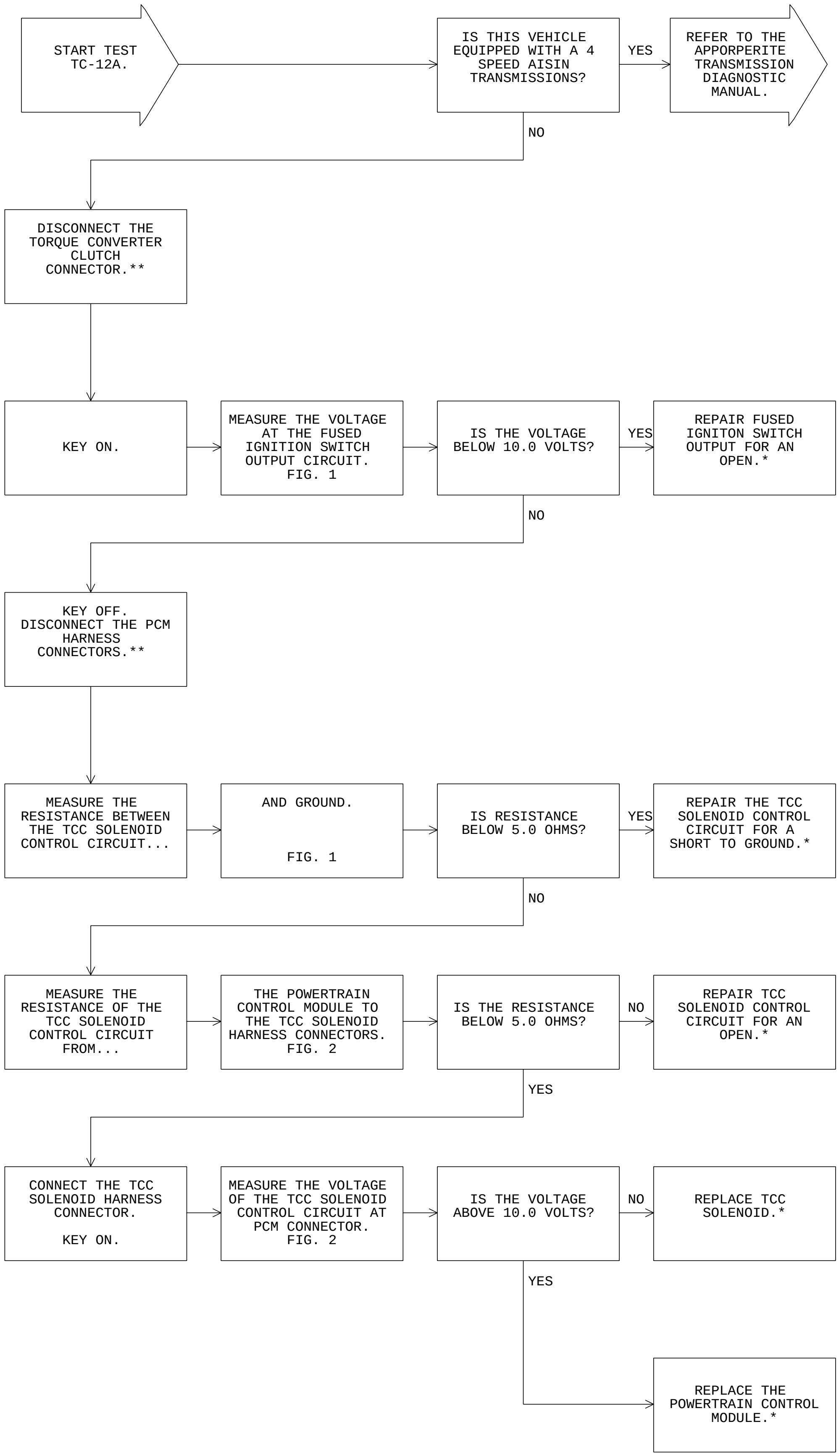
CAV	COLOR	FUNCTION
A	RD/LG	FUSED IGNITION SWITCH OUTPUT (TJ ALL A/T)
A	WT	FUSED IGNITION SWITCH OUTPUT (XJ 2.5L A/T)
B	OR/LG	TCC SOLENOID CONTROL (TJ ALL A/T)
B	OR/BK	TCC SOLENOID CONTROL (XJ 2.5L A/T)

80b6b1ca

FIG. 2

TEST TC-12A — REPAIRING TORQUE CONVERTER CLUTCH/TRANS RELAY CKT (TJ/XJ BODY WITH 3SPD AUTO TRANS)

Perform TEST DTC Before Proceeding



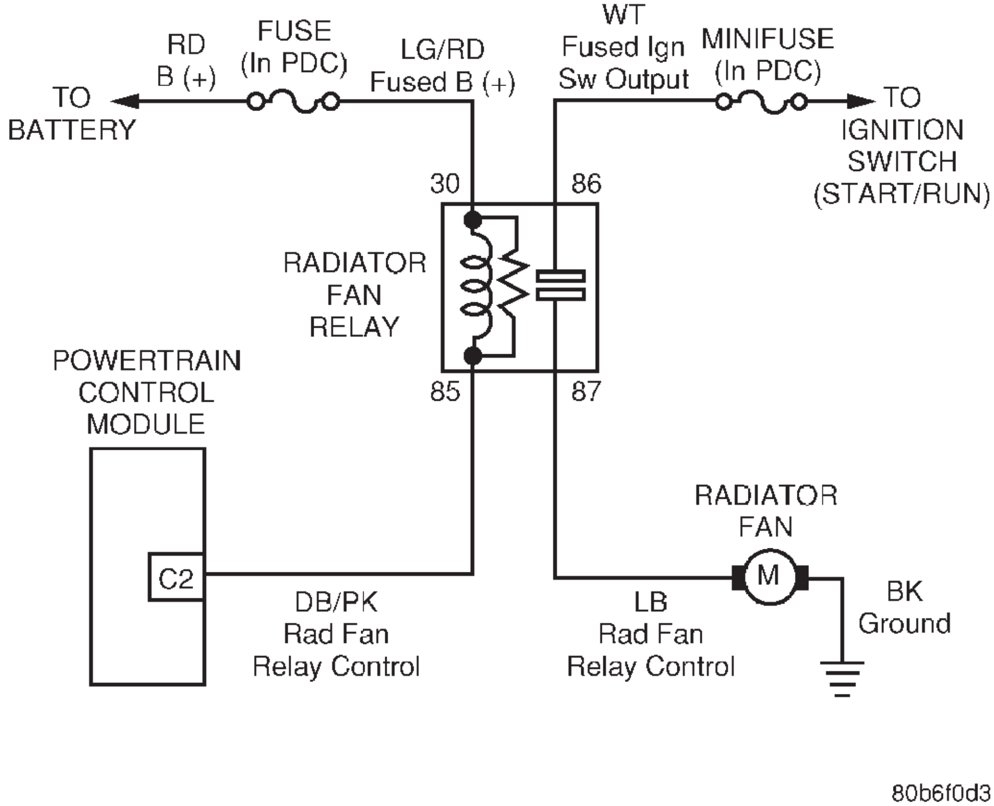
**Perform Verification TEST VER-2A.*

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

TEST TC-14A	REPAIRING - RADIATOR FAN RELAY CIRCUIT

Perform TEST DTC Before Proceeding

XJ BODY



XJ BODY

Name of Code: Rad Fan Control Relay Circuit

When monitored: With the ignition key on and battery voltage greater than 10.4 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.

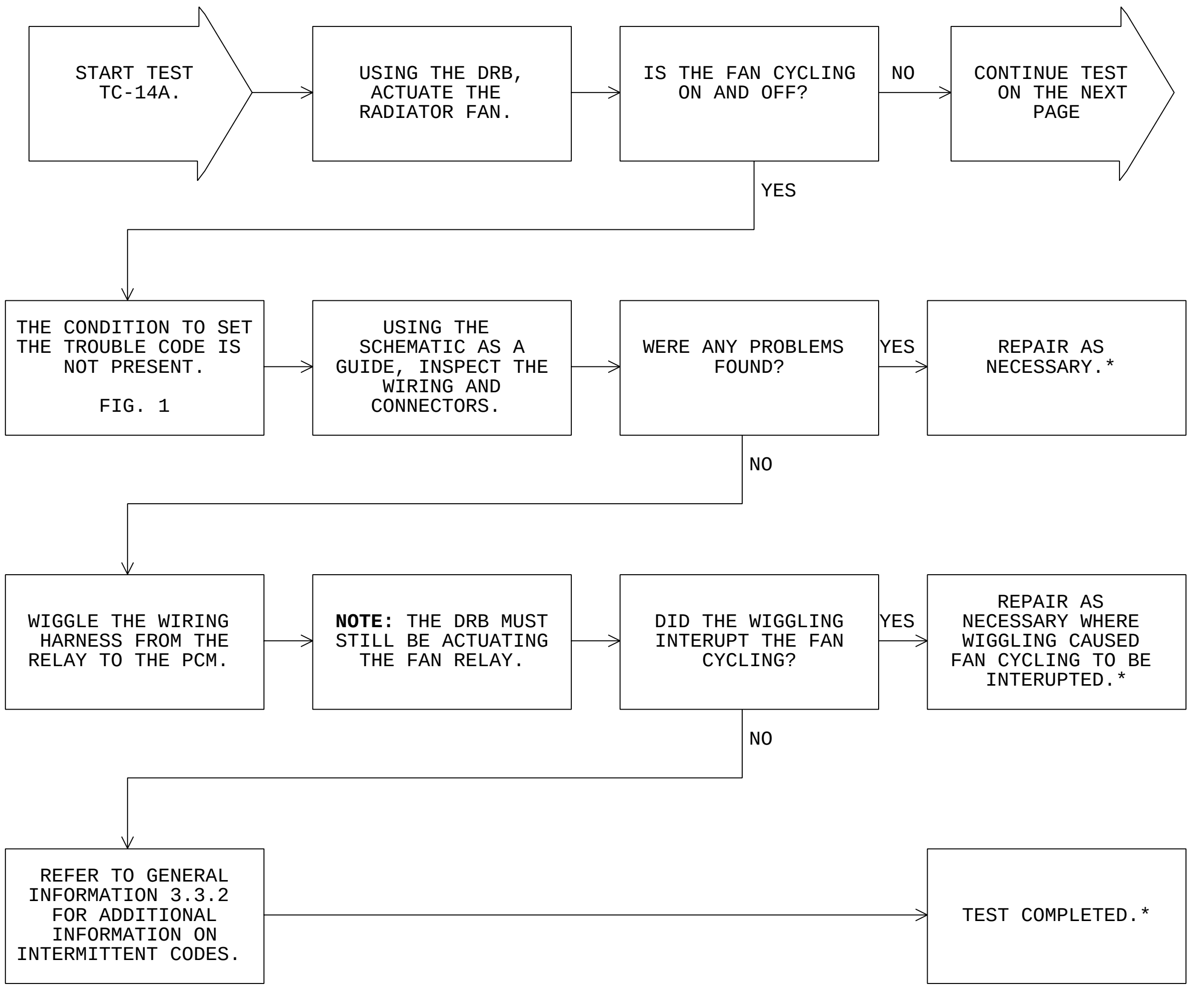
Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Low speed radiator fan relay control circuit open or shorted
> PCM failure
> Connector terminals
> Connector wires

80aa4c32

FIG. 1

TEST TC-14A REPAIRING - RADIATOR FAN RELAY CIRCUIT

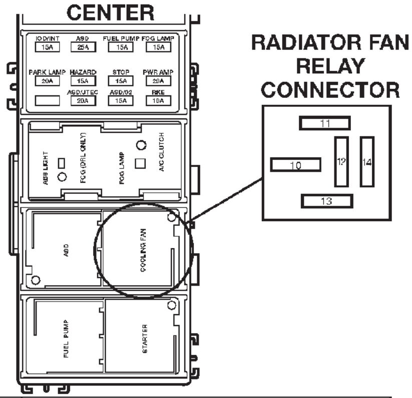
Perform TEST DTC Before Proceeding



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

TEST TC-14A — CONTINUED - REPAIRING - RADIATOR FAN RELAY CIRCUIT

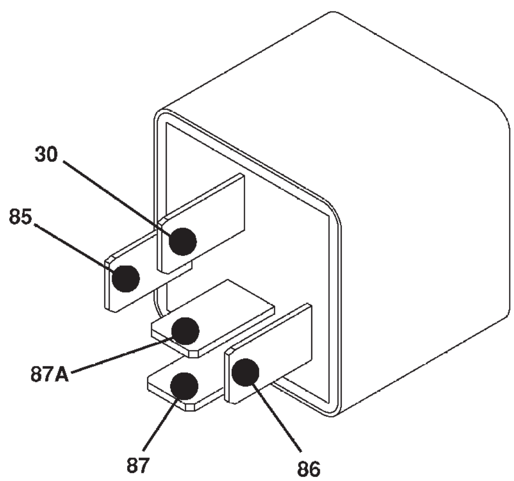
XJ BODY



CAV	COLOR	FUNCTION
10 (30)	LG/RD	FUSED B(+)
11 (86)	WT	FUSED IGNITION SWITCH OUTPUT
13 (85)	DB/PK	RAD FAN RELAY CONTROL
14 (87)	LB	RAD FAN RELAY OUTPUT

FIG. 1 80b76e94

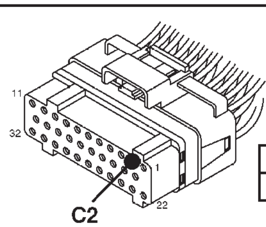
XJ BODY



80b76e98

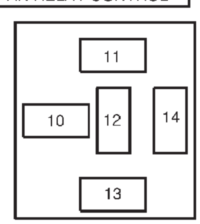
FIG. 2

XJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C2	DB/PK	RAD FAN RELAY CONTROL



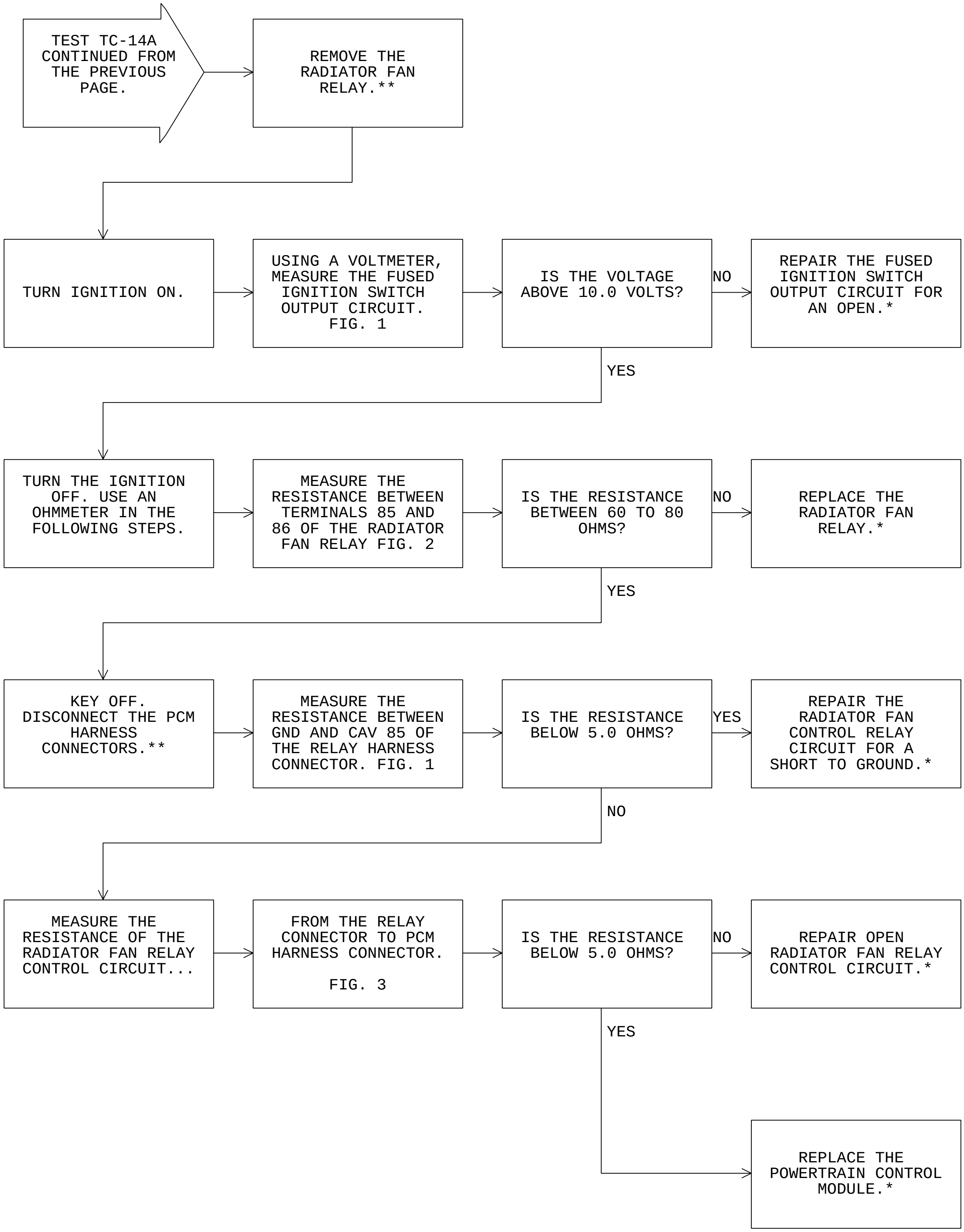
RADIATOR FAN RELAY CONNECTOR (IN PDC)

CAV	COLOR	FUNCTION
10 (30)	LG/RD	FUSED B(+)
11 (86)	WT	FUSED IGNITION SWITCH OUTPUT
13 (85)	DB/PK	RAD FAN RELAY CONTROL
14 (87)	LB	RAD FAN RELAY OUTPUT

80b76e99

FIG. 3

TEST TC-14A | **CONTINUED - REPAIRING - RADIATOR FAN RELAY CIRCUIT**



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

TEST TC-15A — REPAIRING - SPEED CONTROL CIRCUITS

Perform TEST DTC Before Proceeding

Name of code: Speed Control Solenoid Circuits

When monitored: Engine running, speed control switch on and battery voltage greater than 10.4 volts.

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

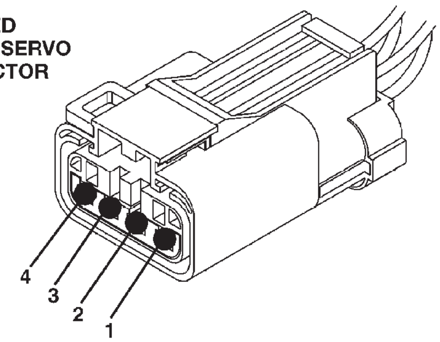
Theory of operation: When the SET switch is pressed, the vehicle must be moving forward at a speed between 35-85 mph, with the transmission gear selector in other than park or neutral. The PCM locks in a set speed. Then the PCM energizes the vacuum solenoid to open the throttle and actuates the vent solenoid to close the throttle. These actuations are dependent on power supplied to the servo from the PCM or 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 or shorted speed control power supply circuit
> PCM failure

80abff10

TJ/XJ BODY

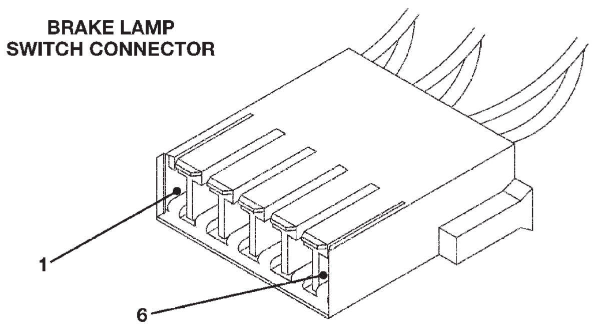


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b0d705

FIG. 1

TJ BODY

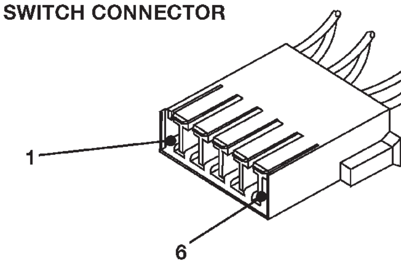


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

FIG. 2

XJ BODY

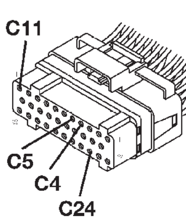


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80b04fe6

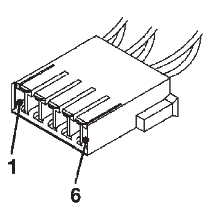
FIG. 3

TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C4	TN/RD	S/C VAC SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	S/C POWER SUPPLY
C24	WT/PK	BRAKE SW SENSE



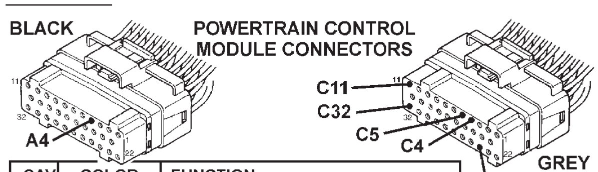
BRAKE LAMP SWITCH CONNECTOR

CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SW SENSE
2	BK	GROUND
3	YL/RD	S/C POWER SUPPLY
4	DB/RD	S/C BRAKE SW OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	STOP LAMP SW OUTPUT

80b01d73

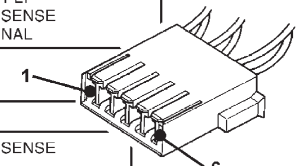
FIG. 4

XJ BODY



CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOLENOID CONTROL
C5	LG/RD	S/C VENT SOLENOID
C11	YL/RD	S/C POWER SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

BRAKE LAMP SWITCH CONNECTOR



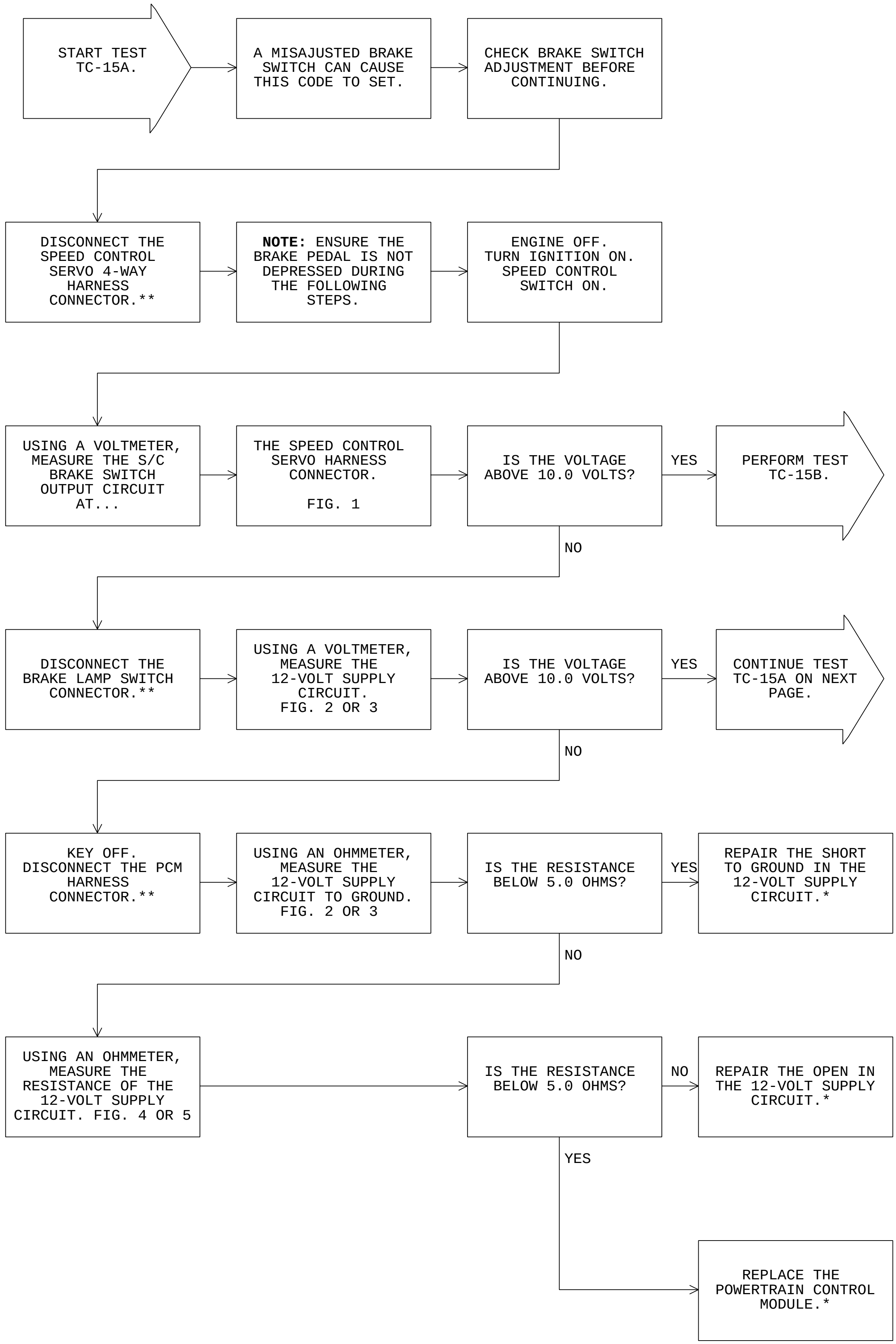
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	S/C POWER SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80ab5ce9

FIG. 5

TEST TC-15A REPAIRING - SPEED CONTROL CIRCUITS

Perform TEST DTC Before Proceeding

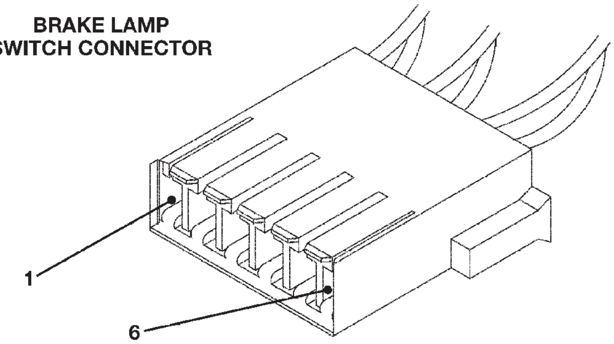


***Perform Verification TEST VER-4A.**

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

TEST TC-15A CONTINUED - REPAIRING - SPEED CONTROL CIRCUITS

TJ BODY

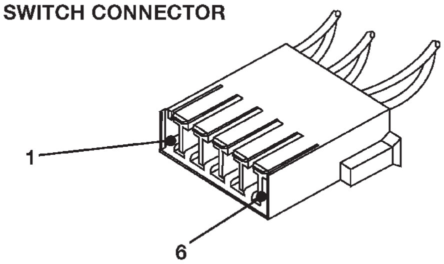


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

FIG. 1

XJ BODY



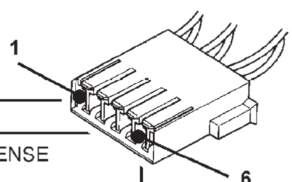
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80b04fe6

FIG. 2

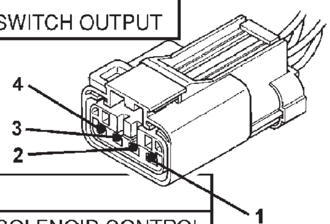
TJ BODY

BRAKE LAMP SWITCH CONNECTOR



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B (+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

SPEED CONTROL SERVO CONNECTOR



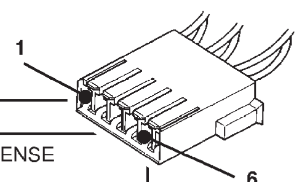
CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b09a9f

FIG. 3

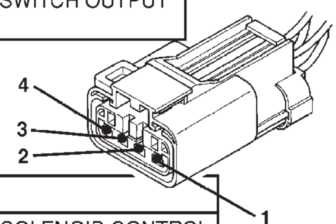
XJ BODY

BRAKE LAMP SWITCH CONNECTOR



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B (+)

SPEED CONTROL SERVO CONNECTOR

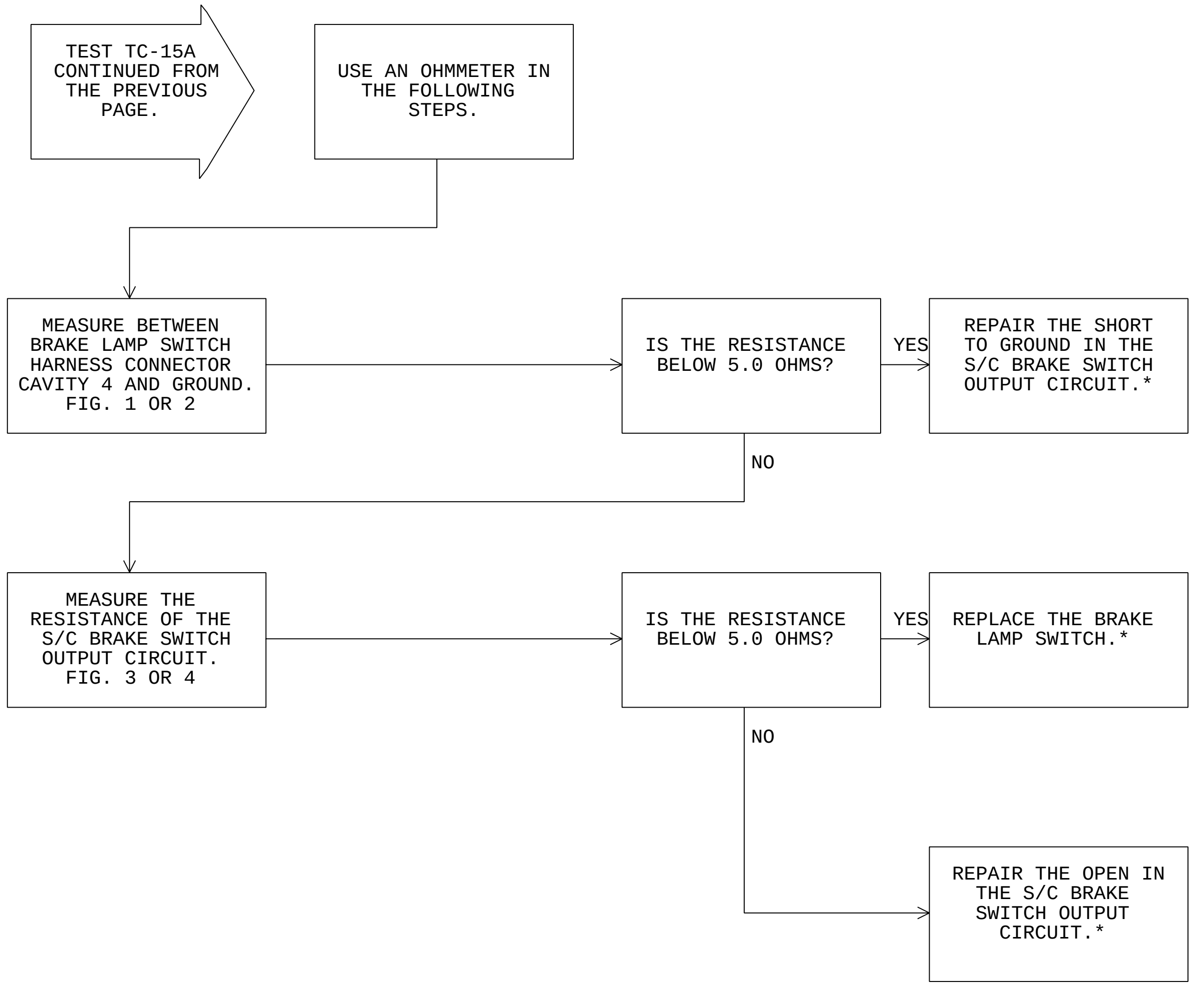


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b0981c

FIG. 4

TEST TC-15A CONTINUED - REPAIRING - SPEED CONTROL CIRCUITS

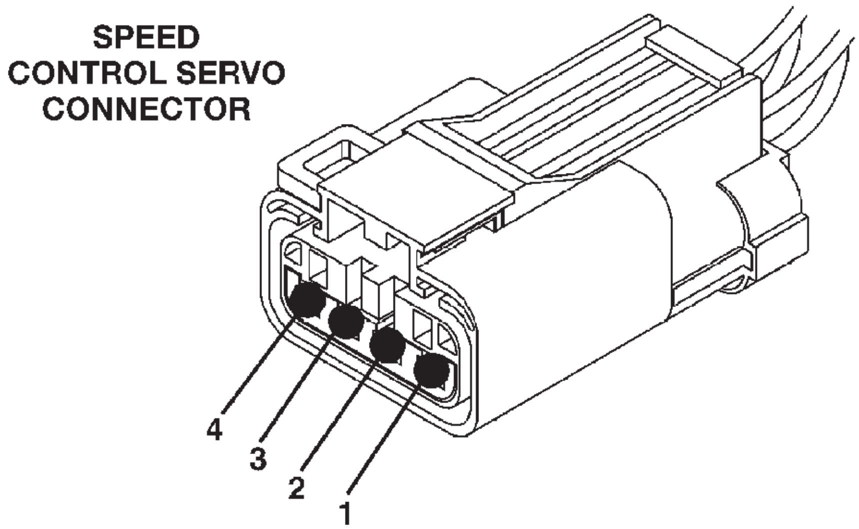


Perform Verification TEST VER-4A. | ***Check connectors - Clean / repair as necessary.***

TEST TC-15B — REPAIRING - SPEED CONTROL CIRCUITS

Perform TEST TC-15A Before Proceeding

TJ/XJ BODY

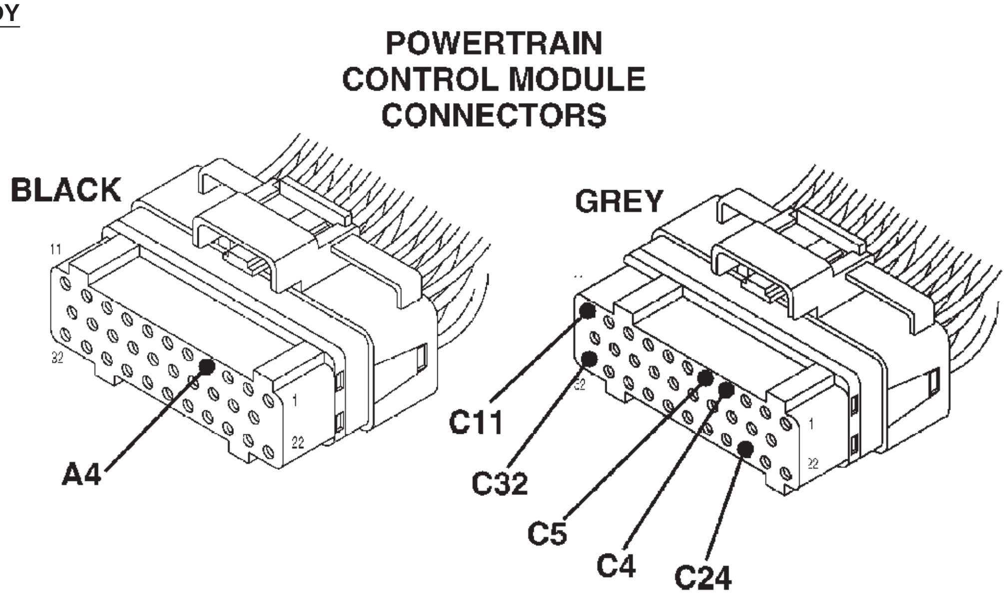


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b0d705

FIG. 1

TJ/XJ BODY



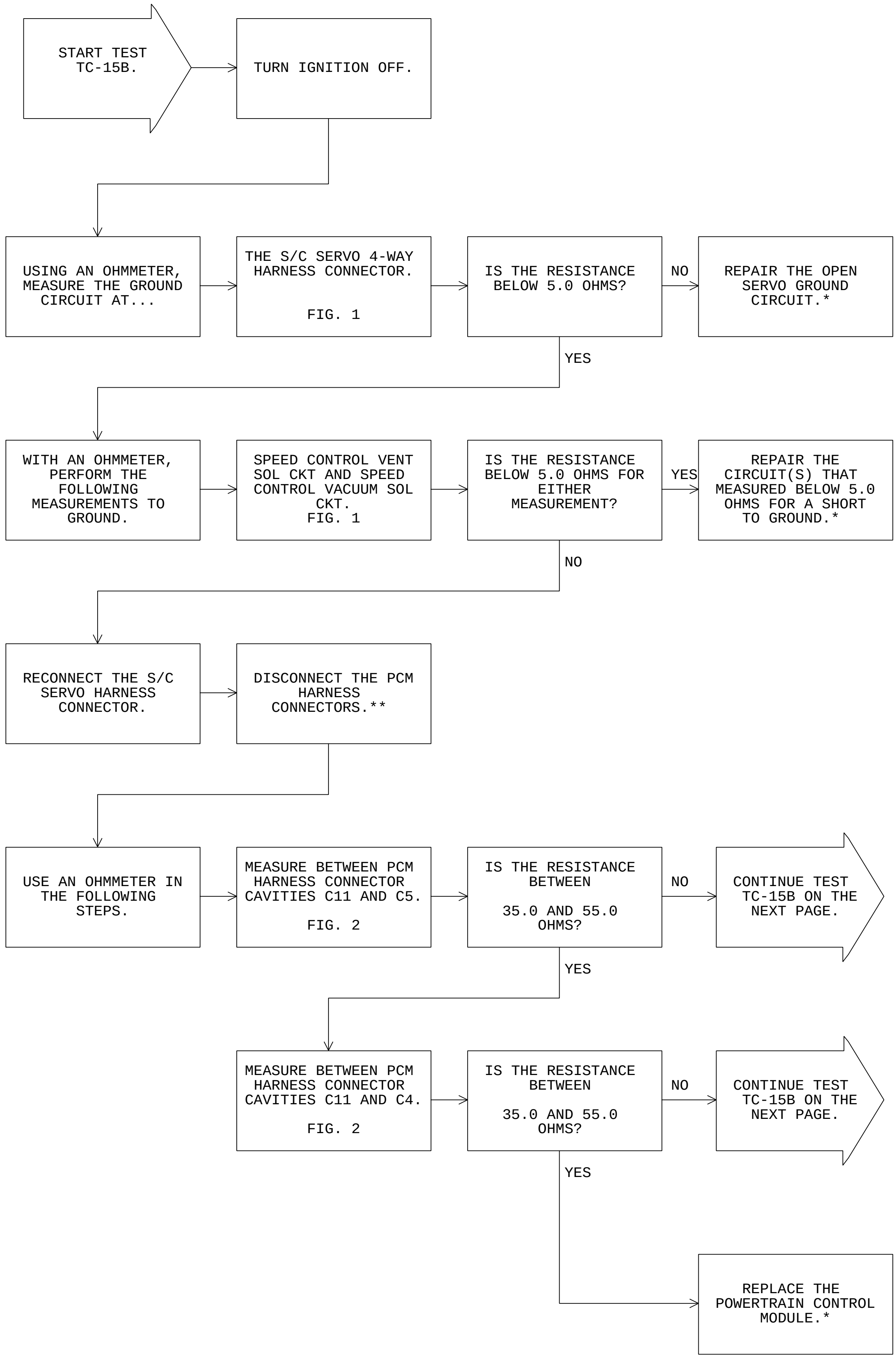
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

80b6b1cb

FIG. 2

TEST TC-15B | REPAIRING - SPEED CONTROL CIRCUITS

Perform TEST TC-15A Before Proceeding

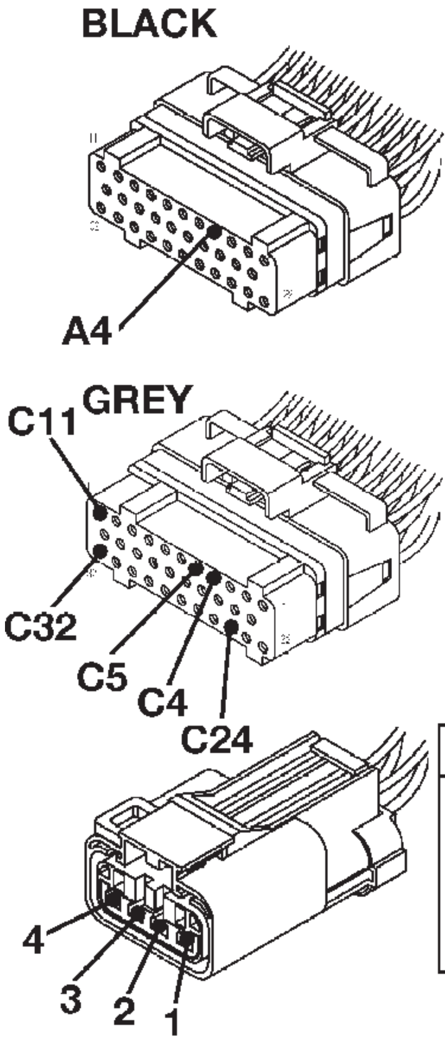


Perform Verification TEST VER-4A.

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

TEST TC-15B | **CONTINUED - REPAIRING - SPEED CONTROL CIRCUITS**

TJ/XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CTRL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

SPEED CONTROL SERVO CONNECTOR

CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOL CTRL
2	LG/RD	S/C VENT SOLENOID CTRL
3	DB/RD	S/C BRAKE SW OUTPUT
4	BK	GROUND

80b04fe5

FIG. 1

TEST TC-15B CONTINUED - REPAIRING - SPEED CONTROL CIRCUITS

TEST TC-15B CONTINUED FROM THE PREVIOUS PAGE.

DISCONNECT THE S/C SERVO 4-WAY CONNECTOR.**

USING AN OHMMETER, MEASURE THE S/C VACUUM SOLENOID CONTROL CIRCUIT...

BETWEEN THE S/C SERVO AND PCM.

FIG. 1

IS THE RESISTANCE BELOW 5.0 OHMS?

NO — REPAIR THE OPEN S/C VACUUM SOLENOID CONTROL CIRCUIT.*

YES

USING AN OHMMETER, MEASURE THE S/C VENT SOLENOID CONTROL CIRCUIT...

BETWEEN THE S/C SERVO AND PCM.

IS THE RESISTANCE BELOW 5.0 OHMS?

NO — REAPIR THE OPEN S/C VENT SOLENOID CONTROL CIRCUIT.*

YES — REPLACE THE SPEED CONTROL SERVO.*

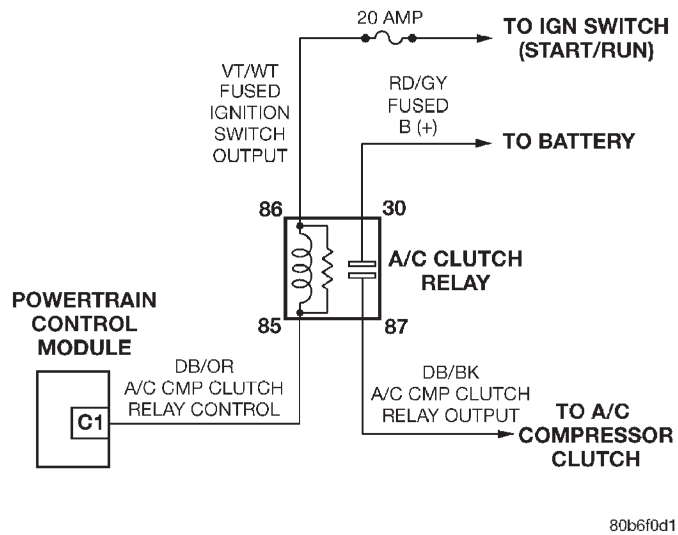
Perform Verification TEST VER-4A.

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

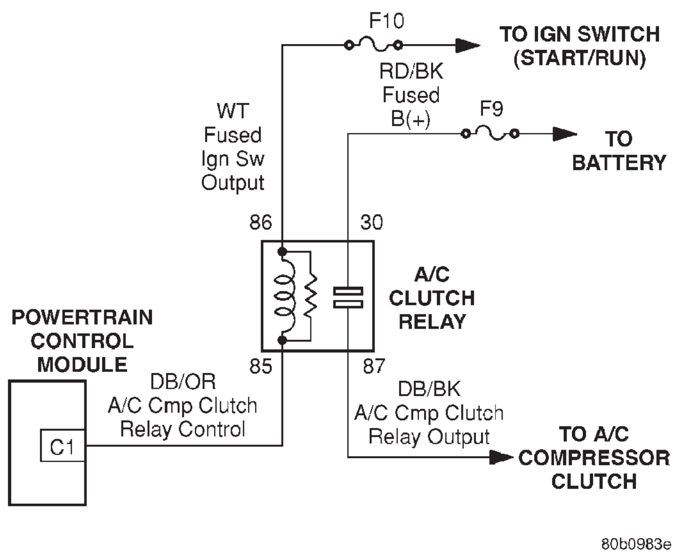
TEST TC-16A REPAIRING - A/C CLUTCH RELAY CIRCUIT

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



Name of code: A/C Clutch Relay Circuit

When monitored: With the ignition key in the run position and battery voltage above 10.4 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 adjusts 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 request and adjustment of the idle speed has been implemented.

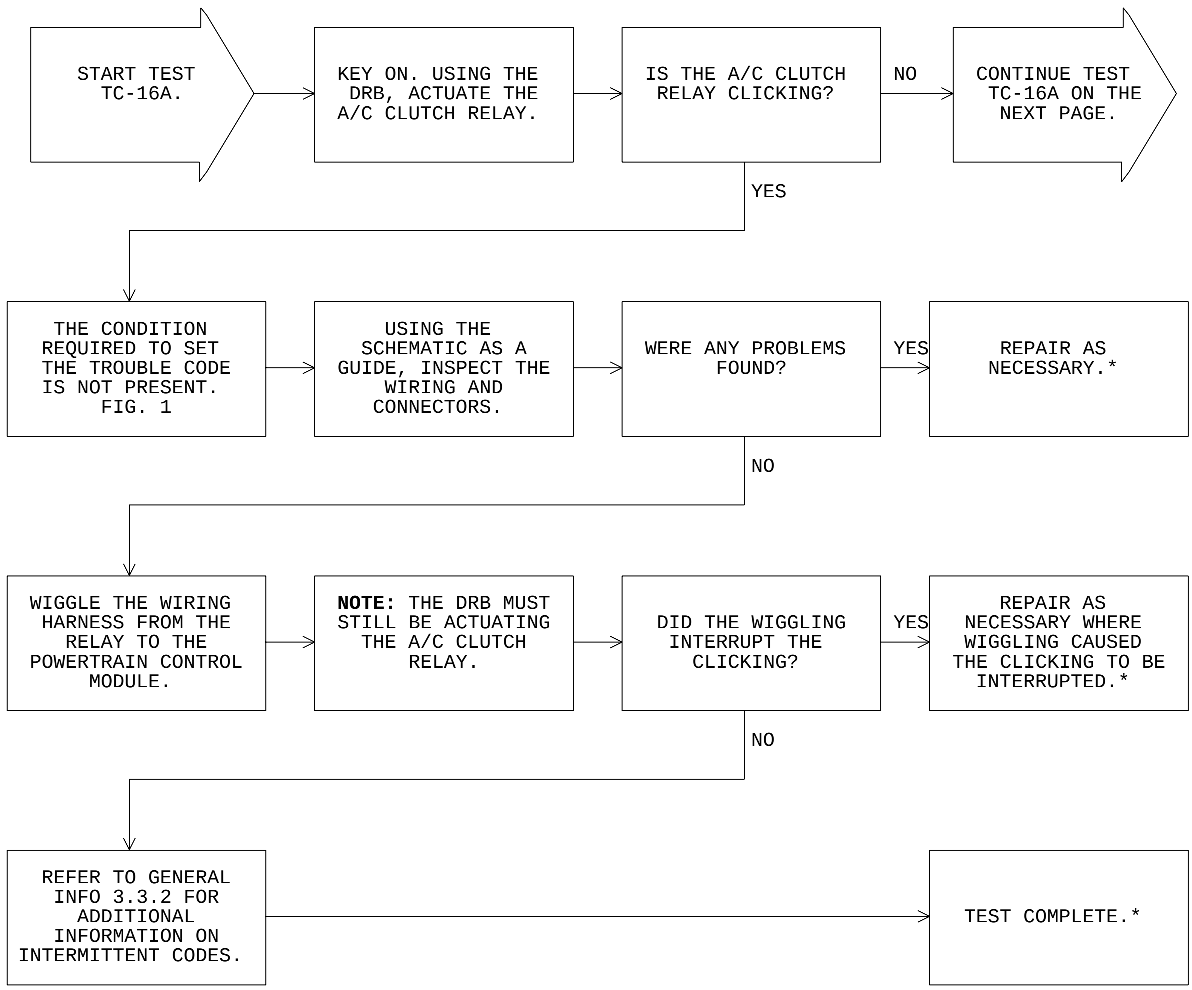
Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Compressor clutch relay control circuit open or shorted
> Inoperative circuit driver in powertrain control module

80aa4c18

FIG. 1

TEST TC-16A — REPAIRING - A/C CLUTCH RELAY CIRCUIT

Perform TEST DTC Before Proceeding

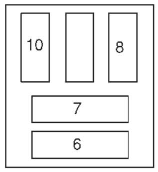


Perform Verification TEST VER-2A.** | ****Check connectors - Clean / repair as necessary.

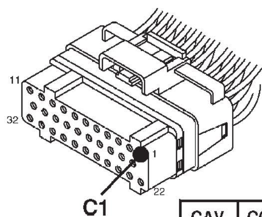
TEST TC-16A	CONTINUED - REPAIRING A/C CLUTCH RELAY CIRCUIT

TJ BODY

A/C CLUTCH
RELAY CONNECTOR



CAV	COLOR	FUNCTION
6 (30)	RD/GY	FUSED B(+)
7 (87)	DB/BK	A/C CMP CLUTCH RELAY OUTPUT
8 (86)	VT/WT	FUSED IGNITION SWITCH OUTPUT
10 (85)	DB/OR	A/C CMP CLUTCH RELAY CONTROL



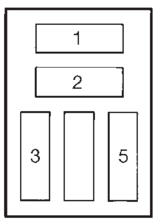
POWERTRAIN CONTROL
MODULE GREY
CONNECTOR

CAV	COLOR	FUNCTION
C1	DB/OR	A/C CMP CLUTCH RELAY CONTROL

80b76e91

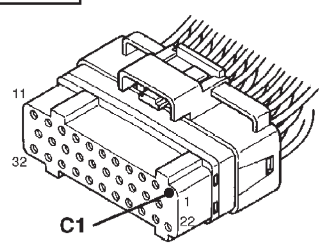
FIG. 1

XJ BODY



A/C CLUTCH RELAY CONNECTOR
(IN PDC)

CAV	COLOR	FUNCTION
1 (30)	RD/BK	FUSED B(+)
2 (87)	DB/BK	A/C CMP CLUTCH RELAY OUTPUT
3 (85)	DB/OR	A/C CMP CLUTCH RELAY CONTROL
5 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT

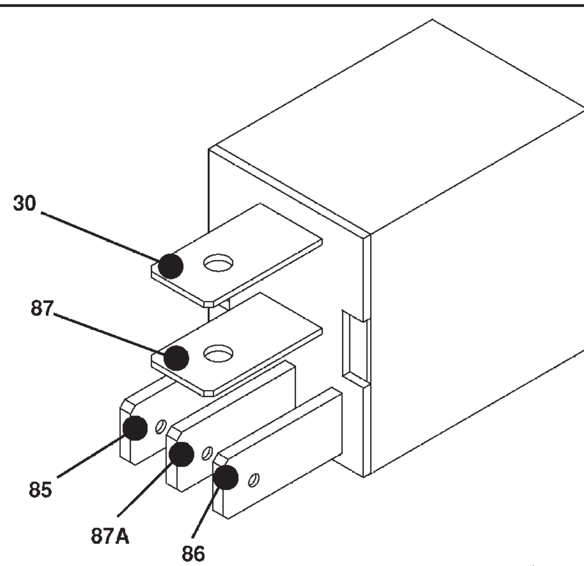


POWERTRAIN
CONTROL MODULE
GREY CONNECTOR

CAV	COLOR	FUNCTION
C1	DB/OR	A/C CMP CLUTCH RELAY CONTROL

FIG. 2

80b76e95



80b76e97

FIG. 3

TEST TC-16A — CONTINUED - REPAIRING - A/C CLUTCH RELAY CIRCUIT

TEST TC-16A CONTINUED FROM THE PREVIOUS PAGE. → KEY OFF. DISCONNECT THE A/C CLUTCH RELAY.**

KEY ON. USING A VOLTMETER, MEASURE THE FUSED IGN SWITCH OUTPUT CKT. FIG. 1 OR 2 → IS THE VOLTAGE ABOVE 10.0 VOLTS?
- NO → REPAIR THE FUSED IGNITION SWITCH OUTPUT CIRCUIT FOR AN OPEN.*
- YES ↓

KEY OFF. USE AN OHMMETER IN THE FOLLOWING STEP. → MEASURE THE RESISTANCE BETWEEN TERMINALS 85 AND 86 OF THE A/C CLUTCH RELAY. FIG. 3 → IS THE RESISTANCE BETWEEN 70 AND 90 OHMS?
- NO → REPLACE THE A/C CLUTCH RELAY.*
- YES ↓

KEY OFF. DISCONNECT THE PCM HARNESS CONNECTORS.** → USING AN OHMMETER, MEASURE THE A/C CLUTCH CONTROL CKT AT PCM TO GROUND. FIG. 1 OR 2 → IS THE RESISTANCE BELOW 5.0 OHMS?
- YES → REPAIR THE A/C CLUTCH RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND.*
- NO ↓

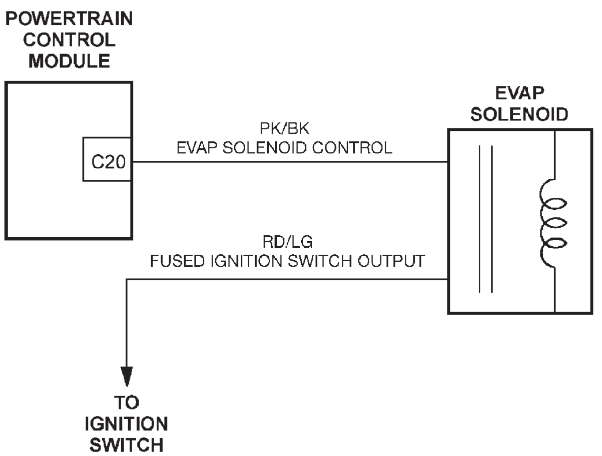
USING AN OHMMETER, MEASURE THE RESISTANCE OF THE A/C CLUTCH RELAY CONTROL CIRCUIT... → BEWTEEN THE RELAY AND THE PCM. FIG. 1 OR 2 → IS THE RESISTANCE BELOW 5.0 OHMS?
- NO → REPAIR THE A/C CLUTCH RELAY CONTROL CIRCUIT FOR AN OPEN.*
- YES → REPLACE THE POWERTRAIN CONTROL MODULE.*

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

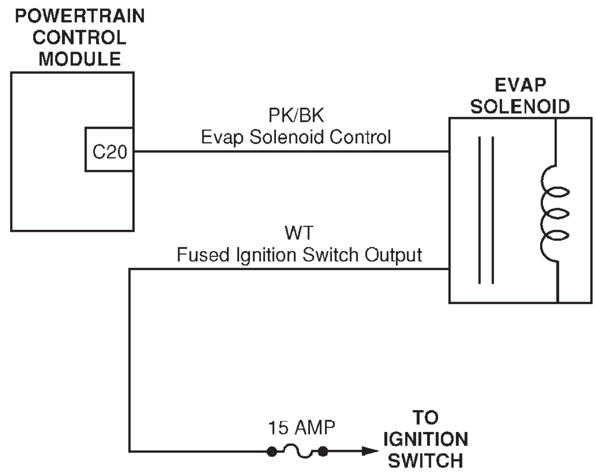
TEST TC-18A REPAIRING - EVAP PURGE SOLENOID CIRCUIT

Perform TEST DTC Before Proceeding

TJ BODY

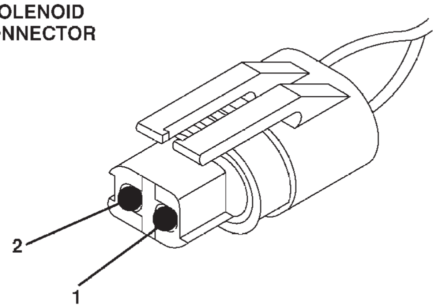


XJ BODY



TJ BODY

EVAPORATIVE SOLENOID CONNECTOR



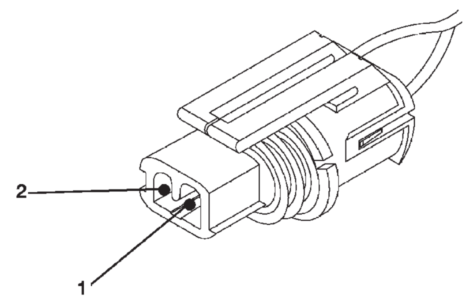
CAV	COLOR	FUNCTION
1	PK/BK	EVAP SOLENOID CONTROL
2	RD/LG	FUSED IGNITION SWITCH OUTPUT

80b6f0e2

FIG. 1

XJ BODY

EVAPORATIVE SOLENOID CONNECTOR



CAV	COLOR	FUNCTION
1	PK/BK	EVAP SOLENOID CONTROL
2	WT	FUSE IGNITION SWITCH OUTPUT

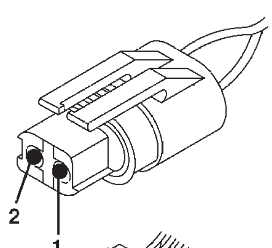
80b6f0da

FIG. 2

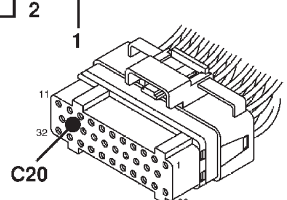
TJ BODY

EVAPORATIVE SOLENOID CONNECTOR

CAV	COLOR	FUNCTION
1	PK/BK	EVAP SOLENOID CONTROL
2	RD/LG	FUSED IGNITION SWITCH OUTPUT



POWERTRAIN CONTROL MODULE GREY CONNECTOR



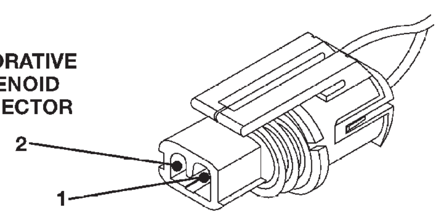
CAV	COLOR	FUNCTION
C20	PK/BK	EVAP SOLENOID CONTROL

80b76e92

FIG. 3

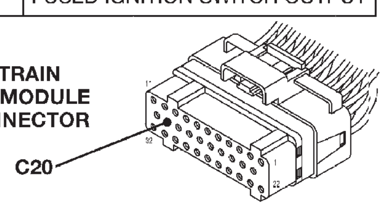
XJ BODY

EVAPORATIVE SOLENOID CONNECTOR



CAV	COLOR	FUNCTION
1	PK/BK	EVAP SOLENOID CONTROL
2	WT	FUSED IGNITION SWITCH OUTPUT

POWERTRAIN CONTROL MODULE GREY CONNECTOR



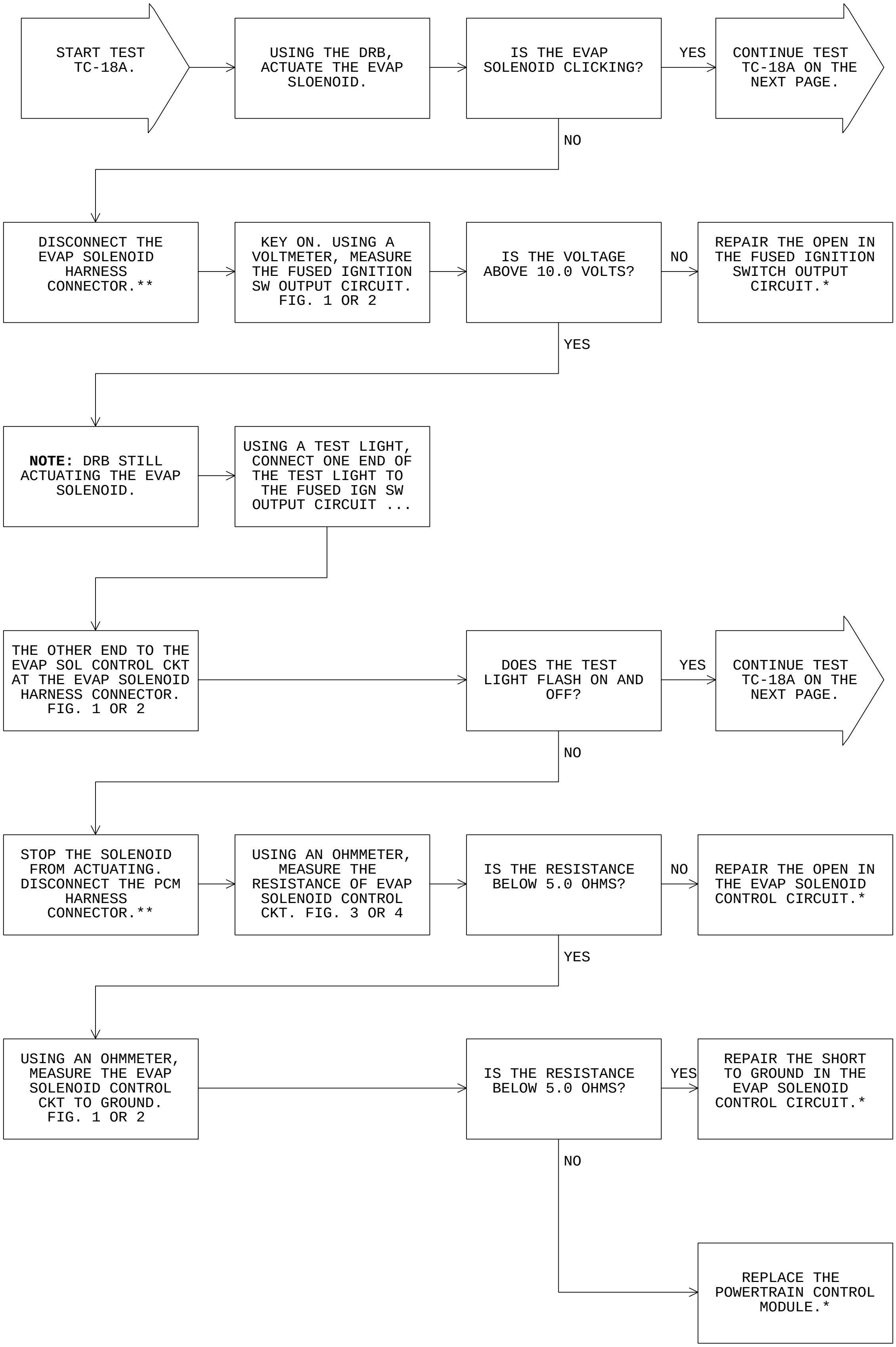
CAV	COLOR	FUNCTION
C20	PK/BK	EVAP SOLENOID CONTROL

80b76e96

FIG. 4

TEST TC-18A — REPAIRING - EVAP PURGE SOLENOID CIRCUIT

Perform TEST DTC Before Proceeding



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

TEST TC-18A	CONTINUED - REPAIRING - EVAP PURGE SOLENOID CIRCUIT

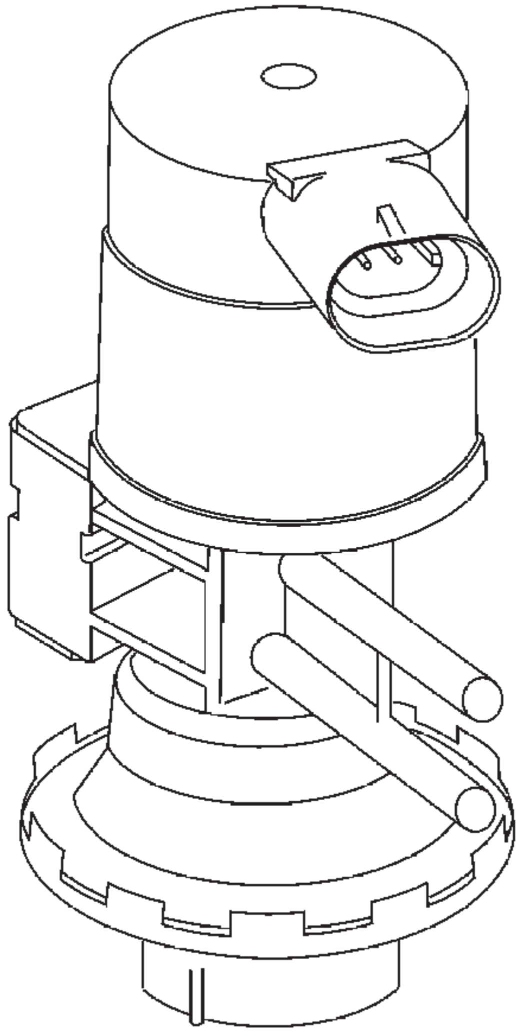
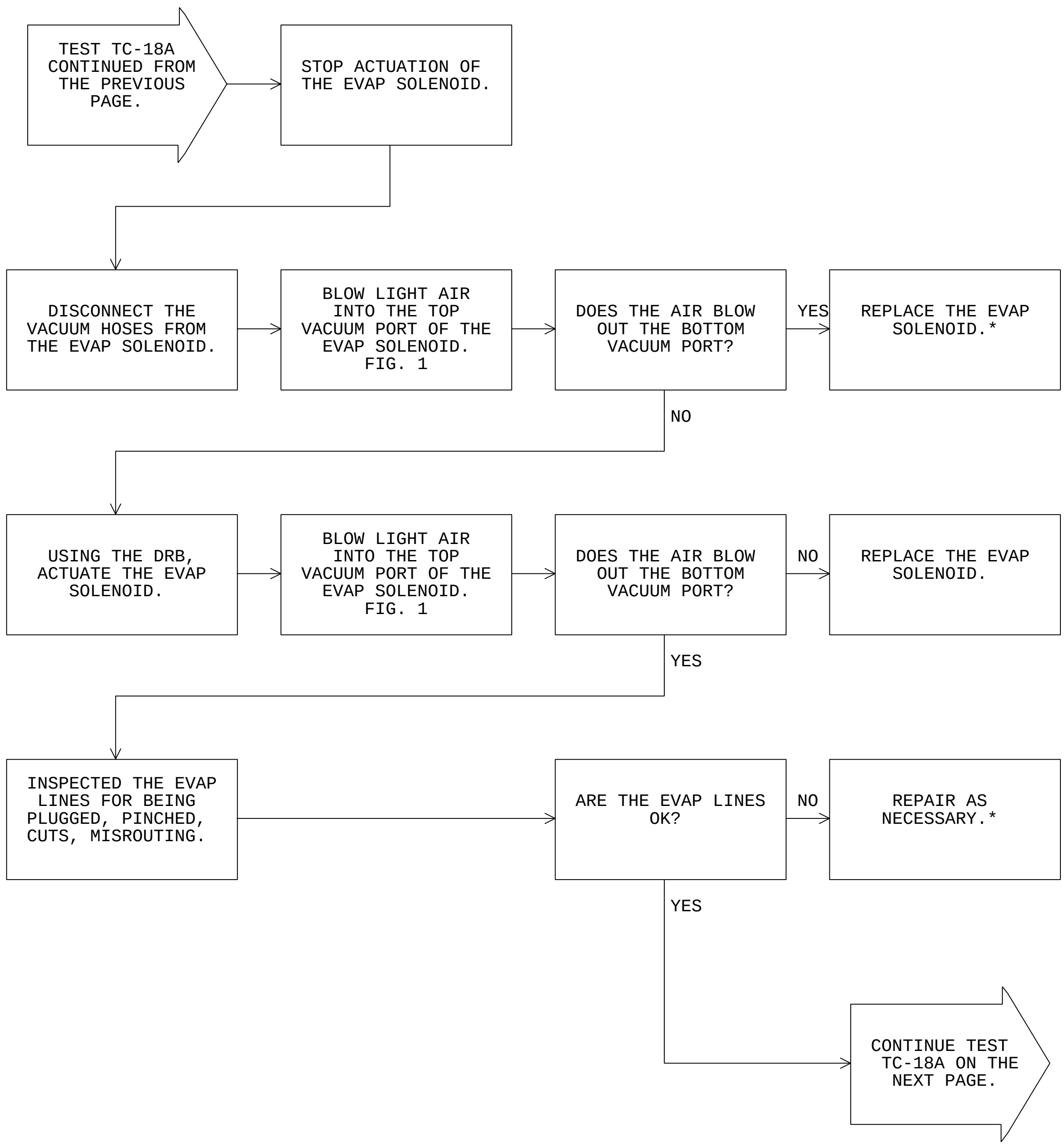


FIG. 1

TEST TC-18A CONTINUED - REPAIRING - EVAP PURGE SOLENOID CIRCUIT



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

TEST TC-18A | **CONTINUED - REPAIRING - EVAP PURGE SOLENOID CIRCUIT**

Name of code: Evap Purge Solenoid Circuit

When monitored: At ignition key on and battery voltage greater than 10.4 volts.

Set condition: After the arming conditions are satisfied: not powering down, not already in limp-in, time since the last solenoid activation > 72 micro seconds. The powertrain control module will set a trouble code if the actual state of the solenoid does not match the intended state.

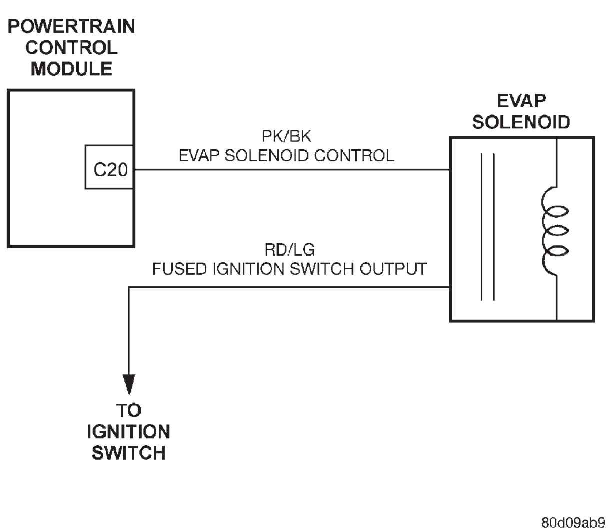
Theory of operation: Its purpose is to regulate, by means of a duty cycle, the flow of vapors from the evap canister to the throttle body. The PCM controls the time the solenoid is on during a duty cycle. During off idle operations (higher flows), higher percentages of duty cycle are used. At idle (lower flow), lower percentages of duty cycle are used.

Possible causes:
> Open or shorted control circuit
> Open fused ignition switch output circuit
> Open or shorted solenoid control coil
> Powertrain control module failure
> Connector terminals
> Connector wires

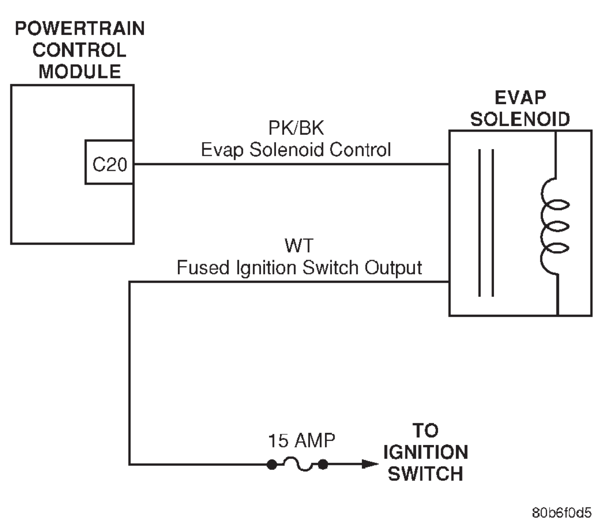
80aa0f82

FIG. 1

TJ BODY



XJ BODY



TEST TC-18A CONTINUED - REPAIRING - EVAP PURGE SOLENOID CIRCUIT

TEST TC-18A CONTINUED.FROM THE PREVIOUS PAGE.

→ AT THIS TIME, THE CONDITION REQUIRED TO SET THE CODE IS NOT PRESENT. FIG. 1

→ REFER TO GEN INFO 3.3.2 FOR INFORMATION ON INACTIVE TROUBLE CODES.

→ RECONNECT THE VACUUM HOSES.

→ USING THE SCHEMATIC AS A GUIDE, INSPECT THE WIRING AND CONNECTORS.

→ WERE ANY PROBLEM FOUND?

- YES → REPAIR AS NECESSARY.*
- NO → WITH THE DRB, READ CODES. **NOTE:** ACTUATE THE EVAP SOLENOID.

→ WIGGLE WIRING HARNESS FROM THE SOLENOID TO THE PCM.

→ DOES THE EVAP SOLENOID EVER STOP ACTUATING.

- YES → REPAIR AS NECESSARY WHERE WIGGLING CAUSED PROBLEM TO APPEAR.
- NO → TEST COMPLETE.*

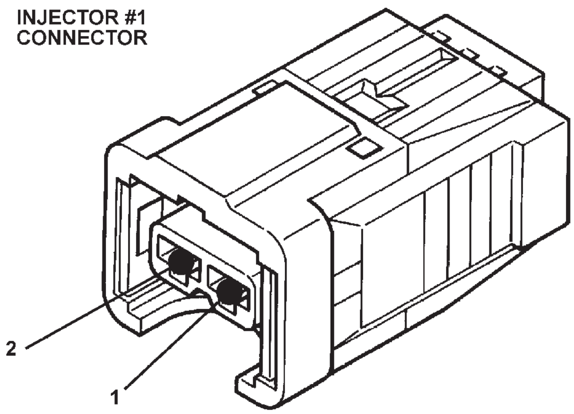
Perform Verification TEST VER-2A.

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

TEST TC-19A — REPAIRING - INJECTOR #3 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

2.5L

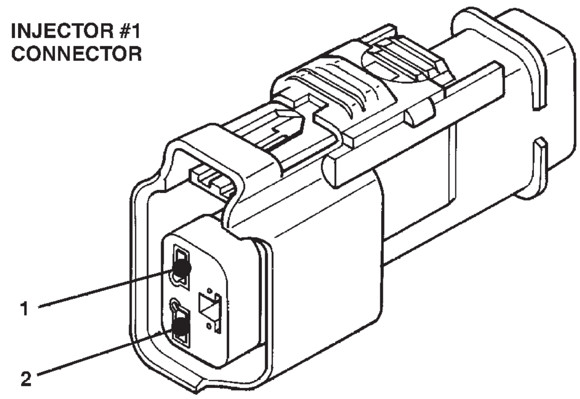


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	WT/DB	INJECTOR #1 DRIVER

80b76e62

FIG. 1

4.0L

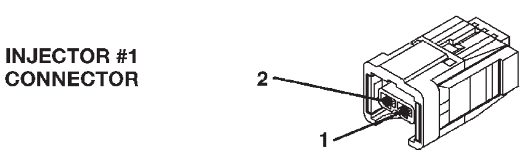


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	WT/DG	INJECTOR #1 DRIVER

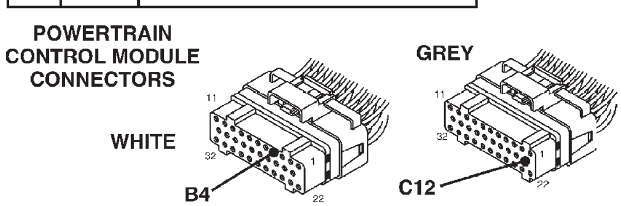
80b76e67

FIG. 2

2.5L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	WT/DB	INJECTOR #1 DRIVER

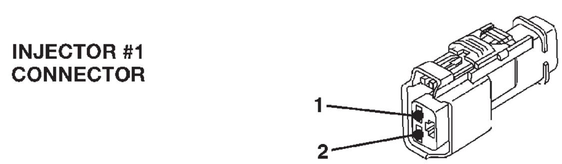


CAV	COLOR	FUNCTION
B4	WT/DB	INJECTOR #1 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

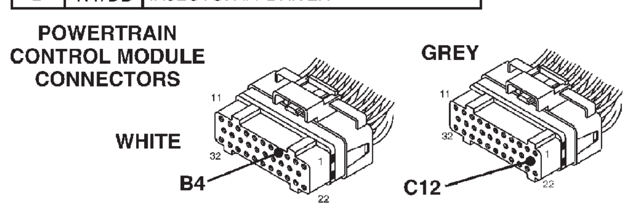
80b76ea2

FIG. 3

4.0L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	WT/DB	INJECTOR #1 DRIVER



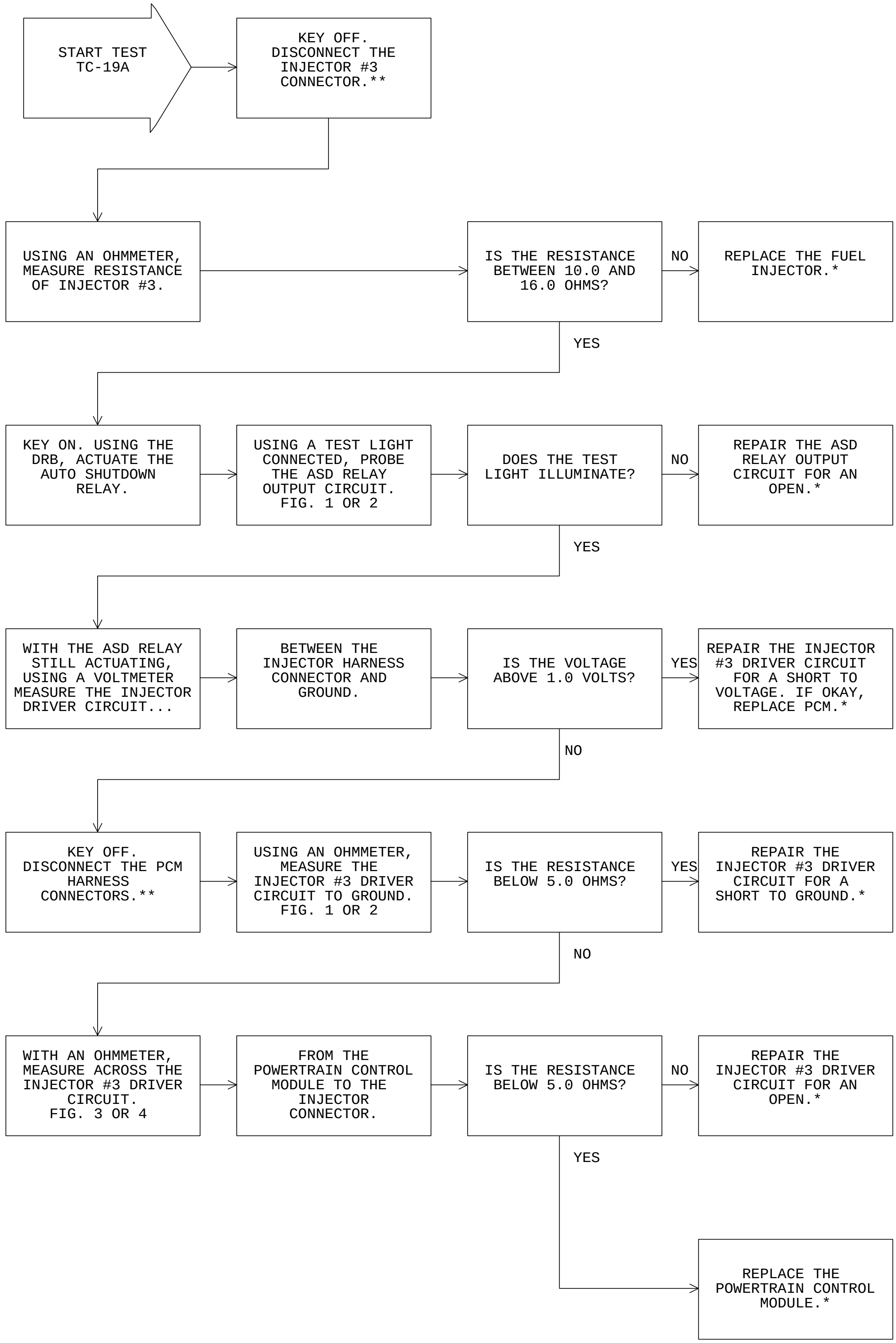
CAV	COLOR	FUNCTION
B4	WT/DB	INJECTOR #1 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

80b76ea6

FIG. 4

TEST TC-19A | REPAIRING - INJECTOR #3 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

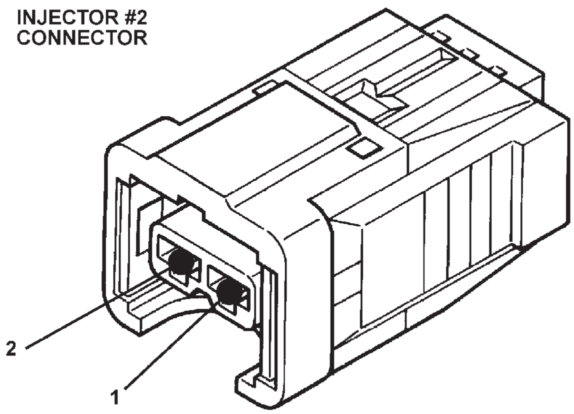


Perform Verification TEST VER-2A.** | ****Check connectors - Clean / repair as necessary.

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

Perform TEST TC-21A Before Proceeding

2.5L

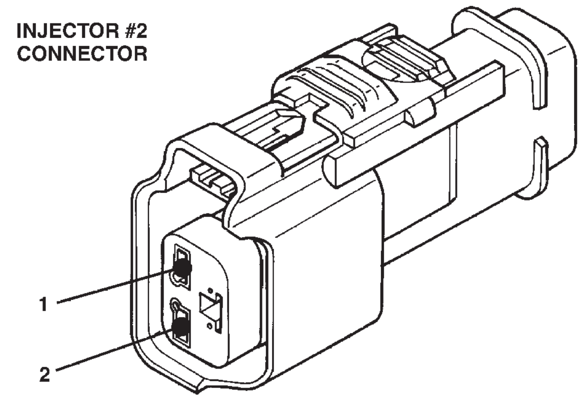


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	TN	INJECTOR #2 DRIVER

80b76e64

FIG. 1

4.0L

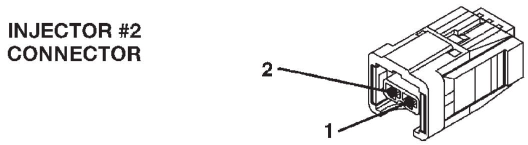


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	TN	INJECTOR #2 DRIVER

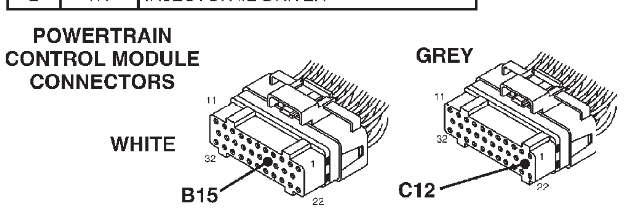
80b76e68

FIG. 2

2.5L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	TN	INJECTOR #2 DRIVER

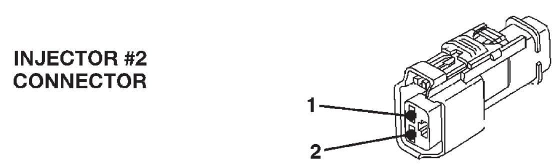


CAV	COLOR	FUNCTION
B15	TN	INJECTOR #2 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

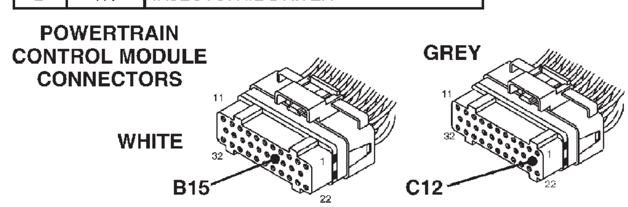
80b76ea3

FIG. 3

4.0L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	TN	INJECTOR #2 DRIVER



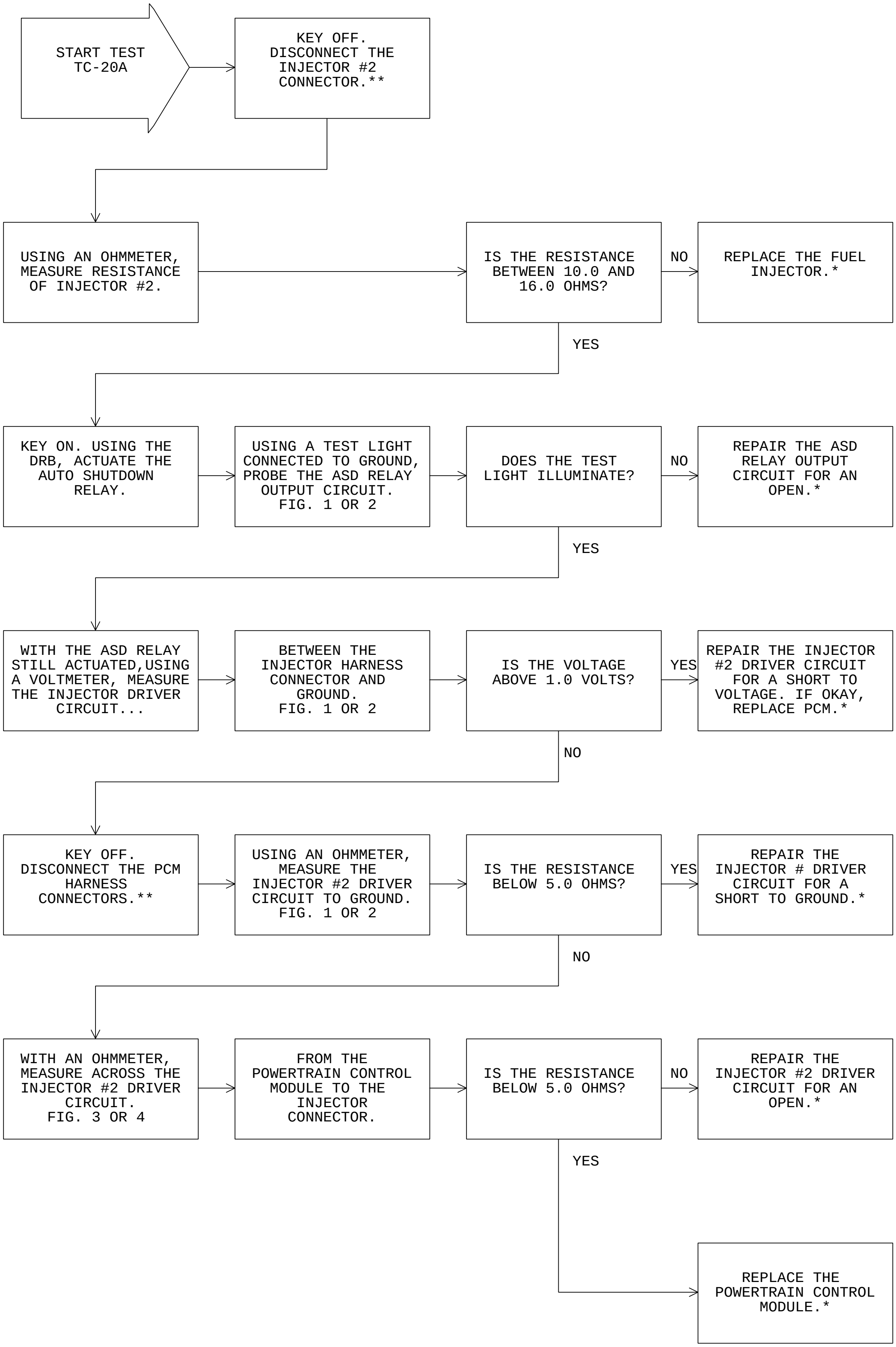
CAV	COLOR	FUNCTION
B15	TN	INJECTOR #2 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

80b76ea7

FIG. 4

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

Perform TEST TC-21A Before Proceeding



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

TEST TC-21A | **REPAIRING - INJECTOR CONTROL CIRCUITS**

Perform TEST DTC Before Proceeding

Name of code: Injector Control Circuit

When monitored: With battery voltage greater than 10.4 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.

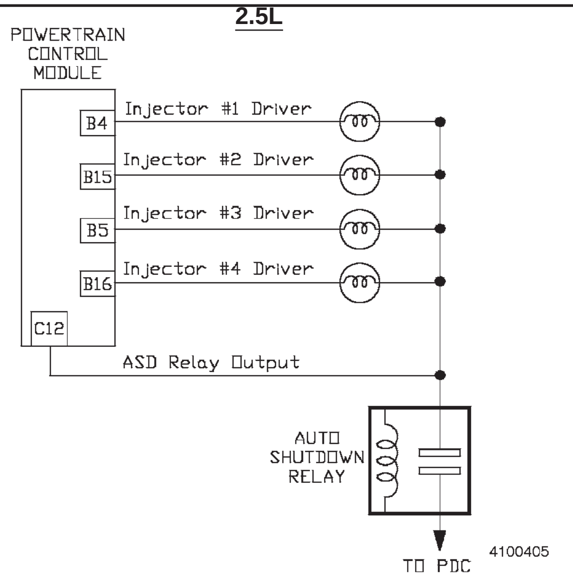
Theory of operation: Fuel injectors are high-impedance solenoids controlled by the PCM. Battery voltage is supplied by the ASD relay. The injector on time (pulse width) is controlled by the amount of time the PCM grounds the injector control circuit. By varying this time, more or less fuel is allowed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

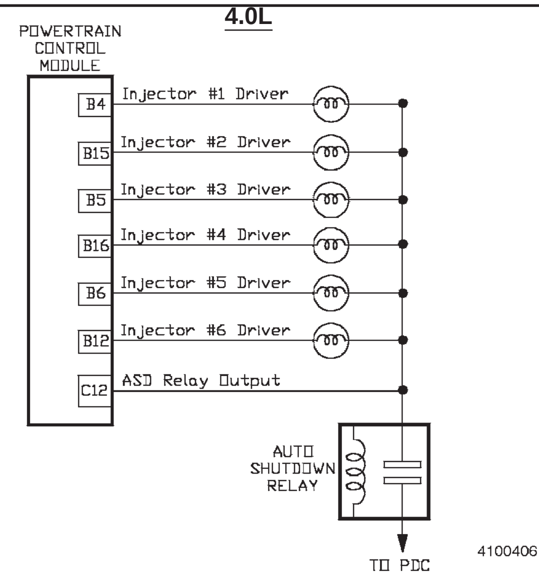
80aa4c19

FIG. 1

2.5L

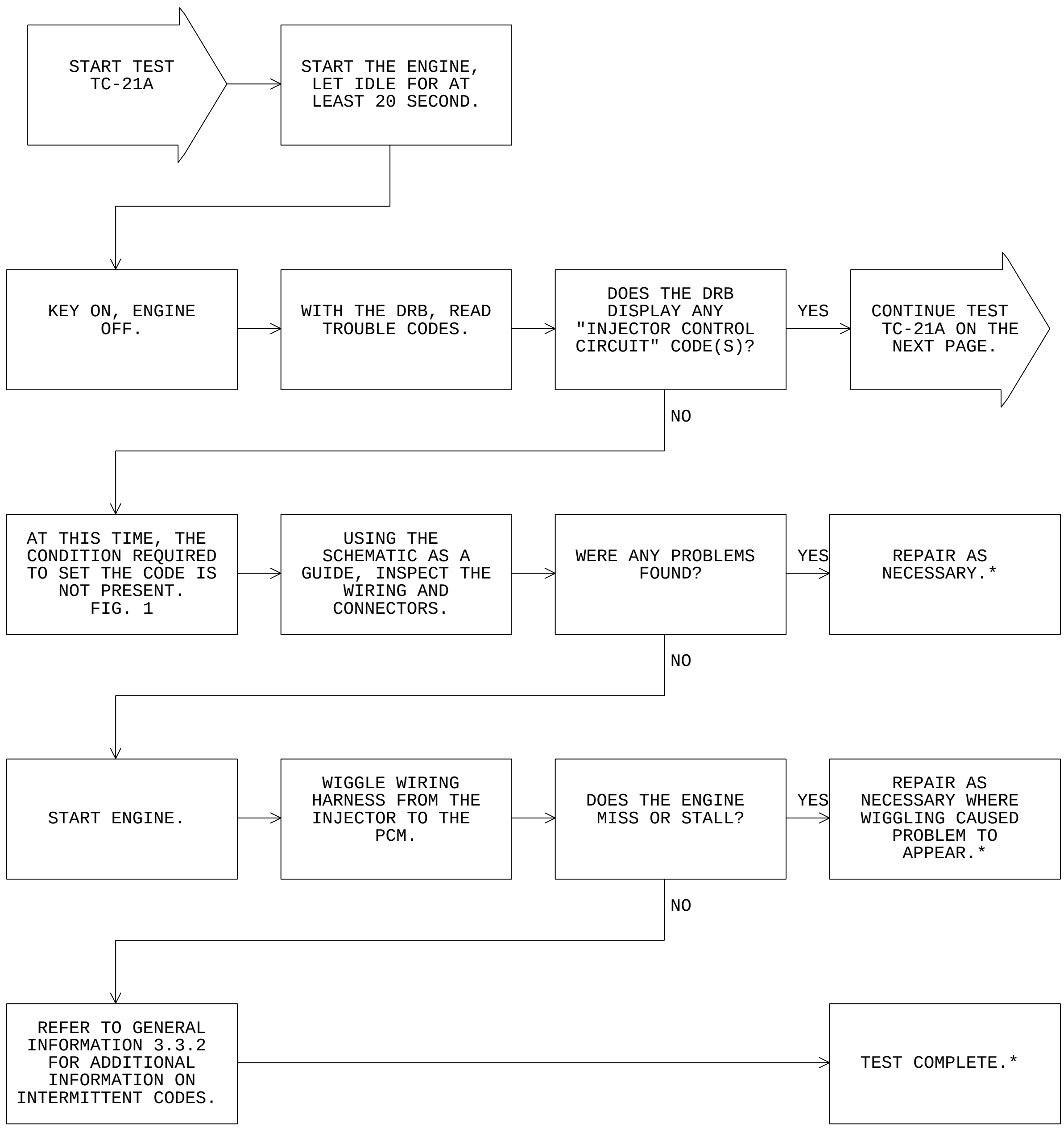


4.0L



TEST TC-21A — REPAIRING - INJECTOR CONTROL CIRCUITS

Perform TEST DTC Before Proceeding



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

NOTES

TEST TC-21A CONTINUED - REPAIRING - INJECTOR CONTROL CIRCUITS

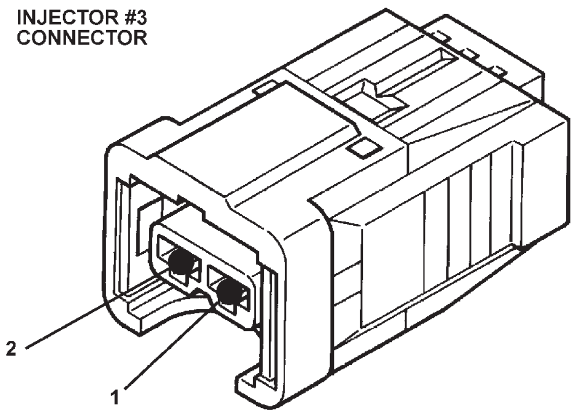
Refer to the chart below and perform the diagnostic test that corresponds to the trouble code displayed on the DRB.

TROUBLE CODE	DIAGNOSTIC TEST
INJECTOR #1 CONTROL CIRCUIT	TC-21B
INJECTOR #2 CONTROL CIRCUIT	TC-20A
INJECTOR #3 CONTROL CIRCUIT	TC-19A
INJECTOR #4 CONTROL CIRCUIT	TC-61A
INJECTOR #5 CONTROL CIRCUIT	TC-69A
INJECTOR #6 CONTROL CIRCUIT	TC-70A

TEST TC-21B | REPAIRING - INJECTOR #1 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

2.5L

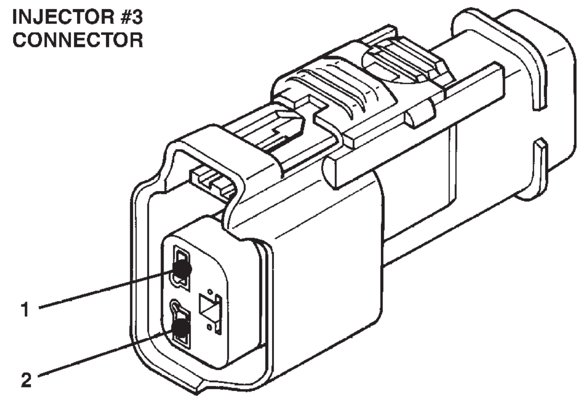


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	YL/WT	INJECTOR #3 DRIVER

80b76e65

FIG. 1

4.0L

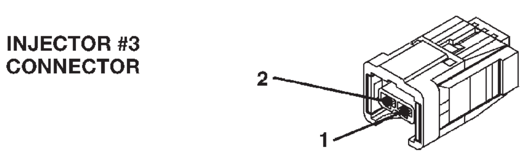


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	YL/WT	INJECTOR #3 DRIVER

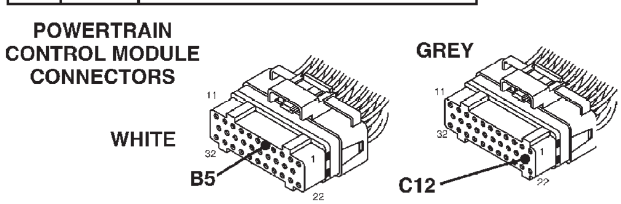
80b76e69

FIG. 2

2.5L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	YL/WT	INJECTOR #3 DRIVER

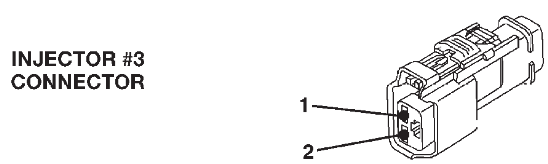


CAV	COLOR	FUNCTION
B5	YL/WT	INJECTOR #3 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

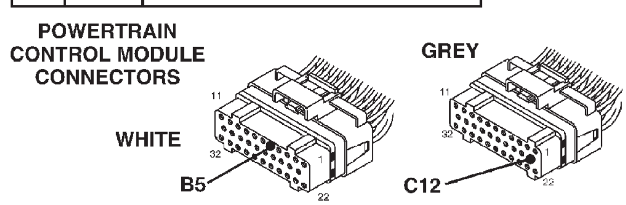
80b76ea4

FIG. 3

4.0L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	YL/WT	INJECTOR #3 DRIVER



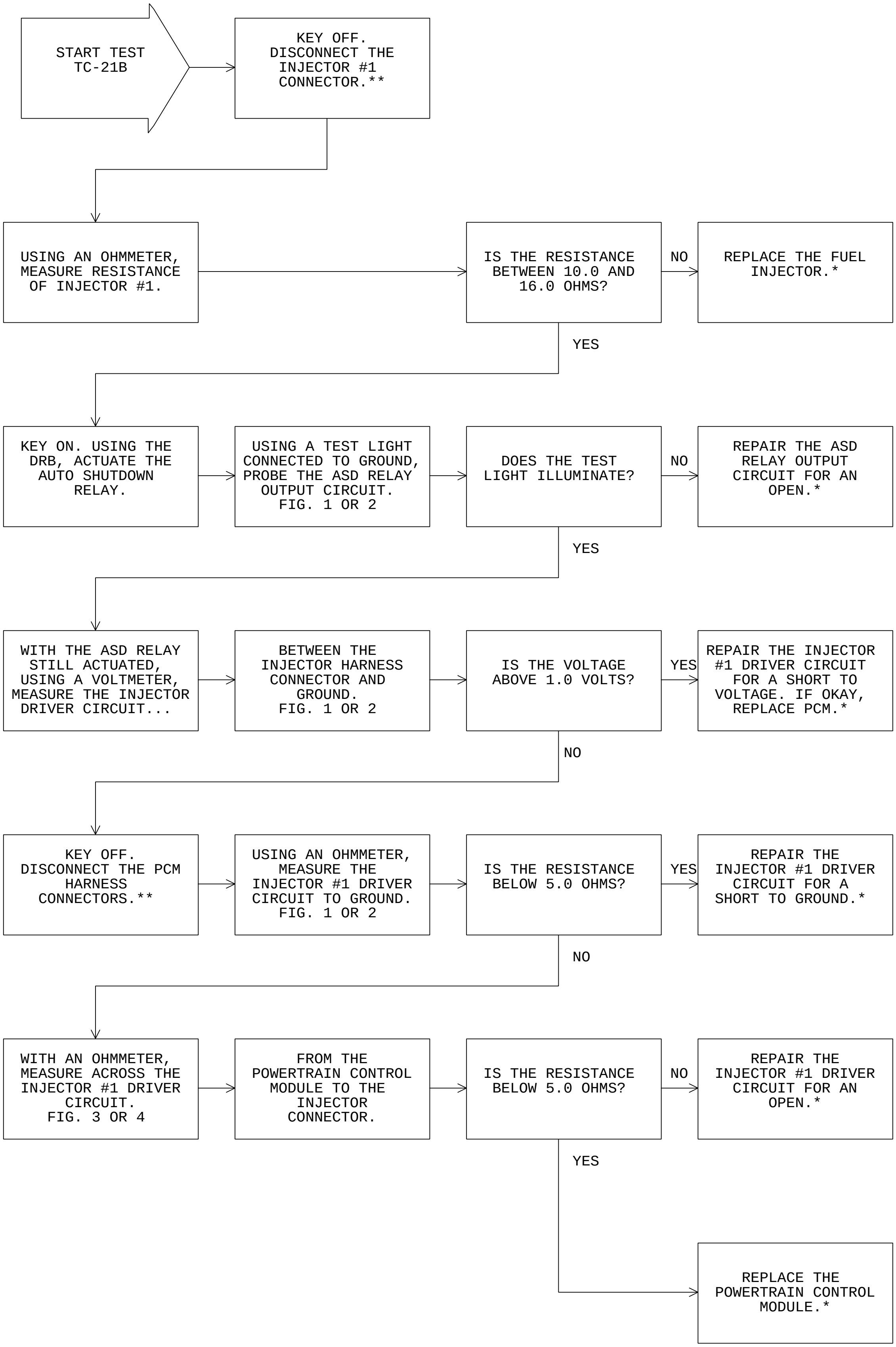
CAV	COLOR	FUNCTION
B5	YL/WT	INJECTOR #3 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

80b76ea8

FIG. 4

TEST TC-21B REPAIRING - INJECTOR #1 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding



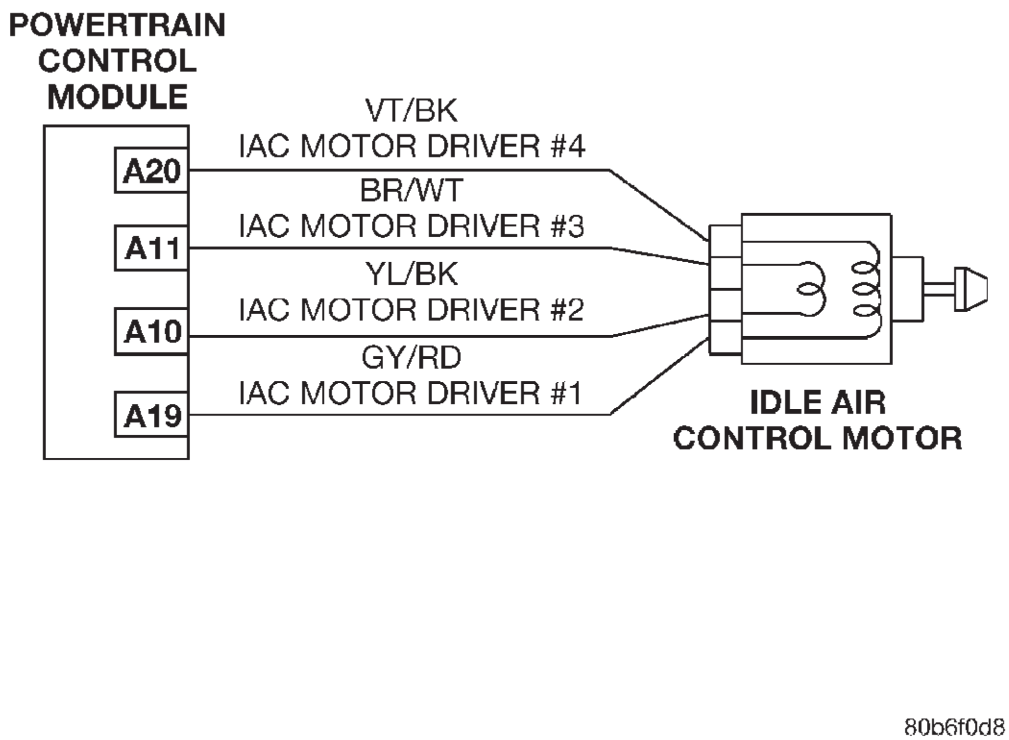
***Perform Verification TEST VER-2A.**

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

TEST TC-25A	REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: Idle Air Control Motor Circuits

When monitored: At key on and battery voltage greater than 11.5 volts.

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.

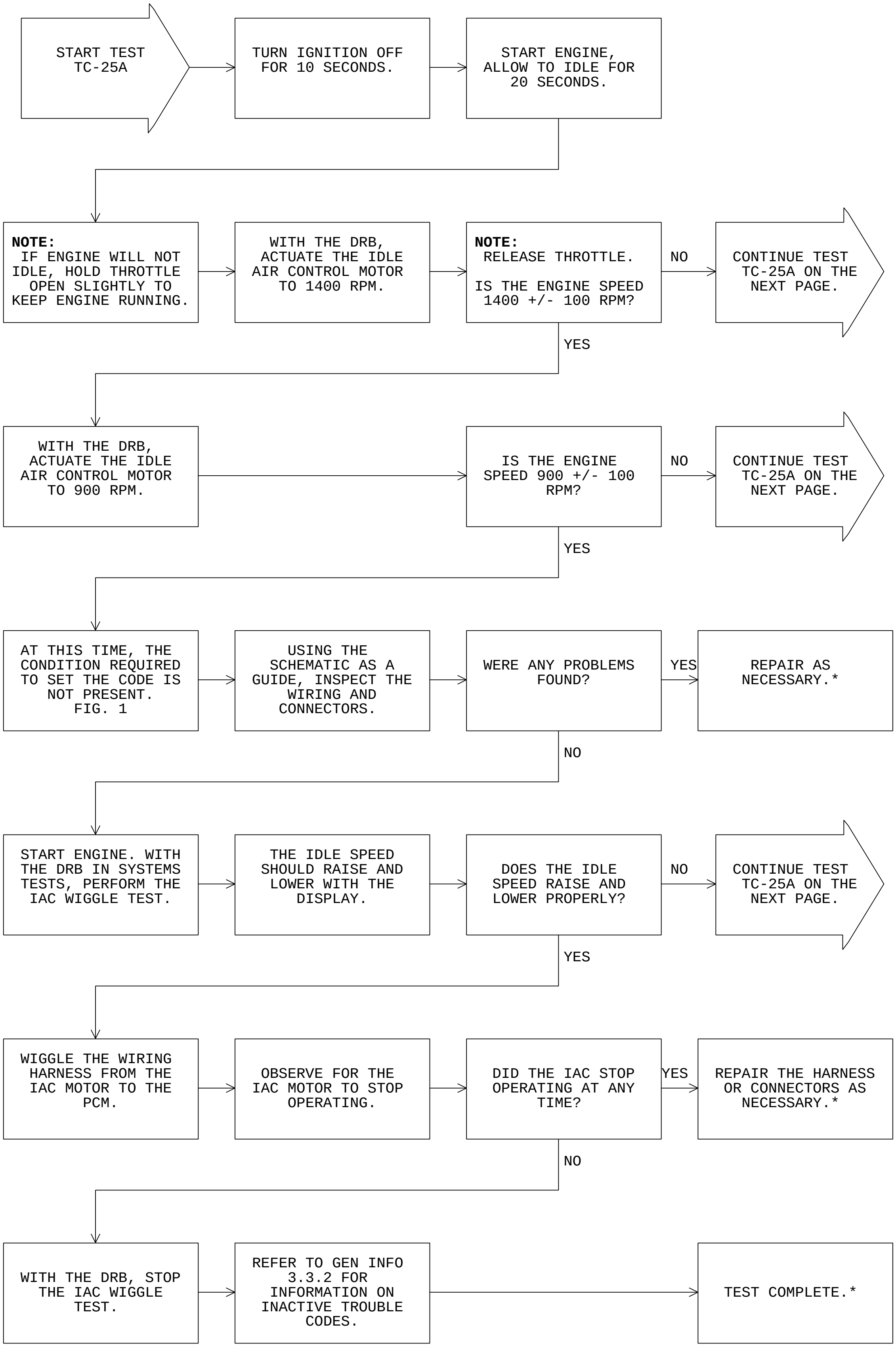
Possible causes:
- Driver circuit shorted to ground
- Driver circuit shorted to battery
- Driver circuits shorted together
- Failed PCM
- Shorted IAC motor
- Connector terminals
- Connector wires

80aa4ba1

FIG. 1

TEST TC-25A REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST DTC Before Proceeding

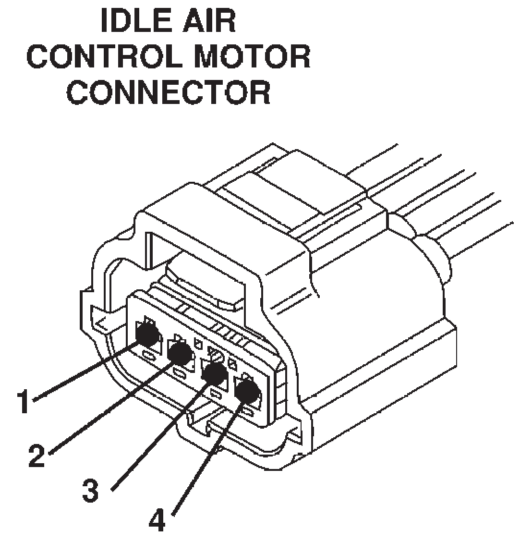


**Perform Verification TEST VER-2A.*

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

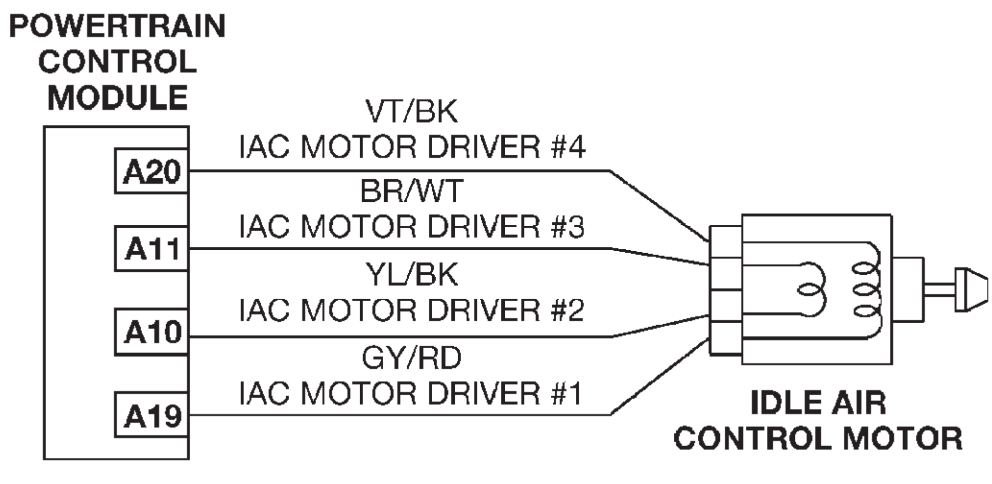
TEST TC-25A	CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

TJ/XJ BODY



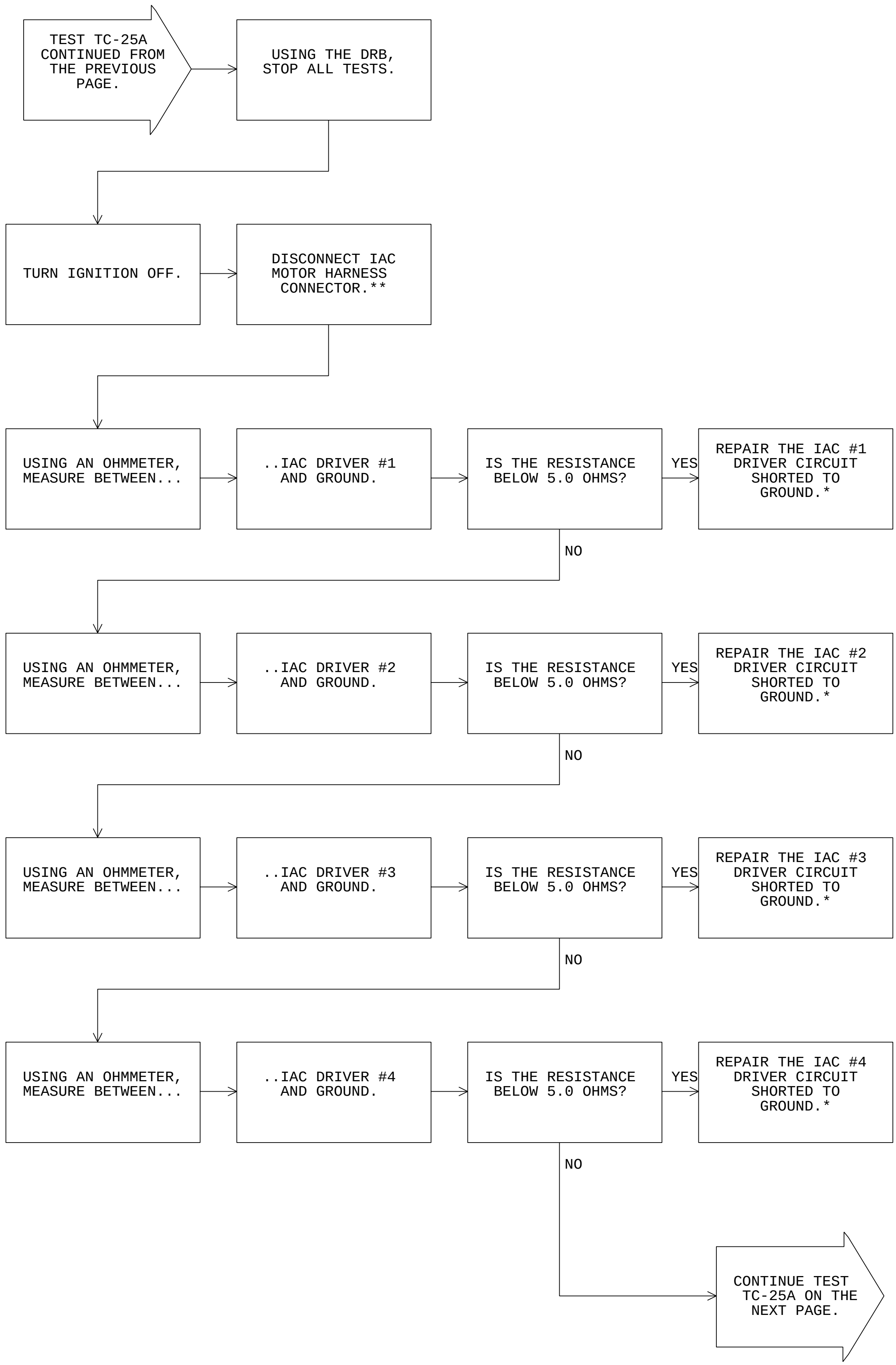
CAV	COLOR	FUNCTION
1	VT/BK	IDLE AIR CONTROL #1 DRIVER
2	BR/WT	IDLE AIR CONTROL #2 DRIVER
3	YL/BK	IDLE AIR CONTROL #3 DRIVER
4	GY/RD	IDLE AIR CONTROL #4 DRIVER

80b898b2



80b6f0d8

TEST TC-25A CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

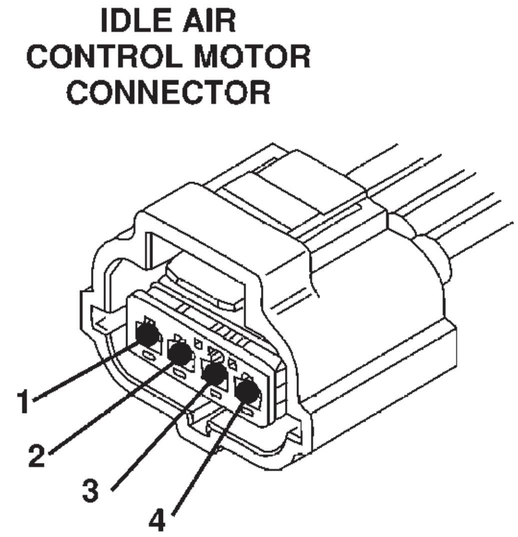


Perform Verification TEST VER-2A.

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

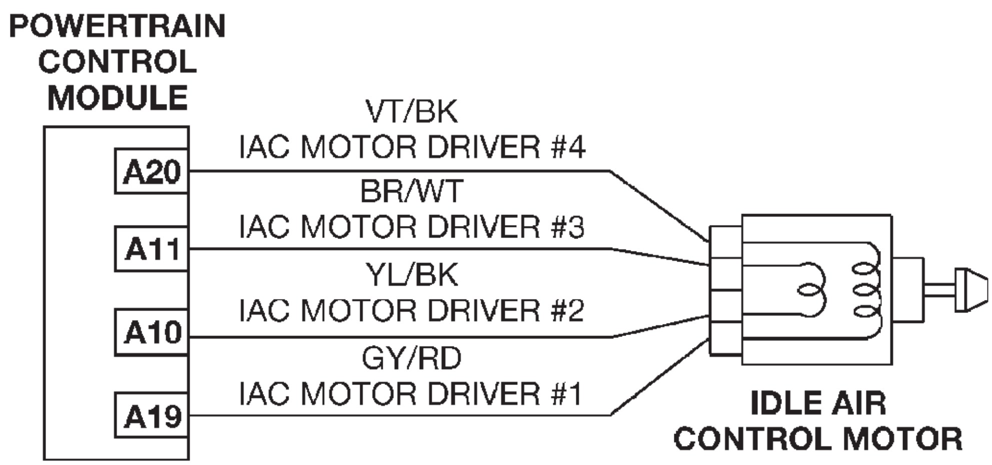
TEST TC-25A	CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

TJ/XJ BODY



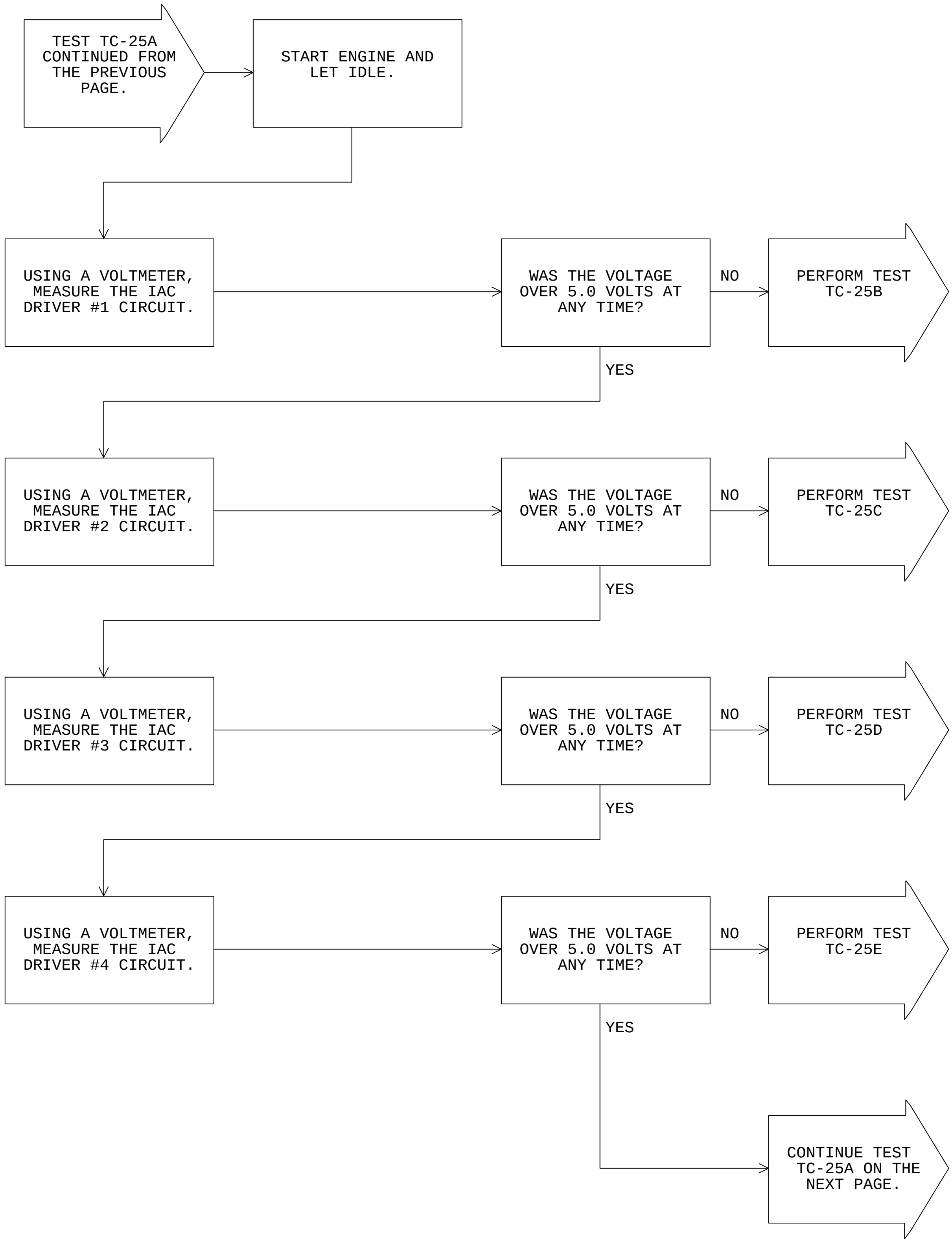
CAV	COLOR	FUNCTION
1	VT/BK	IDLE AIR CONTROL #1 DRIVER
2	BR/WT	IDLE AIR CONTROL #2 DRIVER
3	YL/BK	IDLE AIR CONTROL #3 DRIVER
4	GY/RD	IDLE AIR CONTROL #4 DRIVER

80b898b2



80b6f0d8

TEST TC-25A CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

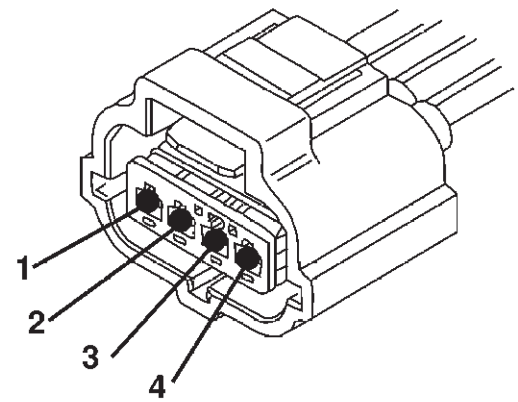


Perform Verification TEST VER-2A.	*****Check connectors - Clean / repair as necessary.***

TEST TC-25A	CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

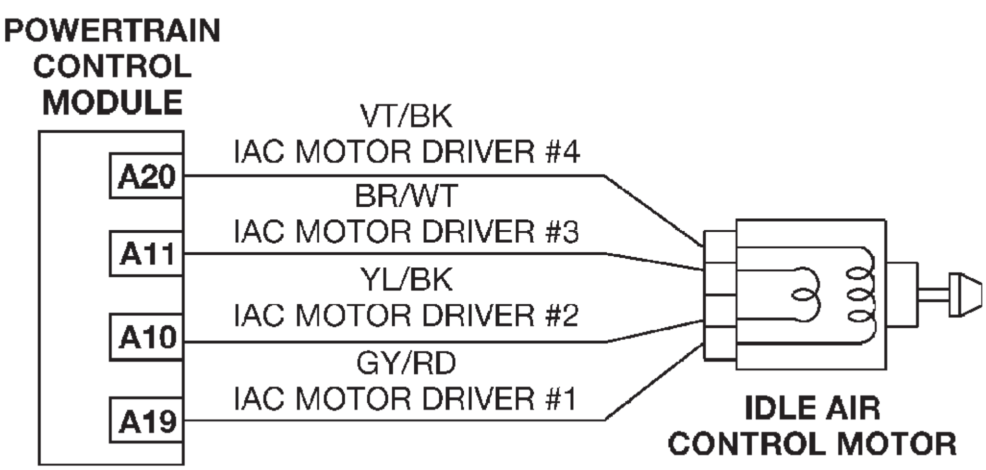
TJ/XJ BODY

IDLE AIR CONTROL MOTOR CONNECTOR



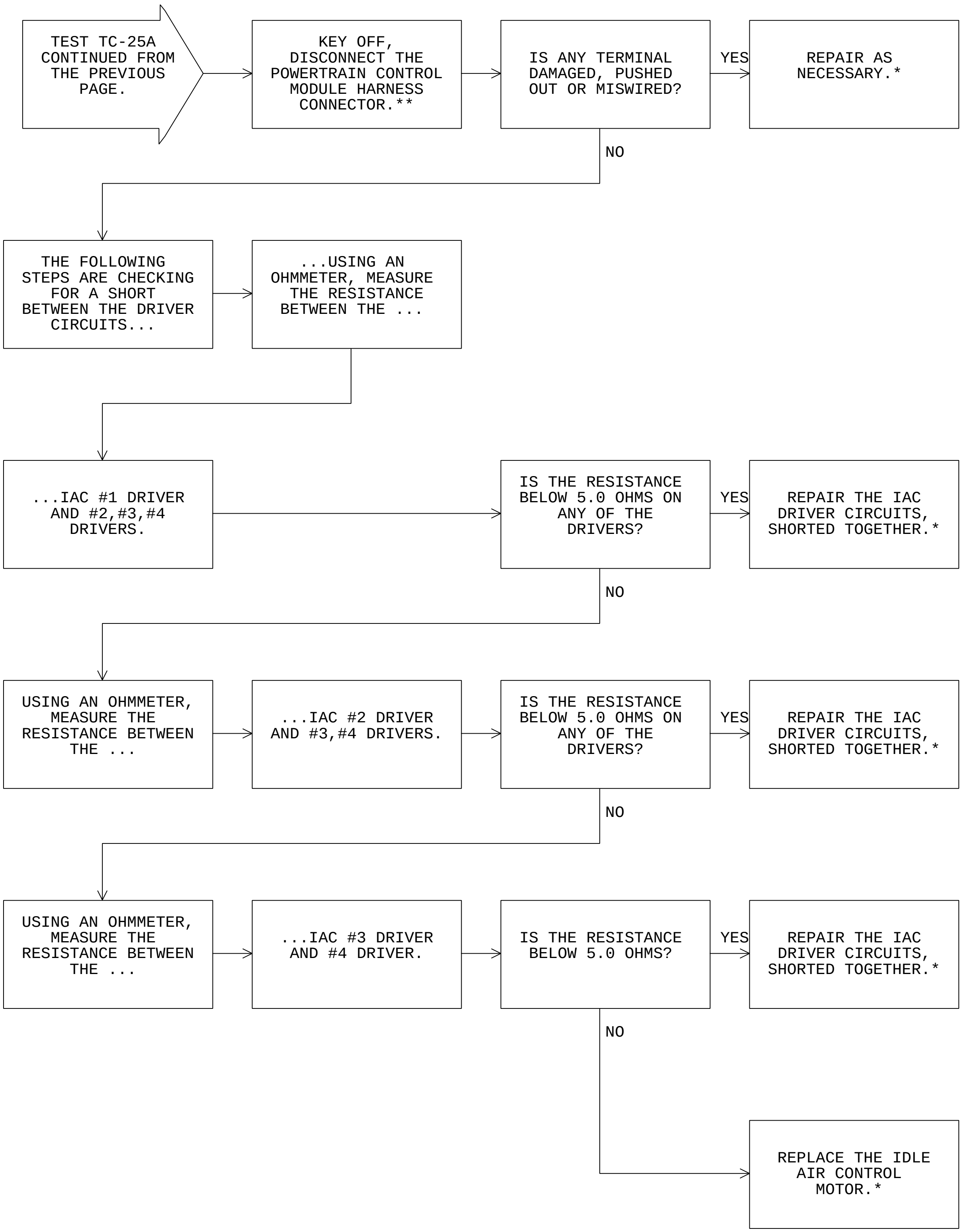
CAV	COLOR	FUNCTION
1	VT/BK	IDLE AIR CONTROL #1 DRIVER
2	BR/WT	IDLE AIR CONTROL #2 DRIVER
3	YL/BK	IDLE AIR CONTROL #3 DRIVER
4	GY/RD	IDLE AIR CONTROL #4 DRIVER

80b898b2



80b6f0d8

TEST TC-25A | **CONTINUED - REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS**

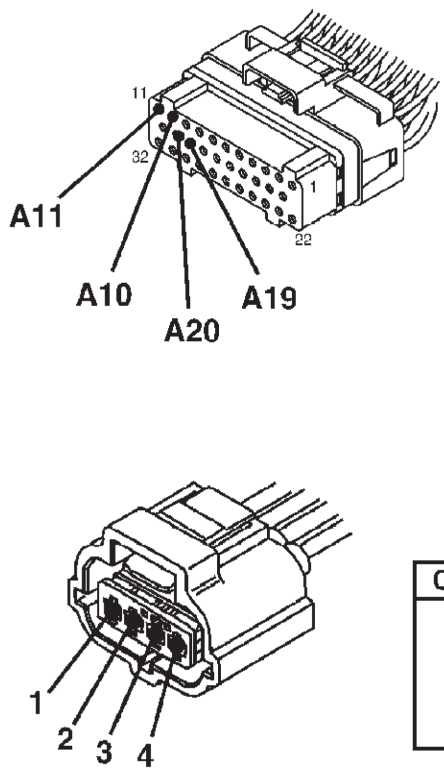


Perform Verification TEST VER-2A.* | *****Check connectors - Clean / repair as necessary.*

TEST TC-25B	REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-25A Before Proceeding

TJ/XJ BODY



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

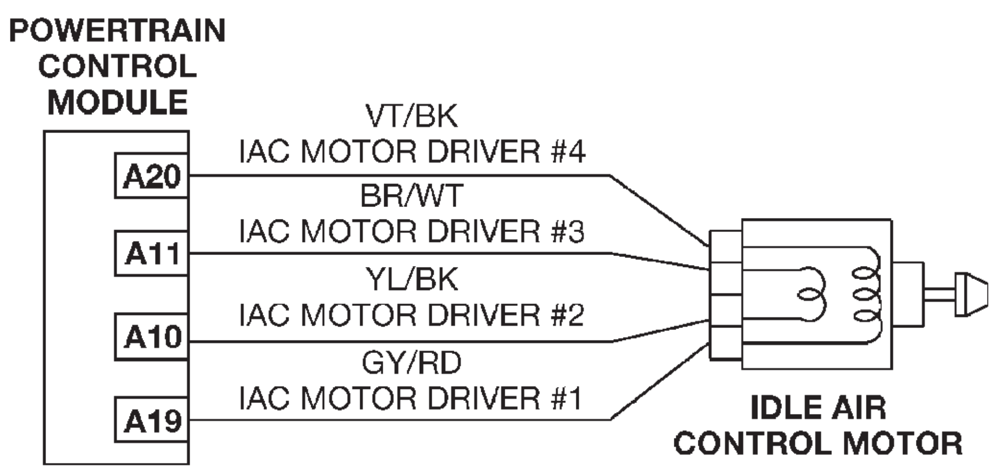
CAV	COLOR	FUNCTION
A10	YL/BK	IAC #3 DRIVER
A11	BR/WT	IAC #2 DRIVER
A19	GY/RD	IAC #4 DRIVER
A20	VT/BK	IAC #1 DRIVER

IDLE AIR CONTROL MOTOR CONNECTOR

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

80b898b3

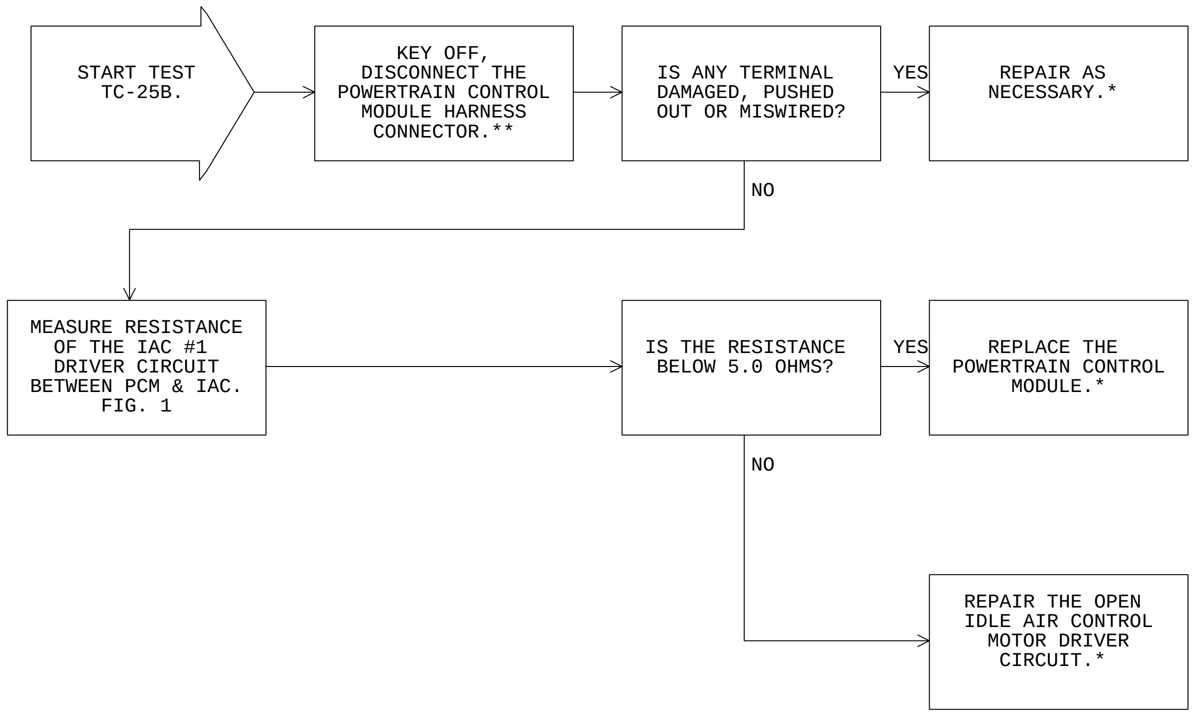
FIG. 1



80b6f0d8

TEST TC-25B | REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-25A Before Proceeding



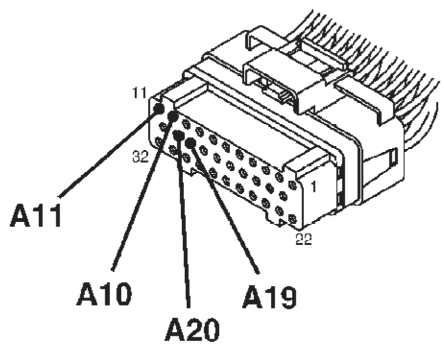
*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

TROUBLE CODE TESTS

TEST TC-25C	REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

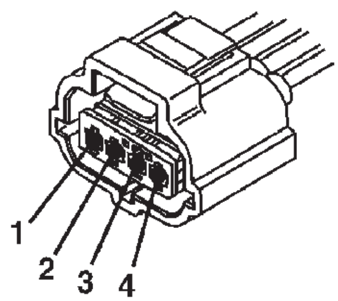
Perform TEST TC-25A Before Proceeding

TJ/XJ BODY



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A10	YL/BK	IAC #3 DRIVER
A11	BR/WT	IAC #2 DRIVER
A19	GY/RD	IAC #4 DRIVER
A20	VT/BK	IAC #1 DRIVER

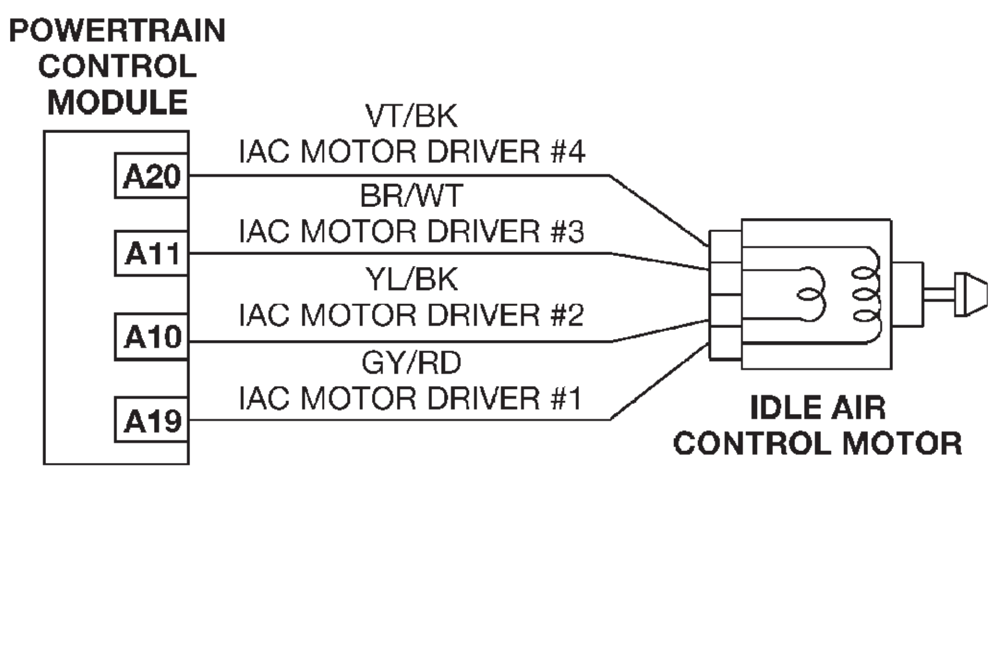


IDLE AIR CONTROL MOTOR CONNECTOR

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

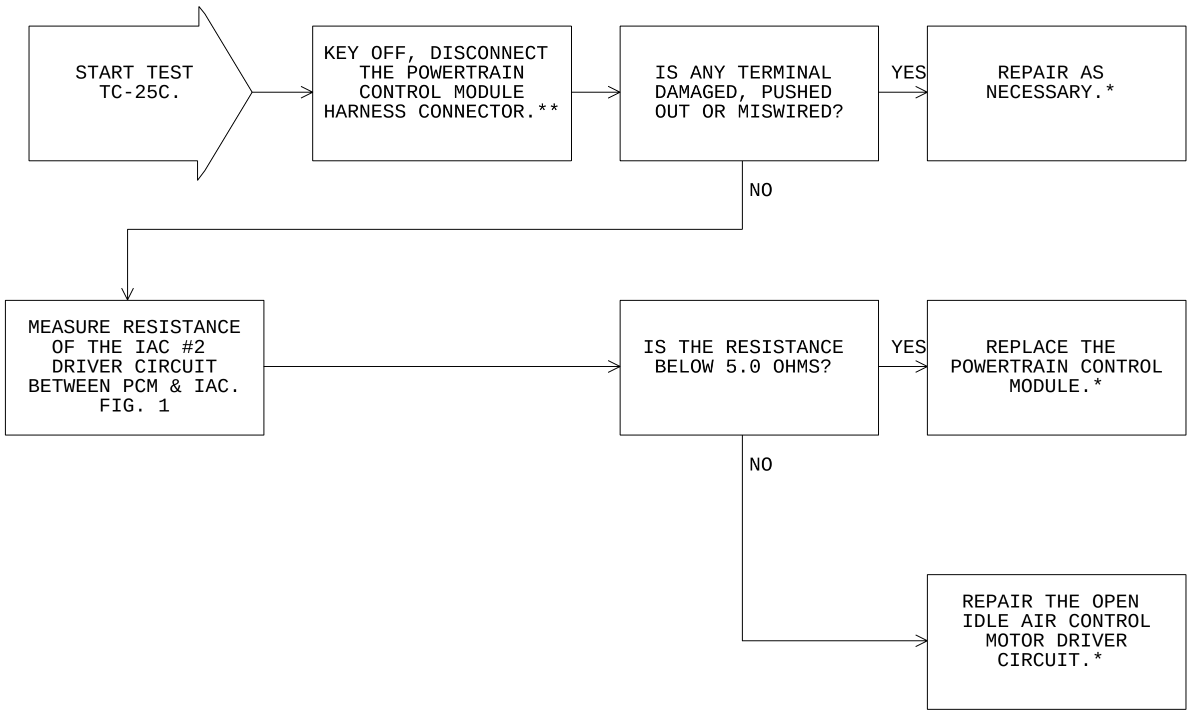
80b898b3

FIG. 1



TEST TC-25C | REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-25A Before Proceeding



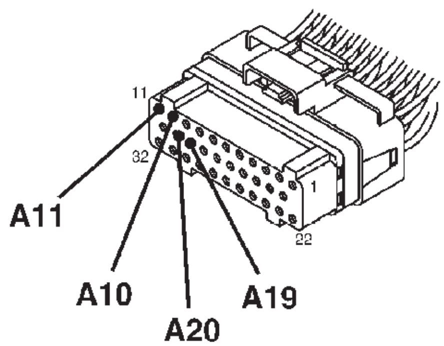
Perform Verification TEST VER-2A.

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

TEST TC-25D	REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

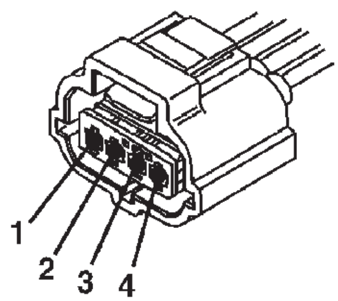
Perform TEST TC-25A Before Proceeding

<u>TJ/XJ BODY</u>



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A10	YL/BK	IAC #3 DRIVER
A11	BR/WT	IAC #2 DRIVER
A19	GY/RD	IAC #4 DRIVER
A20	VT/BK	IAC #1 DRIVER

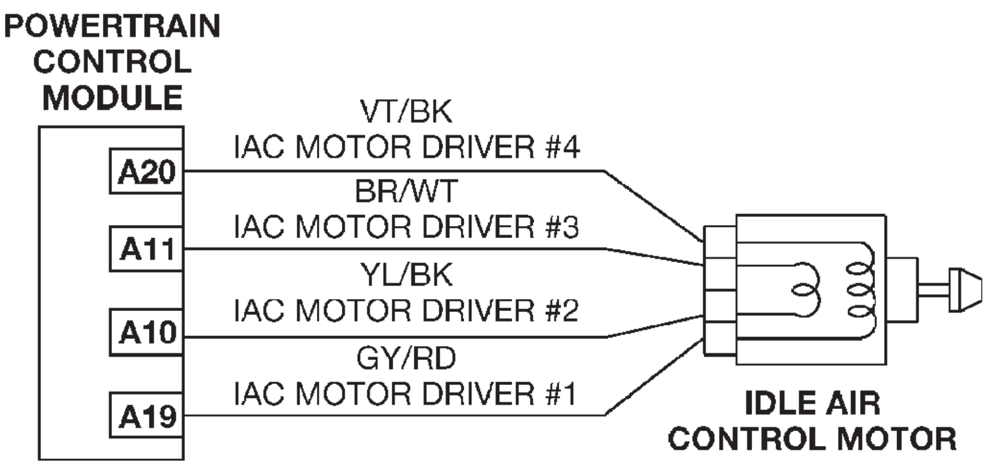


IDLE AIR CONTROL MOTOR CONNECTOR

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

80b898b3

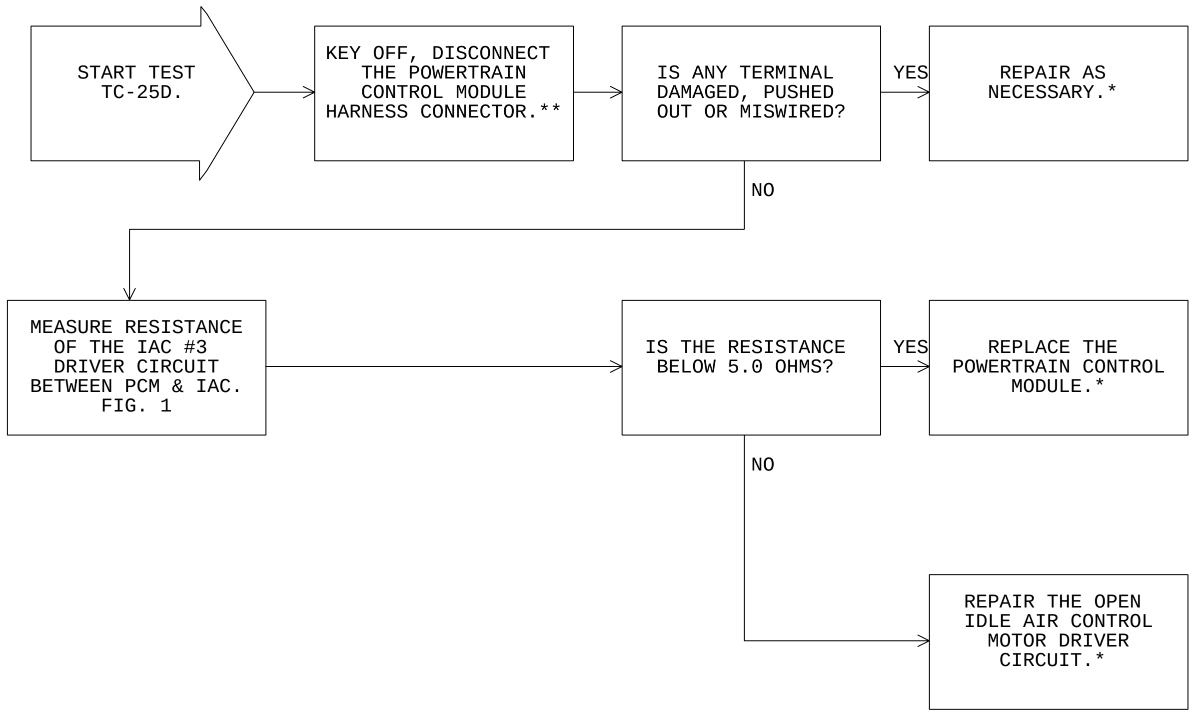
FIG. 1



80b6f0d8

TEST TC-25D | REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-25A Before Proceeding

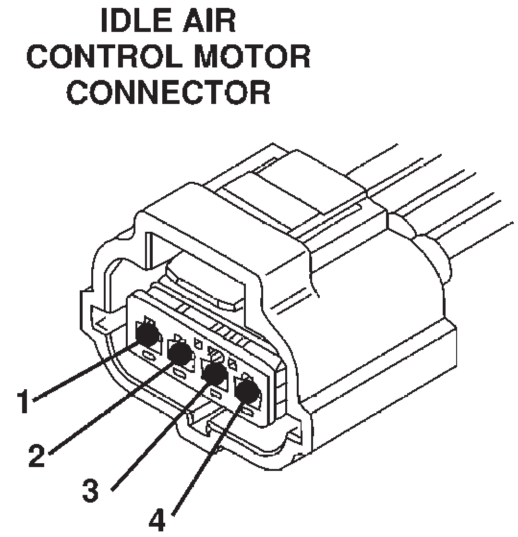


Perform Verification TEST VER-2A. | ****Check connectors - Clean / repair as necessary.***

TEST TC-25E	REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS

Perform TEST TC-25A Before Proceeding

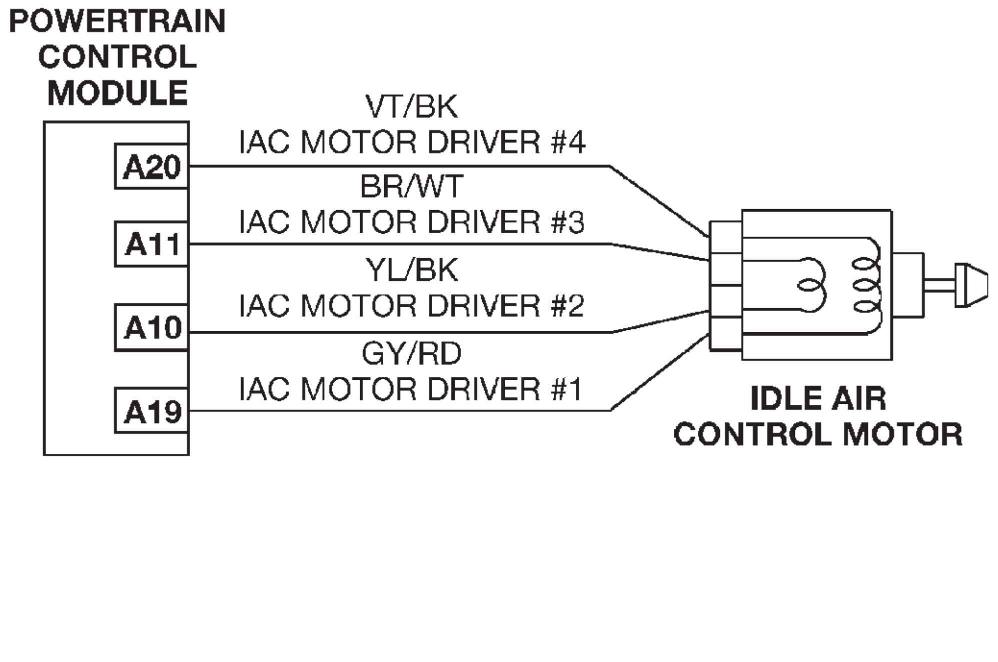
TJ/XJ BODY



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

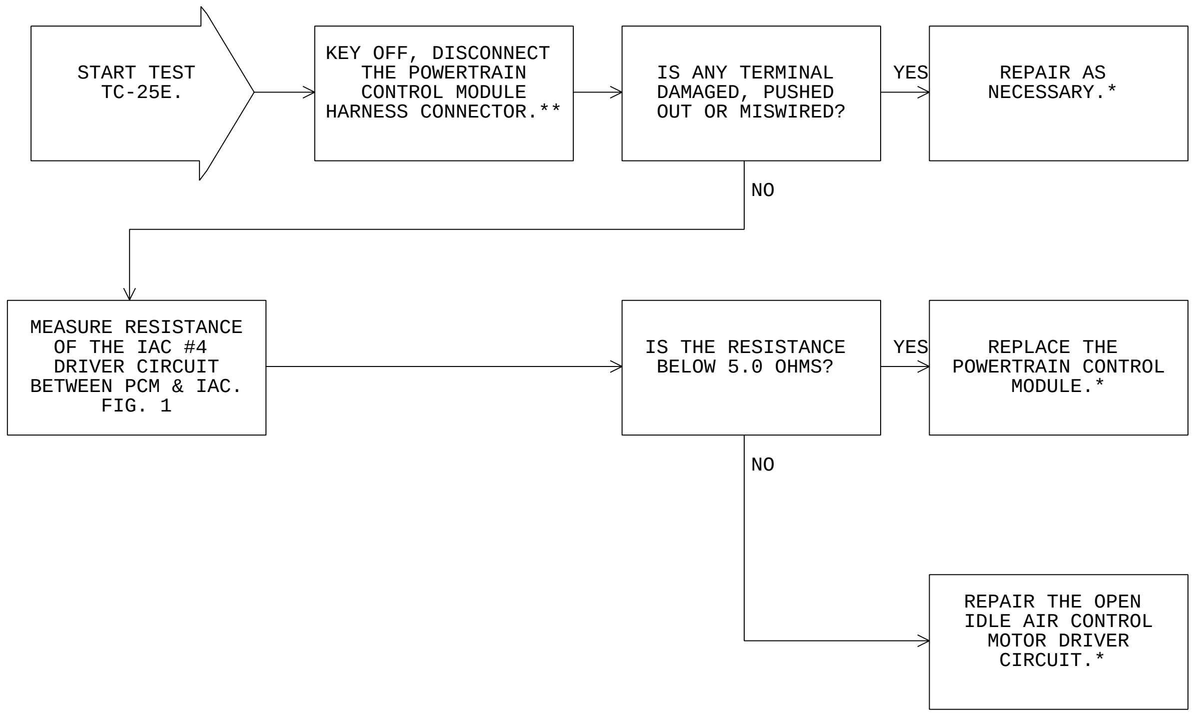
80b898b2

FIG. 1



TEST TC-25E | **REPAIRING - IDLE AIR CONTROL MOTOR CIRCUITS**

Perform TEST TC-25A Before Proceeding

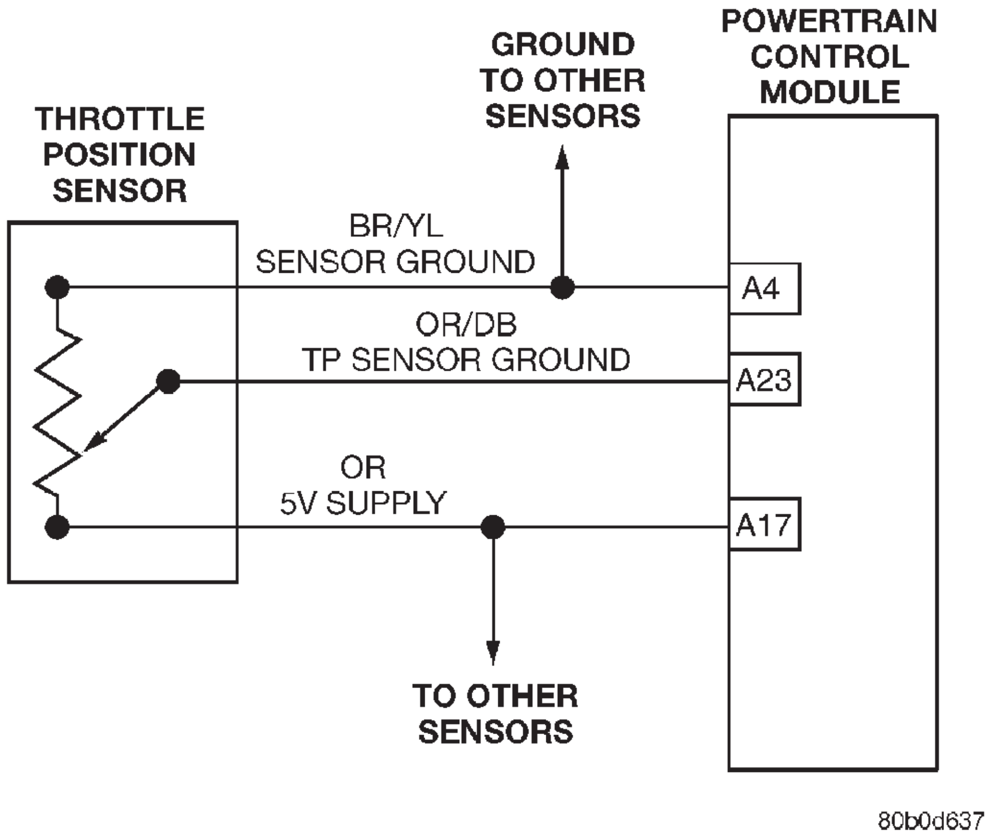


Perform Verification TEST VER-2A.** | ****Check connectors - Clean / repair as necessary.

TEST TC-26A	REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: Throttle Position Sensor Voltage Low

When monitored: With the ignition on, and battery voltage above 10.4 volts.

Set condition: TP sensor voltage at PCM .1 volt for 3.2 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. 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. The sensor ground is provided by PCM.

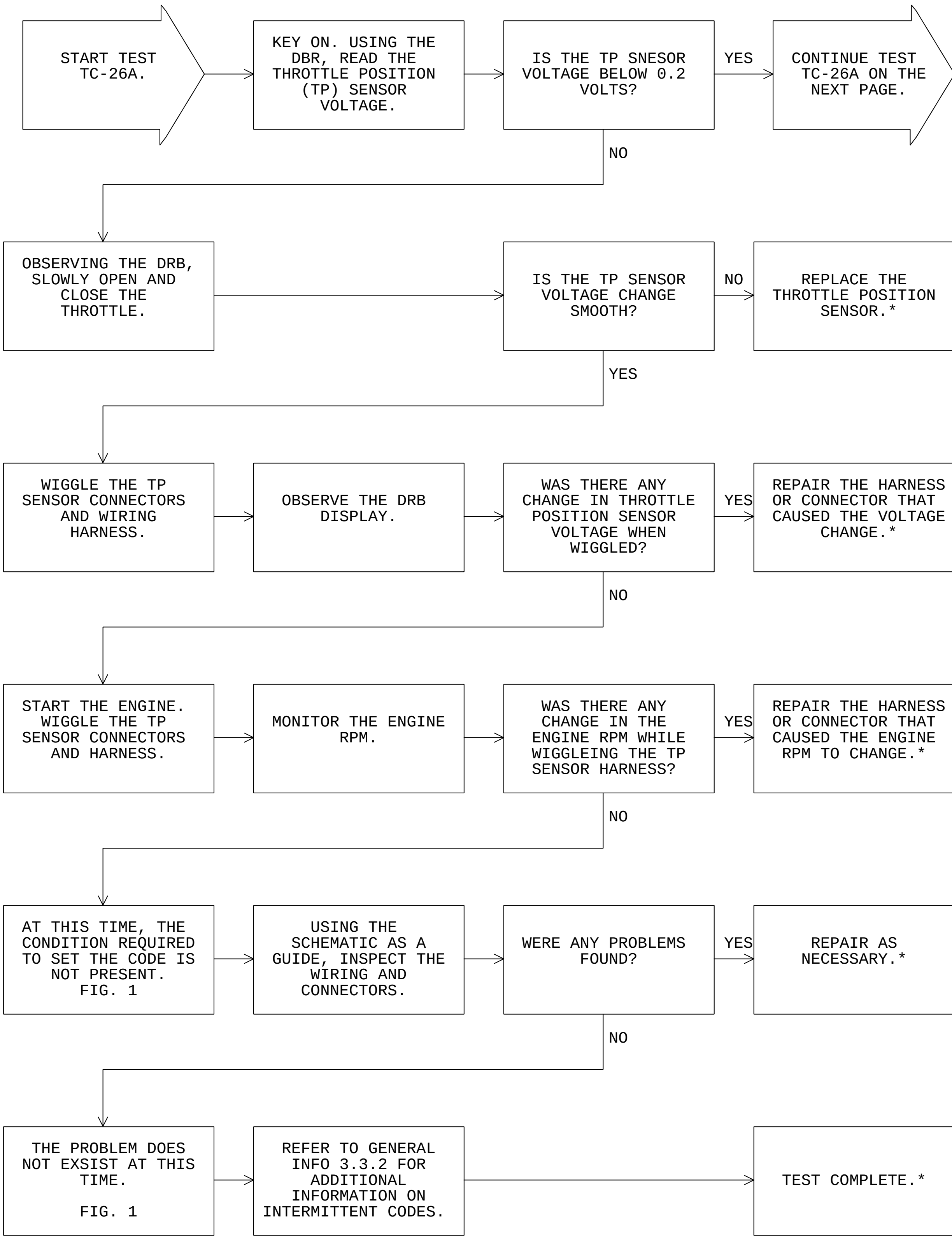
Possible causes:
> Sensor signal circuit shorted to ground
> Throttle position sensor failure
> Loss of 5-volt supply

80aa4b9b

FIG. 1

TEST TC-26A REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW

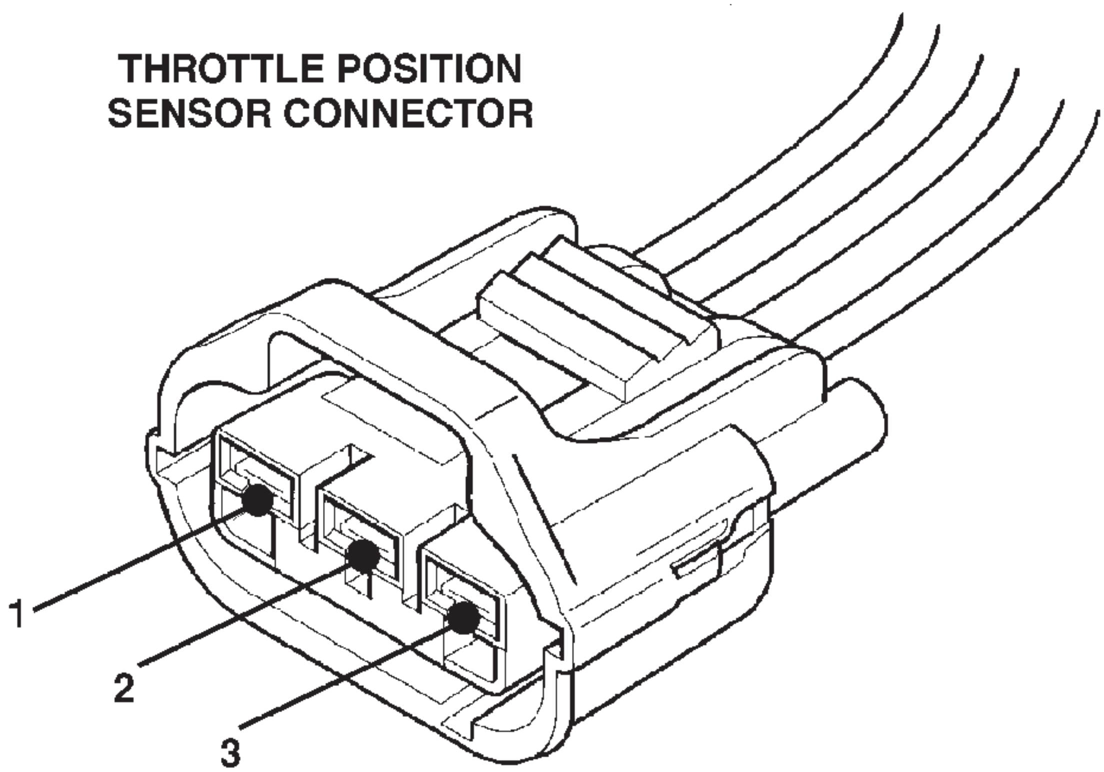
Perform TEST DTC Before Proceeding



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

TEST TC-26A	CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW

TJ/XJ BODY

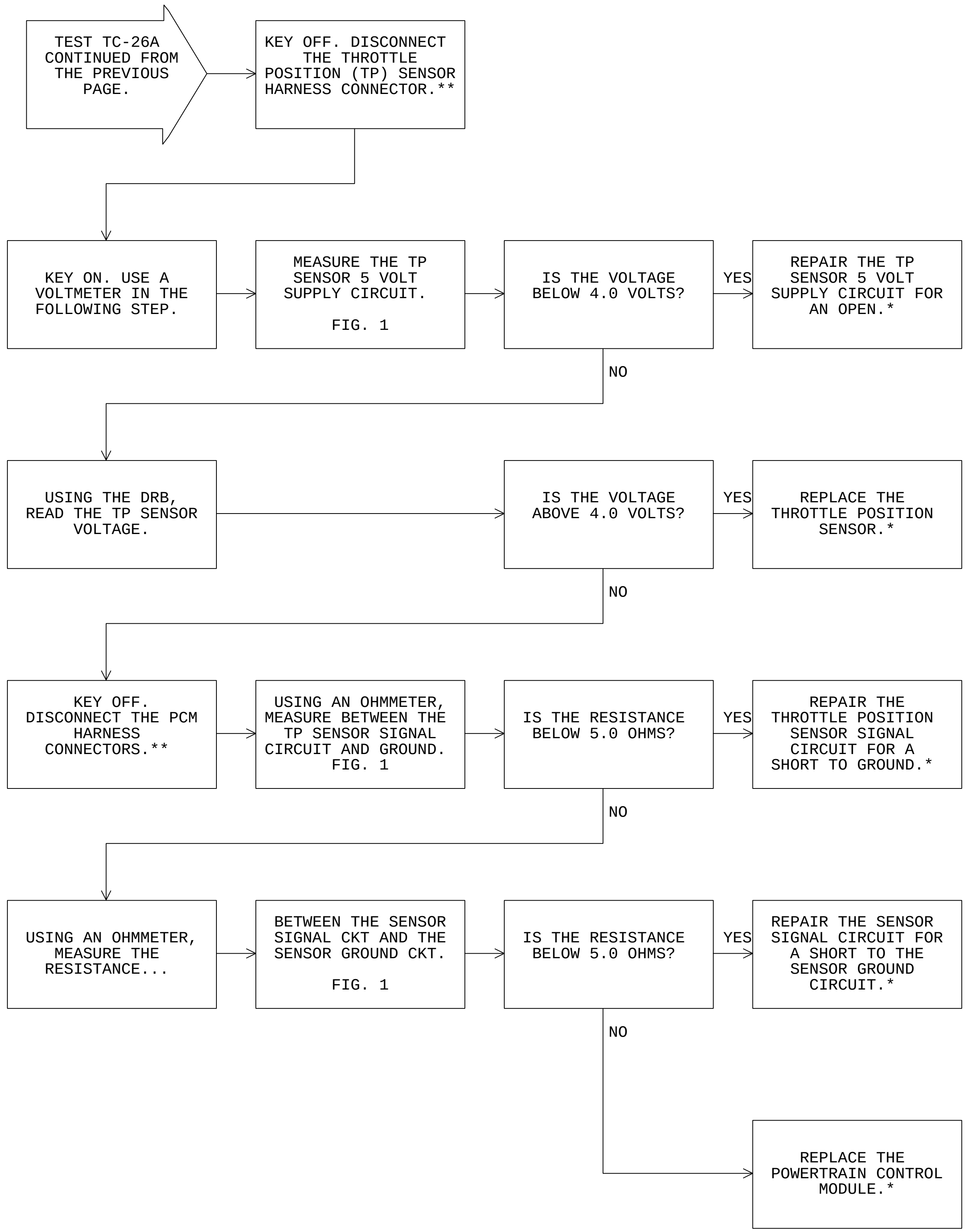


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b6f0e7

FIG. 1

TEST TC-26A — CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE LOW



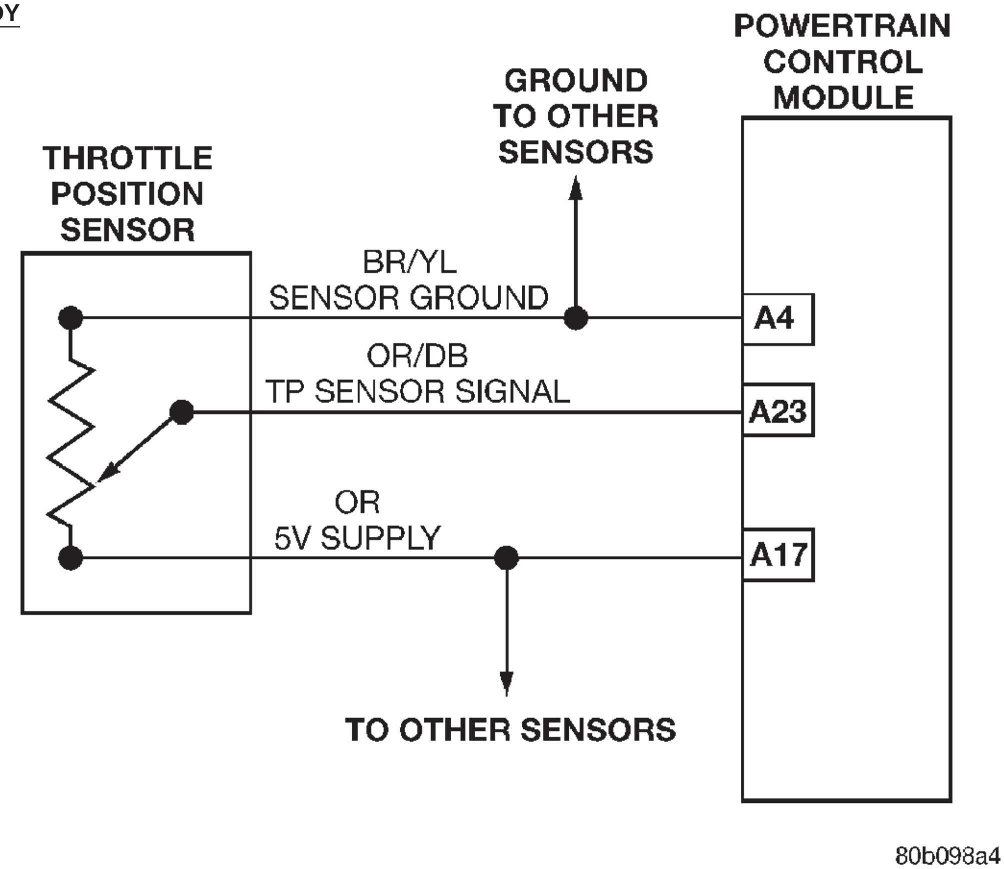
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-27A	REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: Throttle Position Sensor Voltage High

When monitored: With the ignition on, and battery voltage above 10.4 volts.

Set condition: TP sensor voltage at PCM goes above 4.9 volts for 3.2 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. 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. The sensor ground is provided by PCM.

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

80aa4b9c

FIG. 1

TEST TC-27A — REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

Perform TEST DTC Before Proceeding

START TEST TC-27A.

USING THE DRB, READ THE THROTTLE POSITION SENSOR VOLTAGE.

IS THE THROTTLE POSITION SENSOR VOLTAGE ABOVE 4.5 VOLTS?

- YES → CONTINUE TEST TC-27A ON THE NEXT PAGE.
- NO → OBSERVING THE DRB, SLOWLY OPEN AND CLOSE THE THROTTLE.

IS THE VOLTAGE CHANGE SMOOTH?

- NO → REPLACE THE THROTTLE POSITION SENSOR.*
- YES → WIGGLE THROTTLE POSITON SENSOR CONNECTORS AND WIRING HARNESS.

MONITOR THE DRB DISPLAY.

WAS THERE ANY CHANGE IN THROTTLE POSITION SENSOR VOLTAGE WHEN WIGGLED?

- YES → REPAIR THE HARNESS OR CONNECTOR THAT CAUSED THE VOLTAGE CHANGE.*
- NO → AT THIS TIME, THE CONDITION REQUIRED TO SET THE CODE IS NOT PRESENT. FIG. 1

USING THE SCHEMATIC AS A GUIDE, INSPECT THE WIRING AND CONNECTORS.

WERE ANY PROBLEMS FOUND?

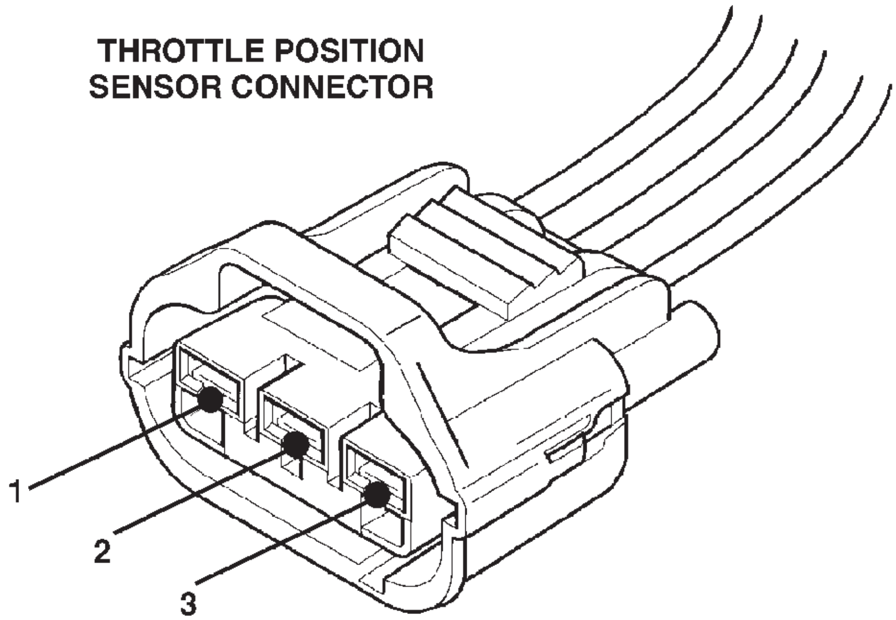
- YES → REPAIR AS NECESSARY.*
- NO → REFER TO GENERAL INFO 3.3.2 FOR ADDITIONAL INFORMATION ON INTERMITTENT CODES.

TEST COMPLETE.*

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

TEST TC-27A — CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH

TJ/XJ BODY

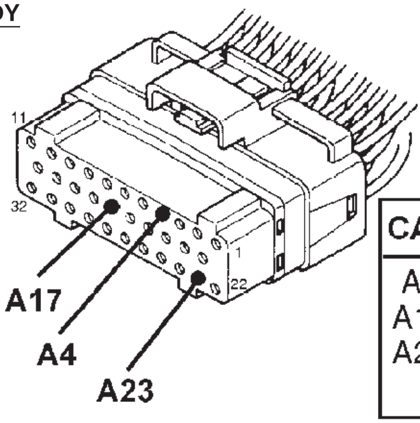


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b6f0e7

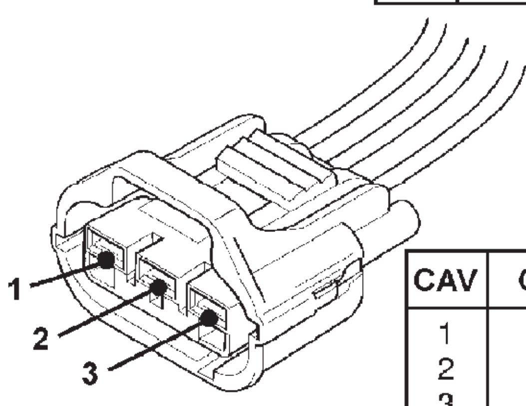
FIG. 1

TJ/XJ BODY



POWERTRAIN
CONTROL MODULE
BLACK CONNECTOR

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
A23	OR/DB	THROTTLE POSITION SENSOR SIGNAL



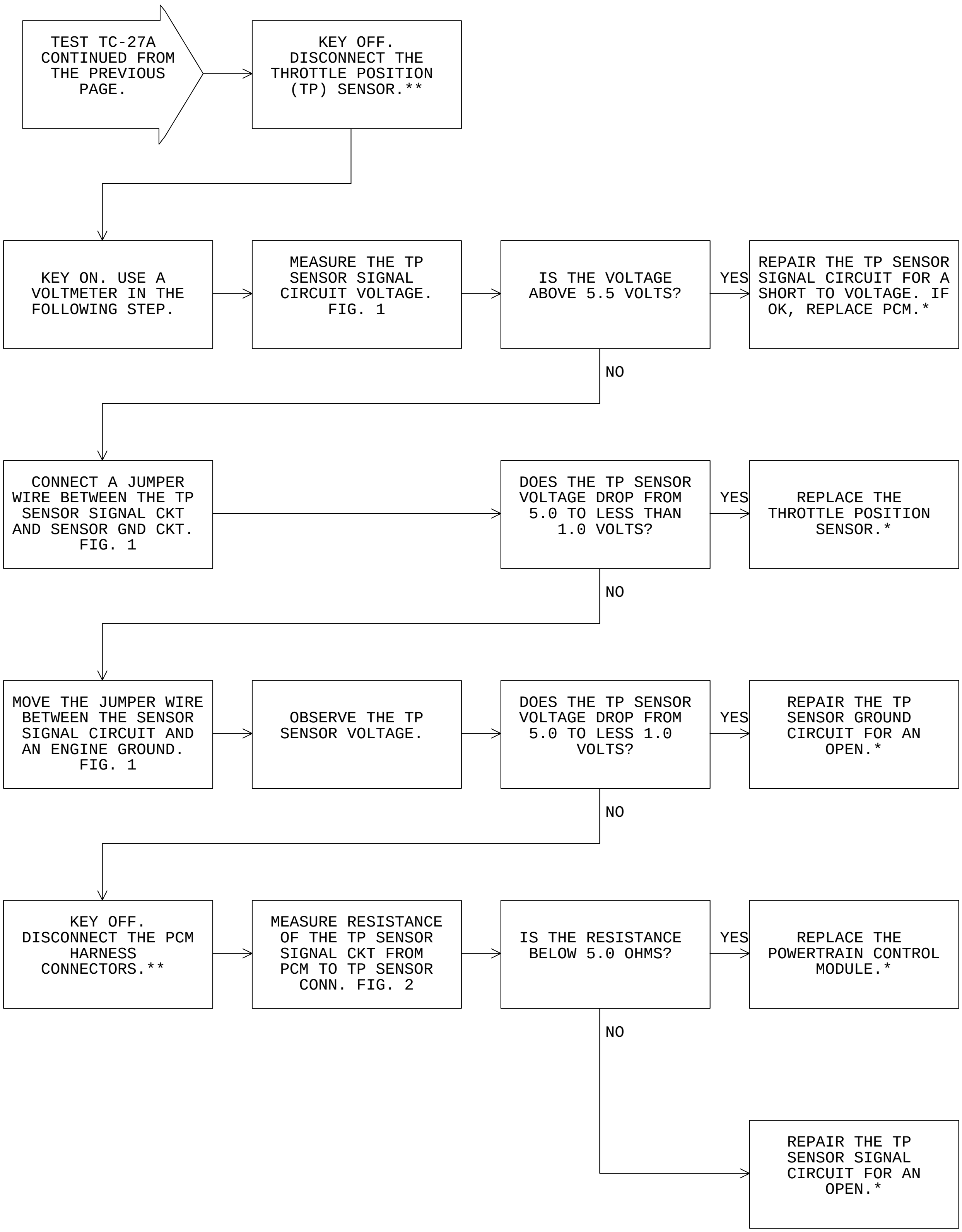
THROTTLE
POSITION SENSOR
CONNECTOR

CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b098a6

FIG. 2

TEST TC-27A — CONTINUED - REPAIRING - THROTTLE POSITION SENSOR VOLTAGE HIGH



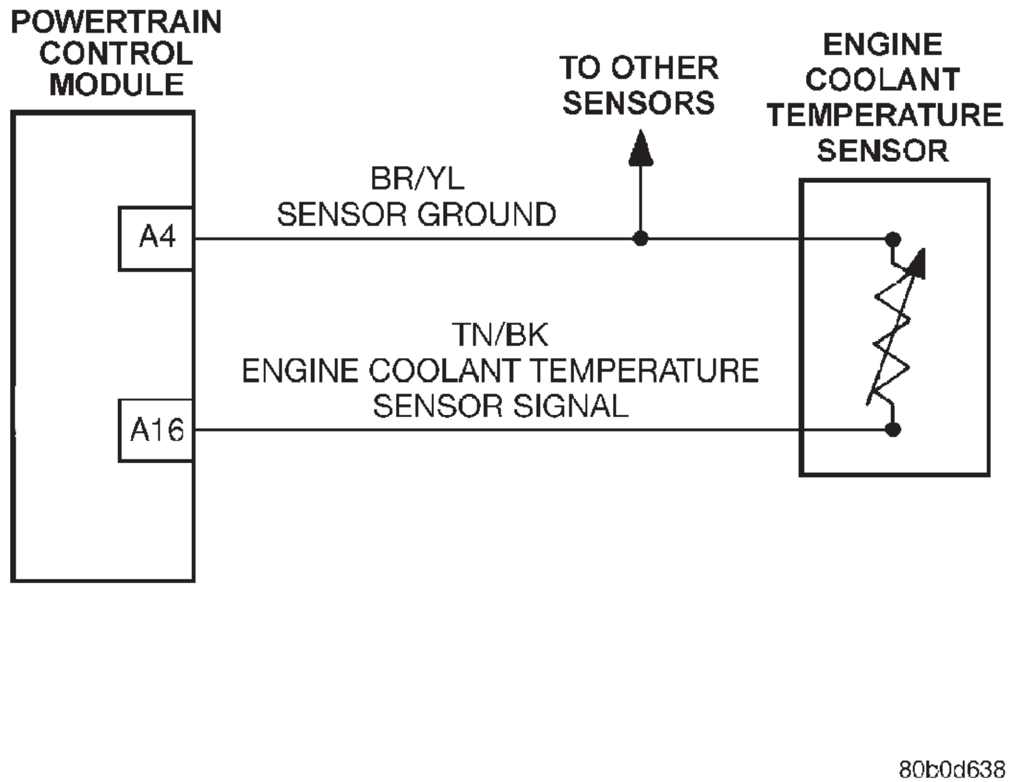
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-30A	REPAIRING - ECT SENSOR VOLTAGE TOO LOW

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: ECT Sensor Voltage Too High

When monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set condition: The engine coolant temperature sensor circuit voltage at the PCM goes below .8 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 the PCM.

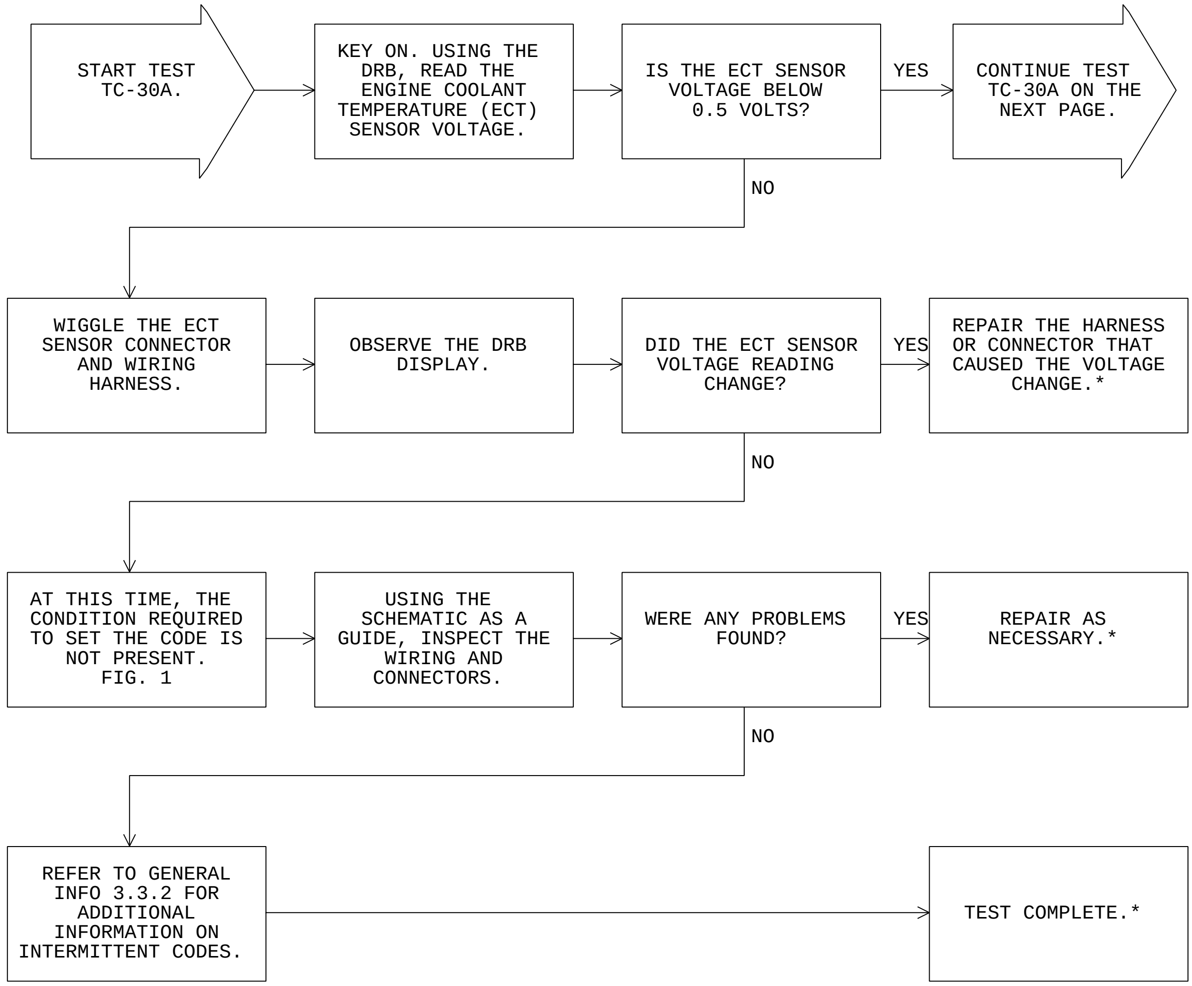
Possible causes:
- Sensor signal shorted to ground
- Sensor internally shorted
- PCM failure
- Connector terminals
- Connector wires

80aa4c21

FIG. 1

TEST TC-30A — REPAIRING - ECT SENSOR VOLTAGE TOO LOW

Perform TEST DTC Before Proceeding

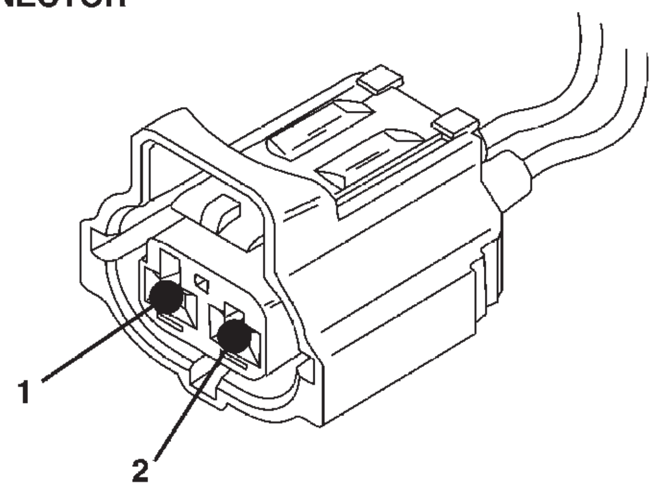


Perform Verification TEST VER-2A.	***Check connectors - Clean / repair as necessary.***

TEST TC-30A | **CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO LOW**

TJ BODY

ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR



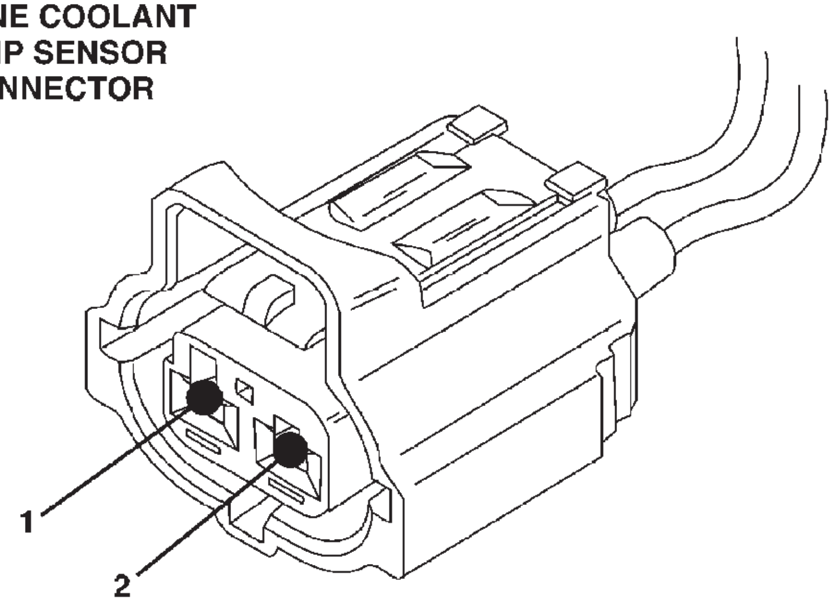
CAV	COLOR	FUNCTION
1	TN/BK	ECT SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

80aff5a0

FIG. 1

XJ BODY

ENGINE COOLANT TEMP SENSOR CONNECTOR



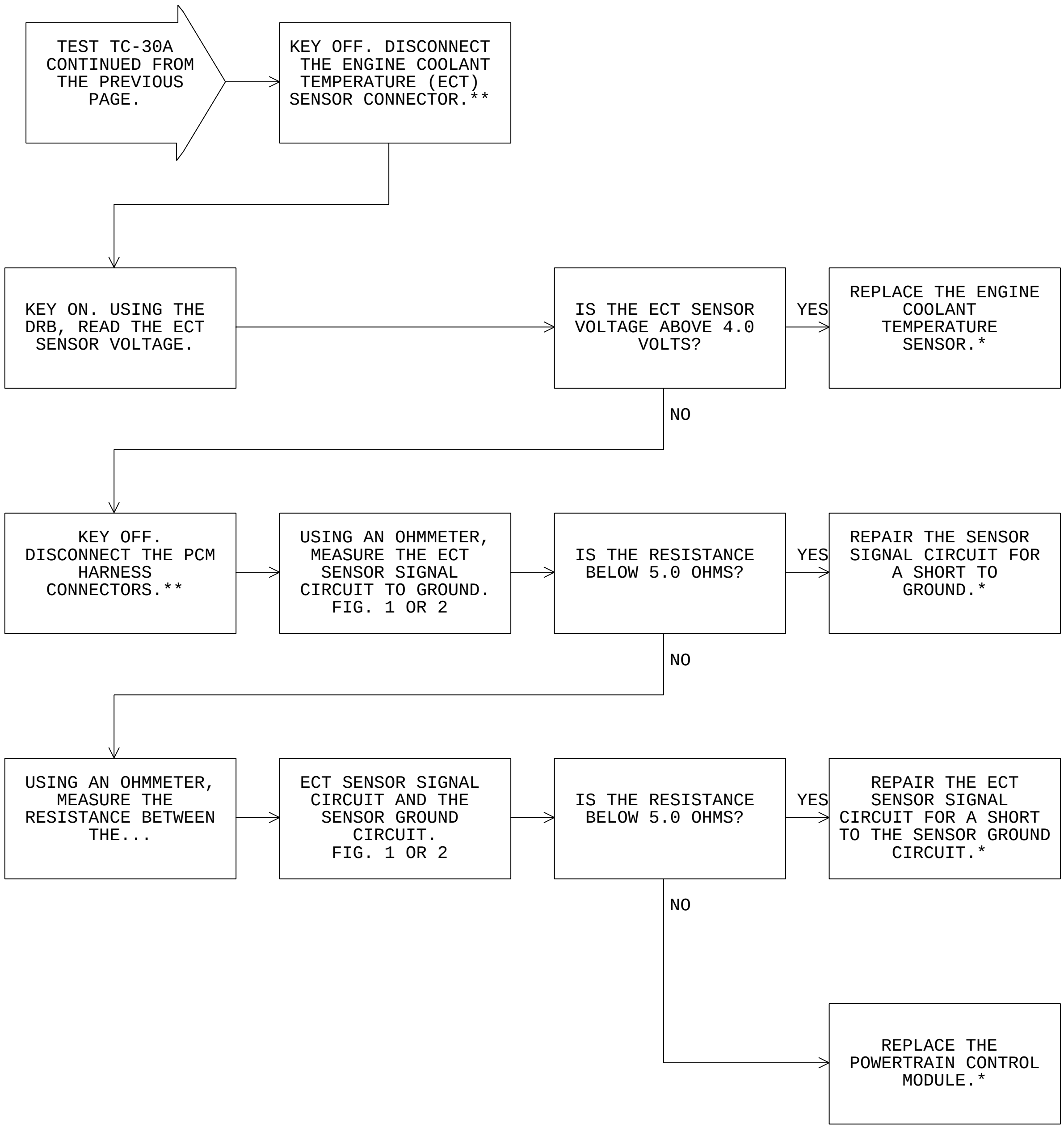
CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	TN/BK	ECT SENSOR SIGNAL

80b098a7

FIG. 2

TEST TC-30A

CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO LOW

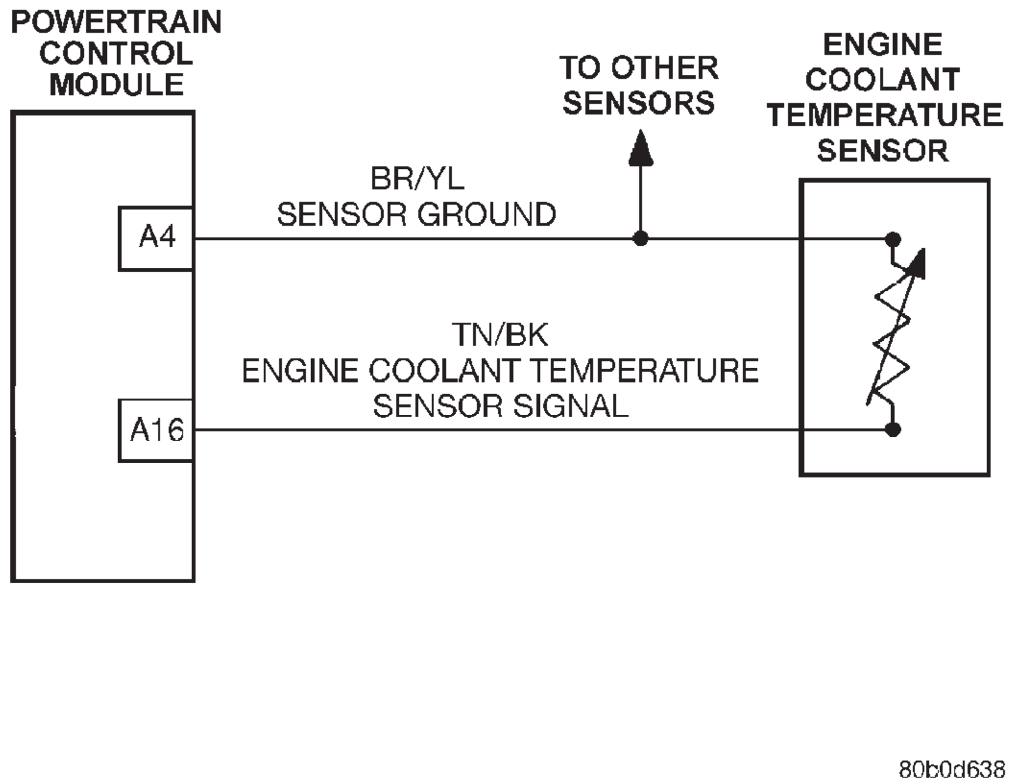


***Perform Verification TEST VER-2A.**	****Check connectors - Clean / repair as necessary.**

TEST TC-31A	REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: ECT Sensor Voltage Too High

When monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set condition: The engine coolant temperature sensor circuit voltage at the PCM goes above 4.98 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 will be low. This allows the sensor to provide an analog voltage signal (0 to 5-volt) to the PCM.

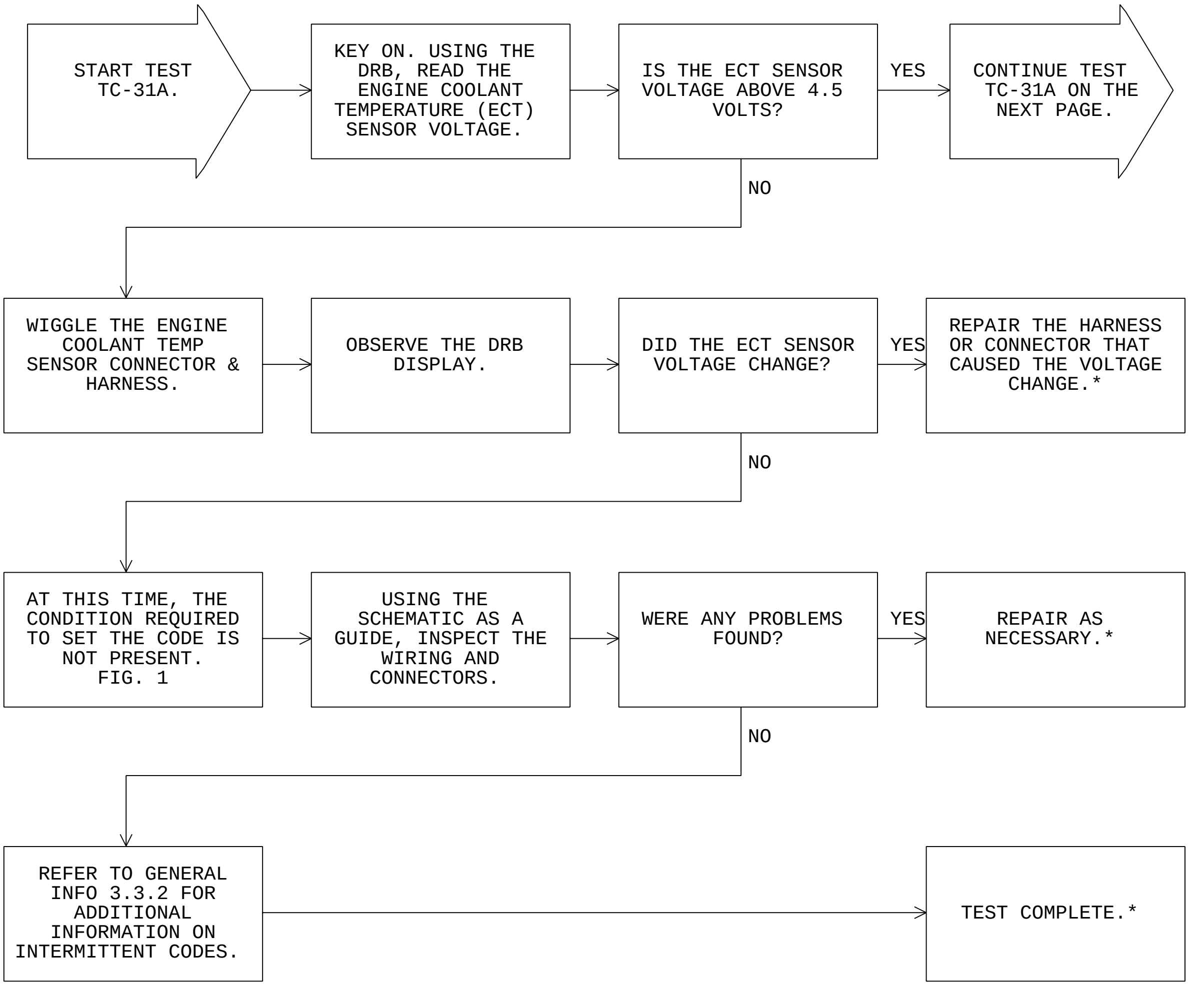
Possible causes:
> Sensor signal circuit open or shorted
> Sensor internally open
> Sensor ground circuit open
> PCM failure
> Connector terminals
> Connector wires

80b04fd9

FIG. 1

TEST TC-31A	REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

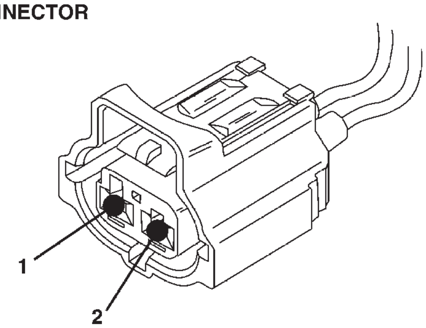
Perform TEST DTC Before Proceeding



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

TEST TC-31A — CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO HIGH

TJ BODY

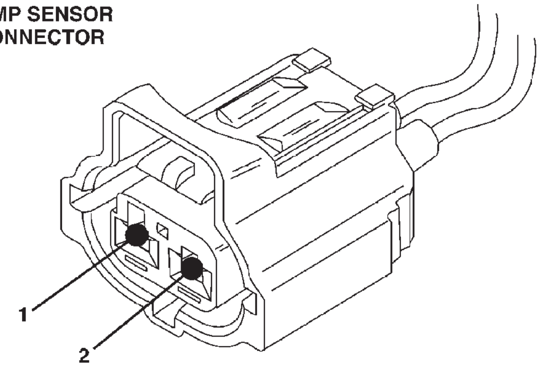


CAV	COLOR	FUNCTION
1	TN/BK	ECT SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

80aff5a0

FIG. 1

XJ BODY

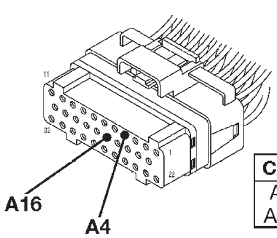


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	TN/BK	ECT SENSOR SIGNAL

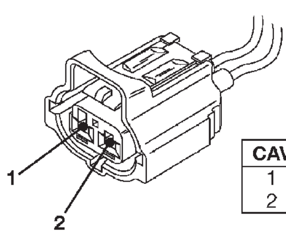
80b098a7

FIG. 2

TJ BODY



CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A16	TN/BK	ECT SENSOR SIGNAL

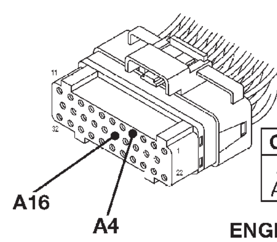


CAV	COLOR	FUNCTION
1	TN/BK	ECT SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

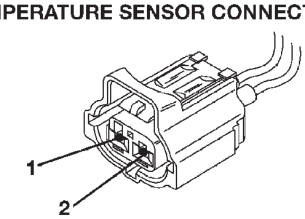
80afb69f

FIG. 3

XJ BODY



CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A16	TN/BK	ECT SENSOR SIGNAL

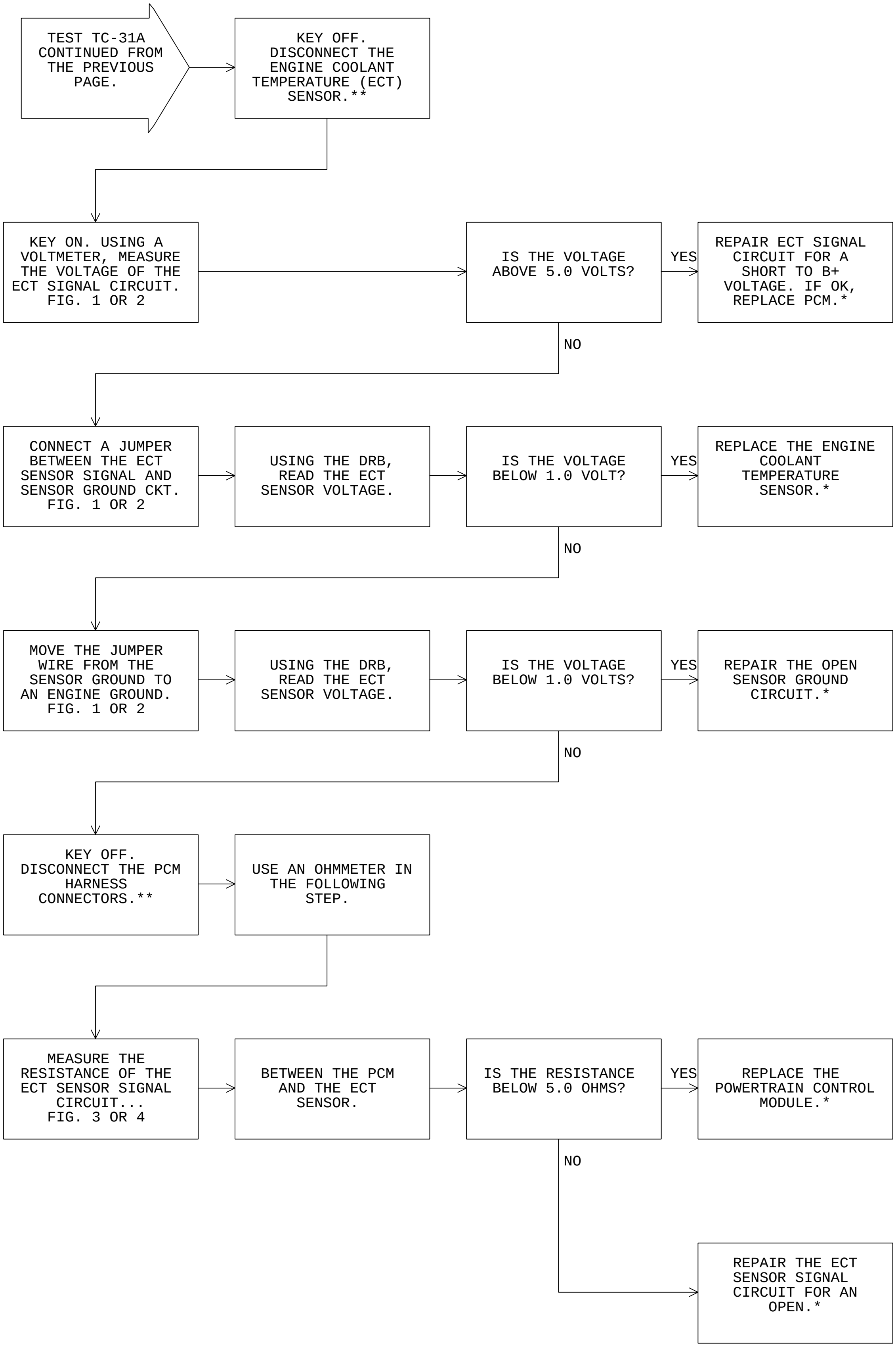


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	TN/BK	ECT SENSOR SIGNAL

80b0995a

FIG. 4

TEST TC-31A | **CONTINUED - REPAIRING - ECT SENSOR VOLTAGE TOO HIGH**



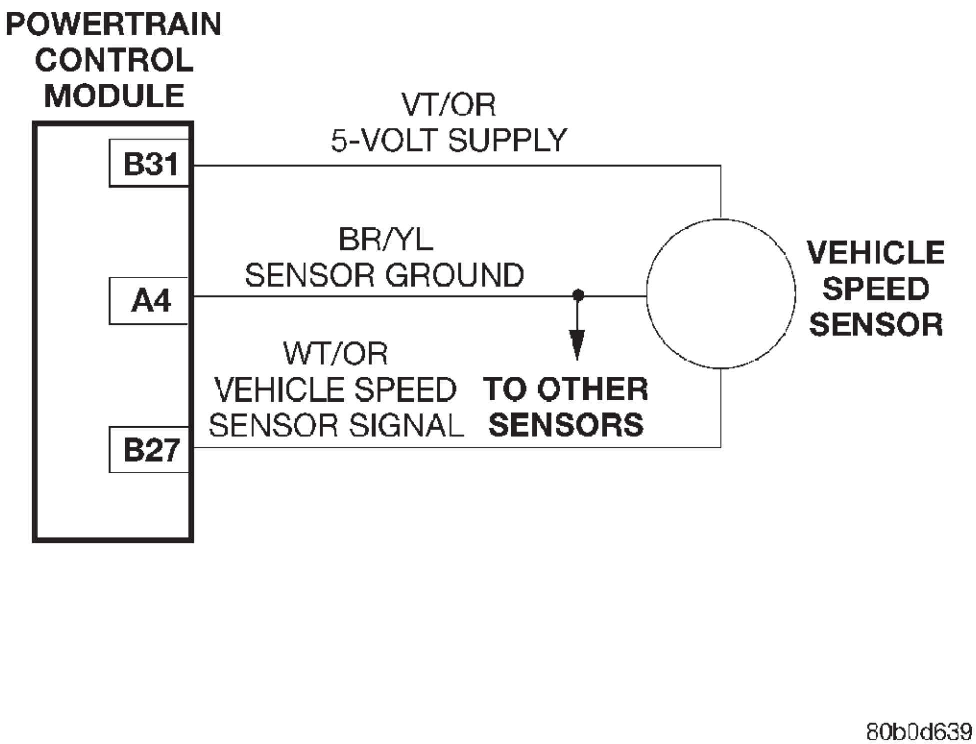
***Perform Verification TEST VER-2A.** | ****Check connectors - Clean / repair as necessary.**

TROUBLE CODE TESTS

TEST TC-35A	REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of Code: No Vehicle Speed Sensor Signal

When monitored: With engine temperature greater than 104°F, MAP approximately 350 torr, (or MAP vacuum 15 to 16"), and engine speed between 1400 and 3000 RPM.

Set condition: No signal from the vehicle speed sensor for more than 15 seconds on two (2) consecutive trips.

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 5 volts to power up the sensor. Sensor ground is supplied by the PCM. The PCM also supplies a 5-volt pull-up voltage to the sensor. The VSS signal is created with the sensor alternates the 5-volt pull-up from high to low.

Possible causes:

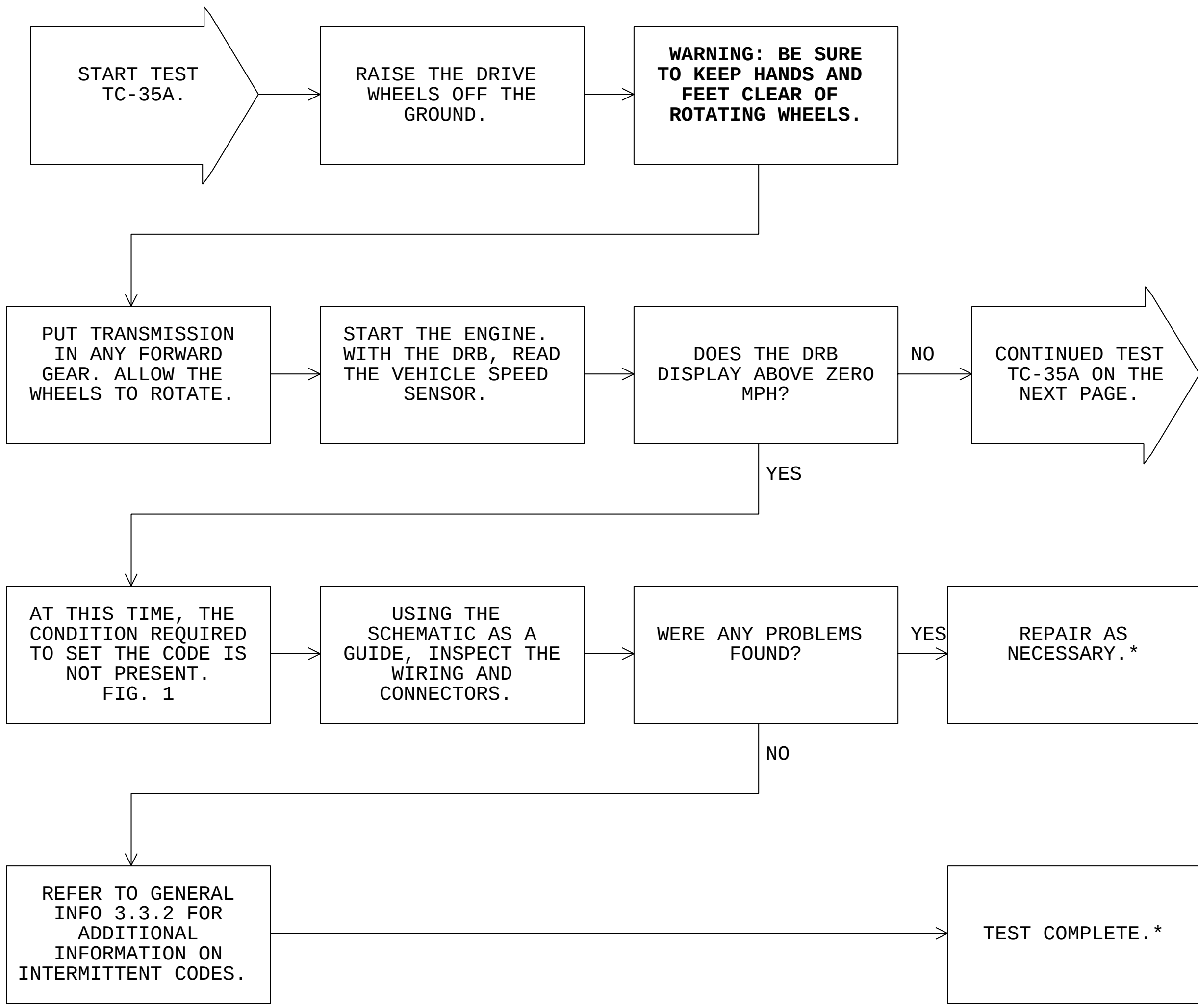
> VSS adapter misaligned or not seated properly
> Open or shorted signal circuit
> Speedometer pinion damaged
> Open 5-volt supply circuit
> Open sensor ground circuit
> Failed vehicle speed sensor
> Failed PCM

80a5573b

FIG. 1

TEST TC-35A | REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

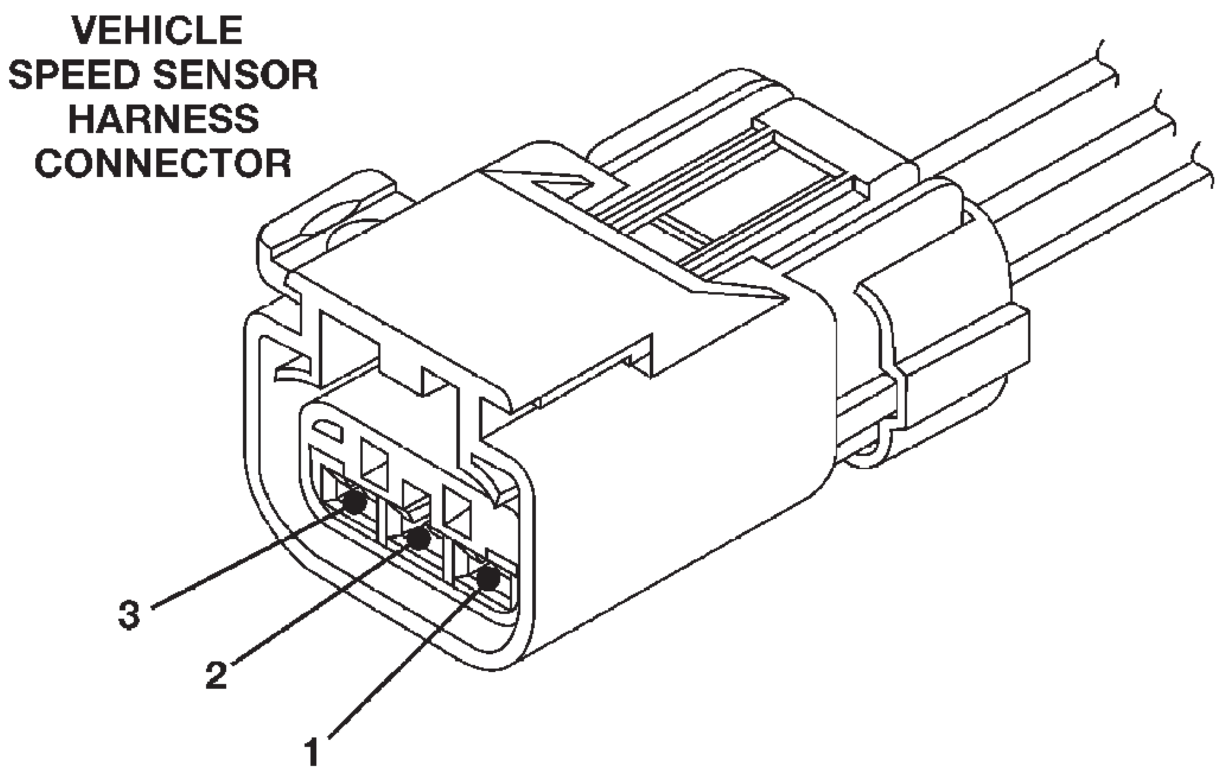
Perform TEST DTC Before Proceeding



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

TEST TC-35A — CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

TJ/XJ BODY

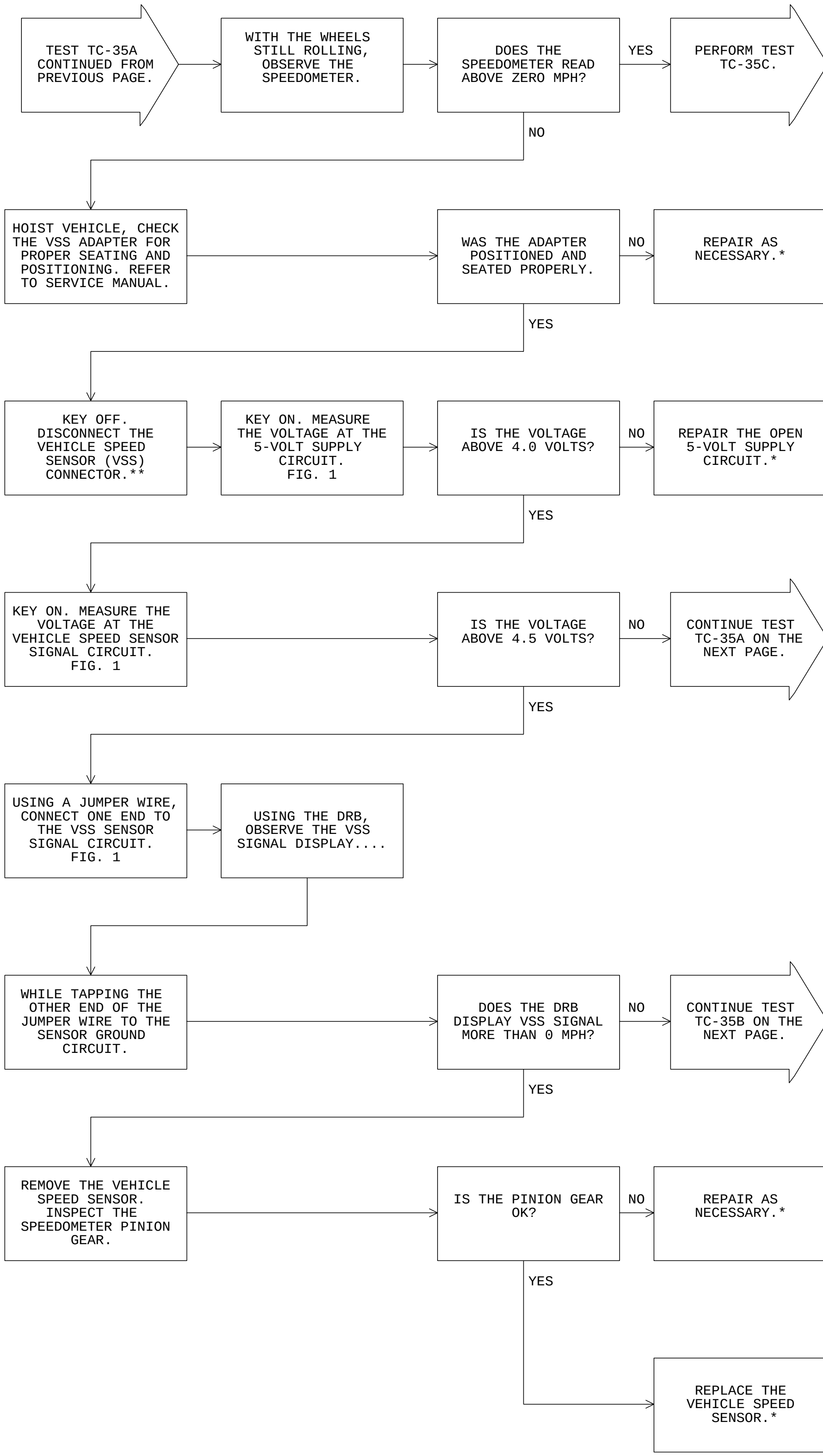


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY
2	BR/YL	SENSOR GROUND
3	WT/OR	VEHICLE SPEED SENSOR SIGNAL

80b0d63c

FIG. 1

TEST TC-35A — CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

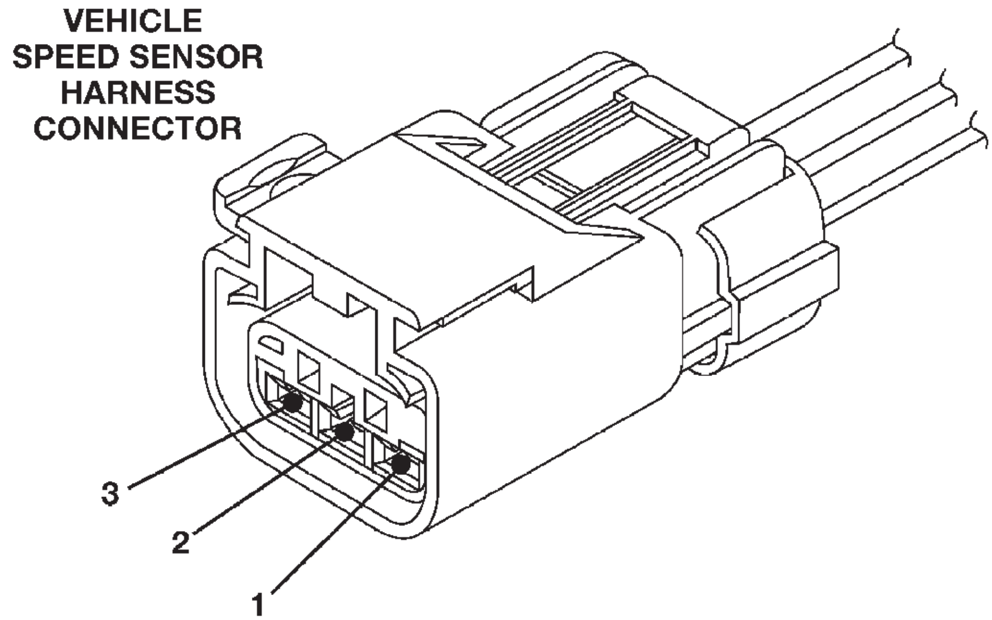


Perform Verification TEST VER-2A.

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

TEST TC-35A	CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

TJ/XJ BODY

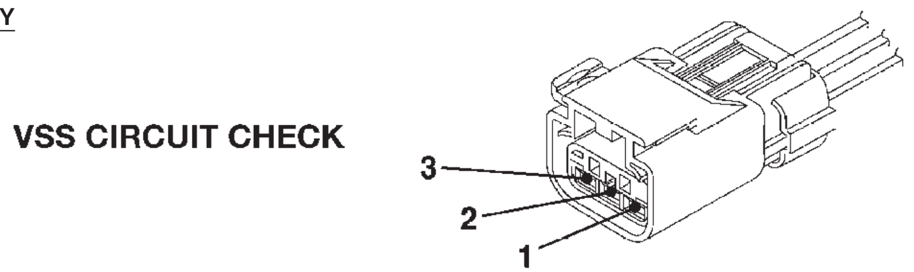


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY
2	BR/YL	SENSOR GROUND
3	WT/OR	VEHICLE SPEED SENSOR SIGNAL

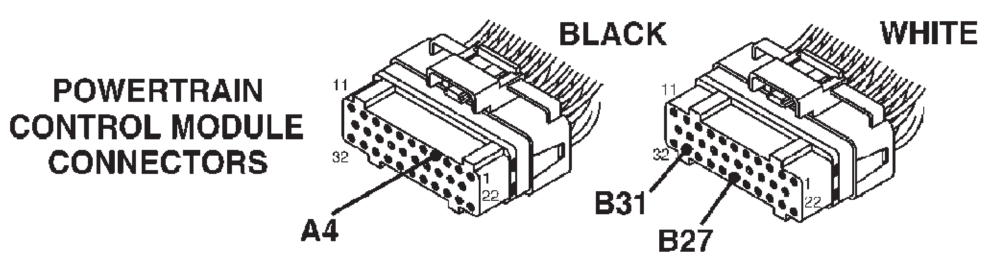
80b0d63c

FIG. 1

TJ/XJ BODY



CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY
2	BR/YL	SENSOR GROUND
3	WT/OR	VEHICLE SPEED SENSOR SIGNAL

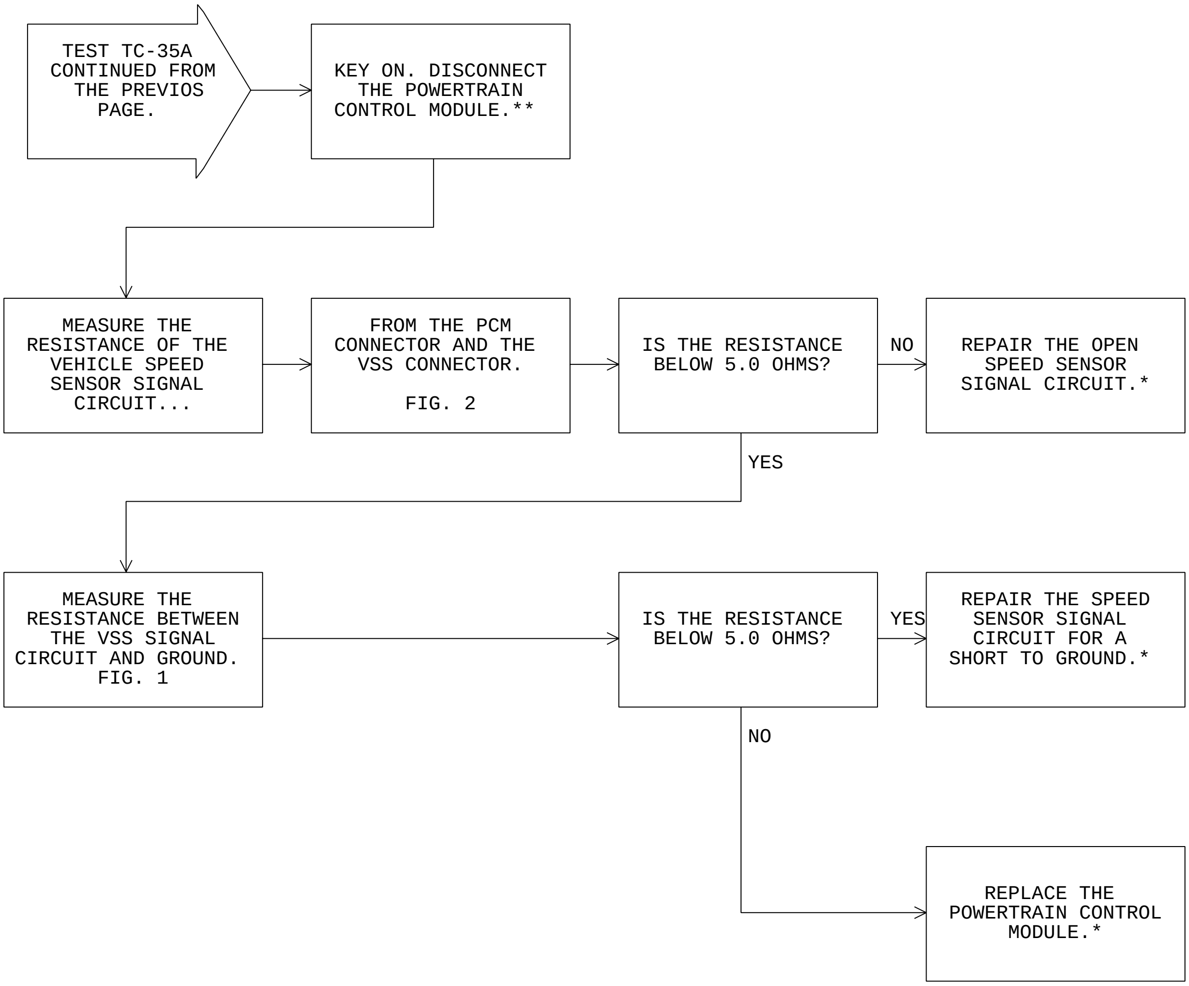


CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
B27	WT/OR	VEHICLE SPEED SENSOR SIGNAL
B31	VT/OR	5-VOLT SUPPLY

80b0d6de

FIG. 2

TEST TC-35A CONTINUED - REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL



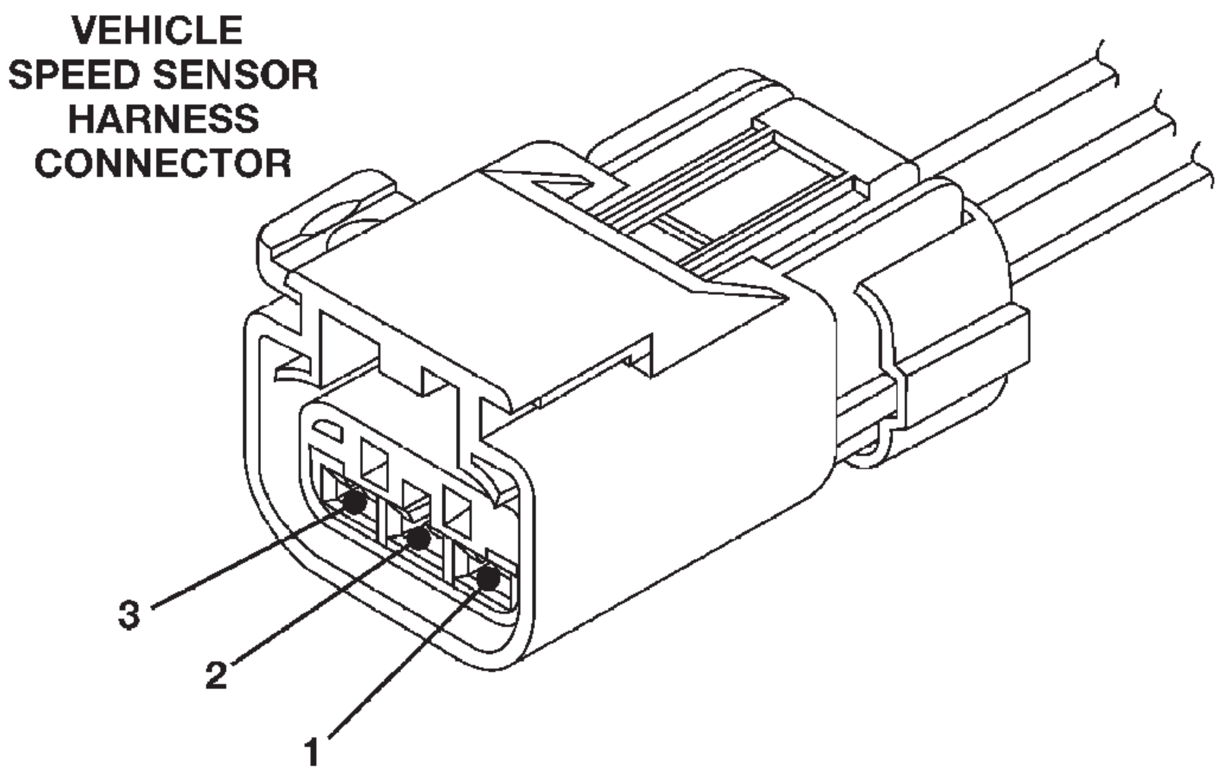
**Perform Verification TEST VER-2A.*

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

TEST TC-35B — REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-35A Before Proceeding

TJ/XJ BODY



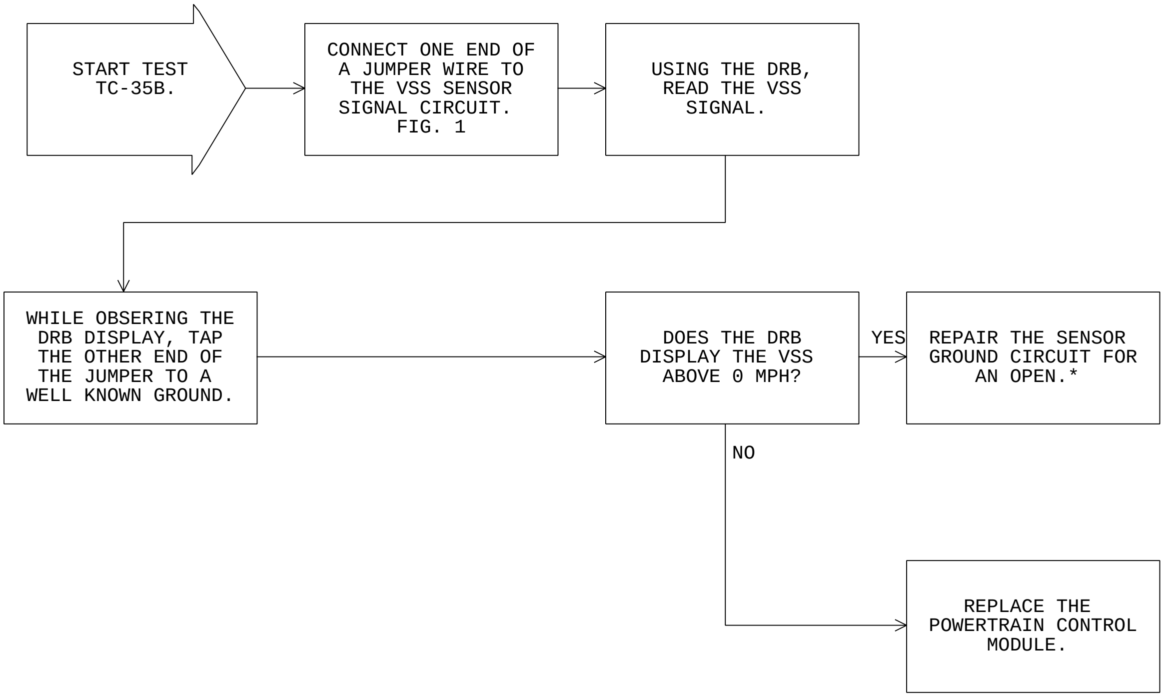
CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY
2	BR/YL	SENSOR GROUND
3	WT/OR	VEHICLE SPEED SENSOR SIGNAL

80b0d63c

FIG. 1

TEST TC-35B	REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-35A Before Proceeding



**Perform Verification TEST VER-2A.*

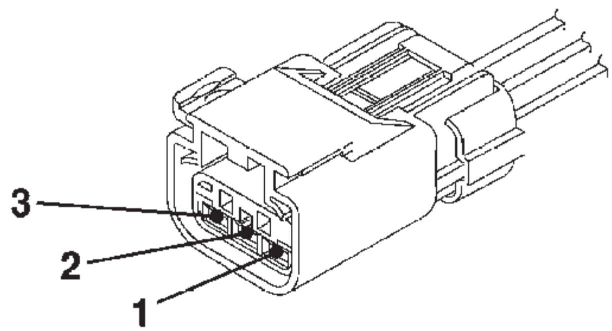
***Check connectors - Clean / repair as necessary.*

TEST TC-35C	REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-35A Before Proceeding

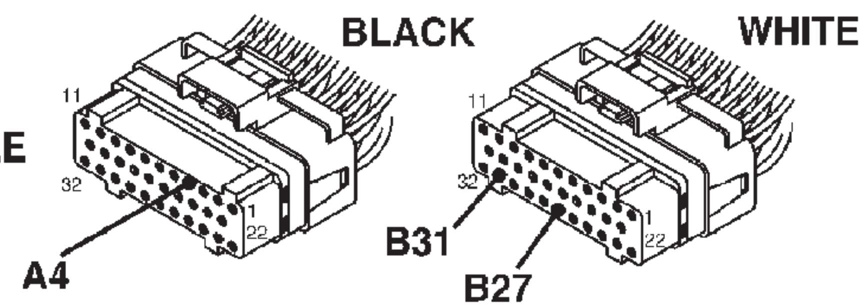
TJ/XJ BODY

VSS CIRCUIT CHECK



CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY
2	BR/YL	SENSOR GROUND
3	WT/OR	VEHICLE SPEED SENSOR SIGNAL

POWERTRAIN CONTROL MODULE CONNECTORS



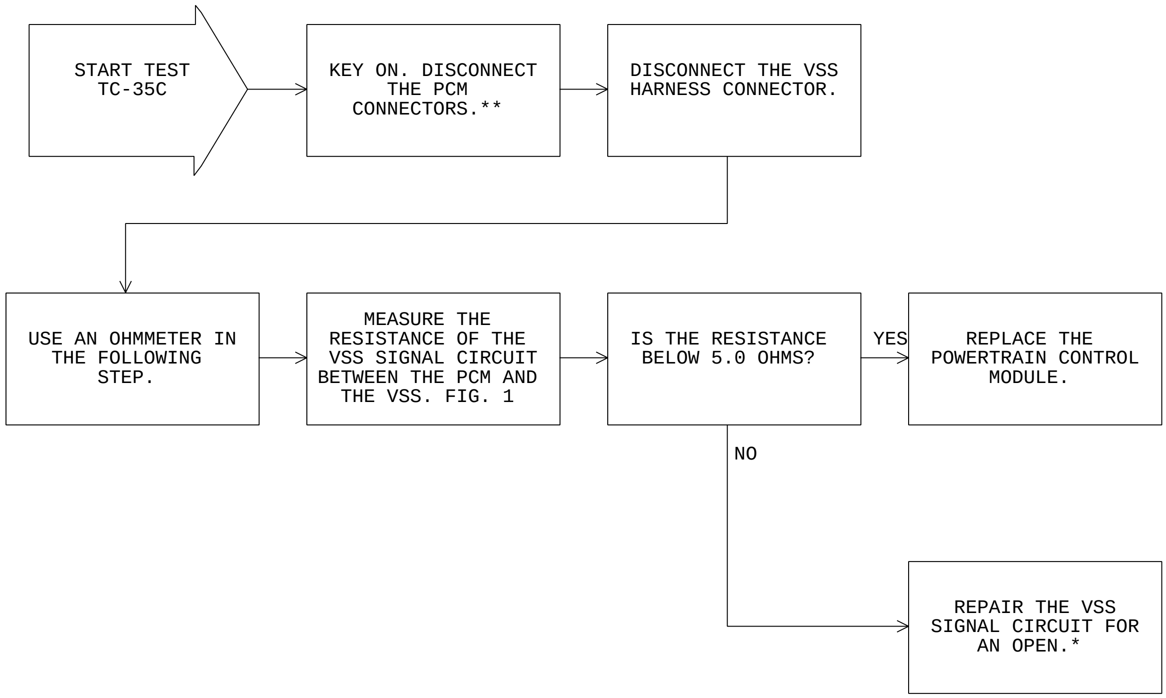
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
B27	WT/OR	VEHICLE SPEED SENSOR SIGNAL
B31	VT/OR	5-VOLT SUPPLY

80b0d6de

FIG. 1

TEST TC-35C REPAIRING - NO VEHICLE SPEED SENSOR SIGNAL

Perform TEST TC-35A Before Proceeding

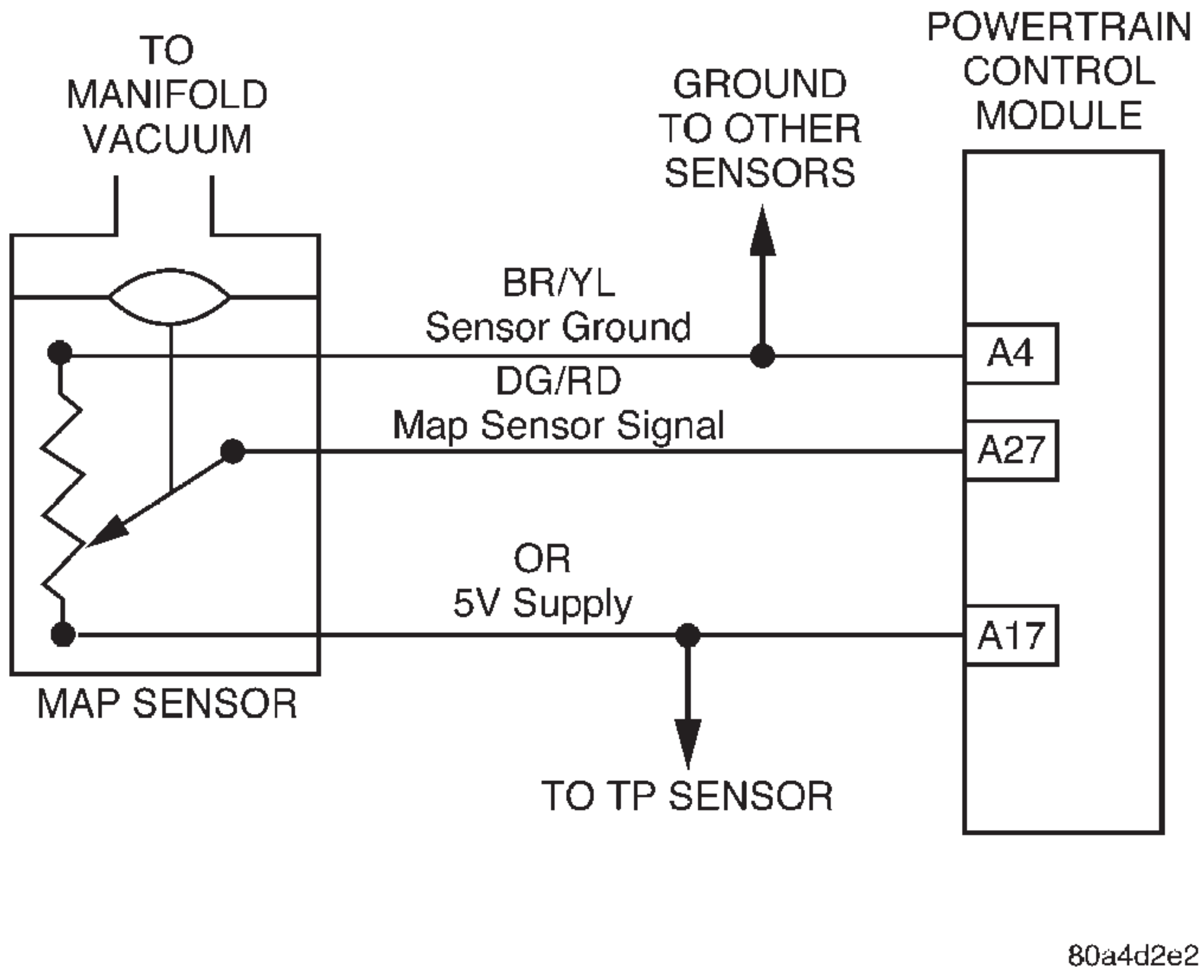


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

TEST TC-36A	REPAIRING - MAP SENSOR VOLTAGE TOO LOW/NO 5 VOLTS TO MAP SENSOR

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: MAP Sensor Voltage Too Low

When monitored: With engine rpm above 416 but less than 3520 and the TP sensor voltage less than 1.13 volt and battery voltage greater than 10.4 volts.

Set condition: The MAP sensor signal voltage is below .1 volt for 2.0 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. 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; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM.

Possible causes:
> Signal circuit shorted to ground
> Failed sensor
> Failed PCM

80aa0f80

FIG. 1

Name of code: No 5 Volts to MAP Sensor

When monitored: With the ignition off and battery voltage greater than 10.4 volts.

Set condition: The MAP sensor signal voltage goes below 2.35 volts with key off for 5.0 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. 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; voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM.

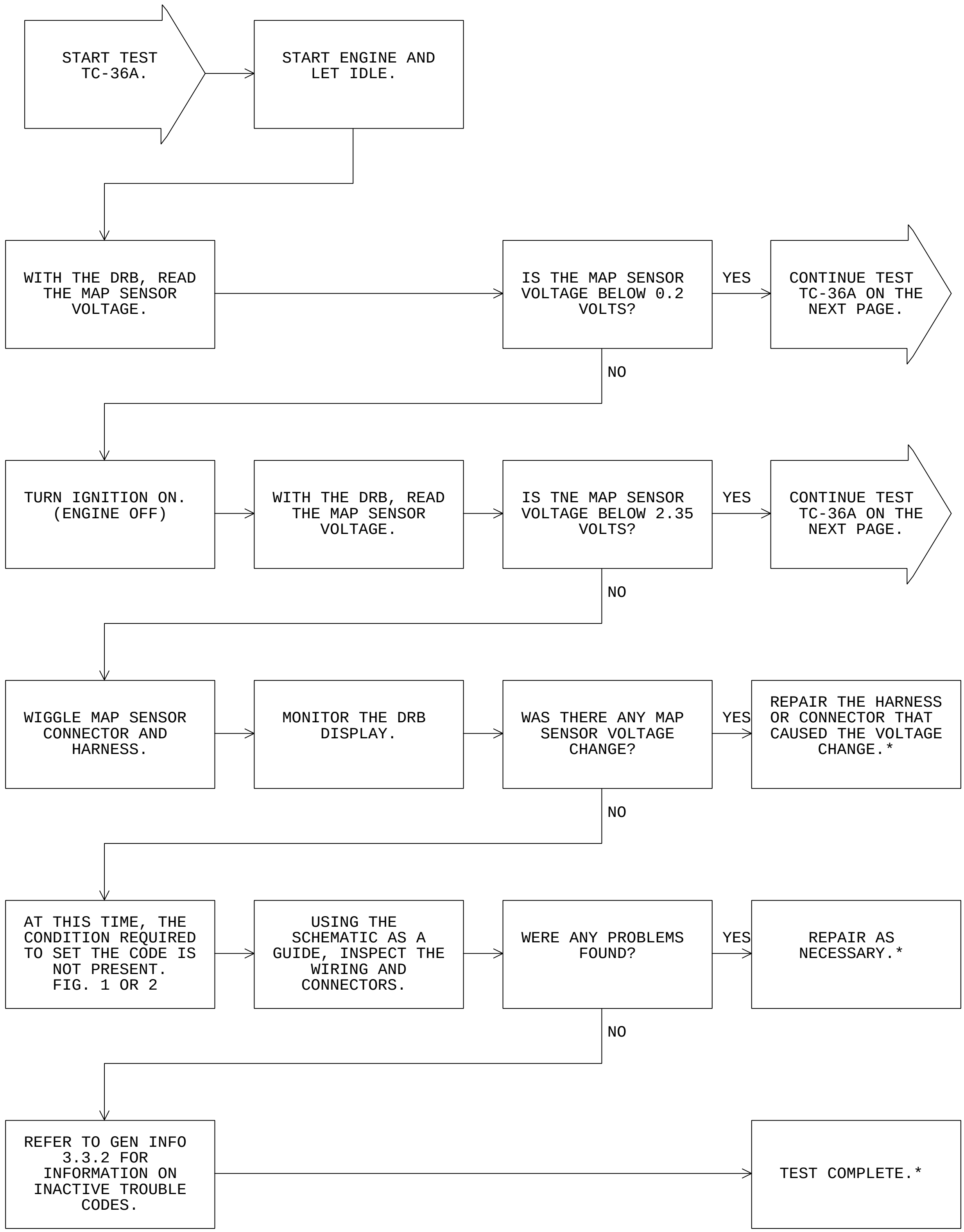
Possible causes:
> Open 5-volt supply
> MAP sensor failure

80aa0f81

FIG. 2

TEST TC-36A REPAIRING - MAP SENSOR VOLTAGE TOO LOW/NO 5 VOLTS TO MAP SENSOR

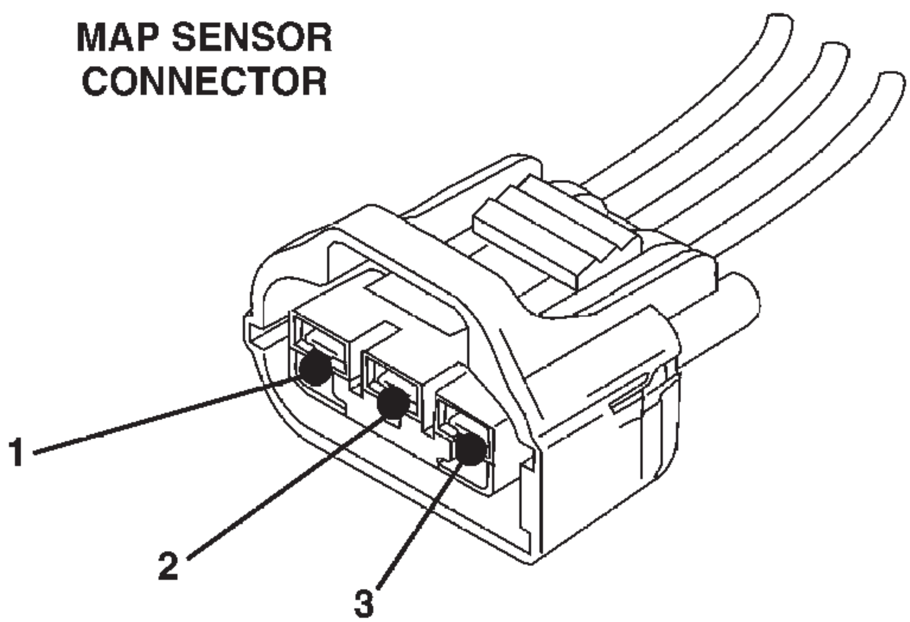
Perform TEST DTC Before Proceeding



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

TEST TC-36A	CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO LOW/NO 5 VOLTS TO MAP SENSOR

TJ/XJ BODY



CAV	COLOR	FUNCTION
3	OR	5-VOLT SUPPLY
2	DG/RD	MAP SENSOR SIGNAL
1	BR/YL	SENSOR GROUND

80afa155

FIG. 1

TEST TC-36A — CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO LOW/NO 5 VOLTS TO MAP SENSOR

TEST TC-36A CONTINUED FROM THE PREVIOUS PAGE.

TURN ENGINE OFF AND IGNITION ON IF ENGINE IS RUNNING.

DISCONNECT THE MAP SENSOR HARNESS CONNECTOR.**

USING A VOLTMETER, MEASURE THE VOLTAGE OF THE MAP SENSOR 5-VOLT SUPPLY CIRCUIT AT THE...

MAP SENSOR CONNECTOR.

FIG. 1

IS THE VOLTAGE ABOVE 4.5 VOLTS?

NO → CONTINUE TEST TC-36A ON THE NEXT PAGE.

YES ↓

USE THE DRB TO READ THE MAP SENSOR VOLTAGE.

IS THE MAP SENSOR VOLTAGE ABOVE 4.5 VOLTS?

YES → REPLACE THE MAP SENSOR.*

NO ↓

TURN IGNITION OFF.

DISCONNECT THE POWERTRAIN CONTROL MODULE HARNESS CONNECTOR.**

USE AN OHMMETER IN THE FOLLOWING STEP.

MEASURE THE RESISTANCE BETWEEN THE MAP SENSOR SIGNAL CIRCUIT AND...

THE MAP SENSOR GROUND CIRCUIT AT MAP SENSOR CONNECTOR.
FIG. 1

IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR THE MAP SENSOR SIGNAL CIRCUIT SHORTED TO MAP SENSOR GROUND CIRCUIT.*

NO ↓

USING AN OHMMETER, MEASURE THE RESISTANCE OF THE MAP SENSOR SIGNAL CIRCUIT...

AT MAP SENSOR CONNECTOR TO GROUND.

FIG. 1

IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR THE MAP SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND.*

NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

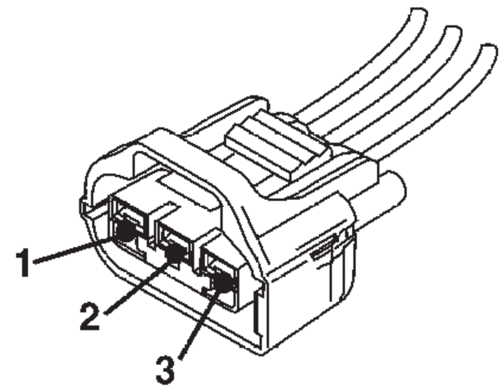
Perform Verification TEST VER-2A.

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

TEST TC-36A	CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO LOW/NO 5 VOLTS TO MAP SENSOR

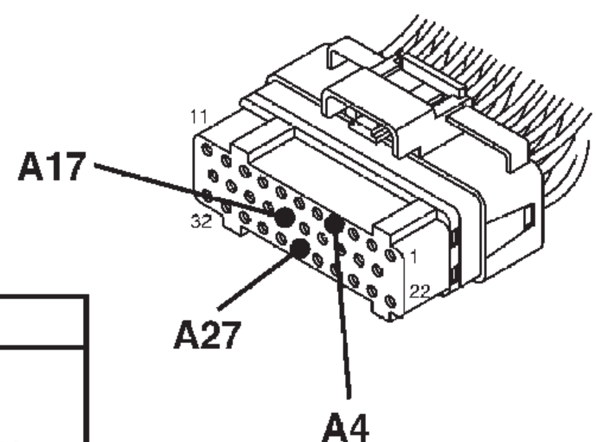
TJ/XJ BODY

MAP SENSOR CONNECTOR



CAV	COLOR	FUNCTION
3	OR	5-VOLT SUPPLY
2	DG/RD	MAP SENSOR SIGNAL
1	BR/YL	SENSOR GROUND

POWERTRAIN CONTROL MODULE BLACK CONNECTOR

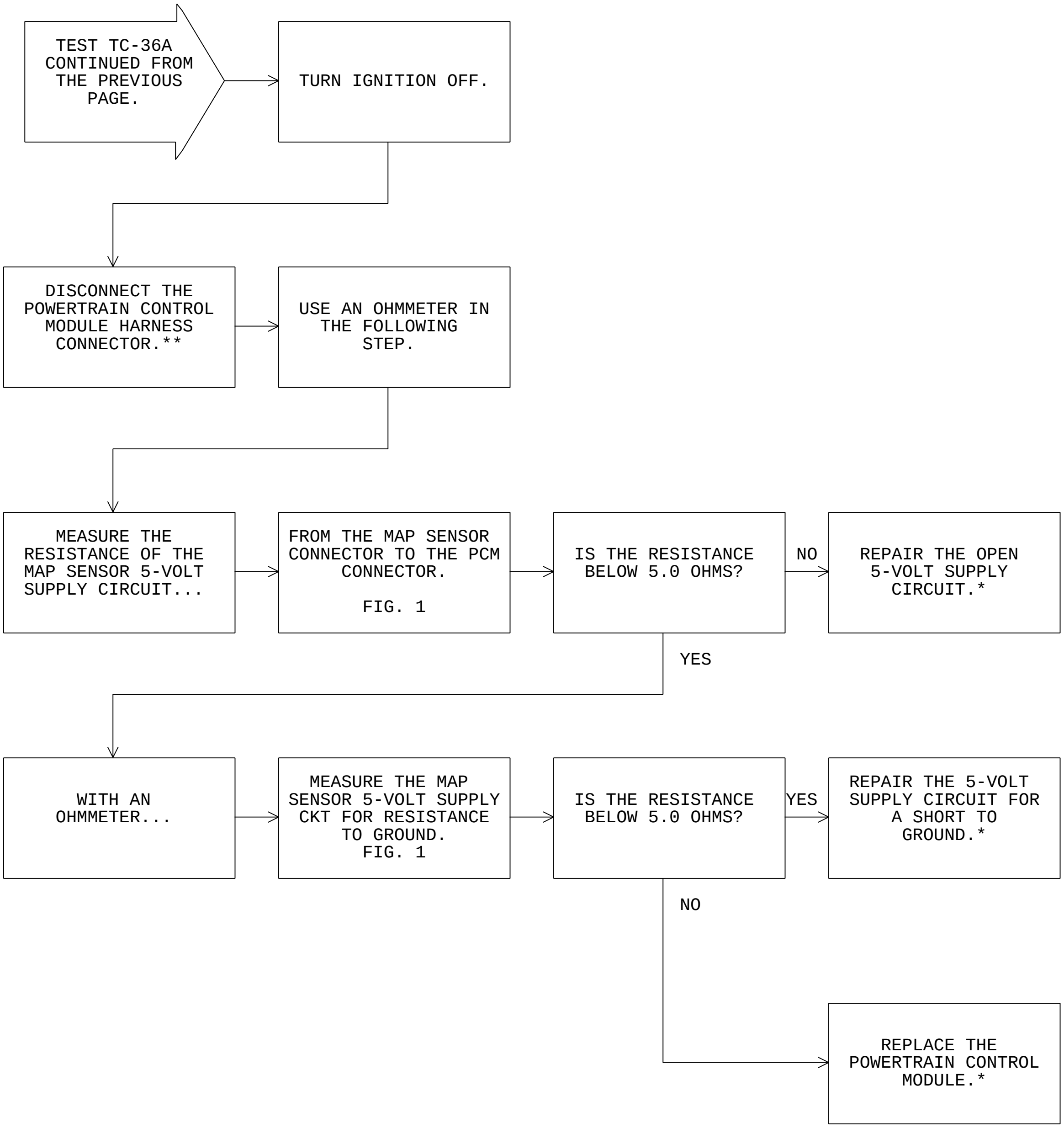


CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
A27	DG/RD	MAP SENSOR SIGNAL

80afa154

FIG. 1

TEST TC-36A — CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO LOW/NO 5 VOLTS TO MAP SENSOR



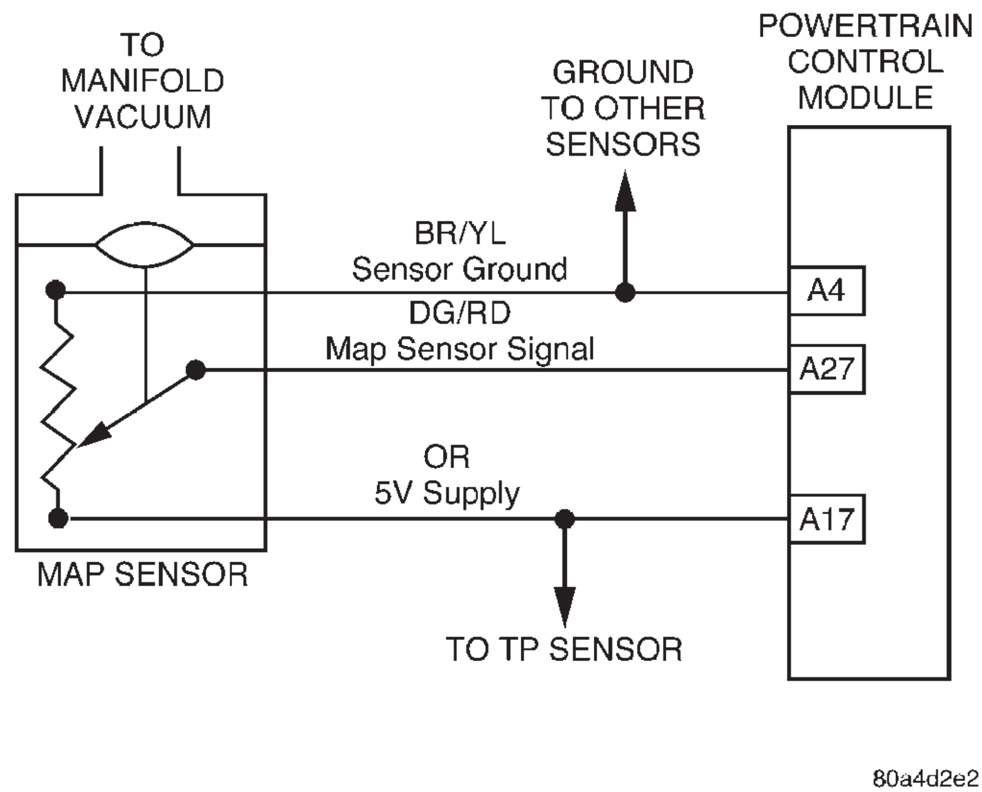
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-37A	REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: Map Sensor Voltage Too High

When monitored: With engine rpm above 400 but less than 3520 and the TP sensor voltage less than 1.13 volt and battery voltage greater than 10.4 volts.

Set condition: The MAP sensor signal voltage is greater than 4.88 volts at start or with the engine running for 2.2 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. 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. Voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM.

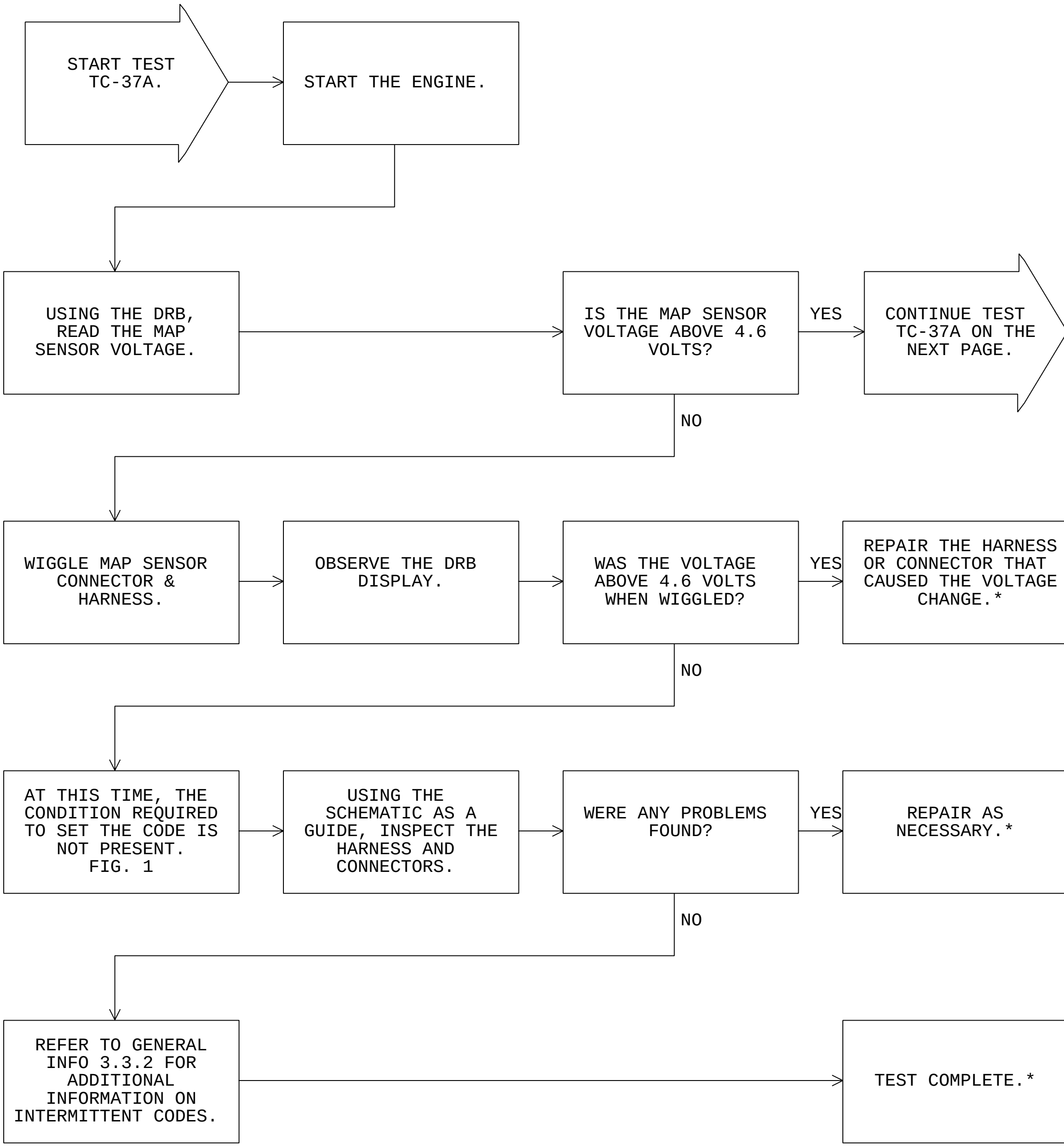
Possible causes:
> Signal circuit open
> Sensor open internally
> Sensor ground circuit
> Sensor signal circuit shorted to voltage
> Failed PCM

80aa0f83

FIG. 1

TEST TC-37A | REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

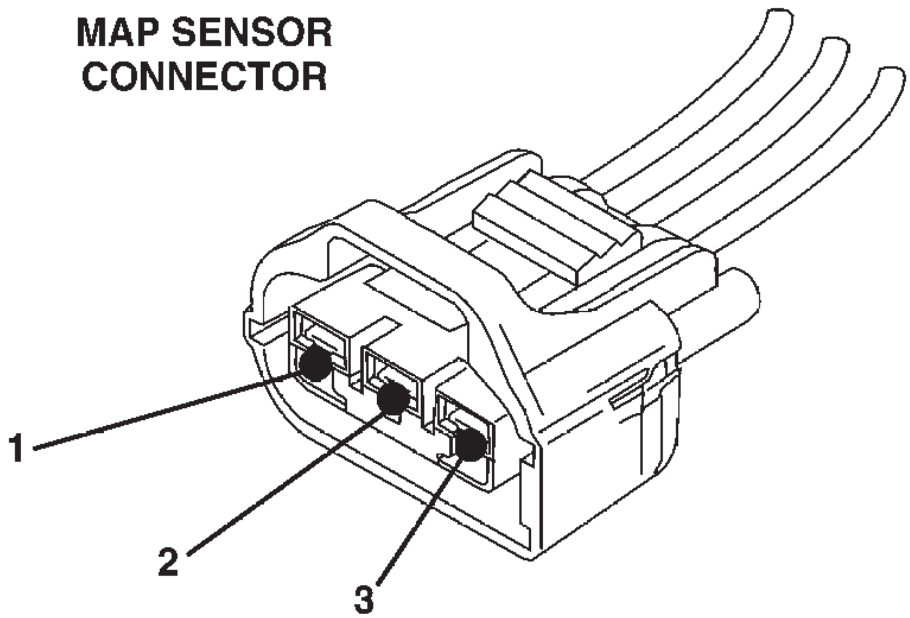
Perform TEST DTC Before Proceeding



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

TEST TC-37A	CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

TJ/XJ BODY



CAV	COLOR	FUNCTION
3	OR	5-VOLT SUPPLY
2	DG/RD	MAP SENSOR SIGNAL
1	BR/YL	SENSOR GROUND

80afa155

FIG. 1

TEST TC-37A — CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

TEST TC-37A CONTINUED FROM THE PREVIOUS PAGE.

KEY ON, ENGINE OFF.

DISCONNECT THE MAP SENSOR HARNESS CONNECTOR.**

USING A VOLTMETER, MEASURE THE VOLTAGE OF THE MAP SENSOR SIGNAL CIRCUIT...

AT THE MAP SENSOR HARNESS CONNECTOR.

FIG. 1

IS THE VOLTAGE ABOVE 5.0 VOLTS?

- YES: REPAIR MAP SENSOR SIGNAL FOR A SHORT TO VOLTAGE. IF OKAY, REPLACE THE PCM.*
- NO:

KEY OFF. USING AN OHMMETER, MEASURE THE RESISTANCE OF THE MAP SENSOR SIGNAL CIRCUIT...

TO THE 5 VOLT SUPPLY CIRCUIT.

FIG. 1

IS RESISTANCE BELOW 5.0 OHMS.

- YES: REPAIR THE MAP SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE 5 VOLT SUPPLY CIRCUIT.*
- NO:

CONNECT A JUMPER WIRE BETWEEN THE SENSOR SIGNAL AND SENSOR GROUND CKTS.
FIG. 1

KEY ON. USING THE DRB, READ THE MAP SENSOR VOLTAGE.

IS THE VOLTAGE BELOW 1.0 VOLTS?

- YES: REPLACE THE MAP SENSOR.*
- NO:

MOVE THE JUMPER WIRE FROM THE SENSOR GROUND CIRCUIT TO ENGINE GROUND.
FIG. 1

READ THE MAP SENSOR VOLTAGE.

IS THE MAP SENSOR VOLTAGE BELOW 1.0 VOLTS?

- YES: REPAIR THE MAP SENSOR GROUND CIRCUIT FOR AN OPEN.*
- NO:

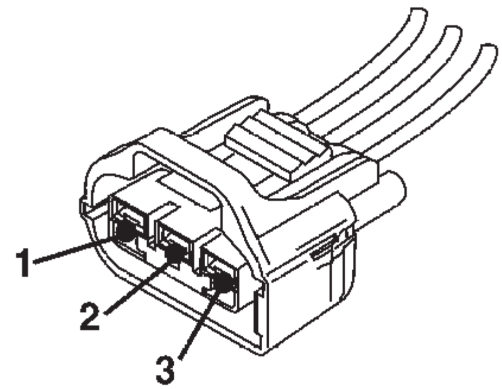
CONTINUE TEST TC-37A ON THE NEXT PAGE.

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

TEST TC-37A	CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO HIGH

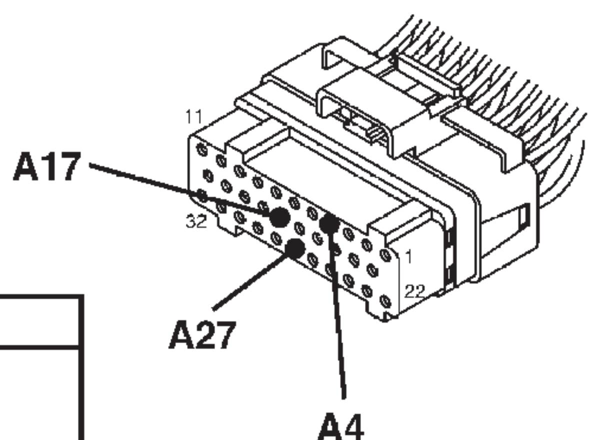
TJ/XJ BODY

MAP SENSOR CONNECTOR



CAV	COLOR	FUNCTION
3	OR	5-VOLT SUPPLY
2	DG/RD	MAP SENSOR SIGNAL
1	BR/YL	SENSOR GROUND

POWERTRAIN CONTROL MODULE BLACK CONNECTOR

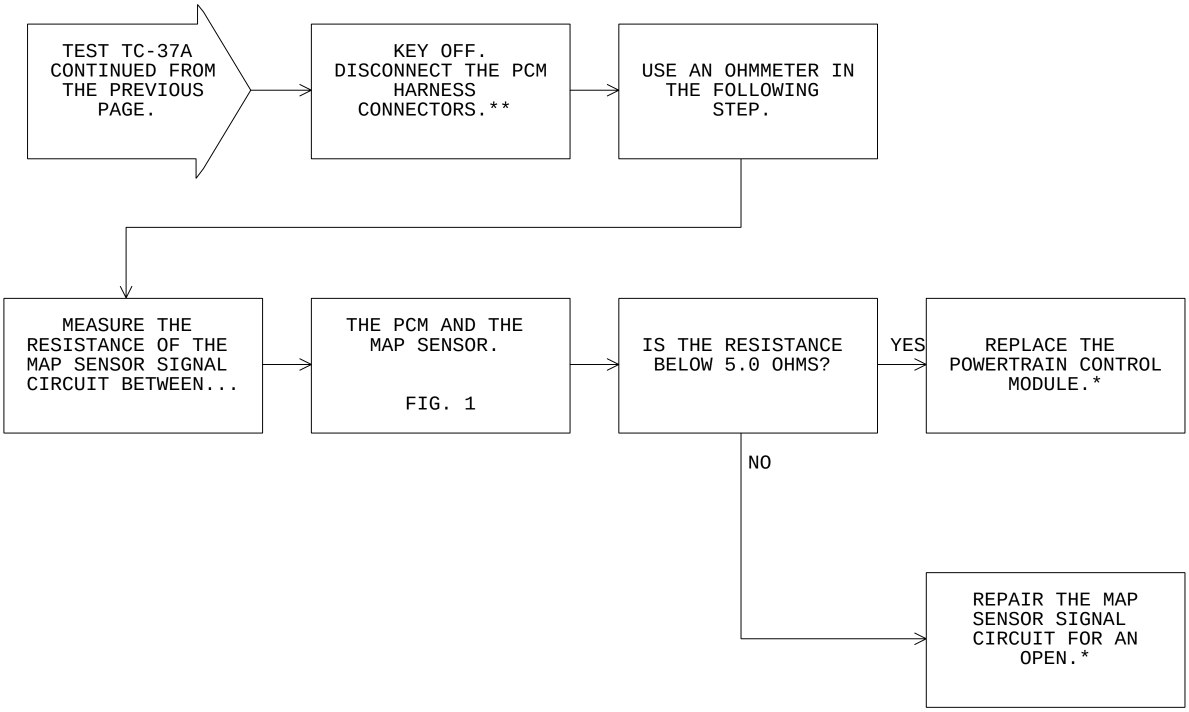


CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
A27	DG/RD	MAP SENSOR SIGNAL

80afa154

FIG. 1

TEST TC-37A | **CONTINUED - REPAIRING - MAP SENSOR VOLTAGE TOO HIGH**



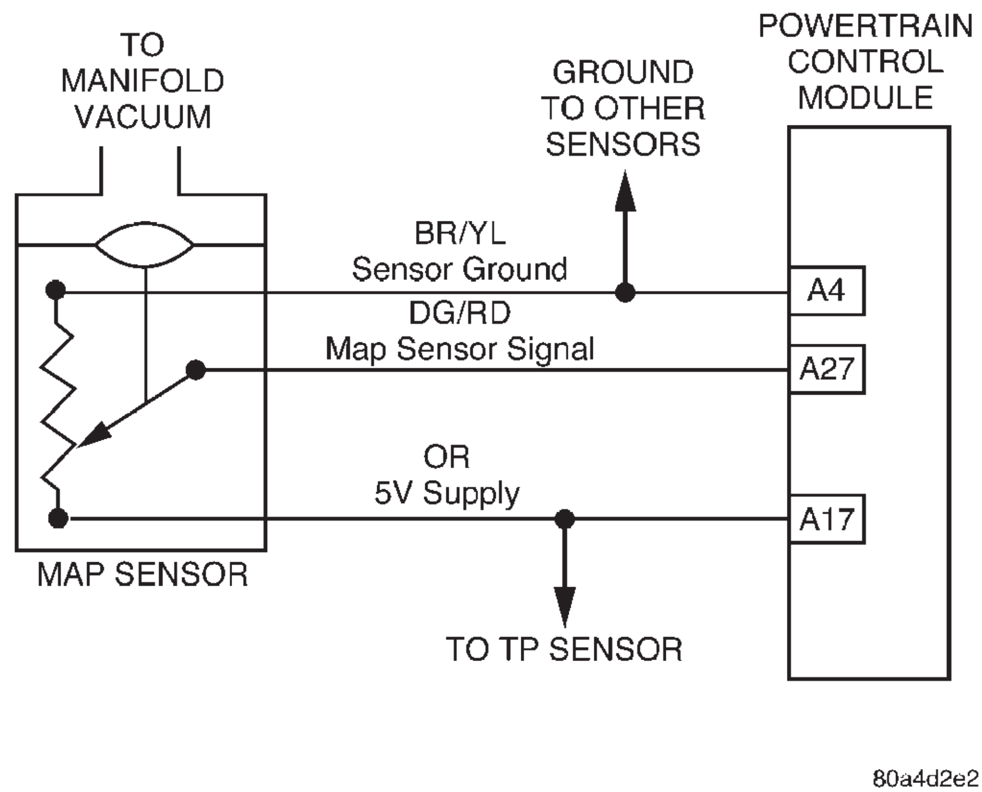
***Perform Verification TEST VER-2A.**

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

TEST TC-39A	REPAIRING - NO CHANGE IN MAP FROM START TO RUN

Perform TEST DTC Before Proceeding

TJ/XJ BODY



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: To 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 A27. 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 A17 voltage may vary from 4.8 to 5.1 volts. The sensor ground is provided by PCM cavity A4.

Possible causes:

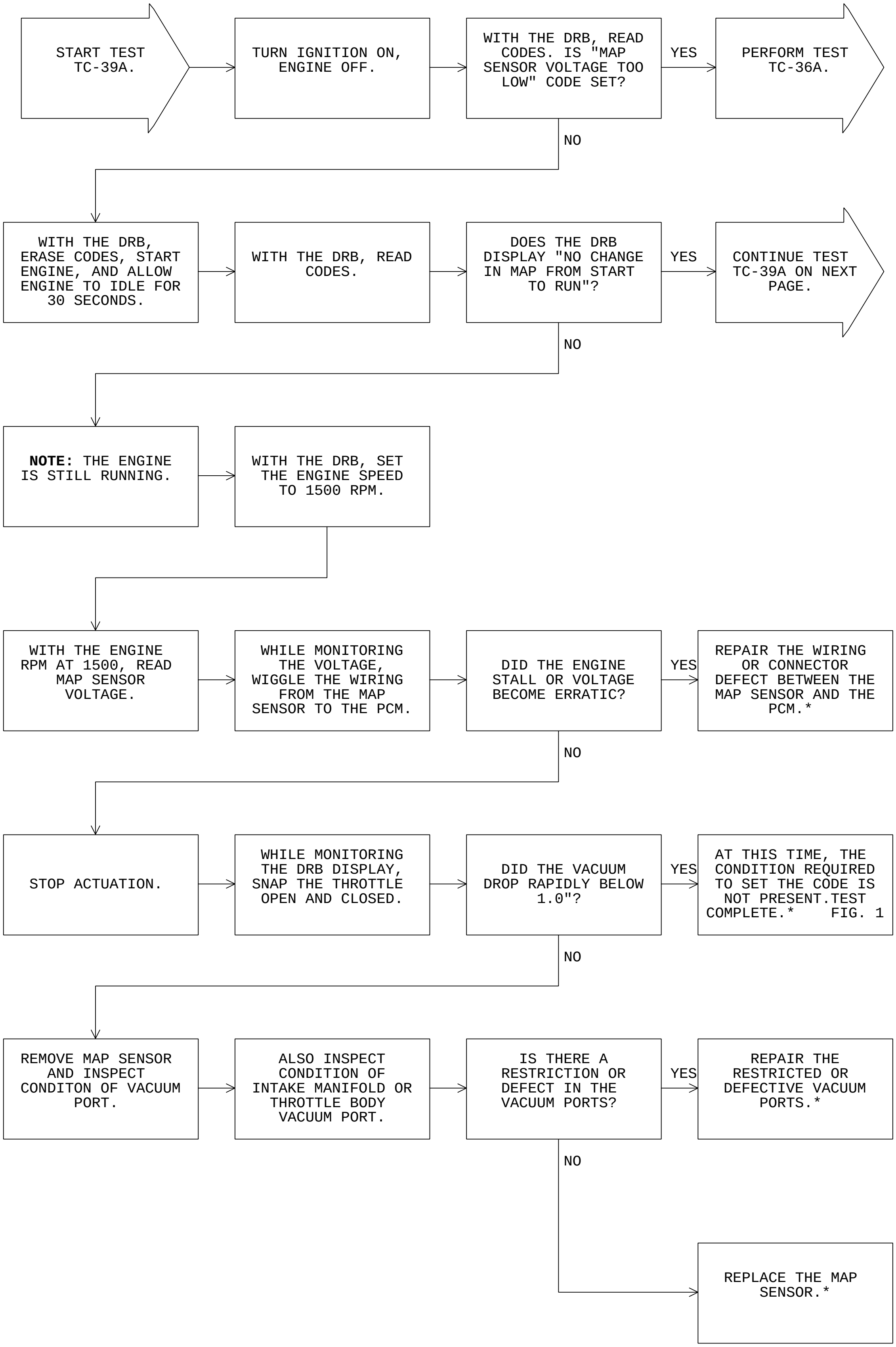
> Restricted or leaking vacuum/pressure to MAP sensor
> Ice in sensor or passage
> Failed sensor
> Failed PCM

3470403

FIG. 1

TEST TC-39A REPAIRING - NO CHANGE IN MAP FROM START TO RUN

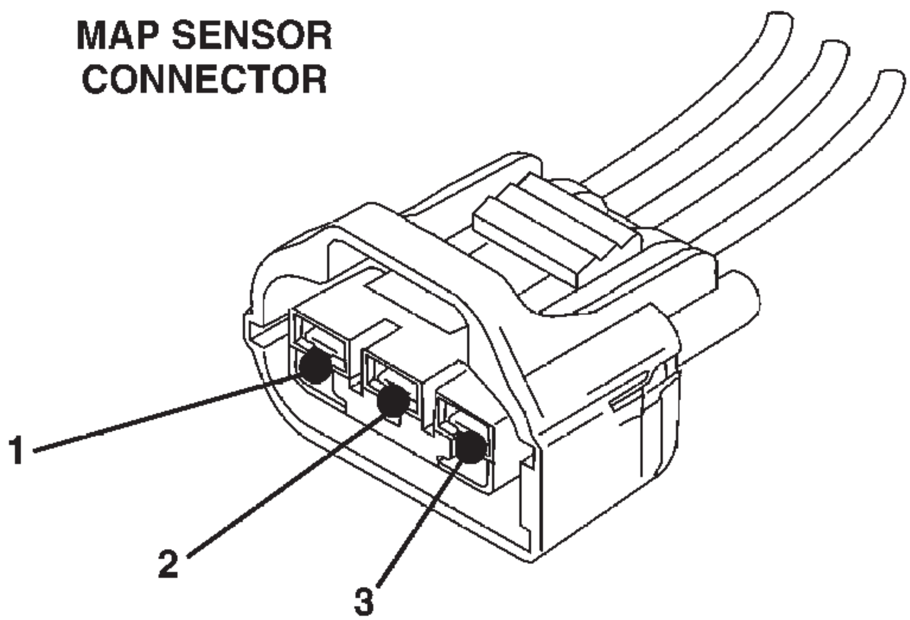
Perform TEST DTC Before Proceeding



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

TEST TC-39A — CONTINUED - REPAIRING - NO CHANGE IN MAP FROM START TO RUN

TJ/XJ BODY



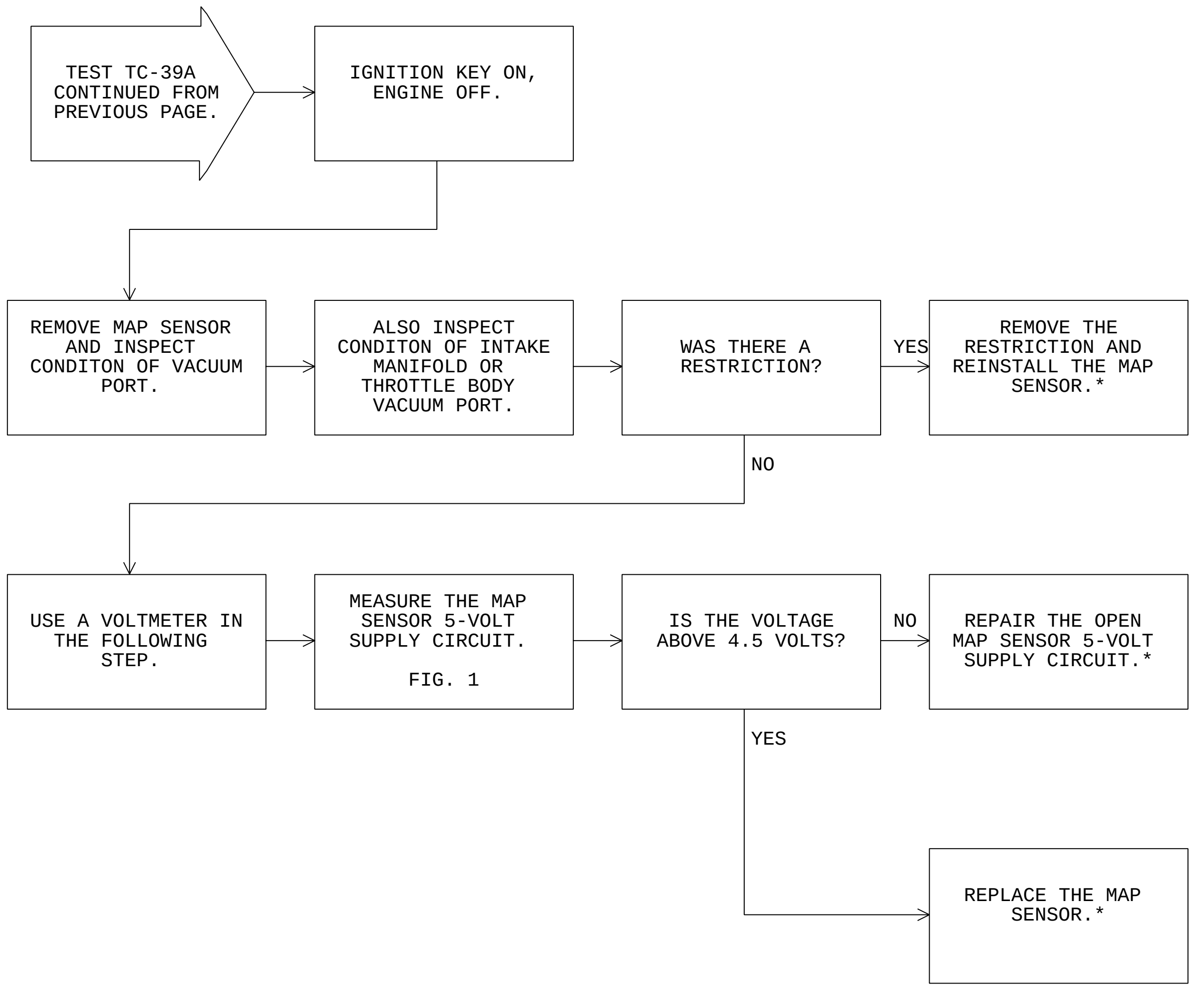
CAV	COLOR	FUNCTION
3	OR	5-VOLT SUPPLY
2	DG/RD	MAP SENSOR SIGNAL
1	BR/YL	SENSOR GROUND

80afa155

FIG. 1

TEST TC-39A

CONTINUED - REPAIRING - NO CHANGE IN MAP FROM START TO RUN



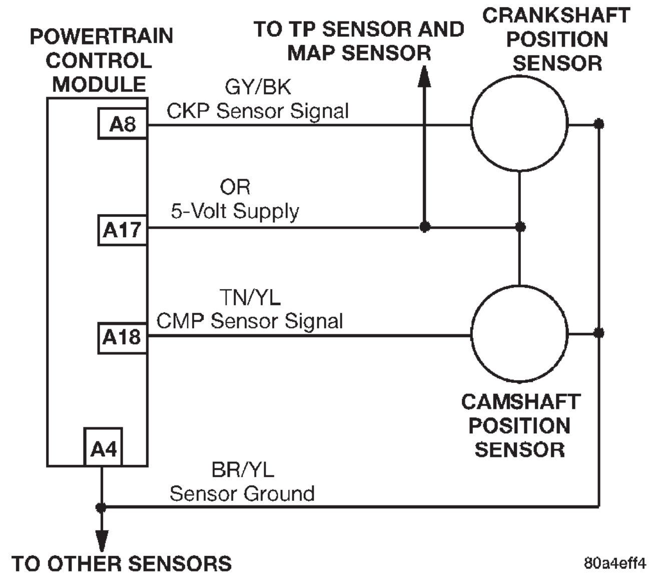
Perform Verification TEST VER-2A.

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

TEST TC-40A | REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST DTC Before Proceeding

TJ/XJ BODY



Name of code: No Crank Reference Signal at PCM

When monitored: During engine cranking.

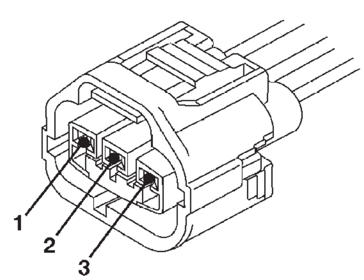
Set condition: No signal from the crank position sensor is present during engine cranking, and at least 3 cam position signals have occured.

Theory of operation: The crank position sensor is a hall effect-type sensor used to detect the crankshaft speed and position. The PCM supplies 5 volts and a ground to power up the sensor. The PCM also supplies a 5-volt pull up voltage. The sensor signal is created by the slots passing under the sensor. When a slot is under the sensor the signal is high (5.0V); when the metal between the slots is under the sensor, the signal is low (.03V).

Probable causes:
- Open or shorted 5-volt supply circuit
- Open sensor ground
- Open or shorted signal circuit
- Excessive clearance between the sensor and flywheel or crankshaft
- Damaged flywheel
- Failed sensor
- Failed PCM
- Shorted VSS 5-volt supply circuit

80aa4bdf

CRANKSHAFT POSITION SENSOR CONNECTOR

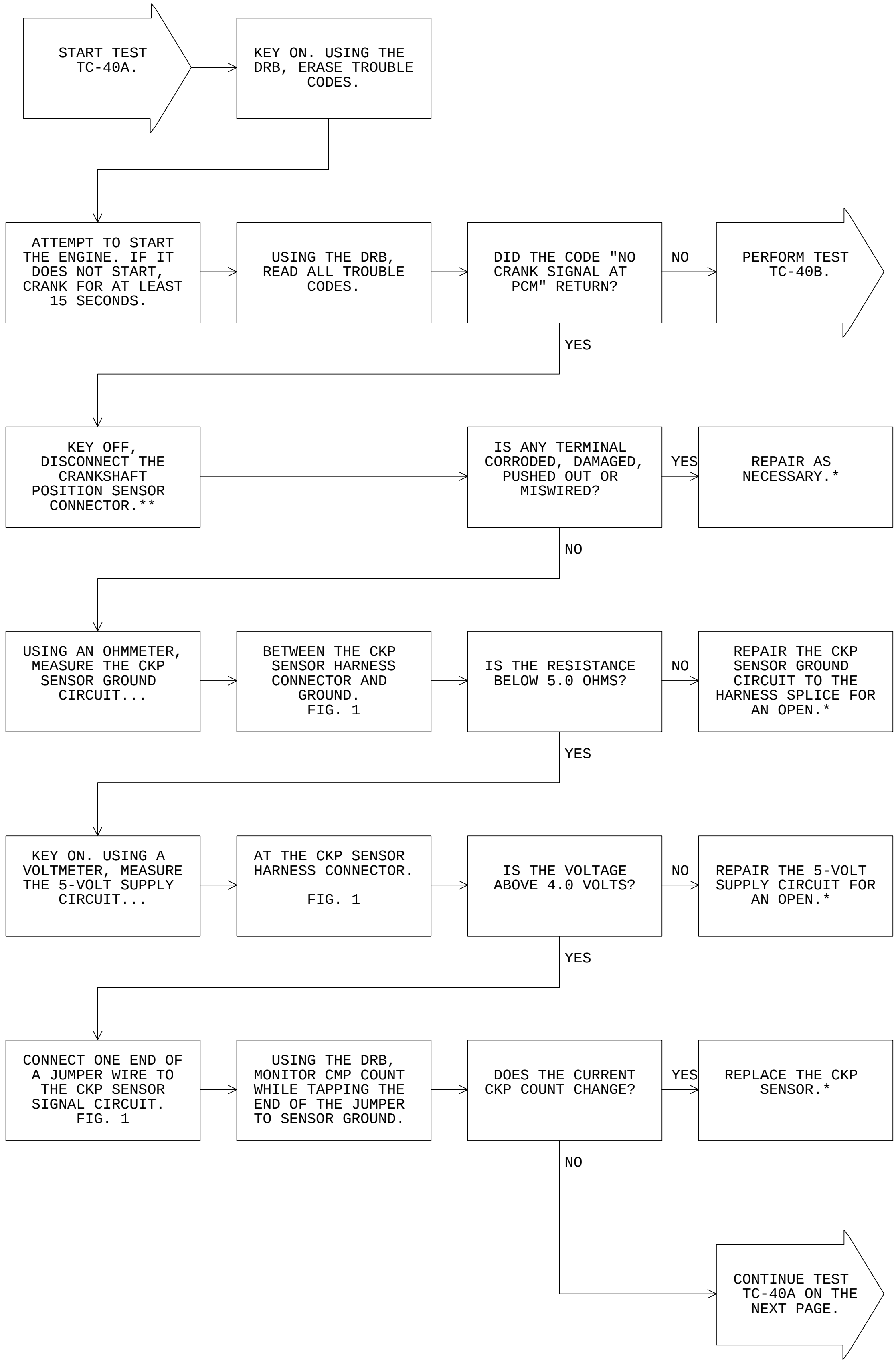


CAV	COLOR	FUNCTION
1	GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

FIG. 1 80b0995b

TEST TC-40A — REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST DTC Before Proceeding



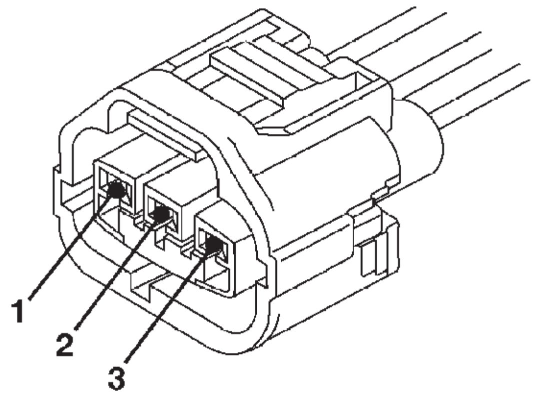
**Perform Verification TEST VER-2A.*

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

TEST TC-40A	CONTINUED - REPAIRING - NO CRANK REFERNCE SIGNAL AT PCM

TJ/XJ BODY

CRANKSHAFT POSITION SENSOR CONNECTOR



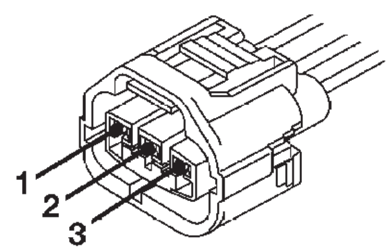
CAV	COLOR	FUNCTION
1	GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

80b0995b

FIG. 1

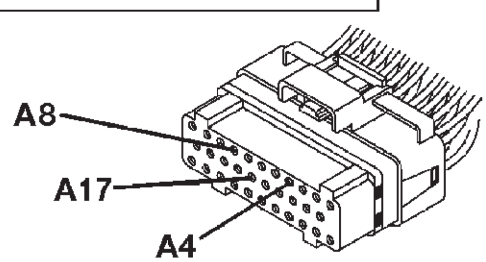
TJ/XJ BODY

CRANKSHAFT POSITION SENSOR CONNECTOR



CAV	COLOR	FUNCTION
1	GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	BR/YL	SENSOR GROUND
3	OR	5-VOLT SUPPLY

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A8	GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
A17	OR	5-VOLT SUPPLY

80b0d6e0

FIG. 2

TEST TC-40A | **CONTINUED - REPAIRING - NO CRANK REFERNCE SIGNAL AT PCM**

TEST TC-40A CONTINUED FROM THE PREVIOUS PAGE.

KEY OFF.

DISCONNECT THE PCM HARNESS CONNECTORS.**

USING AN OHMMETER, MEASURE THE RESISTANCE OF THE CKP SENSOR SIGNAL CIRCUIT... → BETWEEN THE CKP SENSOR CONNECTOR AND THE PCM.

FIG. 2

→ IS THE RESISTANCE BELOW 5.0 OHMS?

NO → REPAIR THE CKP SENSOR SIGNAL CIRCUIT FOR AN OPEN.*

YES

MEASURE THE RESISTANCE OF THE CKP SENSOR SIGNAL CIRCUIT... → BETWEEN THE CKP SENSOR CONNECTOR AND THE SENSOR GROUND .

FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR THE CKP SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE SENSOR GROUND.*

NO

MEASURE THE RESISTANCE OF THE CKP SENSOR SIGNAL CIRCUIT... → BETWEEN THE CKP SENSOR CONNECTOR AND GROUND.

FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR THE CKP SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND.*

NO

MEASURE THE RESISTANCE BETWEEN THE CKP SENSOR SIGNAL CIRCUIT AND THE... → 5-VOLT SUPPLY CIRCUIT AT THE CKP SENSOR CONNECTOR.

FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?

YES → REPAIR THE CKP SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE 5-VOLT SUPPLY CIRCUIT.*

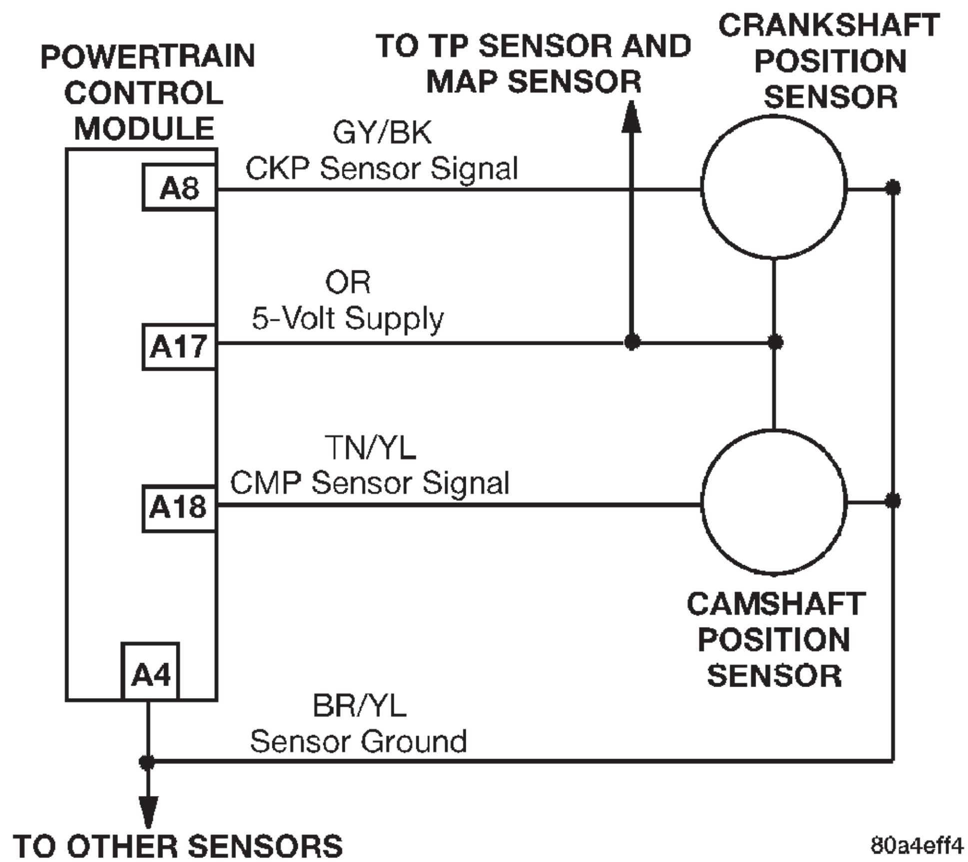
NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

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

TEST TC-40B REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST TC-40A Before Proceeding

TJ/XJ BODY



TJ/XJ BODY

Name of code: No Crank Reference Signal at PCM

When monitored: During engine cranking.

Set condition: No signal from the crank position sensor is present during engine cranking, and at least 3 cam position signals have occured.

Theory of operation: The crank position sensor is a hall effect-type sensor used to detect the crankshaft speed and position. The PCM supplies 5 volts and a ground to power up the sensor. The PCM also supplies a 5-volt pull up voltage. The sensor signal is created by the slots passing under the sensor. When a slot is under the sensor the signal is high (5.0V); when the metal between the slots is under the sensor, the signal is low (.03V).

Probable causes:

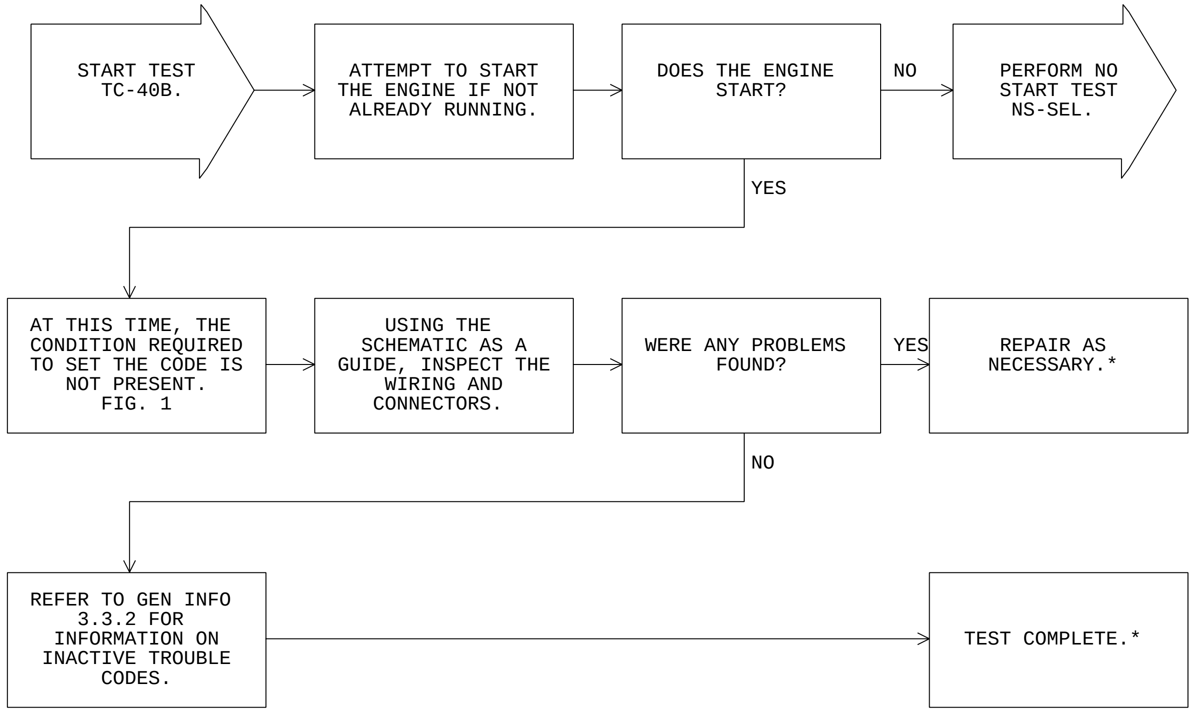
- Open or shorted 5-volt supply circuit
- Open sensor ground
- Open or shorted signal circuit
- Excessive clearance between the sensor and flywheel or crankshaft
- Damaged flywheel
- Failed sensor
- Failed PCM
- Shorted VSS 5-volt supply circuit

80aa4bdf

FIG. 1

TEST TC-40B REPAIRING - NO CRANK REFERENCE SIGNAL AT PCM

Perform TEST TC-40A Before Proceeding



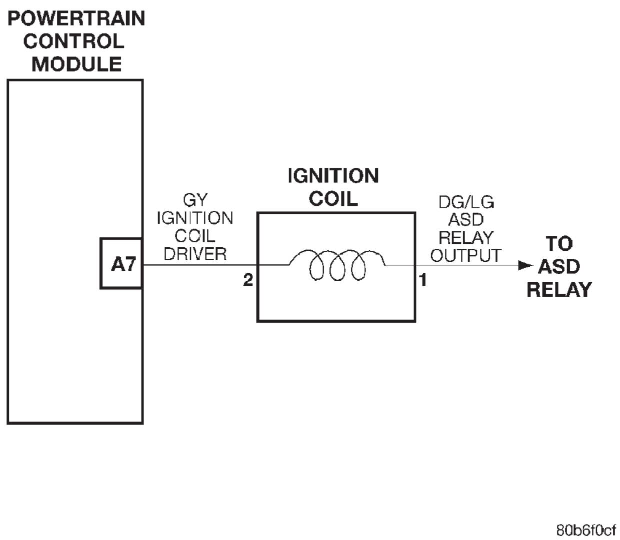
**Perform Verification TEST VER-2A.*

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

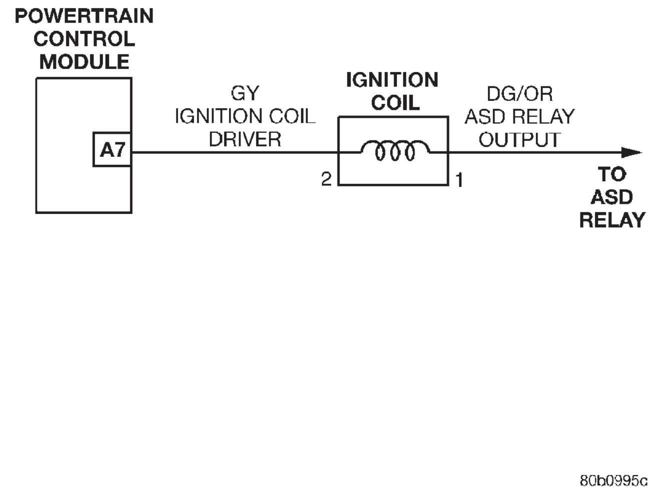
TEST TC-43A	REPAIRING - IGNITION COIL #1 PRIMARY CIRCUIT

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



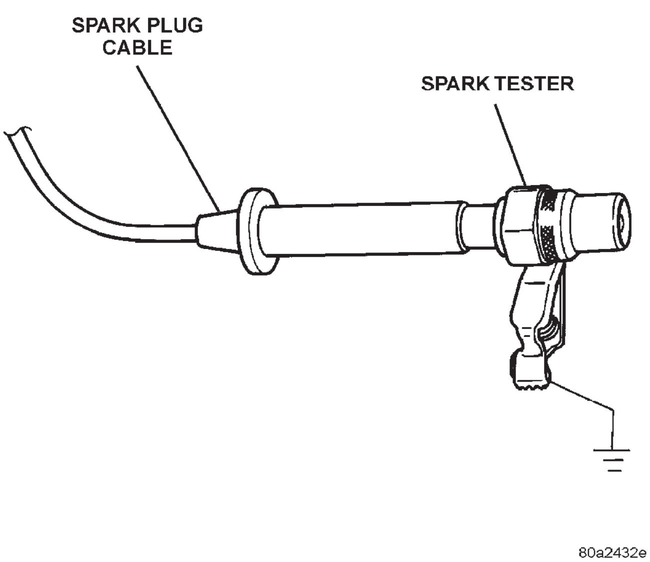


FIG. 1

Name of code: Ignition Coil Primary Circuit

When monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, and with engine rpm less than 2016, and none of the coils in dwell when checked.

Set condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

Theory of operation: The ignition coil is supplied 12 volts from ASD relay. The PCM controls the individual primary circuits, which fires the individual coils. The amount of dwell time is based on crankshaft speed and camshaft position.

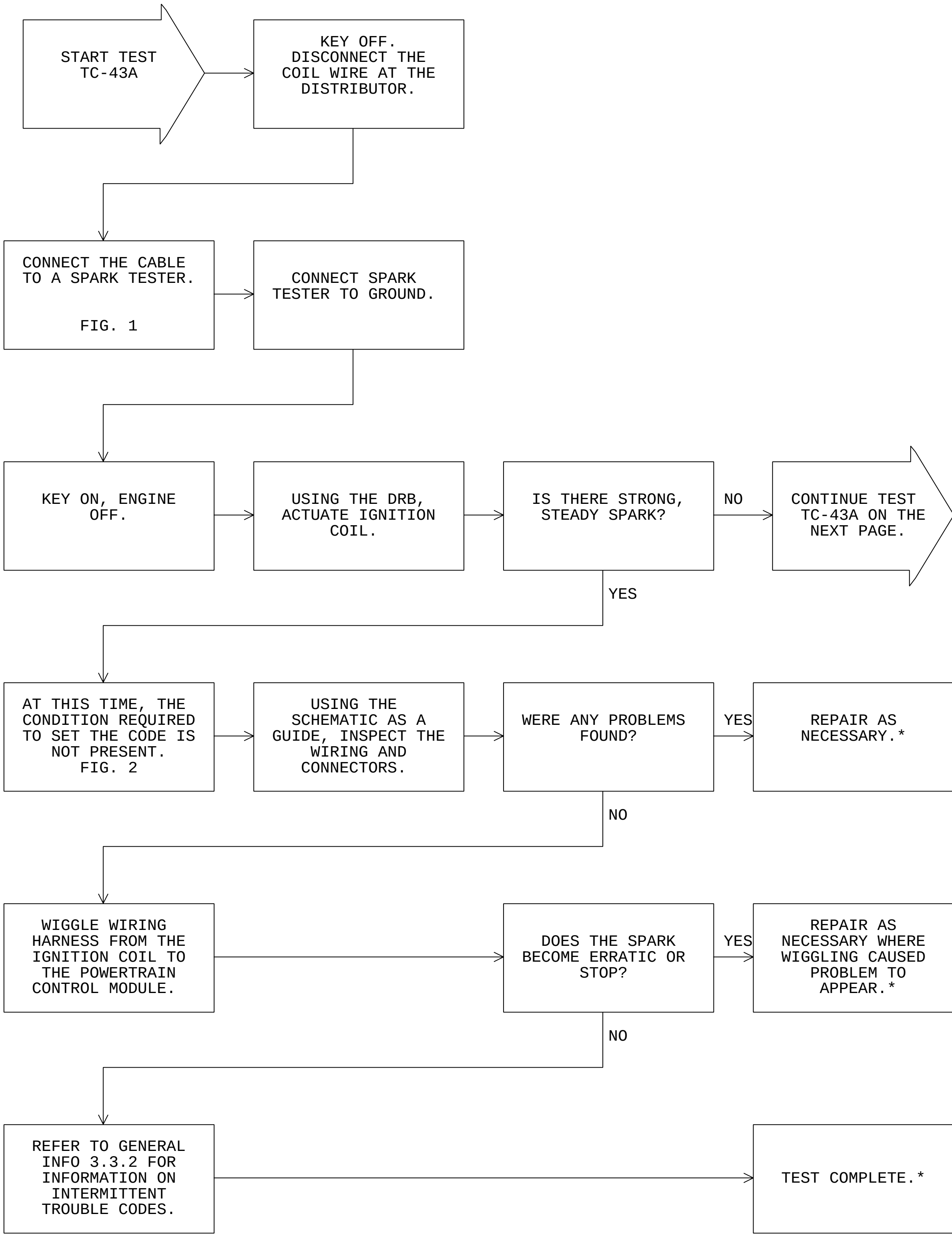
Possible causes:
> Open or shorted ignition coil driver circuit
> Open ignition coil primary
> Open ASD output circuit
> Failed PCM

3470203

FIG. 2

TEST TC-43A | REPAIRING - IGNITION COIL #1 PRIMARY CIRCUIT

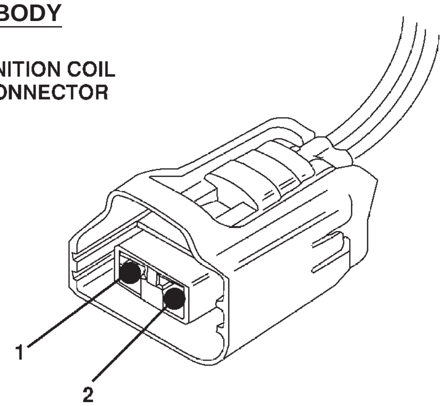
Perform TEST DTC Before Proceeding



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

TEST TC-43A — CONTINUED - REPAIRING - IGNITION COIL #1 PRIMARY CIRCUIT

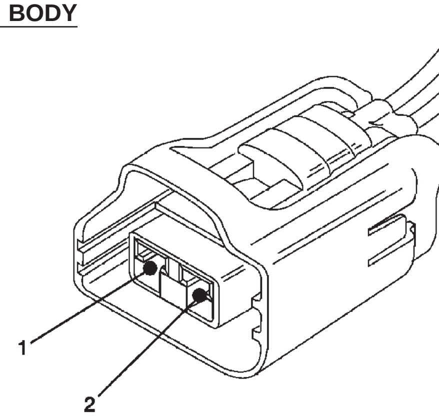
TJ BODY



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

FIG. 1

XJ BODY



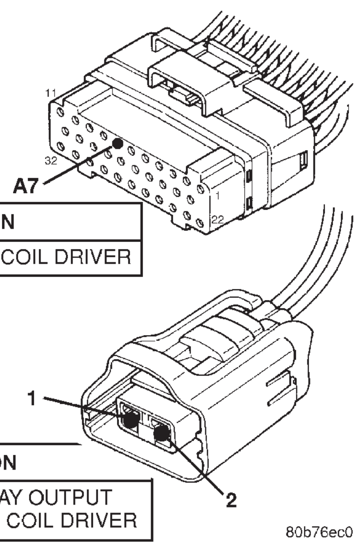
CAV	COLOR	FUNCTION
1	DG/OR	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

NOTE: WIRES CAN BE IN EITHER CAVITY

FIG. 2

TJ BODY

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



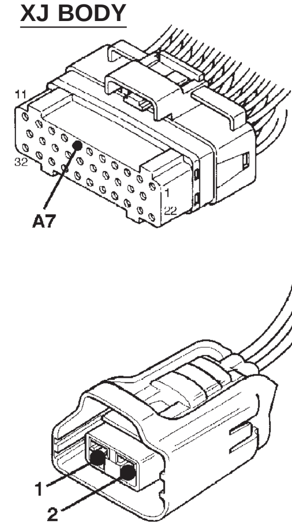
CAV	COLOR	FUNCTION
A7	GY	IGNTION COIL DRIVER

IGNITION COIL CONNECTOR

CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

FIG. 3

XJ BODY



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A7	GY	IGNITION COIL DRIVER

IGNITION COIL CONNECTOR

CAV	COLOR	FUNCTION
1	DG/OR	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

FIG. 4

IGNITION COIL

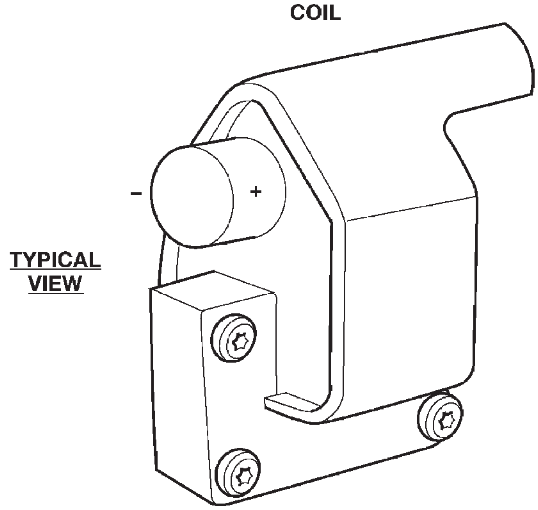
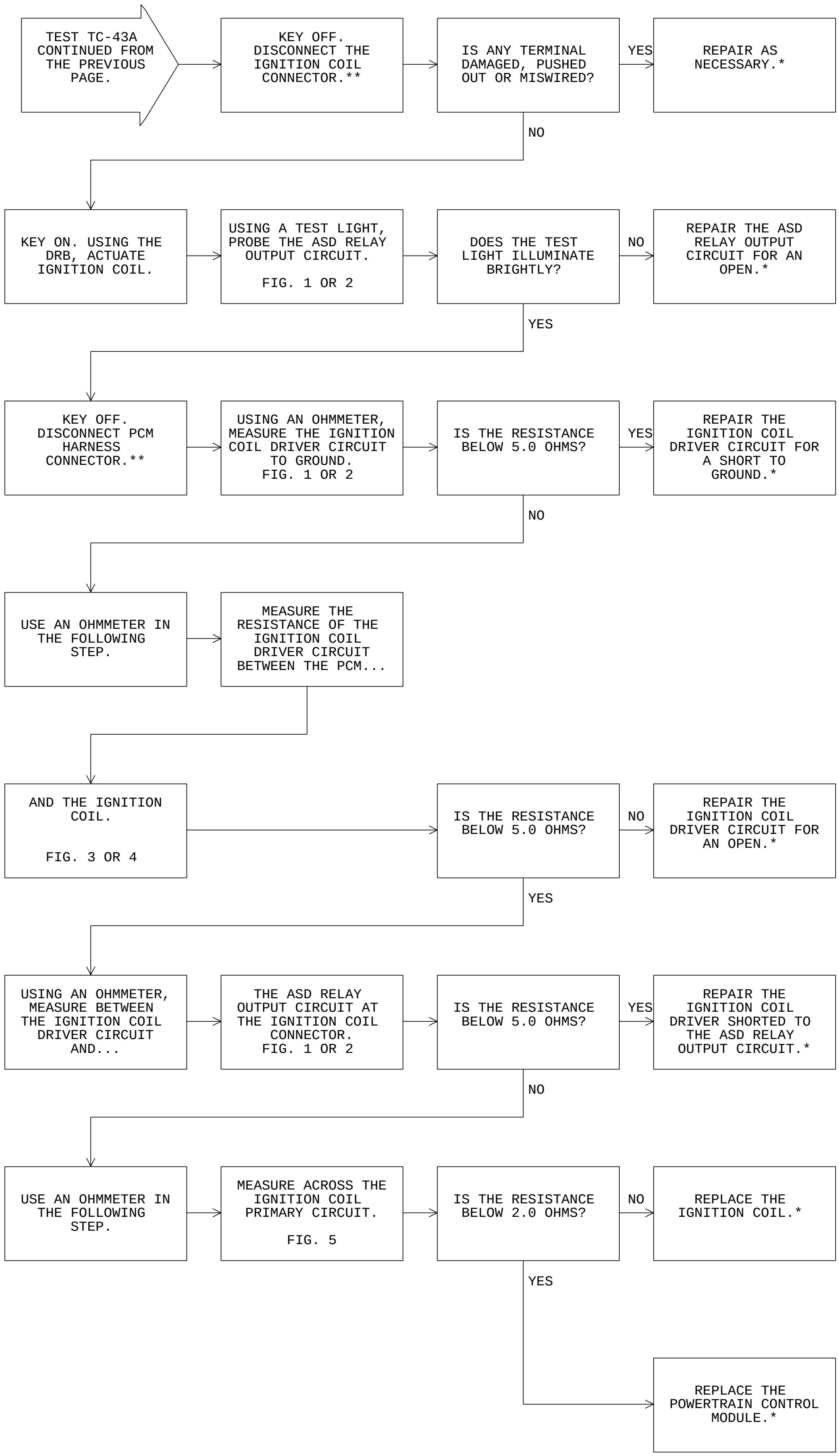


FIG. 5

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

TEST TC-43A — CONTINUED - REPAIRING - IGNITION COIL #1 PRIMARY CIRCUIT



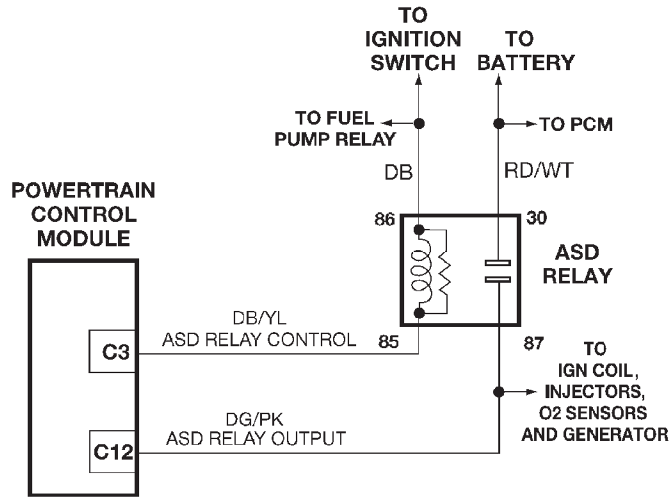
***Perform Verification TEST VER-2A.** | ****Check connectors - Clean / repair as necessary.**

TROUBLE CODE TESTS

TEST TC-44A REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

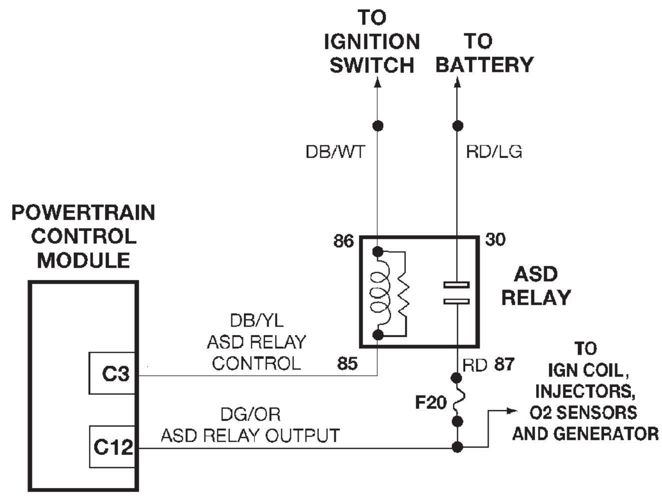
Perform TEST DTC Before Proceeding

TJ BODY



80b6f0d0

XJ BODY



80b04fe0

Name of code: Auto Shutdown Relay Control Circuit

When monitored: With ignition key on and battery voltage greater than 10.4 volts.

Theory of operation: The Automatic Shutdown Relay (ASD) controls the 12-volt source to the fuel injectors, ignition coil(s), and the oxygen heaters sensor. The relay is located in the Power Distribution Center (PDC). One side of the relay control coil is supplied with battery voltage when the ignition switch is in the start or 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 control circuit when the ignition switch is in the start or run position and engine RPM is detected. If engine RPM is not detected, the PCM will remove the ASD relay control circuit ground.

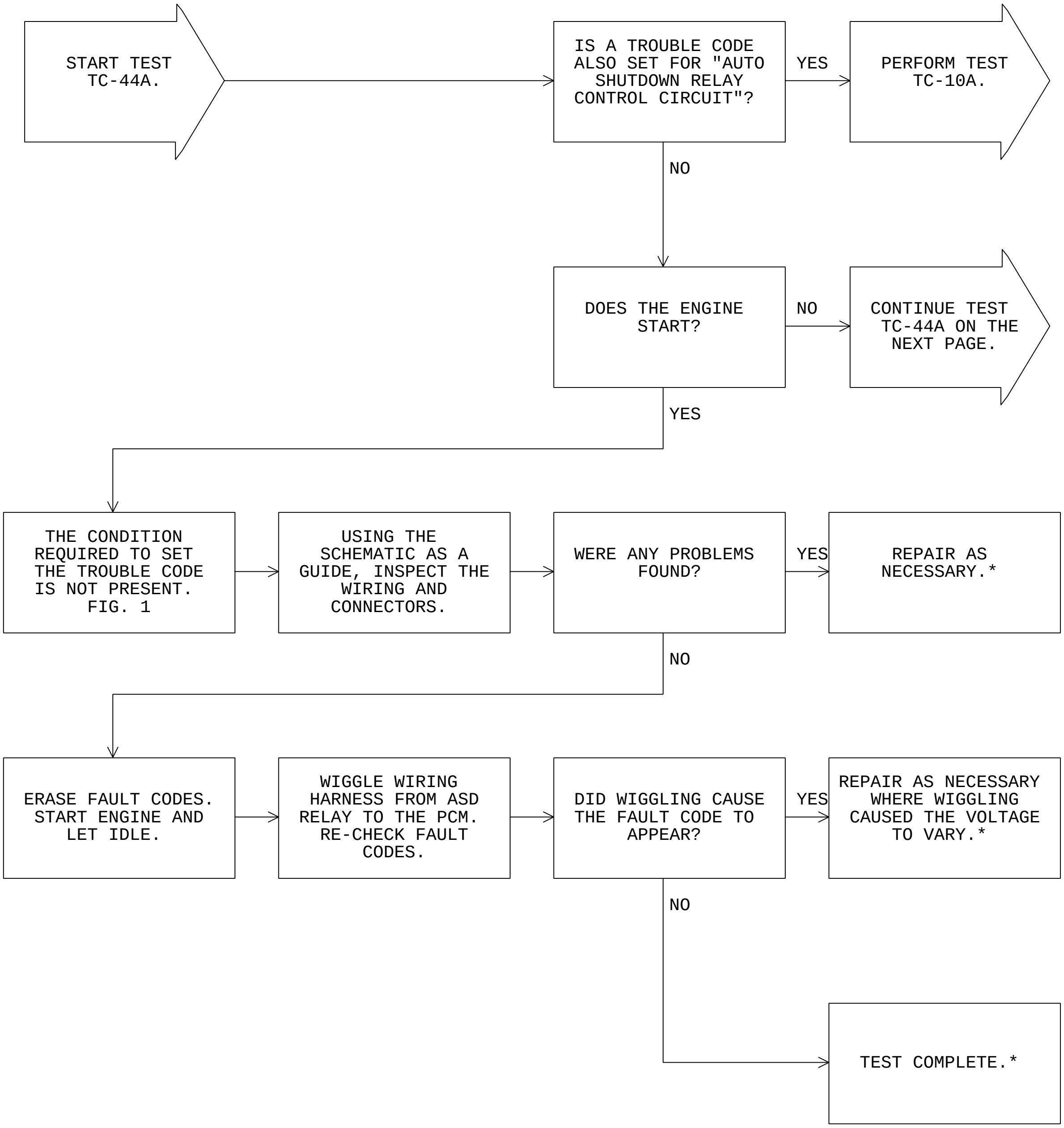
Possible causes:
> Relay coil open or shorted.
> Fused ignition switch output circuit open.
> Auto shutdown relay control circuit open or shorted.
> Inoperative circuit driver in PCM (PCM Failure)
> Connector terminals

80afb5d2

FIG. 1

TEST TC-44A — REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

Perform TEST DTC Before Proceeding



**Perform Verification TEST VER-2A.*

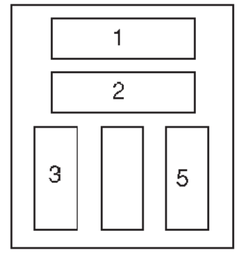
***Check connectors - Clean / repair as necessary.*

TEST TC-44A	CONTINUED - REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM

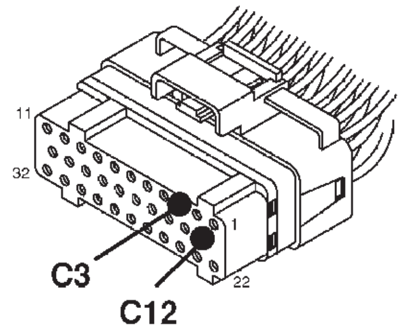
TJ BODY

AUTO SHUTDOWN RELAY CONNECTOR
(IN PDC)

CAV	COLOR	FUNCTION
1 (30)	RD/WT	FUSED B+
2 (87)	DG/PK	AUTO SHUTDOWN RELAY OUTPUT
3 (86)	DB	IGNITION SWITCH OUTPUT
5 (85)	DB/YL	AUTO SHUTDOWN RELAY CONTROL



POWERTRAIN
CONTROL MODULE
GREY CONNECTOR



CAV	COLOR	FUNCTION
C3	DB/YL	AUTO SHUTDOWN RELAY CONTROL
C12	DG/PK	AUTO SHUTDOWN RELAY OUTPUT

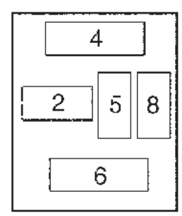
80b76e90

FIG. 1

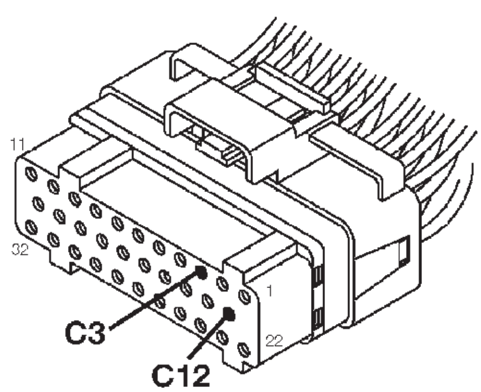
XJ BODY

AUTO SHUTDOWN RELAY CONNECTOR
(IN PDC)

CAV	COLOR	FUNCTION
2 (30)	RD/LG	FUSED B(+)
4 (85)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (86)	DB/YL	ASD RELAY CONTROL
8 (87)	RD	ASD RELAY OUTPUT



POWERTRAIN
CONTROL MODULE
GREY CONNECTOR

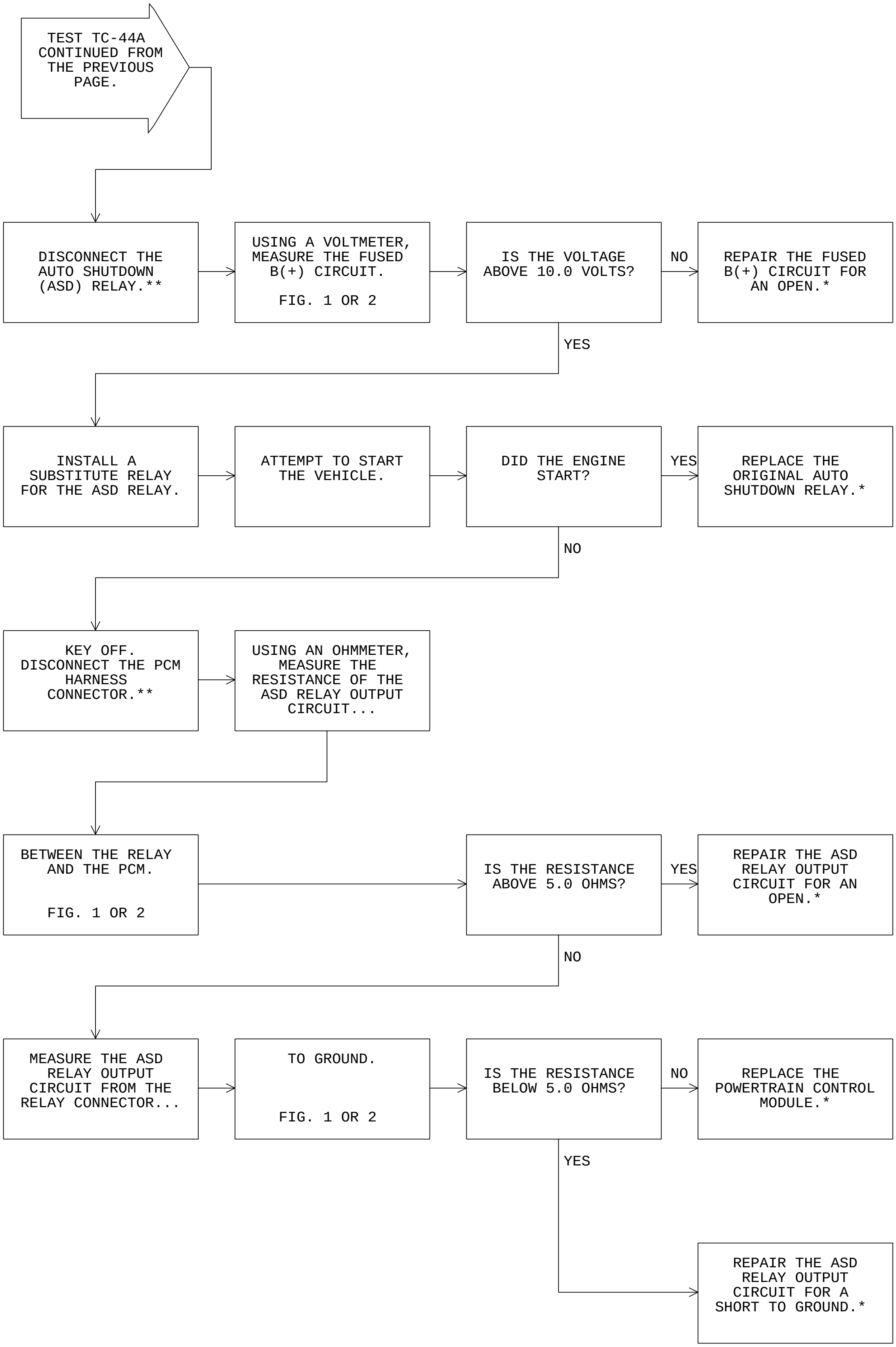


CAV	COLOR	FUNCTION
C3	DB/YL	AUTO SHUTDOWN RELAY CONTROL
C12	DG/OR	AUTO SHUTDOWN RELAY OUTPUT

80b76e93

FIG. 2

TEST TC-44A CONTINUED - REPAIRING - NO ASD RELAY OUTPUT VOLTAGE AT PCM



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

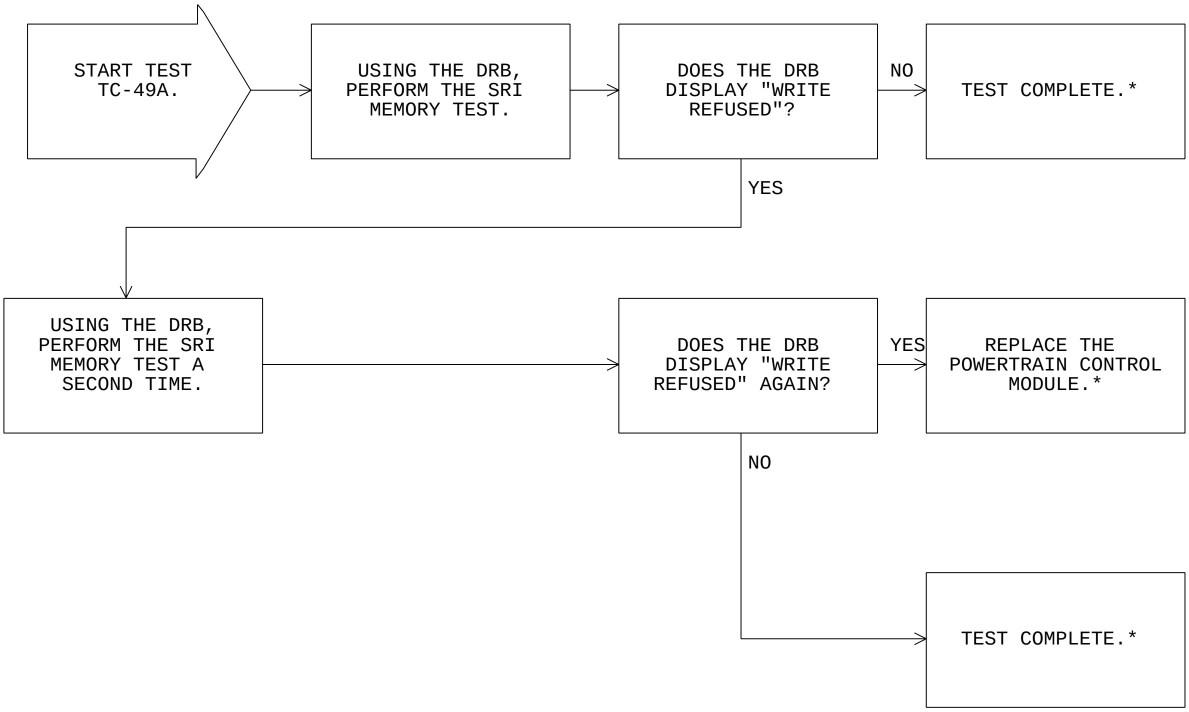
TEST TC-49A	REPAIRING - PCM FAILURE EEPROM WRITE DENIED

Perform TEST DTC Before Proceeding

NOTES

TEST TC-49A	REPAIRING - PCM FAILURE EEPROM WRITE DENIED

Perform TEST DTC Before Proceeding



**Perform Verification TEST VER-2A.*

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

TEST TC-57A	REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW

Perform TEST DTC Before Proceeding

Name of code: Intake Air Temp Sensor Voltage Low

When monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set condition: The intake air sensor circuit voltage at the PCM goes below .08 volt.

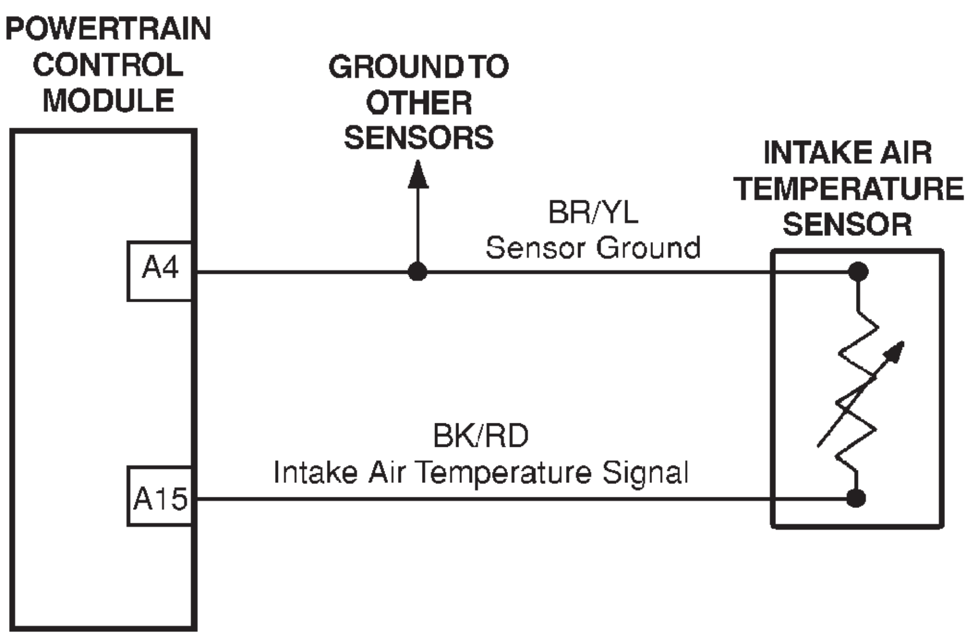
Theory of operation: The intake air temperature sensor (IAT) is located in the intake manifold where it measures the temperature of the air that is about to enter the combustion chambers. The IAT is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). 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 the PCM. 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
> Powertrain control module failure
> Connector terminals
> Connector wires

80aa0f76

FIG. 1

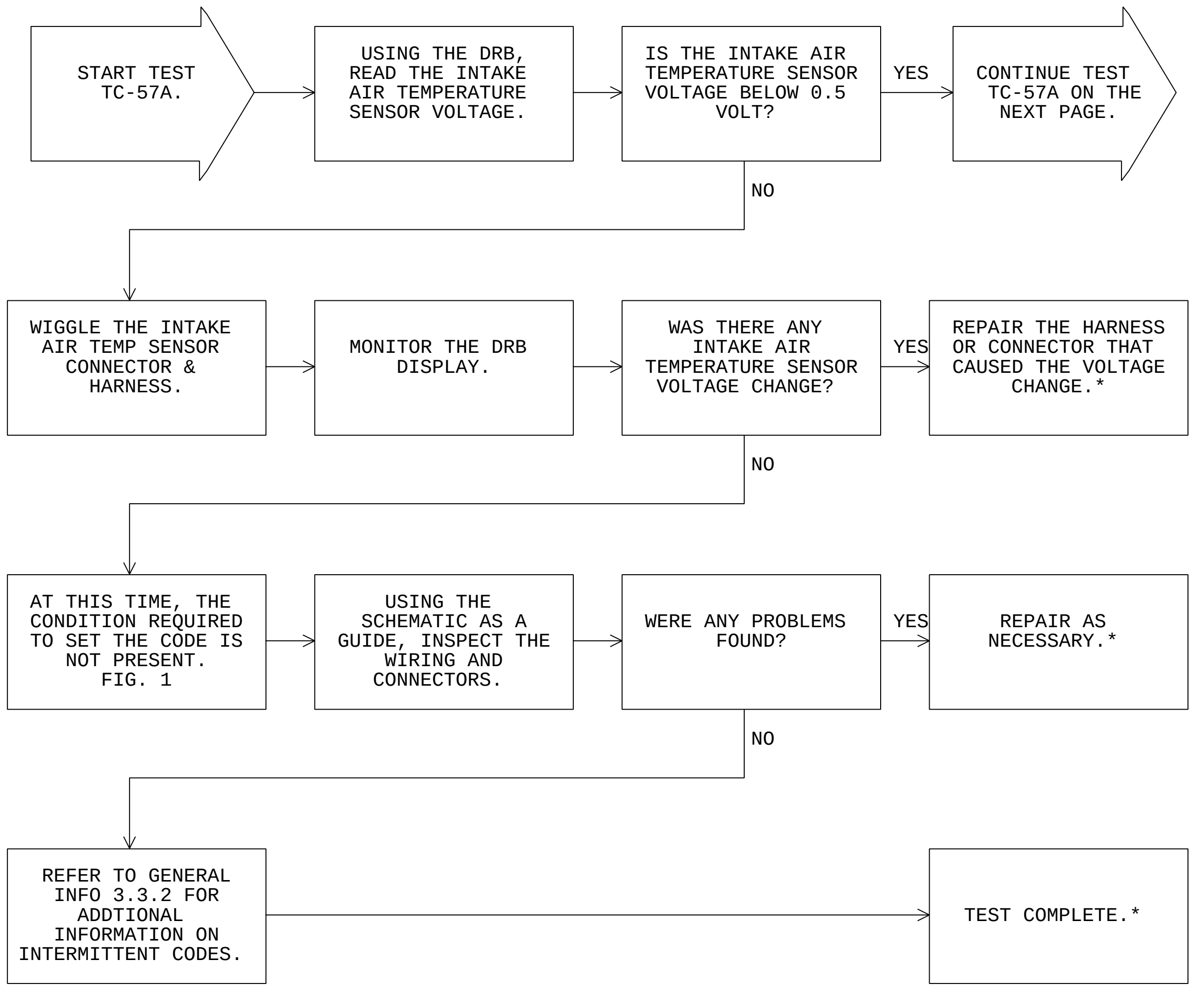
TJ/XJ BODY



80b118a4

TEST TC-57A — REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW

Perform TEST DTC Before Proceeding



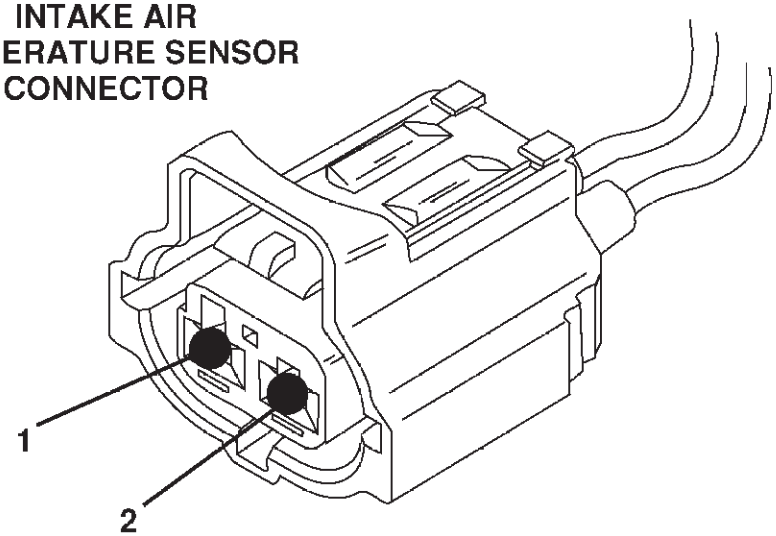
**Perform Verification TEST VER-2A.*

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

TEST TC-57A — **CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW**

TJ BODY

INTAKE AIR TEMPERATURE SENSOR CONNECTOR



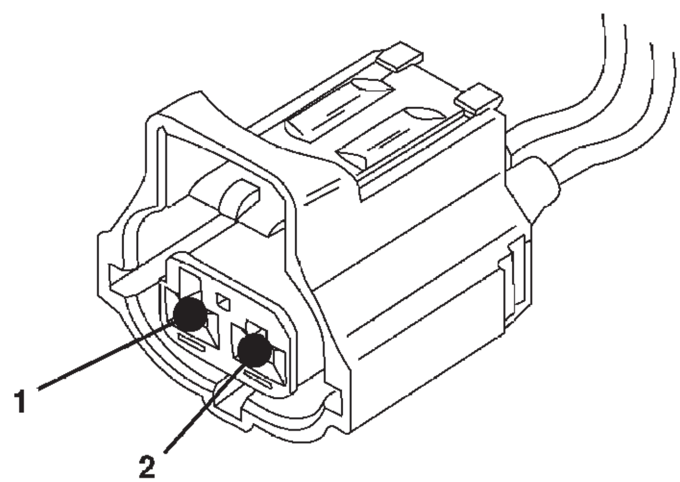
CAV	COLOR	FUNCTION
1	BK/RD	IAT SIGNAL
2	BR/YL	SENSOR GROUND

80b6f0e4

FIG. 1

XJ BODY

INTAKE AIR TEMPERATURE SENSOR CONNECTOR

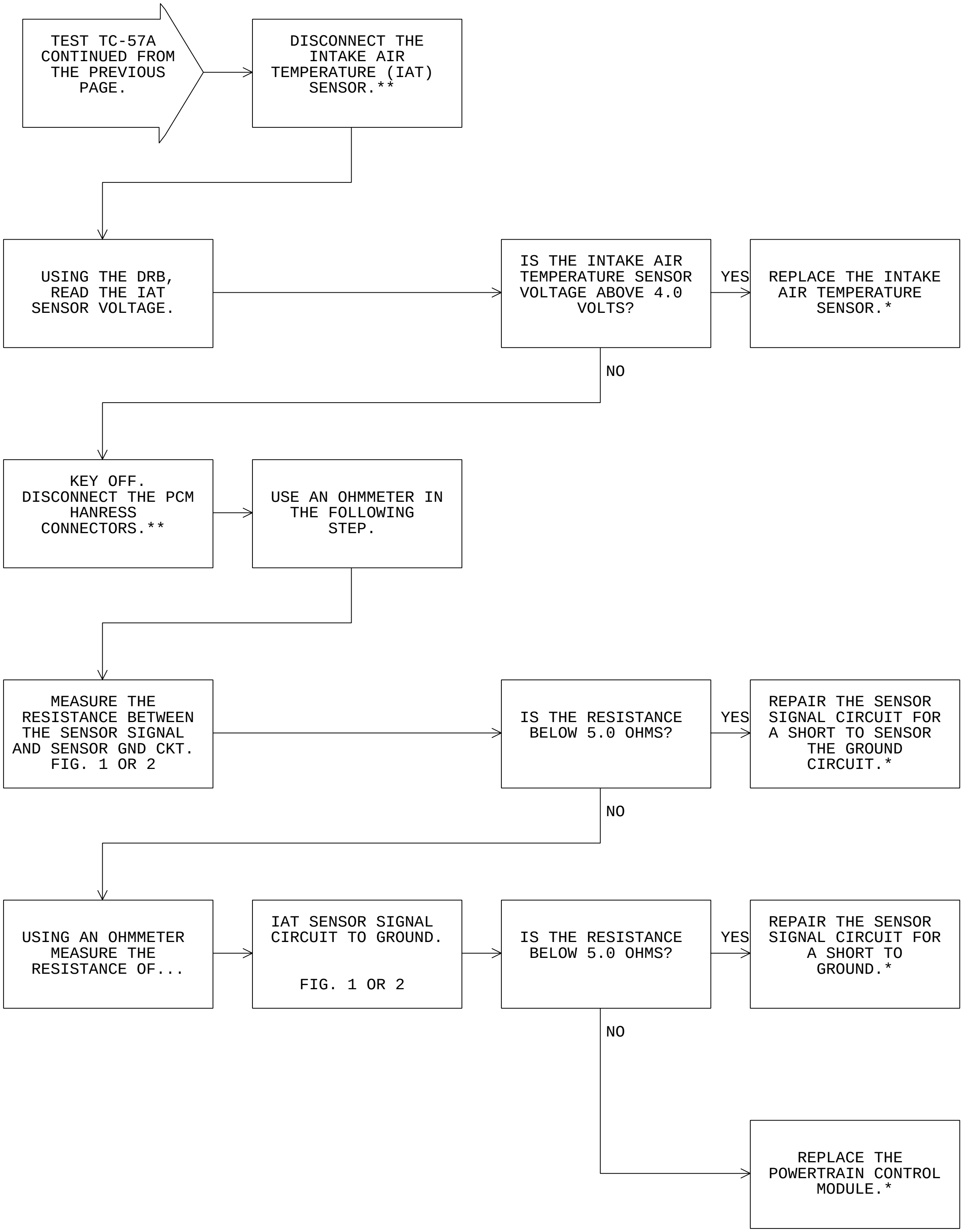


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	BK/RD	IAT SIGNAL

80b099c6

FIG. 2

TEST TC-57A CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE LOW



Perform Verification TEST VER-2A.

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

TEST TC-58A	REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

Perform TEST DTC Before Proceeding

Name of code: Intake Air Temp Sensor Voltage High

When monitored: With the ignition on and battery voltage greater than 10.4 volts.

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

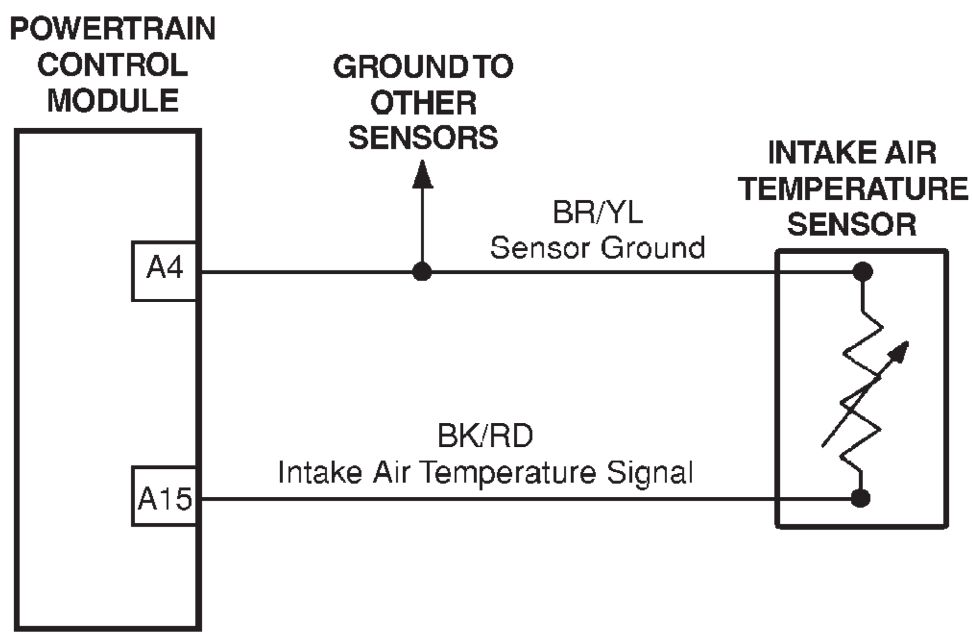
Theory of operation: The intake air temperature sensor (IAT) is located in the intake manifold where it measures the temperature of the air that is about to enter the combustion chambers. The IAT is a negative temperature coefficient (NTC) thermistor-type sensor (resistance varies inversely with temperature). 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 the PCM. The PCM uses this signal to compensate for changes in air density due to temperature.

Possible causes:
- Sensor signal circuit open or shorted
- Sensor internally open
- Sensor ground circuit open
- PCM failure
- Connector terminals
- Connector wires

80b04fda

FIG. 1

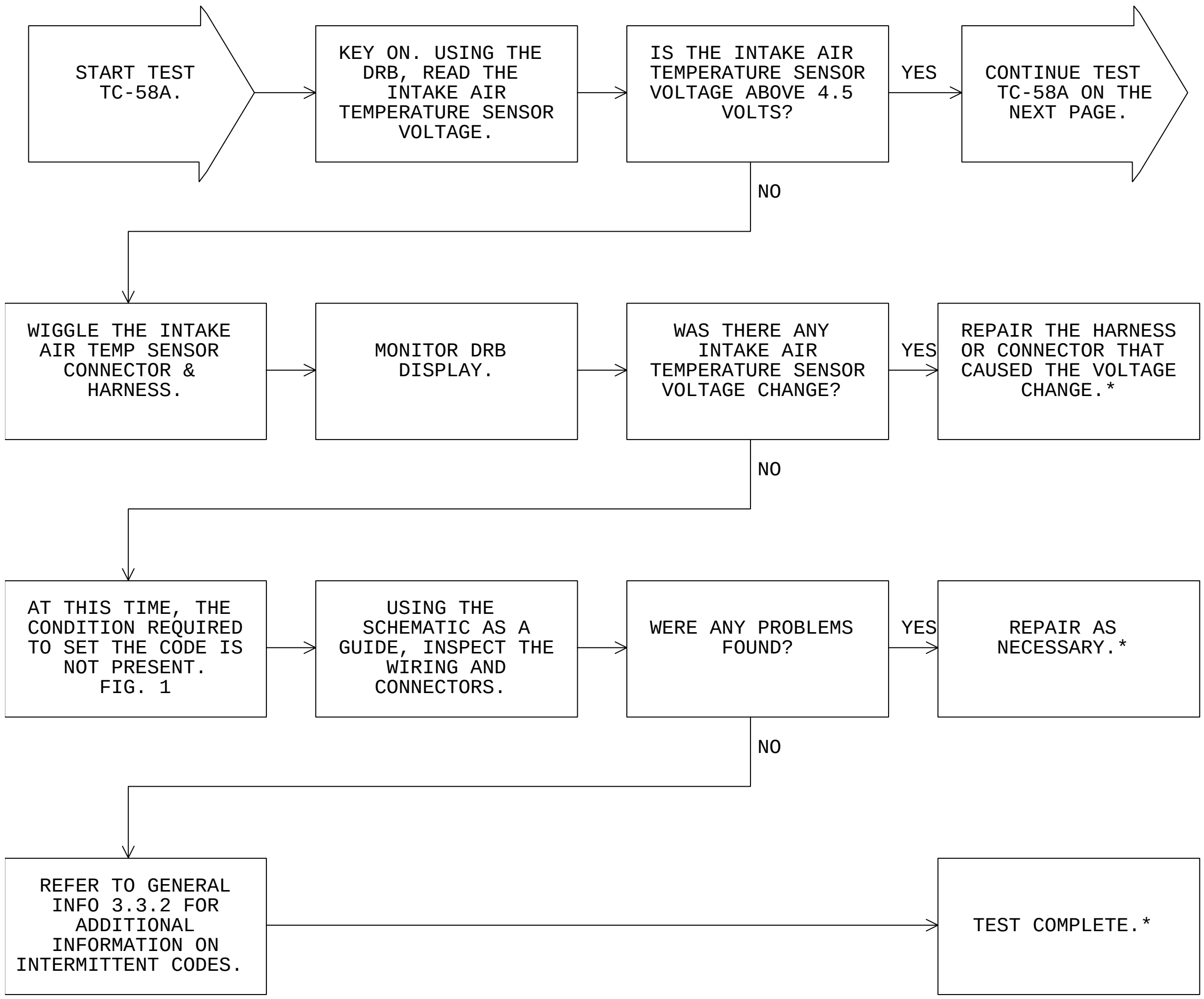
TJ/XJ BODY



80b118a4

TEST TC-58A — REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

Perform TEST DTC Before Proceeding

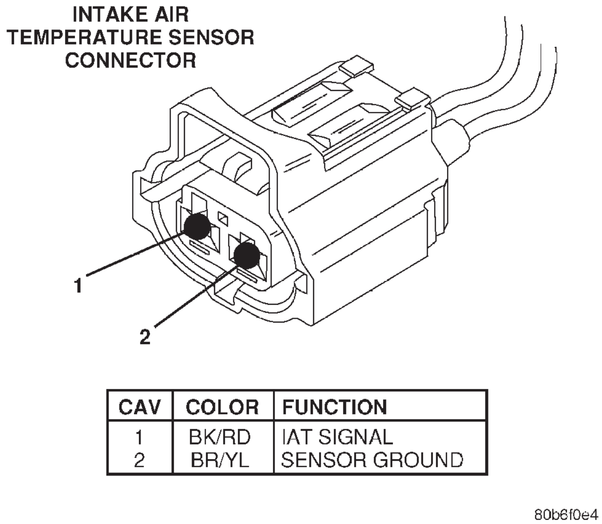


***Perform Verification TEST VER-2A.**

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

TEST TC-58A — CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

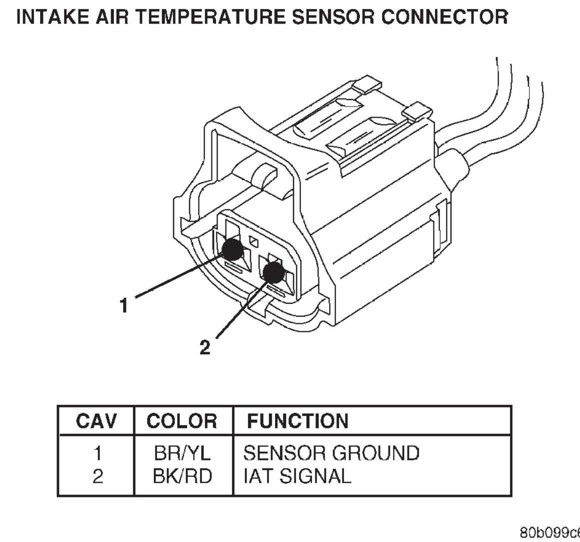
TJ BODY



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

FIG. 1

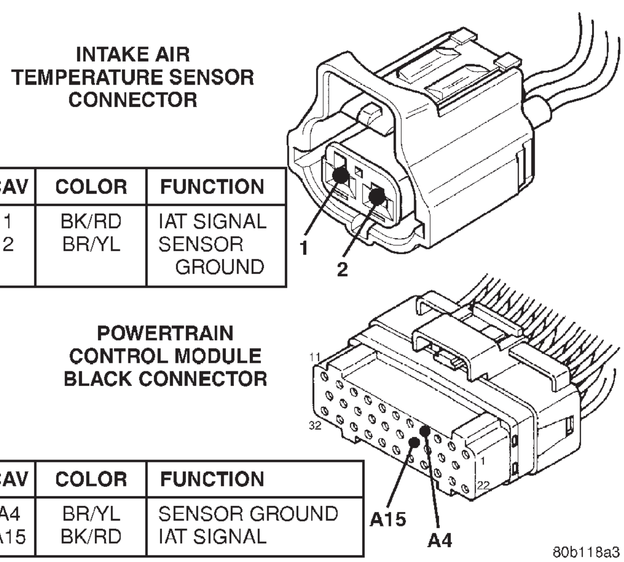
XJ BODY



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

FIG. 2

TJ BODY

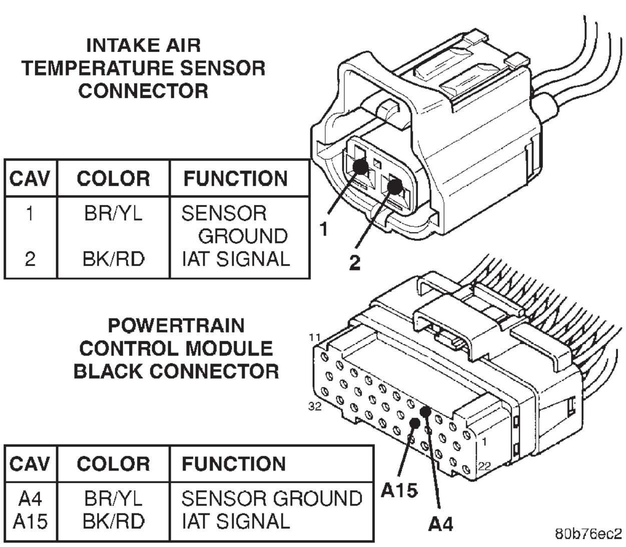


CAV	COLOR	FUNCTION
1	BK/RD	IAT SIGNAL
2	BR/YL	SENSOR GROUND

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A15	BK/RD	IAT SIGNAL

FIG. 3

XJ BODY

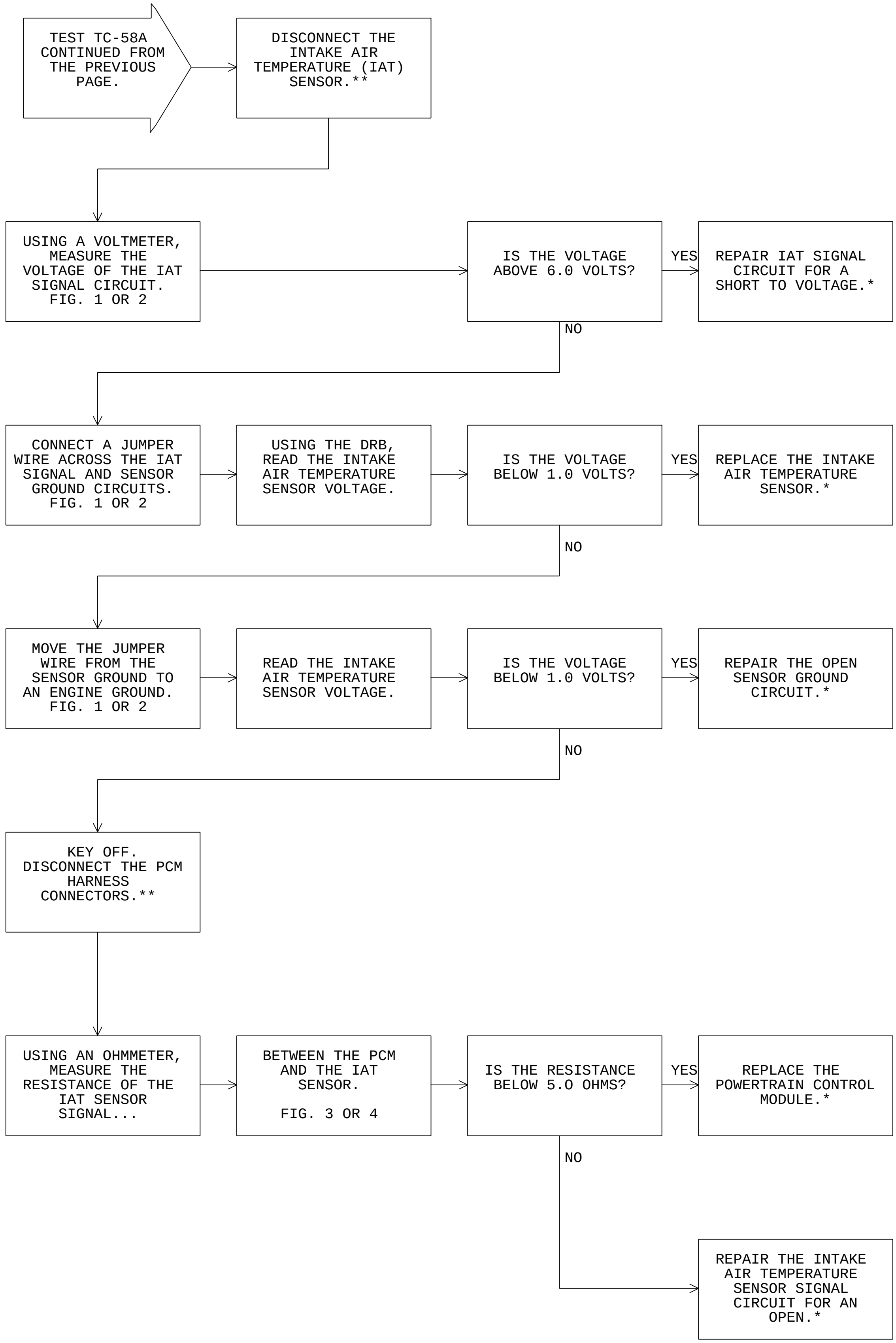


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	BK/RD	IAT SIGNAL

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A15	BK/RD	IAT SIGNAL

FIG. 4

TEST TC-58A CONTINUED - REPAIRING - INTAKE AIR TEMP SENSOR VOLTAGE HIGH



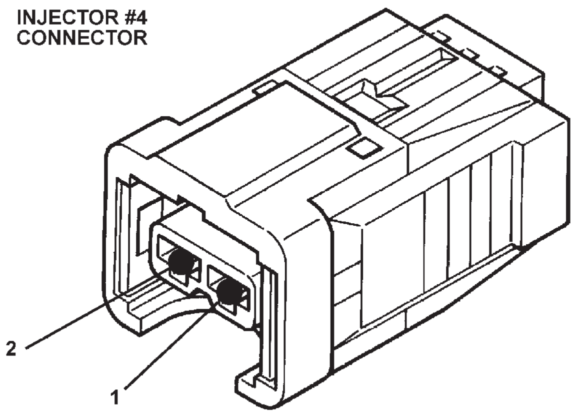
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-61A — REPAIRING - INJECTOR #4 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

2.5L

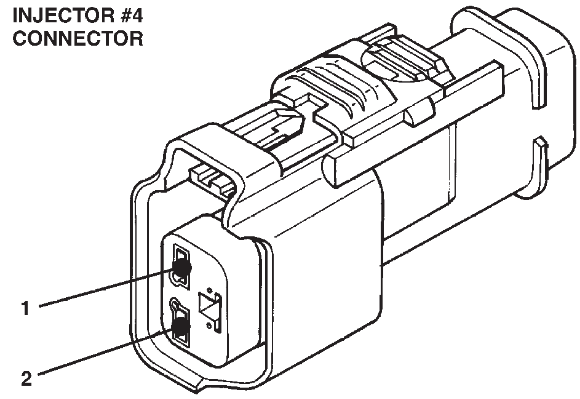


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	LB/BR	INJECTOR #4 DRIVER

80b76e66

FIG. 1

4.0L

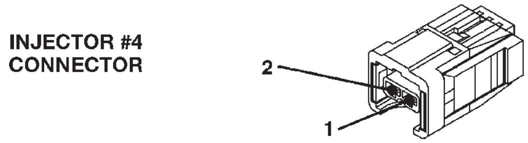


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	LB/BR	INJECTOR #4 DRIVER

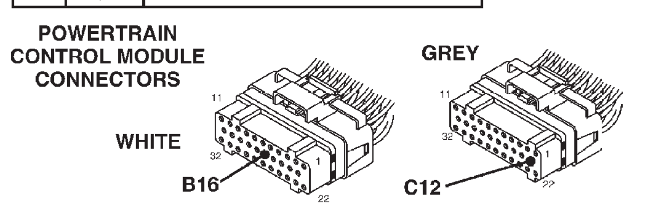
80b76e6a

FIG. 2

2.5L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	LB/BR	INJECTOR #4 DRIVER

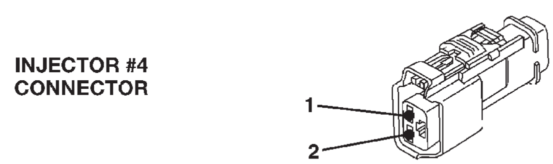


CAV	COLOR	FUNCTION
B16	LB/BR	INJECTOR #4 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

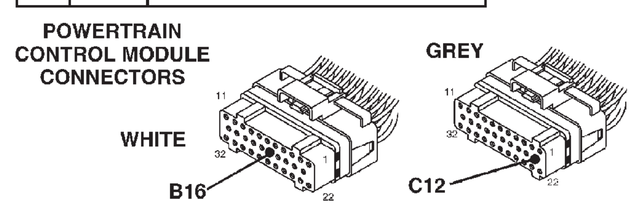
80b76ea5

FIG. 3

4.0L



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	LB/BR	INJECTOR #4 DRIVER



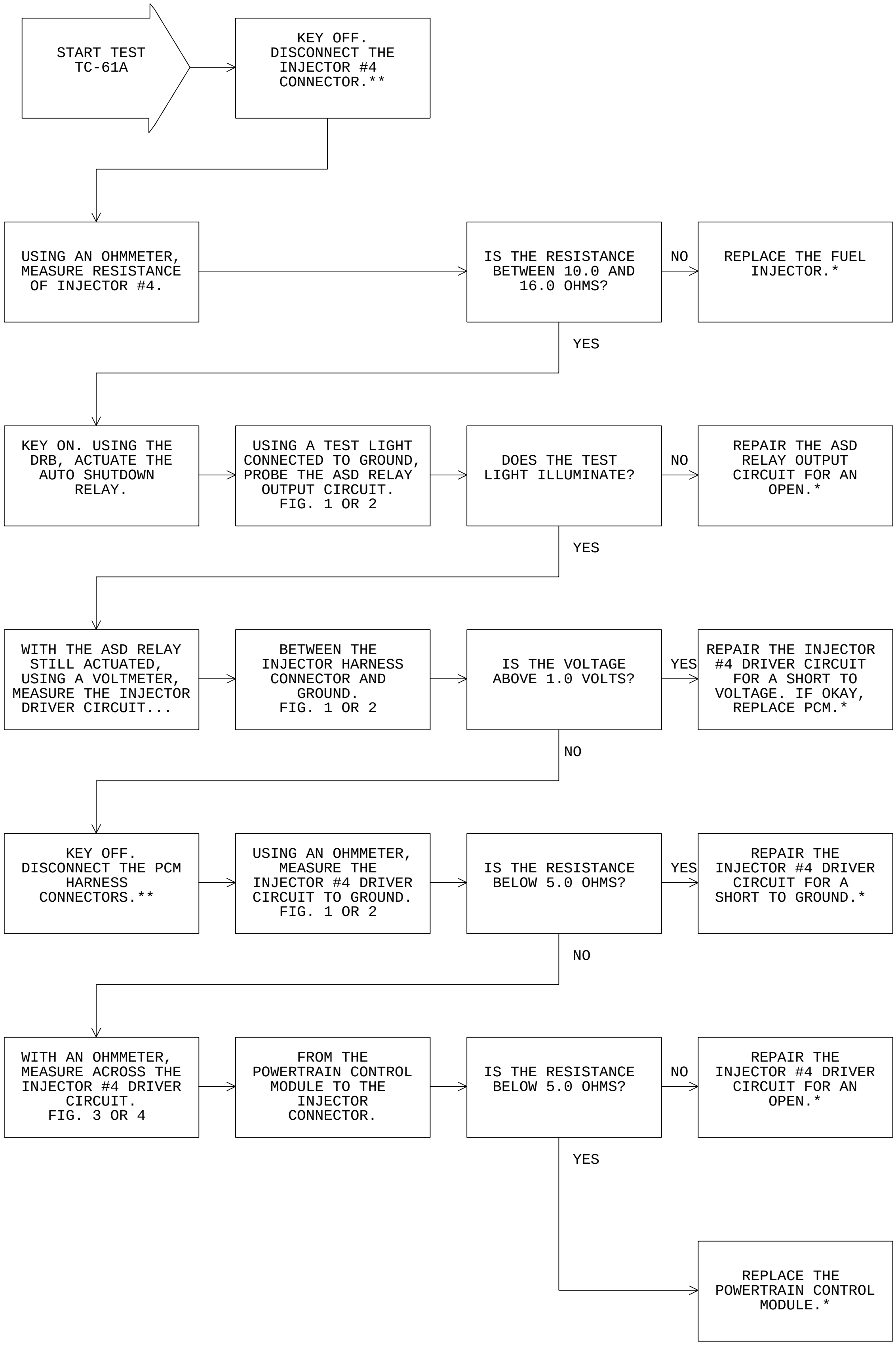
CAV	COLOR	FUNCTION
B16	LB/BR	INJECTOR #4 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

80b76ea9

FIG. 4

TEST TC-61A REPAIRING - INJECTOR #4 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

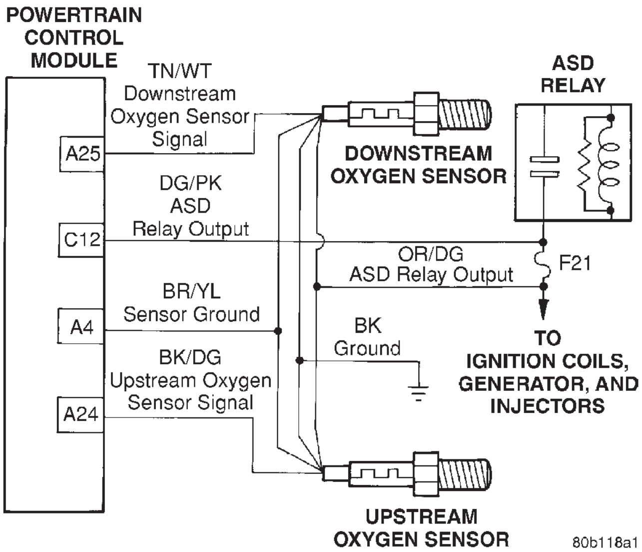


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

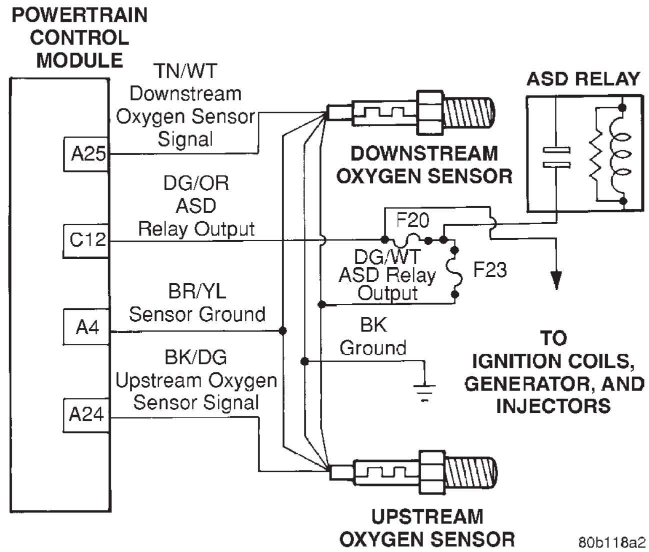
TEST TC-62A — REPAIRING - 1/1 O2 SENSOR SHORTED TO VOLTAGE

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



JTEC 02 SENSOR CONFIGURATION

TJ2.5L	1/1	UPSTREAM	XJ2.5L	1/1	UPSTREAM
TJ2.5L	1/2	DOWNSTREAM	XJ2.5L	1/2	DOWNSTREAM
TJ4.0L	1/1	UPSTREAM	XJ4.0L	1/1	UPSTREAM
TJ4.0L	1/2	DOWNSTREAM	XJ4.0L	1/2	DOWNSTREAM

80b76ec3

Name of code: O2 Sensor Shorted To Voltage

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

Set condition: The oxygen sensor voltage is above 1.2 volts.

Theory of operation: Effective control of exhaust emissions is achieved by an oxygen feedback system. The oxygen sensor (O2S), which is located in the exhaust path, monitors the exhaust emissions. Once the sensor reaches its normal operating temperature of 300°-350°C (572°-662°F), it generates a voltage inversely proportional to the amount of oxygen in the exhaust.

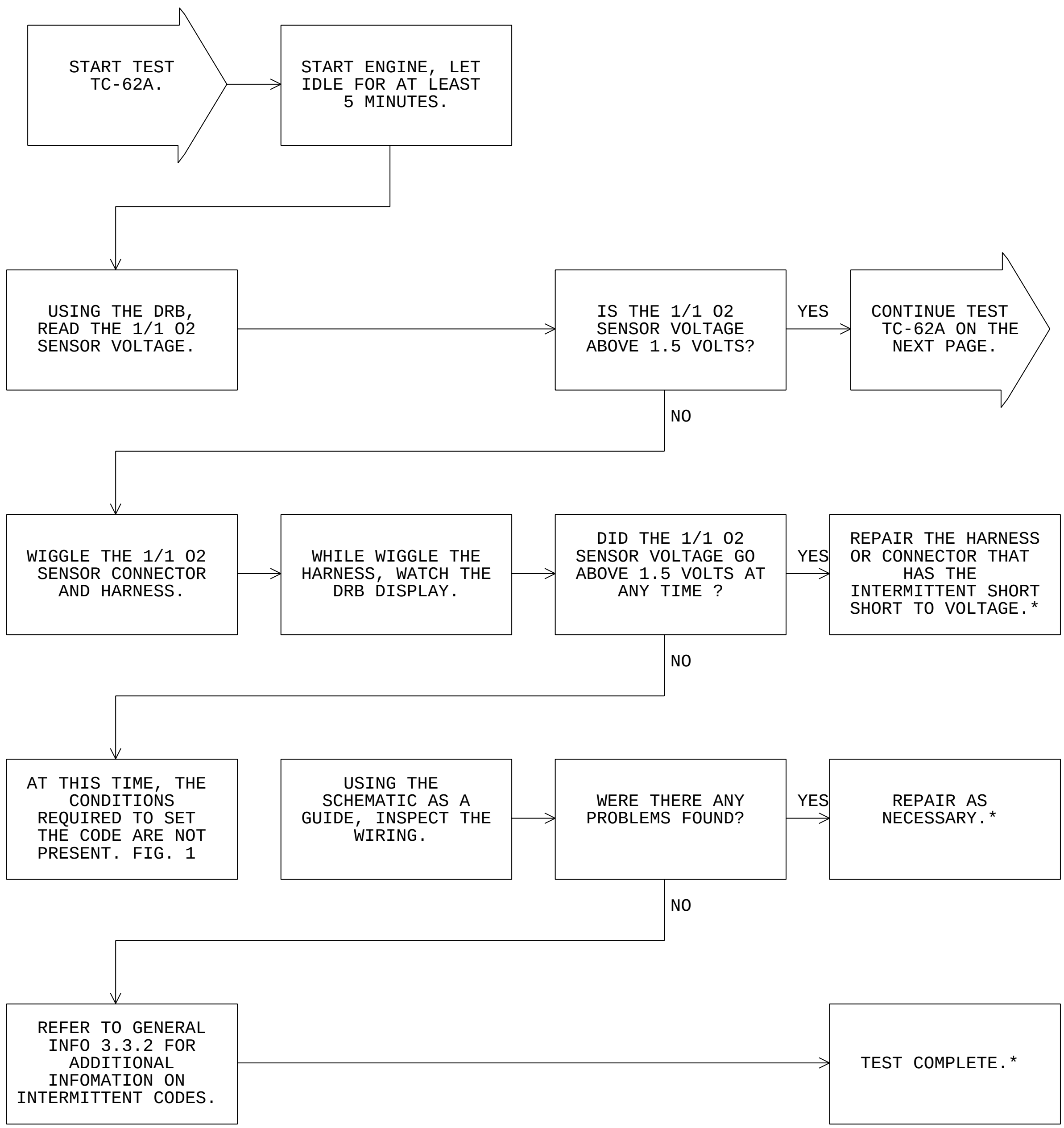
Possible causes:
- > Sensor output wire shorted to a power circuit
- > O2 sensor failure
- > Powertrain control module failure
- > Connector terminals
- > Connector wires
- > Open O2 sensor signal circuit

80b01cfe

FIG. 1

TEST TC-62A — REPAIRING - 1/1 O2 SENSOR SHORTED TO VOLTAGE

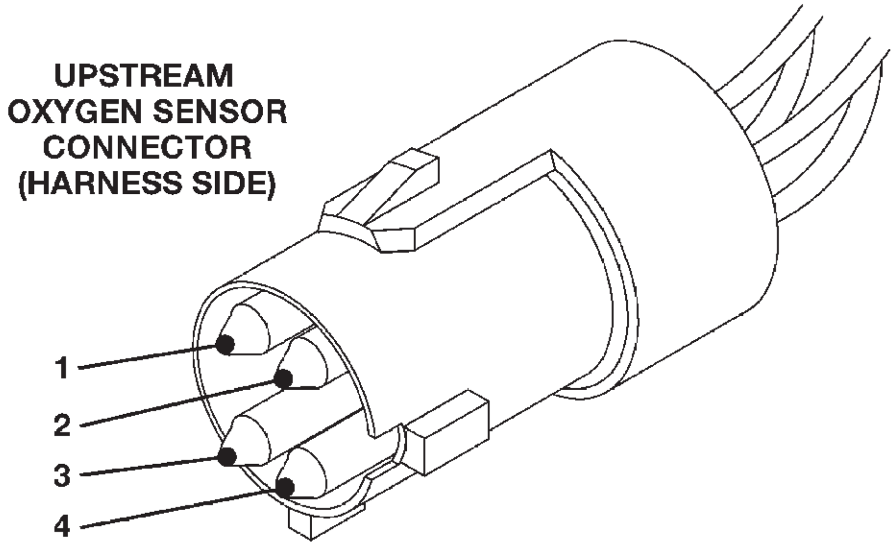
Perform TEST DTC Before Proceeding



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

TEST TC-62A — CONTINUED - REPAIRING - 1/1 O2 SENSOR SHORTED TO VOLTAGE

TJ BODY

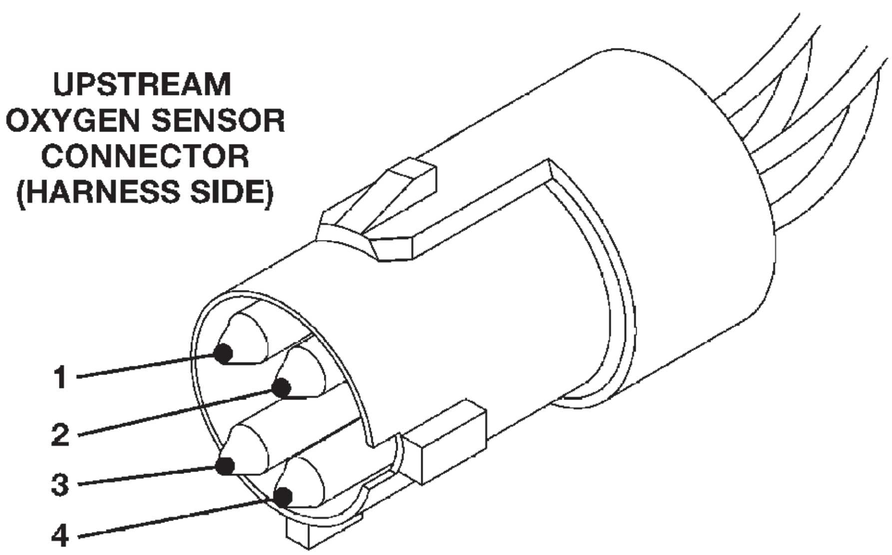


CAV	COLOR	FUNCTION
1	OR/DG	ASD Relay Output
2	BK	Ground (Heater)
3	BR/YL	Sensor Ground
4	BK/DG	Oxygen Sensor Signal

80b6f0e5

FIG. 1

XJ BODY



CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

80b6f0db

FIG. 2

TEST TC-62A | **CONTINUED - REPAIRING - 1/1 O2 SENSOR SHORTED TO VOLTAGE**

TEST TC-62A CONTINUED FROM THE PREVIOUS PAGE.

KEY OFF. DISCONNECT THE 1/1 O2 SENSOR HARNESS CONNECTOR.**

USE A VOLTMETER IN THE FOLLOWING STEP.

KEY ON. MEASURE THE 1/1 O2 SENSOR SIGNAL CIRCUIT...

BETWEEN THE 1/1 O2 SENSOR HARNESS CONNECTOR AND GROUND.
FIG. 1 OR 2

WAS THE VOLTAGE BETWEEN 4.2 AND 5.2 VOLTS?

NO → CONTINUE TEST TC-62A ON THE NEXT PAGE.

YES → INSTALL A JUMPER WIRE FROM THE 1/1 O2 SENSOR SIGNAL CIRCUIT TO THE SENSOR GROUND...

AT THE 1/1 O2 SENSOR HARNESS CONNECTOR. OBSERVE THE DRB.

FIG. 1 OR 2

DID THE 1/1 O2 SENSOR VOLTAGE DROP BELOW 1.0 VOLTS?

YES → REPLACE THE 1/1 O2 SENSOR.*

NO → MOVE THE JUMPER WIRE FROM THE SENSOR GROUND...

TO AN ENGINE GROUND. OBSERVE THE DRB.

DID THE 1/1 O2 SENSOR VOLTAGE DROP BELOW 1.0 VOLTS?

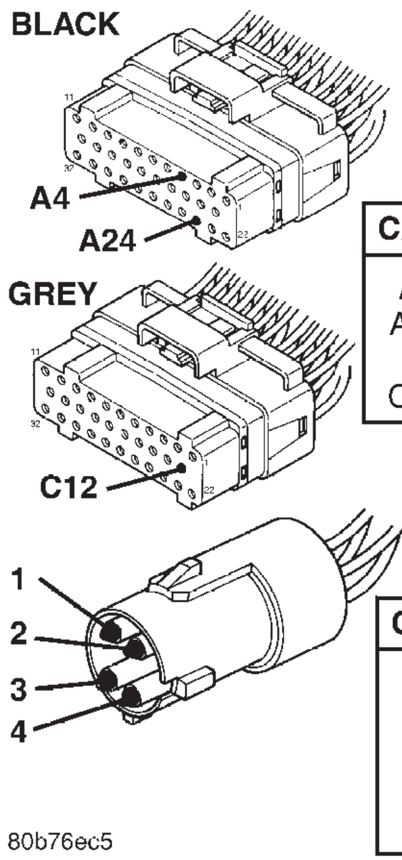
YES → REPAIR THE SENSOR GROUND CIRCUIT FOR AN OPEN.*

NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

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

TEST TC-62A	CONTINUED - REPAIRING - 1/1 O2 SENSOR SHORTED TO VOLTAGE

TJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

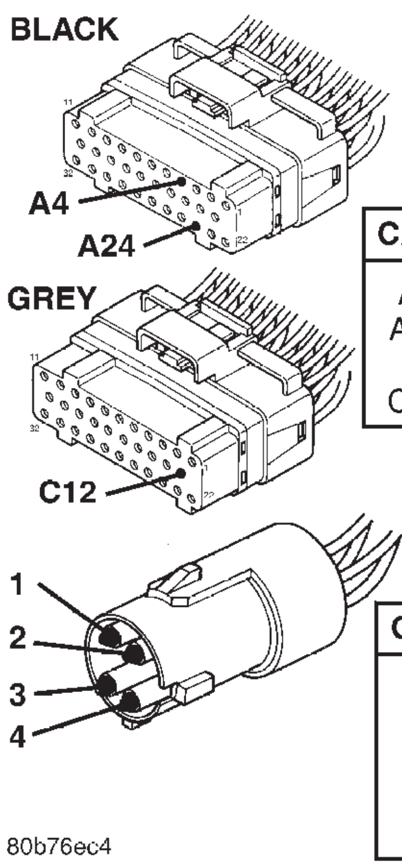
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 1

XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

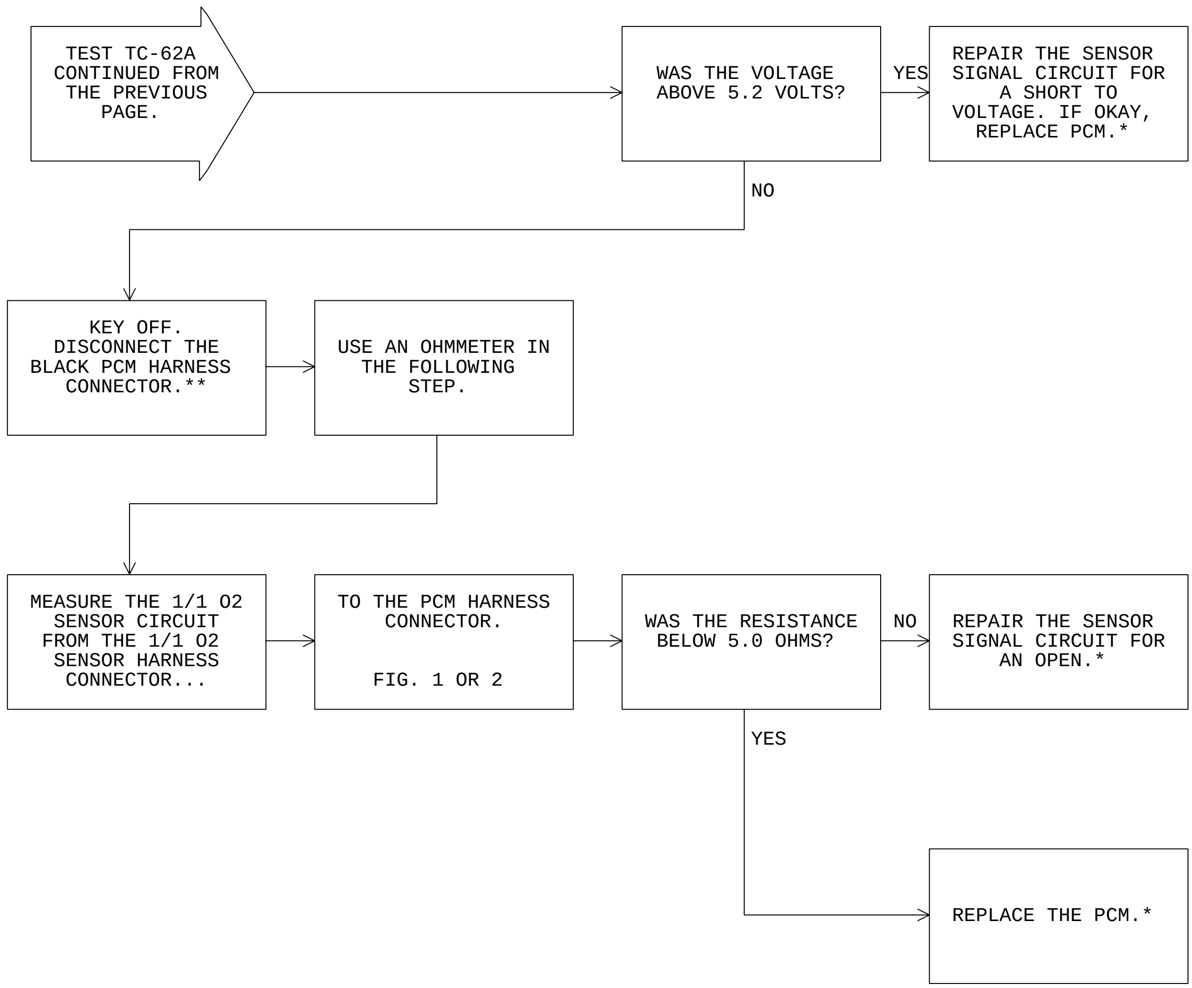
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 2

TEST TC-62A CONTINUED - REPAIRING - 1/1 O2 SENSOR SHORTED TO VOLTAGE



*Perform Verification TEST VER-2A.

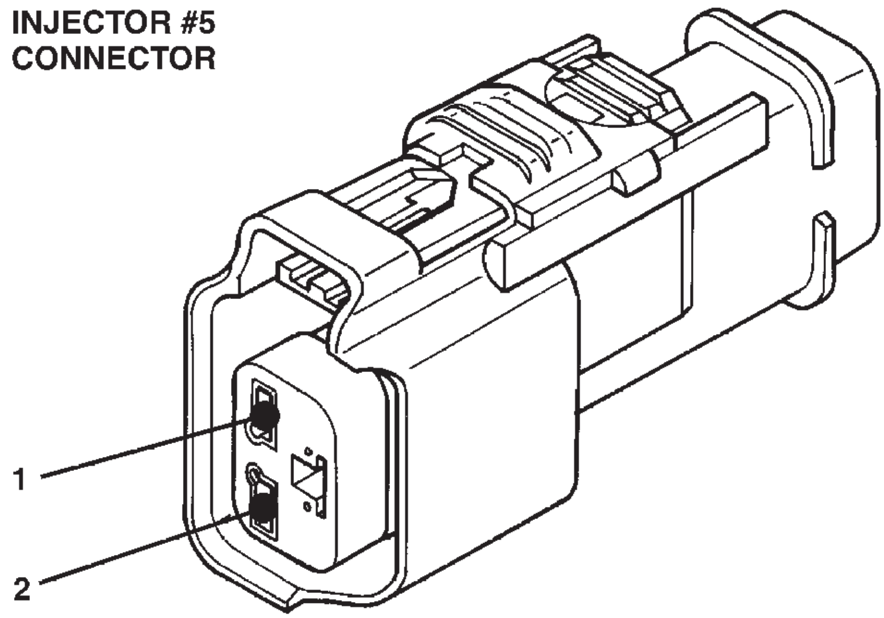
**Check connectors - Clean / repair as necessary.

TEST TC-69A — REPAIRING - INJECTOR #5 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

4.0L

INJECTOR #5 CONNECTOR



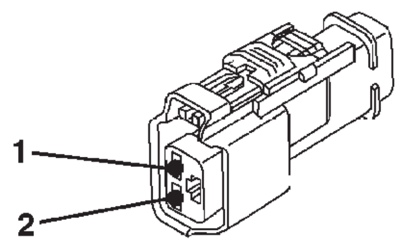
CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	PK/BK	INJECTOR #5 DRIVER

80b76e6b

FIG. 1

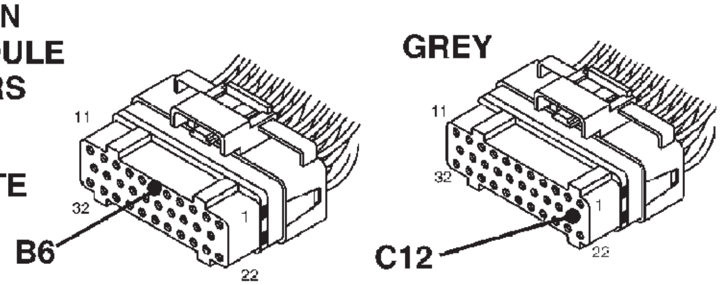
4.0L

INJECTOR #5 CONNECTOR



CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	PK/BK	INJECTOR #5 DRIVER

POWERTRAIN CONTROL MODULE CONNECTORS



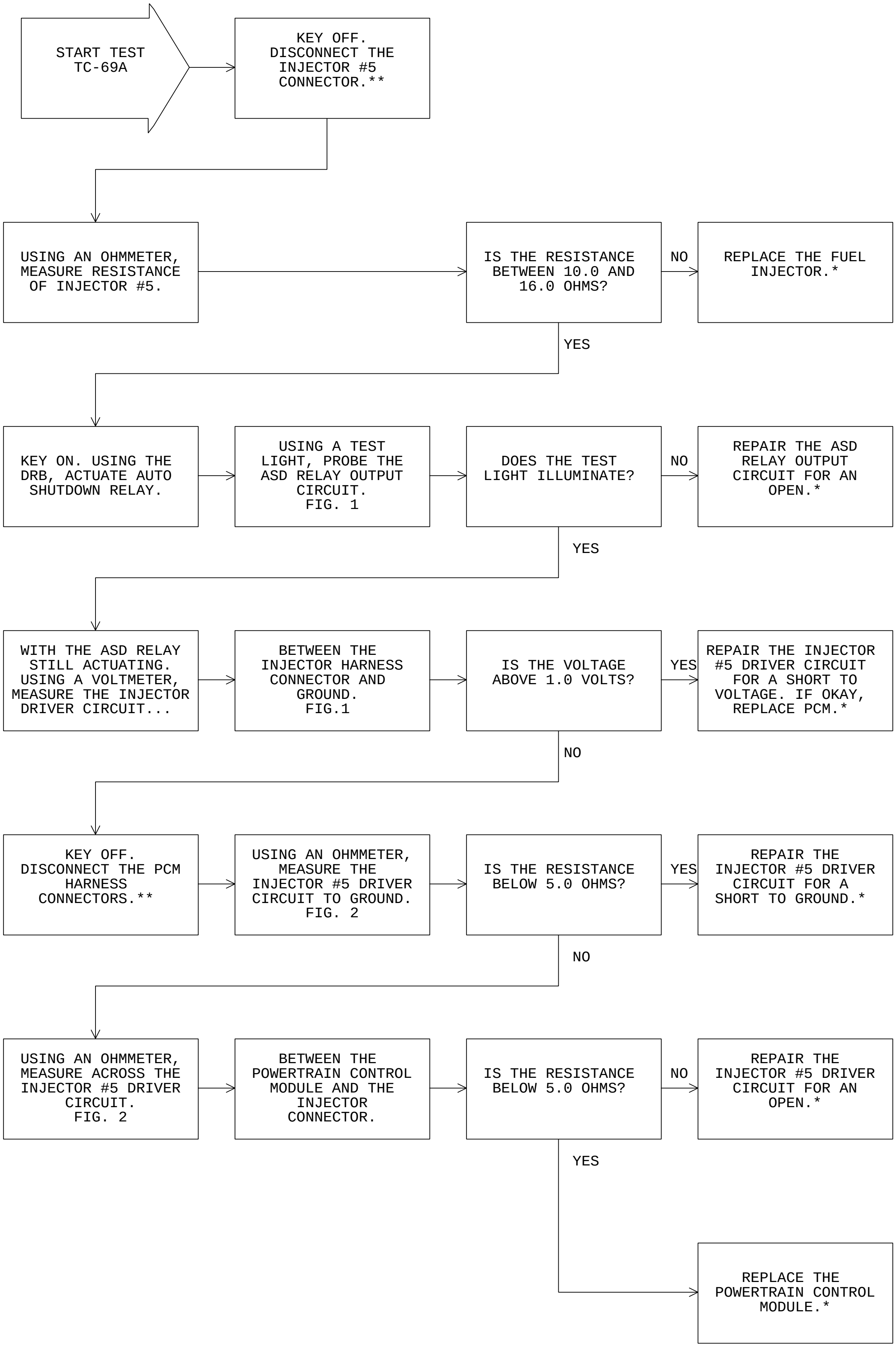
CAV	COLOR	FUNCTION
B6	PK/BK	INJECTOR #5 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

80b76eaa

FIG. 2

TEST TC-69A REPAIRING - INJECTOR #5 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding

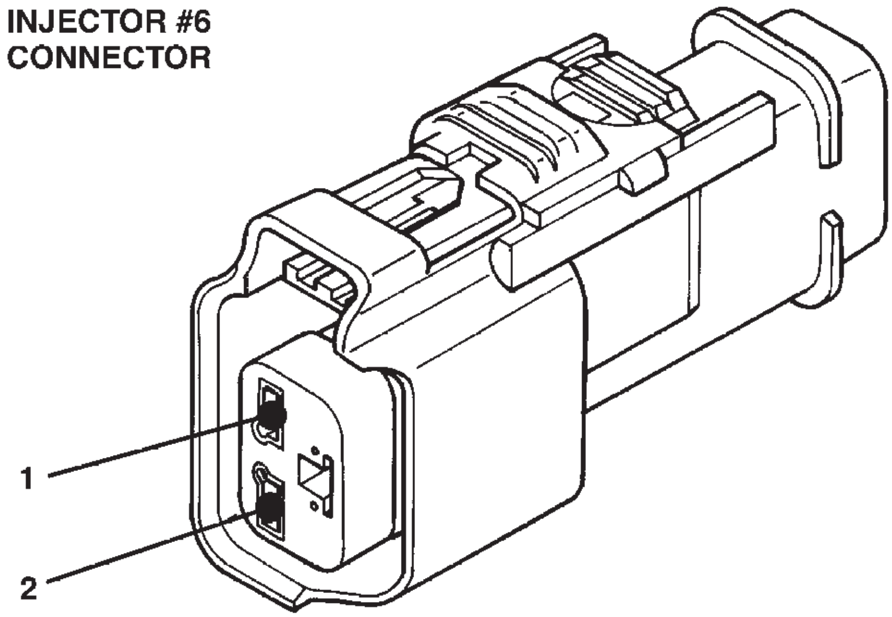


Perform Verification TEST VER-2A.* | *****Check connectors - Clean / repair as necessary.*

TEST TC-70A | **REPAIRING - INJECTOR #6 CONTROL CIRCUIT**

Perform TEST TC-21A Before Proceeding

4.0L



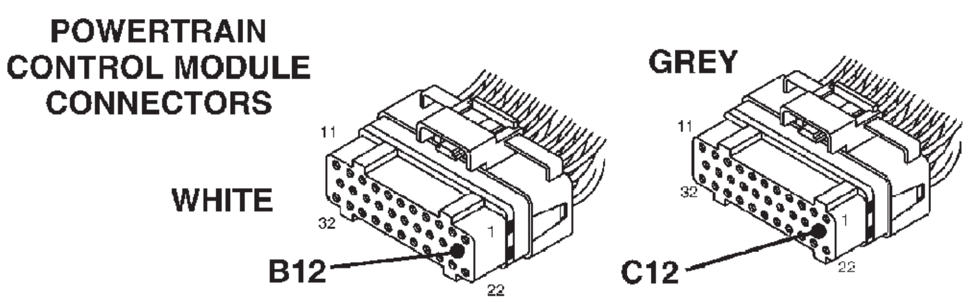
CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	LG/BK	INJECTOR #6 DRIVER

80b76e6c

FIG. 1

4.0L

CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT (TJ)
1	DG/OR	ASD RELAY OUTPUT (XJ)
2	LG/BK	INJECTOR #6 DRIVER



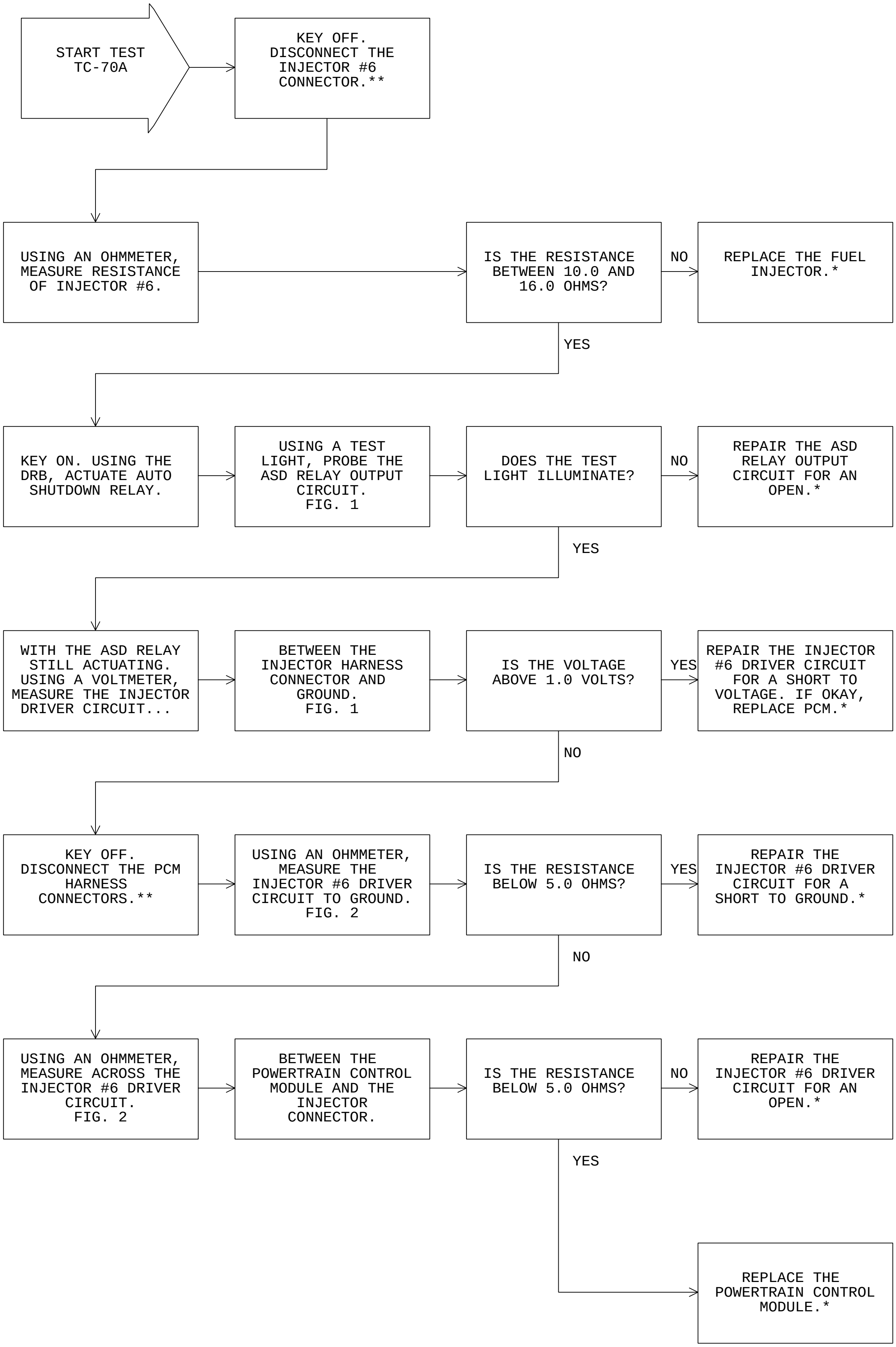
CAV	COLOR	FUNCTION
B12	LG/BK	INJECTOR #6 DRIVER
C12	DG/PK	ASD RELAY OUTPUT (TJ)
C12	DG/OR	ASD RELAY OUTPUT (XJ)

80b76eab

FIG. 2

TEST TC-70A | REPAIRING - INJECTOR #6 CONTROL CIRCUIT

Perform TEST TC-21A Before Proceeding



**Perform Verification TEST VER-2A.*

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

TEST TC-82A — REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT

Perform TEST DTC Before Proceeding

Name of code: Speed Control Power Relay Circuit

When monitored: With the ignition key on, speed control switched on.

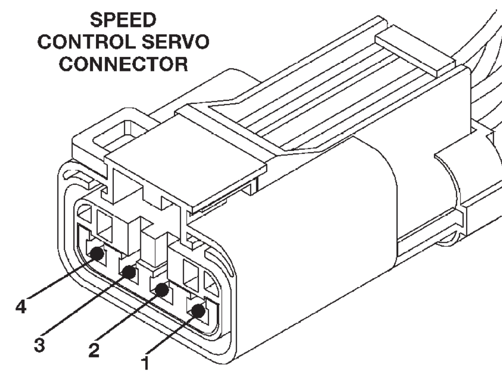
Set condition: The speed control power supply circuit is either open or shorted to ground.

Theory of operation: The PCM monitors the voltage drop across all speed control solenoids and the power supply circuit.

Possible causes:
> Open and shorted power supply circuit
> Failed dump solenoid (S/C servo)

80aa0f65

TJ/XJ BODY

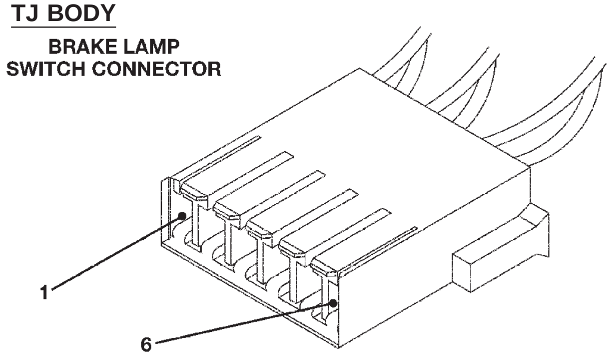


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

FIG. 1

80b04fe4

TJ BODY

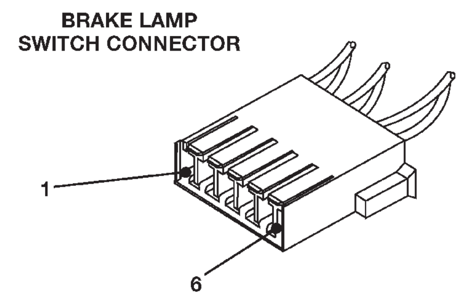


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

FIG. 2

XJ BODY

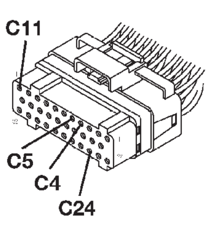


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80b04fe6

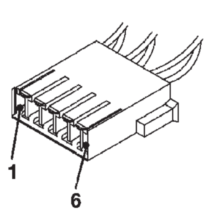
FIG. 3

TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C4	TN/RD	S/C VAC SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SW SENSE



BRAKE LAMP SWITCH CONNECTOR

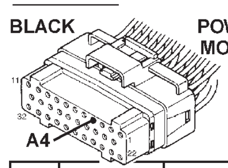
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SW SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SW OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	STOP LAMP SW OUTPUT

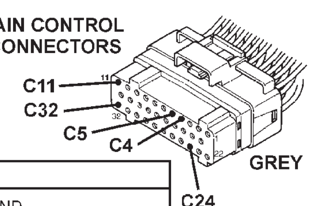
80b6b1cc

FIG. 4

XJ BODY

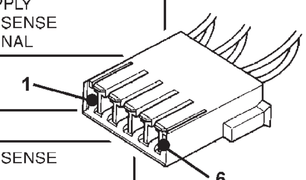
POWERTRAIN CONTROL MODULE CONNECTORS





CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOLENOID CONTROL
C5	LG/RD	S/C VENT SOLENOID
C11	YL/RD	S/C POWER SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

BRAKE LAMP SWITCH CONNECTOR



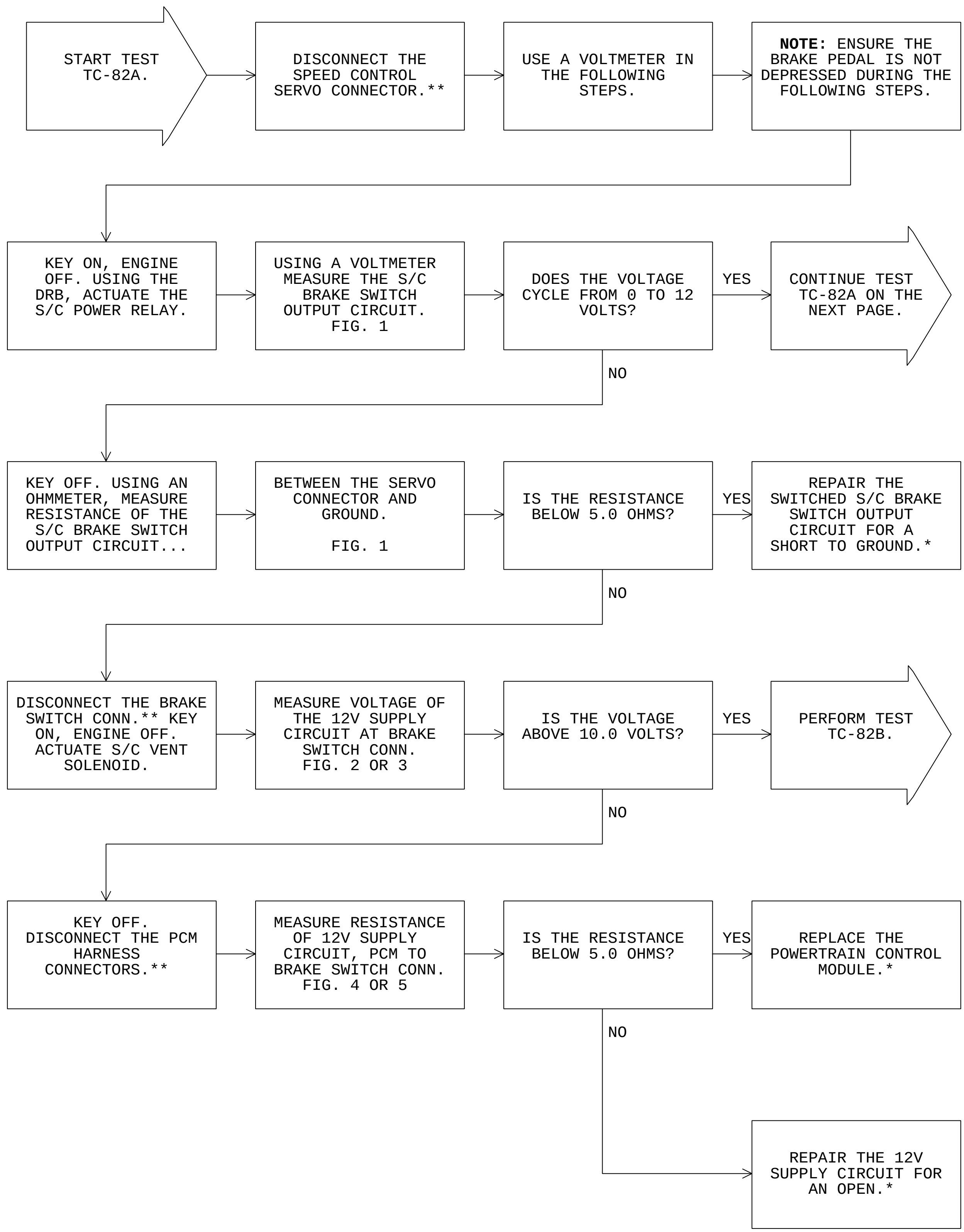
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	S/C POWER SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80ab5ce9

FIG. 5

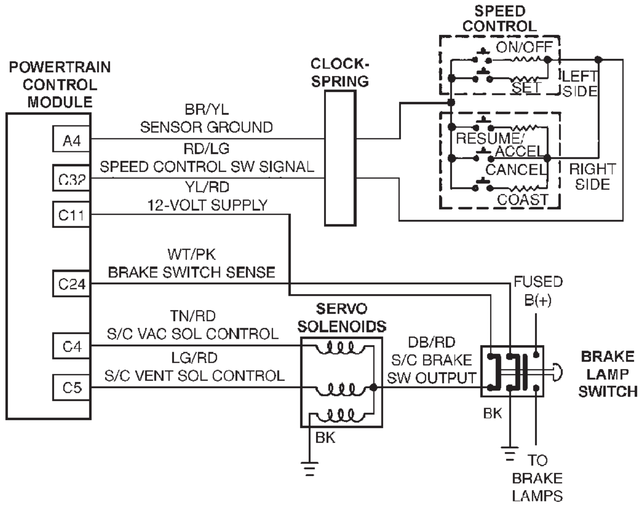
TEST TC-82A — REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT

Perform TEST DTC Before Proceeding



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

TEST TC-82A	CONTINUED - REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT



80b099e0

Name of code: Speed Control Power Relay Circuit

When monitored: With the ignition key on, speed control switched on.

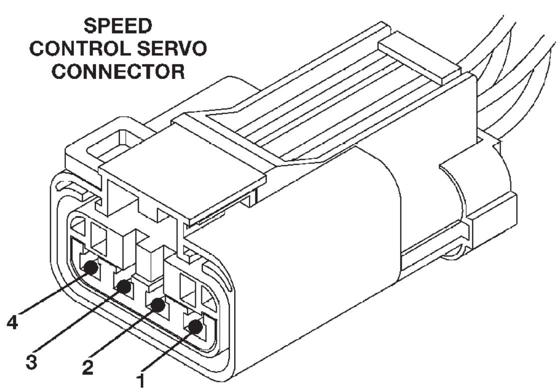
Set condition: The speed control power supply circuit is either open or shorted to ground.

Theory of operation: The PCM monitors the voltage drop across all speed control solenoids and the power supply circuit.

Possible causes:
> Open and shorted power supply circuit
> Failed dump solenoid (S/C servo)

80aa0f65

TJ/XJ BODY

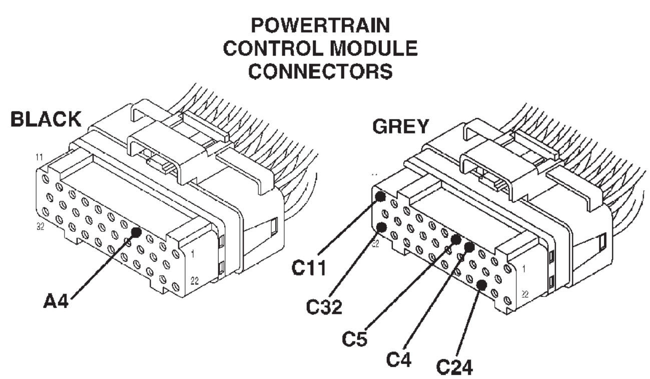


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b04fe4

FIG. 1

TJ/XJ BODY



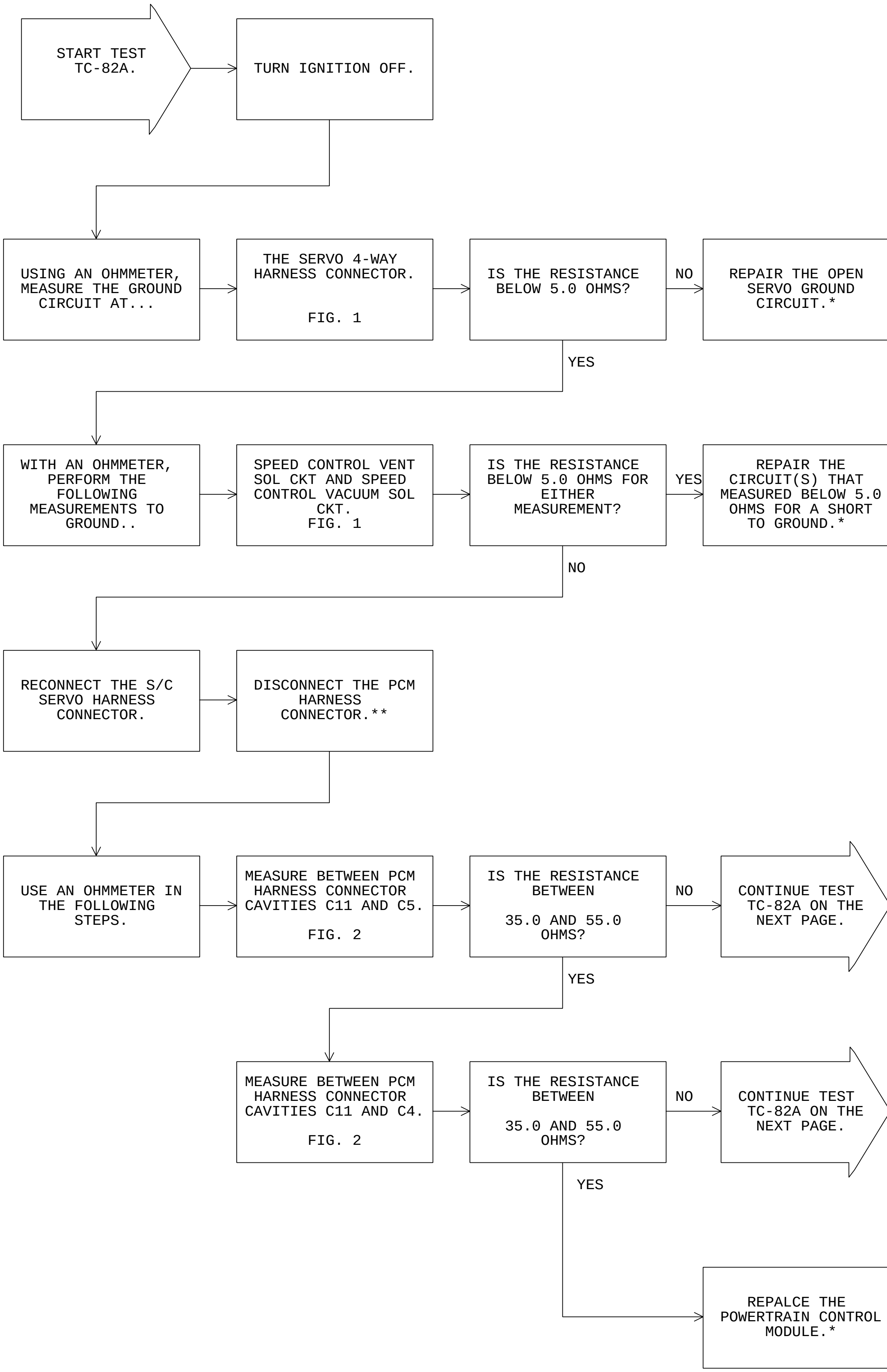
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

80b6b1cb

FIG. 2

TEST TC-82A

CONTINUED - REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT

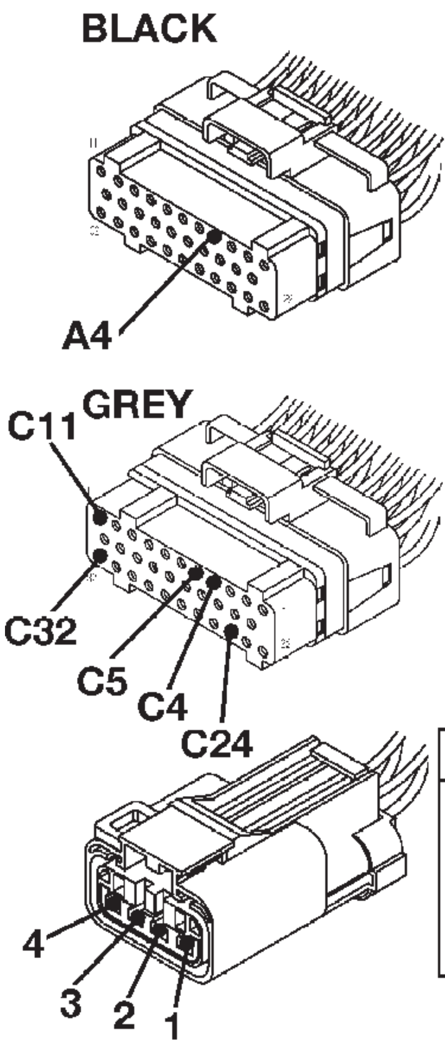


**Perform Verification TEST VER-4A.*

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

TEST TC-82A	CONTINUED - REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT

TJ/XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CTRL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

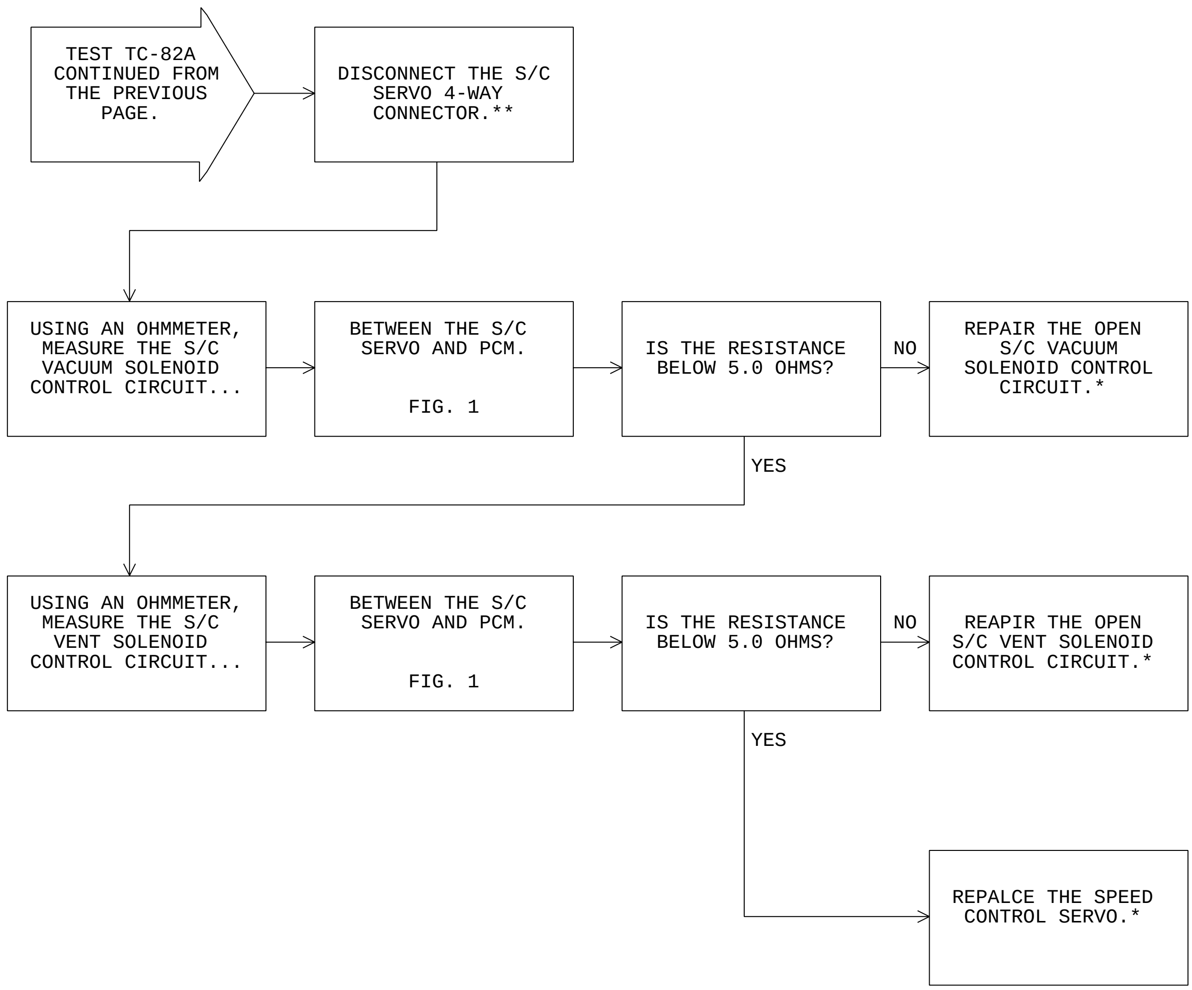
SPEED CONTROL SERVO CONNECTOR

CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOL CTRL
2	LG/RD	S/C VENT SOLENOID CTRL
3	DB/RD	S/C BRAKE SW OUTPUT
4	BK	GROUND

80b04fe5

FIG. 1

TEST TC-82A — CONTINUED - REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT



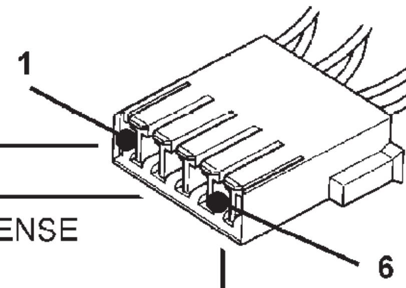
Perform Verification TEST VER-4A.	*****Check connectors - Clean / repair as necessary.***

TEST TC-82B	REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT

Perform TEST TC-82A Before Proceeding

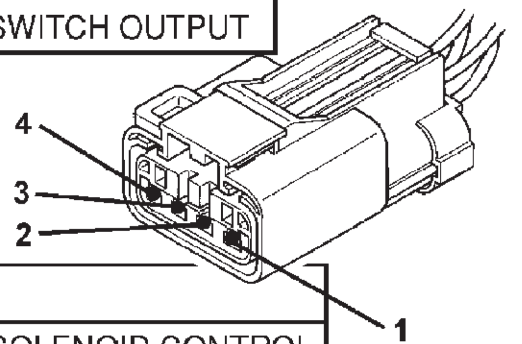
TJ BODY

BRAKE LAMP SWITCH CONNECTOR



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B (+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

SPEED CONTROL SERVO CONNECTOR



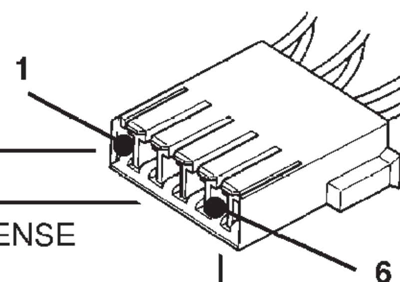
CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b09a9f

FIG. 1

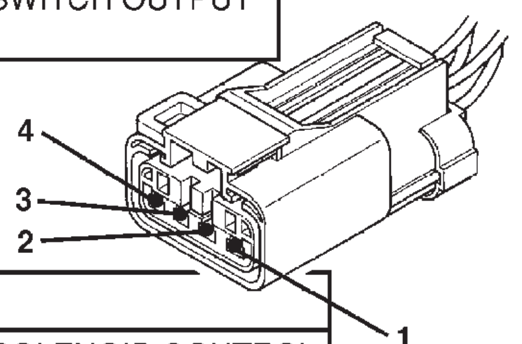
XJ BODY

BRAKE LAMP SWITCH CONNECTOR



CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B (+)

SPEED CONTROL SERVO CONNECTOR



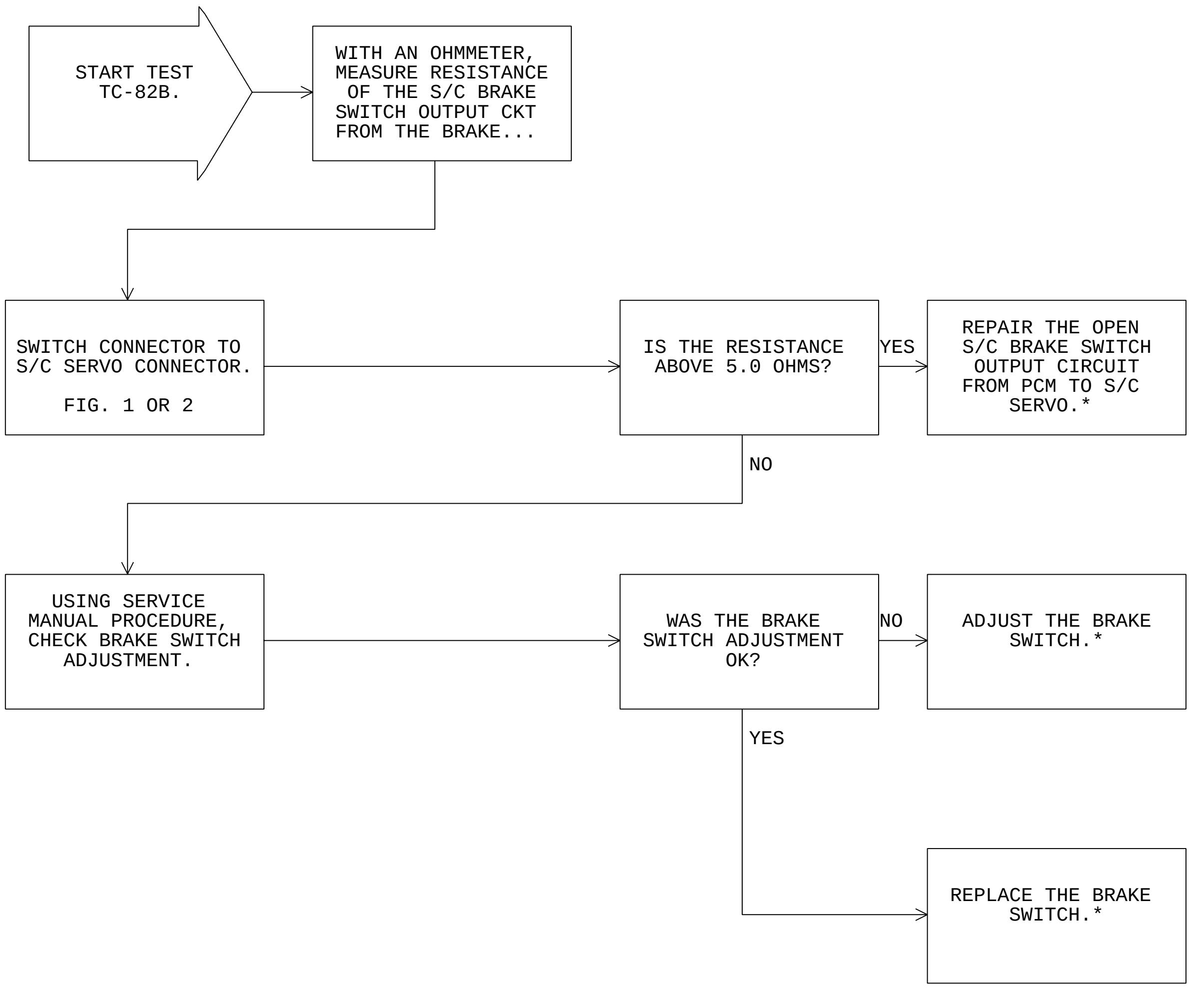
CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b0981c

FIG. 2

TEST TC-82B | REPAIRING - SPEED CONTROL POWER RELAY OR SPEED CONTROL 12V DRIVER CIRCUIT

Perform TEST TC-82A Before Proceeding



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

TEST TC-86A — REPAIRING - SPEED CONTROL SWITCH ALWAYS HIGH

Perform TEST DTC Before Proceeding

Name of Code: Speed Control Switch Always High

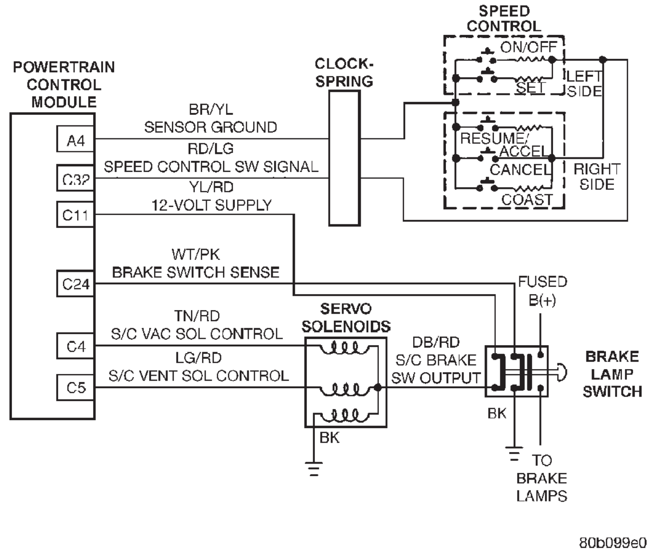
When monitored: With the ignition key on.

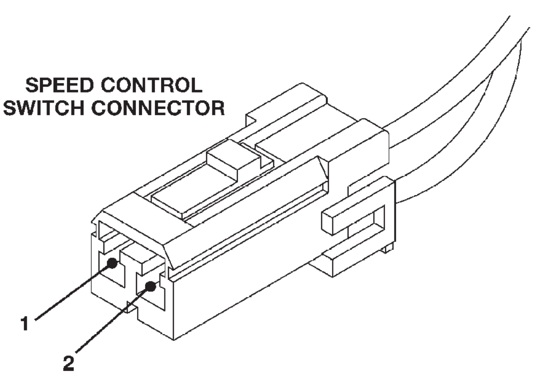
Set condition: An open condition is detected in the speed control on/off switch circuit.

Theory of operation: This circuit is monitored continuously by the PCM whenever the ignition is turned on. The trouble code sets if the voltage in this circuit is above 4.7 volts for more than 1 second.

Possible causes:
> Mux switch circuit shorted to power
> Mux switch circuit open
> Open on/off switch
> PCM failure

805005a6

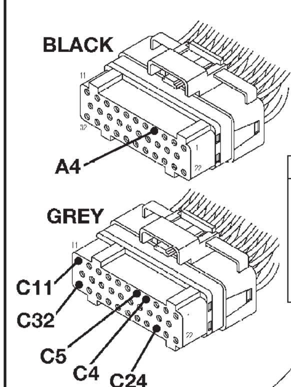




CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

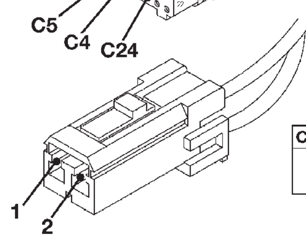
80ab3724

FIG. 1



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL



SPEED CONTROL SWITCH CONNECTOR

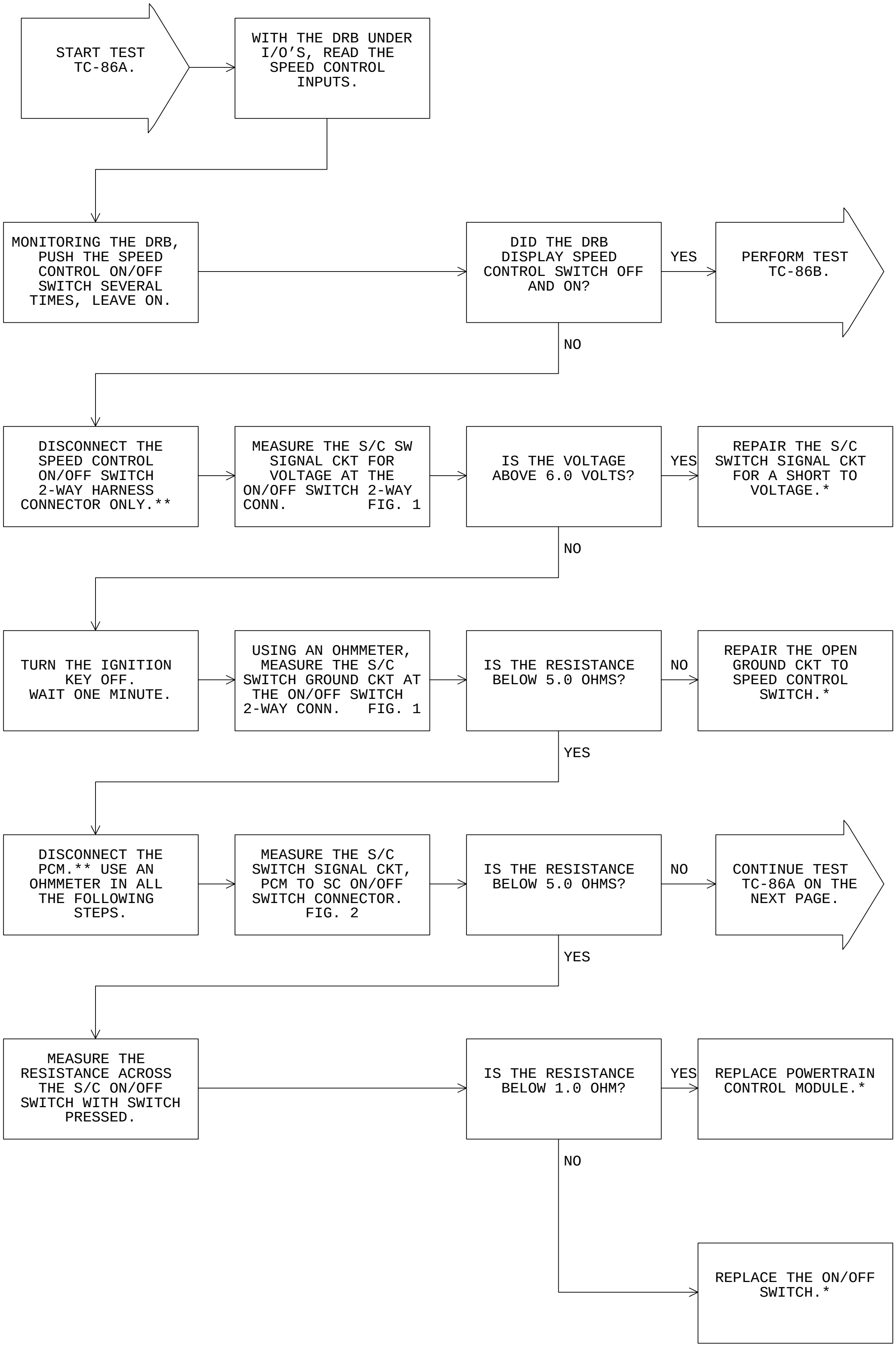
CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

80b6b36a

FIG. 2

TEST TC-86A — REPAIRING - SPEED CONTROL SWITCH ALWAYS HIGH

Perform TEST DTC Before Proceeding



**Perform Verification TEST VER-4A.*

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

TEST TC-86A	CONTINUED - REPAIRING - SPEED CONTROL SWITCH ALWAYS HIGH

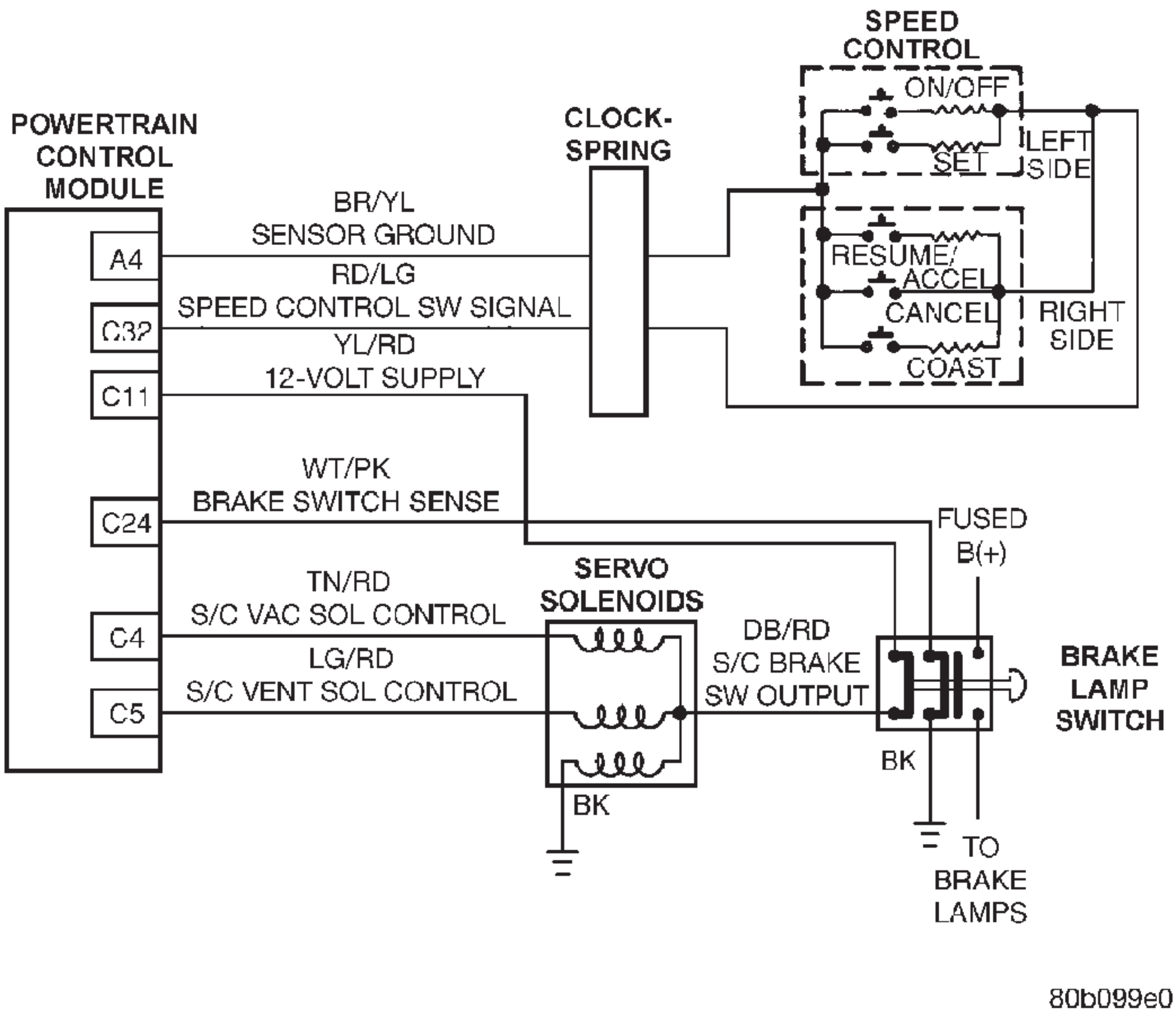
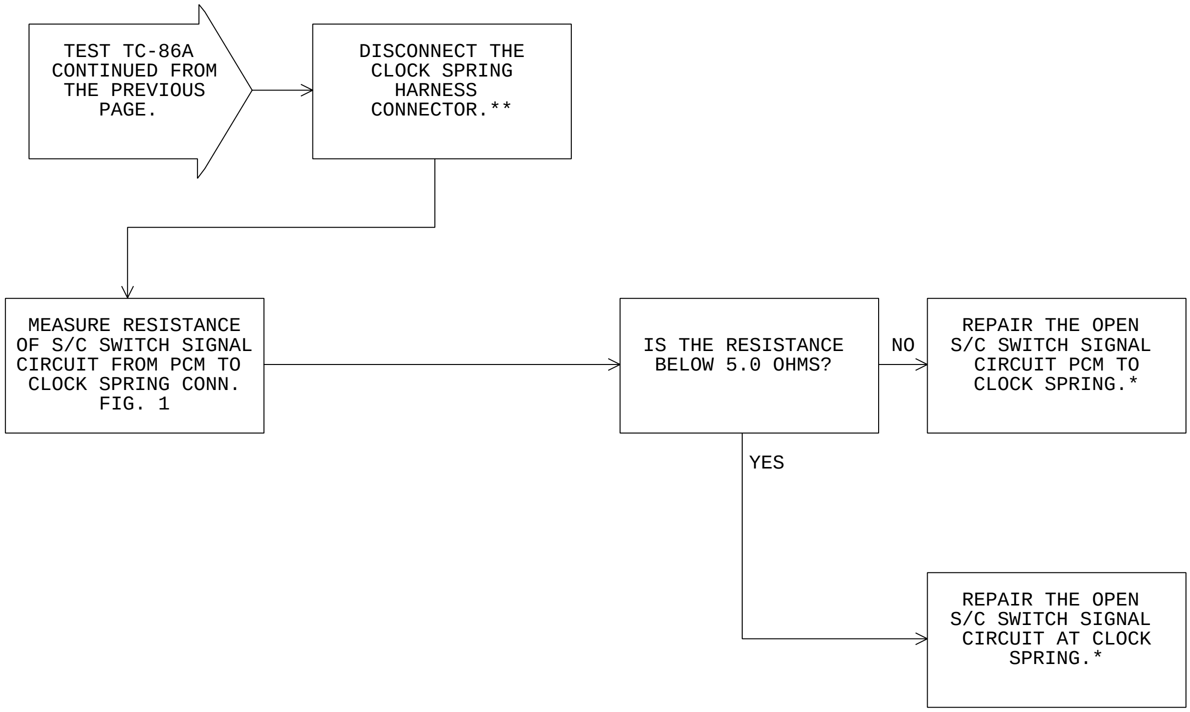


FIG. 1

TEST TC-86A CONTINUED - REPAIRING - SPEED CONTROL SWITCH ALWAYS HIGH

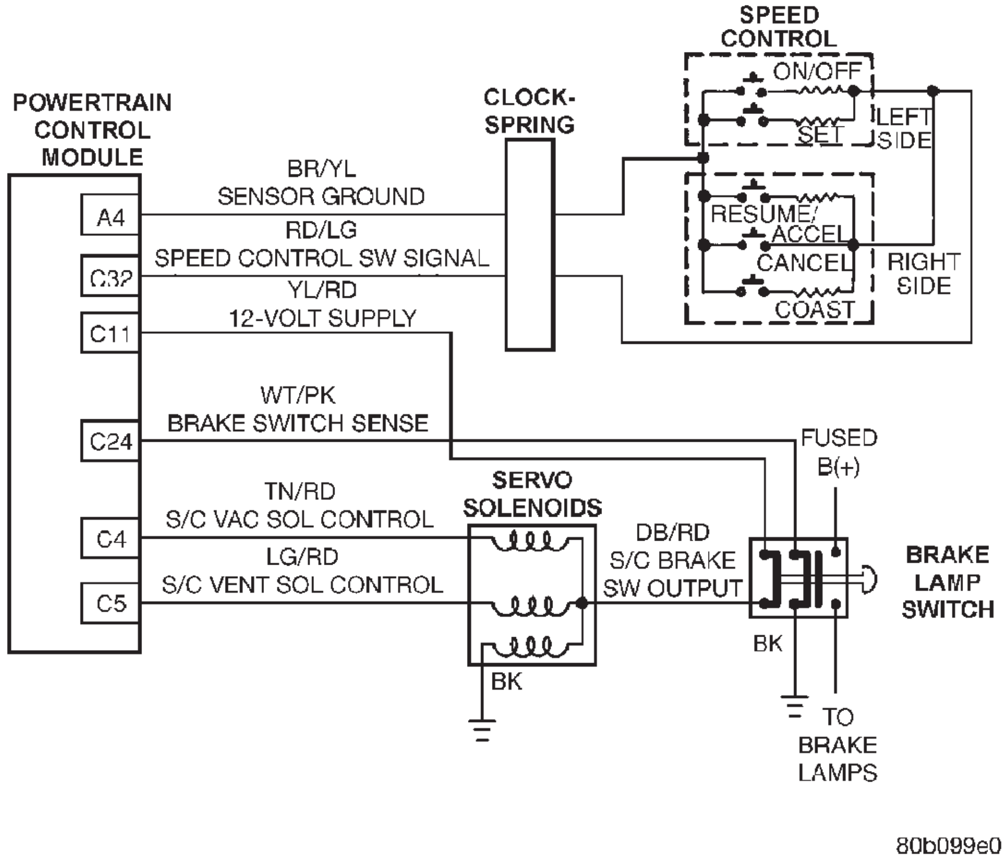


***Perform Verification TEST VER-4A.**

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

TEST TC-86B	REPAIRING - SPEED CONTROL SWITCH ALWAYS HIGH

Perform TEST TC-86A Before Proceeding



Name of Code: Speed Control Switch Always High

When monitored: With the ignition key on.

Set condition: An open condition is detected in the speed control on/off switch circuit.

Theory of operation: This circuit is monitored continuously by the PCM whenever the ignition is turned on. The trouble code sets if the voltage in this circuit is above 4.7 volts for more than 1 second.

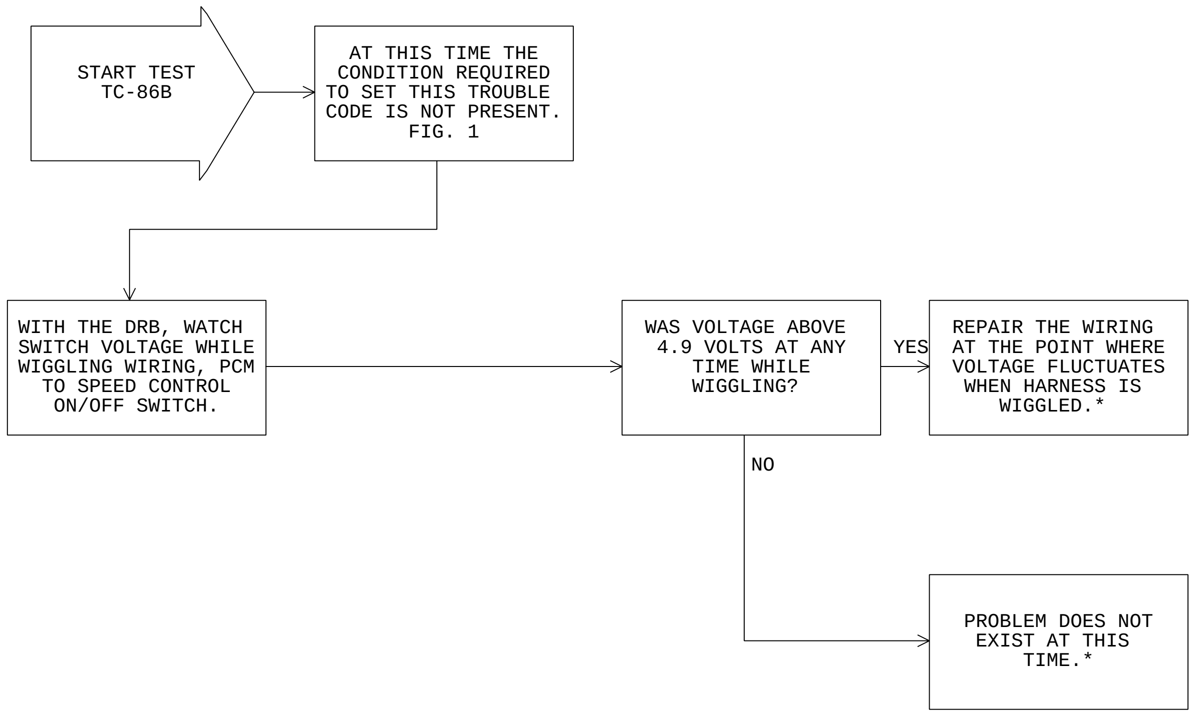
Possible causes:
> Mux switch circuit shorted to power
> Mux switch circuit open
> Open on/off switch
> PCM failure

805005a6

FIG. 1

TEST TC-86B REPAIRING - SPEED CONTROL SWITCH ALWAYS HIGH

Perform TEST TC-86A Before Proceeding



**Perform Verification TEST VER-4A.*

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

TEST TC-87A REPAIRING - SPEED CONTROL SWITCH ALWAYS LOW

Perform TEST DTC Before Proceeding

Name of code: Speed Control Switches

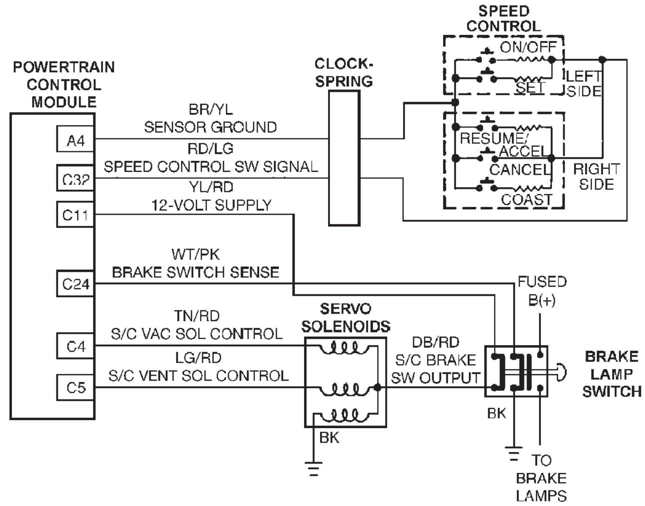
When monitored: With the ignition key on, and battery voltage greater than 10.4 volts.

Set condition: When switch voltage is less than 4.5 volts for 2 minutes.

Theory of operation: A single wire referenced to sensor return ground is used to sense steering wheel mounted switches. Each switch has an associated resistance valve. The switch resistance forms a voltage divider with the PCM's internal pull up resistor to 5 volts. The resistor divider creates a unique voltage at the PCM's input pin thereby allowing multiple switches to be "multiplexed" on a single input.

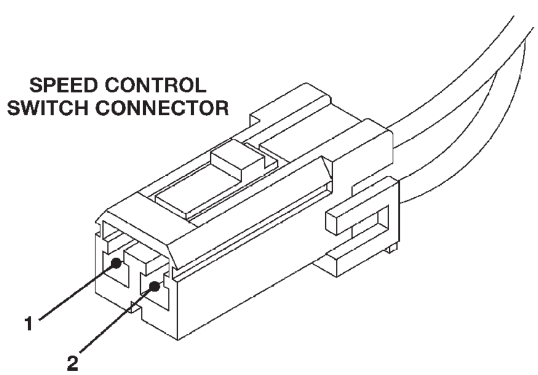
Possible causes:
> Switch circuit shorted
> PCM failure
> Shorted S/C switch
> One or more switch stuck or held closed

80aff507



80b099e0

TJ/XJ BODY

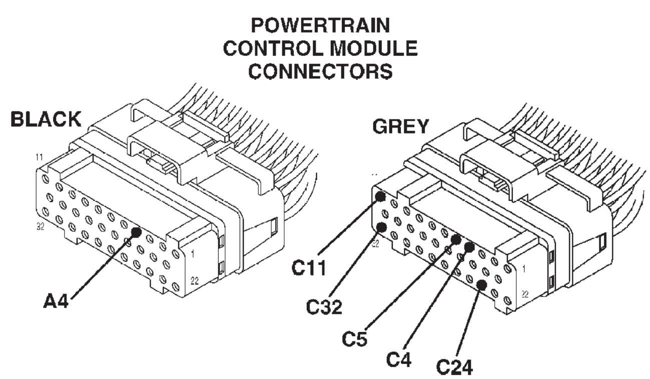


CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

80ab3724

FIG. 1

TJ/XJ BODY



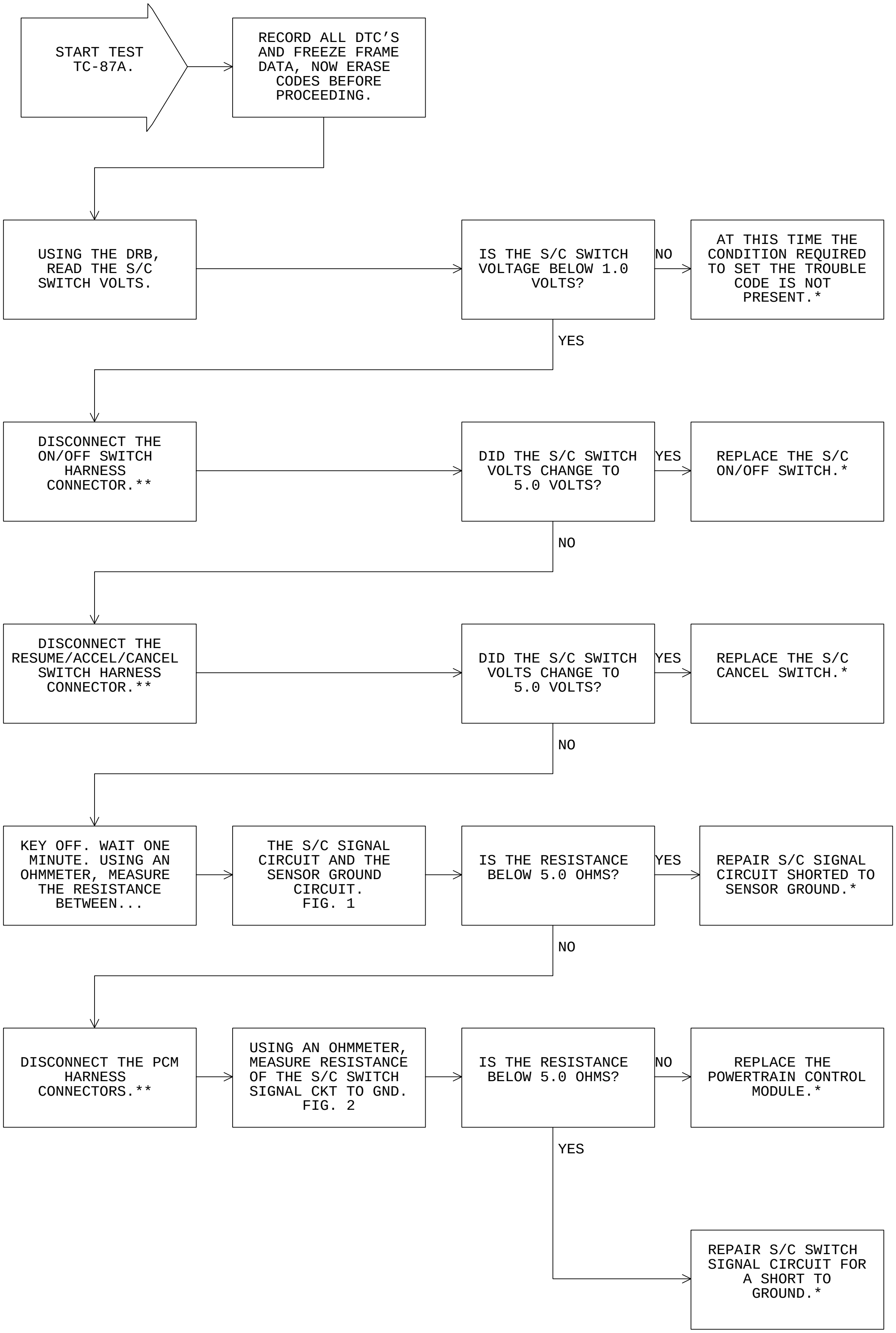
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

80b6b1cb

FIG. 2

TEST TC-87A REPAIRING - SPEED CONTROL SWITCH ALWAYS LOW

Perform TEST DTC Before Proceeding



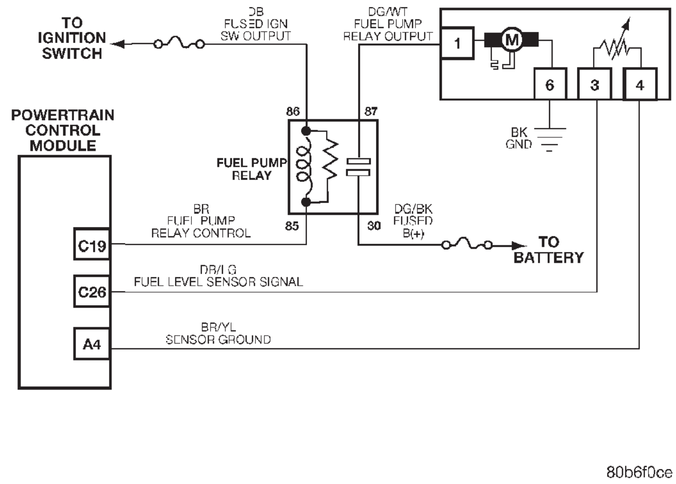
***Perform Verification TEST VER-4A.**

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

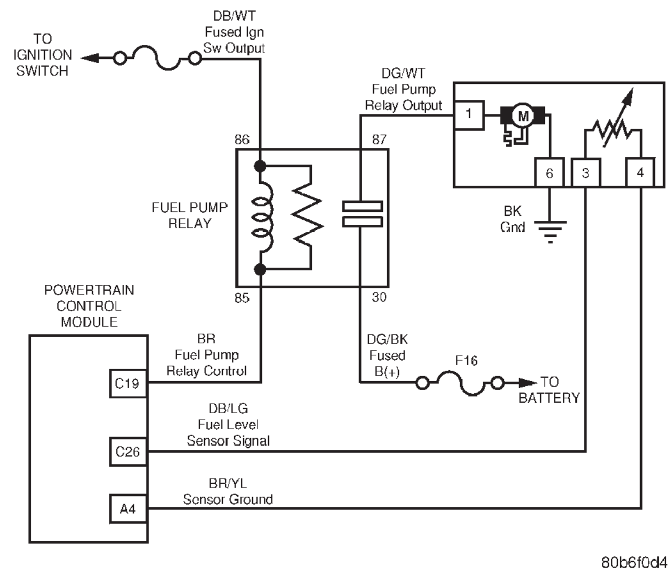
TEST TC-101A REPAIRING - FUEL PUMP (SYSTEM) RELAY CONTROL CIRCUIT

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



Name of code: Fuel Pump 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 fuel pump relay control circuit.

Theory of operation: The fuel pump relay controls the 12-volt source to the fuel pump. The relay is located in the power distribution center (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. 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 fuel pump relay control circuit ground.

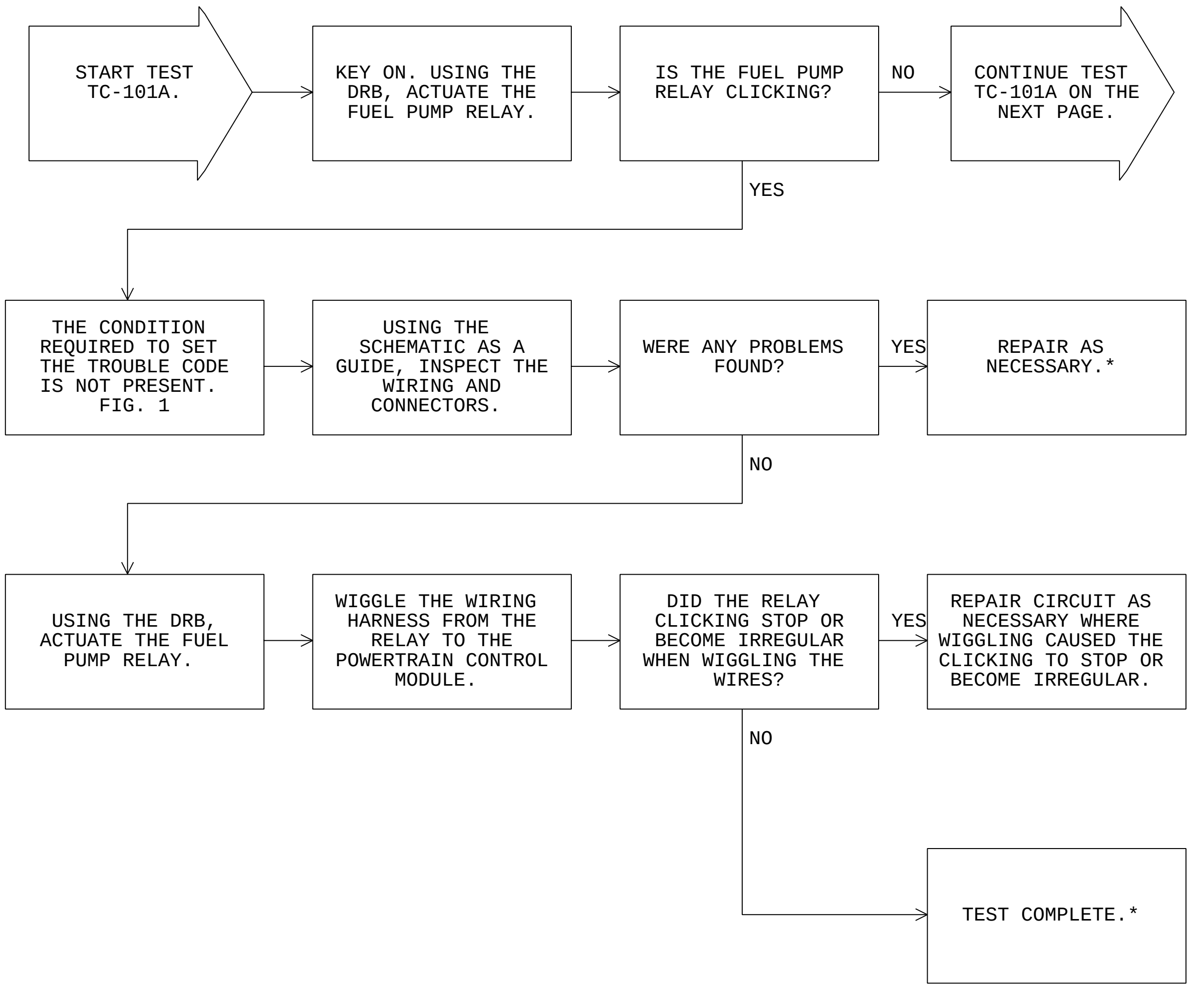
Possible causes:
> Relay coil open or shorted
> Fused ignition switch output circuit open
> Fuel pump relay control circuit is open or shorted
> Inoperative circuit driver in powertrain control module
> Connector terminals
> Connector wires

3350206

FIG. 1

TEST TC-101A — REPAIRING - FUEL PUMP (SYSTEM) RELAY CONTROL CIRCUIT

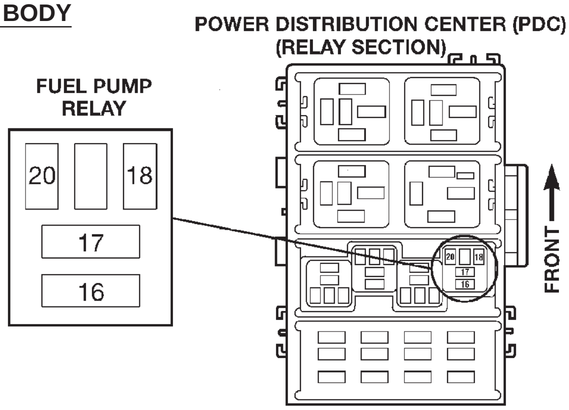
Perform TEST DTC Before Proceeding



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

TEST TC-101A CONTINUED - REPAIRING - FUEL PUMP (SYSTEM) RELAY CONTROL CIRCUIT

TJ BODY

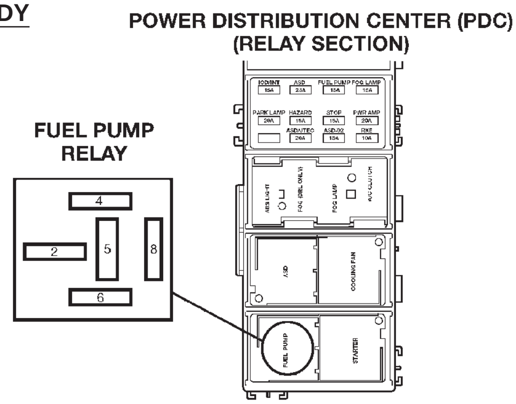


CAV	COLOR	FUNCTION
16(30)	DG/BK	FUSED B(+)
17(87)	DG/WT	FUEL PUMP RELAY OUTPUT
18(86)	DB	FUSED IGNITION SWITCH OUTPUT
20(85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e9

FIG. 1

XJ BODY

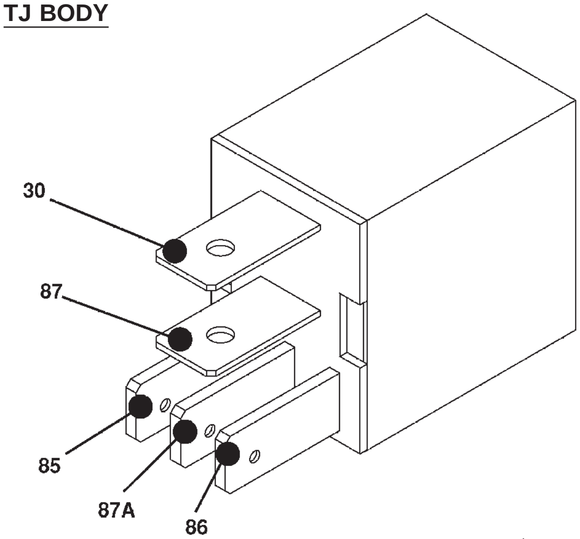


CAV	COLOR	FUNCTION
2 (30)	DG/BK	FUSED B(+)
8 (87)	DG/WT	FUEL PUMP RELAY OUTPUT
4 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e0

FIG. 2

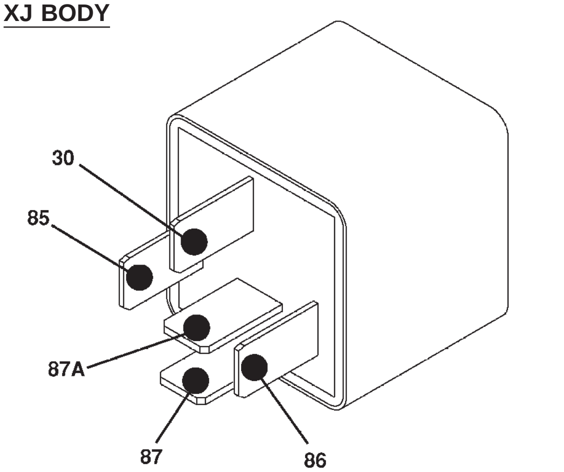
TJ BODY



80b76e97

FIG. 3

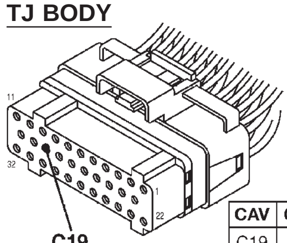
XJ BODY



80b76e98

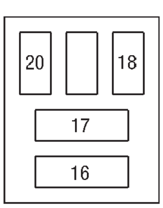
FIG. 4

TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C19	BR	FUEL PUMP RELAY CONTROL



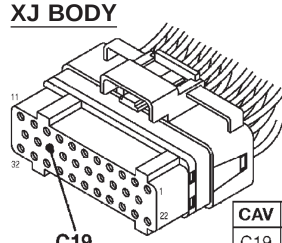
FUEL PUMP RELAY CONNECTOR (IN PDC)

CAV	COLOR	FUNCTION
16 (30)	DG/BK	FUSED B(+)
17 (87)	DG/WT	FUEL PUMP RELAY OUTPUT
18 (86)	DB	FUSED IGNITION SWITCH OUTPUT
20 (85)	BR	FUEL PUMP RELAY CONTROL

80b76ec6

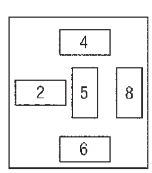
FIG. 5

XJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C19	BR	FUEL PUMP RELAY CONTROL



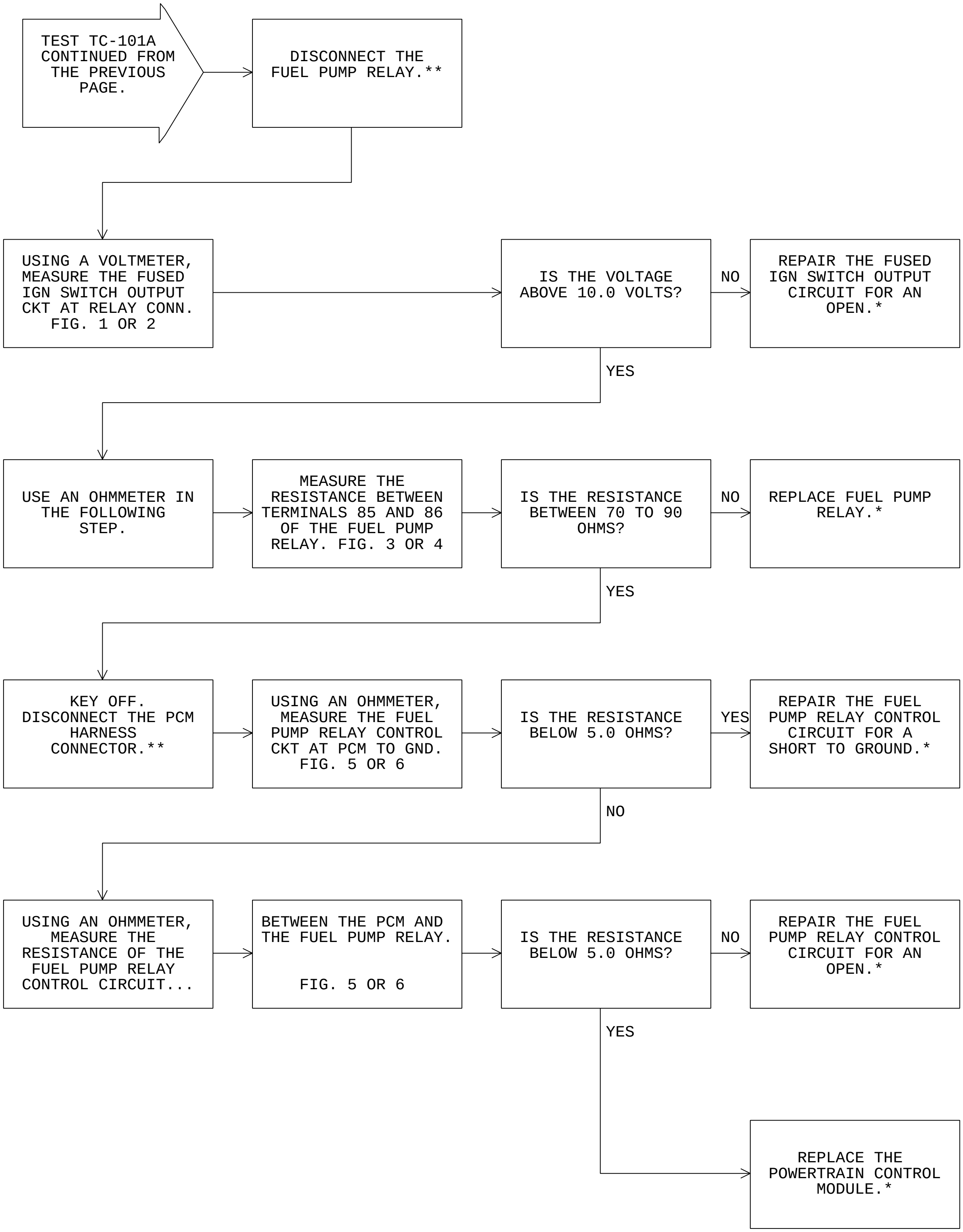
FUEL PUMP RELAY CONNECTOR (IN PDC)

CAV	COLOR	FUNCTION
2 (30)	DG/BK	FUSED B(+)
4 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (85)	BR	FUEL PUMP RELAY CONTROL
8 (87)	DG/WT	FUEL PUMP RELAY OUTPUT

80b76ec7

FIG. 6

TEST TC-101A CONTINUED - REPAIRING - FUEL PUMP (SYSTEM) RELAY CONTROL CIRCUIT



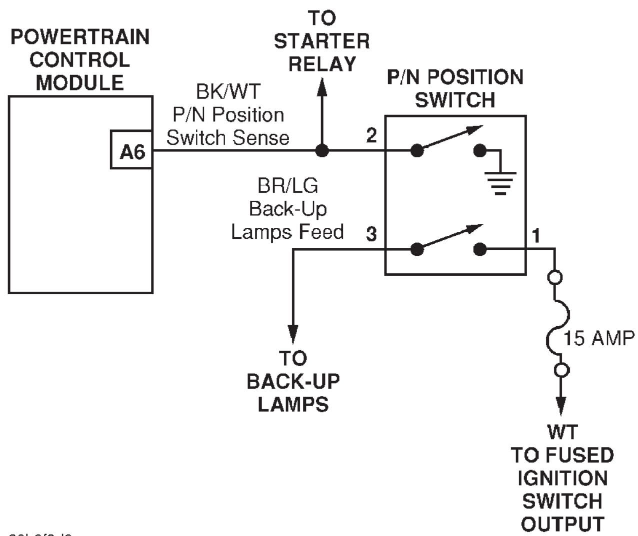
**Perform Verification TEST VER-2A.*

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

TEST TC-114A REPAIRING - P/N SWITCH STUCK IN PARK OR GEAR

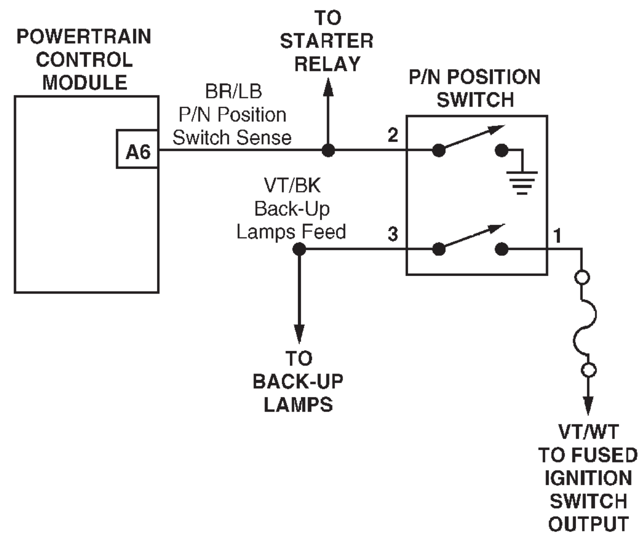
Perform TEST DTC Before Proceeding

XJ BODY (2.5L)



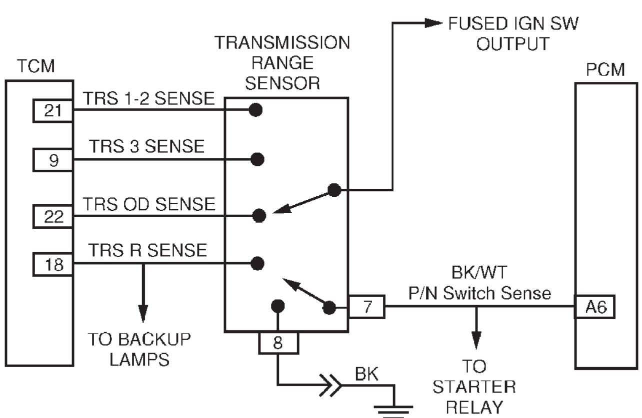
80b6f0d6

TJ BODY (2.5L AND 4.0L)



80b11885

XJ BODY (4.0L)



80b76ec9

Name of code: Park/Neutral Switch Failure (Sense Circuit)

When monitored: With the transmission in park, neutral, or drive and not in limp-in mode.

Set condition: This code is set if the PCM detects an incorrect park/neutral switch state for a given mode of vehicle operation.

Theory of operation: The park/neutral position switch is used to communicate whether or not the transmission is in park or neutral to the PCM. When the transmission is in park or neutral, the park/neutral position switch sense circuit is grounded.

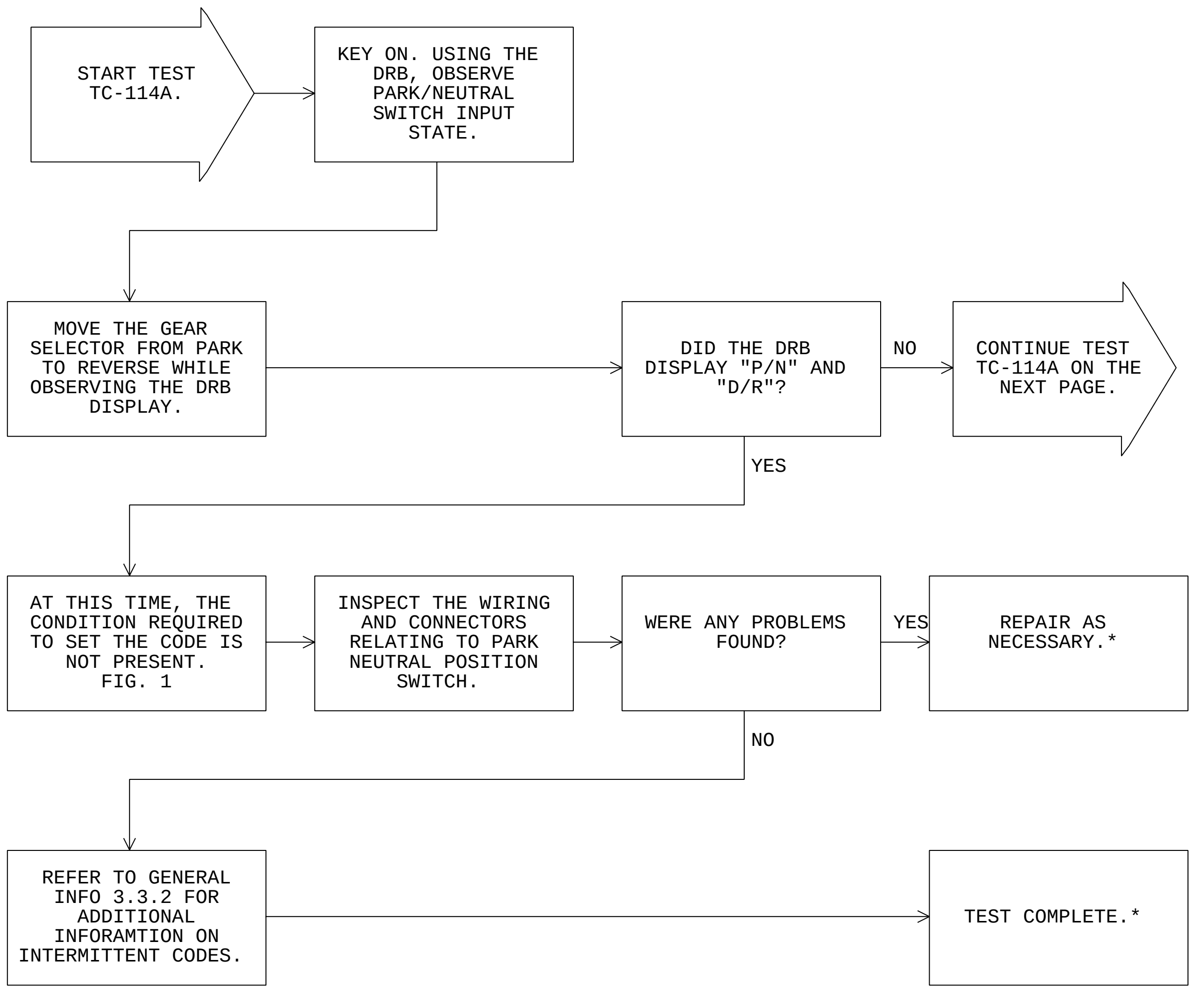
Probable causes:
> Connector terminals and/or wires
> Park/neutral switch failure
> Mechanical transmission problem
> PCM failure

80aa0f39

FIG. 1

TEST TC-114A REPAIRING - P/N SWITCH STUCK IN PARK OR GEAR

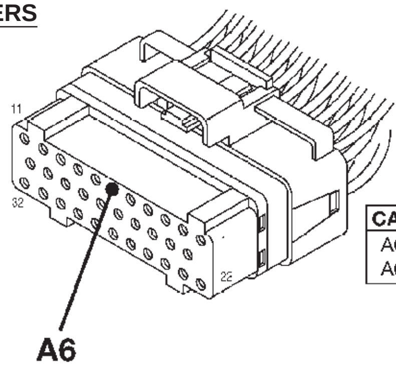
Perform TEST DTC Before Proceeding



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

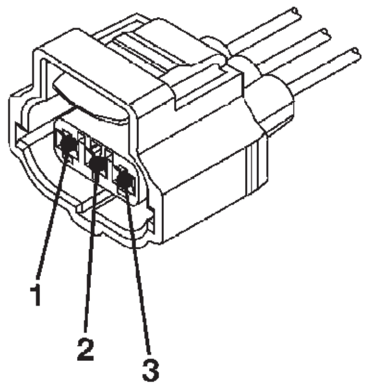
TEST TC-114A — CONTINUED - REPAIRING - P/N SWITCH STUCK IN PARK OR IN GEAR

ALL OTHERS



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SW SENSE (XJ 2.5L)
A6	BR/LB	PARK/NEUTRAL POSITION SW SENSE (TJ 2.5L, 4.0L)



PARK/NEUTRAL POSITION SWITCH CONNECTOR

XJ 2.5L A/T

CAV	COLOR	FUNCTION
1	WT	FUSED IGNITION SWITCH OUTPUT
2	BK/WT	PARK/NEUTRAL POSITION SW SENSE
3	BR/LG	BACK-UP LAMPS FEED

TJ 2.5L AND 4.0L A/T

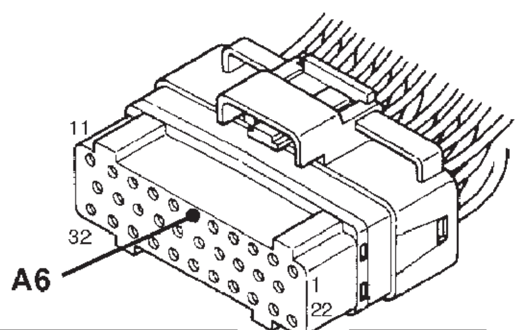
CAV	COLOR	FUNCTION
1	VT/WT	FUSED IGNITION SWITCH OUTPUT
2	BR/LB	PARK/NEUTRAL POSITION SW SENSE
3	VT/BK	BACK-UP LAMPS FEED

80b76ec8

FIG. 1

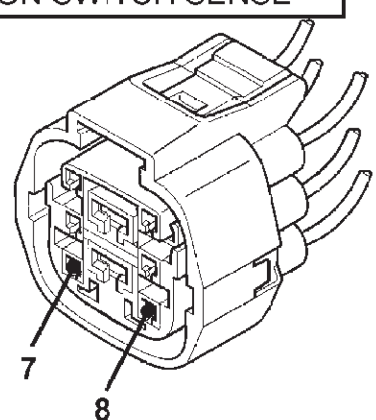
XJ BODY 4.0L

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE

TRANSMISSION RANGE SENSOR CONNECTOR

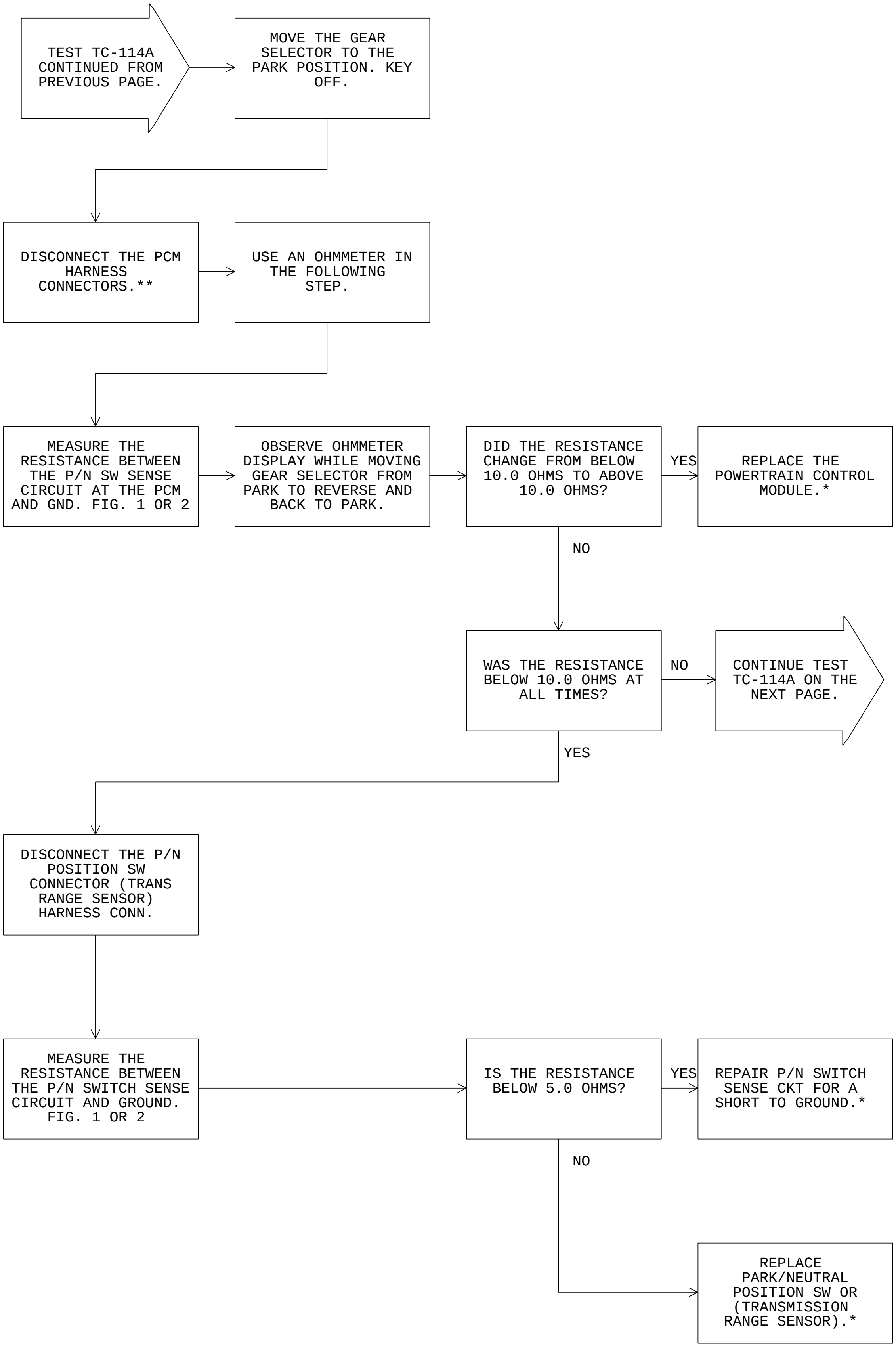


CAV	COLOR	FUNCTION
7	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
8	BK	GROUND

80ab373a

FIG. 2

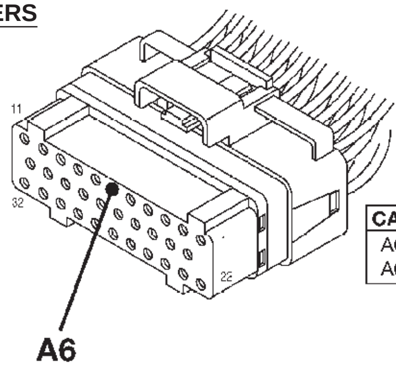
TEST TC-114A **CONTINUED - REPAIRING - P/N SWITCH STUCK IN PARK OR IN GEAR**



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

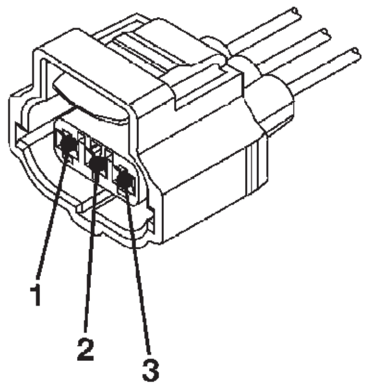
TEST TC-114A — CONTINUED - REPAIRING - P/N SWITCH STUCK IN PARK OR GEAR

ALL OTHERS



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SW SENSE (XJ 2.5L)
A6	BR/LB	PARK/NEUTRAL POSITION SW SENSE (TJ 2.5L, 4.0L)



PARK/NEUTRAL POSITION SWITCH CONNECTOR

XJ 2.5L A/T

CAV	COLOR	FUNCTION
1	WT	FUSED IGNITION SWITCH OUTPUT
2	BK/WT	PARK/NEUTRAL POSITION SW SENSE
3	BR/LG	BACK-UP LAMPS FEED

TJ 2.5L AND 4.0L A/T

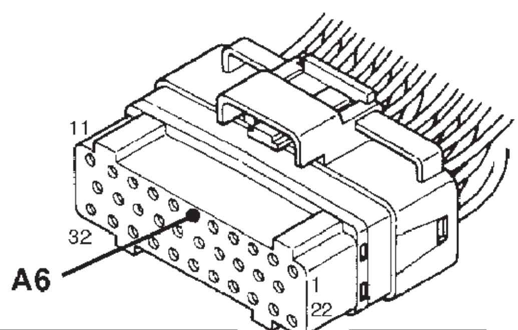
CAV	COLOR	FUNCTION
1	VT/WT	FUSED IGNITION SWITCH OUTPUT
2	BR/LB	PARK/NEUTRAL POSITION SW SENSE
3	VT/BK	BACK-UP LAMPS FEED

80b76ec8

FIG. 1

XJ BODY 4.0L

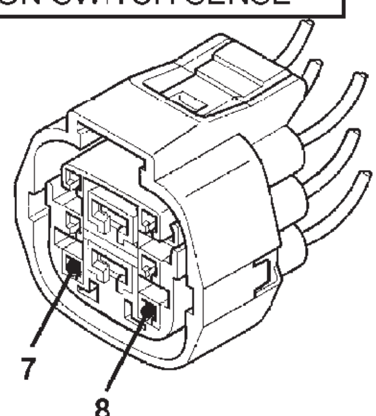
POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE

TRANSMISSION RANGE SENSOR CONNECTOR

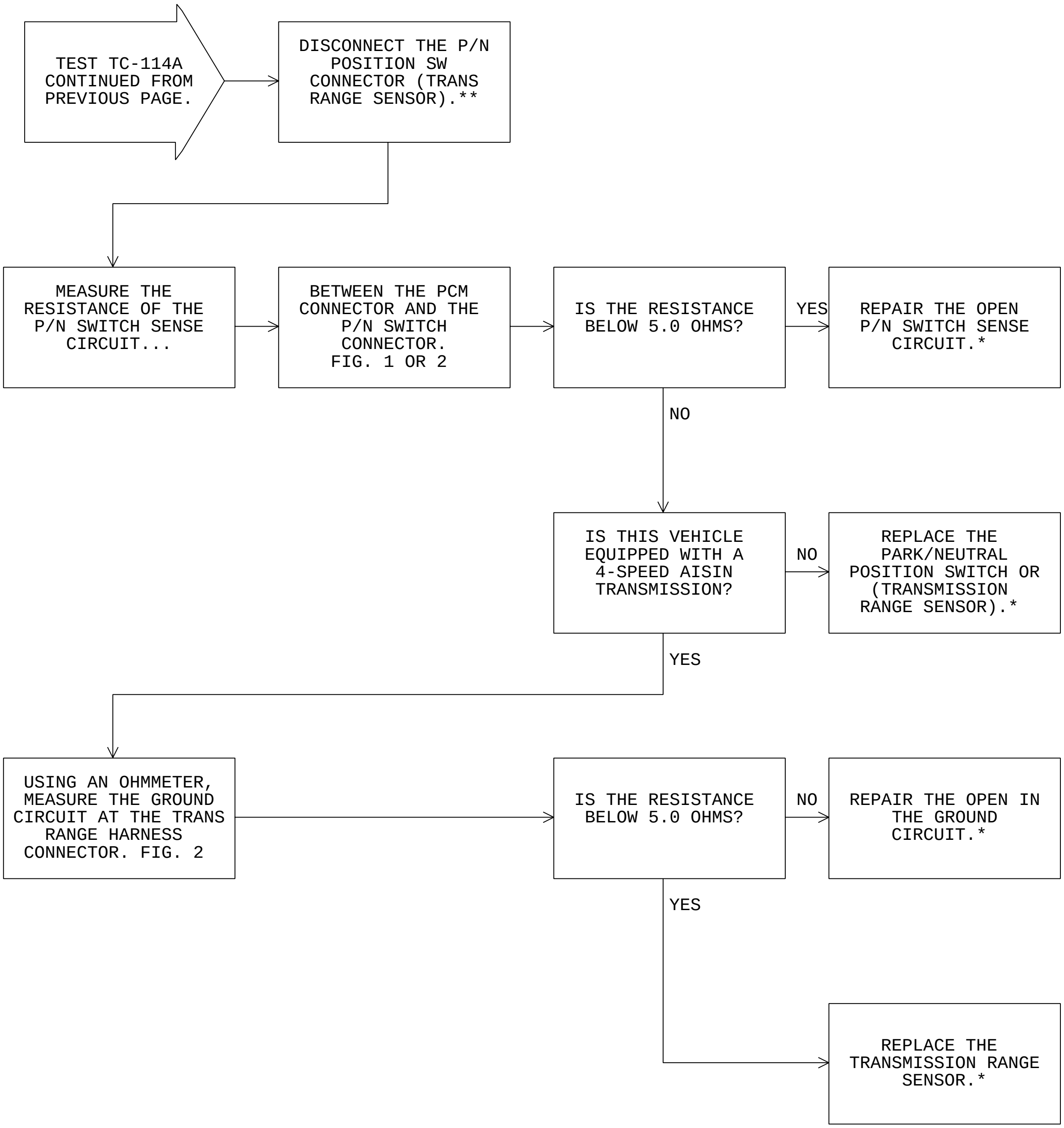
CAV	COLOR	FUNCTION
7	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
8	BK	GROUND



80ab373a

FIG. 2

TEST TC-114A CONTINUED - REPAIRING - P/N SWITCH STUCK IN PARK OR GEAR



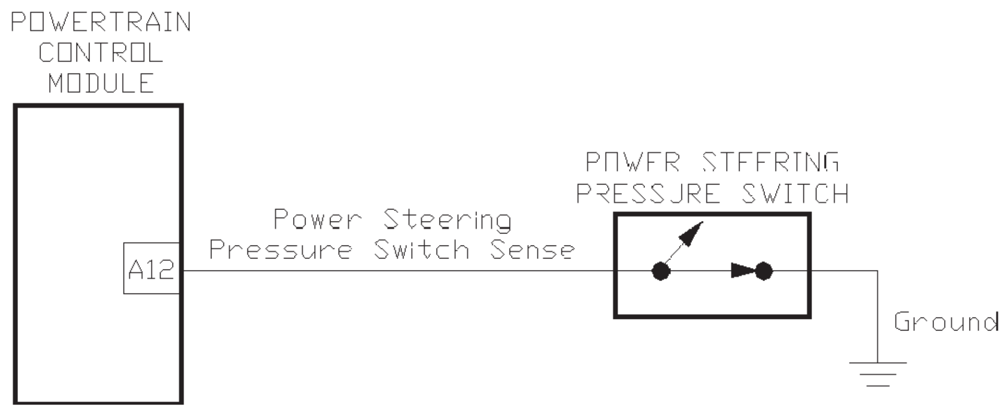
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-115A **REPAIRING - POWER STEERING SWITCH FAILURE**

Perform TEST DTC Before Proceeding

2.5L TJ/XJ



Name of code: Power Steering Switch Failure

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

Set condition: With the vehicle above 40 mph for over 30 seconds, the power steering pressure switch remains open.

Theory of operation: The PCM monitors the power steering pressure switch for a high pressure condition. The power steering pressure switch signals the PCM whenever there is a power steering load (pressure exceeding 500 psi). During this condition, the PCM will adjust the RPM to prevent a possible stall. The power steering switch is a normally closed switch.

Possible causes:
- An open power steering switch
- Powertrain control module failure
- Connector terminals
- Connector wires

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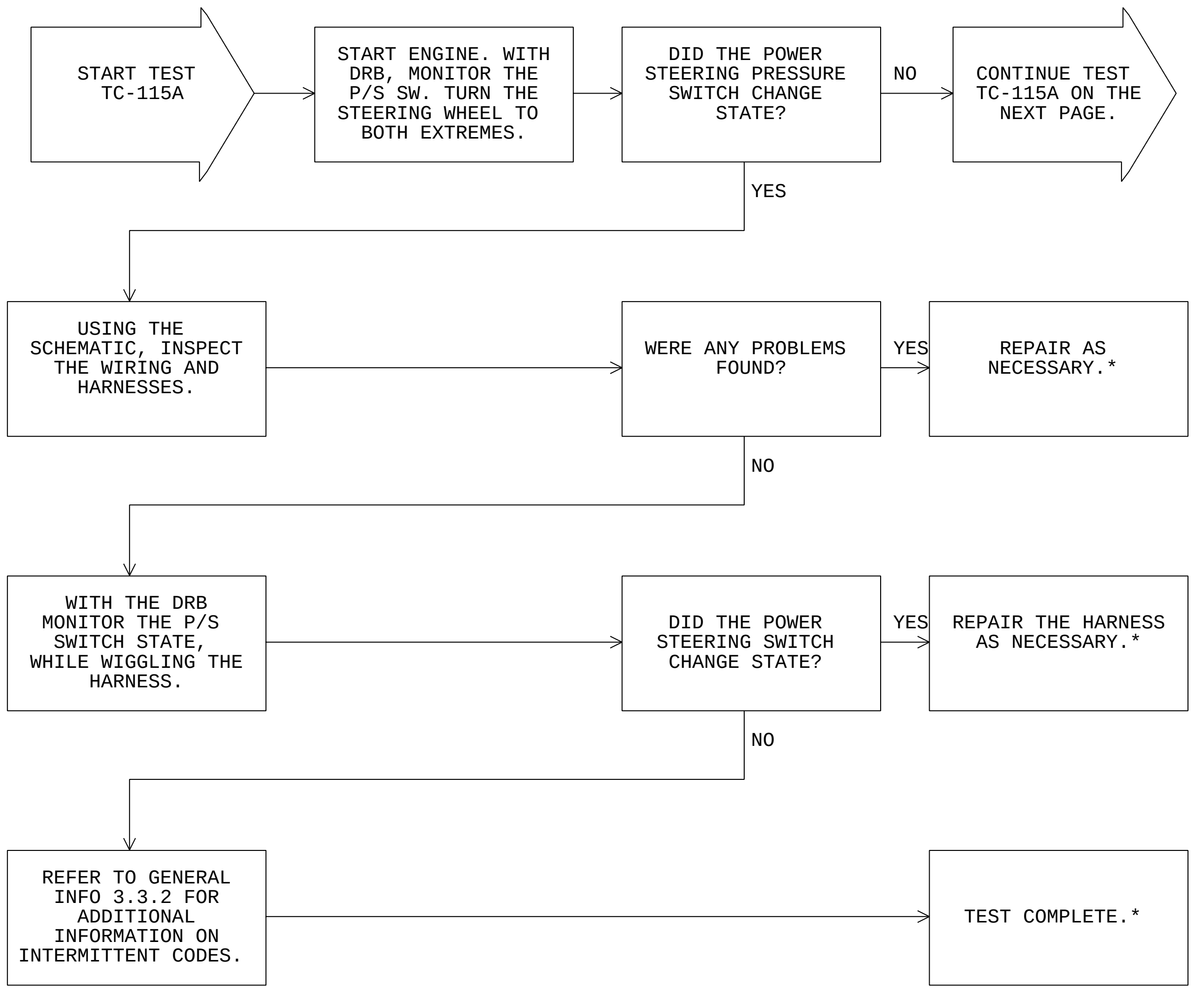
TEST TC-115A | REPAIRING - POWER STEERING SWITCH FAILURE

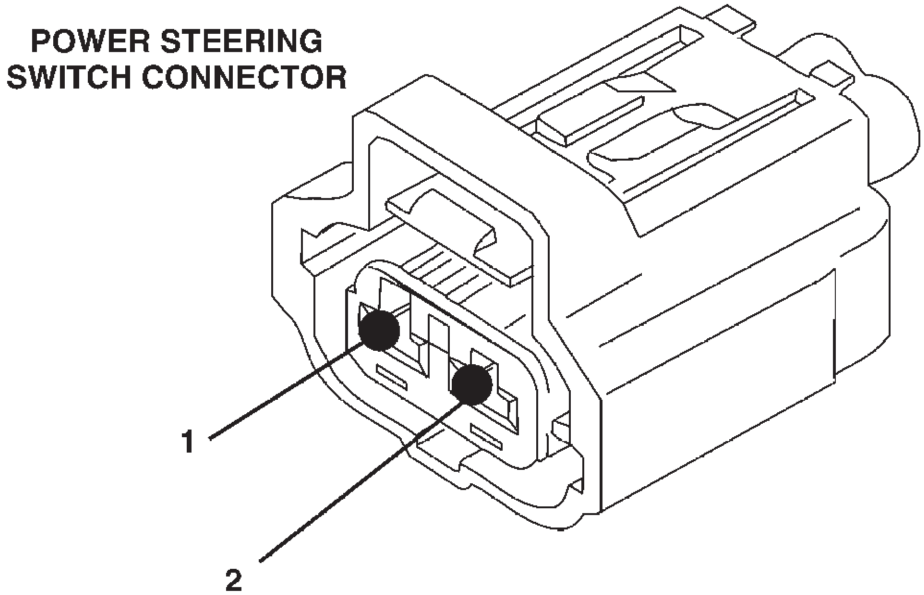
Perform TEST DTC Before Proceeding



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

TEST TC-115A CONTINUED - REPAIRING POWER STEERING SWITCH FAILURE

2.5L TJ/XJ

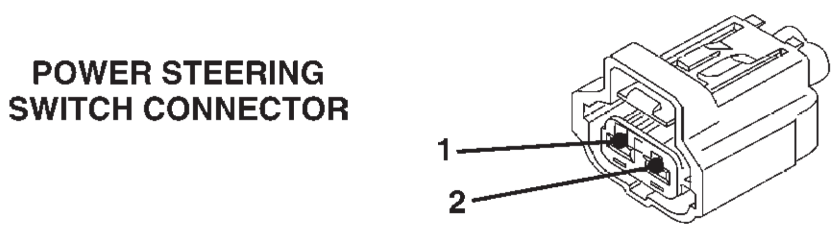


CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/BR	POWER STEERING PRESSURE SW SENSE (2.5L TJ/XJ)

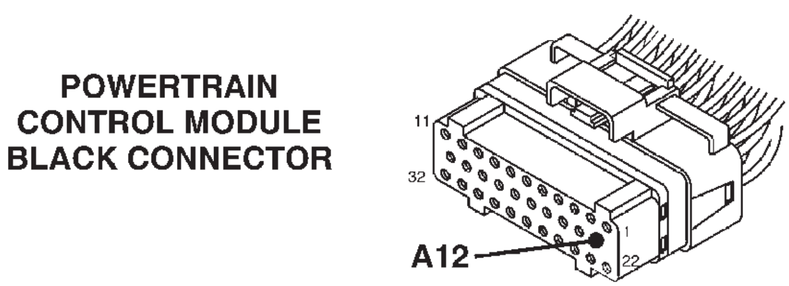
80b76f27

FIG. 1

2.5L TJ/XJ



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/BR	POWER STEERING PRESSURE SW SENSE



CAV	COLOR	FUNCTION
A12	DB/BR	POWER STEERING PRESSURE SW SENSE (2.5L TJ/XJ)

80b76f28

FIG. 2

TEST TC-115A — CONTINUED - REPAIRING POWER STEERING SWITCH FAILURE

TEST TC-115A CONTINUED FROM THE PREVIOUS PAGE.

ENGINE OFF, KEY ON. DISCONNECT THE POWER STEERING PRESSURE SWITCH.**

CONNECT A JUMPER WIRE TO THE POWER STEERING PRESSURE SWITCH CIRCUIT. FIG. 1

WITH THE DRB, MONITOR THE POWER STEERING PRESSURE SWITCH.

TOUCH THE OTHER END OF THE JUMPER TO GROUND 5 TIMES.

DID THE POWER STEERING PRESSURE SWITCH CHANGE STATES?

YES

CONTINUE TEST TC-115A ON THE NEXT PAGE.

NO

DISCONNECT POWERTRAIN CONTROL MODULE.**

USING AN OHMMETER MEASURE THE P/S PRESSURE SW CKT FROM THE PCM TO THE CONN. FIG. 2

WAS THE RESISTANCE BELOW 5.0 OHMS?

NO

REPAIR THE OPEN POWER STEERING PRESSURE SWITCH CIRCUIT.*

YES

MEASURE THE P/S PRESSURE SWITCH CIRCUIT AT THE P/S SWITCH TO GROUND. FIG. 1

WAS THE RESISTANCE BELOW 5.0 OHMS?

YES

REPAIR THE POWER STEERING PRESSURE SWITCH CIRCUIT FOR A SHORT TO GROUND.*

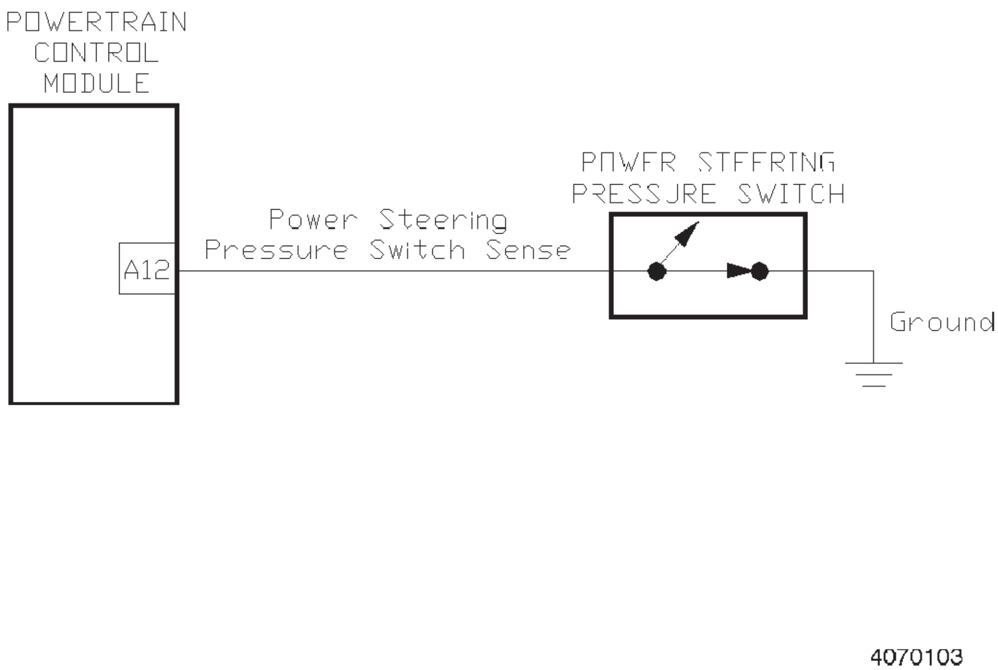
NO

REPLACE POWERTRAIN CONTROL MODULE.*

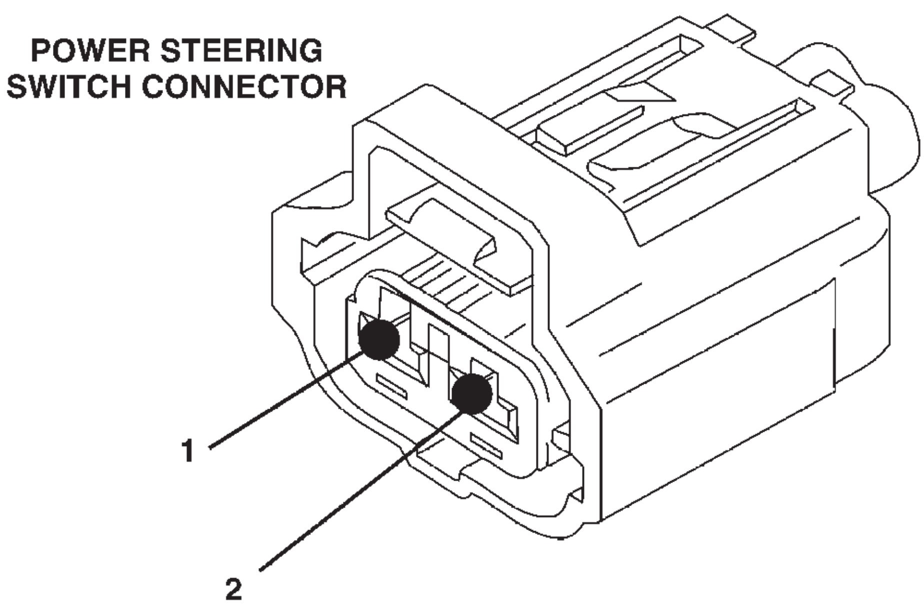
Perform Verification TEST VER-2A.

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

TEST TC-115A	CONTINUED - REPAIRING - POWER STEERING SWITCH FAILURE



2.5L TJ/XJ



CAV	COLOR	FUNCTION
1	BK	GROUND
2	DB/BR	POWER STEERING PRESSURE SW SENSE (2.5L TJ/XJ)

80b76f27

FIG. 1

TEST TC-115A | **CONTINUED - REPAIRING - POWER STEERING SWITCH FAILURE**

TEST TC-115A CONTINUED FROM THE PREVIOUS PAGE.

→ USING AN OHMMETER, MEASURE THE GROUND CKT AT PS PRESSURE SWITCH CONNECTOR. FIG. 1

→ IS RESISTANCE BELOW 5.0 OHMS?

- NO → REPAIR OPEN GROUND CIRCUIT.*
- YES → REPLACE POWER STEERING PRESSURE SWITCH.*

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

TEST TC-118A | **REPAIRING - FUEL SYSTEM RICH 1/1 RICH**

Perform TEST DTC Before Proceeding

Name of Code: Fuel System Rich

When monitored: With the engine running in closed loop mode and the ambient/battery temperature above 20°F and altitude < 8000 ft.

Set condition: The PCM conducts a test to determine whether the fuel system is running too rich. If this happens for 2 trips, the MIL illuminates and a trouble code is stored. The MIL remains on for more than one trip but goes out if the conditions that set the code are not found on subsequent trips.

Theory of operation: The catalytic converter works best when the air/fuel (A/F) ratio is at or near the optimum of 14.7 to 1. The PCM maintains this optimum air/fuel ratio by making short-term corrections in the fuel injector pulse width based on the upstream O2 sensor output. The PCM uses the programmed memory as a self-calibration tool to compensate for variations in engine specifications, sensor tolerances, and engine fatigue over the life span of the engine. Monitoring the actual air/fuel ratio with the upstream O2 sensor (short term) and comparing it to the program (long-term or adaptive) memory determines whether the fuel system is operating within the limits needed to pass an emission test. If a malfunction prevents the PCM from maintaining the optimum A/F ratio, the MIL illuminates.

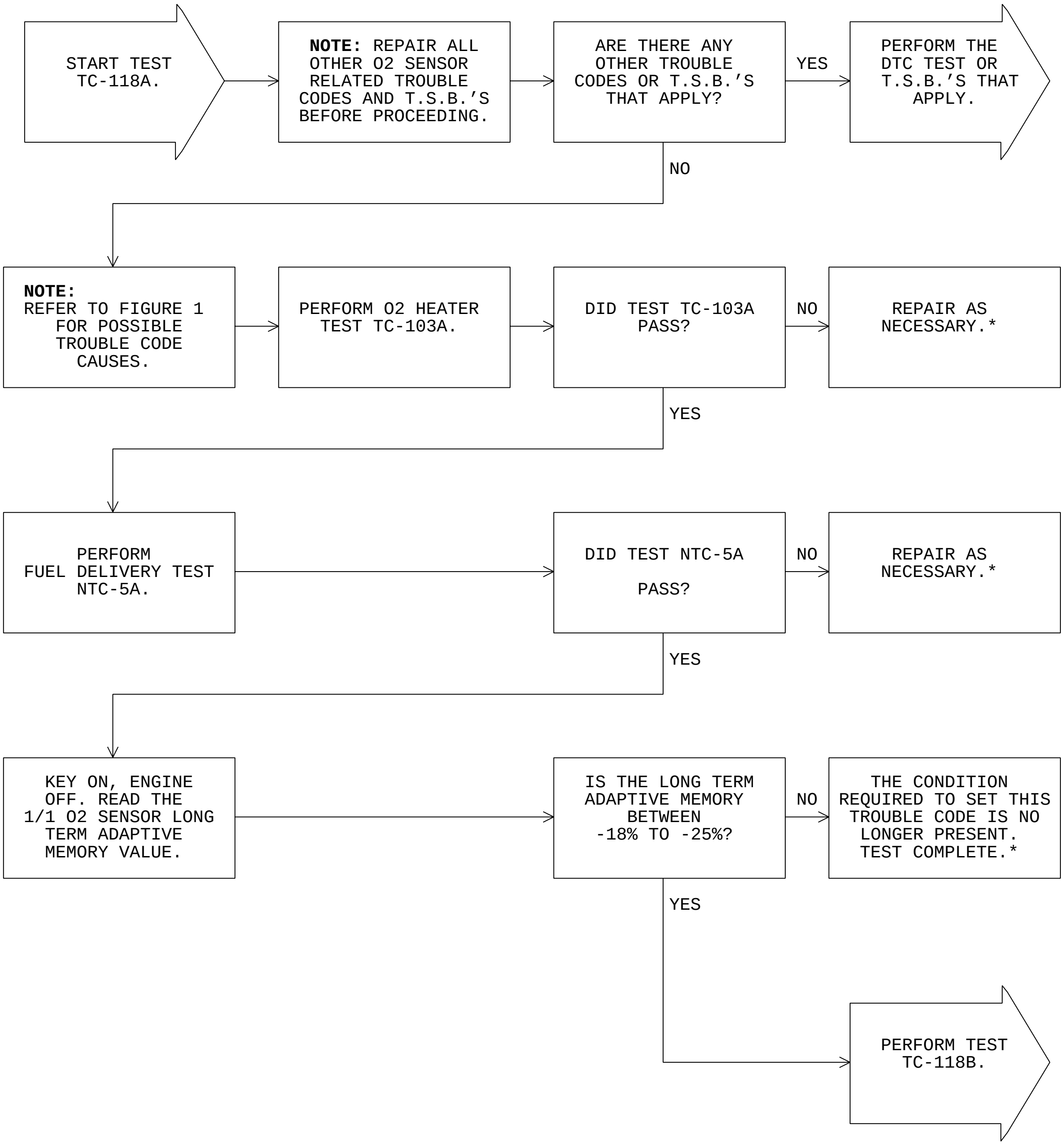
Possible causes:
> Catalyst plugged
> Powertrain control module
> Engine parts tolerance
> Injectors stuck open
> MAP sensor
> O2 sensor (upstream)
> Fuel pressure regulator
> Wiring harness/connectors

80660077

FIG. 1

TEST TC-118A REPAIRING - FUEL SYSTEM RICH 1/1 RICH

Perform TEST DTC Before Proceeding

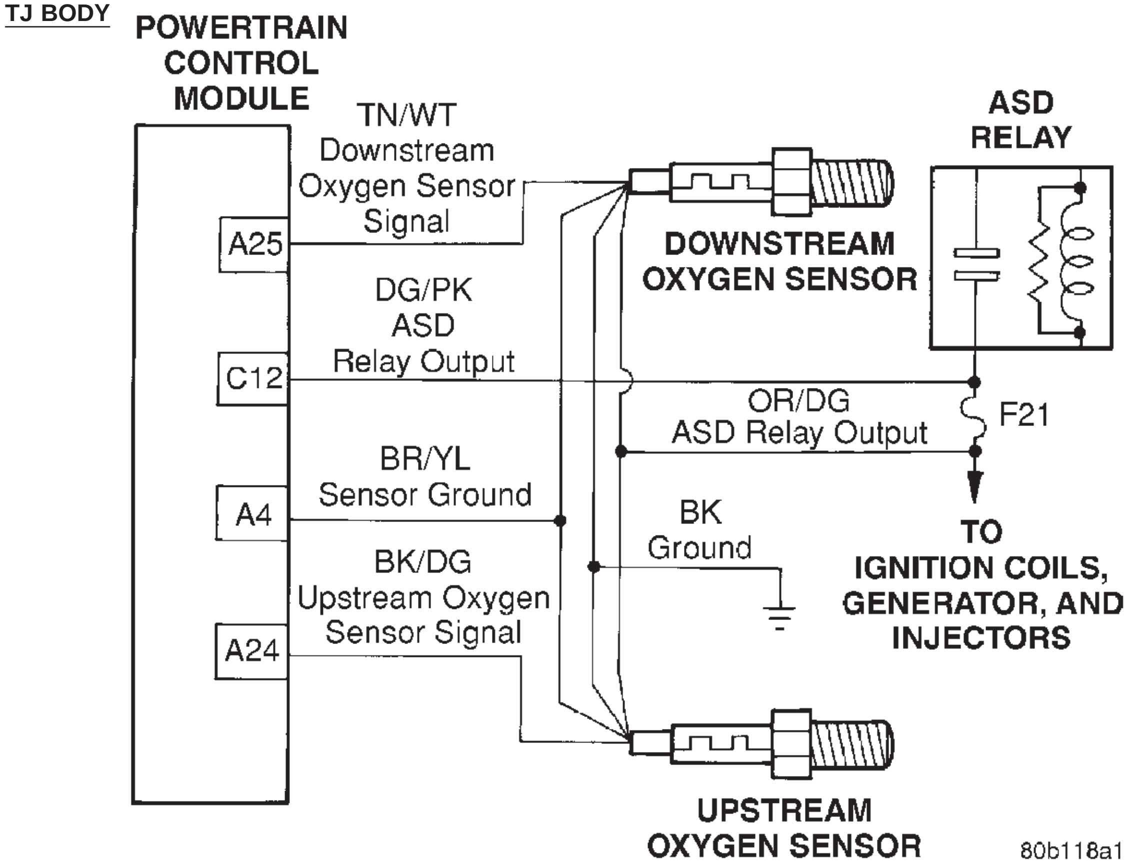


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

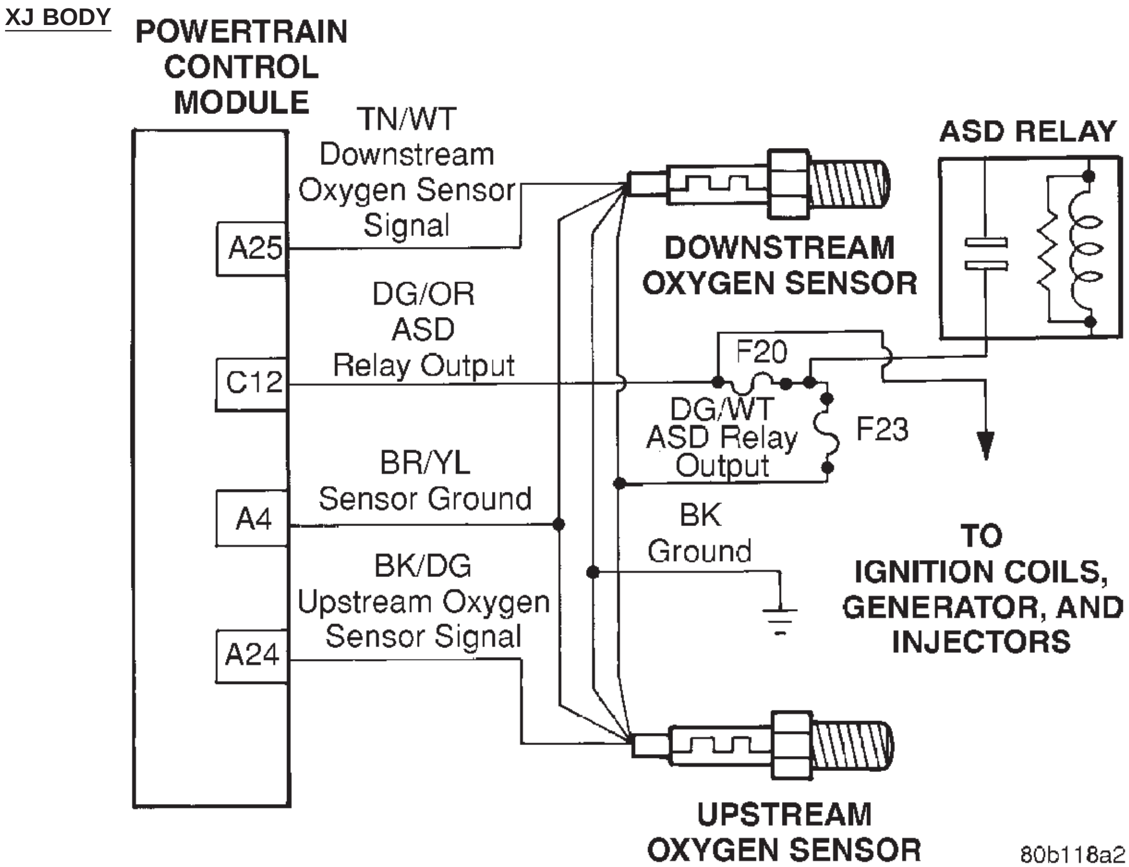
TEST TC-118B	REPAIRING - FUEL SYSTEM RICH 1/1 RICH

Perform TEST TC-118A Before Proceeding

TJ BODY



XJ BODY



TEST TC-118B REPAIRING - FUEL SYSTEM RICH 1/1 RICH

Perform TEST TC-118A Before Proceeding

Using the test schematic as a guide, make sure all the wiring and connectors are okay.

Perform each of the following tests in the order listed below. If a test passes, continue to the next until the problem is found.

Fuel Pressure. . . . . .TEST NTC-5A

Coolant Temperature Sensor. . . . . .TEST NTC-6A

Throttle Position Sensor . . . . .TEST NTC-7A

MAP Sensor. . . . . .TEST NTC-8A

Engine Mechanical Systems . . . . .TEST NTC-13A

Evaporative Emission Sensor . . . . .TEST NTC-17A

TEST TC-119A | **REPAIRING - FUEL SYSTEM LEAN 1/1 LEAN**

Perform TEST DTC Before Proceeding

Name of Code: Fuel System Lean

When monitored: With the engine running in closed loop mode and the ambient/battery temperature above 20°F and altitude < 8000 ft.

Set condition: The PCM conducts a test to determine whether the fuel system is running too lean. If this happens for 2 trips, the MIL illuminates and a trouble code is stored. The MIL remains on for more than one trip but goes out if the conditions that set the code are not found on subsequent trips.

Theory of operation: The catalytic converter works best when the air/fuel (A/F) ratio is at or near the optimum of 14.7 to 1. The PCM maintains this optimum air/fuel ratio by making short-term corrections in the fuel injector pulse width based on the upstream O2 sensor output. The PCM uses the programmed memory as a self-calibration tool to compensate for variations in engine specifications, sensor tolerances, and engine fatigue over the life span of the engine. Monitoring the actual air/fuel ratio with the upstream O2 sensor (short term) and comparing it to the program (long-term or adaptive) memory determines whether the fuel system is operating within the limits needed to pass an emission test. If a malfunction prevents the PCM from maintaining the optimum A/F ratio, the MIL illuminates.

Possible causes:

> Ignition coil
> Powertrain control module
> Engine parts tolerance
> Exhaust pipe manifold
> Fuel pump
> Fuel pump inlet filter
> Ignition secondary wires
> Low fuel level
> Injectors stuck closed
> MAP sensor
> O2 sensor (upstream)
> Fuel pressure regulator
> Fuel pump relay
> Spark plugs
> Wiring harness/connectors

80660063

FIG. 1

TEST TC-119A	REPAIRING - FUEL SYSTEM LEAN 1/1 LEAN

Perform TEST DTC Before Proceeding

START TEST TC-119A.

NOTE: VERY LOW FUEL LEVEL COULD CAUSE THIS TROUBLE CODE TO SET. MAKE SURE TANK IS AT LEAST 1/4 FULL

DID THE VEHICLE RUN OUT OF FUEL SHORTLY BEFORE COMING IN?

YES

ERASE TROUBLE CODES.

TEST COMPLETE.*

NO

REFER TO FIGURE 1 FOR POSSIBLE TROUBLE CODE CAUSES.

WITH THE DRB, READ ALL TROUBLE CODES.

ARE THERE ANY OTHER TROUBLE CODES OR T.S.B.'S THAT APPLY?

YES

PERFORM THE DTC TEST OR THE T.S.B.'S THAT APPLY.

NO

PERFORM FUEL DELIVERY TEST NTC-3A.

DID TEST NTC-3A PASS?

NO

REPAIR AS NECESSARY.*

YES

START THE ENGINE AND ALLOW IT TO REACH NORMAL OPERATING TEMPERATURE.

CHECK EXHAUST SYSTEM FOR LEAKS BETWEEN ENGINE AND THE O2 SENSORS.

ARE THERE ANY EXHAUST LEAKS?

YES

REPAIR OR REPLACE EXHAUST COMPONENTS AS NECESSARY.*

NO

CYCLE KEY OFF, THEN ON.

READ THE 1/1 O2 SENSOR LONG TERM ADAPTIVE MEMORY VALUES.

ARE ANY OF THE LONG TERM ADAPTIVE MEMORY BETWEEN +20% AND +32%?

YES

THE CONDITION REQUIRED TO SET THIS TROUBLE CODE IS NO LONGER PRESENT. TEST COMPLETE.*

NO

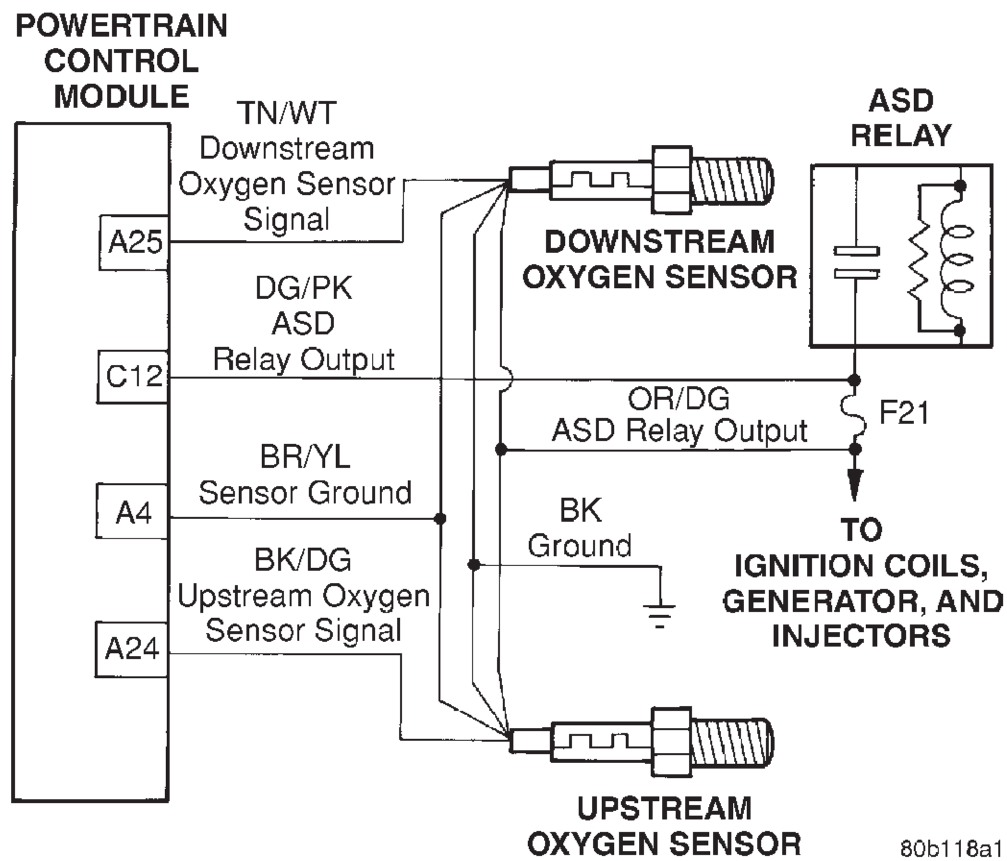
PERFORM TEST TC-119B.

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

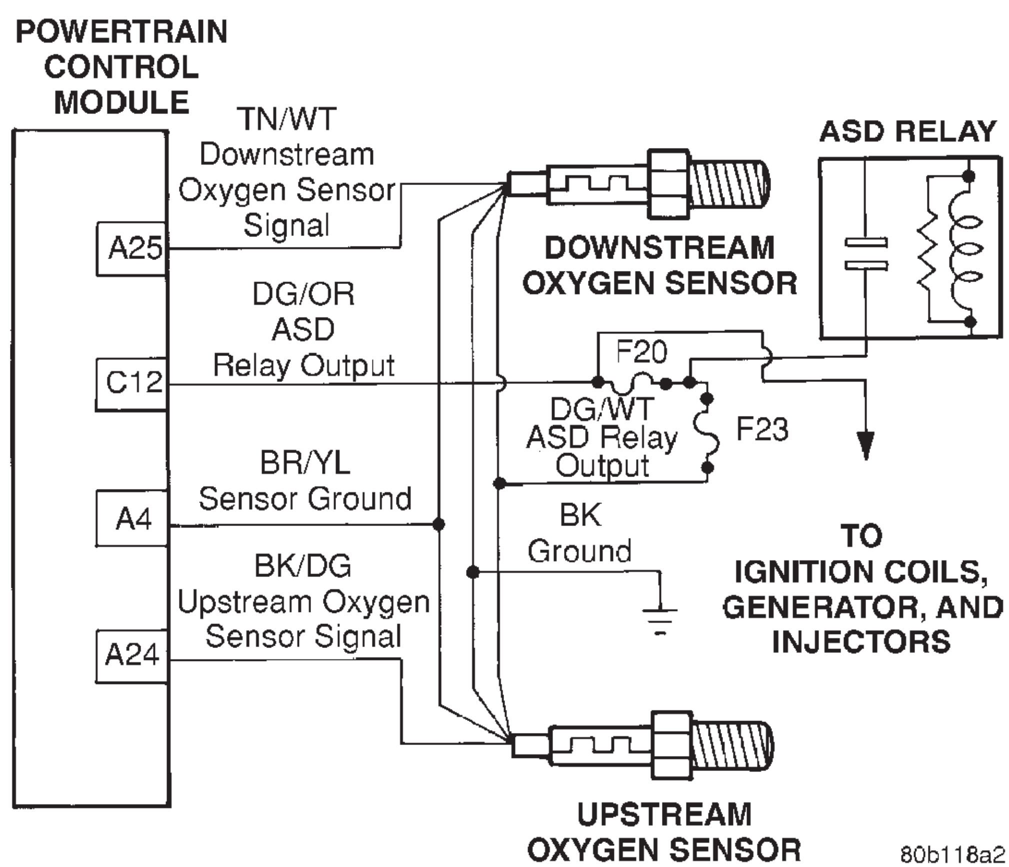
TEST TC-119B	REPAIRING - FUEL SYSTEM LEAN 1/1 LEAN

Perform TEST TC-119A Before Proceeding

TJ BODY



XJ BODY



TEST TC-119B	REPAIRING - FUEL SYSTEM LEAN 1/1 LEAN

Perform TEST TC-119A Before Proceeding

Using the test schematic as a guide, make sure all the wiring and connectors are okay.

Perform each of the following tests in the order listed below. If a test passes, continue to the next until the problem is found.

Fuel Pressure . . . . TEST NTC-5A

Coolant Temperature Sensor . . . . TEST NTC-6A

Throttle Position Sensor . . . . TEST NTC-7A

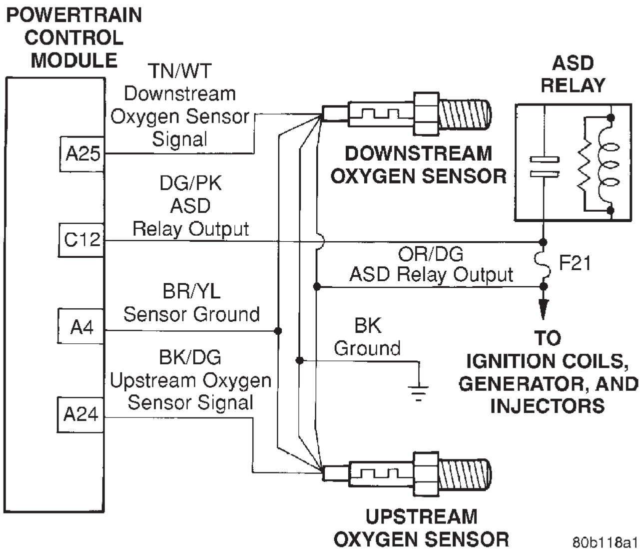
MAP Sensor . . . . TEST NTC-8A

Engine Mechanical Systems . . . . TEST NTC-13A

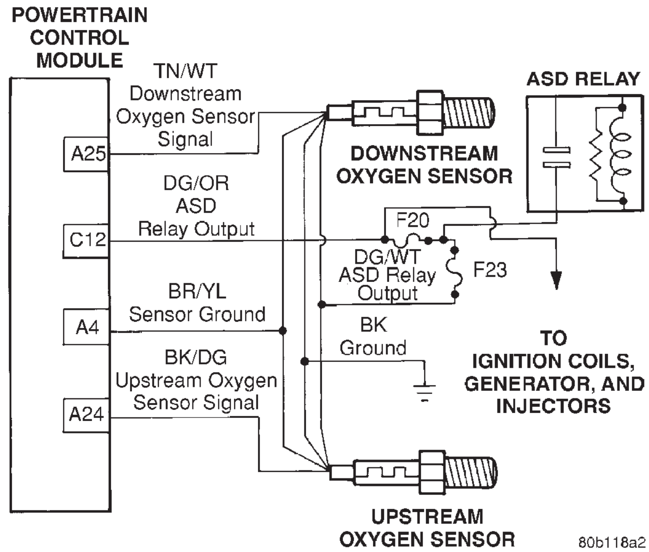
TEST TC-126A REPAIRING - 1/2 O2 SENSOR SHORTED TO VOLTAGE

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



JTEC 02 SENSOR CONFIGURATION

TJ2.5L	1/1	UPSTREAM	XJ2.5L	1/1	UPSTREAM
TJ2.5L	1/2	DOWNSTREAM	XJ2.5L	1/2	DOWNSTREAM
TJ4.0L	1/1	UPSTREAM	XJ4.0L	1/1	UPSTREAM
TJ4.0L	1/2	DOWNSTREAM	XJ4.0L	1/2	DOWNSTREAM

80b76ec3

Name of code: Downstream O2 Sensor Shorted To Voltage

When monitored: With the engine running and coolant temperature at 180° F for 4 minutes or more.

Set condition: The downstream oxygen sensor signal is above 1.5 volts. Two trips are required with the condition present to set the code.

Theory of operation: Effective control of exhaust emissions is achieved by an oxygen feedback system. The downstream oxygen sensor (O2S), which is located in the exhaust path after the catalyst. It monitors the oxygen content of the exhaust gas as it leaves the catalyst. Once the sensor reaches its normal operating temperature of 300 - 350 degrees Celsius, it generates a voltage inversely proportional to the amount of oxygen in the exhaust. The PCM uses this voltage along with that of the upstream oxygen sensor to calculate the efficiency of the catalytic convertor.

Possible causes:
- Sensor output wire shorted to a power circuit
- O2 sensor failure
- Powertrain control module failure
- Connector terminal/wires
- Open O2 sensor signal circuit

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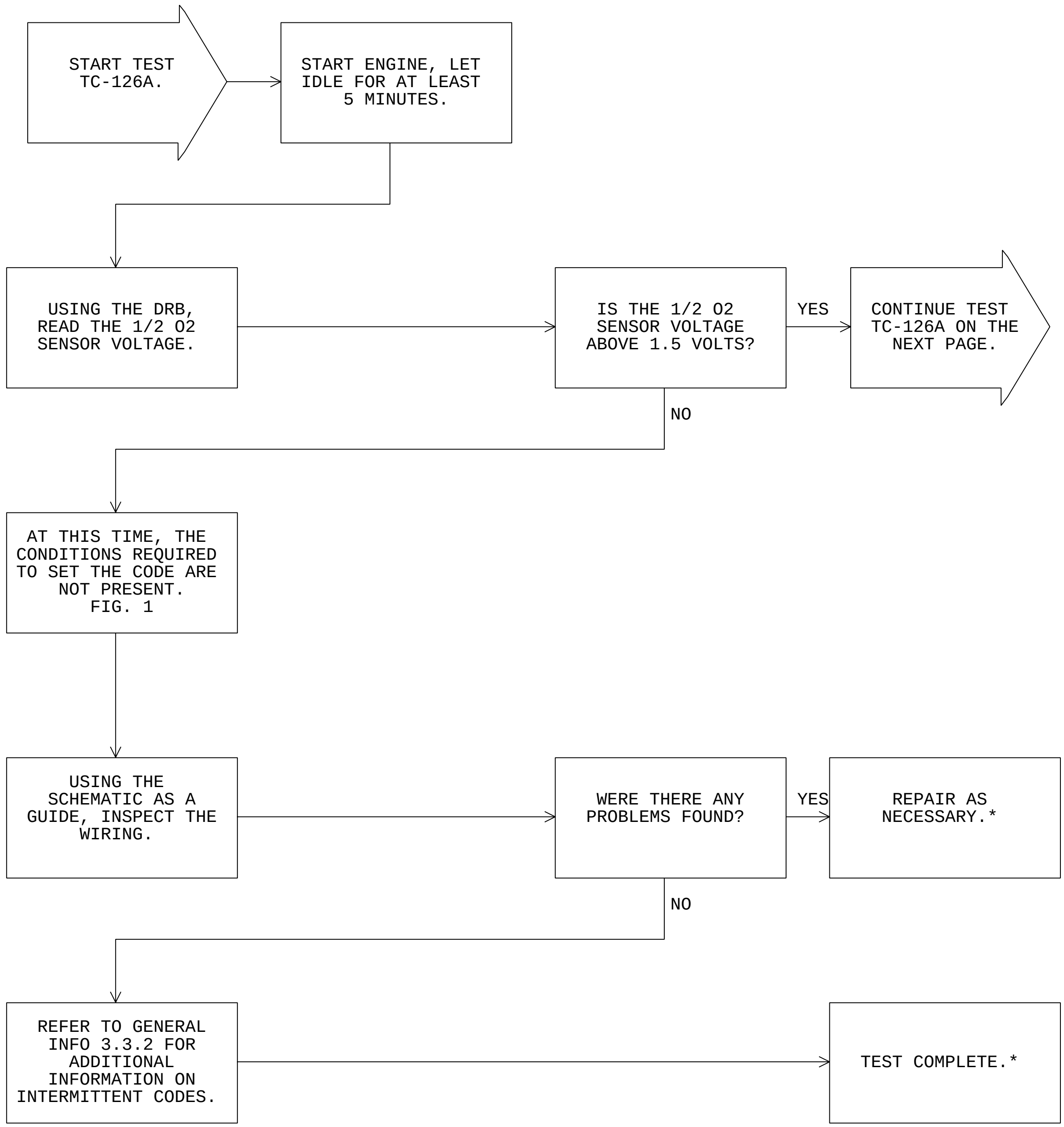
FIG. 1

TEST TC-126A REPAIRING - 1/2 O2 SENSOR SHORTED TO VOLTAGE

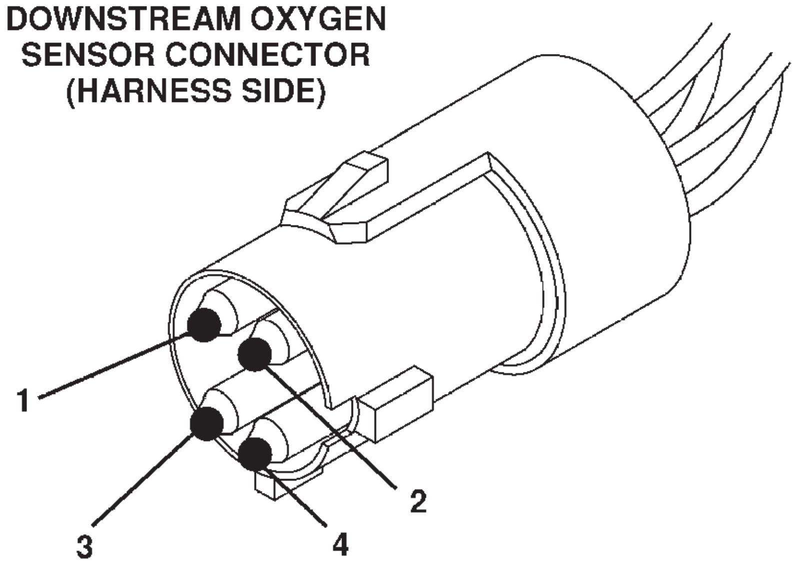
Perform TEST DTC Before Proceeding



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

TEST TC-126A	CONTINUED - REPAIRING - 1/2 O2 SENSOR SHORTED TO VOLTAGE

TJ BODY

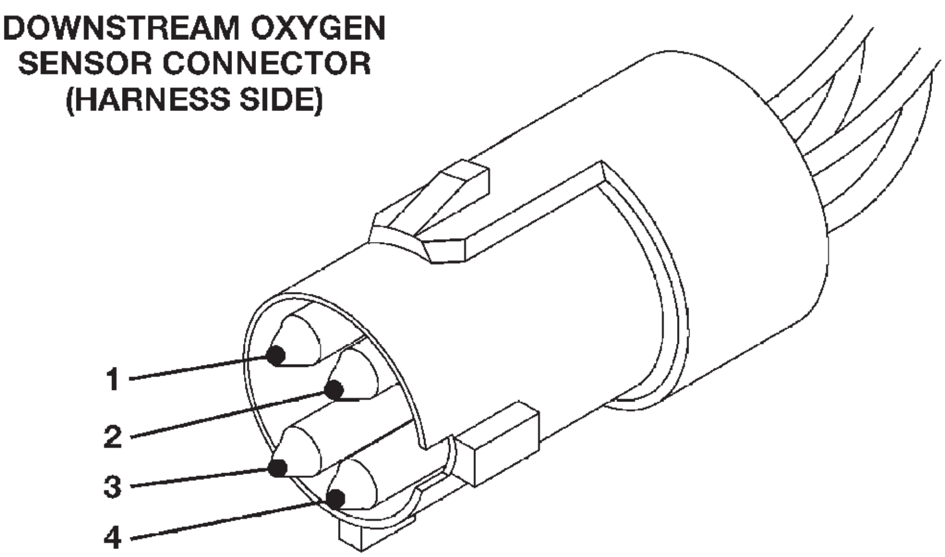


CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	OXYGEN SENSOR SIGNAL

80b6f0e6

FIG. 1

XJ BODY



CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	OXYGEN SENSOR SIGNAL

80b6f0dc

FIG. 2

TEST TC-126A — CONTINUED - REPAIRING - 1/2 O2 SENSOR SHORTED TO VOLTAGE

TEST TC-126A CONTINUED FROM THE PREVIOUS PAGE.

KEY OFF. DISCONNECT THE 1/2 O2 SENSOR HARNESS CONNECTOR.**

USE A VOLTMETER IN THE FOLLOWING STEP.

KEY ON. MEASURE THE 1/2 O2 SENSOR SIGNAL CIRCUIT...

BETWEEN THE 1/2 O2 SENSOR HARNESS CONNECTOR AND GROUND. FIG. 1 OR 2

WAS THE VOLTAGE BETWEEN 4.0 AND 5.2 VOLTS?

NO → CONTINUE TEST TC-126A ON THE NEXT PAGE.

YES ↓

INSTALL A JUMPER WIRE FROM THE 1/2 O2 SENSOR SIGNAL CIRCUIT TO THE SNESOR GROUND...

AT THE 1/2 O2 SENSOR HARNESS CONNECTOR. OBSERVE THE DRB. FIG. 1 OR 2

DID THE 1/2 O2 SENSOR VOLTAGE DROP BELOW 1.0 VOLTS?

YES → REPLACE THE 1/2 O2 SENSOR.*

NO ↓

MOVE THE JUMPER WIRE FROM THE SENSOR GROUND...

TO AN ENGINE GROUND. OBSERVE THE DRB.

DID THE 1/2 O2 SENSOR VOLTAGE DROP BELOW 1.0 VOLTS?

YES → REPAIR THE SENSOR GROUND CIRCUIT FOR AN OPEN.*

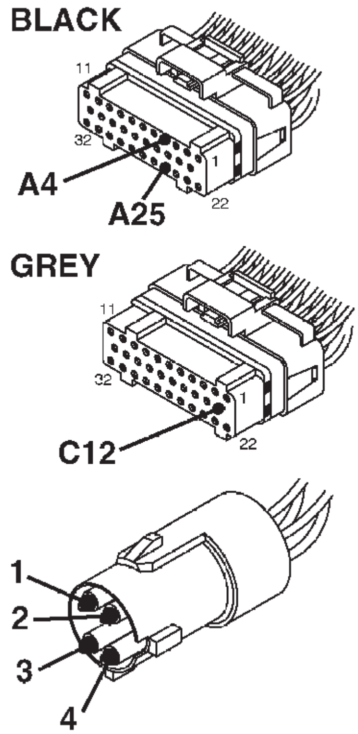
NO → REPLACE THE PCM.*

Perform Verification TEST VER-2A.

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

TEST TC-126A — CONTINUED - REPAIRING - 1/2 O2 SENSOR SHORTED TO VOLTAGE

TJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A25	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

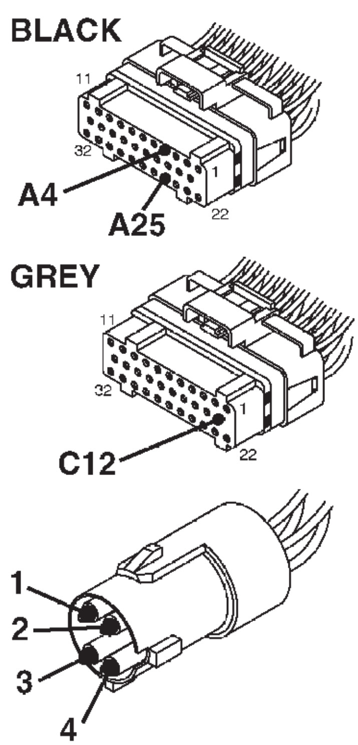
DOWNSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL

80b118a8

FIG. 1

XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A25	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

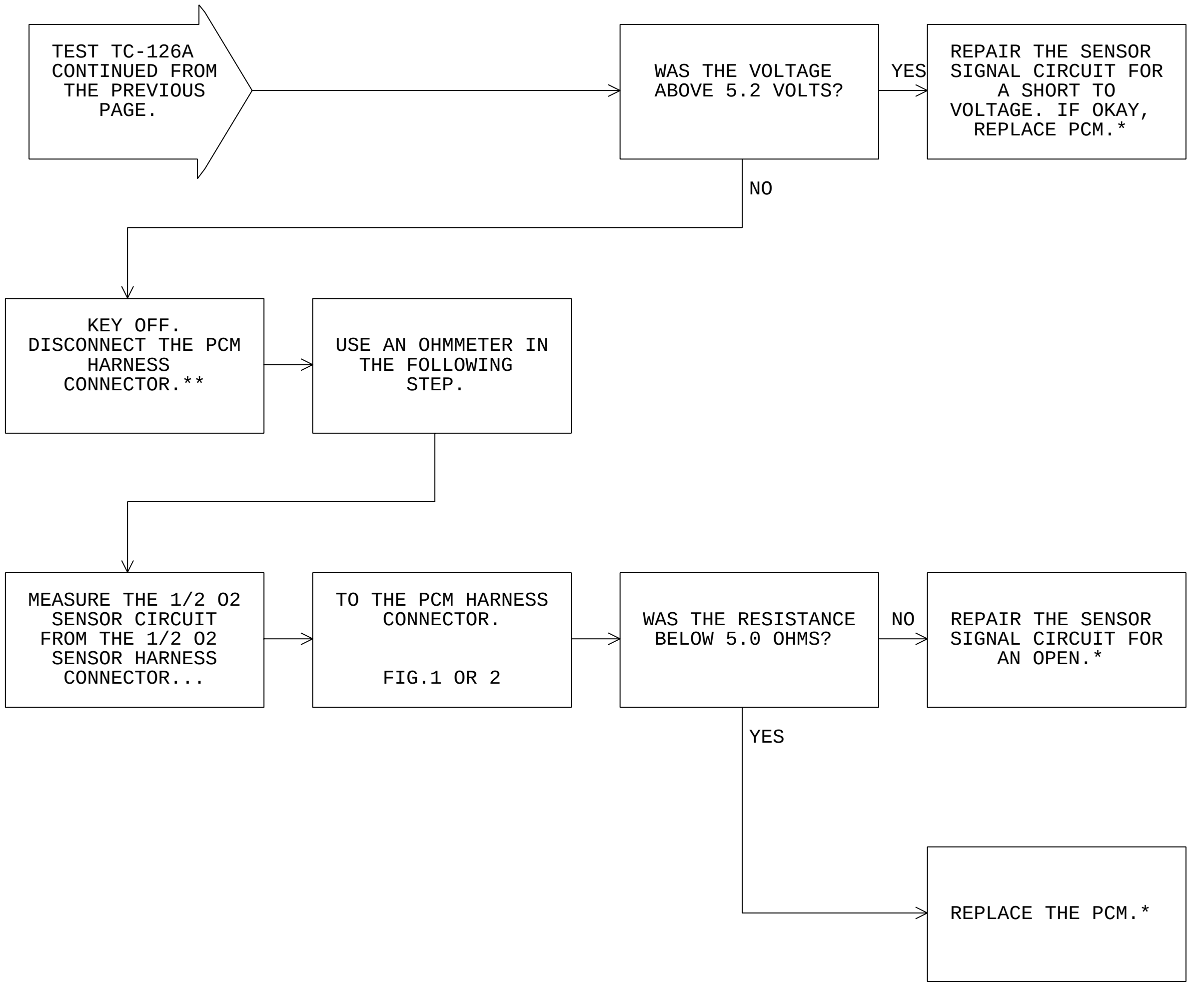
DOWNSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL

80b118a9

FIG. 2

TEST TC-126A | CONTINUED - REPAIRING - 1/2 O2 SENSOR SHORTED TO VOLTAGE



**Perform Verification TEST VER-2A.*

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

TEST TC-132A	REPAIRING - TPS VOLTAGE DOES NOT AGREE WITH MAP

Perform TEST DTC Before Proceeding

Name of Code: TPS Voltage Does Not Agree with MAP

When monitored: With the engine running and no MAP sensor or TP sensor trouble codes.

Set condition: Engine speed must be greater than 1600 RPM for all TPS testing.

Theory of operation: The TP sensor contains a potentiometer that is operated by the throttle blade shaft. As a throttle plate rotates, the TP sensor provides a variable 0 to 5-volt signal to PCM. 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 the PCM. The sensor ground is provided by the PCM.

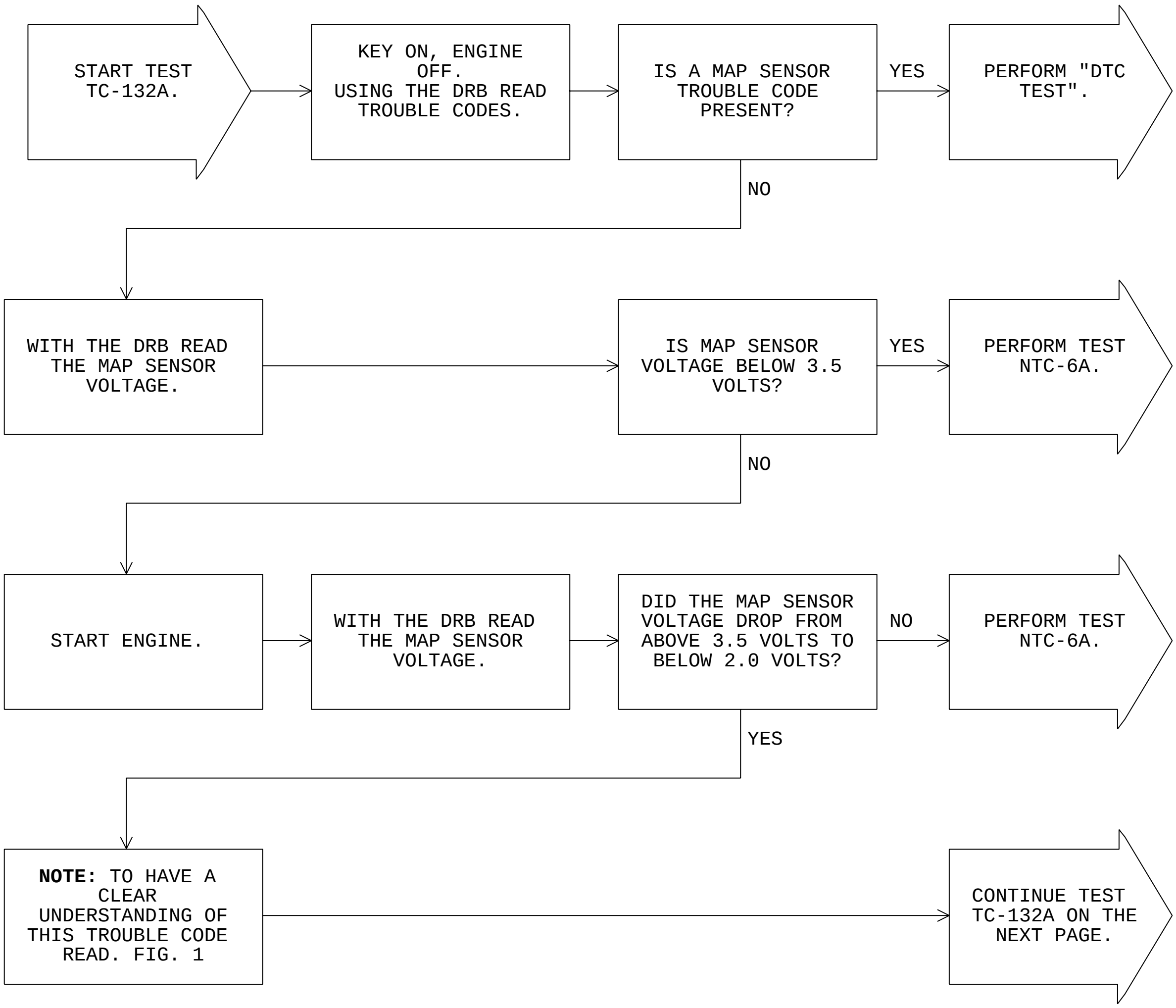
Possible causes:
> Failed powertrain control module
> TP sensor failure
> Mechanical failure
> Connector terminals
> Connector wires
> Vehicle speed
> MAP sensor

80660065

FIG. 1

TEST TC-132A — REPAIRING - TPS VOLTAGE DOES NOT AGREE WITH MAP

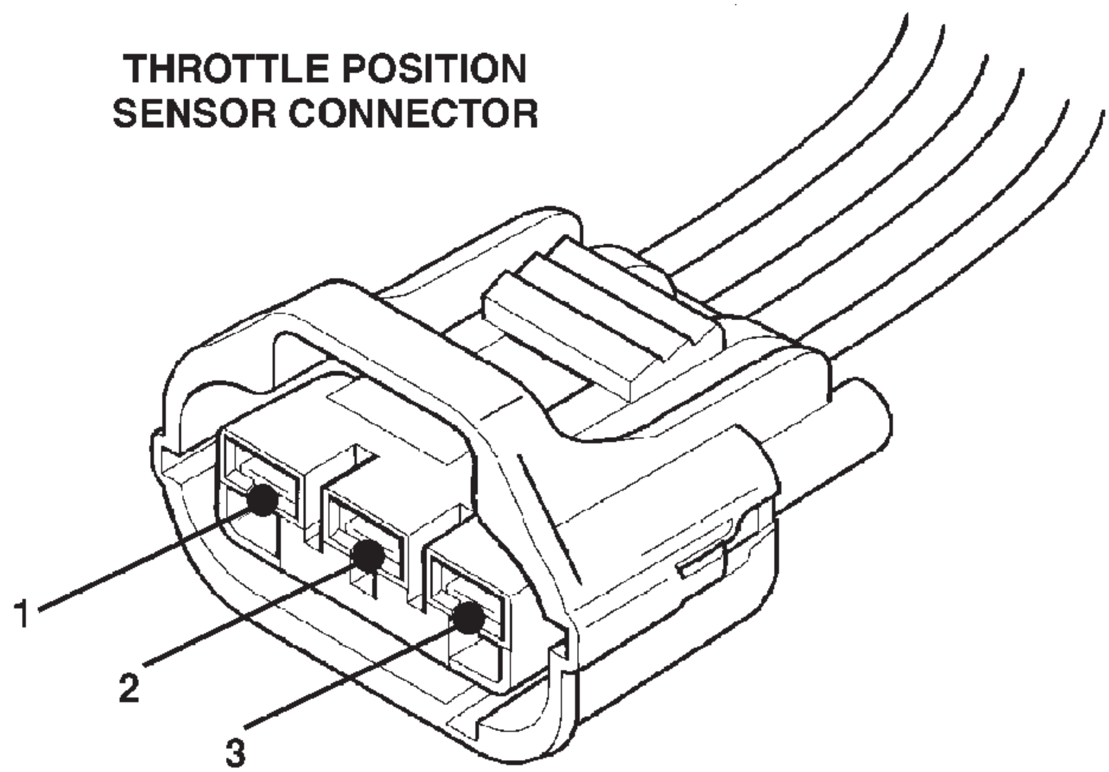
Perform TEST DTC Before Proceeding



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

TEST TC-132A — CONTINUED - REPAIRING - TPS VOLTAGE DOES NOT AGREE WITH MAP

TJ/XJ BODY

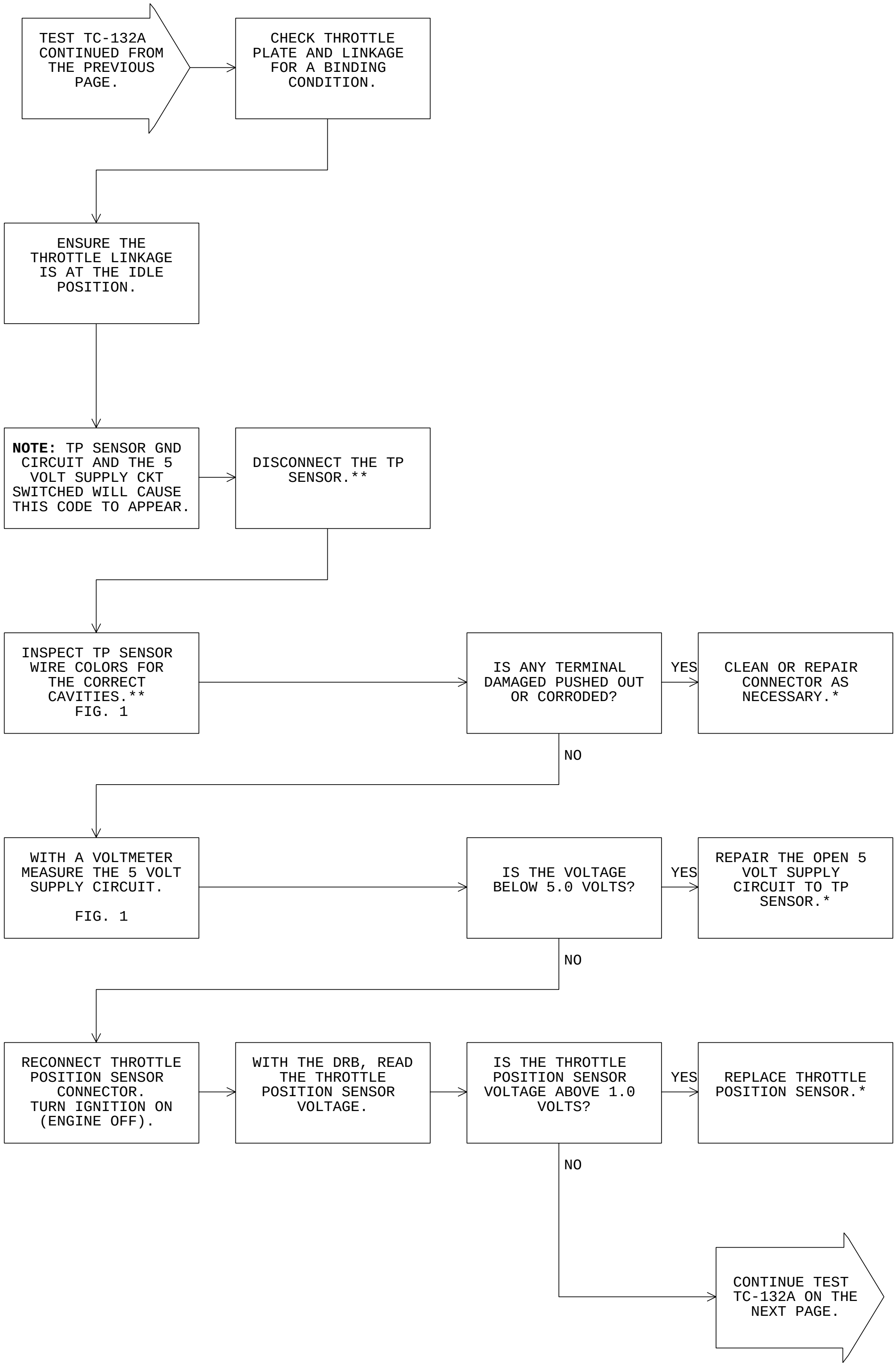


CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b6f0e7

FIG. 1

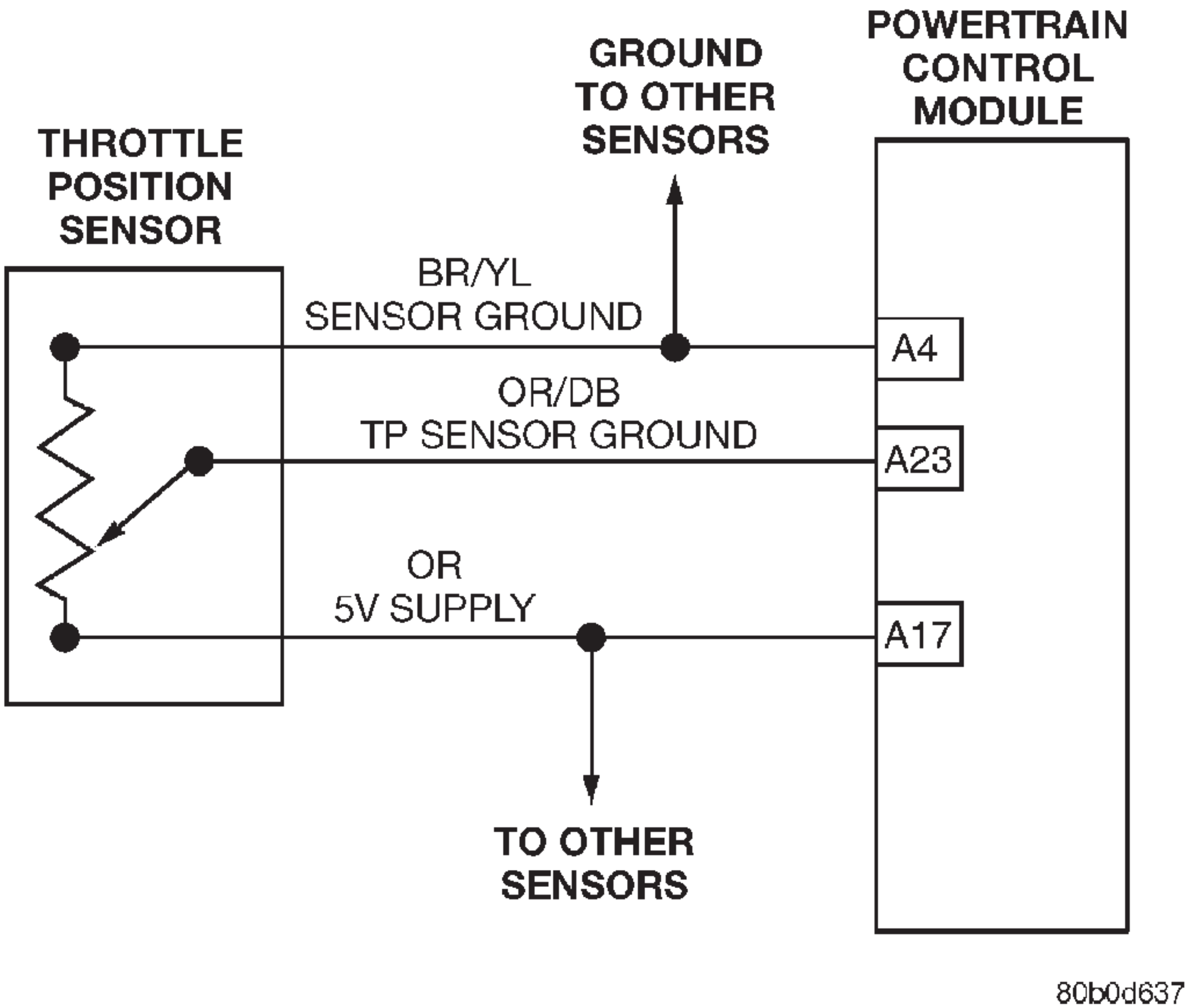
TEST TC-132A CONTINUED - REPAIRING - TPS VOLTAGE DOES NOT AGREE WITH MAP



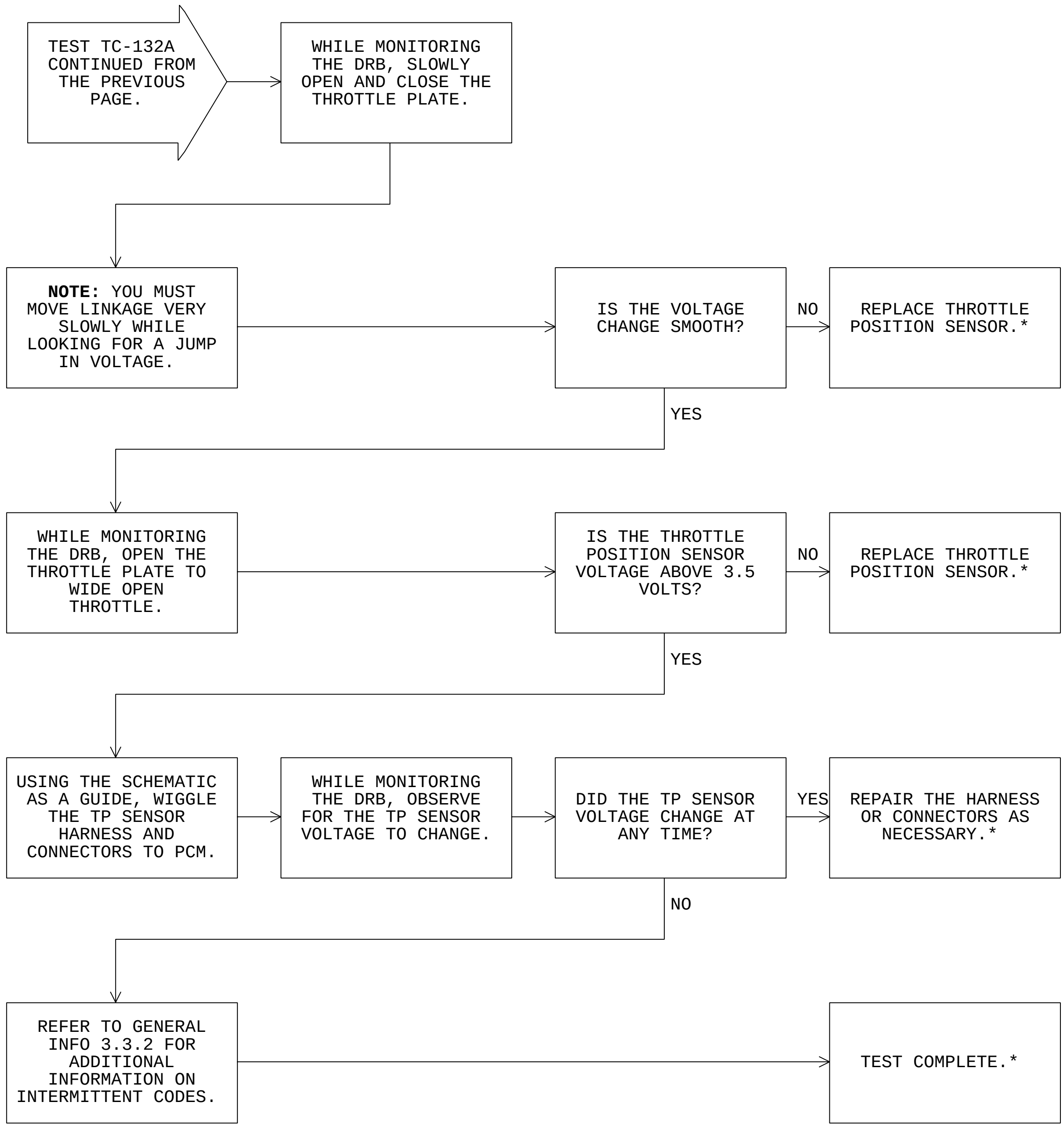
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-132A — **CONTINUED - REPAIRING - TPS VOLTAGE DOES NOT AGREE WITH MAP**



TEST TC-132A — CONTINUED - REPAIRING - TPS VOLTAGE DOES NOT AGREE WITH MAP



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

TROUBLE CODE TESTS

TEST TC-148A	REPAIRING - TORQUE CONVERTER CLUTCH - NO RPM DROP AT LOCK-UP (TJ/XJ BODY WITH 3 SPD AUTO TRANS)

Perform TEST DTC Before Proceeding

TJ/XJ BODY WITH 3 SPD AUTO TRANSMISSION

Name of code: Torq Conv Clu, No RPM Drop at Lockup

When monitored: When all of the following steps are taken.

1. None of the following matured or maturing trouble code conditions:
   a) TCC solenoid circuit
   b) Any cam/crank-related code
   c) Vehicle speed signal
   d) Any TPS-related code
2. Battery voltage > 11.0 volts
3. Vehicle speed < 60 mph during step 5.
4. Run vehicle in third gear at about 40 mph with torque converter unlocked for at least 10 seconds.
5. Apply 1/3 throttle while making sure transmission does not downshift. Back off on the throttle slightly until the torque converter locks. Keep the torque converter locked for at least 5 seconds by holding the throttle and vehicle speed constant.

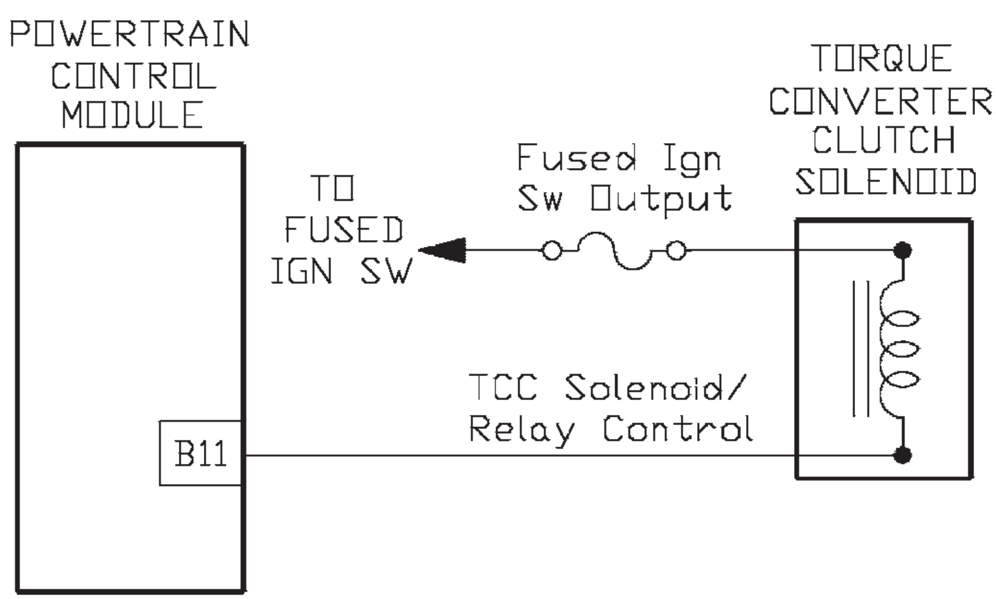
Set condition: Torque converter malfunctions that are detected are the torque converter not locking up properly when desired, and the torque converter not unlocking properly when desired. A minimum amount of improvement in torque converter efficiency is expected after the torque converter is locked. This expected minimum improvement will not be seen when the torque converter is malfunctioning. Three consecutive test failures over one trip will store the trouble code.

Theory of operation: The torque converter lock-up system locks the crankshaft to the output shaft of the transmission when vehicle road load is stable and transmission is in third gear. This action reduces transmission oil heating, and improves fuel economy. The lock-up system is controlled by the powertrain control module.

Possible causes:
> Drive wheel size is bigger than standard wheel size or smaller than spare wheel size
> Low transmission oil level or pressure
> Debris in transmission oil
> Incorrect speedo gear for the front wheels
> PTU solenoid not securely connected or stuck
> Malfunctioning lock-up valve in transmission
> Hydraulic leak at torque converter lock-up clutch
> Worn out friction material on friction disc in torque converter
> Failed gear box or differential
> Powertrain control module failure
> Worn out connector terminals/wires

3380104

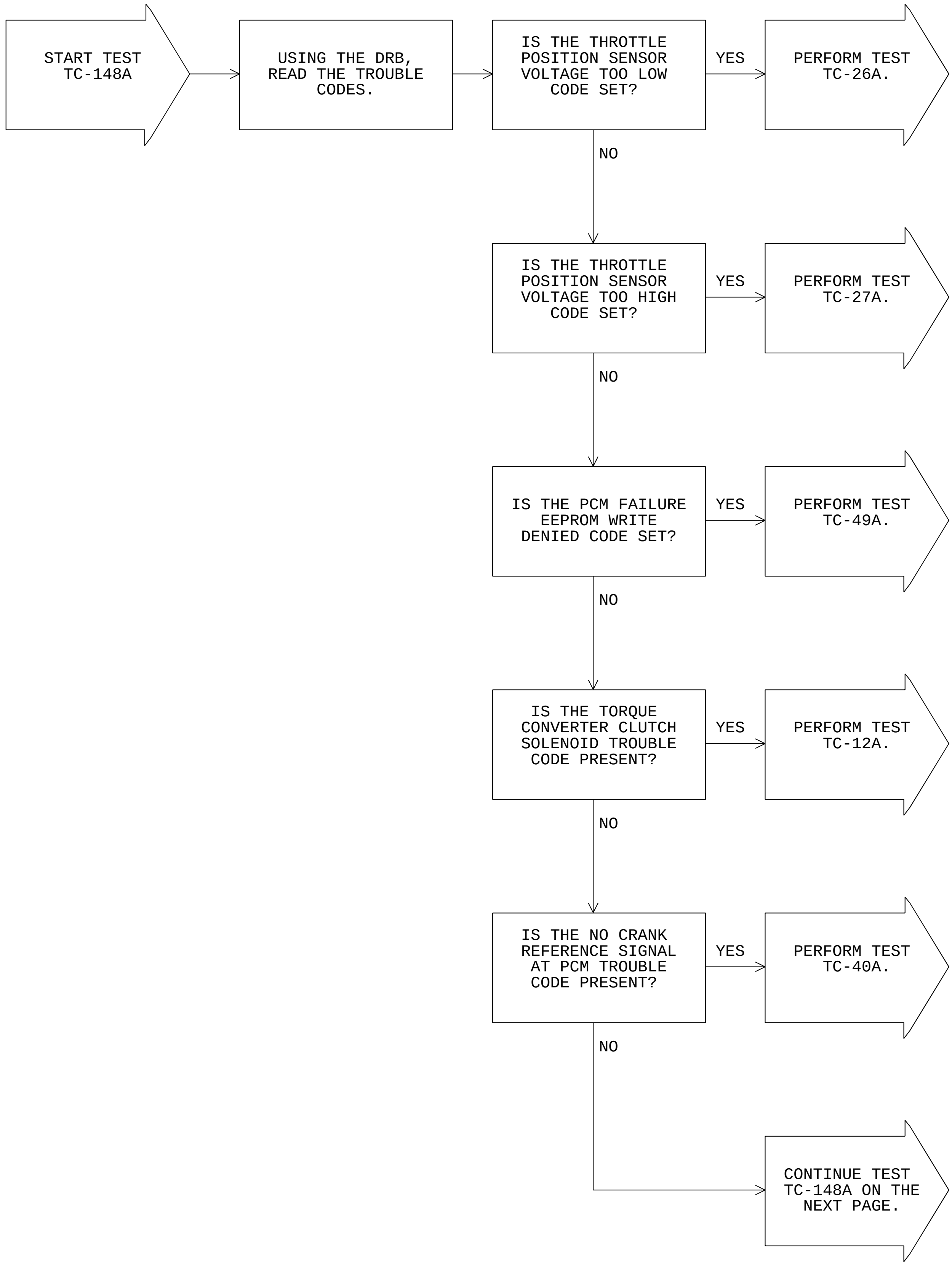
TJ/XJ BODY WITH 3 SPD AUTO TRANSMISSION



4070105

TEST TC-148A — REPAIRING - TORQUE CONVERTER CLUTCH - NO RPM DROP AT LOCK-UP (TJ/XJ BODY WITH 3 SPD AUTO TRANS)

Perform TEST DTC Before Proceeding



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

TEST TC-148A CONTINUED - REPAIRING - TORQUE CONVERTER CLUTCH - NO RPM DROP AT LOCK-UP (TJ/XJ BODY WITH 3 SPD AUTO TRANS)

TJ/XJ BODY WITH 3 SPD AUTO TRANSMISSION

Name of code: Torq Conv Clu, No RPM Drop at Lockup

When monitored: When all of the following steps are taken.

1. None of the following matured or maturing trouble code conditions:
   a) TCC solenoid circuit
   b) Any cam/crank-related code
   c) Vehicle speed signal
   d) Any TPS-related code
2. Battery voltage > 11.0 volts
3. Vehicle speed < 60 mph during step 5.
4. Run vehicle in third gear at about 40 mph with torque converter unlocked for at least 10 seconds.
5. Apply 1/3 throttle while making sure transmission does not downshift. Back off on the throttle slightly until the torque converter locks. Keep the torque converter locked for at least 5 seconds by holding the throttle and vehicle speed constant.

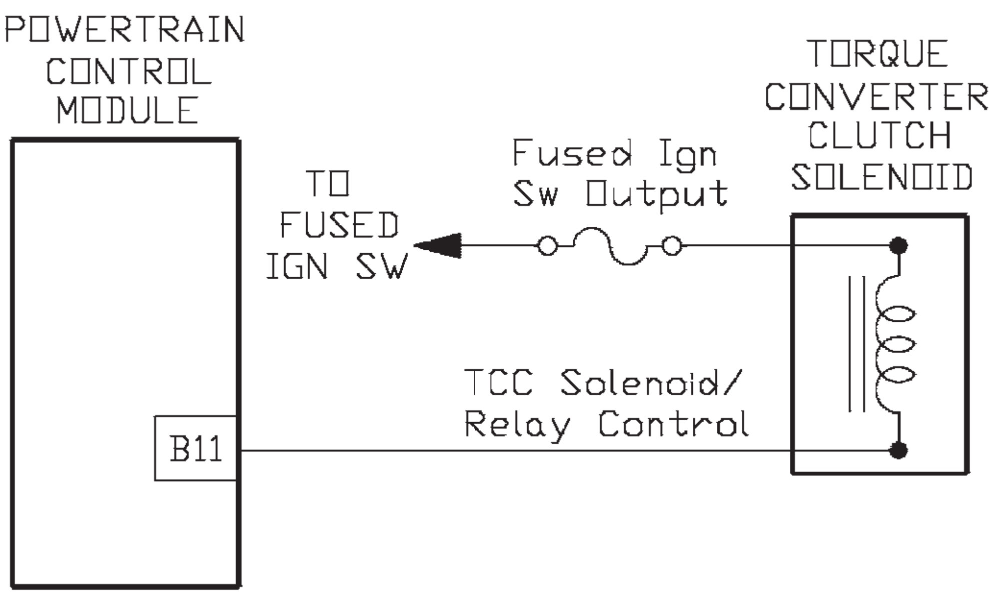
Set condition: Torque converter malfunctions that are detected are the torque converter not locking up properly when desired, and the torque converter not unlocking properly when desired. A minimum amount of improvement in torque converter efficiency is expected after the torque converter is locked. This expected minimum improvement will not be seen when the torque converter is malfunctioning. Three consecutive test failures over one trip will store the trouble code.

Theory of operation: The torque converter lock-up system locks the crankshaft to the output shaft of the transmission when vehicle road load is stable and transmission is in third gear. This action reduces transmission oil heating, and improves fuel economy. The lock-up system is controlled by the powertrain control module.

Possible causes:
> Drive wheel size is bigger than standard wheel size or smaller than spare wheel size
> Low transmission oil level or pressure
> Debris in transmission oil
> Incorrect speedo gear for the front wheels
> PTU solenoid not securely connected or stuck
> Malfunctioning lock-up valve in transmission
> Hydraulic leak at torque converter lock-up clutch
> Worn out friction material on friction disc in torque converter
> Failed gear box or differential
> Powertrain control module failure
> Worn out connector terminals/wires

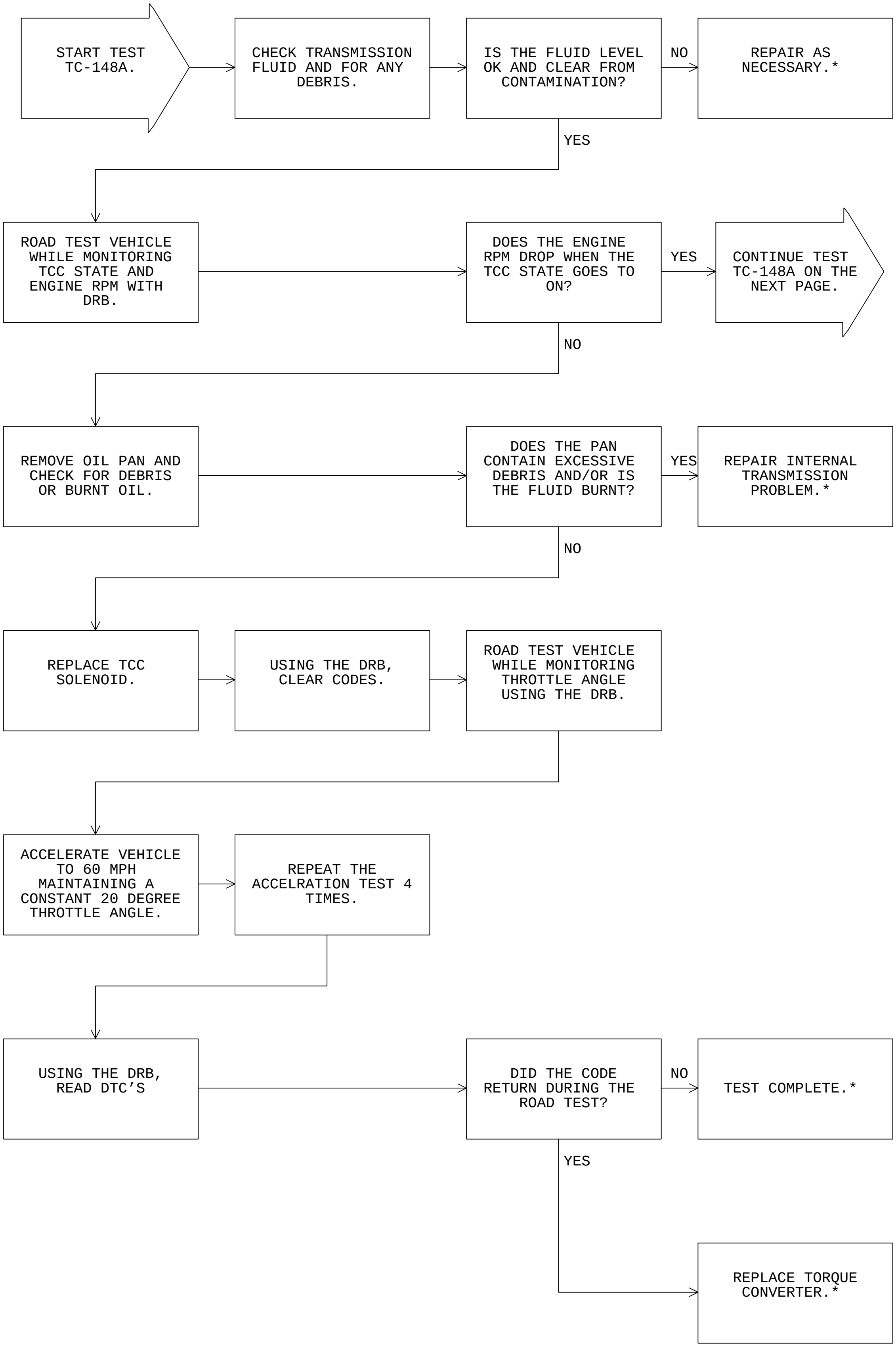
3380104

TJ/XJ BODY WITH 3 SPD AUTO TRANSMISSION



4070105

TEST TC-148A — CONTINUED - REPAIRING - TORQUE CONVERTER CLUTCH - NO RPM DROP AT LOCK-UP (TJ/XJ BODY WITH 3 SPD AUTO TRANS)



*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

NOTES

TEST TC-148A	CONTINUED - REPAIRING - TORQUE CONVERTER CLUTCH - NO RPM DROP AT LOCK-UP (TJ/XJ BODY WITH 3 SPD AUTO TRANS)

TEST TC-148A CONTINUED FROM THE PREVIOUS PAGE.

REMOVE OIL PAN AND INSPECT FOR EXCESSIVE DEBRIS AND BURNT OIL.

IS THE OIL BURNT OR DOES THE PAN CONTAIN EXCESSIVE DEBRIS?

YES → REPAIR INTERNAL TRANSMISSION PROBLEM.*

NO → AT THIS TIME THE CONDITIONS REQUIRED TO SET THIS CODE ARE NOT PRESENT.

TEST COMPLETE.*

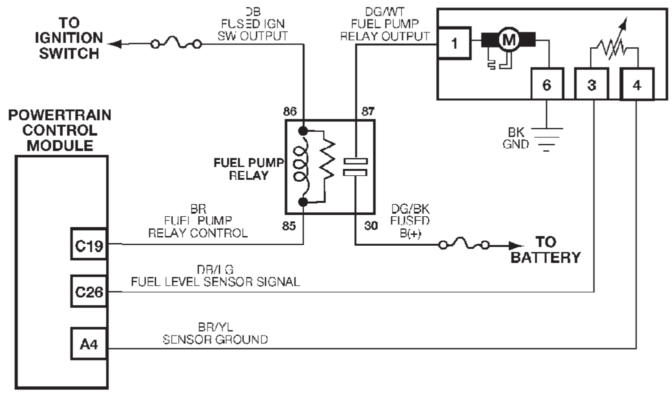
TROUBLE CODE TESTS

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

TEST TC-149A REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO LOW

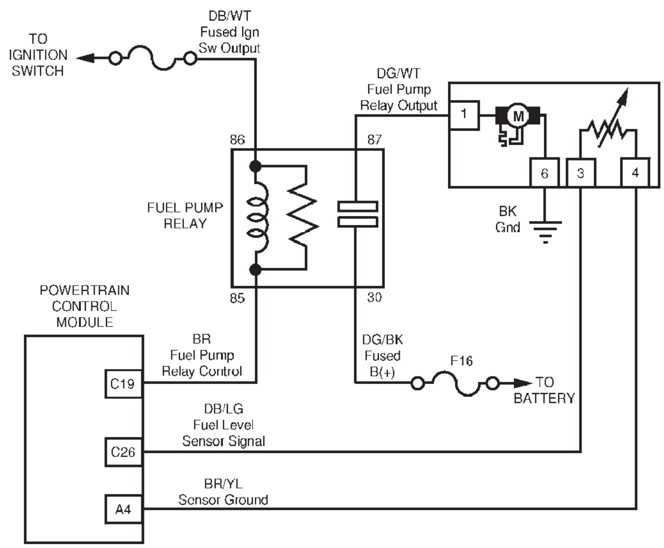
Perform TEST DTC Before Proceeding

TJ BODY



80b6f0ce

XJ BODY



80b6f0d4

Name of code: Fuel Level Sending Unit Volts Too Low

When monitored: Ignition on and battery voltage above 10.4 volts.

Set condition: The fuel level sensor signal circuit voltage at the PCM goes below .4 volts for 90 seconds.

Theory of operation: The fuel sending unit provides a variable voltage signal to the powertrain control module to indicate fuel level. The purpose of this feature is to prevent false setting of misfire and fuel system monitor codes when the vehicle is operating at low fuel levels. When the fault is detected by the PCM, the PCM will default the fuel gauge to an empty reading. This will alert the driver of a malfunction in the fuel level sending unit system.

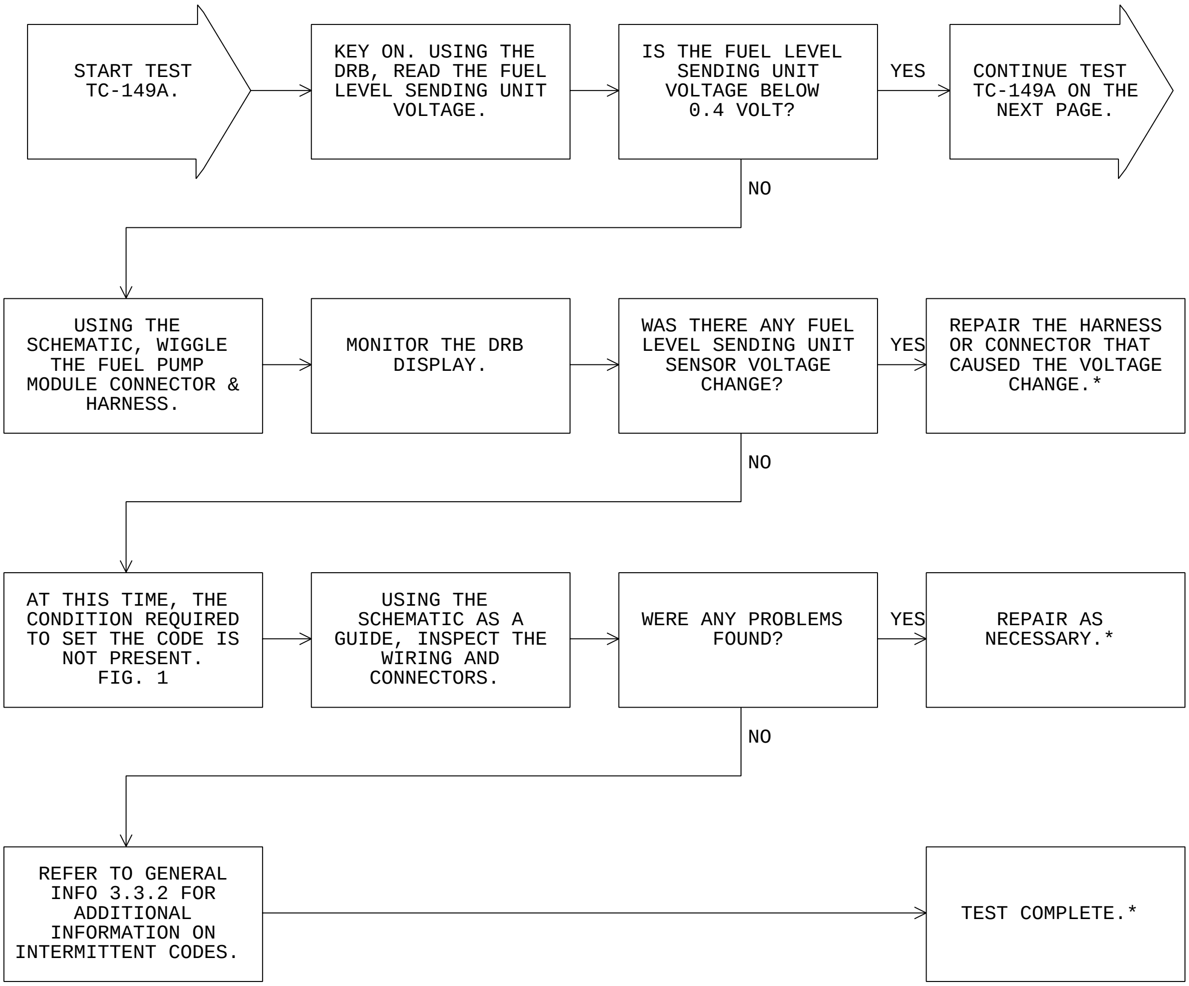
Possible causes:
> Sensor signal circuit shorted to ground
> Fuel pump module failure
> Powertrain control module failure
> Connector wires
> Connector terminals

FIG. 1

80b7700c

TEST TC-149A REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO LOW

Perform TEST DTC Before Proceeding

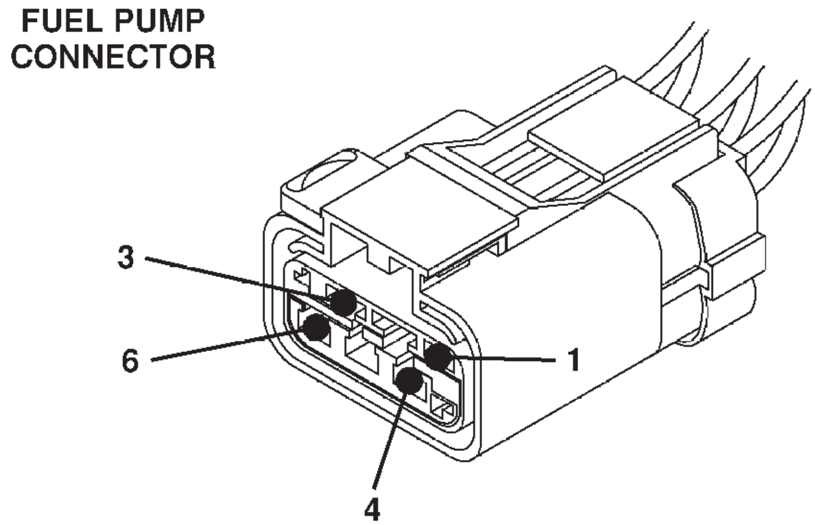


*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-149A	CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO LOW

TJ BODY

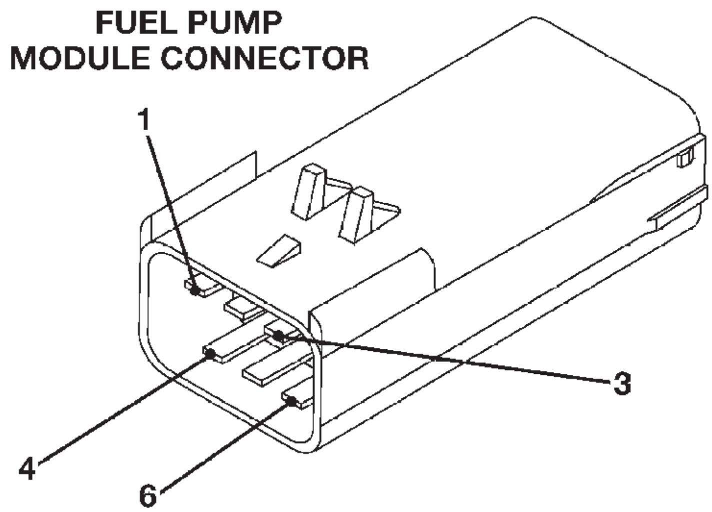


CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80b6f0e8

FIG. 1

XJ BODY

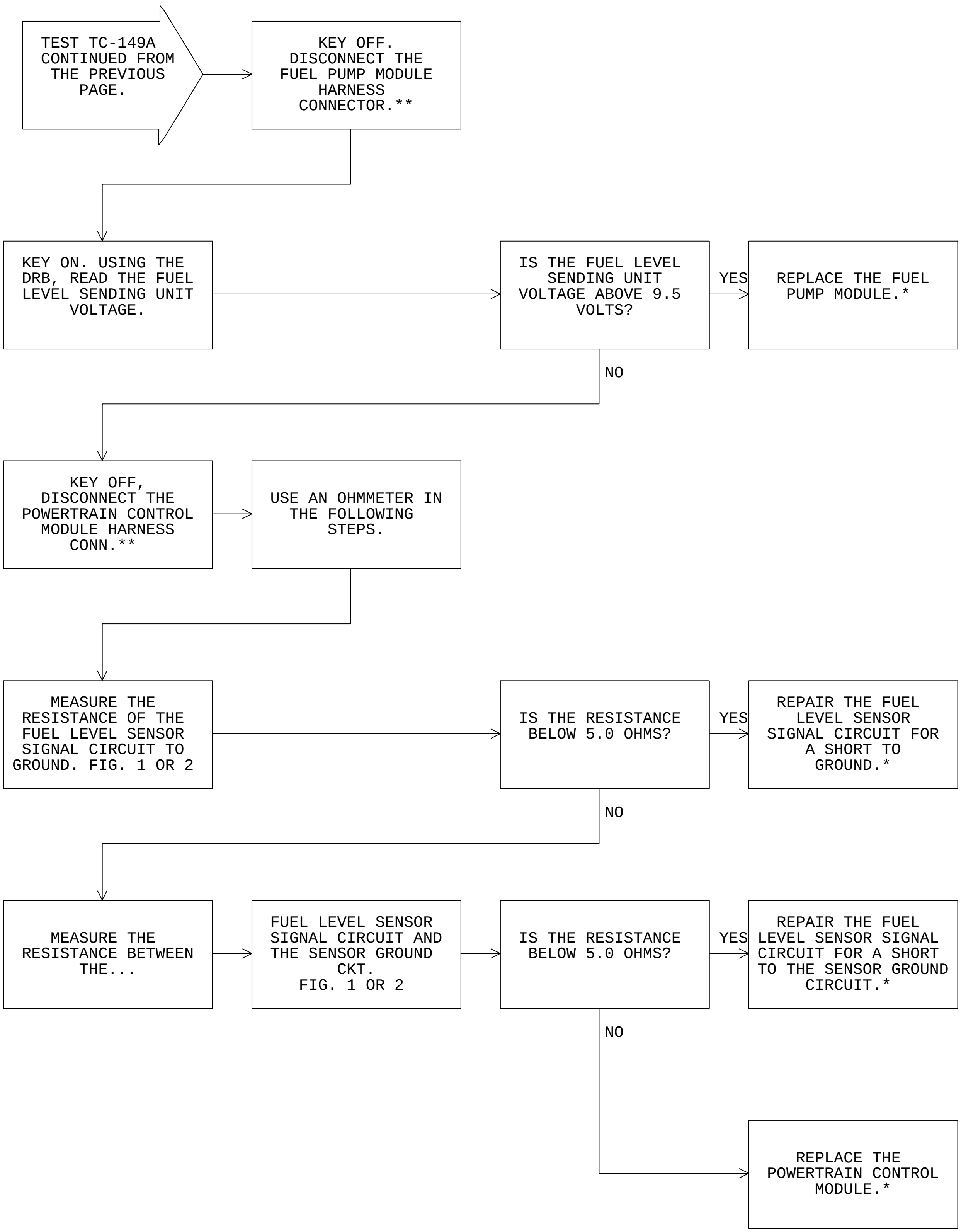


CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80aafa16

FIG. 2

TEST TC-149A CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO LOW



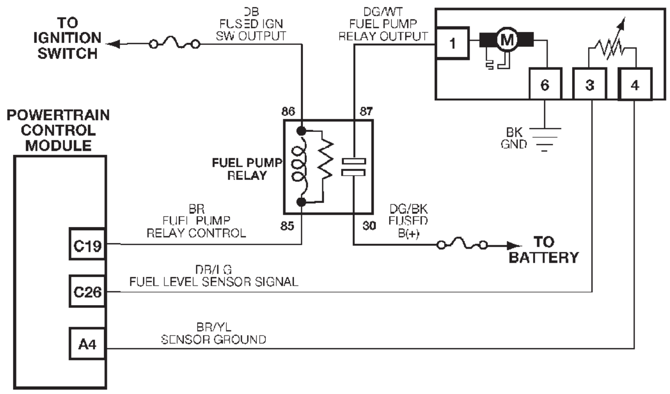
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-150A — REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

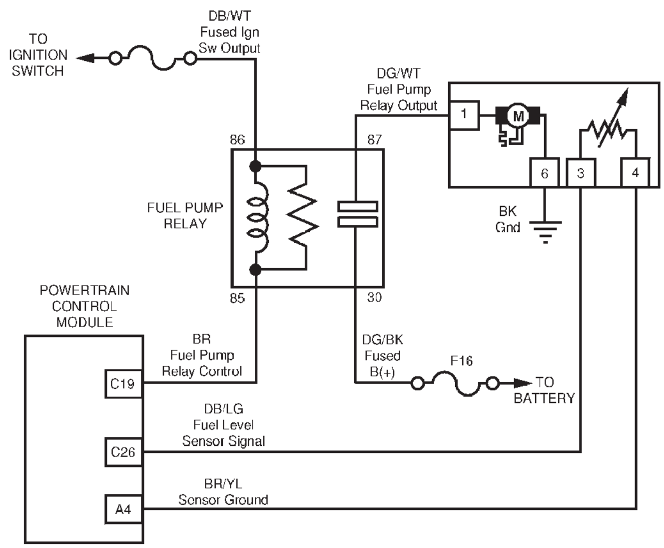
Perform TEST DTC Before Proceeding

TJ BODY



80b6f0ce

XJ BODY



80b6f0d4

TJ/XJ BODY

Name of code: Fuel Level Sending Unit Volts Too High

When monitored: Ignition on and battery voltage above 10.4 volts.

Set condition: The fuel level sensor signal circuit voltage at the PCM goes above 9.9 volts for 90 seconds.

Theory of operation: The fuel sending unit provides a variable voltage signal to the powertrain control module to indicate fuel level. The purpose of this feature is to prevent false setting of misfire and fuel system monitor codes when the vehicle is operating at low fuel levels. When the fault is detected by the PCM, the PCM will default the fuel gauge to an empty reading. This will alert the driver of a malfunction in the fuel level sending unit system.

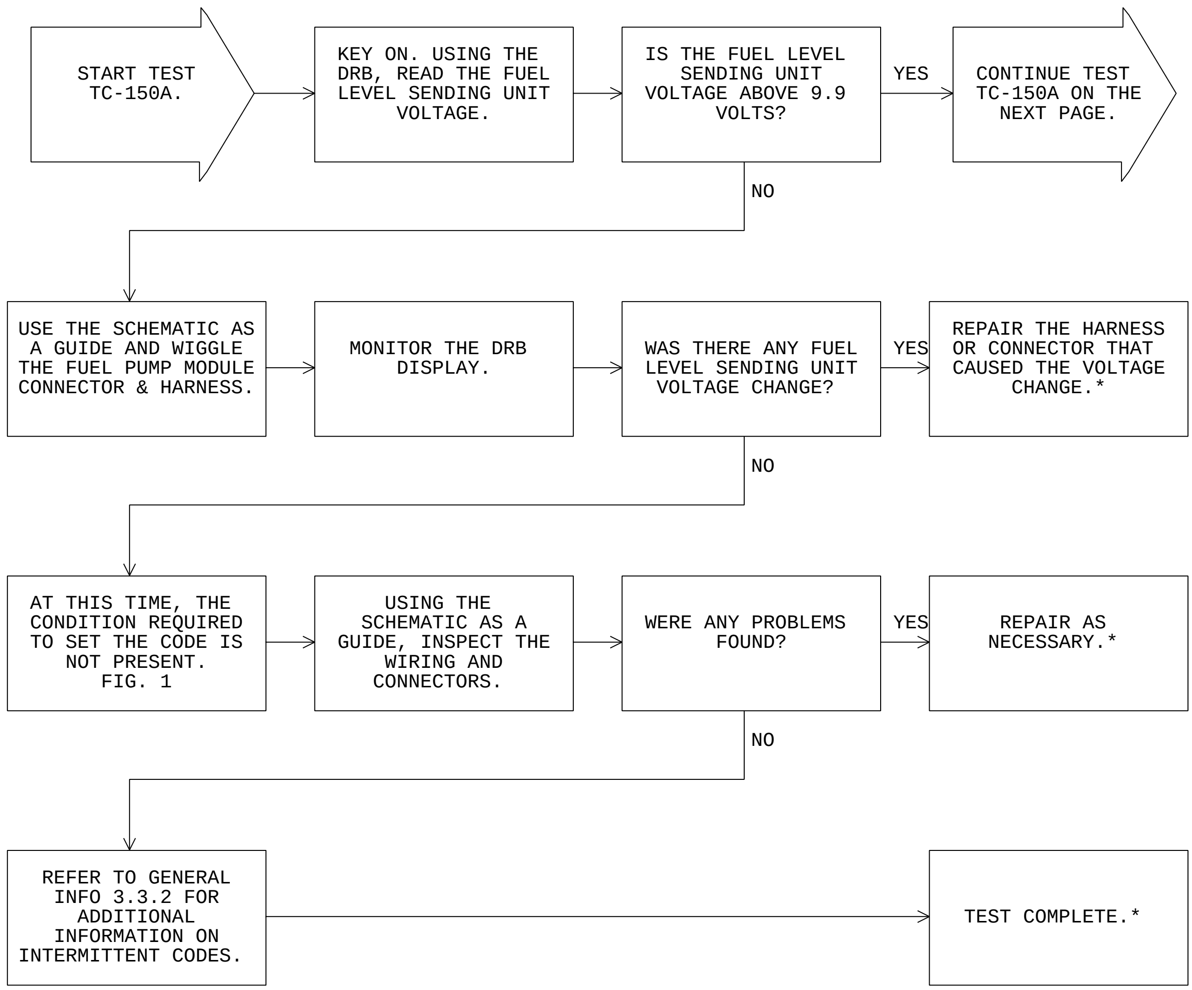
Possible causes:
> Open sensor signal circuit
> Open sensor ground circuit
> Fuel level sending unit failure
> Powertrain control module failure
> Connector wires
> Connector terminals

FIG. 1

80b7700b

TEST TC-150A REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

Perform TEST DTC Before Proceeding



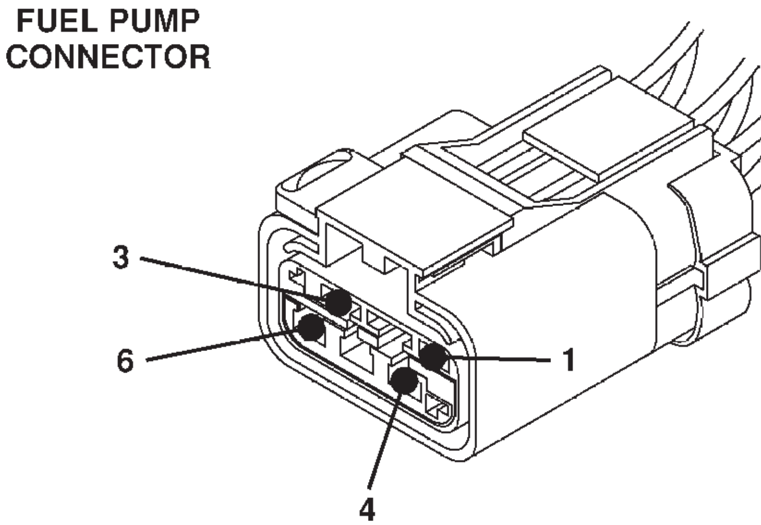
*Perform Verification TEST VER-2A.

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

TROUBLE CODE TESTS

TEST TC-150A	CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

TJ BODY

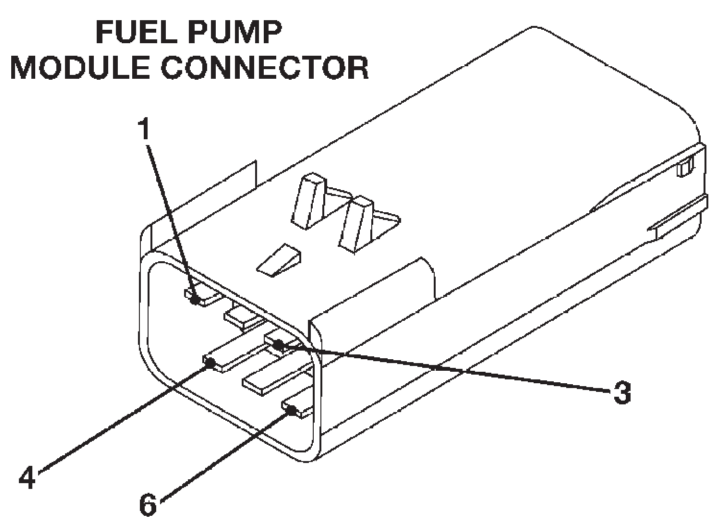


CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80b6f0e8

FIG. 1

XJ BODY

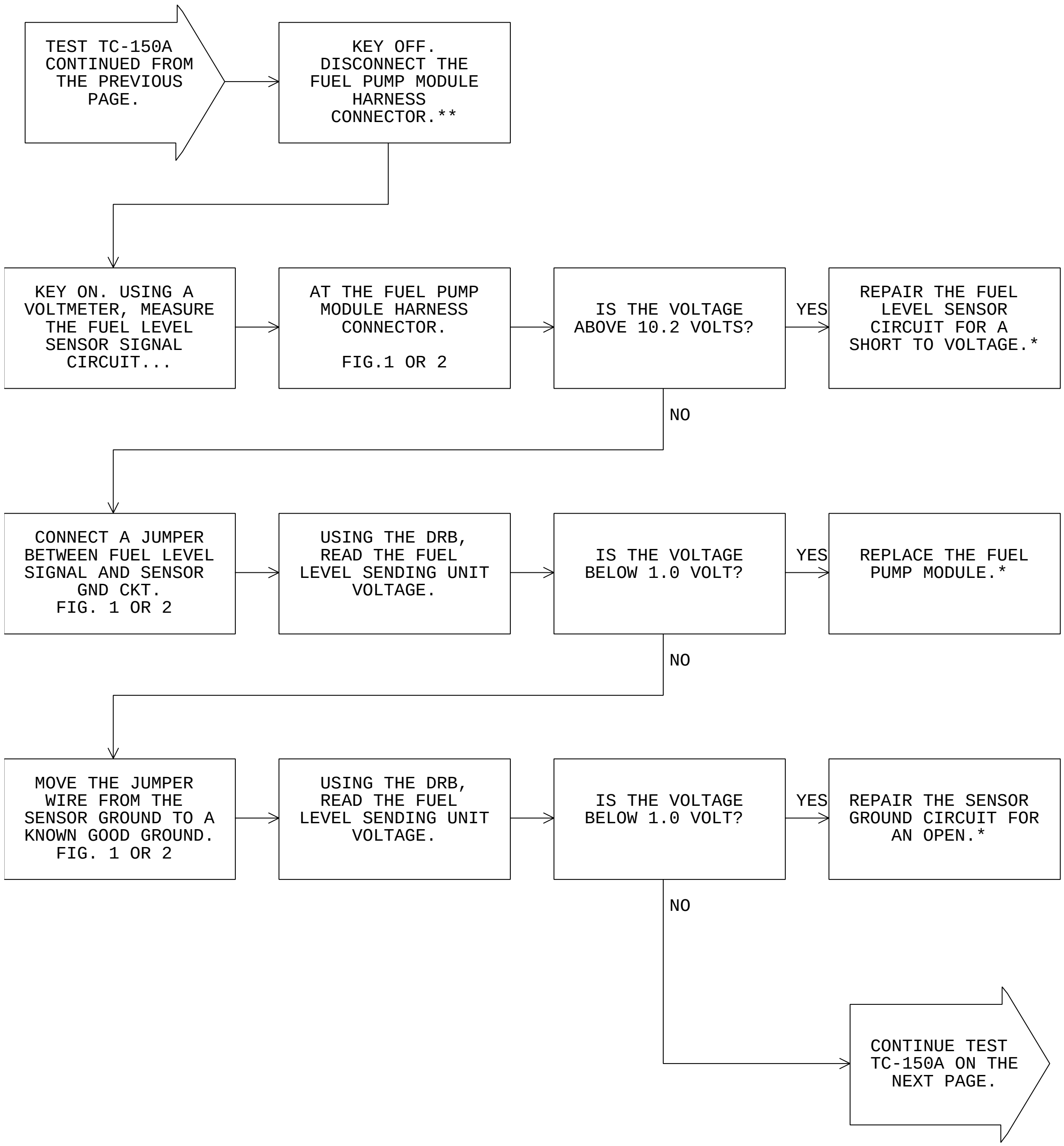


CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80aafa16

FIG. 2

TEST TC-150A — CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

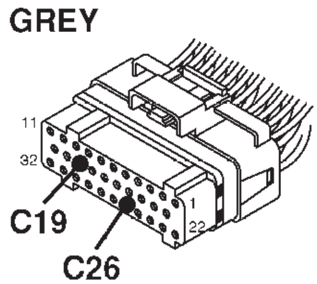


**Perform Verification TEST VER-2A.*

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

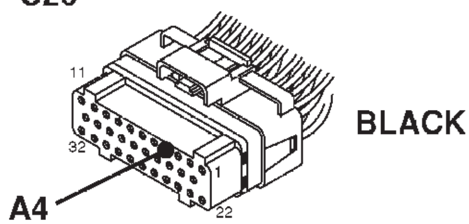
TEST TC-150A — CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

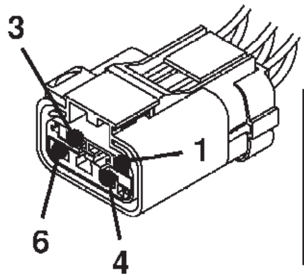
TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C19	BR	FUEL PUMP RELAY CONTROL
C26	DB/LG	FUEL LEVEL SENSOR SIGNAL





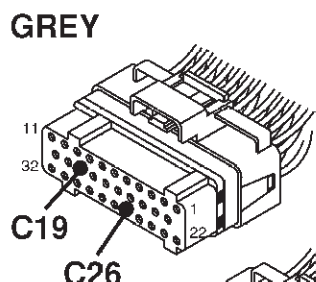
FUEL PUMP CONNECTOR

CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (GAUGE)
4	BR/YL	GROUND (GAUGE)
6	BK	GROUND (PUMP)

80b76eee

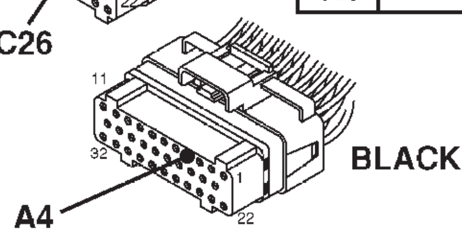
FIG. 1

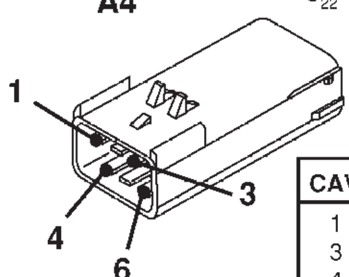
XJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C19	BR	FUEL PUMP RELAY CONTROL
C26	DB/LG	FUEL LEVEL SENSOR SIGNAL





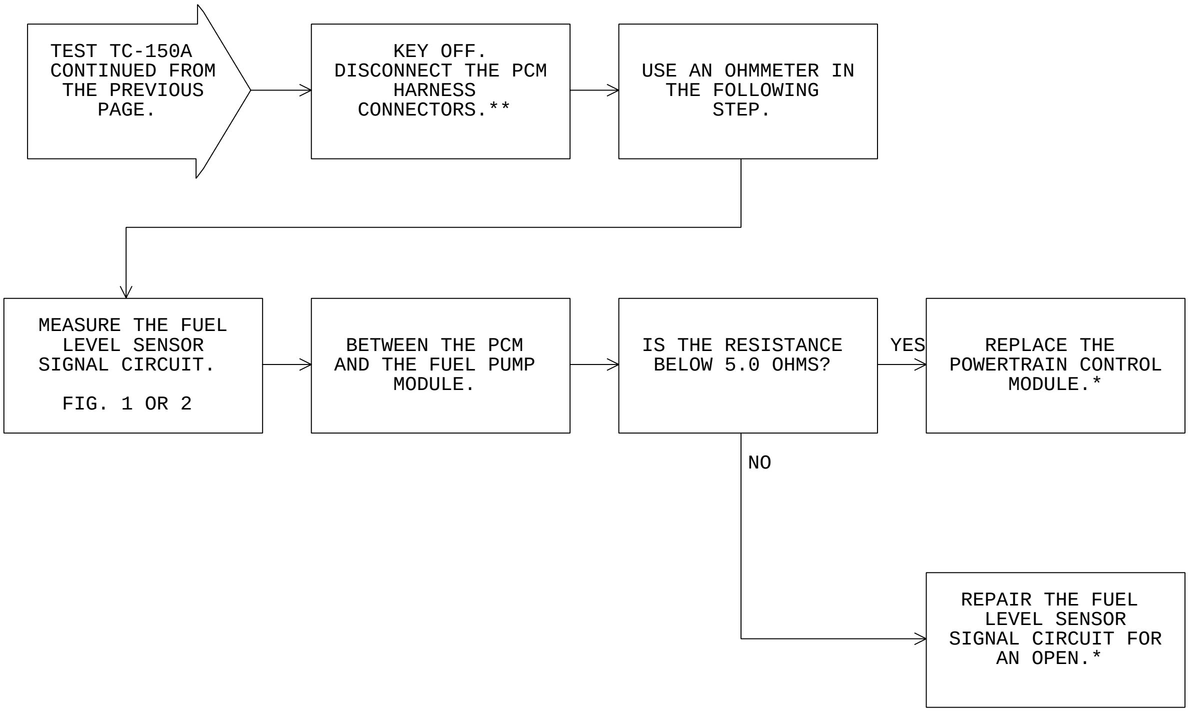
FUEL PUMP CONNECTOR

CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (GAUGE)
4	BR/YL	GROUND (GAUGE)
6	BK	GROUND (PUMP)

80b76ef0

FIG. 2

TEST TC-150A CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT VOLTS TOO HIGH



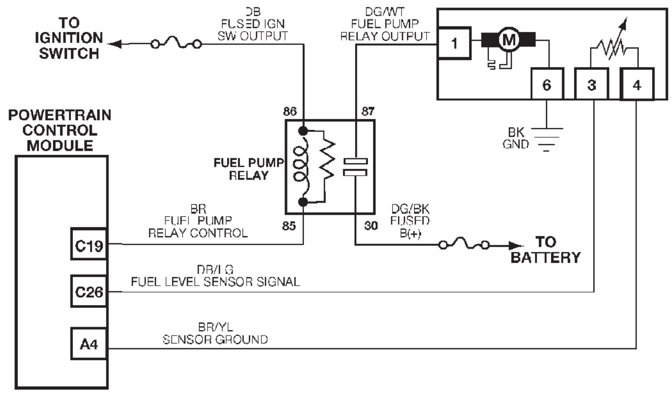
***Perform Verification TEST VER-2A.**

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

TEST TC-151A REPAIRING - FUEL LEVEL SENDING UNIT NO CHANGE OVER TIME

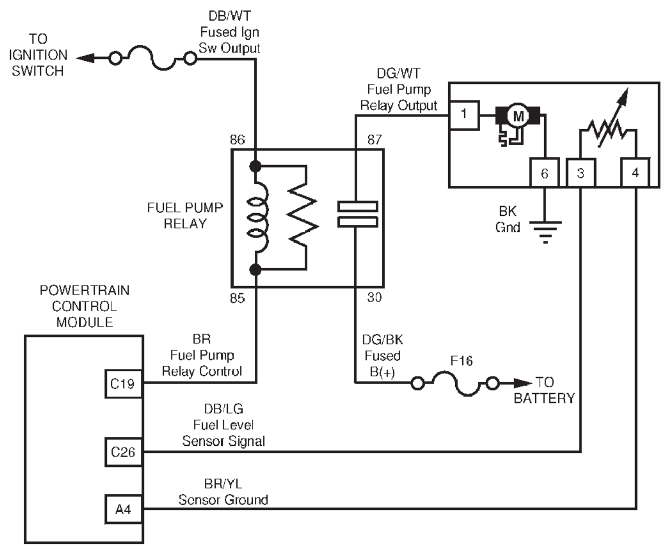
Perform TEST DTC Before Proceeding

TJ BODY



80b6f0ce

XJ BODY



80b6f0d4

TJ/XJ BODY

Name of code: Fuel Level Sending Unit No Change Over Time

When monitored: Ignition on, vehicle running at normal operating temperature.

Set condition: The PCM sees the fuel level between 9.4 and 9.9 for 4.5 minutes.

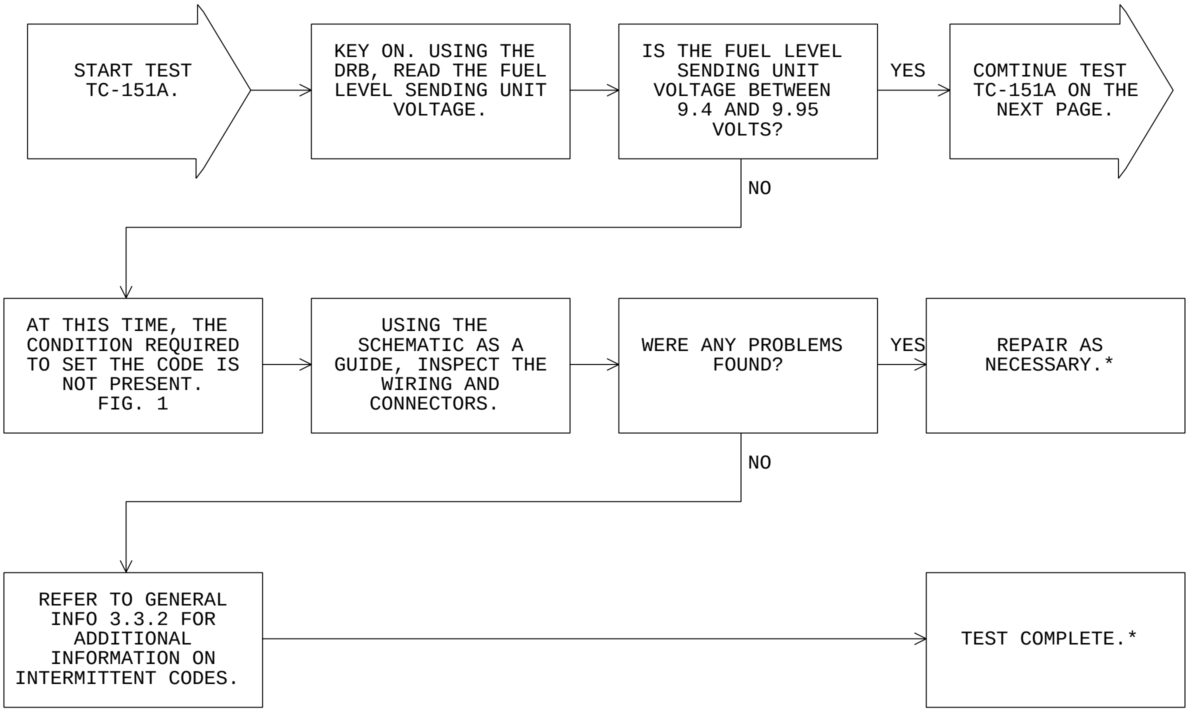
Theory of operation: The fuel sending unit provides a variable voltage signal to the powertrain control module to indicate fuel level. The purpose of this feature is to prevent false setting of misfire and fuel system monitor codes when the vehicle is operating at low fuel levels. When the fault is detected by the PCM, the PCM will default the fuel gauge to an empty reading. This will alert the driver of a malfunction in the fuel level sending unit system.

Possible causes:
> Sensor signal circuit high resistance
> Fuel level sending unit failure
> Connector wires
> Connector terminals

FIG. 1 80b6f010

TEST TC-151A | REPAIRING - FUEL LEVEL SENDING UNIT NO CHANGE OVER TIME

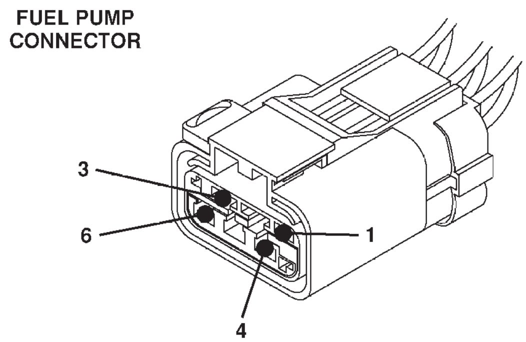
Perform TEST DTC Before Proceeding



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

TEST TC-151A — CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT SENDING UNIT NO CHANGE OVER TIME

TJ BODY

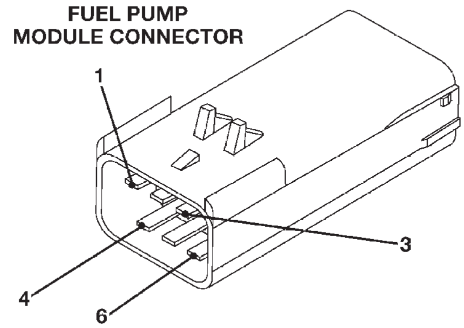


CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80b6f0e8

FIG. 1

XJ BODY

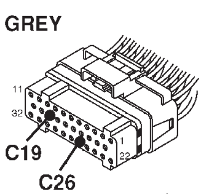


CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80aafa16

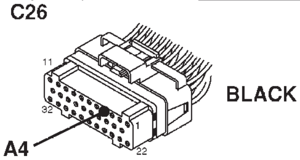
FIG. 2

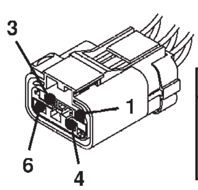
TJ BODY



POWERTRAIN CONTROL MODULE
GREY CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C19	BR	FUEL PUMP RELAY CONTROL
C26	DB/LG	FUEL LEVEL SENSOR SIGNAL





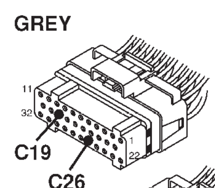
FUEL PUMP
CONNECTOR

CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (GAUGE)
4	BR/YL	GROUND (GAUGE)
6	BK	GROUND (PUMP)

80b76eee

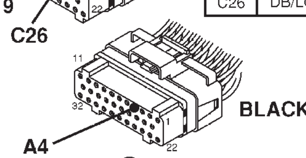
FIG. 3

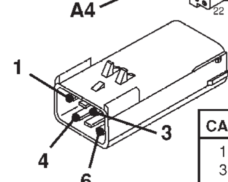
XJ BODY



POWERTRAIN CONTROL MODULE
GREY CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C19	BR	FUEL PUMP RELAY CONTROL
C26	DB/LG	FUEL LEVEL SENSOR SIGNAL





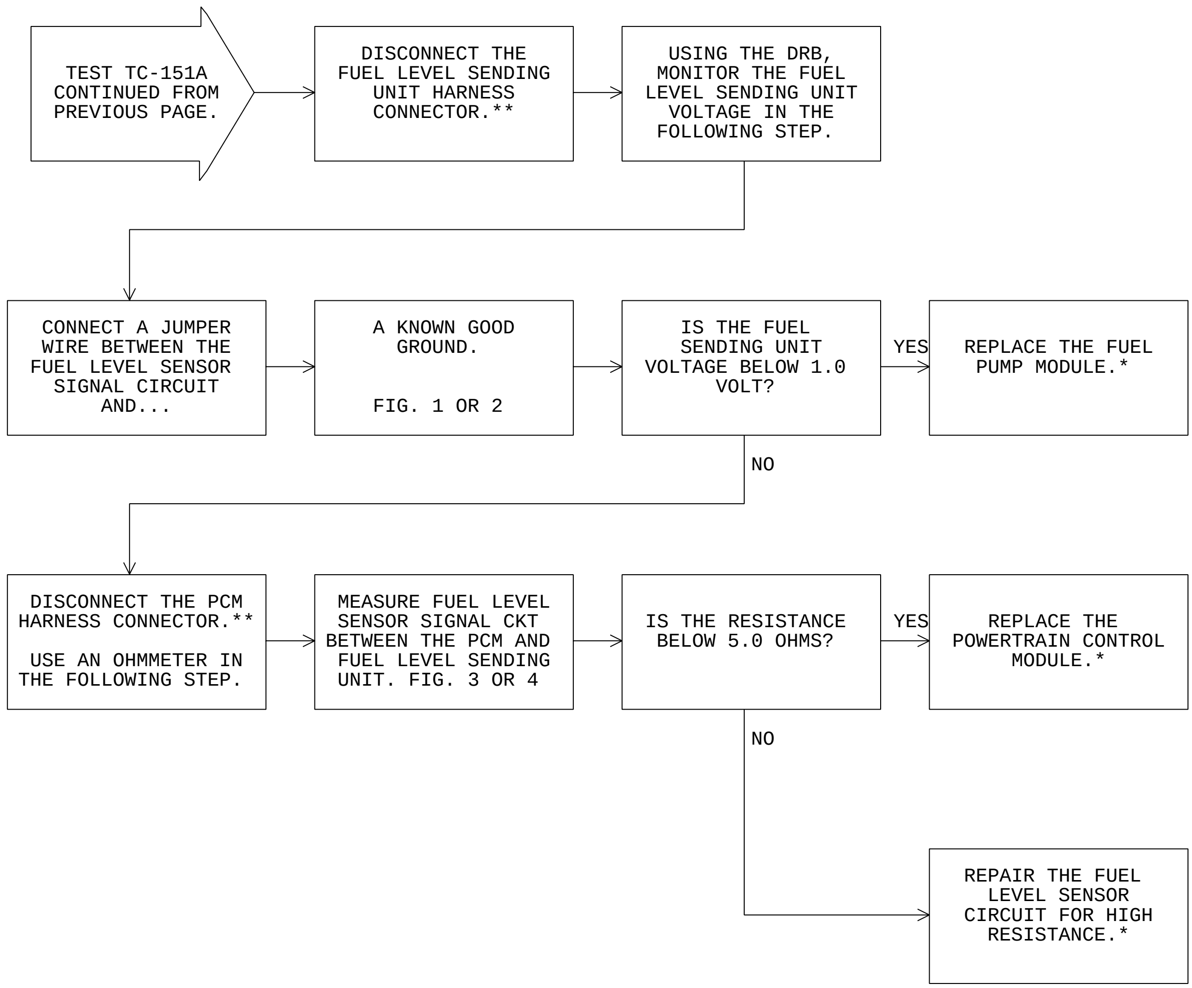
FUEL PUMP
CONNECTOR

CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (GAUGE)
4	BR/YL	GROUND (GAUGE)
6	BK	GROUND (PUMP)

80b76ef0

FIG. 4

TEST TC-151A — CONTINUED - REPAIRING - FUEL LEVEL SENDING UNIT SENDING UNIT NO CHANGE OVER TIME



*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-153A	REPAIRING - BATTERY TEMP SENSOR VOLTAGE TOO LOW/TOO HIGH

Perform TEST DTC Before Proceeding

Name of code: Battery Temp Sensor Voltage Either Too High or Too Low

When monitored: With the ignition key on.

Set condition: The PCM senses the voltage from the BTS to be either below 0.5 volts or above 4.9 volts for 3 seconds.

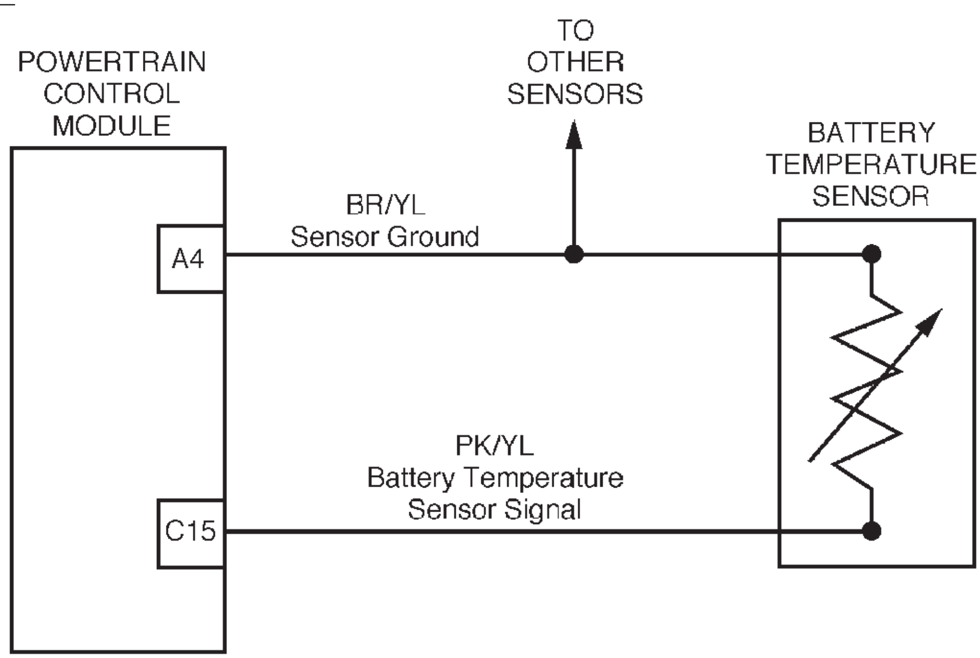
Theory of operation: The battery temp sensor voltage is used by the PCM to determine what the charging system goal should be. The PCM uses that goal to determine the charging output level. The battery temp sensor is external to the PCM.

Possible causes:
> Battery temp sensor failure
> Open circuit in battery temp sensor signal circuit
> Short circuit in battery temp sensor signal circuit
> PCM failure
> Connector terminals
> Connector wires

805e2a55

FIG. 1

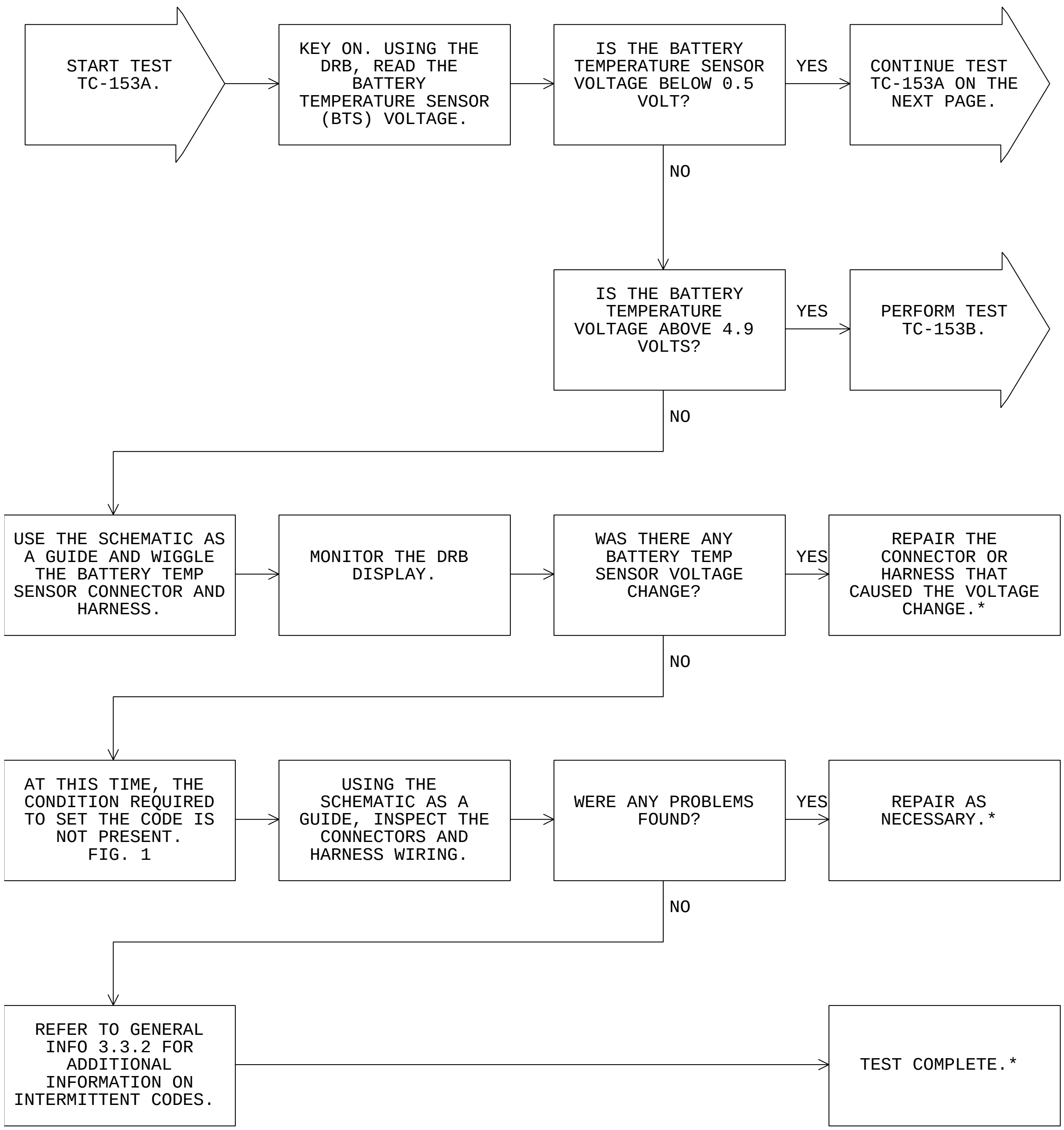
TJ/XJ BODY



80b118ad

TEST TC-153A REPAIRING - BATTERY TEMP SENSOR VOLTAGE TOO LOW/TOO HIGH

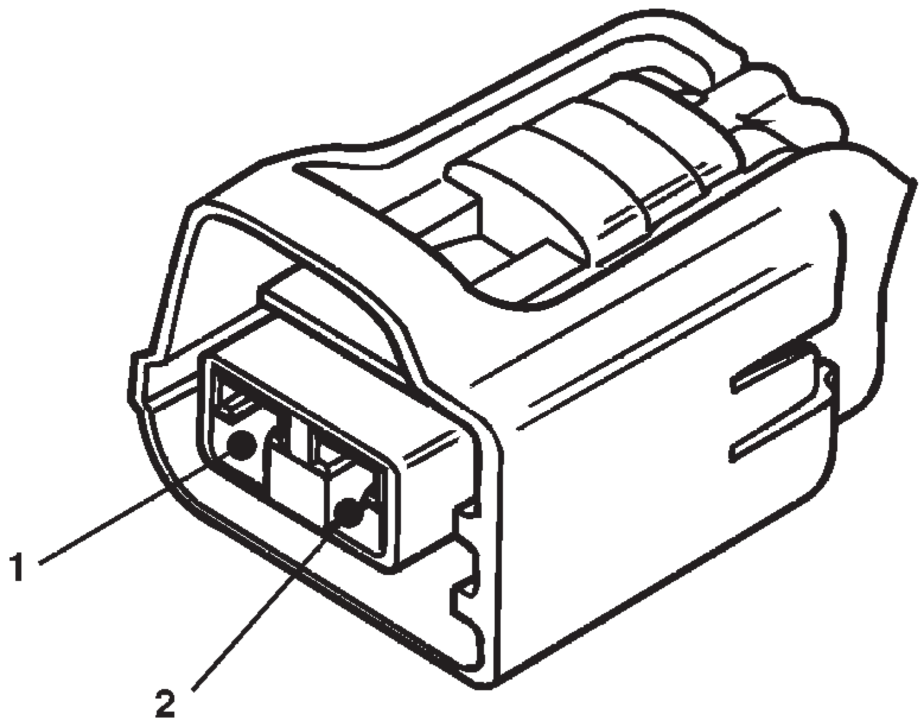
Perform TEST DTC Before Proceeding



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

TEST TC-153A	CONTINUED - REPAIRING - BATTERY TEMP SENSOR VOLTAGE TOO LOW/TOO HIGH

TJ/XJ BODY



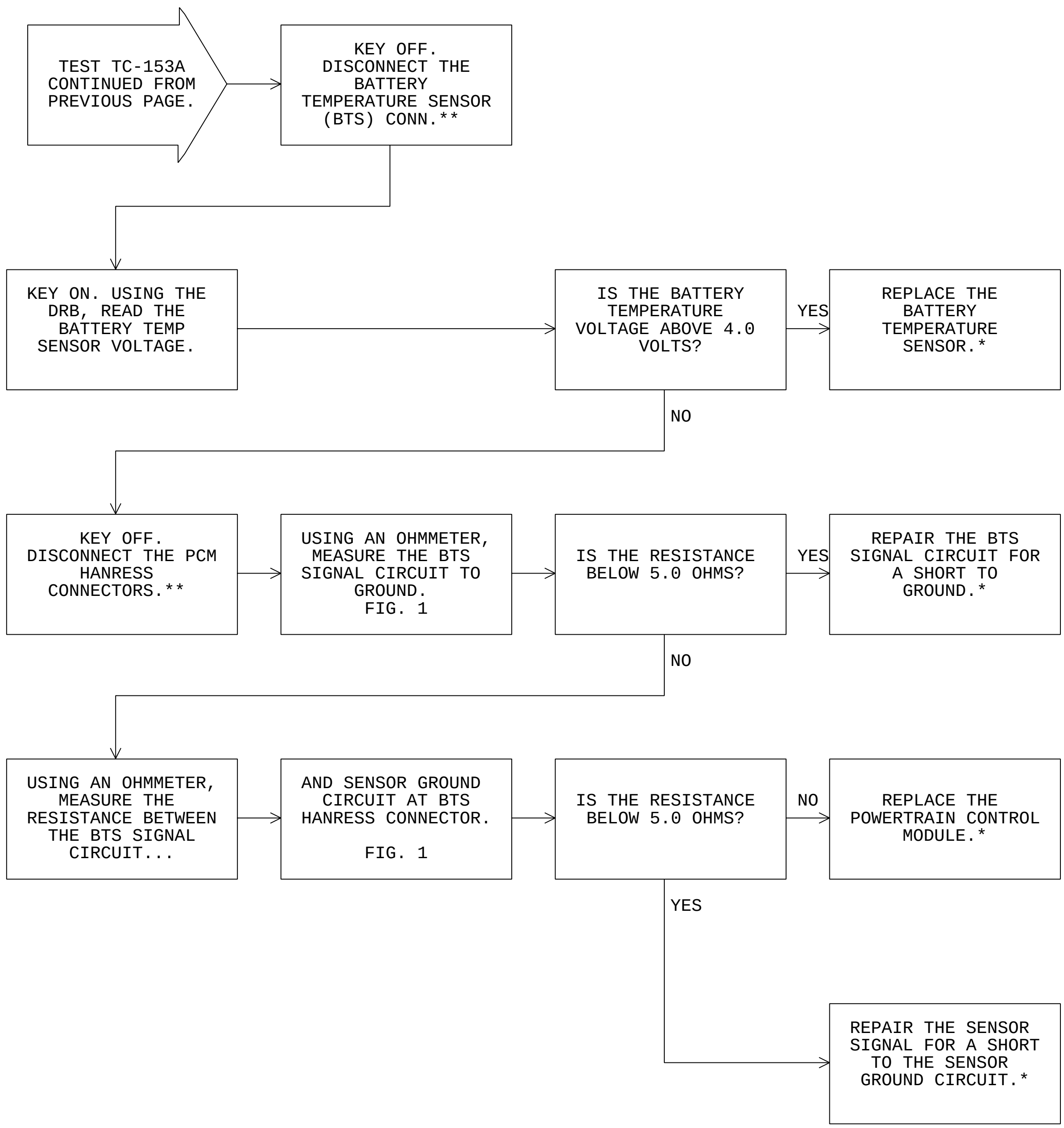
CAV	COLOR	FUNCTION
1	PK/YL	BATTERY TEMP SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

80a5348d

FIG. 1

TEST TC-153A

CONTINUED - REPAIRING - BATTERY TEMP SENSOR VOLTAGE TOO LOW/TOO HIGH



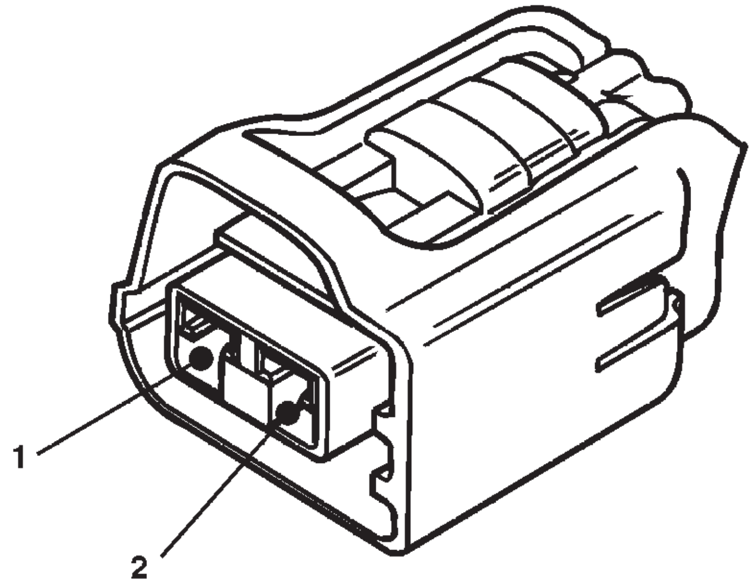
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-153B — REPAIRING - BATTERY TEMP SENSOR VOLTAGE TOO LOW/TOO HIGH

Perform TEST TC-153A Before Proceeding

TJ/XJ BODY

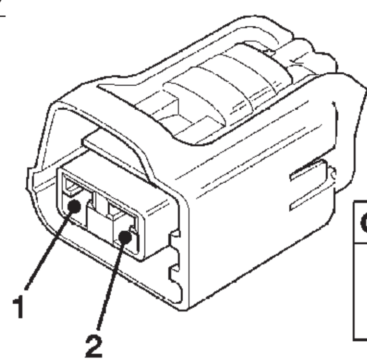


CAV	COLOR	FUNCTION
1	PK/YL	BATTERY TEMP SENSOR SIGNAL
2	BR/YL	SENSOR GROUND

80a5348d

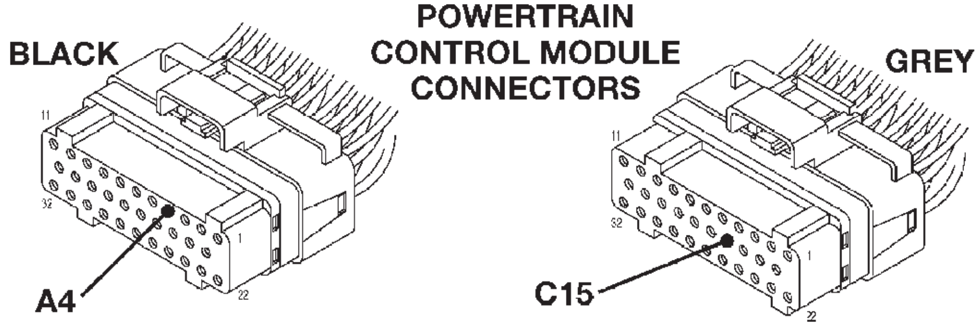
FIG. 1

TJ/XJ BODY



BATTERY TEMPERATURE SENSOR CONNECTOR

CAV	COLOR	FUNCTION
1	PK/YL	Battery Temp Sensor Signal
2	BR/YL	Sensor Ground



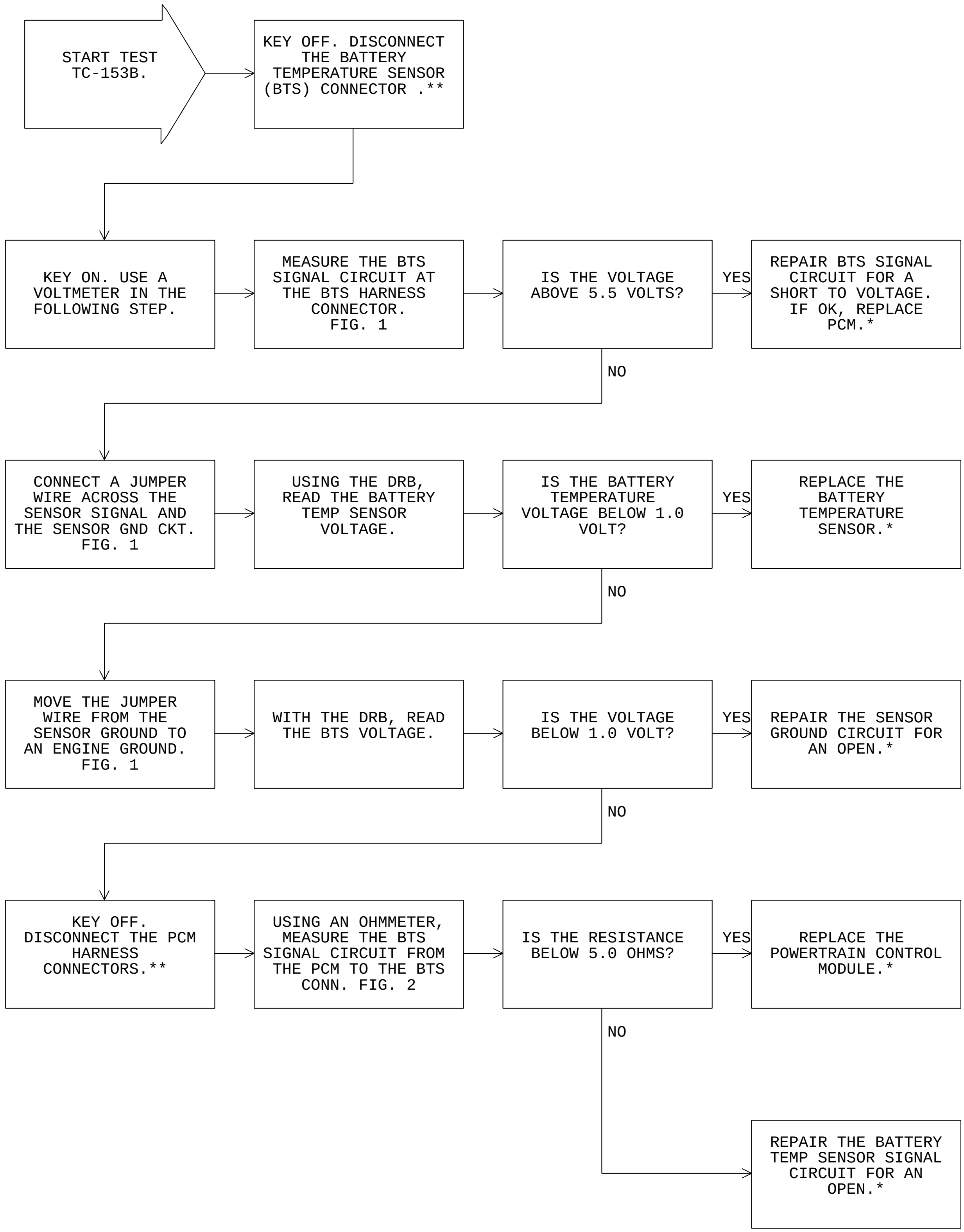
CAV	COLOR	FUNCTION
A4	BR/YL	Sensor Ground
C15	PK/YL	BTS Signal

80a9b344

FIG. 2

TEST TC-153B — REPAIRING - BATTERY TEMP SENSOR VOLTAGE TOO LOW/TOO HIGH

Perform TEST TC-153A Before Proceeding



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

TEST TC-155A REPAIRING - 1/1 O2 SENSOR SHORTED TO GROUND

Perform TEST DTC Before Proceeding

Name of Code: O2S Voltage Shorted To Ground

When monitored: With engine coolant temperature above 170°F on the previous key on, after a cold start, engine coolant below 98°F, and ambient/battery sensor reading within 27°F of engine coolant.

Set condition: The oxygen sensor signal voltage is below 0.156 volts for 28 seconds after starting engine.

Theory of operation: The oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from this 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 signal from this 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 low, approximately 0.1 volt.

Possible causes:
- > Sensor output wire shorted to ground
- > Dirty/wet connection causing voltage tracking in connector
- > O2 sensor failure
- > Powertrain control module failure
- > Connector terminals
- > Connector wires

80b01cfc

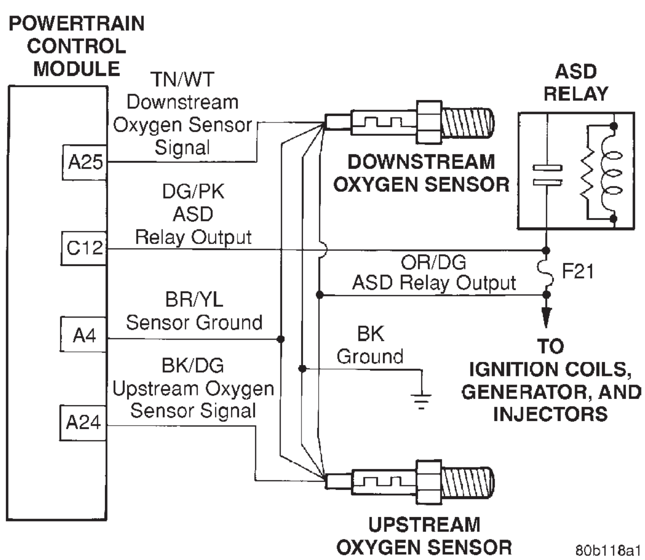
FIG. 1

JTEC 02 SENSOR CONFIGURATION

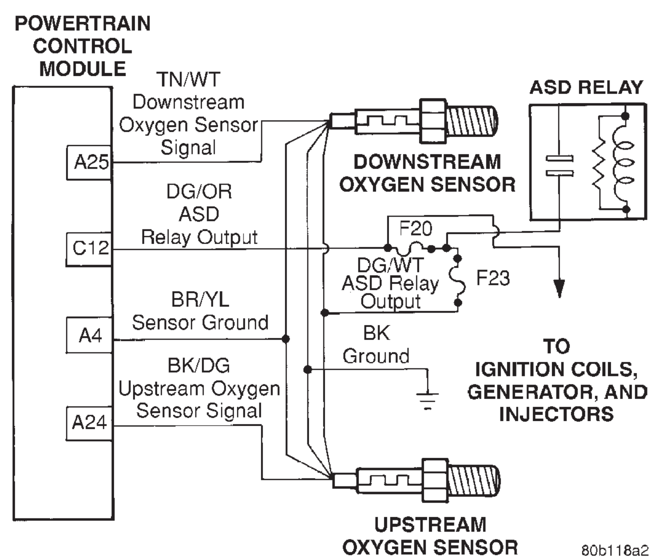
TJ2.5L	1/1	UPSTREAM	XJ2.5L	1/1	UPSTREAM
TJ2.5L	1/2	DOWNSTREAM	XJ2.5L	1/2	DOWNSTREAM
TJ4.0L	1/1	UPSTREAM	XJ4.0L	1/1	UPSTREAM
TJ4.0L	1/2	DOWNSTREAM	XJ4.0L	1/2	DOWNSTREAM

80b76ec3

TJ BODY

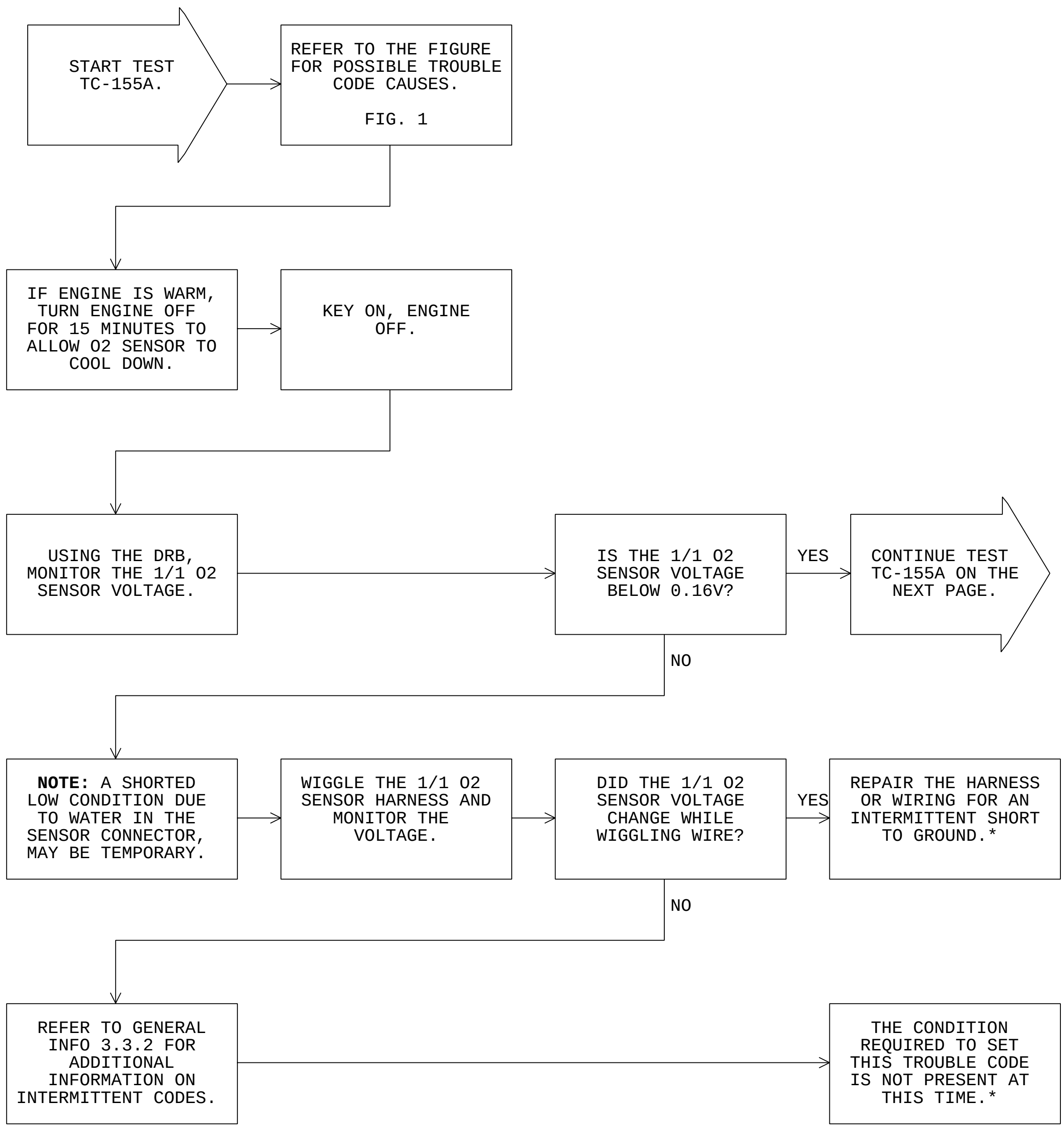


XJ BODY



TEST TC-155A REPAIRING - 1/1 O2 SENSOR SHORTED TO GROUND

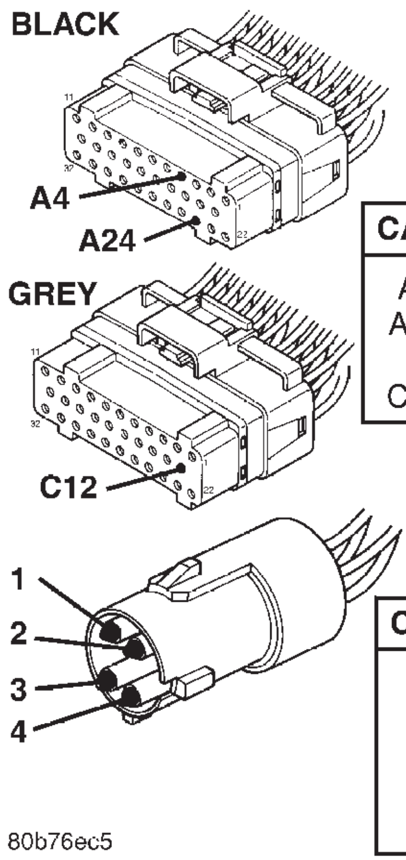
Perform TEST DTC Before Proceeding



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

TEST TC-155A | **CONTINUED - REPAIRING - 1/1 O2 SENSOR SHORTED TO GROUND**

TJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

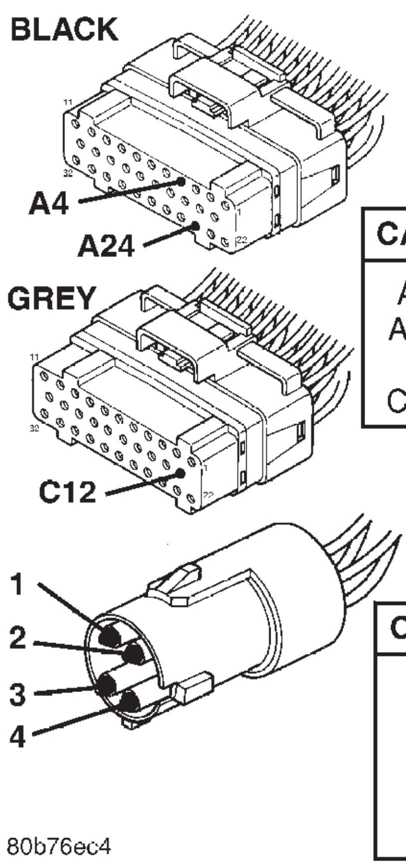
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 1

XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

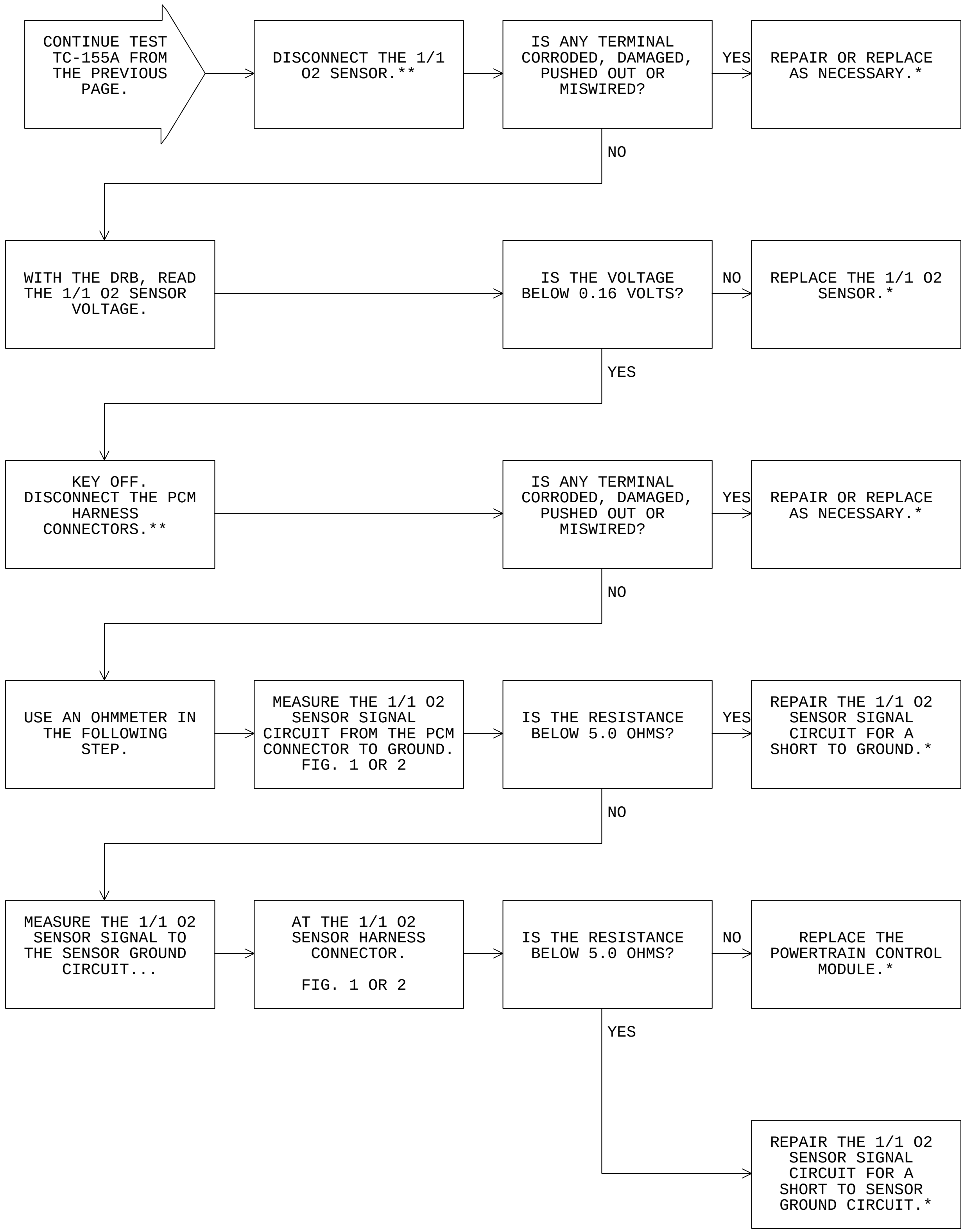
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 2

TEST TC-155A CONTINUED - REPAIRING - 1/1 O2 SENSOR SHORTED TO GROUND



*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST TC-156A REPAIRING - 1/2 O2 SENSOR SHORTED TO GROUND

Perform TEST DTC Before Proceeding

Name of code: Downstream O2S Voltage Shorted To Ground

When monitored: With engine coolant temperature above 170°F on the previous key on, after a cold start, engine coolant below 90°F, and ambient sensor reading within +/-59°F of engine coolant.

Set condition: The downstream oxygen sensor signal voltage is below 0.156 volt prior to O2 sensor heater test.

Theory of operation: The downstream oxygen sensor is a voltage generating device. The PCM receives exhaust gas information from this O2 sensor. The sensor detects exhaust gas content by a galcanic reaction within the sensor that produces a voltage. After measuring the amount of oxygen in the exhaust gases. Variations in the signals from this O2 sensor serve as an indicator of oxygen content.

Possible causes:
- Sensor output wire shorted to ground
- Dirty/wet connection causing voltage tracking in connector
- O2 sensor failure
- Powertrain control module failure
- Connector terminals/wires

80a5571b

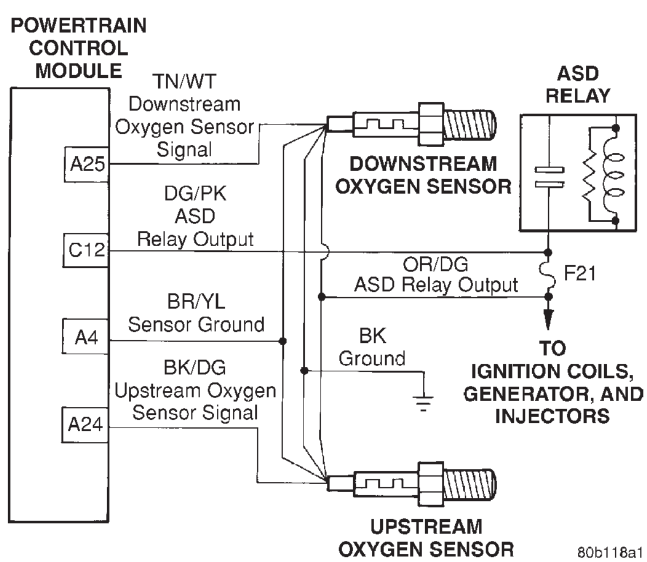
FIG. 1

JTEC 02 SENSOR CONFIGURATION

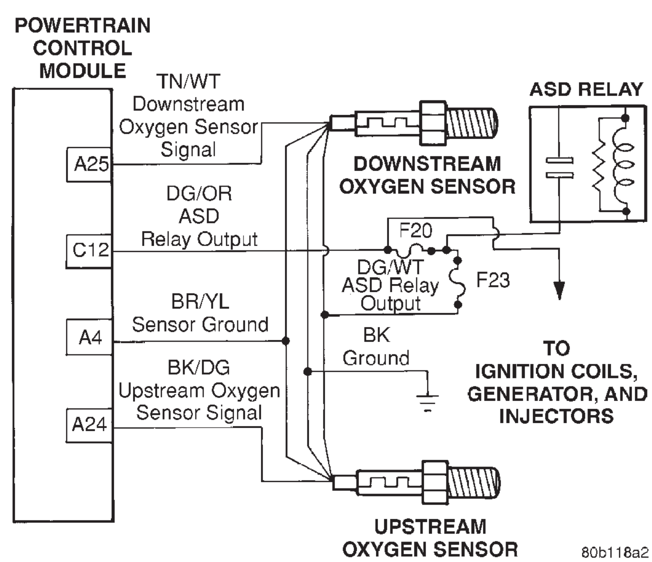
TJ2.5L	1/1	UPSTREAM	XJ2.5L	1/1	UPSTREAM
TJ2.5L	1/2	DOWNSTREAM	XJ2.5L	1/2	DOWNSTREAM
TJ4.0L	1/1	UPSTREAM	XJ4.0L	1/1	UPSTREAM
TJ4.0L	1/2	DOWNSTREAM	XJ4.0L	1/2	DOWNSTREAM

80b76ec3

TJ BODY

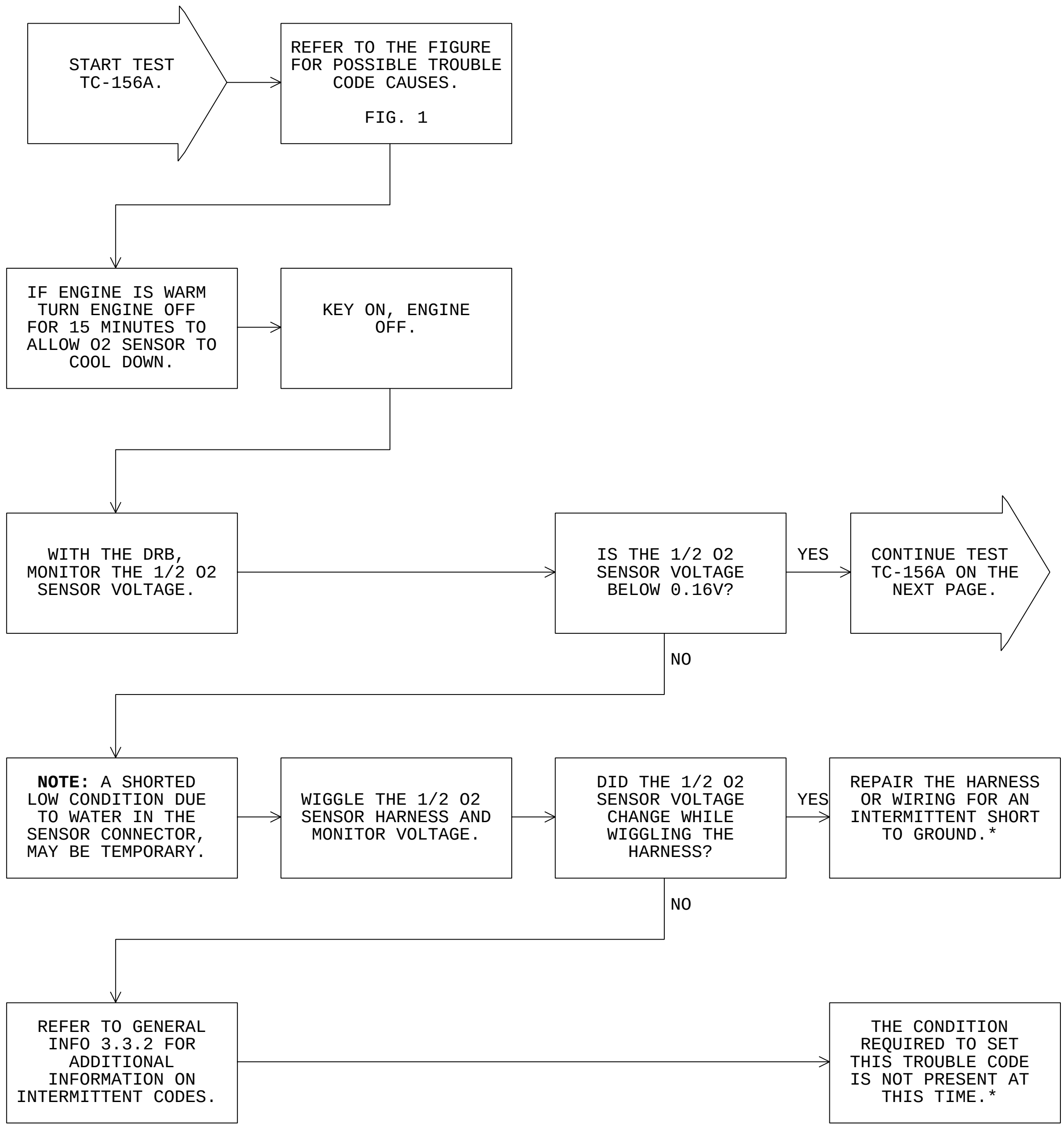


XJ BODY



TEST TC-156A REPAIRING - 1/2 O2 SENSOR SHORTED TO GROUND

Perform TEST DTC Before Proceeding

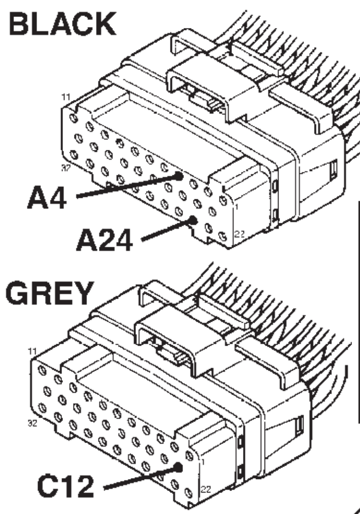


****Perform Verification TEST VER-2A.***	***Check connectors - Clean / repair as necessary.*

TROUBLE CODE TESTS

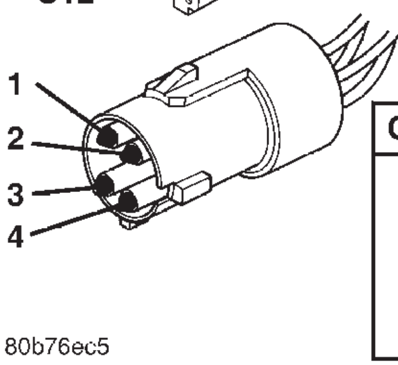
TEST TC-156A	CONTINUED - REPAIRING - 1/2 O2 SENSOR SHORTED TO GROUND

TJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

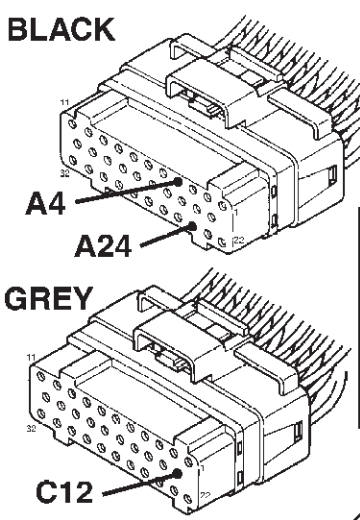


UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

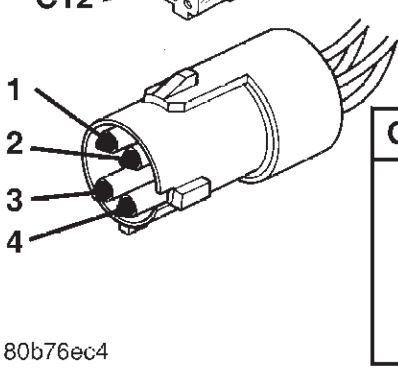
FIG. 1

XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

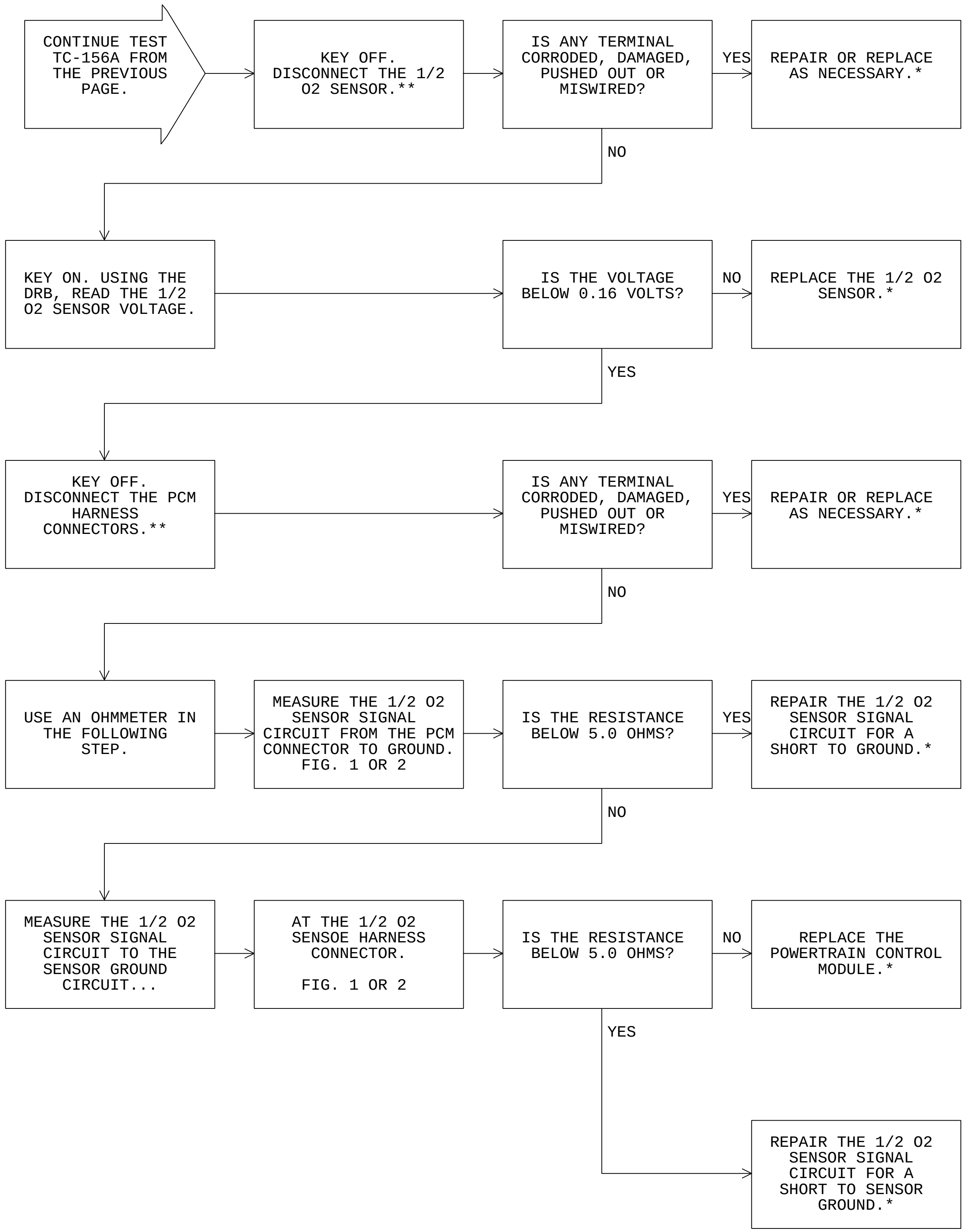


UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 2

TEST TC-156A CONTINUED - REPAIRING - 1/2 O2 SENSOR SHORTED TO GROUND



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

TEST TC-157A	REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST DTC Before Proceeding

Name of code: Intermittent Loss of CMP or CKP

When Monitored: Engine running or cranking.

Set Condition: When the failure counter reaches 96 for 2 consecutive trips.

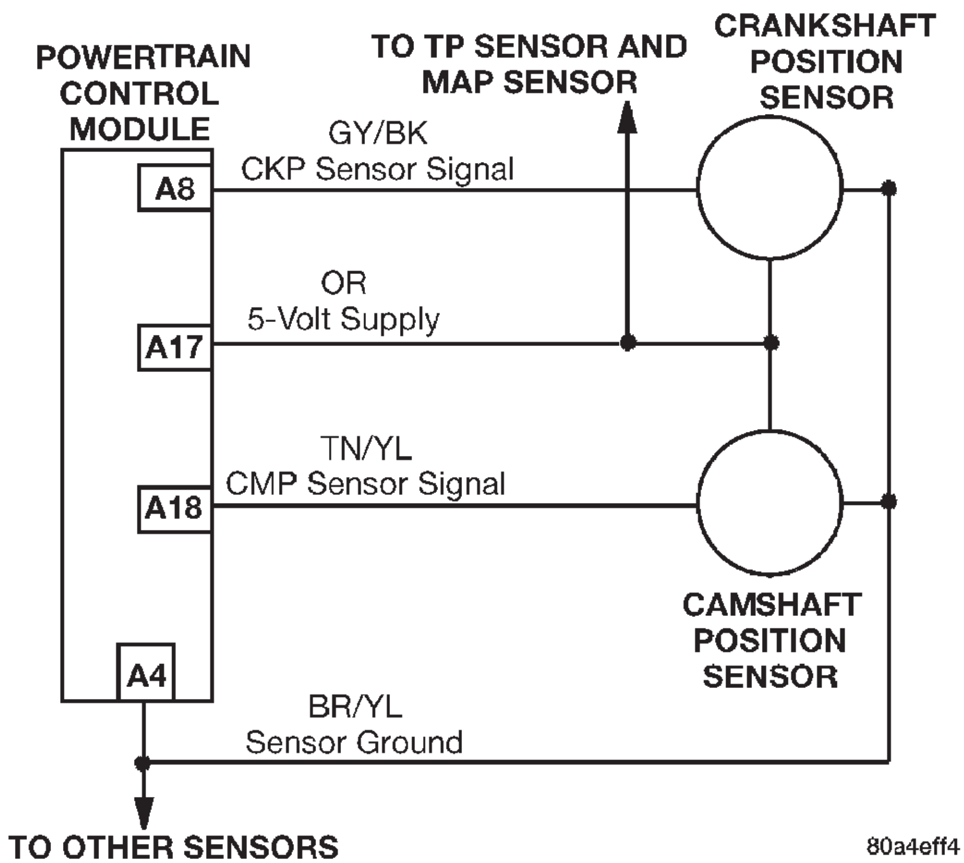
Theory of operation: A failure counter is incremented whenever the correct number of crank signals is not seen between two cam signals. A bad trip is stored when the failure counter reaches 96. Two consecutive bad trips are required to set the fault.

Possible Causes:
> Open or shorted 5 volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Excessive crankshaft sensor clearance
> Excessive camshaft sensor clearance
> Damaged crankshaft sensor rotating component
> Damaged camshaft sensor rotating component
> Failed sensor
> Failed PCM

80a5574d

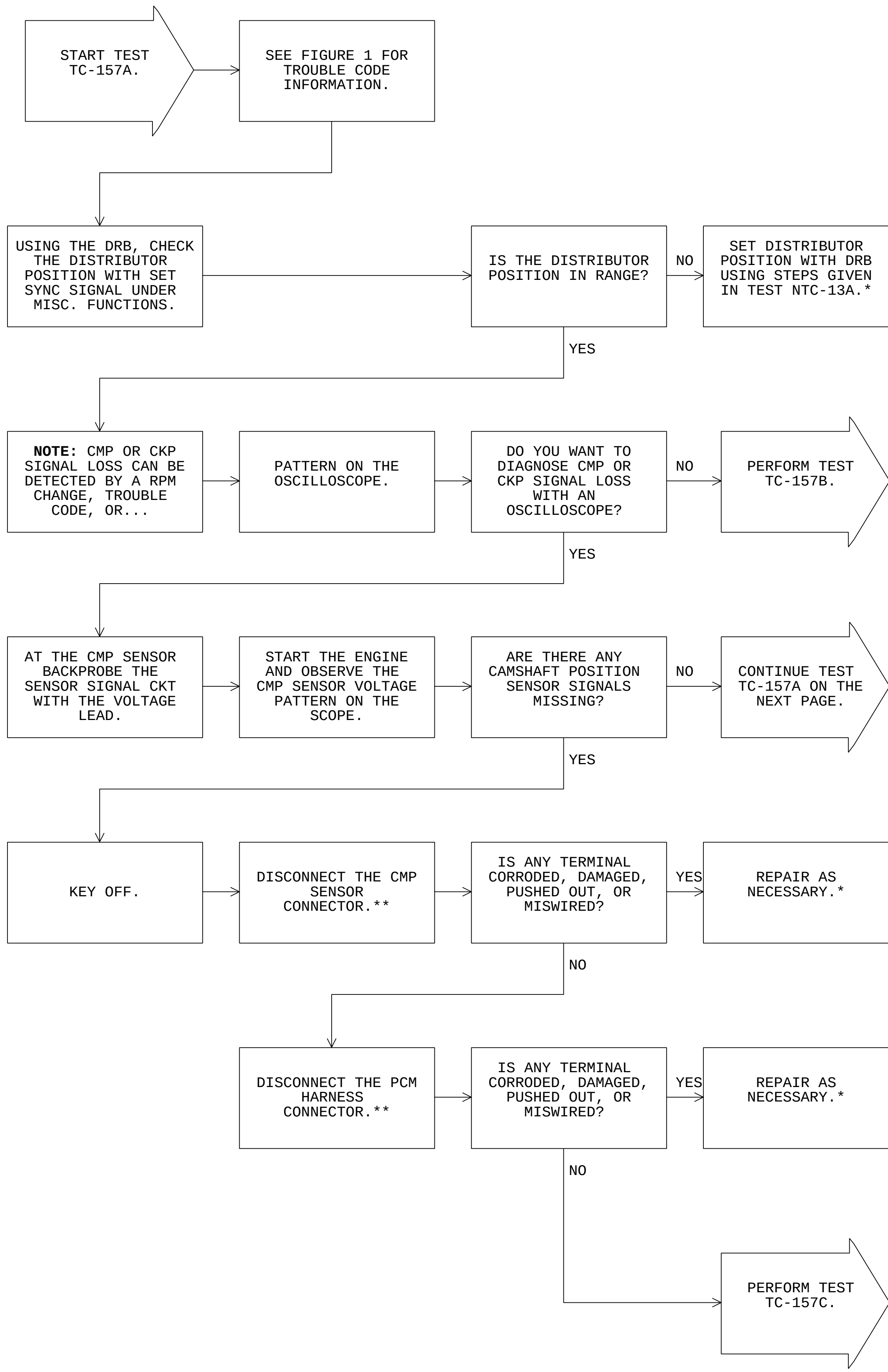
FIG. 1

TJ/XJ BODY



TEST TC-157A REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST DTC Before Proceeding

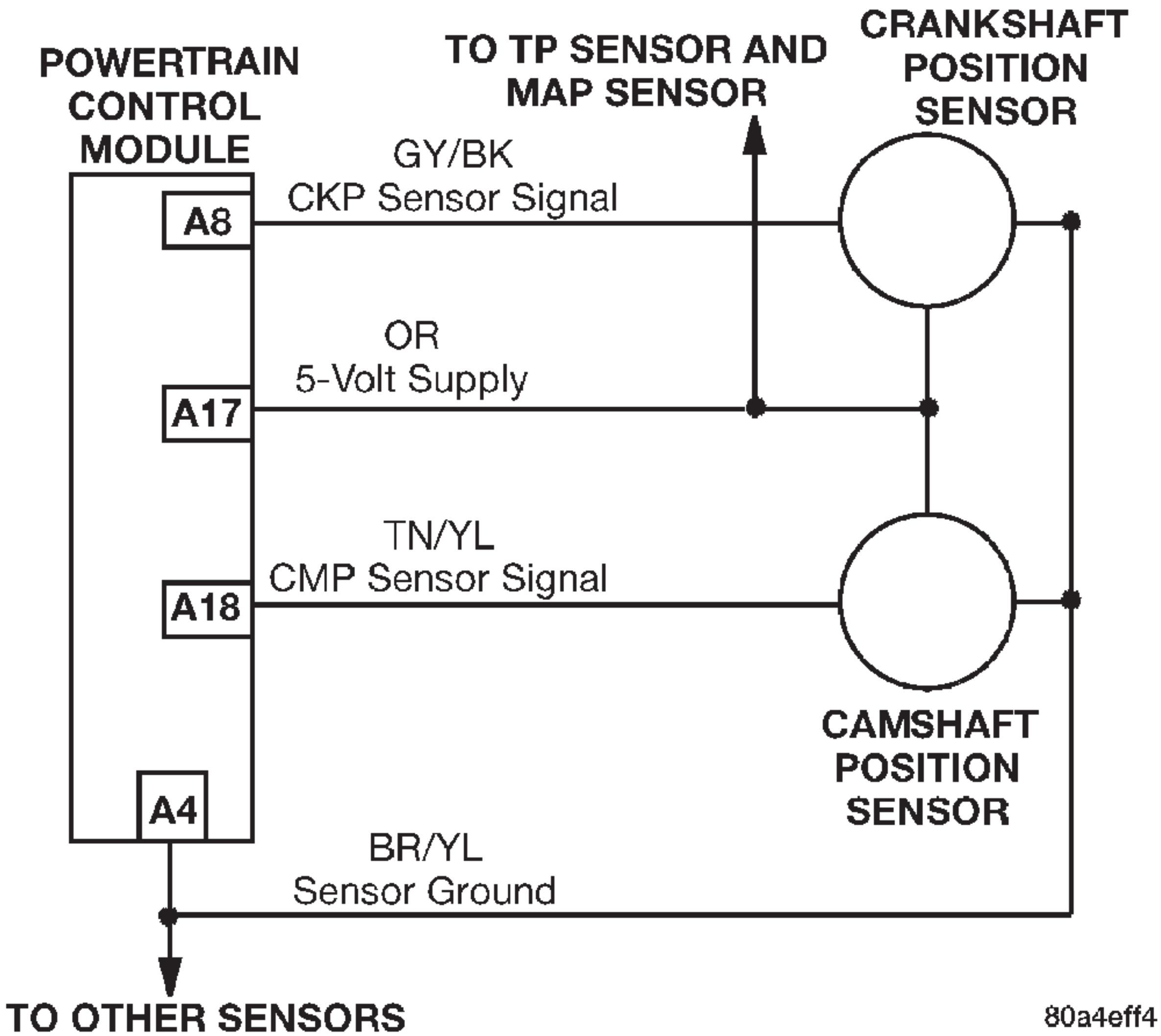


*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

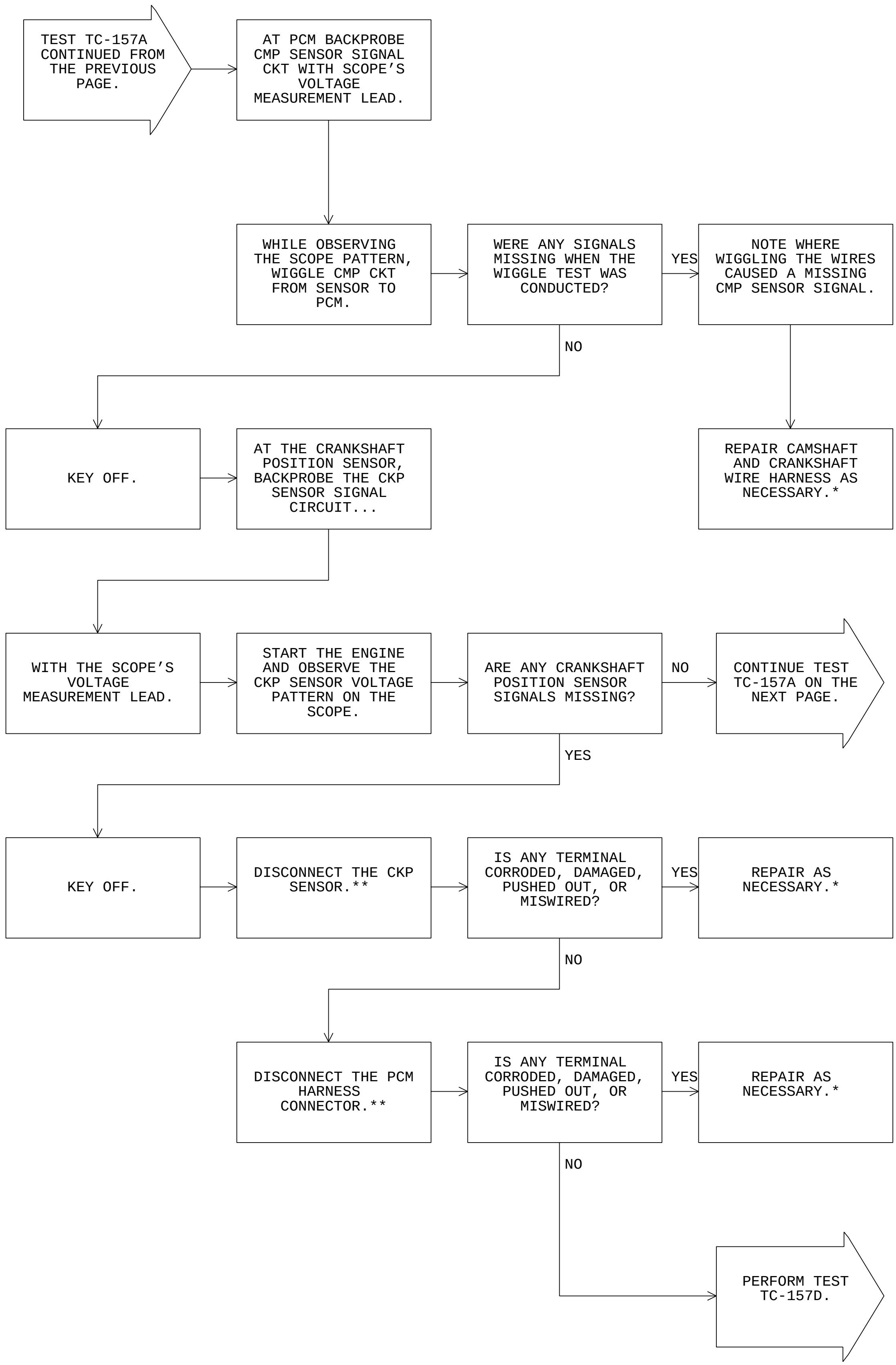
TEST TC-157A	CONTINUED - REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

TJ/XJ BODY



TEST TC-157A CONTINUED - REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

TROUBLE CODE TESTS



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

TEST TC-157A CONTINUED - REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Name of code: Intermittent Loss of CMP or CKP

When Monitored: Engine running or cranking.

Set Condition: When the failure counter reaches 96 for 2 consecutive trips.

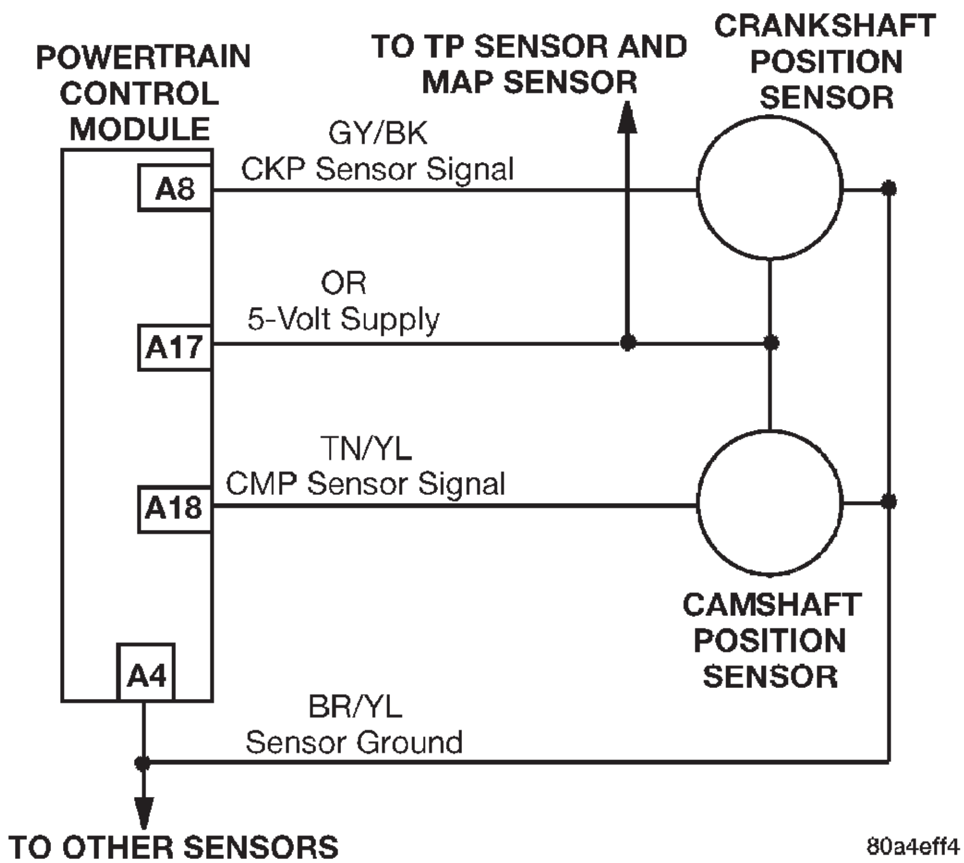
Theory of operation: A failure counter is incremented whenever the correct number of crank signals is not seen between two cam signals. A bad trip is stored when the failure counter reaches 96. Two consecutive bad trips are required to set the fault.

Possible Causes:
> Open or shorted 5 volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Excessive crankshaft sensor clearance
> Excessive camshaft sensor clearance
> Damaged crankshaft sensor rotating component
> Damaged camshaft sensor rotating component
> Failed sensor
> Failed PCM

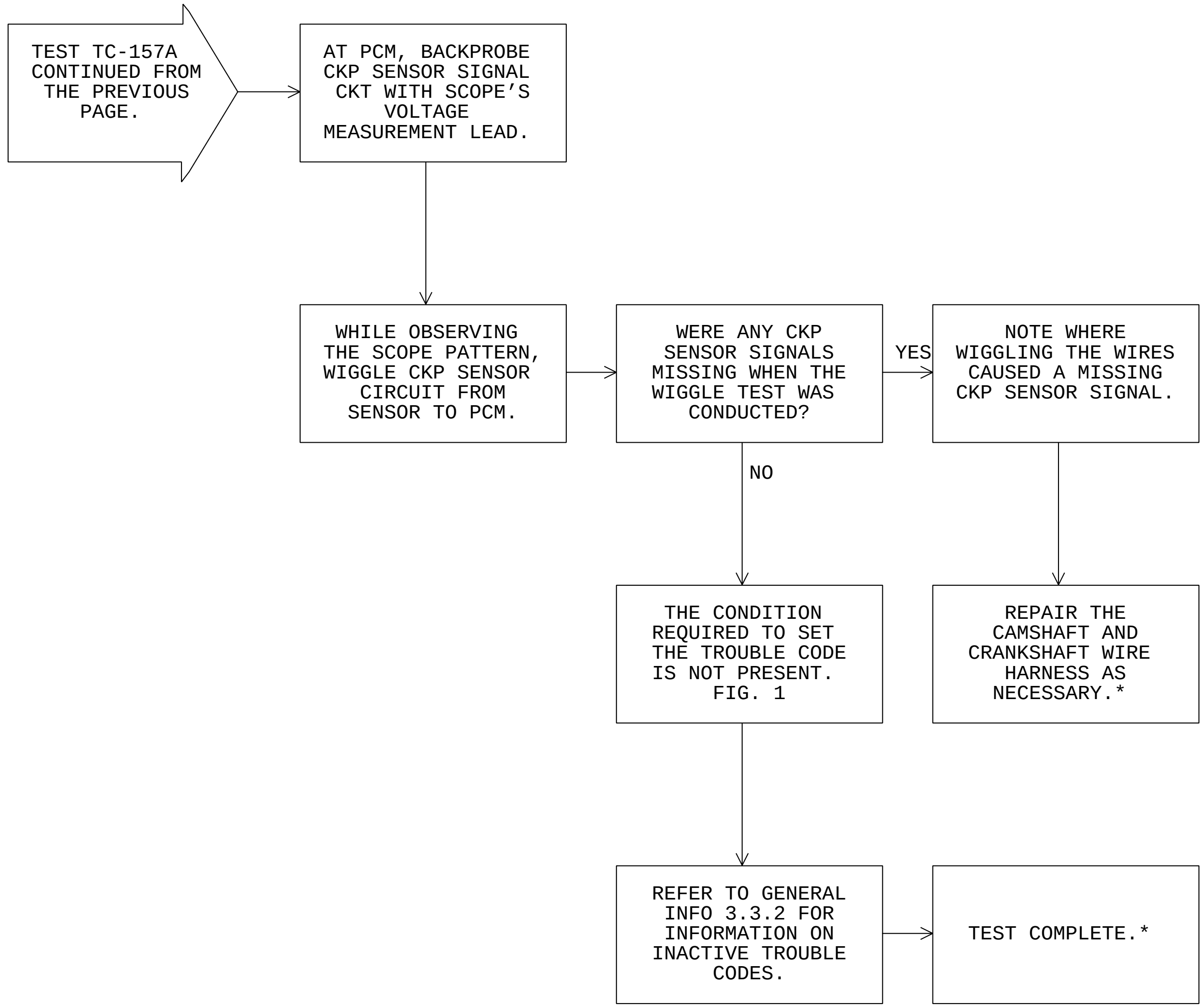
80a5574d

FIG. 1

TJ/XJ BODY



TEST TC-157A CONTINUED - REPAIRING - INTERMITTENT LOSS OF CMP OR CKP



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

TEST TC-157B	REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST TC-157A Before Proceeding

Name of code: Intermittent Loss of CMP or CKP

When Monitored: Engine running or cranking.

Set Condition: When the failure counter reaches 96 for 2 consecutive trips.

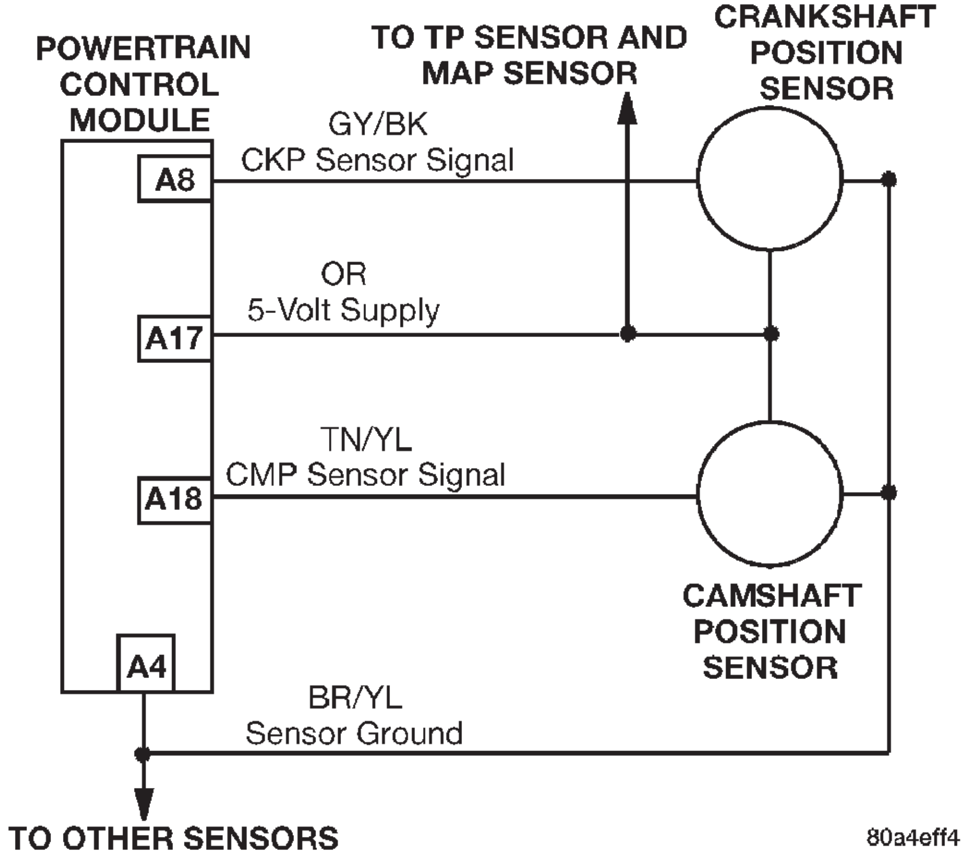
Theory of operation: A failure counter is incremented whenever the correct number of crank signals is not seen between two cam signals. A bad trip is stored when the failure counter reaches 96. Two consecutive bad trips are required to set the fault.

Possible Causes:
> Open or shorted 5 volt supply circuit
> Open sensor ground
> Open or shorted signal circuit
> Excessive crankshaft sensor clearance
> Excessive camshaft sensor clearance
> Damaged crankshaft sensor rotating component
> Damaged camshaft sensor rotating component
> Failed sensor
> Failed PCM

80a5574d

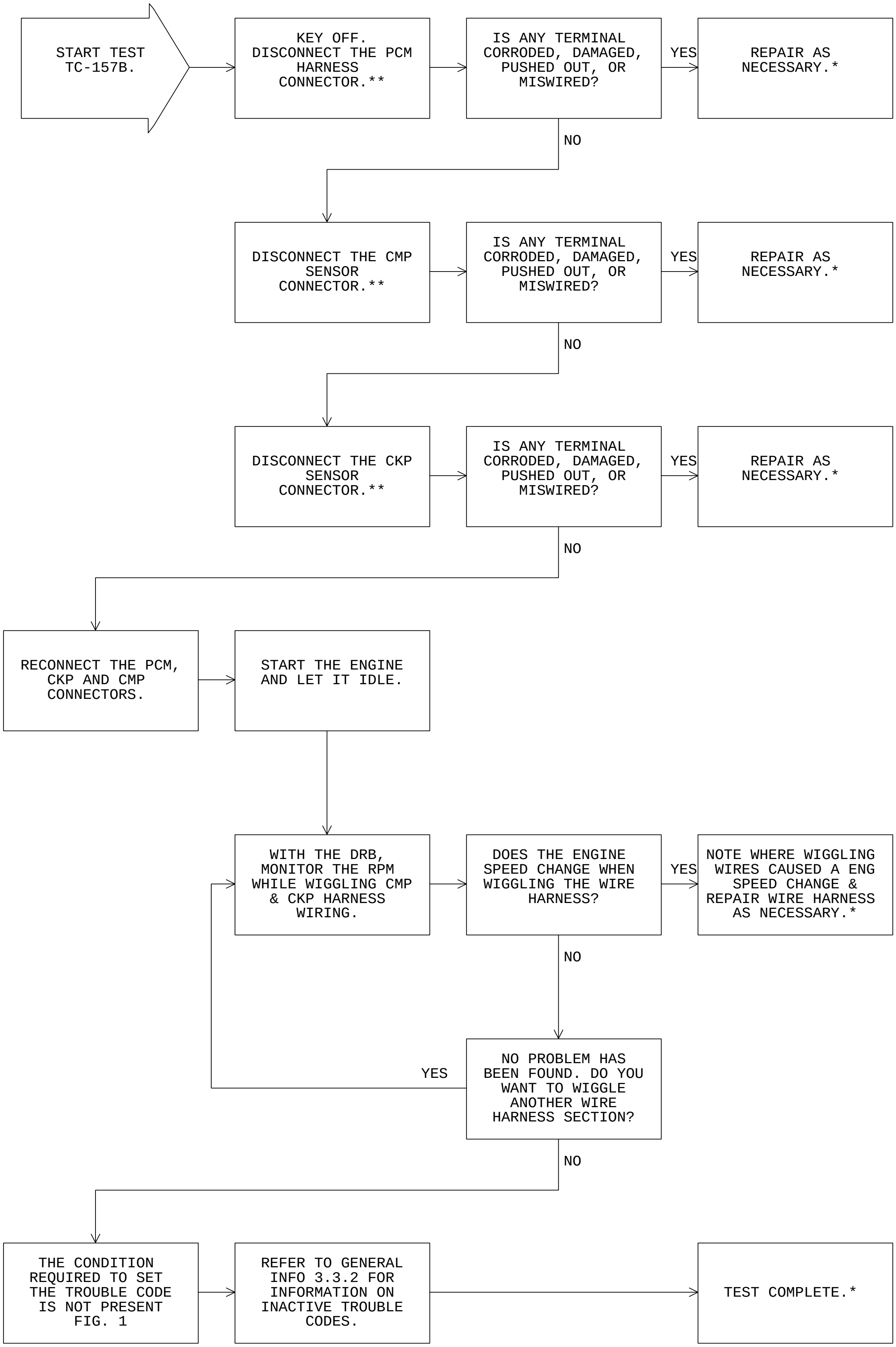
FIG. 1

TJ/XJ BODY



TEST TC-157B REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST TC-157A Before Proceeding



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

TROUBLE CODE TESTS

TEST TC-157C	REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST TC-157A Before Proceeding

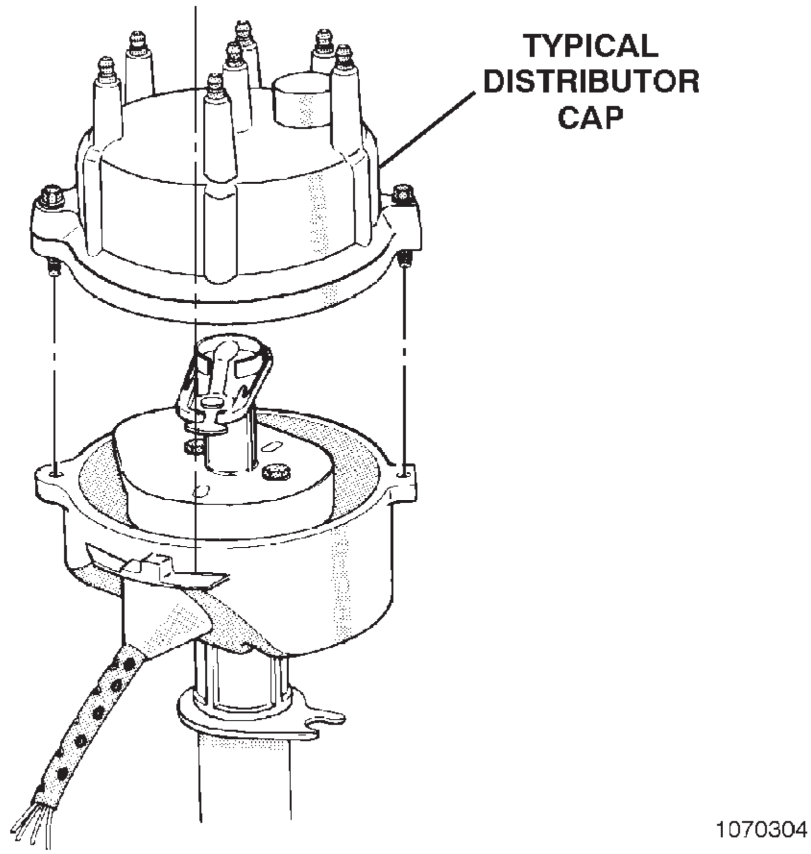
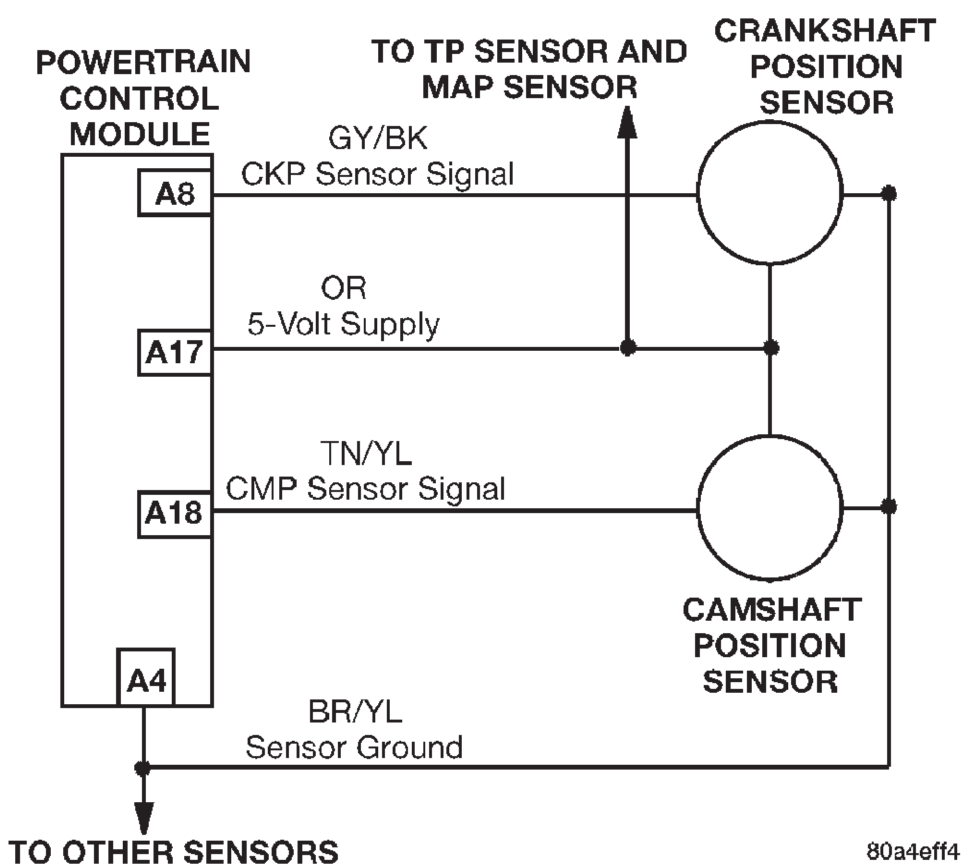


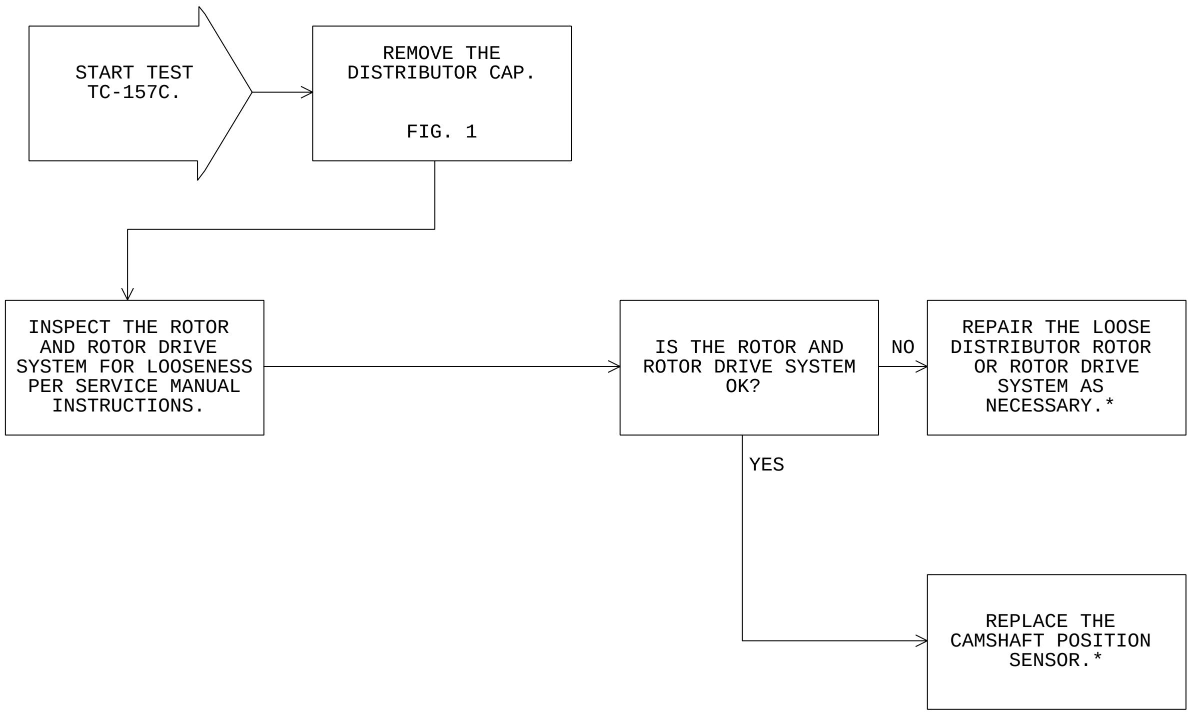
FIG. 1

TJ/XJ BODY



TEST TC-157C REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST TC-157A Before Proceeding



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

TROUBLE CODE TESTS

TEST TC-157D	REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST TC-157A Before Proceeding

TJ/XJ BODY 2.5L AND 4.0L

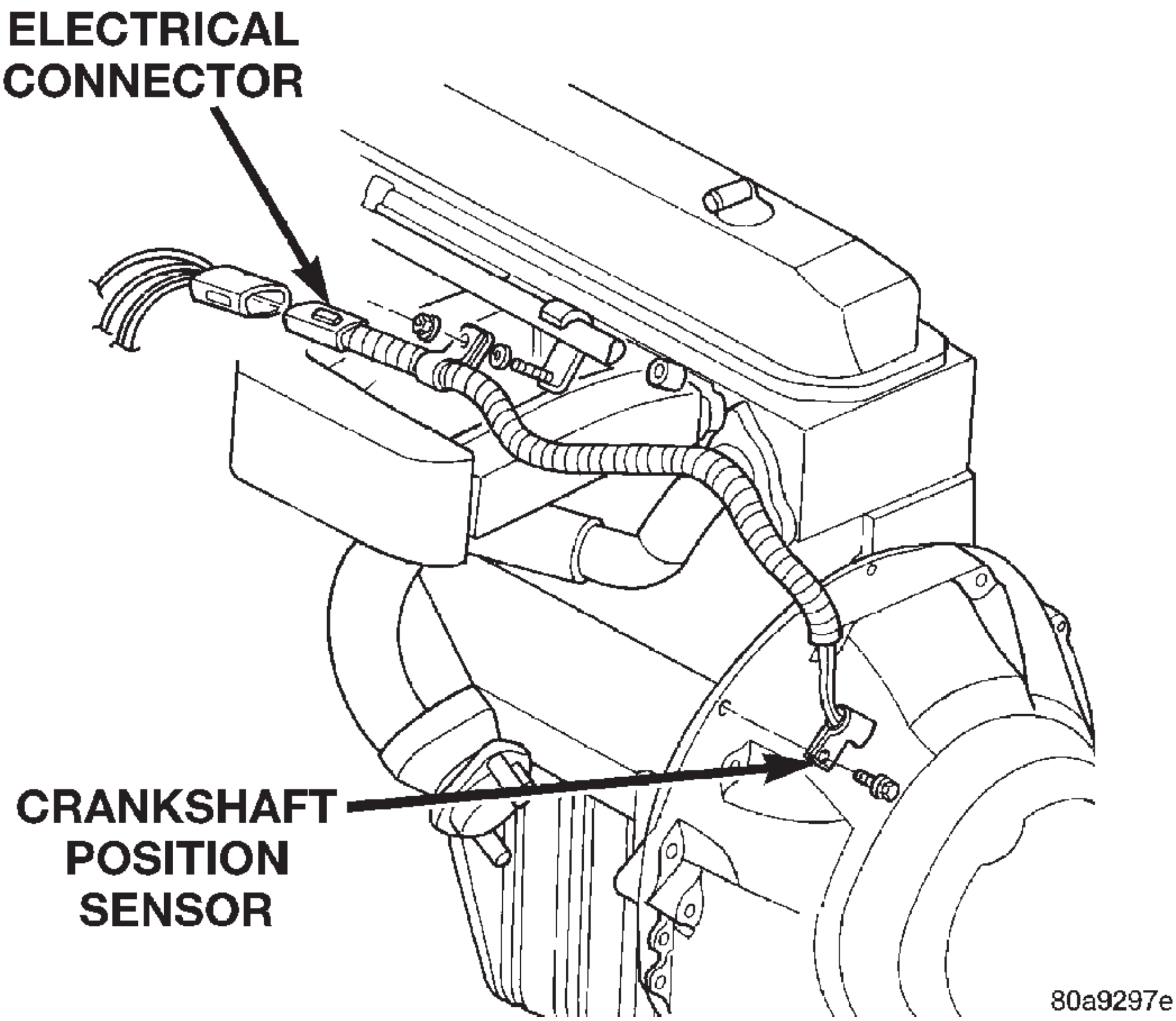
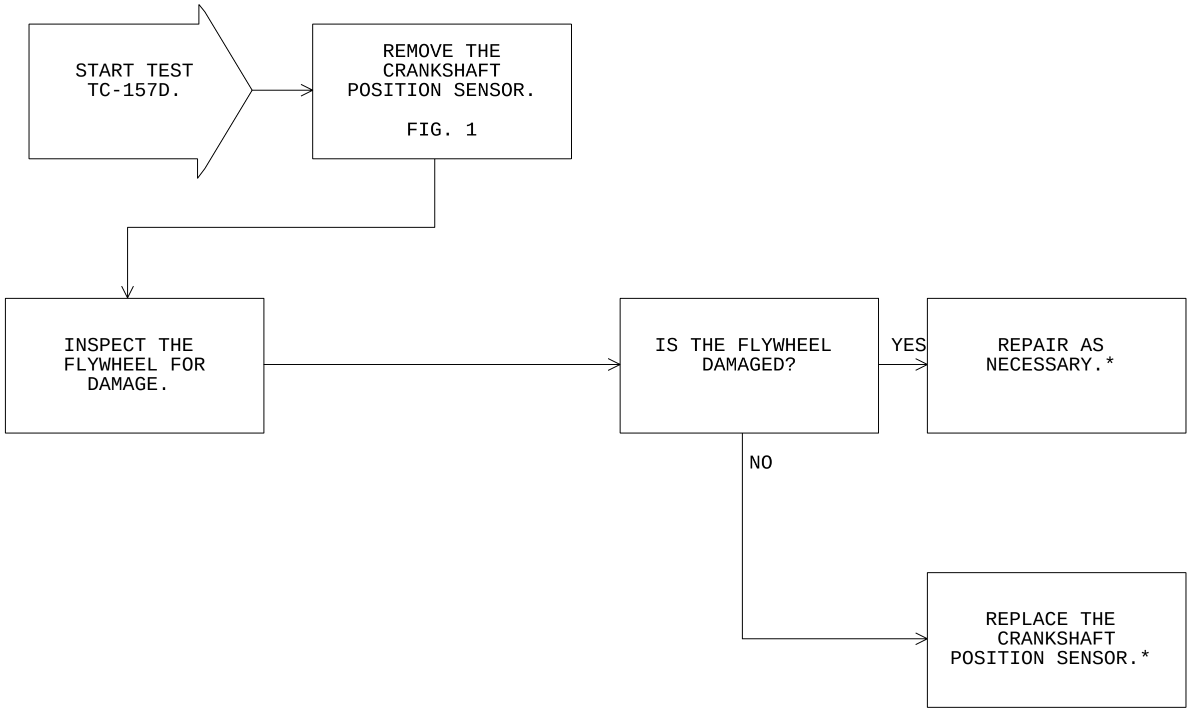


FIG. 1

TEST TC-157D	REPAIRING - INTERMITTENT LOSS OF CMP OR CKP

Perform TEST TC-157A Before Proceeding



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

TEST TC-225A	REPAIRING - NO CDD BUS MESSAGE FROM THE MIC

Perform TEST DTC Before Proceeding

TJ BODY

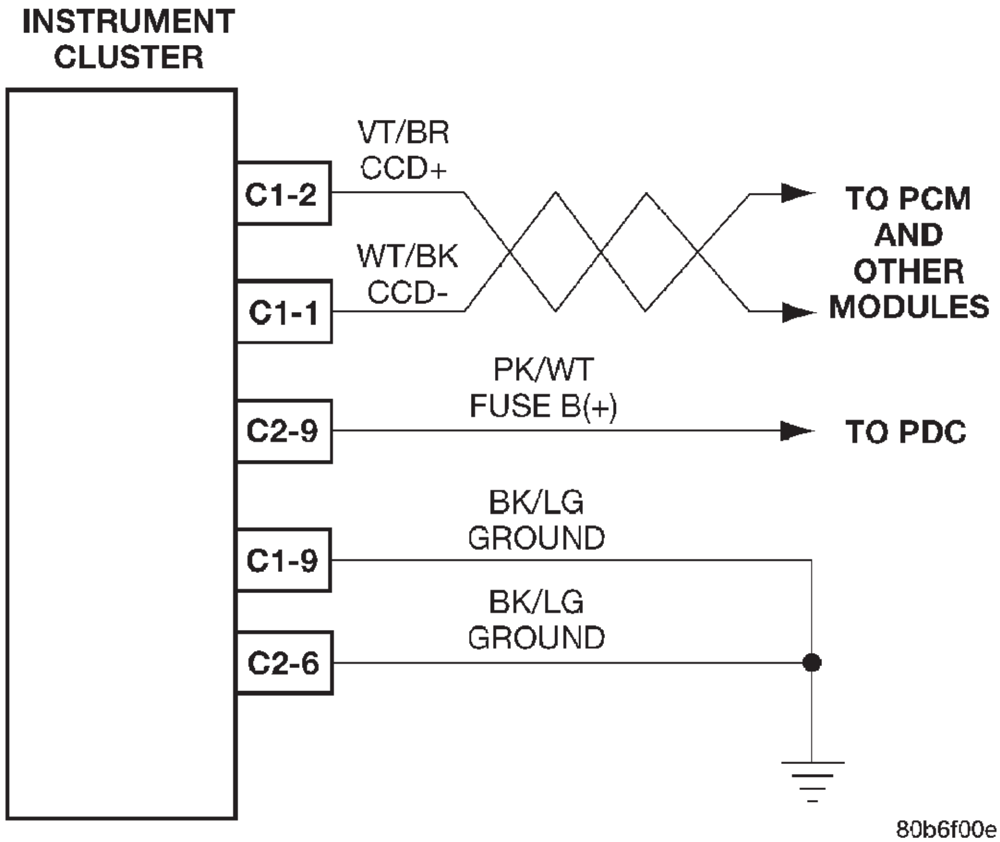


FIG. 1

XJ BODY

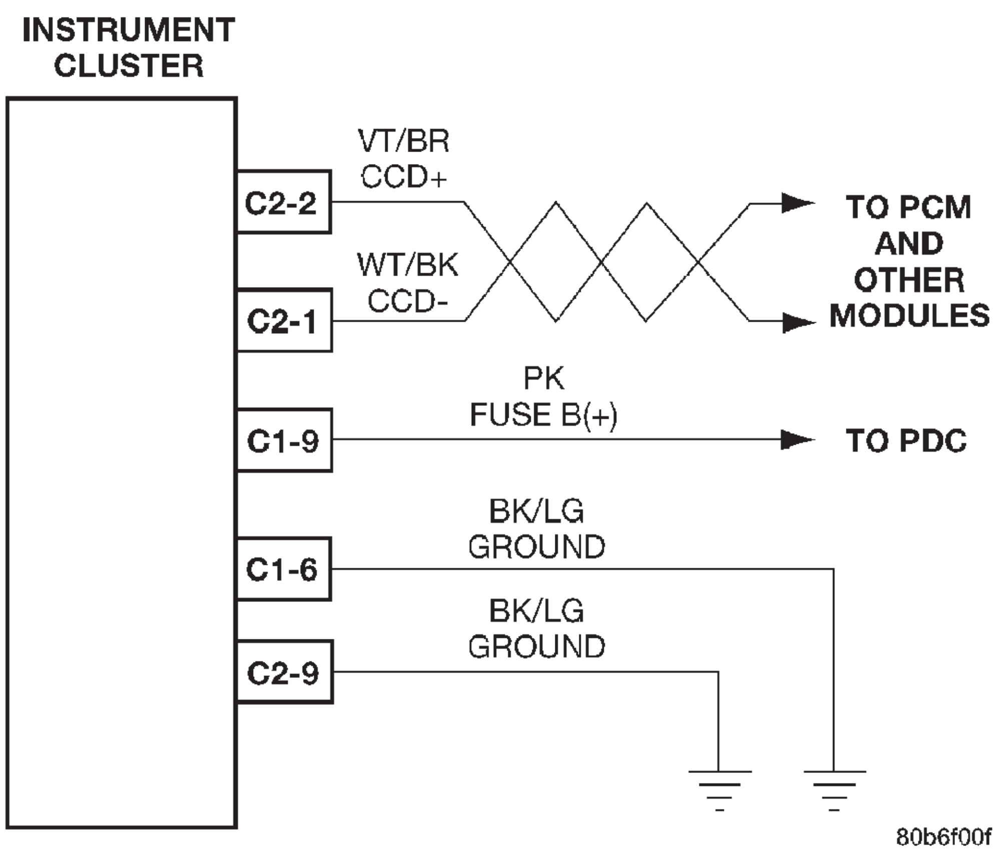
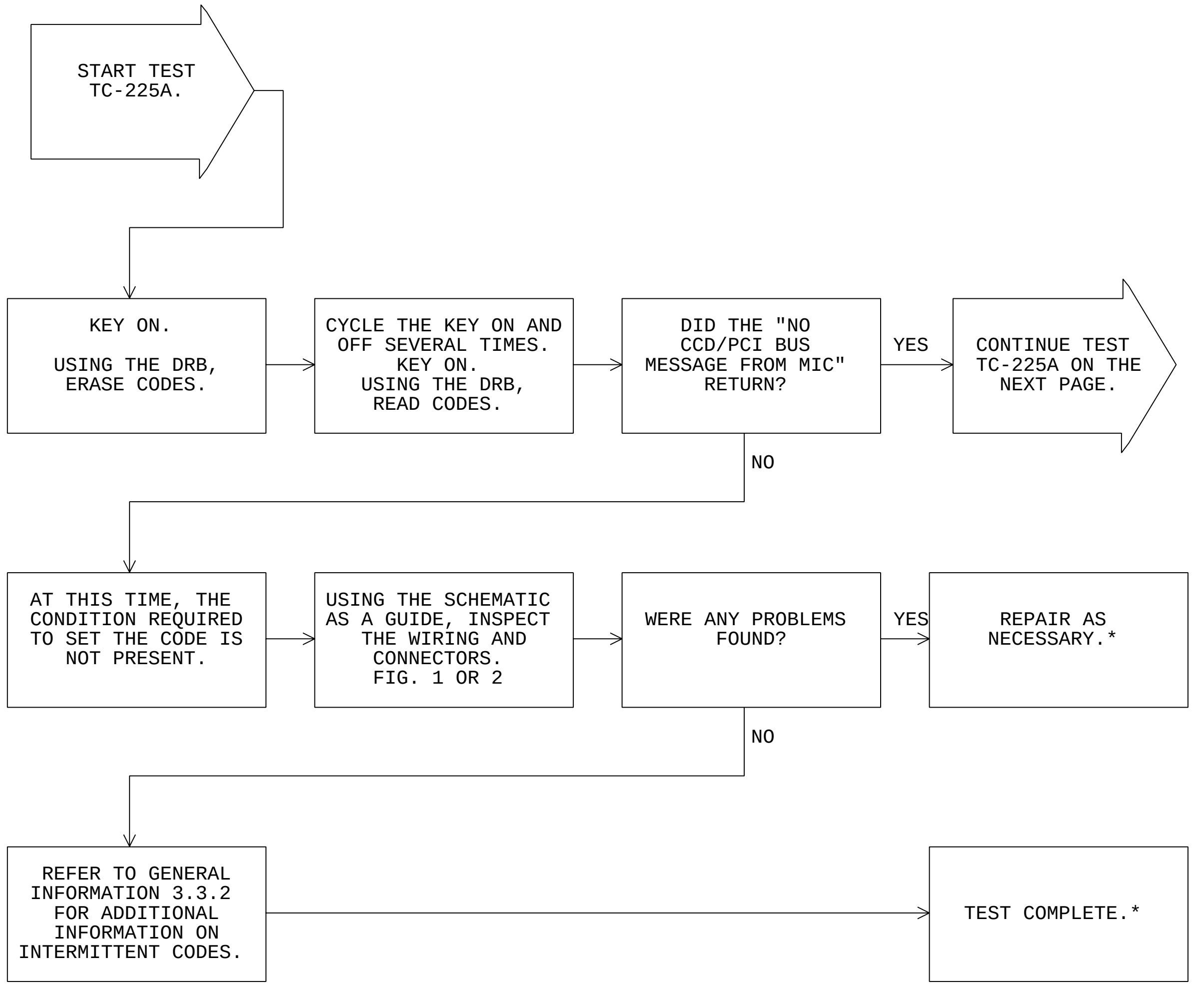


FIG. 2

TEST TC-225A | REPAIRING - NO CDD BUS MESSAGE FROM THE MIC

Perform TEST DTC Before Proceeding

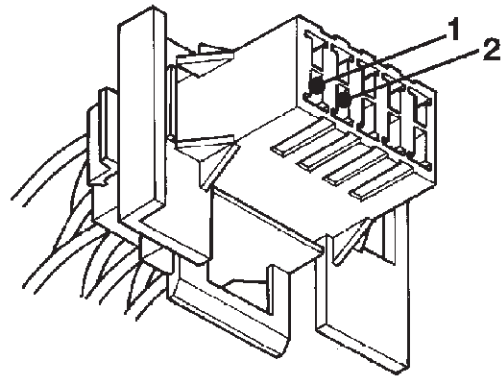


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

TEST TC-225A CONTINUED - REPAIRING NO CCD BUS MESSAGE FROM MIC

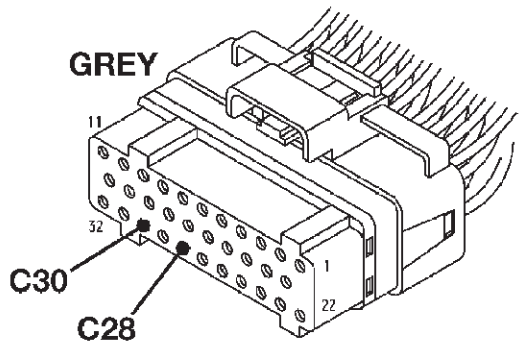
TJ BODY

INSTRUMENT CLUSTER HARNESS CONNECTOR C1



CAV	COLOR	FUNCTION
1	WT/BK	CCD BUS (-)
2	VT/BR	CCD BUS (+)

POWERTRAIN CONTROL MODULE HARNESS CONNECTOR



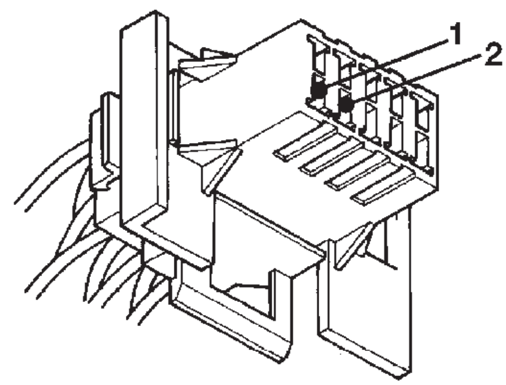
CAV	COLOR	FUNCTION
C28	WT/BK	CCD BUS (-)
C30	VT/BR	CCD BUS (+)

80b6b37c

FIG. 1

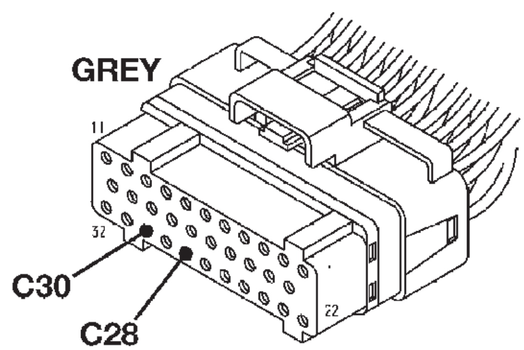
XJ BODY

INSTRUMENT CLUSTER HARNESS CONNECTOR C2



CAV	COLOR	FUNCTION
1	WT/BK	CCD BUS (-)
2	VT/BR	CCD BUS (+)

POWERTRAIN CONTROL MODULE HARNESS CONNECTOR

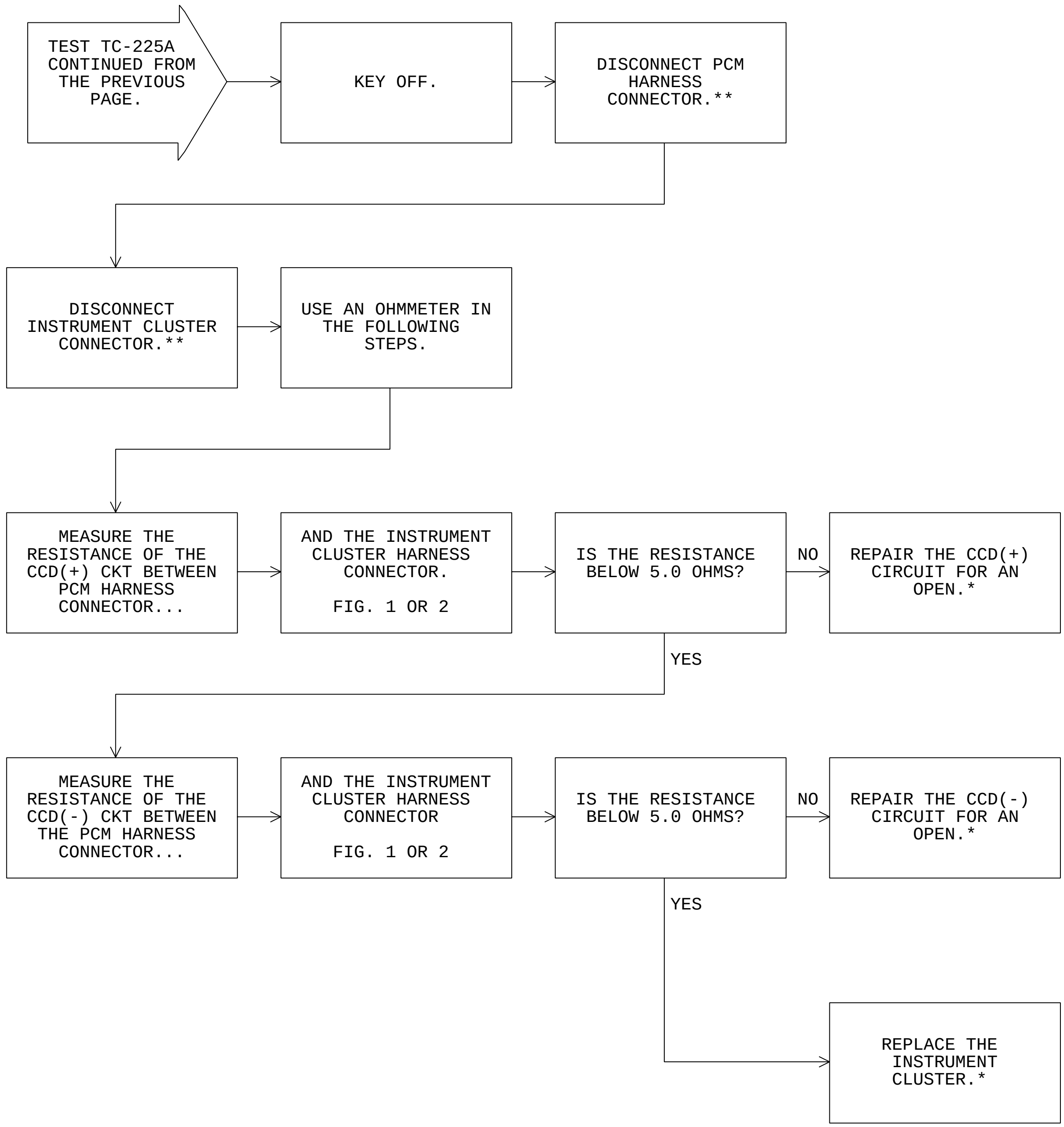


CAV	COLOR	FUNCTION
C28	WT/BK	CCD BUS (-)
C30	VT/BR	CCD BUS (+)

80b6b37e

FIG. 2

TEST TC-225A CONTINUED - REPAIRING NO CCD BUS MESSAGE FROM MIC



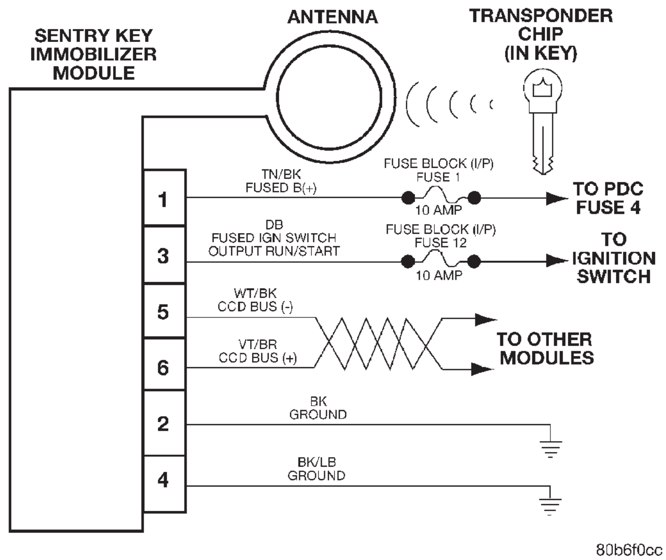
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

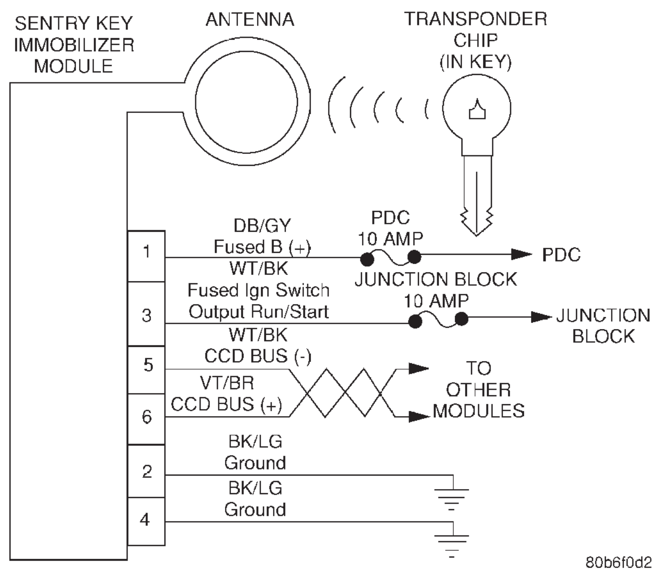
TEST TC-226A REPAIRING - NO CCD BUS MESSAGE RECEIVED FROM SKIM

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



Name of code: No CCD Message From SKIM Module

When Monitored: With ignition on.

Set Condition: The PCM does not receive a CCD Bus message from the SKIM module when expected.

Theory of operation: At ignition on, the SKIM module sends a message to the PCM verifying the correct ignition key. If the PCM receives a correct message, it will allow the engine to start and continue to run. If the PCM does not receive a message or receives an incorrect key message the PCM will allow the engine to start and run for two seconds. If the PCM does not receive a valid key message in six start attempts the PCM will disable the starter relay until a valid key message is received.

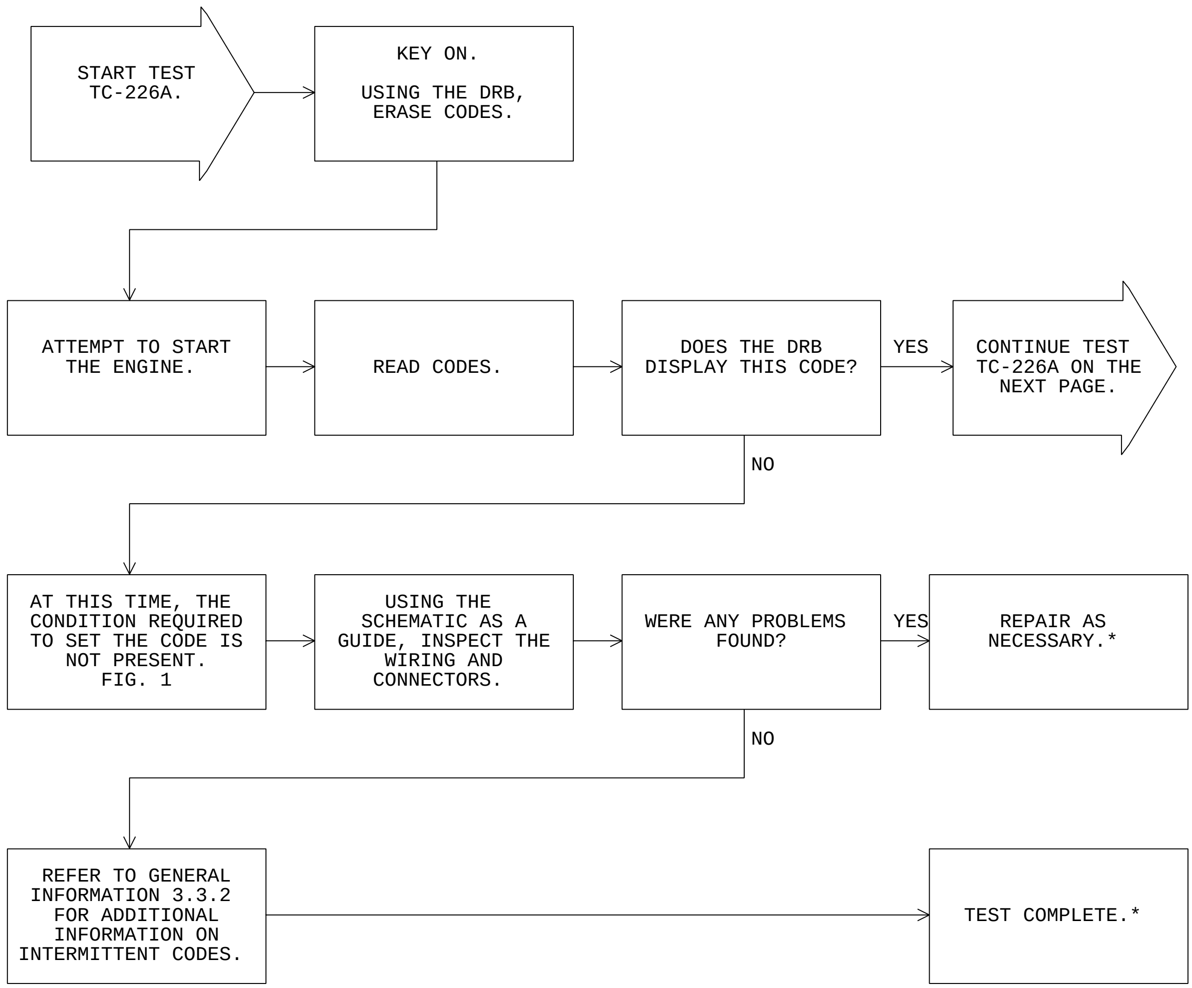
Possible causes:
> Open or shorted CCD Bus circuit(s)
> Failed SKIM module
> Failed PCM
> Connector terminals
> Connector wires

80b118e6

FIG. 1

TEST TC-226A REPAIRING - NO CCD BUS MESSAGE RECEIVED FROM SKIM

Perform TEST DTC Before Proceeding



Perform Verification TEST VER-1A.** | ****Check connectors - Clean / repair as necessary.

TEST TC-226A	CONTINUED - REPAIRING - NO CCD BUS MESSAGE RECEIVED FROM SKIM

TJ BODY

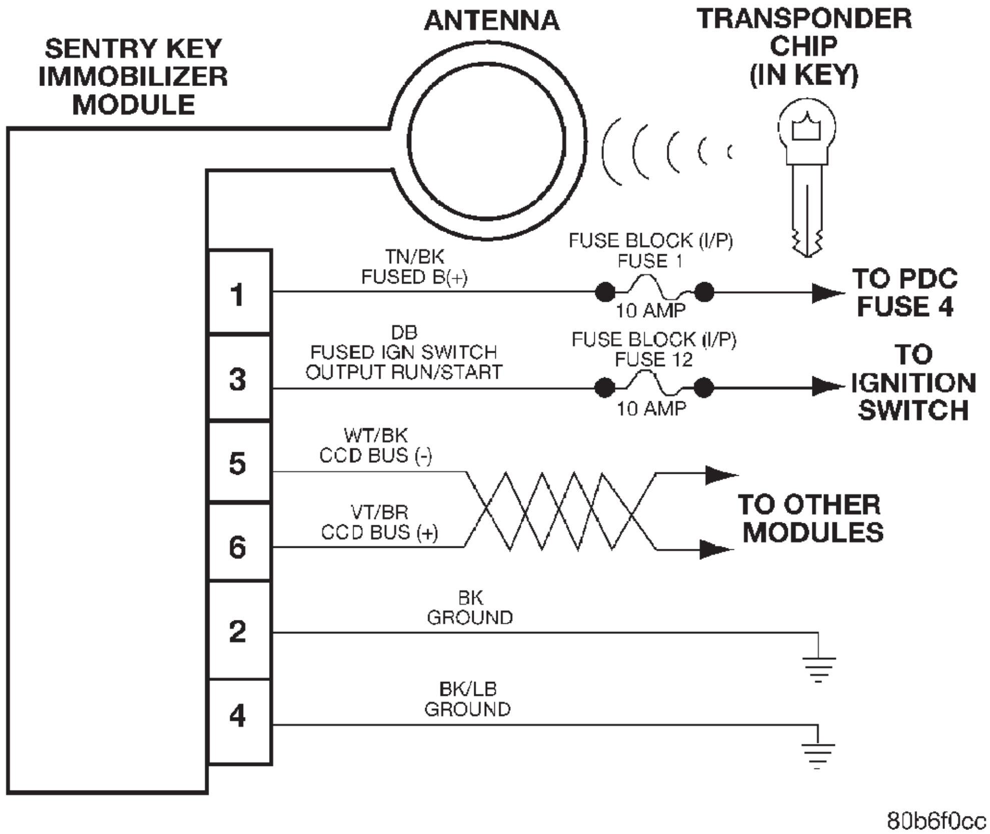


FIG. 1

XJ BODY

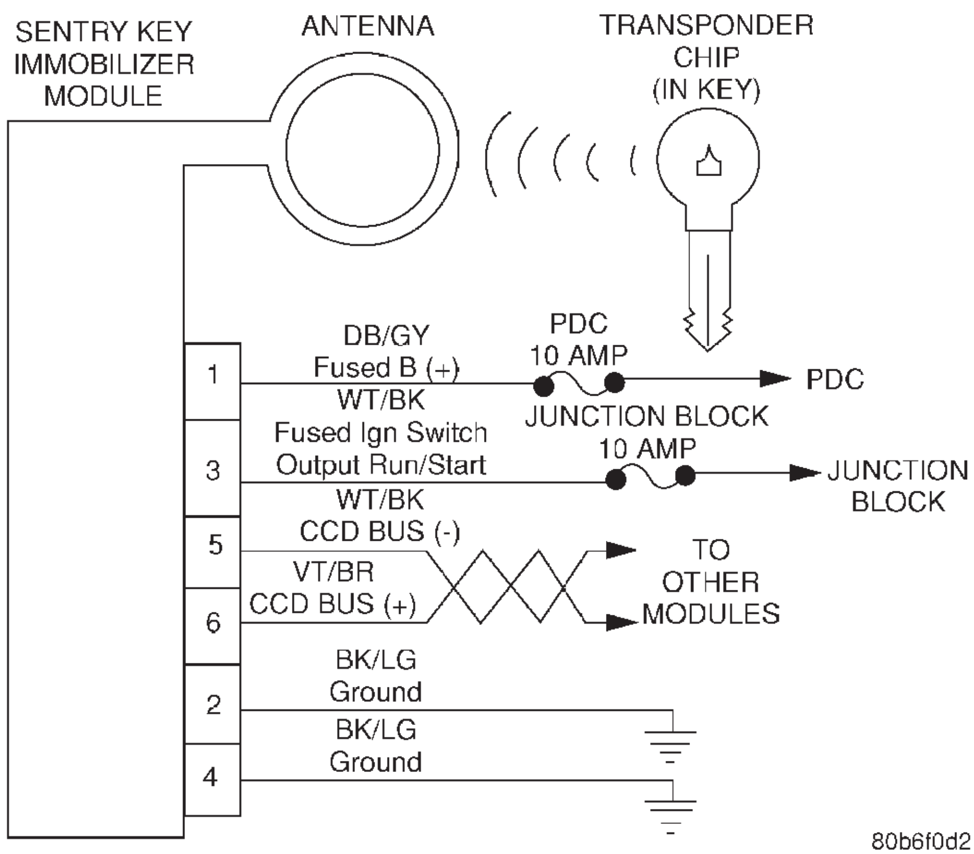
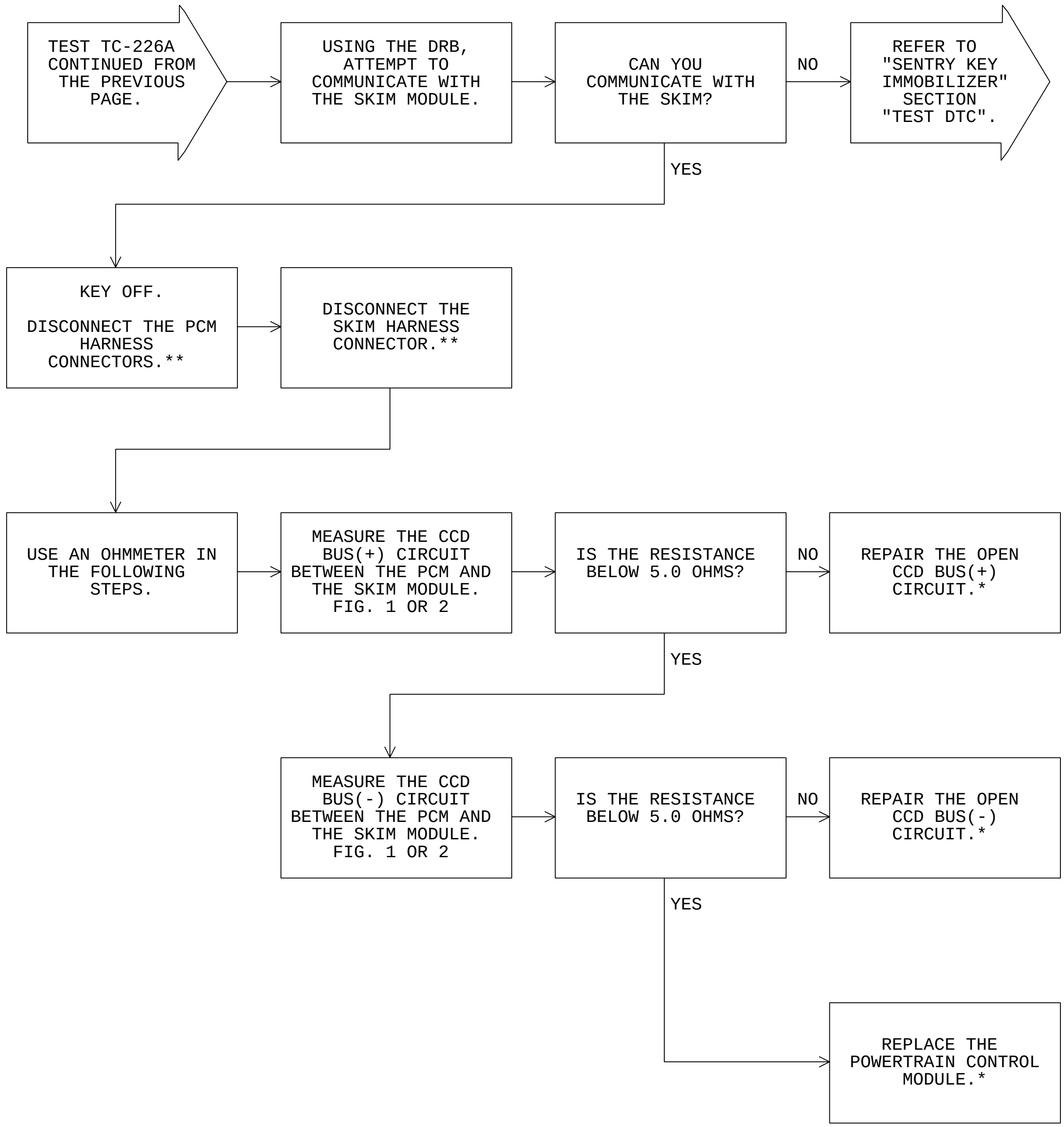


FIG. 2

TEST TC-226A CONTINUED - REPAIRING - NO CCD BUS MESSAGE RECEIVED FROM SKIM

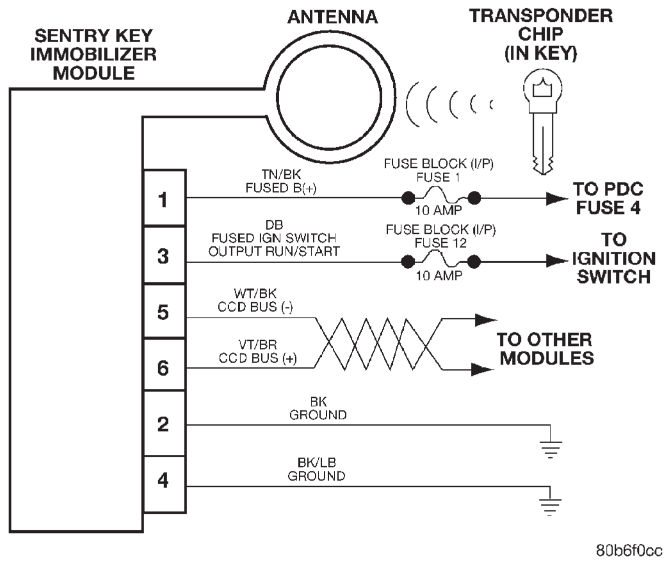


Perform Verification TEST VER-1A. | ***Check connectors - Clean / repair as necessary.***

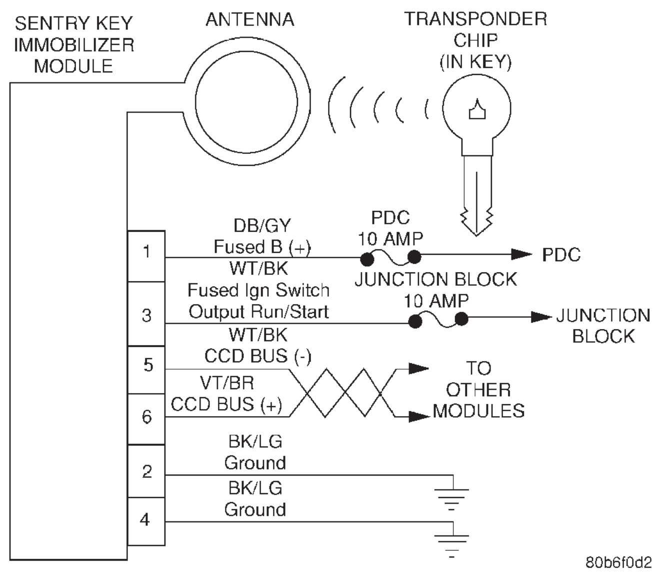
TEST TC-232A — REPAIRING - INVALID OR WRONG KEY MESSAGE FROM SKIM

Perform TEST DTC Before Proceeding

TJ BODY



XJ BODY



Name of code: Invalid or Wrong Key Message From SKIM

When Monitored: With ignition on.

Set Condition: The PCM does not receive a valid key message from the SKIM module.

Theory of operation: At ignition on, the SKIM module sends a message to the PCM verifying the correct ignition key. If the PCM receives a correct message, it will allow the engine to start and continue to run. If the PCM does not receive a message or receives an incorrect message the PCM will allow the engine to start and run for two seconds. If the PCM does not receive a valid key message in six start attempts the PCM will disable the starter relay until a valid key message is received.

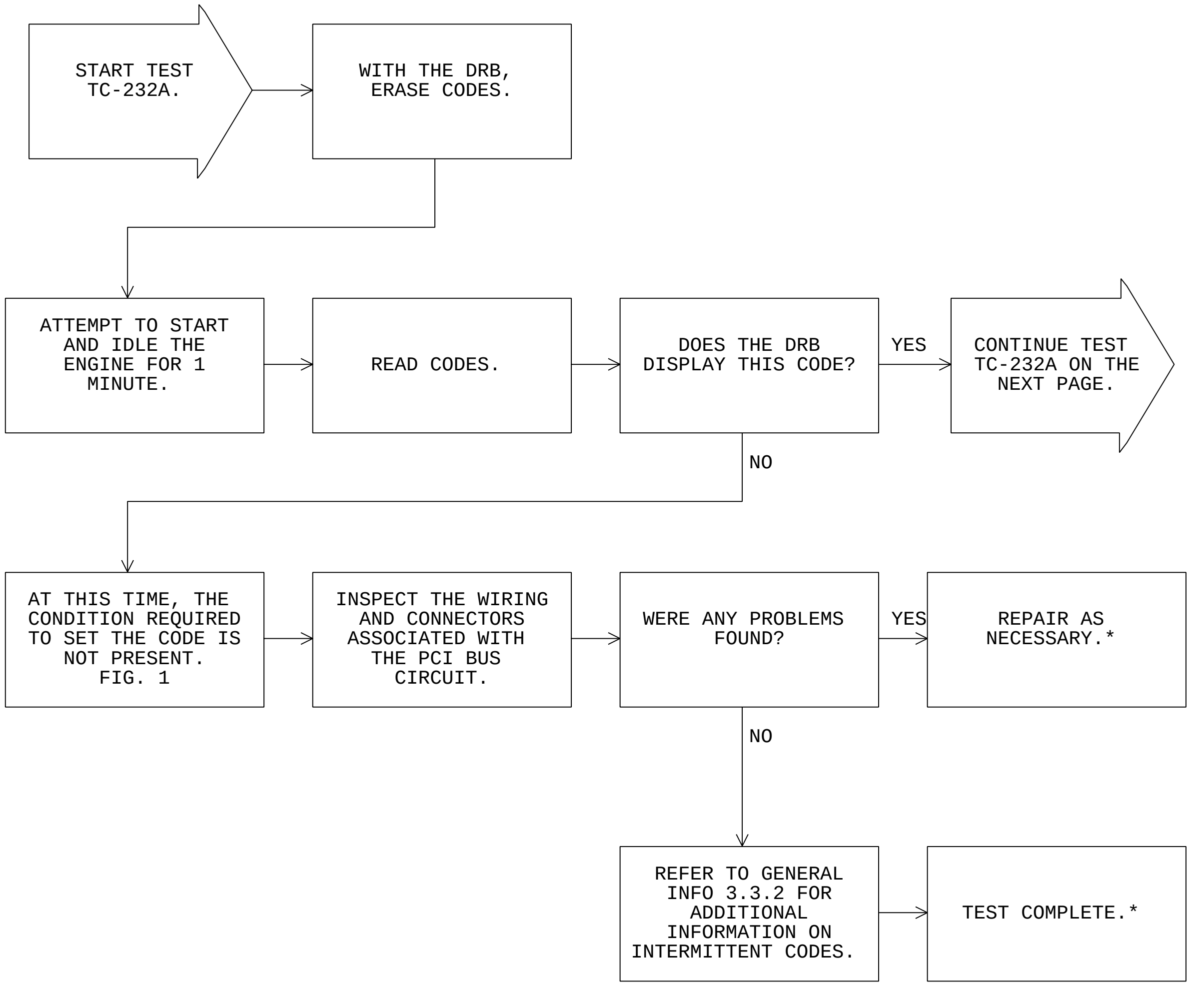
Possible causes:
> Ignition key not programmed
> Wrong ignition key
> Incorrect VIN stored in PCM
> Failed SKIM module
> Failed PCM

80b118e7

FIG. 1

TEST TC-232A REPAIRING - INVALID OR WRONG KEY MESSAGE FROM SKIM

Perform TEST DTC Before Proceeding

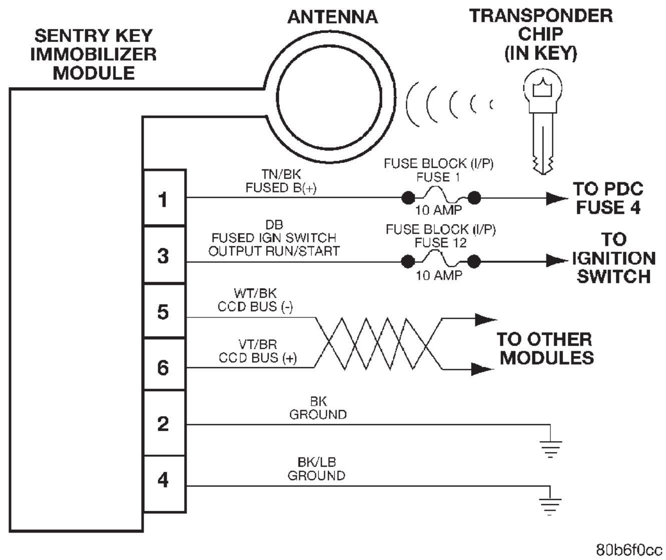


**Perform Verification TEST VER-1A.*

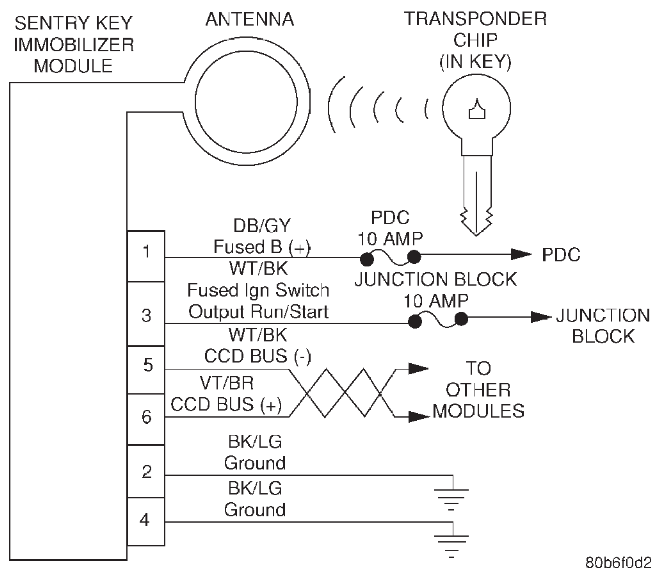
***Check connectors - Clean / repair as necessary.*

TEST TC-232A REPAIRING - INVALID OR WRONG KEY MESSAGE FROM SKIM

TJ BODY



XJ BODY



Name of code: Invalid or Wrong Key Message From SKIM

When Monitored: With ignition on.

Set Condition: The PCM does not receive a valid key message from the SKIM module.

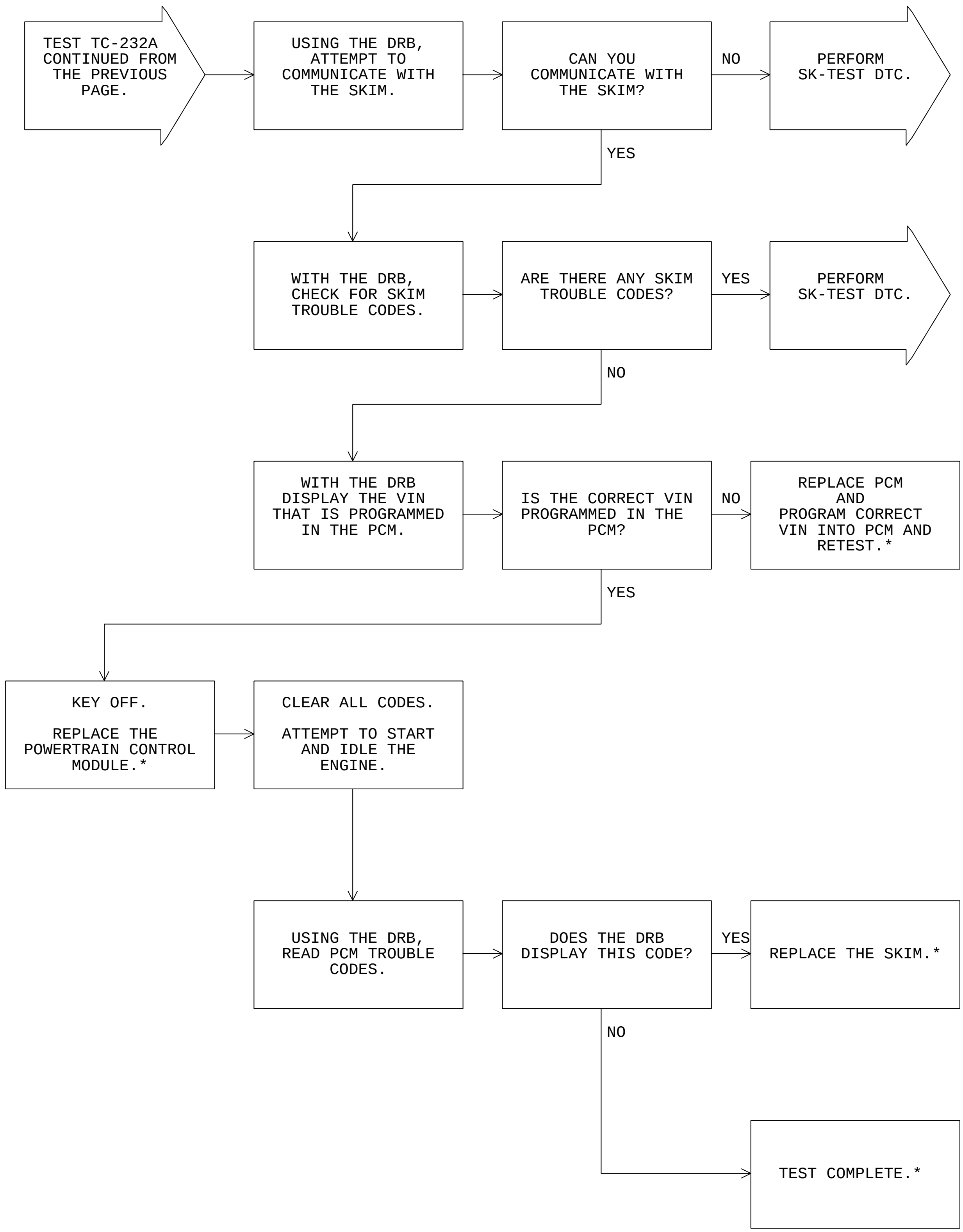
Theory of operation: At ignition on, the SKIM module sends a message to the PCM verifying the correct ignition key. If the PCM receives a correct message, it will allow the engine to start and continue to run. If the PCM does not receive a message or receives an incorrect message the PCM will allow the engine to start and run for two seconds. If the PCM does not receive a valid key message in six start attempts the PCM will disable the starter relay until a valid key message is received.

Possible causes:
> Ignition key not programmed
> Wrong ignition key
> Incorrect VIN stored in PCM
> Failed SKIM module
> Failed PCM

80b118e7

FIG. 1

TEST TC-232A REPAIRING - INVALID OR WRONG KEY MESSAGE FROM SKIM



Perform Verification TEST VER-1A.** | ****Check connectors - Clean / repair as necessary.

TROUBLE CODE TESTS

TEST TC-235A	REPAIRING - OIL PRESSURE SENSOR LOW EXCEEDED

Perform TEST DTC Before Proceeding

TJ/XJ BODY

Name of code: Oil Pressure Sensor Low Exceeded

When monitored: With the ignition switch on.

Set condition: The PCM detects voltage on the oil pressure sensor signal circuit below 0.1 volts.

Theory of operation: The sensor consists of dual ceramic plates that vary resistance with applied oil pressure. The PCM sends a 5.0 volt supply to the sensor. The change in signal voltage is proportional to the change in distance between the ceramic plates (which varies with applied oil pressure). The PCM uses this input to determine oil pressure and provides this information to the instrument cluster for oil pressure gauge operation. The signal voltage is provided at PCM cavity B23. Ground is provided at PCM cavity A4. The 5-volt supply is provided at PCM cavity A17.

Possible cause:
> Sensor signal circuit shorted to ground
> Failed oil pressure sensor
> Failed PCM
> Connector terminals
> Connector wires

80b76fed

FIG. 1

TJ/XJ BODY

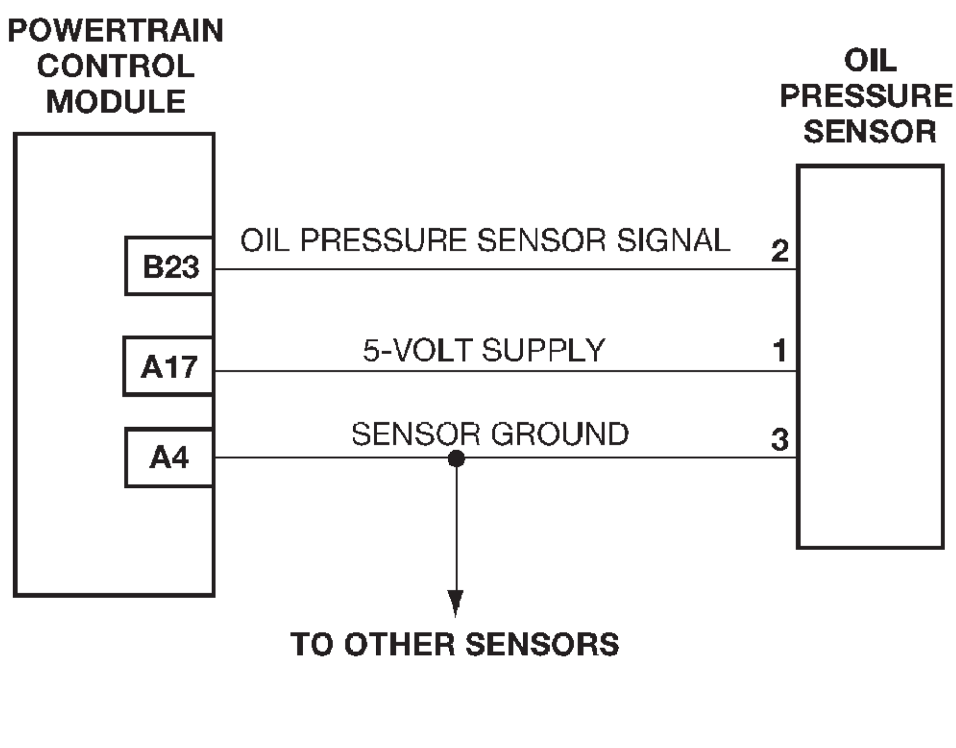
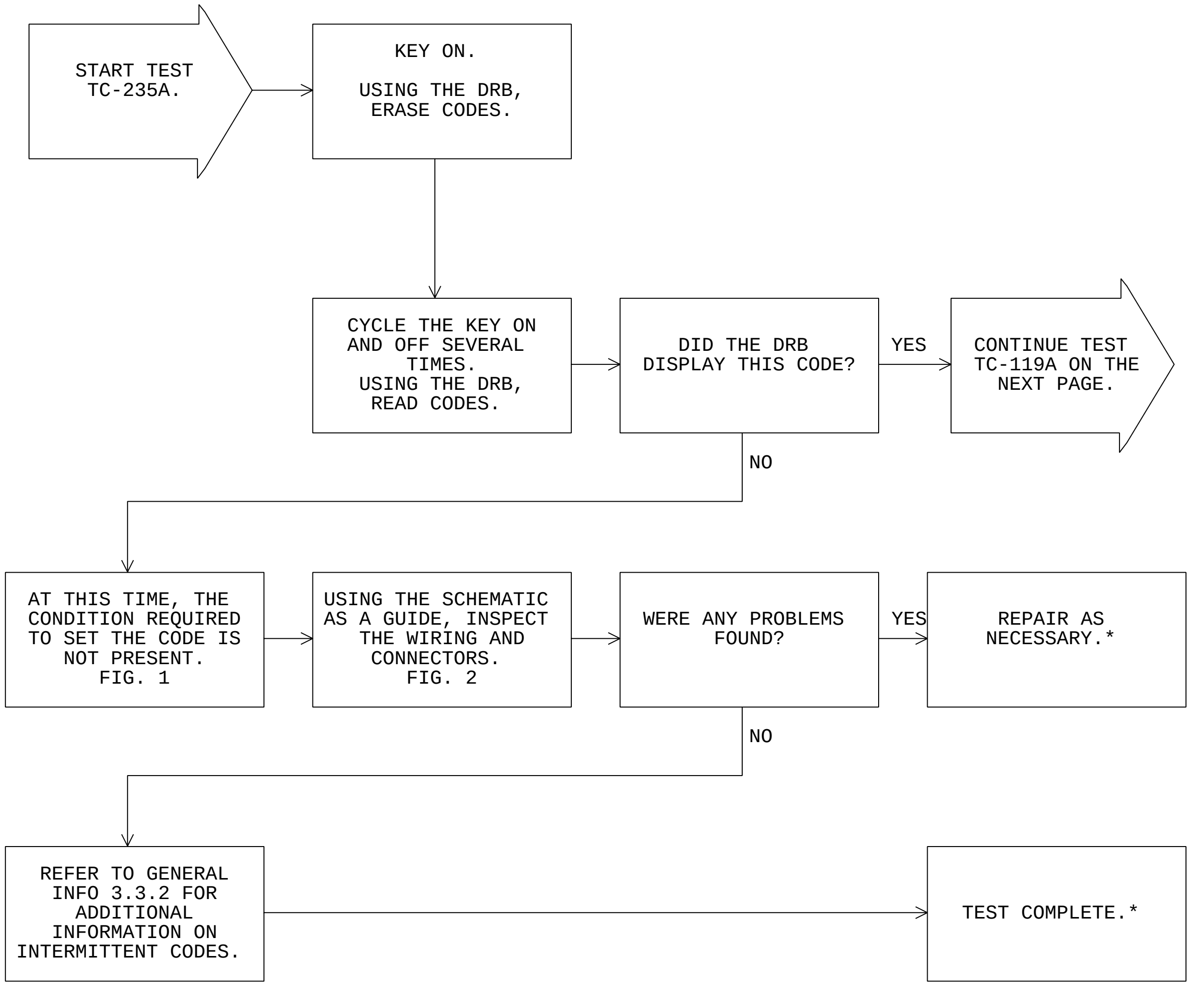


FIG. 2

TEST TC-235A | **REPAIRING - OIL PRESSURE SENSOR LOW EXCEEDED**

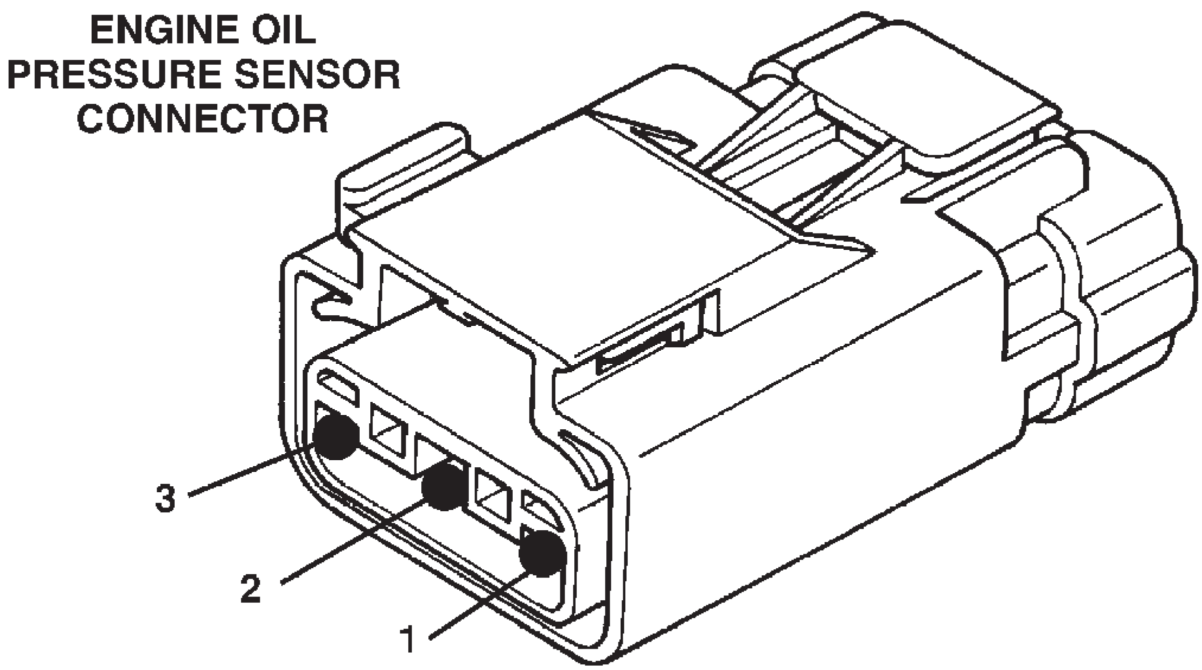
Perform TEST DTC Before Proceeding



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

TEST TC-235A CONTINUED - REPAIRING - OIL PRESSURE SENSOR LOW EXCEEDED

TJ/XJ BODY

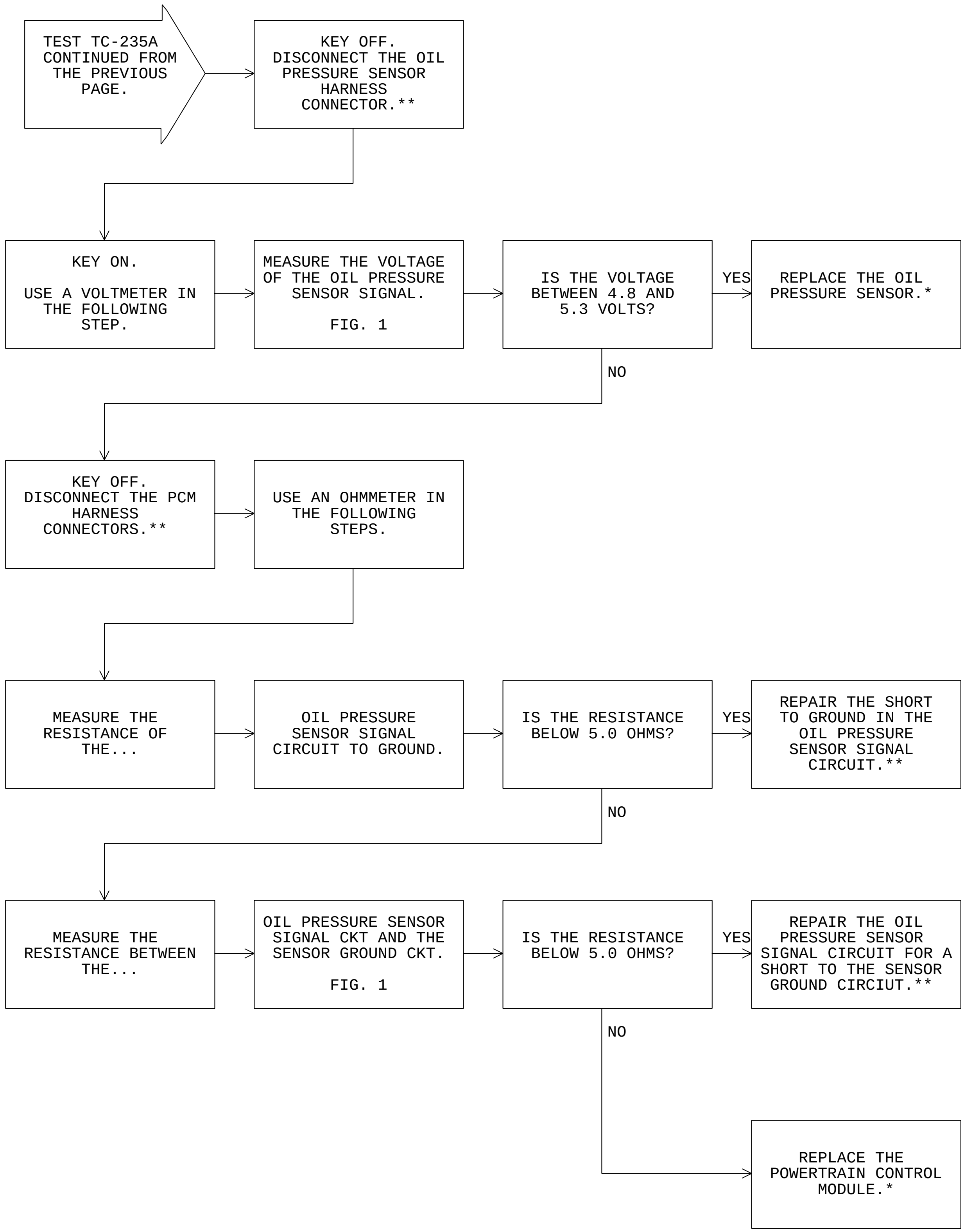


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b37f

FIG. 1

TEST TC-235A CONTINUED - REPAIRING - OIL PRESSURE SENSOR LOW EXCEEDED



**Perform Verification TEST VER-2A.*

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

TEST TC-236A REPAIRING OIL PRESSURE SENSOR HIGH EXCEEDED

Perform TEST DTC Before Proceeding

TJ/XJ BODY

Name of code: Oil Pressure Sensor High Exceeded

When monitored: With the ignition switch on.

Set condition: The PCM detects voltage on the oil pressure sensor signal circuit above 4.8 volts.

Theory of operation: The sensor consists of dual ceramic plates that vary resistance with applied oil pressure. The PCM sends a 5.0 volt supply to the sensor. The change in signal voltage is proportional to the change in distance between the ceramic plates (which varies with applied oil pressure). The PCM uses this input to determine oil pressure and provides this information to the instrument cluster for oil pressure gauge operation. The signal voltage is provided at PCM cavity B23. Ground is provided at PCM cavity A4. The 5-volt supply is provided at PCM cavity A17.

Possible cause:
> Sensor signal circuit shorted to voltage
> Sensor signal circuit open
> Sensor ground circuit open
> Failed oil pressure sensor
> Failed PCM
> Connector terminals
> Connector wires

80b76fee

FIG. 1

TJ/XJ BODY

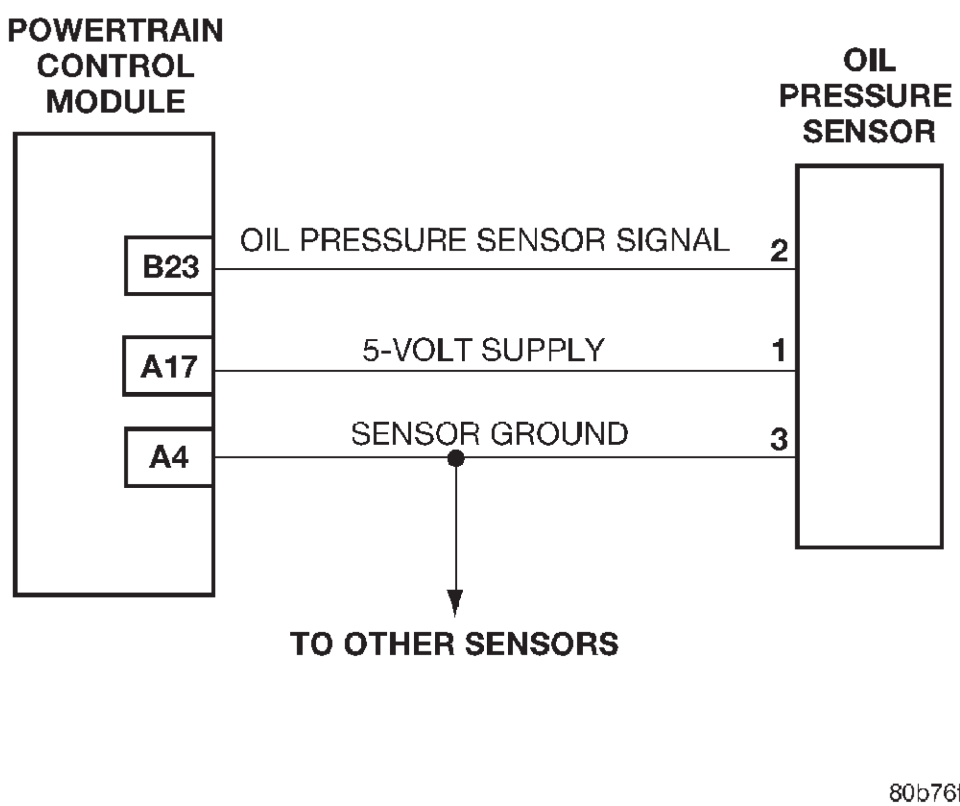
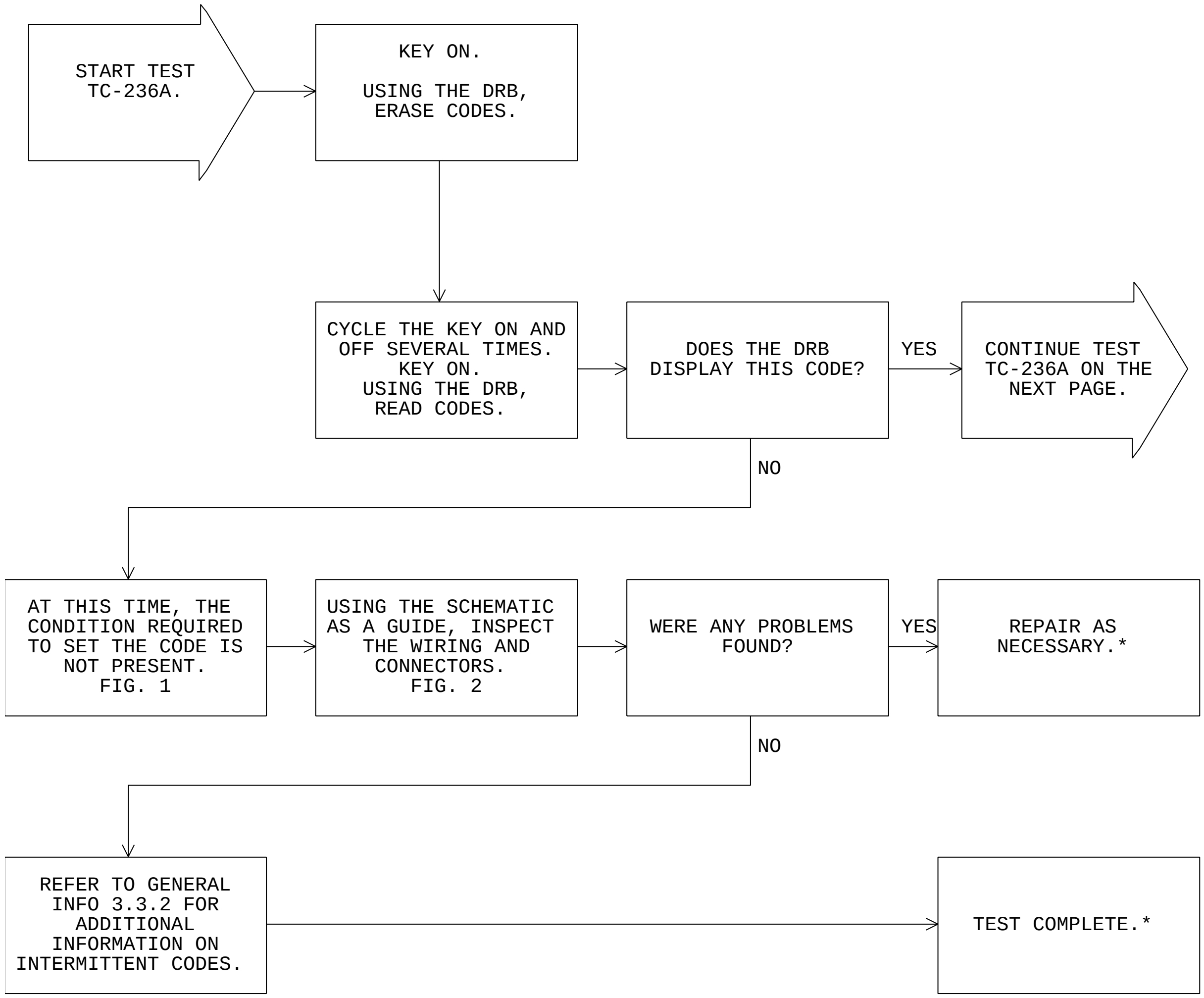


FIG. 2

TEST TC-236A REPAIRING OIL PRESSURE SENSOR HIGH EXCEEDED

Perform TEST DTC Before Proceeding

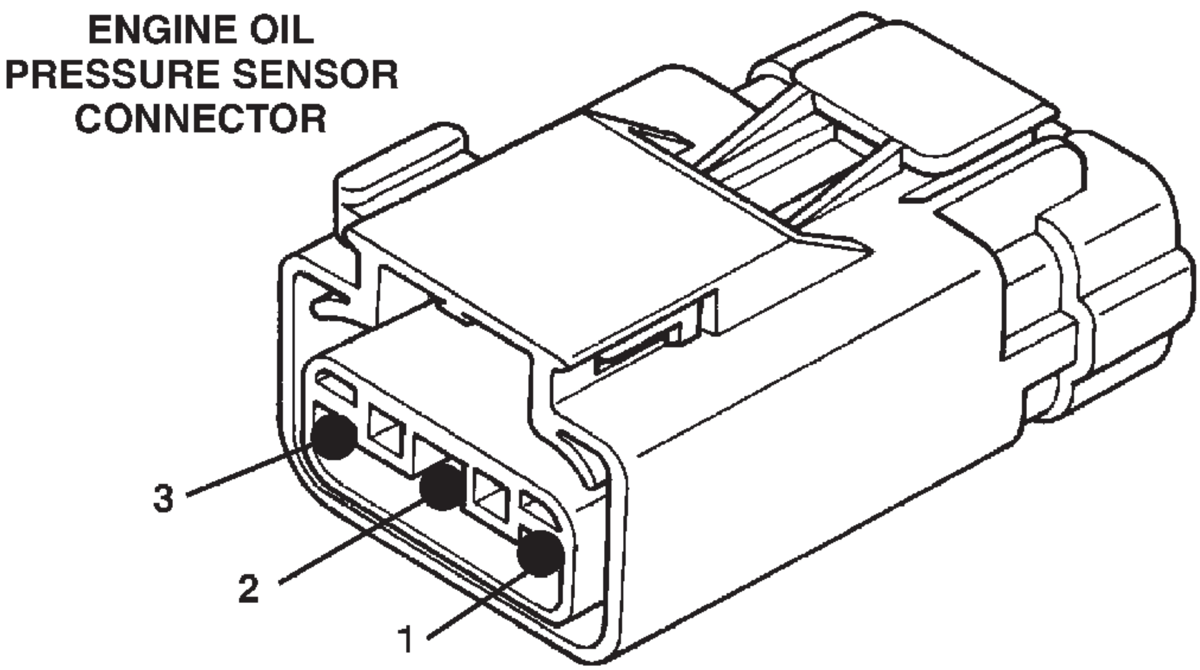


**Perform Verification TEST VER-2A.*

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

TEST TC-236A — CONTINUED - REPAIRING - OIL PRESSURE SENSOR HIGH EXCEEDED

TJ/XJ BODY



CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b37f

FIG. 1

TEST TC-236A CONTINUED - REPAIRING - OIL PRESSURE SENSOR HIGH EXCEEDED

TEST TC-236A CONTINUED FROM THE PREVIOUS PAGE.

KEY OFF.

DISCONNECT THE OIL PRESSURE SENSOR HARNESS CONNECTOR.**

KEY ON.

USE A VOLTMETER IN THE FOLLOWING STEPS.

MEASURE THE VOLTAGE OF THE OIL PRESSURE SENSOR SIGNAL CIRCUIT. FIG. 1

IS THE VOLTAGE ABOVE 5.5 VOLTS?

NO

CONTINUE TEST TC-236A ON THE NEXT PAGE.

YES

KEY OFF.

DISCONNECT THE PCM HARNESS CONNECTOR.**

KEY ON. MEASURE THE VOLTAGE OF THE OIL PRESSURE SENSOR SIGNAL CIRCUIT. FIG. 1

IS THE VOLTAGE BELOW 0.5 VOLT?

NO

REPAIR THE SHORT TO VOLTAGE IN THE OIL PRESSURE SENSOR SIGNAL CIRCUIT.*

YES

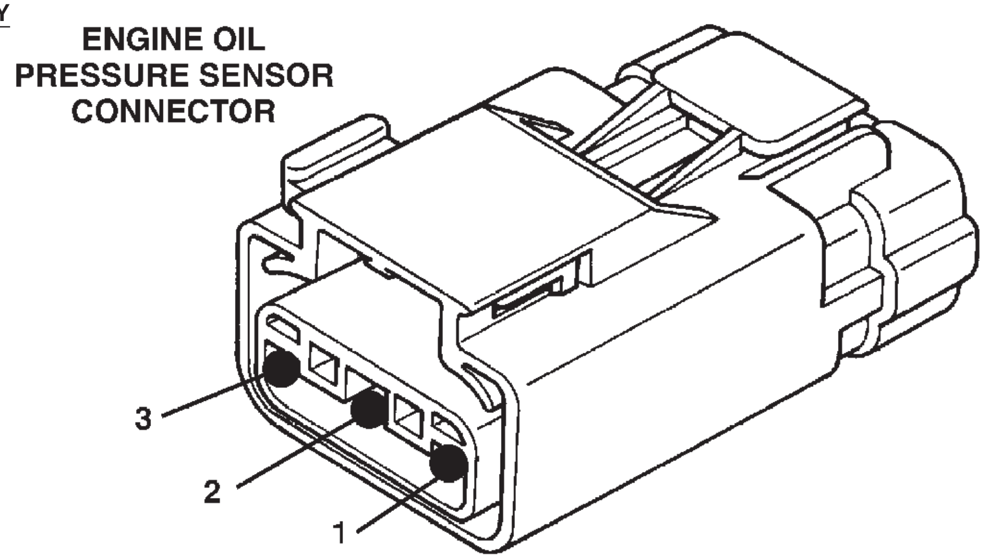
REPLACE THE POWERTRAIN CONTROL MODULE.*

Perform Verification TEST VER-2A.

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

TEST TC-236A **CONTINUED - REPAIRING OIL PRESSURE SENSOR HIGH EXCEEDED**

TJ/XJ BODY

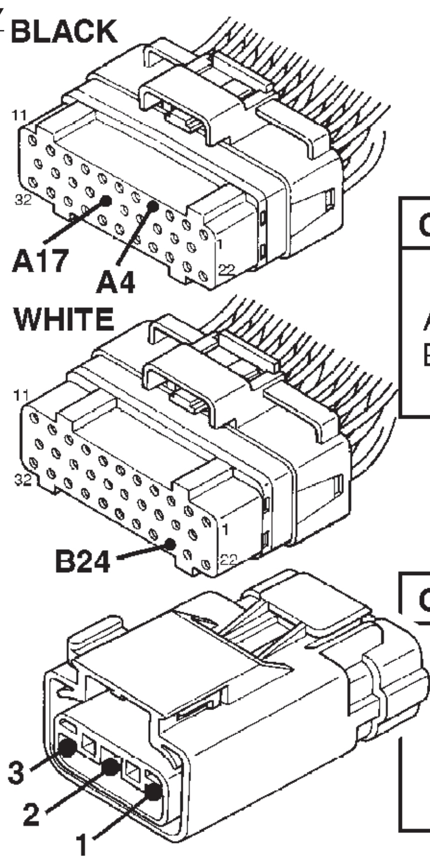


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b37f

FIG. 1

TJ/XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
B24	GY/YL	OIL PRESSURE SENSOR SIGNAL

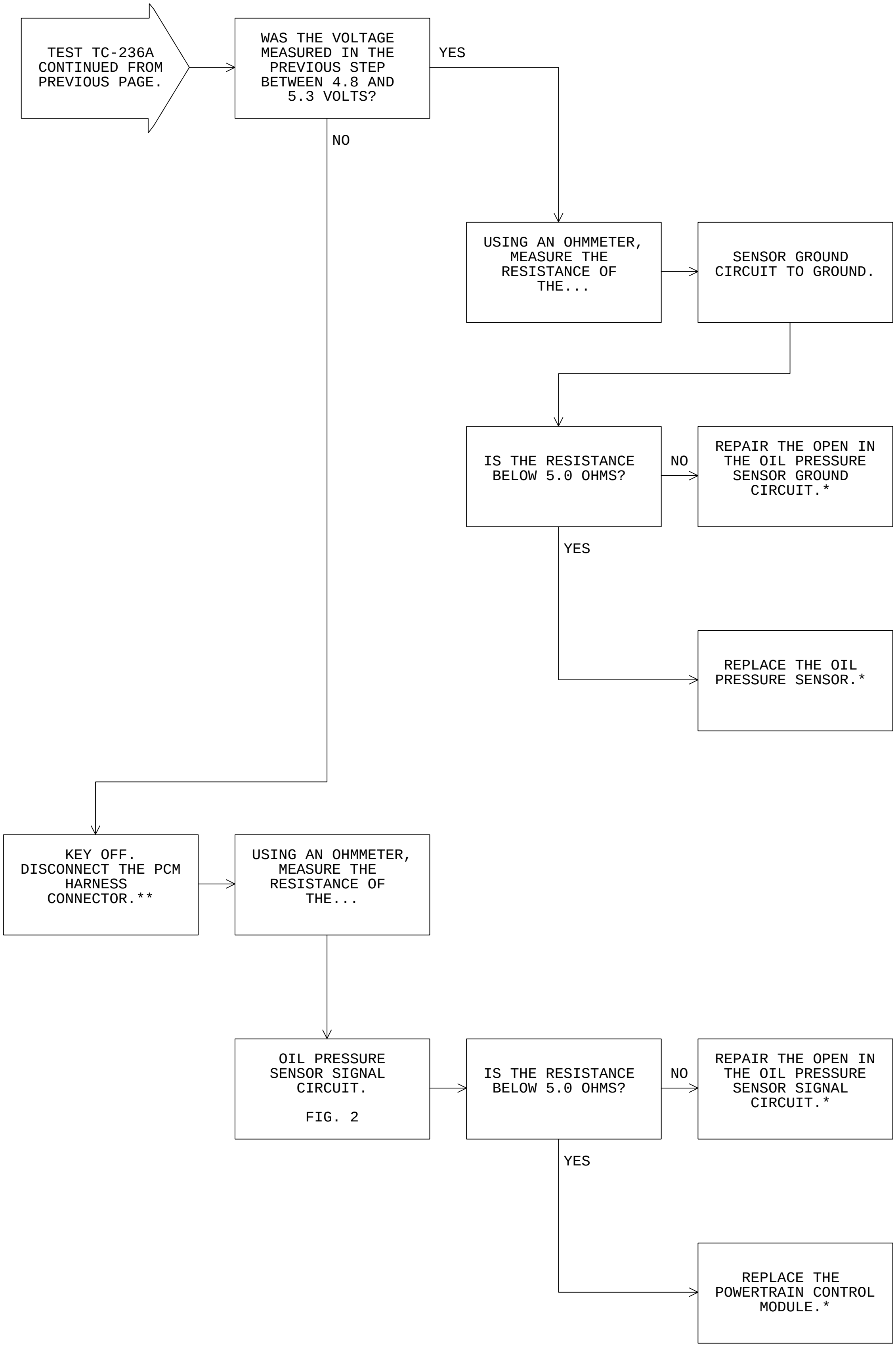
ENGINE OIL PRESSURE SENSOR CONNECTOR

CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b38a

FIG. 2

TEST TC-236A CONTINUED - REPAIRING OIL PRESSURE SENSOR HIGH EXCEEDED



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

TEST SK-1A **IDENTIFYING SENTRY KEY IMMOBILIZER SYSTEM**

Perform TEST DTC Before Proceeding

DIAGNOSTIC TROUBLE CODE (DTC) DISPLAYED	DIAGNOSTIC TEST
ANTENNA FAILURE	**
COP FAILURE	**
EEPROM FAILURE	**
EMS STATUS FAILURE	SK-2A
INTERNAL FAULT	**
RAM FAILURE	**
ROLLING CODE FAILURE	SK-3A
SERIAL LINK EXTENERAL FAULT	SK-4A
SERIAL LINK INTERNAL	**
STACK OVERFLOW FAILURE	**
TRANSPONDER COMMUNICATION FAILURE	SK-5A
TRANSPONDER CRC (CYCLE REDUNDANCY CHECK) FAIL-URE	SK-6A
TRANSPONDER ID MISMATCH	SK-7A
TRANSPONDER RESPONSE MISMATCH	SK-8A
VIN MISMATCH	SK-9A

**These trouble codes indicate an internal SKIM fault. Using the DRB, clear SKIM trouble code(s). Perform several key cycles, leaving the key on for a minimum of 30 seconds per cycle. Using the DRB, read SKIM trouble codes. If the trouble code is present, replace the SKIM.

NOTE: An intermittent start and stall condition accompanied with a transponder DTC can be caused by the presence of a non-programmed key or key programmed to another vehicle, near the SKIM antenna (ignition halo). This can occur if the customer has a key holder (ring) that contains more than one key equipped with a transponder chip.

After replacement of the Sentry Key Immobilizer Module (SKIM) see **GENERAL INFORMATION SECTION 8.0 for SKIM initialization.**

NOTE: For all component locations, REFER TO GENERAL INFORMATION Section 4.0 in this manual.

TEST SK-1A | IDENTIFYING SENTRY KEY IMMOBILIZER SYSTEM

Perform TEST DTC Before Proceeding

NOTE: The Sentry Key Immobilizer System (SKIS) diagnosis may require usage of the customer's additional keys to verify the cause of the system failure. In the event that the Sentry Key Immobilizer Module (SKIM) needs replacing, all of the keys previously programmed into the SKIM's memory must be programmed into the new SKIM. **THEREFORE IT IS IMPORTANT THAT ALL OF THE CUSTOMER'S KEYS PROGRAMMED FOR THE VEHICLE BE OBTAINED PRIOR TO BEGINNING VEHICLE DIAGNOSIS.**

NOTE: It is necessary to obtain the four-digit Personal Identification Number (PIN) from the customer or the vehicle invoice. The PIN is required to perform certain SKIM tasks using the DRB.

NOTE: It is very important that the PCM is programmed with the correct Vehicle Identification Number (VIN). Incorrect VIN programming may result in incorrect diagnosis and unnecessary component replacement. Use the DRB to verify the correct VIN and country code in the SKIM.

1. The battery must be fully charged for any test in this manual.
2. Attempt to start the engine. Crank for up to 10 seconds if necessary.
3. Connect the DRB to the diagnostic connector and select ''Theft Alarm'' then ''SKIM''.
   If the DRB displays ''No Response'' . . . . .perform test 1B

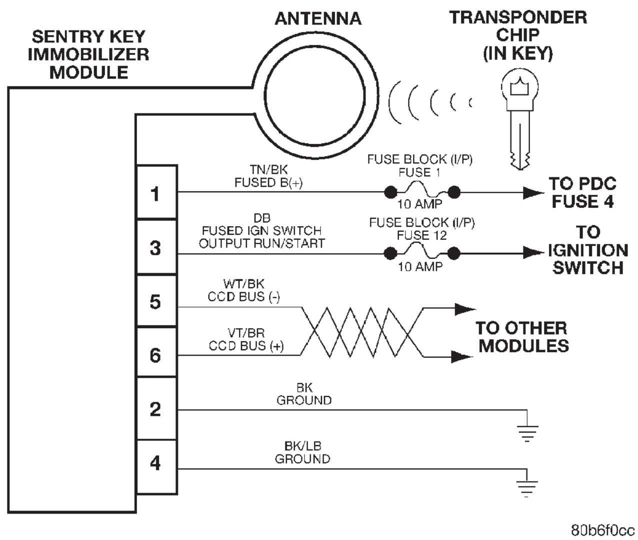
NOTE: If the DRB screen is blank or has a DRB error message displayed, go to **General Information Section 3.5** in this manual.

4. With the DRB, read and record SKIM trouble codes.
5. If diagnostic trouble code(s) are displayed, refer to the diagnostic trouble code list on the next page for the appropriate test.

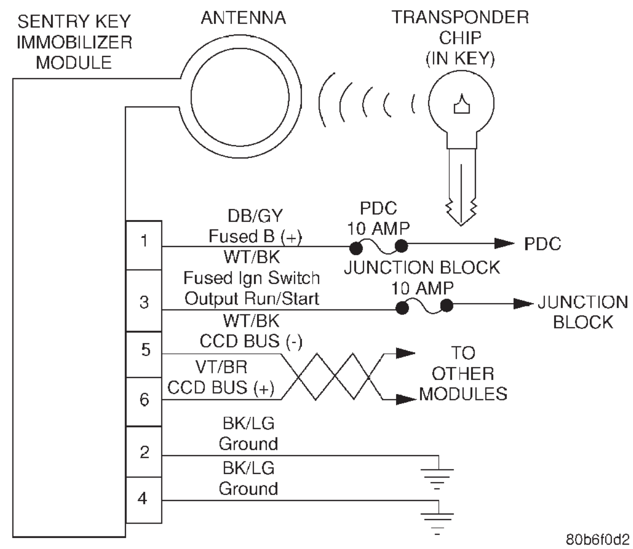
TEST SK-1B — SKIM COMMUNICATION

Perform TEST SK-1A Before Proceeding

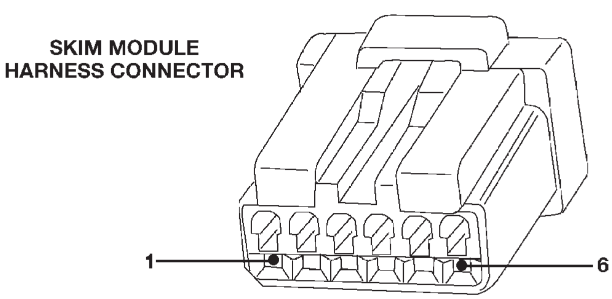
TJ BODY



XJ BODY



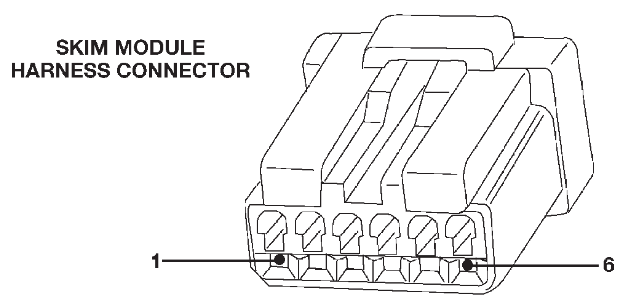
TJ BODY



CAV	COLOR	FUNCTION
1	TN/BK	FUSED BATTERY SUPPLY
2	BK	GROUND
3	RD/LG	FUSED IGNITION SWITCH OUTPUT
5	WT/BK	CCD BUS (-)
6	VT/BR	CCD BUS (+)

80b11874

XJ BODY



CAV	COLOR	FUNCTION
1	DB/GY	FUSED BATTERY SUPPLY
2	BK/LG	GROUND
3	WT/BK	FUSED IGNITION SWITCH OUTPUT
5	WT/BK	CCD BUS (-)
6	VT/BR	CCD BUS (+)

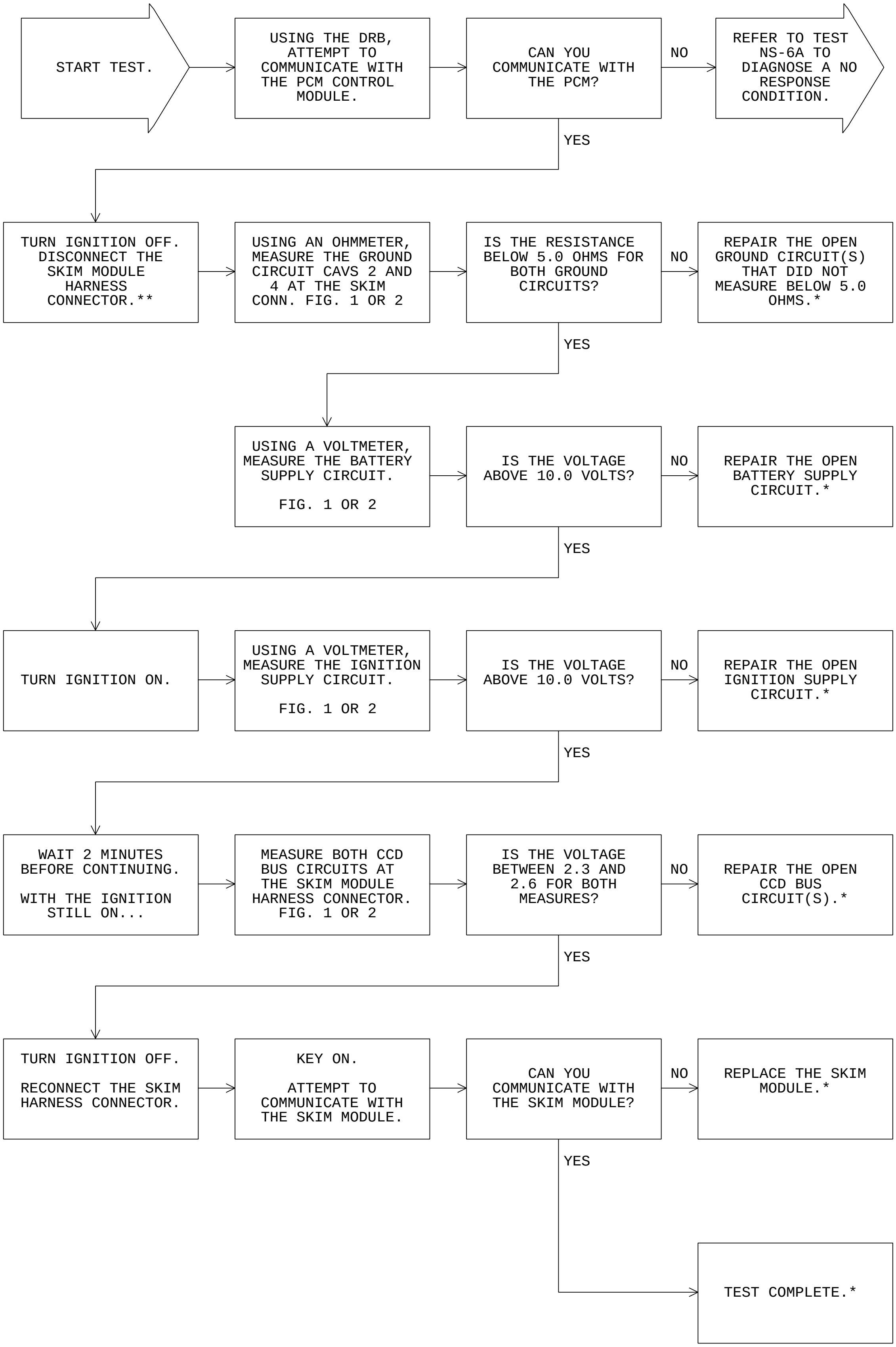
80b11875

FIG. 1

FIG. 2

TEST SK-1B | SKIM COMMUNICATION

Perform TEST SK-1A Before Proceeding

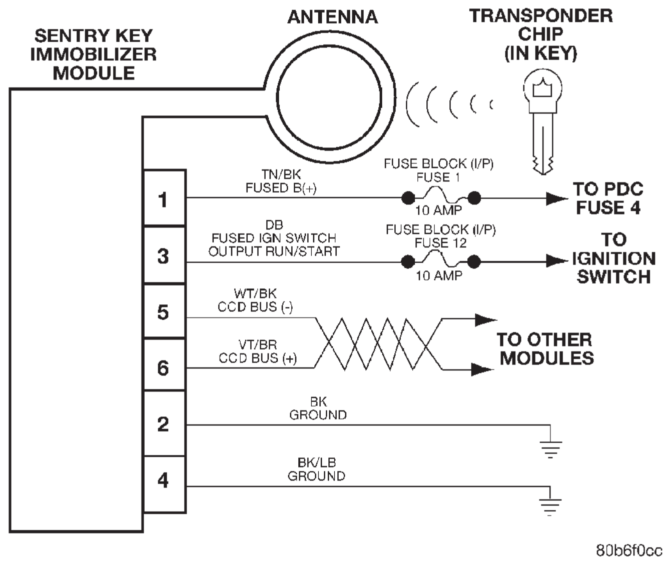


*Perform Verification TEST VER-1A.	**Check connectors - Clean / repair as necessary.

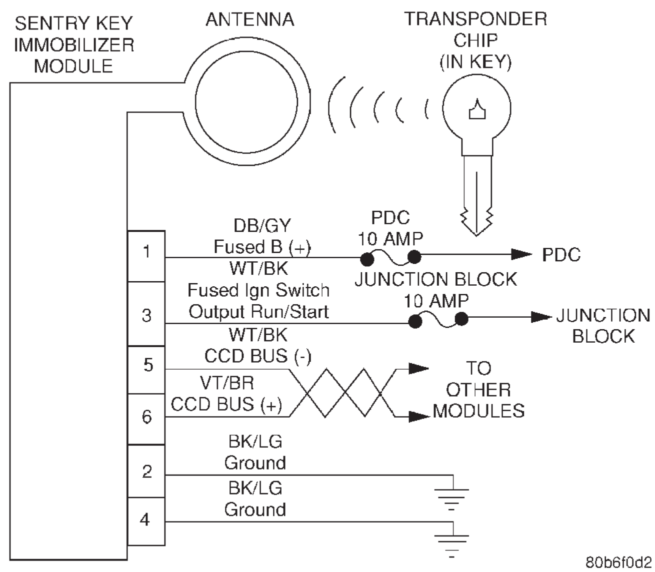
TEST SK-2A | REPAIRING - PCM STATUS FAILURE

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: PCM Status Failure

When monitored: With the ignition on.

Set condition: The SKIM does not receive an expected PCM Status CCD BUS message from the PCM within the last 20 seconds.

Theory of operation: The PCM status message informs the SKIM whether the PCM has received a “valid key” or “invalid key” message from the SKIM. The PCM broadcasts the PCM status every 2.7 seconds on the CCD BUS.

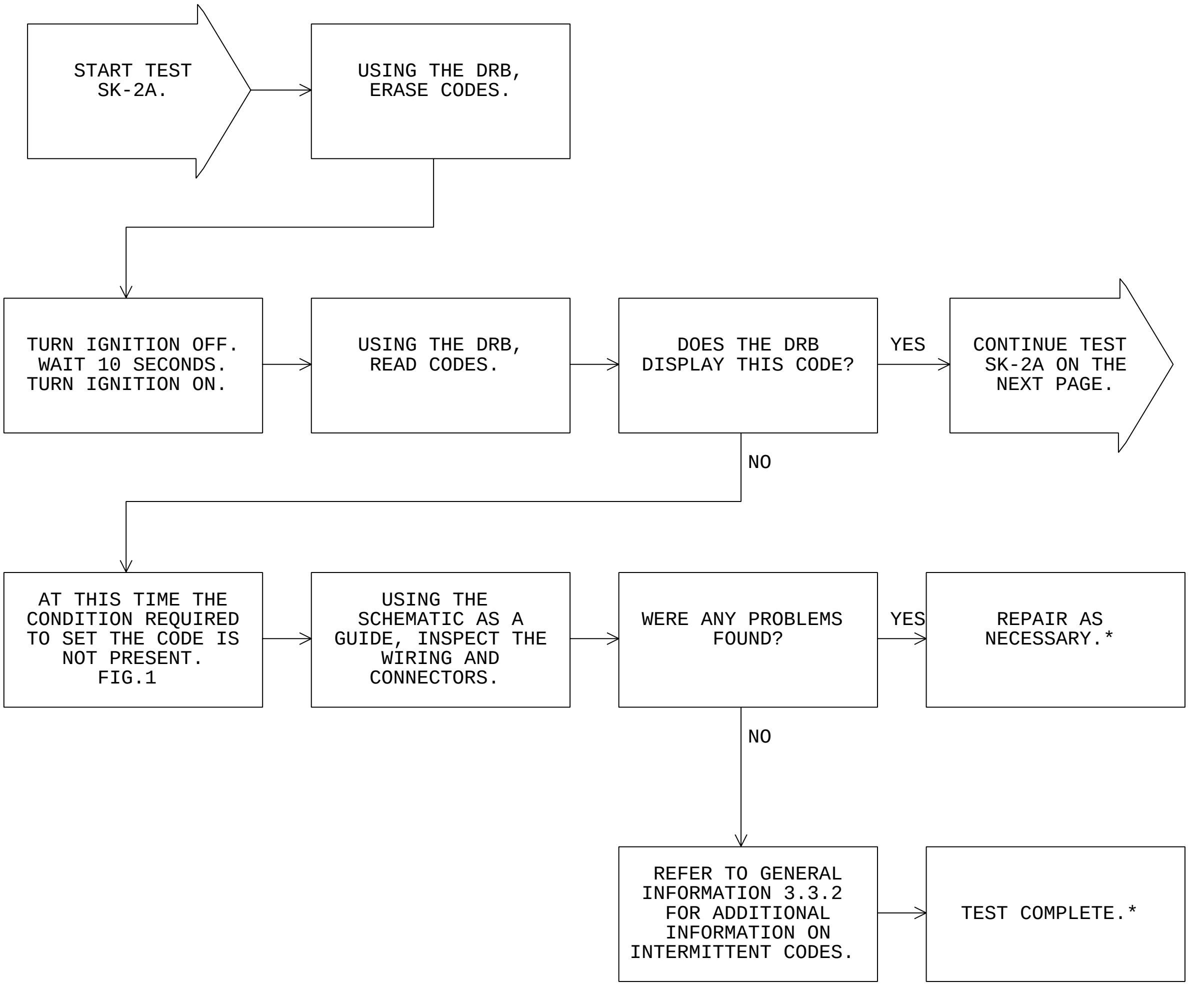
Possible causes:
> CCD BUS circuits open, shorted to voltage or shorted to ground
> Failed SKIM
> Failed PCM

80b5cc6e

FIG. 1

TEST SK-2A — REPAIRING - PCM STATUS FAILURE

Perform TEST SK-1A Before Proceeding

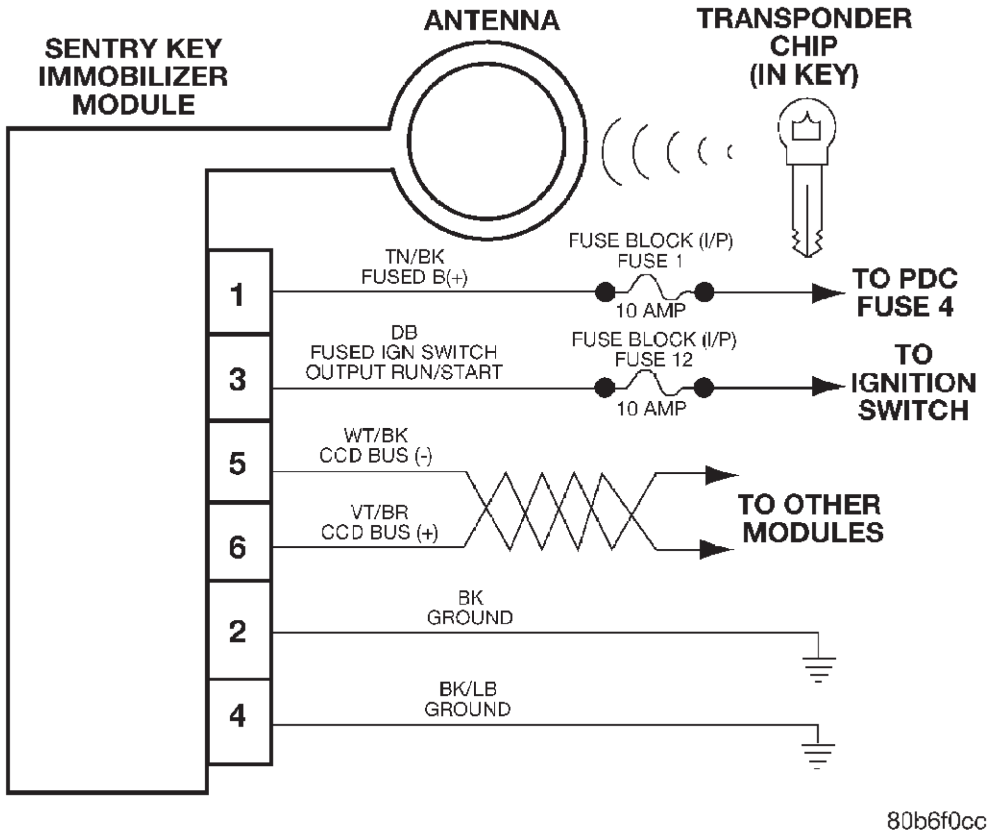


**Perform Verification TEST VER-1A.*

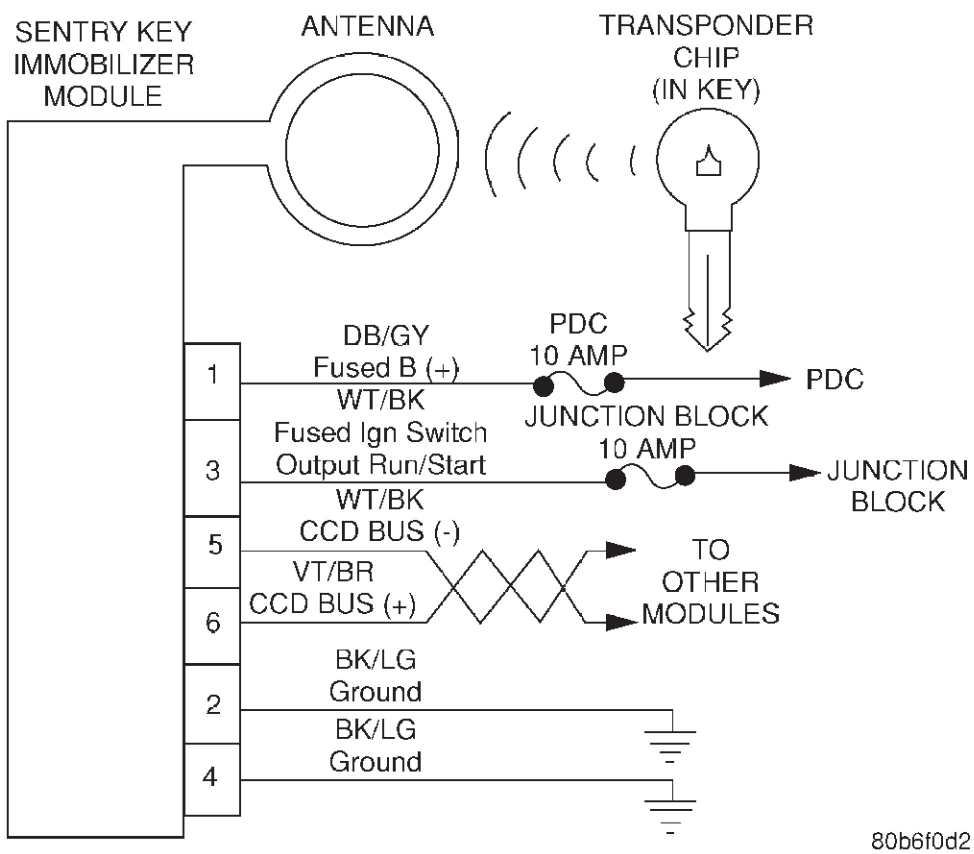
***Check connectors - Clean / repair as necessary.*

TEST SK-2A	CONTINUED - REPAIRING - PCM STATUS FAILURE

TJ BODY

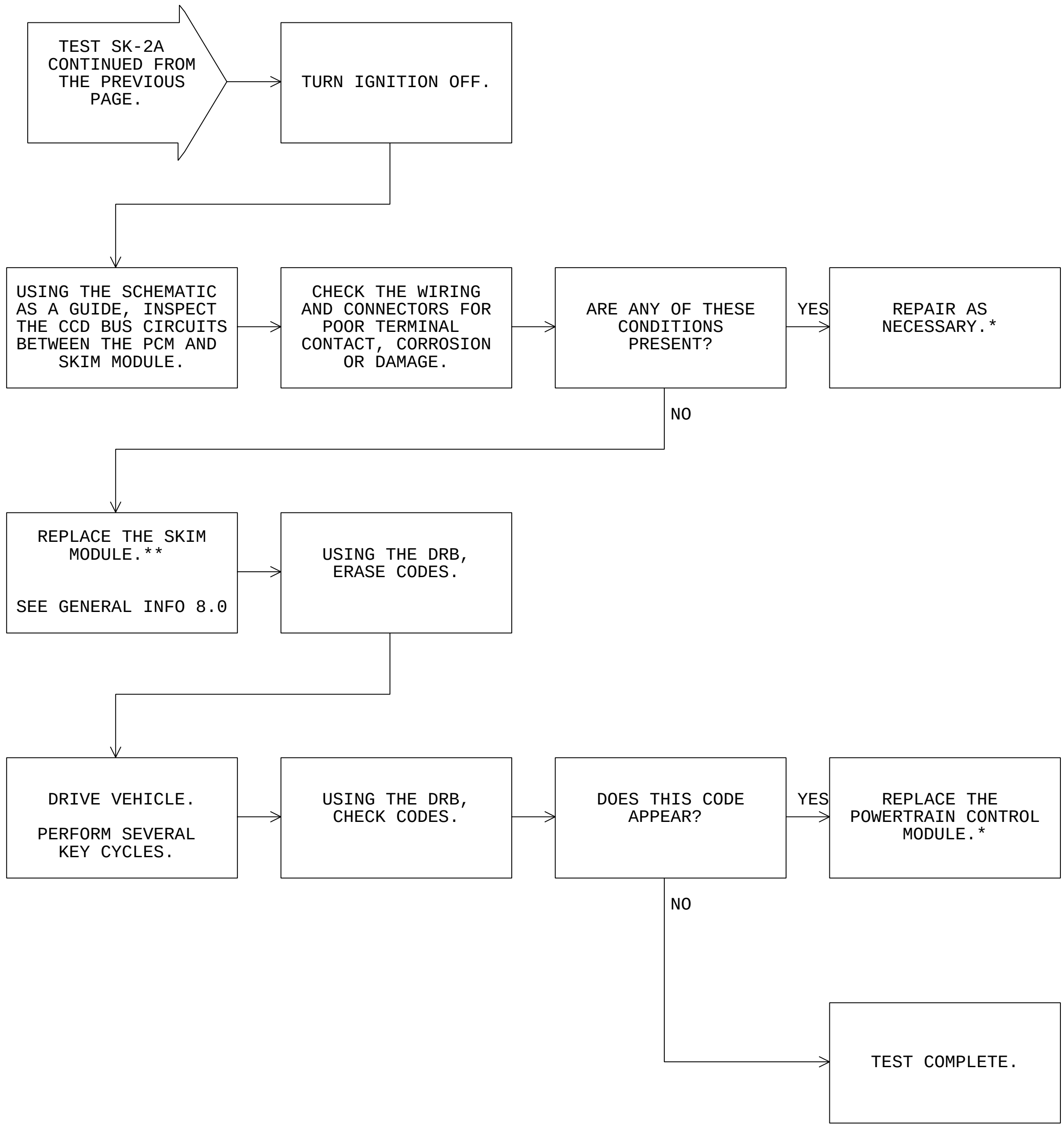


XJ BODY



TEST SK-2A

CONTINUED - REPAIRING - PCM STATUS FAILURE



Perform Verification TEST VER-1A.

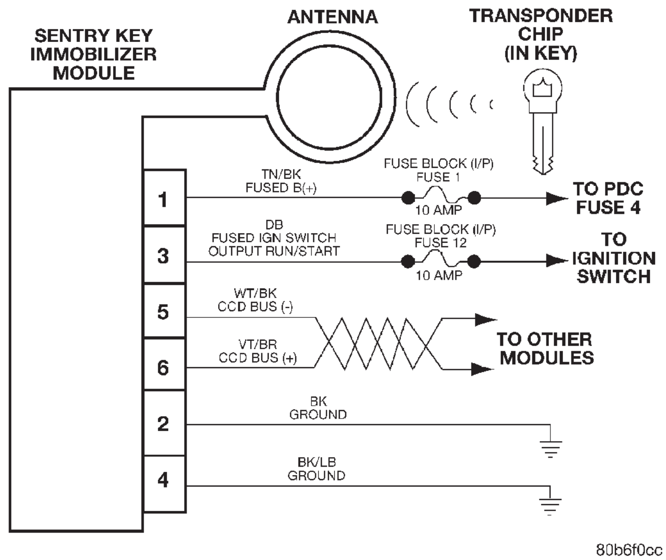
***Check connectors - Clean / repair as necessary.*

S E N T R Y K E Y I M M O B I L I Z E R S Y S T E M

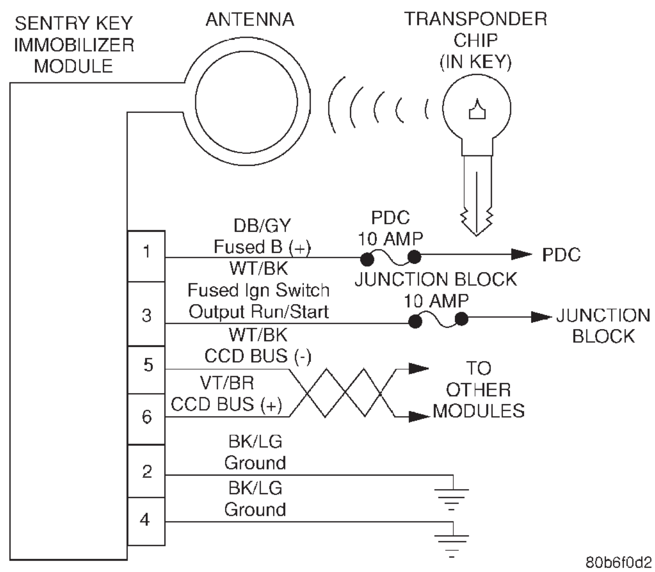
TEST SK-3A — REPAIRING - ROLLING CODE FAILURE

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: Rolling Code Failure

When monitored: With the ignition on.

Set condition: The SKIM does not receive an expected EMS status CCD BUS message from the PCM within 3.5 seconds of transmitting a “valid key” message to the PCM.

Theory of operation: After determining the ignition key is a valid key, the SKIM sends a coded “valid key” CCD BUS message to the PCM. The SKIM expects a CCD BUS message acknowledgment from the PCM.

Possible cause:

> CCD BUS circuits open, shorted to voltage or shorted to ground

> Failed SKIM

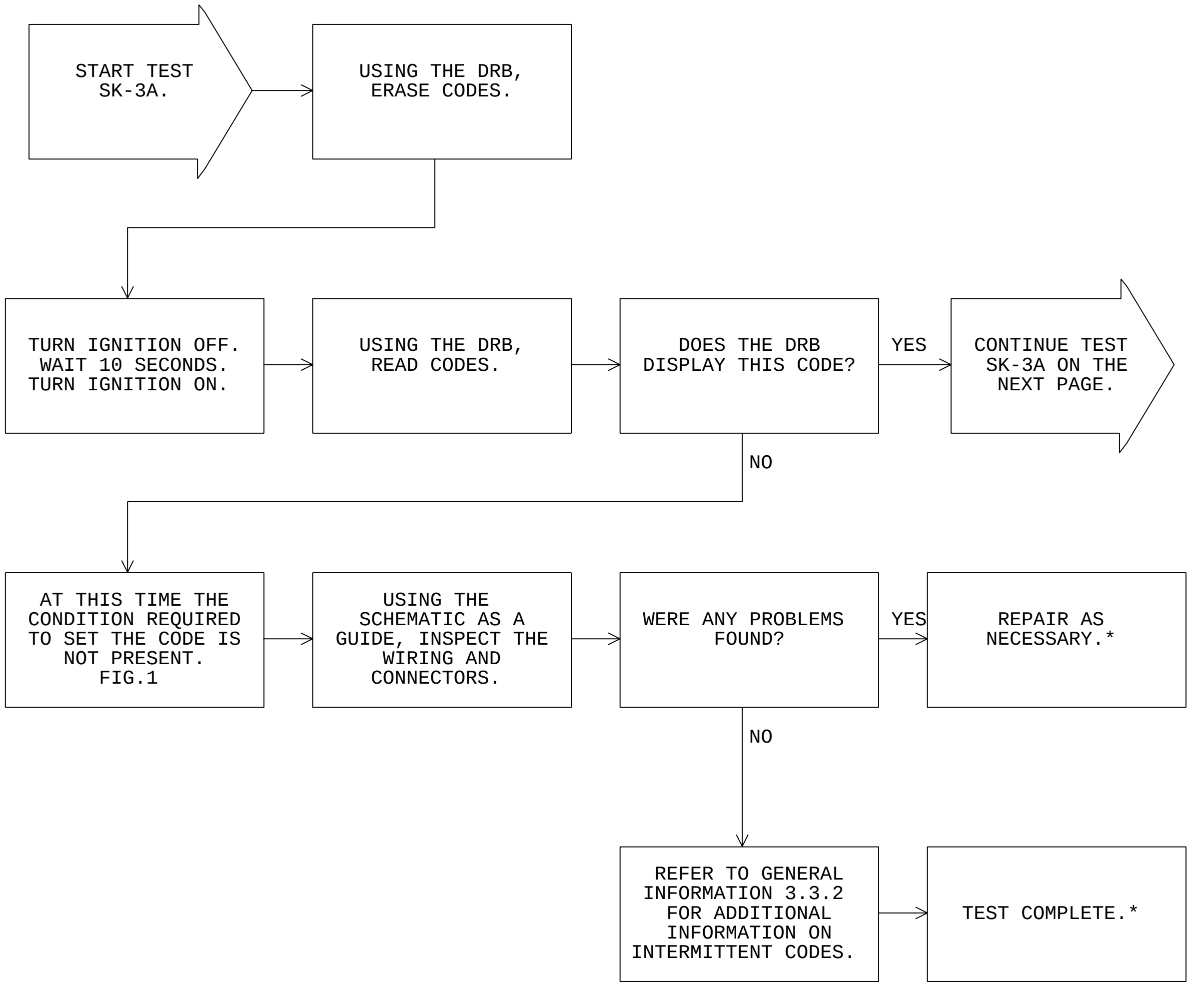
> Failed PCM

80b5cc6f

FIG. 1

TEST SK-3A | REPAIRING - ROLLING CODE FAILURE

Perform TEST SK-1A Before Proceeding

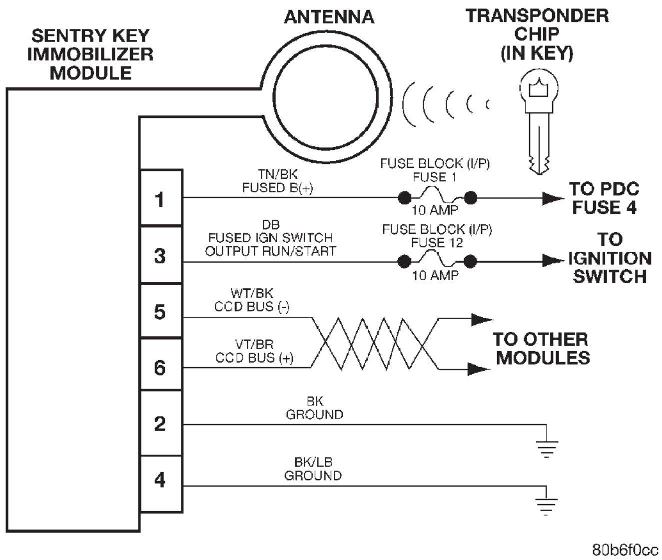


**Perform Verification TEST VER-1A.*

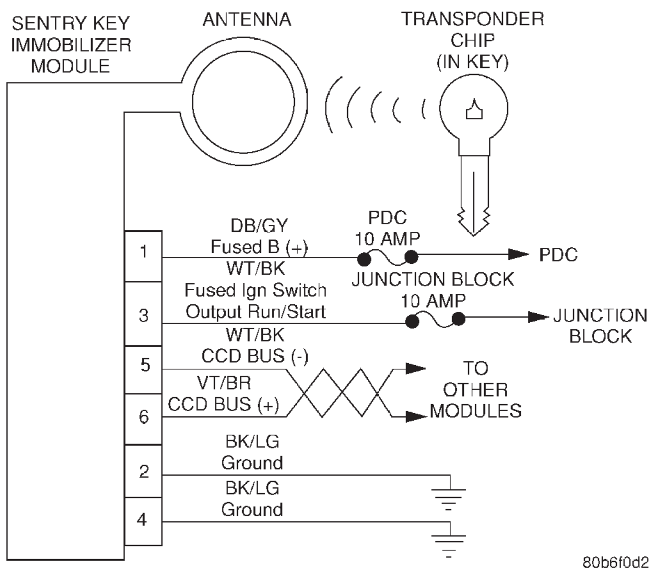
***Check connectors - Clean / repair as necessary.*

TEST SK-3A — CONTINUED - REPAIRING ROLLING CODE FAILURE

TJ BODY



XJ BODY



Name of code: Rolling Code Failure

When monitored: With the ignition on.

Set condition: The SKIM does not receive an expected EMS status CCD BUS message from the PCM within 3.5 seconds of transmitting a “valid key” message to the PCM.

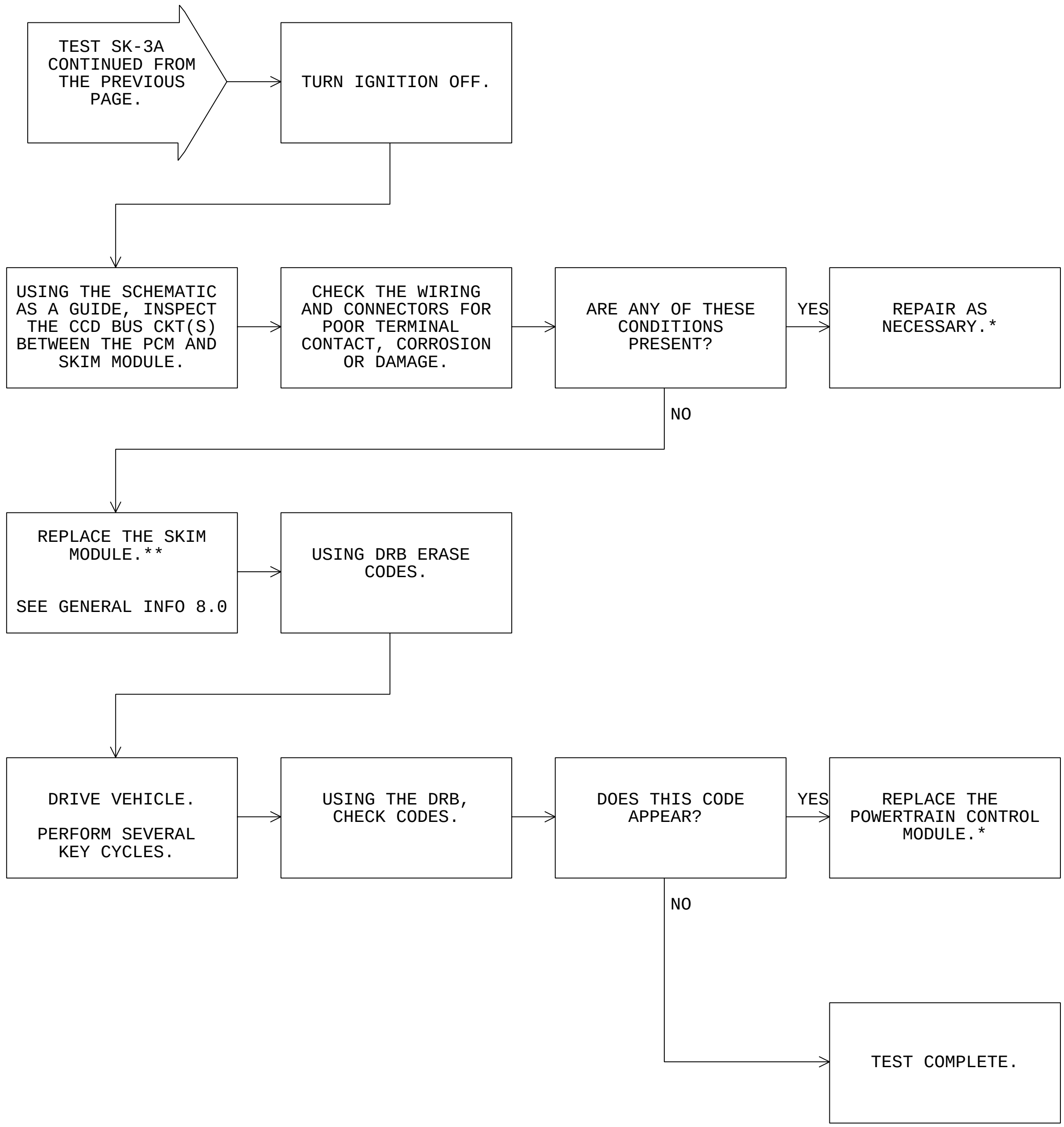
Theory of operation: After determining the ignition key is a valid key, the SKIM sends a coded “valid key” CCD BUS message to the PCM. The SKIM expects a CCD BUS message acknowledgment from the PCM.

Possible cause:

> CCD BUS circuits open, shorted to voltage or shorted to ground
> Failed SKIM
> Failed PCM

80b5cc6f

TEST SK-3A | CONTINUED - REPAIRING ROLLING CODE FAILURE

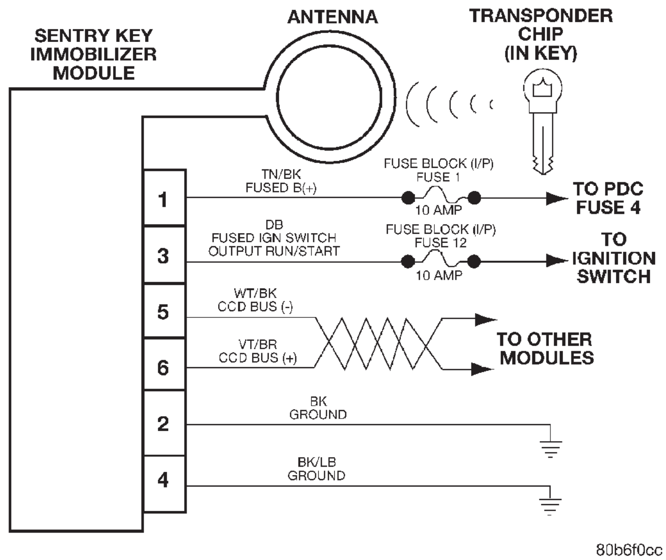


Perform Verification TEST VER-1A. | ***Check connectors - Clean / repair as necessary.*

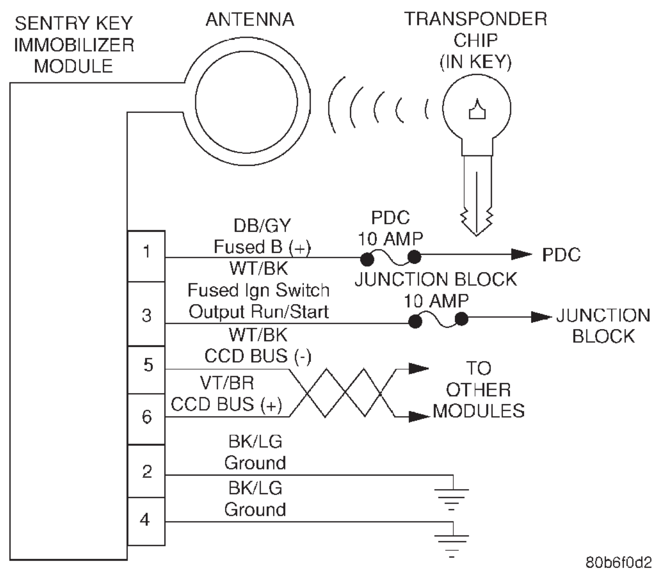
TEST SK-4A REPAIRING - SERIAL LINK EXTERNAL FAILURE

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: Serial Link External Fault

When monitored: With the ignition on.

Set condition: The SKIM does not receive an expected CCD BUS message transmission acknowledgment from the PCM after three transmit attempts.

Theory of operation: The SKIM expects a CCD BUS message acknowledgment from the PCM on the BUS during its communication process.

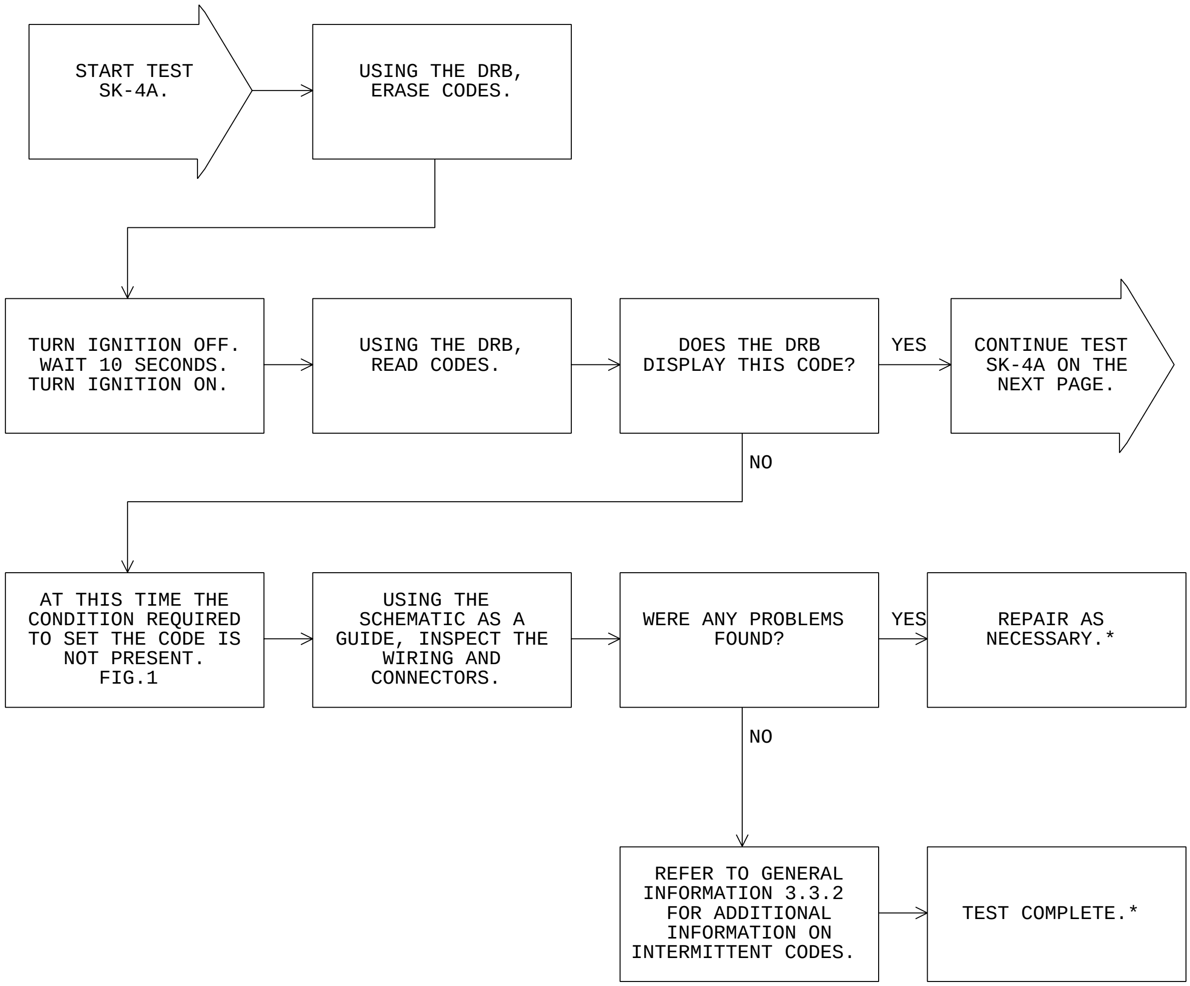
Possible cause:
> CCD BUS circuits open, shorted to voltage or shorted to ground
> Failed SKIM
> Failed PCM

80b5cc70

FIG. 1

TEST SK-4A | REPAIRING - SERIAL LINK EXTERNAL FAILURE

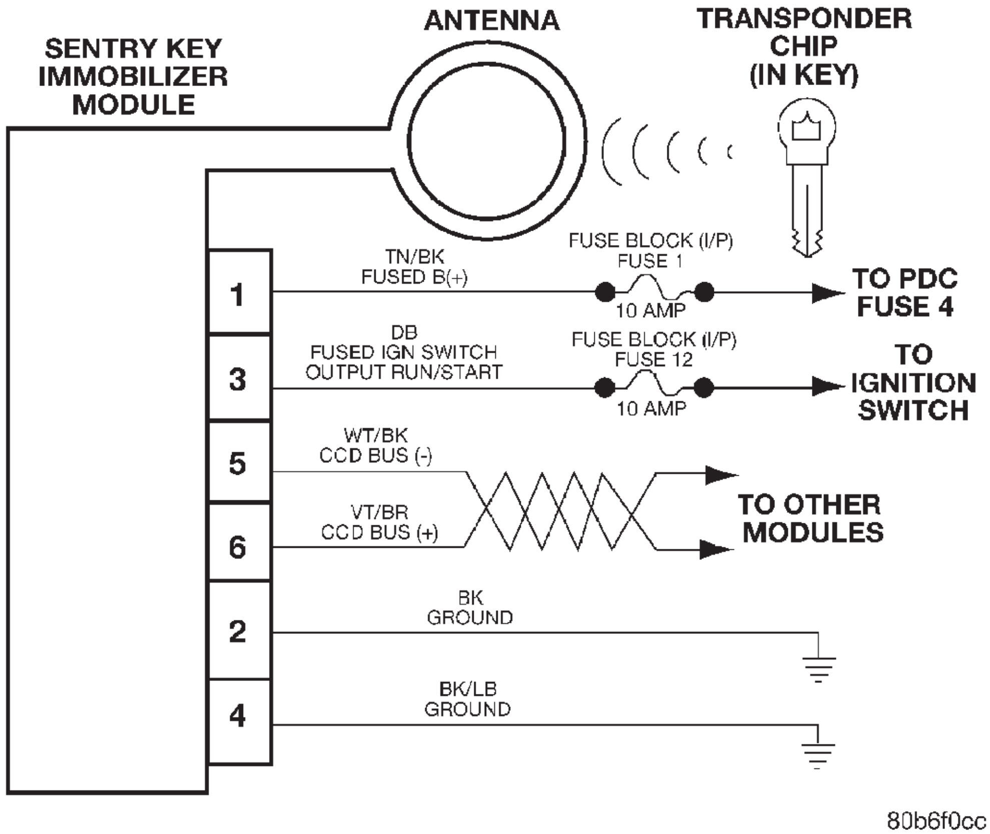
Perform TEST SK-1A Before Proceeding



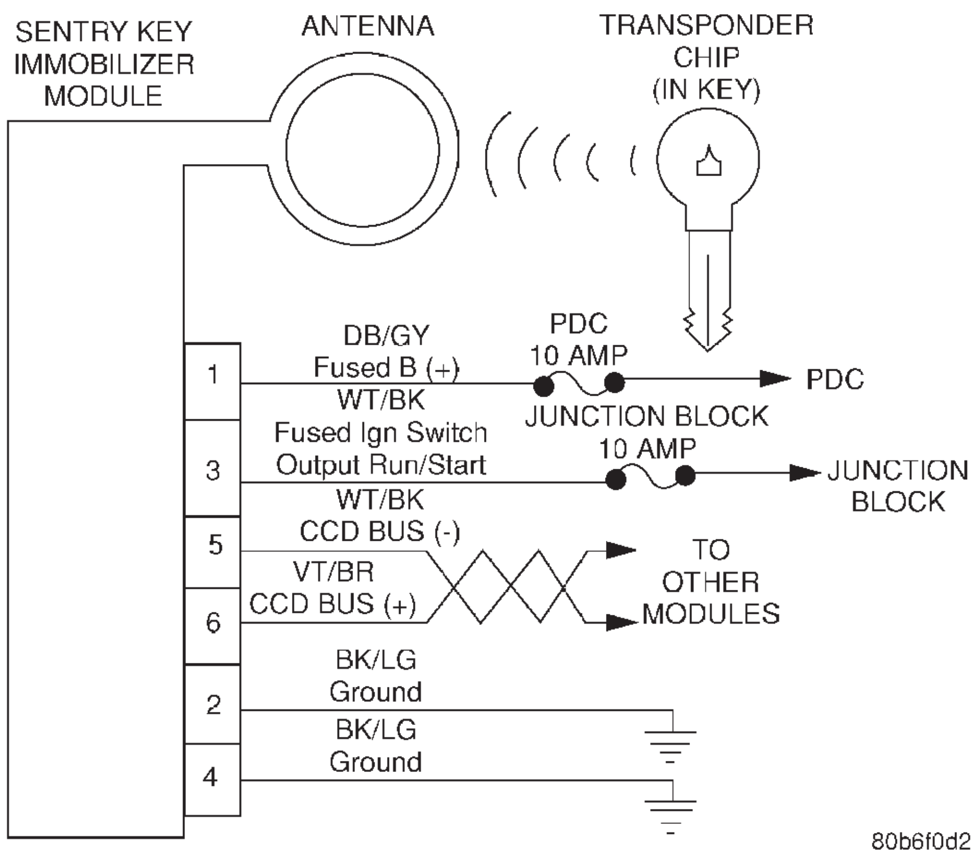
*Perform Verification TEST VER-1A.	**Check connectors - Clean / repair as necessary.

TEST SK-4A — CONTINUED - REPAIRING - SERIAL LINK EXTERNAL FAILURE

TJ BODY



XJ BODY



TEST SK-4A — CONTINUED - REPAIRING - SERIAL LINK EXTERNAL FAILURE

TEST SK-4A CONTINUED FROM THE PREVIOUS PAGE.

TURN IGNITION OFF.

USING THE SCHEMATIC AS A GUIDE, INSPECT THE CCD BUS CKT(S) BETWEEN THE PCM AND SKIM MODULE.

CHECK THE WIRING AND CONNECTORS FOR POOR TERMINAL CONTACT, CORROSION OR DAMAGE.

ARE ANY OF THESE CONDITIONS PRESENT?

YES → REPAIR AS NECESSARY.*

NO → REPLACE THE SKIM MODULE.**

SEE GENERAL INFO 8.0

USING DRB ERASE CODES.

DRIVE VEHICLE.

PERFORM SEVERAL KEY CYCLES.

USING THE DRB, CHECK CODES.

DOES THIS CODE APPEAR?

YES → REPLACE THE POWERTRAIN CONTROL MODULE.*

NO → TEST COMPLETE.

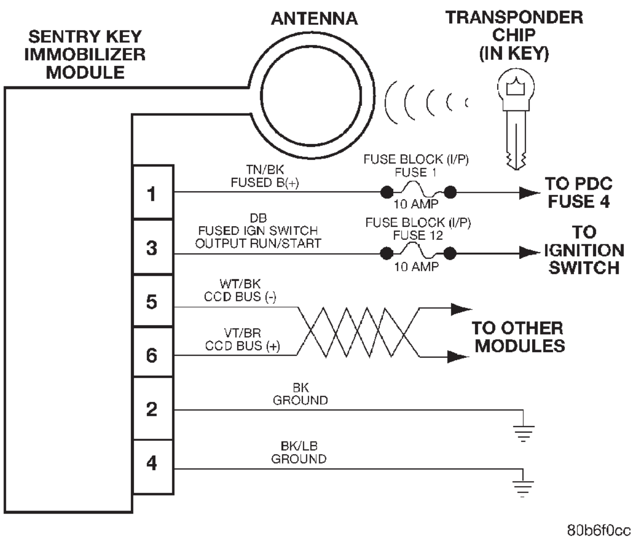
Perform Verification TEST VER-1A.

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

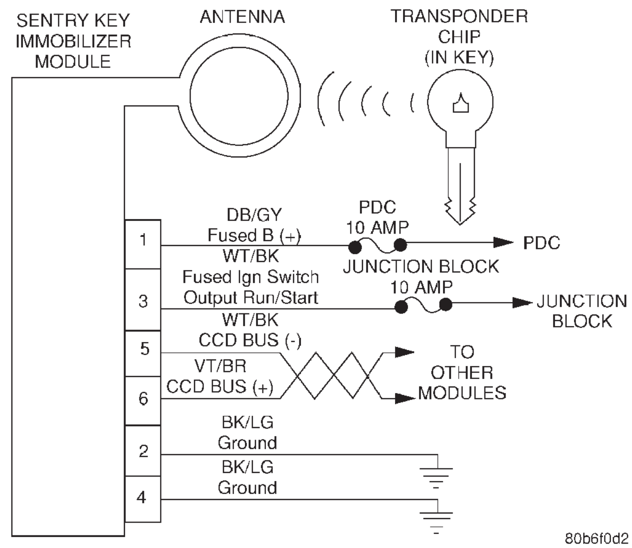
TEST SK-5A | REPAIRING - TRANSPONDER COMMUNICATION FAILURE

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: Transponder Communication Failure

When monitored: With the ignition on and during key programming operation.

Set condition: The SKIM fails to receive a valid message from the transponder after five consecutive read attempts.

Theory of operation: When the ignition is turned on or during key programming, the SKIM attempts to power up the transponder. The SKIM makes up to five attempts to communicate with the transponder. If the SKIM does not receive a response from the transponder, no further communication is attempted and a code is stored in memory.

Possible cause:
> Failed transponder
> Invalid ignition key
> Electro-magnetic interference
> Failed SKIM

80b5cc71

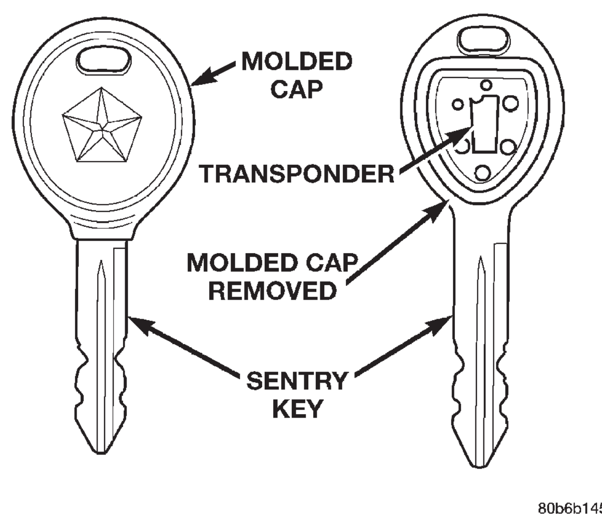
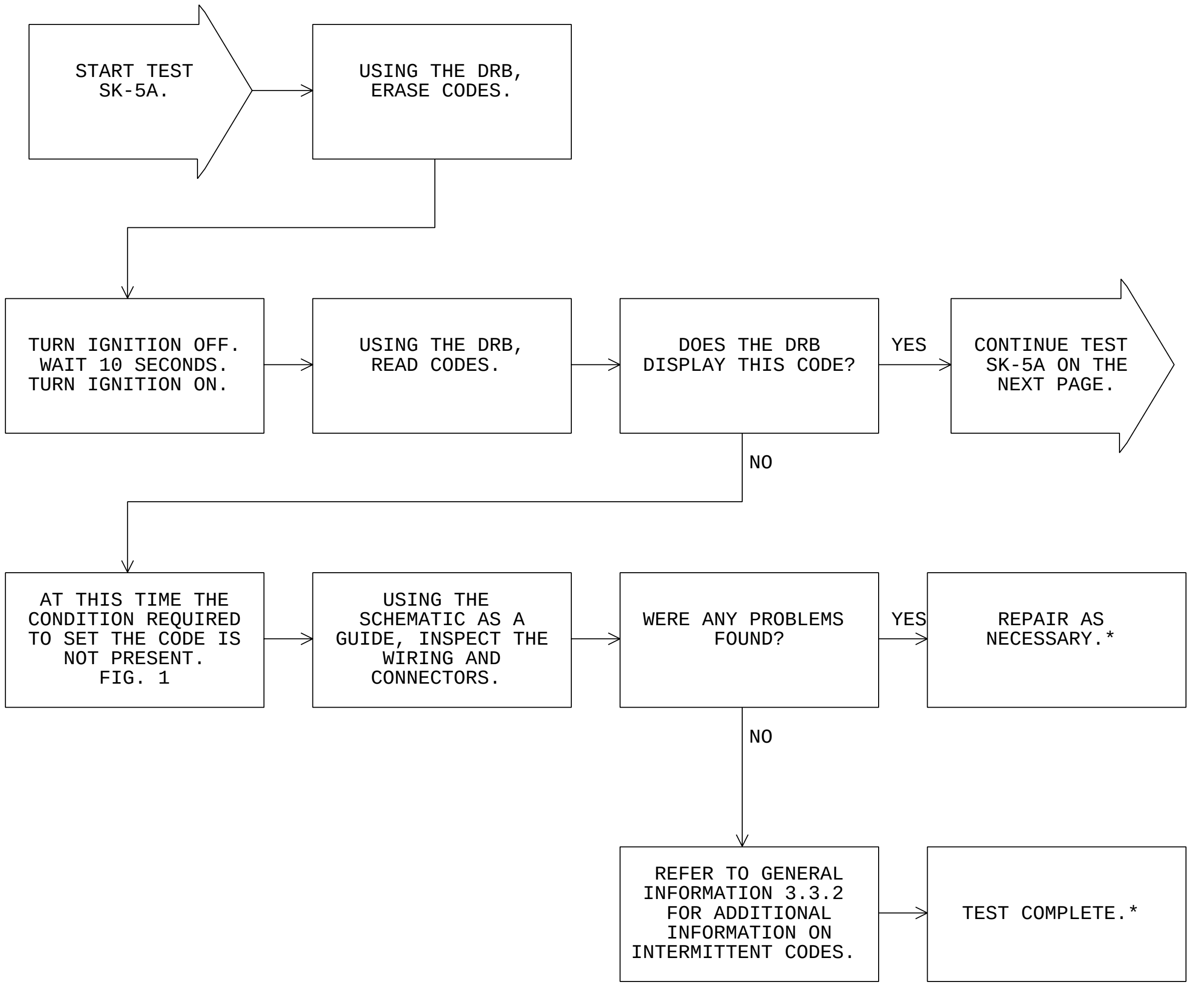


FIG. 1

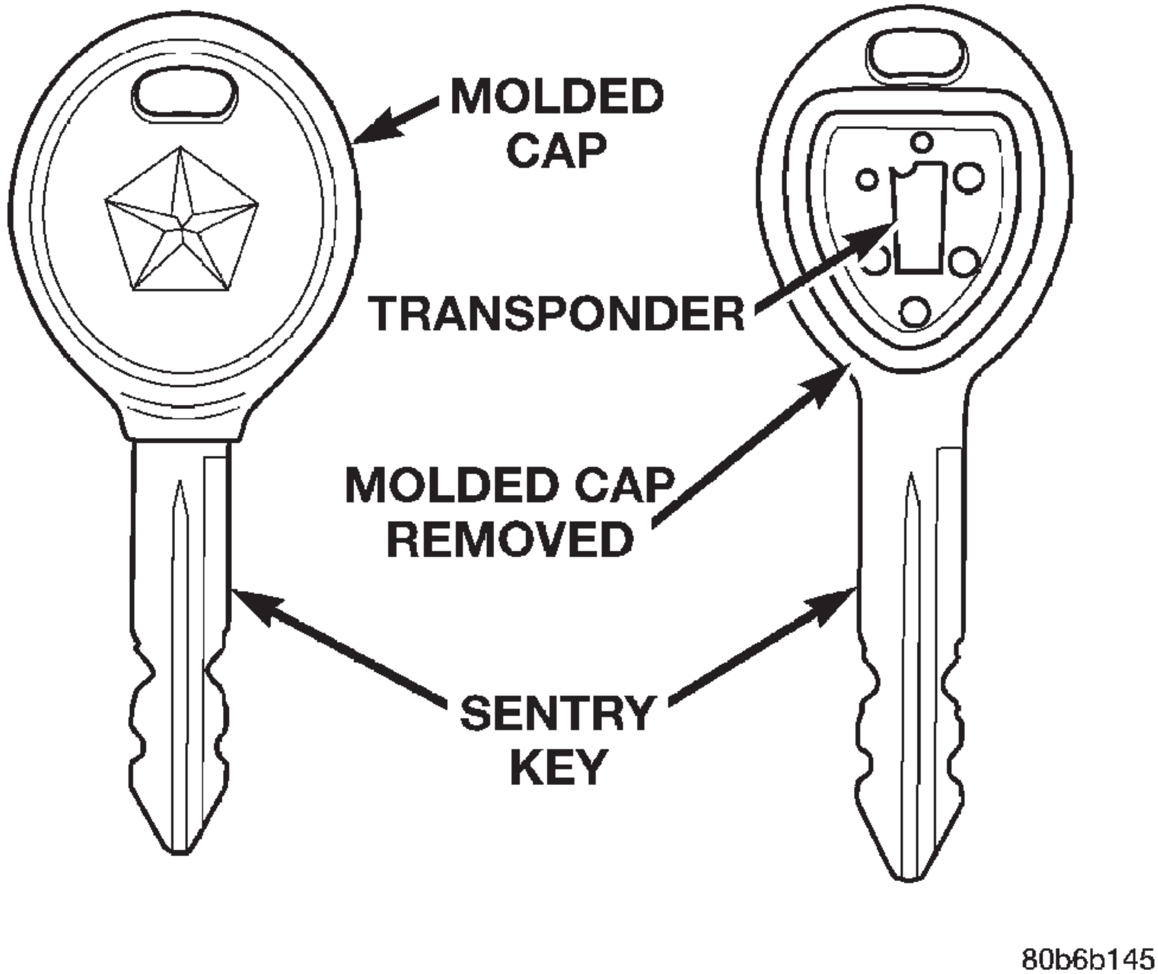
TEST SK-5A | REPAIRING - TRANSPONDER COMMUNICATION FAILURE

Perform TEST SK-1A Before Proceeding

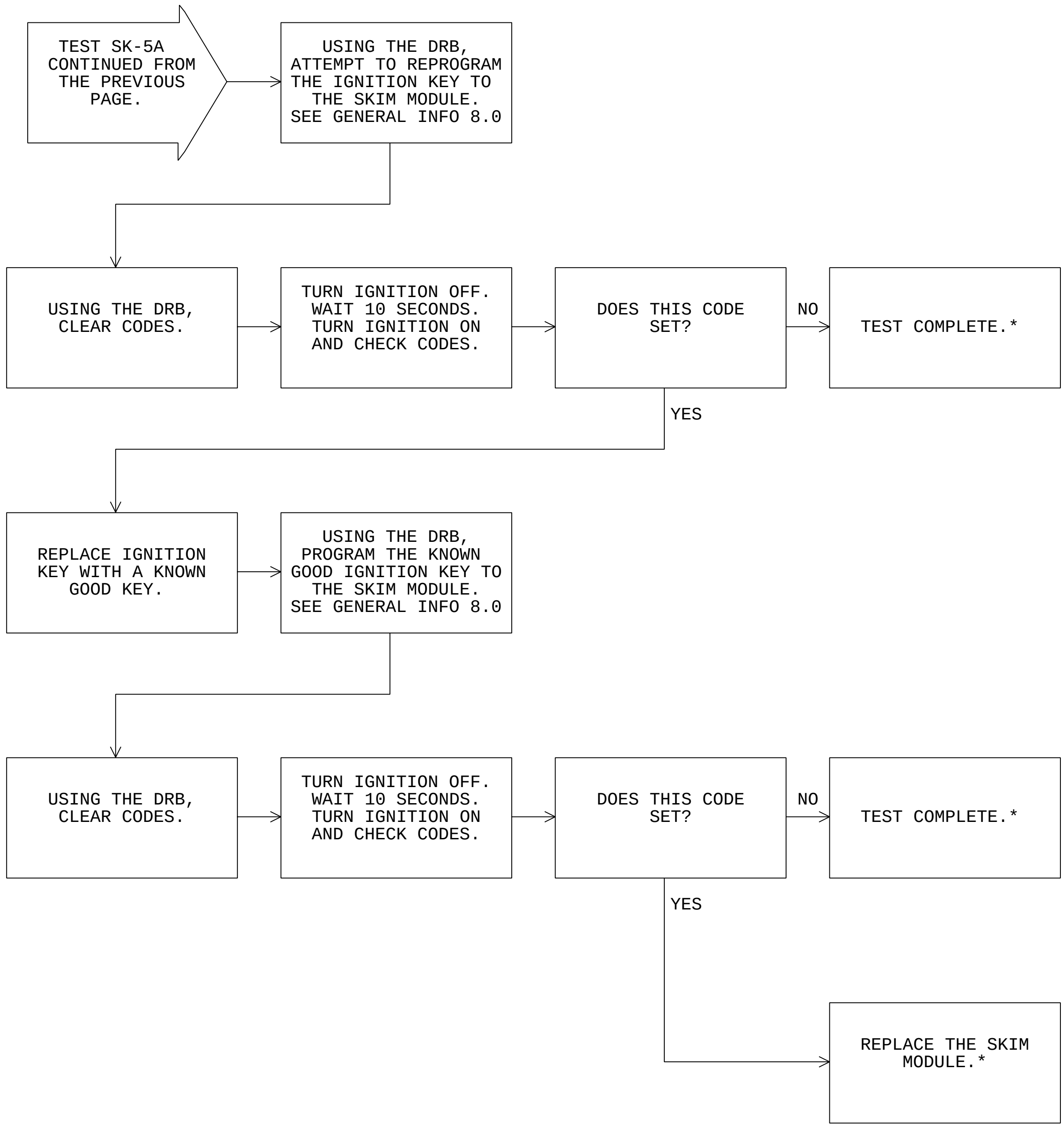


****Perform Verification TEST VER-1A.***	***Check connectors - Clean / repair as necessary.*

TEST SK-5A	CONTINUED - REPAIRING - TRANSPONDER COMMUICATION FAILURE



TEST SK-5A | **CONTINUED - REPAIRING - TRANSPONDER COMMUICATION FAILURE**



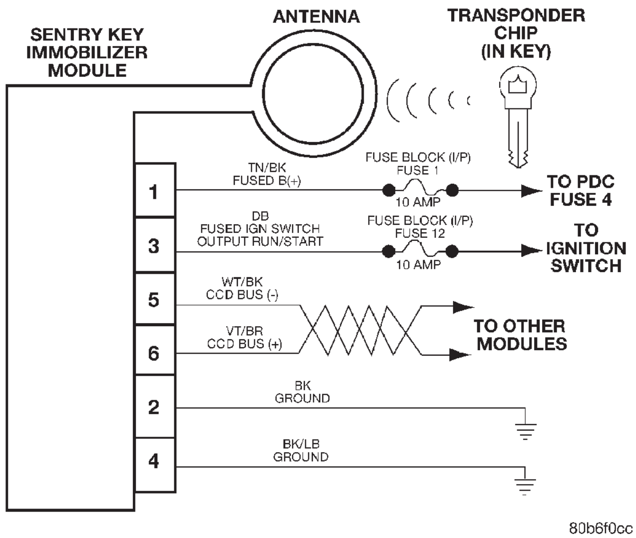
**Perform Verification TEST VER-1A.*

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

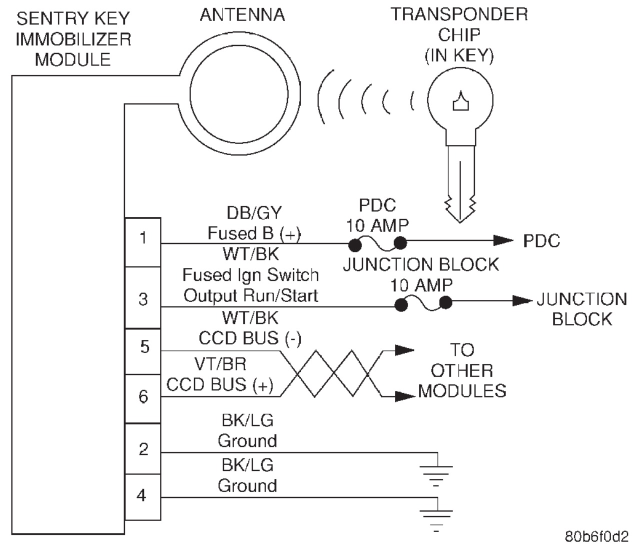
TEST SK-6A — REPAIRING - TRANSPONDER CRC (CYCLIC REDUNDANCY CHECK) FAILURE

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: Transponder CRC (Cyclic Redundancy Check) Failure

When monitored: With the ignition on and during key programming operation.

Set condition: The SKIM receives five consecutive transponder messages that are correctly formatted but contain invalid data.

Theory of operation: When the ignition is turned on or during key programming, the SKIM attempts to power up the transponder. The SKIM makes up to five attempts to communicate with the transponder. The SKIM checks for proper communication format and valid data from the transponder.

Possible cause:
> Failed transponder
> Failed SKIM
> Invalid key
> Electro-magnetic interference

80b5cc72

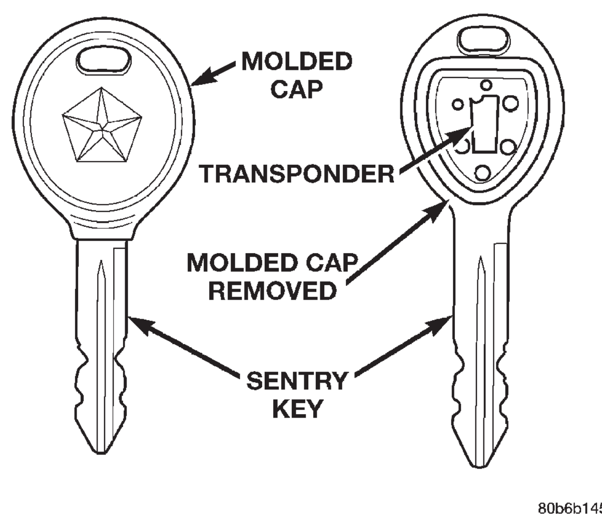
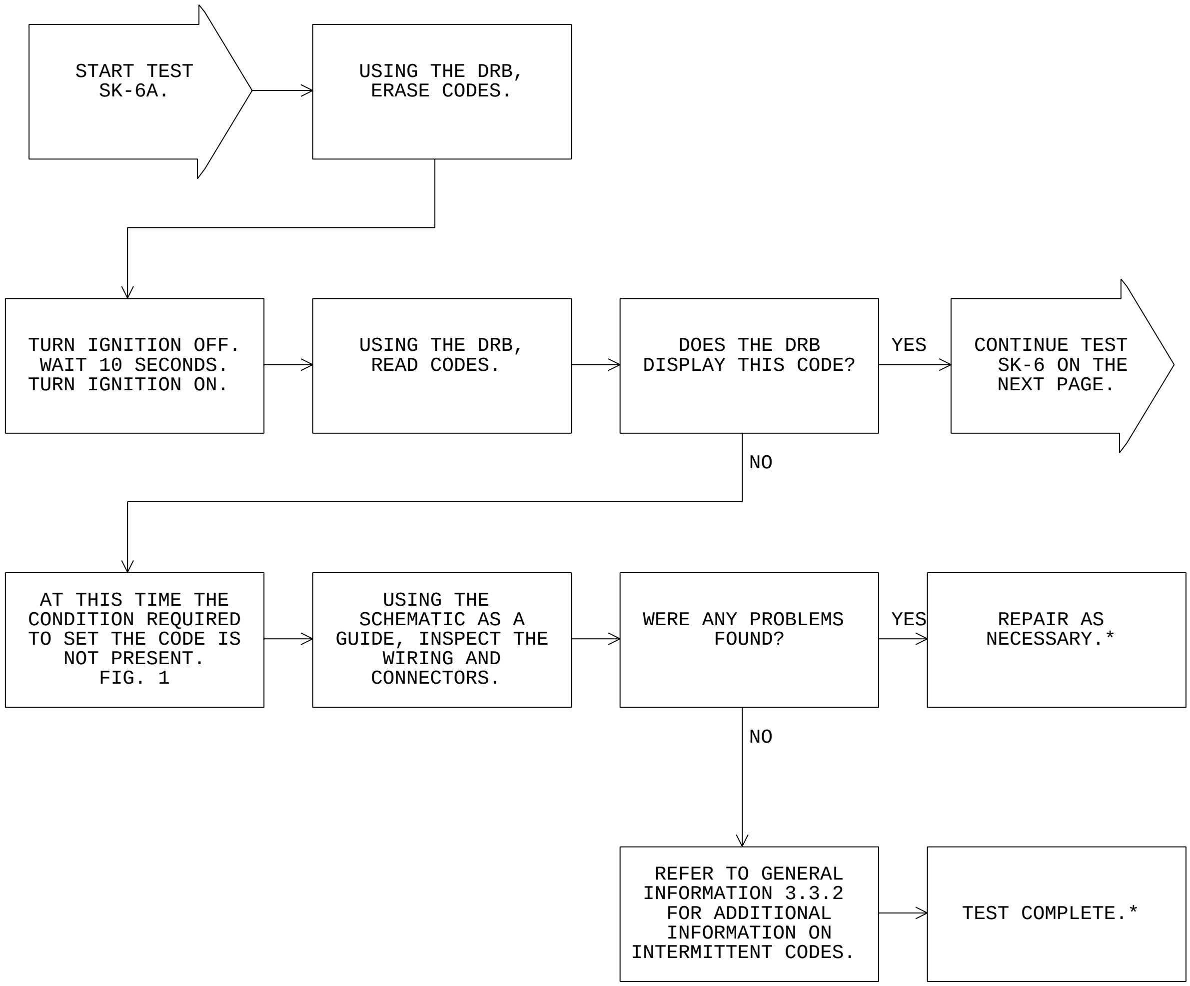


FIG. 1

TEST SK-6A — REPAIRING - TRANSPONDER CRC (CYCLIC REDUNDANCY CHECK) FAILURE

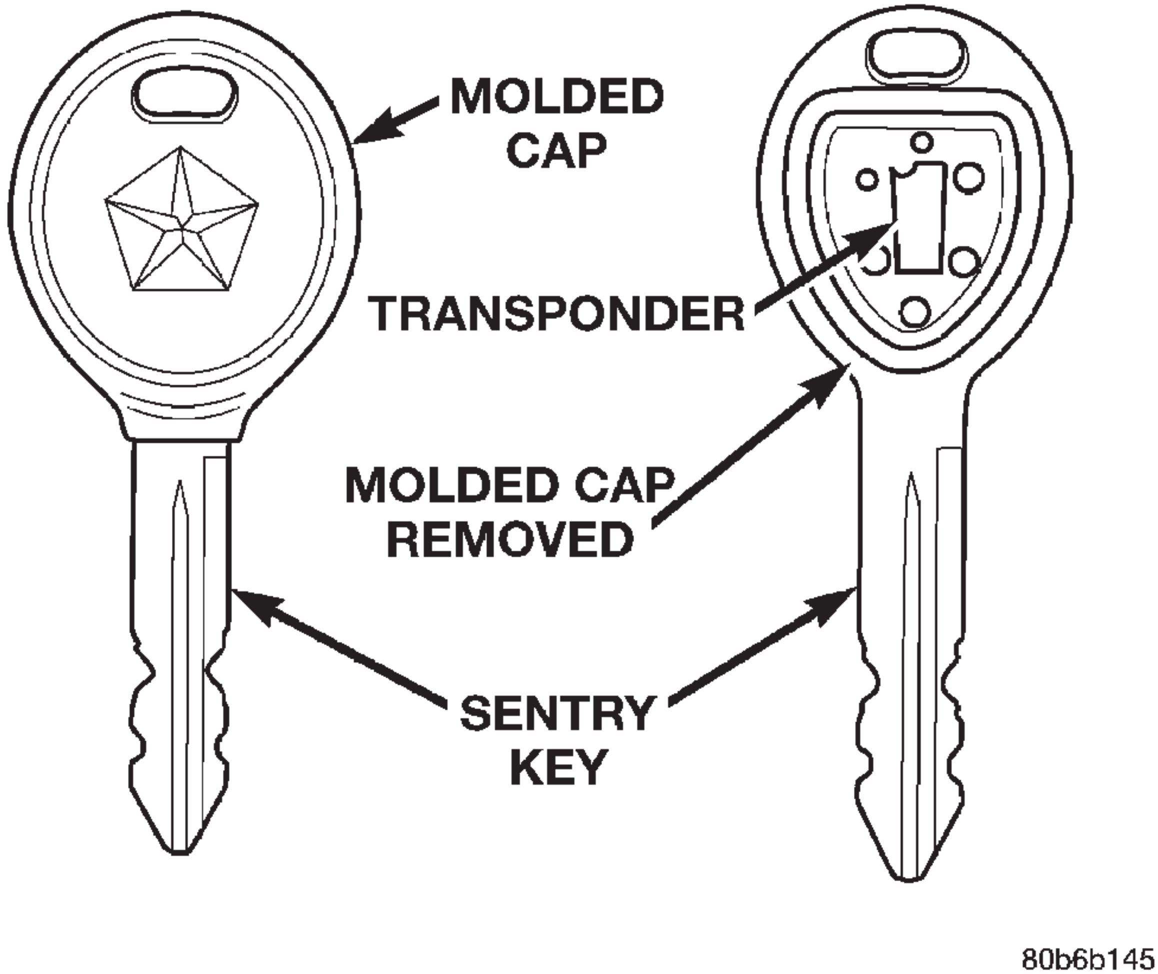
Perform TEST SK-1A Before Proceeding



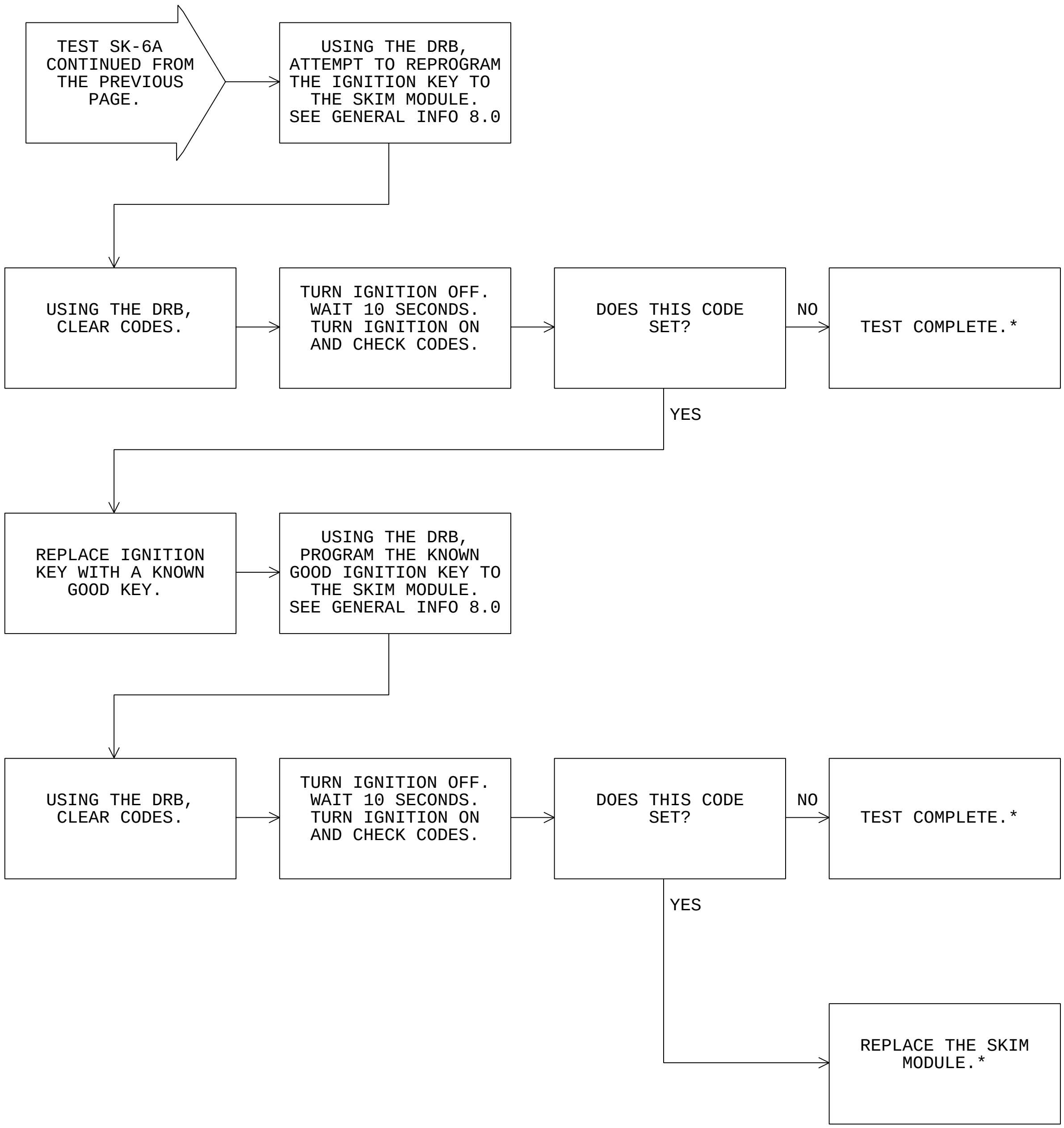
**Perform Verification TEST VER-1A.*

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

TEST SK-6A	CONTINUED - REPAIRING - TRANSPONDER CRC (CYCLIC REDUNDANCY CHECK) FAILURE



TEST SK-6A	CONTINUED - REPAIRING - TRANSPONDER CRC (CYCLIC REDUNDANCY CHECK) FAILURE

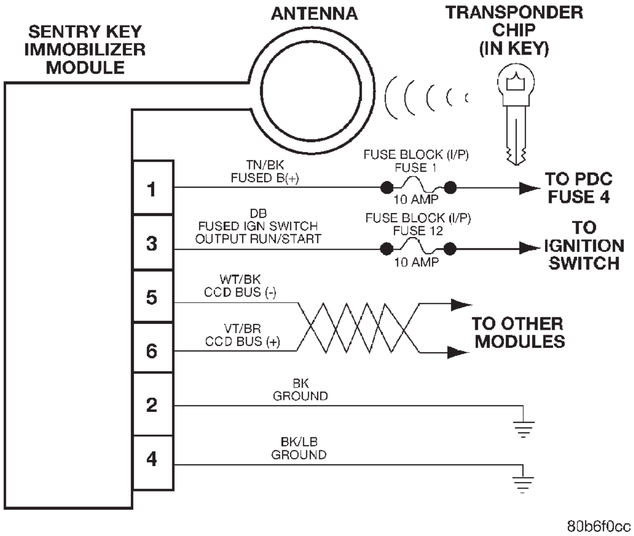


*Perform Verification TEST VER-1A.	**Check connectors - Clean / repair as necessary.

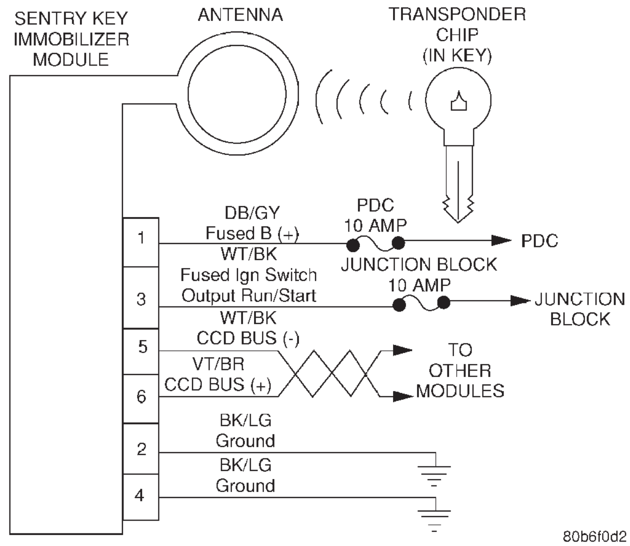
TEST SK-7A REPAIRING - TRANSPONDER ID MISMATCH

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: Transponder ID Mismatch

When monitored: With the ignition on and during key programming operation.

Set condition: The SKIM receives a transponder ID that does not match any ID stored in SKIM memory.

Theory of operation: When the ignition is turned on or during key programming, the SKIM attempts to power up the transponder. The SKIM makes up to three attempts to communicate with the transponder. The SKIM checks for proper communication format and valid data from the transponder.

Possible cause:
> Invalid key
> Failed transponder
> Failed SKIM

80b5cc73

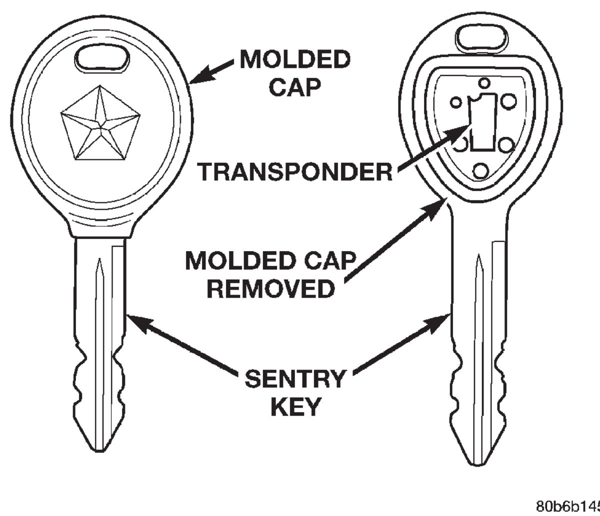
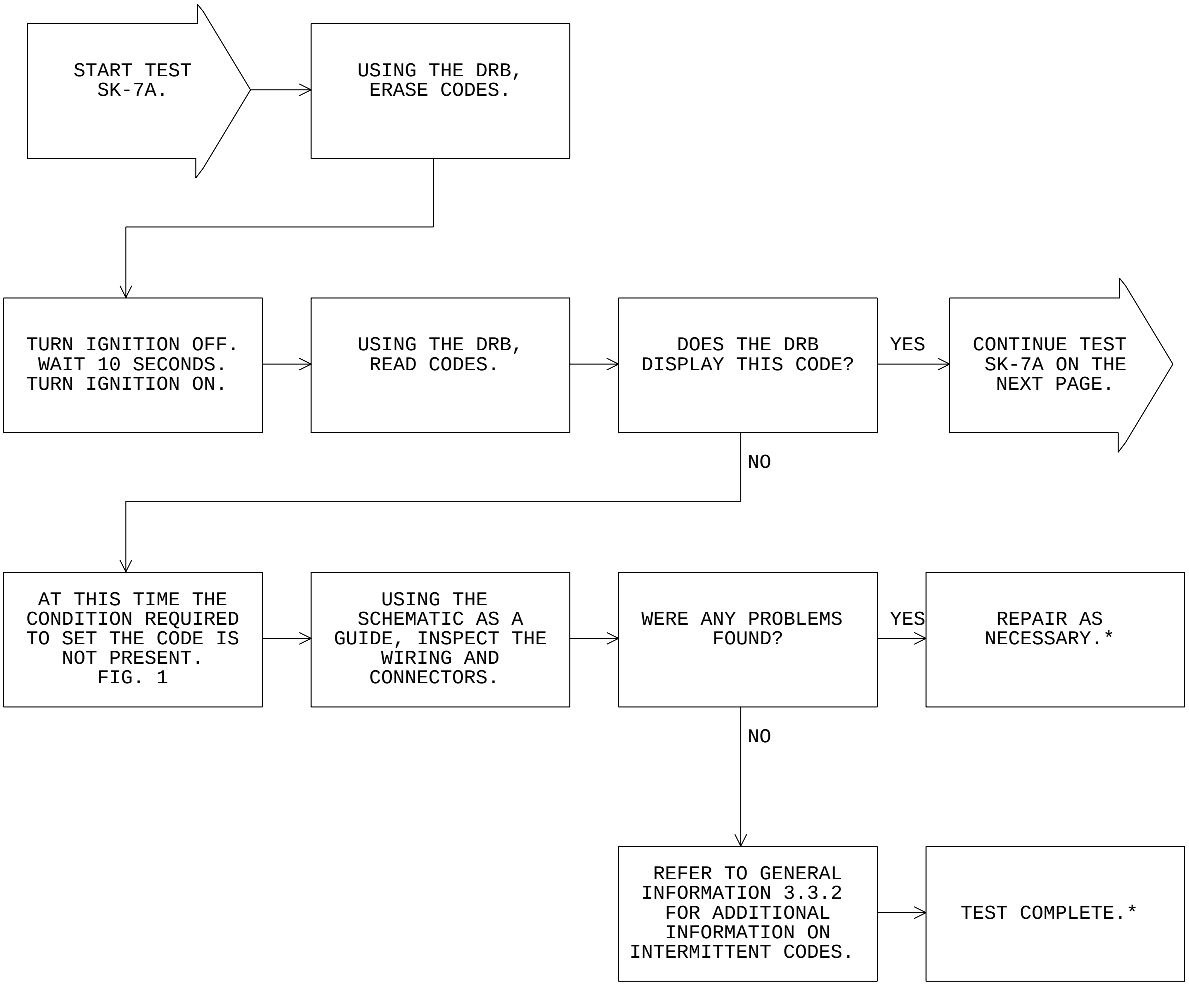


FIG. 1

TEST SK-7A — REPAIRING - TRANSPONDER ID MISMATCH

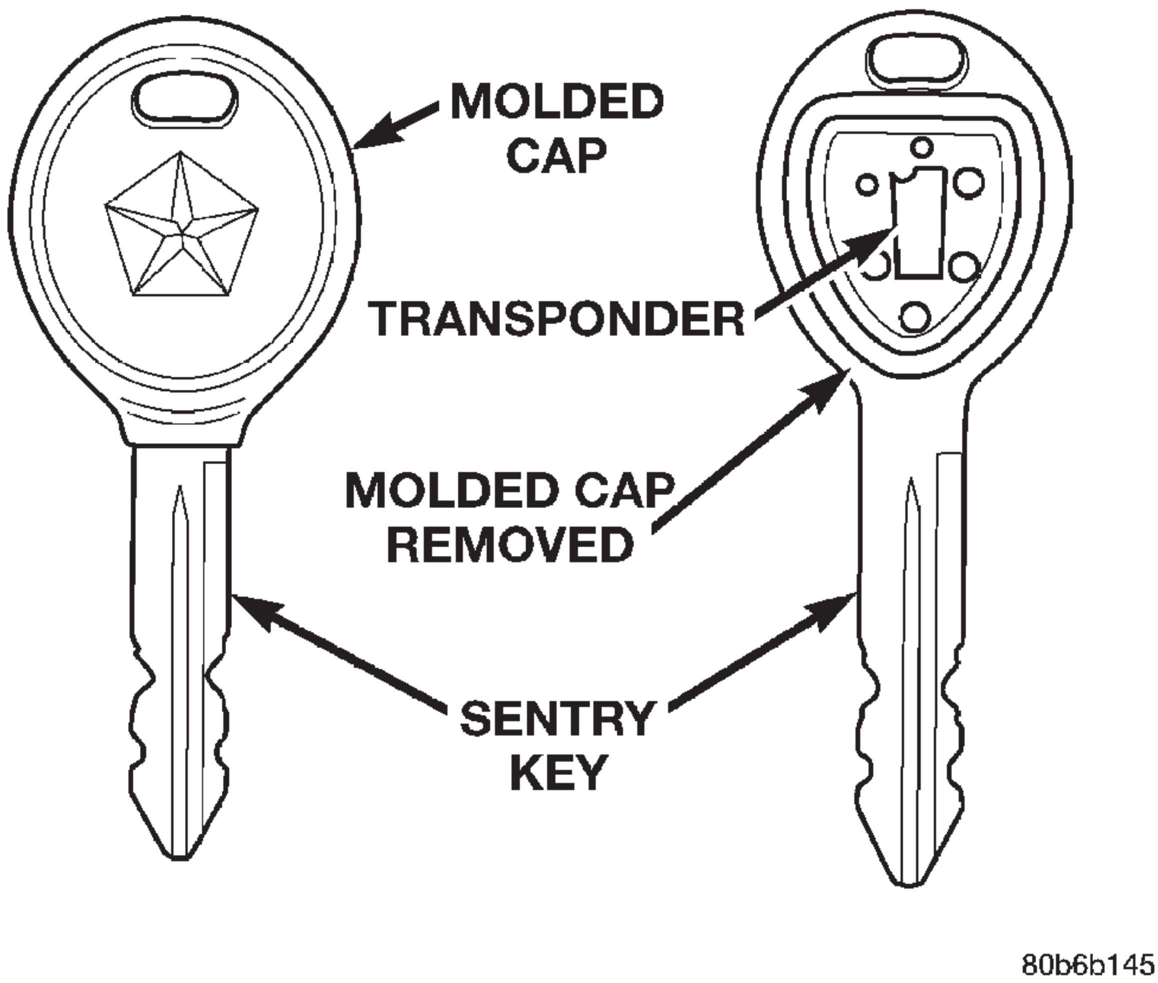
Perform TEST SK-1A Before Proceeding



**Perform Verification TEST VER-1A.*

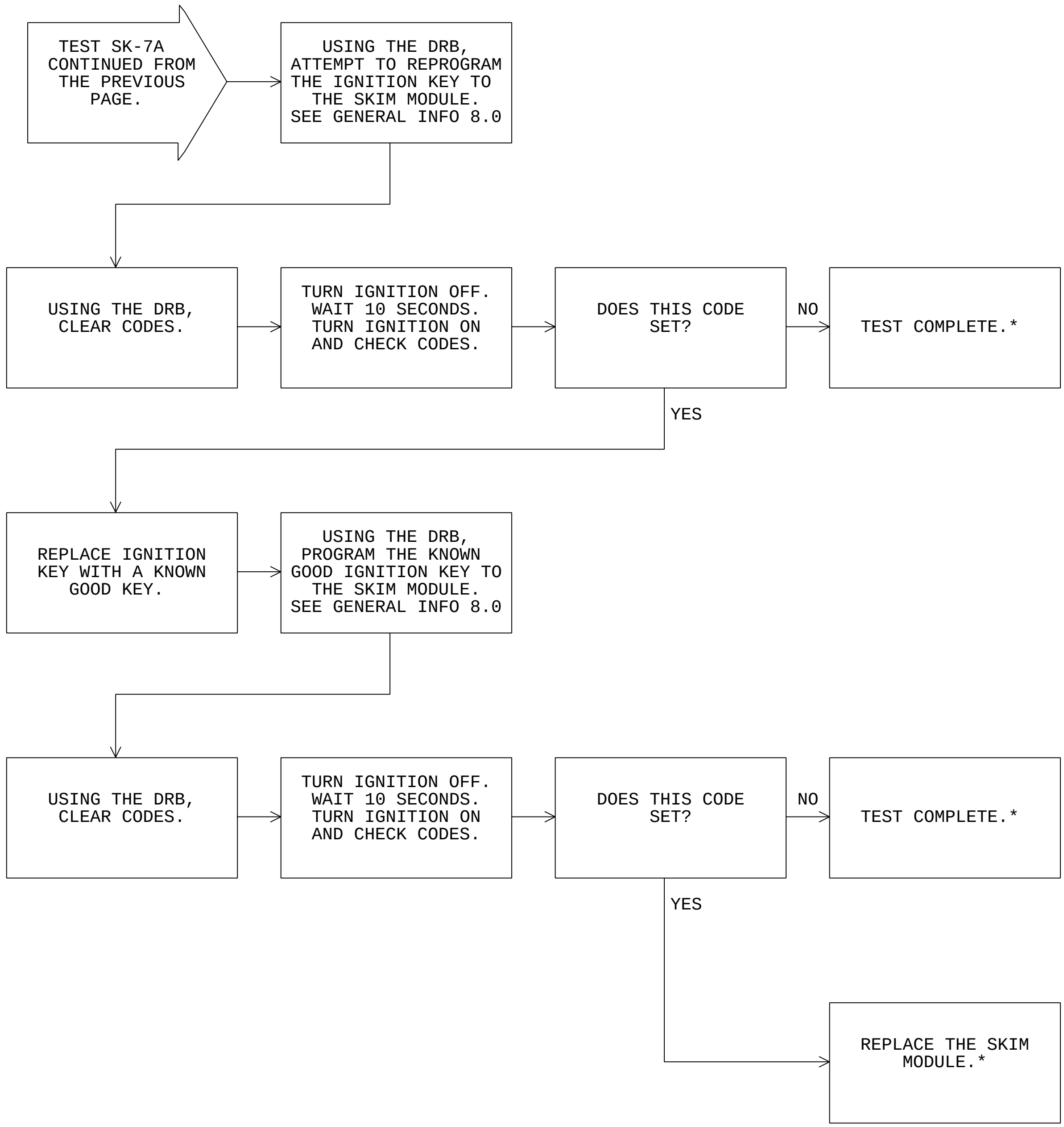
***Check connectors - Clean / repair as necessary.*

TEST SK-7A	CONTINUED - REPAIRING - TRANSPONDER ID MISMATCH



TEST SK-7A

CONTINUED - REPAIRING - TRANSPONDER ID MISMATCH



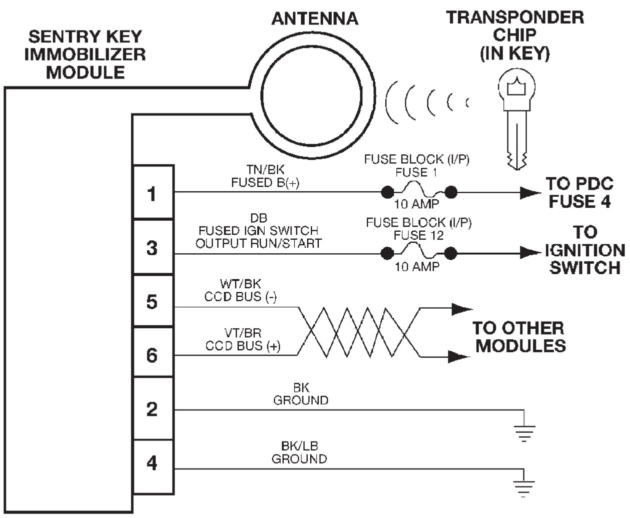
*Perform Verification TEST VER-1A.

**Check connectors - Clean / repair as necessary.

TEST SK-8A	REPAIRING - TRANSPONDER RESPONSE MISMATCH

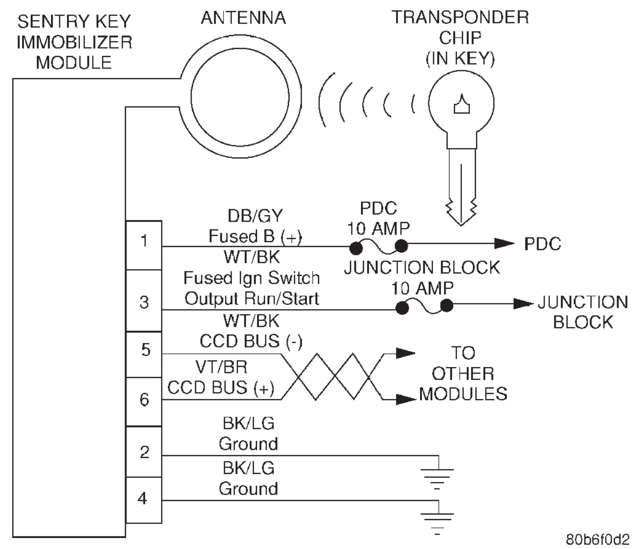
Perform TEST SK-1A Before Proceeding

TJ BODY



80b6f0cc

XJ BODY



80b6f0d2

Name of code: Transponder Response Mismatch

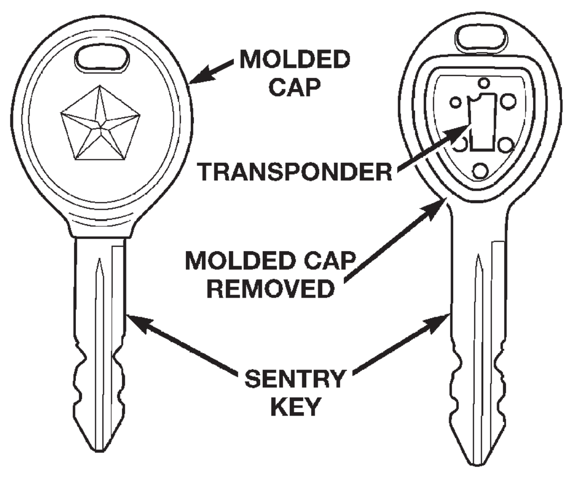
When monitored: With the ignition on and during key programming operation.

Set condition: The transponder response from the "Crypto" algorithm fails to match the SKIM "Crypto" results.

Theory of operation: When the ignition is turned on or during key programming the SKIM attempts to power up the transponder. The SKIM makes up to three attempts to communicate with the transponder. The SKIM checks for proper communication format and valid data from the transponder.

Possible cause:
> Invalid key
> Failed transponder
> Failed SKIM

80b5cc74

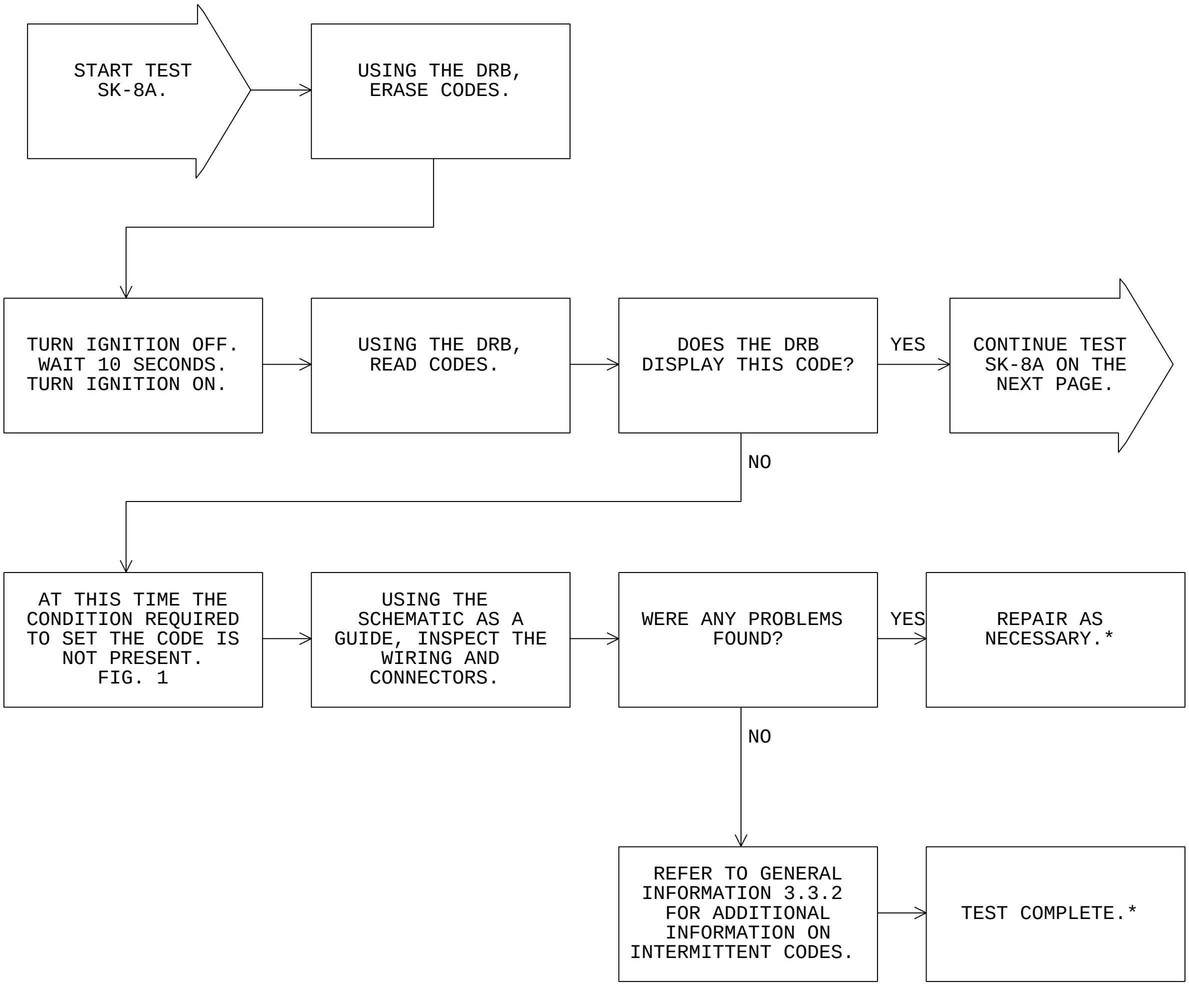


80b6b145

FIG. 1

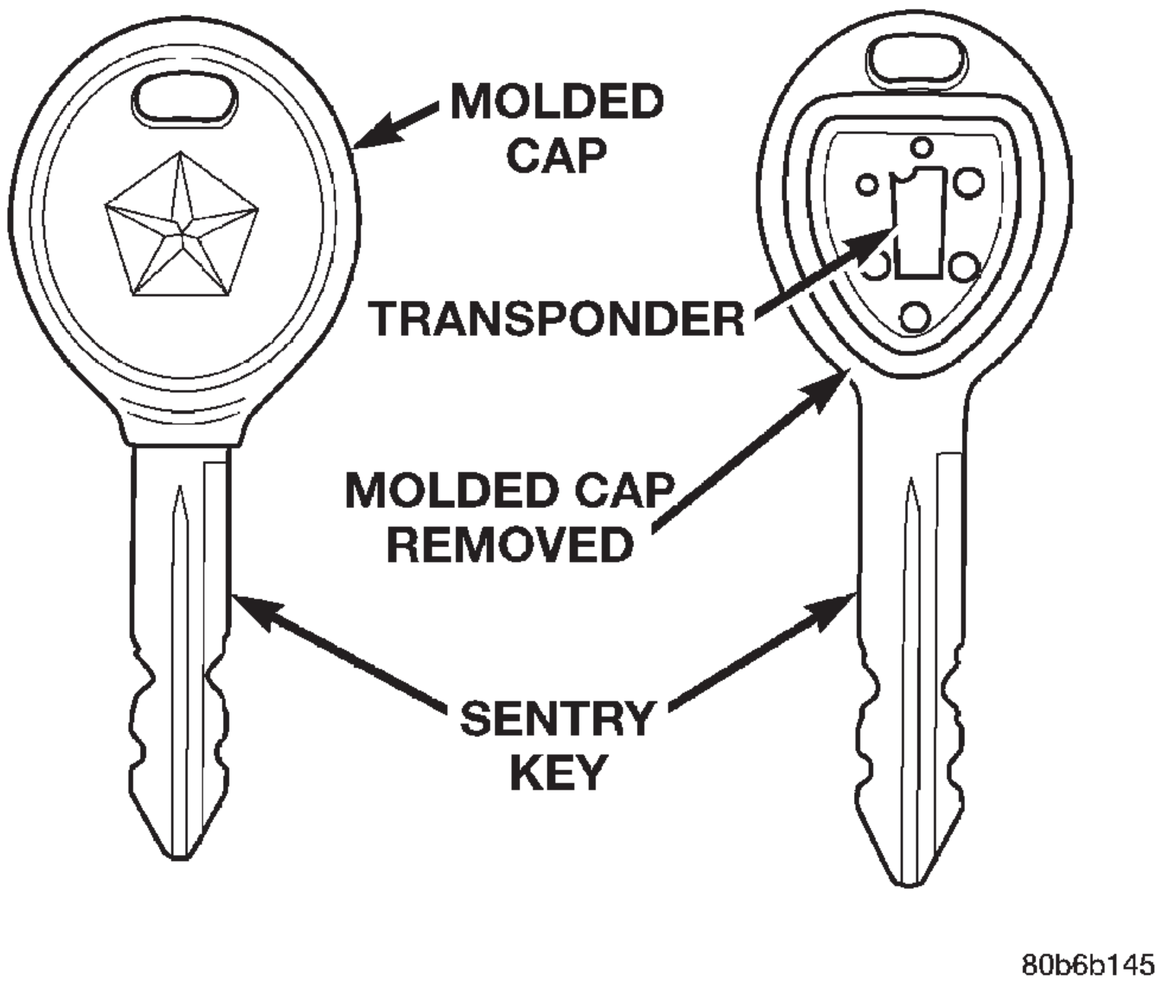
TEST SK-8A	REPAIRING - TRANSPONDER RESPONSE MISMATCH

Perform TEST SK-1A Before Proceeding

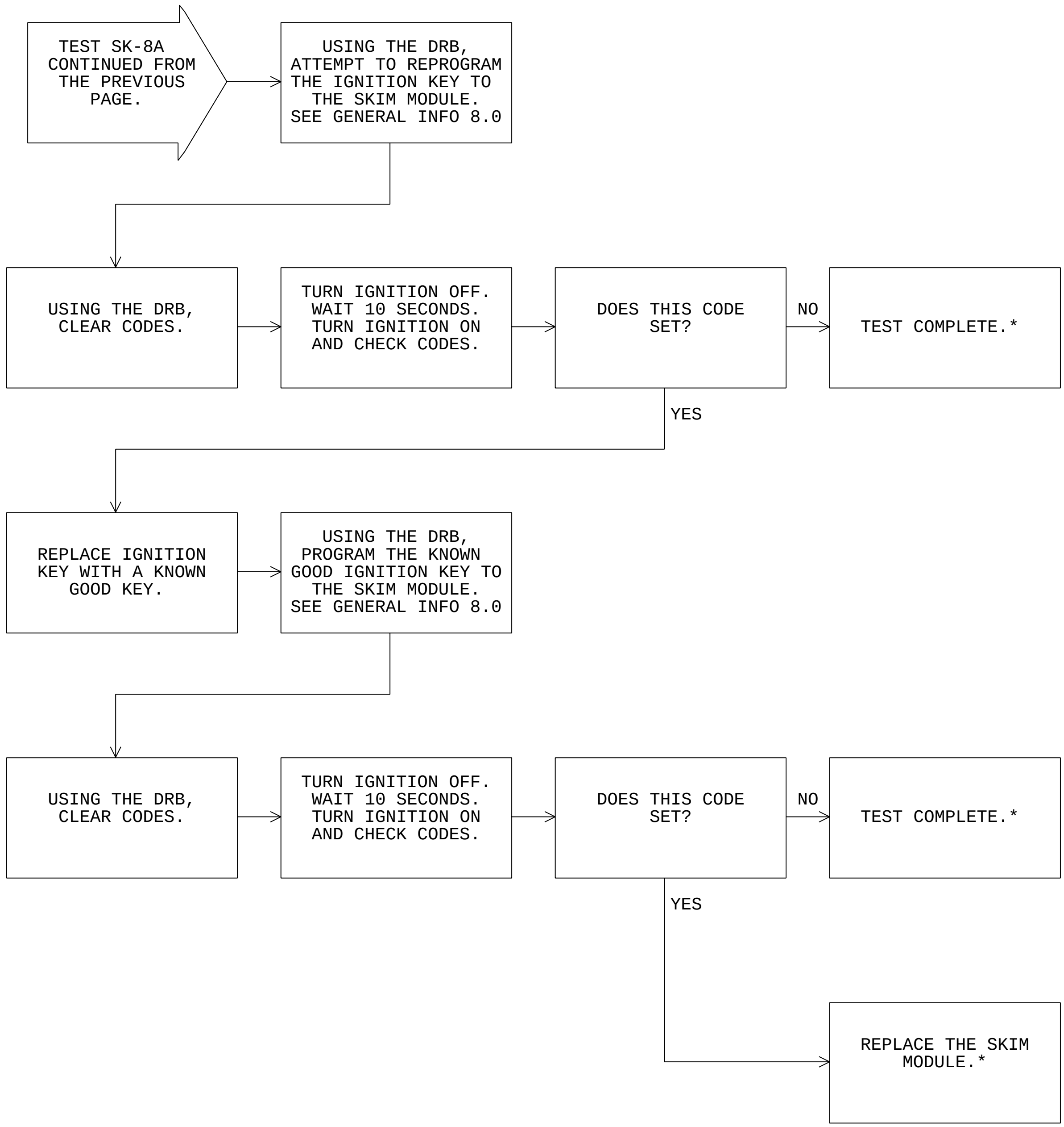


**Perform Verification TEST VER-1A.* | ***Check connectors - Clean / repair as necessary.*

TEST SK-8A	CONTINUED - REPAIRING - TRANSPONDER RESPONSE MISMATCH



TEST SK-8A | CONTINUED - REPAIRING - TRANSPONDER RESPONSE MISMATCH

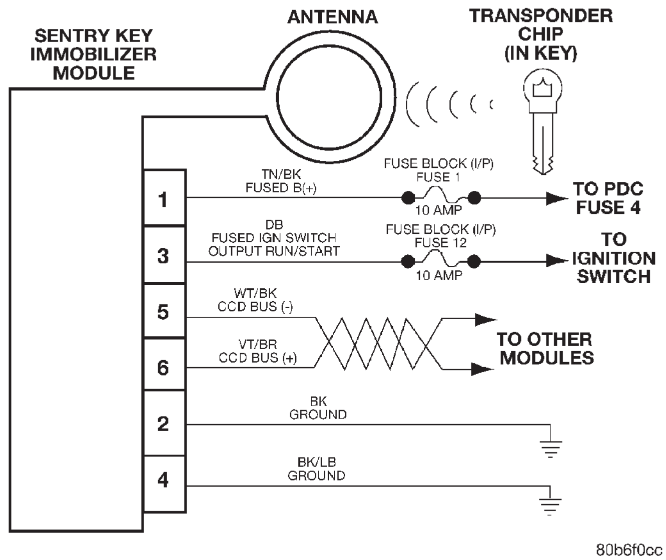


***Perform Verification TEST VER-1A.** | ****Check connectors - Clean / repair as necessary.**

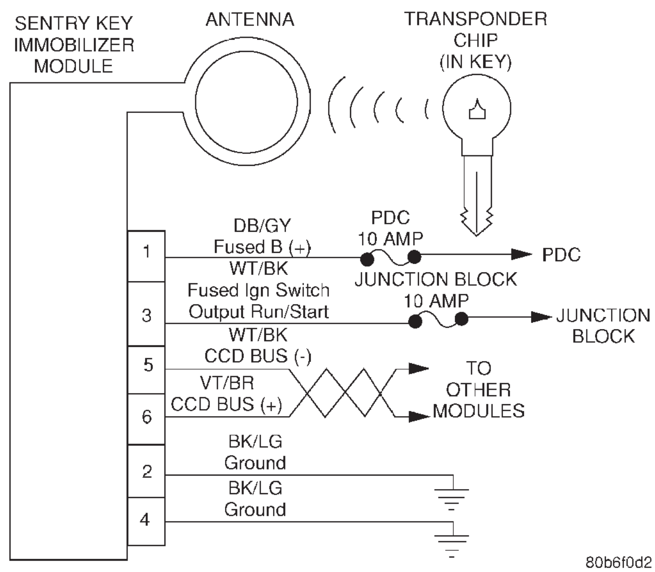
TEST SK-9A — REPAIRING - VIN MISMATCH

Perform TEST SK-1A Before Proceeding

TJ BODY



XJ BODY



Name of code: VIN Mismatch

When monitored: With the ignition on.

Set condition: The VIN received from the PCM does not match the VIN stored in the SKIM EEPROM.

Theory of operation: The PCM broadcasts the Vehicle Identification Number (VIN) on the CCD BUS. The SKIM receives and compares this number to the number stored in SKIM EEPROM.

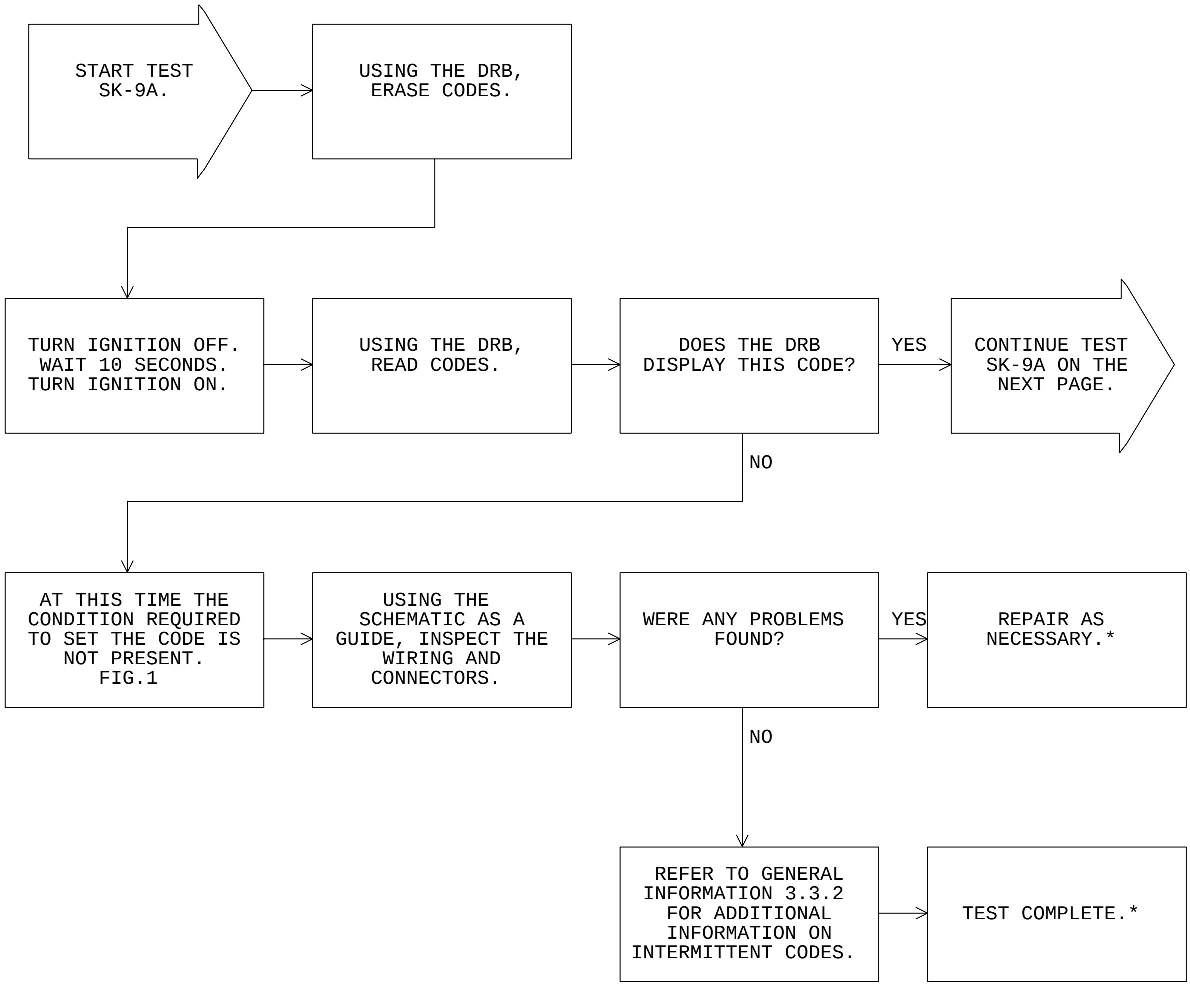
Possible cause:
> Incorrect VIN stored in PCM memory
> Incorrect VIN stored in SKIM memory
> Failed SKIM

80b5cc77

FIG. 1

TEST SK-9A	REPAIRING - VIN MISMATCH

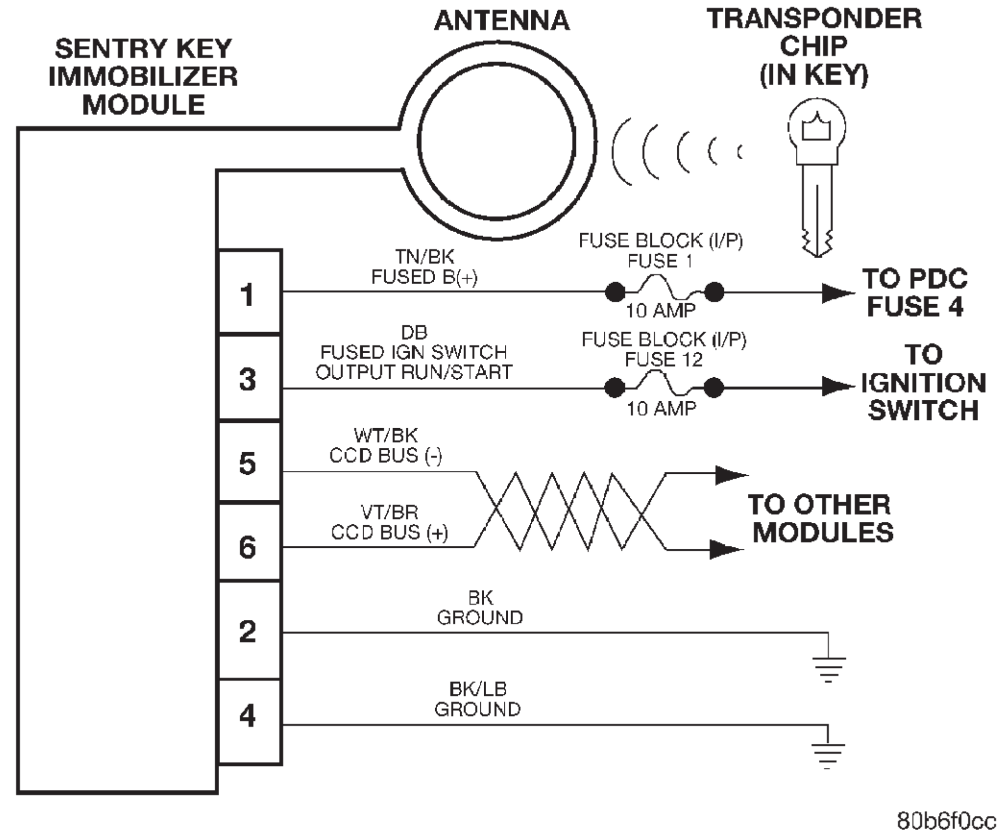
Perform TEST SK-1A Before Proceeding



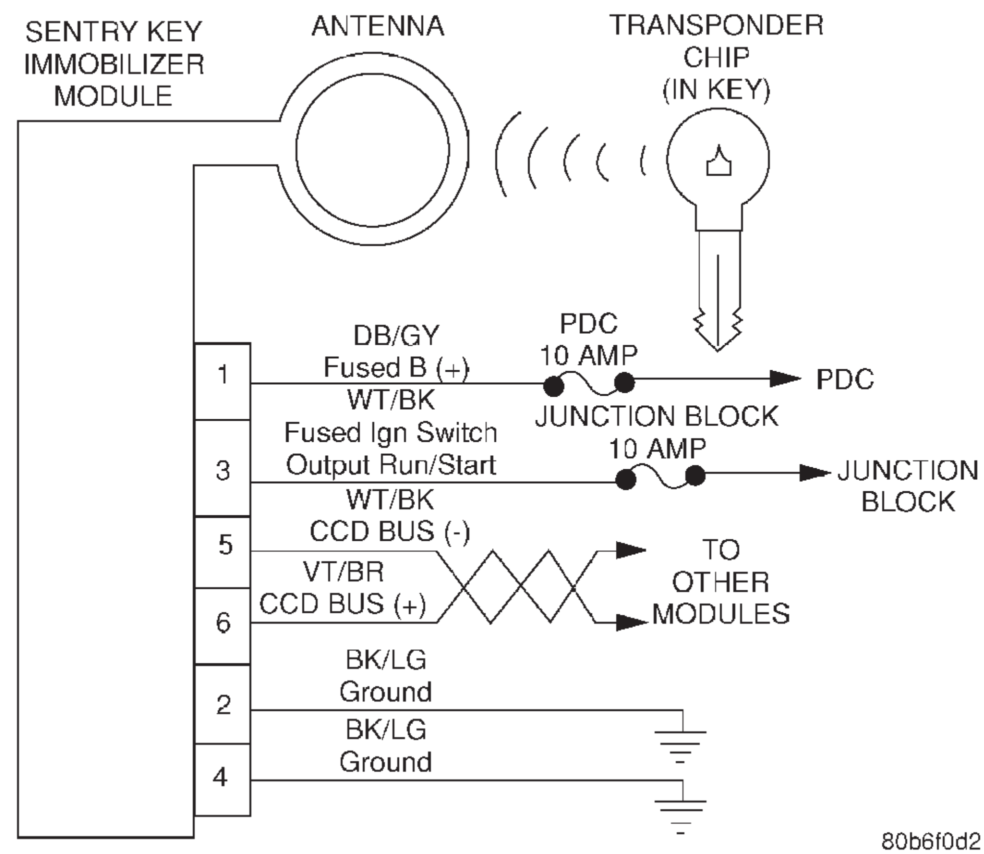
*Perform Verification TEST VER-1A.	**Check connectors - Clean / repair as necessary.

TEST SK-9A | **CONTINUED - REPAIRING - VIN MISMATCH**

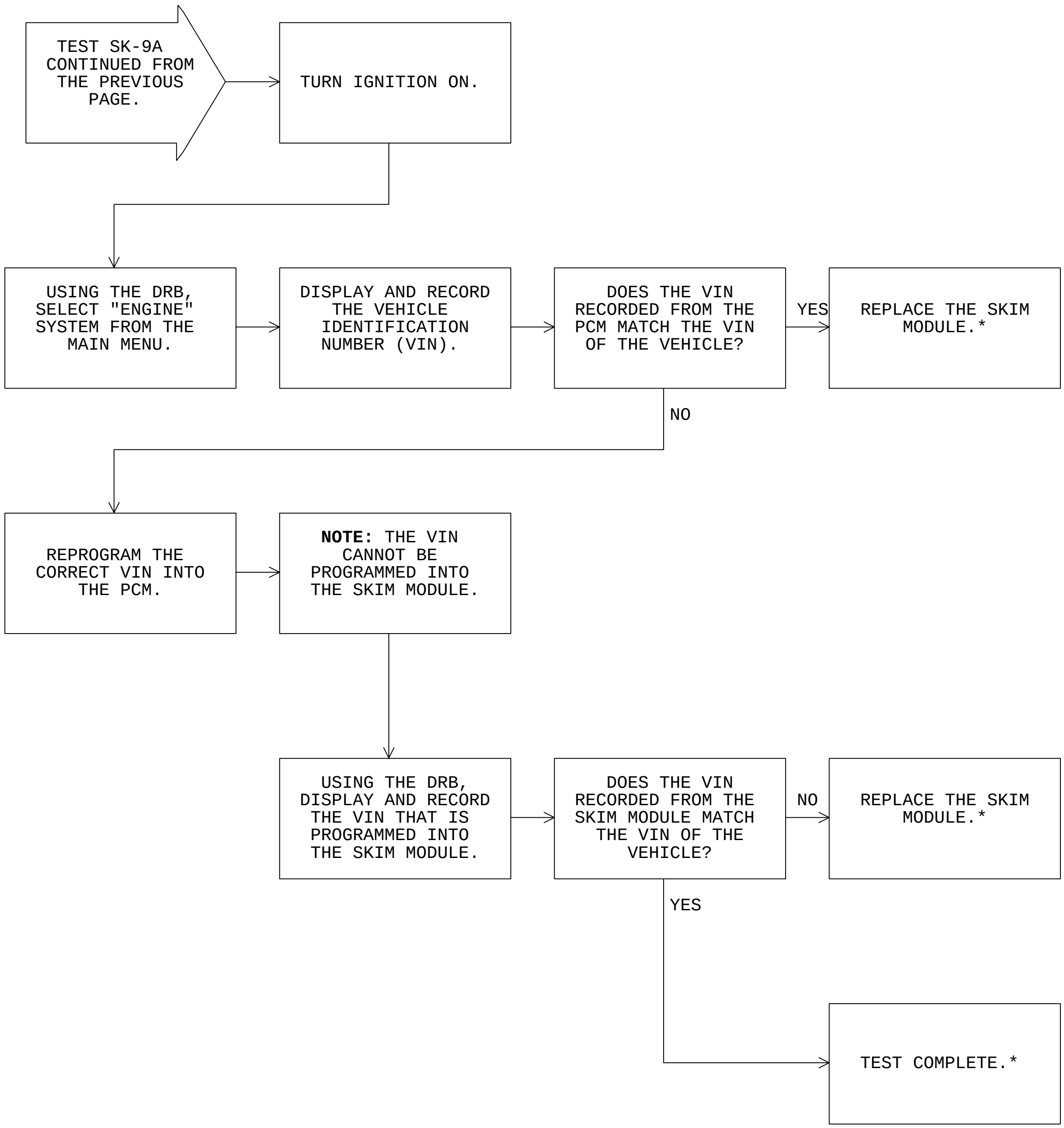
TJ BODY



XJ BODY



TEST SK-9A — CONTINUED - REPAIRING - VIN MISMATCH



**Perform Verification TEST VER-1A.*

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

TEST NTC-1A	NO TROUBLE CODE TEST MENU

Perform TEST DTC Before Proceeding

NOTE: For all component locations, REFER TO GENERAL INFORMATION SECTION 4.0 in this manual.

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

Second, read Diagnostics Trouble Codes, and repair any Diagnostic Trouble codes before continuing.

1. **No Trouble Code Complete Test** (non-monitored circuits and monitored circuits). Perform Tests NTC-2A through NTC-19A in sequence for Driveability problem.
2. **No Trouble Code Quick Individual Test.** If you suspect a symptom is directly related to a component or system perform the associated NTC-Test(s) individually. Symptom check cannot be used properly unless the Driveability problem actually happens while the vehicle is being tested. Review of the appropriate General Information sections is essential before attempting to diagnose any symptom. Return to No Trouble Code Menu if driveability problem still exists, or perform No Trouble Code Complete Test.
3. **No Trouble Code** Tests NTC-20A through NTC-27A are intended to be performed according to the component or system malfunction.

NO TROUBLE CODE MENU

TEST NTC-1A NO TROUBLE CODE TEST MENU

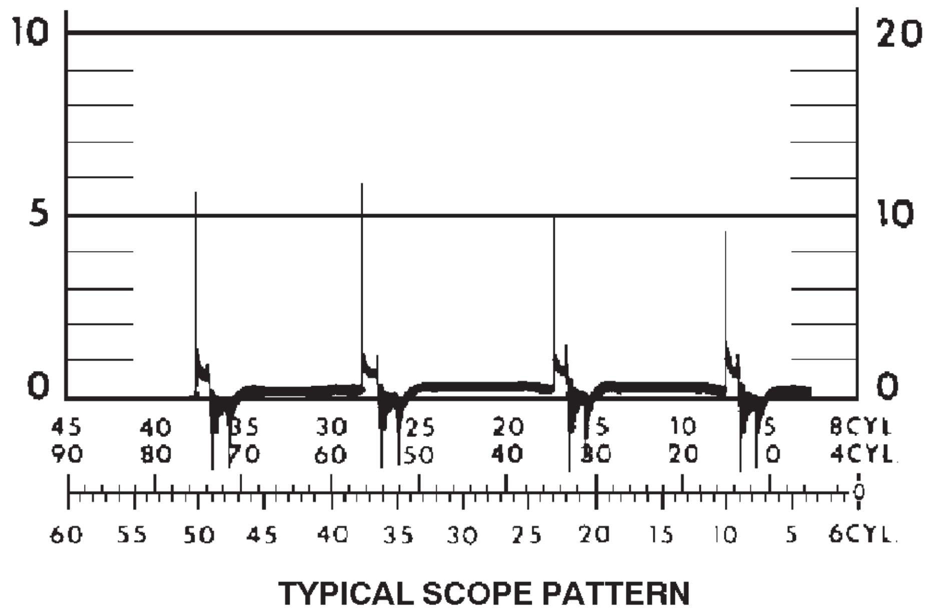
Perform TEST DTC Before Proceeding

SYMPTOM	DIAGNOSTIC TEST ROUTINE
HARD START	NTC-4A, 5A, 6A, 7A, 8A, 9A, 10A, 12A, 13A, 17A, 18A, 19A
START AND STALL	NTC-3A, 5A, 6A, 7A, 8A, 9A, 12A
HESITATION/SAG/STUMBLE	NO TROUBLE CODE COMPLETE TEST (STEP 1)
SURGE	NTC-3A, 5A, 6A, 7A, 8A, 9A, 10A, 12A, 17A
LACK OF POWER/SLUGGISH	NTC-3A, 5A, 6A, 7A, 8A, 9A, 10A, 12A, 18A
SPARK KNOCK/ DETONATION	NTC-3A, 5A, 6A, 7A, 8A, 9A, 10A, 12A, 17A
CUT OUTS/MISSES	NTC-3A, 5A, 9A, 10A, 18A
BACKFIRE/POPBACK	NTC-3A, 5A, 8A, 9A, 10A, 18A
RUNS ROUGH/UNSTABLE/ ERRATIC IDLE	NO TROUBLE CODE COMPLETE TEST (STEP 1)
POOR FUEL ECONOMY	NO TROUBLE CODE COMPLETE TEST (STEP 1)

TEST NTC-2A	CHECKING SECONDARY IGNITION AND TIMING

Perform TEST NTC-1A Before Proceeding

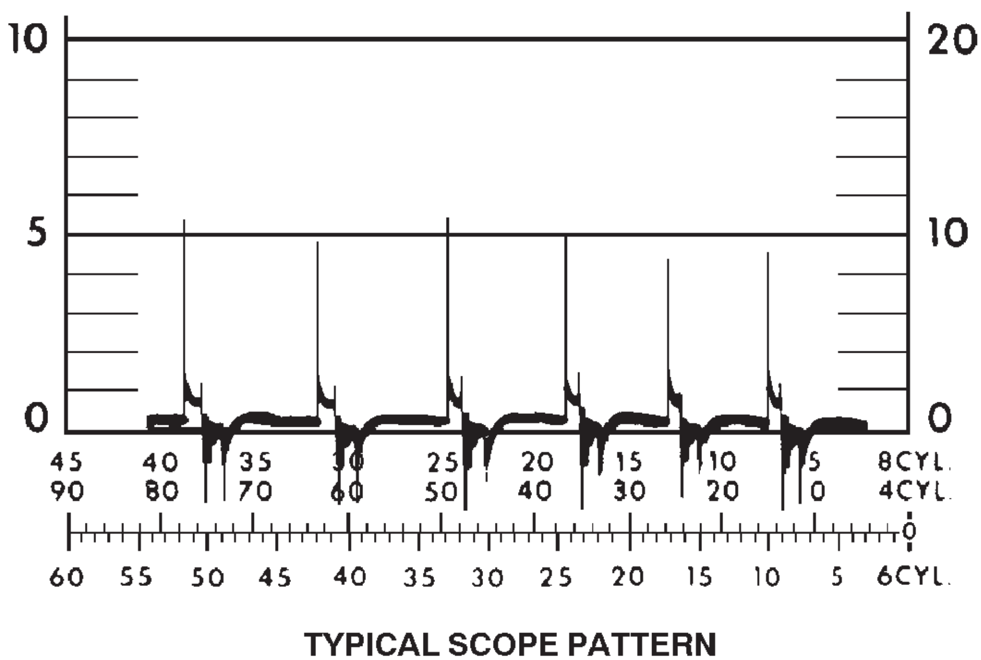
2.5L



2460401

FIG. 1

4.0L

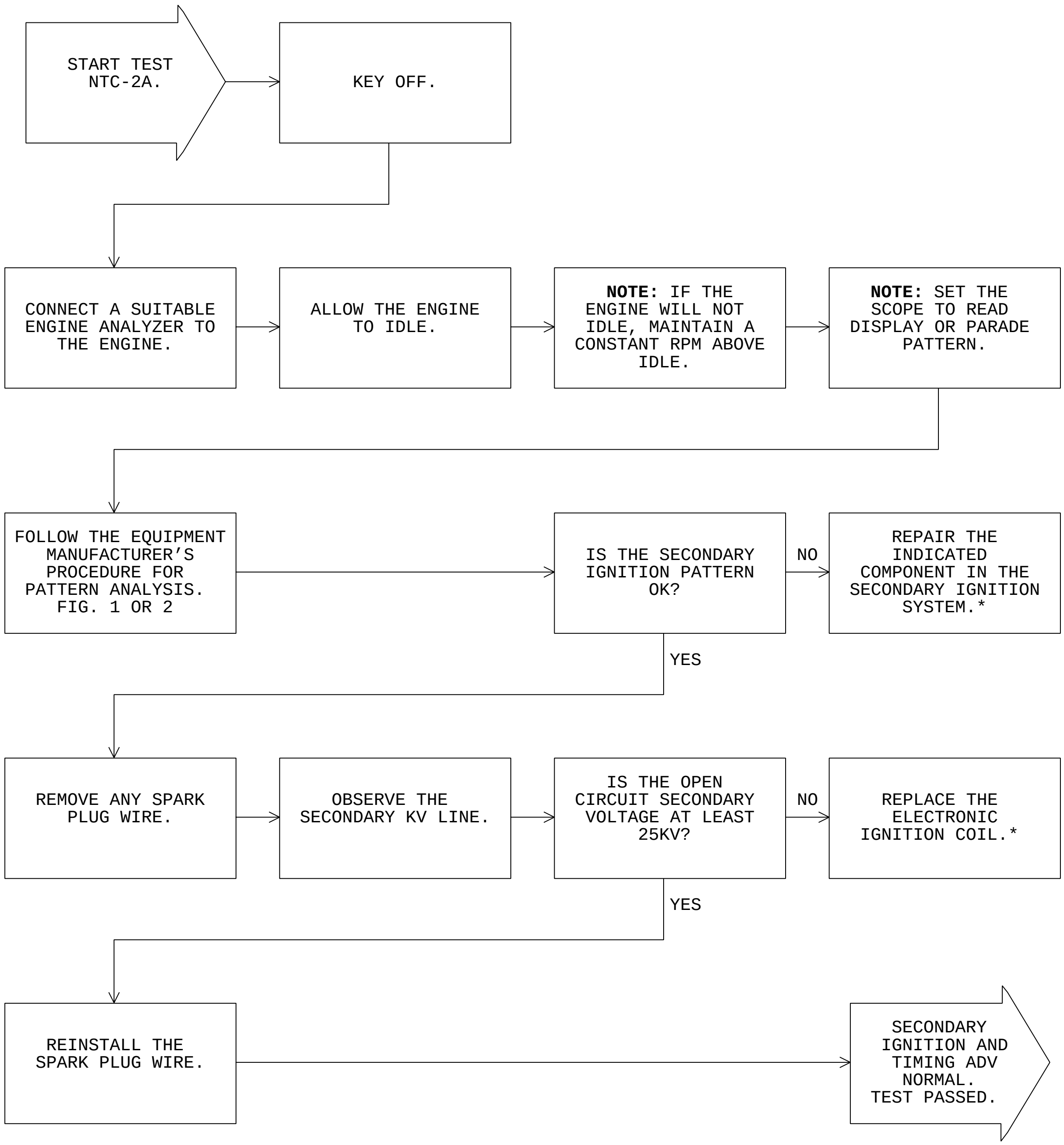


3250303

FIG. 2

TEST NTC-2A	CHECKING SECONDARY IGNITION AND TIMING

Perform TEST NTC-1A Before Proceeding

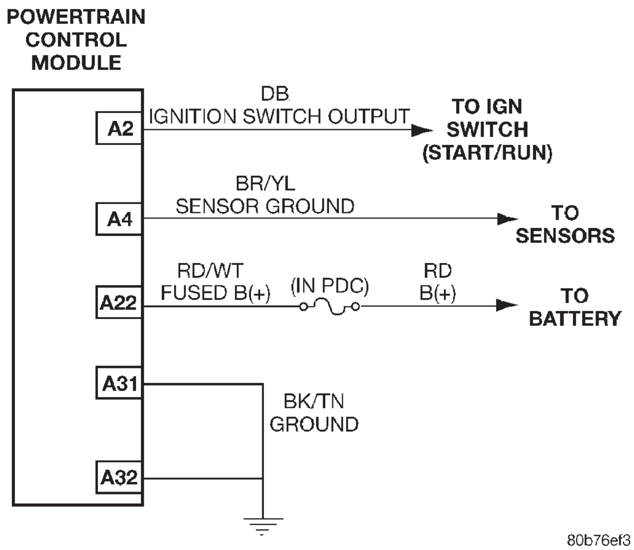


Perform Verification TEST VER-2A.	***Check connectors - Clean / repair as necessary.*

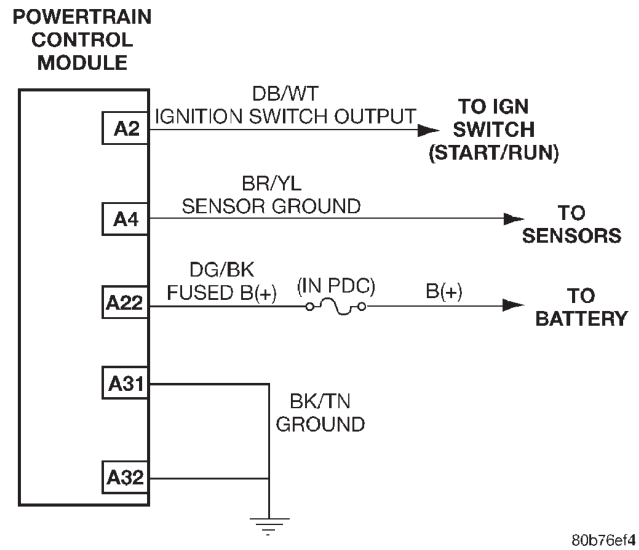
TEST NTC-3A CHECKING - THE PCM POWER AND GROUND CIRCUITS

Perform TEST NTC-1A Before Proceeding

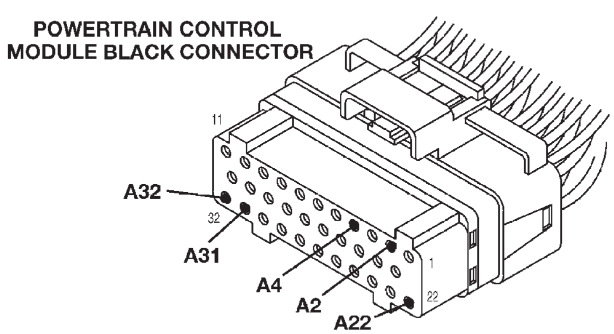
TJ BODY



XJ BODY



TJ BODY

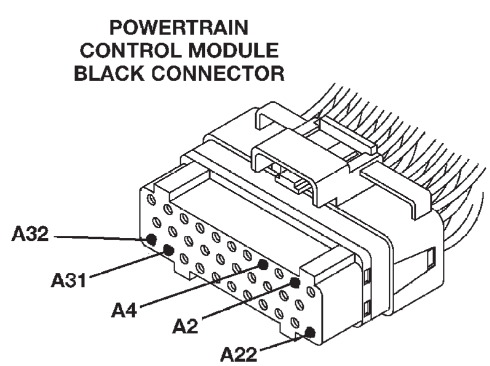


CAV	COLOR	FUNCTION
A2	DB	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	RD/WT	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80b76ef5

FIG. 1

XJ BODY



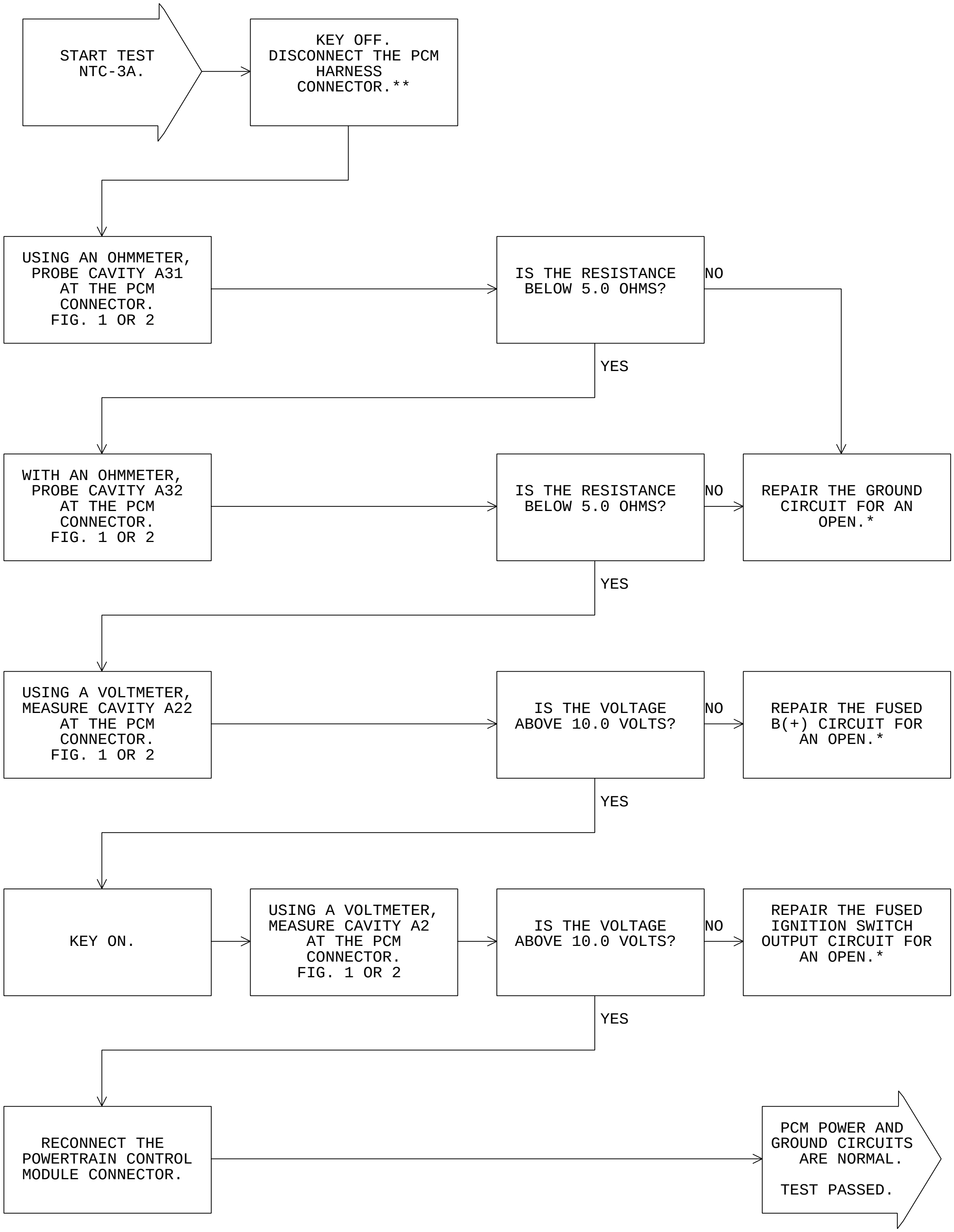
CAV	COLOR	FUNCTION
A2	DB/WT	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	DG/BK	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80aafae7

FIG. 2

TEST NTC-3A 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-4A	CHECKING THE ENGINE VACUUM

Perform TEST NTC-1A Before Proceeding

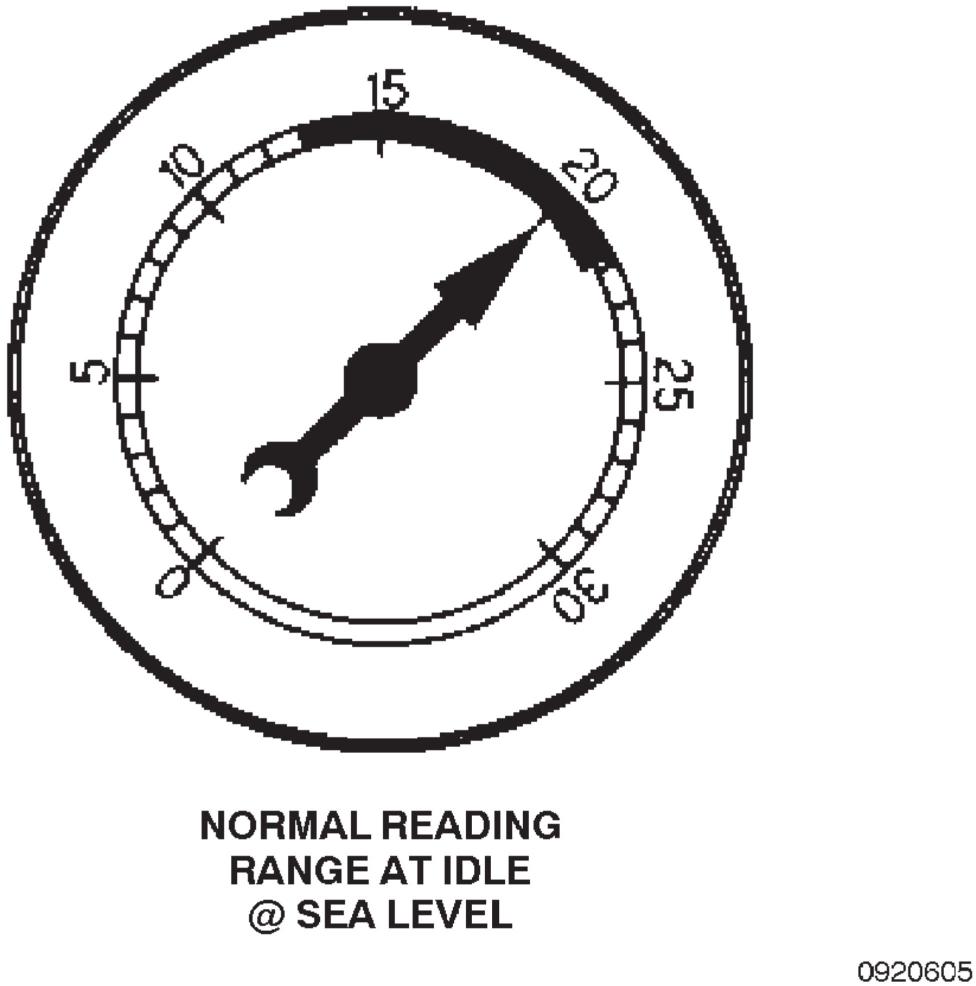
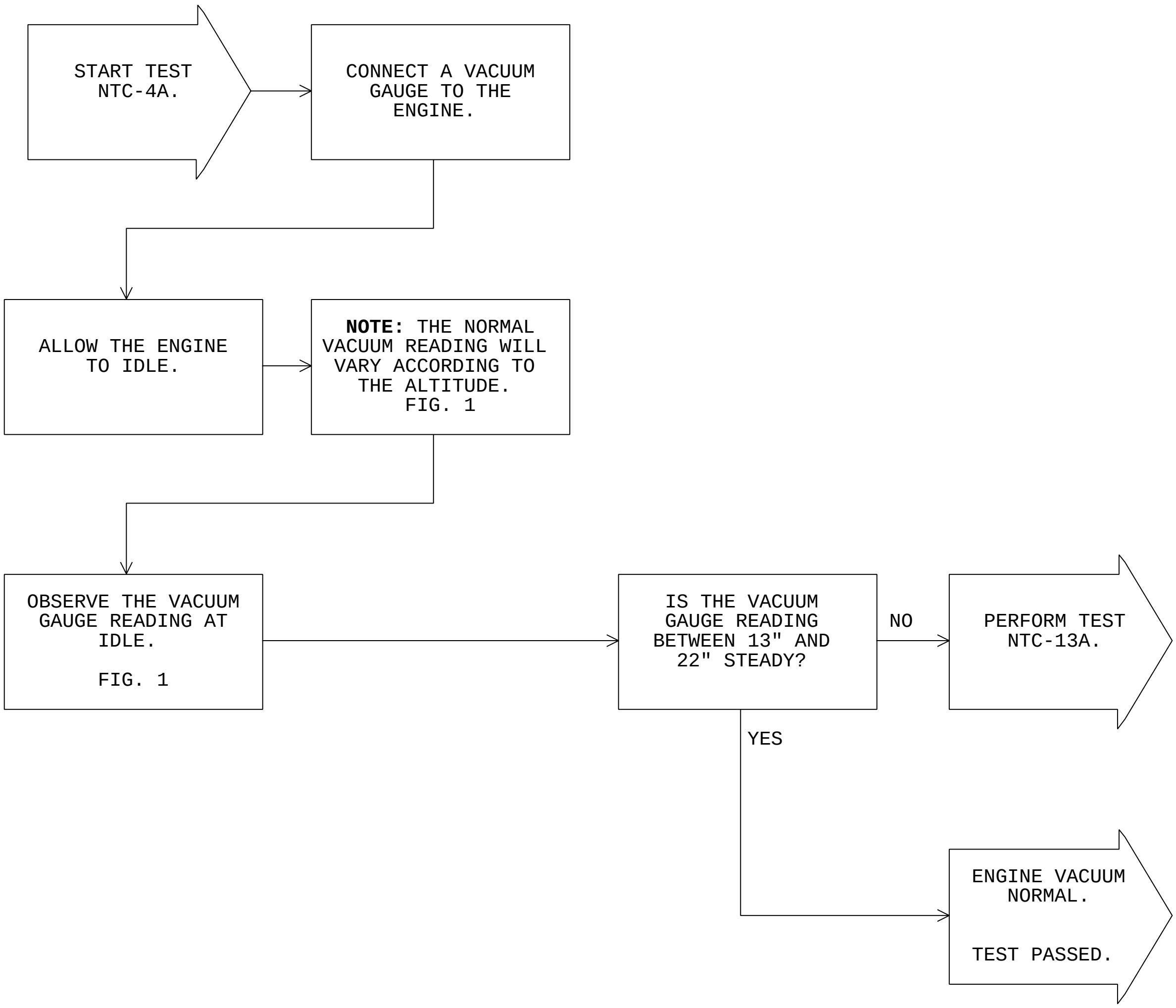


FIG. 1

TEST NTC-4A — CHECKING THE ENGINE VACUUM

Perform TEST NTC-1A Before Proceeding

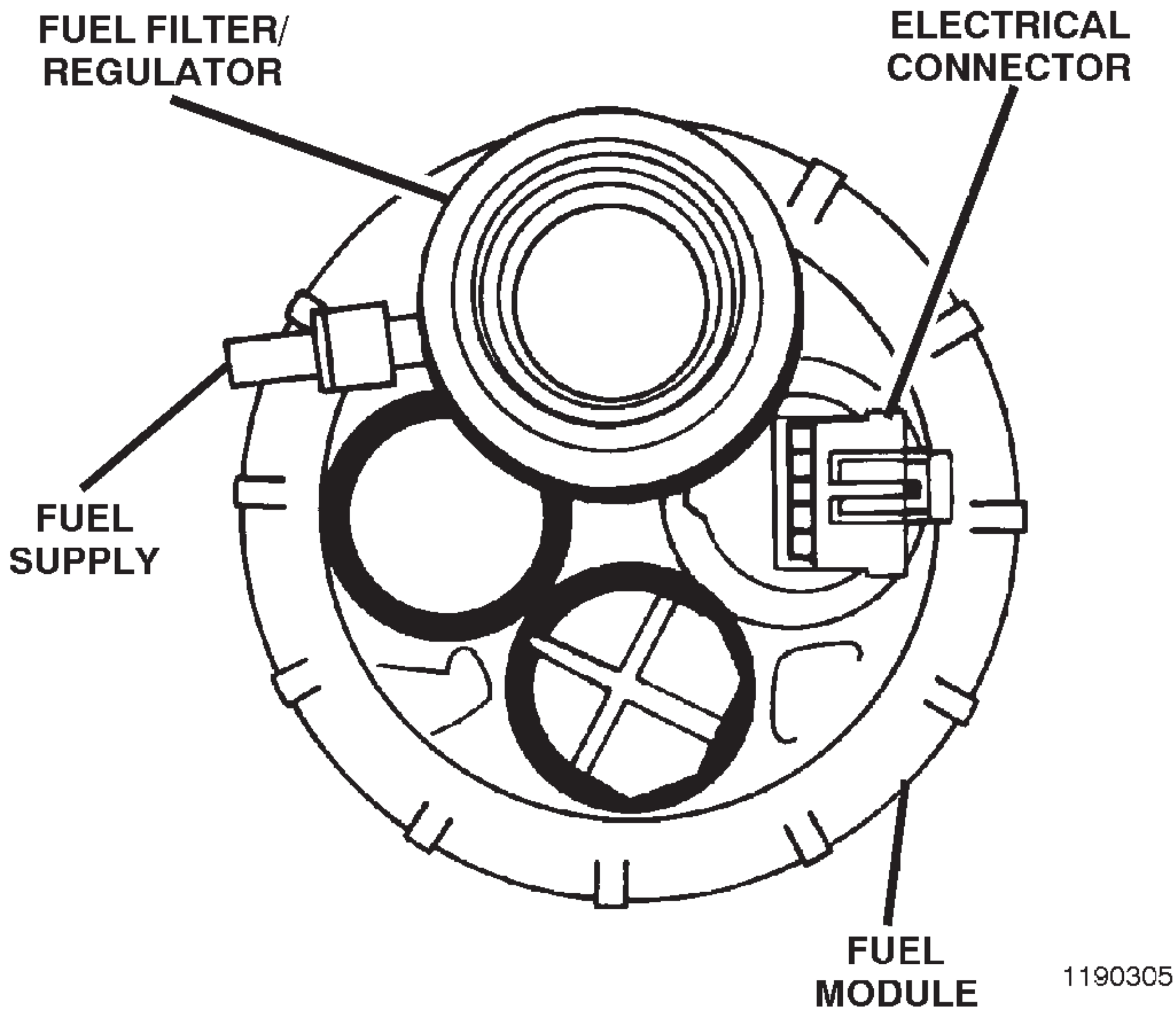


*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

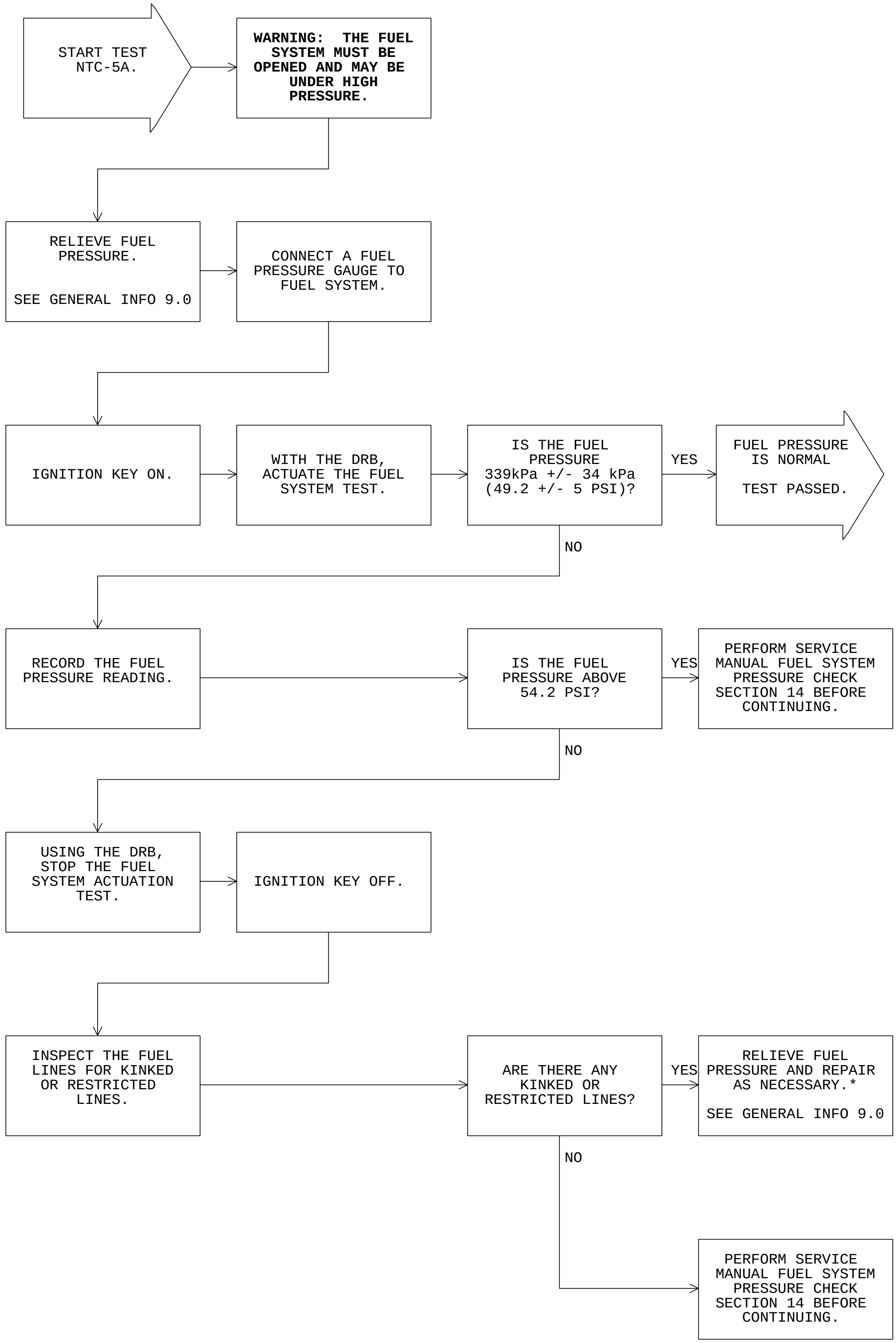
TEST NTC-5A	CHECKING THE FUEL DELIVERY

Perform TEST NTC-1A Before Proceeding



TEST NTC-5A CHECKING THE FUEL DELIVERY

Perform TEST NTC-1A Before Proceeding



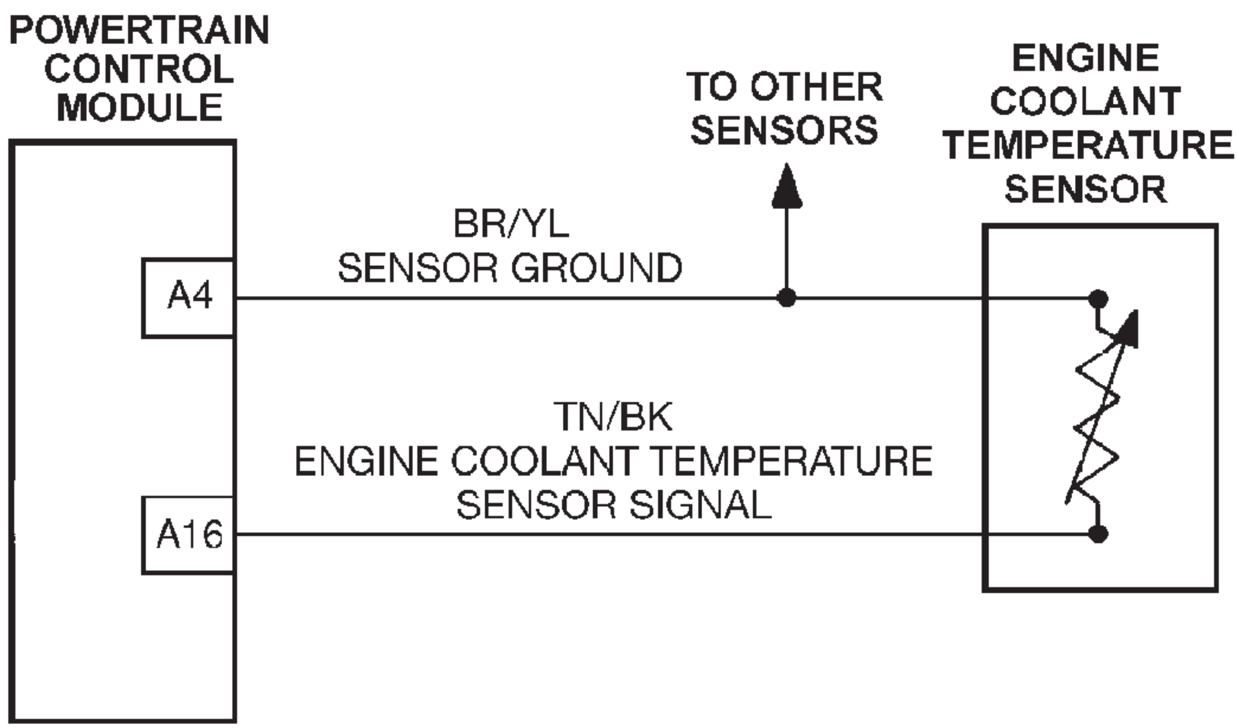
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST NTC-6A	CHECKING THE COOLANT SENSOR

Perform TEST NTC-1A Before Proceeding

TJ/XJ BODY



TEST NTC-6A — CHECKING THE COOLANT SENSOR

Perform TEST NTC-1A Before Proceeding

START TEST NTC-6A.

KEY ON.

USING THE DRB, READ THE ENGINE COOLANT TEMPERATURE SENSOR VALUE.

NOTE: IF VEHICLE TEMP IS ABOVE 82°C (180°F, ALLOW ENGINE TO COOL UNTIL 64°C (150°F) IS REACHED.

START THE ENGINE.

WHILE MONITORING DRB, ALLOW ENGINE TO REACH NORMAL OPERATING TEMP 82°C 180°F OR ABOVE.

WAS THE COOLANT TEMPERATURE VALUE INCREASE A SMOOTH TRANSITION?

NO → **NOTE:** INSPECT FOR MECHANICAL COOLING PROBLEMS BEFORE REPLACING THE SENSOR. → REPLACE THE ECT SENSOR.*

YES → DID THE COOLANT TEMPERATURE REACH 82°C (180°F) OR ABOVE?

NO → **NOTE:** INSPECT FOR MECHANICAL COOLING PROBLEMS BEFORE REPLACING THE SENSOR. → REPLACE THE ECT SENSOR.*

YES → ECT SENSOR OPERATING NORMALLY

TEST PASSED.

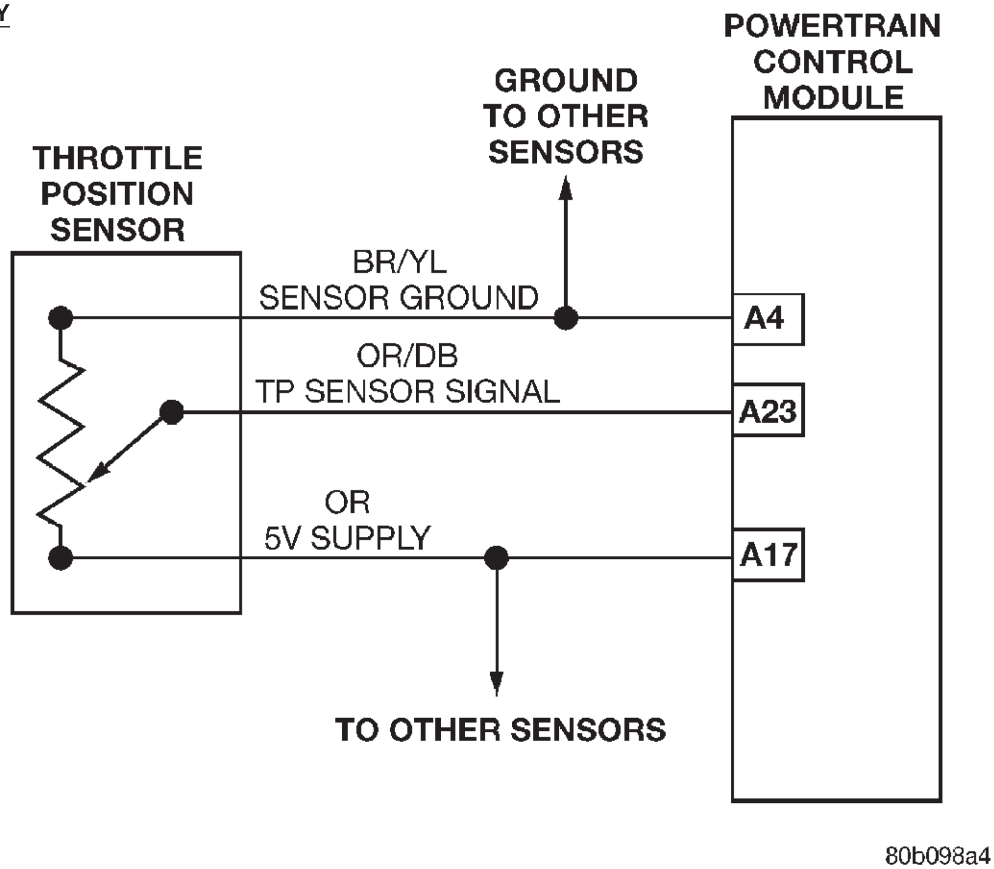
**Perform Verification TEST VER-2A.*

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

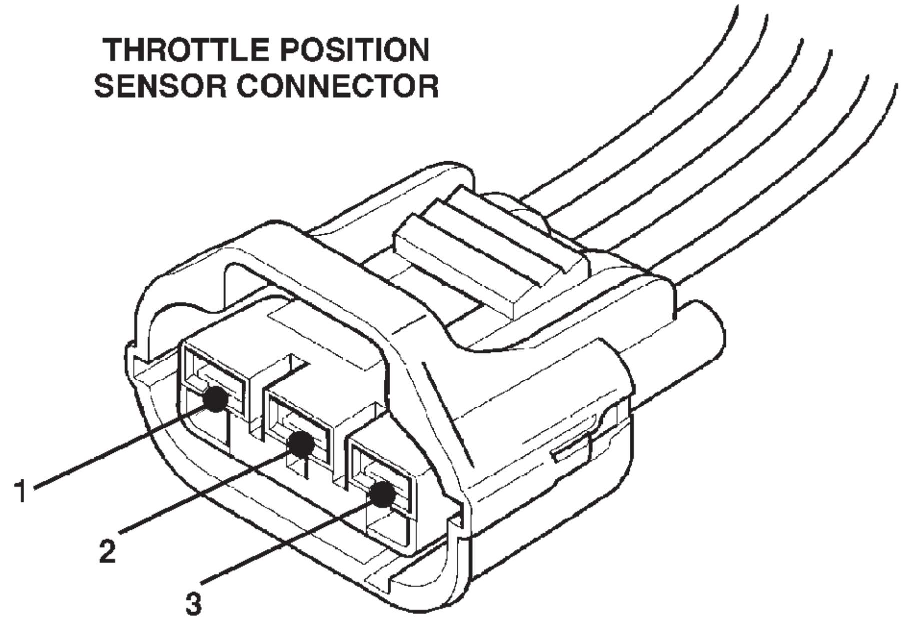
TEST NTC-7A	CHECKING THE THROTTLE POSITION SENSOR

Perform TEST NTC-1A Before Proceeding

TJ/XJ BODY



TJ/XJ BODY



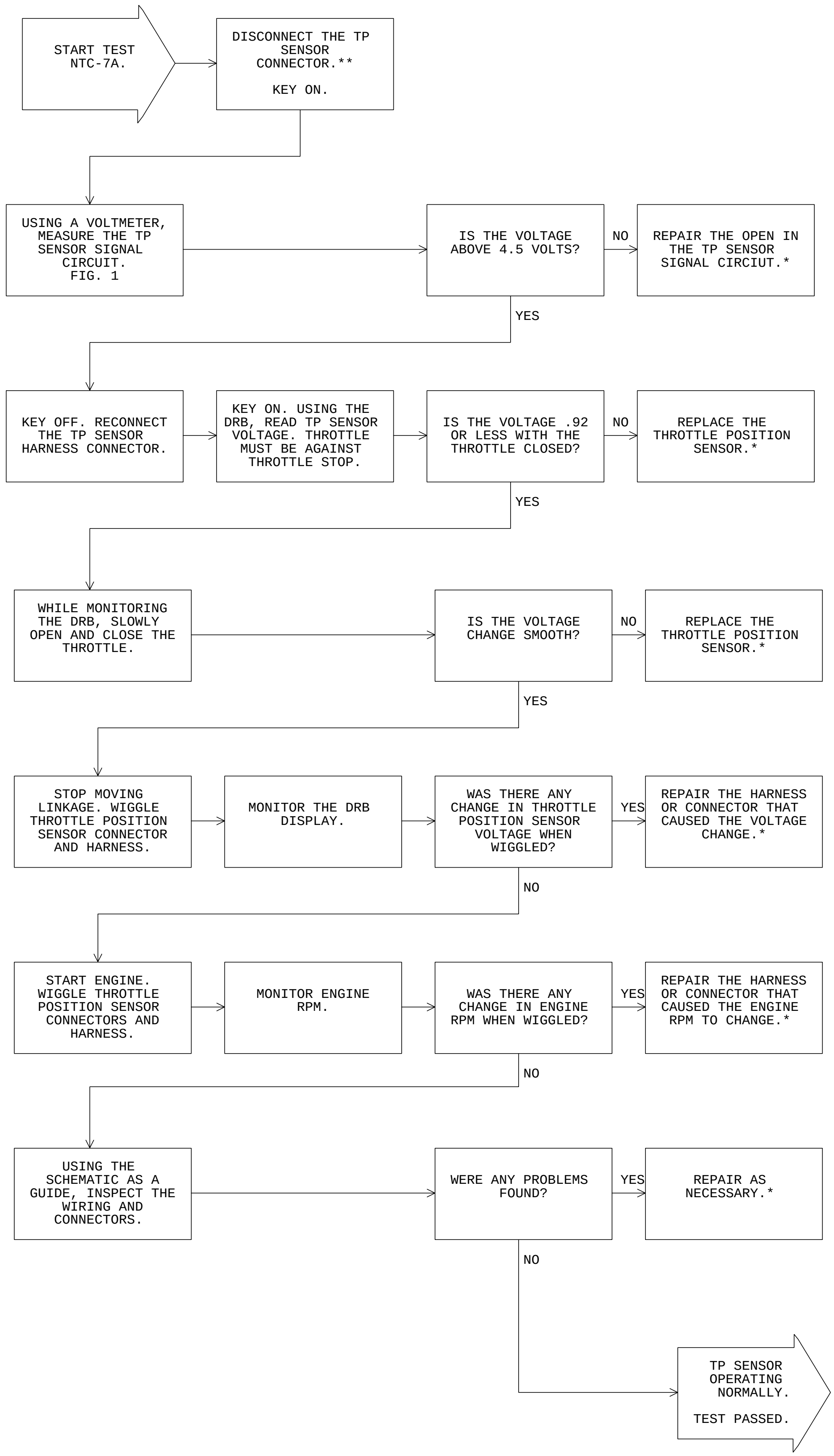
CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b6f0e7

FIG. 1

TEST NTC-7A CHECKING THE THROTTLE POSITION SENSOR

Perform TEST NTC-1A Before Proceeding



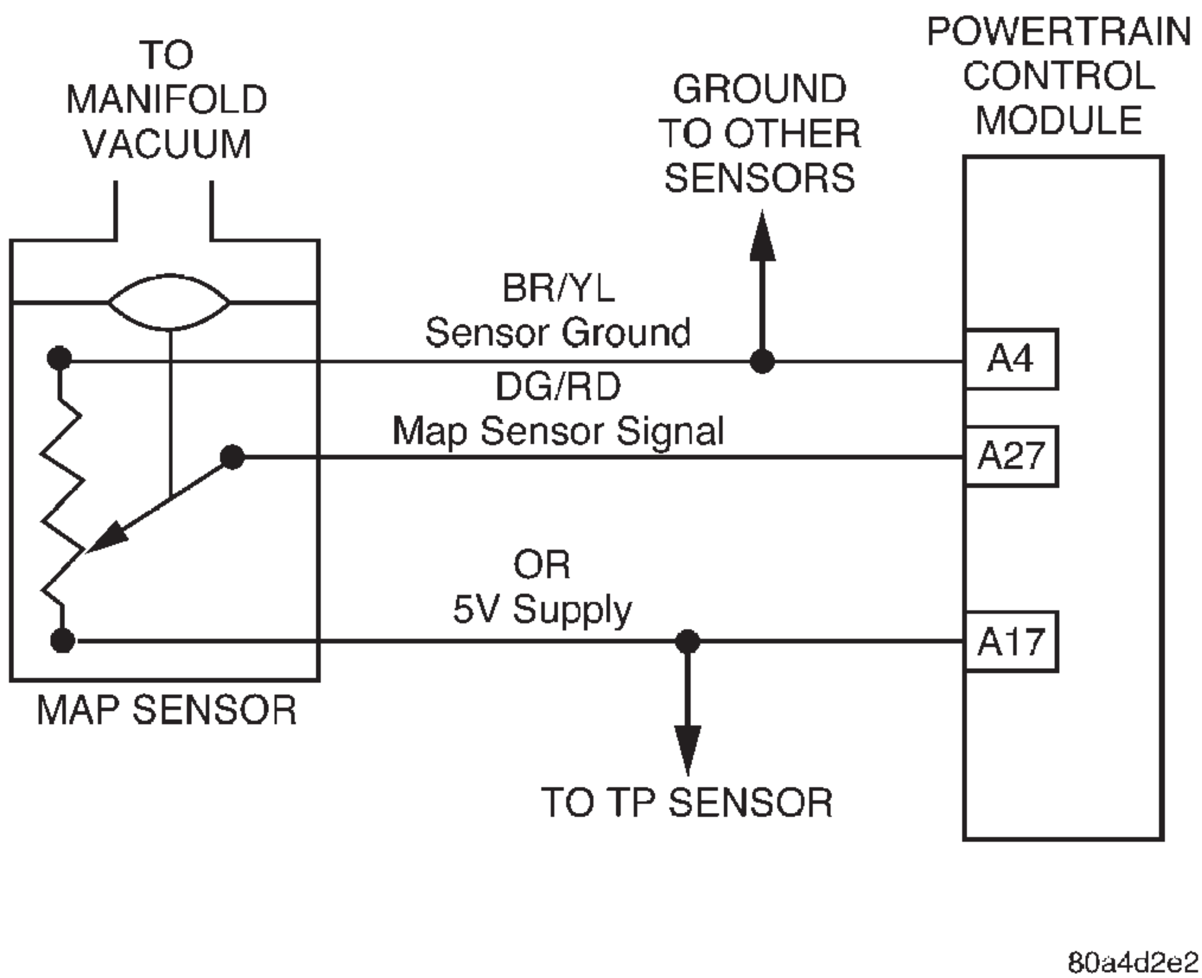
**Perform Verification TEST VER-2A.*

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

TEST NTC-8A	CHECKING THE MAP SENSOR

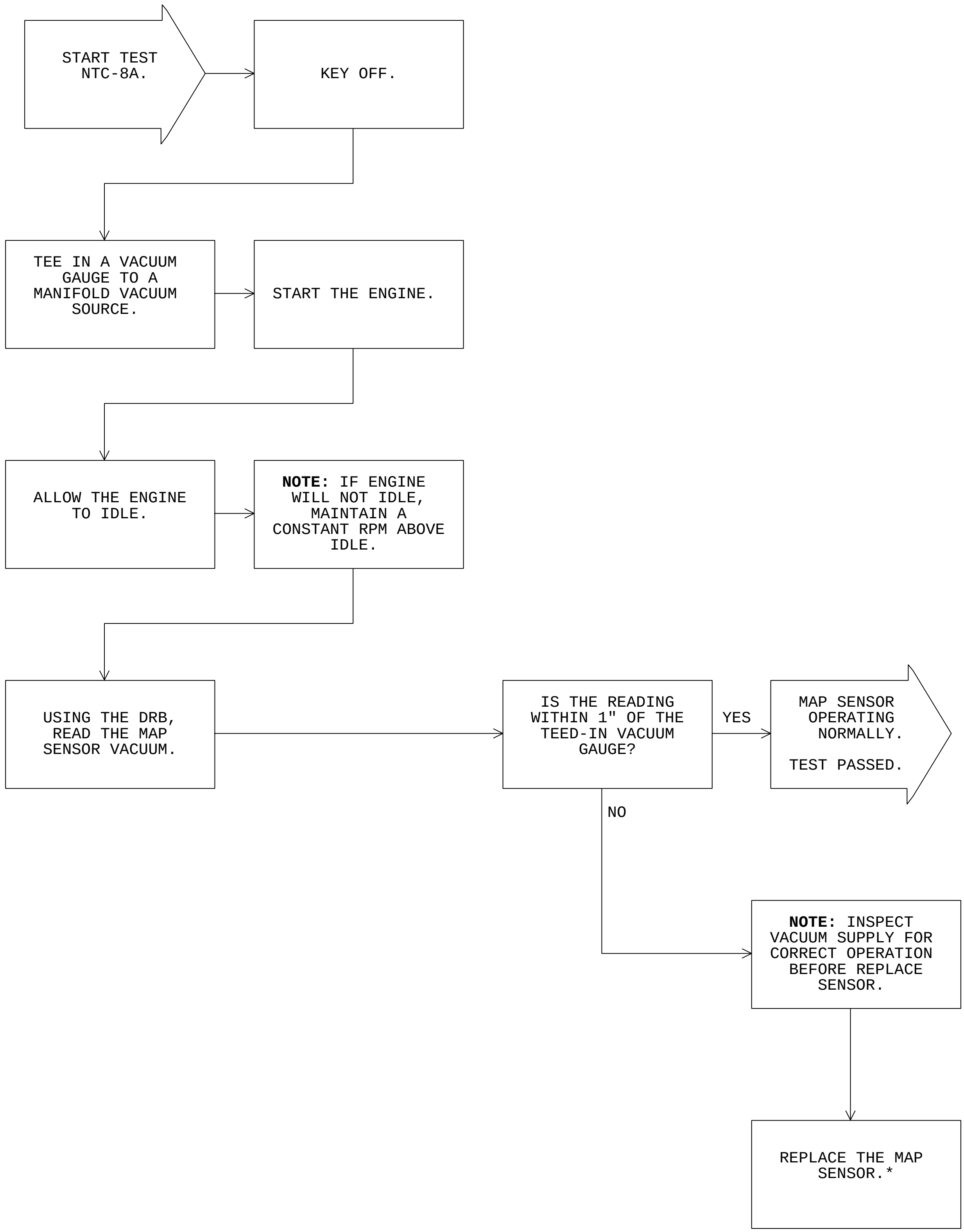
Perform TEST NTC-1A Before Proceeding

TJ/XJ BODY



TEST NTC-8A | **CHECKING THE MAP SENSOR**

Perform TEST NTC-1A Before Proceeding



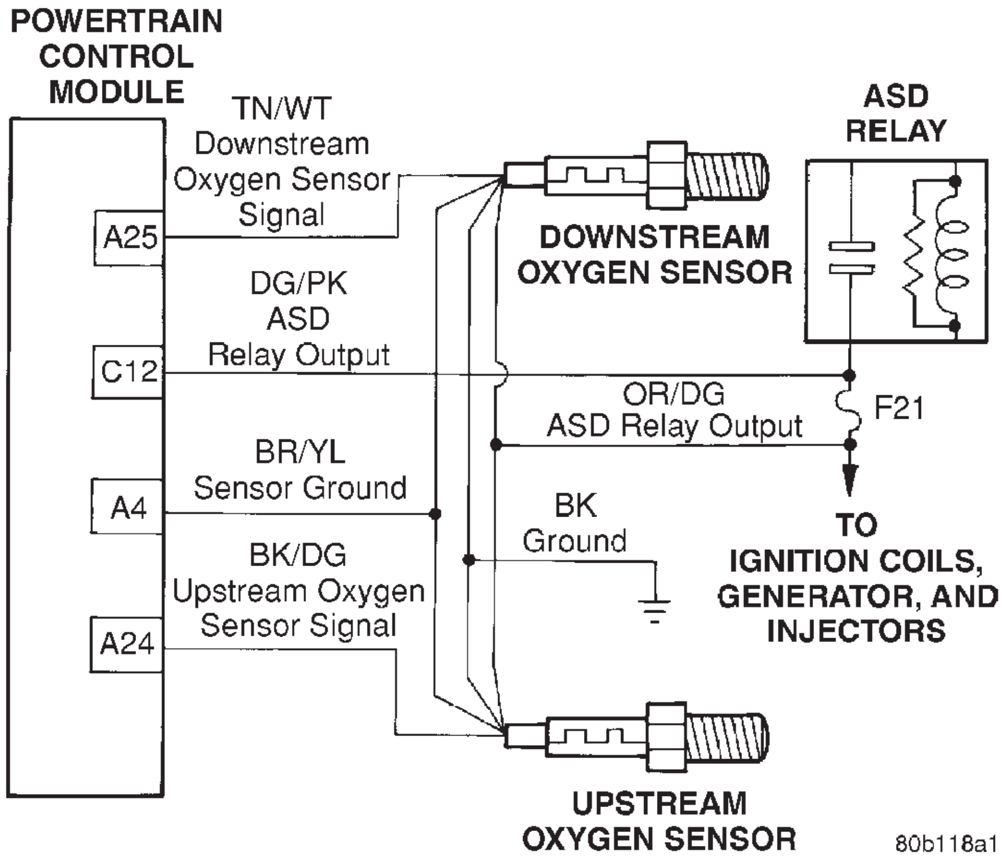
**Perform Verification TEST VER-2A.*

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

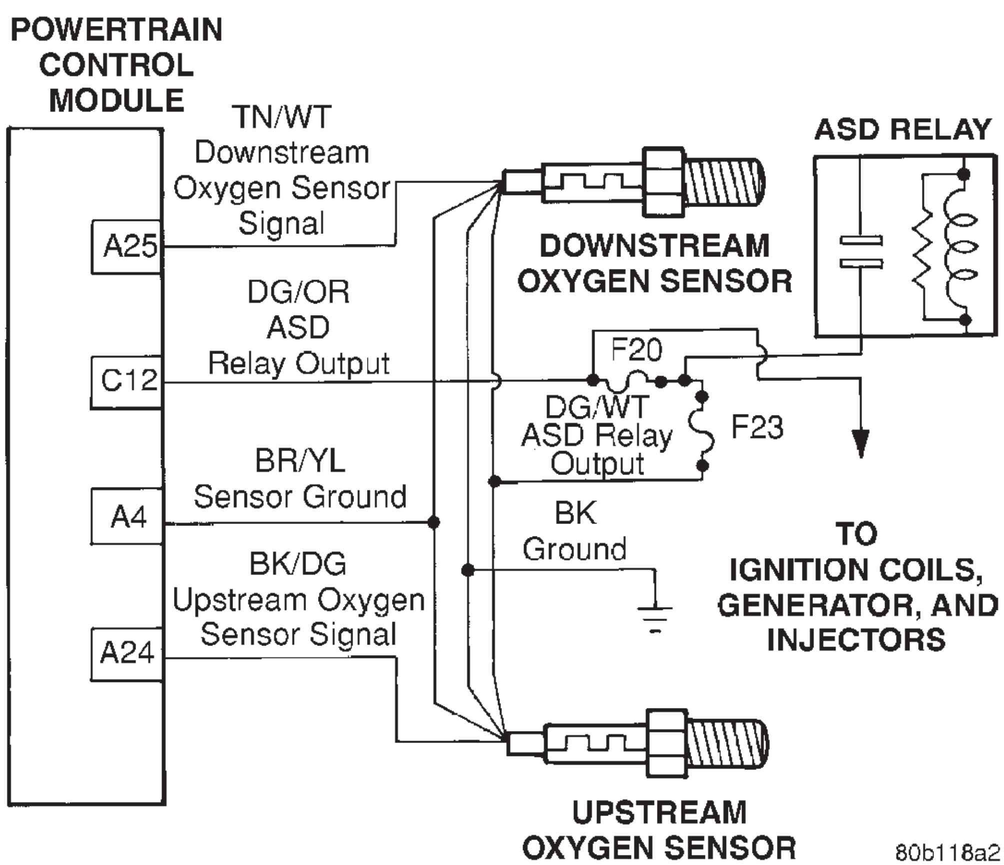
TEST NTC-10A	CHECKING THE OXYGEN SENSOR SWITCHING

Perform TEST NTC-1A Before Proceeding

TJ BODY

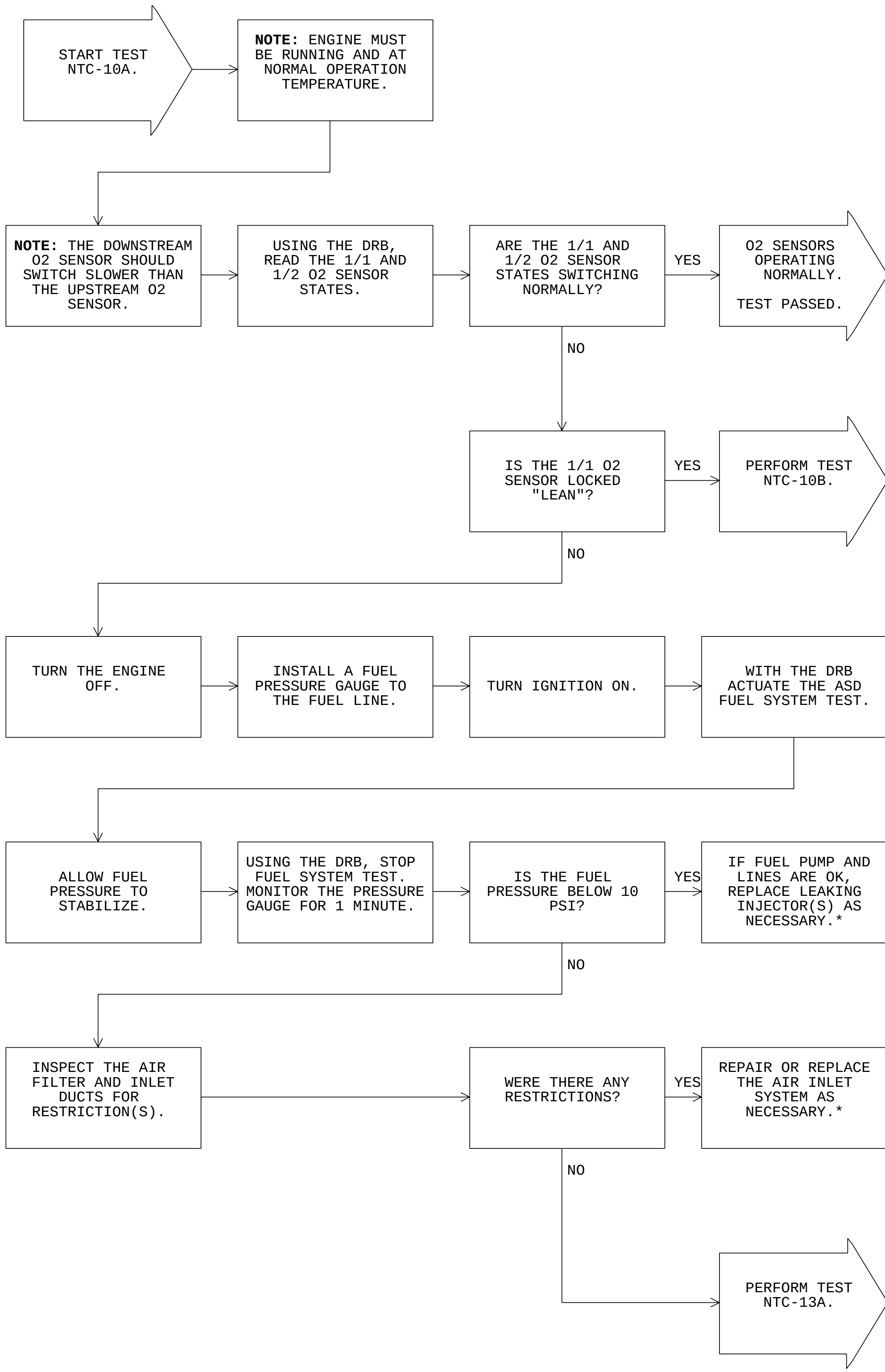


XJ BODY



TEST NTC-10A CHECKING THE OXYGEN SENSOR SWITCHING

Perform TEST NTC-1A Before Proceeding



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

TEST NTC-10B CHECKING THE OXYGEN SENSOR SWITCHING

Perform TEST NTC-10A Before Proceeding

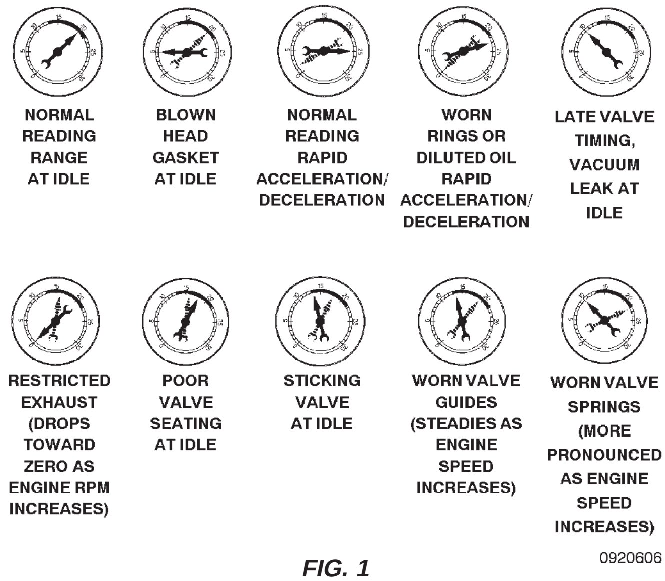
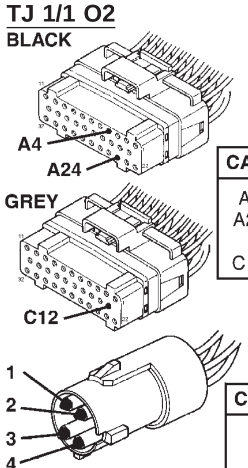


FIG. 1

TJ 1/1 O2



POWERTRAIN CONTROL MODULE CONNECTORS

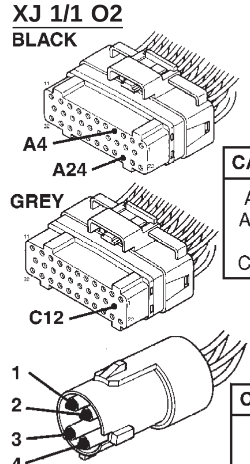
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 2

XJ 1/1 O2



POWERTRAIN CONTROL MODULE CONNECTORS

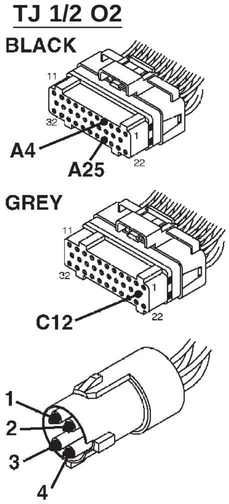
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 3

TJ 1/2 O2



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A25	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

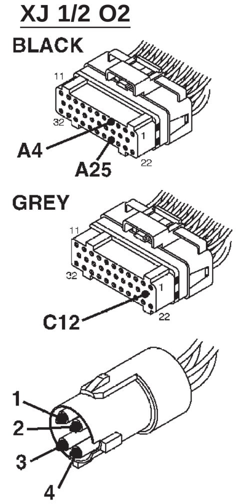
DOWNSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL

80b118a8

FIG. 4

XJ 1/2 O2



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A25	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

DOWNSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

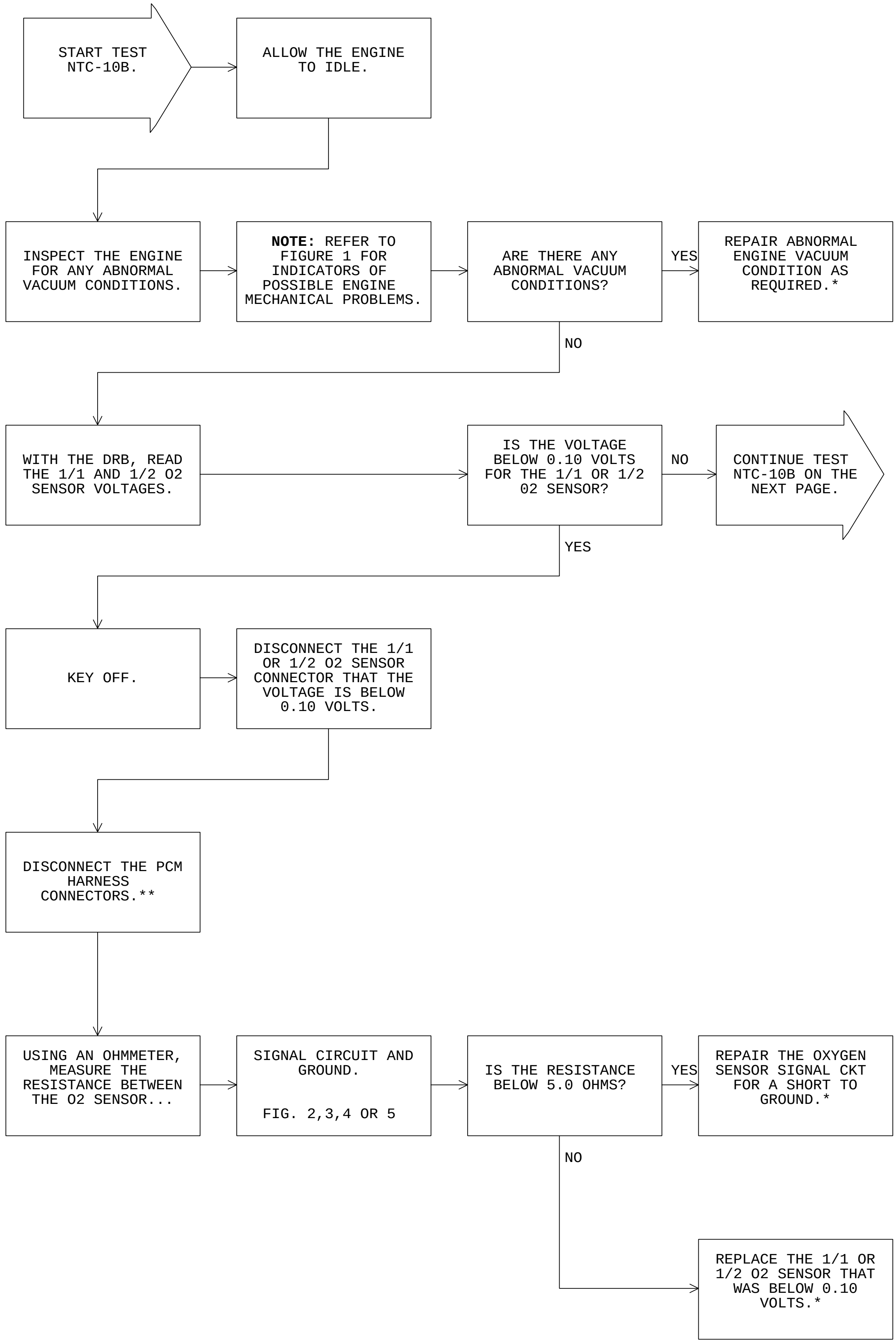
CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL

80b118a9

FIG. 5

TEST NTC-10B	CHECKING THE OXYGEN SENSOR SWITCHING

Perform TEST NTC-10A Before Proceeding

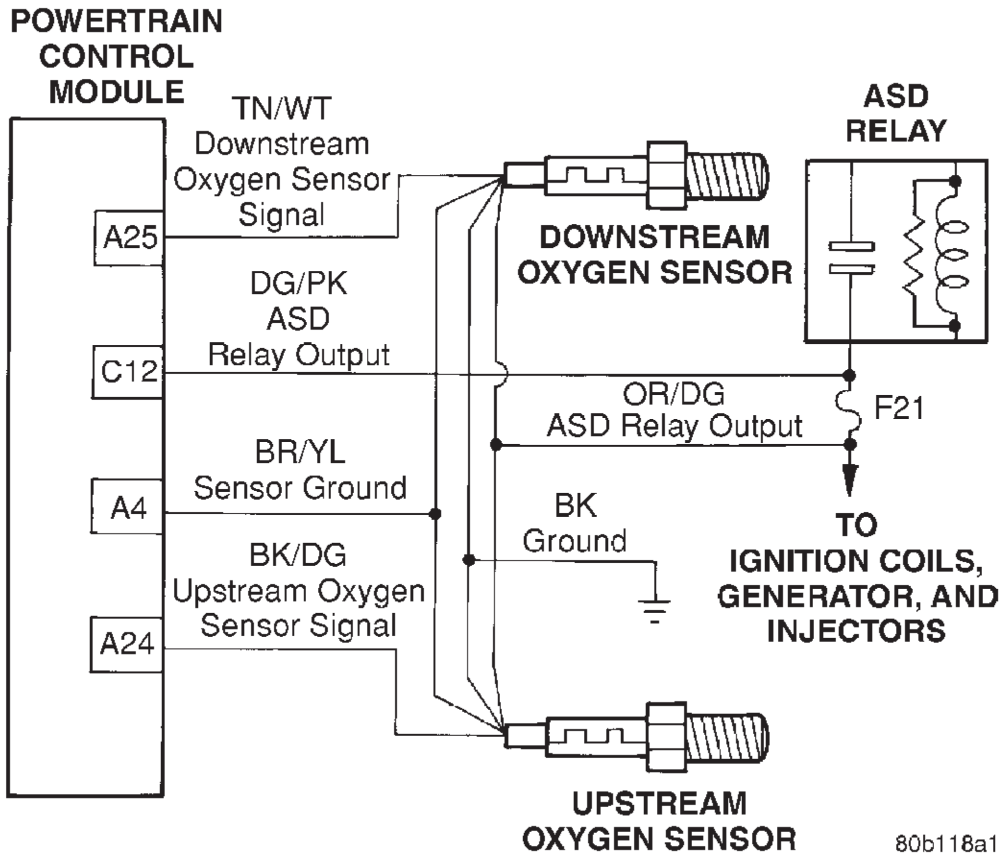


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

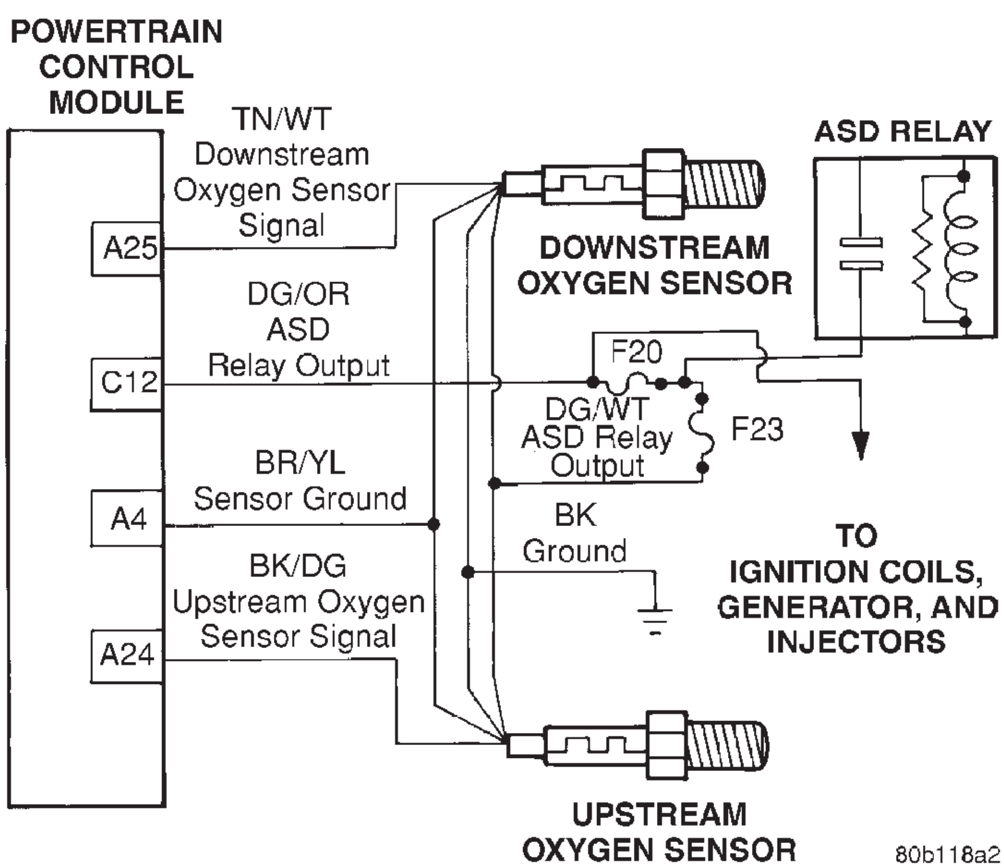
N O T R O U B L E C O D E T E S T S

TEST NTC-10B	CONTINUED - CHECKING THE OXYGEN SENSOR SWITCHING

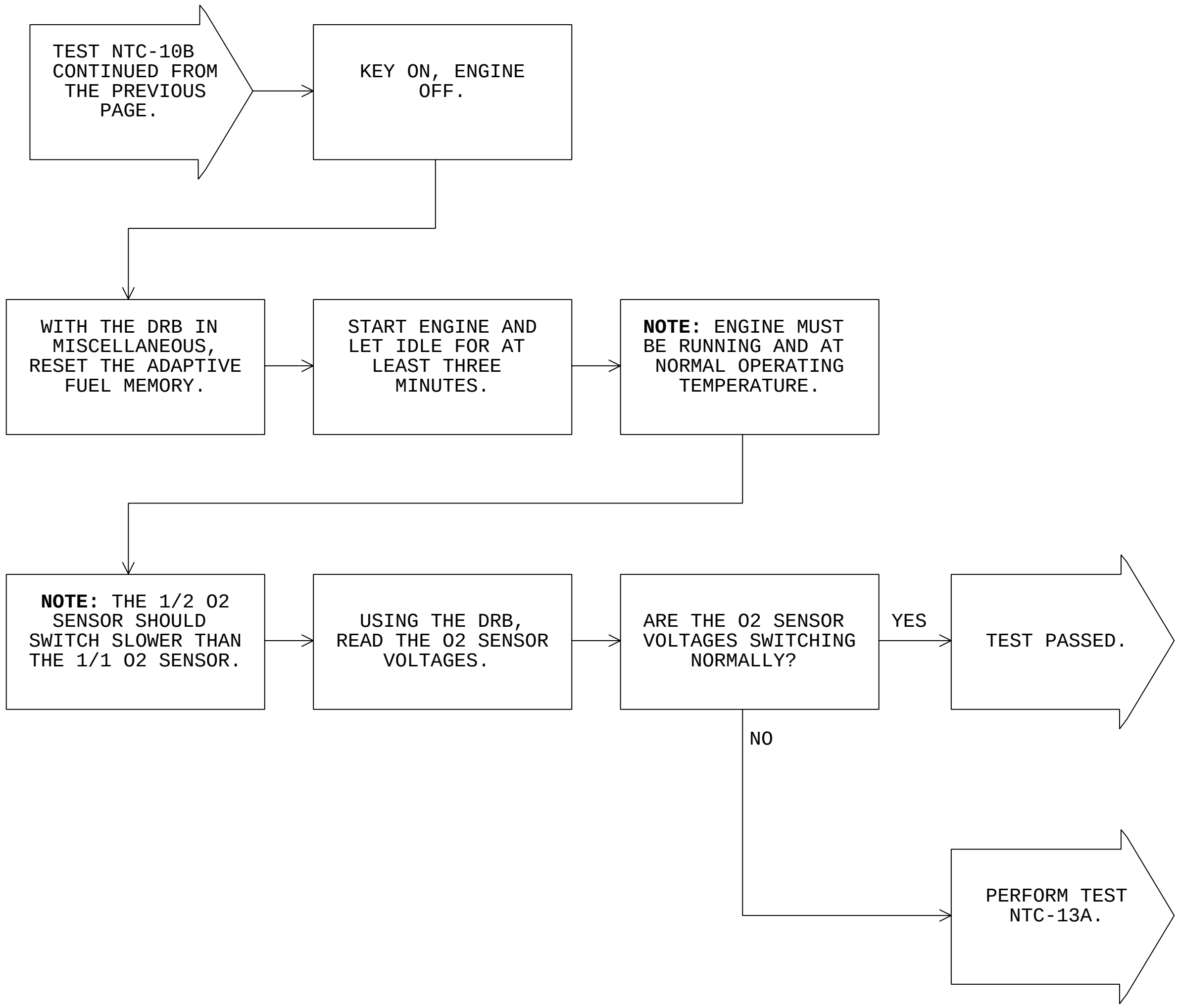
TJ BODY



XJ BODY



TEST NTC-10B CONTINUED - CHECKING THE OXYGEN SENSOR SWITCHING



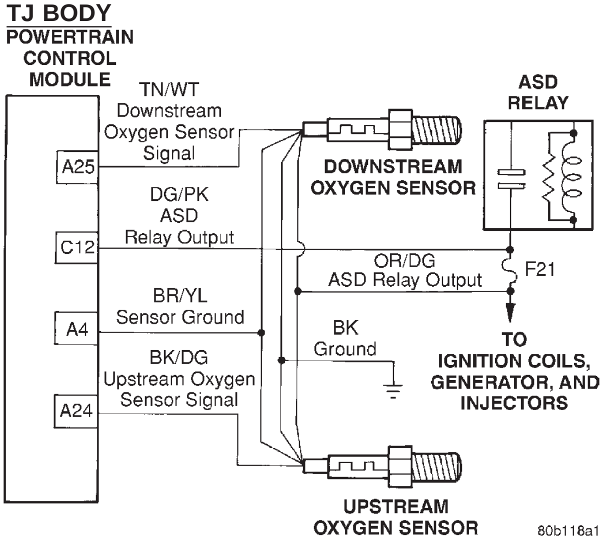
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

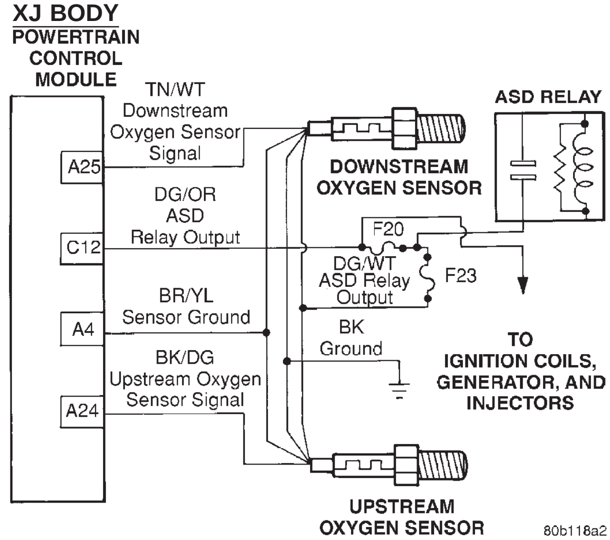
TEST NTC-11A CHECKING THE OXYGEN SENSOR HEATER

Perform TEST NTC-1A Before Proceeding

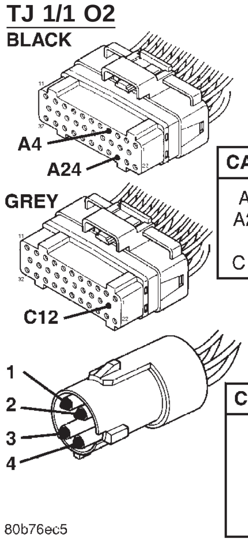
TJ BODY



XJ BODY



TJ 1/1 O2



POWERTRAIN CONTROL MODULE CONNECTORS

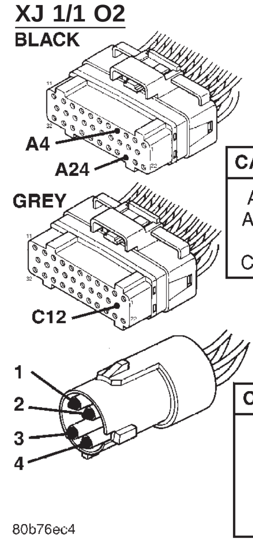
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 1

XJ 1/1 O2



POWERTRAIN CONTROL MODULE CONNECTORS

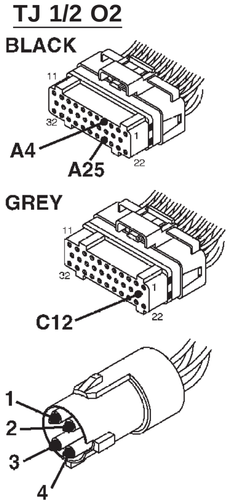
CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A24	BK/DG	UPSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

UPSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	BK/DG	OXYGEN SENSOR SIGNAL

FIG. 2

TJ 1/2 O2



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A25	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL
C12	DG/PK	ASD RELAY OUTPUT

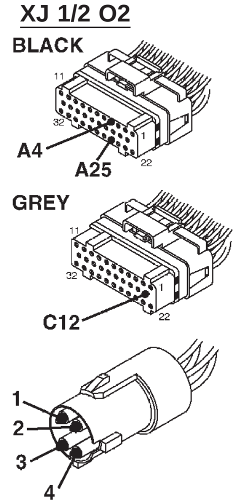
DOWNSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	OR/DG	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL

80b118a8

FIG. 3

XJ 1/2 O2



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A25	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL
C12	DG/OR	ASD RELAY OUTPUT

DOWNSTREAM OXYGEN SENSOR CONNECTOR (HARNESS SIDE)

CAV	COLOR	FUNCTION
1	DG/WT	ASD RELAY OUTPUT
2	BK	GROUND (HEATER)
3	BR/YL	SENSOR GROUND
4	TN/WT	DOWNSTREAM OXYGEN SENSOR SIGNAL

80b118a9

FIG. 4

TEST NTC-11A CHECKING THE OXYGEN SENSOR HEATER

Perform TEST NTC-1A Before Proceeding

START TEST NTC-11A.

KEY ON. USING THE DRB, ACTUATE THE O2 SENSOR HEATER TEST.

NOTE: USE THE APPROPRIATE O2 SENSOR CONNECTOR WHEN USING THIS TEST. (1/1 OR 1/2)

WAIT TWO MINUTES FOR THE O2 SENSOR VOLTAGES TO STABILIZE.

USING THE DRB, READ THE 1/1 AND 1/2 O2 SENSOR VOLTAGES.

IS THE VOLTAGE FOR EITHER OF THE O2 SENSORS ABOVE 1.0 VOLT?

- NO → STOP THE ACTUATION TEST. O2 SENSOR HEATERS OK AT THIS TIME. TEST PASSED.
- YES ↓

NOTE: THE O2 SENSOR VOLTAGE STAYING ABOVE 1.0 VOLT INDICATES A PROBLEM WITH THAT SENSOR.

NOTE: THE DRB IS STILL ACTUATING THE O2 SENSOR HEATER TEST.

DISCONNECT THE O2 SENSOR CONNECTOR THAT HAS VOLTAGE ABOVE 1.0 VOLT.**

USING A VOLTMETER MEASURE THE ASD RELAY OUTPUT CIRCUIT AT SENSOR CONNECTOR. FIG. 1,2,3 OR 4

IS THE VOLTAGE ABOVE 10.0 VOLTS?

- NO → REPAIR THE ASD RELAY OUTPUT CIRCUIT TO THE O2 SENSOR CONNECTOR FOR AN OPEN.*
- YES ↓

USING THE DRB, STOP THE ACTUATOR TEST.

USING AN OHMMETER MEASURE THE RESISTANCE BETWEEN THE HEATER GROUND...

CIRCUIT AND GROUND. FIG. 1,2,3 OR 4

IS THE RESISTANCE BELOW 5.0 OHMS?

- NO → REPAIR THE HEATER GROUND CIRCUIT FOR AN OPEN.*
- YES → REPLACE THE O2 SENSOR.*

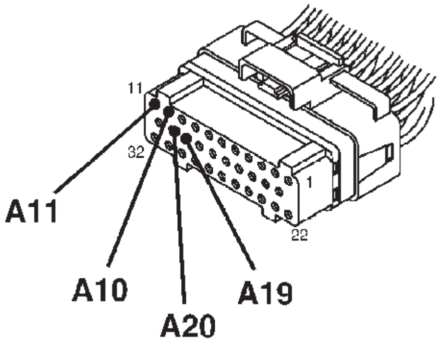
Perform Verification TEST VER-2A.

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

TEST NTC-12A — CHECKING THE IDLE AIR CONTROL MOTOR

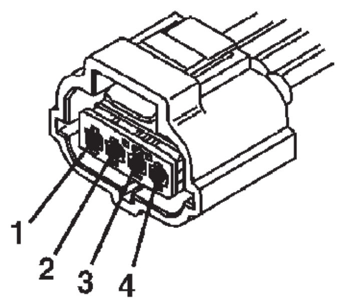
Perform TEST NTC-1A Before Proceeding

TJ/XJ BODY



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A10	YL/BK	IAC #3 DRIVER
A11	BR/WT	IAC #2 DRIVER
A19	GY/RD	IAC #4 DRIVER
A20	VT/BK	IAC #1 DRIVER



IDLE AIR CONTROL MOTOR CONNECTOR

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

80b898b3

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.

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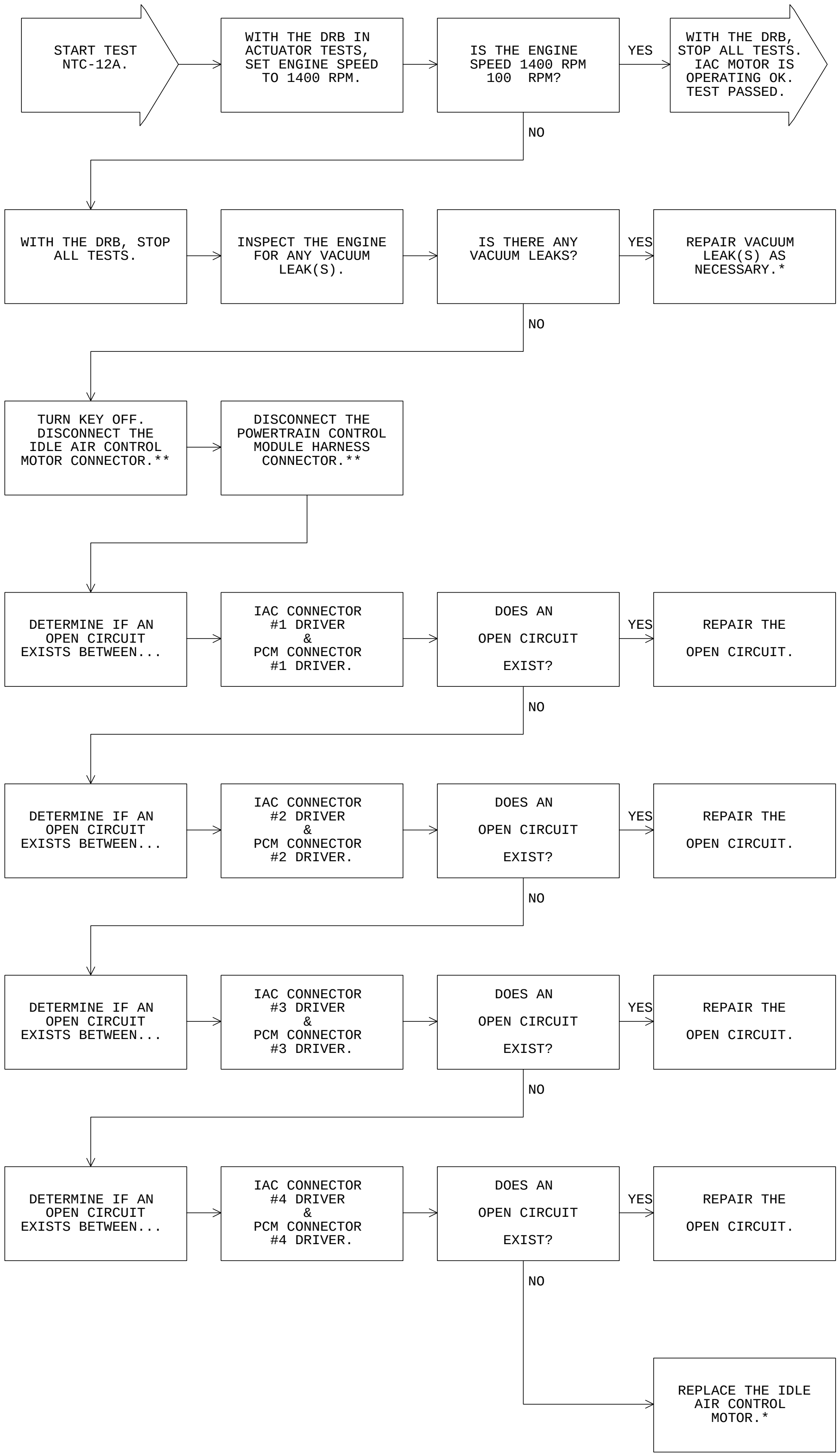
TEST NTC-12A | CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NTC-1A Before Proceeding



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

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

TEST NTC-13A CHECKING THE ENGINE MECHANICAL

Perform TEST NTC-1A Before Proceeding

NOTES

TEST NTC-13A | **CHECKING THE ENGINE MECHANICAL**

Perform TEST NTC-1A Before Proceeding

The components and systems that you have checked before this are operating properly. Here are additional non-monitored components or systems to check, that could cause a driveability problem.

1. **DISTRIBUTOR POSITION** — must be within specifications
2. **ENGINE VACUUM** — must be at least 13 inches in neutral (see below) †
3. **ENGINE VALVE TIMING** — must be within specifications
4. **ENGINE COMPRESSION** — must be within specifications
5. **ENGINE EXHAUST SYSTEM** — must be free of any restrictions
6. **ENGINE PCV SYSTEM** — must flow freely
7. **ENGINE DRIVE SPROCKET** — must be properly positioned
8. **TORQUE CONVERTER STALL SPEED** — must be within specifications (auto only)
9. **POWER BRAKE BOOSTER** — no internal vacuum leaks
10. **FUEL** — must be free of contamination
11. **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)

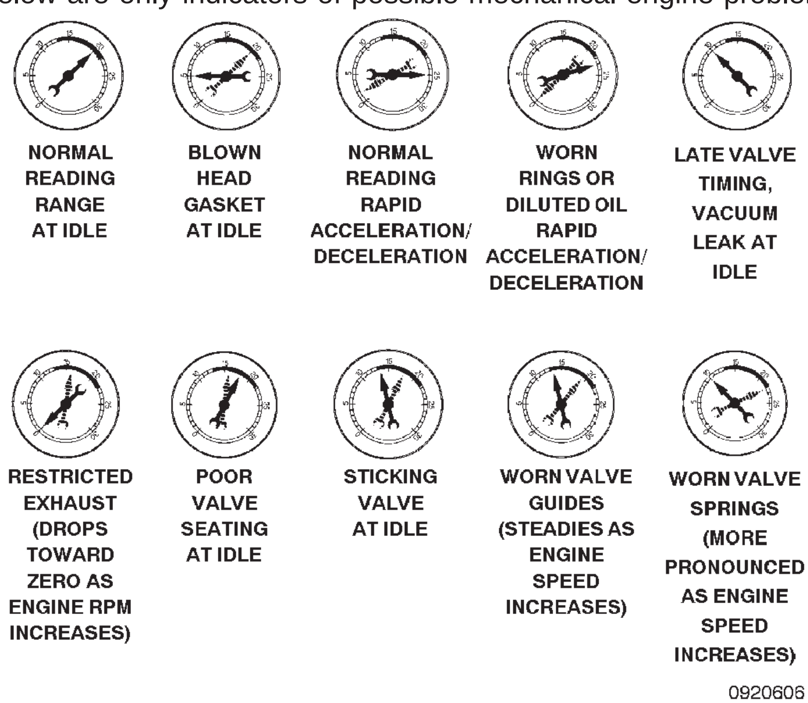
Checking Distributor Position With DRBIII®

§Connect the DRB to the data link connector and select SET SYNC from the menu. **WARNING:** The following test will be performed with the engine running: avoid contact with rotating components.

Start the engine and observe the DRB display. When the distributor is correctly positioned, the IN RANGE message should appear along with 0°. If the distributor needs to be adjusted, loosen the distributor hold-down clamp bolt. Rotate the distributor until reading is as close to 0° as possible and the IN RANGE message displayed. Tighten the clamp bolt to 22.5 N·m (200 in. lbs.) torque.

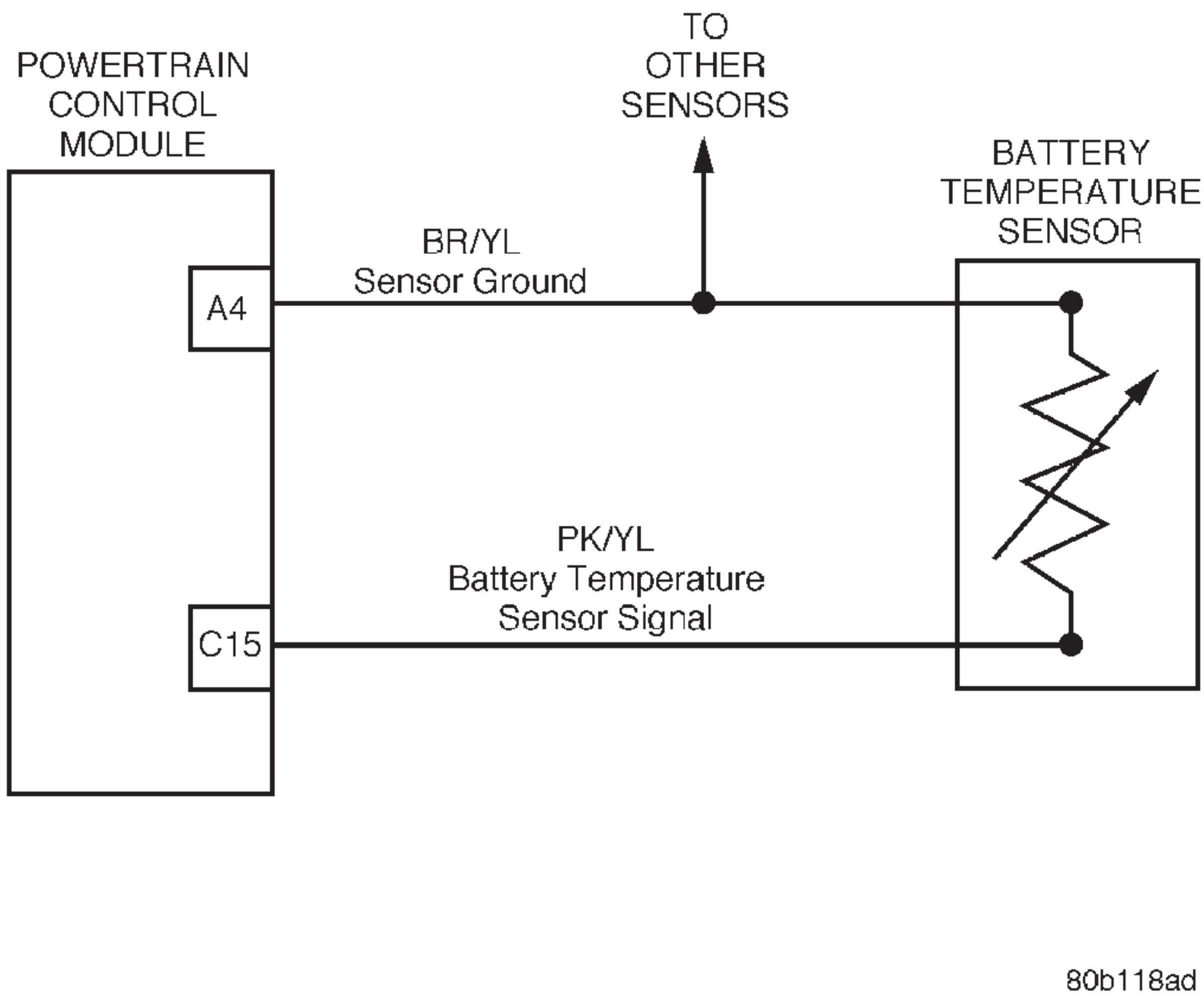
NOTE: Setting the distributor position does not adjust the ignition timing. Ignition timing valves are determined by the powertrain control module:

† The readings below are only indicators of possible mechanical engine problems.



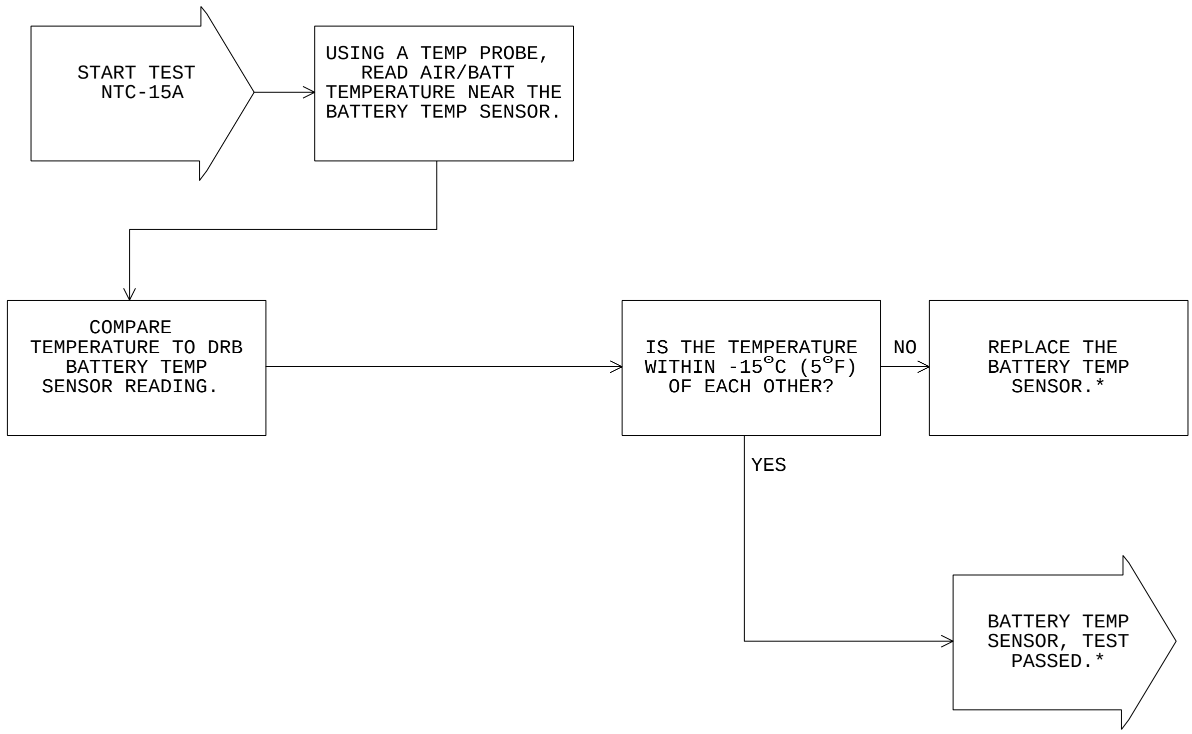
TEST NTC-15A **CHECKING BATTERY TEMP SENSOR**

Perform TEST NTC-1A Before Proceeding



TEST NTC-15A — CHECKING BATTERY TEMP SENSOR

Perform TEST NTC-1A Before Proceeding



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-17A	CHECKING THE EVAPORATIVE EMISSION SYSTEM

Perform TEST NTC-1A Before Proceeding

TJ BODY

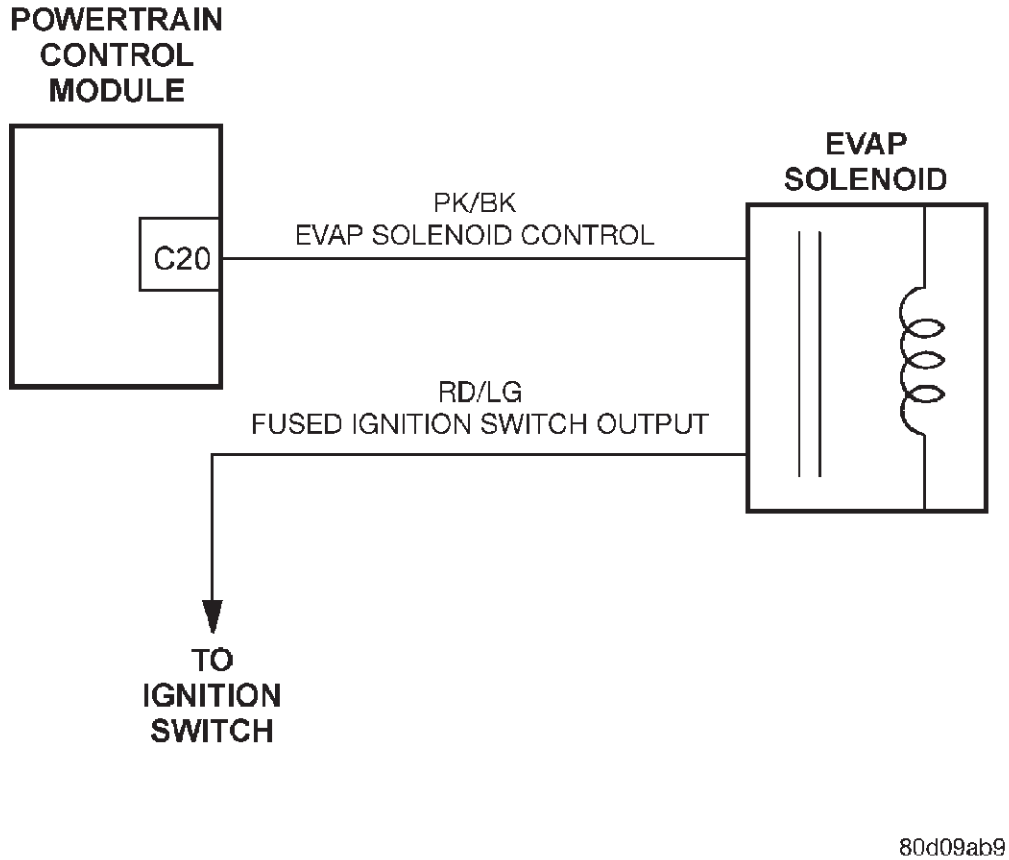


FIG. 1

XJ BODY

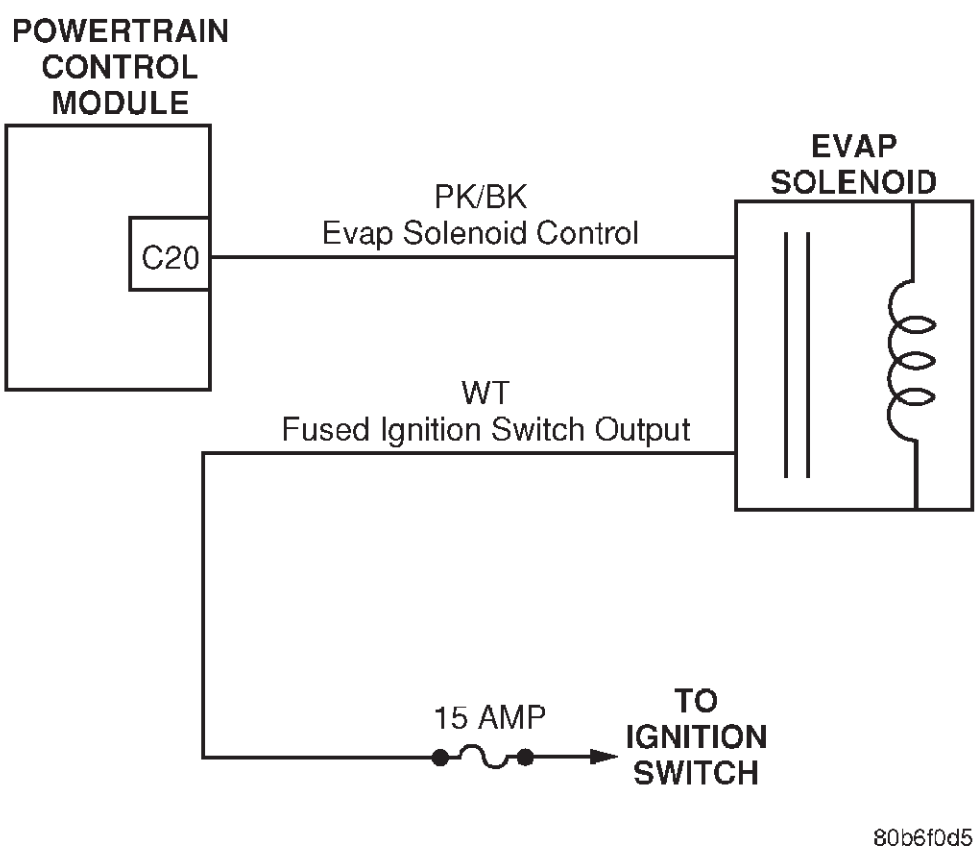
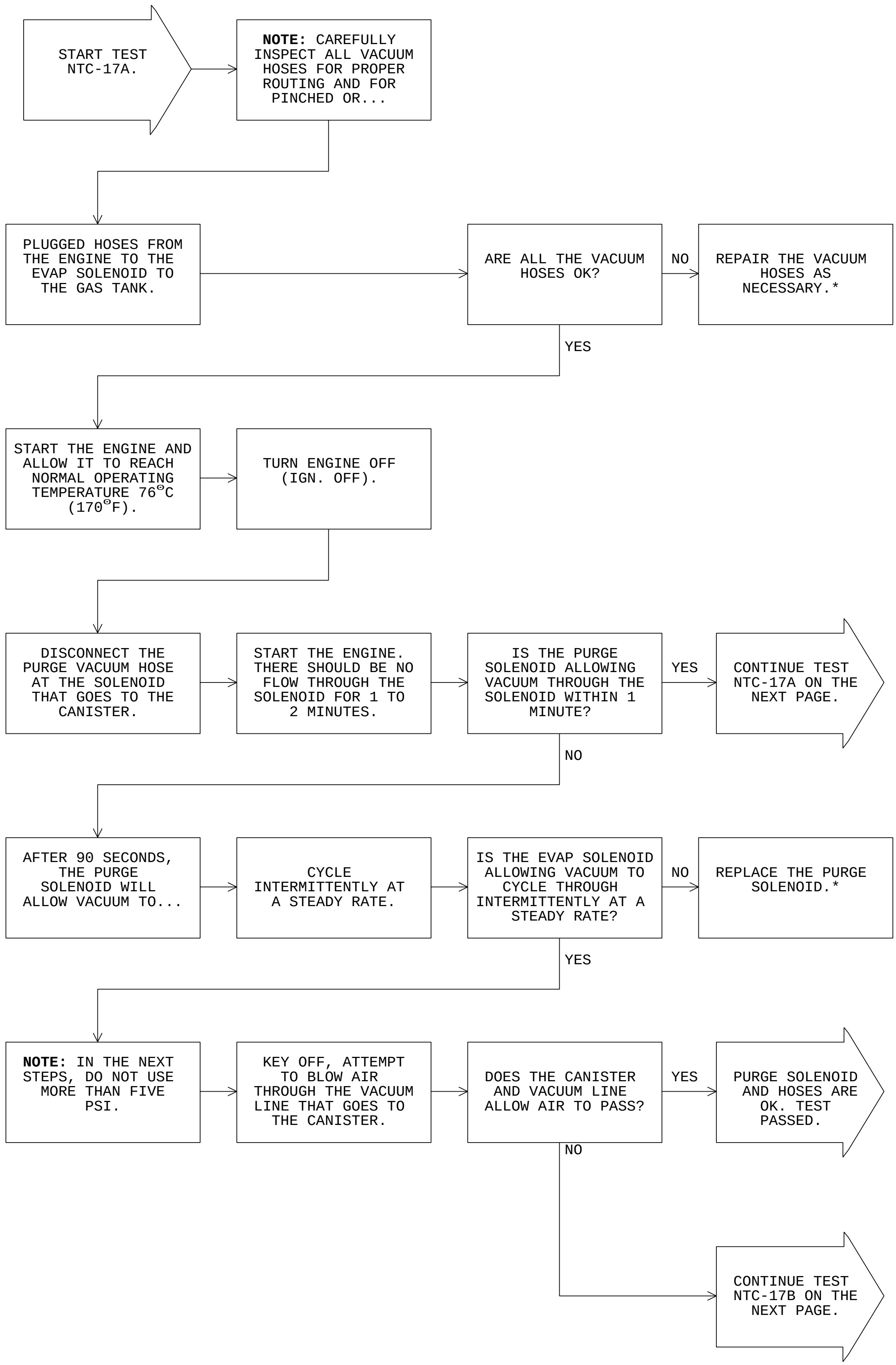


FIG. 2

TEST NTC-17A CHECKING THE EVAPORATIVE EMISSION SYSTEM

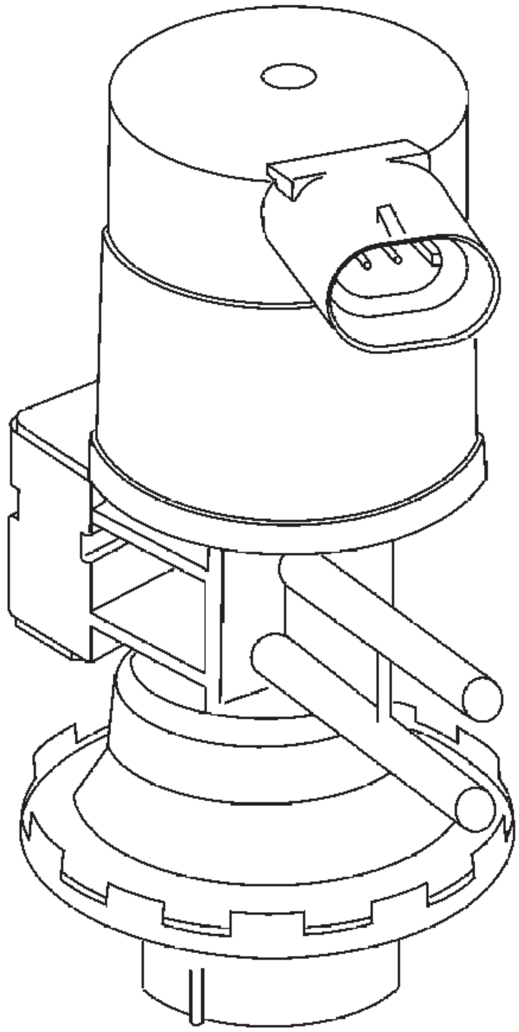
Perform TEST NTC-1A Before Proceeding



*Perform Verification TEST VER-2A.

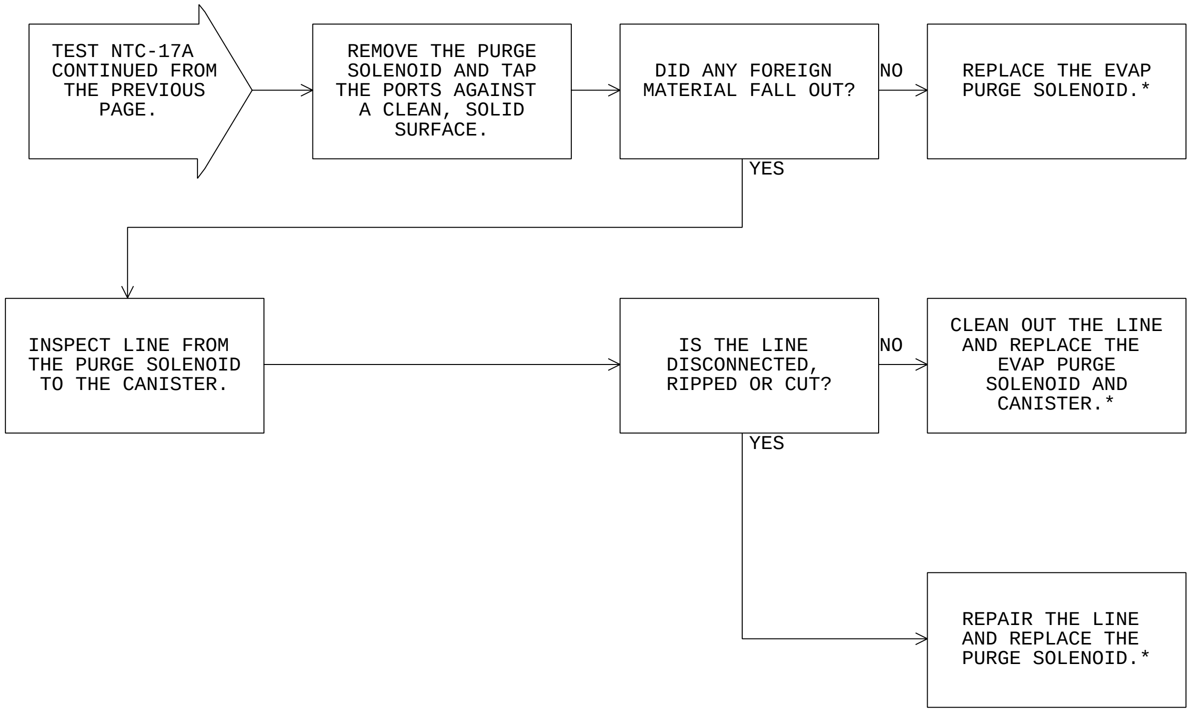
Check connectors - Clean / repair as necessary.

TEST NTC-17A	CONTINUED - CHECKING THE EVAPORATIVE EMISSION SYSTEM



80b27d34

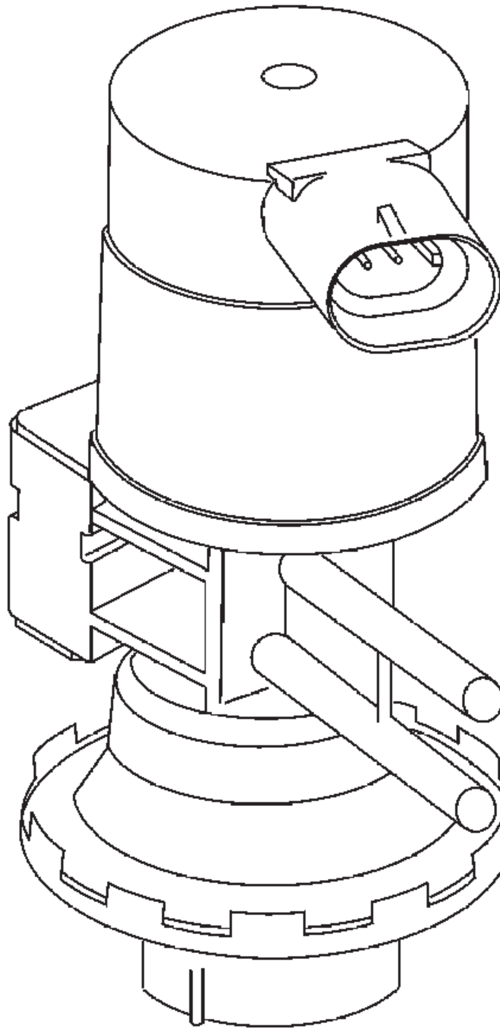
TEST NTC-17A | **CONTINUED - CHECKING THE EVAPORATIVE EMISSION SYSTEM**



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

TEST NTC-17B	CHECKING THE EVAPORATIVE EMISSION SYSTEM

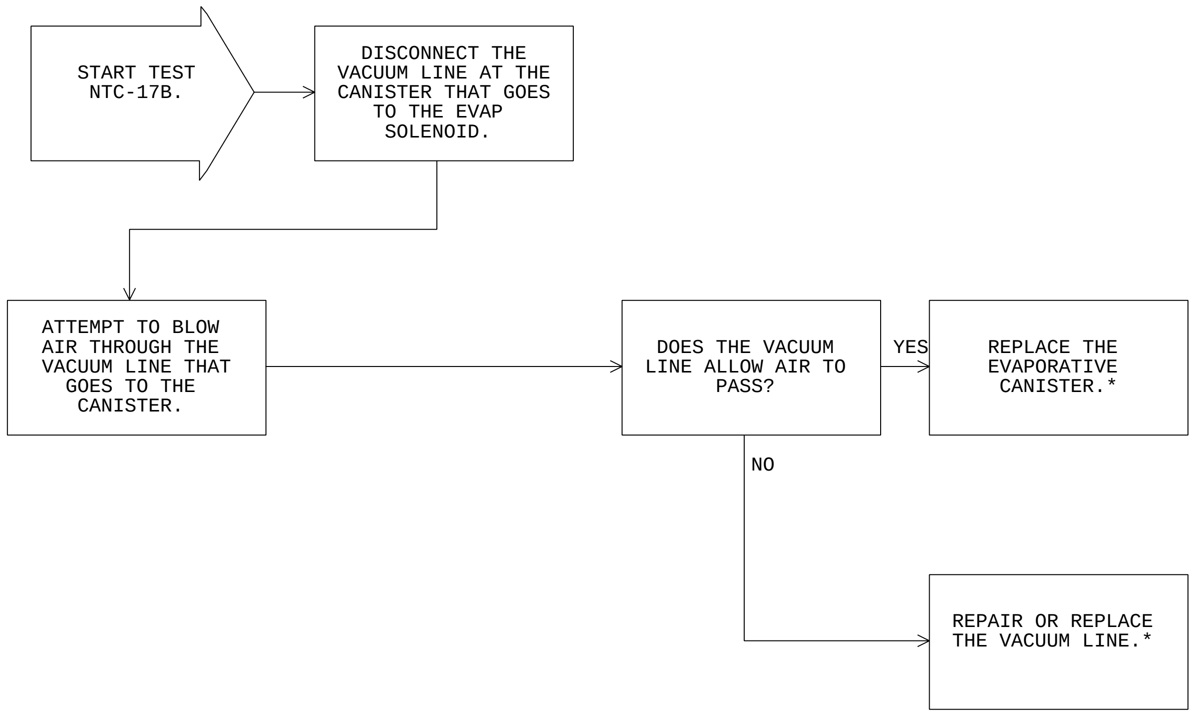
Perform TEST NTC-17A Before Proceeding



80b27d34

TEST NTC-17B | **CHECKING THE EVAPORATIVE EMISSION SYSTEM**

Perform TEST NTC-17A Before Proceeding



***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-19A CHECKING THE INTAKE AIR TEMPERATURE SENSOR

Perform TEST NTC-1A Before Proceeding

TJ BODY

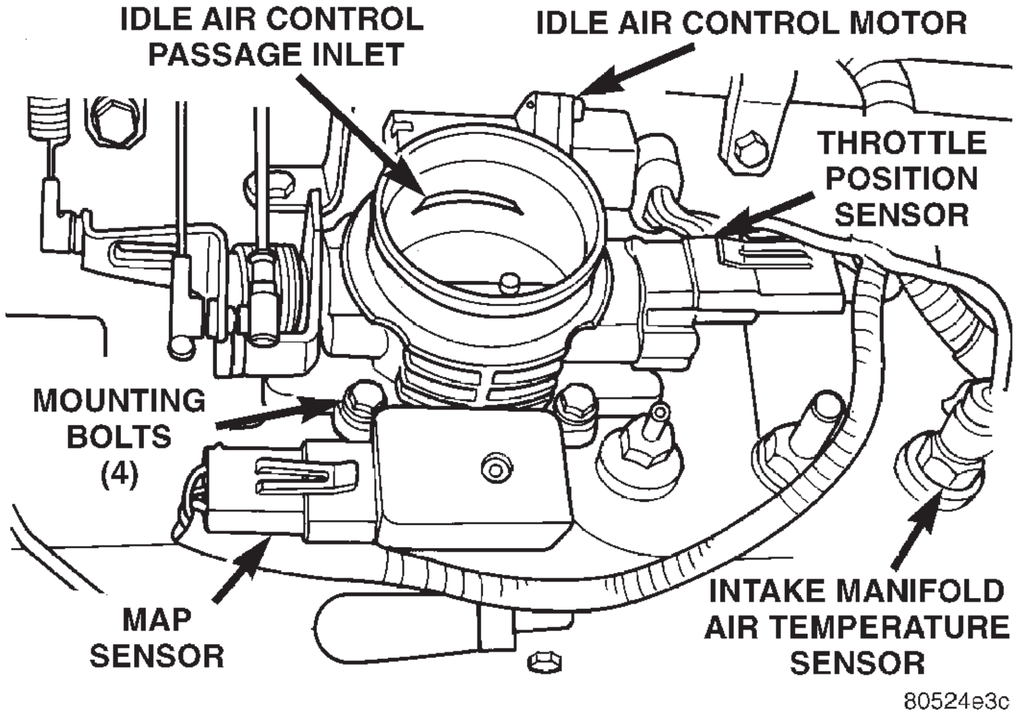


FIG. 1

XJ BODY

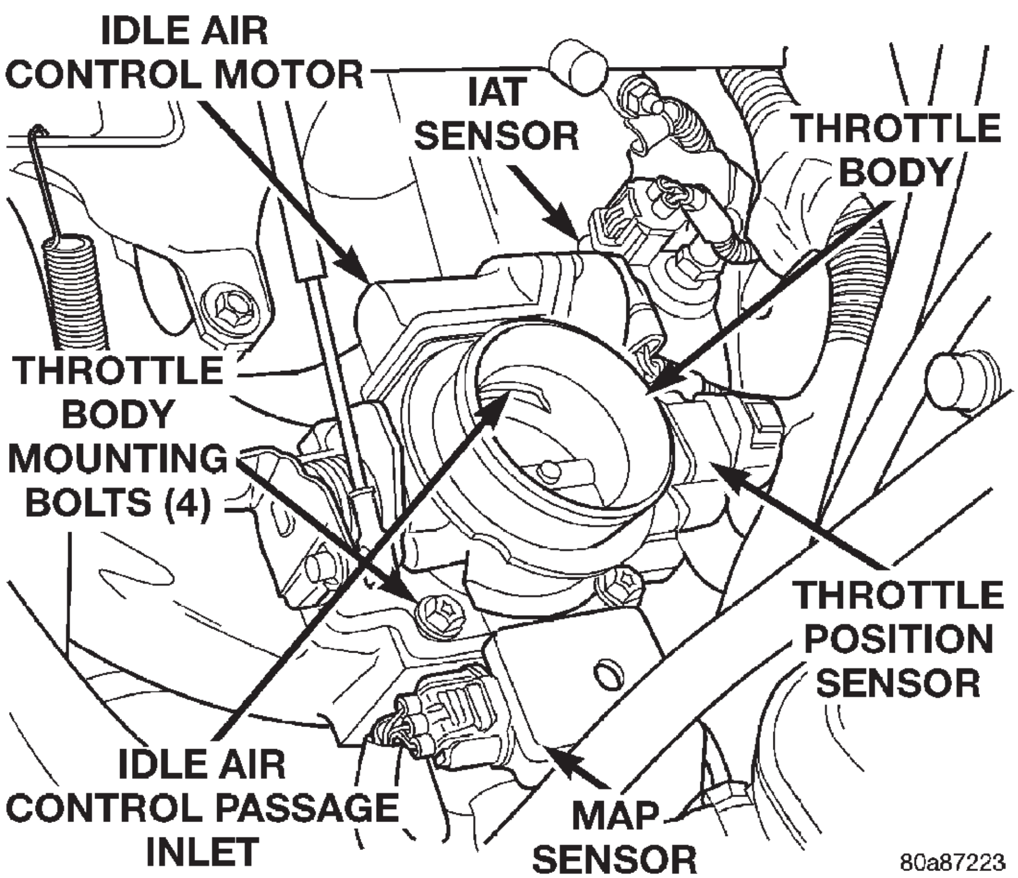
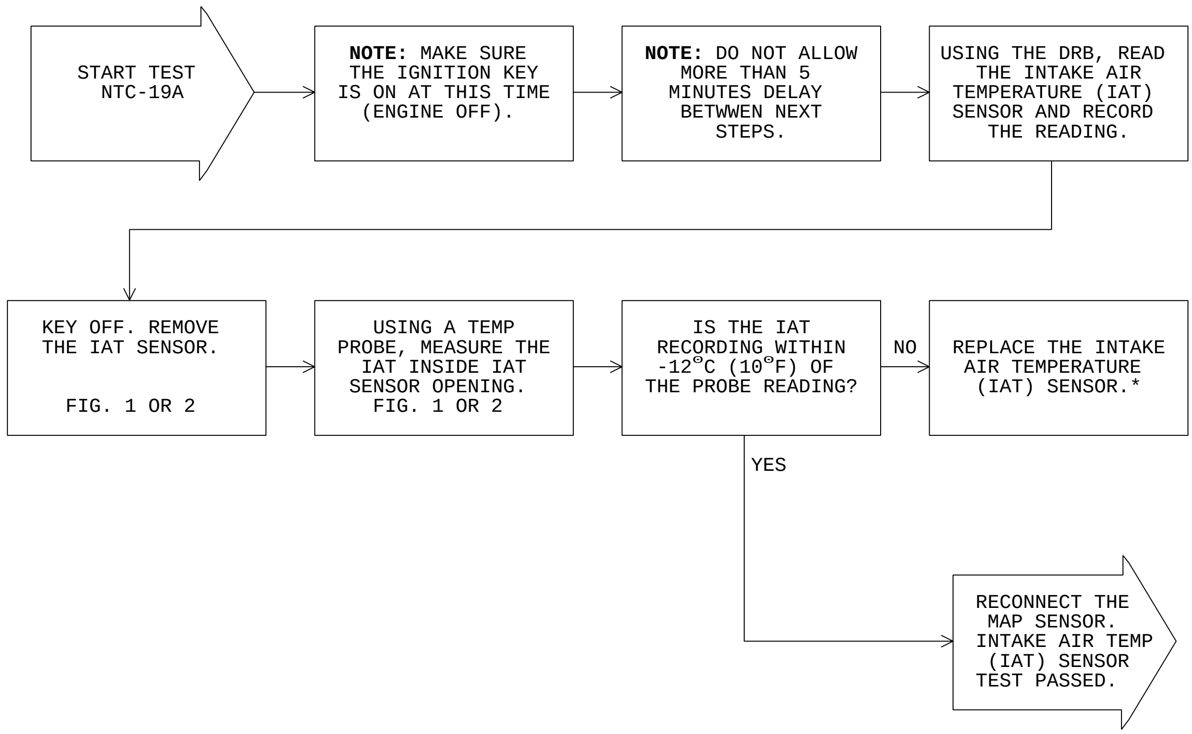


FIG. 2

TEST NTC-19A CHECKING THE INTAKE AIR TEMPERATURE SENSOR

Perform TEST NTC-1A Before Proceeding



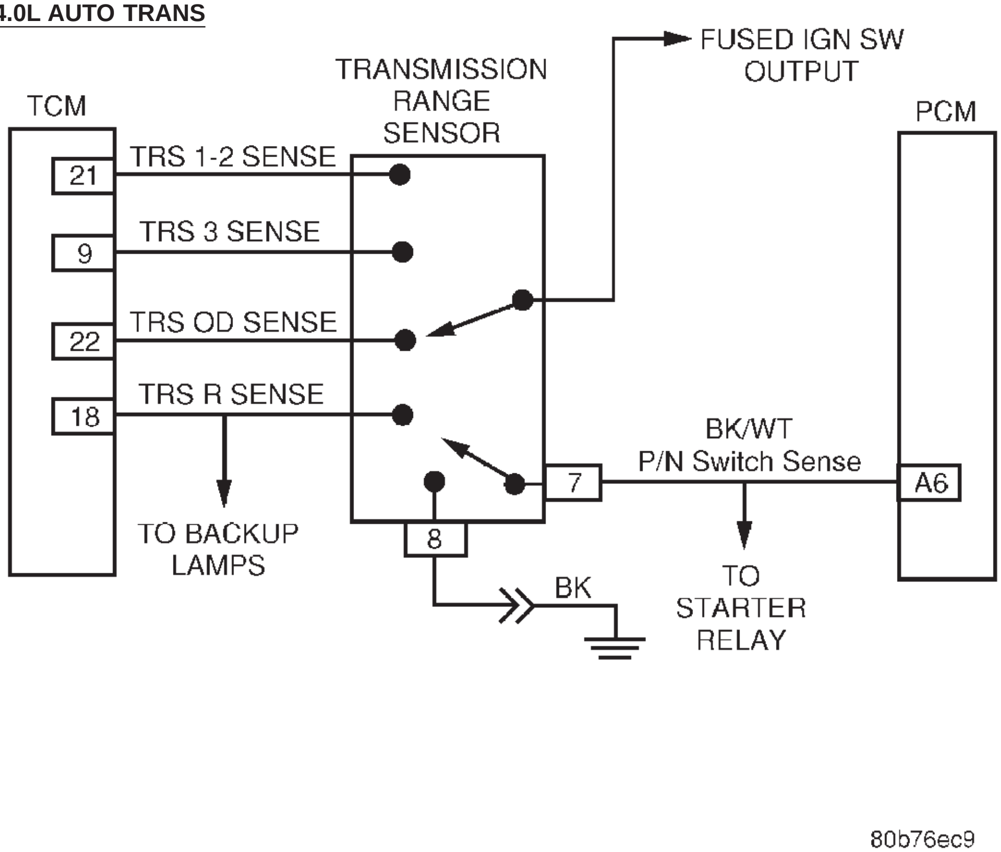
**Perform Verification TEST VER-2A.*

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

TEST NTC-20A | **CHECKING THE PARK/NEUTRAL POSITION SWITCH**

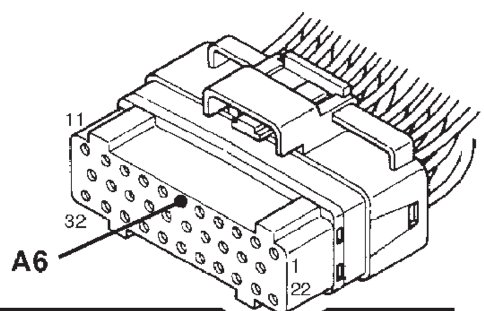
Perform TEST NTC-1A Before Proceeding

XJ BODY 4.0L AUTO TRANS



XJ BODY 4.0L AUTO TRANS

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE

TRANSMISSION RANGE SENSOR CONNECTOR

CAV	COLOR	FUNCTION
7	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
8	BK	GROUND

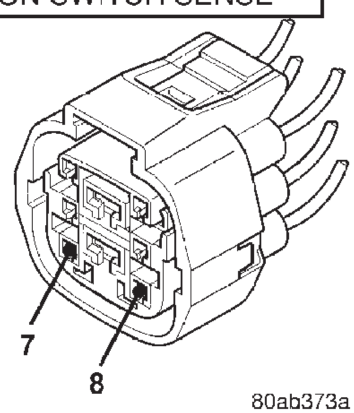
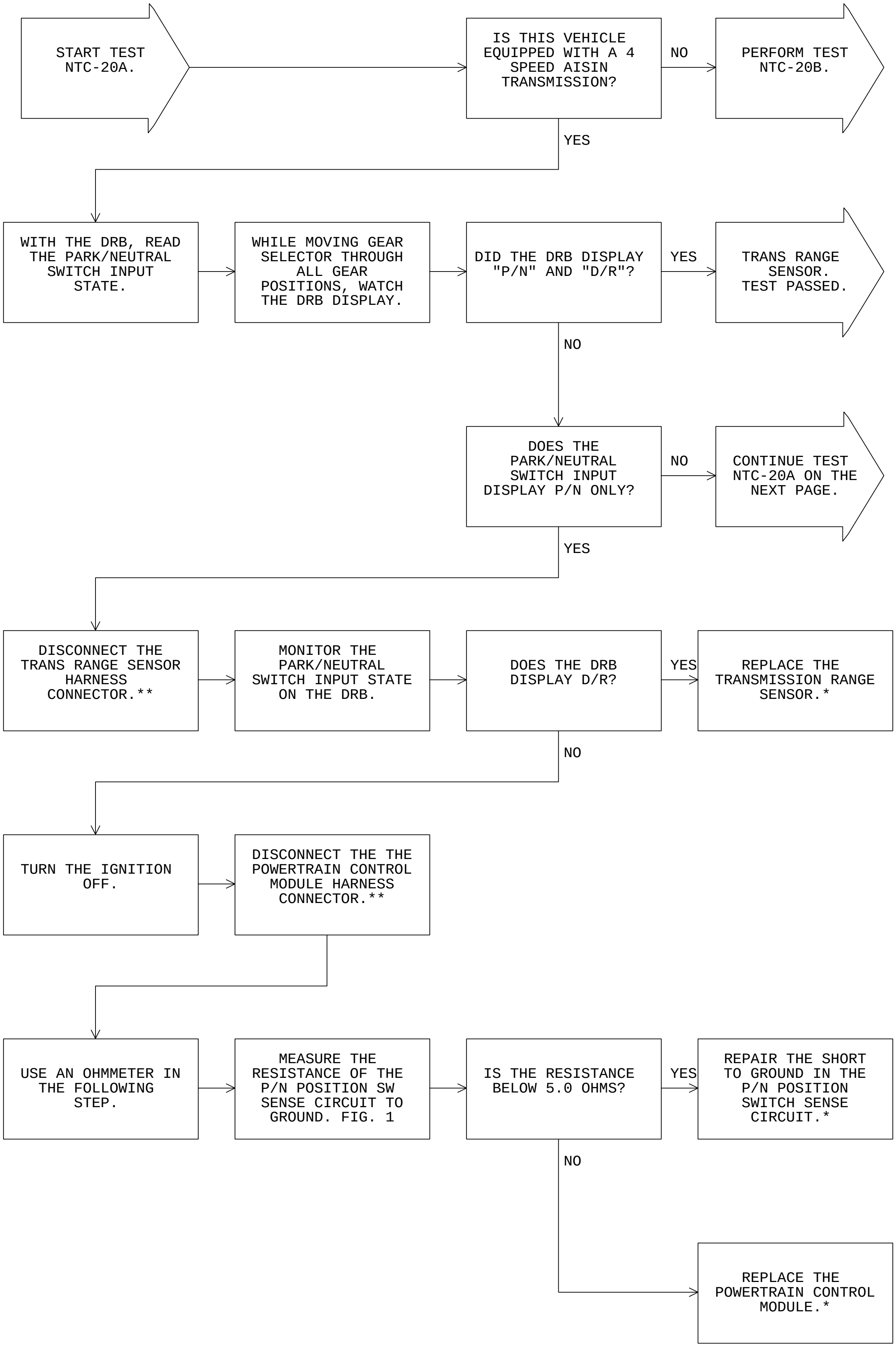


FIG. 1

TEST NTC-20A CHECKING THE PARK/NEUTRAL POSITION SWITCH

Perform TEST NTC-1A Before Proceeding



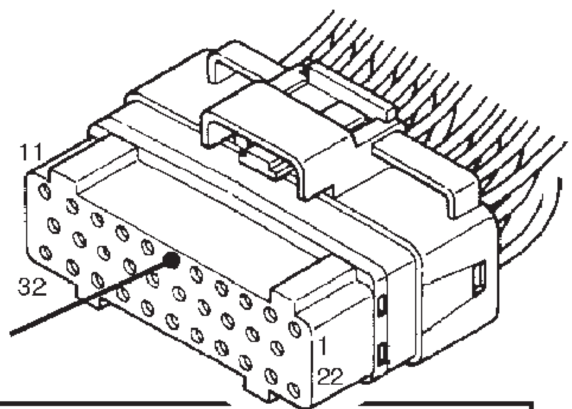
**Perform Verification TEST VER-2A.*

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

TEST NTC-20A	CONTINUED - CHECKING THE PARK/NEUTRAL POSITION SWITCH

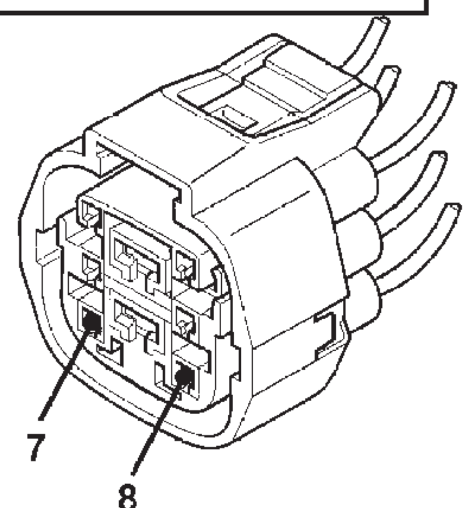
XJ BODY 4.0L AUTO TRANS

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE

TRANSMISSION RANGE SENSOR CONNECTOR

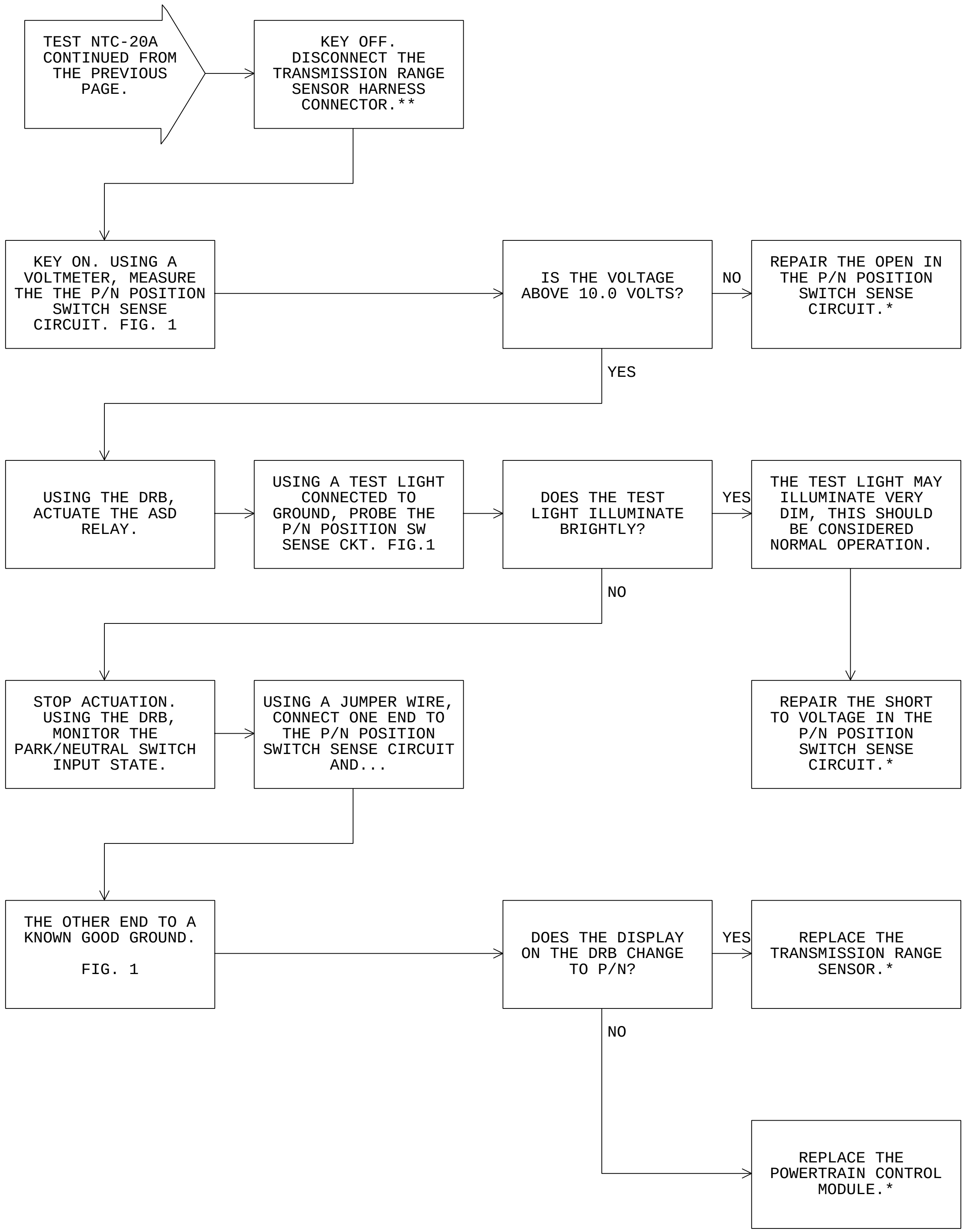


CAV	COLOR	FUNCTION
7	BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
8	BK	GROUND

80ab373a

FIG. 1

TEST NTC-20A CONTINUED - CHECKING THE PARK/NEUTRAL POSITION SWITCH



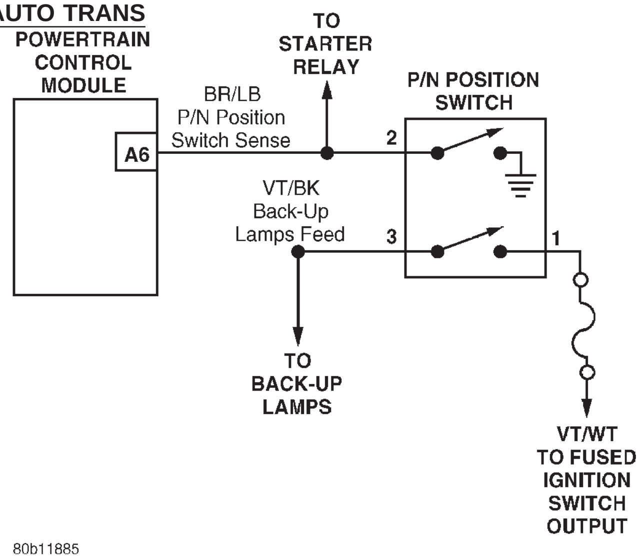
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

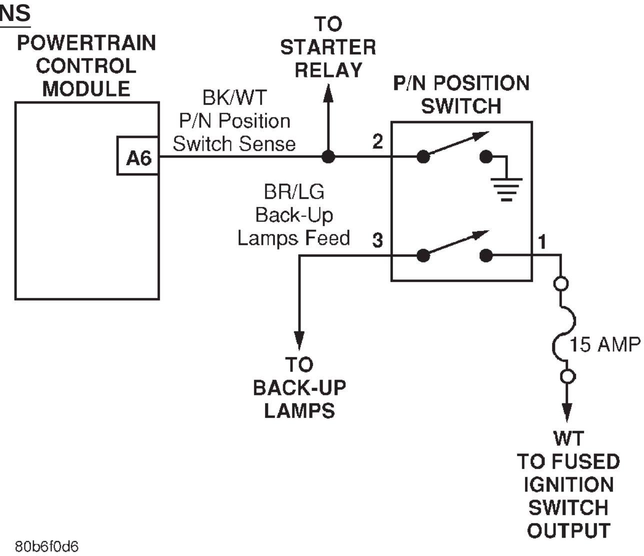
TEST NTC-20B CHECKING THE PARK/NEUTRAL POSITION SWITCH

Perform TEST NTC-21A Before Proceeding

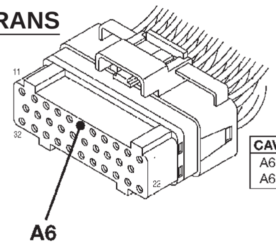
TJ BODY 2.5L AND 4.0L AUTO TRANS



XJ BODY 2.5L AUTO TRANS

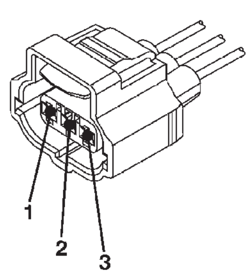


TJ/XJ 3 SPEED AUTO TRANS



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SW SENSE (XJ 2.5L)
A6	BR/LB	PARK/NEUTRAL POSITION SW SENSE (TJ 2.5L, 4.0L)



PARK/NEUTRAL POSITION SWITCH CONNECTOR

XJ 2.5L A/T

CAV	COLOR	FUNCTION
1	WT	FUSED IGNITION SWITCH OUTPUT
2	BK/WT	PARK/NEUTRAL POSITION SW SENSE
3	BR/LG	BACK-UP LAMPS FEED

TJ 2.5L AND 4.0L A/T

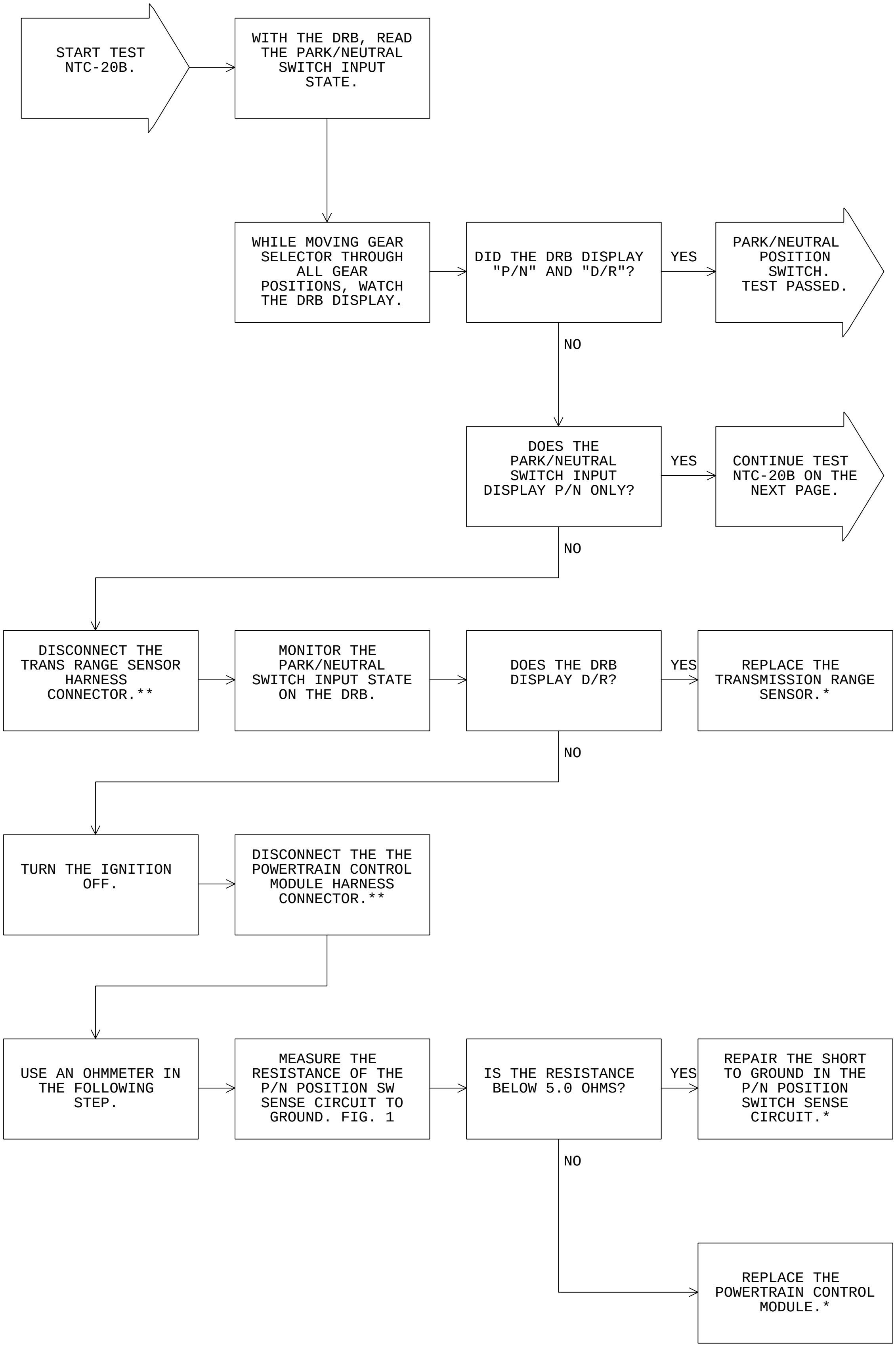
CAV	COLOR	FUNCTION
1	VT/WT	FUSED IGNITION SWITCH OUTPUT
2	BR/LB	PARK/NEUTRAL POSITION SW SENSE
3	VT/BK	BACK-UP LAMPS FEED

FIG. 1

80b76ec8

TEST NTC-20B CHECKING THE PARK/NEUTRAL POSITION SWITCH

Perform TEST NTC-21A Before Proceeding

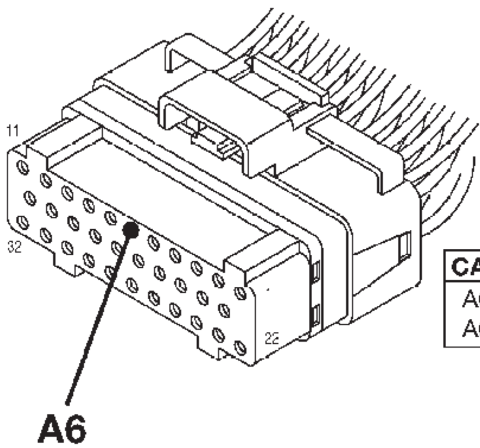


**Perform Verification TEST VER-2A.*

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

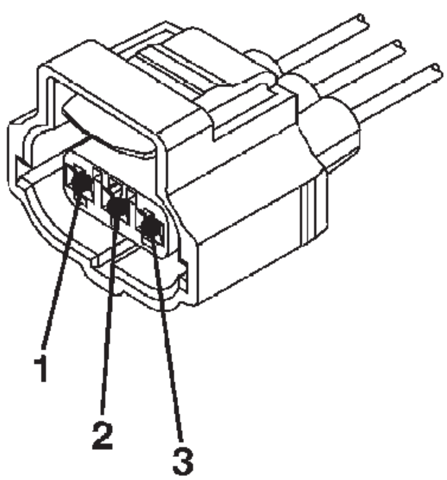
TEST NTC-20B — **CONTINUED - CHECKING THE PARK/NEUTRAL POSITION SWITCH**

TJ/XJ 3 SPEED AUTO TRANS



POWERTRAIN CONTROL MODULE BLACK CONNECTOR

CAV	COLOR	FUNCTION
A6	BK/WT	PARK/NEUTRAL POSITION SW SENSE (XJ 2.5L)
A6	BR/LB	PARK/NEUTRAL POSITION SW SENSE (TJ 2.5L, 4.0L)



PARK/NEUTRAL POSITION SWITCH CONNECTOR

XJ 2.5L A/T

CAV	COLOR	FUNCTION
1	WT	FUSED IGNITION SWITCH OUTPUT
2	BK/WT	PARK/NEUTRAL POSITION SW SENSE
3	BR/LG	BACK-UP LAMPS FEED

TJ 2.5L AND 4.0L A/T

CAV	COLOR	FUNCTION
1	VT/WT	FUSED IGNITION SWITCH OUTPUT
2	BR/LB	PARK/NEUTRAL POSITION SW SENSE
3	VT/BK	BACK-UP LAMPS FEED

80b76ec8

FIG. 1

TEST NTC-20B — CONTINUED - CHECKING THE PARK/NEUTRAL POSITION SWITCH

TEST NTC-20B CONTINUED FROM THE PREVIOUS PAGE.

→ KEY OFF. DISCONNECT THE P/N POSITION SWITCH HARNESS CONNECTOR.**

→ KEY ON. USING A VOLTMETER, MEASURE THE THE P/N POSITION SWITCH SENSE CIRCUIT. FIG. 1

→ IS THE VOLTAGE ABOVE 10.0 VOLTS?

- NO → REPAIR THE OPEN IN THE P/N POSITION SWITCH SENSE CIRCUIT.*
- YES → USING THE DRB, ACTUATE THE ASD RELAY. → USING A TEST LIGHT CONNECTED TO GROUND, PROBE THE P/N POSITION SW SENSE CKT. FIG.1 → DOES THE TEST LIGHT ILLUMINATE BRIGHTLY?
  - YES → **NOTE:** THE TEST LIGHT MAY ILLUMINATE VERY DIM, THIS SHOULD BE CONSIDERED NORMAL OPERATION. → REPAIR THE SHORT TO VOLTAGE IN THE P/N POSITION SWITCH SENSE CIRCUIT.*
  - NO → STOP ACTUATION. USING THE DRB, MONITOR THE PARK/NEUTRAL SWITCH INPUT STATE. → USING A JUMPER WIRE, CONNECT ONE END TO THE P/N POSITION SWITCH SENSE CIRCUIT AND... → THE OTHER END TO A KNOWN GOOD GROUND. FIG. 1 → DOES THE DISPLAY ON THE DRB CHANGE TO P/N?
    - YES → REPLACE THE PARK/NEUTRAL POSITION SWITCH.*
    - NO → REPLACE THE POWERTRAIN CONTROL MODULE.*

Perform Verification TEST VER-2A.

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

TEST NTC-21A CHECKING THE OIL PRESSURE SENDING UNIT

Perform TEST NTC-1A Before Proceeding

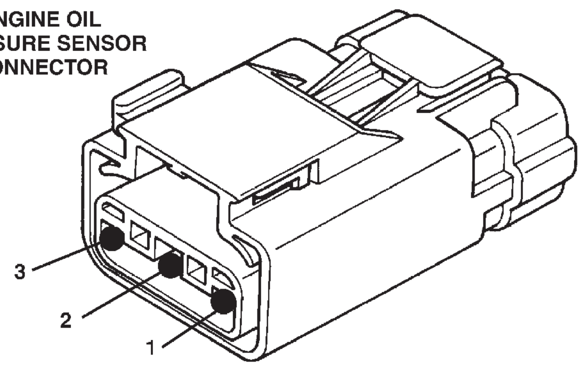
CLUSTER SYSTEM TEST CALIBRATION POINTS

Gauge	cal. point #1	cal. point #2	cal. point #3	cal. point #4	cal. point #5
Speedometer	0	20	55	80	100
Tachometer	0	2000	5000	6000	
Fuel	Empty	1/2	Full		
Volts	9	14	19		
Oil	0	40	80		
Temperature	100	210	260		

80a4d35f

FIG. 1

TJ/XJ BODY

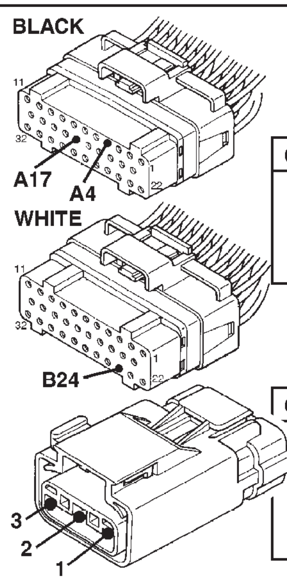


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b37f

FIG. 2

TJ/XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
B24	GY/YL	OIL PRESSURE SENSOR SIGNAL

ENGINE OIL PRESSURE SENSOR CONNECTOR

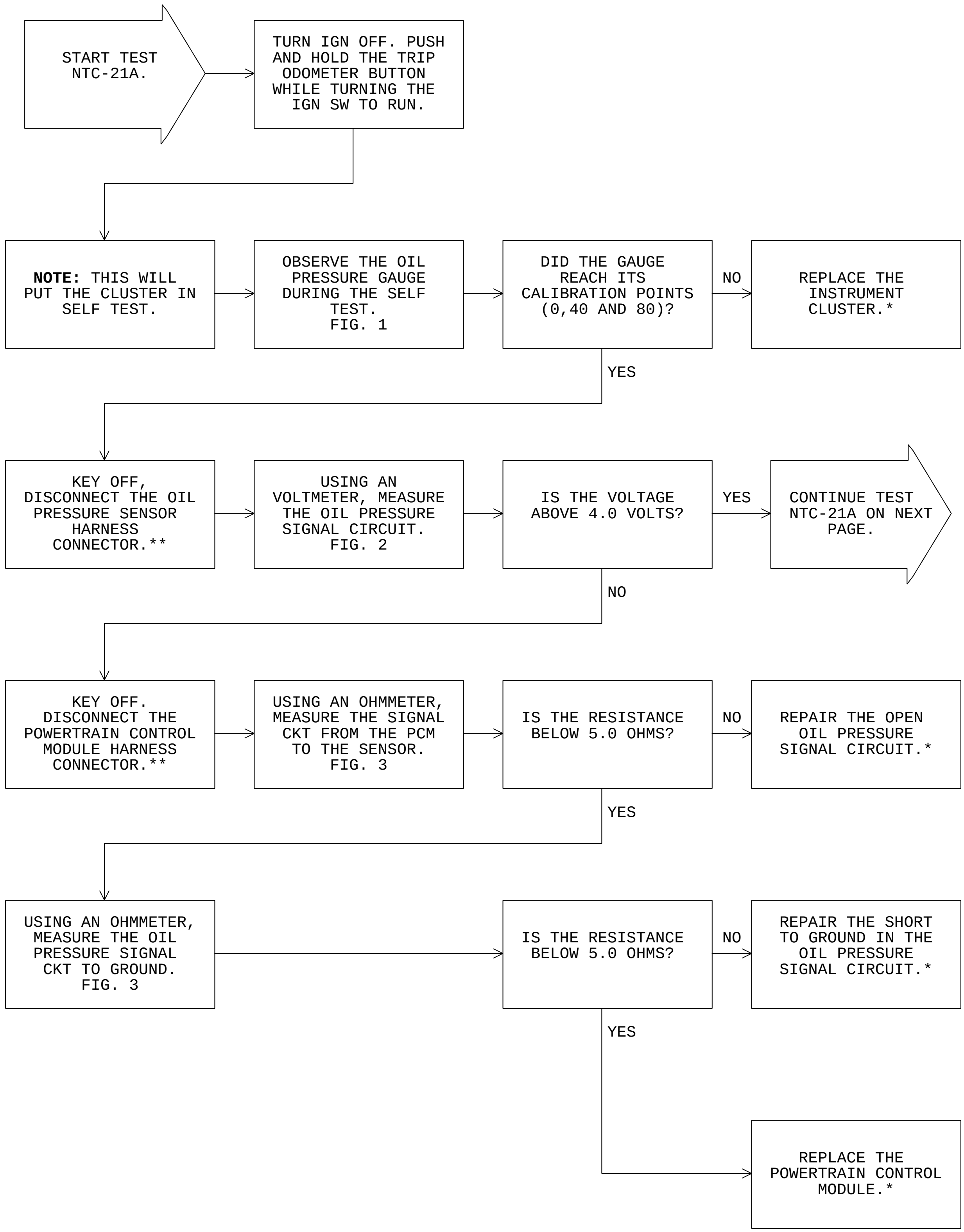
CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b38a

FIG. 3

TEST NTC-21A CHECKING THE OIL PRESSURE SENDING UNIT

Perform TEST NTC-1A Before Proceeding

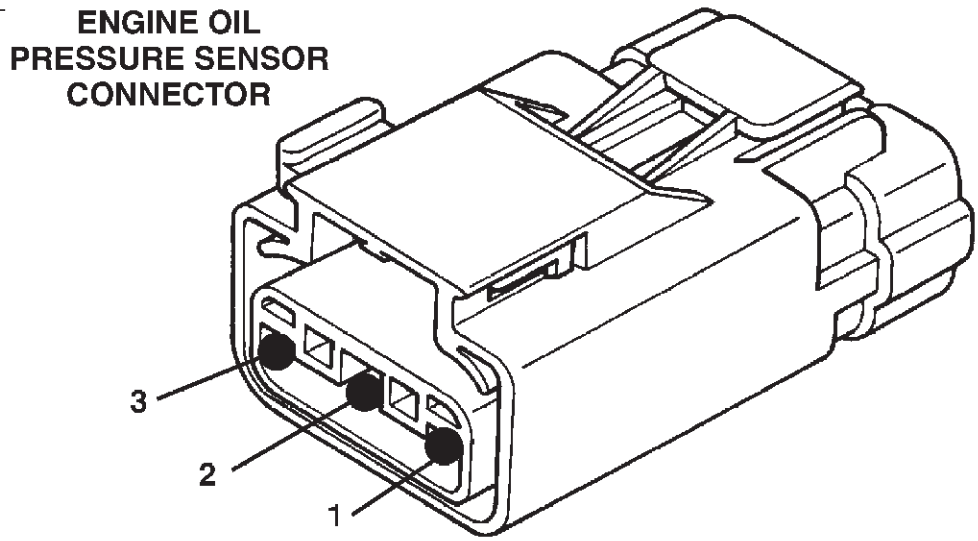


**Perform Verification TEST VER-2A.*

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

TEST NTC-21A | **CONTINUED - CHECKING OIL PRESSURE SENDING UNIT**

TJ/XJ BODY

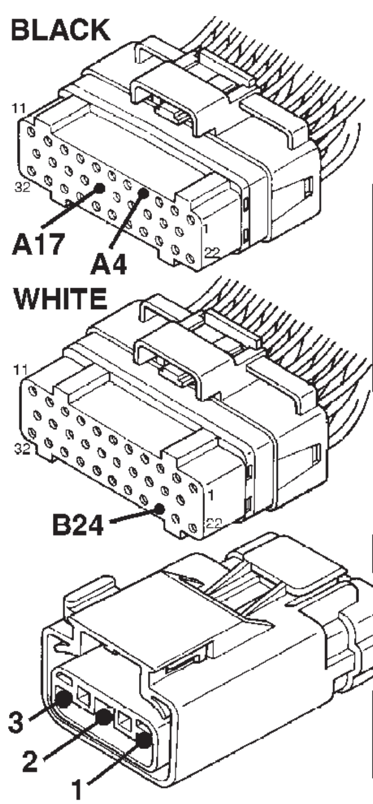


CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b37f

FIG. 1

TJ/XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
A17	OR	5-VOLT SUPPLY
B24	GY/YL	OIL PRESSURE SENSOR SIGNAL

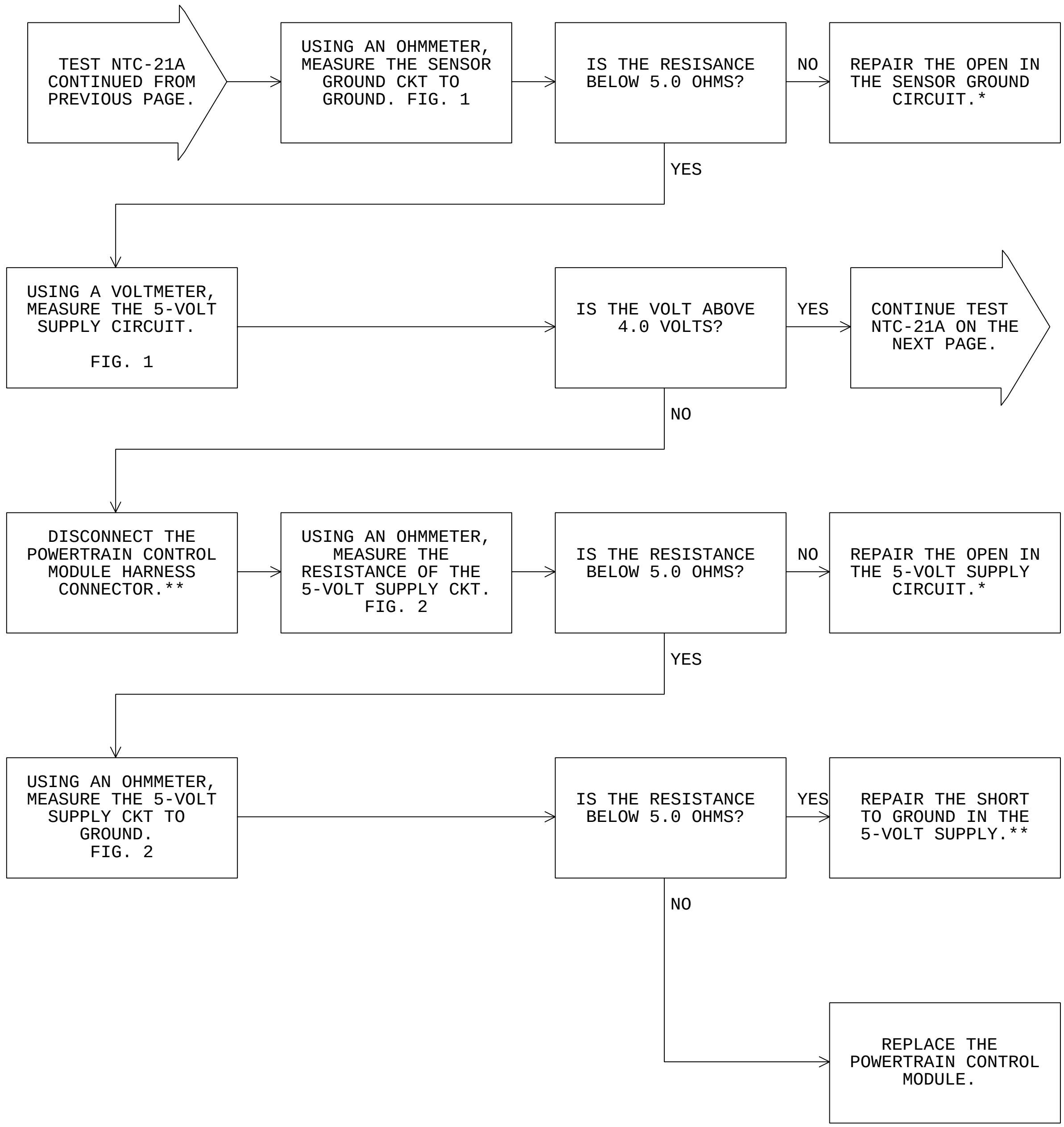
ENGINE OIL PRESSURE SENSOR CONNECTOR

CAV	COLOR	FUNCTION
1	VT/OR	5-VOLT SUPPLY (TJ)
1	OR	5-VOLT SUPPLY (XJ)
2	GY/YL	OIL PRESSURE SENSOR SIGNAL
3	BR/YL	SENSOR GROUND

80b6b38a

FIG. 2

TEST NTC-21A CONTINUED - CHECKING OIL PRESSURE SENDING UNIT



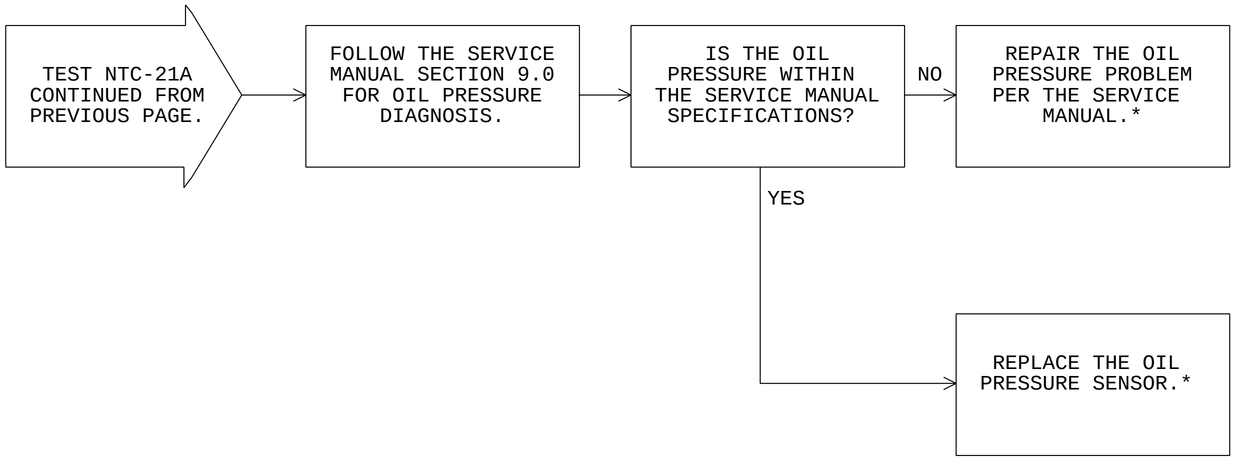
**Perform Verification TEST VER-2A.*

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

TEST NTC-21A CONTINUED - CHECKING OIL PRESSURE SENDING UNIT

NOTES

TEST NTC-21A CONTINUED - CHECKING OIL PRESSURE SENDING UNIT

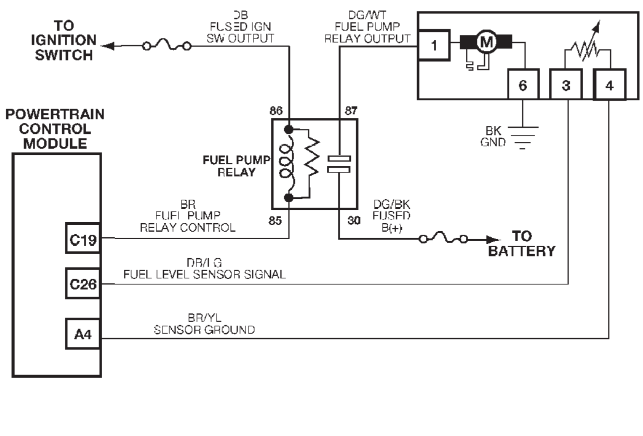


Perform Verification TEST VER-2A. | ***Check connectors - Clean / repair as necessary.***

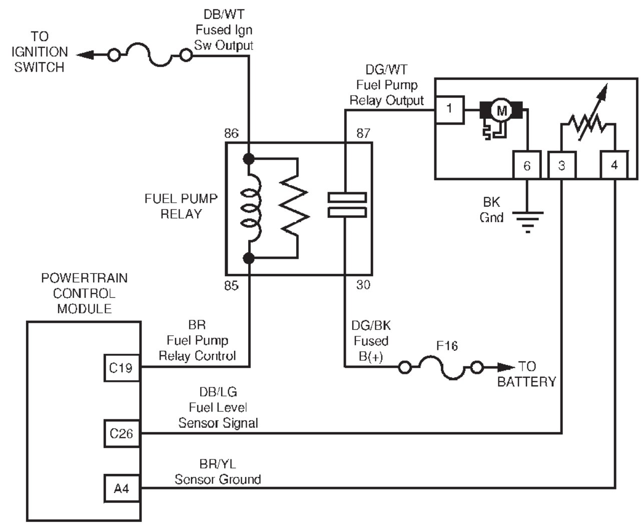
TEST NTC-25A	CHECKING THE FUEL LEVEL SENSOR

Perform TEST NTC-1A Before Proceeding

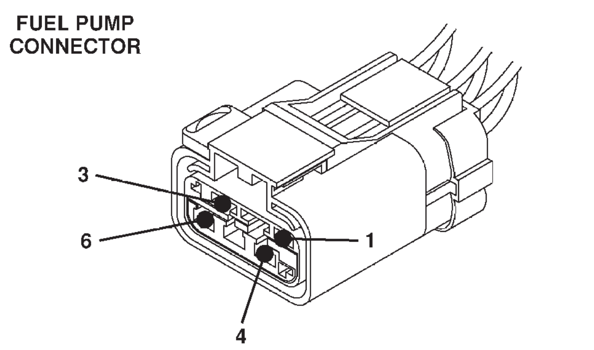
TJ BODY



XJ BODY



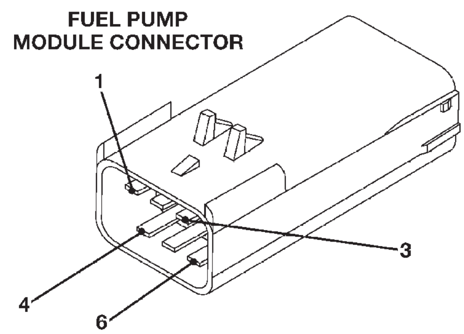
TJ BODY



CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

80b6f0e8

XJ BODY



CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL
4	BR/YL	SENSOR GROUND
6	BK	GROUND

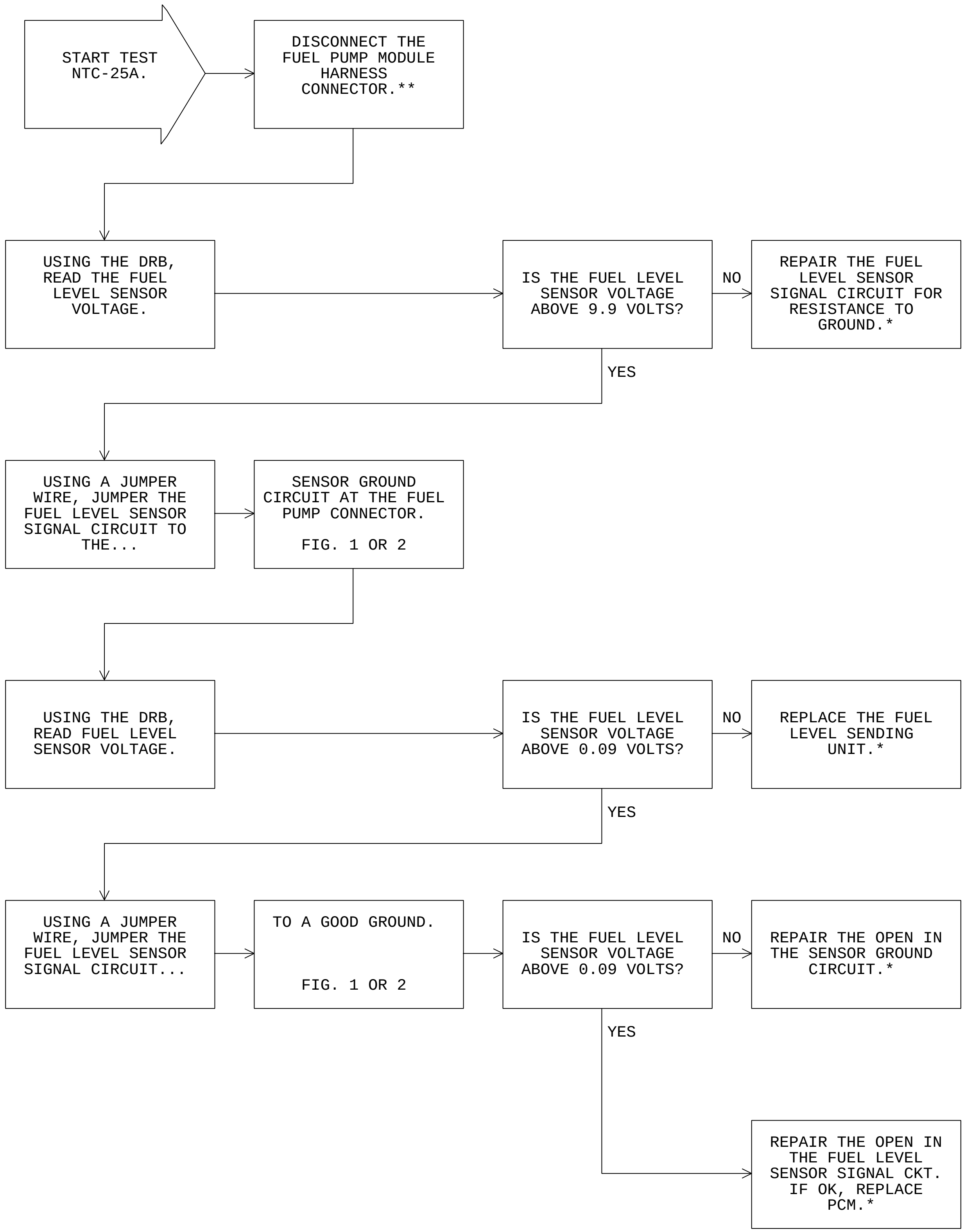
80aafa16

FIG. 1

FIG. 2

TEST NTC-25A — CHECKING THE FUEL LEVEL SENSOR

Perform TEST NTC-1A Before Proceeding

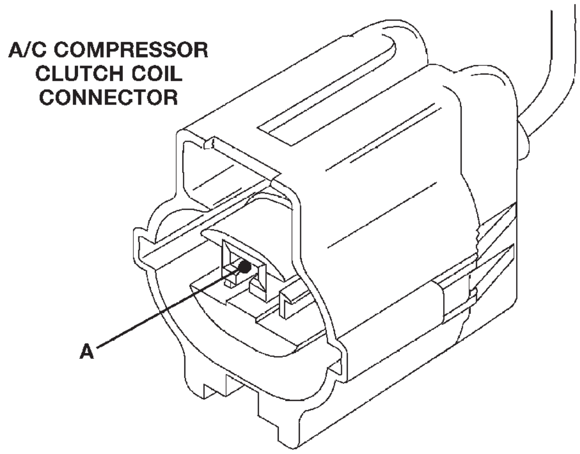


*Perform Verification TEST VER-2A.	**Check connectors - Clean / repair as necessary.

TEST NTC-26A CHECKING THE A/C SYSTEM

Perform TEST NTC-1A Before Proceeding

TJ/XJ BODY

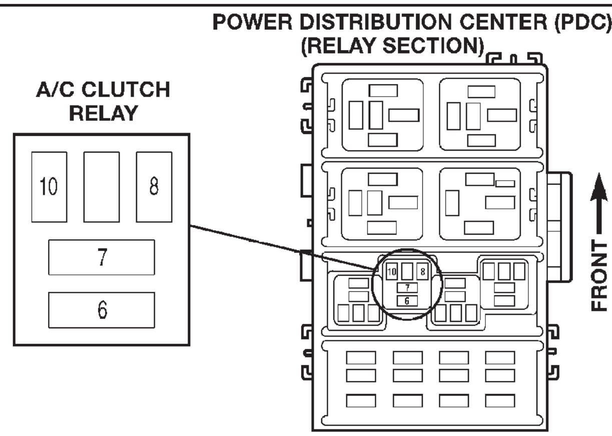


CAV	COLOR	FUNCTION
A	DB/BK	A/C CMP CLUTCH RELAY OUTPUT

80b09803

FIG. 1

TJ BODY

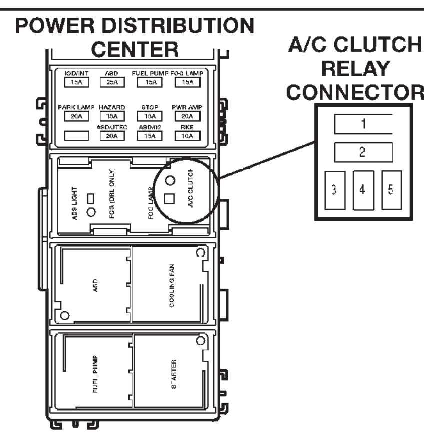


CAV	COLOR	FUNCTION
6(30)	RD/GY	FUSED B(+)
7(87)	DB/BK	A/C CMP CLUTCH RELAY OUTPUT
8(86)	VT/WT	FUSED IGNITION SWITCH OUTPUT
10(85)	DB/OR	A/C CMP CLUTCH RELAY CONTROL

80b6f108

FIG. 2

XJ BODY



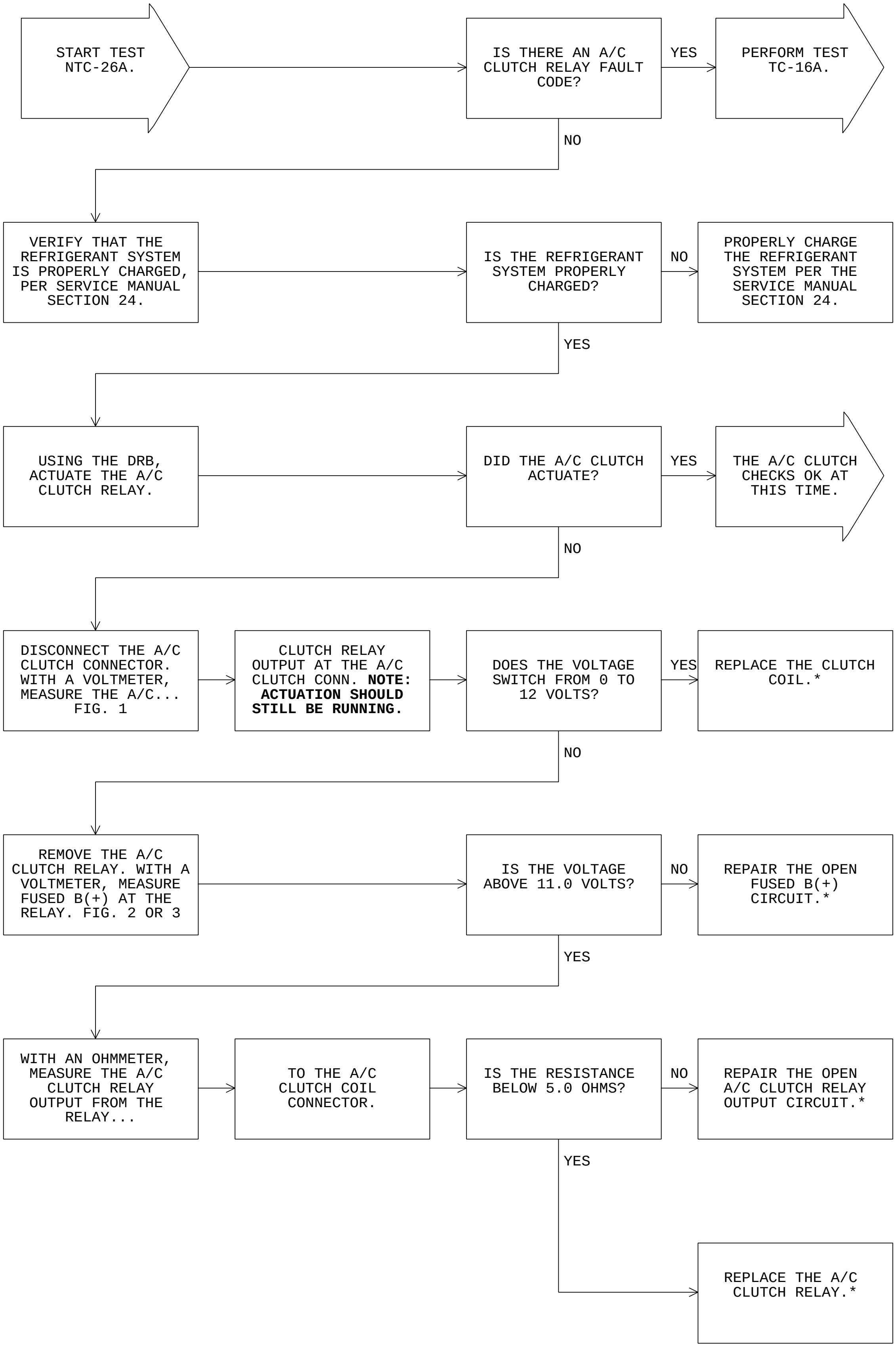
CAV	COLOR	FUNCTION
1 (30)	RD/BK	FUSED B(+)
2 (87)	DB/BK	A/C CLUTCH RELAY OUTPUT
3 (85)	DB/OR	A/C CLUTCH RELAY CONTROL
5 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT

80b6f0de

FIG. 3

TEST NTC-26A CHECKING THE A/C SYSTEM

Perform TEST NTC-1A Before Proceeding

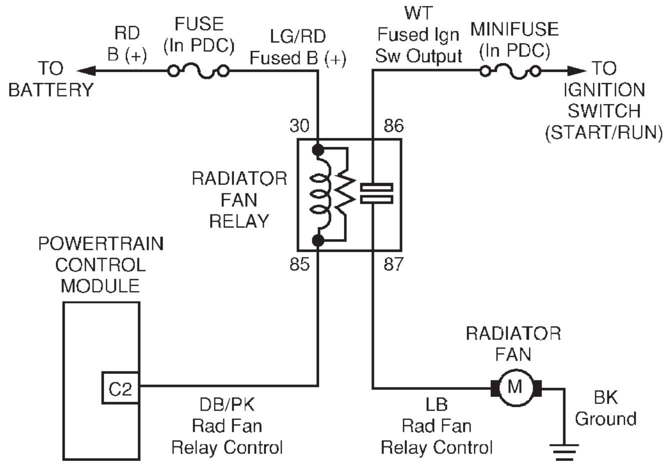


Perform Verification TEST VER-2A.	***Check connectors - Clean / repair as necessary.*

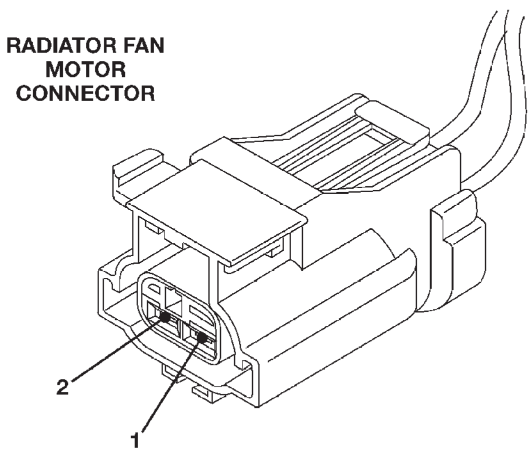
TEST NTC-27A — CHECKING THE RADIATOR FAN OPERATION

Perform TEST NTC-1A Before Proceeding

XJ BODY



XJ BODY

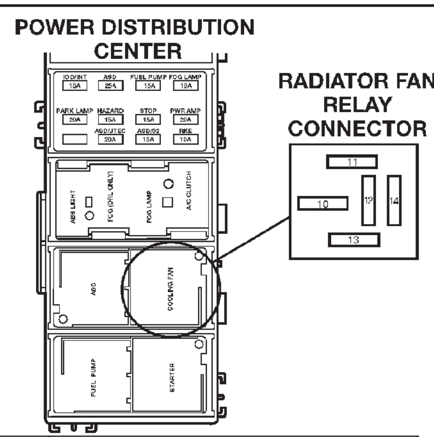


CAV	COLOR	FUNCTION
1	LB	RADIATOR FAN RELAY OUTPUT
2	BK	GROUND

80b6b3c0

FIG. 1

XJ BODY



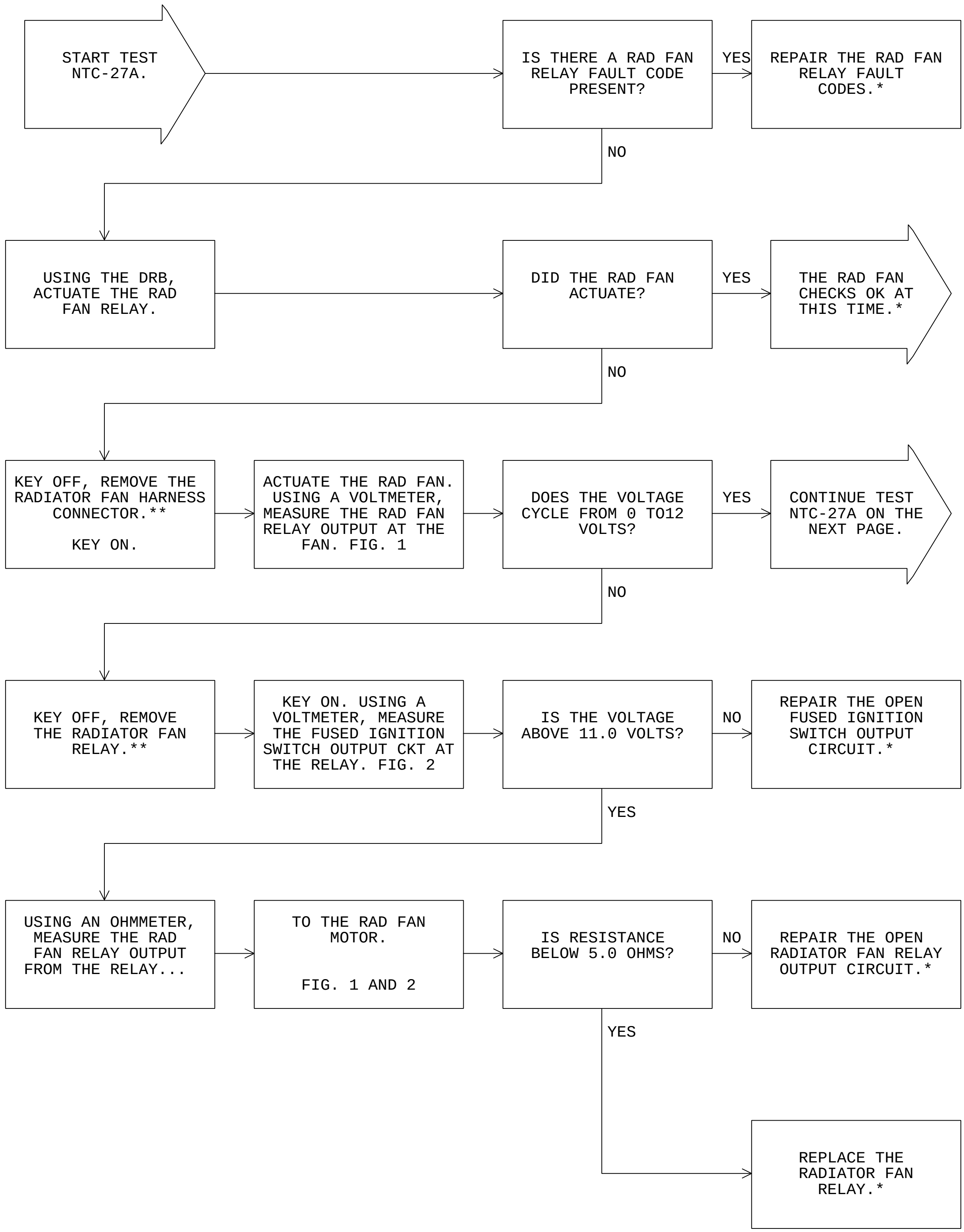
CAV	COLOR	FUNCTION
10 (30)	LG/RD	FUSED B(+)
11 (86)	WT	FUSED IGNITION SWITCH OUTPUT
13 (85)	DB/PK	RAD FAN RELAY CONTROL
14 (87)	LB	RAD FAN RELAY OUTPUT

80b76e94

FIG. 2

TEST NTC-27A CHECKING THE RADIATOR FAN OPERATION

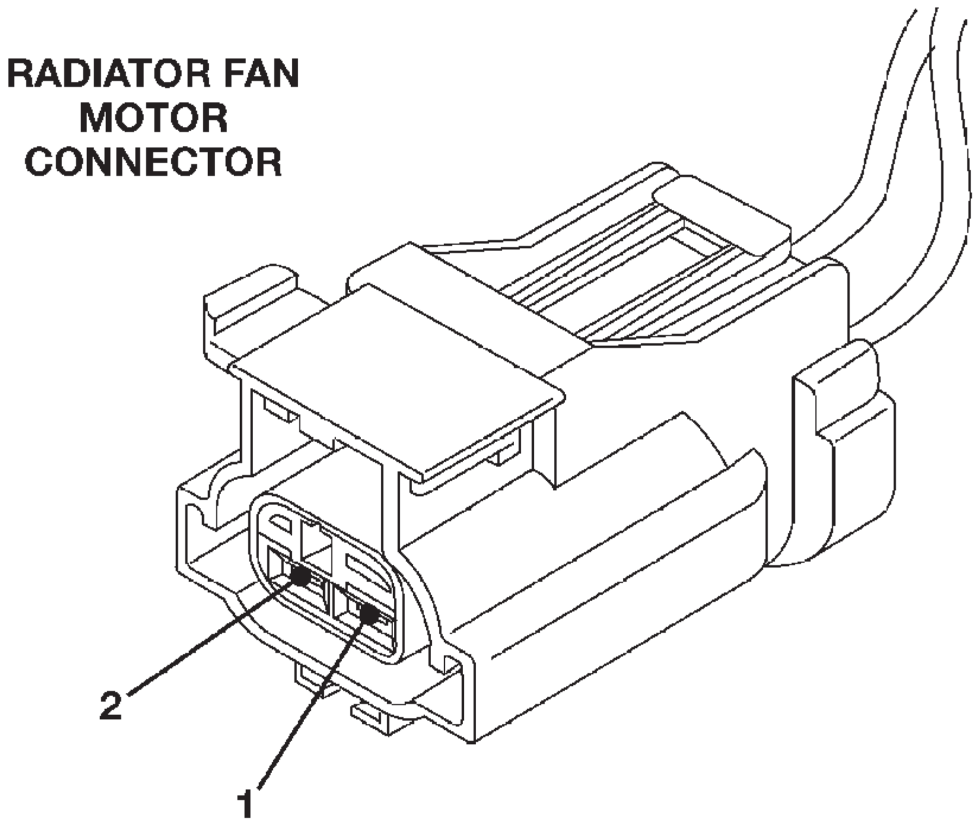
Perform TEST NTC-1A Before Proceeding



**Perform Verification TEST VER-2A.*

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

TEST NTC-27A	CONTINUED - CHECKING THE RADIATOR FAN OPERATION



CAV	COLOR	FUNCTION
1	LB	RADIATOR FAN RELAY OUTPUT
2	BK	GROUND

80b6b3c0

FIG. 1

TEST NTC-27A CONTINUED - CHECKING THE RADIATOR FAN OPERATION

TEST NTC-27A CONTINUED FROM THE PREVIOUS PAGE.

→ USING AN OHMMETER, MEASURE THE RAD FAN GROUND CIRCUIT TO A GROUND. FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?

NO → REPAIR THE OPEN RADIATOR FAN GROUND CIRCUIT.*

YES → REPLACE THE RADIATOR FAN MOTOR.*

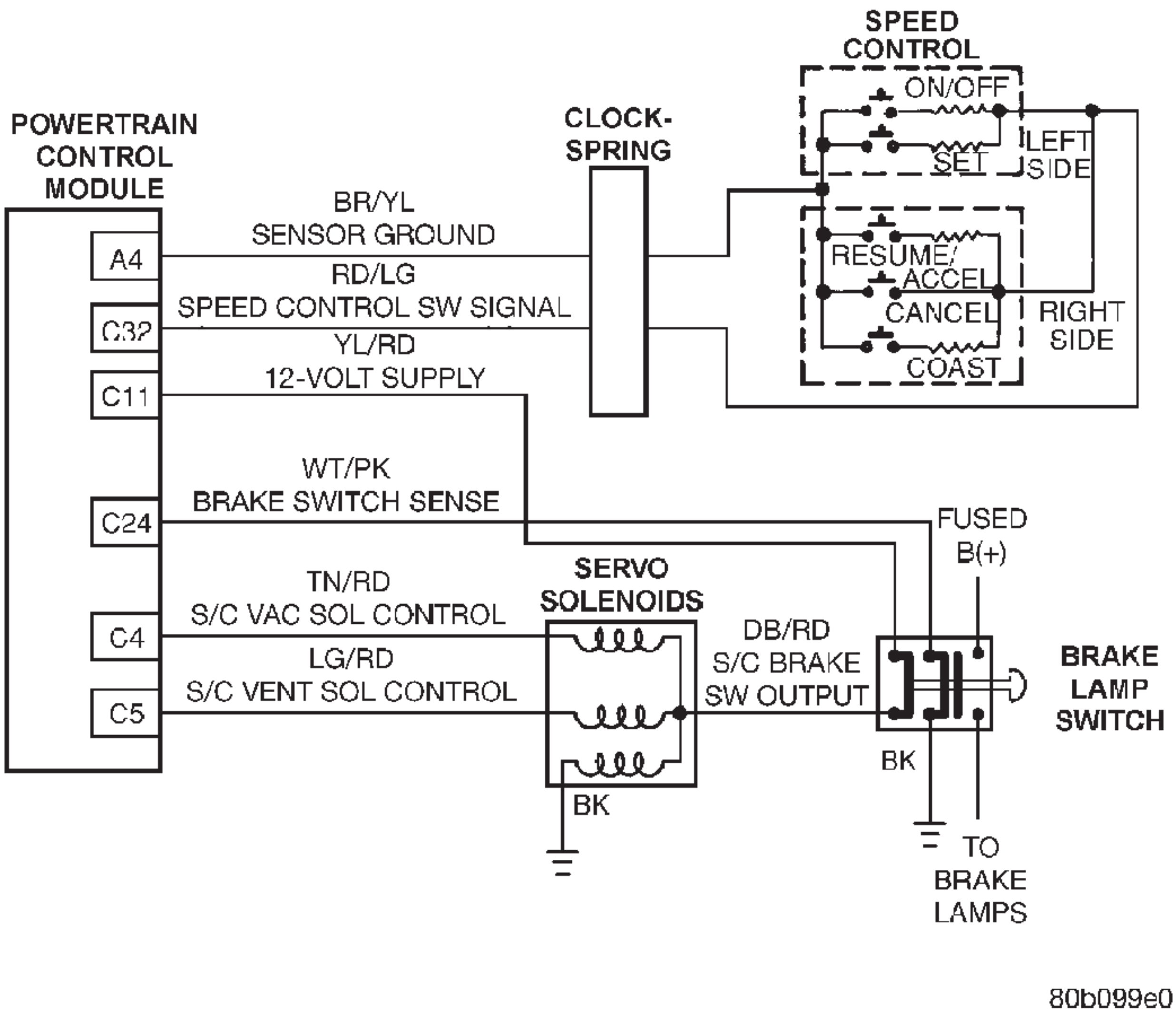
*Perform Verification TEST VER-2A.

**Check connectors - Clean / repair as necessary.

TEST SC-1A	CHECKING THE SPEED CONTROL SYSTEM

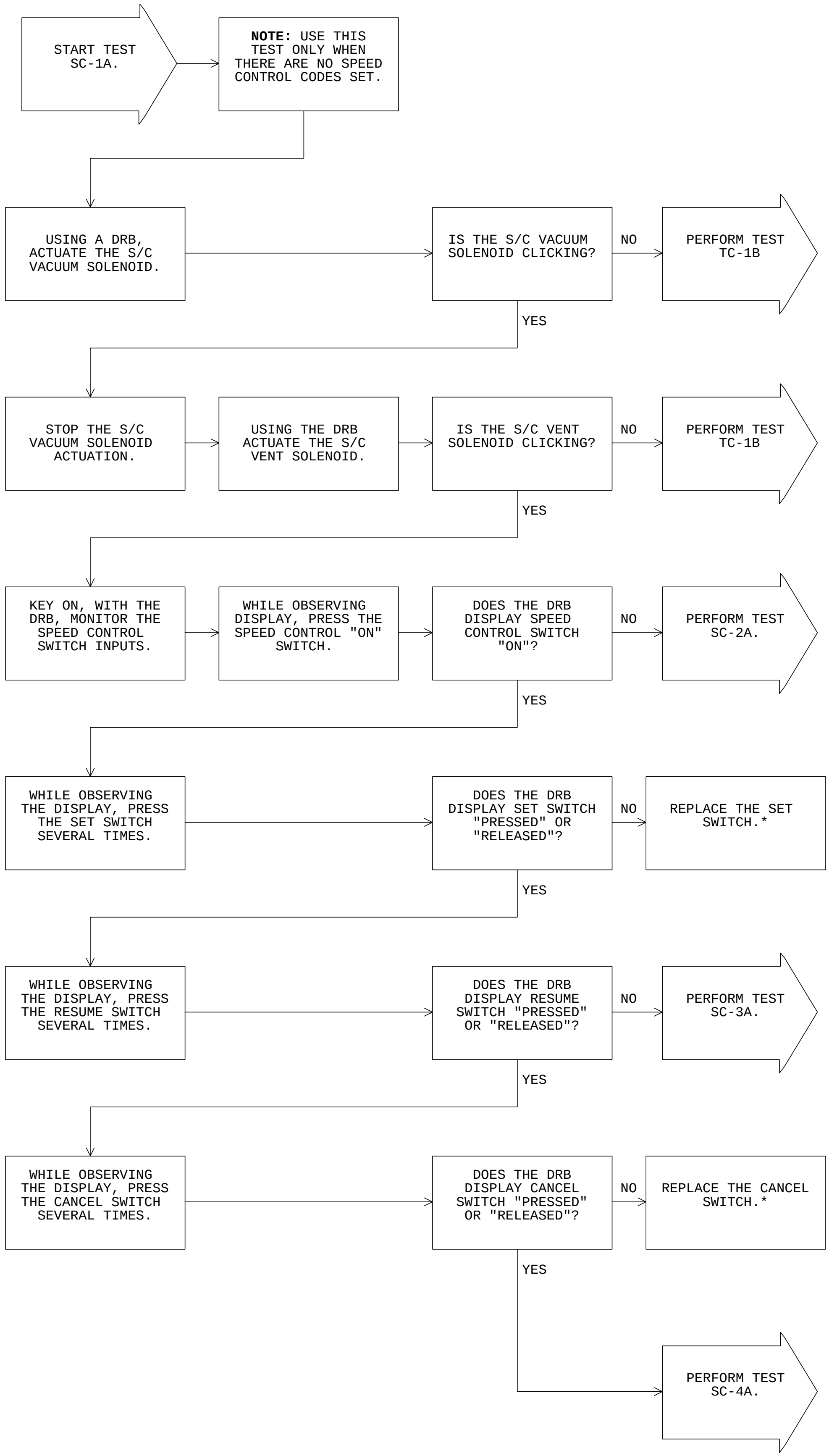
Perform TEST DTC Before Proceeding

TJ/XJ BODY



TEST SC-1A CHECKING THE SPEED CONTROL SYSTEM

Perform TEST DTC Before Proceeding

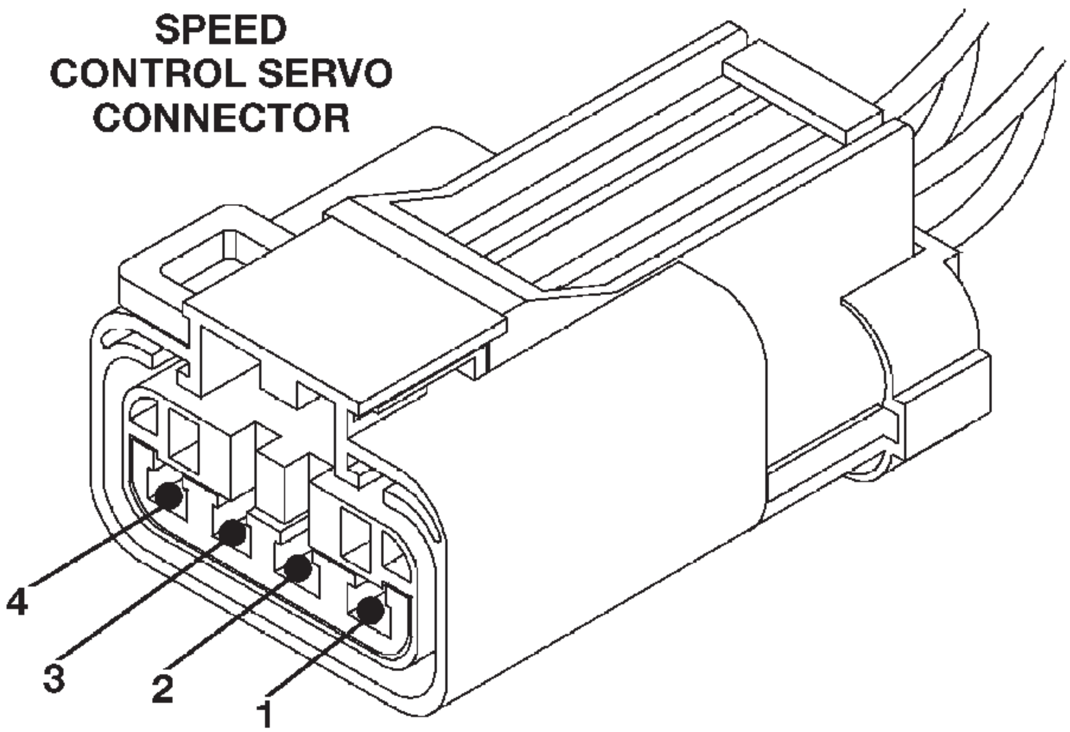


***Perform Verification TEST VER-4A.**

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

TEST SC-1B	CHECKING THE SPEED CONTROL SYSTEM

Perform TEST SC-1A Before Proceeding



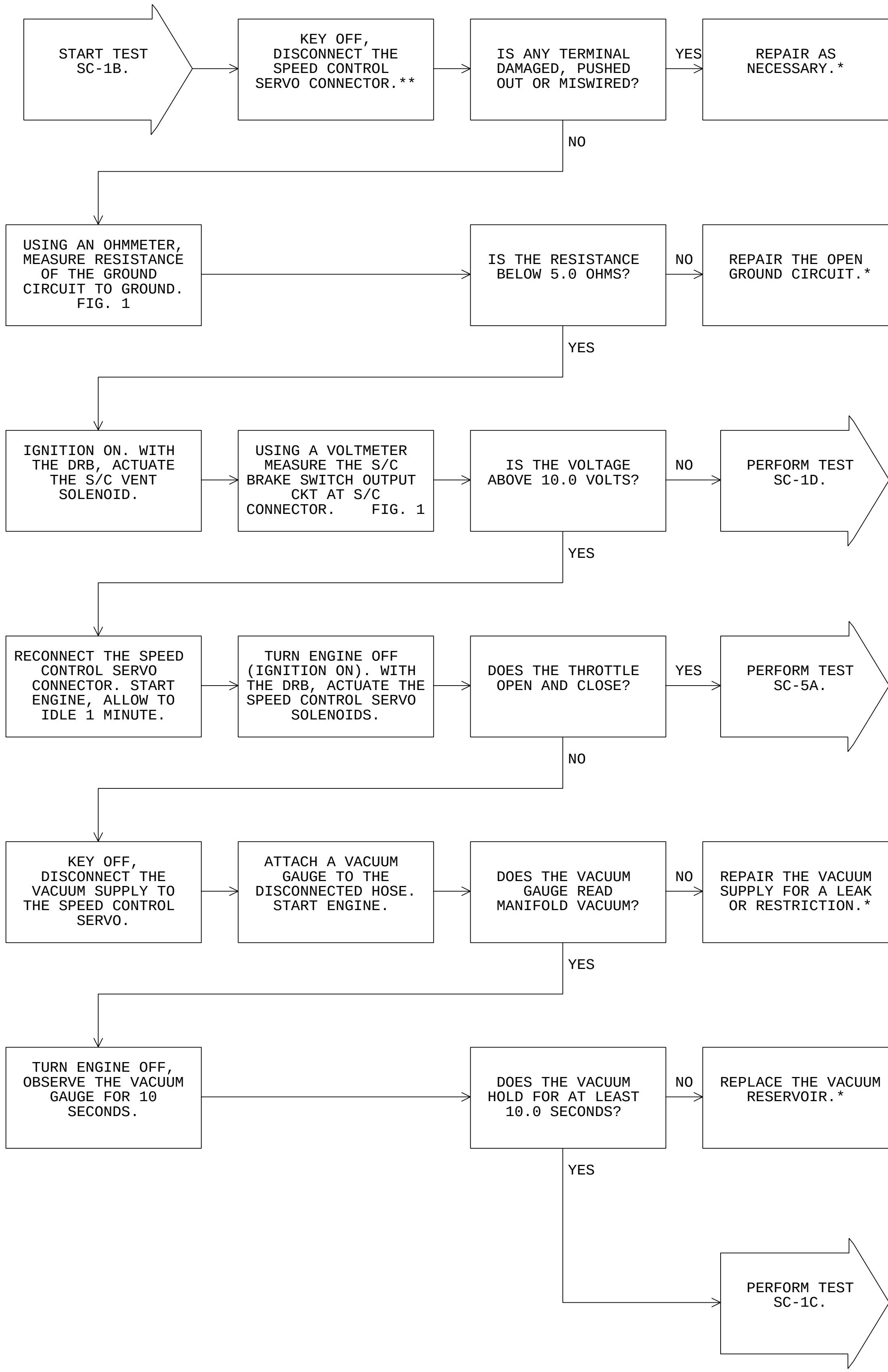
CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b04fe4

FIG. 1

TEST SC-1B CHECKING THE SPEED CONTROL SYSTEM

Perform TEST SC-1A Before Proceeding



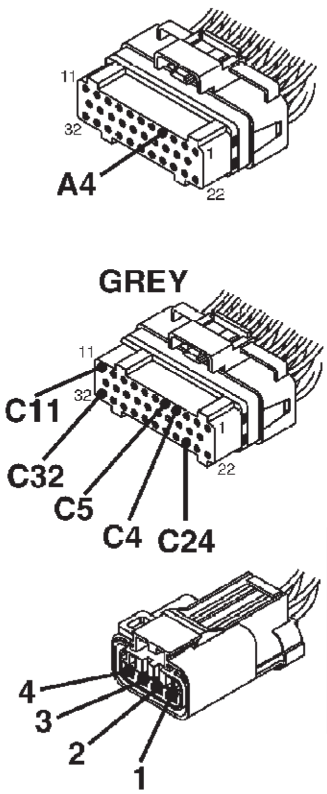
***Perform Verification TEST VER-4A.**

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

TEST SC-1C	CHECKING THE SPEED CONTROL SYSTEM

Perform TEST SC-1A Before Proceeding

TJ/XJ BODY



POWERTRAIN CONTROL MODULE CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

SPEED CONTROL SERVO CONNECTOR

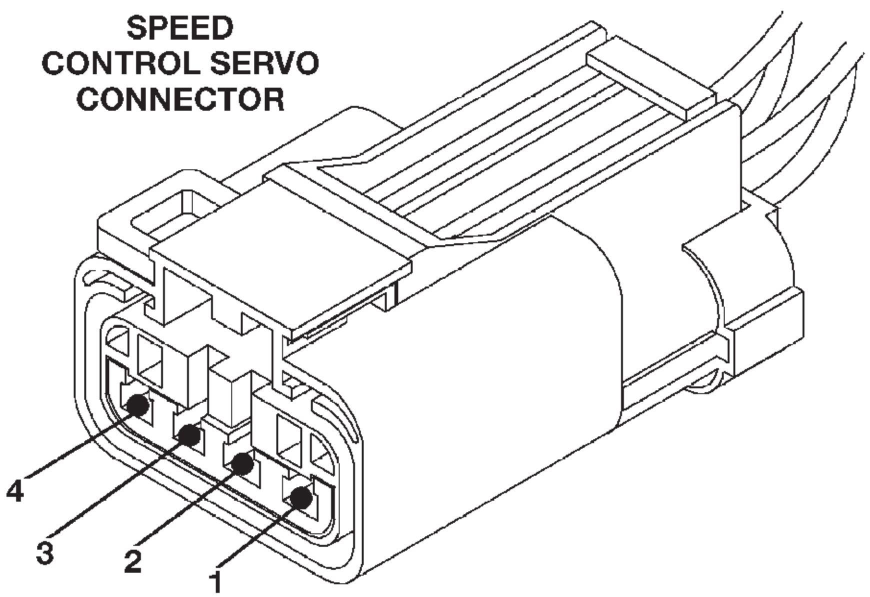
CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOL CONTROL
2	LG/RD	S/C VENT SOL CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

80b099e2

FIG. 1

TJ/XJ BODY

SPEED CONTROL SERVO CONNECTOR



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

80b04fe4

FIG. 2

TEST SC-1C — CHECKING THE SPEED CONTROL SYSTEM

Perform TEST SC-1A Before Proceeding

START TEST SC-1C

→ INSPECT THE THROTTLE CABLE.

→ IS THE CABLE DISCONNECTED OR DAMAGED?
- YES → REPAIR AS NECESSARY.*
- NO → KEY OFF. DISCONNECT THE SPEED CONTROL SERVO 4 WAY HARNESS CONNECTOR.**

→ DISCONNECT THE POWERTRAIN CONTROL MODULE HARNESS CONNECTOR.**

→ USING AN OHMMETER, MEASURE THE RESISTANCE OF THE S/C VACUUM SOLENOID CONTROL CIRCUIT...

→ FROM PCM CONNECTOR TO S/C SERVO CONNECTOR. FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?
- NO → REPAIR THE OPEN SPEED CONTROL VACUUM SOLENOID CONTROL CIRCUIT.*
- YES → USING AN OHMMETER, MEASURE S/C VACUUM SOLENOID CONTROL CIRCUIT TO GROUND. FIG. 2

→ IS THE RESISTANCE BELOW 5.0 OHMS?
- YES → REPAIR THE SHORT TO GROUND IN THE SPEED CONTROL VACUUM SOLENOID CONTROL CIRCUIT.*
- NO → USING AN OHMMETER, MEASURE THE RESISTANCE OF THE S/C VENT SOLENOID CONTROL CIRCUIT...

→ FROM PCM CONNECTOR TO S/C SERVO CONNECTOR. FIG. 1

→ IS THE RESISTANCE BELOW 5.0 OHMS?
- NO → REPAIR THE OPEN SPEED CONTROL VENT SOLENOID CONTROL CIRCUIT.*
- YES → USING AN OHMMETER, MEASURE THE S/C VENT SOLENOID CONTROL CIRCUIT TO GROUND. FIG. 2

→ IS THE RESISTANCE BELOW 5.0 OHMS?
- NO → REPAIR THE SHORT TO GROUND IN THE SPEED CONTROL VENT SOLENOID CONTROL CIRCUIT.*
- YES → REPLACE THE SPEED CONTROL SERVO.*

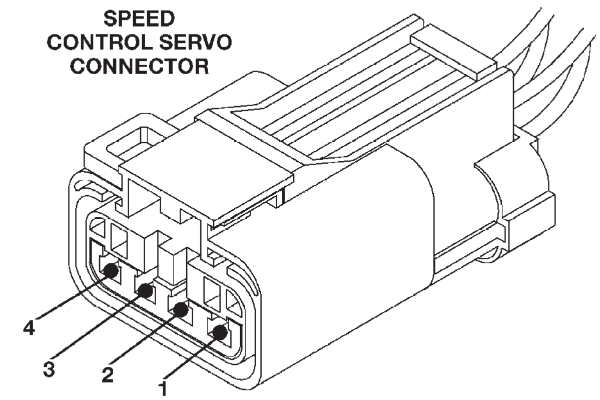
**Perform Verification TEST VER-4A.*

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

TEST SC-1D — CHECKING THE SPEED CONTROL SYSTEM

Perform TEST SC-1A Before Proceeding

TJ/XJ BODY

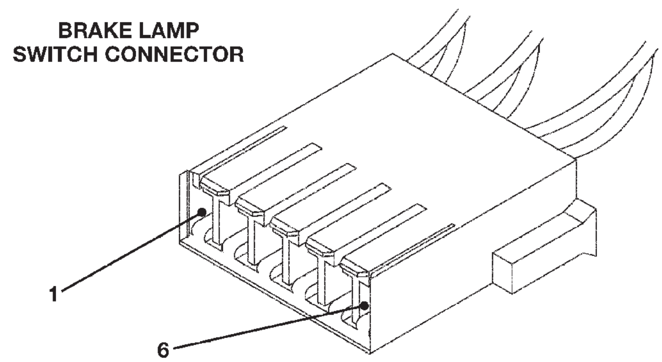


CAV	COLOR	FUNCTION
1	TN/RD	S/C VACUUM SOLENOID CONTROL
2	LG/RD	S/C VENT SOLENOID CONTROL
3	DB/RD	S/C BRAKE SWITCH OUTPUT
4	BK	GROUND

FIG. 1

80b04fe4

TJ BODY

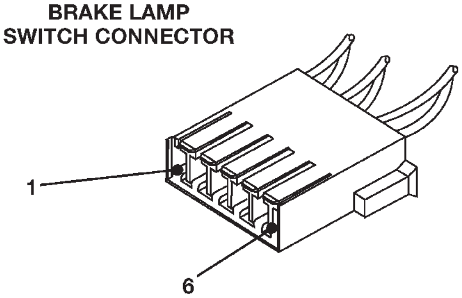


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

FIG. 2

XJ BODY



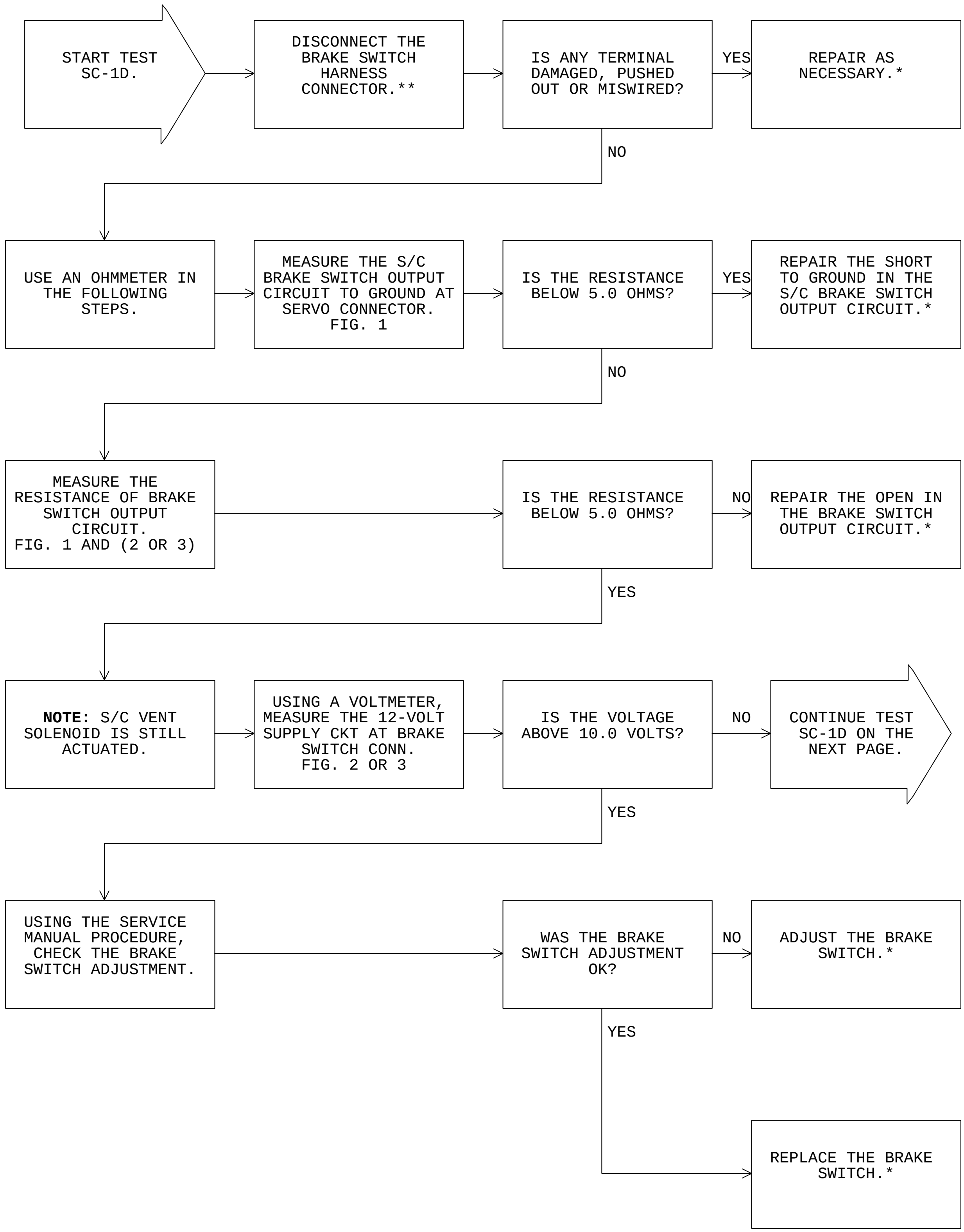
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

FIG. 3

80b04fe6

TEST SC-1D — CHECKING THE SPEED CONTROL SYSTEM

Perform TEST SC-1A Before Proceeding

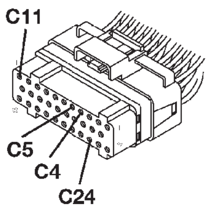


**Perform Verification TEST VER-4A.*

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

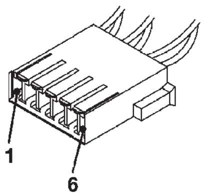
TEST SC-1D — CONTINUED - CHECKING THE SPEED CONTROL SYSTEM

TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C4	TN/RD	S/C VAC SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SW SENSE



BRAKE LAMP SWITCH CONNECTOR

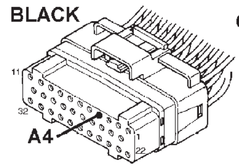
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SW SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SW OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	STOP LAMP SW OUTPUT

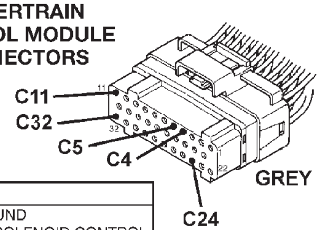
80b6b1cc

FIG. 1

XJ BODY

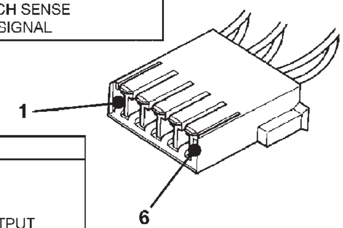
POWERTRAIN CONTROL MODULE CONNECTORS





CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOLENOID CONTROL
C5	LG/RD	S/C VENT SOLENOID
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

BRAKE LAMP SWITCH CONNECTOR



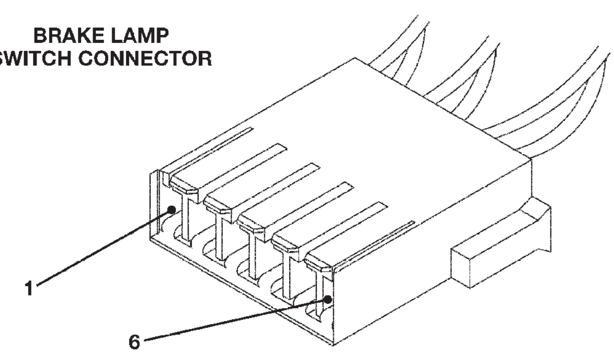
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B (+)

80b6b1cd

FIG. 2

TJ BODY

BRAKE LAMP SWITCH CONNECTOR



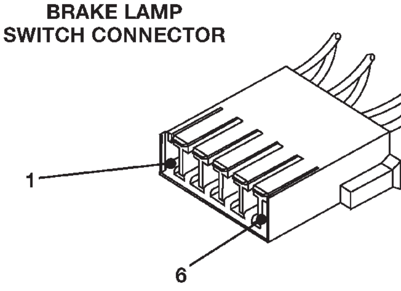
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

FIG. 3

XJ BODY

BRAKE LAMP SWITCH CONNECTOR

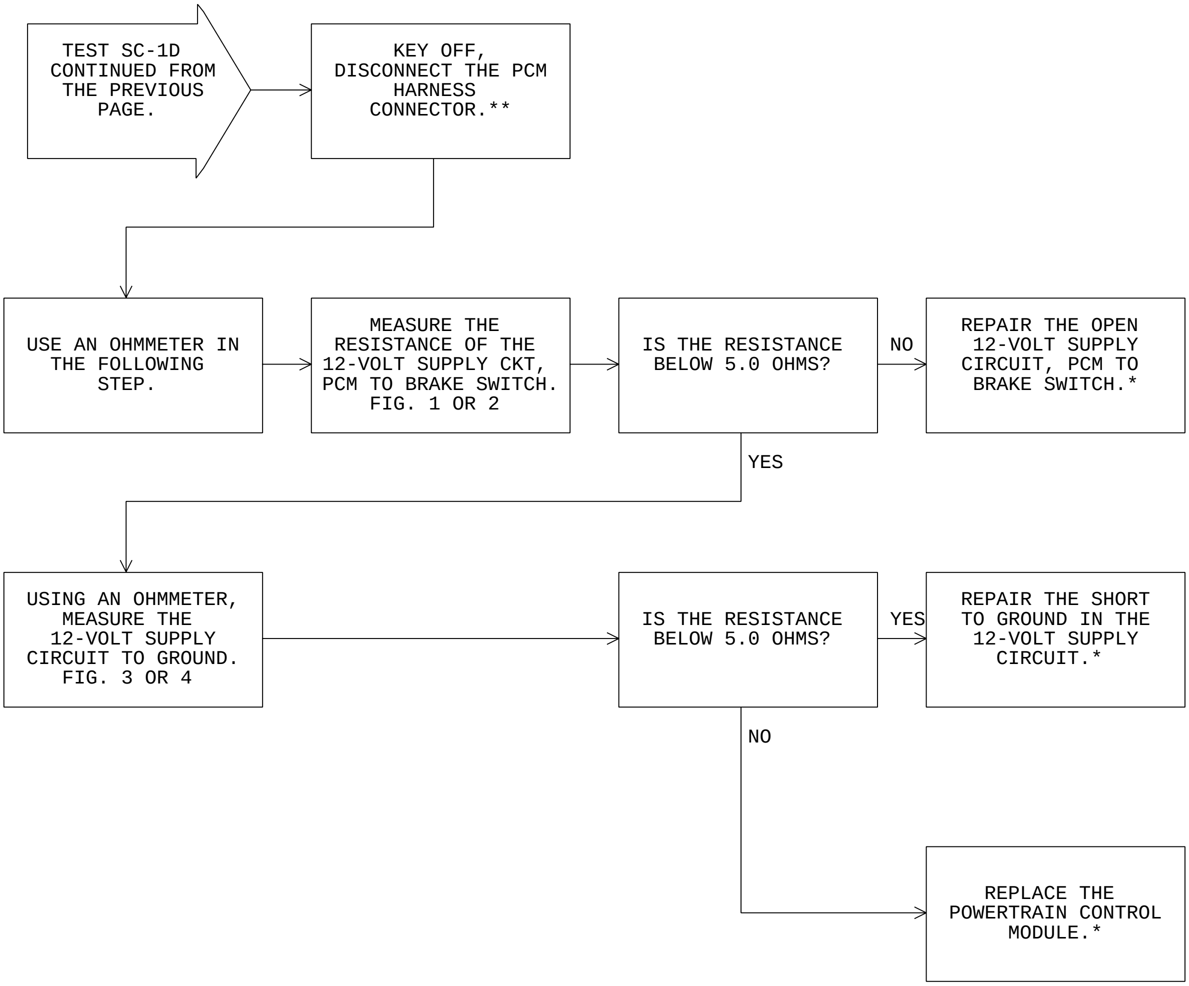


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80b04fe6

FIG. 4

TEST SC-1D — CONTINUED - CHECKING THE SPEED CONTROL SYSTEM



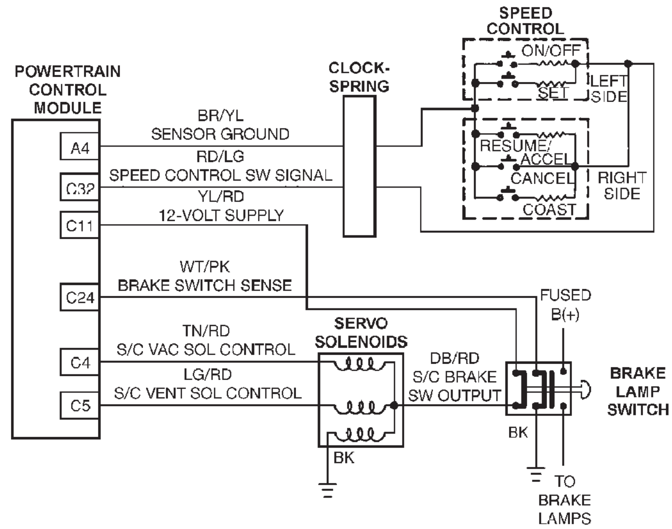
**Perform Verification TEST VER-4A.*

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

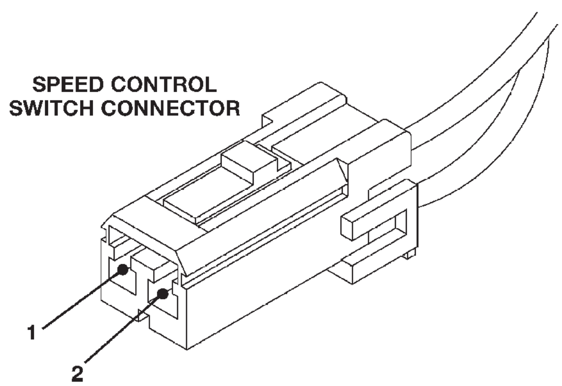
TEST SC-2A — CHECKING SPEED CONTROL ON/OFF SWITCH

Perform TEST SC-1A Before Proceeding

TJ/XJ BODY



TJ/XJ BODY

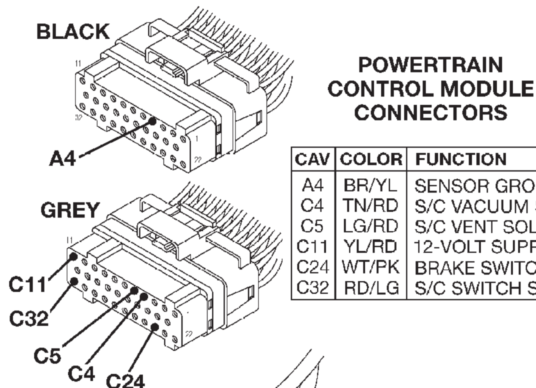


CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

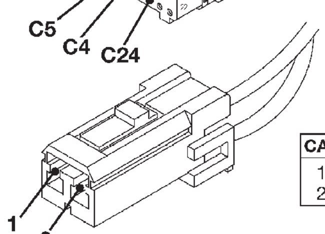
FIG. 1

80ab3724

TJ/XJ BODY



CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL



SPEED CONTROL SWITCH CONNECTOR

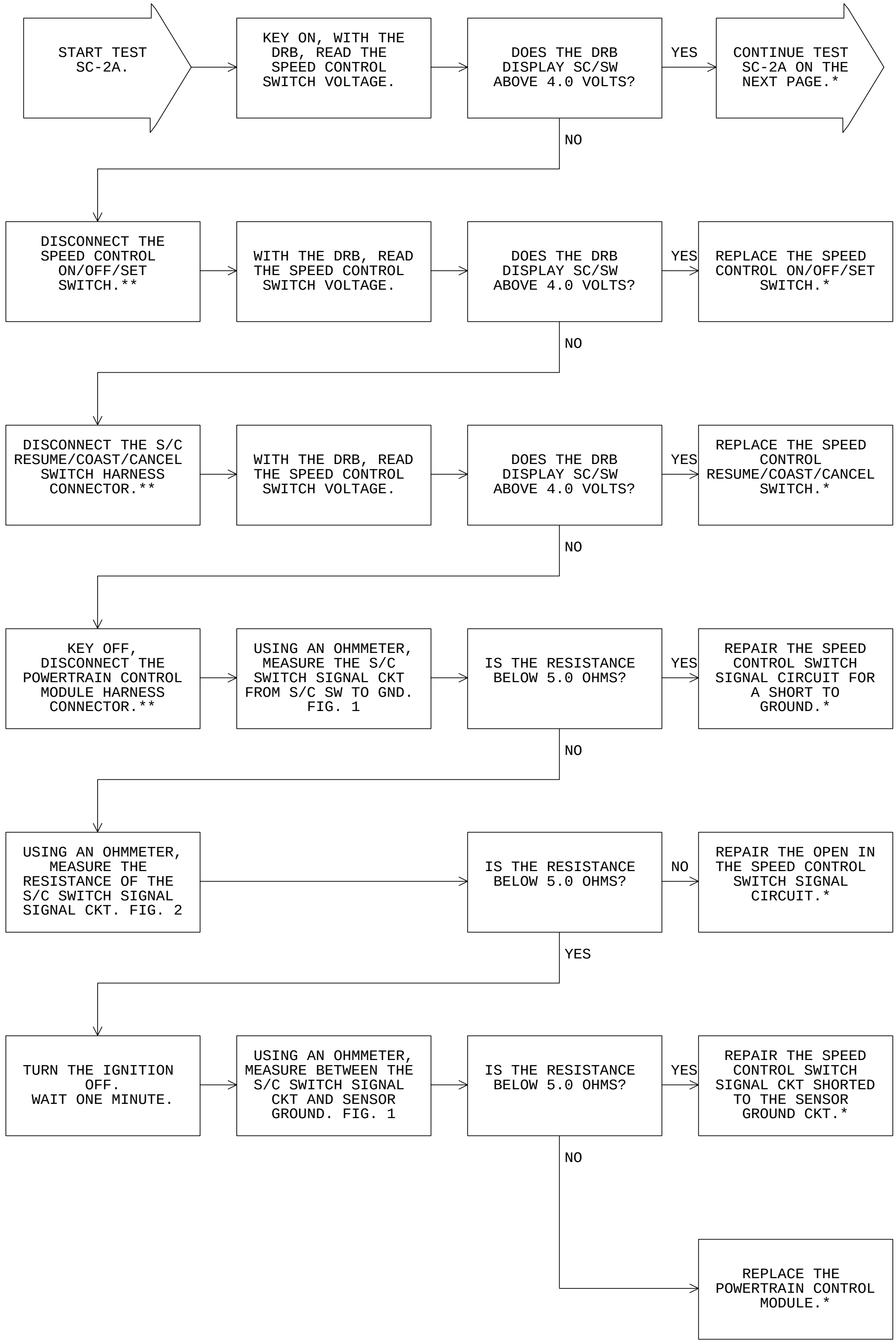
CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

FIG. 2

80b6b36a

TEST SC-2A CHECKING SPEED CONTROL ON/OFF SWITCH

Perform TEST SC-1A Before Proceeding

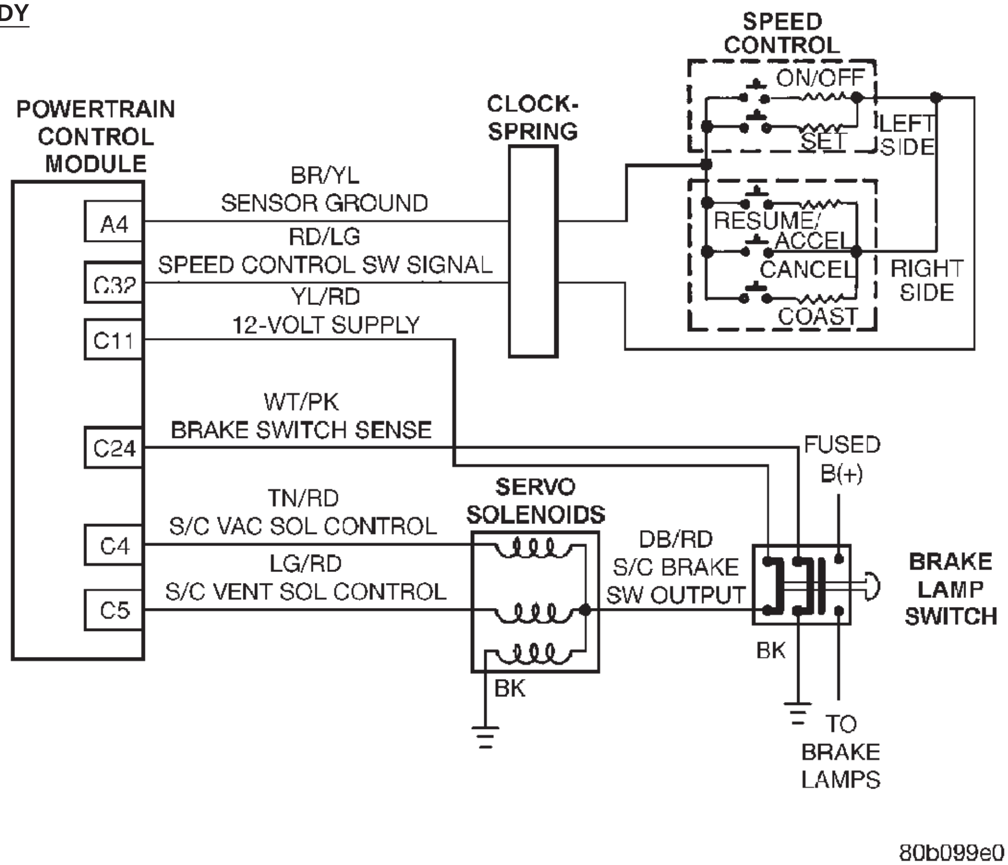


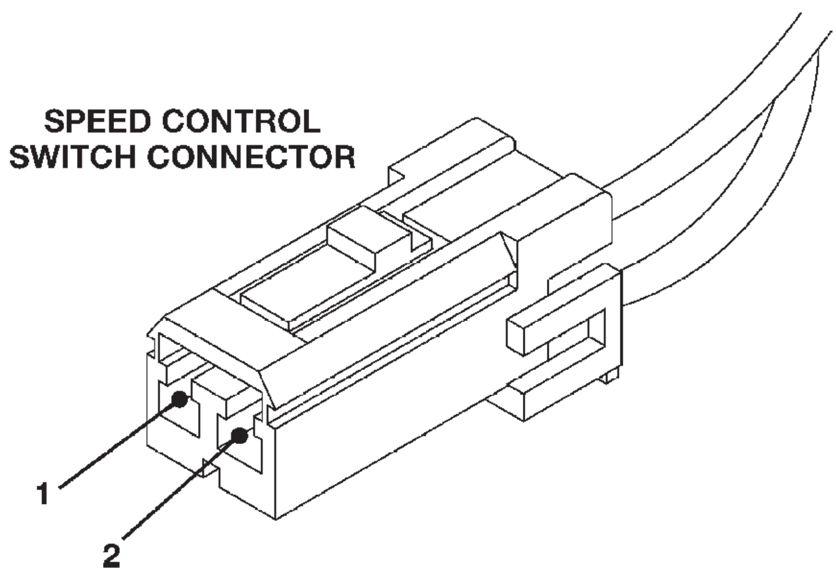
**Perform Verification TEST VER-4A.*

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

TEST SC-2A	CONTINUED - CHECKING SPEED CONTROL ON/OFF SWITCH

TJ/XJ BODY



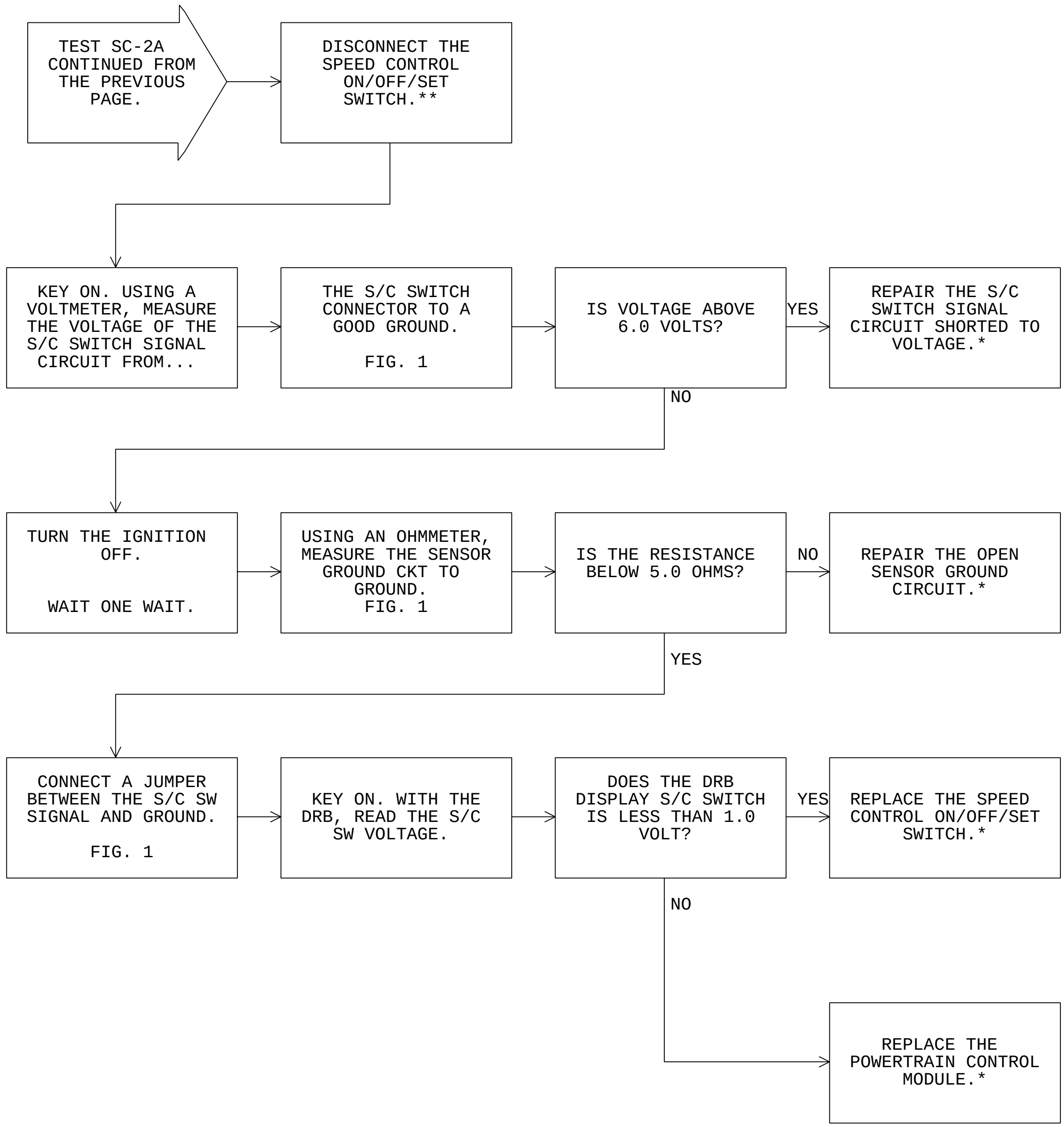


CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

80ab3724

FIG. 1

TEST SC-2A | CONTINUED - CHECKING SPEED CONTROL ON/OFF SWITCH



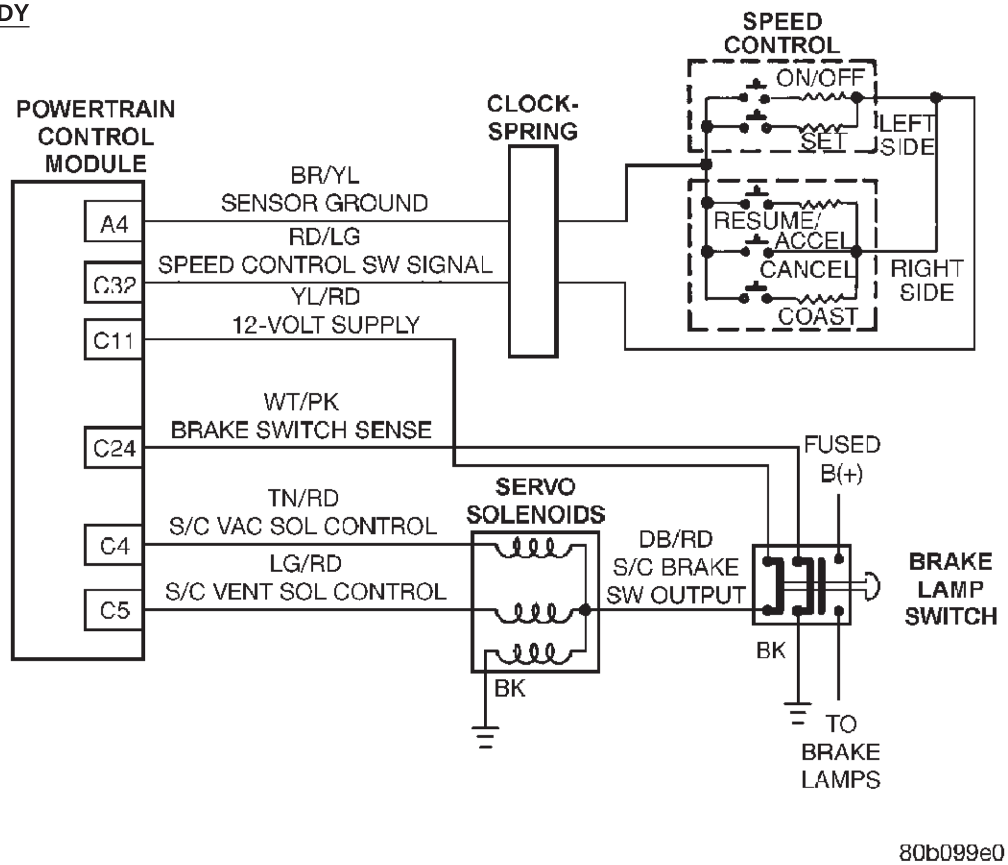
*Perform Verification TEST VER-4A.

**Check connectors - Clean / repair as necessary.

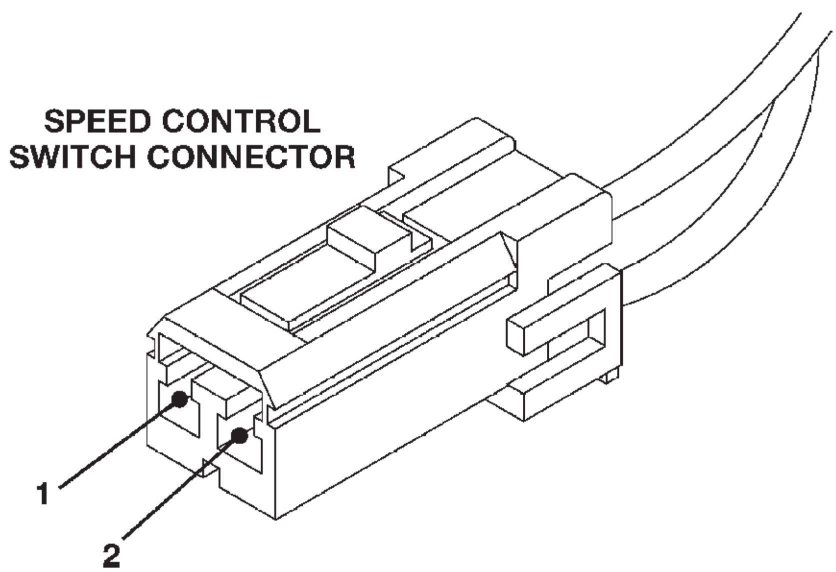
TEST SC-3A	CHECKING THE SPEED CONTROL RESUME SWITCH

Perform TEST SC-1A Before Proceeding

TJ/XJ BODY



TJ/XJ BODY



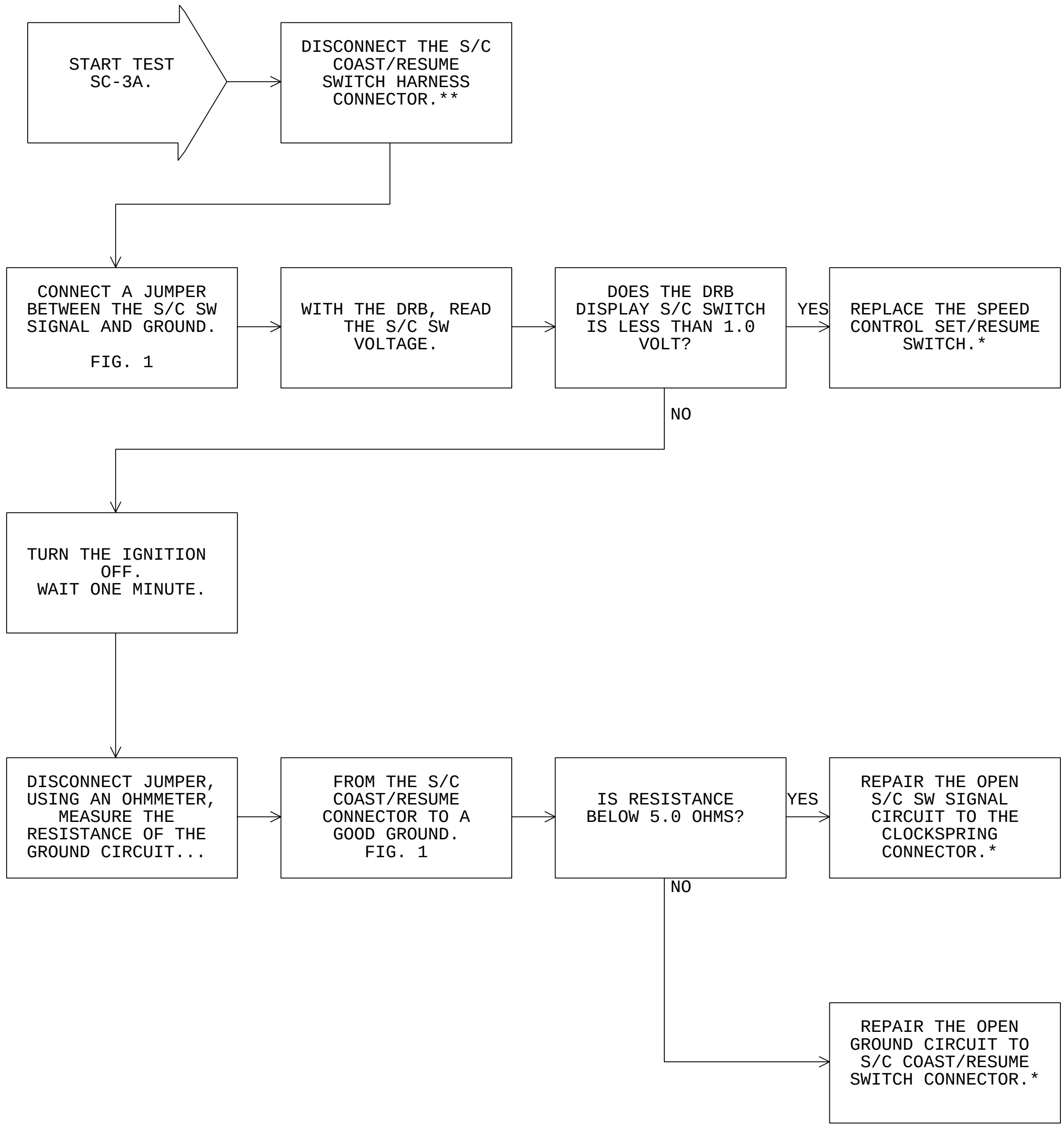
CAV	COLOR	FUNCTION
1	BR/YL	GROUND
2	RD/LG	SPEED CONTROL SIGNAL

80ab3724

FIG. 1

TEST SC-3A CHECKING THE SPEED CONTROL RESUME SWITCH

Perform TEST SC-1A Before Proceeding

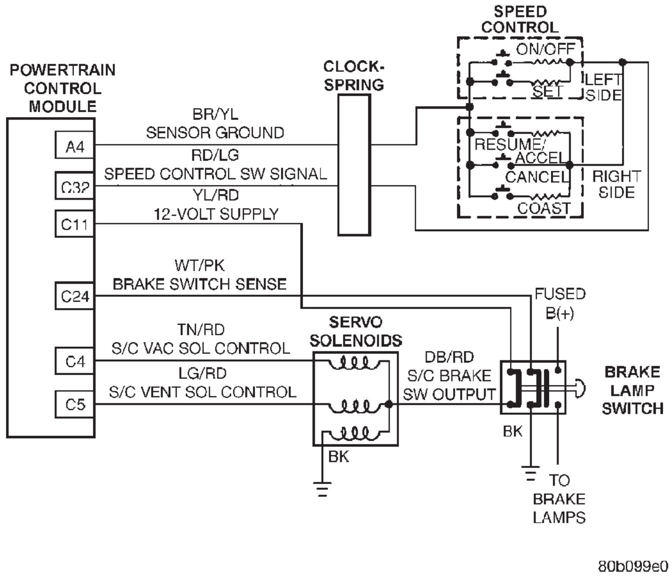


*Perform Verification TEST VER-4A.	**Check connectors - Clean / repair as necessary.

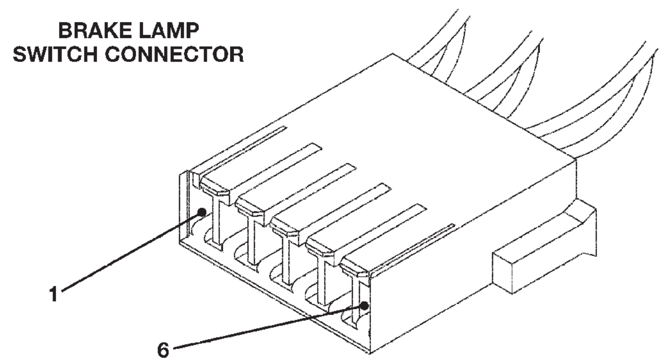
TEST SC-4A — CHECKING THE BRAKE SWITCH SENSE

Perform TEST SC-1A Before Proceeding

TJXJ BODY



TJ BODY

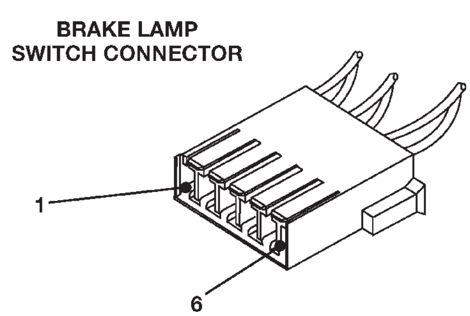


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	BRAKE LAMP SWITCH OUTPUT

80b099e1

FIG. 1

XJ BODY



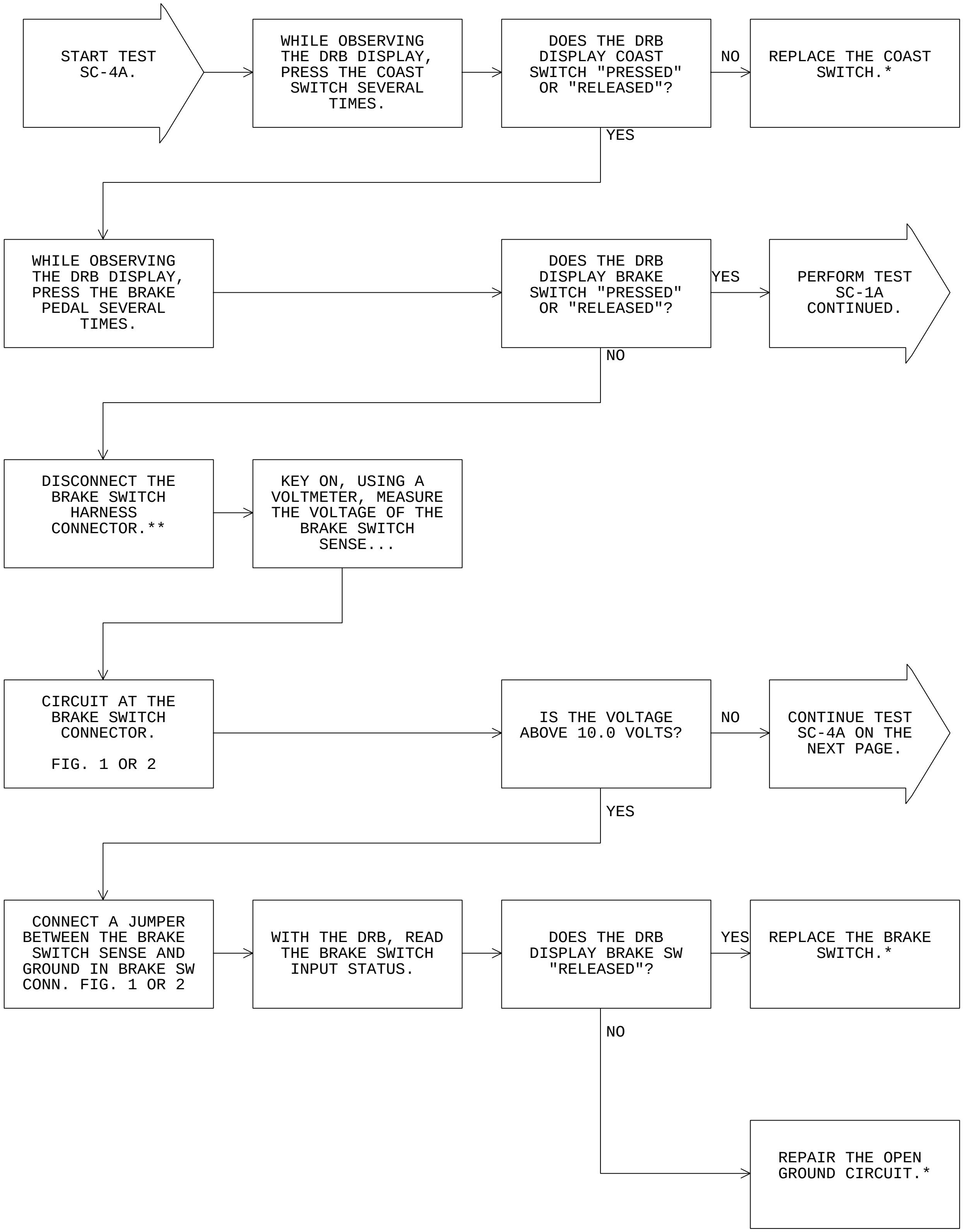
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B(+)

80b04fe6

FIG. 2

TEST SC-4A — CHECKING THE BRAKE SWITCH SENSE

Perform TEST SC-1A Before Proceeding



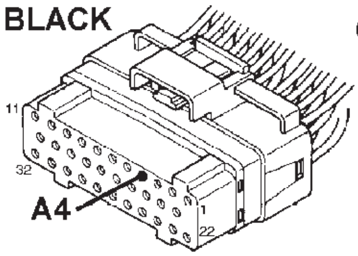
**Perform Verification TEST VER-4A.*

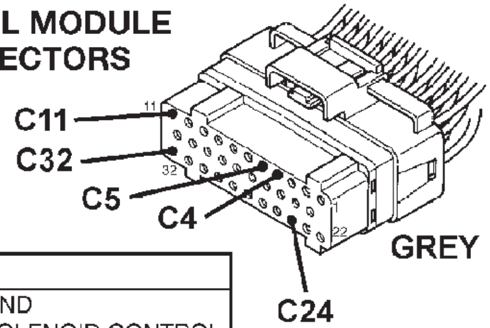
***Check connectors - Clean / repair as necessary.*

TEST SC-4A — CONTINUED - CHECKING THE BRAKE SWITCH SENSE

TJ BODY

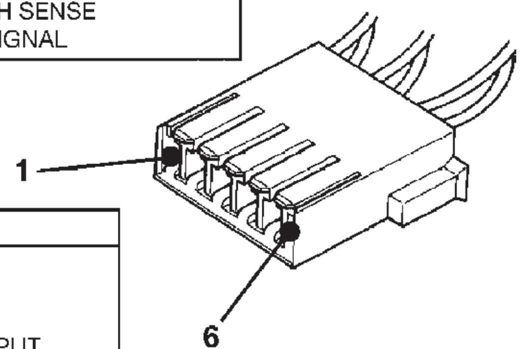
POWERTRAIN CONTROL MODULE CONNECTORS





CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C4	TN/RD	S/C VACUUM SOLENOID CONTROL
C5	LG/RD	S/C VENT SOLENOID
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SWITCH SENSE
C32	RD/LG	S/C SWITCH SIGNAL

BRAKE LAMP SWITCH CONNECTOR



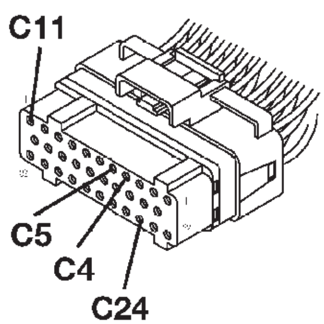
CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SWITCH SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SWITCH OUTPUT
5	WT/TN	BRAKE LAMP SWITCH OUTPUT
6	PK/DB	FUSED B (+)

80b6b1cd

FIG. 1

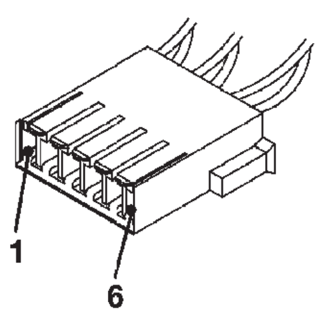
XJ BODY

POWERTRAIN CONTROL MODULE GREY CONNECTOR



CAV	COLOR	FUNCTION
C4	TN/RD	S/C VAC SOL CONTROL
C5	LG/RD	S/C VENT SOL CONTROL
C11	YL/RD	12-VOLT SUPPLY
C24	WT/PK	BRAKE SW SENSE

BRAKE LAMP SWITCH CONNECTOR

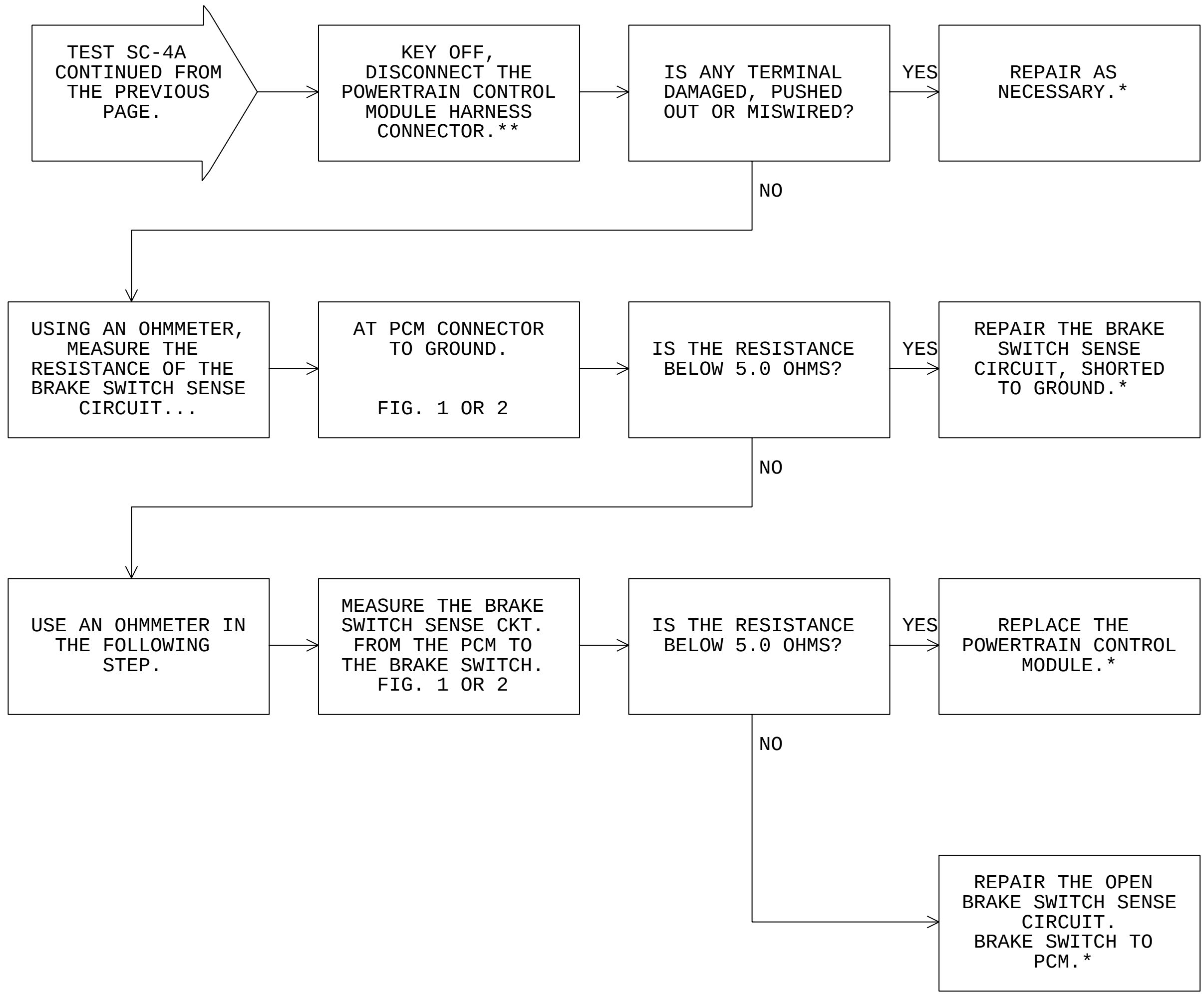


CAV	COLOR	FUNCTION
1	WT/PK	BRAKE SW SENSE
2	BK	GROUND
3	YL/RD	12-VOLT SUPPLY
4	DB/RD	S/C BRAKE SW OUTPUT
5	PK/DB	FUSED B(+)
6	WT/TN	STOP LAMP SW OUTPUT

80b6b1cc

FIG. 2

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 SPEED CONTROL OPERATION

Perform TEST SC-1A Before Proceeding

NOTES

TEST SC-5A	CHECKING THE SPEED CONTROL OPERATION

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.

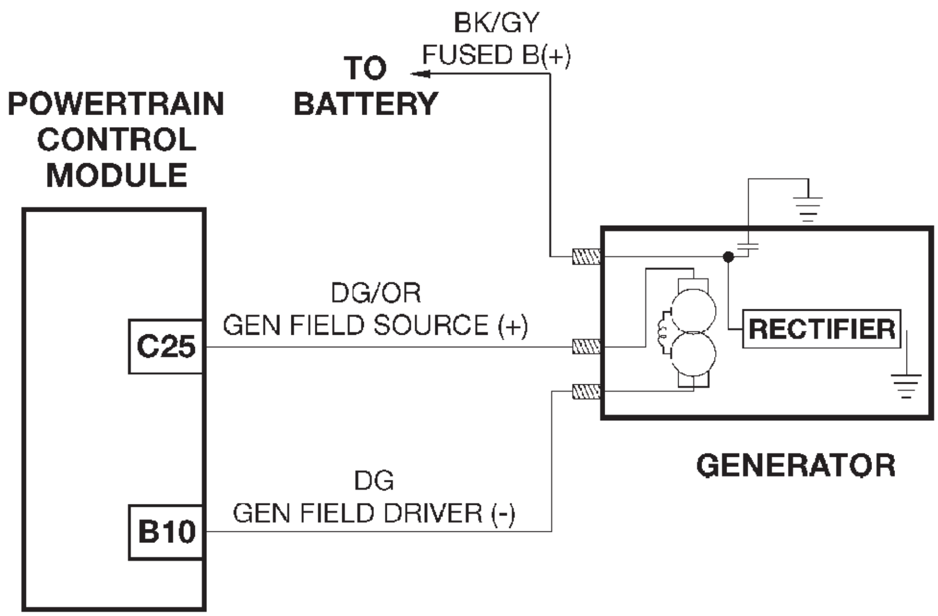
Denied Message

ON/OFF	The powertrain control module does not see an ‘‘ON’’ signal from the switch.
SPEED	The vehicle speed as seen by the powertrain control module 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 is grounded through the brake pedal switch when the brakes are released.
P/N	The park/neutral switch sense circuit is malfunctioning indicating the powertrain control module that the transmission is not in gear. The sense circuit is grounded (XJ4 SPEED A/T) or opened (TJ/XJ 3 SPEED A/T) 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.

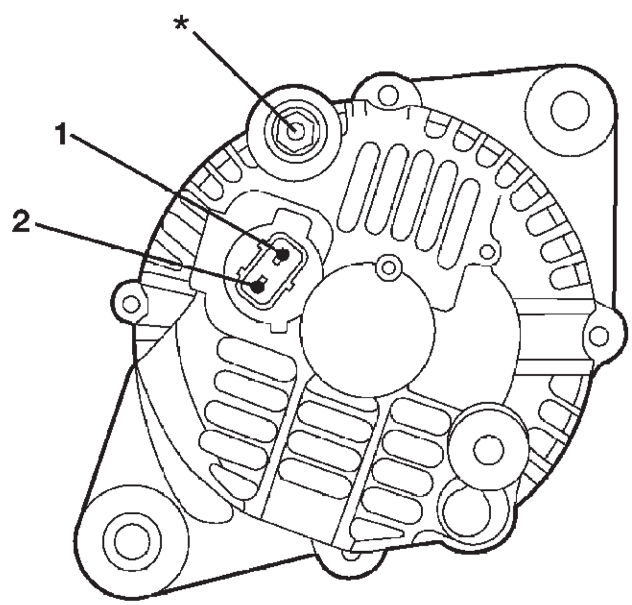
TEST CH-1A	CHARGING SYSTEM NO CODE TEST

Perform TEST DTC Before Proceeding

TJ/XJ BODY



80b6f0cd



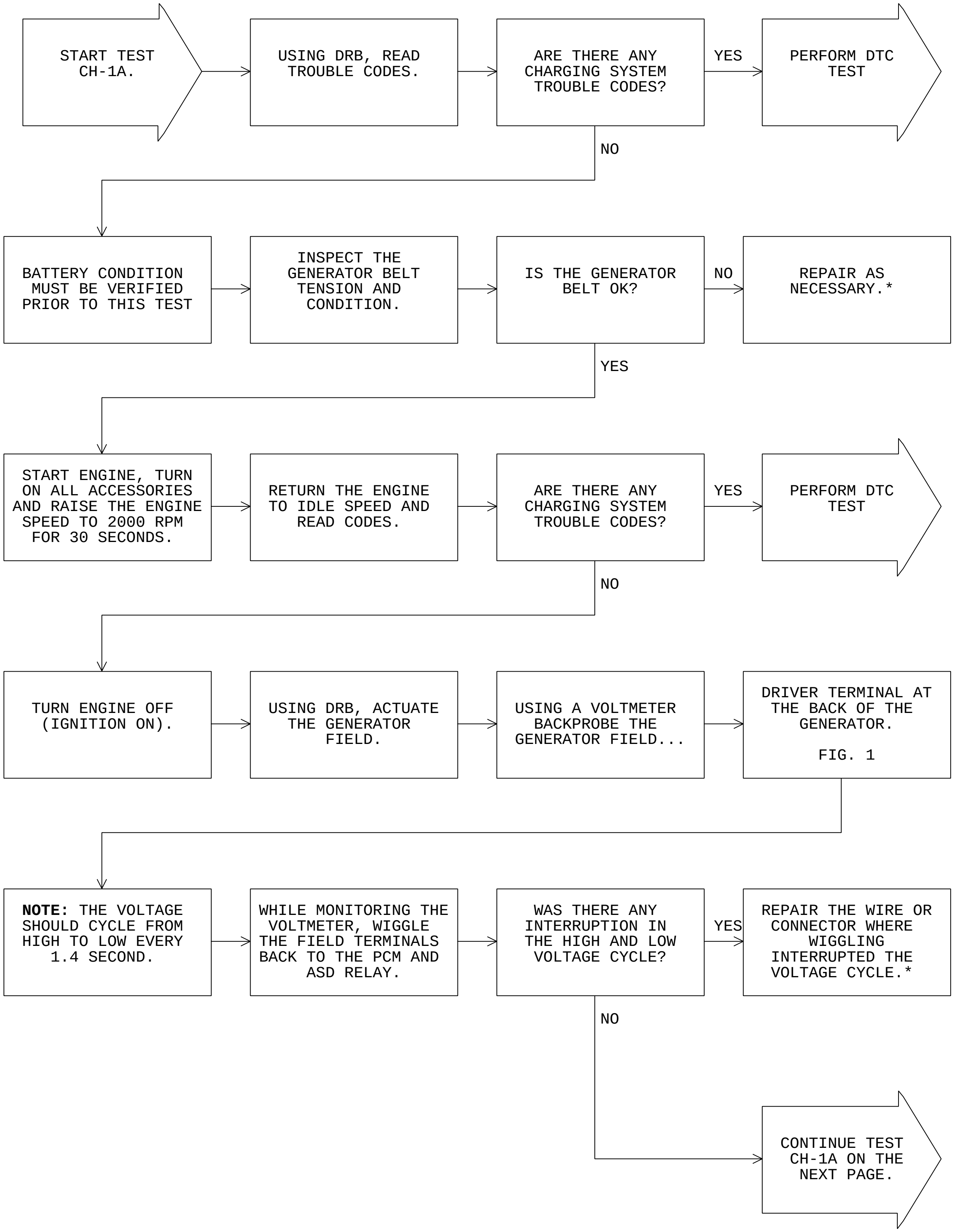
CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD
*	BK/GY	B(+)

80b6b36c

FIG. 1

TEST CH-1A CHARGING SYSTEM NO CODE TEST

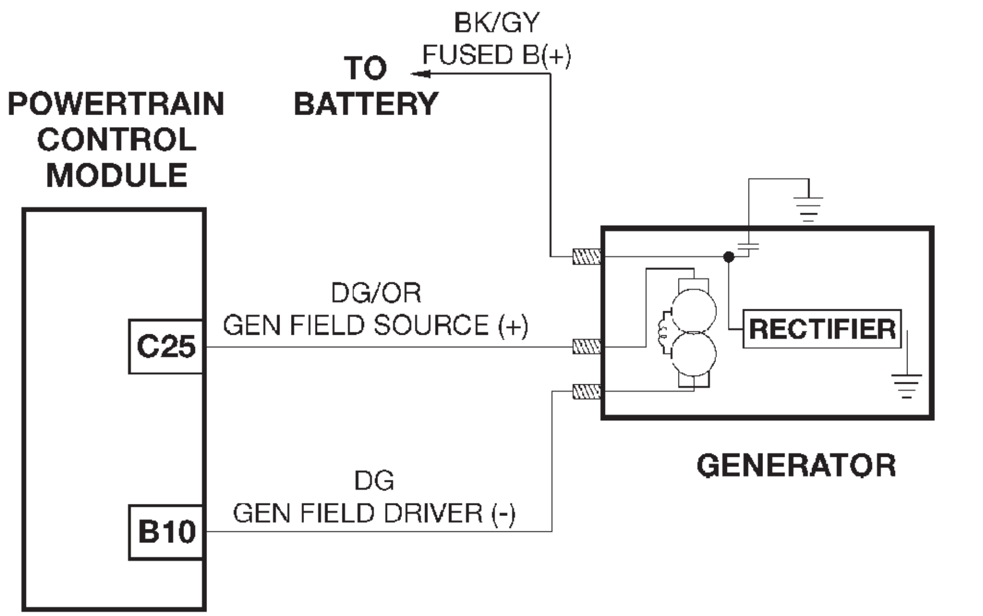
Perform TEST DTC Before Proceeding

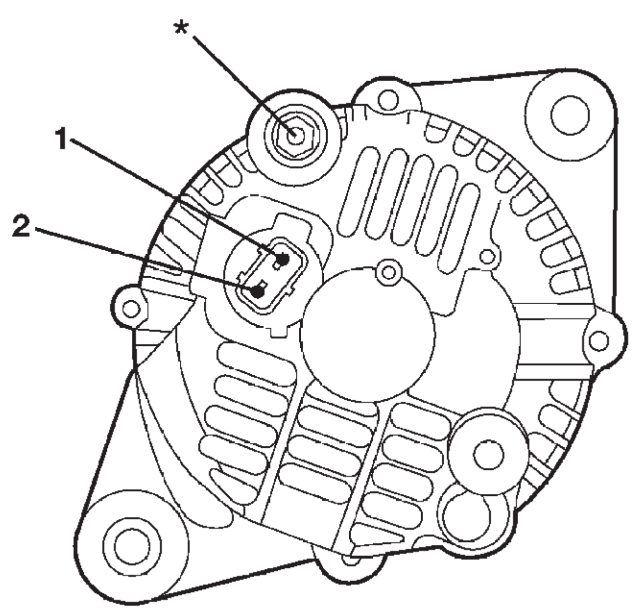


Perform Verification TEST VER-3A.	***Check connectors - Clean / repair as necessary.*

TEST CH-1A	CONTINUED - CHARGING SYSTEM NO CODE TEST

TJ/XJ BODY



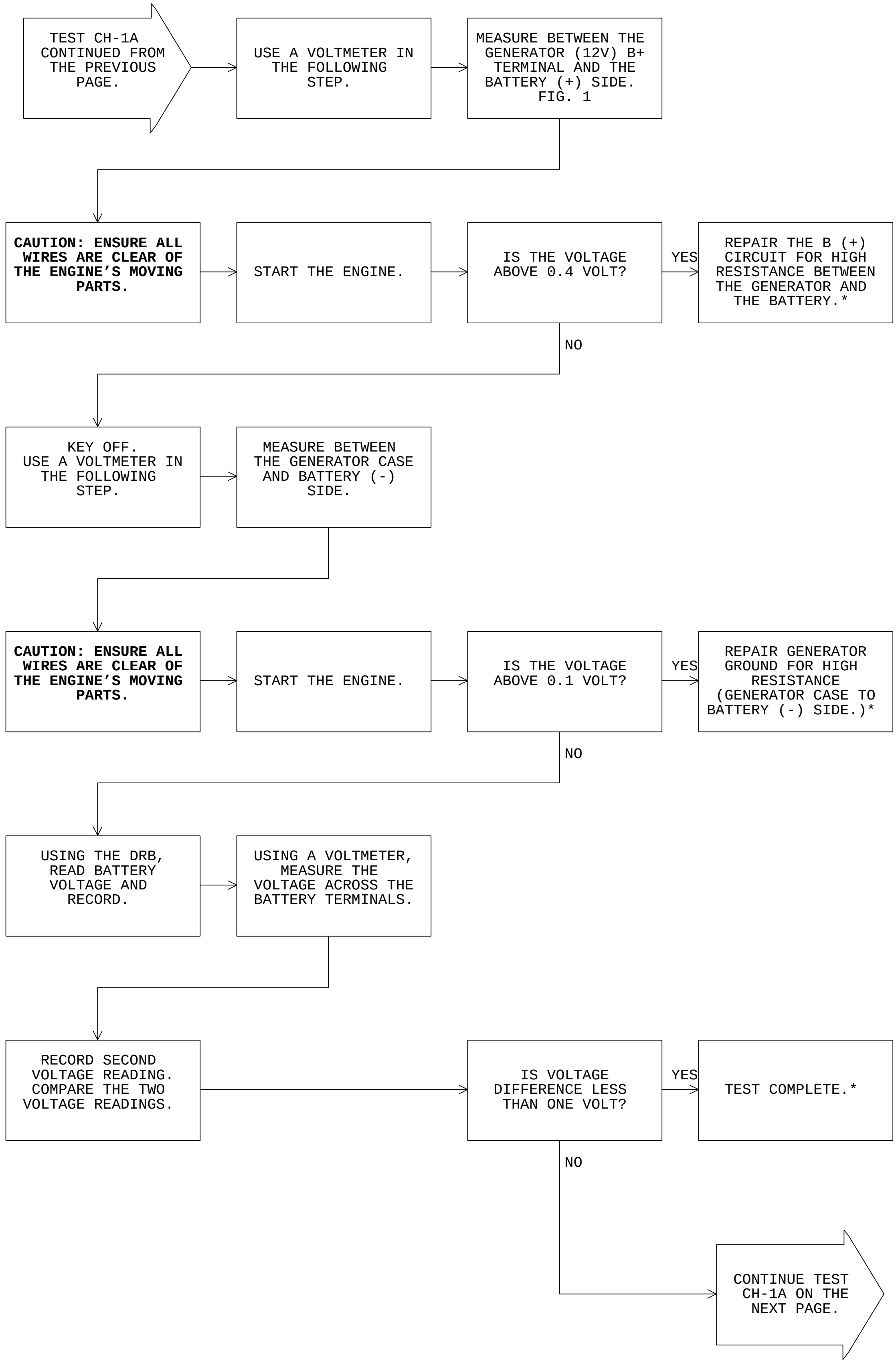


CAV	COLOR	FUNCTION
1	DG/OR	GENERATOR SOURCE
2	DG	GENERATOR FIELD
*	BK/GY	B(+)

80b6b36c

FIG. 1

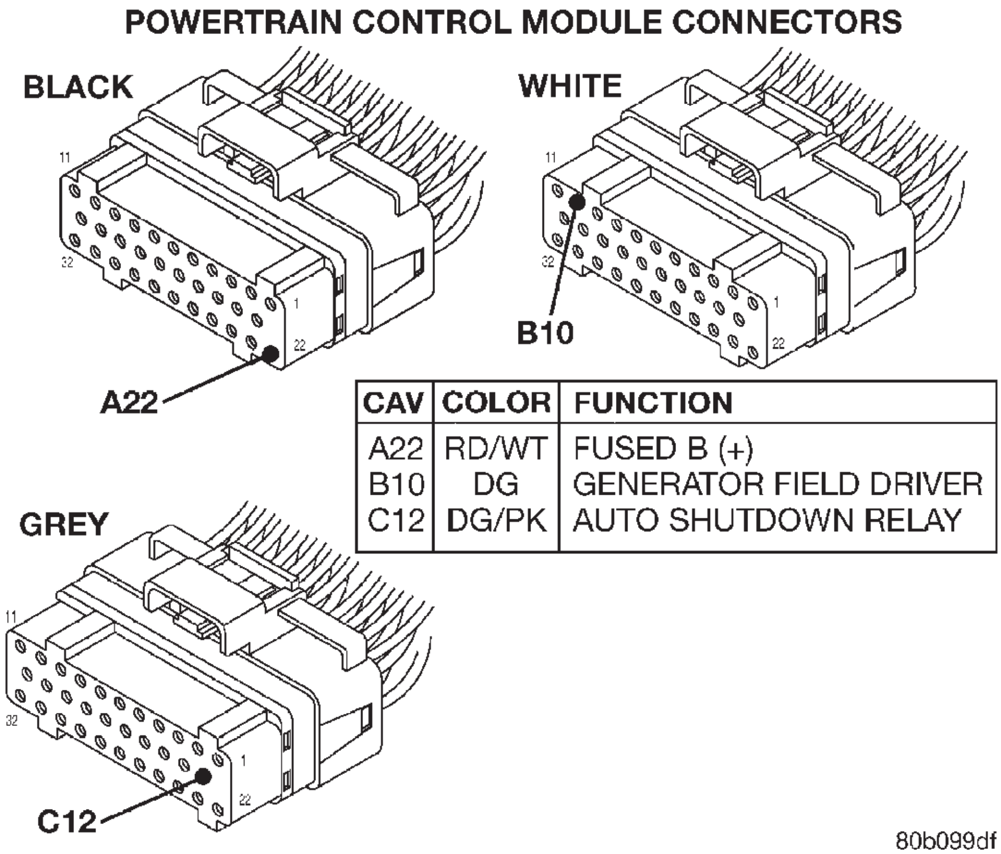
TEST CH-1A — CONTINUED - CHARGING SYSTEM NO CODE TEST



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

TEST CH-1A	CONTINUED - CHARGING SYSTEM NO CODE TEST

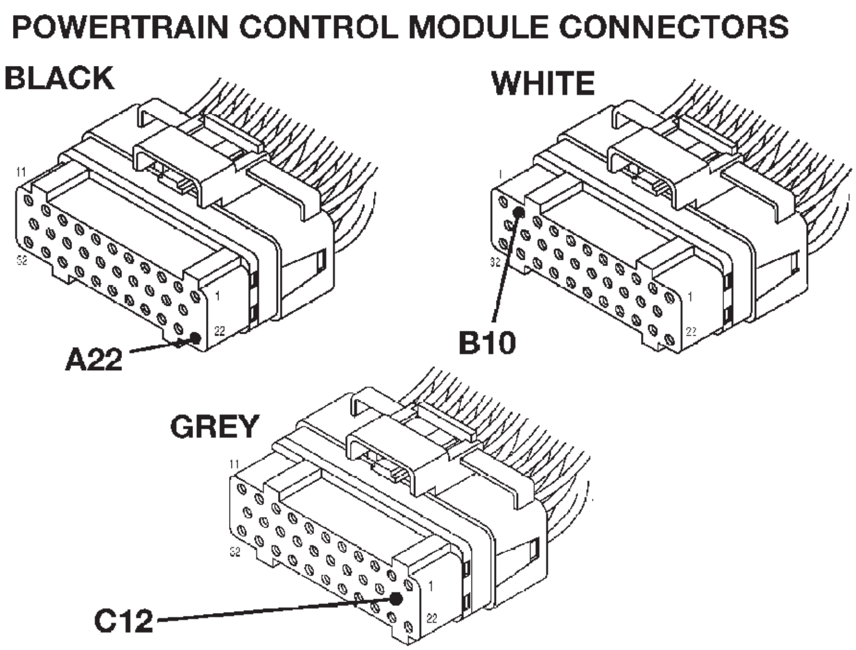
TJ BODY



CAV	COLOR	FUNCTION
A22	RD/WT	FUSED B (+)
B10	DG	GENERATOR FIELD DRIVER
C12	DG/PK	AUTO SHUTDOWN RELAY

FIG. 1

XJ BODY

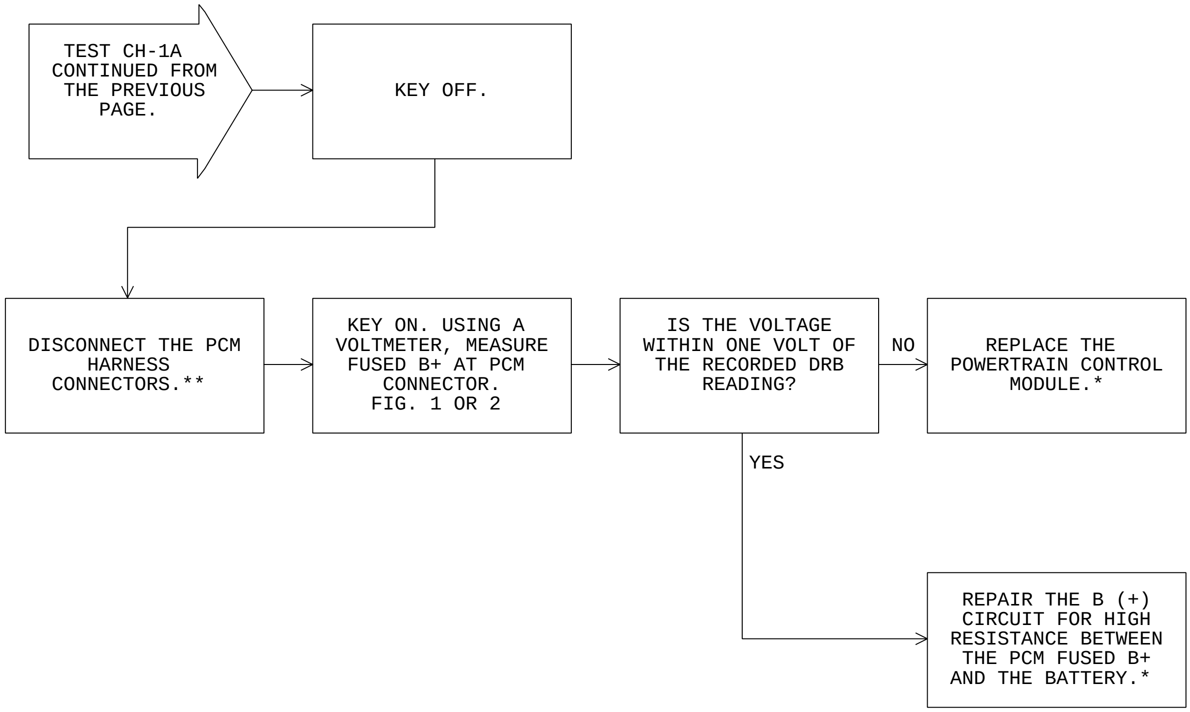


CAV	COLOR	FUNCTION
A22	DG/BK	FUSED B(+)
B10	DG	GENERATOR FIELD DRIVER
C12	DG/OR	AUTO SHUTDOWN RELAY

80b04fdf

FIG. 2

TEST CH-1A CONTINUED - CHARGING SYSTEM NO CODE TEST



Perform Verification TEST VER-3A.

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

TEST NS-SEL NO START SELECTION MENU

Perform TEST DTC Before Proceeding

NOTES

TEST NS-SEL	NO START SELECTION MENU

Perform TEST DTC Before Proceeding

NOTE: For all component locations, REFER TO GENERAL INFORMATION section 4.0 in this manual

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

NOTE: If the engine will not crank or cranks but will not run, be sure to check the SKIM module for proper communication and trouble codes.

NOTE: If there are any trouble codes present they must be repaired before continuing with the No Start Symptom diagnostics.

NOTE: If the DRB does not power up, REFER TO GENERAL INFORMATION section 3.5.1.

Below you will find a recommended procedure to correct a No Start Problem by symptom. They should be performed in the order that they are listed.

TEST NS-1A	QUALIFYING A NO START CONDITION

Perform TEST NS-SEL Before Proceeding

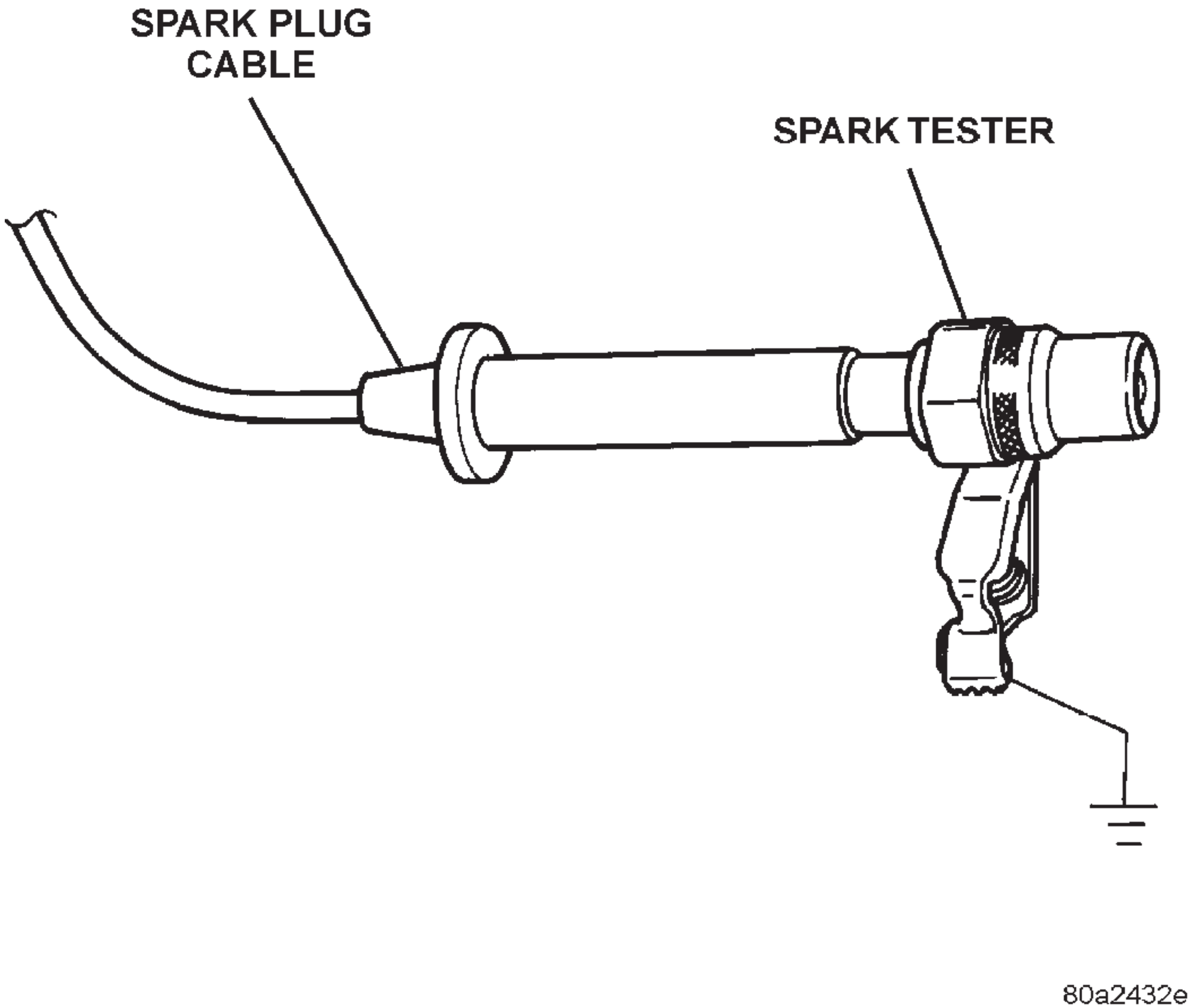
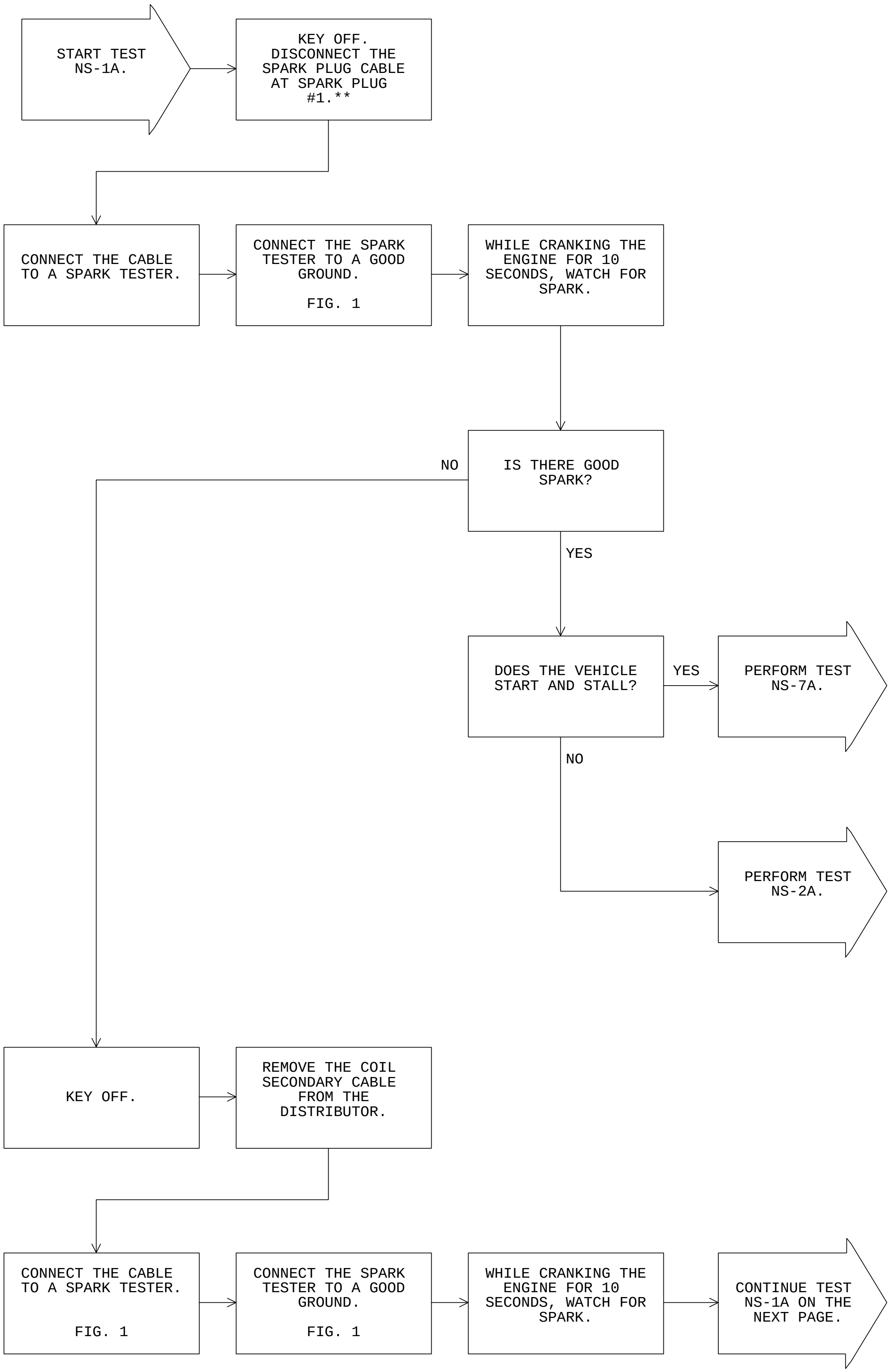


FIG. 1

TEST NS-1A QUALIFYING A NO START CONDITION

Perform TEST NS-SEL Before Proceeding



***Perform Verification TEST VER-1A.**	****Check connectors - Clean / repair as necessary.**

TEST NS-1A	CONTINUED - QUALIFYING A NO START CONDITION

SPARK PLUG CABLE RESISTANCE

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

80b171eb

FIG. 1

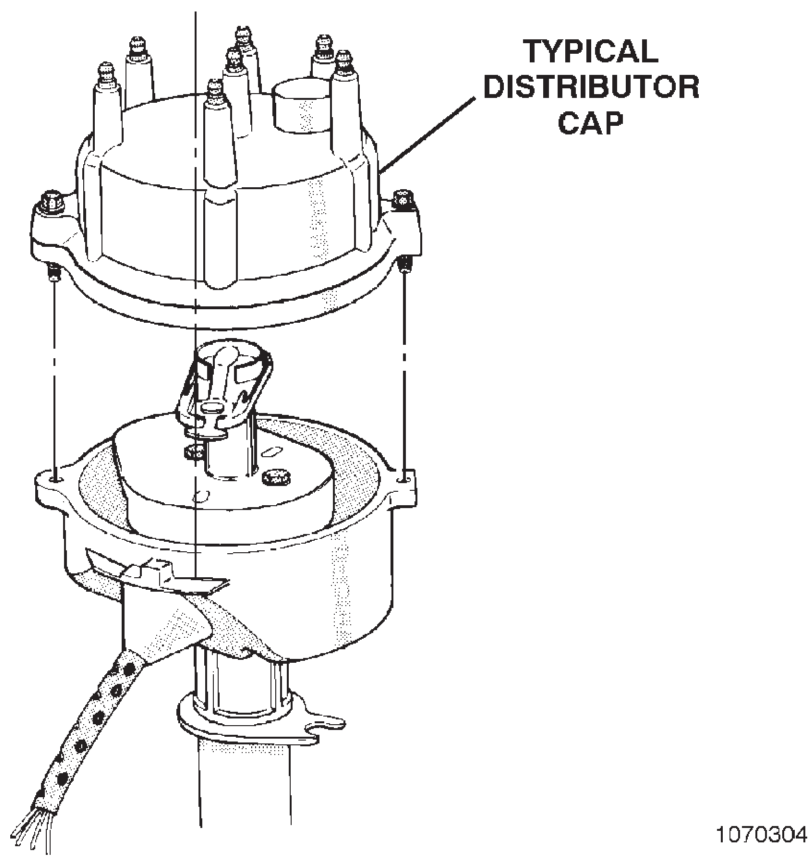
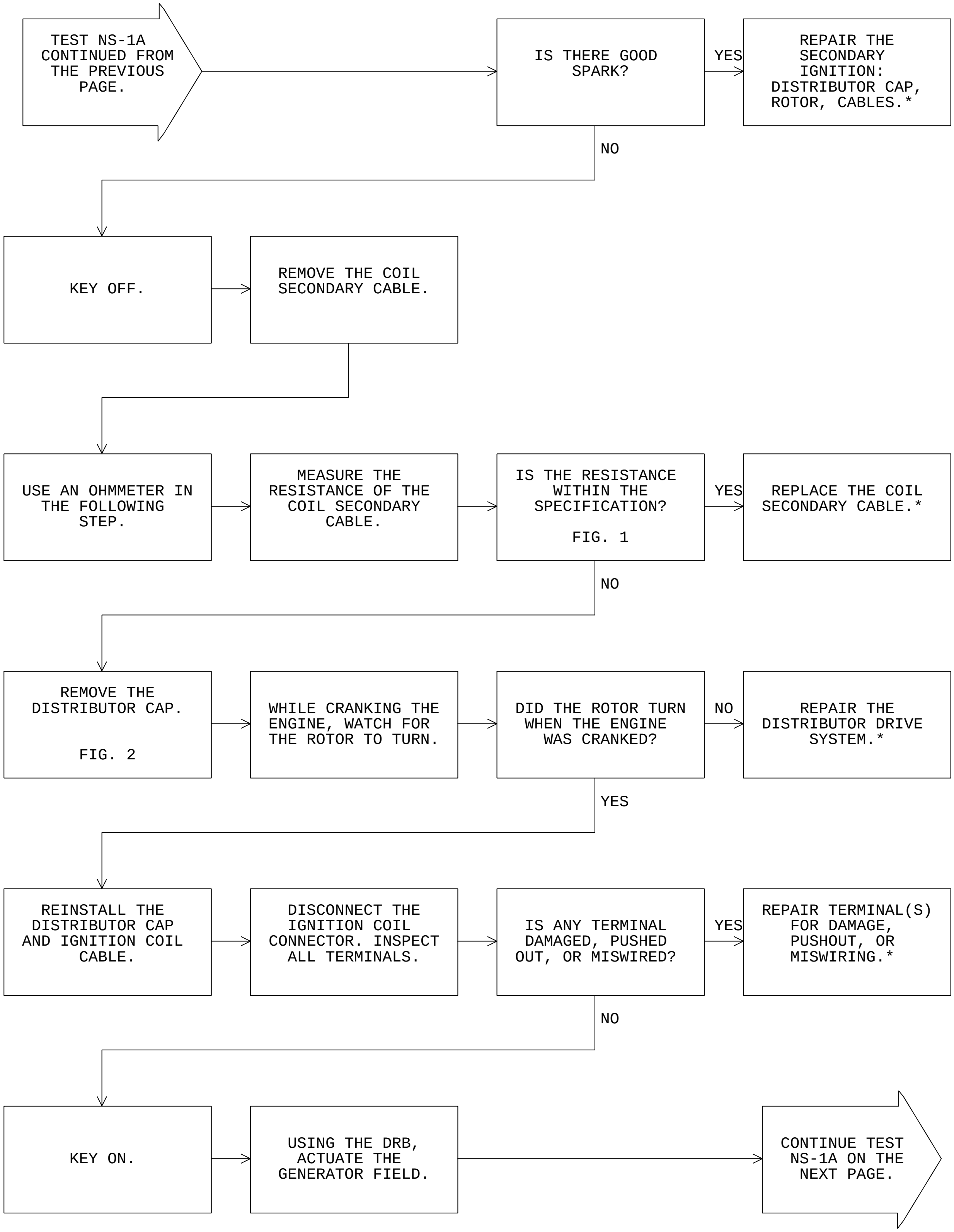


FIG. 2

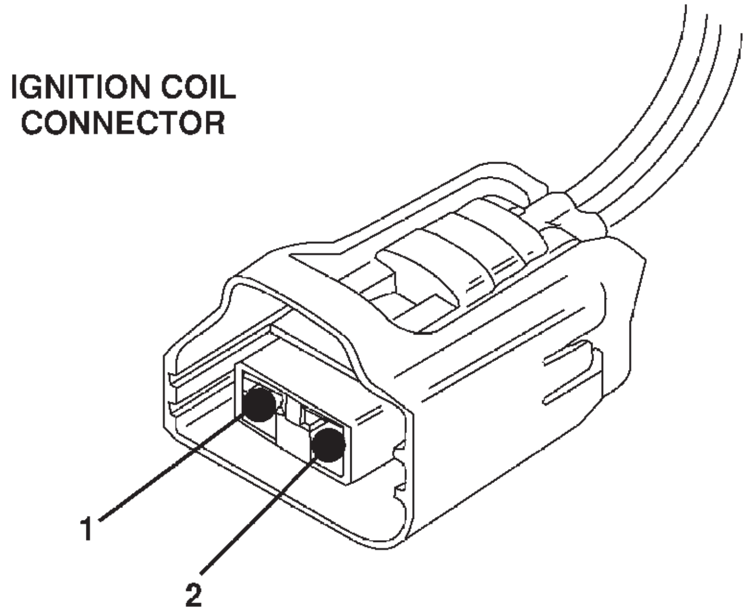
TEST NS-1A CONTINUED - QUALIFYING A NO START CONDITION



*Perform Verification TEST VER-1A. | **Check connectors - Clean / repair as necessary.

TEST NS-1A — CONTINUED - QUALIFYING A NO START CONDITION

TJ BODY

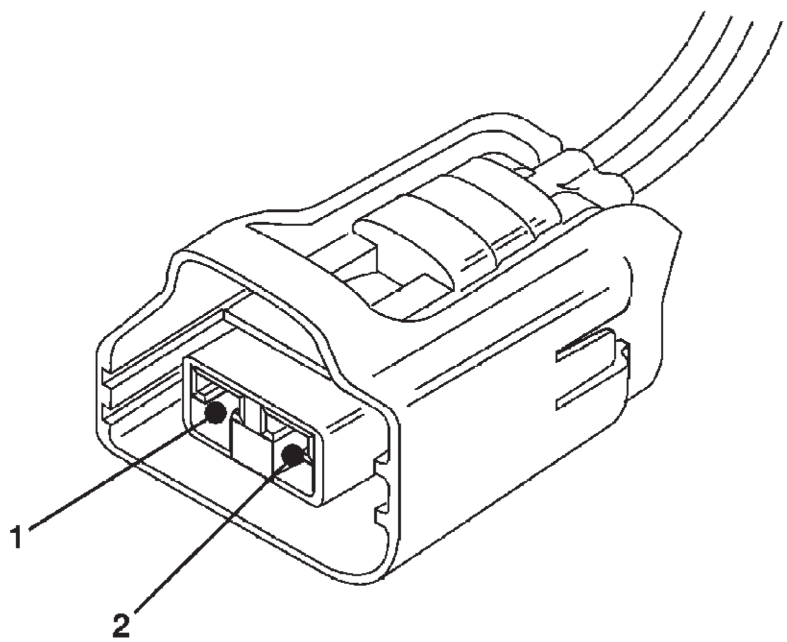


CAV	COLOR	FUNCTION
1	DG/LG	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

80b6f0e3

FIG. 1

XJ BODY



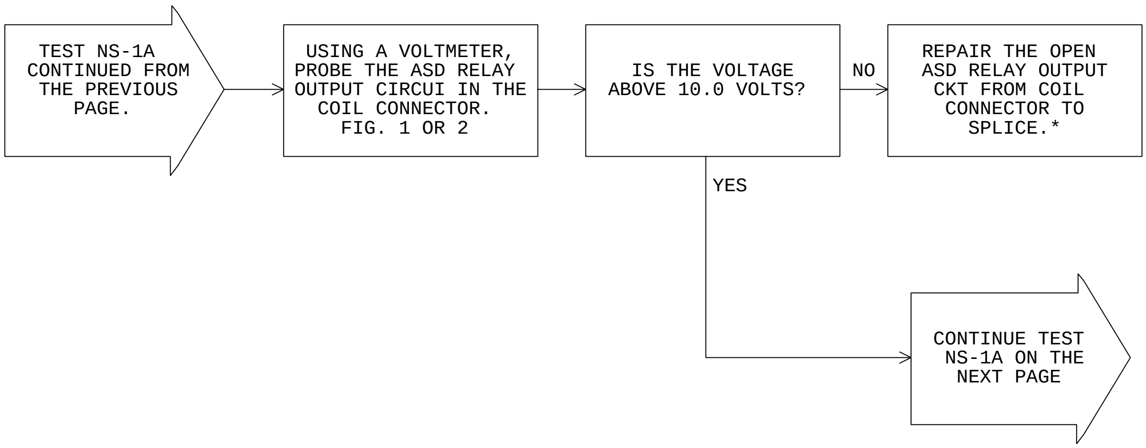
CAV	COLOR	FUNCTION
1	DG/OR	ASD RELAY OUTPUT
2	GY	IGNITION COIL DRIVER

80afb691

NOTE: WIRES CAN BE IN EITHER CAVITY

FIG. 2

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

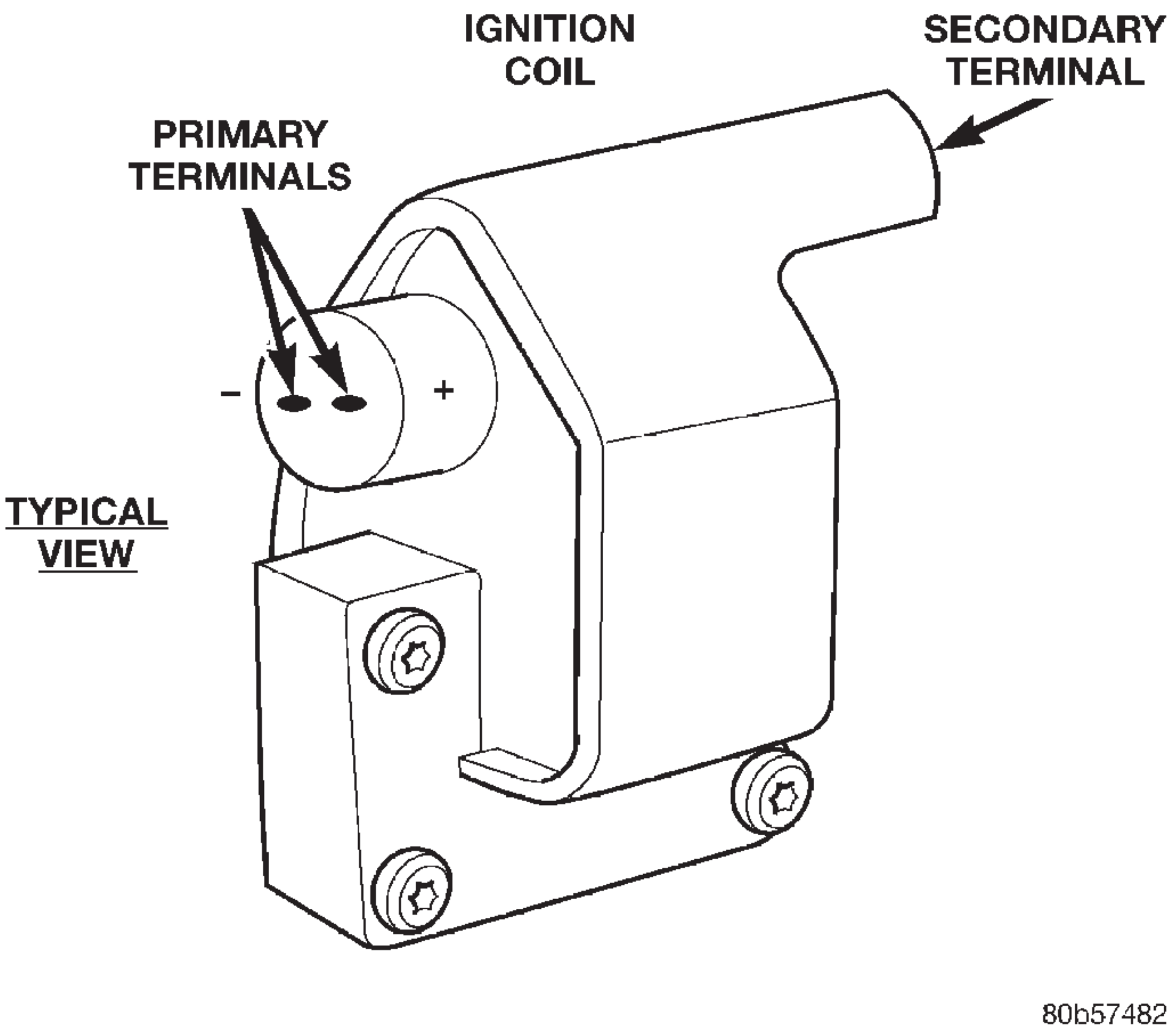
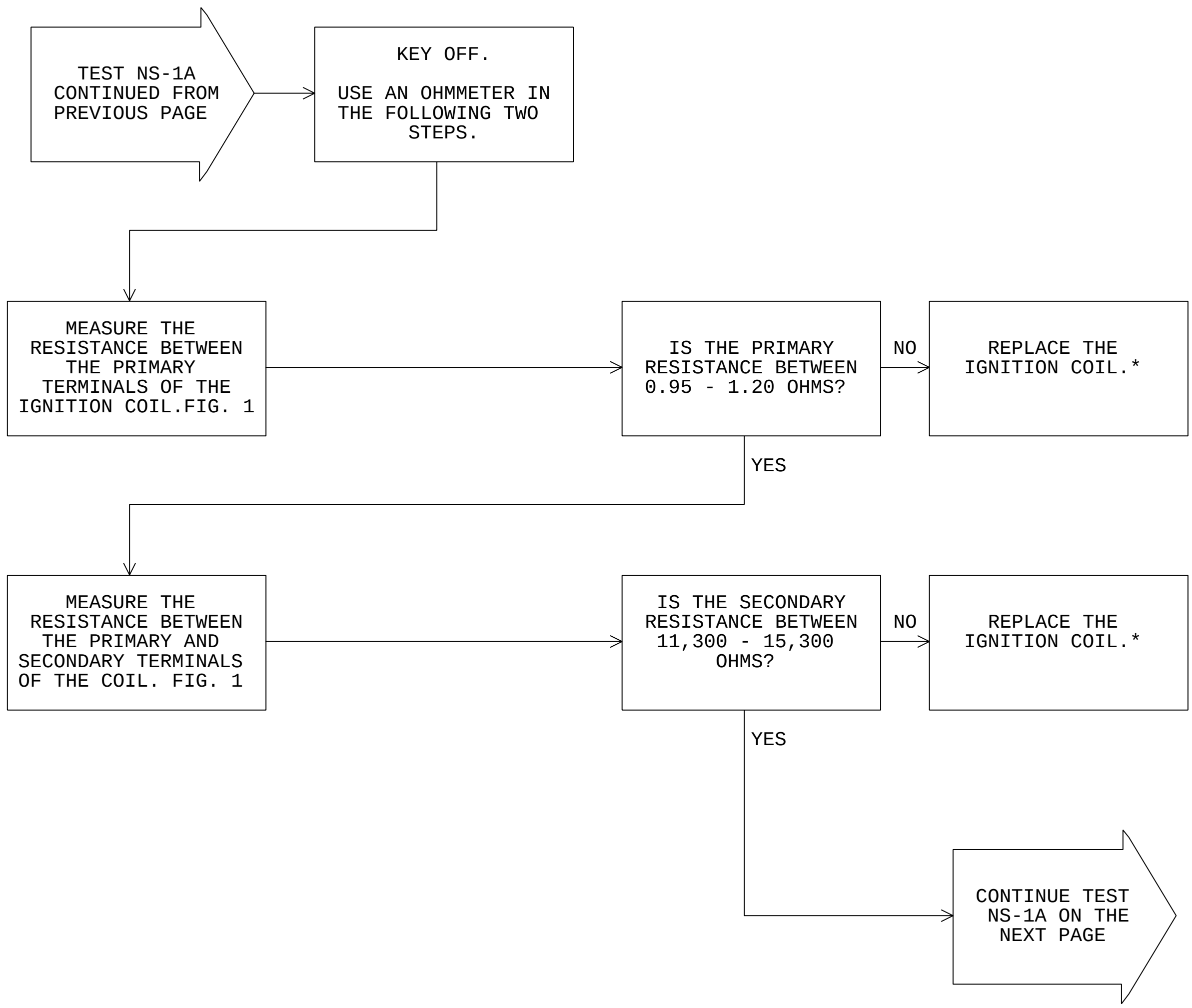


FIG. 1

TEST NS-1A CONTINUED - QUALIFYING A NO START CONDITION



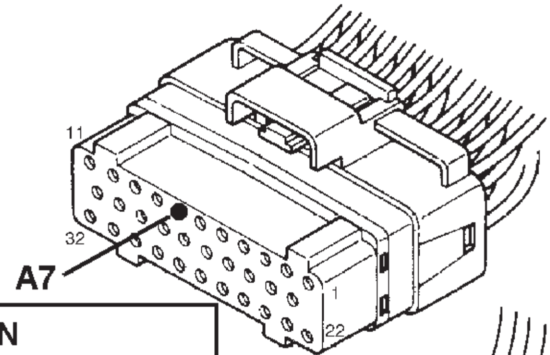
*Perform Verification TEST VER-1A.

**Check connectors - Clean / repair as necessary.

TEST NS-1A	CONTINUED - QUALIFYING A NO START CONDITION

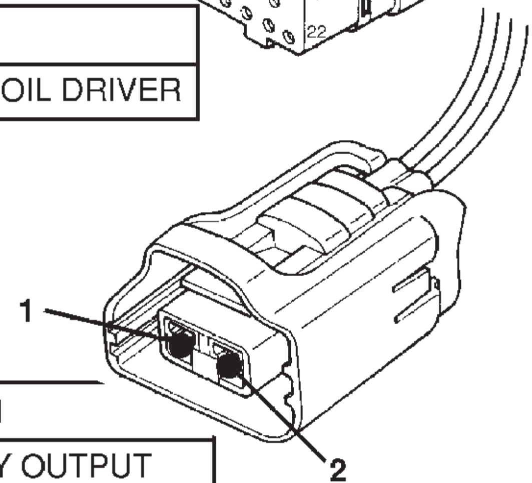
TJ BODY

POWERTRAIN CONTROL MODULE BLACK CONNECTOR



CAV	COLOR	FUNCTION
A7	GY	IGNTION COIL DRIVER

IGNITION COIL CONNECTOR



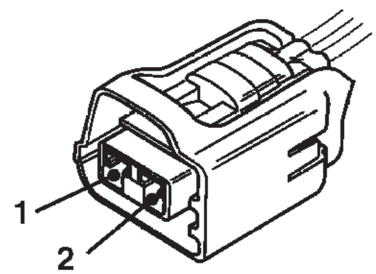
CAV	COLOR	FUNCTION
1 2	DG/LG GY	ASD RELAY OUTPUT IGNITION COIL DRIVER

80b76ec0

FIG. 1

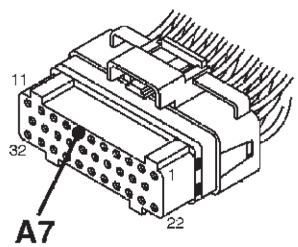
XJ BODY

IGNITION COIL CONNECTOR



CAV	COLOR	FUNCTION
1 2	GY DG /OR	IGNITION COIL DRIVER ASD RELAY OUTPUT

POWERTRAIN CONTROL MODULE BLACK CONNECTOR

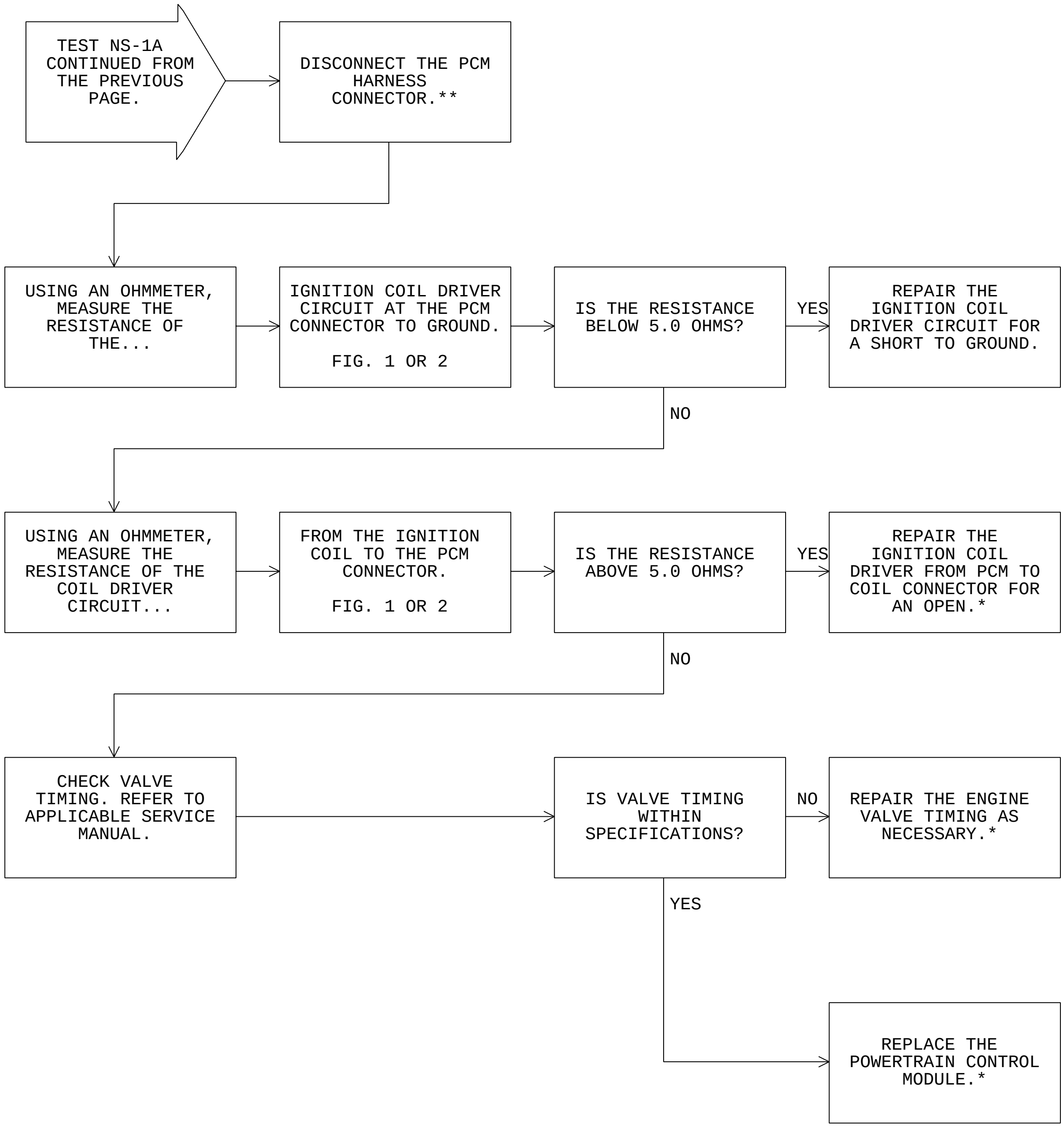


CAV	COLOR	FUNCTION
A7	GY	IGNITION COIL DRIVER

80b118ae

FIG. 2

TEST NS-1A — CONTINUED - QUALIFYING A NO START CONDITION



*Perform Verification TEST VER-1A.	**Check connectors - Clean / repair as necessary.

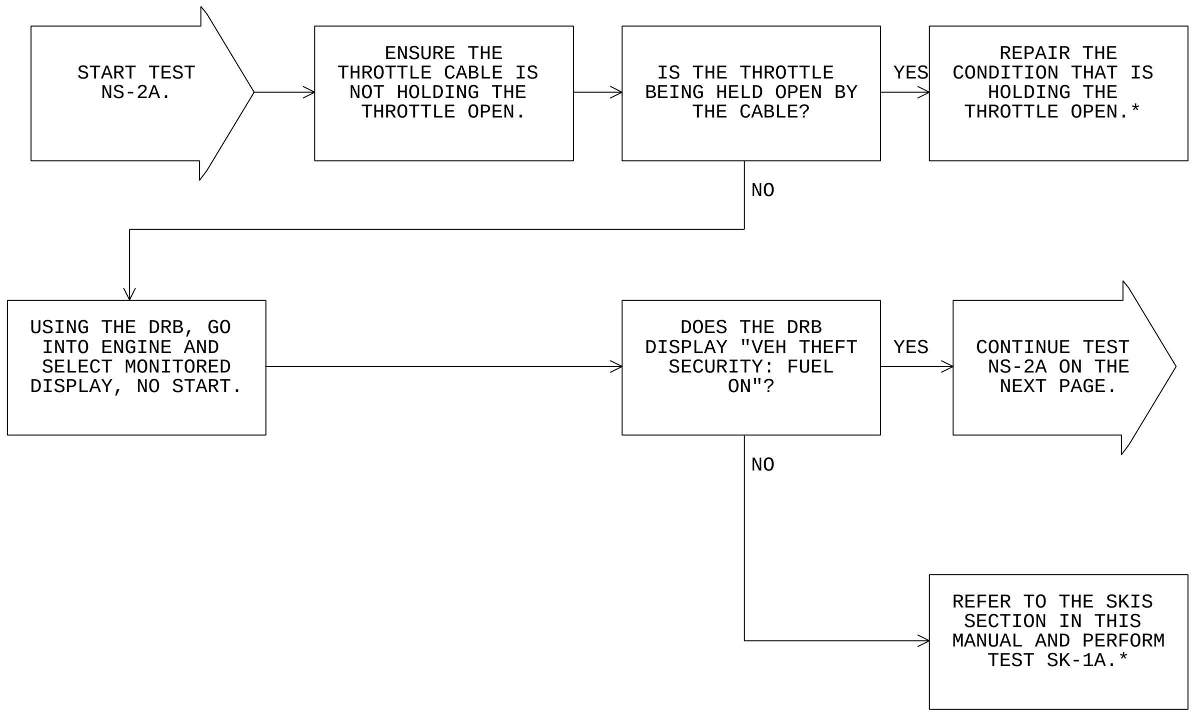
TEST NS-2A	CHECKING THE FUEL SYSTEM

Perform TEST NS-SEL Before Proceeding

NOTES

TEST NS-2A CHECKING THE FUEL SYSTEM

Perform TEST NS-SEL Before Proceeding

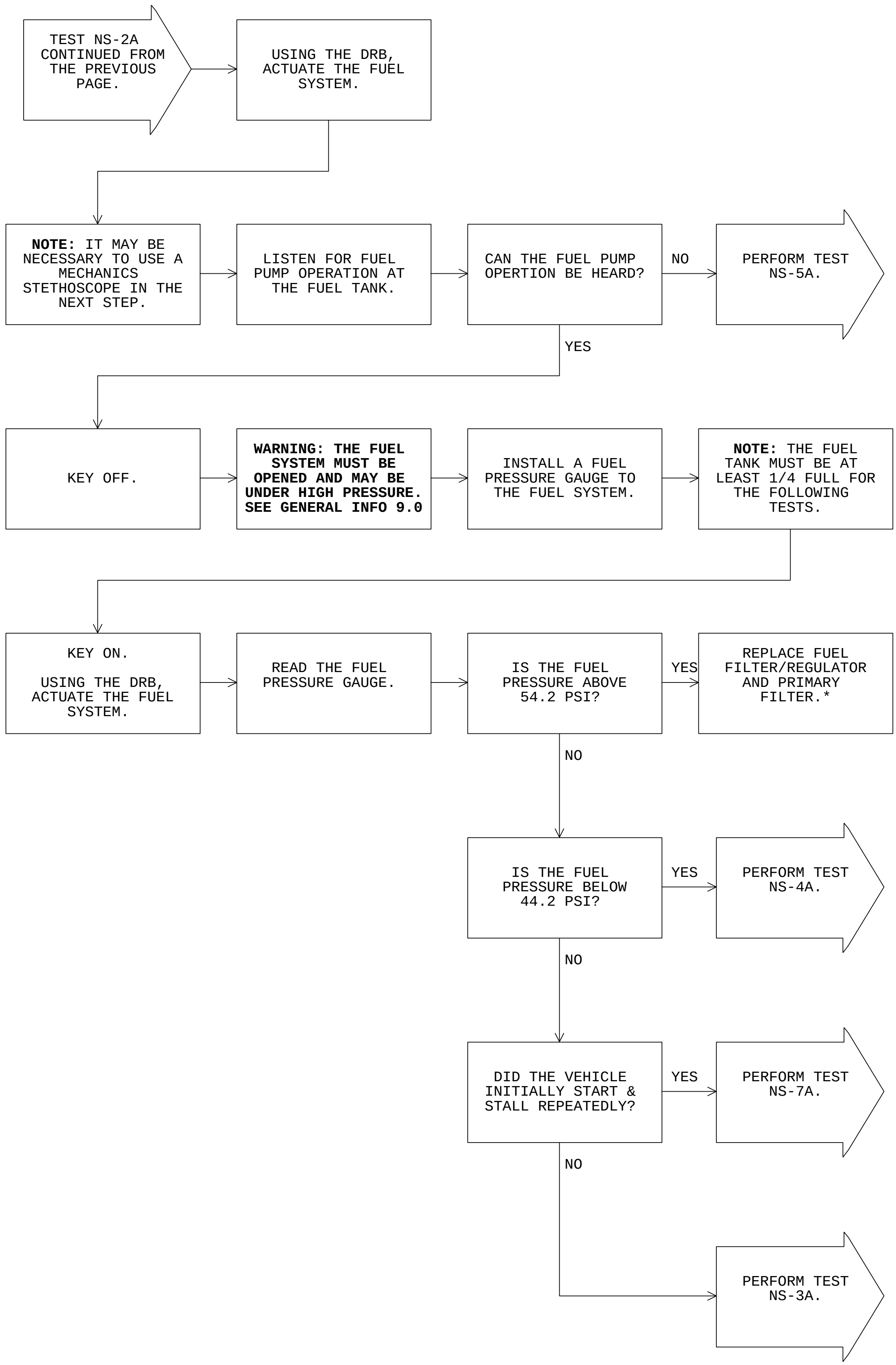


**Perform Verification TEST VER-1A.*

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

NOTES

TEST NS-2A | CONTINUED - CHECKING THE FUEL SYSTEM



**Perform Verification TEST VER-1A.* | ***Check connectors - Clean / repair as necessary.*

TEST NS-3A	CHECKING ENGINE MECHANICAL SYSTEMS

Perform TEST NS-SEL Before Proceeding

2.5L

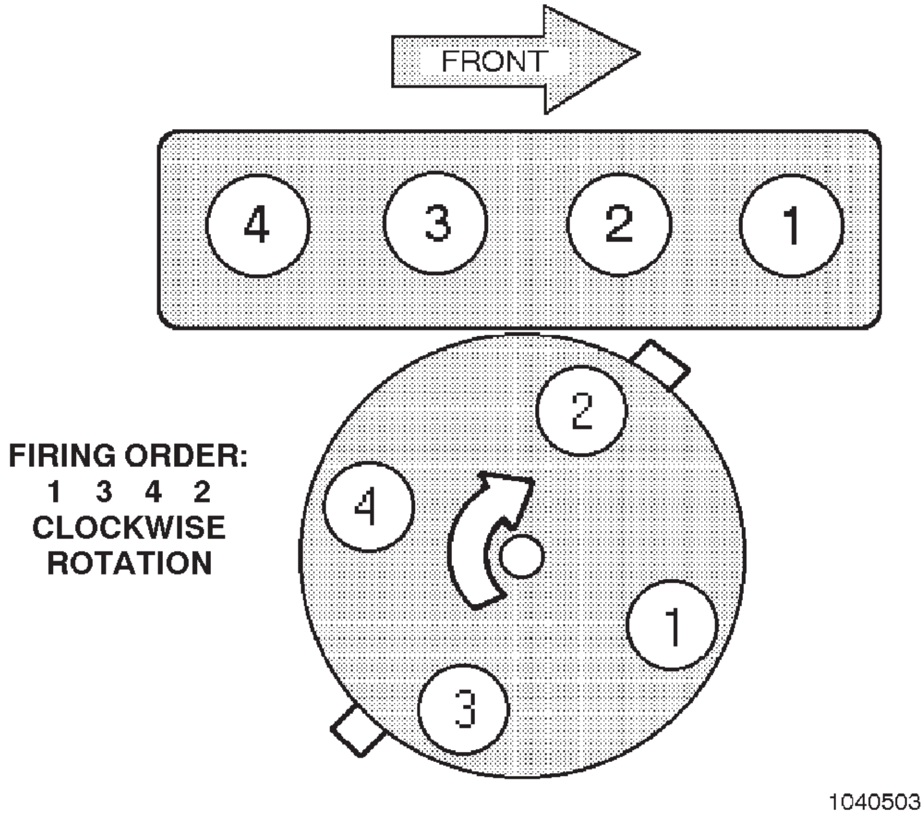


FIG. 1

4.0L

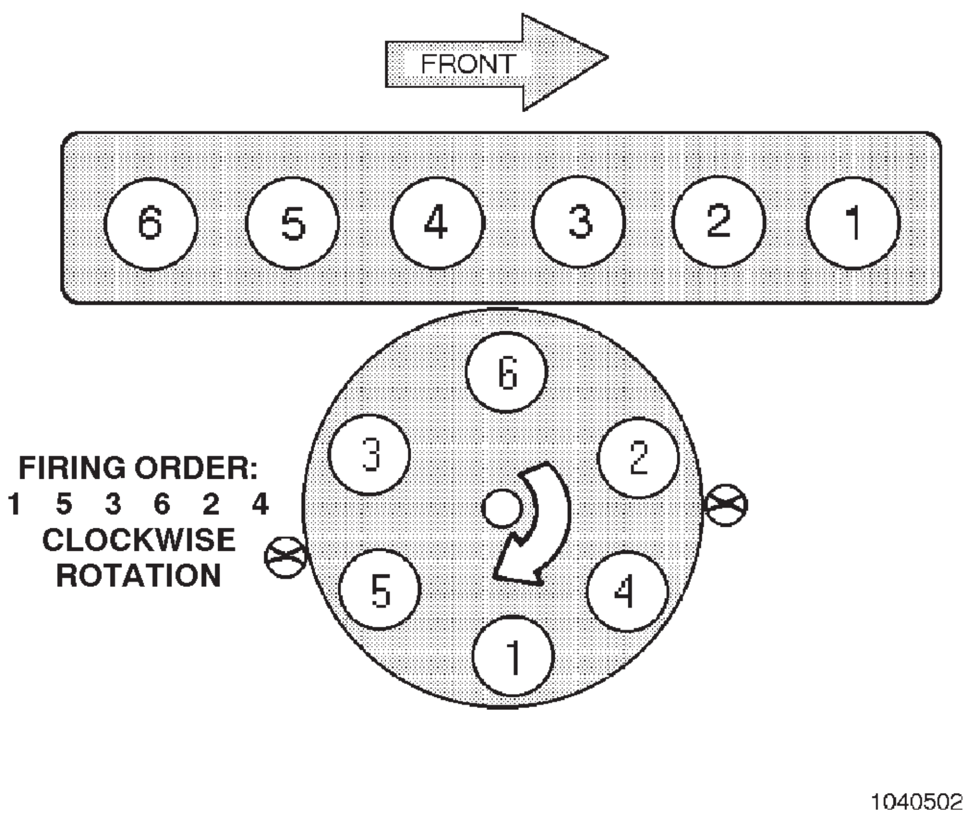
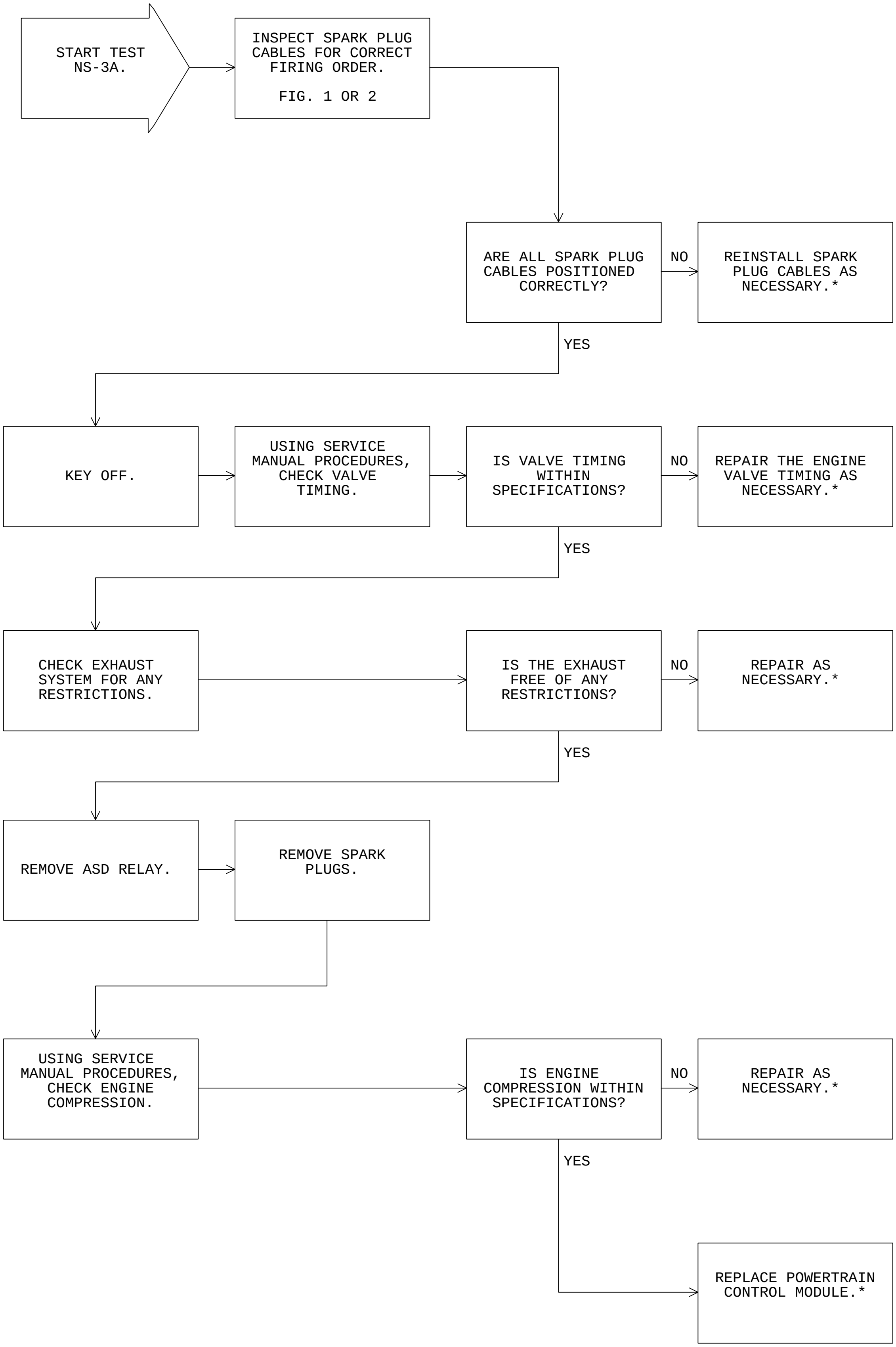


FIG. 2

TEST NS-3A — CHECKING ENGINE MECHANICAL SYSTEMS

Perform TEST NS-SEL Before Proceeding



**Perform Verification TEST VER-1A.*

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

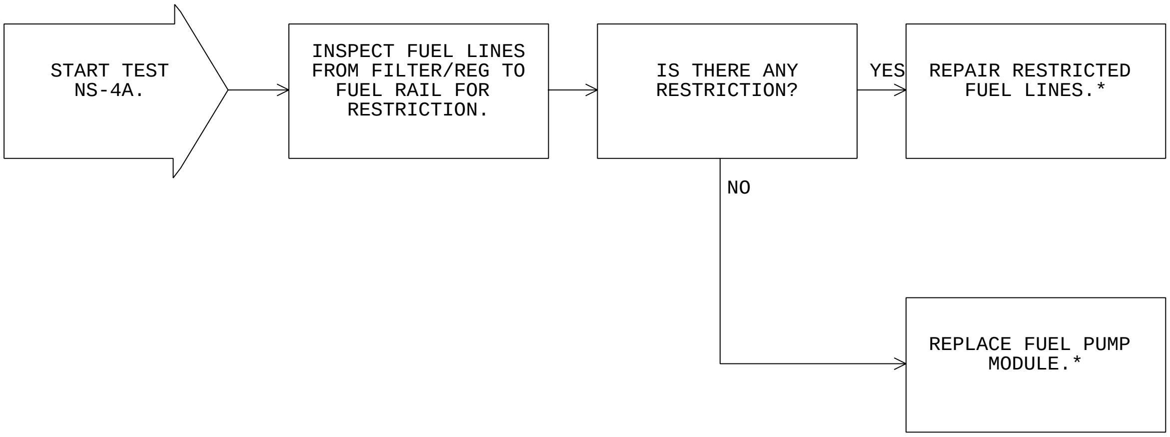
TEST NS-4A	REPAIRING LOW FUEL PRESSURE

Perform TEST NS-SEL Before Proceeding

NOTES

TEST NS-4A REPAIRING LOW FUEL PRESSURE

Perform TEST NS-SEL Before Proceeding

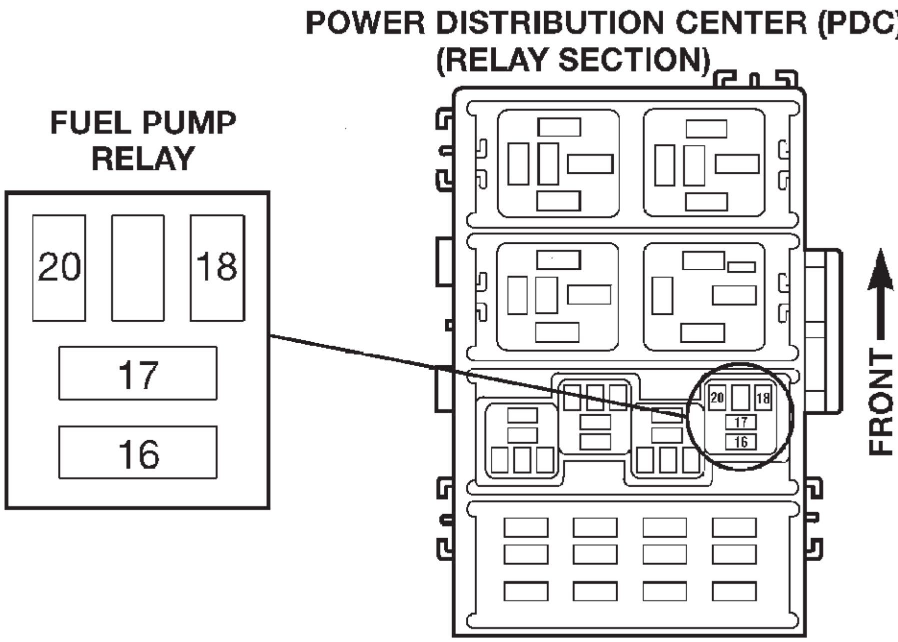


Perform Verification TEST VER-1A.** | ****Check connectors - Clean / repair as necessary.

TEST NS-5A CHECKING THE FUEL PUMP

Perform TEST NS-2A Before Proceeding

TJ BODY

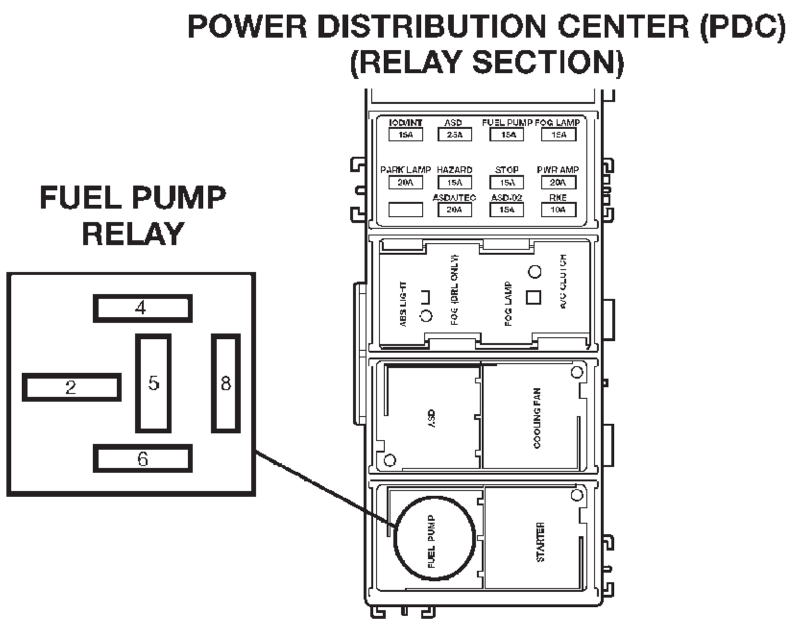


CAV	COLOR	FUNCTION
16(30)	DG/BK	FUSED B(+)
17(87)	DG/WT	FUEL PUMP RELAY OUTPUT
18(86)	DB	FUSED IGNITION SWITCH OUTPUT
20(85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e9

FIG. 1

XJ BODY



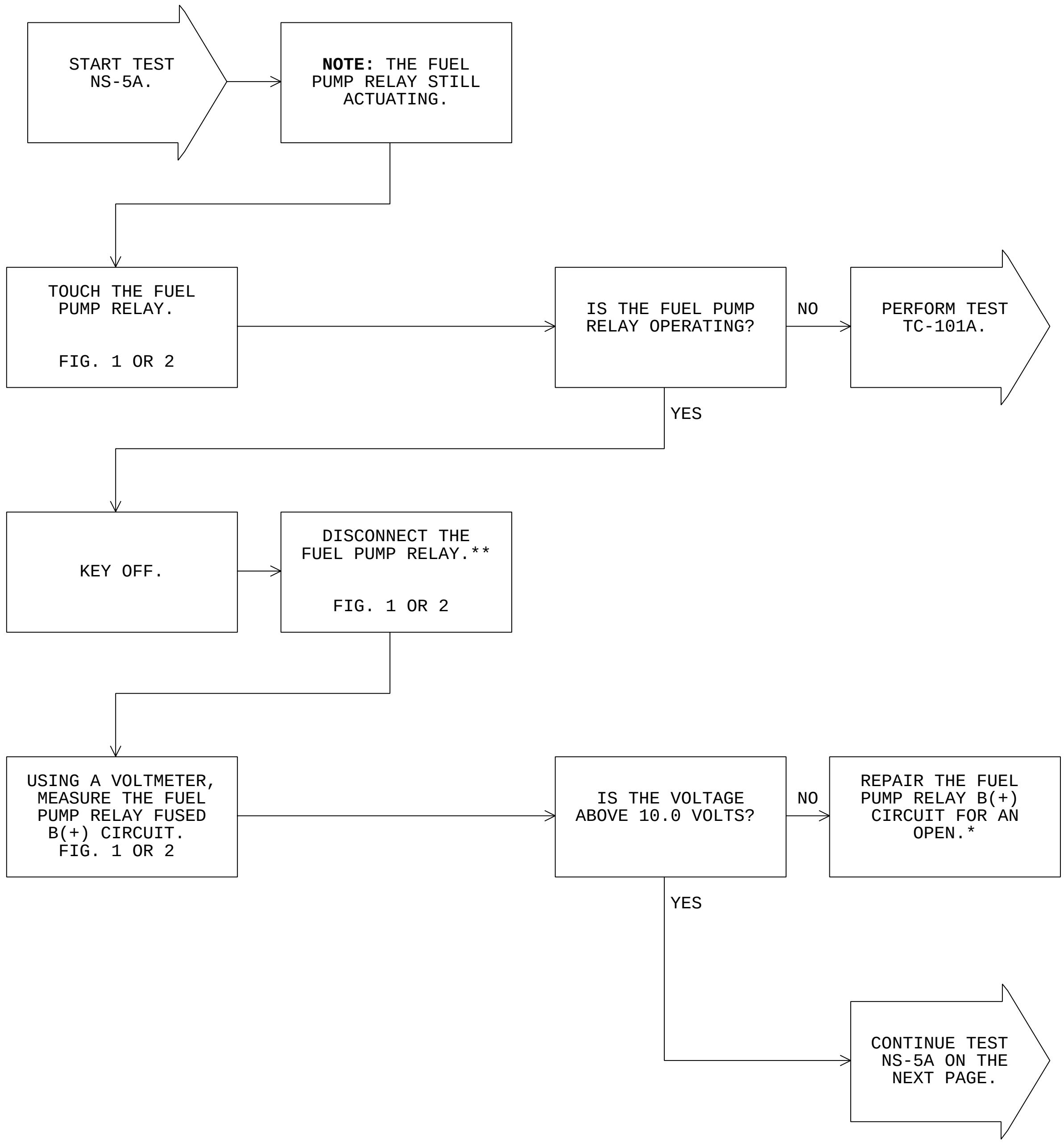
CAV	COLOR	FUNCTION
2 (30)	DG/BK	FUSED B(+)
8 (87)	DG/WT	FUEL PUMP RELAY OUTPUT
4 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e0

FIG. 2

TEST NS-5A CHECKING THE FUEL PUMP

Perform TEST NS-2A Before Proceeding

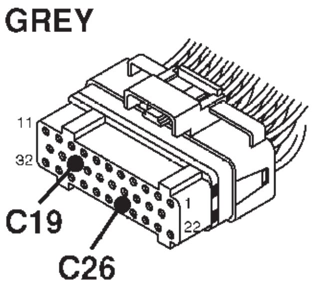


**Perform Verification TEST VER-1A.*

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

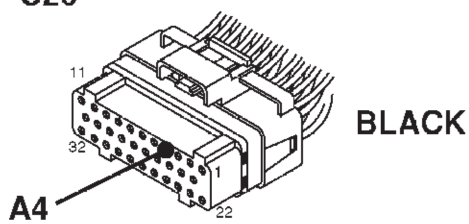
TEST NS-5A	CONTINUED - CHECKING THE FUEL PUMP

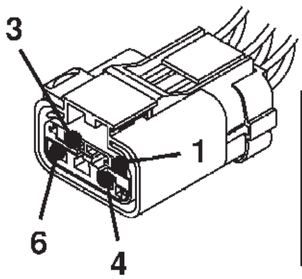
TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C19	BR	FUEL PUMP RELAY CONTROL
C26	DB/LG	FUEL LEVEL SENSOR SIGNAL





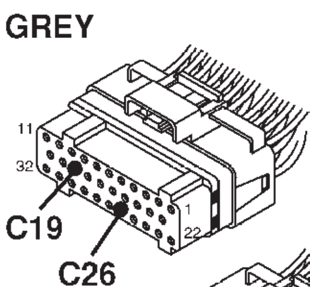
FUEL PUMP CONNECTOR

CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (GAUGE)
4	BR/YL	GROUND (GAUGE)
6	BK	GROUND (PUMP)

80b76eee

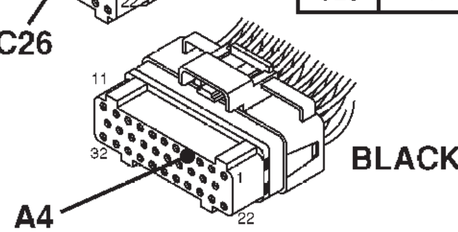
FIG. 1

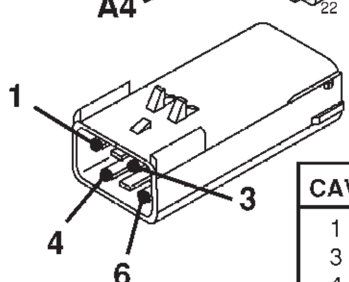
XJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTORS

CAV	COLOR	FUNCTION
A4	BR/YL	SENSOR GROUND
C19	BR	FUEL PUMP RELAY CONTROL
C26	DB/LG	FUEL LEVEL SENSOR SIGNAL





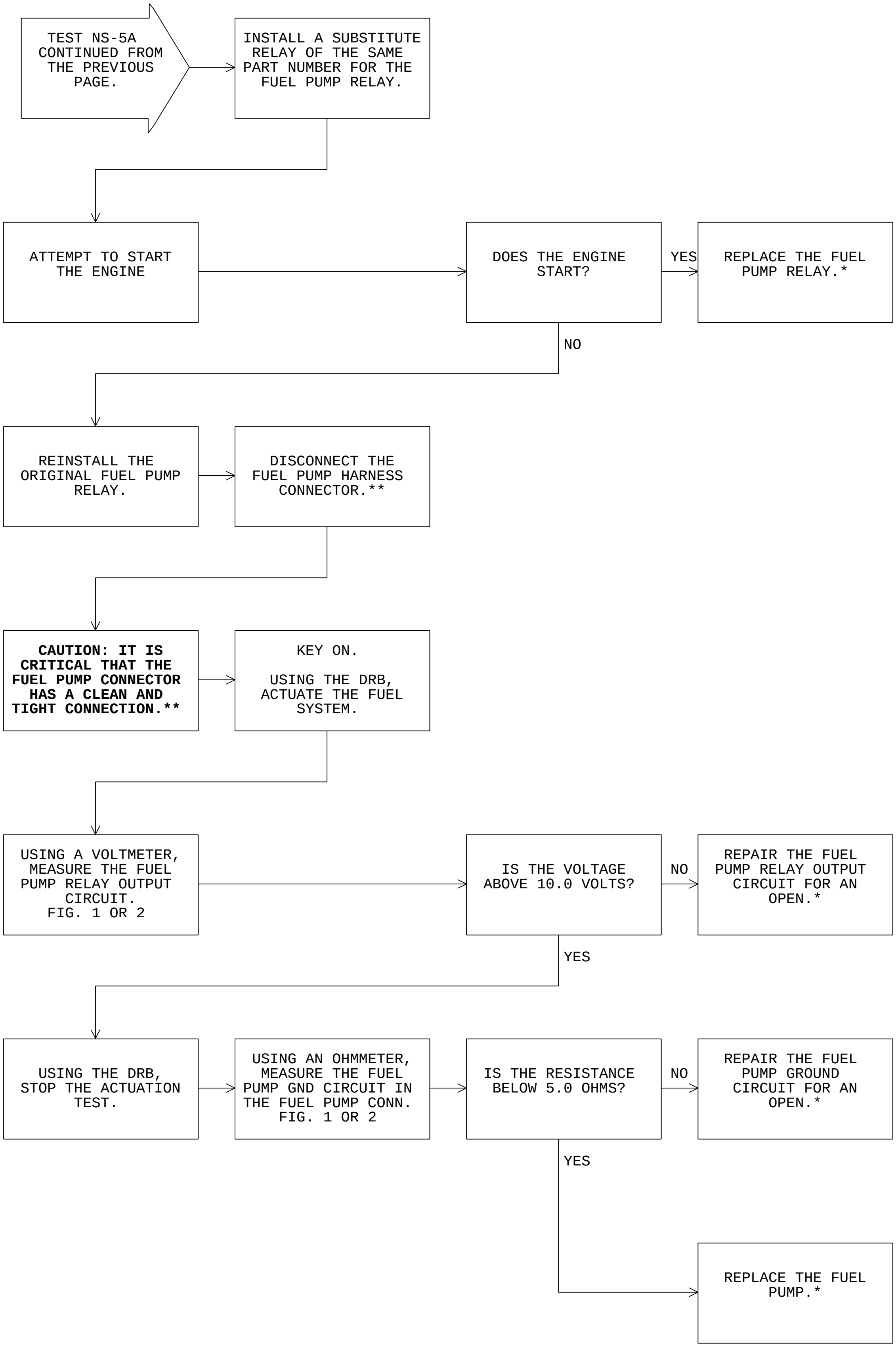
FUEL PUMP CONNECTOR

CAV	COLOR	FUNCTION
1	DG/WT	FUEL PUMP RELAY OUTPUT
3	DB/LG	FUEL LEVEL SENSOR SIGNAL (GAUGE)
4	BR/YL	GROUND (GAUGE)
6	BK	GROUND (PUMP)

80b76ef0

FIG. 2

TEST NS-5A CONTINUED - CHECKING THE FUEL PUMP

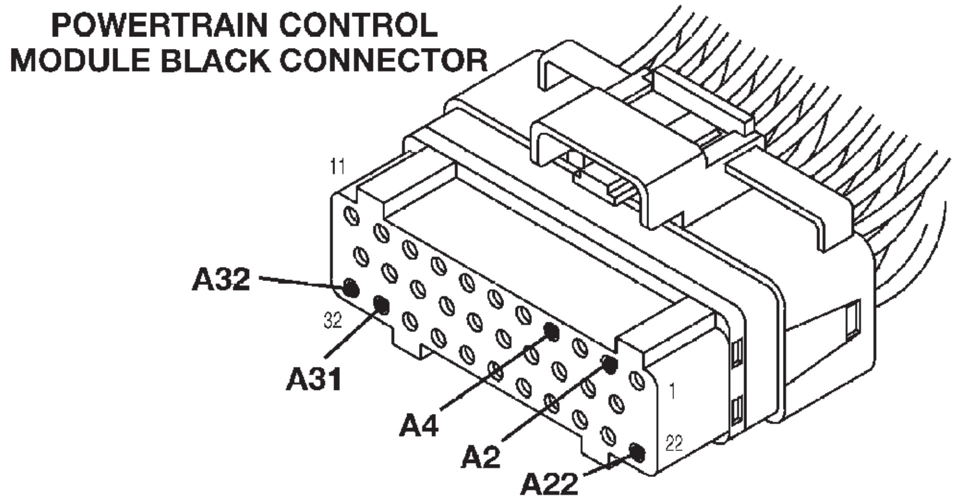


Perform Verification TEST VER-1A. | ****Check connectors - Clean / repair as necessary.***

TEST NS-6A	REPAIRING - NO RESPONSE CONDITION

Perform TEST NS-SEL Before Proceeding

TJ BODY

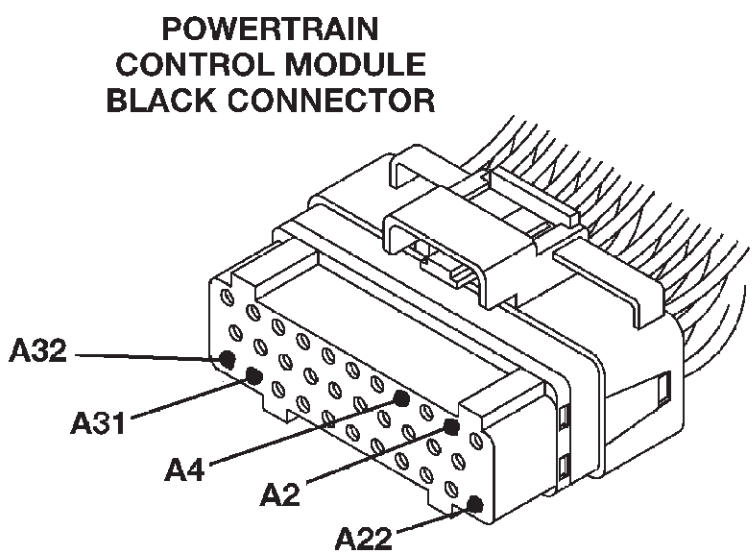


CAV	COLOR	FUNCTION
A2	DB	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	RD/WT	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80b76ef5

FIG. 1

XJ BODY



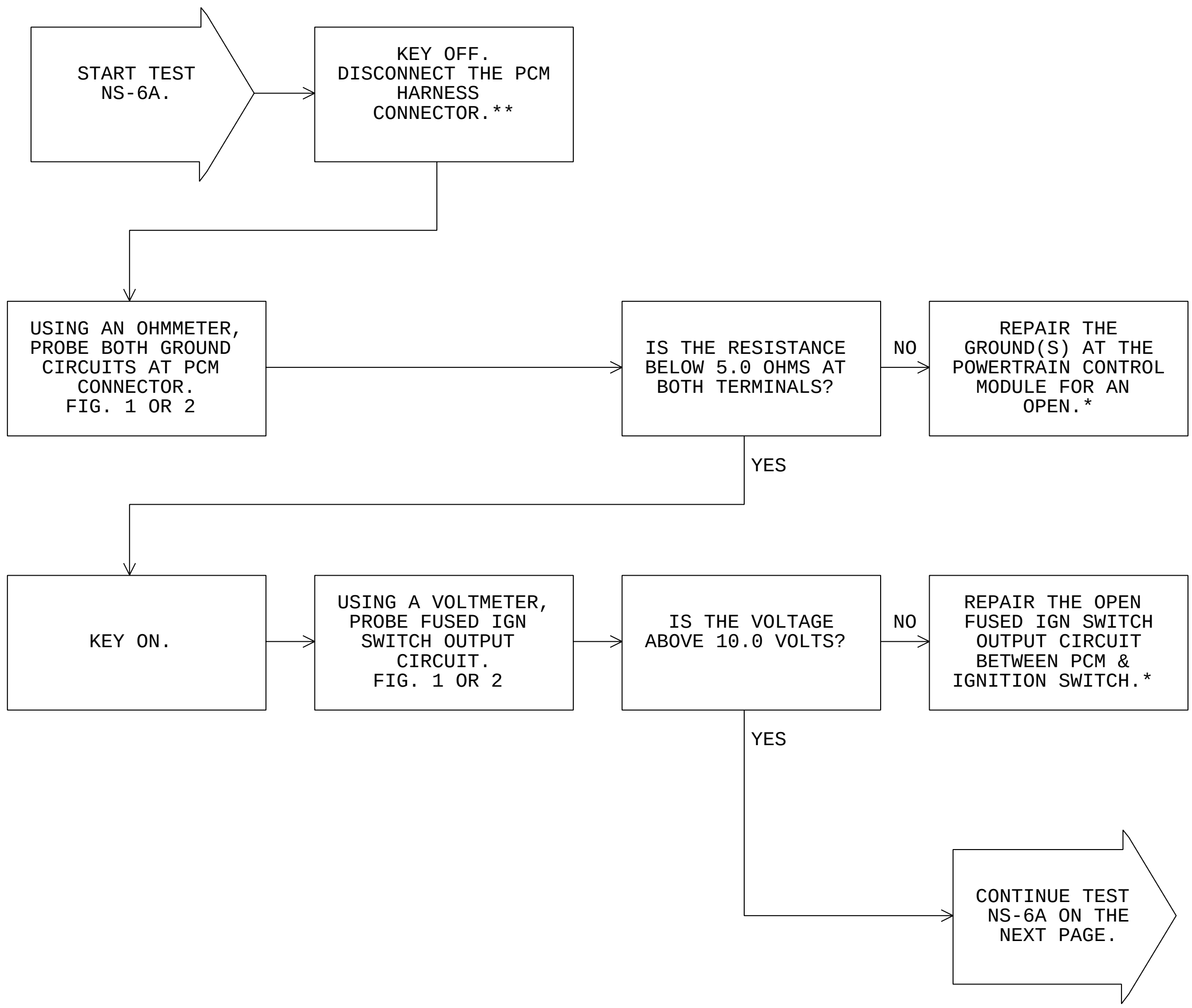
CAV	COLOR	FUNCTION
A2	DB/WT	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	DG/BK	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80aafae7

FIG. 2

TEST NS-6A | **REPAIRING - NO RESPONSE CONDITION**

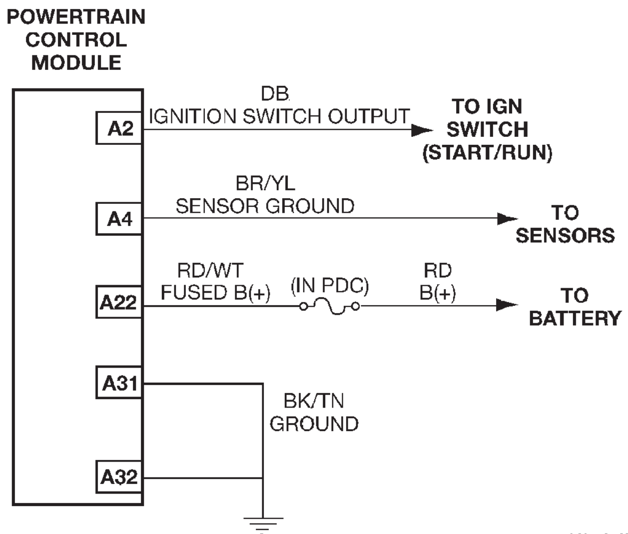
Perform TEST NS-SEL Before Proceeding



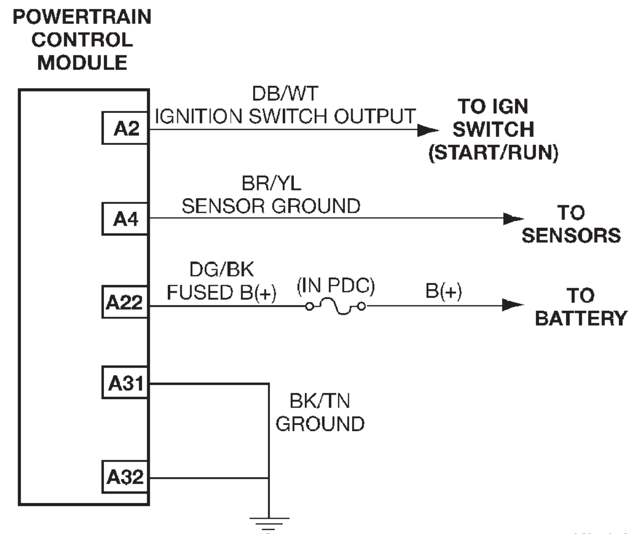
**Perform Verification TEST VER-1A.* | ***Check connectors - Clean / repair as necessary.*

TEST NS-6A — CONTINUED - REPAIRING - NO RESPONSE CONDITION

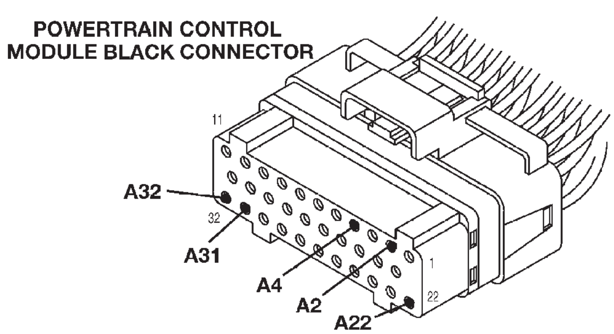
TJ BODY



XJ BODY



TJ BODY

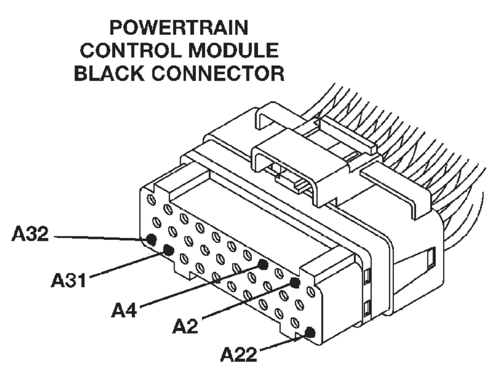


CAV	COLOR	FUNCTION
A2	DB	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	RD/WT	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80b76ef5

FIG. 1

XJ BODY

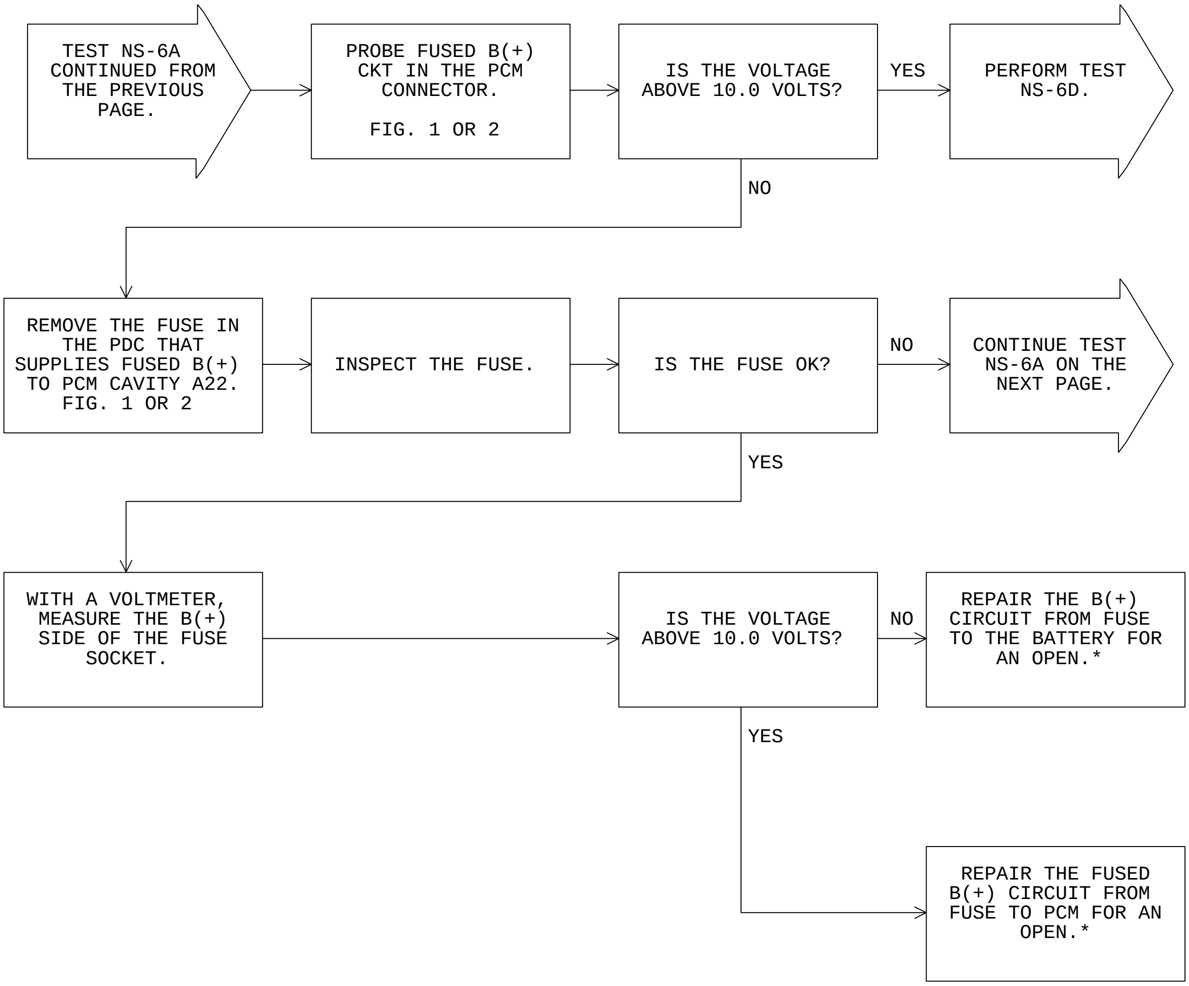


CAV	COLOR	FUNCTION
A2	DB/WT	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	DG/BK	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80aafae7

FIG. 2

TEST NS-6A CONTINUED - REPAIRING - NO RESPONSE CONDITION

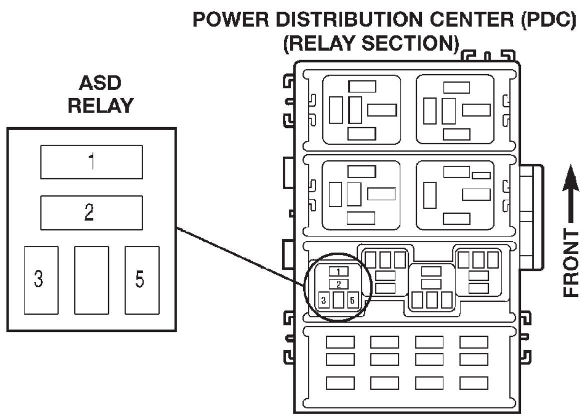


**Perform Verification TEST VER-1A.*

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

TEST NS-6A — CONTINUED - REPAIRING - NO RESPONSE CONDITION

TJ BODY

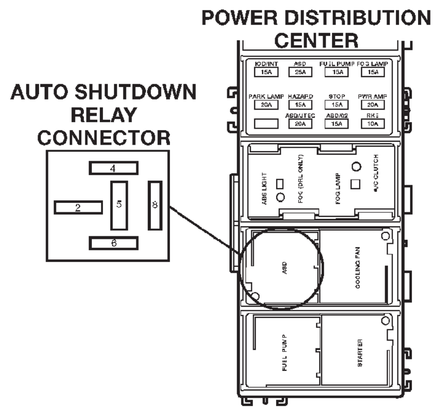


CAV	COLOR	FUNCTION
1(30)	RD/WT	FUSED B(+)
2(87)	DG/PK	AUTO SHUTDOWN RELAY OUTPUT
3(86)	DB	IGNITION SWITCH OUTPUT
5(85)	DB/YL	AUTO SHUTDOWN RELAY CONTROL

80b6f109

FIG. 1

XJ BODY

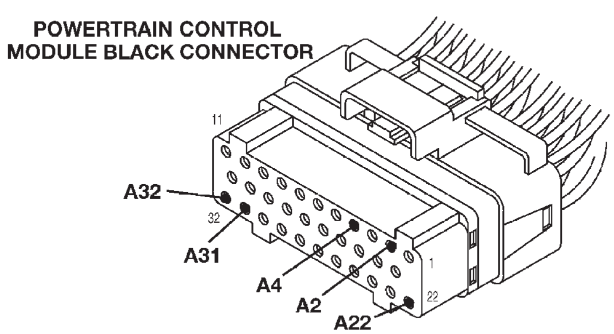


CAV	COLOR	FUNCTION
2 (30)	RD/LG	FUSED B(+)
4 (85)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (86)	DB/YL	ASD RELAY CONTROL
8 (87)	RD	ASD RELAY OUTPUT

80b6f0df

FIG. 2

TJ BODY

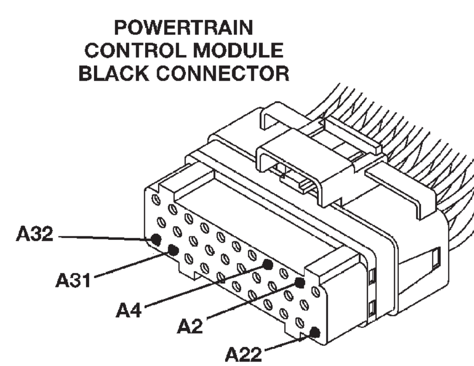


CAV	COLOR	FUNCTION
A2	DB	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	RD/WT	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80b76ef5

FIG. 3

XJ BODY

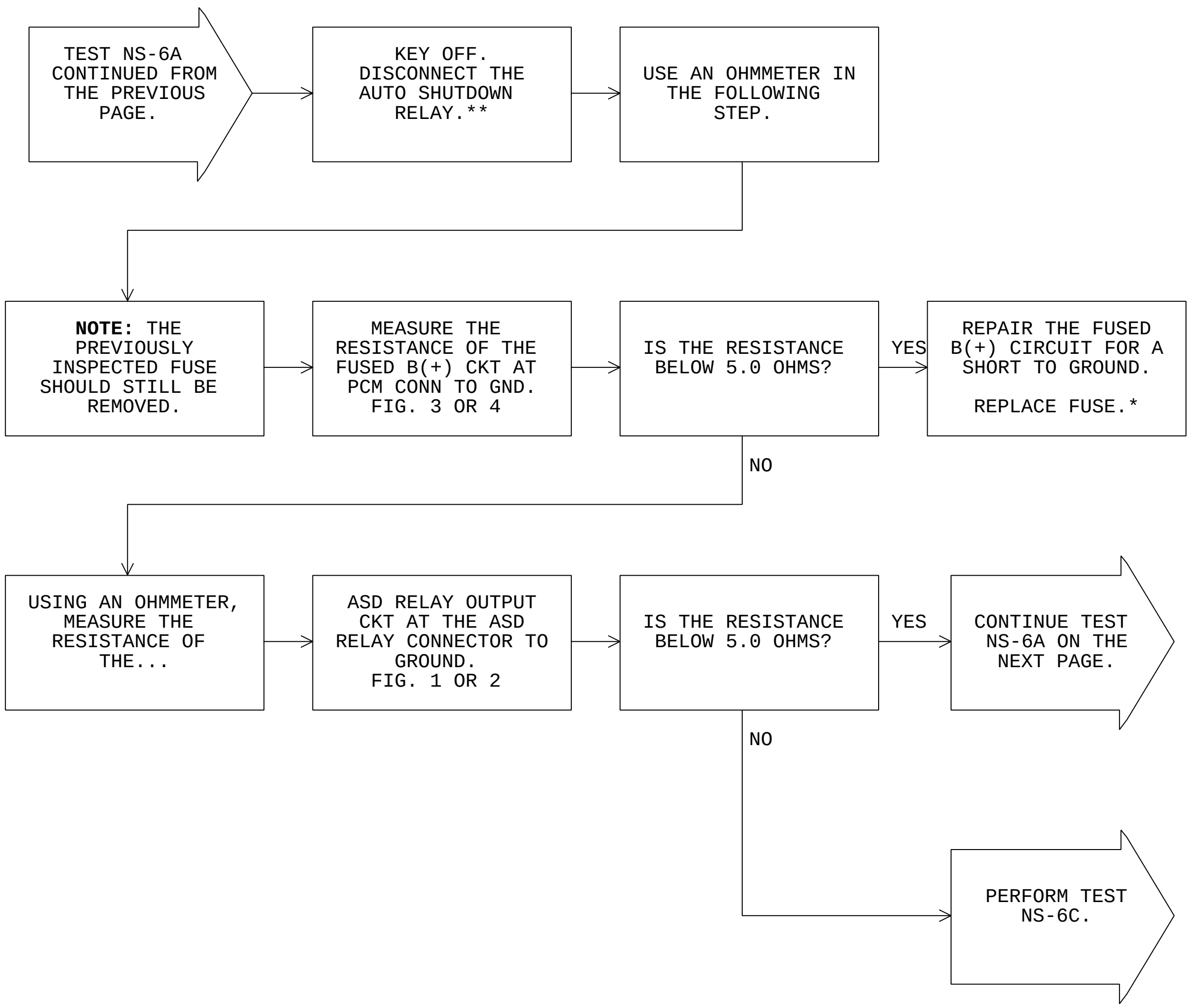


CAV	COLOR	FUNCTION
A2	DB/WT	IGNITION SWITCH OUTPUT
A4	BR/YL	SENSOR GROUND
A22	DG/BK	FUSED B(+)
A31	BK/TN	GROUND
A32	BK/TN	GROUND

80aafae7

FIG. 4

TEST NS-6A | **CONTINUED - REPAIRING - NO RESPONSE CONDITION**

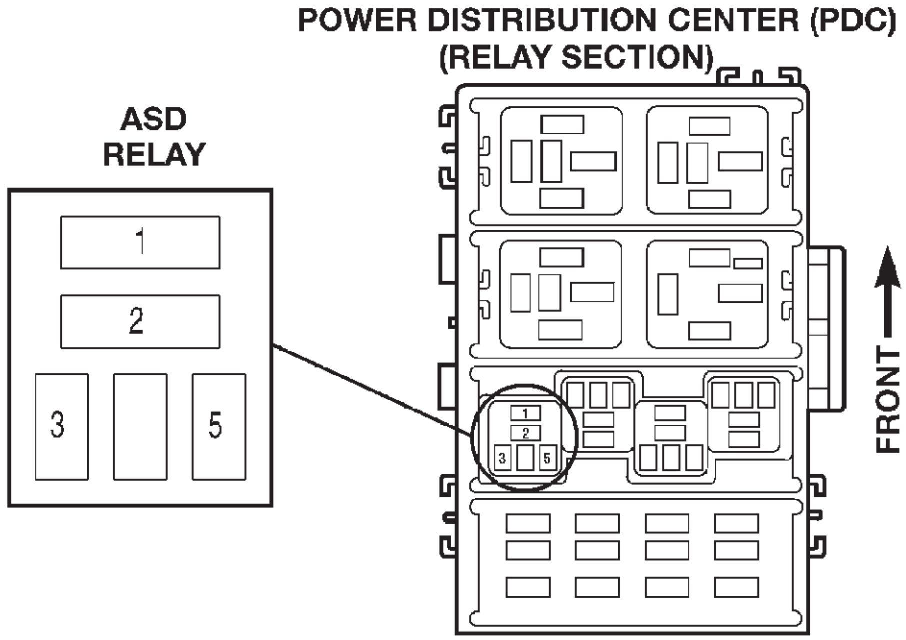


***Perform Verification TEST VER-1A.**

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

TEST NS-6A	CONTINUED - REPAIRING - NO RESPONSE CONDITION

TJ BODY

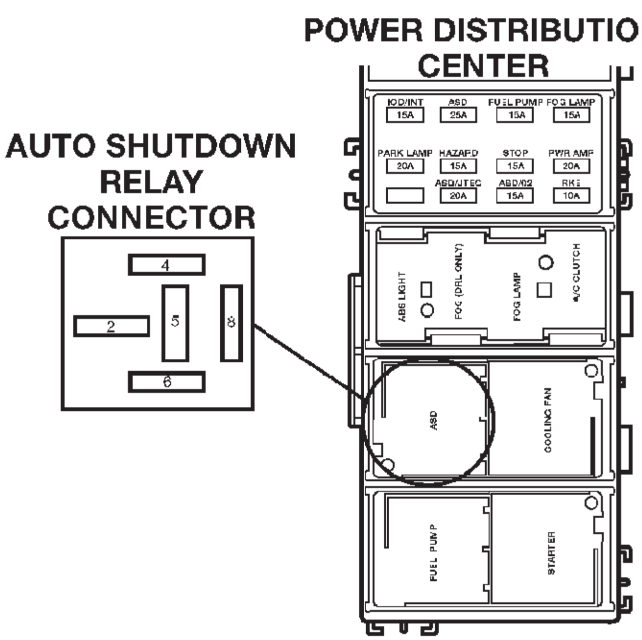


CAV	COLOR	FUNCTION
1(30)	RD/WT	FUSED B(+)
2(87)	DG/PK	AUTO SHUTDOWN RELAY OUTPUT
3(86)	DB	IGNITION SWITCH OUTPUT
5(85)	DB/YL	AUTO SHUTDOWN RELAY CONTROL

80b6f109

FIG. 1

XJ BODY

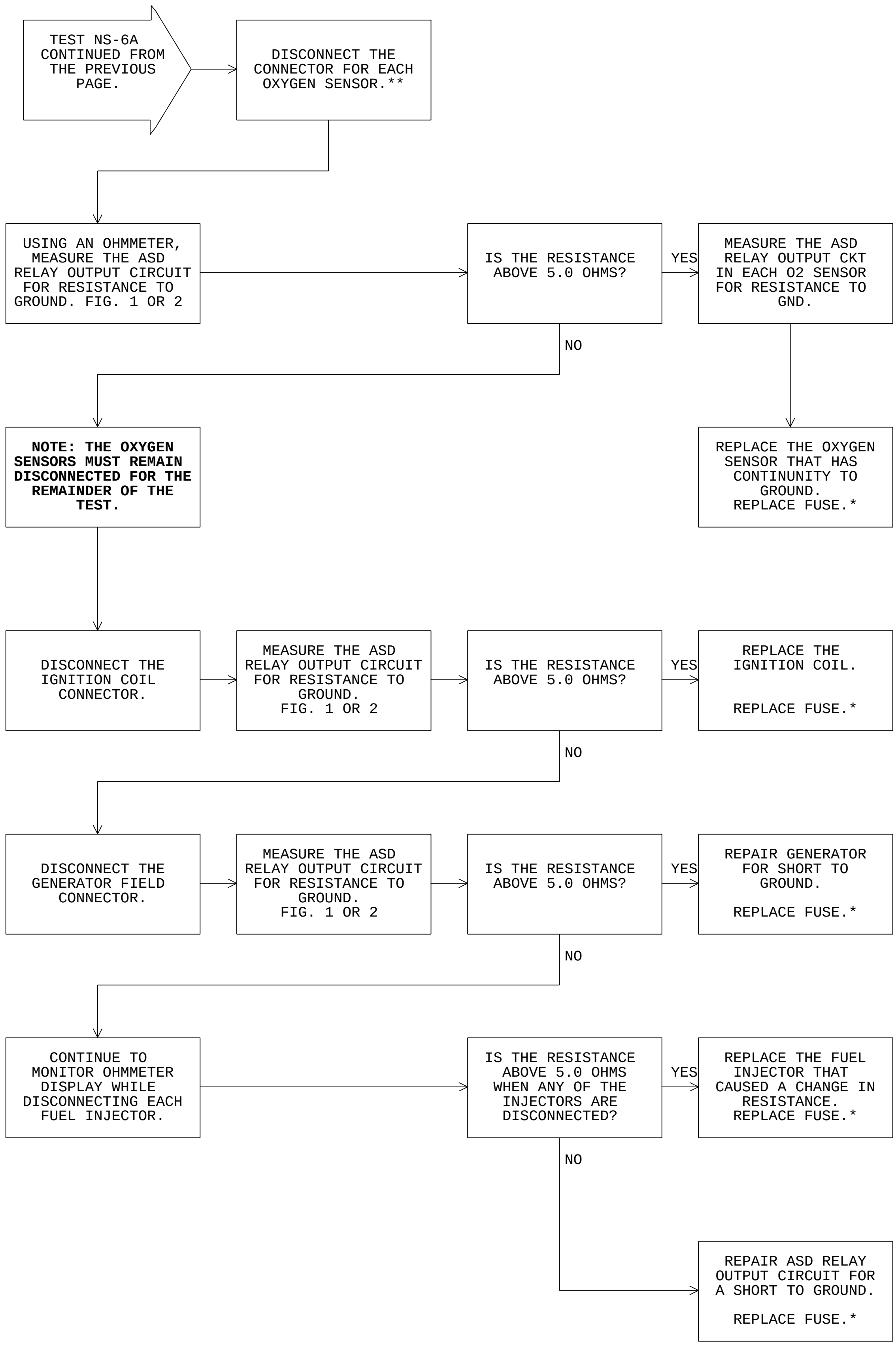


CAV	COLOR	FUNCTION
2 (30)	RD/LG	FUSED B(+)
4 (85)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (86)	DB/YL	ASD RELAY CONTROL
8 (87)	RD	ASD RELAY OUTPUT

80b6f0df

FIG. 2

TEST NS-6A CONTINUED - REPAIRING - NO RESPONSE CONDITION



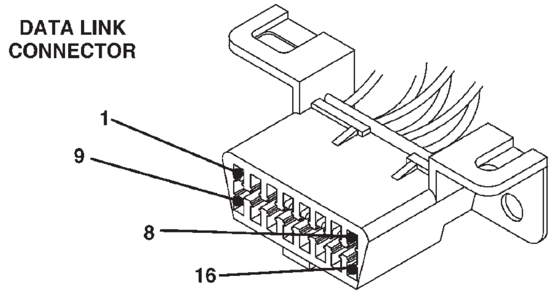
Perform Verification TEST VER-1A.

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

TEST NS-6B — REPAIRING - NO REPONSE CONDITION

Perform TEST NS-6A Before Proceeding

TJ BODY

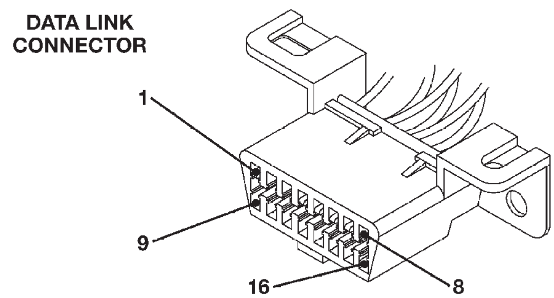


CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK/LB	GROUND
5	BK/TN	GROUND
6	LG	SCI RECEIVE
7	PK	SCI TRANSMIT/ISO 9141K
11	WT/BK	CCD BUS (-)
16	PK/WT	FUSED B(+)

80a4508e

FIG. 1

XJ BODY

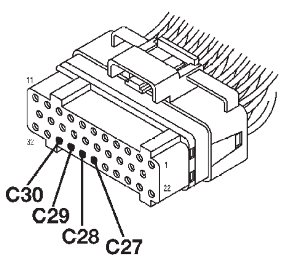


CAV	COLOR	FUNCTION
3	VT/BR	CCD Bus (+)
4	BK	Ground
5	BK/LB	Power Ground
6	LG/BK	SCI Receive
7	PK	SCI Transmit
11	WT/BK	CCD Bus (-)
16	TN/BK	Fused B (+)

80aa4c3a

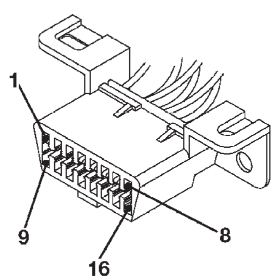
FIG. 2

TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C27	PK	SCI TRANSMIT
C28	WT/BK	CCD BUS (-)
C29	LG	SCI RECEIVE
C30	VT/BR	CCD BUS (+)



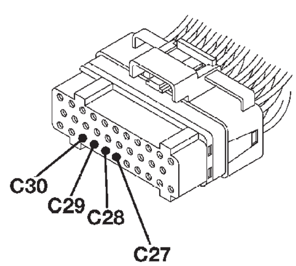
DATA LINK CONNECTOR

CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK/LB	GROUND
5	BK/TN	GROUND
6	LG	SCI RECEIVE
7	PK	SCI TRANSMIT
11	WT/BK	CCD BUS (-)
16	PK/WT	FUSED B (+)

80aaf128

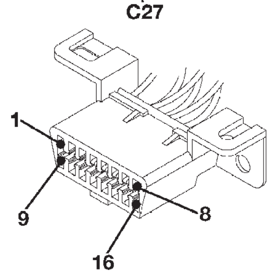
FIG. 3

XJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C27	PK	SCI TRANSMIT
C28	WT/BK	CCD BUS (-)
C29	LG/BK	SCI RECEIVE
C30	VT/BR	CCD BUS (+)



DATA LINK CONNECTOR

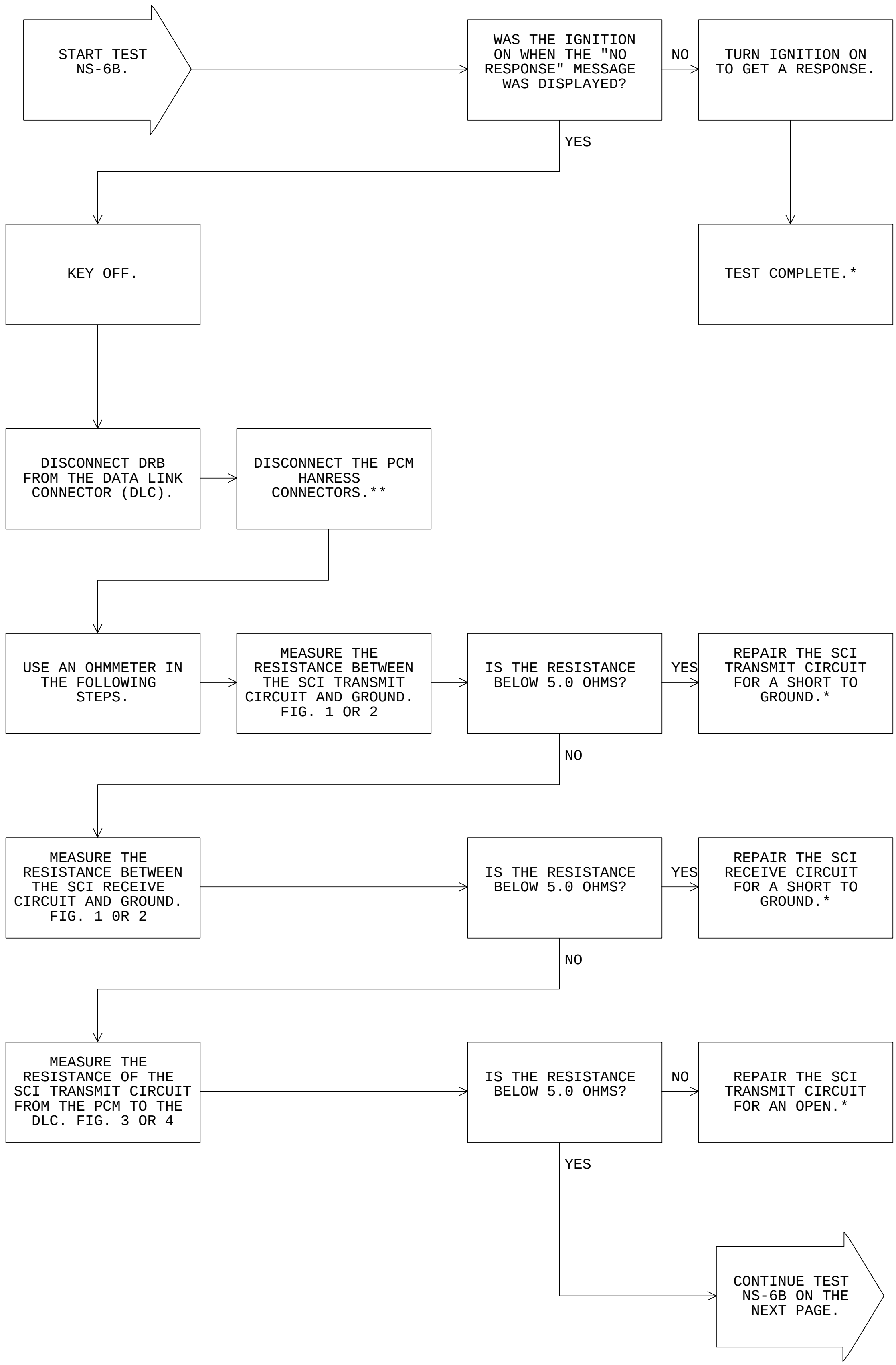
CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK	GROUND
5	BK/LB	POWER GROUND
6	LG/BK	SCI RECEIVE
7	PK	SCI TRANSMIT
11	WT/BK	CCD BUS (-)
16	TN/BK	FUSED B (+)

80aafaf2

FIG. 4

TEST NS-6B | **REPAIRING - NO REPONSE CONDITION**

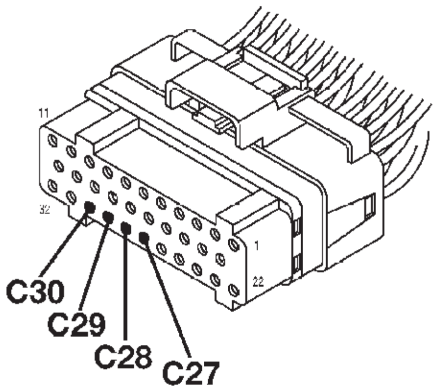
Perform TEST NS-6A Before Proceeding



Perform Verification TEST VER-1A. | *****Check connectors - Clean / repair as necessary.***

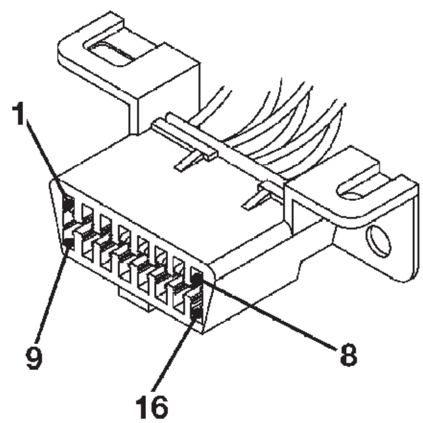
TEST NS-6B — CONTINUED - REPAIRING - NO RESPONSE CONDITION

TJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C27	PK	SCI TRANSMIT
C28	WT/BK	CCD BUS (-)
C29	LG	SCI RECEIVE
C30	VT/BR	CCD BUS (+)



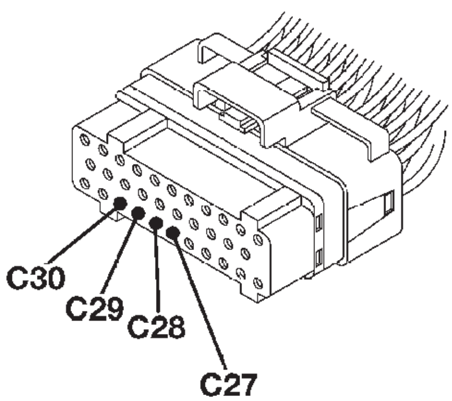
DATA LINK CONNECTOR

CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK/LB	GROUND
5	BK/TN	GROUND
6	LG	SCI RECEIVE
7	PK	SCI TRANSMIT
11	WT/BK	CCD BUS (-)
16	PK/WT	FUSED B (+)

80aaf128

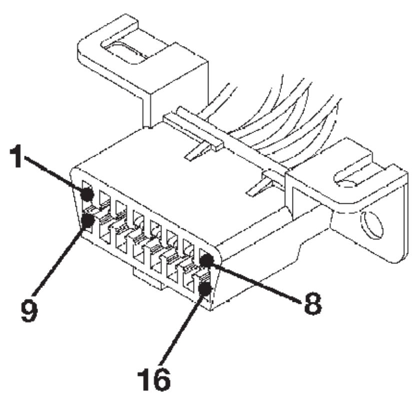
FIG. 1

XJ BODY



POWERTRAIN CONTROL MODULE GREY CONNECTOR

CAV	COLOR	FUNCTION
C27	PK	SCI TRANSMIT
C28	WT/BK	CCD BUS (-)
C29	LG/BK	SCI RECEIVE
C30	VT/BR	CCD BUS (+)



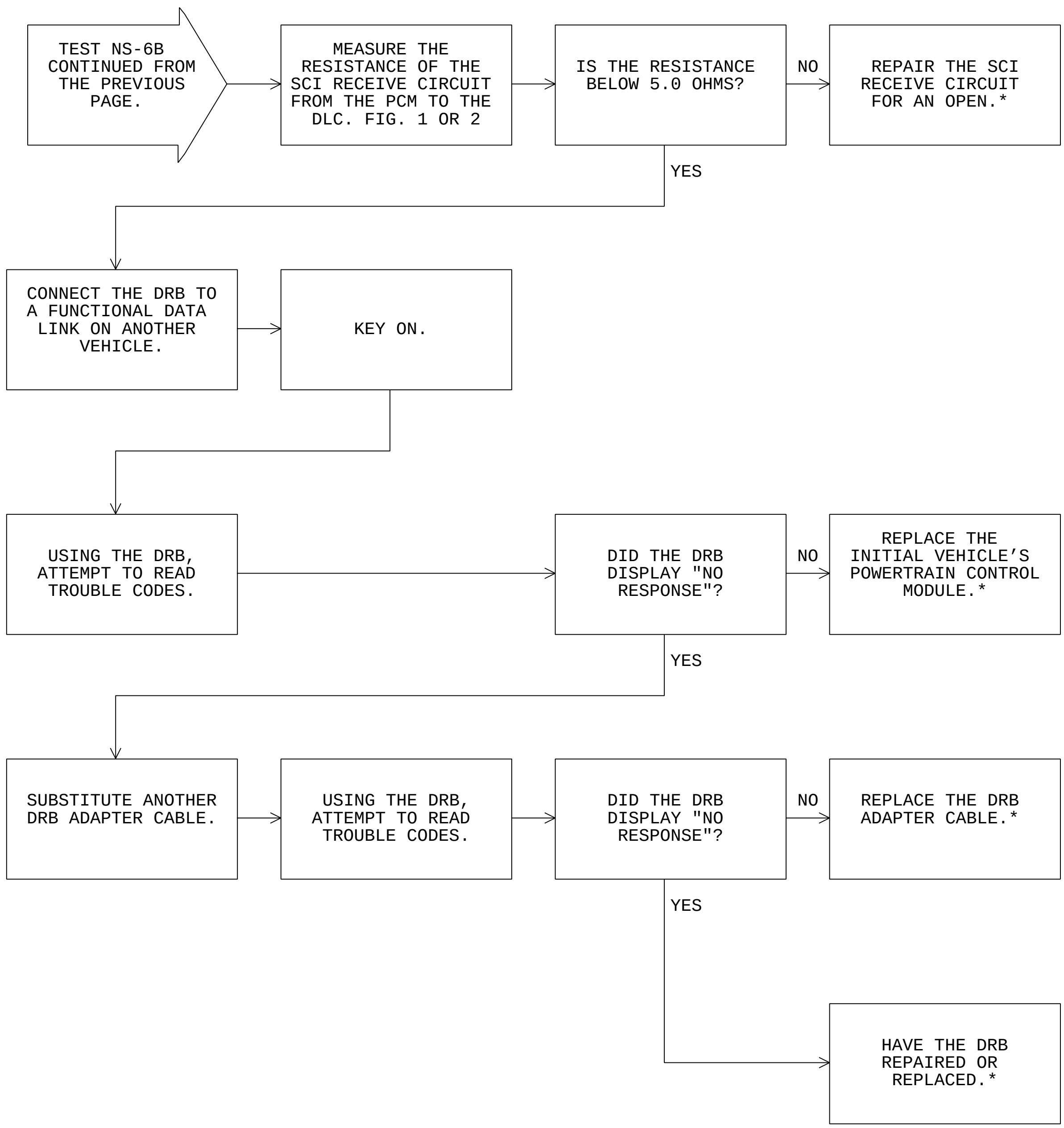
DATA LINK CONNECTOR

CAV	COLOR	FUNCTION
3	VT/BR	CCD BUS (+)
4	BK	GROUND
5	BK/LB	POWER GROUND
6	LG/BK	SCI RECEIVE
7	PK	SCI TRANSMIT
11	WT/BK	CCD BUS (-)
16	TN/BK	FUSED B (+)

80aafaf2

FIG. 2

TEST NS-6B — CONTINUED - REPAIRING - NO RESPONSE CONDITION



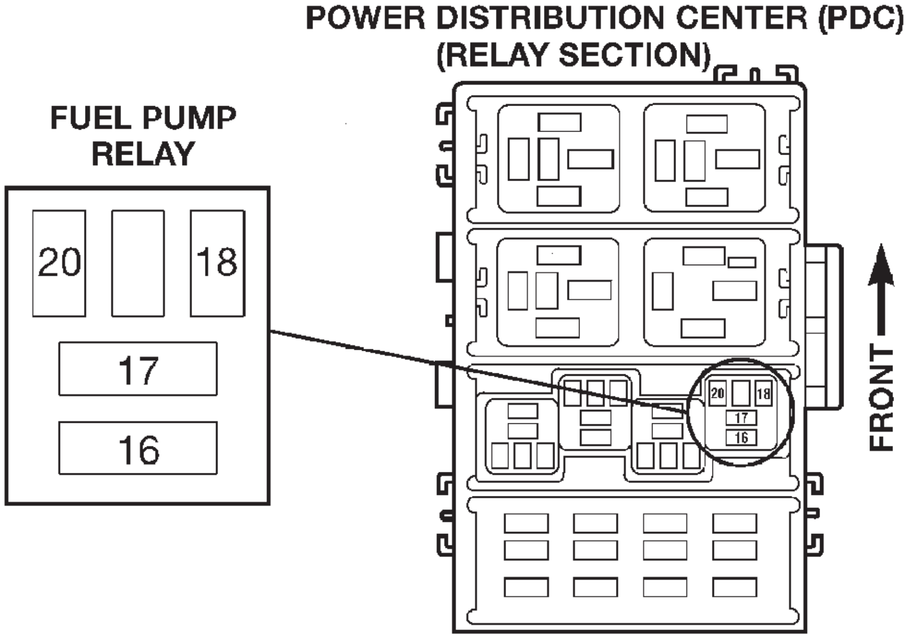
**Perform Verification TEST VER-1A.*

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

TEST NS-6C	REPAIRING - NO RESPONSE CONDITION

Perform TEST NS-6A Before Proceeding

TJ BODY

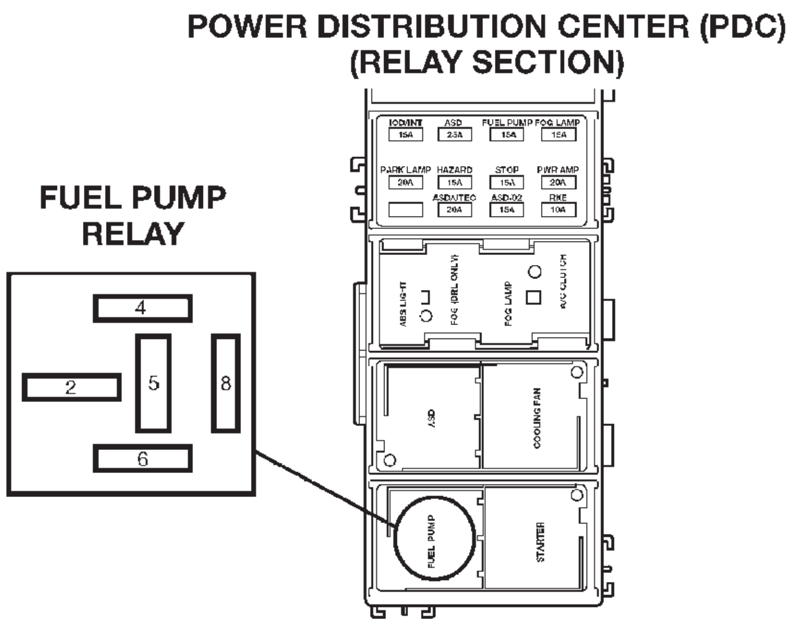


CAV	COLOR	FUNCTION
16(30)	DG/BK	FUSED B(+)
17(87)	DG/WT	FUEL PUMP RELAY OUTPUT
18(86)	DB	FUSED IGNITION SWITCH OUTPUT
20(85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e9

FIG. 1

XJ BODY



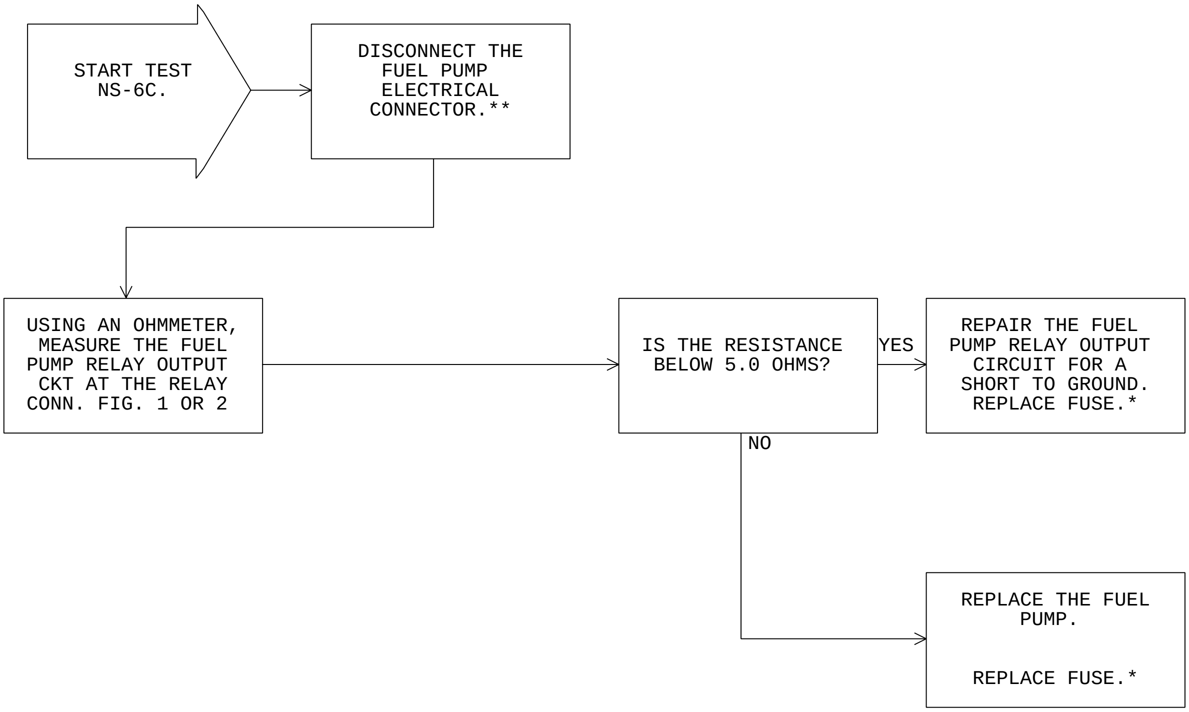
CAV	COLOR	FUNCTION
2 (30)	DG/BK	FUSED B(+)
8 (87)	DG/WT	FUEL PUMP RELAY OUTPUT
4 (86)	DB/WT	FUSED IGNITION SWITCH OUTPUT
6 (85)	BR	FUEL PUMP RELAY CONTROL

80b6f0e0

FIG. 2

TEST NS-6C REPAIRING - NO RESPONSE CONDITION

Perform TEST NS-6A Before Proceeding

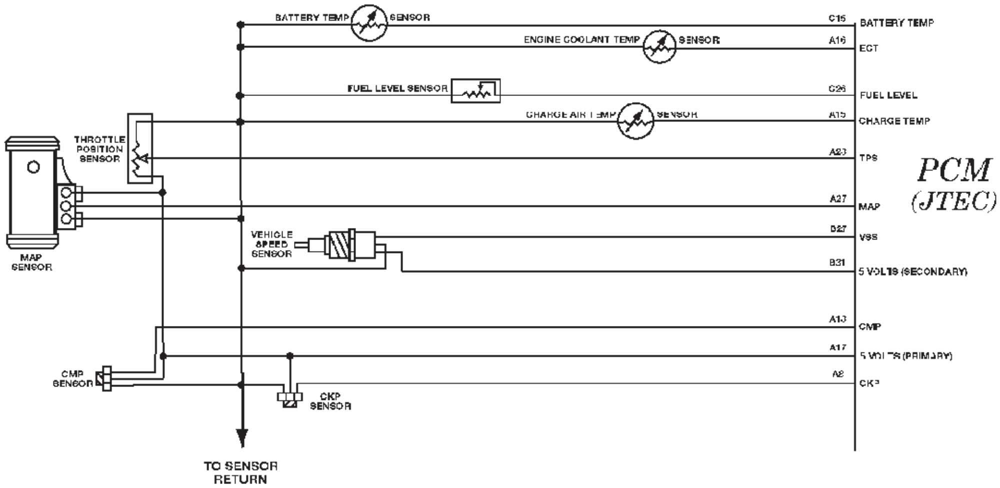


Perform Verification TEST VER-1A.	***Check connectors - Clean / repair as necessary.*

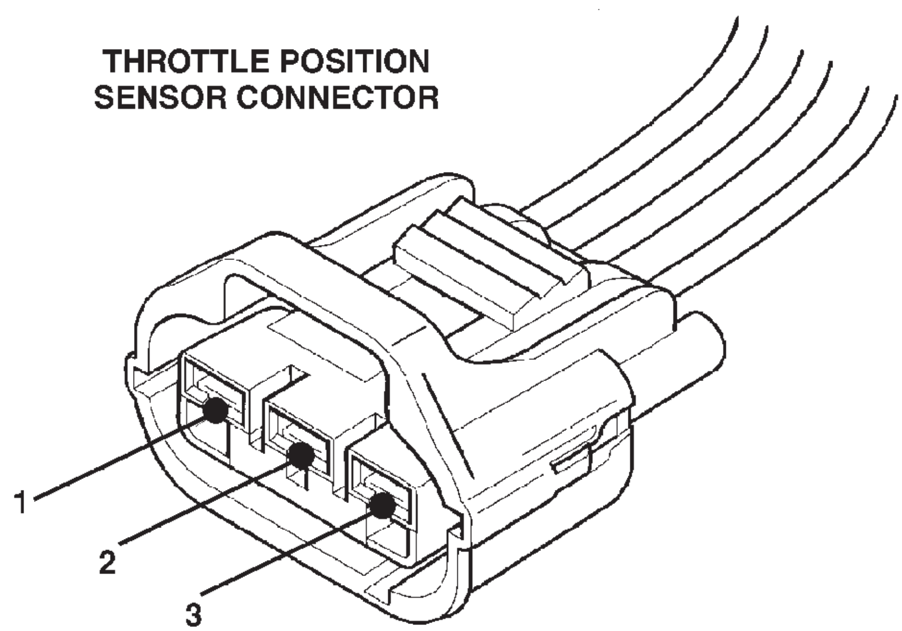
TEST NS-6D — REPAIRING - NO RESPONSE CONDITION

Perform TEST NS-6A Before Proceeding

TJ/XJ BODY



TJ/XJ BODY



CAV	COLOR	FUNCTION
1	BR/YL	SENSOR GROUND
2	OR/DB	TP SENSOR SIGNAL
3	OR	5-VOLT SUPPLY

80b6f0e7

FIG. 1

TEST NS-6D | **REPAIRING - NO RESPONSE CONDITION**

Perform TEST NS-6A Before Proceeding

START TEST NS-6D.

RECONNECT ALL DISCONNECTED CONNECTORS.

DISCONNECT THE THROTTLE POSITION SENSOR.**

KEY ON.

CONNECT A VOLTMETER TO THE...

THROTTLE POSITION SENSOR 5 VOLT SUPPLY CIRCUIT.

FIG. 1

IS THE VOLTAGE BELOW 4.0 VOLTS?

NO

REPLACE THE POWERTRAIN CONTROL MODULE.*

YES

DISCONNECT THE CAMSHAFT SENSOR.**

READ VOLTMETER.

IS THE VOLTAGE BELOW 4.0 VOLTS?

NO

REPLACE THE CAMSHAFT SENSOR.*

YES

DISCONNECT THE CRANKSHAFT SENSOR.**

READ VOLTMETER.

IS THE VOLTAGE BELOW 4.0 VOLTS?

NO

REPLACE THE CRANKSHAFT SENSOR.*

YES

DISCONNECT THE MAP SENSOR.**

READ VOLTMETER.

IS THE VOLTAGE BELOW 4.0 VOLTS?

NO

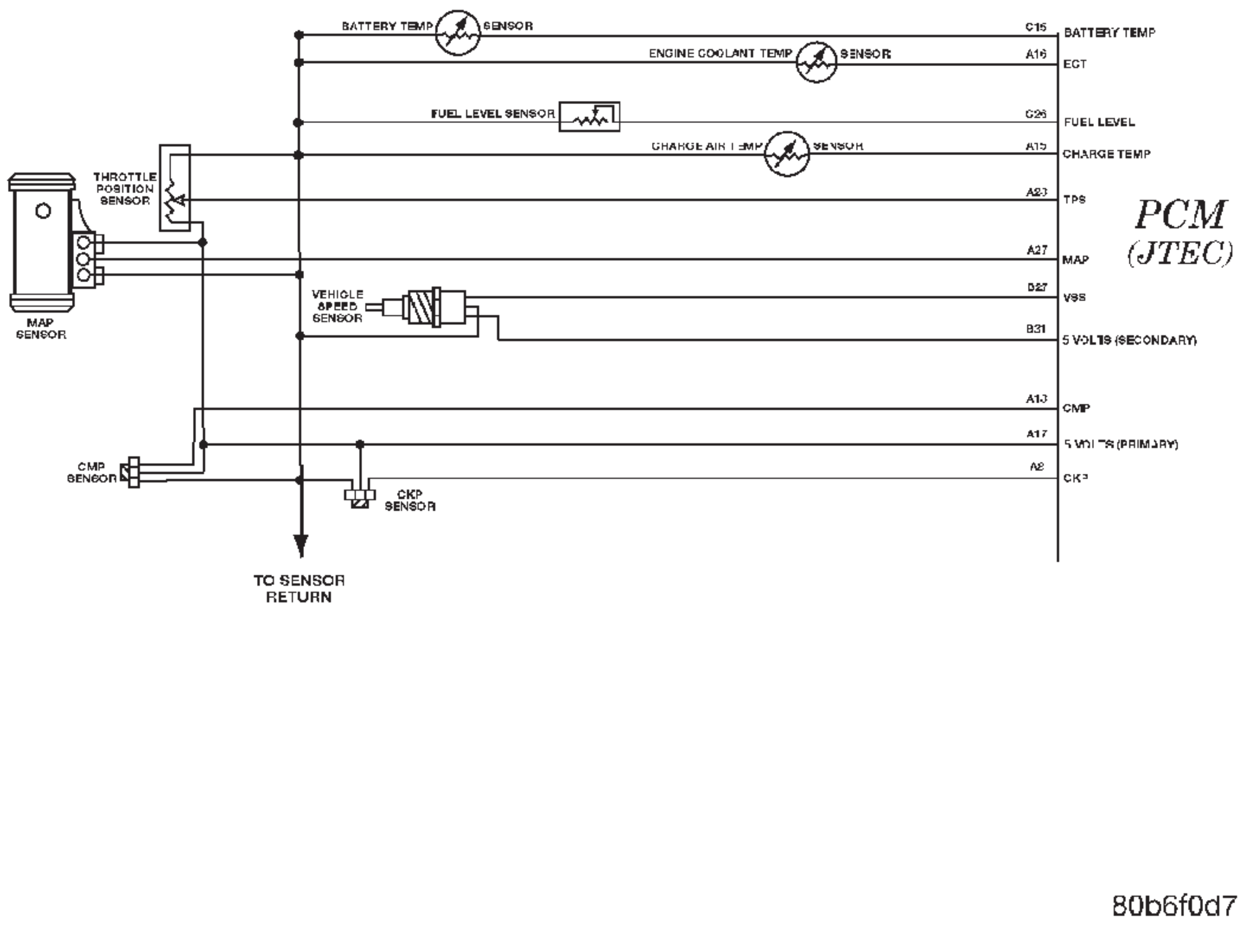
REPLACE THE MAP SENSOR.*

YES

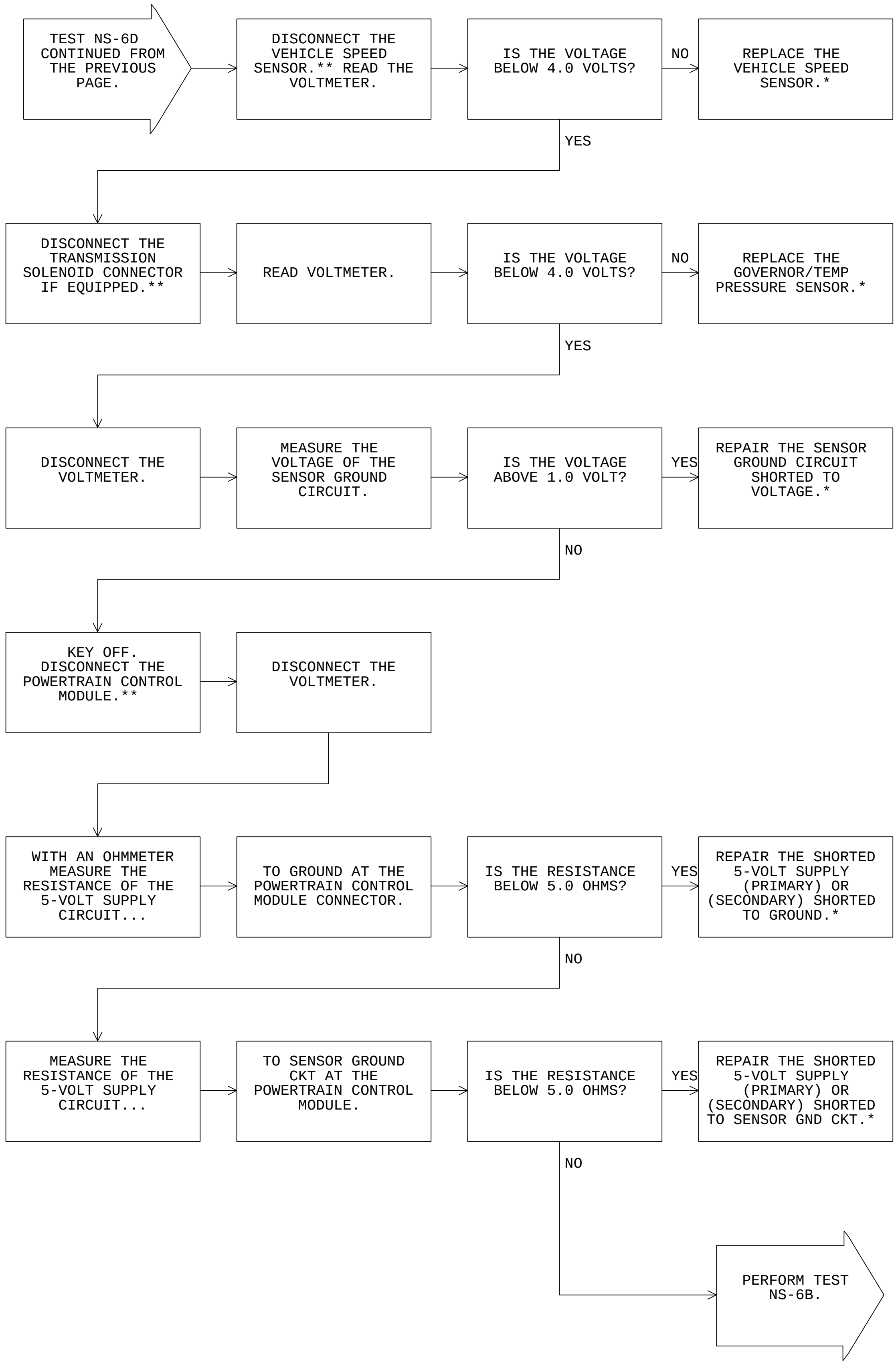
CONTINUE TEST NS-6D ON THE NEXT PAGE.

Perform Verification TEST VER-1A.** | ****Check connectors - Clean / repair as necessary.

TEST NS-6D	CONTINUED - REPAIRING - NO RESPONSE CONDITION



TEST NS-6D — CONTINUED - REPAIRING - NO RESPONSE CONDITION



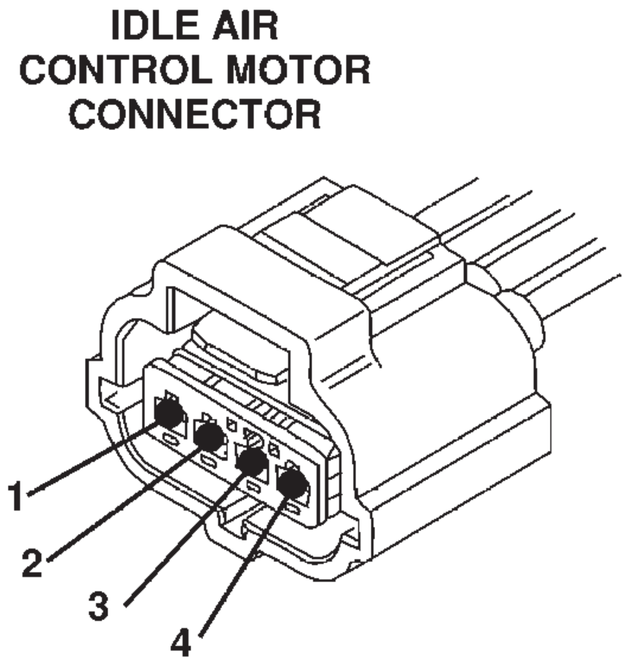
Perform Verification TEST VER-1A.

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

TEST NS-7A	CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-SEL Before Proceeding

TJ/XJ BODY



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

80b898b2

FIG. 1

TEST NS-7A — CHECKING THE IDLE AIR CONTROL MOTOR

Perform TEST NS-SEL Before Proceeding

1. START TEST NS-7A.
2. IS THERE A IAC MOTOR DTC?
   - YES → PERFORM TEST TC-25A.
   - NO → continue.
3. HOLD THE ENGINE THROTTLE 1/4 OF THE WAY DOWN AND ATTEMPT TO START ENGINE.
4. DOES THE ENGINE START AND STAY RUNNING AND THEN STALL WHEN THROTTLE IS RELEASED?
   - NO → PERFORM TEST NS-8A.
   - YES → continue.
5. DISCONNECT THE IDLE AIR CONTROL MOTOR CONNECTOR.
6. WITH DRB, ACTUATE THE IDLE AIR CONTROL MOTOR.
7. PUT A VOLTMETER.
8. MEASURE THE IDLE AIR CONTROL #1 DRIVER CKT. FIG. 1
9. DID THE VOLTAGE STAY BELOW 1.0 VOLT?
   - YES → PERFORM TEST TC-25B.
   - NO → continue.
10. MEASURE THE IDLE AIR CONTROL #2 DRIVER CKT. FIG. 1
11. DID THE VOLTAGE STAY BELOW 1.0 VOLT?
    - YES → PERFORM TEST TC-25C.
    - NO → continue.
12. MEASURE THE IDLE AIR CONTROL #3 DRIVER CKT. FIG. 1
13. DID THE VOLTAGE STAY BELOW 1.0 VOLT?
    - YES → PERFORM TEST TC-25D.
    - NO → continue.
14. MEASURE THE IDLE AIR CONTROL #4 DRIVER CKT. FIG. 1
15. DID THE VOLTAGE STAY BELOW 1.0 VOLT?
    - YES → PERFORM TEST TC-25E.
    - NO → CONTINUE TEST NS-7A ON THE NEXT PAGE.

Perform Verification TEST VER-1A.** | ****Check connectors - Clean / repair as necessary.

TEST NS-7A	CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR

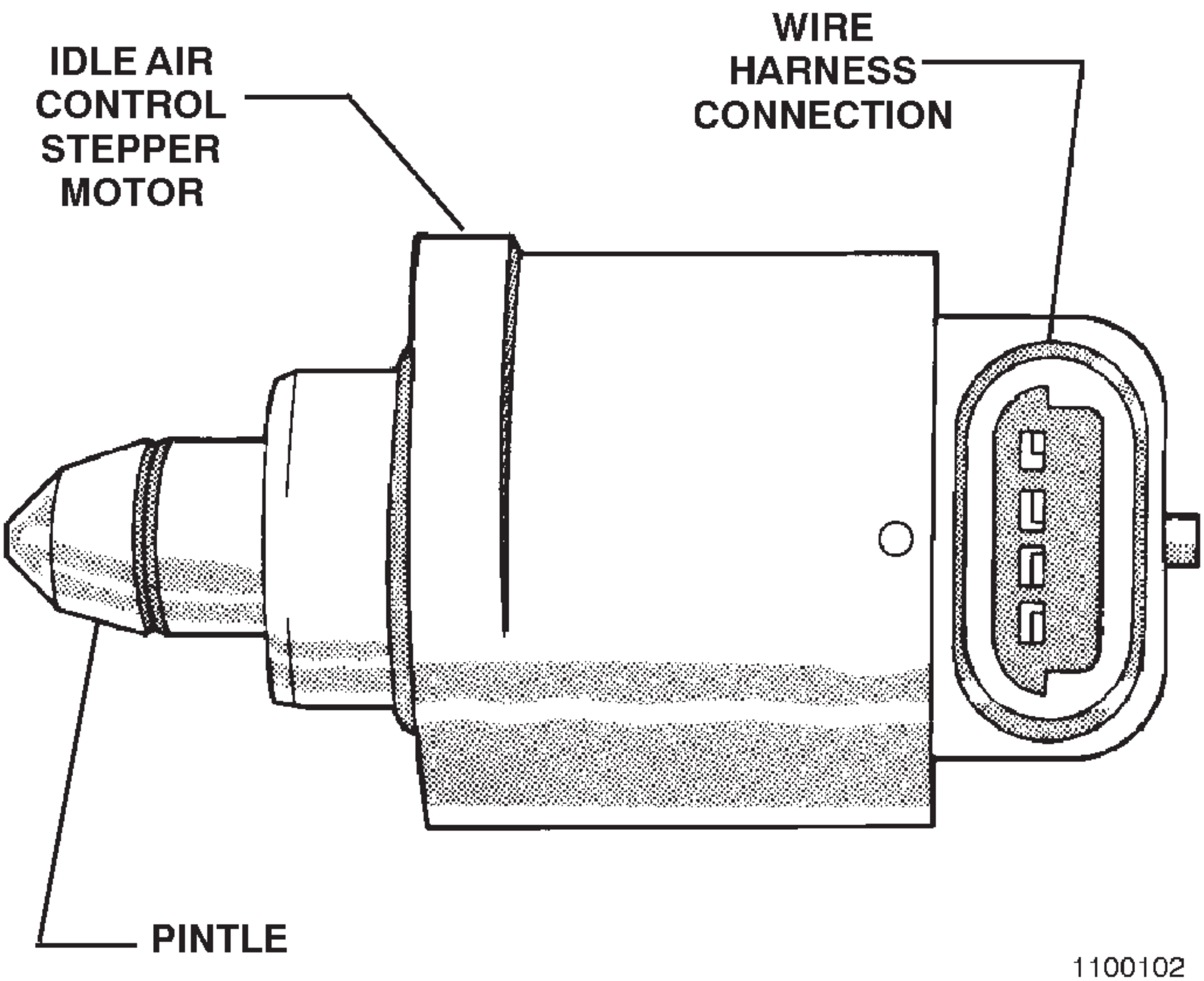
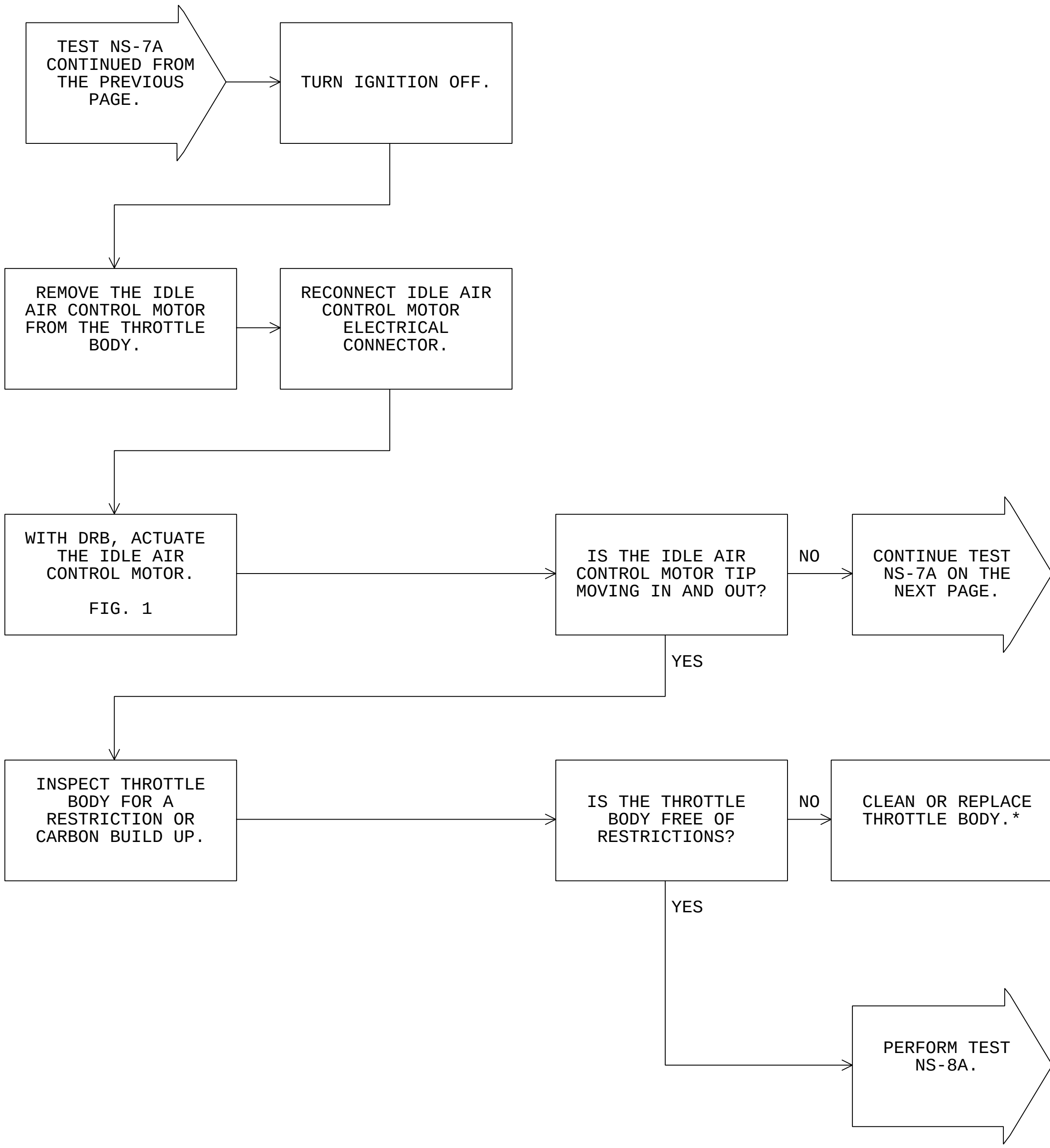


FIG. 1

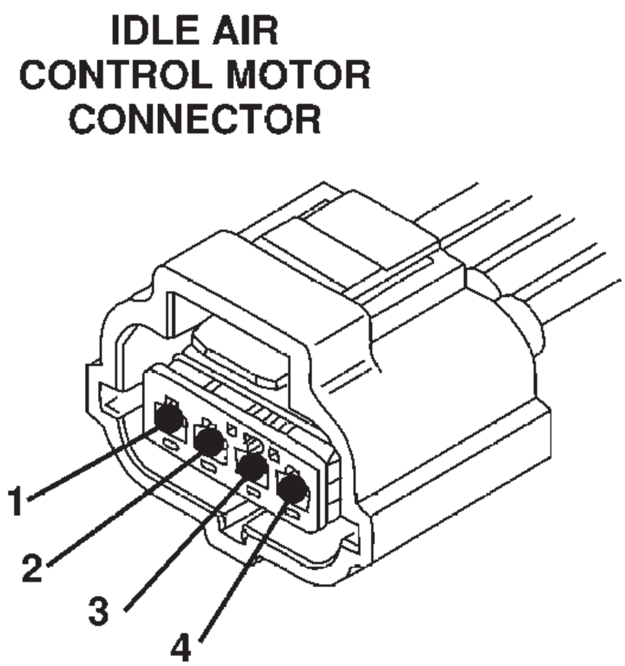
TEST NS-7A — CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR



Perform Verification TEST VER-1A. | *****Check connectors - Clean / repair as necessary.***

TEST NS-7A	CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR

TJ/XJ BODY



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

80b898b2

FIG. 1

TEST NS-7A — CONTINUED - CHECKING THE IDLE AIR CONTROL MOTOR

TEST NS-7A CONTINUED FROM THE PREVIOUS PAGE.

→ KEY OFF, DISCONNECT THE POWERTRAIN CONTROL MODULE.**

→ 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 → 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 → 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 IDLE AIR CONTROL MOTOR.*

Perform Verification TEST VER-1A.

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

TEST NS-8A	REPAIRING A START AND STALL CONDITION

Perform TEST NS-SEL Before Proceeding

NOTES

TEST NS-8A	REPAIRING A START AND STALL CONDITION

Perform TEST NS-SEL 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. **DISTRIBUTOR POSITION** — must be within specifications*
2. **ENGINE VALVE TIMING** — must be within specifications
3. **ENGINE COMPRESSION** — must be within specifications
4. **ENGINE EXHAUST** — must be free of any restrictions
5. **ENGINE PCV SYSTEM** — must flow freely
6. **ENGINE DRIVE SPROCKETS** — must be properly positioned
7. **FUEL** — must be free of contamination
8. **ENGINE SECONDARY IGNITION CHECK** — must exhibit a normal scope pattern

Always look for any Technical Service Bulletins that may relate to this condition.

Checking Distributor Position With DRBIII®

Connect the DRB to the Data Link Connector and select the set SYNC from the menu.

WARNING: The following test will be performed with the engine running: avoid contact with rotating components.

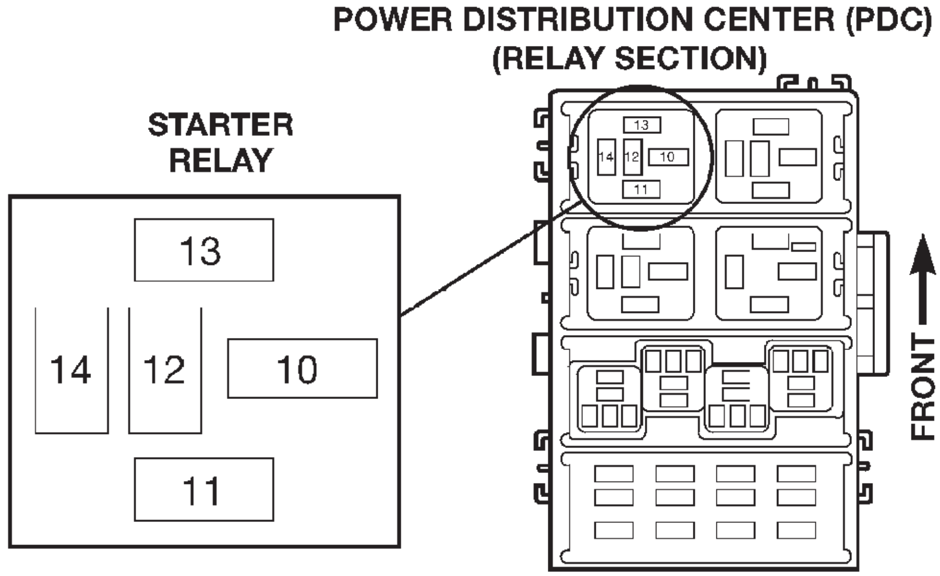
Start the engine and observe the DRB display. When the distributor is correctly positioned, the IN RANGE message should appear along with 0°. If the distributor needs to be adjusted, loosen the distributor hold-down clamp bolt. Rotate the distributor until reading is as close to 0° as possible and the IN RANGE message is displayed. Tighten the clamp bolt to 22.5 N·m (200 in. lbs.) torque.

NOTE: Setting the distributor position does not adjust the ignition timing. Ignition timing values are determined by the powertrain control module.

TEST NS-9A	REPAIRING A NO CRANK CONDITION

Perform TEST NS-SEL Before Proceeding

TJ BODY

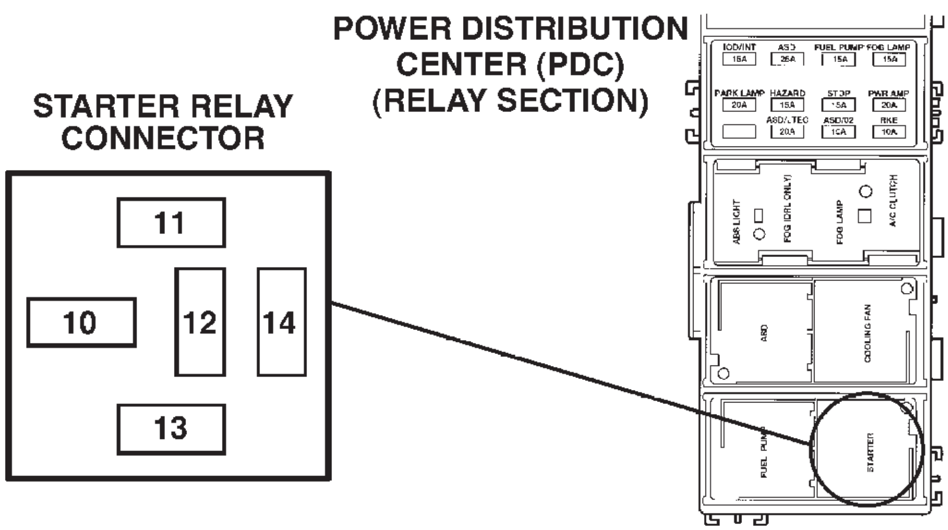


CAV	COLOR	FUNCTION
10(30)	PK/BK	FUSED B(+)
11(85)	YL/RD	IGNITION SWITCH OUTPUT
13(86)	BR/LB	PARK NEUTRAL SWITCH SENSE (AUTO TRANS) GROUND (MANUAL TRANS)
14(87)	BR	STARTER RELAY OUTPUT

80b6f107

FIG. 1

XJ BODY



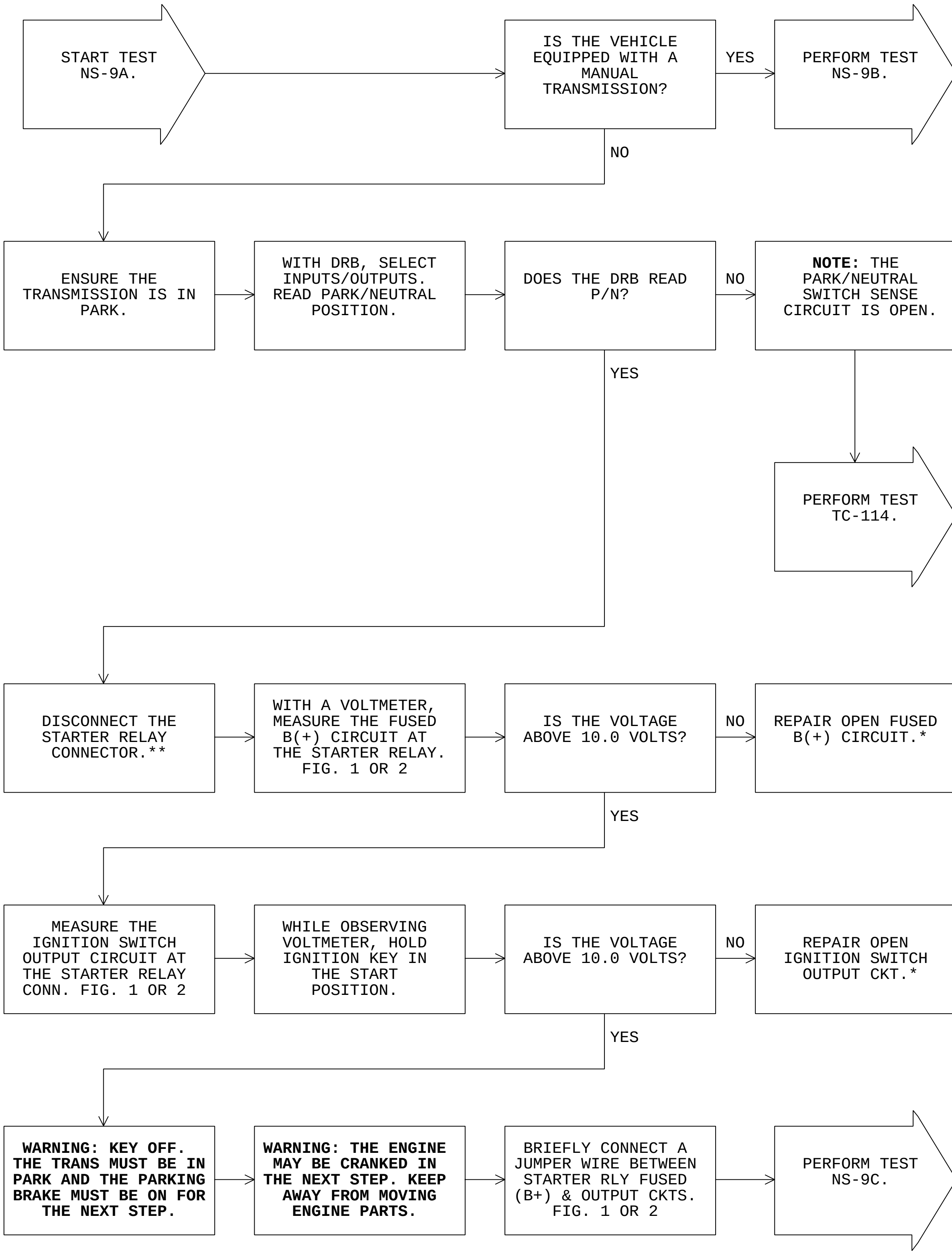
CAV	COLOR	FUNCTION
10 (30)	YL	FUSED B(+)
11 (85)	BK/WT	P/N POSITION SWITCH SENSE (AUTO TRANSMISSION)
11 (85)	BK	GROUND (MANUAL TRANSMISSION)
13 (86)	YL	FUSED IGNITION SWITCH OUTPUT
14 (87)	BR	STARTER RELAY OUTPUT

80b6f0e1

FIG. 2

TEST NS-9A — REPAIRING A NO CRANK CONDITION

Perform TEST NS-SEL Before Proceeding



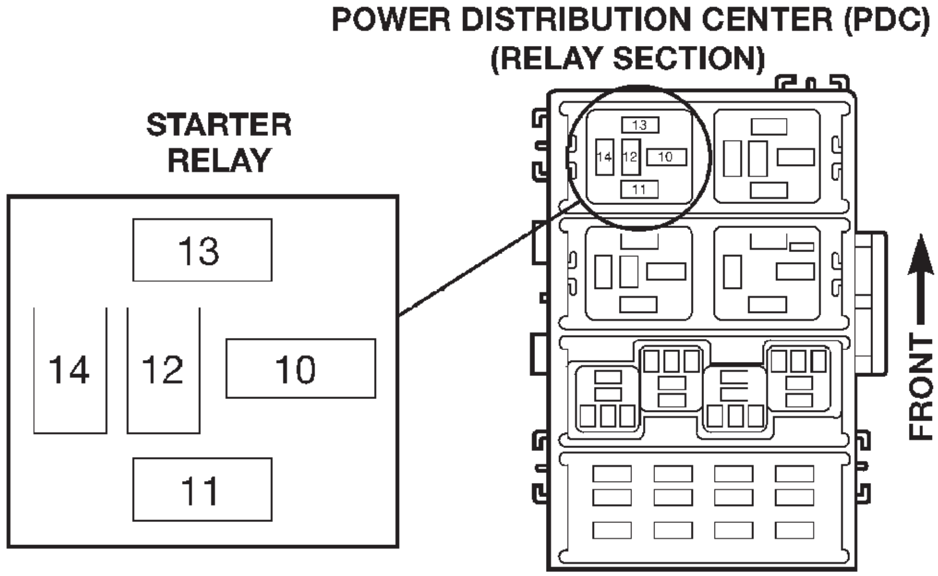
**Perform Verification TEST VER-1A.*

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

TEST NS-9B	REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A Before Proceeding

TJ BODY

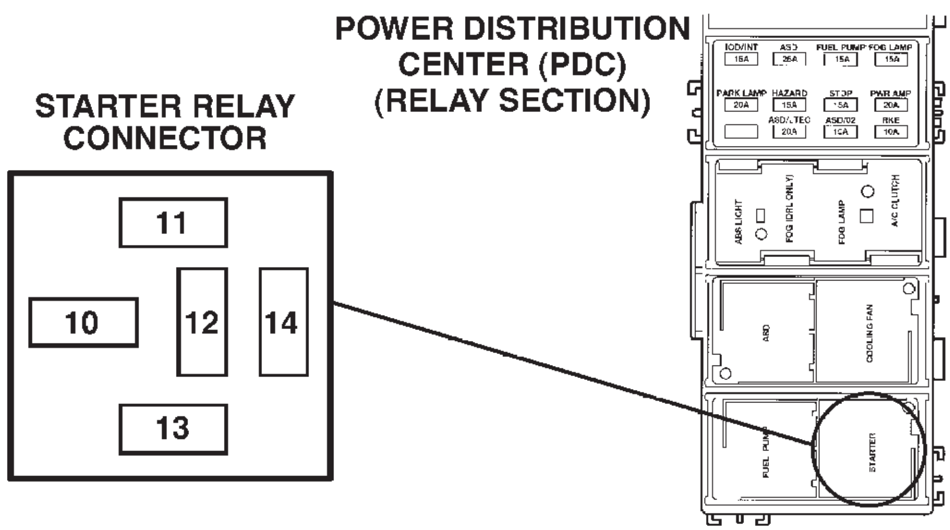


CAV	COLOR	FUNCTION
10(30)	PK/BK	FUSED B(+)
11(85)	YL/RD	IGNITION SWITCH OUTPUT
13(86)	BR/LB	PARK NEUTRAL SWITCH SENSE (AUTO TRANS)
		GROUND (MANUAL TRANS)
14(87)	BR	STARTER RELAY OUTPUT

80b6f107

FIG. 1

XJ BODY



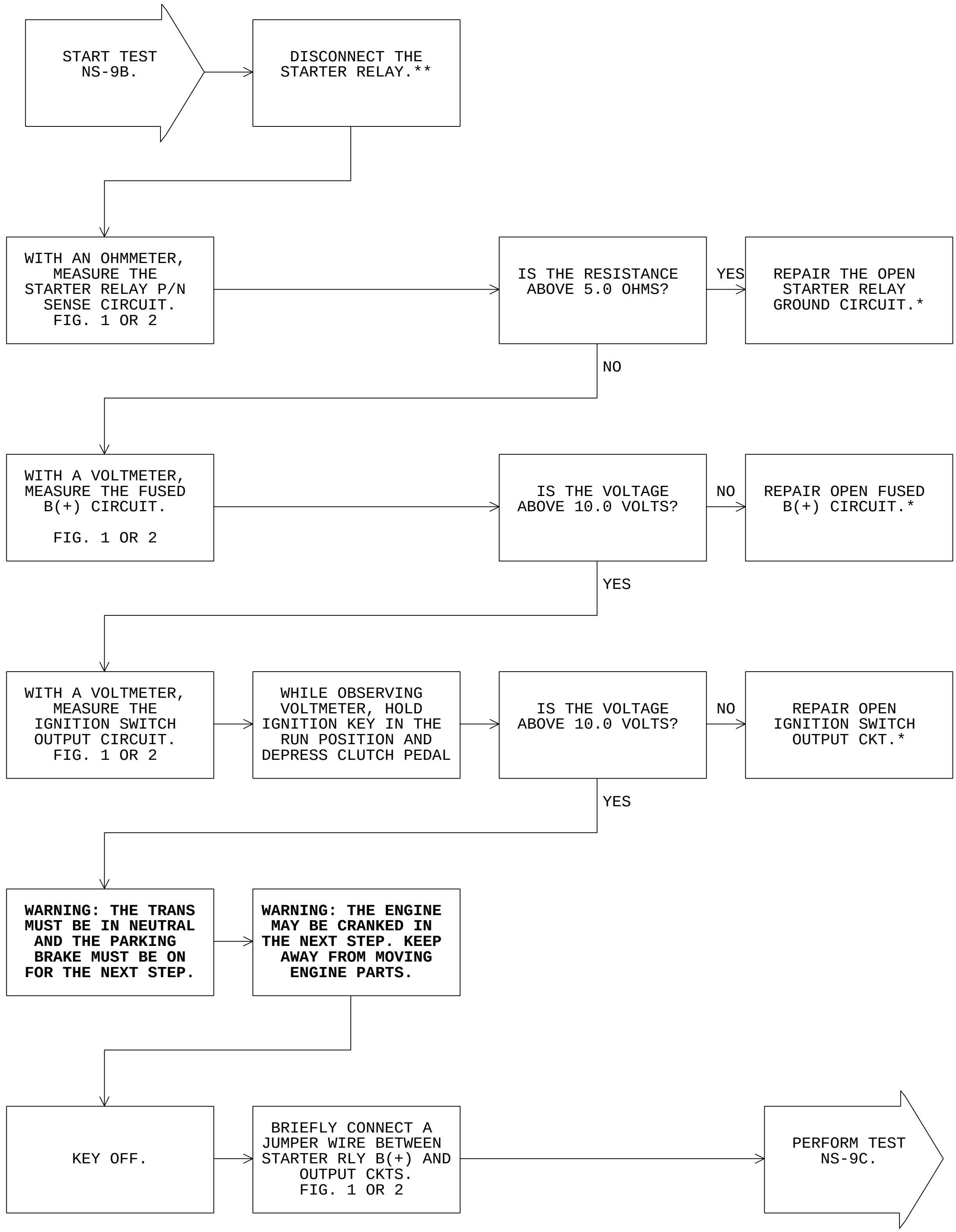
CAV	COLOR	FUNCTION
10 (30)	YL	FUSED B(+)
11 (85)	BK/WT	P/N POSITION SWITCH SENSE (AUTO TRANSMISSION)
11 (85)	BK	GROUND (MANUAL TRANSMISSION)
13 (86)	YL	FUSED IGNITION SWITCH OUTPUT
14 (87)	BR	STARTER RELAY OUTPUT

80b6f0e1

FIG. 2

TEST NS-9B REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A Before Proceeding



**Perform Verification TEST VER-1A.*

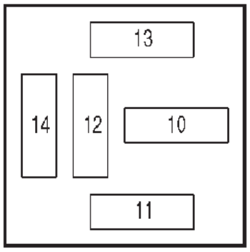
***Check connectors - Clean / repair as necessary.*

TEST NS-9C	REPAIRING A NO CRANK CONDITION

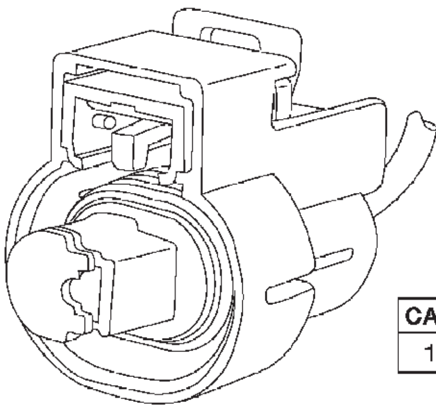
Perform TEST NS-9A Before Proceeding

TJ BODY

STARTER RELAY CONNECTOR (IN PDC)



CAV		FUNCTION
10 (30)	PK/BK	FUSED B(+)
11 (85)	YL/RD	IGNITION SWITCH OUTPUT
13 (86)	BR/LB	PARK NEUTRAL SW SENSE (AUTO TRANS) GROUND (MANUAL TRANS)
14 (87)	BR	STARTER RELAY OUTPUT



STARTER RELAY OUTPUT WIRE CONNECTOR (AT SOLENOID)

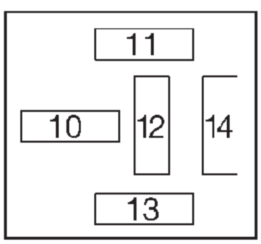
CAV	COLOR	FUNCTION
1	BR	STARTER RELAY OUTPUT

80b76f25

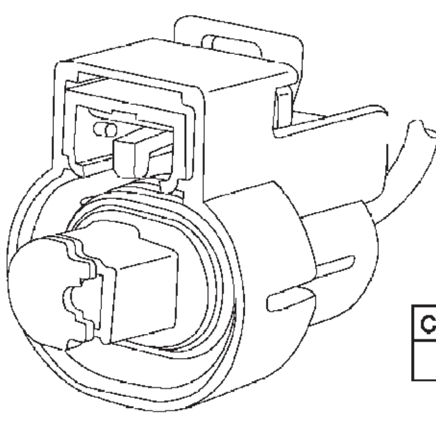
FIG. 1

XJ BODY

STARTER RELAY CONNECTOR (IN PDC)



CAV	COLOR	FUNCTION
10 (30)	YL	FUSED B(+)
11 (85)	BK/WT	PIN POSITION SW SENSE (AUTO TRANS)
11 (85)	BK	GROUND (MANUAL TRANS)
13 (86)	YL	FUSED IGNITION SW OUTPUT
14 (87)	BR	STARTER RELAY OUTPUT



STARTER RELAY OUTPUT WIRE CONNECTOR (AT SOLENOID)

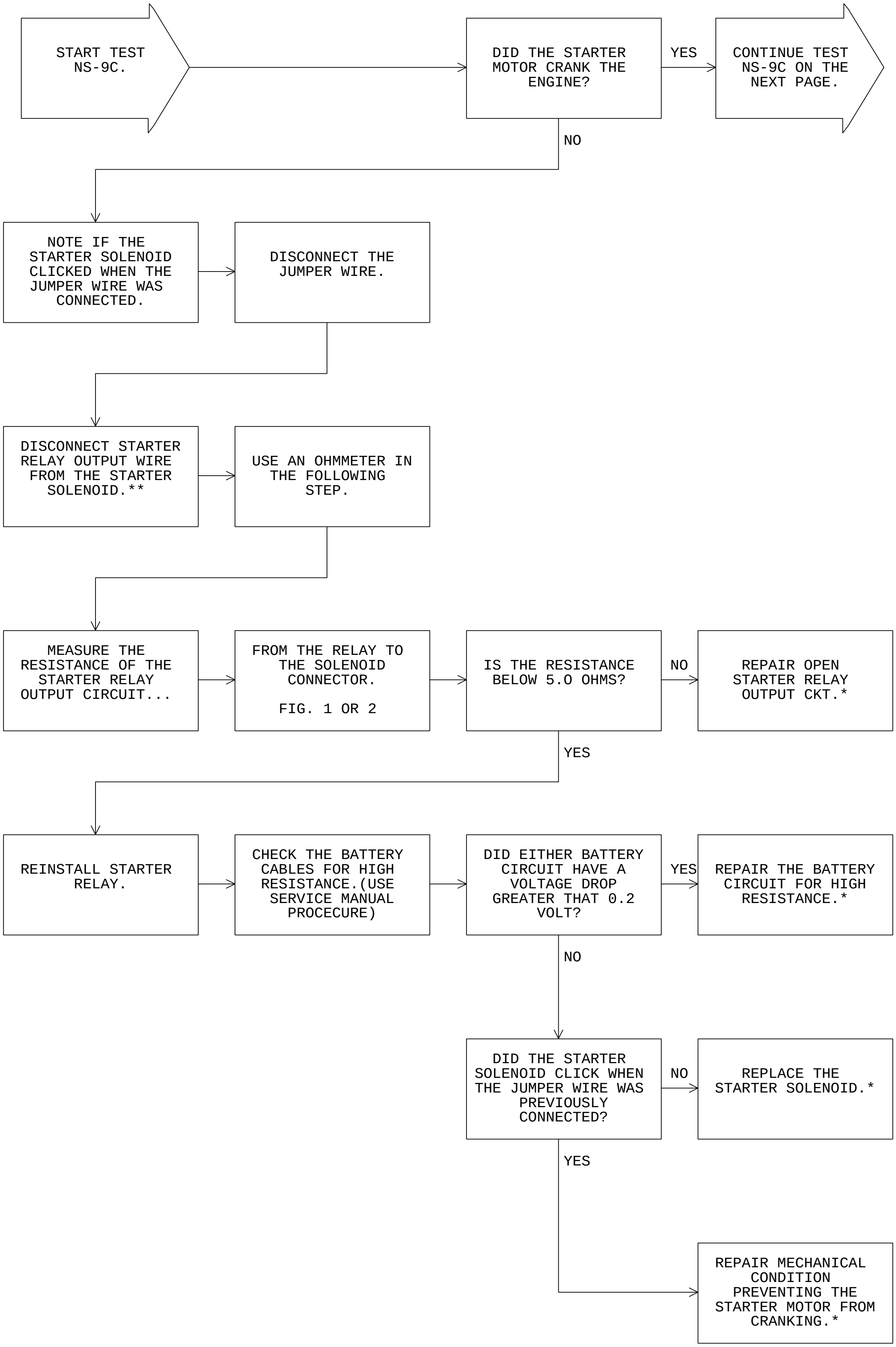
CAV	COLOR	FUNCTION
1	BR	STARTER RELAY OUTPUT

80b76f26

FIG. 2

TEST NS-9C REPAIRING A NO CRANK CONDITION

Perform TEST NS-9A Before Proceeding

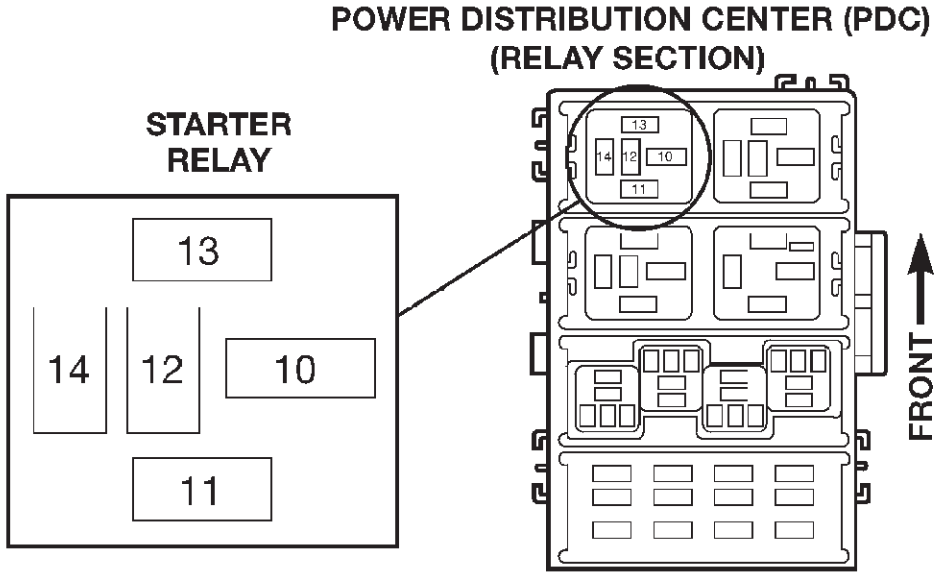


**Perform Verification TEST VER-1A.* | ***Check connectors - Clean / repair as necessary.*

TEST NS-9C | **CONTINUED - REPARING A NO CRANK CONDITION**

Perform TEST NS-9A Before Proceeding

TJ BODY

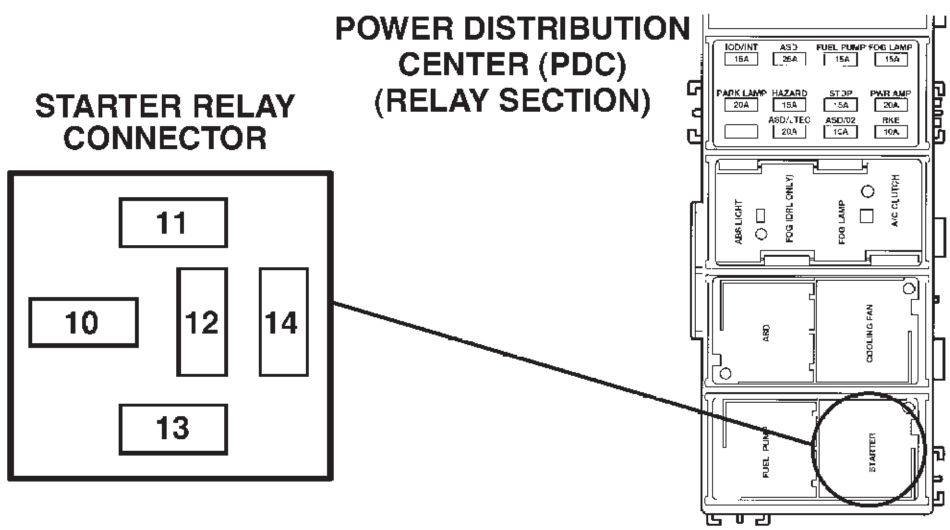


CAV	COLOR	FUNCTION
10(30)	PK/BK	FUSED B(+)
11(85)	YL/RD	IGNITION SWITCH OUTPUT
13(86)	BR/LB	PARK NEUTRAL SWITCH SENSE (AUTO TRANS)
		GROUND (MANUAL TRANS)
14(87)	BR	STARTER RELAY OUTPUT

80b6f107

FIG. 1

XJ BODY



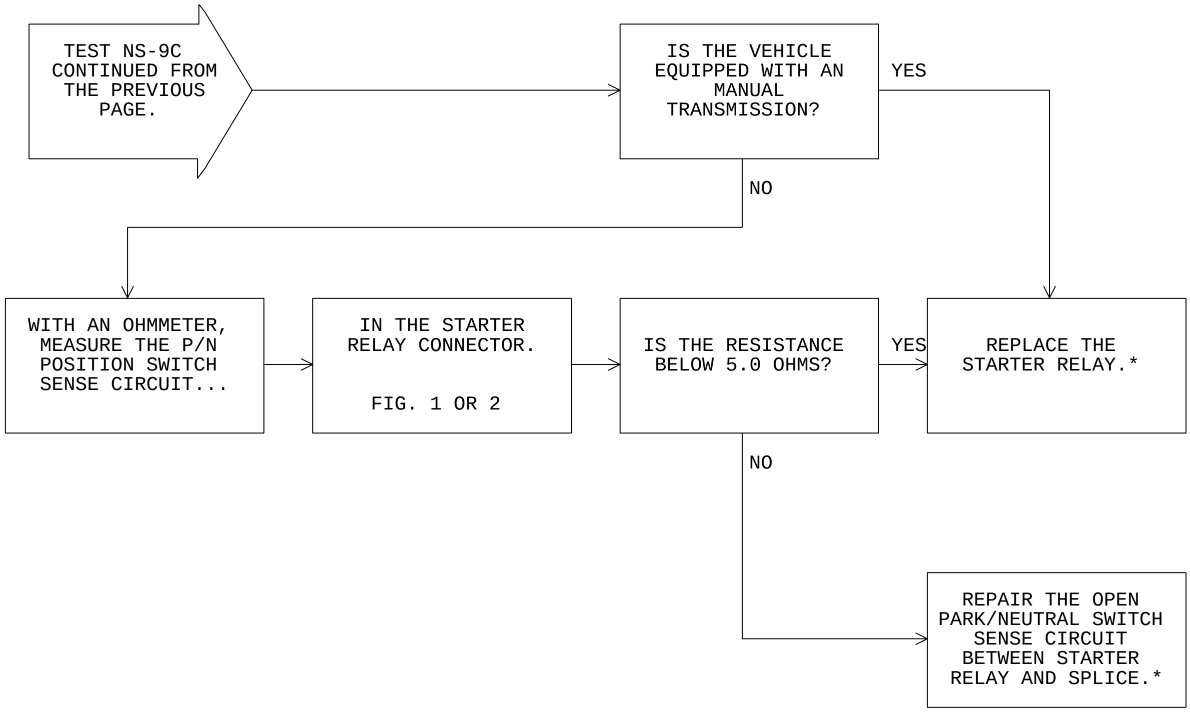
CAV	COLOR	FUNCTION
10 (30)	YL	FUSED B(+)
11 (85)	BK/WT	P/N POSITION SWITCH SENSE (AUTO TRANSMISSION)
11 (85)	BK	GROUND (MANUAL TRANSMISSION)
13 (86)	YL	FUSED IGNITION SWITCH OUTPUT
14 (87)	BR	STARTER RELAY OUTPUT

80b6f0e1

FIG. 2

TEST NS-9C CONTINUED - REPARING A NO CRANK CONDITION

Perform TEST NS-9A Before Proceeding



Perform Verification TEST VER-1A.	***Check connectors - Clean / repair as necessary.*

TEST VER-1A	NO START VERIFICATION

Important Note:

If the Powertrain Control Module has been changed and the correct VIN and mileage have not been programmed, a DTC will be set in the ABS, Airbag and SKIM modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable starting. Refer to GENERAL INFORMATION section 8.0 for programming the Powertrain Control Module and the SKIM.

For ABS and Airbag Systems:
ACTION:

1. Enter correct VIN and Mileage in PCM.
2. Erase codes in ABS and Airbag modules.

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect components as necessary.

Inspect the engine oil for contamination. If it is contaminated, change the oil and filter.

Attempt to start the engine.

If the engine is **unable** to start, look for any Technical Service Bulletins that may relate to this condition. Return to **DTC TEST** if necessary.

The repair is now complete.

Important Note:

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect all components as necessary.

Important Note:

If the Powertrain Control Module has been changed and the correct VIN and mileage have not been programmed, a DTC will be set in the ABS, Airbag and SKIM modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable starting. Refer to GENERAL INFORMATION section 8.0 for programming the Powertrain Control Module and SKIM.

For ABS and Airbag Systems:

ACTION:

1. Enter the correct VIN and Mileage in PCM.
2. Erase ABS and Airbag module codes.

All trouble codes should be repaired before continuing, if not, return **DTC-TEST** and follow suggested test.

Use the following methods depending on the type of test you came from, **No Trouble Code,** or **Trouble Code.**

- Connect the DRBIII to the data link connector.

No Trouble Code Repair

1. Check to see if the initial symptom still exists (use DRB freeze frame when available to assist).
2. If the initial or another symptom exists, or a Trouble Code Set, repairs are not complete. Check all pertinent Technical Service Bulletins and return to **TEST NTC-1A,** or for codes return to **DTC-TEST.**

TEST VER-2A | **ROAD TEST VERIFICATION**

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect all components as necessary.

For previously read trouble codes that have not been dealt with, return to **DTC TEST** and follow the path specified; otherwise continue.

If the powertrain control module has not been changed:

1. Connect the DRB to the PCM data link connector and erase trouble codes.
2. With the DRB, reset all values in the adaptive memory.
3. Disconnect the DRB.

Ensure no trouble code remains by doing the following:

1. If this test is for any **A/C Relay Control Circuit Code,** drive the vehicle for at least five minutes with the A/C on. For some of the drive, go at least 40 mph; at some point stop the car and turn the engine off for 10 seconds or more; then restart and continue. Ensure the transmission shifts through all gears. Upon completion of the road test, turn the engine off, and read trouble codes with the DRB.
2. If the repaired code has reset, the repair is not complete. Check all related Technical Service Bulletins and return to **DTC TEST** if necessary. If another trouble code has set, return to **DTC TEST** and follow the path specified for that trouble code. If there are no trouble codes, the repair was successful and is now complete.

TEST VER-3A | **CHARGING VERIFICATION**

Important Note:

If the Powertrain Control Module has been changed and the correct VIN and mileage have not been programmed, a DTC will be set in the ABS, Airbag and SKIM modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable starting. Refer to GENERAL INFORMATION section 8.0 for programming the Powertrain Control Module and SKIM.

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 as reset, or another one has set, check all pertinent Technical Service Bulletins and return to **DTC TEST** if necessary.

If there are no codes, the repair is now complete.

TEST VER-4A | **SPEED CONTROL VERIFICATION**

Important Note:
If the Powertrain Control Module has been changed and the correct VIN and mileage have not been programmed, a DTC will be set in the ABS, Airbag and SKIM modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable starting. Refer to GENERAL INFORMATION section 8.0 for programming the Powertrain Control Module and SKIM.

For ABS and Airbag Systems:

ACTION:

1. Enter correct VIN and Mileage in PCM.
2. Erase codes in ABS and Airbag modules.

Inspect the vehicle to ensure that all engine components are connected. Reassemble and reconnect components as necessary.

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 30 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. Quickly depress and release the RESUME/ACCEL switch. If the vehicle speed did not increase by 2 mph, the repair is not complete.*
5. Press and HOLD coast switch, vehicle speed should decrease, if no decrease, the repair is not complete.*
6. Using caution, depress and release the brake pedal. If the speed control did not disengage, the repair is not complete.*
7. Bring the vehicle speed back up to 25 mph.
8. Depress the RESUME/ACCEL switch. If the speed control did not resume the previously set speed, the repair is not complete.*
9. Hold down the SET switch. If the vehicle did not decelerate, the repair is not complete.*
10. Ensure the vehicle speed is greater than 30 mph and release the SET switch. If the vehicle did not adjust and set a new vehicle speed, the repair is not complete.*
11. Depress and release the cancel switch. If the speed control did not disengage, the repair is not complete.*
12. Bring the vehicle back up to 35 mph and engage speed control.
13. Turn 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 speed control problem and then, if necessary, return to **DTC TEST.**

8.0 MAINTENANCE AND SERVICE INFORMATION

8.1 Programming the Powertrain Control Module

The SKIS "Secret Key" is an I.D. code that is unique to each SKIM. This code is programmed and stored in the SKIM, engine controller and transponder chip (ignition keys). When replacing the PCM it is necessary to program the secret key into the new PCM using the DRB. Perform the following steps to program the secret key into the engine controller.

1. Turn the ignition on (transmission in park/neutral)
2. Use the DRB and select "MISCELLANEOUS" from the main menu.
3. Select "PCM REPLACED" (GAS ENGINE).
4. Enter secured access mode by entering the vehicle four-digit PIN.

NOTE: If three attempts are made to enter secure access mode using an incorrect PIN, secured access mode will be locked out for one hour. To exit this lockout mode, turn the ignition to the RUN position for one hour then enter the correct PIN. (Ensure all accessories are turned off. Also monitor the battery state and connect a battery charger if necessary).

5. Press "ENTER" to transfer the secret key (the SKIM will send the secret key to the PCM).

8.2 Programming the Sentry Key Immobilizer Module

NOTE: If the PCM and the SKIM are replaced at the same time, program the VIN into the PCM first. All vehicle keys will need to be replaced and programmed to the new SKIM.

1. Turn the ignition on (transmission in park/neutral).
2. Use the DRB and select "THEFT ALARM", "SKIM", "MISCELLANEOUS".
4. Program the vehicle four-digit PIN into SKIM.
5. Select "COUNTRY CODE" and enter the correct country.

NOTE: Be sure to enter the correct country code. If the incorrect country code is programmed into SKIM, the SKIM must be replaced.

6. Select "UPDATE VIN" (the skim will learn the VIN from the PCM).
7. Press "ENTER" to transfer the secret key (the PCM will send the secret key to the SKIM).
8. Program ignition keys to SKIM (for programming procedure, refer to **GENERAL INFORMATION SECTION 8.3**).

8.3 Programming Ignition Keys to the Sentry Key Immobilizer Module

1. Turn the ignition on (transmission in park/neutral).
2. Use the DRB and select "THEFT ALARM", "SKIM", "MISCELLANEOUS".
3. Select "PROGRAM IGNITION KEYS" (Indicator lamp will begin flashing to indicate that learn mode is in progress.
4. Enter secured access mode by entering the vehicle four-digit PIN

NOTE: The PIN must be re-entered each time an additional key is learned.

5. Insert key into ignition switch and observe ALARM SET lamp. Once the key has been learned, the ALARM SET lamp will turn off.

NOTE: A maximum of eight keys can be learned to each SKIM. Once a key is learned to a SKIM it (the key) cannot be transferred to another vehicle.

If ignition key programming is unsuccessful, the DRB will display one of the following messages:

Programming Not Attempted − The DRB attempts to read the programmed key status and there are no keys programmed into SKIM memory.

Programming Key Failed (Possible Used Key From Wrong Vehicle − SKIM is unable to program key due to one of the following:

- faulty ignition key transponder
- ignition key is programmed to another vehicle.

8 Keys Already Learned, Programming Not Done − SKIM transponder ID memory is full.

1. Obtain ignition keys to be programmed from customer (8 keys maximum)
2. Using the DRB, erase all ignition keys by selecting ''MISCELLANEOUS'' and ''ERASE ALL CURRENT IGN. KEYS''
3. Program all ignition keys.

Learned Key In Ignition − Ignition key transponder ID is currently programmed in SKIM memory.

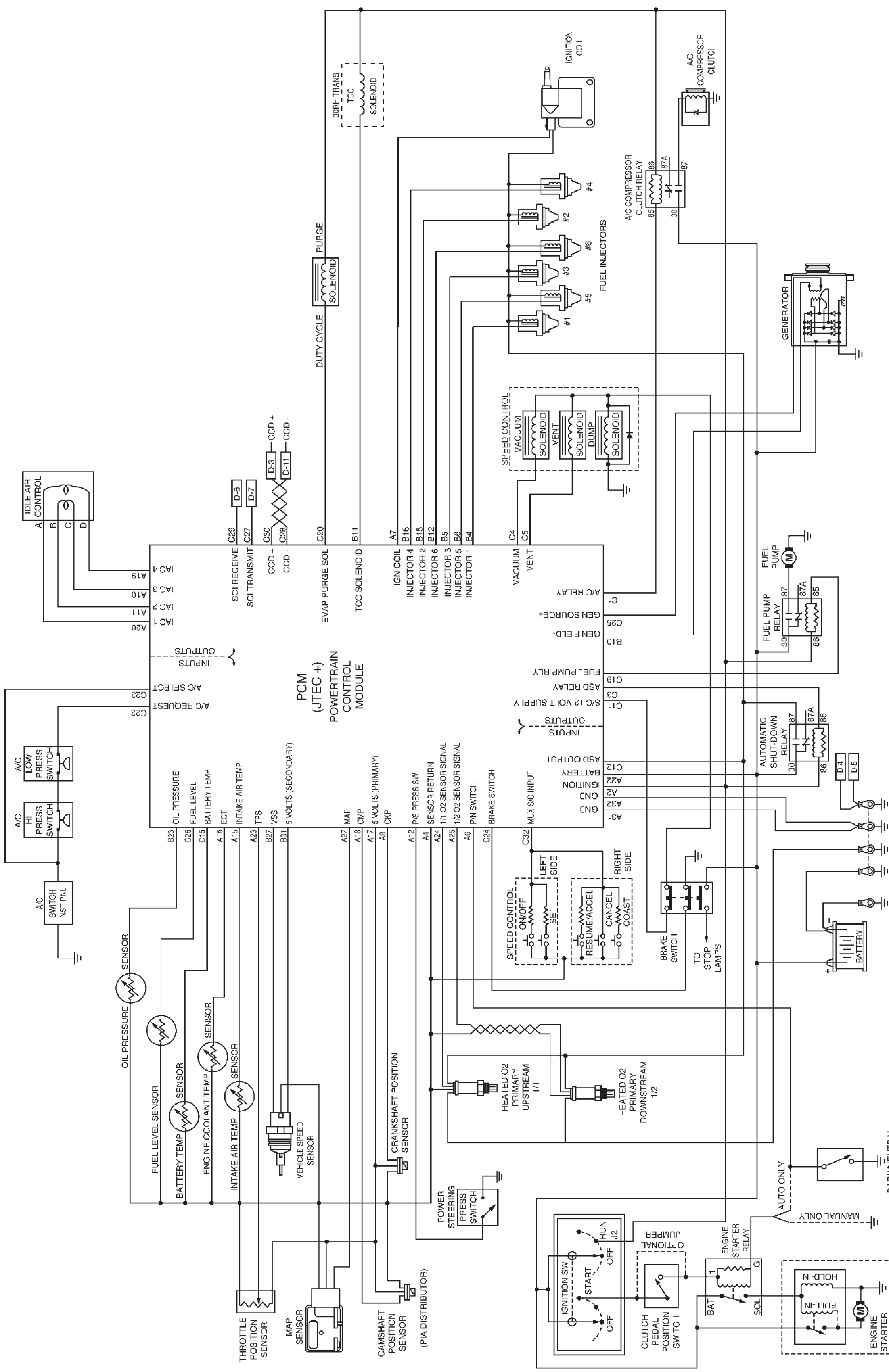
9.0 SPECIFICATIONS

9.1 Fuel System Release Procedure (Gasoline)

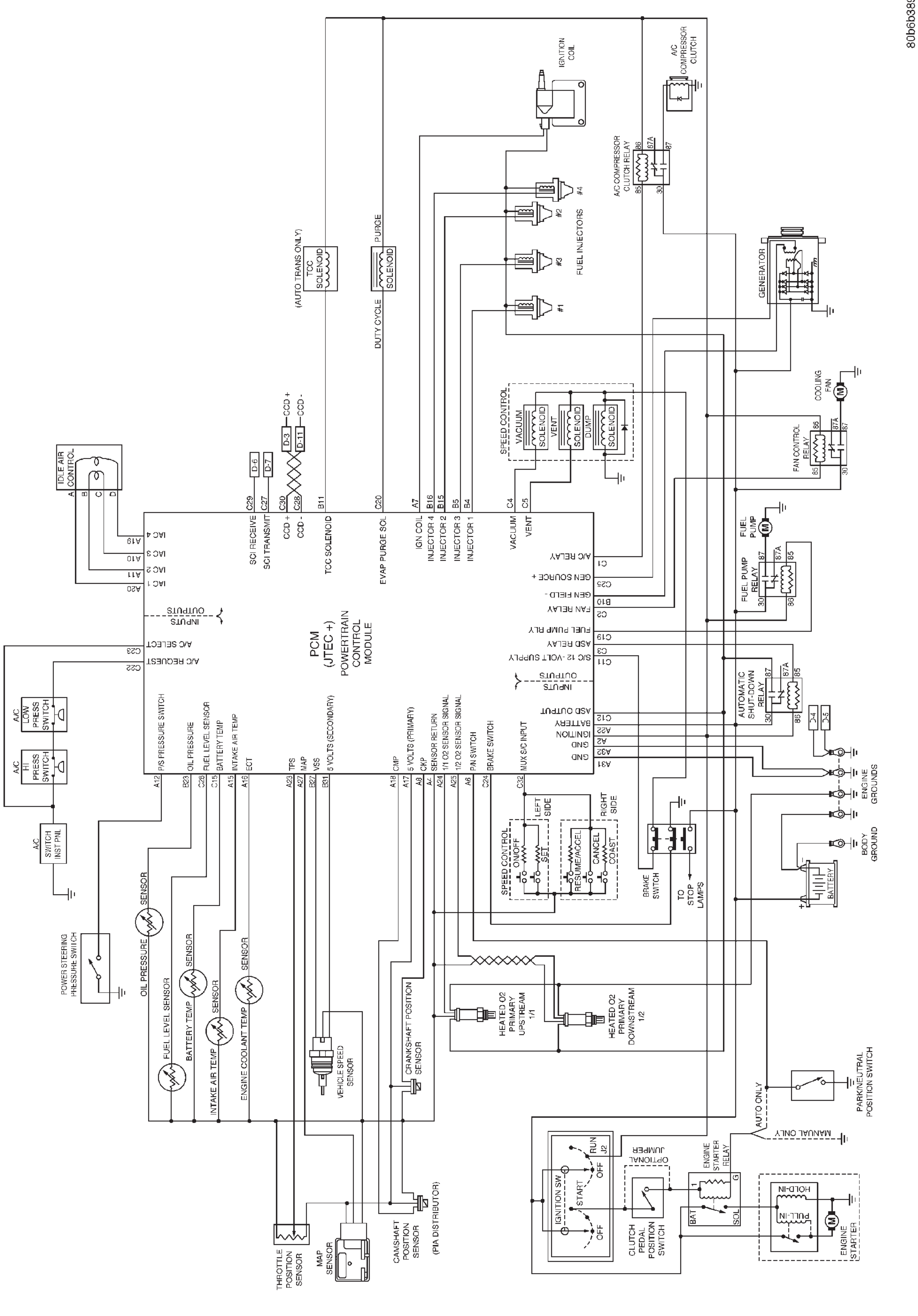
1. Remove the fuel pump relay.
2. Start and run engine until it stalls.
3. Attempt to restart the engine until it will no longer run.
4. Ensure the ignition key is off.
5. With fuel pressure relieved the fuel system can now be opened for required work. Continue to use caution, fuel leakage is still possible.

10.0 SCHEMATIC DIAGRAMS

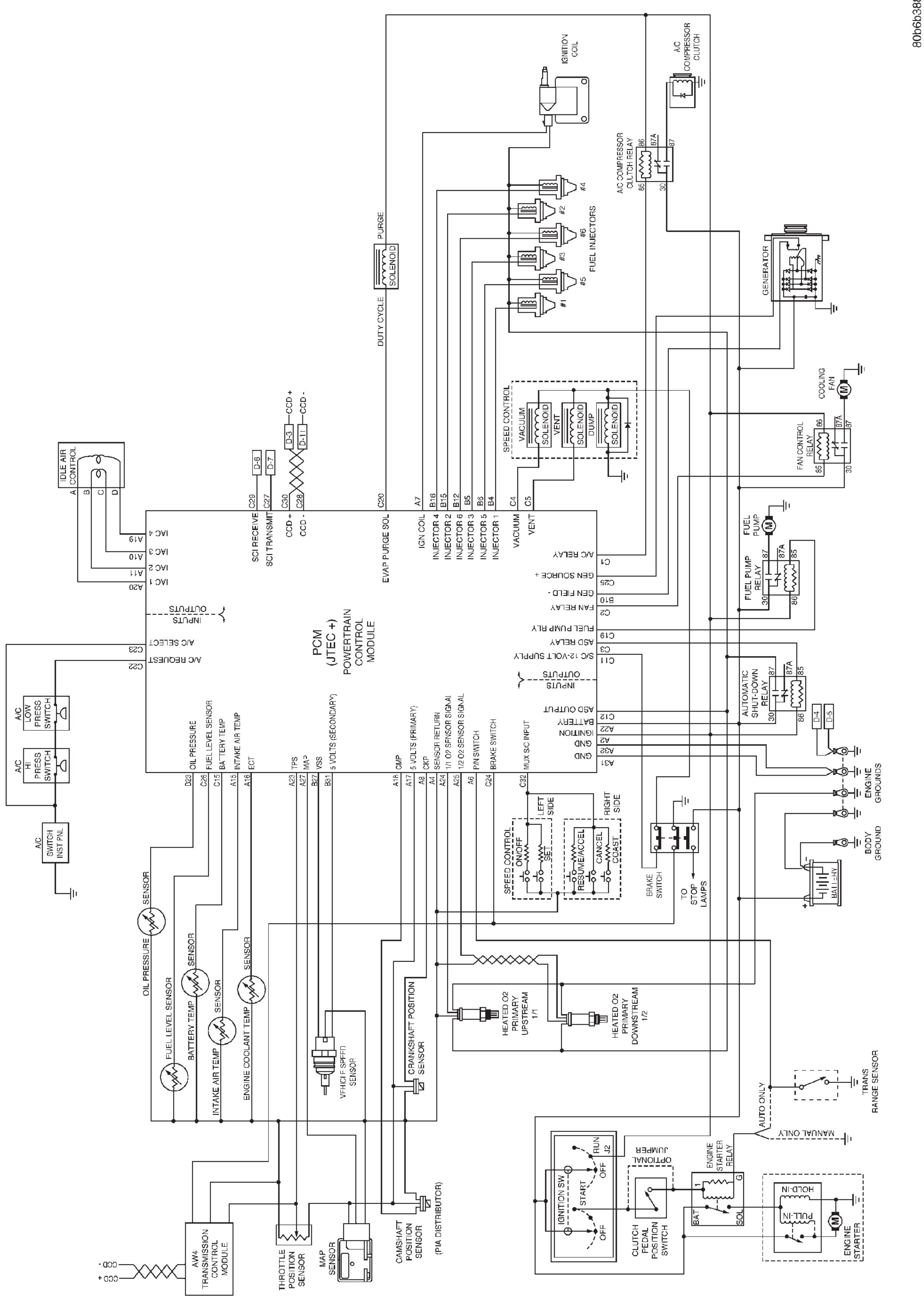
10.1 TJ Body 2.5/4.0L JTEC+



10.2 XJ Body 2.5L JTEC+



10.3 XJ Body 4.0 JTEC+



11.0 RECOMMENDED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box)
fuel line adapter 6523, 6539 or 6941
fuel pressure test kit C-4799-B or 5069
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, stuble	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
JTEC+	Combined engine and transmission control module
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 crankshaft ventilation
poor fuel economy	There is significantly less fuel mileage than other vehicles of the same design and configuration.
rough, unstable 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.
SKIS	Sentry Key Immobilizer System
surge	engine rpm fluctuation without corresponding change in throttle position sensor
TPS	throttle position sensor
VSS	vehicle speed sensor

NOTES