1994 CAR SERVICE MANUAL

Powertrain Control/Emissions Diagnosis

— Powertrain Control Systems Not Designed In North America —

TECHNICAL
PUBLICATIONS DEPARTMENT
Ford Customer Service Division

FPS-12106-94A1 Litho in U.S.A. August, 1993

Foreword

This portion of the 1994 Car Service Manual provides the Powertrain Control/Emissions Diagnostic information for the following vehicle, engine, and transaxle combinations:

MODEL YEAR	VEHICLE	ENGINE	SYSTEMS COVERED IN THIS PORTION OF THE MANUAL	SYSTEMS NOT COVERED IN THIS PORTION OF THE MANUAL
1994	Aspire	1.3L	All EEC Diagnostics	—
1994	Capri	1.6L	All EEC and 4EAT Diagnostics	—
1994	Escort/Tracer	1.8L	All EEC and 4EAT Diagnostics	—
1994	Probe	2.0L	EEC Diagnostics	2.0L CD4E Diagnostics
1994	Probe	2.5L	All EEC and 4EAT Diagnostics	—

The descriptions and specifications contained in this manual were in effect at the time this manual was approved for printing. Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design without notice and without incurring obligation.

For service information on specific vehicle lines for Body, Chassis and Electrical and Powertrains, refer to the individual service manual. For information on pre-delivery, maintenance and lubrication for all vehicles, refer to the Pre-Delivery, Maintenance and Lubrication manual.

TECHNICAL
PUBLICATIONS DEPARTMENT
Ford Customer Service Division

What's New In This Manual

The following is a list of the modifications to this manual for 1994.

New Name

The name of the manual has changed due to the addition of a new manual covering On Board Diagnostics II vehicles. The names are Powertrain Control/Emissions Diagnosis Service Manual, On Board Diagnostics I, and On Board Diagnostics II. (See Other Changes or Additions for applications in the new manual. All other vehicle diagnostics are in the On Board Diagnostics I manual.)

New or Modified Applications

- 2.0L SFI CD4E Probe (new EGR system)
- 2.0L SFI M/T Probe (California only) (new EGR system)

Deleted Applications

- 2.3L OHC MFI Mustang
- 5.0L MA SFI Thunderbird/Cougar

Other Changes or Additions

- The diagnostics for the 3.8L SFI Mustang and 4.6L SFI Thunderbird/Cougar are in the On Board Diagnostics II (OBD II) manual.
- Diagnostics for the 2.0L Probe will start in Section 2A. Electronic Engine Control (EEC) concerns are diagnosed within Section A of the manual. System concerns for the 2.0L Probe are diagnosed in Section B.
- Intermittent ignition diagnostic procedures have been added to Section 8A.
- Throttle body material has been removed from Section 9A and is now part of Air Intake Systems, Section 12A.
- Section 9A, formerly Fuel/Throttle Body Systems Diagnostics is now Fuel Delivery Systems.

This Chart Identifies:

- The starting point of diagnostic routines and section location for vehicles with an integrated Powertrain and Transmission Control Module.
- The starting point of diagnostic routines and section location for vehicles with separate stand alone Powertrain Control Modules (PCM) and a separate stand alone Transmission Control Module (TCM).
- The starting point of diagnostic routines and section location for electronic transmission Quick Test section for vehicles equipped with 4EAT or 4F20E electronic transmission.

1994 COMPONENT DIAGNOSIS AND REPAIR PROCEDURES

ASSOCIATION VEHICLES

Engine	Vehicle Application	Diagnostic Routine	Engine Supplement	EEC Quick Test	EEC Pin Point Test	EEC Monitor Box	EEC Engine Codes	4EAT Codes	4EAT Quick Test	4EAT Pin Point Test	IGN SYS	Fuel Delivery	EGR	EVAP	PCV	CAT CONV	Emission Related Components
1.3L	Aspire	2B	3B	5B	6B	7B	3B				8B	9B	10B	11B	14B	15B	**
1.6L	Capri	2B	3B	5B	6B	7B	3B	3B	5B	6B	8B	9B	10B	11B	14B	15B	**
1.6L Turbo	Capri	2B	3B	5B	6B	7B	3B				8B	9B	10B	11B	14B	15B	**
1.8L ATX	Escort/Tracer	2B	3B	5B	6B	7B	3B	3B	5B	6B	8B	9B	10B	11B	14B	15B	**
1.8L MTX	Escort/Tracer	2B	3B	5B	6B	7B	3B				8B	9B	10B	11B	14B	15B	**
1.9L ATX	Escort/Tracer	2A	3A	2A	6A	7A	3A	3A	2A	6A	8A	9A	10A	11A	14A	15A	17A
1.9L MTX	Escort/Tracer	2A	3A	2A	6A	7A	3A				8A	9A	10A	11A	14A	15A	17A
2.0L	Probe	2A	3A	2A	6A	7A	3A	*	*	*	8B	9B	10B	11B	14B	15B	**
2.5L	Probe	2B	3B	5B	6B	7B	3B	3B	5B	6B	8B	9B	10B	11B	14B	15B	**
3.0L	Villager	2B	4B	5B	6B	7B	4B	***	***	***	8B	9B	10B	11B	14B	15B	**

* CD4E Transaxle diagnostics sections are 2A, 3A and 6A

** Emission Related components have been merged into sections 6B, 8B, 9B, 10B, 11B, 12B, 14B and 15B where appropriate

*** 4F20E Transaxle diagnostics sections are 4B, 5B and 6B

Important Safety Notice

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This Service Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

Notes, Cautions, and Warnings

As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. NOTES give you added information that will help you to complete a particular procedure. CAUTIONS are given to prevent you from making an error that could damage the vehicle. WARNINGS remind you to be especially careful in those areas where carelessness can cause you personal injury. The following list contains some general WARNINGS that you should follow when you work on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle.
- Be sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. If you have an automatic transmission or automatic transaxle, set in PARK unless instructed otherwise for a specific operation. If you have a manual transmission or manual transaxle, it should be in REVERSE (engine OFF) or NEUTRAL (engine ON) unless instructed otherwise for a specific operation. Place wood blocks (4" x 4" or larger) against the front and rear surfaces of the tires to provide further restraint from inadvertent vehicle movement.
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.
- Keep yourself and your clothing away from moving parts when the engine is running, especially the drive belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, three-way catalytic converter and muffler.
- Do not smoke while working on a vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle.
- If it is necessary to work under the hood, keep hands and other objects clear of the radiator fan blades! Your vehicle may be equipped with a cooling fan that may turn on, even though the ignition switch is in the OFF position. For this reason care should be taken to ensure that the radiator electric motor is completely disconnected when working under the hood when engine is not running.

How to Use This Manual

Contents

How To Use This Manual

SPECIAL NOTES:

- This manual is designed to assist the service technician in diagnosing and correcting driveability engine malfunctions.
- In each case, begin diagnosis with Section 2B, Diagnostic Routines. Section 2B defines the probable causes of the vehicle's symptoms. It functions as a checklist to ensure that all potential causes are reviewed. Refer to the flowchart on the following page.
- If a diagnostic procedure does not find the solution to a vehicle symptom, it is important to return to Section 2B to review all other possible causes of the symptom, as shown in the flowchart on the following page.
- Refer to Section 3B for electrical schematic diagrams, connector pin usage, quick test codes and code definitions, and mechanical schematic diagrams.
- Section 22B defines the terms used in this manual.

How To Use This Manual

DO

- Refer to Section 1B, Emission Control Identification/Application, to identify the emission components on the vehicle.
- Begin diagnosis with the diagnostic routines in Section 2B.
- Read all special notes.
- Prevent any unsafe or hazardous conditions by following the notes, cautions and warnings listed at the beginning of this book.
- After service, always verify that the repair corrected the customer complaint.

DON'T

- Skip from Section to Section.

Flowchart

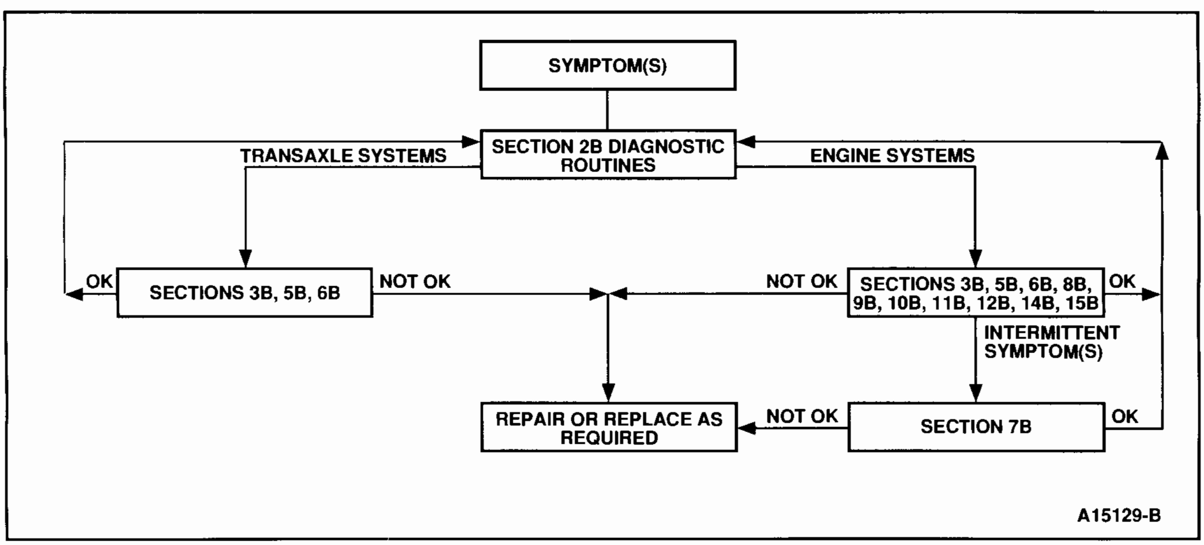


Table Of Contents

Contents

SECTION 1B

Emission Control Identification / Application

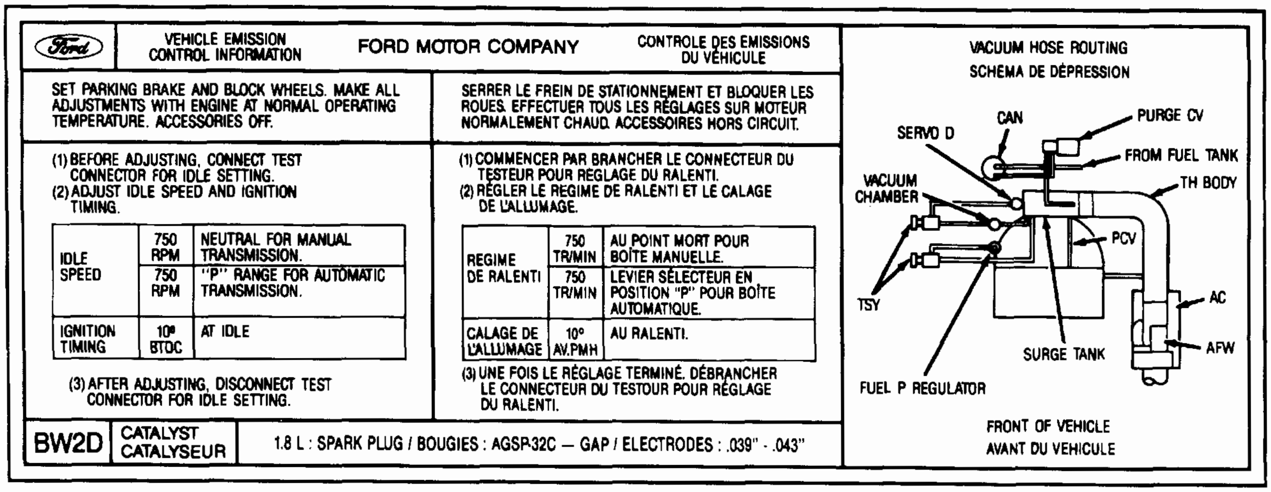
Contents

Emission Control Identification/Application

Vehicle Emission Control Information (VECI)

Each vehicle is equipped with a decal containing emission control data that applies specifically to that vehicle and engine. The specifications provided on the decal are critical to servicing engine/emissions systems.

Examples



VEHICLE EMISSION CONTROL INFORMATION — FORD MOTOR COMPANY — CONTROLE DES EMISSIONS DU VEHICULE

SET PARKING BRAKE AND BLOCK WHEELS. MAKE ALL ADJUSTMENTS WITH ENGINE AT NORMAL OPERATING TEMPERATURE. ACCESSORIES OFF.

(1) BEFORE ADJUSTING, CONNECT TEST CONNECTOR FOR IDLE SETTING.
(2) ADJUST IDLE SPEED AND IGNITION TIMING.

IDLE SPEED	750 RPM	NEUTRAL FOR MANUAL TRANSMISSION.
	750 RPM	"P" RANGE FOR AUTOMATIC TRANSMISSION.
IGNITION TIMING	10° BTDC	AT IDLE

(3) AFTER ADJUSTING, DISCONNECT TEST CONNECTOR FOR IDLE SETTING.

SERRER LE FREIN DE STATIONNEMENT ET BLOQUER LES ROUES. EFFECTUER TOUS LES RÉGLAGES SUR MOTEUR NORMALEMENT CHAUD. ACCESSOIRES HORS CIRCUIT.

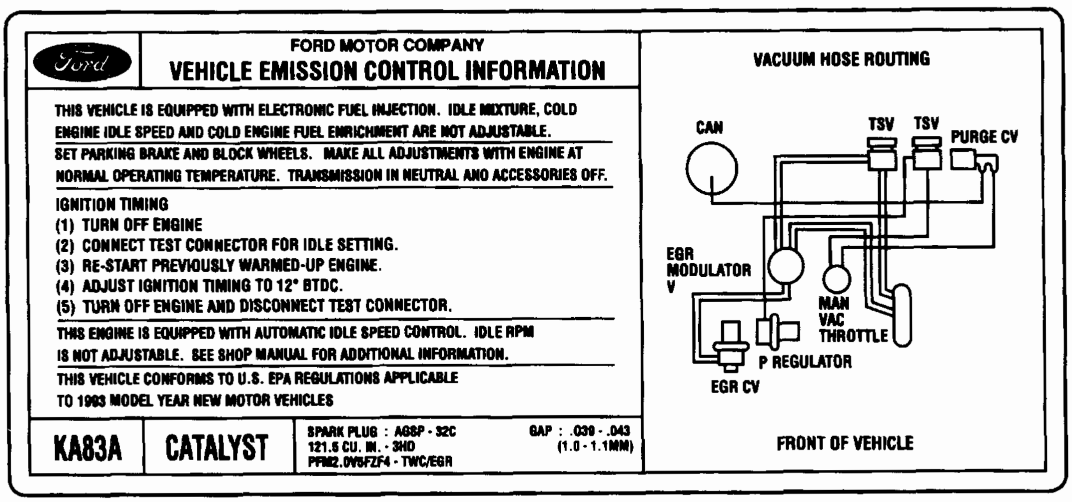
(1) COMMENCER PAR BRANCHER LE CONNECTEUR DU TESTEUR POUR REGLAGE DU RALENTI.
(2) RÉGLER LE REGIME DE RALENTI ET LE CALAGE DE L'ALLUMAGE.

REGIME DE RALENTI	750 TR/MIN	AU POINT MORT POUR BOÎTE MANUELLE.
	750 TR/MIN	LEVIER SÉLECTEUR EN POSITION "P" POUR BOÎTE AUTOMATIQUE.
CALAGE DE L'ALLUMAGE	10° AV.PMH	AU RALENTI.

(3) UNE FOIS LE RÉGLAGE TERMINÉ, DÉBRANCHER LE CONNECTEUR DU TESTOUR POUR RÉGLAGE DU RALENTI.

BW2D — CATALYST / CATALYSEUR — 1.8 L : SPARK PLUG / BOUGIES : AGSP-32C — GAP / ELECTRODES : .039" - .043"

A13877-A



FORD MOTOR COMPANY
VEHICLE EMISSION CONTROL INFORMATION

THIS VEHICLE IS EQUIPPED WITH ELECTRONIC FUEL INJECTION. IDLE MIXTURE, COLD ENGINE IDLE SPEED AND COLD ENGINE FUEL ENRICHMENT ARE NOT ADJUSTABLE.
SET PARKING BRAKE AND BLOCK WHEELS. MAKE ALL ADJUSTMENTS WITH ENGINE AT NORMAL OPERATING TEMPERATURE. TRANSMISSION IN NEUTRAL AND ACCESSORIES OFF.

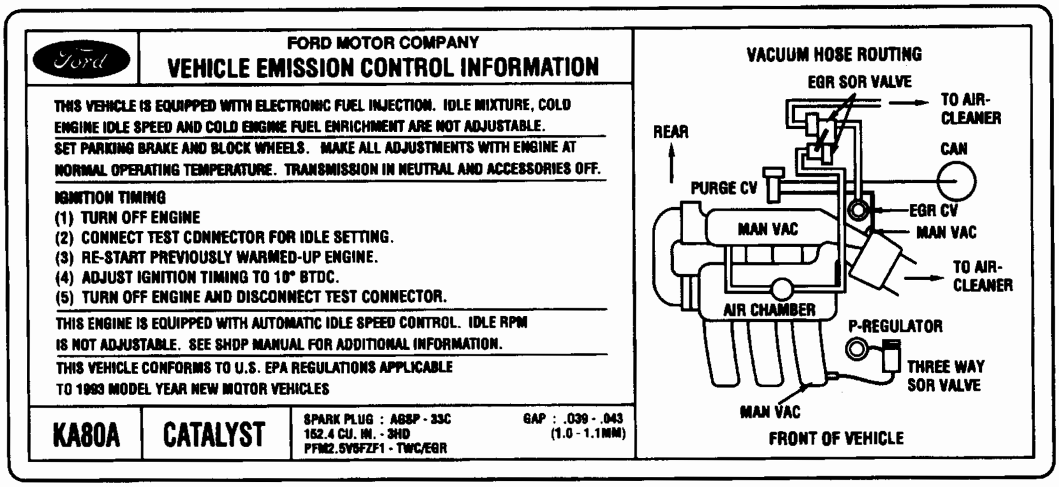
IGNITION TIMING
(1) TURN OFF ENGINE
(2) CONNECT TEST CONNECTOR FOR IDLE SETTING.
(3) RE-START PREVIOUSLY WARMED-UP ENGINE.
(4) ADJUST IGNITION TIMING TO 12° BTDC.
(5) TURN OFF ENGINE AND DISCONNECT TEST CONNECTOR.

THIS ENGINE IS EQUIPPED WITH AUTOMATIC IDLE SPEED CONTROL. IDLE RPM IS NOT ADJUSTABLE. SEE SHOP MANUAL FOR ADDITIONAL INFORMATION.
THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO 1993 MODEL YEAR NEW MOTOR VEHICLES

KA83A — CATALYST — SPARK PLUG : AGSP-32C GAP : .039 - .043 (1.0 - 1.1MM) 121.6 CU. IN. - 3HD PFM2.0V5FZF4 - TWC/EGR

A16844-B

Emission Control Identification/Application



A16845-B

In addition to the tune-up specifications and procedures, the emission decal shows a schematic of the engine vacuum system.

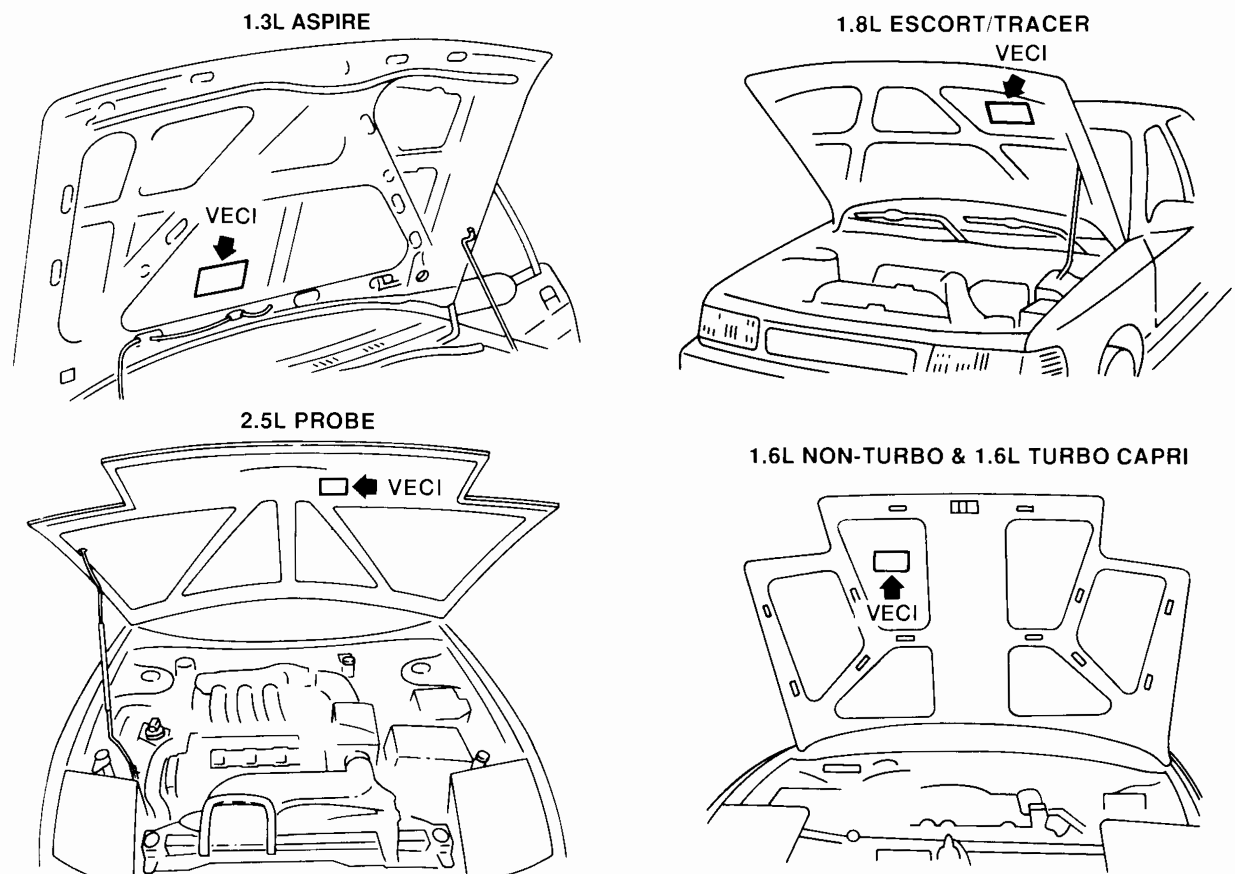
DECAL LOCATION

Vehicle	Location
1.3L Aspire	Engine Hood RH Side
1.6L Non-Turbo Capri	Engine Hood RH Side
1.6L Turbo Capri	Engine Hood RH Side
1.8L Escort/Tracer	Engine Hood LH Side
2.5L Probe	Engine Hood Center

Refer to the illustrations in this section for VECI decal locations.

Emission Control Identification / Application

Vehicle Emission Control Information Decal Location



A13879-E

Emission Control Systems Information

EMISSION CONTROL INFORMATION

System	Engine				
	1.3L	**1.6L Non-Turbo**	**1.6L Turbo**	**1.8L**	**2.5L**
Catalyst and Exhaust	TWC	TWC	TWC	TWC	TWC
Catalyst Location	UB	UB	UB	UB	UB
EGR	CVS	None	None	None	CVS
EVAP	CANP	CANP	CANP	CANP	CANP
BPA	IAC BPA	IAC BPA	IAC BPA	BPA	IAC BPA
IAC	IAC BPA	IAC BPA	IAC BPA	IAC	IAC BPA
IMRC	None	CONV	CONV	HSIA	VRIS

(Continued)

Emission Control Identification / Application

EMISSION CONTROL INFORMATION (Cont'd)

System	Engine				
	1.3L	1.6L Non-Turbo	1.6L Turbo	1.8L	2.5L
PCV	CONV	CONV	CONV	CONV	CONV
Turbocharger	None	None	CONV	None	None
Ignition	DI	DMIVA	DMIVA	TI3	DI

Abbreviations:

BPA - Bypass Air

CANP - Carbon Canister Storage / Purging

CONV - Conventional Systems

CVS - Control / Vent Solenoids

DI - Distributor Ignition

DI TFI-IV - Distributor Ignition (TFI-IV)

DMIVA - Distributor Mounted Ignition Vacuum Advance

EGR - Exhaust Gas Recirculation

EGRM - Exhaust Gas Recirculation Modulator Valve

EVAP - Evaporative Emission System

HSIA - High Speed Inlet Air

IAC - Idle Air Control

IMRC - Intake Manifold Runner Control

MFI - Multiport Fuel Injection

PCV - Positive Crankcase Ventilation

SFI - Sequential Multiport Fuel Injection

TI3 - Transistorized Ignition 3-pin

TWC - Three Way Catalytic Converter

UB - Underbody

VRIS - Variable Resonance Induction System

Engine/Vehicle Applications

Application Chart

APPLICATION CHART

Engine	1.3L	1.6L Non-Turbo	1.6L Turbo	1.8L	2.5L
Vehicle	Aspire	Capri	Capri	Escort/Tracer	Probe
In-line 4 cylinders	Yes	Yes	Yes	Yes	No
V-6	No	No	No	No	Yes
MFI	No	Yes	Yes	Yes	No
SFI	Yes	No	No	No	Yes
Valves per Cylinder (Intake/Exhaust)	1/1	2/2	2/2	2/2	2/2
Camshaft, Belt Drive	SOHC	DOHC	DOHC	DOHC	DOHC
Free Wheeling	Yes	Yes	Yes	Yes	Yes

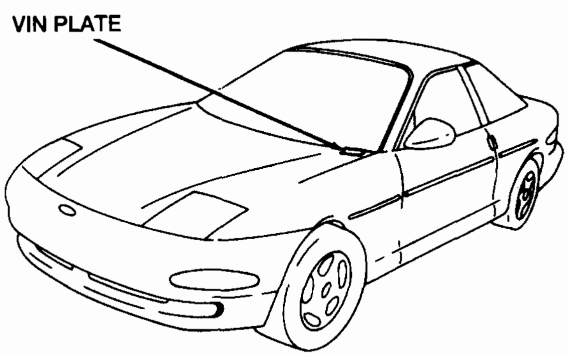
Vehicle Identification Number (VIN) Location

Vehicle Identification Number

The official Vehicle Identification Number (VIN) for title and registration purposes is stamped on a metal plate. The plate is fastened to the instrument panel close to the windshield on the driver's side of the vehicle, and is visible from the outside. The vehicle identification number is 17 characters long.

The last six digits of the vehicle identification number indicate the serial number of each unit built at each assembly plant. Refer to the vehicle service manual for explanation / decoding of the VIN.

VIN Location



A16832-A

SECTION 2B

Diagnostic Routines

Contents

Diagnostic Routines

Contents (continued)

Diagnostic Routines Preface

The Diagnostic Routines list in test step form the systems that can contribute to a particular condition in the order of probability, ease of accomplishment, and accessibility. These routines can be used as check lists for reference in the event of unusual or infrequent occurrences of a malfunction.

The order in which the Diagnostic Routines are listed has been carefully organized to include the most frequent faults at the top of each symptom list and least frequent at the bottom. Therefore, in some cases a system is listed ahead of another due to the fact that it is much easier to diagnose and less time consuming. Unless the fault is obvious, it is recommended that all diagnoses begin with a thorough visual inspection of a suspected system or component, followed by a system-by-system diagnosis as presented in the following routines. After each repair is made, check to see if the symptom(s) is(are) still present. If a particular system is determined to be operating normally, return to the Diagnostic Routines for other possible causes of the symptom.

NOTE: The technician is not required to adhere to the order specified in the Diagnostic Routines due to variations in vehicle type, system accessibility, vehicle repair history, or technician experience.

All references in each diagnostic routine are as follows:

- Section numbers reference a section in this manual.
- Service Manual section numbers reference the Body / Chassis / Electrical / Powertrain Service Manual.
- On-line Automotive Service Information System (OASIS) numbers have been included where applicable.

Special Note

The technician should obtain OASIS special service information on the customer's concern prior to performing extensive diagnosis and repairs.

NOTE: When referenced to a section in the Powertrain Control / Emissions Diagnosis Manual, look at the visual inspection chart provided prior to the test procedure. These charts list obvious fault possibilities that may have been overlooked.

NOTE: This section also contains a "Customer Information Worksheet." This worksheet is to be filled in by the customer so that his / her description of the problem can be given to the technician working on the vehicle.

Diagnostic Routines Worksheet

Customer Information Worksheet

Customer Information Worksheet

Repair Order No. ____________

CUSTOMER NAME ____________ DATE ____________

PLEASE HELP US HELP YOU by checking off all the boxes below that describe the drive problem which brought you here today.

Problem Description

Engine Starting Problems	Engine Quits Running Problems Engine Quits:	Engine Idle Problems with the Vehicle Not Moving	Enging Problems While the Vehicle is Moving
__ Will Not Start – Will Not Even Crank __ Cranks But Will Not Start __ Tries to Start, But Won't __ Starts, But Takes a Long Time	__ Right After Starting __ While Idling __ When Put into Gear __ On Acceleration __ During Steady Speed Driving __ On Deceleration __ Right After the Vehicle is Brought to a Stop __ When Parking	__ Engine Speed is Too Slow All the Time __ Engine Speed is Too Slow When the A/C is On __ Engine Speed is Too Fast __ Engine Speed is Rough or Uneven	__ Runs Rough __ Bucks and Jerks __ Hesitates/Stumbles on Acceleration __ Misfires — Cuts Out __ Engine Knocks or Rattles __ Lack of Power __ Backfires __ Poor Fuel Economy

When did the problem start to occur? __ Suddenly __ Gradually Approximate mileage ______

About how often does the problem happen? __ All the time __ Most of the time __ Occasionally

When does the problem usually occur? In the: __ Morning __ Later in the day __ Anytime

About how long after starting the engine does the problem happen?
- __ Within 2 minutes of starting the engine
- __ Between 2 and 10 minutes after the engine starts
- __ At least 10 minutes or longer after starting the engine
- __ It could happen any time after starting the engine

About how long does the engine have to be off before the problem will happen again?
- __ 4 hours or more
- __ More than 30 minutes but less than 4 hours
- __ Less than 30 minutes after being turned off
- __ It does not matter how long the engine was off

Do weather conditions affect the problem? __ No __ Yes
If yes, which ones? __ Hot __ Cold __ Rain __ Fog __ Snow __ Humid __ Dry
Does outside temperature affect the problem? __ No __ Yes
If yes, what temperature? ______ °F

Please check any of these driving conditions that cause the problem. __ Accelerating __ Decelerating __ Turning Right/Left
__ Steady Speed (approximate vehicle speed ______ mph)

What are the traffic conditions that cause the problem? __ In/Around Town (frequent stops) __ Highways (expressways) __ Offroad __ Anytime

Type of fuel used? __ Regular Unleaded __ Premium Unleaded __ Gasohol __ Other

Was the Check Engine Light On? __ Yes __ No __ Flashing

Were Other Warning Lights On? __ Yes __ No Which Ones? ____________

Additional Comments:

____

____

____

____

____

Please use the back of this sheet if needed.

A17101-A

Diagnostic Routine Index

DRIVEABILITY			
Concern	Condition	OASIS Number	Routine Number
Starting Concerns	No Crank	601300	1
	Hard Start / Long Crank	602300	2
	Stall After Start	—	3
	No Start / Normal Crank	603300	4
Unique Idle Concerns	Slow Return To Idle	617400	5
	Rolling Idle	618400	6
	Fast Idle	619400	7
	Low / Slow Idle	—	8
Performance While Driving Concerns	Stalls / Quits	607000	3 / 8 / 9
	— Idle	607400	3
	— Acceleration	607500	9
	— Cruise	607600	9
	— Deceleration	607700	8
	Runs Rough	608000	6 / 10
	— Idle	608400	6
	— Acceleration	608500	10
	— Cruise	608600	10
	Misses	609000	6 / 10
	— Idle	609400	6
	— Acceleration	609500	10
	— Cruise	609600	10
	Buck / Jerk	610000	9
	— Acceleration	610500	9
	— Cruise	610600	9
	— Deceleration	610700	9
	Hesitation / Stumble	611000	9
	— Acceleration	611500	9
	Surge	612000	11
	— Acceleration	612500	11
	— Cruise	612600	11
	Backfires	613000	12
	— Idle	613400	12
	— Acceleration	613500	12
	— Deceleration	613700	12
	Lack / Loss Of Power	614000	13
	— Acceleration	614500	13
	— Cruise	614600	13
	Spark Knock	615000	14
	— Acceleration	615500	14
	— Cruise	615600	14
Additional Driveability Concerns	Diesels / Runs On	621000	7
	Poor Fuel Economy	622000	15
	Emissions Compliance	623000	16

Diagnostic Routine Index

Concern	OASIS Number	Routine Number
DRIVELINE		
Automatic Transaxle Upshift Concerns	501000	18
Automatic Transaxle Downshift Concerns	502000	18
Automatic Transaxle Engagement Concerns	503000	18
Other Automatic Transaxle Concerns	504000	18
Manual Transaxle Concerns	505000	19
ELECTRICAL		
Warning Indicators (Malfunction Indicator Lamp [MIL], Overdrive Off)	206000	17
ENGINE		
Oil System Concerns (High Oil Consumption)	401000	20
Cooling System Concerns	402000	
— Runs Hot (Overheating)		21
— Runs Cold		22
Exhaust System Concerns (Visual Smoke or Odor)	403000	23
Fuel System Concerns (Odor)	404000	24
Engine Noise	497000	25
Vibration Concerns	703000	26
Basic Engine	499000	27

Diagnostic Routines

Routine 1

Routine 1 — No Crank

Symptom	OASIS Number
No Crank	601300

TEST STEP		RESULT ▶	ACTION TO TAKE
1-1	CHECK BATTERY VOLTAGE		
	• Go to Service Manual Section 14-01 and check the battery. • **Is the battery OK?**	Yes ▶ No ▶	GO to 1-2. SERVICE as necessary.
1-2	CHECK STARTING CIRCUIT		
	• Go to Service Manual Section 11-05 and check the starting circuit. • **Is the starting circuit OK?**	Yes ▶ No ▶	GO to 1-3. SERVICE as necessary.
1-3	CHECK STARTER MOTOR		
	• Go to Service Manual Section 03-06 and check the starter motor. • **Is the starter motor OK?**	Yes ▶ No ▶	GO to 1-4. SERVICE as necessary.
1-4	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-01 and check for damaged flywheel or seized engine components. • **Is the engine OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 2

Routine 2 — Hard Start/Long Crank

Concern	OASIS Number
Hard Start / Long Crank	602300

NOTE: It is a good practice to confirm that the correct starting procedure was being used by the customer before proceeding with diagnosis.

TEST STEP		RESULT ▶	ACTION TO TAKE
2-1	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 2-2. SERVICE as necessary.
2-2	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 2-3.
2-3	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 2-4. SERVICE as necessary.
2-4	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 2-5. SERVICE as necessary.
2-5	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system and the Bypass Air (BPA) control system diagnostic procedures. • **Are the air intake system and the Bypass Air (BPA) control system OK?**	Yes (1.3L and 2.5L) ▶ Yes (All others) ▶ No ▶	GO to 2-6. GO to 2-7. SERVICE as necessary.
2-6	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 2-7. SERVICE as necessary.
2-7	CHECK COOLING FAN SYSTEM (HOT START CONCERN ONLY)		
	• Go to Service Manual Section 03-03 and check the cooling fan system. • **Is the cooling fan system OK?**	Yes ▶ No ▶	GO to 2-8. SERVICE as necessary.

Diagnostic Routines

Routine 2

TEST STEP		RESULT ▶	ACTION TO TAKE
2-8	CHECK BASIC ENGINE		
	● Go to Service Manual Section 03-00 and check the engine compression. ● Go to Service Manual Section 03-01 and check camshaft, valve train, and timing belt condition. ● **Is the basic engine OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 3

Routine 3 — Stall After Start, Stalls/Quits

Concern	OASIS Number
Stall After Start	—
Stalls/Quits — Idle	607000 607400

	TEST STEP	RESULT	ACTION TO TAKE
3-1	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 3-2. SERVICE as necessary.
3-2	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 3-3.
3-3	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system and the Bypass Air (BPA) control system diagnostic procedures. • **Are the air intake system and the Bypass Air (BPA) control system OK?**	Yes ▶ No ▶	GO to 3-4. SERVICE as necessary.
3-4	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes (1.3L and 2.5L) ▶ Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 3-5. GO to 3-6. GO to 3-7. SERVICE as necessary.
3-5	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 3-7. SERVICE as necessary.
3-6	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 3-7. SERVICE as necessary.

Diagnostic Routines

Routine 3

TEST STEP		RESULT ▶	ACTION TO TAKE
3-7	CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM		
	• Go to Section 14B and perform the Positive Crankcase Ventilation (PCV) system diagnostic procedures. • **Is the PCV system OK?**	Yes ▶ No ▶	GO to $\boxed{3\text{-}8}$. SERVICE as necessary.
3-8	CHECK EVAPORATIVE EMISSION (EVAP) SYSTEM		
	• Go to Section 11B and perform the Evaporative Emission (EVAP) system diagnostic procedures. • **Is the EVAP system OK?**	Yes ▶ No ▶	GO to $\boxed{3\text{-}9}$. SERVICE as necessary.
3-9	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check engine compression. • Go to Service Manual Section 03-01 and check camshaft, valve train, and timing belt condition. • **Is the basic engine system OK?**	Yes ▶ No ▶	GO to $\boxed{3\text{-}10}$. SERVICE as necessary.
3-10	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 4

Routine 4 — No Start/Normal Crank

Concern	OASIS Number
No Start/Normal Crank	603300

NOTE: Extended cranking due to a "NO START" condition can load the exhaust system with raw fuel and ruin the three way catalytic converter after the engine starts. After the "NO START" condition has been repaired, disconnect the injectors and crank the engine until surplus fuel is purged, as evidenced by the absence of fuel odor in the exhaust.

	TEST STEP	RESULT ▶	ACTION TO TAKE
4-1	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 4-2.
4-2	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 4-3. SERVICE as necessary.
4-3	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check engine compression. • Go to Service Manual Section 03-01 and check camshaft, valve train, and timing belt condition. • **Is the basic engine OK?**	Yes ▶ No ▶	GO to 4-4. SERVICE as necessary.
4-4	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system and the Bypass Air (BPA) control system diagnostic procedures. • **Are the air intake system and the Bypass Air (BPA) control system OK?**	Yes (1.3L and 2.5L) ▶ Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 4-5. GO to 4-6. GO to 4-7. SERVICE as necessary.
4-5	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 4-7. SERVICE as necessary.
4-6	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 4-7. SERVICE as necessary.

Diagnostic Routines

Routine 4

TEST STEP		RESULT ▶	ACTION TO TAKE
4-7	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 5

Routine 5 — Slow Return To Idle

Concern	OASIS Number
Slow Return To Idle	617400

	TEST STEP	RESULT ▶	ACTION TO TAKE
5-1	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 5-2.
5-2	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 5-3. SERVICE as necessary.
5-3	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 5-4. SERVICE as necessary.
5-4	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system and the Bypass Air (BPA) control system diagnostic procedures. • **Are the air intake system and the Bypass Air (BPA) control system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 6

Routine 6 — Rolling Idle, Runs Rough, Misses

Concern	OASIS Number
Rolling Idle	618400
Runs Rough — Idle	608000 608400
Misses — Idle	609000 609400

TEST STEP		RESULT ▶	ACTION TO TAKE
6-1	CHECK VACUUM DISTRIBUTION		
	● Check the vacuum distribution system for leaks. ● **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 6-2. SERVICE as necessary.
6-2	CHECK AIR INTAKE SYSTEM		
	● Go to Section 12B and perform the air intake system and the Bypass Air (BPA) control system diagnostic procedures. ● **Are the air intake system and the Bypass Air (BPA) control system OK?**	Yes ▶ No ▶	GO to 6-3. SERVICE as necessary.
6-3	CHECK IGNITION SYSTEM		
	● Go to Section 8B and perform the ignition system diagnostic procedures. ● **Is the ignition system OK?**	Yes ▶ No ▶	GO to 6-4. SERVICE as necessary.
6-4	CHECK FUEL DELIVERY SYSTEM		
	● Go to Section 9B and perform the fuel delivery system diagnostic procedures. ● **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 6-5. SERVICE as necessary.
6-5	PERFORM EEC QUICK TEST		
	● Go to Section 5B and perform the EEC Quick Test. ● **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No (1.3L and 2.5L) ▶ No (All others) ▶	SERVICE as necessary. GO to 6-6. GO to 6-7.
6-6	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	● Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. ● **Is the EGR system OK?**	Yes ▶ No ▶	GO to 6-7. SERVICE as necessary.

Diagnostic Routines

Routine 6

TEST STEP		RESULT ▶	ACTION TO TAKE
6-7	CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM		
	• Go to Section 14B and perform the Positive Crankcase Ventilation (PCV) system diagnostic procedures. • **Is the PCV system OK?**	Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 6-8. GO to 6-9. SERVICE as necessary.
6-8	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 6-9. SERVICE as necessary.
6-9	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check engine compression. • Go to Service Manual Section 03-01 and check camshaft, valve train, and timing belt condition. • **Is the basic engine OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 7

Routine 7 — Fast Idle, Diesels/Runs On

Concern	OASIS Number
Fast Idle	619400
Diesels/Runs On	621000

TEST STEP		RESULT	▶	ACTION TO TAKE
7-1	CHECK AIR INTAKE SYSTEM			
	● Go to Section 12B and perform the air intake system diagnostic procedures. ● **Is the air intake system OK?**	Yes	▶	GO to 7-2.
		No	▶	SERVICE as necessary.
7-2	CHECK VACUUM DISTRIBUTION			
	● Check the vacuum distribution system for leaks. ● **Is the vacuum distribution system OK?**	Yes	▶	GO to 7-3.
		No	▶	SERVICE as necessary.
7-3	PERFORM EEC QUICK TEST			
	● Go to Section 5B and perform the EEC Quick Test. ● **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes	▶	SERVICE as necessary.
		No	▶	GO to 7-4.
7-4	CHECK COOLING SYSTEM			
	● Go to Service Manual Section 03-03 and check the cooling system. ● **Is the cooling system OK?**	Yes (Vehicle has air-conditioning)	▶	GO to 7-5.
		Yes (Vehicle does not have air-conditioning)	▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No	▶	SERVICE as necessary.
7-5	CHECK AIR-CONDITIONING SYSTEM			
	● Go to Service Manual Section 12-00 and check the air-conditioning system. ● **Is the air-conditioning system OK?**	Yes	▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No	▶	SERVICE as necessary.

Diagnostic Routines

Routine 8

Routine 8 — Low/Slow Idle, Stalls/Quits

Concern	OASIS Number
Low/Slow Idle	—
Stalls/Quits — Deceleration	607000 607700

TEST STEP		RESULT	ACTION TO TAKE
8-1	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system and the Bypass Air (BPA) control system diagnostic procedures. • **Are the air intake system and the Bypass Air (BPA) control system OK?**	Yes ▶ No ▶	GO to 8-2. SERVICE as necessary.
8-2	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 8-3. SERVICE as necessary.
8-3	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No (1.3L and 2.5L) ▶ No (All others) ▶	SERVICE as necessary. GO to 8-4. RETURN to the Diagnostic Routine Index and CHECK for other concerns.
8-4	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 9

Routine 9 — Stalls/Quits, Buck/Jerk, Hesitation/Stumble

Concern	OASIS Number
Stalls/Quits	607000
— Acceleration	607500
— Cruise	607600
Buck/Jerk	610000
— Acceleration	610500
— Cruise	610600
— Deceleration	610700
Hesitation/Stumble	611000
— Acceleration	611500

TEST STEP		RESULT ▶	ACTION TO TAKE
9-1	CHECK BYPASS AIR (BPA) CONTROL SYSTEM		
	• Go to Section 12B and perform the Bypass Air (BPA) control system diagnostic procedures. • **Is the BPA control system OK?**	Yes ▶	GO to 9-2.
		No ▶	SERVICE as necessary.
9-2	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶	SERVICE as necessary.
		No ▶	GO to 9-3.
9-3	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶	GO to 9-4.
		No ▶	SERVICE as necessary.
9-4	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶	GO to 9-5.
		No ▶	SERVICE as necessary.
9-5	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system diagnostic procedures. • **Is the air intake system OK?**	Yes (1.3L and 2.5L) ▶	GO to 9-6.
		Yes (1.6L Turbo) ▶	GO to 9-7.
		Yes (All others) ▶	GO to 9-8.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 9

TEST STEP		RESULT ▶	ACTION TO TAKE
9-6	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 9-8. SERVICE as necessary.
9-7	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 9-8. SERVICE as necessary.
9-8	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-01 and check camshaft, valve train, and timing belt condition. • **Is the basic engine OK?**	Yes ▶ No ▶	GO to 9-9. SERVICE as necessary.
9-9	CHECK EXHAUST SYSTEM		
	• Go to Section 15B, Test Step EX1, and perform the exhaust system diagnostic procedures. • **Is the exhaust system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 10

Routine 10 — Runs Rough, Misses

Concern	OASIS Number
Runs Rough	608000
— Acceleration	608500
— Cruise	608600
Misses	609000
— Acceleration	609500
— Cruise	609600

	TEST STEP	RESULT ▶	ACTION TO TAKE
10-1	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶	GO to 10-2.
		No ▶	SERVICE as necessary.
10-2	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶	SERVICE as necessary.
		No ▶	GO to 10-3.
10-3	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶	GO to 10-4.
		No ▶	SERVICE as necessary.
10-4	CHECK BYPASS AIR (BPA) CONTROL SYSTEM		
	• Go to Section 12B and perform the Bypass Air (BPA) control system diagnostic procedures. • **Is the BPA control system OK?**	Yes (1.3L and 2.5L) ▶	GO to 10-5.
		Yes (All others) ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.
10-5	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• GO to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 11

Routine 11 — Surge

Concern	OASIS Number
Surge	612000
— Acceleration	612500
— Cruise	612600

TEST STEP		RESULT ▶	ACTION TO TAKE
11-1	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 11-2. SERVICE as necessary.
11-2	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 11-3. SERVICE as necessary.
11-3	CHECK BYPASS AIR (BPA) CONTROL SYSTEM		
	• Go to Section 12B and perform the Bypass Air (BPA) control system diagnostic procedures. • **Is the BPA control system OK?**	Yes ▶ No ▶	GO to 11-4. SERVICE as necessary.
11-4	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 11-5. SERVICE as necessary.
11-5	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No (1.3L and 2.5L) ▶ No (All others) ▶	SERVICE as necessary. GO to 11-6. GO to 11-7.
11-6	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 11-7. SERVICE as necessary.
11-7	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system diagnostic procedures. • **Is the air intake system OK?**	Yes ▶ No ▶	GO to 11-8. SERVICE as necessary.

Diagnostic Routines

Routine 11

TEST STEP		RESULT ▶	ACTION TO TAKE
11-8	CHECK EVAPORATIVE EMISSION (EVAP) SYSTEM		
	• Go to Section 11B and perform the Evaporative Emission (EVAP) system diagnostic procedures. • **Is the EVAP system OK?**	Yes (1.6L Turbo) ▶	GO to 11-9.
		Yes (All others) ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.
11-9	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 12

Routine 12 — Backfires

Concern	OASIS Number
Backfires	613000
— Idle	613400
— Acceleration	613500
— Deceleration	613700

TEST STEP		RESULT ▶	ACTION TO TAKE
12-1	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 12-2. SERVICE as necessary.
12-2	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 12-3. SERVICE as necessary.
12-3	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check engine compression. • Go to Service Manual Section 03-01 and check the intake manifold, intake manifold gasket, camshaft, and valves. • **Is the basic engine OK?**	Yes ▶ No ▶	GO to 12-4. SERVICE as necessary.
12-4	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 12-5.
12-5	CHECK EXHAUST SYSTEM		
	• Go to Section 15B, Test Step EX1, and perform the exhaust system diagnostic procedures. • **Is the exhaust system OK?**	Yes ▶ No ▶	GO to 12-6. SERVICE as necessary.
12-6	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	RETURN to Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 13

Routine 13 — Lack/Loss Of Power

Concern	OASIS Number
Lack/Loss Of Power	614000
— Acceleration	614500
— Cruise	614600

TEST STEP		RESULT ▶	ACTION TO TAKE
13-1	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system diagnostic procedures. • **Is the air intake system OK?**	Yes ▶ No ▶	GO to 13-2. SERVICE as necessary.
13-2	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 13-3. SERVICE as necessary.
13-3	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 13-4. SERVICE as necessary.
13-4	CHECK EXHAUST SYSTEM		
	• Go to Section 15B, Test Step EX1, and perform the exhaust system diagnostic procedures. • **Is the exhaust system OK?**	Yes (1.3L and 2.5L) ▶ Yes (All others) ▶ No ▶	GO to 13-5. GO to 13-6. SERVICE as necessary.
13-5	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 13-6. SERVICE as necessary.
13-6	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check the engine compression. • Go to Service Manual Section 03-01 and check the camshaft and valves. • **Is the basic engine OK?**	Yes ▶ No ▶	GO to 13-7. SERVICE as necessary.

Diagnostic Routines

Routine 13

TEST STEP		RESULT ▶	ACTION TO TAKE
13-7	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No (1.6L Turbo) ▶ No (All others) ▶	SERVICE as necessary. GO to 13-8. GO to 13-9.
13-8	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 13-9. SERVICE as necessary.
13-9	CHECK DRIVETRAIN AND BRAKES		
	• Go to Service Manual Section 08-00 and perform the clutch system diagnostic procedures (MTX). • Go to Service Manual Section 07-01 and perform the automatic transaxle diagnostic procedures (ATX). • Go to Service Manual Section 06-00 and check for dragging brakes. • **Are the drivetrain and brakes OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 14

Routine 14 — Spark Knock

Concern	OASIS Number
Spark Knock	615000
— Acceleration	615500
— Cruise	615600

NOTE: If the following tests fail to correct the condition, it is recommended that the owner change the source of fuel. Water, alcohol percentage, fuel vapor pressure, and lead can be detected by using Rotunda Gas Check 014-00335, or equivalent.

TEST STEP		RESULT ▶	ACTION TO TAKE
14-1	CHECK IGNITION SYSTEM		
	• Go to Section 8B and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 14-2. SERVICE as necessary.
14-2	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes (1.3L and 2.5L) ▶ Yes (All others) ▶ No ▶	GO to 14-3. GO to 14-4. SERVICE as necessary.
14-3	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 14-4. SERVICE as necessary.
14-4	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 14-5.
14-5	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and check the cooling system for overheating conditions. • **Is the cooling system OK?**	Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 14-6. RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 14

TEST STEP		RESULT ▶	ACTION TO TAKE
14-6	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 15

Routine 15 — Poor Fuel Economy

Concern	OASIS Number
Poor Fuel Economy	622000

	TEST STEP	RESULT ▶	ACTION TO TAKE
15-1	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 15-2. SERVICE as necessary.
15-2	CHECK IGNITION SYSTEM		
	• Go to Section 8B, Test Step ADV1 for the 1.6L or Test Step IST1 for the 1.3L, 1.8L, or the 2.5L and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 15-3. SERVICE as necessary.
15-3	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system diagnostic procedures. • **Is the air intake system OK?**	Yes ▶ No ▶	GO to 15-4. SERVICE as necessary.
15-4	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 15-5. SERVICE as necessary.
15-5	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No (1.3L and 2.5L) ▶ No (All others) ▶	SERVICE as necessary. GO to 15-6. GO to 15-7.
15-6	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 15-7. SERVICE as necessary.
15-7	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and check the cooling system (thermostat). • **Is the cooling system OK?**	Yes ▶ No ▶	GO to 15-8. SERVICE as necessary.

Diagnostic Routines

Routine 15

TEST STEP		RESULT ▶	ACTION TO TAKE
15-8	CHECK EXTERNAL FACTORS		
	● Check all factors external to the engine: — Tire pressure (Service Manual Section 04-04) — Transaxle slipping (Service Manual Section 07-01 or 07-03) — Brake dragging (Service Manual Section 06-00) — Odometer calibration (Service Manual Section 13-01) — Vehicle load — Driving habits — Road and weather conditions ● **Are all of the external factors OK?**	Yes ▶ No ▶	GO to 15-9. SERVICE as necessary.
15-9	CHECK EXHAUST SYSTEM		
	● Go to Section 15B, Test Step EX1, and perform the exhaust system diagnostic procedures. ● **Is the exhaust system free of restrictions?**	Yes ▶ No ▶	GO to 15-10. SERVICE as necessary.
15-10	CHECK BASIC ENGINE		
	● Go to Service Manual Section 03-00 and check engine compression. ● Go to Service Manual Section 03-01 and check the intake manifold, intake manifold gasket, camshaft and valves. ● **Is the basic engine OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 16

Routine 16 — Emissions Compliance

Concern	OASIS Number
Emissions Compliance	623000

NOTE: Canada and some states or metropolitan areas in the United States require periodic idle emission tests. All Ford products have been designed to pass these tests. If a Ford product fails an idle emission test, it is probable that 1) the engine temperature was not warm and stabilized prior to the test, or 2) the vehicle had idled excessively long prior to the test.

Prior to starting any services, complaints of an idle emission test failure should be verified by using the test procedure of the area which failed the vehicle if the area is approved by Ford for performance warranty.

The following example encompasses most of the emissions measurement modes of the current state idle test procedures:

- Ensure that the engine is at normal operating temperature and that all accessories are turned off.
- Read the emissions at idle.
- Run the engine at 2500 ± 300 rpm.
- Read the emissions within 30 seconds.
- Return the engine speed to idle.
- Read the emissions within 30 seconds.

If any emission components are changed, Keep Alive Memory (KAM) should be cleared before repeating the state emission test procedure. Refer to Erasing Diagnostic Trouble Codes in the Quick Test Appendix in Section 5B.

TEST STEP		RESULT ▶	ACTION TO TAKE
16-1	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained, or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 16-2.
16-2	CHECK IGNITION SYSTEM		
	• Go to Section 8B, Test Step ADV1 for the 1.6L or Test Step IST1 for the 1.3L, 1.8L, or the 2.5L and perform the ignition system diagnostic procedure. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 16-3. SERVICE as necessary.
16-3	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Is the vacuum distribution system OK?**	Yes ▶ No ▶	GO to 16-4. SERVICE as necessary.

Diagnostic Routines

Routine 16

TEST STEP		RESULT ▶	ACTION TO TAKE
16-4	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B, Test Step FD1, and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes (1.3L and 2.5L) ▶ Yes (All others) ▶ No ▶	GO to 16-5. GO to 16-6. SERVICE as necessary.
16-5	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶ No ▶	GO to 16-6. SERVICE as necessary.
16-6	CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM		
	• Go to Section 14B and perform the Positive Crankcase Ventilation (PCV) system diagnostic procedures. • **Is the PCV system OK?**	Yes ▶ No ▶	GO to 16-7. SERVICE as necessary.
16-7	CHECK EVAPORATIVE EMISSION (EVAP) SYSTEM		
	• Go to Section 11B and perform the Evaporative Emission (EVAP) system diagnostic procedures. • **Is the EVAP system OK?**	Yes ▶ No ▶	GO to 16-8. SERVICE as necessary.
16-8	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and perform the air intake system diagnostic procedures. • **Is the air intake system OK?**	Yes ▶ No ▶	GO to 16-9. SERVICE as necessary.
16-9	CHECK EXHAUST SYSTEM		
	• Go to Section 15B and perform the exhaust system diagnostic procedures. • **Is the exhaust system OK?**	Yes ▶ No ▶	GO to 16-10. SERVICE as necessary.
16-10	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and perform the cooling system diagnostic procedures. • **Is the cooling system OK?**	Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 16-11. GO to 16-12. SERVICE as necessary.
16-11	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 16-12. SERVICE as necessary.

Diagnostic Routines

Routine 16

TEST STEP		RESULT ▶	ACTION TO TAKE
16-12	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check the engine compression. • Go to Service Manual Section 03-01 and check the intake manifold gasket, the camshaft, and the valves. • **Is the engine OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 17

Routine 17 — Warning Indicator Lamps

Concern	OASIS Number
Warning Indicator Lamps (MIL, Overdrive Off)	206000

NOTE: Use this Routine when the Malfunction Indicator Lamp (MIL) or "Check Engine" lamp, or the Overdrive Off Lamp (O/D OFF) (1.6L 4EAT and 2.5L 4EAT only) is on or flashing while driving.

TEST STEP		RESULT ▶	ACTION TO TAKE
17-1	PERFORM EEC OR 4EAT QUICK TEST		
	• Go to Section 5B and perform the appropriate Quick Test: — EEC Quick Test if the MIL is on or flashing while driving — 4EAT Quick Test if the Overdrive Off Lamp (O/D OFF) is on or flashing while driving (other than overdrive off driving) • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. RETURN to the Diagnostic Routine Index and CHECK for other concerns.

Diagnostic Routines

Routine 18

Routine 18 — Automatic Transaxle Concerns

Concern	OASIS Number
Automatic Transaxle Upshift Concerns	501000
Automatic Transaxle Downshift Concerns	502000
Automatic Transaxle Engagement Concerns	503000
Other Automatic Transaxle Concerns	504000

TEST STEP		RESULT ▶	ACTION TO TAKE
18-1	PERFORM 4EAT QUICK TEST		
	• Go to Section 5B (Section 2A, 1.9L 4EAT) and perform the 4EAT Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶	SERVICE as necessary.
		No ▶	GO to 18-2.
18-2	CHECK BASIC TRANSAXLE		
	• Go to Service Manual Section 07-01 and perform the automatic transaxle diagnostic procedures. • **Is the automatic transaxle OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 19

Routine 19 — Manual Transaxle Concerns

Concern	OASIS Number
Manual Transaxle Concerns	505000

TEST STEP		RESULT ▶	ACTION TO TAKE
19-1	CHECK MANUAL TRANSAXLE		
	• Go to Service Manual Section 07-03 and check the manual transaxle. • **Is the manual transaxle OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.

Diagnostic Routines

Routine 20

Routine 20 — Oil System Concerns (High Oil Consumption)

Concern	OASIS Number
Oil System Concerns (High Oil Consumption)	401000

TEST STEP		RESULT ▶	ACTION TO TAKE
20-1	CHECK OIL LEVEL		
	• Check for proper filling of the crankcase and for proper dipstick application. • **Are the oil level and dipstick OK?**	Yes ▶ No ▶	GO to 20-2. SERVICE as required.
20-2	CHECK ENGINE FOR EXTERNAL LEAKS		
	• Check the following components for leakage. Refer to Service Manual Section 03-01. — Valve cover gasket — Crankshaft seals — Oil pan gasket and seals — Dipstick — Oil filter and seal — Oil pump — Engine assembly • **Are external leaks evident?**	Yes ▶ No ▶	SERVICE as necessary. GO to 20-3.
20-3	CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM		
	• Go to Section 14B and perform the Positive Crankcase Ventilation (PCV) system diagnostic procedures. • **Is the PCV system OK?**	Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 20-4. GO to 20-5. SERVICE as necessary.
20-4	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B and perform the turbocharger system diagnostic procedures. • **Is the turbocharger system OK?**	Yes ▶ No ▶	GO to 20-5. SERVICE as necessary.
20-5	CHECK ENGINE FOR INTERNAL LEAKS		
	• Go to Service Manual Section 03-00 and check the engine for internal oil leakage: — Oil contamination / dilution from fuel or water • **Are internal leaks evident?**	Yes ▶ No ▶	SERVICE as necessary. RETURN to the Diagnostic Routine Index and CHECK for other concerns.

Diagnostic Routines

Routine 21

Routine 21 — Cooling System Concerns (Overheating)

Concern	OASIS Number
Cooling System Concerns — Runs Hot (Overheating)	402000

TEST STEP		RESULT	▶ ACTION TO TAKE
21-1	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and perform the cooling system diagnostic procedures. • **Is the cooling system OK?**	Yes ▶ No ▶	GO to 21-2. SERVICE as necessary.
21-2	CHECK TEMPERATURE GAUGE		
	• Go to Service Manual Section 13-01 or 13-05 and perform the temperature gauge diagnostic procedures. • **Is the temperature gauge OK?**	Yes ▶ No ▶	GO to 21-3. SERVICE as necessary.
21-3	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained, or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. GO to 21-4.
21-4	CHECK IGNITION SYSTEM		
	• Go to Section 8B, Test Step ADV1 for the 1.6L or Test Step IST1 for the 1.3L, 1.8L, or the 2.5L and perform the ignition system diagnostic procedures. • **Is the ignition system OK?**	Yes ▶ No ▶	GO to 21-5. SERVICE as necessary.
21-5	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-00 and check for internal engine leaks. • Go to Service Manual Section 03-01 and check the: — Oil level — Coolant passages — Cylinder head and gasket — Engine block • **Is the basic engine OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 22

Routine 22 — Cooling System Concerns (Runs Cold)

Concern	OASIS Number
Cooling System Concerns — Runs Cold	402000

TEST STEP		RESULT ▶	ACTION TO TAKE
22-1	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and check the cooling system: — Thermostat — Cooling fan • **Is the cooling system OK?**	Yes ▶ No ▶	GO to 22-2. SERVICE as necessary.
22-2	CHECK TEMPERATURE GAUGE		
	• Go to Service Manual Section 13-01 or 13-05 and perform the temperature gauge diagnostic procedures. • **Is the temperature gauge OK?**	Yes ▶ No ▶	GO to 22-3. SERVICE as necessary.
22-3	PERFORM EEC QUICK TEST		
	• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶ No ▶	SERVICE as necessary. RETURN to the Diagnostic Routine Index and CHECK for other concerns.

Diagnostic Routines

Routine 23

Routine 23 — Exhaust System Concerns

Concern	OASIS Number
Exhaust System Concerns (Visual Smoke or Odor)	403000

Symptom	Action To Take
Odor From Exhaust System	GO to 23-1.
Black Smoke (Rich Mixture)	GO to 23-3.
Blue Smoke (Burning Oil)	GO to 23-6.
White Smoke (Coolant in Combustion)	GO to 23-9.

TEST STEP	RESULT ▶	ACTION TO TAKE
23-1 CHECK EXHAUST EMISSIONS		
• Go to Section 15B and perform the exhaust emissions diagnostic procedures. • **Are the exhaust emissions OK?**	Yes (1.3L and 2.5L) ▶	GO to 23-2.
	Yes (All others) ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
	No ▶	SERVICE as necessary.
23-2 CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
• Go to Section 10B and perform the Exhaust Gas Recirculation (EGR) system diagnostic procedures. • **Is the EGR system OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
	No ▶	SERVICE as necessary.
23-3 CHECK AIR INTAKE SYSTEM		
• Go to Section 12B and perform the air intake system diagnostic procedures. • **Is the air intake system OK?**	Yes ▶	GO to 23-4.
	No ▶	SERVICE as necessary.
23-4 CHECK FUEL DELIVERY SYSTEM		
• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶	GO to 23-5.
	No ▶	SERVICE as necessary.
23-5 PERFORM EEC QUICK TEST		
• Go to Section 5B and perform the EEC Quick Test. • **Are diagnostic trouble codes obtained or are any other conditions noticed?**	Yes ▶	SERVICE as necessary.
	No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.

Diagnostic Routines

Routine 23

	TEST STEP	RESULT ▶	ACTION TO TAKE
23-6	CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM		
	• Go to Section 14B and perform the Positive Crankcase Ventilation (PCV) system diagnostic procedures. • **Is the PCV system OK?**	Yes ▶ No ▶	GO to 23-7. SERVICE as necessary.
23-7	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-01 and check the following: — Valve guides / stems / seals — Oil drain passages in head — Piston rings (seized, worn) — Pistons (worn) — Cylinder bores (scuffed) • **Is the basic engine OK?**	Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to 23-8. RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.
23-8	CHECK TURBOCHARGER SYSTEM		
	• Go to Section 9B, Test Step PFO1, and check the turbocharger system. • **Is the turbocharger system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.
23-9	CHECK BYPASS AIR (BPA) CONTROL SYSTEM		
	• Go to Section 12B and perform the Bypass Air (BPA) control system diagnostic procedures. • **Is the BPA control system OK?**	Yes ▶ No ▶	GO to 23-10. SERVICE as necessary.
23-10	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and perform the cooling system pressure test. • **Is the cooling system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 24

Routine 24 — Fuel System Concerns (Odor)

Concern	OASIS Number
Fuel System Concerns (Odor)	404000

TEST STEP		RESULT ▶	ACTION TO TAKE
24-1	CHECK FUEL DELIVERY SYSTEM		
	• Go to Section 9B and perform the fuel delivery system diagnostic procedures. • **Is the fuel delivery system OK?**	Yes ▶ No ▶	GO to 24-2. SERVICE as necessary.
24-2	CHECK EVAPORATIVE EMISSION (EVAP) SYSTEM		
	• Go to Section 11B and perform the Evaporative Emission (EVAP) system diagnostic procedures. • **Is the EVAP system OK?**	Yes ▶ No ▶	GO to 24-3. SERVICE as necessary.
24-3	CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM		
	• Go to Section 14B and perform the Positive Crankcase Ventilation (PCV) system diagnostic procedures. • **Is the PCV system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 25

Routine 25 — Engine Noise

Concern	OASIS Number
Engine Noise	497000

Symptom	Action To Take
Squeal, Click, or Chirp	GO to 25-1.
Rumble, Grind	GO to 25-4.
Rattle	GO to 25-5.
Hiss	GO to 25-6.
Snap	GO to 25-11.
Rap, Roar	GO to 25-12.
Knock	GO to 25-14.

TEST STEP	RESULT	ACTION TO TAKE
25-1 CHECK ACCESSORY DRIVE		
• Go to Service Manual Section 03-05 and check the drive belts and the drive belt components. • **Is the accessory drive OK?**	Yes ▶ No ▶	GO to 25-2. SERVICE as necessary.
25-2 CHECK BASIC ENGINE		
• Go to Service Manual Section 03-01 and check the oil level and valves. • **Is the basic engine OK?**	Yes ▶ No ▶	GO to 25-3. SERVICE as necessary.
25-3 CHECK ELECTRONIC ENGINE CONTROL (EEC) SOLENOIDS		
• Go to Section 6B, Pinpoint Tests SCP and SCG, and perform the EEC solenoid diagnostic procedures. • **Are the EEC solenoids OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.
25-4 CHECK ACCESSORY DRIVE COMPONENTS		
• Go to Service Manual Section 03-05 and check the drive belt components. • **Are the drive belt components OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 25

TEST STEP		RESULT	ACTION TO TAKE
25-5	CHECK FOR LOOSE COMPONENTS		
	• Visually inspect the vehicle for loose components. • **Are there any loose components?**	Yes ▶ No ▶	SERVICE as necessary. RETURN to the Diagnostic Routine Index and CHECK for other concerns.
25-6	CHECK VACUUM DISTRIBUTION		
	• Check the vacuum distribution system for leaks. • **Are there any vacuum distribution system leaks?**	Yes ▶ No ▶	SERVICE as necessary. GO to 25-7.
25-7	CHECK AIR INTAKE SYSTEM		
	• Go to Section 12B and check the air intake system for leaks. • **Is the air intake system OK?**	Yes ▶ No ▶	GO to 25-8. SERVICE as necessary.
25-8	CHECK SPARK PLUGS		
	• Go to Service Manual Section 03-07 and check the spark plugs for proper torque. • **Are the spark plugs OK?**	Yes ▶ No ▶	GO to 25-9. SERVICE as necessary.
25-9	CHECK COOLING SYSTEM		
	• Go to Service Manual Section 03-03 and check the cooling system for leaks. • **Is the cooling system OK?**	Yes ▶ No ▶	GO to 25-10. SERVICE as necessary.
25-10	CHECK EVAPORATIVE EMISSION (EVAP) SYSTEM		
	• Go to Section 11B and check the Evaporative Emission (EVAP) system for leaks. • **Is the EVAP system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.
25-11	CHECK SECONDARY IGNITION		
	• Go to Service Manual Section 03-07 and check the secondary ignition system. • **Is the secondary ignition system OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines Index and CHECK for other concerns. SERVICE as necessary.

Diagnostic Routines

Routine 25

TEST STEP		RESULT ▶	ACTION TO TAKE
25-12	CHECK EXHAUST SYSTEM		
	• Go to Section 15B and check the exhaust system for leaks. • **Is the exhaust system OK?**	Yes (1.3L and 2.5L) ▶	GO to 25-13.
		Yes (All others) ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.
25-13	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM		
	• Go to Section 10B and check the Exhaust Gas Recirculation (EGR) system for leaks. • **Is the EGR system OK?**	Yes ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.
		No ▶	SERVICE as necessary.
25-14	CHECK BASIC ENGINE		
	• Go to Service Manual Section 03-01 and check the: — Connecting rod bearings — Main bearings — Piston pins — Piston-to-bore clearance • **Is the basic engine OK?**	Yes ▶	GO to 25-15.
		No ▶	SERVICE as necessary.
25-15	CHECK FOR SPARK KNOCK		
	• Perform Diagnostic Routine 14. • **Does the vehicle have spark knock?**	Yes ▶	SERVICE as necessary.
		No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.

Diagnostic Routines

Routine 26

Routine 26 — Vibration Concerns

Concern	OASIS Number
Vibration Concerns	703000

TEST STEP		RESULT ▶	ACTION TO TAKE
26-1	CHECK VIBRATION CONCERNS		
	• Go to Service Manual Section 00-04 and check for noise, vibration, and harshness. • **Is there a vibration concern?**	Yes ▶	SERVICE as necessary.
		No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns.

Diagnostic Routines

Routine 27

Routine 27 — Basic Engine

Concern	OASIS Number
Basic Engine	499000

TEST STEP	RESULT ▶	ACTION TO TAKE
27-1 CHECK BASIC ENGINE		
● Go to Service Manual Section 03-00 and check the engine compression. ● Go to Service Manual Section 03-01 and check the: — Oil level — Valve cover — Crankshaft — Oil pan — Oil filter — Oil pump — Cylinder head — Engine block — Valves — Timing belt — Intake manifold ● **Is the basic engine OK?**	Yes ▶ No ▶	RETURN to the Diagnostic Routine Index and CHECK for other concerns. SERVICE as necessary.

Specifications/Special Service Tools

Special Service Tools/Equipment

ROTUNDA EQUIPMENT

Model	Description
014-00335	Gas Check

SECTION 3B

EEC Engine Supplement — Car

Contents

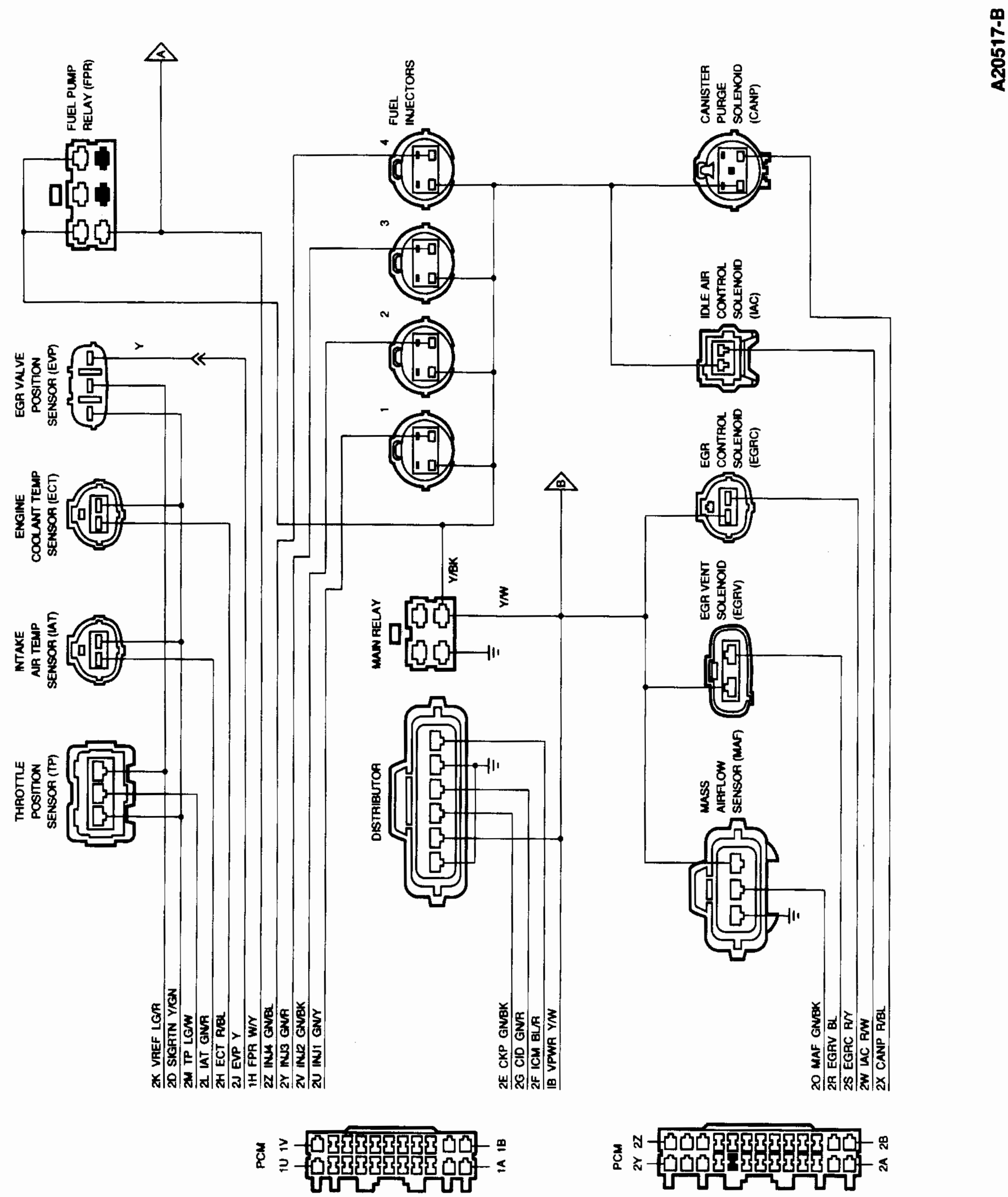
SECTION 3B

EEC Engine Supplement — Car

Contents (continued)

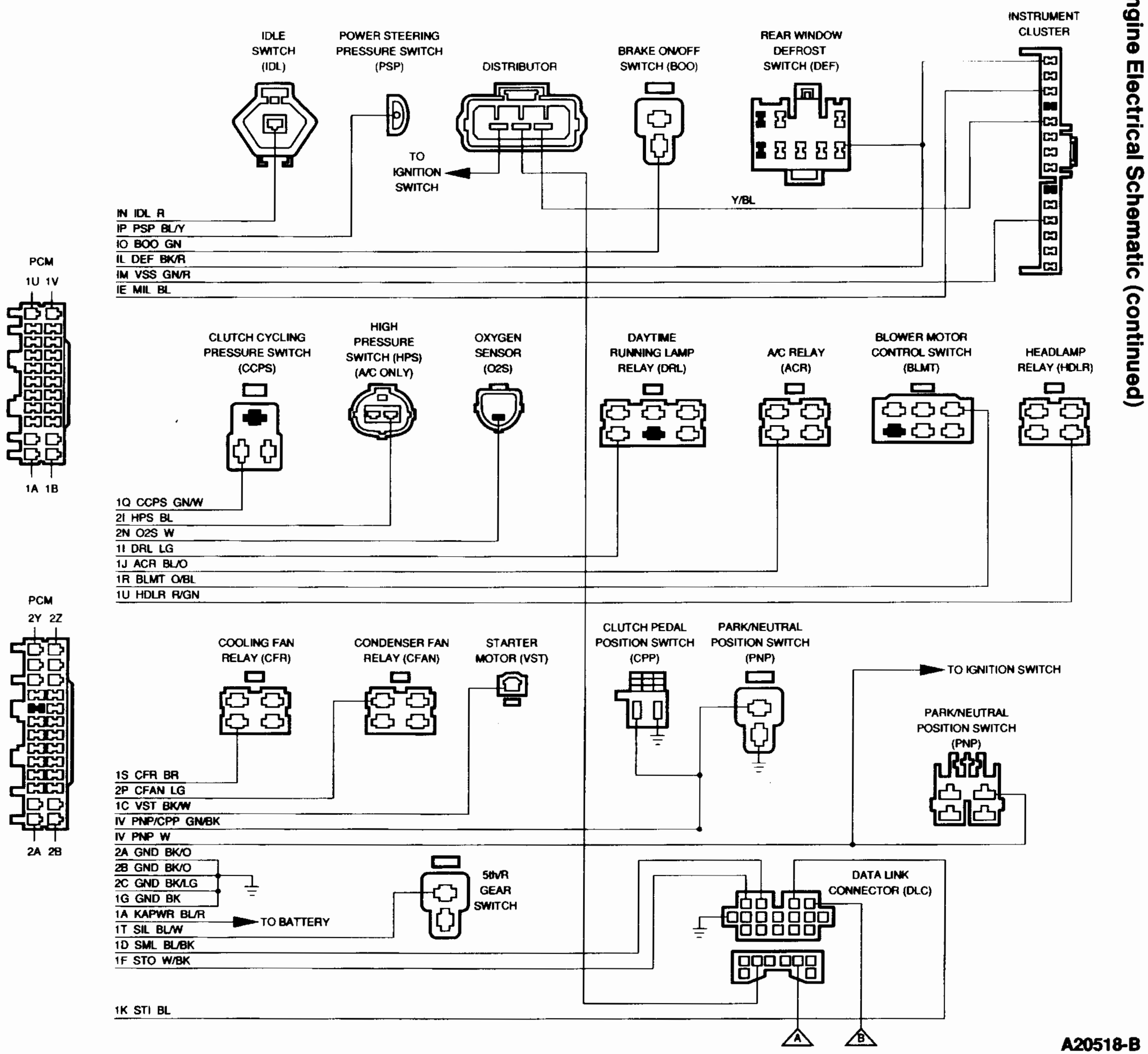
1.3L Electrical Schematics

Engine Electrical Schematic



1.3L Electrical Schematics

Engine Electrical Schematic (continued)



1.3L Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	1	BL/R	Keep Alive Power	KAPWR
1B	37,57	Y/W	Vehicle Power	VPWR
1C	5	BK/W	Vehicle Start	VST
1D	38	BL/BK	Switch Monitor Lamp	SML
1E	15	BL	Malfunction Indicator Lamp	MIL
1F	17	W/BK	Self Test Output	STO
1G	36	BK	Ground (MTX Only)	GND
1H	55	W/Y	Fuel Pump Relay	FPR
1I	35	LG	Daytime Running Lamp Relay (Canada Only)	DRL
1J	54	BL/O	A/C Relay (A/C Only)	ACR
1K	48	BL	Self Test Input	STI
1L	42	BK/R	Rear Window Defroster Switch	DEF
1M	21	GN/R	Vehicle Speed Sensor (In Instrument Cluster)	VSS
1N	18	R	Idle Switch	IDL
1O	2	GN	Brake ON/OFF Switch	BOO
1P	19	BL/Y	Power Steering Pressure Switch (5-Door ATX Only)	PSP
1Q	10	GN/W	Clutch Cycling Pressure Switch (A/C Only)	CCPS
1R	22	O/BL	Blower Motor Switch	BLMT
1S	23	BR	Cooling Fan Relay	CFR
1T	30	BL/W	Shift Indicator Lamp (MTX Only)	SIL
1U	28	R/GN	Headlamp Relay	HDLR
1V	43	GN/BK	Park/Neutral Position Switch/Clutch Pedal Position Switch (MTX Only)	PNP/CPP
1V	43	W	Park/Neutral Position Switch (ATX Only)	PNP
2A	39,40,44,60	BK/O	Ground	GND
2B	20	BK/O	Ground	GND
2C	16	BK/LG	Ground	GND
2D	46, 49	Y/GN	Signal Return	SIGRTN
2E	56	GN/BK	Crankshaft Position Sensor (In Distributor)	CKP
2F	3	BL/R	Ignition Control Module (In Distributor)	ICM
2G	24	GN/R	Cylinder Identification Sensor (In Distributor)	CID
2H	51	R/BL	Engine Coolant Temperature Senor	ECT
2I	50	BL	High Pressure Switch (A/C Only)	HPS
2J	6	Y	EGR Valve Position Sensor	EVP
2K	26	LG/R	Reference Voltage	VREF
2L	27	GN/R	Intake Air Temperature Sensor	IAT
2M	47	LG/W	Throttle Position Sensor	TP
2N	29	W	Oxygen Sensor	O2S

(Continued)

1.3L Electrical Schematics

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
2O	25	GN/BK	Mass Air Flow Sensor	MAF
2P	45	LG	Condenser Fan Relay (A/C Only)	CFAN
2Q	7	—	NOT USED	—
2R	13	BL	EGR Vent Solenoid	EGRV
2S	53	R/Y	EGR Control Solenoid	EGRC
2T	11	—	NOT USED	—
2U	58	GN/Y	Injector #1	INJ1
2V	59	GN/BK	Injector #2	INJ2
2W	41	R/W	Idle Air Control Solenoid	IAC
2X	31	R/BL	Canister Purge Solenoid	CANP
2Y	33	GN/R	Injector #3	INJ3
2Z	8	GN/BL	Injector #4	INJ4

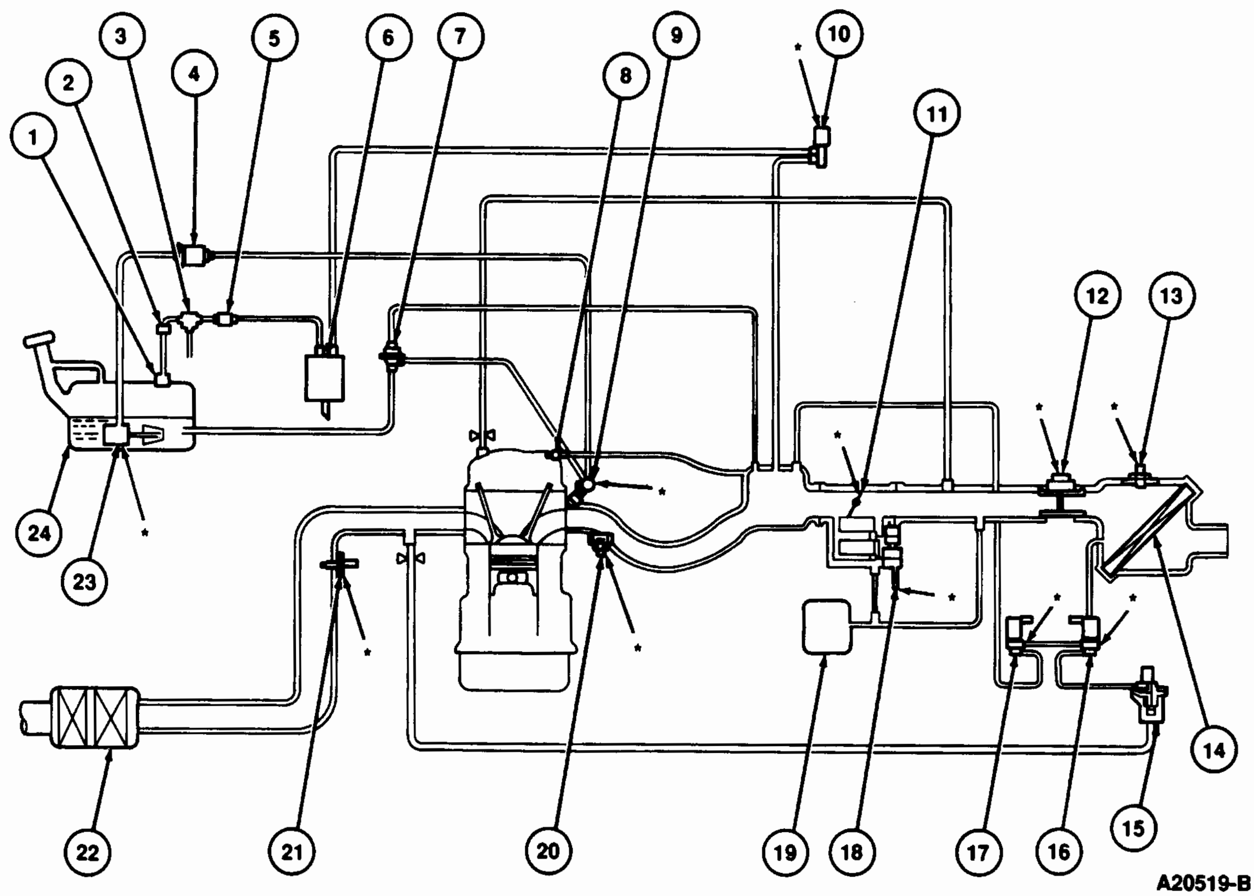
Quick Test Codes and Code Definitions

PCM Diagnostic Trouble Code	Diagnostic Trouble Code Definition
03	Cylinder Identification (CID) Sensor
04	Crankshaft Position Sensor (CKP)
06	Vehicle Speed Sensor (VSS)
08	Mass Air Flow (MAF) Sensor
09	Engine Coolant Temperature (ECT) Sensor
10	Intake Air Temperature (IAT) Sensor
12	Throttle Position (TP) Sensor
14	Barometric Pressure (BARO) Sensor
15	Oxygen Sensor (O2S) Voltage Below 0.55V
16	EGR Valve Position (EVP) Sensor
17	Oxygen Sensor (O2S) Voltage Does Not Change
"STO LO" always ON	Not able to initiate diagnostic test mode
"STI LO" always ON and no codes (Blank Super STAR II screen)	Pass Code

1.3L Fuel/Vacuum/Electrical Schematics

Mechanical Emission Related Systems

Schematic Diagram



* : To PCM.

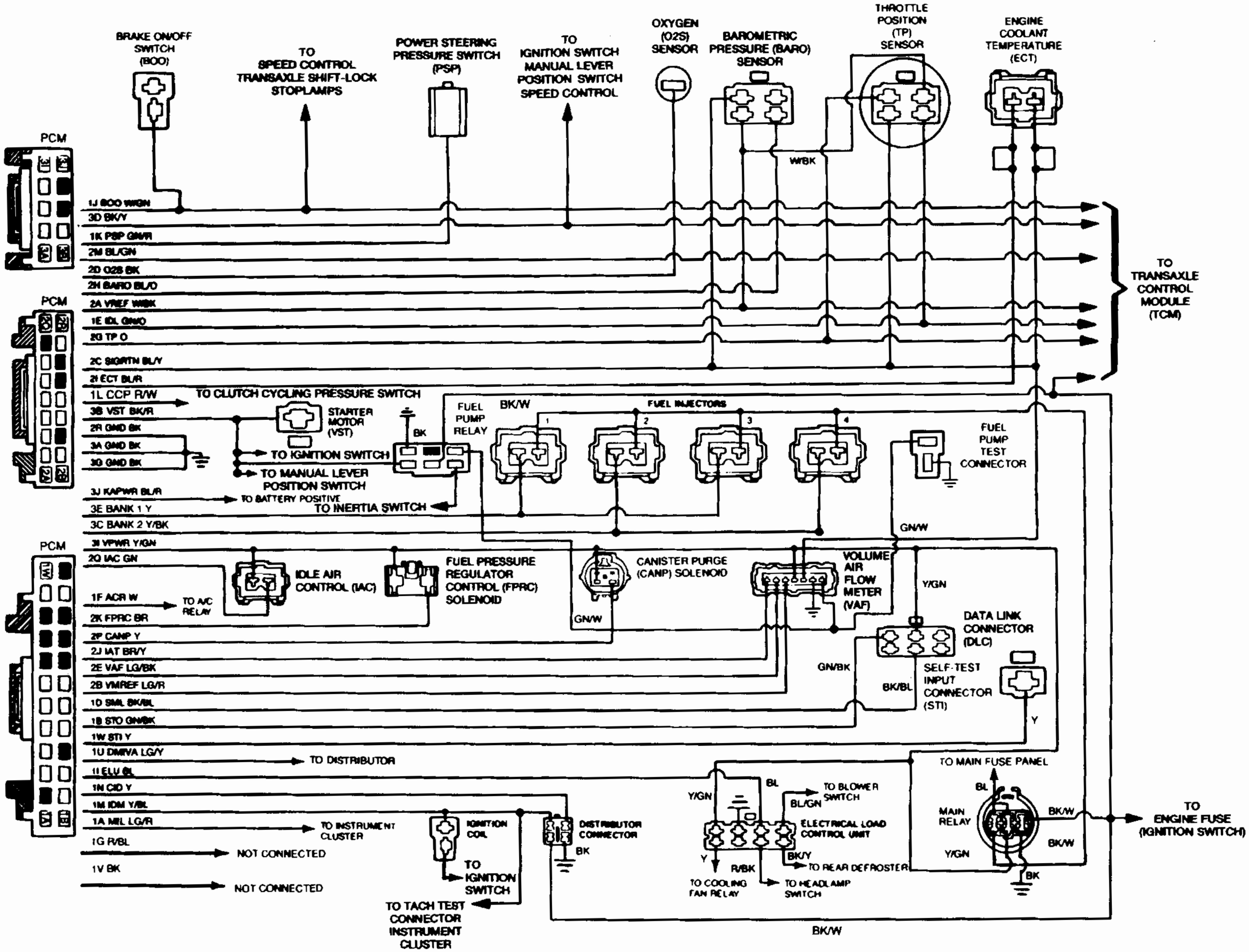
1.3L Fuel/Vacuum/Electrical Schematics

Component Identification

Item	Base Part Number	Description	System
1	9B593	Rollover/Vent Valve (5-Door Only)	Evaporative Emission
2	9B963	Vapor Separator (3-Door Only)	Evaporative Emission
3	9B593	Rollover/Vent Valve (3-Door Only)	Evaporative Emission
4	9155	Fuel Filter	Fuel Delivery
5	9576	Two-Way Check Valve	Evaporative Emission
6	9D653	Carbon Canister	Evaporative Emission
7	9C968	Fuel Pressure Regulator	Fuel Delivery
8	6A666	PCV Valve	Positive Crankcase Ventilation
9	9F593	Fuel Injector (4)	Fuel Delivery & PCM
10	9C915	Canister Purge Solenoid	Evaporative Emission & PCM
11	9989	Throttle Position Sensor	Inlet Air Control & PCM
12	12B579	Mass Air Flow Sensor	PCM
13	12B579	Intake Air Temperature Sensor	Inlet Air Control & PCM
14	9600	Air Cleaner	Inlet Air Control
15	9F489	EGR Control Valve	Exhaust Gas Recirculation
16	9B981	EGR Vent Solenoid	Exhaust Gas Recirculation & PCM
17	9B981	EGR Vacuum Solenoid	Exhaust Gas Recirculation & PCM
18	9B289	Idle Air Control Bypass Air (IAC BPA) Valve	Bypass Air Control & PCM
19	9F763	Resonance Chamber	Inlet Air Control
20	12A648	Engine Coolant Temperature Sensor	PCM
21	9F472	Oxygen Sensor	Catalyst and Exhaust & PCM
22	5E212	Three Way Catalytic Converter	Catalyst and Exhaust
23	9350	Fuel Pump and Inlet Screen	Fuel Delivery & PCM
24	9002	Fuel Tank	Fuel Delivery

1.6L Non-Turbo Electrical Schematics

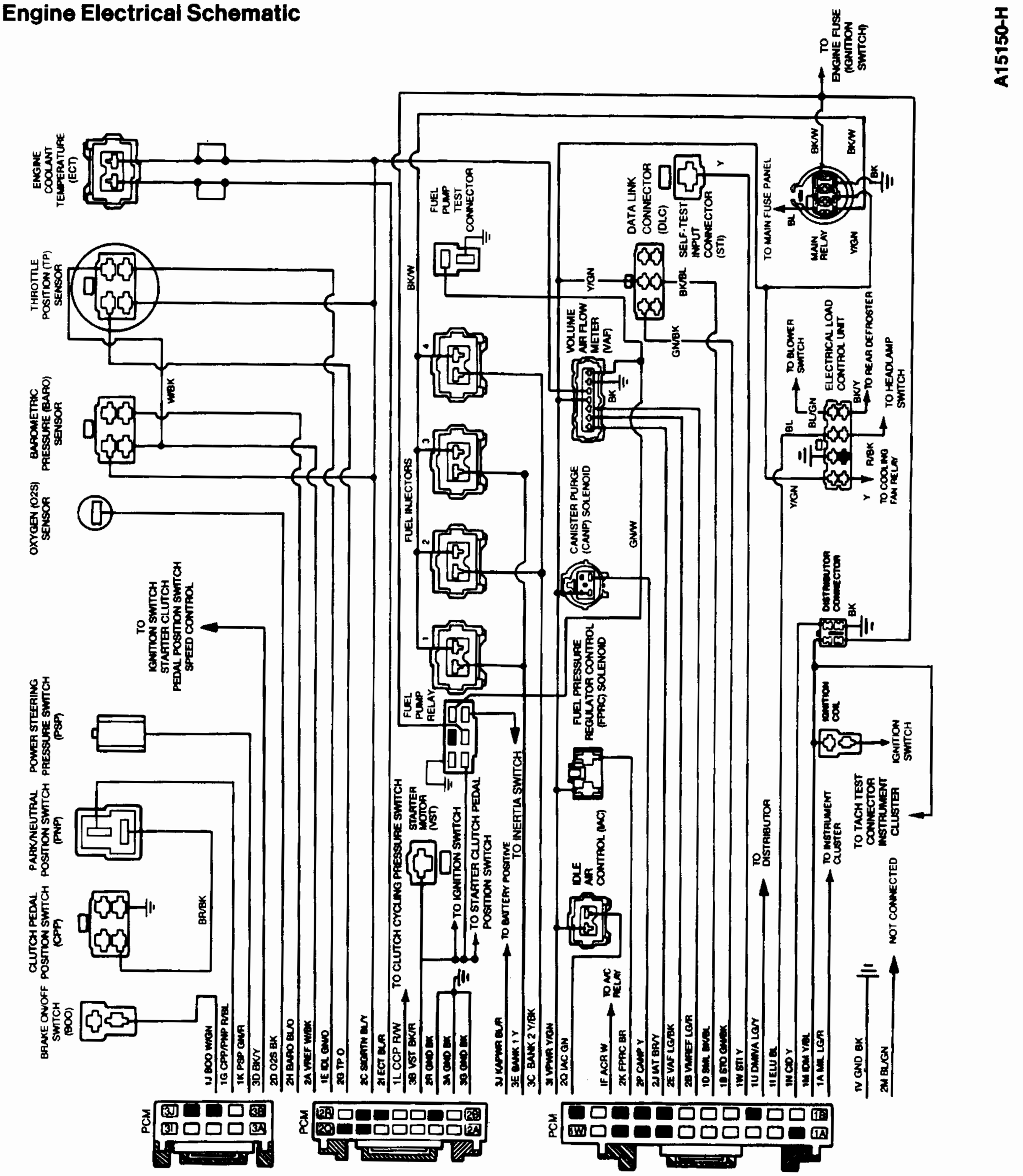
4EAT Engine Electrical Schematic



A15149-G

1.6L Non-Turbo Electrical Schematics

MTX Engine Electrical Schematic



A15150-H

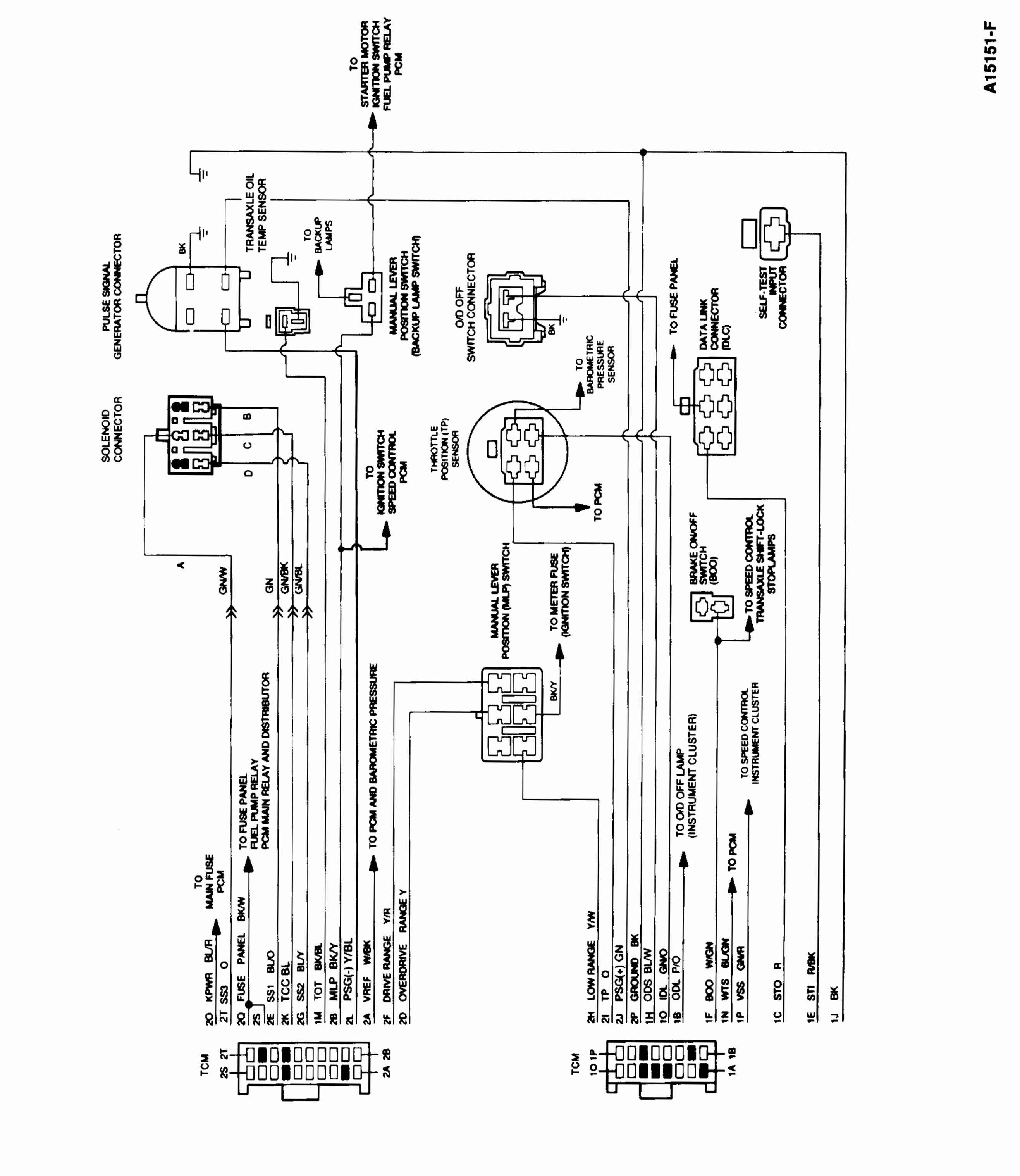
1.6L Non-Turbo Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	51	LG/R	MIL	MIL
1B	17	GN/BK	Self Test Output	STO
1D	38	BK/BL	Switch Monitor Lamp	SML
1E	28	GN/O	Idle Switch	IDL
1F	30	W	A/C Relay	ACR
1G	8	R/BL	Park/Neutral Position Switch (MTX)	PNP
1I	24	BL	Electrical Load Control Unit	ELU
1J	3	W/GN	Brake ON/OFF Switch	BOO
1K	19	GN/R	Power Steering Pressure Switch	PSP
1L	14	R/W	Clutch Cycling Pressure Switch	CCP
1M	6	Y/BL	Ignition Diagnostic Monitor	IDM
1N	34	Y	Cylinder Identification Sensor	CID
1U	36	LG/Y	Distributor Mounted Ignition Module With Vacuum Advance	DMIVA
1V	44	BK	Ground (MTX)	GND
1W	48	Y	Self Test Input	STI
2A	26	W/BK	Reference Voltage	VREF
2B	18	LG/R	Volume Air Flow Reference	VMREF
2C	46	BL/Y	Signal Return	SIGRTN
2D	29	BK	Oxygen Sensor	O2S
2E	43	LG/BK	Volume Air Flow Signal	VAF
2G	47	O	Throttle Position Sensor	TP
2H	45	BL/O	Barometric Pressure Sensor	BARO
2I	7	BL/R	Engine Coolant Temperature Sensor	ECT
2J	25	BR/Y	Intake Air Temperature Sensor	IAT
2K	31	BR	Fuel Pressure Regulator Control Solenoid	FPRC
2M	52	BL/GN	Water Temperature Switch (ATX)	WTS
2P	32	Y	Canister Purge Solenoid	CANP
2Q	41	GN	Idle Air Control	IAC
2R	49	BK	Ground	GND
3A	20	BK	Ground	GND
3B	5	BK/R	Vehicle Start	VST
3C	59	Y/BK	Fuel Injectors 2 and 4	BANK 2
3D	2	BK/Y	Manual Lever Position Switch (4EAT)/Starter Clutch Pedal Position Switch (MTX)	MLP/SCPP
3E	58	Y	Fuel Injectors 1 and 3	BANK 1
3G	40	BK	Ground	GND
3I	37	Y/GN	Vehicle Power	VPWR
3J	1	BL/R	Keep Alive Power	KAPWR

1.6L Non-Turbo Electrical Schematics

4EAT Transaxle Control Module (TCM) Electrical Schematic



1.6L Non-Turbo Electrical Schematics

4EAT Transaxle Control Module (TCM) Connector Pin Usage

Module Pin	Wire Color	Application	Abbrev.
1B	P/O	O/D OFF Lamp	ODL
1C	R	Self Test Output	STO
1E	R/BK	Self Test Input	STI
1F	W/GN	Brake ON/OFF Switch	BOO
1H	BL/W	O/D OFF Switch	ODS
1J	BK	Ground	GND
1M	BK/BL	Trans. Oil Temperature Switch	TOT
1N	BL/GN	Water Temp. Switch	WTS
1O	GN/O	Idle Switch	IDL
1P	GN/R	Vehicle Speed Sensor	VSS
2A	W/BK	Vehicle Reference	VREF
2B	BK/Y	Manual Lever Position Switch	MLP
2D	Y	Overdrive Range (Selector Lever)	MLPOD
2E	BL/O	1-2 Shift Solenoid (Shift Solenoid #1)	SS1
2F	Y/R	Drive Range (Selector Lever)	MLPD
2G	BL/Y	2-3 Shift Solenoid (Shift Solenoid #2)	SS2
2H	Y/W	Low Range (Selector Lever)	MLPL
2I	O	Throttle Position Sensor	TP
2J	GN	Pulse Signal Generator (+)	PSG(+)
2K	BL	Torque Converter Clutch Control Solenoid	TCCC
2L	Y/BL	Pulse Signal Generator (-)	PSG(-)
2O	BL/R	Keep Alive Power	KAPWR
2P	BK	Ground	GND
2Q	BK/W	Battery	BAT
2S	BK/W	Battery	BAT
2T	O	3-4 Shift Solenoid (Shift Solenoid #3)	SS3

1.6L Non-Turbo Electrical Schematics

Quick Test Codes and Code Definitions

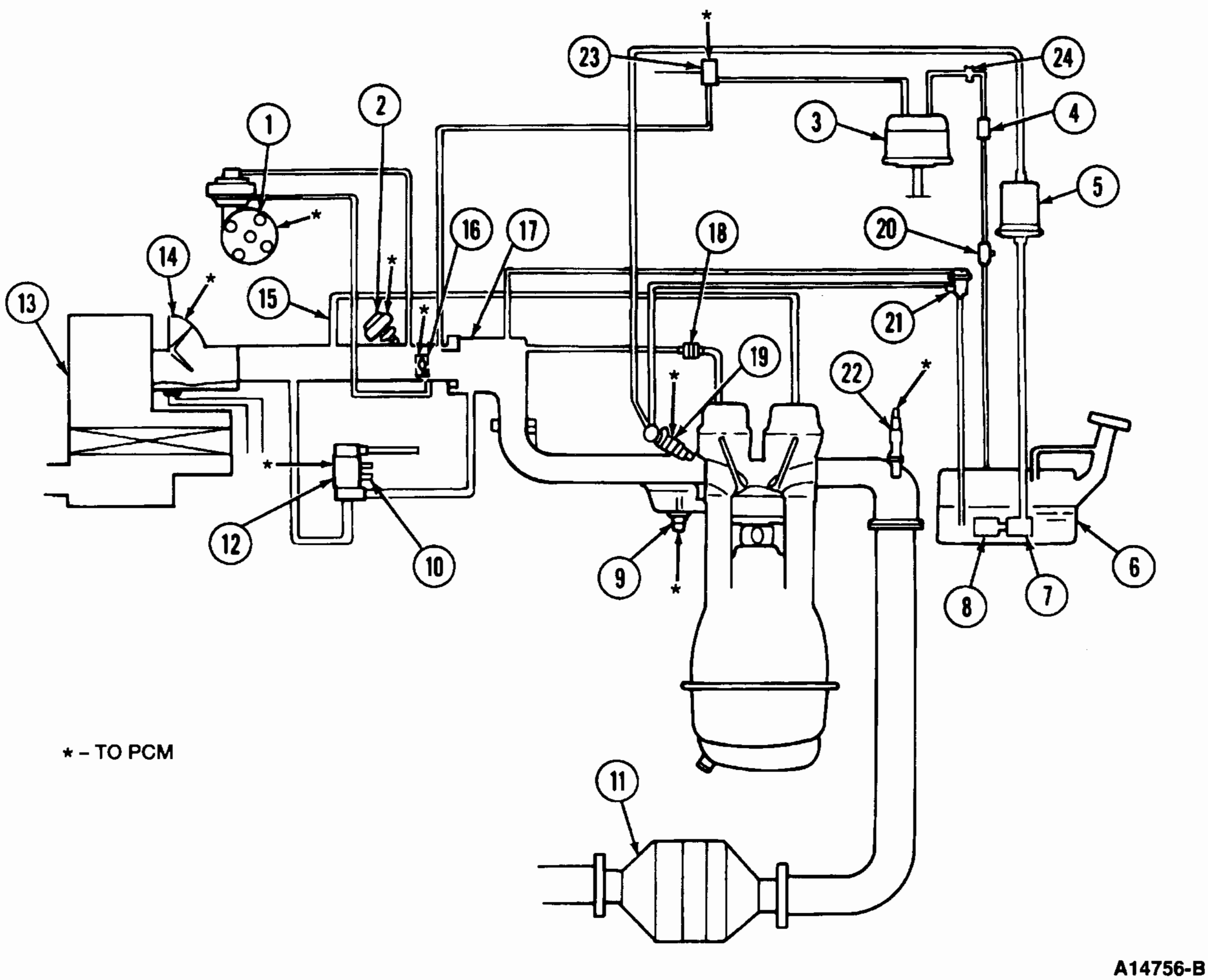
PCM Diagnostic Trouble Code	Diagnostic Trouble Code Definition
01	Ignition Diagnostic Monitor (IDM)
03	Cylinder Identification (CID) Sensor
08	Volume Air Flow (VAF) Meter
09	Engine Coolant Temperature (ECT) Sensor
10	Intake Air Temperature (IAT) Sensor
12	Throttle Position (TP) Sensor
14	Barometric Pressure (BARO)Sensor
15	Oxygen Sensor (O2S) - voltage always below 0.55V (Lean)
17	Oxygen Sensor (O2S) - voltage has not changed 30 sec. after the engine exceeds 1,500 RPM
25	Fuel Pressure Regulator Control (FPRC) Solenoid
26	Canister Purge (CANP) Solenoid
34	Idle Air Control (IAC) Solenoid
"STO LO" always ON	Not able to initiate diagnostic test mode
"STI LO" always ON and no codes (Blank Super STAR II screen)	Pass Code

TCM Diagnostic Trouble Code	Diagnostic Trouble Code Definition
06	Vehicle Speed Sensor (VSS)
12	Throttle Position (TP) Sensor
55	Pulse Signal Generator (PSG)
60	1-2 Shift Solenoid (SS1)
61	2-3 Shift Solenoid (SS2)
62	3-4 Shift Solenoid (SS3)
63	Torque Converter Clutch Control (TCCC) Solenoid

1.6L Non-Turbo Fuel/Vacuum/Electrical Schematics

Mechanical Emission Related Systems

Schematic Diagram



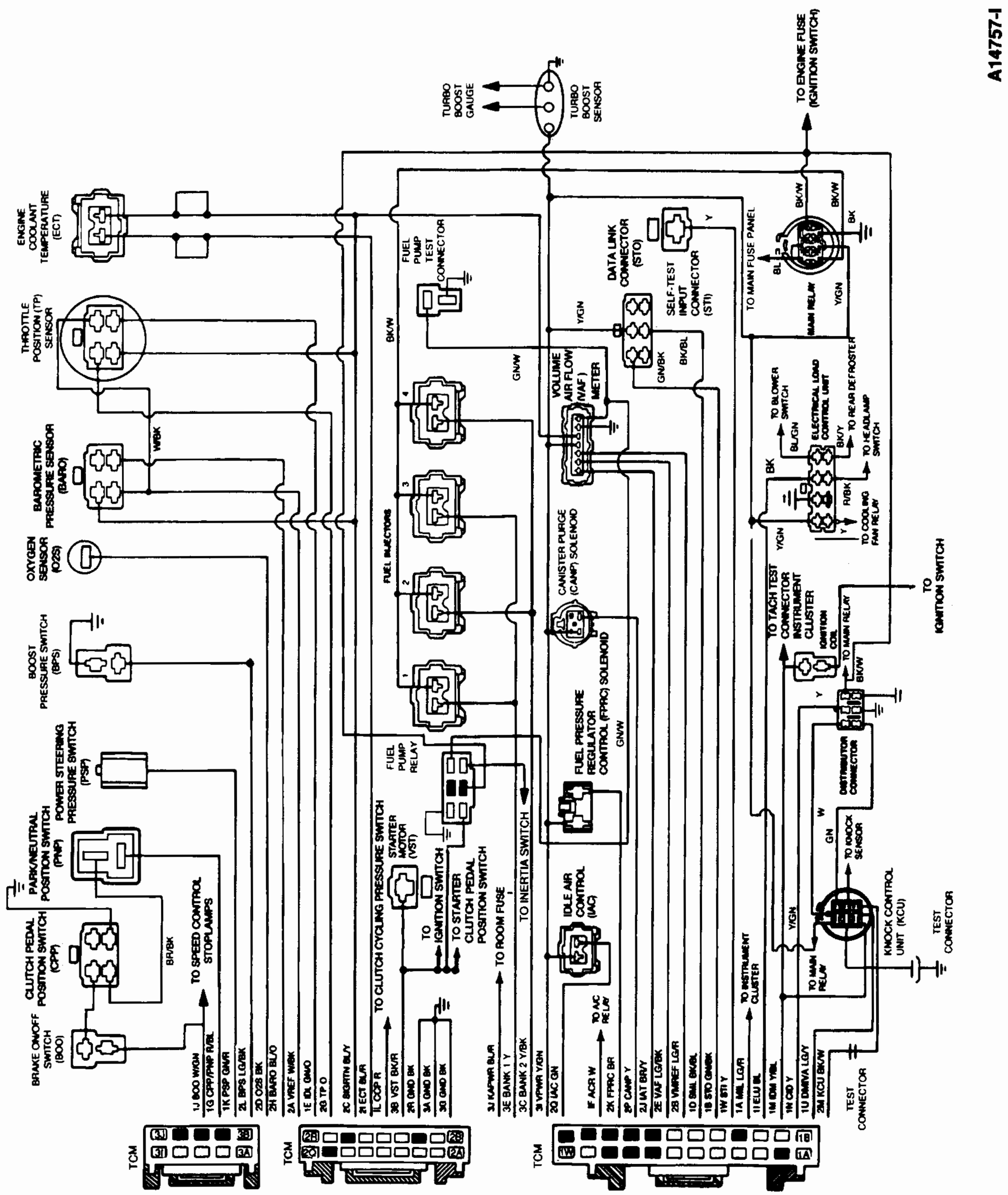
1.6L Non-Turbo Fuel/Vacuum/Electrical Schematics

Component Identification

Item	Base Part Number	Description	System
1	12127	Distributor	PCM
2	9B549	Dashpot	Inlet Air Control & PCM
3	9D653	Carbon Canister	Evaporative Emission
4	9576	Two-Way Check Valve	Evaporative Emission
5	9155	Fuel Filter (Outlet)	Fuel Delivery
6	9002	Fuel Tank	Fuel Delivery
7	9350	Fuel Pump (In Tank)	Fuel Delivery
8	9155	Fuel Filter	Fuel Delivery
9	12A648	Engine Coolant Temperature Sensor	PCM
10	19549	Engine Coolant	Bypass Air Control
11	5E212	Three Way Catalytic Converter	Catalyst and Exhaust
12	9B289	Idle Air Control Bypass Air (IAC BPA) Valve	Bypass Air Control
13	9600	Air Cleaner	Inlet Air Control
14	12B529	Volume Air Flow Meter (VAF)	Inlet Air Control & PCM
15	—	Orifice	Inlet Air Control
16	9989	Throttle Position Sensor	Inlet Air Control & PCM
17	9429	Intake Manifold	Inlet Air Control
18	6A666	PCV Valve	Positive Crankcase Ventilation
19	9F593	Fuel Injector (4)	Fuel Delivery & PCM
20	9B593	Rollover/Vent Valve	Evaporative Emission
21	9C968	Fuel Pressure Regulator	Fuel Delivery
22	9F472	Oxygen Sensor	Catalyst and Exhaust & PCM
23	9C915	Canister Purge Solenoid	Evaporative Emission & PCM
24	9F323	Restrictor	Evaporative Emission

1.6L Turbo Electrical Schematics

Engine Electrical Schematic



1.6L Turbo Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	51	LG/R	MIL	MIL
1B	17	GN/BK	Self Test Output	STO
1D	38	BK/BL	Switch Monitor Lamp	SML
1E	28	GN/O	Idle Switch	IDL
1F	30	W	A/C Relay	ACR
1G	8	R/BL	Park/Neutral Position Switch/Starter Clutch Pedal Position Switch	PNP/SCPP
1I	24	BK	Electrical Load Control Unit	ELU
1J	3	W/GN	Brake ON/OFF Switch	BOO
1K	19	GN/R	Power Steering Pressure Switch	PSP
1L	14	R	Clutch Cycling Pressure Switch	CCP
1M	6	Y/BL	Ignition Diagnostic Monitor	IDM
1N	34	Y	Cylinder Identification Sensor	CID
1U	36	LG/Y	Distributor Mounted Ignition Module With Vacuum Advance	DMIVA
1W	48	Y	Self Test Input	STI
2A	26	W/BK	Reference Voltage	VREF
2B	18	LG/R	Volume Air Flow Reference	VMREF
2C	46	BL/Y	Signal Return	SIGRTN
2D	29	BK	Oxygen Sensor	O2S
2E	43	LG/BK	Volume Air Flow Signal	VAF
2G	47	O	Throttle Position Sensor	TP
2H	45	BL/O	Barometric Pressure Sensor	BARO
2I	7	BL/R	Engine Coolant Temperature Sensor	ECT
2J	25	BR/Y	Intake Air Temperature Sensor	IAT
2K	31	BR	Fuel Pressure Regulator Control Solenoid	FPRC
2L	12	LG/BK	Boost Pressure Switch	BPS
2M	52	BK/W	Knock Control Unit	KCU
2P	32	Y	Canister Purge Solenoid	CANP
2Q	41	GN	Idle Air Control	IAC
2R	49	BK	Ground	GND
3A	20	BK	Ground	GND
3B	5	BK/R	Vehicle Start	VST
3C	59	Y/BK	Fuel Injectors 2 and 4	BANK 2
3E	58	Y	Fuel Injectors 1 and 3	BANK 1
3G	40	BK	Ground	GND
3I	37	Y/GN	Vehicle Power	VPWR
3J	1	BL/R	Keep Alive Power	KAPWR

1.6L Turbo Electrical Schematics

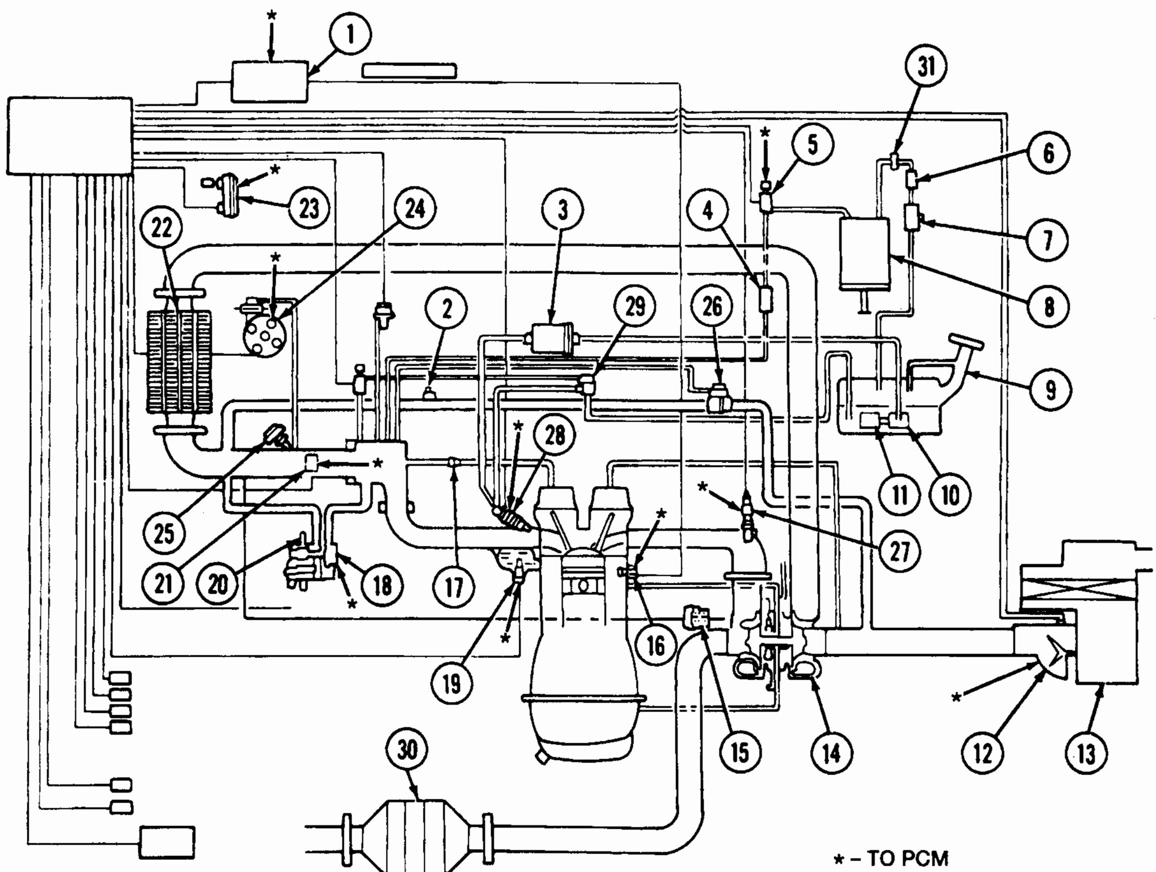
Quick Test Codes and Code Definitions

Diagnostic Trouble Code	Diagnostic Trouble Code Definition
01	Ignition Diagnostic Monitor (IDM)
03	Cylinder Identification (CID) Sensor
08	Volume Air Flow (VAF) Meter
09	Engine Coolant Temperature (ECT) Sensor
10	Intake Air Temperature (IAT) Sensor
12	Throttle Position (TP) Sensor
14	Barometric Pressure (BARO) Sensor
15	Oxygen Sensor (O2S) - voltage always below 0.55V (Lean)
17	Oxygen Sensor (O2S) - voltage has not changed 30 sec. after the engine exceeds 1,500 RPM
25	Fuel Pressure Regulator Control (FPRC) Solenoid
26	Canister Purge (CANP) Solenoid
34	Idle Air Control (IAC) Solenoid
"STO LO" always ON	Not able to initiate diagnostic test mode
"STI LO" always ON and no codes (Blank Super STAR II screen)	Pass Code

1.6L Turbo Fuel/Vacuum/Electrical Schematics

Mechanical Emission Related Systems

Schematic Diagram



1.6L Turbo Fuel/Vacuum/Electrical Schematics

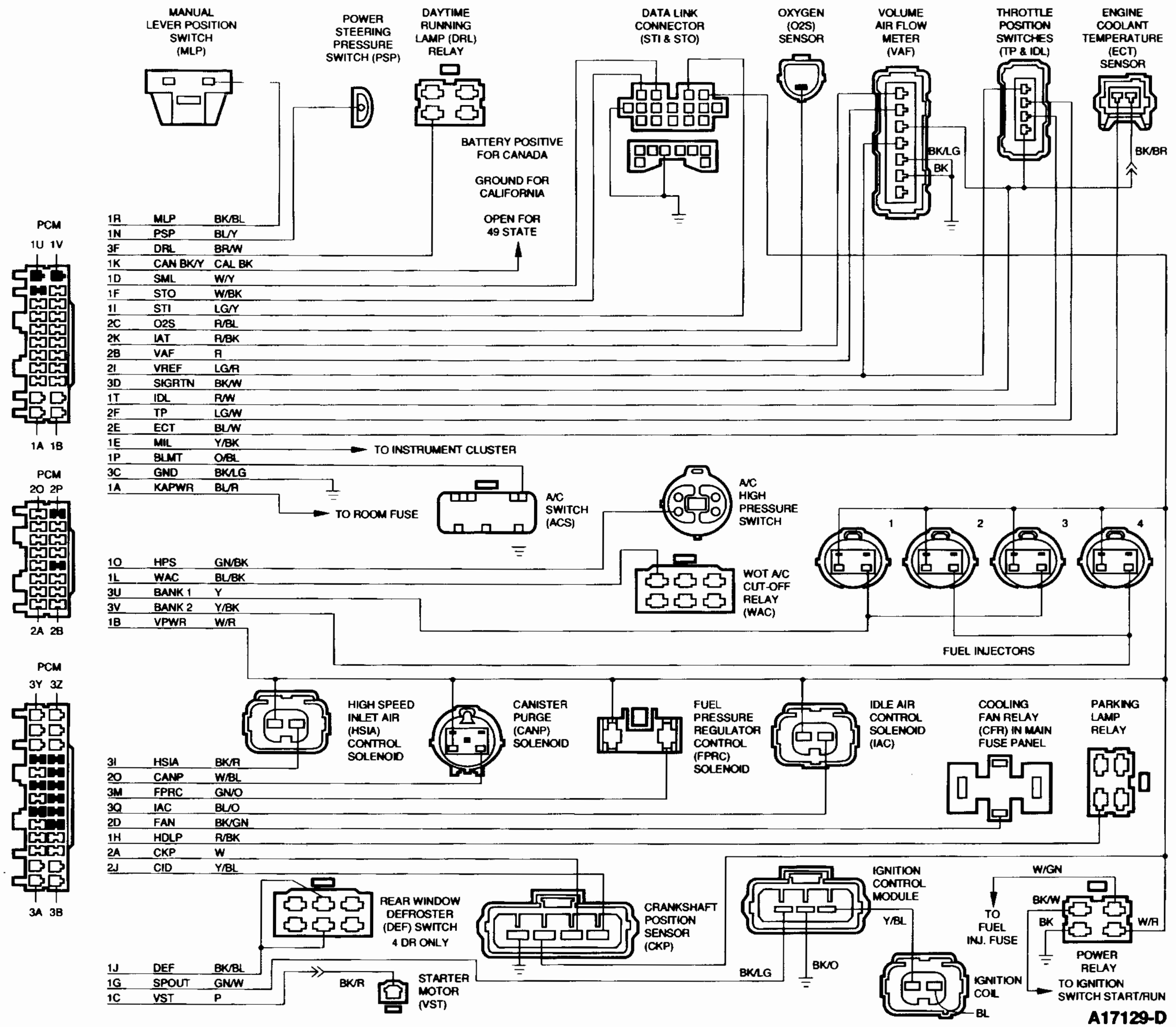
Component Identification

Item	Base Part Number	Description	System
1	—	Knock Control Unit	Turbocharger & PCM
2	—	Orifice	Bypass Air Control
3	9155	Fuel Filter (Outlet)	Fuel Delivery
4	—	Check Valve	Evaporative Emission
5	9C915	Canister Purge Solenoid	Evaporative Emission & PCM
6	9576	Two-Way Check Valve	Evaporative Emission
7	9B593	Rollover/Vent Valve	Evaporative Emission
8	9D653	Carbon Canister	Evaporative Emission
9	9002	Fuel Tank	Fuel Delivery
10	9350	Fuel Pump (In Tank)	Fuel Delivery
11	9155	Fuel Filter	Fuel Delivery
12	12B529	Volume Air Flow Meter	Inlet Air Control & PCM
13	9600	Air Cleaner	Inlet Air Control
14	9G438	Turbocharger (Water Cooled)	Turbocharger
15	—	Wastegate Valve	Turbocharger
16	12A699	Knock Sensor	Turbocharger & PCM
17	6A666	PCV Valve	Positive Crankcase Ventilation
18	9B289	IAC Valve	Bypass Air Control & PCM
19	12A648	Engine Coolant Temperature Sensor	PCM
20	19549	Engine Coolant	Bypass Air Control
21	9989	Throttle Position Sensor	Inlet Air Control & PCM
22	9F464	Charge Air Cooler	Turbocharger
23	12A650	Barometric Pressure Sensor	PCM
24	12127	Distributor	PCM
25	9B549	Dashpot	Inlet Air Control
26	9B289	Bypass Air Valve	Bypass Air Control
27	9F472	Oxygen Sensor	Catalyst and Exhaust & PCM
28	9F593	Fuel Injector (4)	Fuel Delivery & PCM
29	9C968	Fuel Pressure Regulator	Fuel Delivery
30	5E212	Three Way Catalytic Converter	Catalyst and Exhaust
31	—	Restrictor	Evaporative Emission

1.8L Electrical Schematics

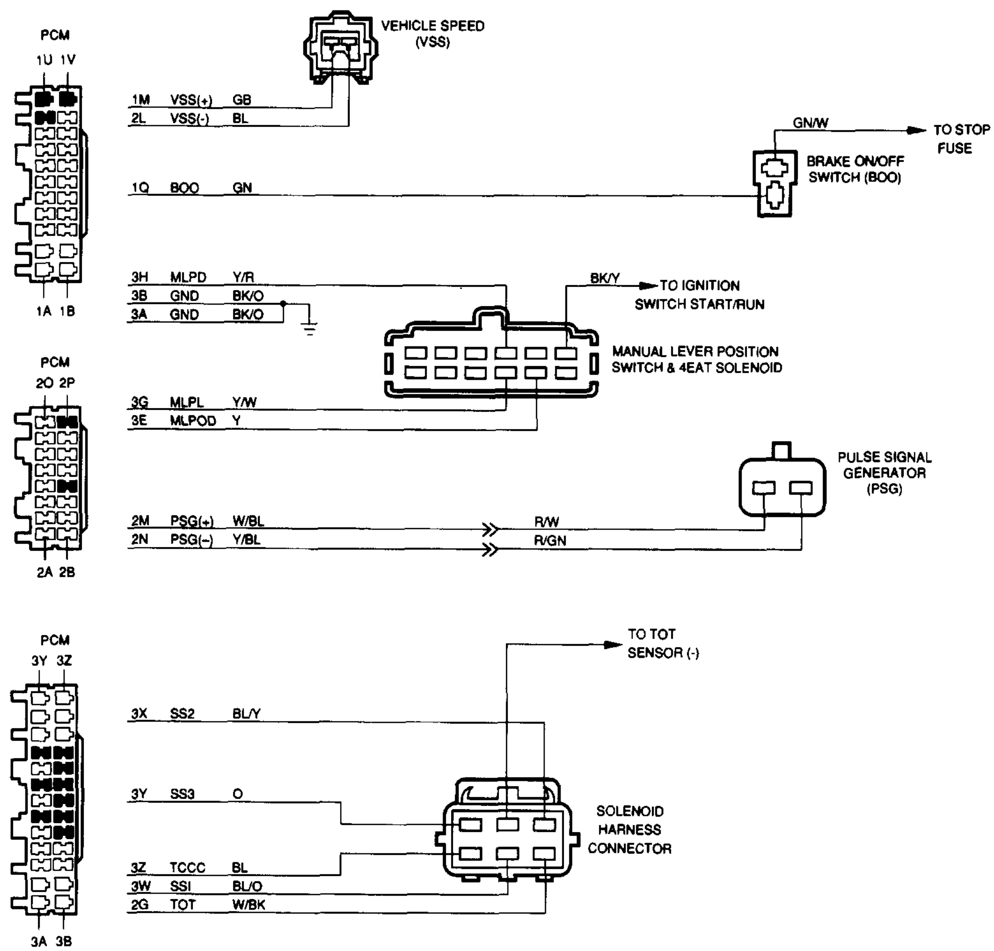
NOTE: The transaxle control module is integrated with the powertrain control module on 1.8L 4EAT vehicles.

4EAT Engine Electrical Schematic



1.8L Electrical Schematics

4EAT Engine Electrical Schematic (Continued)



A17130-C

1.8L Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage (4EAT)

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	1	BL/R	Keep Alive Power	KAPWR
1B	37, 57	W/R	Vehicle Power	VPWR
1C	5	P	Vehicle Start	VST
1D	38	W/Y	Switch Monitor Lamp	SML
1E	51	Y/BK	Malfunction Indicator Lamp	MIL
1F	17	W/BK	Self Test Output	STO
1G	36	GN/W	Ignition Control Module	ICM
1H	32	R/BK	Headlamp Switch	HDLP
1I	48	LG/Y	Self Test Input	STI
1J	34	BK/BL	Rear Window Defroster Switch	DEF
1K	19	BK, BK/Y	Ground (Calif), Vehicle Power (Can), Open (49 States)	GND (CAL), VPWR (CAN)
1L	10	BL/BK	A/C Relay	ACR
1M	3	GN	Vehicle Speed Sensor (+)	VSS+
1N	24	BL/Y	Power Steering Pressure Switch	PSP
1O	41	GN/BK	High Pressure Switch	HPS
1P	22	O/BL	Blower Motor Control Switch	BLMT
1Q	2	GN	Brake ON/OFF Switch	BOO
1R	30	BK/BL	Manual Lever Position Switch	MLP
1T	18	R/W	Idle Switch	IDL
2A	45	W	Crankshaft Position Sensor	CKP
2B	44	R	Volume Air Flow Sensor	VAF
2C	29	R/BL	Oxygen Sensor	O2S
2D	43	BK/GN	Cooling Fan Switch	CFS
2E	7	BL/W	Engine Coolant Temperature Sensor	ECT
2F	47	LG/W	Throttle Position Sensor	TP
2G	50	W/BK	Transaxle Oil Temperature Sensor	TOT
2I	26	LG/R	Reference Voltage	VREF
2J	27	Y/BL	Cylinder Identification Sensor	CID
2K	25	R/BK	Intake Air Temperature Sensor	IAT
2L	28	BL	Vehicle Speed Sensor (-)	VSS-
2M	23	W/BL	Pulse Signal Generator (+)	PSG+
2N	—	Y/BL	Pulse Signal Generator (-)	PSG-
2O	31	W/BL	Canister Purge Solenoid	CANP
3A	40, 60	BK/O	Ground	GND
3B	20	BK/O	Ground	GND

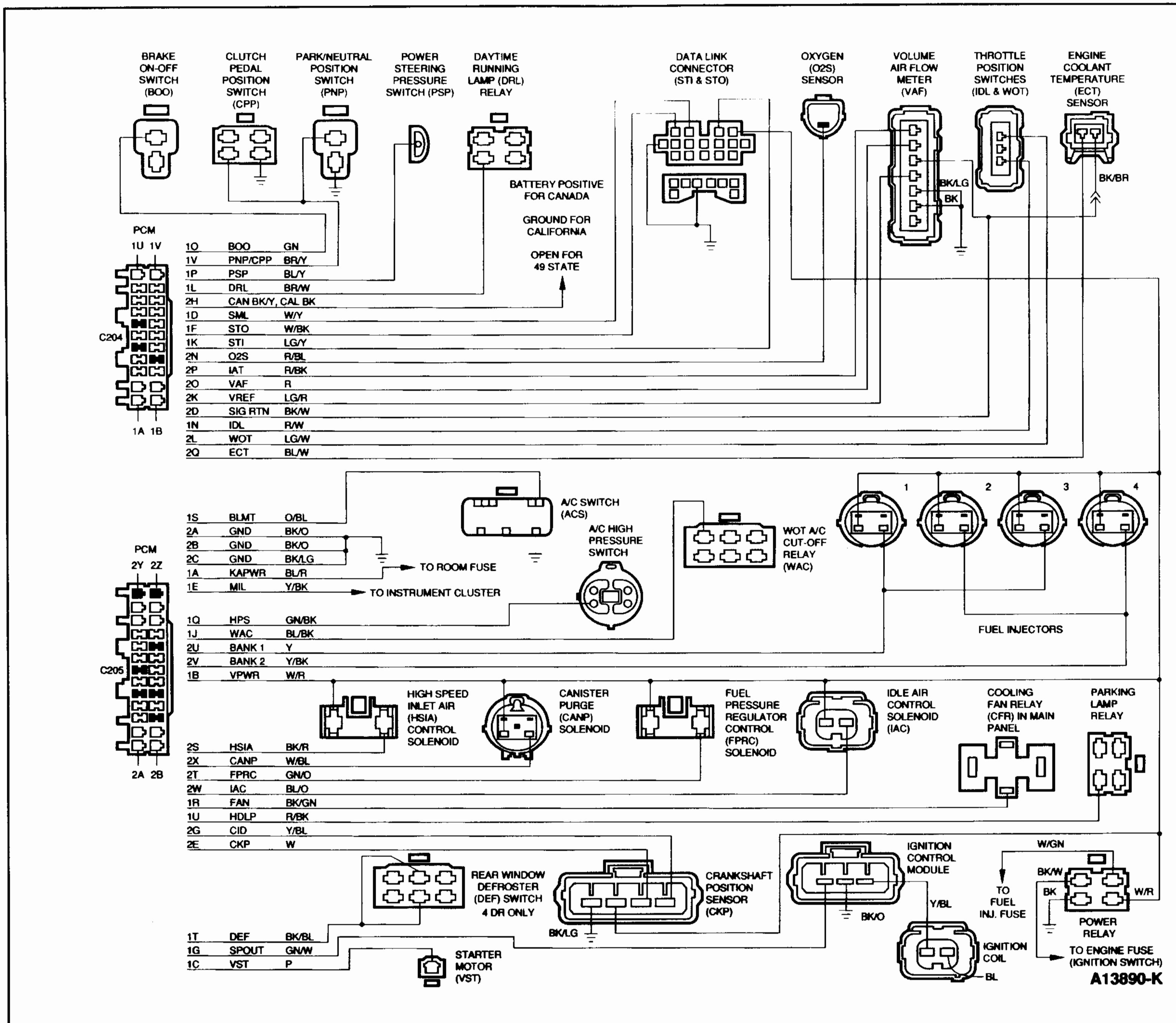
(Continued)

1.8L Electrical Schematics

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
3C	49	BK/LG	Ground	GND
3D	—	BK/W	Signal Return	SIGRTN
3E	46	Y	Overdrive Range (Selector Lever)	MLPOD
3F	16	BR/W	Daytime Running Lamp Relay (Canada Only)	DRL
3G	6	Y/W	Low Range (Selector Lever)	MLPL
3H	4	Y/R	Drive Range (Selector Lever)	MLPD
3I	42	BK/R	High Speed Inlet Air Control Solenoid	HSIA
3M	21A	GN/O	Fuel Pressure Regulator Control Solenoid	FPRC
3Q	21B	BL/O	Intake Air Control Solenoid	IAC
3U	58	Y	Fuel Injectors 1 and 3	BANK1
3V	59	Y/BK	Fuel Injectors 2 and 4	BANK2
3W	12	BL/O	1-2 Shift Solenoid (Shift Solenoid # 1)	SS1
3X	13	BL/Y	2-3 Shift Solenoid (Shift Solenoid #2)	SS2
3Y	14	O	3-4 Shift Solenoid (Shift Solenoid #3)	SS3
3Z	15	BL	Torque Converter Clutch Control Solenoid	TCCC

1.8L Electrical Schematics

MTX Engine Electrical Schematic



1.8L Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage (MTX)

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	1	BL/R	Keep Alive Power	KAPWR
1B	37, 57	W/R	Vehicle Power	VPWR
1C	5	P	Vehicle Start	VST
1D	38	W/Y	Switch Monitor Lamp	SML
1E	15	Y/BK	Malfunction Indicator Lamp	MIL
1F	17	W/BK	Self Test Output	STO
1G	36	GN/W	Spark Output	SPOUT
1J	54	BL/BK	WOT A/C Cut-Off Relay	WAC
1K	48	LG/Y	Self Test Input	STI
1L	42	BR/W	Daytime Running Lamp Relay (Canada Only)	DRL
1N	18	R/W	Idle Switch	IDL
1O	2	GN	Brake ON/OFF Switch	BOO
1P	19	BL/Y	Power Steering Pressure Switch	PSP
1Q	10	GN/BK	High Pressure Switch	HPS
1R	22	BK/GN	Engine Cooling Fan	FAN
1S	23	O/BL	Blower Motor Control Switch	BLMT
1T	30	BK/BL	Rear Window Defroster Switch	DEF
1U	28	R/BK	Headlamp Switch	HDLP
1V	43	BR/Y	Park/Neutral Position Switch/Clutch Pedal Position Switch	PNP/CPP
2A	39, 40, 44, 60	BK/O	Ground	GND
2B	20	BK/O	Ground	GND
2C	16	BK/LG	Ground	GND
2D	46, 49	BK/W	Signal Return	SIGRTN
2E	56	W	Crankshaft Position Sensor	CKP
2G	24	Y/BL	Cylinder Identification Sensor	CID
2H	51	BK/Y	Vehicle Power (Canada Only)	VPWR (CAN)
2H	51	BK	Ground (California Only)	GND (CAL)
2K	26	LG/R	Reference Voltage	VREF
2L	27	LG/W	Wide Open Throttle Switch	WOT
2N	29	R/BL	Oxygen Sensor	O2S
2O	25	R	Volume Air Flow Meter	VAF
2P	45	R/BK	Intake Air Temperature Sensor	IAT
2Q	7	BL/W	Engine Coolant Temperature Sensor	ECT
2S	53	BK/R	High Speed Inlet Air Control Solenoid	HSIA
2T	11	GN/O	Fuel Pressure Regulator Control Solenoid	FPRC
2U	58	Y	Fuel Injectors 1 and 3	BANK1

(Continued)

1.8L Electrical Schematics

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
2V	59	Y/BK	Fuel Injectors 2 and 4	BANK2
2W	41	BL/O	Idle Air Control Solenoid	IAC
2X	31	W/BL	Canister Purge Solenoid	CANP

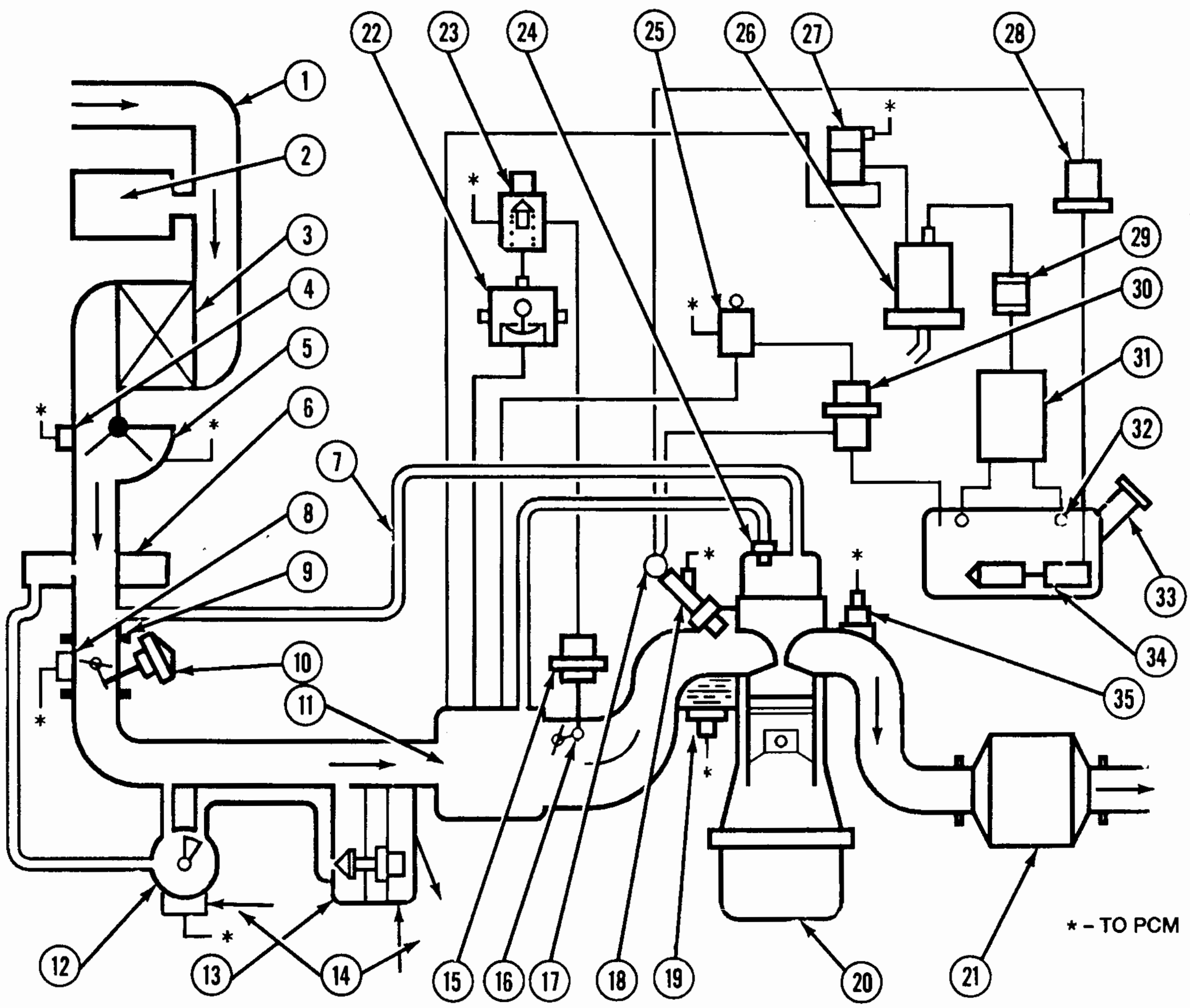
Quick Test Codes and Code Definitions

Diagnostic Trouble Code	Diagnostic Trouble Code Definition
02	Crankshaft Position Sensor (CKP)
03	Cylinder Identification (CID) Sensor
06	Vehicle Speed Sensor (VSS)
08	Volume Air Flow (VAF) Signal
09	Engine Coolant Temperature (ECT) Sensor
10	Intake Air Temperature (IAT) Sensor
12	Throttle Position (TP) Sensor
14	Barometric Pressure (BARO) Sensor
15	Oxygen Sensor (O2S) - voltage always below 0.55V
17	Oxygen Sensor (O2S) - voltage does not change
25	Fuel Pressure Regulator Control (FPRC) Solenoid
26	Canister Purge (CANP) Solenoid
34	Idle Air Control (IAC) Solenoid
41	High Speed Inlet Air (HSIA) Control Solenoid
55	Pulse Signal Generator (PSG)
60	1-2 Shift Solenoid (SS1)
61	2-3 Shift Solenoid (SS2)
62	3-4 Shift Solenoid (SS3)
63	Torque Converter Clutch Control (TCCC) Solenoid
"STO LO" always ON	Not able to initiate diagnostic test mode
"STI LO" always ON and no codes (Blank Super STAR II screen)	Pass Code

1.8L Fuel/Vacuum/Electrical Schematics

Mechanical Emission Related Systems

Schematic Diagram



CA13894-E

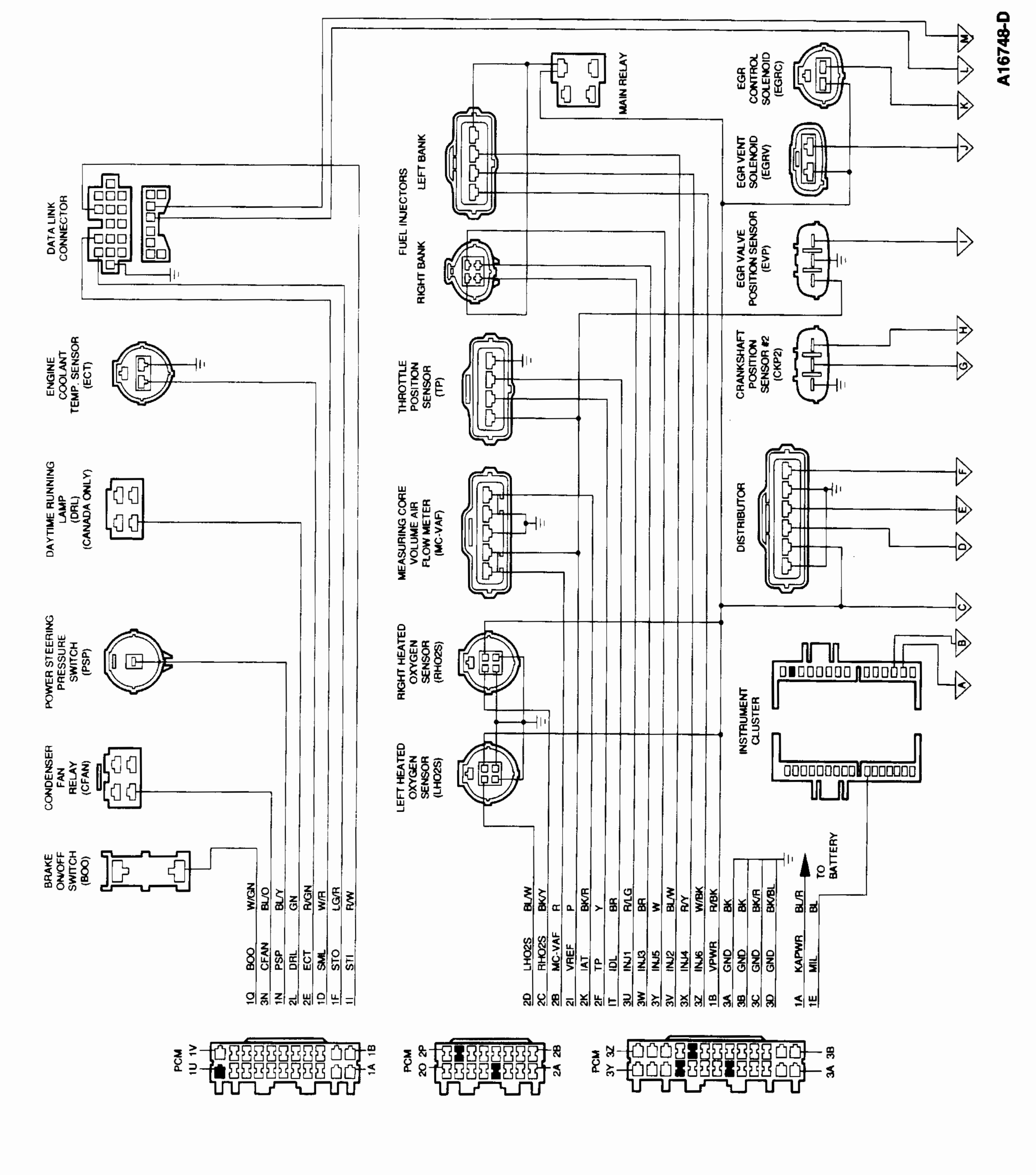
1.8L Fuel/Vacuum/Electrical Schematics

Component Identification

Item	Base Part Number	Description	System
1	9C675A	Air Inlet Duct	Inlet Air Control
2	9F763	Resonance Chamber	Inlet Air Control
3	9600	Air Cleaner	Inlet Air Control
4	12B529	Intake Air Temperature Sensor	Inlet Air Control & PCM
5	12B529	Volume Air Flow Meter	Inlet Air Control & PCM
6	9F763	Resonance Chamber	Inlet Air Control
7	6A664	Fresh Air Supply Hose	Positive Crankcase Ventilation
8	9989	Throttle Position Sensor	Inlet Air Control & PCM
9	9C981	Throttle Body	Inlet Air Control
10	9B549	Dashpot	Inlet Air Control
11	9424	Intake Manifold	Inlet Air Control
12	9B289	Idle Air Control Valve	Inlet Air Control & PCM
13	9B289	Bypass Air Control Valve	Bypass Air Control
14	19549	Engine Coolant	Bypass Air Control
15	—	Shutter Valve Actuator	Inlet Air Control
16	—	Shutter Valve	Inlet Air Control
17	9D280	Fuel Rail	Fuel Delivery
18	9F593	Fuel Injector (4)	Fuel Delivery & PCM
19	12A648	Engine Coolant Temperature Sensor	PCM
20	6007	Engine	—
21	5E212	Three Way Catalytic Converter	Catalyst and Exhaust
22	9E453	Vacuum Reservoir	Inlet Air Control
23	—	High Speed Inlet Air Control Solenoid	Inlet Air Control & PCM
24	6A666	PCV Valve	Positive Crankcase Ventilation
25	9D278	Fuel Pressure Regulator Control Solenoid	Fuel Delivery & PCM
26	9D653	Carbon Canister	Evaporative Emission
27	9C915	Canister Purge Solenoid	Evaporative Emission & PCM
28	9155	Fuel Filter	Fuel Delivery
29	9576	Two-Way Check Valve	Evaporative Emission
30	9C968	Fuel Pressure Regulator	Fuel Delivery
31	9B963	Vapor Separator	Evaporative Emission
32	9B593	Rollover/Vent Valves	Evaporative Emission
33	9002	Fuel Tank	Fuel Delivery
34	9350	Fuel Pump and Inlet Screen	Fuel Delivery
35	9F472	Oxygen Sensor	Catalyst and Exhaust & PCM

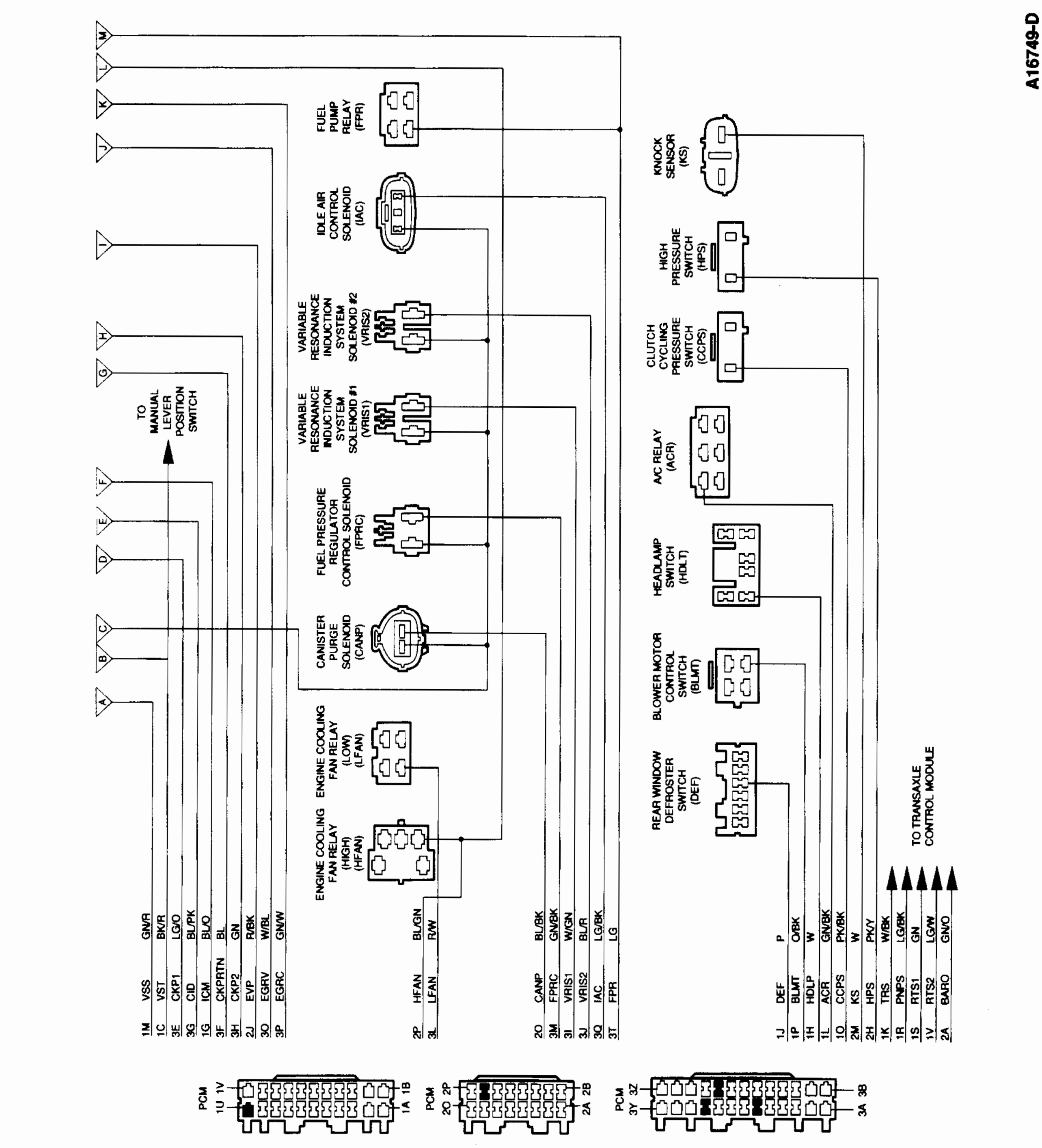
2.5L Electrical Schematics

4EAT Engine Electrical Schematic



2.5L Electrical Schematics

4EAT Engine Electrical Schematic (Continued)



2.5L Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage (4EAT)

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	1	BL/R	Keep Alive Power	KAPWR
1B	37, 57	R/BK	Vehicle Power	VPWR
1C	5	BK/R	Vehicle Start	VST
1D	38	W/R	Switch Monitor Lamp	SML
1E	51	BL	Malfunction Indicator Lamp	MIL
1F	17	LG/R	Self Test Output	STO
1G	36	BL/O	Ignition Control Module	ICM
1H	32	W	Headlamp Switch	HDLP
1I	48	R/W	Self Test Input	STI
1J	34	P	Rear Window Defroster Switch	DEF
1K	19	W/BK	Torque Reduce/Engine Coolant Temperature Signal (To TCM)	TRS
1L	10	GN/BK	A/C Relay	ACR
1M	3	GN/R	Vehicle Speed Sensor	VSS
1N	24	BL/Y	Power Steering Pressure Switch	PSP
1O	41	PK/BK	Clutch Cycling Pressure Switch	CCPS
1P	22	O/BK	Blower Motor Control Switch	BLMT
1Q	2	W/GN	Brake ON/OFF Switch	BOO
1R	30	LG/BK	Park/Neutral Position Signal	PNPS
1S	8	GN	Reduce Torque Signal # 1 (From TCM)	RTS1
1T	18	BR	Idle Switch	IDL
1V	11	LG/W	Reduce Torque Signal #2 (From TCM)	RTS2
2A	45	GN/O	Barometric Pressure Sensor Signal	BARO
2B	44	R	Measuring Core Volume Air Flow Sensor	MC-VAF
2C	29	BK/Y	Right Heated Oxygen Sensor	RHO2S
2D	43	BL/W	Left Heated Oxygen Sensor	LHO2S
2E	7	R/GN	Engine Coolant Temperature Sensor	ECT
2F	47	Y	Throttle Position Sensor	TP
2H	9	PK/Y	High Pressure Switch	HPS
2I	26	P	Reference Voltage	VREF
2J	27	R/BK	EGR Valve Position Sensor	EVP
2K	25	BK/R	Intake Air Temperature Sensor	IAT
2L	28	GN	Daytime Running Lamp (Canada Only)	DRL
2M	23	W	Knock Sensor	KS
2O	31	BL/BK	Canister Purge Solenoid	CANP
2P	54	BL/GN	High Cooling Fan Relay	HFAN
3A	40, 60	BK	Ground	GND
3B	20	BK	Ground	GND
3C	49	BK/R	Ground	GND

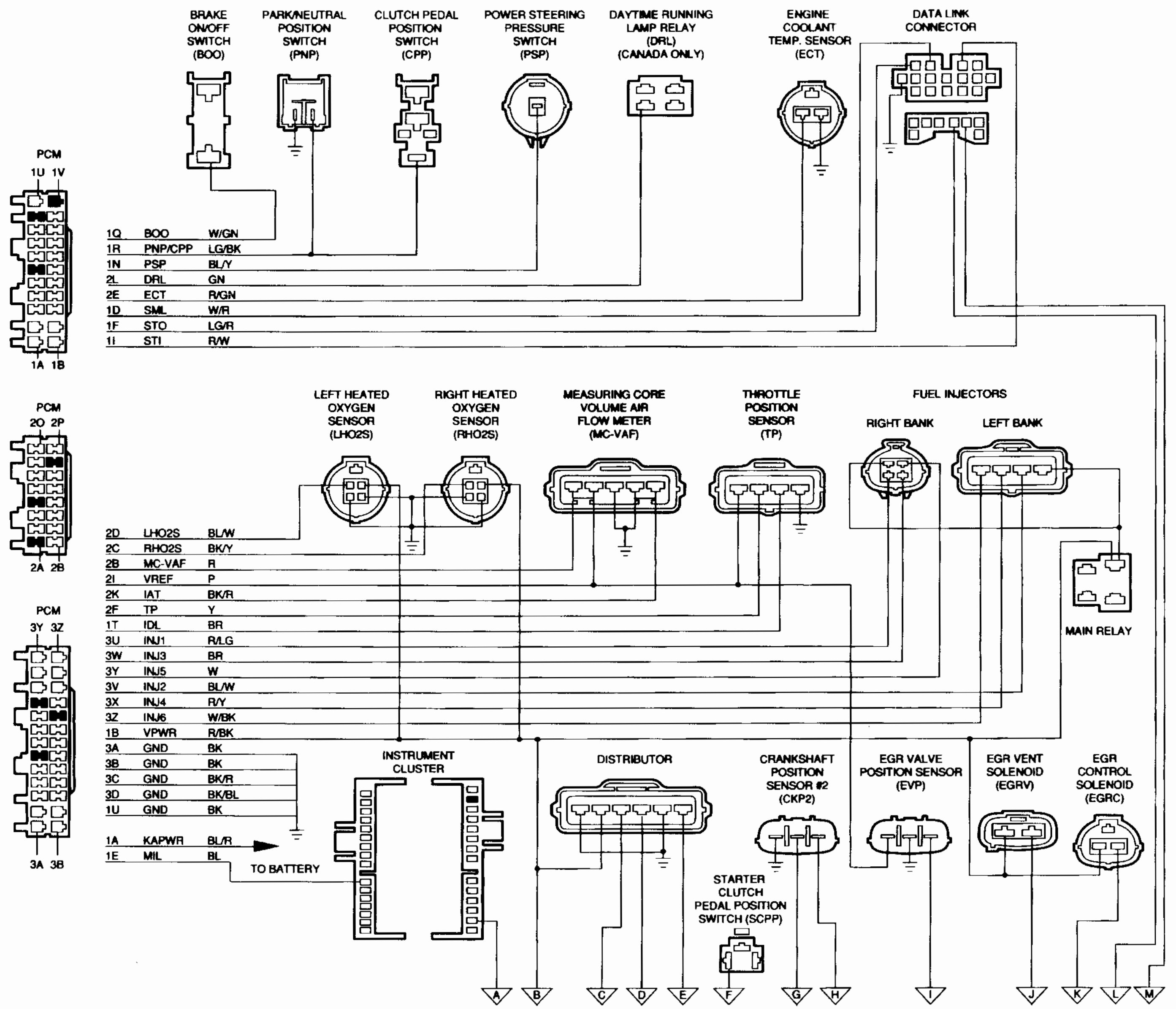
(Continued)

2.5L Electrical Schematics

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
3D	46	BK/BL	Ground	GND
3E	56	LG/O	Crankshaft Position Sensor # 1	CKP1
3F	16	BL	Crankshaft Position Signal Return	CKPRTN
3G	6	BL/PK	Cylinder Identification Sensor	CID
3H	4	GN	Crankshaft Position Sensor #2	CKP2
3I	42	W/GN	Variable Resonance Induction System Solenoid # 1	VRIS1
3J	35	BL/R	Variable Resonance Induction System Solenoid #2	VRIS2
3L	55	R/W	Low Cooling Fan Relay	LFAN
3M	21A	GN/BK	Fuel Pressure Regulator Control Solenoid	FPRC
3N	53A	BL/O	Condenser Fan Relay	CFAN
3O	33A	W/BL	EGR Vent Solenoid	EGRV
3P	52A	GN/W	EGR Control Solenoid	EGRC
3Q	21B	LG/BK	Idle Air Control Solenoid	IAC
3T	52B	LG	Fuel Pump Relay	FPR
3U	58	R/LG	Injector # 1	INJ1
3V	59	BL/W	Injector #2	INJ2
3W	12	BR	Injector #3	INJ3
3X	13	R/Y	Injector #4	INJ4
3Y	14	W	Injector #5	INJ5
3Z	15	W/BK	Injector #6	INJ6

2.5L Electrical Schematics

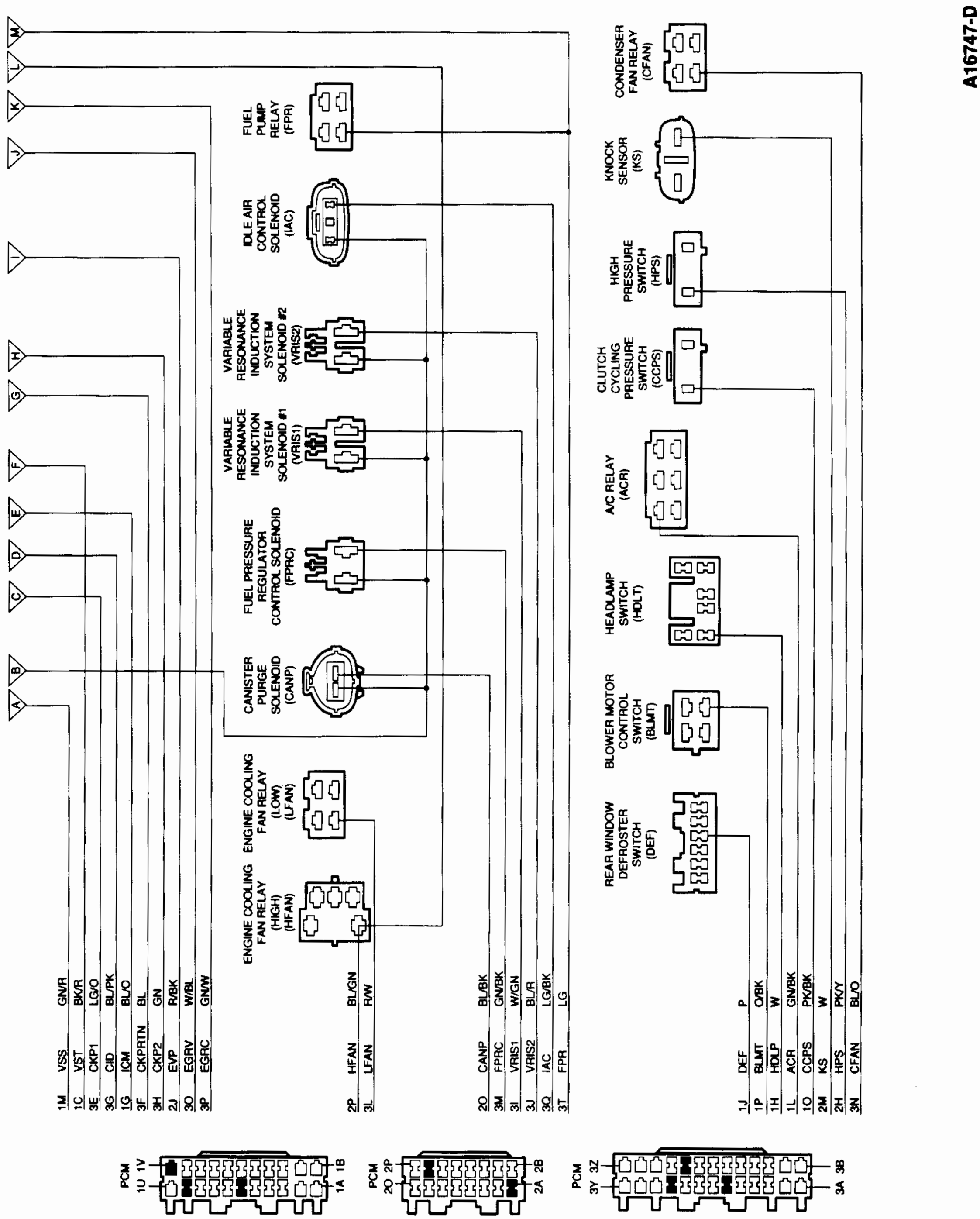
MTX Engine Electrical Schematic



A16746-C

2.5L Electrical Schematics

MTX Engine Electrical Schematic (Continued)



2.5L Electrical Schematics

Powertrain Control Module (PCM) Connector Pin Usage (MTX)

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
1A	1	BL/R	Keep Alive Power	KAPWR
1B	37, 57	R/BK	Vehicle Power	VPWR
1C	5	BK/R	Vehicle Start	VST
1D	38	W/R	Switch Monitor Lamp	SML
1E	51	BL	Malfunction Indicator Lamp	MIL
1F	17	LG/R	Self Test Output	STO
1G	36	BL/O	Ignition Control Module	ICM
1H	32	W	Headlamp Switch	HDLP
1I	48	R/W	Self Test Input	STI
1J	34	P	Rear Window Defroster Switch	DEF
1L	10	GN/BK	A/C Relay	ACR
1M	3	GN/R	Vehicle Speed Sensor	VSS
1N	24	BL/Y	Power Steering Pressure Switch	PSP
1O	41	PK/BK	Clutch Cycling Pressure Switch	CCPS
1P	22	O/BK	Blower Motor Control Switch	BLMT
1Q	2	W/GN	Brake ON/OFF Switch	BOO
1R	30	LG/BK	Park Neutral Position Switch/Clutch Pedal Position Switch	PNP/CPP
1T	18	BR	Idle Switch	IDL
1U	39	BK	Ground (MTX)	GND
2B	44	R	Measuring Core Volume Air Flow Sensor	MC-VAF
2C	29	BK/Y	Right Heated Oxygen Sensor	RHO2S
2D	43	BL/W	Left Heated Oxygen Sensor	LHO2S
2E	7	R/GN	Engine Coolant Temperature Sensor	ECT
2F	47	Y	Throttle Position Sensor	TP
2H	9	PK/Y	High Pressure Switch	HPS
2I	26	P	Reference Voltage	VREF
2J	27	R/BK	EGR Valve Position Sensor	EVP
2K	25	BK/R	Intake Air Temperature Sensor	IAT
2L	28	GN	Daytime Running Lamp (Canada Only)	DRL
2M	23	W	Knock Sensor	KS
2O	31	BL/BK	Canister Purge Solenoid	CANP
2P	54	BL/GN	High Cooling Fan Relay	HFAN
3A	40, 60	BK	Ground	GND
3B	20	BK	Ground	GND
3C	49	BK/R	Ground	GND
3D	46	BK/BL	Ground	GND
3E	56	LG/O	Crankshaft Position Sensor # 1	CKP1
3F	16	BL	Crankshaft Position Signal Return	CKPRTN

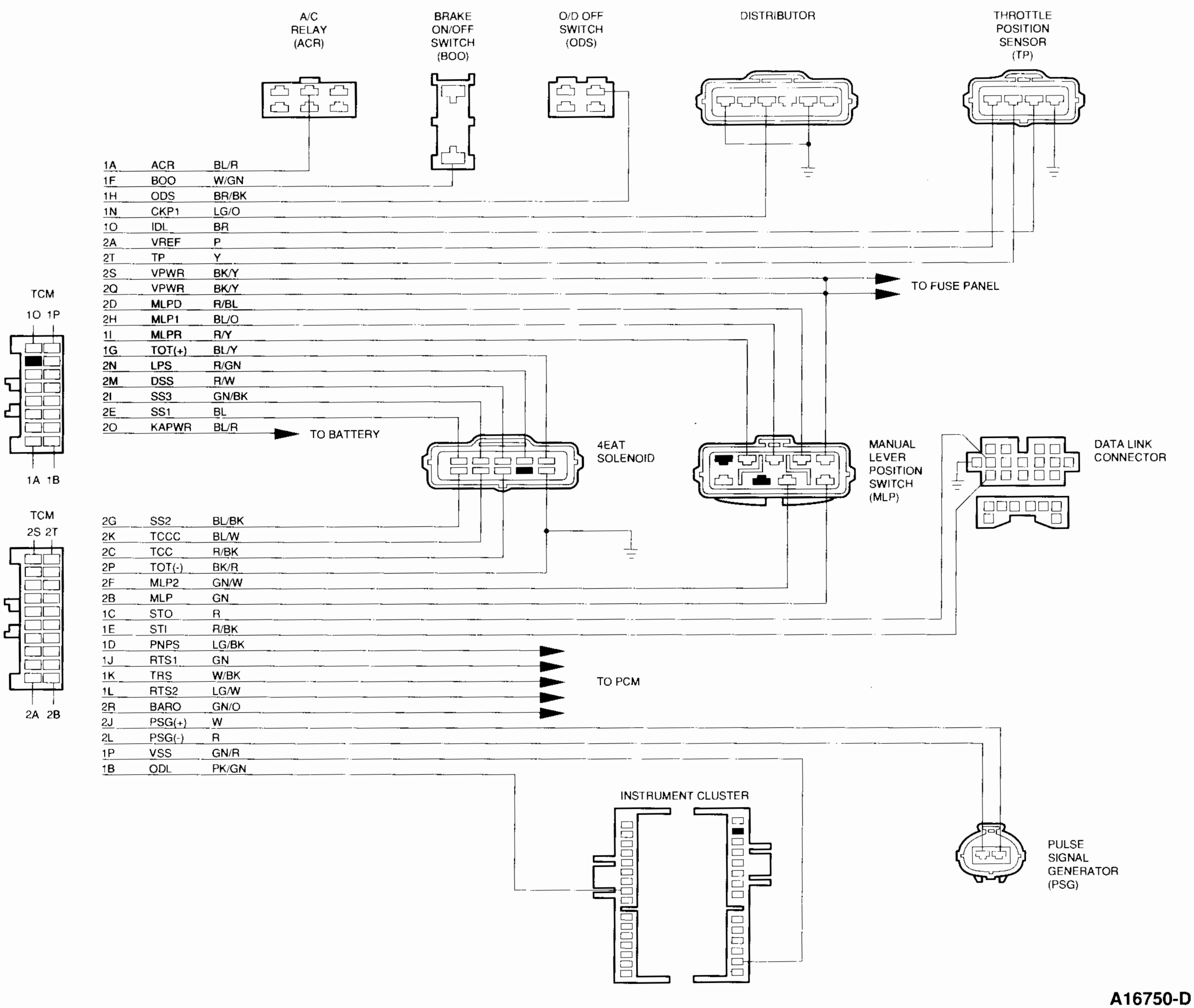
(Continued)

2.5L Electrical Schematics

PCM Pin	Breakout Box Pin	Wire Color	Application	Abbrev.
3G	6	BL/PK	Cylinder Identification Sensor	CID
3H	4	GN	Crankshaft Position Sensor #2	CKP2
3I	42	W/GN	Variable Resonance Induction System Solenoid #1	VRIS1
3J	35	BL/R	Variable Resonance Induction System Solenoid #2	VRIS2
3L	55	R/W	Low Cooling Fan Relay	LFAN
3M	21A	GN/BK	Fuel Pressure Regulator Control Solenoid	FPRC
3N	53A	BL/O	Condenser Fan Relay	CFAN
3O	33A	W/BL	EGR Vent Solenoid	EGRV
3P	52A	GN/W	EGR Control Solenoid	EGRC
3Q	21B	LG/BK	Idle Air Control Solenoid	IAC
3T	52B	LG	Fuel Pump Relay	FPR
3U	58	R/LG	Injector #1	INJ1
3V	59	BL/W	Injector #2	INJ2
3W	12	BR	Injector #3	INJ3
3X	13	R/Y	Injector #4	INJ4
3Y	14	W	Injector #5	INJ5
3Z	15	W/BK	Injector #6	INJ6

2.5L Electrical Schematics

4EAT Transaxle Control Module (TCM) Electrical Schematic



2.5L Electrical Schematics

4EAT Transaxle Control Module (TCM) Connector Pin Usage

Module Pin	Wire Color	Application	Abbrev.
1A	BL/R	A/C Relay	ACR
1B	PK / GN	Overdrive OFF Light	ODL
1C	R	Self Test Output	STO
1D	LG / BK	Park / Neutral Position Signal	PNPS
1E	R / BK	Self Test Input	STI
1F	W / GN	Brake ON / OFF Switch	BOO
1G	BL / Y	Transaxle Oil Temperature Sensor (+)	TOT (+)
1H	BR / BK	Overdrive OFF Switch	ODS
1I	R / Y	Reverse Range (Selector Lever)	MLPR
1J	GN	Reduce Torque Signal # 1 (To PCM)	RTS1
1K	W / BK	Torque Reduce / Engine Coolant Temperature Signal (From PCM)	TRS
1L	LG / W	Reduce Torque Signal #2 (To PCM)	RTS2
1N	LG / O	Crankshaft Position Sensor # 1	CKP1
1O	BR	Idle Switch	IDL
1P	GN / R	Vehicle Speed Sensor	VSS
2A	P	Reference Voltage	VREF
2B	GN	Manual Lever Position Switch	MLP
2C	R / BK	Torque Converter Clutch Solenoid	TCC
2D	R / BL	Drive Range (Selector Lever)	MLPD
2E	BL	1-2 Shift Solenoid (Shift Solenoid # 1)	SS1
2F	GN / W	Second Range (Selector Lever)	MLP2
2G	BL / BK	2-3 Shift Solenoid (Shift Solenoid #2)	SS2
2H	BL / O	First Range (Selector Lever)	MLP1
2I	GN / BK	3-4 Shift Solenoid (Shift Solenoid #3)	SS3
2J	W	Pulse Signal Generator (+)	PSG+
2K	BL / W	Torque Converter Clutch Control Solenoid	TCCC
2L	R	Pulse Signal Generator (-)	PSG-
2M	R / W	Downshift Solenoid	DSS
2N	R / GN	Line Pressure Solenoid	LPS
2O	BL / R	Keep Alive Power	KAPWR
2P	BK / R	Transaxle Oil Temperature Sensor (-)	TOT (-)
2Q	BK / Y	Vehicle Power	VPWR
2R	GN/O	Barometric Pressure Sensor	BARO
2S	BK / Y	Vehicle Power	VPWR
2T	Y	Throttle Position Sensor	TP

2.5L Electrical Schematics

Quick Test Codes and Code Definitions

PCM Diagnostic Trouble Code	Diagnostic Trouble Code Definition
02	Crankshaft Position Sensor #2 (CKP2)
03	Cylinder Identification (CID) Sensor
04	Crankshaft Position Sensor #1 (CKP1)
05	Knock Sensor (KS)
08	Measuring Core Volume Air Flow (MC-VAF) Sensor
09	Engine Coolant Temperature (ECT) Sensor
10	Intake Air Temperature (IAT) Sensor
12	Throttle Position (TP) Sensor
14	Barometric Pressure (BARO) Sensor
15	Left Heated Oxygen Sensor (LHO2S) - voltage always below 0.55V
16	EGR Valve Position (EVP) Sensor
17	Left Heated Oxygen Sensor (LHO2S) - voltage does not change
23	Right Heated Oxygen Sensor (RHO2S) - voltage always below 0.55V
24	Right Heated Oxygen Sensor (RHO2S) - voltage does not change
25	Fuel Pressure Regulator Control (FPRC) Solenoid
26	Canister Purge (CANP) Solenoid
28	EGR Control (EGRC) Solenoid
29	EGR Vent (EGRV) Solenoid
34	Idle Air Control (IAC) Solenoid
41	Variable Resonance Induction System (VRIS) Solenoid #1
46	Variable Resonance Induction System (VRIS) Solenoid #2
67	Low Cooling Fan (LFAN) Relay
69	Cooling Fan Engine Coolant Temperature (ECTF) Sensor
"STO LO" always ON	Not able to initiate diagnostic test mode
"STO LO" always ON and no codes (Blank Super STAR II screen)	Pass Code

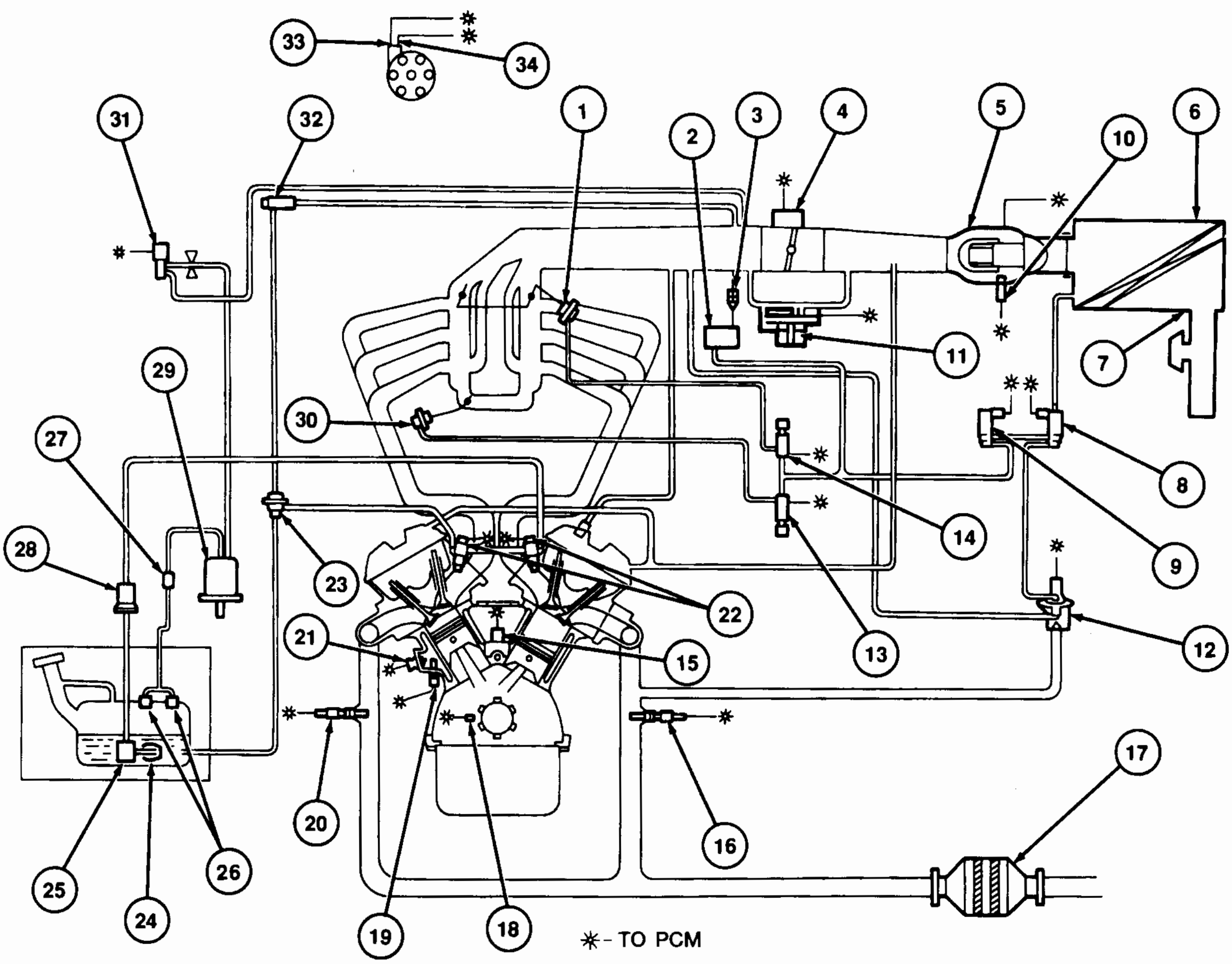
2.5L Electrical Schematics

TCM Diagnostic Trouble Code	Diagnostic Trouble Code Definition
01	Crankshaft Position Sensor # 1 (CKP1)
06	Vehicle Speed Sensor (VSS)
12	Throttle Position (TP) Sensor
14	Barometric Pressure (BARO) Sensor
55	Pulse Signal Generator (PSG)
56	Transaxle Oil Temperature (TOT) Sensor
57	Reduce Torque Signal # 1 (RTS1) (To PCM)
58	Reduce Torque Signal #2 (RTS2) (To PCM)
59	Torque Reduce / Engine Coolant Temperature Signal (TRS) (From PCM)
60	1-2 Shift Solenoid (SS1)
61	2-3 Shift Solenoid (SS2)
62	3-4 Shift Solenoid (SS3)
63	Torque Converter Clutch Control (TCCC) Solenoid
64	Downshift Solenoid (DSS)
65	Torque Converter Clutch (TCC) Solenoid
66	Line Pressure Solenoid (LPS)

2.5L Fuel/Vacuum/Electrical Schematics

Mechanical Emission Related Systems

Schematic Diagram



2.5L Fuel/Vacuum/Electrical Schematics

Component Identification

Item	Base Part Number	Description	System
1	-----	Shutter Valve	Inlet Air Control
2	9E453	Vacuum Reservoir	Exhaust Gas Recirculation
3	-----	Check Valve	Exhaust Gas Recirculation
4	9989	Throttle Position Sensor	Inlet Air Control & PCM
5	-----	Measuring Core Volume Air Flow Sensor	Inlet Air Control & PCM
6	9600	Air Cleaner	Inlet Air Control
7	9C675A	Air Inlet Duct	Inlet Air Control
8	9B981	EGR Vent Solenoid	Exhaust Gas Recirculation & PCM
9	9B981	EGR Control Solenoid	Exhaust Gas Recirculation & PCM
10	12B529	Intake Air Temperature Sensor	Inlet Air Control & PCM
11	9B289	Idle Air Control Valve	Bypass Air Control
12	9F489	EGR Valve	Exhaust Gas Recirculation
13	-----	Variable Resonance Induction System Solenoid #1	Inlet Air Control
14	-----	Variable Resonance Induction System Solenoid #2	Inlet Air Control
15	12A699	Knock Sensor	PCM
16	9F472	Right Heated Oxygen Sensor	Catalyst and Exhaust & PCM
17	5E212	Three Way Catalytic Converter	Catalyst and Exhaust & PCM
18	-----	Crankshaft Position Sensor #2 (at Crankshaft Pulley)	PCM
19	12A648	Cooling Fan Engine Coolant Temperature Sensor	PCM
20	9F472	Left Heated Oxygen Sensor	Catalyst and Exhaust & PCM
21	12A648	Engine Coolant Temperature Sensor	PCM
22	9F593	Fuel Injectors (6)	Fuel Delivery
23	9C968	Fuel Pressure Regulator	Fuel Delivery
24	9155	Fuel Filter Low Pressure Side	Fuel Delivery
25	9350	Fuel Pump	Fuel Delivery
26	9B593	Rollover / Vent Valves	Evaporative Emission
27	9C968	Two-Way Check Valve	Evaporative Emission
28	9155	Fuel Filter High Pressure Side	Fuel Delivery
29	9D653	Carbon Canister	Evaporative Emission
30	-----	Shutter Valve	Inlet Air Control
31	9C915	Canister Purge Solenoid	Evaporative Emission & PCM
32	9D278	Fuel Pressure Regulator Control Solenoid	Fuel Delivery & PCM
33	6C315	Crankshaft Position Sensor (In Distributor)	Ignition System & PCM
34	12126	Cylinder Identification Sensor (In Distributor)	Ignition System & PCM

SECTION 5B

EEC Quick Test Procedures and Appendix (Includes 4EAT Quick Test Procedures)

Contents

SECTION 5B

EEC Quick Test Procedures and Appendix (Includes 4EAT Quick Test Procedures)

Contents (continued)

EEC Quick Test

QT

Description

For a detailed description on PCM Diagnostic Test Mode and equipment operation, refer to the Appendix.

This diagnostic procedure is used on the following vehicle systems:

- 1.3L
- 1.6L
- 1.8L
- 2.5L

NOTE: 1.9L and 2.0L vehicles are covered in the "A" portions of this manual.

Definition

Quick Test is a check of system electronics which utilizes the control module of each system to perform diagnostics on itself and its circuitry. This module capability is referred to as Diagnostic Test Mode. Since little effort is required to initiate Diagnostic Test Mode, but in return vital information is retrieved quickly, this procedure is referred to as Quick Test.

CAUTION

Although Quick Test appears to be a fast and powerful diagnostic aid, it unfortunately cannot detect all possible failures that can occur within the EEC systems. Therefore, the Quick Test procedures in this manual have been carefully constructed to guide and refer you to Pinpoint Tests that inspect components and circuitry associated with particular symptoms.

Keep in mind that all things that went wrong with cars before the age of electronics reached the automobile, can still go wrong and are still the cause of the majority of the driveability problems. That's why the best diagnosis starts with a list of symptoms and possible causes, followed by a careful checking of those causes in the most probable order.

Directions

When the Diagnostic Routines direct you to a Quick Test, perform all of the Quick Test step-by-step, following directions in the "Action To Take" column. If all phases of the Quick Test give no indication of a problem, it is likely that the problem is non-electronic and will be found elsewhere. You should return to Section 2B, Diagnostic Routines for the next possible fault for that particular symptom.

When directed to a Pinpoint Test, always read the cover page(s) for special notes and look carefully at the Pinpoint Test schematic. When a repair has been made, erase codes and rerun the Quick Test to confirm the repair was effective.

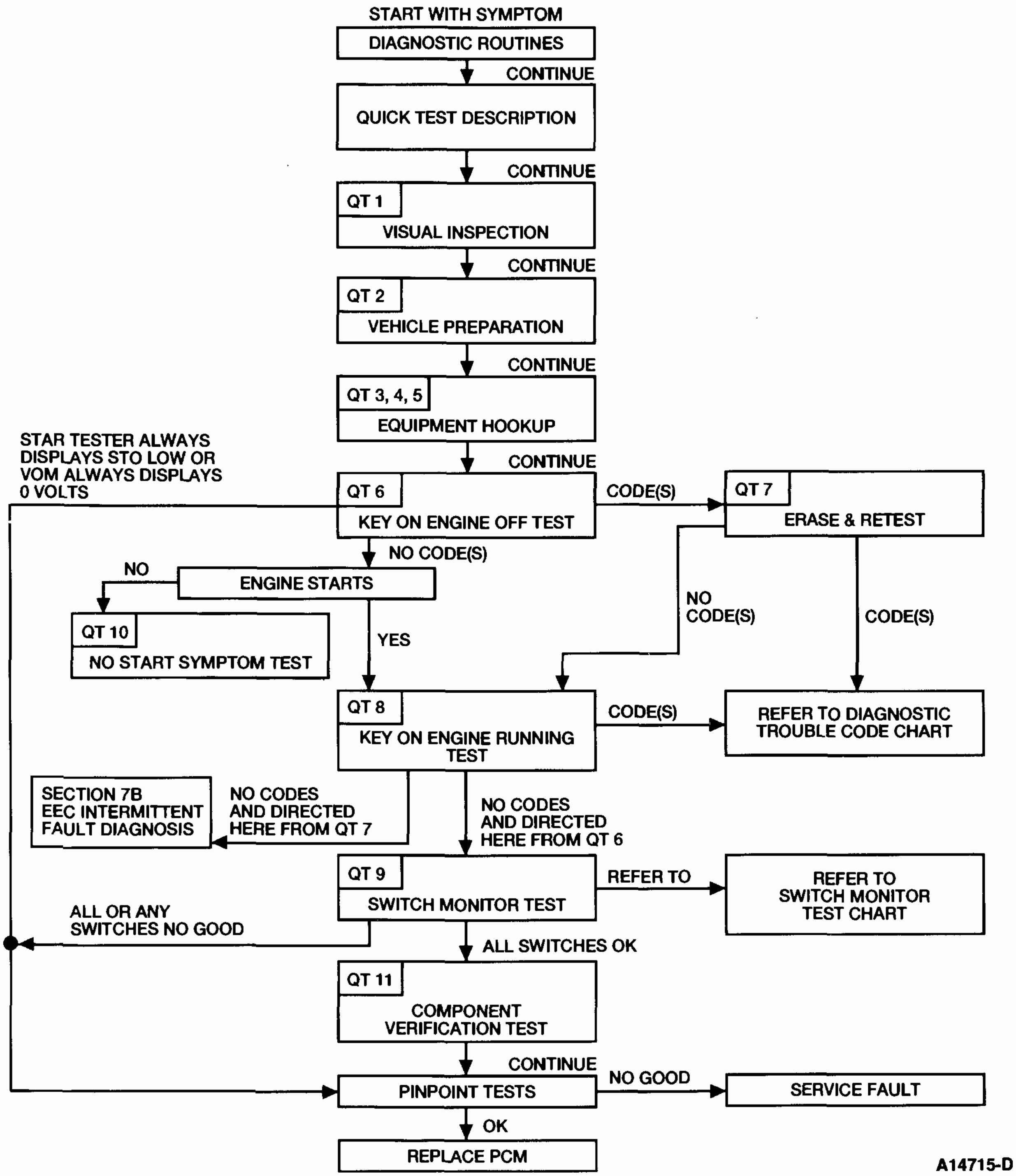
Diagnostic Aids

The following flowchart can be used as a guide for better understanding of the Quick Test flow path. It is not intended as a diagnostic procedure on its own, nor does it contain the detailed information required to run Quick Test.

EEC Quick Test

QT

EEC Quick Test Summary Flowchart



EEC Quick Test

QT

TEST STEP		RESULT	▶	ACTION TO TAKE
QT1	PERFORM VISUAL INSPECTION			
	• Inspect the air cleaner and inlet ducting, tubes, and clamps. • Check all engine vacuum hoses for damage, leaks, cracks, blockage, improper routing, etc. • Check the PCM wiring harness for improper connections, bent or broken pins, corrosion, loose wires, improper routing, blown fuses, etc. • Check the processor, sensors, and actuators for physical damage. • Check the engine coolant for proper level. • Check the engine oil level and quality. • Check the battery voltage. Refer to Service Manual Section 14-01 for checking and charging procedures. • **Do all components and fluids appear OK?**	Yes No	▶ ▶	GO to QT2, Vehicle Preparation. SERVICE the fault(s) in the system as required and REEVALUATE the symptom(s).
QT2	PERFORM VEHICLE PREPARATION			
	• Perform all the following safety steps required to start and run vehicle tests: — Apply the parking brake. — Place the selector lever firmly into the PARK position (NEUTRAL on manual transaxle). — Block the drive wheels. • Turn off all electrical loads: — Radios — Lights — A/C — Rear window defroster — Heater, blower fans, etc. • **Have all the safety steps been performed and all electrical loads been turned off?**	Yes (Using New Generation Star [NGS] Scan Tool) Yes (Using Super STAR II Tester) Yes (Using Analog VOM or Malfunction Indicator Lamp [MIL]) No	▶ ▶ ▶ ▶	GO to QT3, Equipment Hookup. GO to QT4, Equipment Hookup. GO to QT5, Equipment Hookup. Personal safety and correct diagnostic results are dependent on test step QT2. MAKE all the necessary repairs to perform vehicle preparation.

EEC Quick Test

QT

TEST STEP		RESULT	▶	ACTION TO TAKE
QT3	PERFORM EQUIPMENT HOOKUP (NEW GENERATION STAR [NGS] SCAN TOOL ONLY)			
	NOTE: Refer to Figure 2 and Figure 3 in Appendix for proper hookup. ● Key OFF. ● Connect the DLC Adapter to the Diagnostic Data Link (DDL) connector on the Rotunda NGS Scan Tool 007-00500. ● Connect Rotunda Super MECS Adapter 007-00052 to the DLC Adapter. ● Connect the adapter cable leads to the STO and STI connectors on the 1.6L engine or to the Data Link Connector (DLC) on the 1.3L, 1.8L, and 2.5L engines. ● Connect the adapter cable ground clip to the negative (-) battery terminal for the 1.6L engine. ● Slide the adapter switch on the Super MECS Adapter to the PCM position for the 1.3L, 1.8L, and 2.5L engines. ● Connect the NGS Power Cable to the battery with the battery adapter. ● **Is equipment hooked up properly?**	Yes No	▶ ▶	GO to QT6, Key ON, Engine Off Test. SERVICE the fault(s) as necessary and REPEAT QT3.
QT4	PERFORM EQUIPMENT HOOKUP (SUPER STAR II TESTER ONLY)			
	NOTE: Refer to Figure 2 and Figure 3 in Appendix for proper hookup. ● Key OFF. ● Connect Rotunda Super MECS Adapter 007-00052 to the Rotunda Super STAR II Tester 007-0041B. The previously issued Rotunda Adapter 007-00036 may still be used on the 1.6L engine while Rotunda Adapter 007-00049 may be used on the 1.3L, 1.8L, and 2.5L engines. ● Connect the adapter cable leads to the STO and STI connectors on the 1.6L engine or to the Data Link Connector (DLC) on the 1.3L, 1.8L, and 2.5L engines. ● Connect the adapter cable ground clip to the negative (-) battery terminal for the 1.6L engine. ● Slide the adapter switch on the Super MECS adapter to the PCM position for the 1.3L, 1.8L, and 2.5L engines. ● Slide the Super STAR II Tester switch to the MECS position. ● **Is equipment hooked up properly?**	Yes No	▶ ▶	GO to QT6, Key ON, Engine Off Test. SERVICE the fault(s) as necessary and REPEAT QT4.

EEC Quick Test

QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT5	PERFORM EQUIPMENT HOOKUP (ANALOG VOM OR MALFUNCTION INDICATOR LAMP [MIL] ONLY)		
	NOTE: Refer to Figure 2 and Figure 3 in Appendix for proper hookup. ● **If using Analog VOM** — Key OFF. — Connect the VOM positive (+) lead to the PCM STO line and the negative (-) lead to engine ground. — Jumper the PCM STI to engine ground. — Set the VOM on a DC voltage range to read from 0 to 20 volts. ● **If using Malfunction Indicator Lamp (MIL)** NOTE: If the MIL flashes continuously prior to equipment hookup, go to Section 6B, EEC Pinpoint Test STI. — To use the MIL, jumper the PCM STI line to engine ground. ● **Is equipment hooked up properly?**	Yes ▶ No ▶	GO to QT6, Key ON, Engine Off Test. SERVICE the fault(s) as necessary and REPEAT QT5.

EEC Quick Test

QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT6	PERFORM KEY ON ENGINE OFF TEST		
	• Follow one of the test procedures based on the type of equipment used: NOTE: When performing the Diagnostic Test Mode on the 1.8L 4EAT either engine or transaxle codes can be received. Refer to the 4EAT Quick Test in this section for a list of transaxle related codes. • **If using New Generation Star (NGS) Scan Tool** — Follow the procedure in the Appendix to activate and deactivate the Diagnostic Test Mode. • **Are any diagnostic codes present?** • **If using Super STAR II Tester** — Latch the center button to the TEST position. — Turn the Super STAR II Tester ON (the tester will sound and "888" will be displayed for two seconds). — Key ON. — Unlatch and relatch the center test button. — After all codes are received, unlatch the center button to review all codes retained in tester memory. NOTE: The "STI LO" indicator will flash as the codes are received by the Super STAR II Tester. If the "STI LO" indicator goes out and does not come back on, no codes exist. • **Are any diagnostic trouble codes present?** • **If using Analog VOM** — Key ON. — Turn the VOM ON. — Observe the VOM needle for any code indications. Refer to appendix to interpret observed codes. • **Are any diagnostic trouble codes present?** • **If using Malfunction Indicator Lamp (MIL)** — Key ON. — Observe the MIL. Refer to appendix to interpret observed codes. • **Are any diagnostic trouble codes present?**	Yes Code(s) ▶ No codes present and STAR Tester always displays STO LO, or VOM always displays 0 volts ▶ No codes and engine starts ▶ No codes and no start ▶	GO to QT7, Erase and Retest. GO to EEC Pinpoint Test STI, Section 6B. GO to QT8, Key ON Engine Running Test. GO to QT10, Check For Spark.

EEC Quick Test

QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT7	ERASE AND RETEST		
	NOTE: Erasing diagnostic trouble codes and retesting will give an indication whether diagnostic trouble codes received in test step QT6 represent hard or intermittent faults. Hard fault codes will repeat immediately and will be displayed during retest. ● Confirm code(s) were received in test step QT6. ● Turn the Super STAR II Tester or VOM OFF, or disconnect the NGS Scan Tool. ● Disconnect the negative battery cable and depress the brake pedal for 5-10 seconds to erase codes in memory. ● Reconnect the negative battery cable. ● Perform the Key ON Engine Off Test as instructed in test step QT6. NOTE: If codes retrieved the first time cannot be re-created, it may be necessary to tap suspect sensors, shake and wiggle harness, or drive the vehicle in order to induce a failure. Repeat step QT6 each time. ● **Are any diagnostic trouble codes present?**	Yes code(s) ▶ No codes ▶ No codes and no start ▶	REFER to the Diagnostic Trouble Code Chart after Quick Test for Pinpoint Test direction. GO to QT8, Key ON Engine Running Test. GO to QT10, Check For Spark.
QT8	PERFORM KEY ON ENGINE RUNNING TEST		
	NOTE: If using the New Generation Star (NGS) Scan Tool, follow the procedure in the Appendix to activate and deactivate the Diagnostic Test Mode. ● Deactivate the Diagnostic Test Mode by unlatching the center button on the Super STAR II Tester and turning the tester OFF, or disconnect the jumper connecting PCM STI to ground if using VOM or MIL. ● Connect a Rotunda 88 Digital Multimeter 105-00053, or equivalent as a tachometer. ● Run the engine at 2000 rpm for three minutes. ● If using Super STAR II Tester, turn the Super STAR II Tester ON. ● Latch the center button on the Super STAR II Tester, or jumper the PCM STI to ground if using VOM or MIL. ● Turn the engine off. ● Start the engine and run the engine at idle. ● Activate the Diagnostic Test Mode by unlatching then relatching the Super STAR II Tester. ● **Are any diagnostic trouble codes present?**	Yes Code(s) ▶ No Codes and sent here by QT6 ▶ No codes and sent here by QT7 ▶	REFER to the Diagnostic Trouble Code Chart after Quick Test for Pinpoint Test direction. GO to QT9, Switch Monitor Test. GO to Section 7B, EEC Intermittent Fault Diagnosis.

EEC Quick Test

QT

	TEST STEP	RESULT ▶	ACTION TO TAKE
QT9	PERFORM SWITCH MONITOR TEST		
	NOTE: If using the New Generation Star (NGS) Scan Tool, follow the procedure in the Appendix to activate and deactivate the Switch Monitor Test. NOTE: A list of switches to be tested is found in the Switch Monitor Test Charts located after EEC Quick Test. ● The Switch Monitor Test checks input signals from the individual input switches to the PCM. ● Test all switches individually - leaving a switch ON while testing another will lead to a false test result. ● Turn engine off and allow to cool before starting Switch Monitor Test. ● If using Super STAR II Tester, deactivate Diagnostic Test Mode by unlatching the center button of the Super STAR II Tester and turning the tester OFF. ● Turn all accessories off. ● Apply the parking brake. ● Place transaxle in NEUTRAL or PARK. ● Key ON. ● If using Super STAR II Tester, leave tester connected, turn tester ON, latch center button, and watch the output of the LED on the adapter cable as each switch is exercised. ● If using VOM, jumper PCM STI to ground, connect VOM(+) lead to SML line and (-) lead to engine ground. (See illustration in Appendix). ● **Do all the switches listed in the switch monitor test charts test OK?**	Yes All switches OK ▶ No All switches fail ▶ One or more switches fail ▶	GO to QT11, Component Verification Test. GO to EEC Pinpoint Test SML in Section 6B. GO to Section 6B, EEC Pinpoint Test(s), for all switches that fail. REFER to the Switch Monitor Test Charts found after Quick Test for the list of Pinpoint Tests.
QT10	CHECK FOR SPARK		
	● Key OFF. ● Connect a Rotunda Air Gap Spark Tester D81P-6666-A, or equivalent, between the #1 spark plug wire (plug end) and ground. ● Crank engine using ignition switch. ● Repeat for all spark plug wires. ● **Were sparks present at all wires?**	Yes ▶ No ▶	GO to Section 9B, Fuel Delivery/Turbocharger System. GO to Section 8B, Ignition Systems.

EEC Quick Test — QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT11	COMPONENT VERIFICATION TEST		
	NOTE: Refer to Section 3B, EEC Engine Supplement — Car to aid in determining possible causes of the symptom. ● Refer to Section 6B, EEC Pinpoint Tests, and perform the EEC Pinpoint Test for each component that could cause the symptom. ● **Does each Pinpoint Test check out OK?**	Yes ▶	REPEAT Test Step QT11 until all possible components have been checked. If all components check out OK, RETURN to Section 2B, Diagnostic Routines.
		No ▶	SERVICE the fault(s) as indicated in Pinpoint Test and RECHECK the symptom(s).

EEC Quick Test

QT

Diagnostic Trouble Code Chart

Diagnostic Trouble Code	Component	Pinpoint Test Step Direction (Refer to Section 6B)			
		1.3L	1.6L	1.8L	2.5L
01	Ignition Diagnostic Monitor	—	IDM	—	—
02	CKP Sensor	—	—	CKP	CKP2
03	CID Sensor	CID	CID	CID	CID
04	CKP Sensor	CKP	—	—	CKP1
05	Knock Sensor	—	—	—	KS
06	Vehicle Speed Sensor	VSS	—	—	—
08	Air Flow Meter	MAF	VAF	VAF	MC-VAF
09	ECT Sensor	ECT	ECT	ECT	ECT
10	IAT Sensor	IAT	IAT	IAT	IAT
12	TP Sensor	TP	TP	TP	TP
14	BARO Sensor	BARO	BARO	BARO	BARO
15	(Heated) Oxygen Sensor	O2S	O2S	O2S	HO2S
16	EGRT Sensor / EVP Sensor	EVP	—	—	EVP
17	(Heated) Oxygen Sensor	O2S	O2S	O2S	HO2S
23	Heated Oxygen Sensor	—	—	—	HO2S
24	Heated Oxygen Sensor	—	—	—	HO2S
25	FPRC Solenoid	—	SCG	SCG	SCG
26	CANP Solenoid	—	SCG	SCG	SCG
28	EGRC Solenoid	—	—	—	SCG
29	EGRV Solenoid	—	—	—	SCG
34	IAC Solenoid	—	SCG	SCG	SCG
41	HSIA Solenoid / VRIS1 Solenoid	—	—	SCG	SCG
46	VRIS2 Solenoid	—	—	—	SCG
67	LFAN Relay	—	—	—	ROC
Codes Not Listed	—	PGC	PGC	PGC	PGC

• NOTE: Both engine and transaxle codes may be received during the self test on 1.8L 4EAT engines.

EEC Quick Test

QT

Switch Monitor Test Chart

Switch/Relay	1.3L	1.6L Non-Turbo	1.6L Turbo	1.8L	2.5L	Condition	Super STAR II Tester / NGS Scan Tool LED, or Analog VOM Indication	EEC Pinpoint Test
A/C Selector (ACS) Switch	X	X	X	X	X	A/C selector switch on (blower switch on 1st position for 1.3L, 1.6L, and 1.8L)	LED on, or less than 1.5 volts	STG
Blower Motor (BLMT) Switch	X	X	X	X	X	Blower switch on 2nd or above position for 1.3L, 1.6L, 1.8L, and 3rd or Hi position with mode switch on for 2.5L	LED on, or less than 1.5 volts	STG (ELU for 1.6L)
Brake ON/OFF (BOO) Switch	X	X	X	X MTX	X	Brake pedal depressed	LED on, or less than 1.5 volts	STP
Coolant Temperature Switch (CTS)		X	X	X		Cooling fan on low speed (ground fan if necessary)	LED on, or less than 1.5 volts	STP (ELU for 1.6L)
Daytime Running Lamp (DRL) Relay (Canada Only)					X	Parking brake released	LED on, or less than 1.5 volts	DRL
Headlamp (HDLP) Switch	X	X	X	X	X	Headlamp switch on	LED on, or less than 1.5 volts	STP (ELU for 1.6L)
High Cooling Fan (HFAN) Relay					X	Accelerator pedal depressed (fan should operate at high speed)	LED on, or less than 1.5 volts	ROC
Idle (IDL) Switch	X	X	X	X	X	Accelerator pedal depressed	LED on, or less than 1.5 volts	STG
Knock Control (KC)			X			Tap on engine lift bracket while engine running	LED on, or less than 1.5 volts	KC
Cooling Fan Relay (CFR)	X					Accelerator pedal depressed (fan should operate)	LED on, or less than 1.5 volts	ROC
Manual Lever Position (MLP) Switch (ATX)	X	X		X	X	Selector lever in R, D, D, L for 1.8L or R, D, 2, 1 for 1.3L, 1.6L, and 2.5L	LED on, or less than 1.5 volts	STP

(Continued)

EEC Quick Test

QT

Switch/Relay	1.3L	1.6L Non-Turbo	1.6L Turbo	1.8L	2.5L	Condition	Super STAR II Tester / NGS Scan Tool LED, or Analog VOM Indication	EEC Pinpoint Test
Park / Neutral Position (PNP) Switch / Clutch Pedal Position (CPP) Switch (MTX)	X	X	X	X	X	Transaxle in gear and clutch pedal released	LED on, or less than 1.5 volts	STG
Rear Defroster (DEF) Switch	X	X	X	X	X	Rear defroster switch on	LED on, or less than 1.5 volts	STP (ELU for 1.6L)
Wide-Open Throttle (WOT) Switch			X	X MTX		Accelerator pedal fully depressed	LED off, or 12 volts	STG

4EAT Quick Test

QT

Description

This diagnostic procedure is used on the following vehicle systems:

- 1.6L 4EAT
- 1.8L 4EAT
- 2.5L 4EAT

Definition

Quick Test is a check of system electronics which utilizes the control module of each system to perform diagnostics on itself and its circuitry. This module capability is referred to as Diagnostic Test Mode. Since little effort is required to initiate Diagnostic Test Mode, but in return vital information is retrieved quickly, this procedure is referred to as Quick Test.

CAUTION

Although Quick Test appears to be a fast and powerful diagnostic aid, it unfortunately cannot detect all possible failures that can occur within the Transaxle Control Module (TCM) system. Therefore, the Quick Test procedures in this manual have been carefully constructed to guide and refer you to Pinpoint Tests that inspect components and circuitry associated with particular symptoms.

Keep in mind that all things that went wrong with cars before the age of electronics reached the automobile can still go wrong, and are still the cause of the majority of the driveability problems. That's why the best diagnosis starts with a list of symptoms and possible causes, followed by a careful checking of those causes in the most probable order. Refer to Section 2B, Diagnostic Routines and the Group 07 Transaxle Symptom Chart of the appropriate Service Manual for a list of symptoms and probable causes.

Directions

When the Symptom Charts or Diagnostic Routines direct you to Quick Test, perform all of Quick Test step by step, following directions in the "Action To Take" column. If all phases of Quick Test give no indication of a problem, it is likely that the problem is non-electronic and will be found elsewhere. You should return to Section 2B, Diagnostic Routines and the Group 07 Transaxle Symptom Chart of the appropriate Service Manual for the next possible fault for that particular symptom.

When directed to a Pinpoint Test always read the cover page(s) for special notes and look carefully at the Pinpoint Test schematic. When a repair has been made, erase codes and rerun Quick Test to confirm the repair was effective.

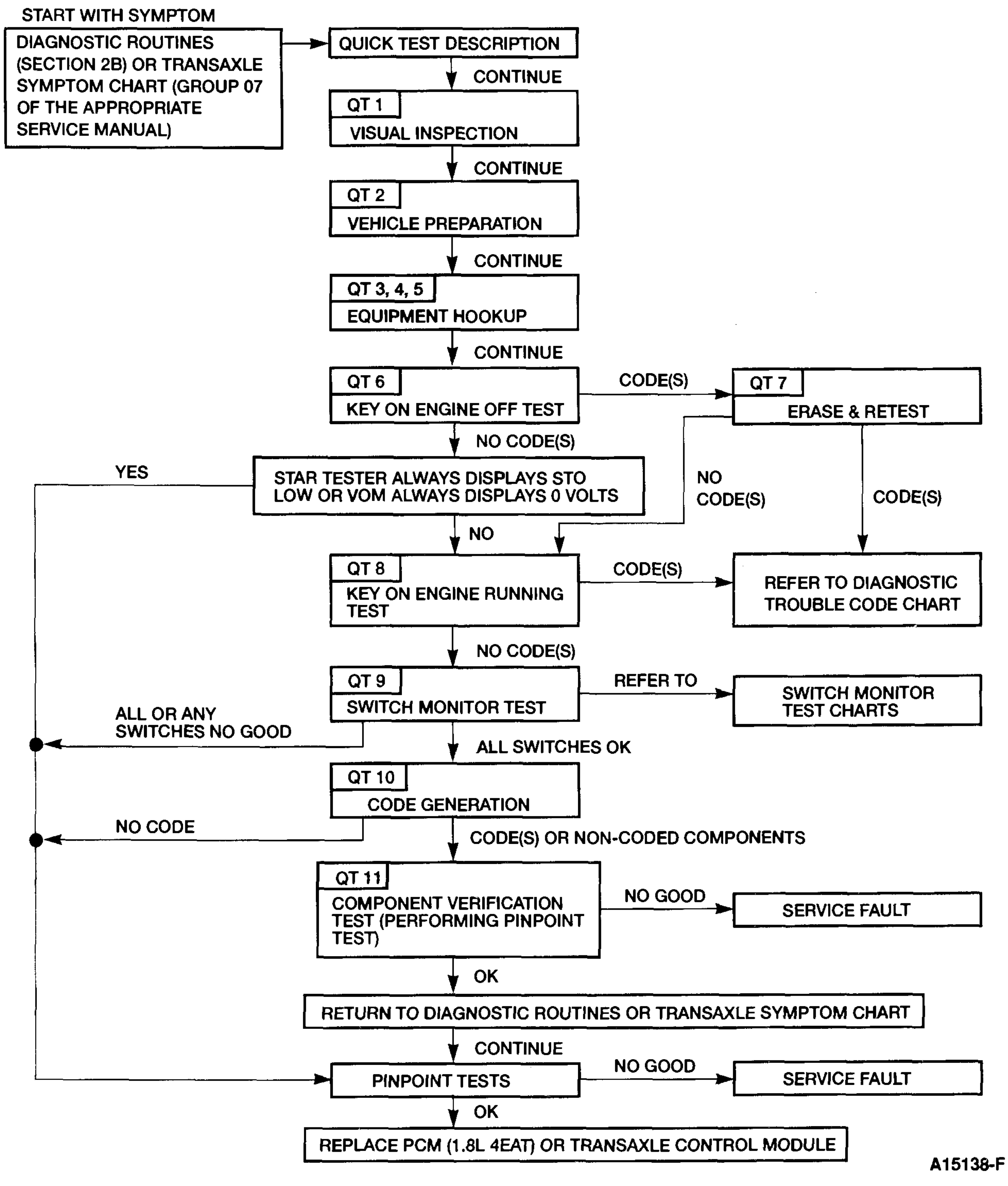
Diagnostic Aids

The following flowchart can be used as a guide for better understanding of the Quick Test flow path. It is not intended as a diagnostic procedure on its own, nor does it contain the detailed information required to run Quick Test.

4EAT Quick Test

QT

4EAT Quick Test Summary Flowchart



4EAT Quick Test

QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT1	PERFORM VISUAL INSPECTION		
	• Check the engine coolant for proper level. • Check the transaxle fluid level and quality. • Check engine oil level and quality. • Check the shift linkage for excessive wear or damage. • Check the TCM wiring harness (PCM wiring harness for 1.8L) for improper connections, bent or broken pins, corrosion, loose wires, improper routing, blown fuses, etc. • Check the TCM (PCM for 1.8L) sensors and solenoids for physical damage. • Check the battery voltage. Refer to Service Manual Section 14-01 for checking and charging procedures. • **Do all components and fluids appear OK?**	Yes ▶	GO to QT2, Vehicle Preparation.
		No ▶	SERVICE the fault(s) in the system as required and REEVALUATE the symptom(s).
QT2	PERFORM VEHICLE PREPARATION		
	• Perform all the following safety steps required to start and run vehicle tests: — Apply the parking brake. — Place the selector lever firmly into the PARK position. — Block the drive wheels. • Turn off all electrical loads: — Radios — Lights — A/C — Rear window defroster — Heater, blower fans, etc. • Start the engine and run until at normal operating temperature. • **Have all the safety steps been performed, electrical loads been turned off, and is engine at operating temperature?**	Yes (Using New Generation Star [NGS] Scan Tool) ▶	GO to QT3, Equipment Hookup.
		Yes (Using Super STAR II Tester) ▶	GO to QT4, Equipment Hookup.
		Yes (Using Analog VOM, Malfunction Indicator Lamp [MIL] or Overdrive Off Lamp [ODL]) ▶	GO to QT5, Equipment Hookup.
		No ▶	Personal safety and correct diagnostic results are dependent on test step QT2. MAKE all the necessary repairs to perform vehicle preparation.

4EAT Quick Test

QT

	TEST STEP	RESULT ▶	ACTION TO TAKE
QT3	PERFORM EQUIPMENT HOOKUP (NEW GENERATION STAR [NGS] SCAN TOOL ONLY)		
	NOTE: Refer to Figure 4 and Figure 5 in Appendix for proper hookup. • Key OFF. • Connect the DLC Adapter to the Diagnostic Data Link (DDL) connector on the Rotunda NGS Scan Tool 007-00500. • Connect Rotunda Super MECS Adapter 007-00052 to the DLC Adapter. • Connect the adapter cable leads to the STO and STI connectors on the 1.6L 4EAT or to the Data Link Connector (DLC) on the 1.8L 4EAT and 2.5L 4EAT. • Connect the adapter cable ground clip to the negative (-) battery terminal on the 1.6L 4EAT. • Slide the adapter switch on the Super MECS Adapter to the TCM position for 2.5L 4EAT. • Slide the adapter switch on the Super MECS Adapter to the PCM position for 1.8L 4EAT. • Connect the NGS Power Cable to the battery with the battery adapter. • **Is equipment hooked up properly?**	Yes ▶ No ▶	GO to QT6, Key ON Engine Off Test. SERVICE the fault(s) as necessary and REPEAT QT3.
QT4	PERFORM EQUIPMENT HOOKUP (SUPER STAR II TESTER ONLY)		
	NOTE: Refer to Figure 4 and Figure 5 in Appendix for proper hookup. • Key OFF. • Connect Rotunda Super MECS Adapter 007-00052 to the Rotunda Super STAR II Tester 007-0041B. The previously issued Rotunda Adapter 007-00036 may still be used on the 1.6L 4EAT while Rotunda Adapter 007-00049 may be used on the 1.8L 4EAT (ECA position) and the 2.5L 4EAT (4EAT position). • Connect the adapter cable leads to the STO and STI connectors on 1.6L 4EAT or to the Data Link Connector (DLC) on the 1.8L 4EAT and the 2.5L 4EAT. • Connect the adapter cable ground clip to the negative (-) battery terminal for 1.6L 4EAT. • Slide the adapter switch on the Super MECS adapter to the PCM position for 1.8L 4EAT or to the TCM position for the 2.5L 4EAT. • Slide the Super STAR II Tester switch to the MECS position. • **Is equipment hooked up properly?**	Yes ▶ No ▶	GO to QT6, Key ON Engine Off Test. SERVICE the fault(s) as necessary and REPEAT QT4.

4EAT Quick Test

QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT5	PERFORM EQUIPMENT HOOKUP (ANALOG VOM, MALFUNCTION INDICATOR LAMP [MIL] OR OVERDRIVE OFF LAMP [ODL] ONLY)		
	NOTE: Refer to Figure 4 and Figure 5 in Appendix for proper hookup. • **If using Analog VOM** — Key OFF. — Connect the VOM positive (+) lead to the TCM STO line (PCM STO line on 1.8L 4EAT) and the negative (-) lead to engine ground. — Jumper the TCM STI (PCM STI on 1.8L 4EAT) to engine ground. — Set the VOM on a DC voltage range to read from 0 to 20 volts. • **If using Malfunction Indicator Lamp (MIL) (1.8L 4EAT Only)** — To use the MIL, jumper the PCM STI line to engine ground. • **If using Overdrive Off Lamp (ODL) (1.6L 4EAT and 2.5L 4EAT Only)** — To use the ODL, jumper the TCM STI line to engine ground. • **Is equipment hooked up properly?**	Yes ▶ No ▶	GO to QT6, Key ON Engine Off Test. SERVICE the fault(s) as necessary and REPEAT QT5.

4EAT Quick Test

QT

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>QT6</td><td>PERFORM KEY ON ENGINE OFF TEST</td><td rowspan="2">Yes
Code(s) ▶

No
STAR Tester always displays STO LO or VOM always displays 0 volts ▶

No codes ▶</td><td rowspan="2">GO to QT7, Erase and Retest.

GO to 4EAT Pinpoint Test STI in Section 6B, EEC Pinpoint Tests.

GO to QT8, Key ON Engine Running Test.</td></tr>
<tr><td colspan="2">
• Follow one of the test procedures based on the type of equipment used:
NOTE: When performing the Diagnostic Test Mode on the 1.8L 4EAT either engine or transaxle codes can be received. Refer to the EEC Quick Test in this section for a list of engine related codes.
• If using New Generation Star (NGS) Scan Tool
— Follow the procedure in the Appendix to activate and deactivate the Diagnostic Test Mode.
• If using Super STAR II Tester
— Latch the center button to the TEST position.
— Turn the Super STAR II Tester ON. (The tester will sound and "888" will be displayed for two seconds).
— Key ON.
— Unlatch and relatch the center button.
— After all codes are received, unlatch the center button to review all codes retained in tester memory.
NOTE: The "STI LO" indicator will flash as the codes are received by the Super STAR II Tester. If the "STI LO" indicator goes out and does not come back on, no codes exist.
— Are any diagnostic trouble codes present?
• If using Analog VOM
— Key ON.
— Turn the VOM ON.
— Observe the VOM needle for any code indications.
— Are any diagnostic trouble codes present?
• If using Malfunction Indicator Lamp (MIL) (1.8L 4EAT Only)
— Key ON.
— Observe the MIL.
— Are any diagnostic trouble codes present?
• If using Overdrive Off Lamp (ODL) (1.6L 4EAT and 2.5L 4EAT Only)
— Key ON.
— Observe the ODL.
— Are any diagnostic trouble codes present?
</td></tr>
</table>

4EAT Quick Test

QT

TEST STEP		RESULT ▶	ACTION TO TAKE
QT7	ERASE AND RETEST		
	NOTE: Erasing diagnostic trouble codes and retesting will give an indication whether diagnostic trouble codes received in test step QT6 represent hard or intermittent faults. Hard faults will repeat immediately and codes will be displayed during retest. • Confirm code(s) were received in test step QT6. • Turn the Super STAR II Tester or VOM OFF, or disconnect the NGS Scan Tool. • Disconnect the negative battery cable and depress the brake pedal for 5-10 seconds to erase codes in memory. • Reconnect the negative battery cable. • Perform the Key ON Engine Off Test as instructed in test step QT6. NOTE: If codes retrieved the first time cannot be re-created, it may be necessary to tap suspect sensors, shake and wiggle harness, or drive the vehicle in order to induce a failure. Repeat test step QT6 each time. • **Are any diagnostic trouble codes present?**	Yes Code(s) ▶ No code(s) ▶	REFER to the Diagnostic Trouble Code Chart after Quick Test for Pinpoint Test direction. GO to QT8, Key ON Engine Running Test.
QT8	PERFORM KEY ON ENGINE RUNNING TEST		
	NOTE: If using the New Generation Star (NGS) Scan Tool, follow the procedure in the Appendix to activate and deactivate the Diagnostic Test Mode. • Deactivate the Diagnostic Test Mode by unlatching the center button on the Super STAR II Tester and turning the tester OFF, or disconnect the jumper connecting the STI to ground if using VOM, ODL (1.6L 4EAT and 2.5L 4EAT), or MIL (1.8L 4EAT only). • Drive the vehicle at 50 km/h (31 mph) and depress the accelerator pedal fully to activate kickdown. Stop the vehicle gradually. • If using Super STAR II Tester, turn the Super STAR II Tester ON. • Latch the center button on the Super STAR II Tester, or jumper the STI to ground if using VOM, ODL (1.6L 4EAT and 2.5L 4EAT only), or MIL (1.8L 4EAT only). • Turn the engine off. • Start the engine and run the engine at idle. • Activate the Diagnostic Test Mode by unlatching and then relatching the Super STAR II Tester. • **Are any diagnostic trouble codes present?**	Yes Code(s) ▶ No Codes ▶	REFER to the Diagnostic Trouble Code Chart after Quick Test for Pinpoint Test direction. GO to QT9, Switch Monitor Test.

4EAT Quick Test

QT

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>QT9</td><td>PERFORM SWITCH MONITOR TEST</td><td></td><td></td></tr>
<tr><td colspan="2">

- Refer to illustration after Switch Monitor Test Chart for proper hookup.
- Connect Rotunda 4EAT Tester 007-0037B, or equivalent to the Powertrain Control Module (PCM) for vehicles with integrated processors (1.8L 4EAT), or to the Transaxle Control Module (TCM) for vehicles with separate processors (1.6L 4EAT and 2.5L 4EAT). Use the appropriate adapter and overlay as listed below.

Vehicle	Adapter	Overlay
1.6L	007-00095A	3122-694
1.8L	007-00100B	3122-731
2.5L	007-00100A	3122-696

- Key ON.
- Turn the 4EAT Tester ON.

NOTE: Make sure Battery test pin LED lights up when tester is turned on. This will verify that tester is working.

- Check the switches listed in the Switch Monitor Test Charts found after Quick Test, under the conditions specified.

NOTE: Switches can also be checked, instead of using the LEDs, by connecting a voltmeter (VOM) between the pin indicated in the Switch Monitor Test Charts found after Quick Test, and the ground pin on the 4EAT Tester.

- **Do the 4EAT Tester lights (LEDs) indicate that all of the switches are functioning properly?**

</td><td>Yes ▶

No ▶</td><td>GO to QT10, Code Generation.

GO to the appropriate Pinpoint Test in Section 6B, 4EAT Pinpoint Tests for the switch(es) in question.</td></tr>
</table>

4EAT Quick Test

QT

TEST STEP	RESULT ▶	ACTION TO TAKE
QT10 PERFORM CODE GENERATION		
• Refer to the Diagnostic Trouble Code Chart located after the Quick Test and look at the components listed that could cause the symptoms. • Disconnect each component from the harness, one at a time, beginning with the first coded component. • Hook up the test equipment as in test step QT3, QT4, or QT5. • Perform the Key ON Engine Running Test as in test step QT8 to confirm that the PCM (1.8L 4EAT) or TCM (1.6L 4EAT or 2.5L 4EAT) recognizes the open circuit to each coded component and generates the diagnostic trouble codes. NOTE: Record and erase codes after generation. NOTE: If diagnostic trouble codes are not generated immediately, it may be necessary to drive vehicle with component disconnected. If engine will not start with component disconnected, perform Key ON Engine Off test instead. • **Are any diagnostic trouble codes recorded?**	Yes Code(s) ▶	REPEAT test step QT10 until all coded components have been checked, then GO to QT11, Component Verification Test.
	No code(s) for any or all components ▶	GO to 4EAT Pinpoint Test STO in Section 6B, EEC Pinpoint Tests.
QT11 PERFORM COMPONENT VERIFICATION TEST		
NOTE: Refer to Section 3B, EEC Engine Supplement — Car to aid in determining possible causes of the symptom. • Refer to Section 6B, EEC Pinpoint Tests, and perform the 4EAT Pinpoint Test for each component that could cause the symptom. • **Does each Pinpoint Test check out OK?**	Yes ▶	REPEAT test step QT11 until all possible components have been checked. If all components check out OK, RETURN to Section 2B, Diagnostic Routines.
	No ▶	SERVICE the fault(s) as indicated in Pinpoint Test and RECHECK the symptom(s).

4EAT Quick Test

QT

Diagnostic Trouble Code Chart

Diagnostic Trouble Code	Component	Pinpoint Test Step Direction (Refer to Section 6B)		
		1.6L 4EAT	1.8L 4EAT*	2.5L 4EAT
01	CKP Sensor	—	—	CKP1
06	VSS Sensor	VSS	VSS	VSS
12	TP Sensor	TP	TP	TP
14	BARO Sensor	—	—	BARO
55	Pulse Signal Generator	PSG	PSG	PSG
56	TOT Sensor	—	—	TOT
57	Reduce Torque Signal No. 1	—	—	RTS1
58	Reduce Torque Signal No. 2	—	—	RTS2
59	Torque Reduce / Engine Coolant Temperature Signal	—	—	TRS
60	SS1 (1-2 Shift Solenoid)	SCP	SCP	SCP
61	SS2 (2-3 Shift Solenoid)	SCP	SCP	SCP
62	SS3 (3-4 Shift Solenoid)	SCP	SCP	SCP
63	Torque Converter Clutch Control Solenoid	SCP	SCP	SCP
64	Downshift Solenoid	—	—	SCP
65	Torque Converter Clutch Solenoid	—	—	DCS
66	Line Pressure Solenoid	—	—	DCS
Codes Not Listed	—	PGC	PGC	PGC

* NOTE: Both engine and transaxle codes may be received during the self test on 1.8L 4EAT engines.

4EAT Quick Test

QT

Switch Monitor Test Chart

Switch	1.6L Pin #	1.8L Pin #	2.5L Pin #	Condition	4EAT Tester Light (LED)	Voltmeter (VOM) Reading	Pinpoint Test
Brake On/Off (BOO)	1F	1Q	1F	Brake Pedal Depressed Brake Pedal Released	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position 1 Range (MLP1)	2H		2H	Selector Lever in 1 Range Other Positions	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position 2 Range (MLP2)	2F		2F	Selector Lever in 2 Range Other Positions	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position D Range (MLPD)	2D	3H	2D	Selector Lever in D Range Other Positions	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position R Range (MLPR)			1I	Selector Lever in R Range Other Positions	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position L Range (MLPL)		3G		Selector Lever in L Range Other Positions	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position O/D Range (MLPO/D)		3E		Selector Lever in O/D Range Other Positions	ON OFF	Above 10V Below 1.5V	STP
Manual Lever Position (MLP)	2B	1R	2B	Selector Lever in N or P Other Positions	ON OFF	Below 1.5V Above 10V	STP
Throttle Position (TP) Sensor	2T			Accelerator Fully Depressed Accelerator Released Every 1/8 Position Change	— — —	4.0-4.5V 0.5V Changes 0.5V	TP
Overdrive Off Switch (ODS)	1H		1H	O/D OFF Switch Depressed O/D OFF Switch Released	OFF ON	Below 1.5V Above 10V	STG
Overdrive Off Light (ODL)	1B		1B	O/D OFF Light On O/D OFF Light Off	ON OFF	Below 1.5V Above 10V	ODL
Idle (IDL) Switch	1O	1T	1O	Accelerator Depressed Accelerator Released	ON OFF	Above 10V Below 1.5V	STG

4EAT Quick Test

QT

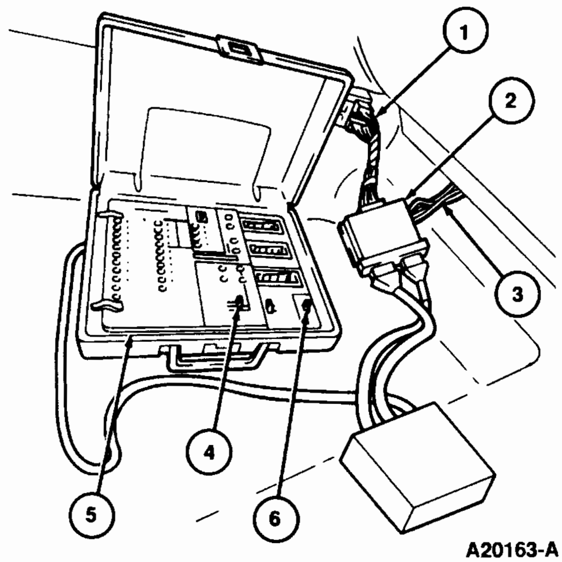


Figure 1.

Item	Description
1	TCM or PCM Harness
2	Adapter
3	To TCM or PCM
4	Throttle Sensor Switch
5	4EAT Tester
6	ON / OFF Switch

Appendix

EEC Quick Test Equipment Hookup

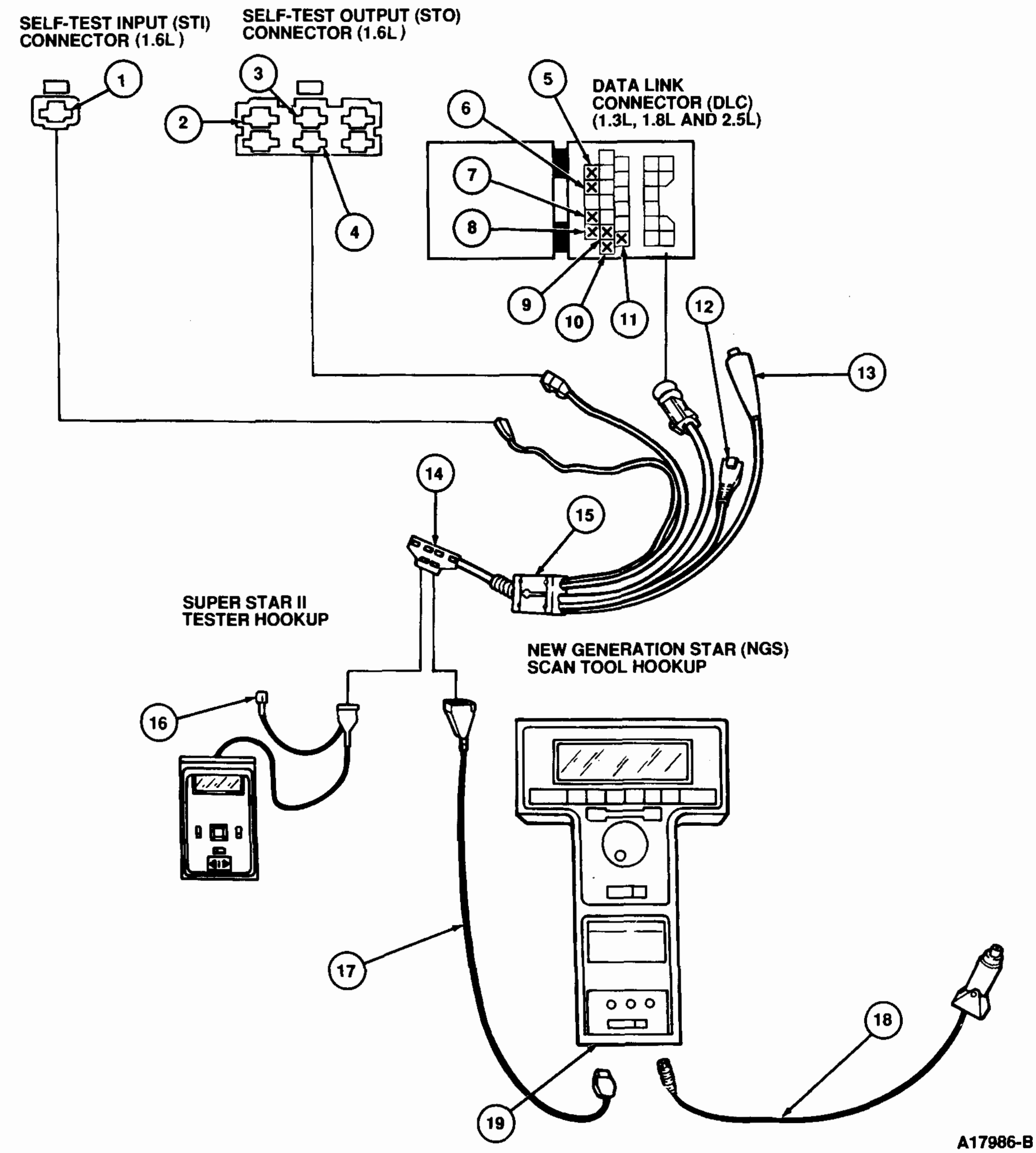


Figure 2.

Item	Description
1	PCM STI
2	PCM STO

(Continued)

Appendix

Item	Description
3	VPWR
4	SML
5	VPWR
6	PCM STI
7	SML
8	PCM STO
9	TCM STO (2.5L)
10	GND
11	TCM STI (2.5L)
12	NOT USED
13	To Negative (-) Battery Terminal (1.6L)
14	Adapter Cable Connector
15	Super MECS Adapter 007-00052
16	NOT USED
17	DLC Adapter
18	Power Cable (To Battery With Adapter)
19	Diagnostic Data Link (DDL) Connector

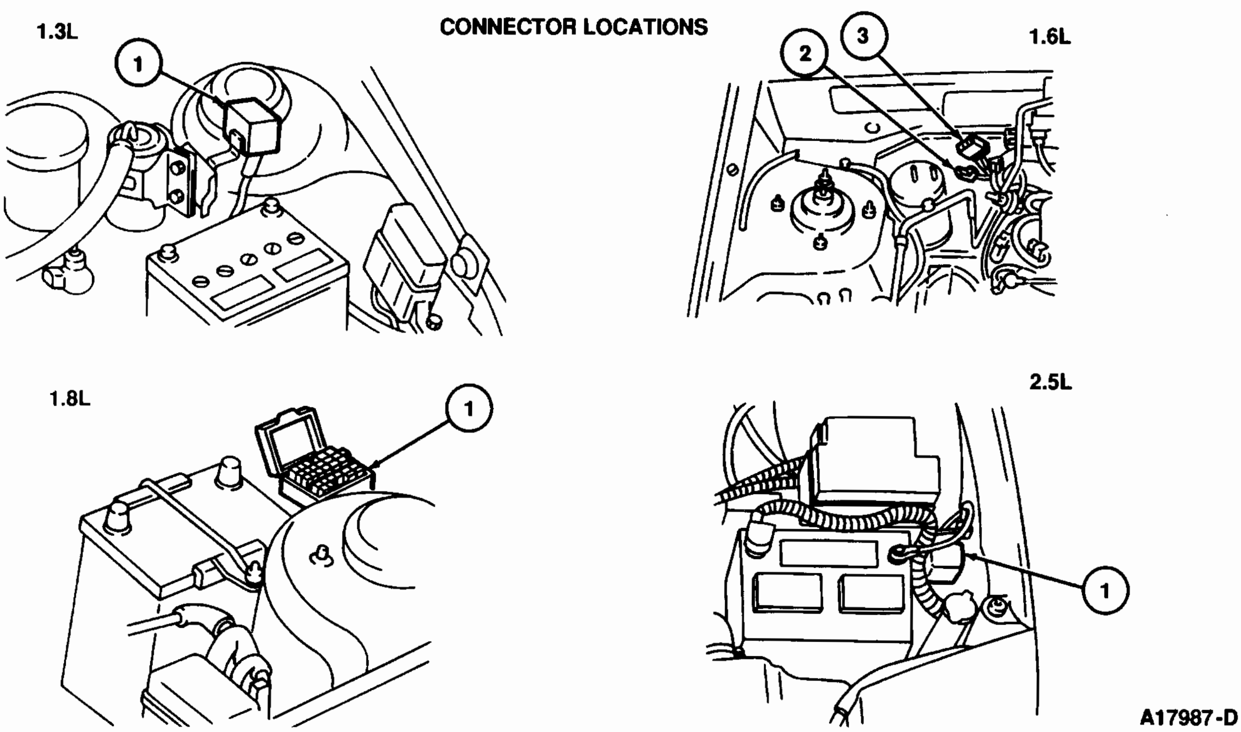


Figure 3.

Item	Description
1	Data Link Connector (DLC)
2	STI Connector
3	STO Connector

Appendix

CONNECTOR INFORMATION CHART

Engine	Connector	Connector Location	Pin	Wire Color
1.3L	DLC	LH Rear Corner of Engine Compartment Near Battery	PCM STO SML PCM STI	W / BK BL / BK BL
1.6L	STO	RH Rear Corner of Engine Compartment	PCM STO SML	GN / BK BK / BL
1.6L	STI	RH Rear Corner of Engine Compartment	PCM STI	Y
1.8L	DLC	LH Rear Corner of Engine Compartment Near Battery	PCM STO SML PCM STI	W / BK W / Y LG / Y
2.5L	DLC	LH Front Corner of Engine Compartment Near Battery	PCM STO SML PCM STI	LG / R W / R R / W

Appendix

4EAT Quick Test Equipment Hookup

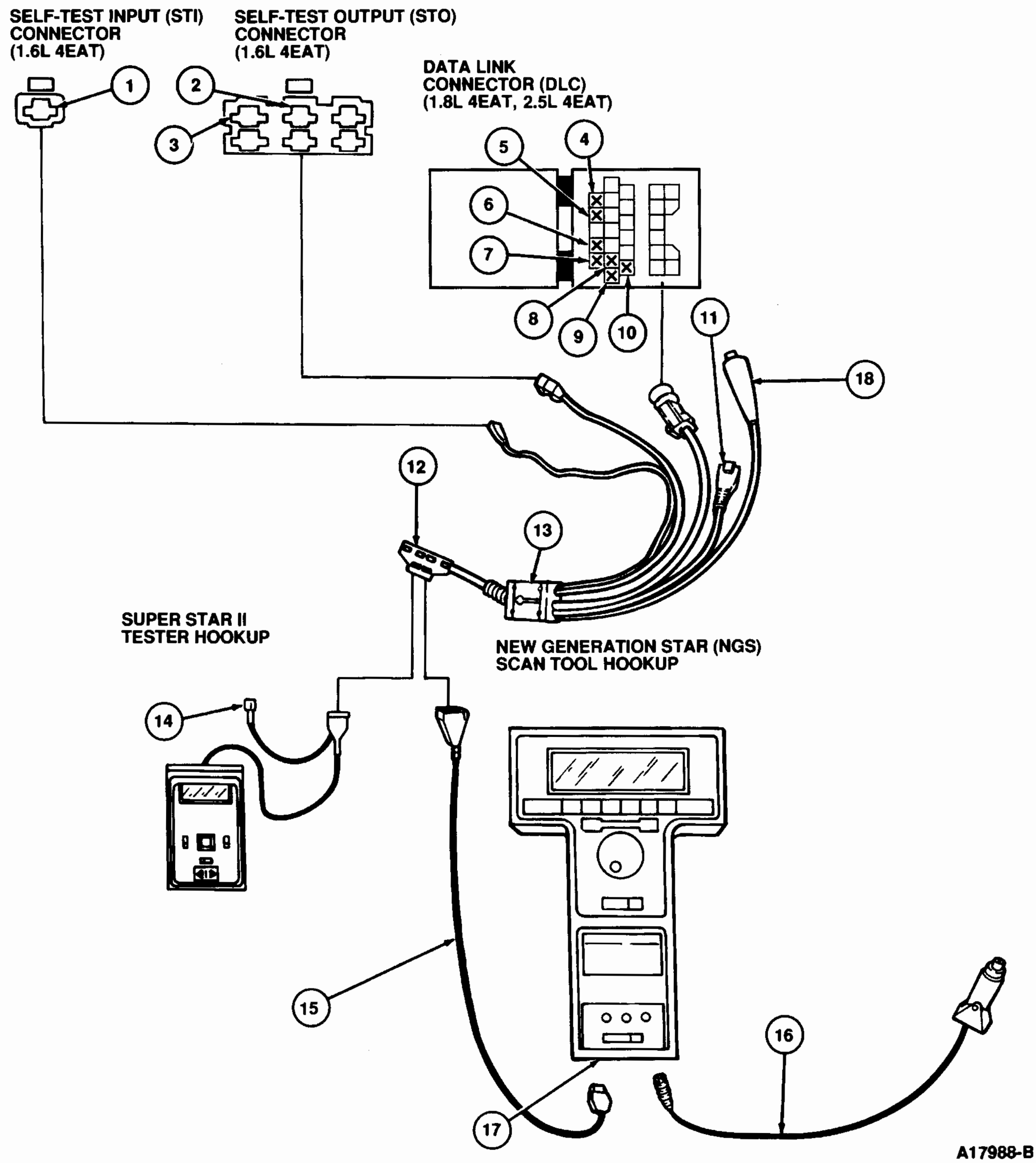


Figure 4.

Appendix

Item	Description
1	TCM STI
2	VPWR
3	TCM STO
4	VPWR
5	PCM STI
6	SML
7	PCM STO
8	TCM STO (2.5L)
9	GND
10	TCM STI (2.5L)
11	NOT USED
12	Adapter Cable Connector
13	Super MECS Adapter 007-00052
14	NOT USED
15	DLC Adapter
16	Power Cable (To Battery With Adapter)
17	Diagnostic Data Link (DDL) Connector
18	To Negative (-) Battery Terminal (1.6L 4EAT)

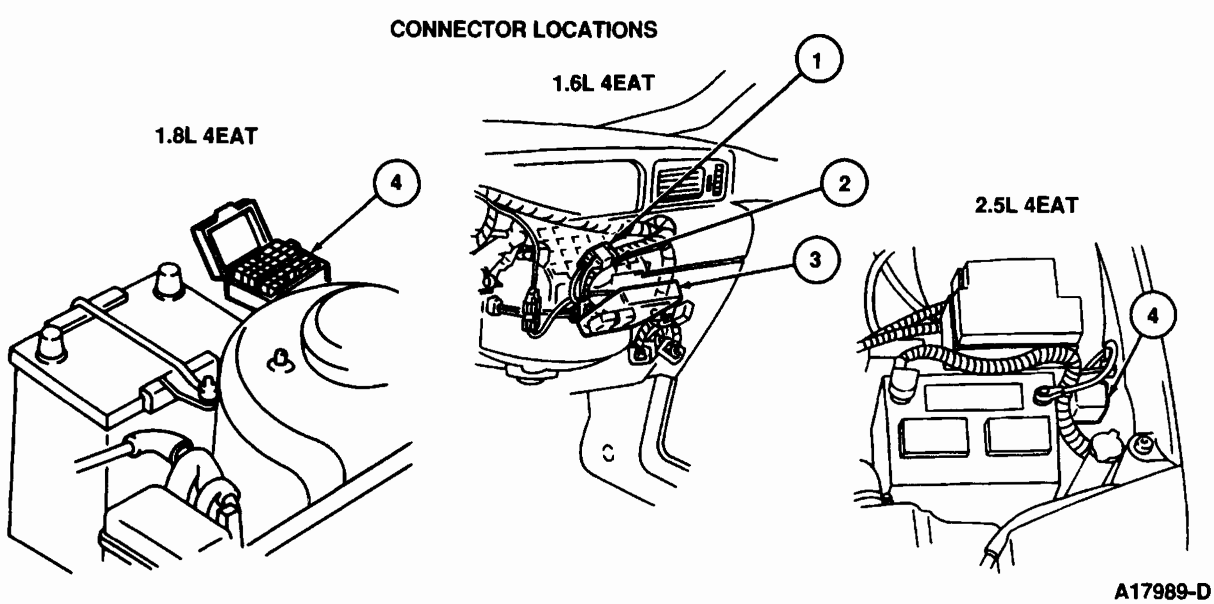


Figure 5.

Item	Description
1	STO Connector
2	STI Connector
3	Transaxle Control Module (TCM)
4	Data Link Connector (DLC)

Appendix

CONNECTOR INFORMATION CHART

Engine	Connector	Connector Location	Pin	Wire Color
1.6L 4EAT	STO	RH Side of Passenger Compartment Behind Glove Compartment	TCM STO	R
1.6L 4EAT	STI	RH Side of Passenger Compartment Behind Glove Compartment	TCM STI	R/BK
1.8L 4EAT	DLC	LH Rear Corner of Engine Compartment Near Battery	PCM STO PCM STI	W/BK LG/Y
2.5L 4EAT	DLC	LH Front Corner of Engine Compartment Near Battery	TCM STO TCM STI	R R/BK

Diagnostic Test Mode Description

The Diagnostic Test Mode for EEC Quick Test is divided into three specialized tests: Key ON Engine Off (KOEO) Test, Key ON Engine Running (KOER) Test, and Switch Monitor Test.

The Diagnostic Test Mode for 4EAT Quick Test is also divided into three specialized tests: Key ON Engine Off (KOEO) Test, Key ON Engine Running (KOER) Test, and Switch Monitor Test.

The Diagnostic Test Mode is not a conclusive test by itself, but is used as a part of the functional Quick Test diagnostic procedures. The Diagnostic Test program is stored in the processor's permanent memory. When activated, it checks the module by testing its memory integrity and processing capability, and verifying that various sensors and actuators are connected and operating properly.

Unlike EEC-IV, no sensors or switches are exercised during Diagnostic Test Mode except in the Switch Monitor Test. Also, intermittent codes are not erased if the fault is removed after 40 vehicle cycles. Therefore, any intermittent code will be stored in permanent memory until erased.

Key ON Engine Off Test

A test of the system is conducted with power applied and engine off.

Key ON Engine Running Test

A test of the system is conducted with the engine running. The sensors are checked under actual operating conditions and at normal operating temperatures.

Switch Monitor Test

A test of the input switches is made with the engine off and cool.

Code Output Format

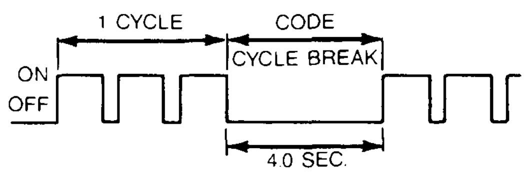
Diagnostic Trouble Codes

The system communicates service information by way of the diagnostic trouble codes. These diagnostic trouble codes are two-digit numbers representing the Diagnostic Test Mode results.

Appendix

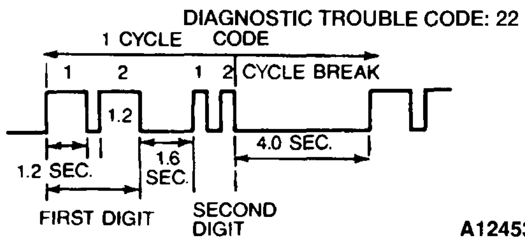
The diagnostic trouble codes are transmitted on the Self-Test Output (STO) line found in the vehicle Self Test Output (STO) connector or Data Link Connector (DLC). They are in the form of timed pulses, and read by the technician on a voltmeter, the Super STAR II Tester, the NGS Scan Tool, the Overdrive Off (O / D OFF) Lamp (1.6L 4EAT and 2.5L 4EAT only), or the Malfunction Indicator Lamp (MIL). On the voltmeter each pulse corresponds to a needle sweep.

1. Code cycle break is a 4.0 second delay between transmission of codes.



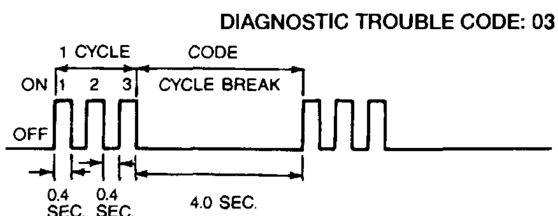
A12452-A

2. The first digit of a diagnostic trouble code (tens position) during one cycle consists of 1.2 second pulses, followed by a 1.6 second delay before the second digit is transmitted.



A12453-B

3. The second digit of a diagnostic trouble code (ones position) during one cycle consists of 0.4 second pulses, followed by a 4.0 second delay before a new code is transmitted.



A12454-B

WARNING

ANYONE WHO DEPARTS FROM THE INSTRUCTIONS PROVIDED IN THIS PUBLICATION MUST FIRST ESTABLISH THAT THEY COMPROMISE NEITHER THEIR PERSONAL SAFETY NOR THE VEHICLE INTEGRITY BY THEIR CHOICE OF METHODS, TOOLS, OR PARTS.

Appendix

Reading EEC and 4EAT Codes With New Generation Star (NGS) Scan Tool

As an option to using the Super STAR II Tester, the Rotunda New Generation Star (NGS) Scan Tool is available for use. The NGS is a user friendly, hand-held scan tool which can be used to perform a variety of diagnostic testing functions, including Diagnostic Test Mode. Similar to the Super STAR II Tester, the NGS has the capability to detect, receive, and display diagnostic trouble codes. Some of the features of the NGS are shown in the following illustrations.

Appendix

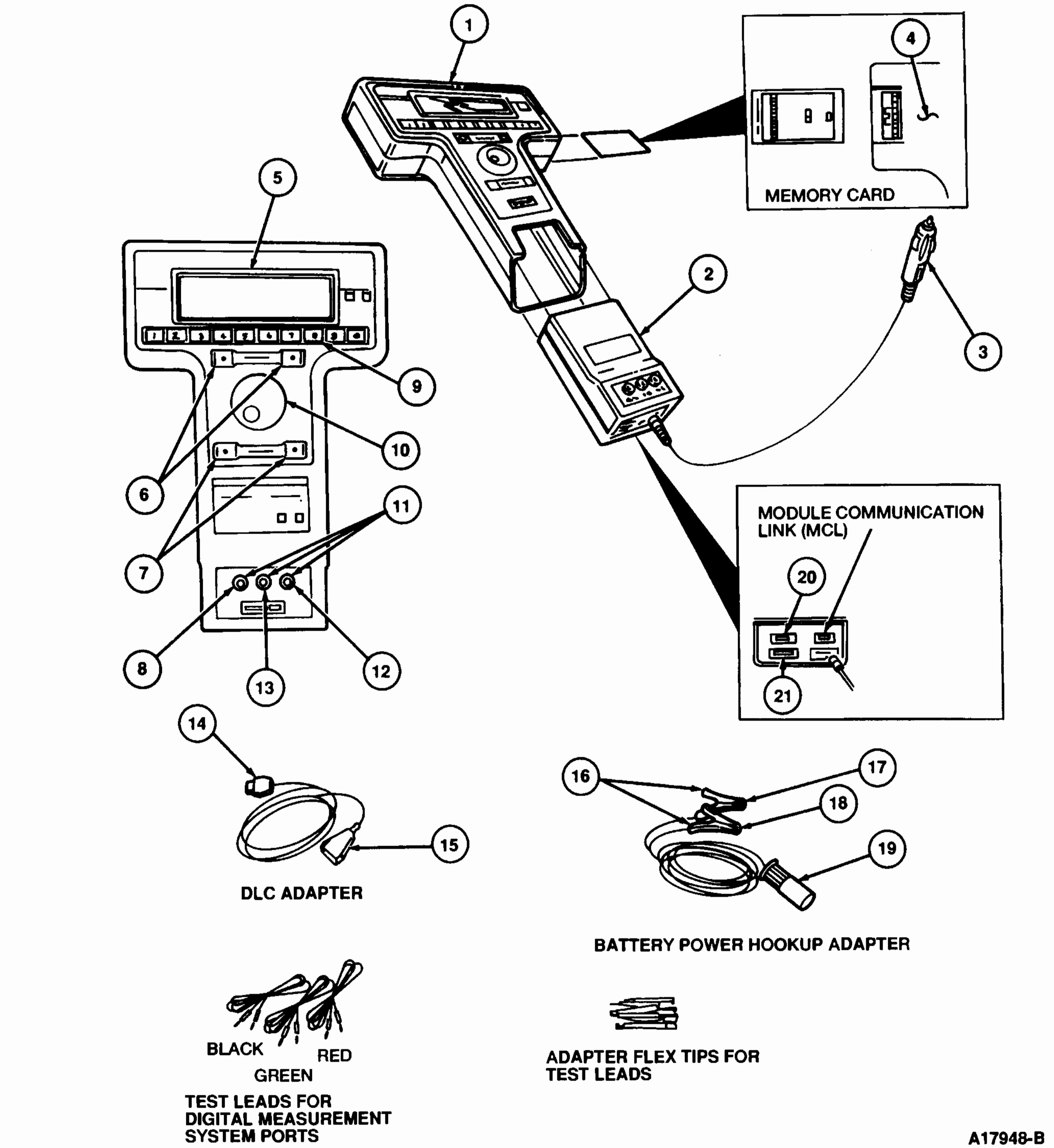


Figure 6.

Appendix

Item	Description
1	Control Unit
2	Vehicle Interface Module (VIM)
3	Power Cable Connector
4	Back of Tester
5	LCD Screen
6	Cancel Keys
7	Trigger Keys
8	Common (-)
9	Number Keys
10	Menu Dial
11	Digital Measurement Ports
12	Auxiliary
13	Signal (+)
14	To NGS Diagnostic Data Link (DDL)
15	To Vehicle Data Link Connector (DLC)
16	To Battery
17	Black Clip (-)
18	Red Clip (+)
19	To NGS Power Cable Connector
20	Printer RS-232 Link
21	Diagnostic Data Link (DDL)

The NGS is user friendly and will display messages to direct you through diagnostic testing functions. The following features are used to perform Diagnostic Test Mode:

1. **Menu Dial.** The menu dial highlights the item you select on the screen display. Turn the menu dial clockwise to move the highlighter down or right and counterclockwise to move the highlighter up or left. An up or down arrow on the right side of the screen display indicates that there are more menu items on that screen display. Turn the menu dial clockwise to move to the next screen display and counterclockwise to move to the previous screen display.

2. **TRIGGER.** The TRIGGER keys are used to select an item on the screen display. At times, it is also used to start, perform, or continue a function.

3. **CANCEL.** The CANCEL keys are used to end a function, as well as back up to a previous function. It also returns you to the main menu.

4. **Number Keys.** The number keys are used to enter numerical values. Numbers three through eight (the dark gray keys) are sometimes also used to control functions that are shown on the screen display.

5. **Main Menu.** The main menu is the first screen display that you encounter. The main menu provides six selections:

   * VEHICLE & ENGINE SELECTION

   * DIAGNOSTIC DATA LINK

   * DIGITAL MEASUREMENT SYSTEM

Appendix

* DIAGNOSTIC TEST MODE
* NEW GENERATION STAR SETUP
* INTERNAL SYSTEM TESTS

Connect the NGS Scan Tool to the vehicle as shown in Quick Test Step QT3. Connect the power cable connector to the battery with the adapter. The NGS Scan Tool will perform an initialization and brief internal system memory check. The NGS has 24 hour memory storage. During initialization a message of M***** indicates that the vehicle selection and recorded data from the last testing session are stored in memory. A message of B***** indicates that memory time has been exceeded and no data is stored from the last testing session. Following initialization, the main menu will be displayed.

1. **Screen Display # 1 (Main Menu).** Key ON. Turn the menu dial to move the highlighter to VEHICLE & ENGINE SELECTION. Press TRIGGER. Screen Display #2 will appear.

Screen Display # 1 (Main Menu)

VEHICLE & ENGINE SELECTION
DIAGNOSTIC DATA LINK
VIEW LINK RECORDER AREA
DIGITAL MEASUREMENT SYSTEM
OBDII FUNCTION
SELECT ITEM AND PRESS TRIGGER TO START

2. **Screen Display #2.** Turn the menu dial to move the highlighter to SELECT NEW VEHICLE YEAR & MODEL. Press TRIGGER. Screen Display #3 will appear.

Screen Display #2

NO VEHICLE SELECTED (1994)
SELECT NEW VEHICLE YEAR & MODEL
DESELECT CURRENT MODEL
SELECT ITEM AND PRESS TRIGGER TO START

3. **Screen Display #3.** Turn the menu dial to move the highlighter to the proper model year. For an example, select 1994 - VIN # 10 : R. Press TRIGGER. Screen Display #4 will appear.

Screen Display #3

1994 - VIN # 10 : R
1993 - VIN # 10 : P
1992 - VIN # 10 : N
1991 - VIN # 10 : M
1990 - VIN # 10 : L
SELECT ITEM AND PRESS TRIGGER TO START

4. **Screen Display #4.** Turn the menu dial to move the highlighter to the proper engine/vehicle. For example, select 94 1.8L ESCORT/TRACER. Press TRIGGER. Screen Display #5 will appear.

Screen Display #4

94 1.3L	ASPIRE
94 1.6L	CAPRI
94 1.6L TURBO	CAPRI
94 1.8L	ESCORT/TRACER
94 1.9L CVH	ESCORT/TRACER
SELECT ITEM AND PRESS TRIGGER TO START	

Appendix

5. **Screen Display #5.** Turn the menu dial to move the highlighter to 94 1.8L ESCORT/TRACER. Press TRIGGER. Screen Display #6 will appear.

Screen Display #5

94 1.8L ESCORT/TRACER
SELECT NEW VEHICLE YEAR & MODEL
DESELECT CURRENT MODEL
SELECT ITEM AND PRESS TRIGGER TO START

6. **Screen Display #6.** Turn the menu dial to move the highlighter to DIAGNOSTIC DATA LINK. Press TRIGGER. Screen Display #7 will appear.

Screen Display #6

VEHICLE AND ENGINE SELECTION
DIAGNOSTIC DATA LINK
VIEW LINK RECORDER AREA
DIGITAL MEASUREMENT SYSTEM
OBDII FUNCTIONS
SELECT ITEM AND PRESS TRIGGER TO START

7. **Screen Display #7.** Turn the menu dial to move the highlighter to PCM - POWERTRAIN CONTROL MODULE. Press TRIGGER. Screen Display #8 will appear.

Screen Display #7

PCM - POWERTRAIN CONTROL MODULE
ABS - ANTI LOCK BRAKE MODULE
TCM - TRANSMISSION CTRL MODULE
SELECT ITEM AND PRESS TRIGGER TO START

8. **Screen Display #8.** Turn the menu dial to move the highlighter to DIAGNOSTIC TEST MODE. Press TRIGGER. Screen Display #9 will appear.

Screen Display #8

DIAGNOSTIC TEST MODE
DIAGNOSTIC TROUBLE CODE LIBRARY
SELECT ITEM AND PRESS TRIGGER TO START

9. **Screen Display #9.** Turn the menu dial to move the highlighter to MECS SELF TEST. Press TRIGGER. Screen Display #10 will appear.

Screen Display #9

MECS SELF TEST
SWITCH MONITOR SELF TEST
SELECT ITEM AND PRESS TRIGGER TO START

Appendix

10. **Screen Display # 10.** Press the START key (number 3), turn the ignition OFF, press the TRIGGER key, then turn the ignition ON or start the engine. This will short STI to ground and start MECS Self Test (Diagnostic trouble code detection / retrieval). As an example, Screen Display # 11 will appear if codes 10 and 12 are present. The Switch Monitor Test may be performed at this time if no diagnostic trouble codes appear on the screen. The LED indicator for the Switch Monitor Test is located on the Super MECS Adapter. Press the STOP key (number 3) to end Diagnostic Test Mode.

Screen Display # 10

TURN IGNITION OFF,
PRESS TRIGGER, THEN
TURN IGNITION ON OR START ENGINE

MECS DIAGNOSTIC TEST MODE

START

11. **Screen Display # 11.** Diagnostic trouble codes (if any) will appear on the screen display. After all codes are received, they will start repeating. Press the STOP key (number 3). This will remove the STI short from ground and stop Diagnostic Test Mode. Screen Display # 12 will appear.

Screen Display # 11

10 12 10 12

MECS DIAGNOSTIC TEST MODE

STOP

12. **Screen Display # 12.** The first diagnostic trouble code received will be highlighted. The definition of this highlighted code will appear on the lower box of the display screen. Turn the menu dial to see the definitions of the other displayed diagnostic trouble codes.

Screen Display # 12

10 12 10 12

IAT > OR < EXPECTED

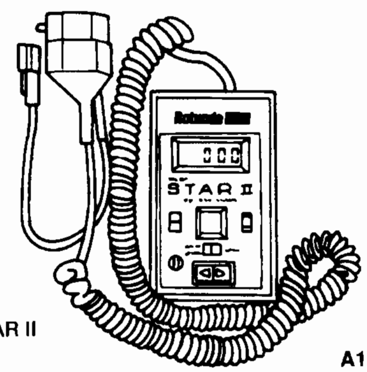
START PRINT

13. Press CANCEL to terminate MECS Self Test and to return to the diagnostic test mode selection menu (Screen Display # 7). Press CANCEL again to return to the main menu (Screen Display # 1).

Appendix

Reading EEC and 4EAT Codes With Super STAR II Tester

After hooking up the Super STAR II Tester and turning on the power switch, the tester will run a display check and the numerals "888" will begin to flash in the display window. A steady "000" will then appear when the center button is unlatched, to signify that the Super STAR II Tester is ready to start the Diagnostic Test Mode and receive the diagnostic trouble codes.



SUPER STAR II
007-0041B

A12793-B

NOTE: During Diagnostic Test Mode, a PASS code is not transmitted. A blank screen will appear continuously.

To receive input and / or output diagnostic trouble codes, latch the center button in the TEST position at the front of the Super STAR II Tester, turn the ignition ON, turn the Super STAR II Tester ON, and unlatch, and then relatch the center button.

To clear the display window during the Diagnostic Test Mode, turn the ignition OFF, and unlatch and relatch the tester's push button. Every time the Super STAR II Tester is turned OFF, the low battery indicator (LO BAT) should show briefly at the upper left corner of the tester's display window. If the LO BAT indicator shows continuously at any other time during the operation of the Super STAR II Tester with any Diagnostic Trouble code, turn its power switch to OFF and replace the 9 volt battery in the tester.

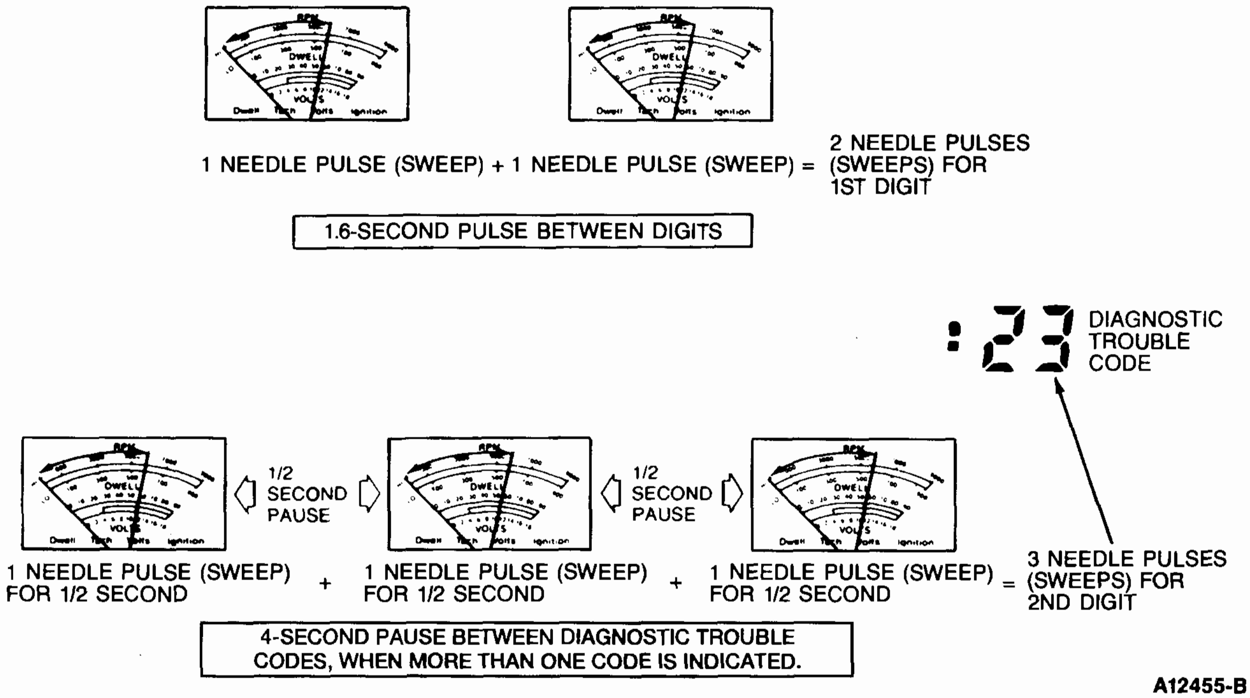
The Super STAR II Tester will display the last diagnostic trouble code received, even after disconnecting it from the vehicle. It will hold the diagnostic trouble code on the display until the power is turned OFF or the push button is unlatched and relatched.

Reading EEC and 4EAT Codes With Analog Voltmeter

When a diagnostic trouble code is reported on the analog voltmeter for a function test, it will represent itself as a pulsing or sweeping movement of the voltmeter's needle across the dial face. Therefore, a single-digit number of three will be reported by three needle pulses (sweeps). However, as previously stated, a diagnostic trouble code is sometimes represented by a two-digit number, such as 23. As a result, the diagnostic trouble code of 23 will appear on the voltmeter as two needle pulses (sweeps) then, after a 1.6-second pause, the needle will pulse (sweep) three times.

Appendix

The continuous memory codes are not separated from the Key ON Engine Off codes. They are produced on the voltmeter in the same manner as the Key ON Engine Off codes.



Reading EEC Codes With Malfunction Indicator Lamp (MIL)

The Malfunction Indicator Lamp is intended to alert the driver to certain malfunctions in the engine control system.

If an engine control system fault occurs, the system processor will substitute a value or values and continue operating. This process is called Limited Operating Strategy (LOS). In some cases this action may result in a slight change in driveability.

System OK

The Malfunction Indicator Lamp will remain on while the key is in the ON position, and go off once the vehicle has started.

System Not OK

If the Malfunction Indicator Lamp remains on after the vehicle has started, perform Key ON Engine Off Test to completion. If the lamp remains on, go to EEC Pinpoint Test PGC. If the Malfunction Indicator Lamp never comes on, go to EEC Pinpoint Test MIL in Section 6B, EEC Pinpoint Tests. If the lamp comes on for a short period then goes off, and a diagnostic trouble code is present, the fault is intermittent.

NOTE: When the PCM is in Diagnostic Test Mode, the Malfunction Indicator Lamp will also flash diagnostic trouble codes.

Appendix

Reading 4EAT Codes With Overdrive Off Lamp (ODL) — 1.6L 4EAT and 2.5L 4EAT Only

The Overdrive Off (O / D OFF) Lamp is intended to alert the driver of certain malfunctions in the 4EAT system.

If such a fault occurs, the system processor will substitute a value or values and continue operating. This process is called Limited Operating Strategy (LOS). In some cases this action may result in a slight change in driveability.

System OK

The O / D OFF Lamp is activated by the switch on the shift lever. If switched on, it should remain ON whether or not the engine is running.

System Not OK

If the O / D OFF Lamp should begin to flash while the vehicle is being driven, perform Key ON Engine Off Test to completion. If the lamp continues to remain on, go to 4EAT Pinpoint Test PGC. If the O / D OFF Lamp never comes on, go to 4EAT Pinpoint Test ODL in Section 6B, EEC Pinpoint Tests.

NOTE: When the TCM is in Diagnostic Test Mode, the O / D OFF Lamp will also flash diagnostic trouble codes.

Reading 4EAT Codes With Malfunction Indicator Lamp (MIL) — 1.8L 4EAT

To retrieve 4EAT codes, the 1.8L 4EAT uses the Malfunction Indicator Lamp (MIL).

If a fault occurs, the PCM processor will substitute a value or values and continue operating. This process is called Limited Operating Strategy (LOS). In some cases this action may result in a slight change in driveability.

System OK

The MIL will remain off as long as the system is OK.

System Not OK

If the MIL illuminates while the vehicle is being driven, perform Key ON Engine Off Test to completion.

Erasing Diagnostic Trouble Codes

1. Disconnect the negative battery cable and depress the brake pedal for 5-10 seconds.
2. Reconnect the negative battery cable.
3. Rerun Quick Test to verify diagnostic trouble code(s) have been erased.

Specifications / Special Service Tools

Special Service Tools / Equipment

SPECIAL SERVICE TOOLS

Tool Number	Description
D81P-6666-A	Air Gap Spark Tester

ROTUNDA EQUIPMENT

Model	Description
007-00500	NGS Scan Tool
007-0041B	Super STAR II Tester
007-00052	Super MECS Adapter
059-00010	Analog Volt-Ohmmeter
007-00036	1.6L Super STAR II Tester
007-00049	1.3L, 1.8L and 2.5L Super STAR II Tester Adapter
007-0037B	4EAT Tester
105-00053	88 Digital Multimeter
007-00095A	1.6L 4EAT Adapter
007-00100B	1.8L 4EAT Adapter
007-00100A	2.5L 4EAT Adapter
3122-694	1.6L 4EAT Overlay
3122-731	1.8L 4EAT Overlay
3122-696	2.5L 4EAT Overlay

SECTION 6B

EEC Pinpoint Tests (Includes 4EAT Pinpoint Tests)

Contents

SECTION 6B

EEC Pinpoint Tests (Includes 4EAT Pinpoint Tests)

Contents (continued)

SECTION 6B

EEC Pinpoint Tests (Includes 4EAT Pinpoint Tests)

Contents (continued)

EEC Pinpoint Tests (Includes 4EAT Pinpoint Tests)

Contents (continued)

SECTION 6B

EEC Pinpoint Tests (Includes 4EAT Pinpoint Tests)

Contents (continued)

EEC PINPOINT TESTS

EEC Pinpoint Tests

NOTE: This section does not contain Pinpoint Test procedures for 1.9L and 2.0L vehicles which are controlled by an EEC-IV processor. Refer to Section 6A, EEC-IV Pinpoint Tests.

Instructions

- **DO NO**T perform any of the following Pinpoint Tests unless instructed by the Quick Test.
- Each Pinpoint Test **assumes** that you are diagnosing causes for a specific symptom described in the Diagnostic Routines and that every cause with a higher probability, (as outlined in Section 2B), has been checked and verified to be operating properly.
- **Diagnostic trouble codes** retrieved in Quick Test Steps 7 or 8 imply that a hard fault is present and the associated Pinpoint Test should be performed to isolate the cause. If more than one diagnostic trouble code is received, always start service with the first code received.
- **Probable** systems listed in the Diagnostic Routines should be diagnosed only when the Quick Test steps have resulted in a pass code. With the knowledge of the symptom, a close observation can be made of each specified component, by performing the associated Pinpoint Test.
- Performing a complete **visual inspection** will often lead to the source of a problem without performing any test step. For example, when directed to a Pinpoint Test, look carefully at the electrical schematic and special notes. Check each component and the related wiring to the control module for any evidence of damage. Loose connections, corrosion, overheating, and physical damage are often the cause of failure.
- **Do not** replace any parts unless the test result indicates they should be replaced.
- **Do not** measure voltage or resistance at the control module or connect any test lights to it, unless otherwise specified.
- **Do** disconnect solenoids and switches from the harness before measuring for continuity or resistance, or before energizing with a power source.
- **Do** start with the first Pinpoint Test Step and follow the appropriate result in order, until the cause of a fault is found.
- **Do** erase codes and perform Quick Test after recommended action has been taken to ensure any repairs made are effective.

EEC Pinpoint Tests

The standard Ford color abbreviations are:

Abbreviation	Color
BK	Black
BL	Blue
BR	Brown
DB	Dark Blue
DG	Dark Green
GY	Gray
GN	Green
LB	Light Blue
LG	Light Green
O	Orange
PK	Pink
P	Purple
R	Red
T	Tan
W	White
Y	Yellow

Where two colors are shown for a wire, the first color is the basic color of the wire. The second color is the stripe marking.

For example:

BR/O is a brown wire with an orange stripe.

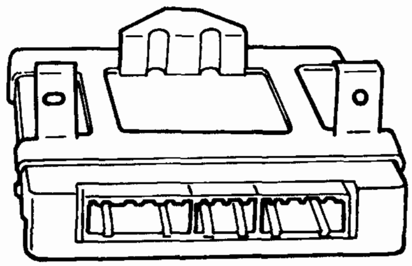
EEC Pinpoint Tests

Description

The Powertrain Control Module (PCM) is the microprocessor of the vehicle. The PCM receives and transmits data to and from relays, sensors, actuators, switches, and other electronic components. From the information gained, the PCM controls fuel economy, driveability, and optimizes emissions. The PCM performs self-diagnosis and detects failures within the electronic engine control system.

NOTE: On the 1.8L 4EAT, the PCM is integrated with the Transaxle Control Module (TCM).

1.3L, 1.6L, 1.8L, 2.5L



A16800-C

Engine	Location
1.3L	Mounted under instrument panel on driver's side.
1.6L, 1.8L, 2.5L	Mounted forward of the center console between the kick panels.

EEC Pinpoint Tests

Breakout Box Connection

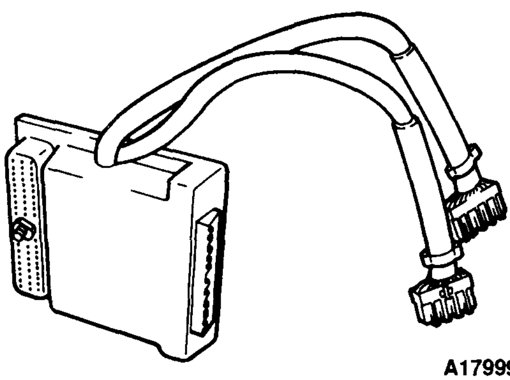
The Breakout Box is connected to the Powertrain Control Module (PCM) harness to pinpoint faults in the Electronic Engine Control (EEC) system. To connect the Breakout Box, disconnect the PCM connectors and attach the Breakout Box, with appropriate adapter, to the harness connectors and to the PCM if the test procedures indicate.

- Use the following Breakout Box Adapters.

Engine	Number	Description	Connector
All	014-00322	Breakout Box	-
1.6L	007-00038	Breakout Box Adapter	-
1.3L 1.8L MTX	007-00057	Breakout Box Adapter	-
1.8L 4EAT	T92C-6000-AH	Breakout Box Adapter	# 2 Adapter Cable
2.5L	T92C-6000-AH	Breakout Box Adapter	# 2 Adapter Cable

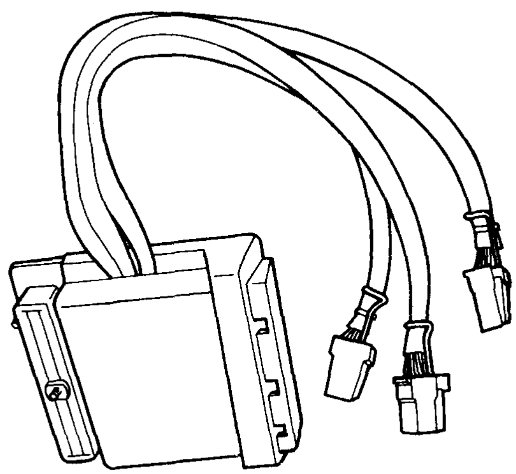
NOTE: 2.0L CD4E and 2.0L MTX Pinpoint Tests are in the "A" portion of this manual.

1.3L and 1.8L MTX Breakout Box Adapter 007-00057



A17999-A

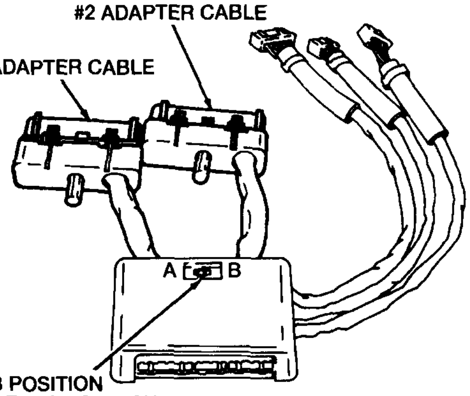
1.6L Breakout Box Adapter 007-00038



A18000-A

EEC Pinpoint Tests

1.8L 4EAT and 2.5L Breakout Box Adapter T92C-6000-AH



A18150-B

NOTE: The Breakout Box Adapter T92C-6000-AH has an A / B position selector switch. Make sure that the switch is in the correct position for each test step, as specified in the Circuit Data Sheets for EEC Pinpoint Tests Relay Output Check (ROC), Solenoid Controlled by Ground (SCG), and 4EAT Pinpoint Test Solenoid Controlled by Power (SCP). If no switch position is given then the switch can be in either position.

Engine	Adapter Cable
1.8L 4EAT	#2 Adapter Cable
2.5L	#2 Adapter Cable

EEC Pinpoint Tests	All Engines	BARO

Barometric Pressure (BARO) Sensor

Note

You should enter this Pinpoint Test only when diagnostic trouble code 14 is received in Quick Test Steps 7 or 8, or when Quick Test 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: BARO

Special Note

1.3L, 1.8L, 2.5L

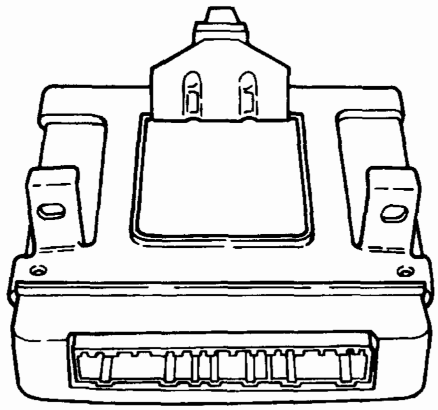
The BARO sensor is located within the PCM and cannot be replaced as a separate item. If a diagnostic trouble code 14 exists and cannot be erased, the PCM must be replaced.

Description

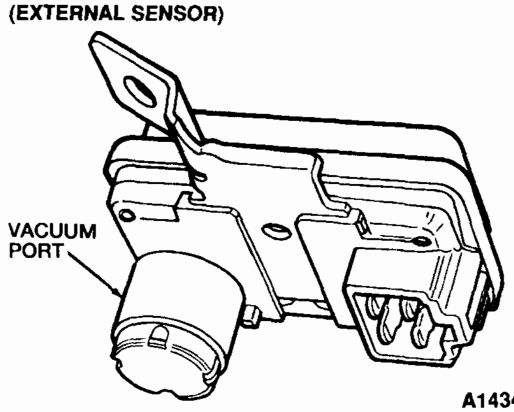
The Barometric Pressure (BARO) sensor detects changes in atmospheric pressure. This information is transferred to the Powertrain Control Module (PCM) by an input signal. The PCM will adjust air / fuel ratio, A / C cutoff, idle speed, and purge control to compensate for the changing pressure.

EEC Pinpoint Tests	All Engines	BARO

1.3L, 1.8L, 2.5L (Sensor Integrated Into PCM)



A16841-E

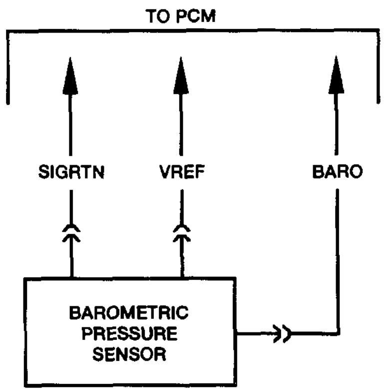


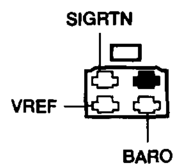
A14345-D

Engine	Location
1.3L	Integrated in PCM.
1.6L	Passenger side cowl.
1.8L	Integrated in PCM.
2.5L	Integrated in PCM.

EEC Pinpoint Tests	1.6L	BARO

Pinpoint Test Schematic





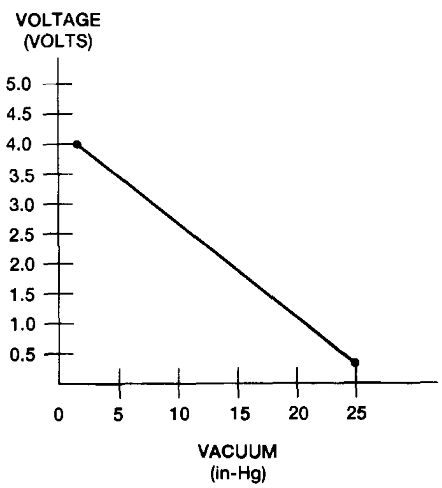
1.6L

BARO SENSOR
HARNESS CONNECTOR

A16743-E

Data Sheet

1.6L



Voltage (Volts)		Vacuum in-Hg	Vacuum kPa
3.84	±0.58	0	0
3.36	±0.50	5	16.7
2.66	±0.40	10	33.7
1.93	±0.29	15	50.7
1.26	±0.19	20	67.7
0.58	±0.09	25	84.7

A14348-B

EEC Pinpoint Tests	1.6L	BARO

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.6L	BARO VREF SIGRTN	2H 2A 2C	45 26 46	BL/O W/BK BL/Y

TEST STEP		RESULT ▶	ACTION TO TAKE
BARO1	CHECK BARO INPUT VOLTAGE TO PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Remove dust cover from Barometric Pressure (BARO) sensor and connect Rotunda Vacuum Tester 021-00014 or equivalent. • Key ON. • Measure the voltage between Test Pins BARO and SIGRTN with vacuum applied as indicated on Data Sheet. • Compare the voltage readings to Data Sheet. • **Are the voltage readings OK?**	Yes ▶ No ▶	BARO circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. GO to BARO2.
BARO2	CHECK VREF AND SIGRTN AT BARO SENSOR		
	• Key OFF. • Disconnect the BARO sensor connector. • Key ON. • Measure the voltage between terminals VREF and SIGRTN at the BARO sensor harness connector. • **Is the voltage between 4.5 and 5.5 volts?**	Yes ▶ No ▶	GO to BARO3. GO to EEC Pinpoint Test VREF in this section.
BARO3	CHECK BARO WIRE TO PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the BARO sensor connector. • Measure the resistance of the BARO wire between BOB Test Pin BARO and the BARO terminal at the BARO sensor harness connector. • Measure the resistance of the BARO wire between BOB Test Pin BARO and ground. • **Is the resistance less than 5 ohms between BOB Test Pin BARO and the BARO terminal at the harness connector, and greater than 10,000 ohms between Test Pin BARO and ground?**	Yes ▶ No ▶	REPLACE the barometric (BARO) pressure sensor. SERVICE the BARO wire.

EEC Pinpoint Tests	1.6L	CID

Cylinder Identification (CID) Sensor — 1.6L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 03 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

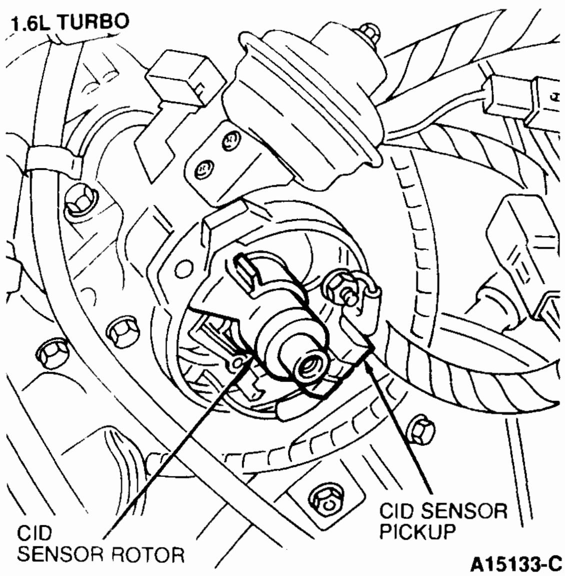
- Circuit: CID

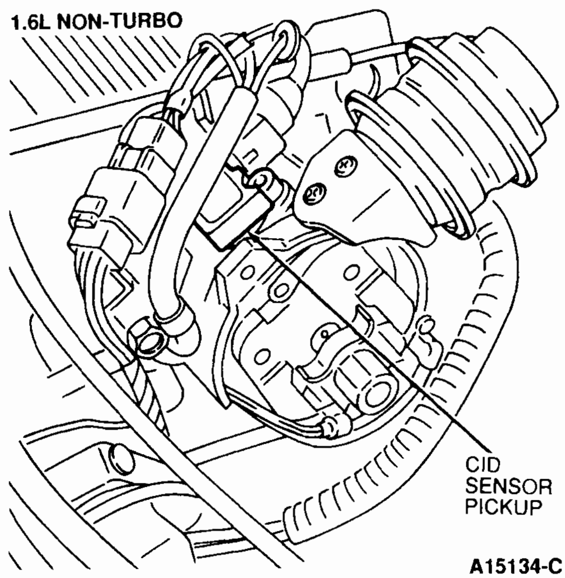
EEC Pinpoint Tests	1.6L	CID

Description

The Cylinder Identification (CID) sensor detects the Number 1 cylinder when it reaches Top Dead Center (TDC) and signals the Powertrain Control Module (PCM) to control fuel injection.

A fixed magnetic sensor is attached to the distributor housing. A rotor is mounted onto the distributor shaft inside the distributor housing. As the rotor rotates, the magnetic sensor detects its position and sends a signal to the PCM.

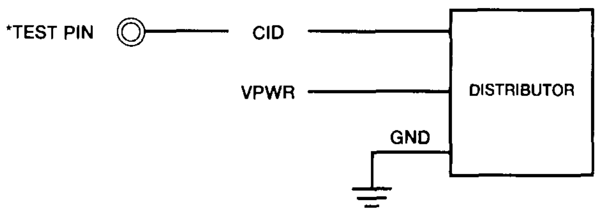


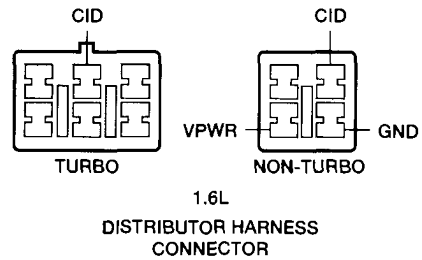


Engine	Location
1.6L	Integrated in the distributor.

EEC Pinpoint Tests	1.6L	CID

Pinpoint Test Schematic





*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A14110-D

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.6L	CID VPWR	1N 3I	34 37	Y Y/BL

TEST STEP		RESULT ▶	ACTION TO TAKE
CID1	CHECK VPWR TO DISTRIBUTOR		
	● Key OFF. ● Disconnect the distributor connector. ● Key ON. ● Measure the voltage between the distributor VPWR wire (harness side) and ground. ● **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **CID2**. GO to EEC Pinpoint Test **VPWR** in this section.
CID2	CHECK GROUND AT DISTRIBUTOR		
	● Key OFF. ● Disconnect the distributor connector. ● Measure the resistance between the distributor GND wire and ground. ● **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **CID3**. SERVICE the distributor GND wire.

EEC Pinpoint Tests	1.6L	CID

TEST STEP	RESULT ▶	ACTION TO TAKE
CID3 CHECK DISTRIBUTOR TO PCM LEADS		
● Key OFF. ● Install Breakout Box to harness connectors (leave PCM disconnected). ● Disconnect the distributor connector. — 1.6L Turbo 6-pin connector — 1.6L Non-Turbo 4-pin connector ● Measure the resistance between BOB Test Pin CID and the CID pin on the distributor harness connector. ● Measure the resistance between BOB Test Pin CID and ground. ● **Is the resistance less than 5 ohms between BOB Test Pin CID and the distributor connector, and greater than 10,000 ohms between Test Pin CID and ground?**	Yes ▶ No ▶	REPLACE the CID sensor. SERVICE the CID wire.

EEC Pinpoint Tests	1.3L 1.8L 2.5L	CID

Cylinder Identification (CID) Sensor — 1.3L, 1.8L, 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 03 is received in Quick Test Steps 7 or 8, or when Quick Test 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: CID

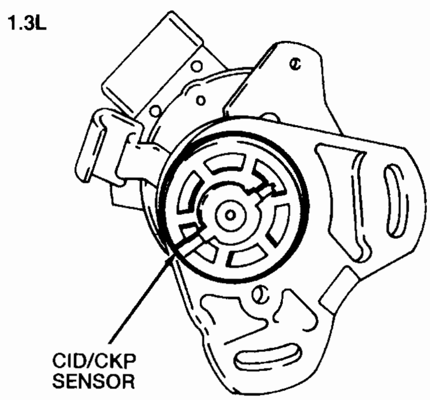
Description

The Cylinder Identification (CID) sensor detects the Number 1 cylinder when it reaches Top Dead Center (TDC) and signals the Powertrain Control Module (PCM) to control fuel injection.

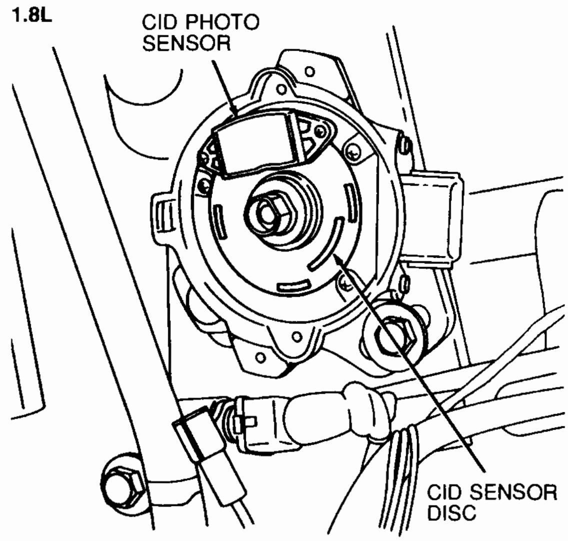
On 1.3L and 2.5L engines, a single vane rotor cap is mounted to the distributor shaft, below the crankshaft position rotor cap, where it spins according to the camshaft speed. As it rotates through a magnetic Hall effect pickup switch, the sensor detects the opening on the rotor cap and sends an input signal to the PCM.

On 1.8L engines, a slotted disc is mounted to the distributor shaft. As the distributor shaft spins, the slotted disc passes a single opening through a phototransistor. The phototransistor transmits an input signal to the PCM.

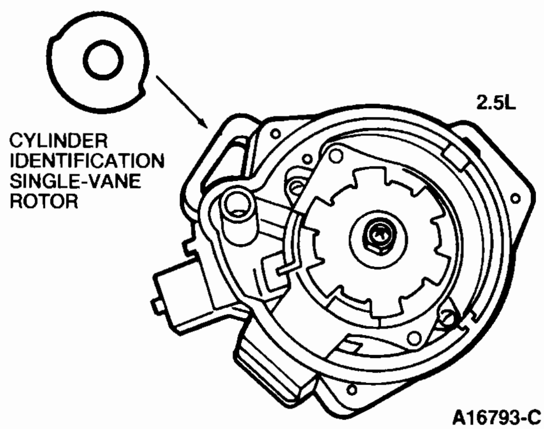
EEC Pinpoint Tests	1.3L 1.8L 2.5L	CID



A20523-B



A13834-B

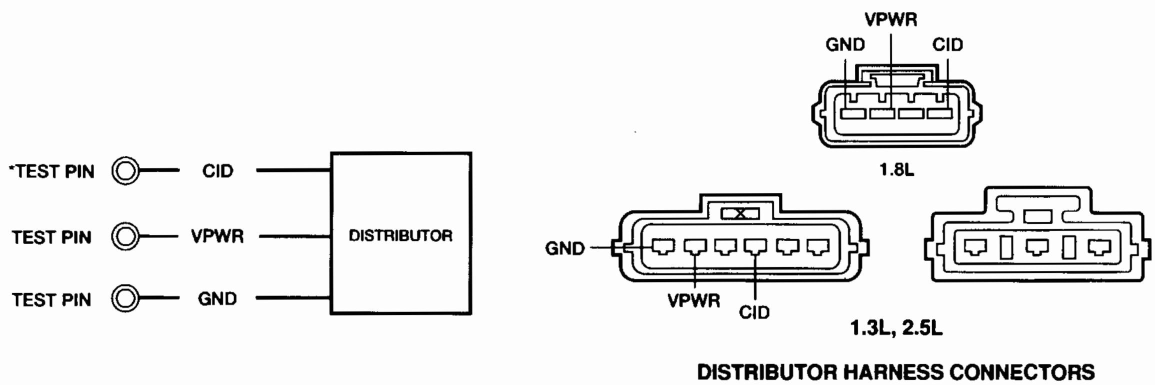


A16793-C

Engine	Location
1.3L, 1.8L, 2.5L	Integrated in the distributor.

EEC Pinpoint Tests	1.3L 1.8L 2.5L	CID

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16537-D

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	CID	2G	24	GN/R
	VPWR	1B	37, 57	Y/W
	GND	2C	16	BK/LG
1.8L MTX	CID	2G	24	Y/BL
	VPWR	1B	37, 57	W/R
	GND	2C	16	BK/LG
1.8L 4EAT	CID	2J	27	Y/BL
	VPWR	1B	37, 57	W/R
	GND	3C	49	BK/LG
2.5L	CID	3G	6	BL/PK
	VPWR	1B	37, 57	R/BK
	GND	3C	49	BK/R

EEC Pinpoint Tests	1.3L 1.8L 2.5L	CID

TEST STEP		RESULT	ACTION TO TAKE
CID1	CHECK CID SIGNAL		
	• Key OFF. • Install Breakout Box (connect PCM). • Measure the voltage at Test Pin CID while bumping the starter. • **Does the voltage alternate between approximately 0 volts and 5 volts?**	Yes ▶	CID circuit OK. If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
		No ▶	GO to CID2.
CID2	CHECK VPWR TO DISTRIBUTOR		
	• Key OFF. • Disconnect the distributor connectors. — 1.8L 4-pin connector — 1.3L and 2.5L 6-pin connector • Key ON. • Measure the voltage at the VPWR wire on the distributor harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to CID3. GO to EEC Pinpoint Test VPWR in this section. If VPWR is OK, SERVICE VPWR wire to distributor.
CID3	CHECK GROUND AT DISTRIBUTOR		
	• Key OFF. • Disconnect the distributor connectors. — 1.8L 4-pin connector — 1.3L and 2.5L 6-pin connector • Measure the resistance of the GND wire between the distributor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CID4. SERVICE the distributor GND wire.
CID4	CHECK CID WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the distributor connectors. — 1.8L 4-pin connector — 1.3L and 2.5L 6-pin connector • Measure the resistance of the CID wire between BOB Test Pin CID and the CID wire at the distributor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CID5. SERVICE the CID wire for open.

EEC Pinpoint Tests

1.3L
1.8L
2.5L

CID

TEST STEP		RESULT ▶	ACTION TO TAKE
CID5	CHECK CID WIRE FOR SHORT TO GROUND		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the distributor connectors. — 1.8L 4-pin connector — 1.3L and 2.5L 6-pin connector • Measure the resistance of the CID wire between BOB Test Pin CID and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to $\boxed{\text{CID6}}$. SERVICE the CID wire for short to ground.
CID6	CHECK FOR SHORTS IN HARNESS		
	• Key OFF. • Disconnect the distributor connectors. — 1.8L 4-pin connector — 1.3L and 2.5L 6-pin connector • PCM disconnected. • Measure the resistance between the CID wire and all the other wire terminals on the distributor connector. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the distributor. SERVICE the wire(s) in question.

EEC Pinpoint Tests	1.3L	CKP

Crankshaft Position (CKP) Sensor — 1.3L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 04 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 or Pinpoint Test ICM in this section directs you here.

Remember

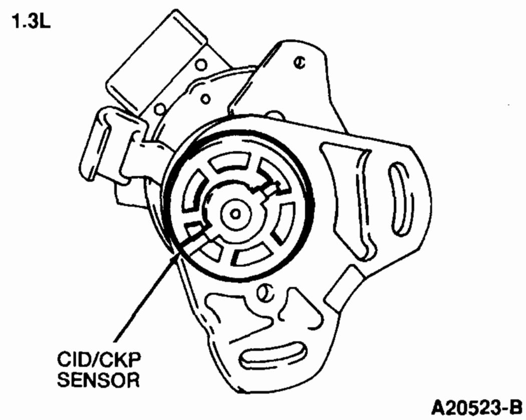
This Pinpoint Test is intended to diagnose only the following:

- Circuit: CKP

EEC Pinpoint Tests	1.3L	CKP

Description

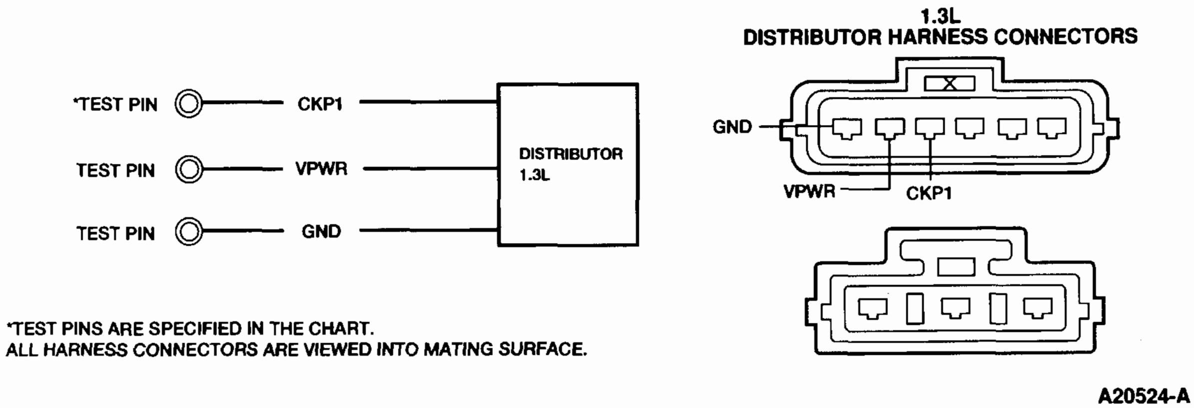
The Crankshaft Position Sensor (CKP) is mounted inside the distributor housing. A six-vane rotor is mounted to the distributor shaft and spins at the speed of the camshaft. As the rotor passes through a magnetic Hall effect pickup switch, the six vanes are detected and sent to the Powertrain Control Module (PCM) in a pulse wave form. The crankshaft position can be determined at 60 degree intervals for fuel injection timing, ignition timing, and emission control.



Engine	Location
1.3L	Integrated in the distributor.

EEC Pinpoint Tests	1.3L	CKP

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	CKP VPWR GND	2E 1B 2C	56 37, 57 16	GN/BK Y/W BK/LG

EEC Pinpoint Tests	1.3L	CKP

TEST STEP		RESULT ▶	ACTION TO TAKE
CKP1	CHECK CKP SIGNAL		
	● Key OFF. ● Install Breakout Box (connect PCM). ● Measure the voltage at BOB Test Pin CKP while bumping the starter. ● **Does the voltage alternate between approximately 0 volts and 5 volts?**	Yes ▶	CKP circuit OK. If sent to this test by Quick Test Step **QT11** in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
		No ▶	GO to **CKP2**.
CKP2	CHECK VPWR TO DISTRIBUTOR		
	● Key OFF. ● Disconnect the 6-pin distributor connector. ● Key ON. ● Measure the voltage at the VPWR wire on the 6-pin distributor harness connector. ● **Is the voltage greater than 10 volts?**	Yes ▶	GO to **CKP3**.
		No ▶	GO to EEC Pinpoint Test **VPWR** in this section. If VPWR is OK, SERVICE the VPWR wire to distributor.
CKP3	CHECK GROUND AT DISTRIBUTOR		
	● Key OFF. ● Disconnect the 6-pin distributor connector. ● Measure the resistance of the GND wire between the 6-pin distributor harness connector and ground. ● **Is the resistance less than 5 ohms?**	Yes ▶	GO to **CKP4**.
		No ▶	SERVICE the distributor GND wire.
CKP4	CHECK CKP WIRE FOR OPEN		
	● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Disconnect the 6-pin distributor connector. ● Measure the resistance of the CKP wire between BOB Test Pin CKP and the CKP wire at the 6-pin distributor harness connector. ● **Is the resistance less than 5 ohms?**	Yes ▶	GO to **CKP5**.
		No ▶	SERVICE the CKP wire for open.
CKP5	CHECK CKP WIRE FOR SHORT		
	● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Disconnect the 6-pin distributor connector. ● Measure the resistance of the CKP wire between BOB Test Pin CKP and ground. ● Measure the resistance between the CKP wire and all the other wire terminals on the 6-pin distributor connector. ● **Are the resistances greater than 10,000 ohms?**	Yes ▶	REPLACE the distributor.
		No ▶	SERVICE the CKP wire for short.

EEC Pinpoint Tests	1.8L	CKP

Crankshaft Position (CKP) Sensor — 1.8L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 02 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

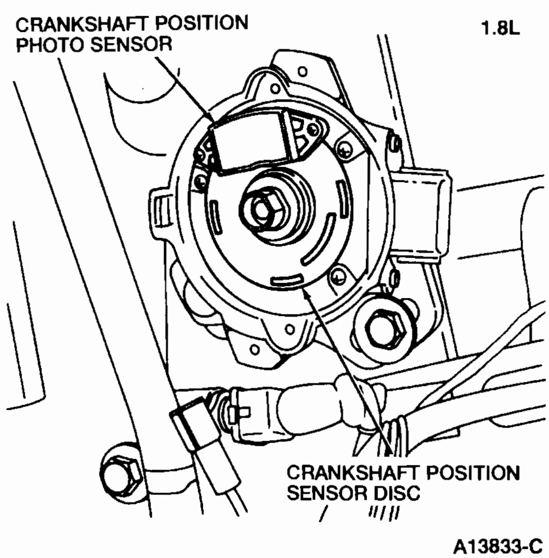
This Pinpoint Test is intended to diagnose only the following:

- Circuit: CKP

Description

The Crankshaft Position (CKP) sensor provides crankshaft position input to the Powertrain Control Module (PCM) which uses this information to control fuel injection, ignition timing, and emissions.

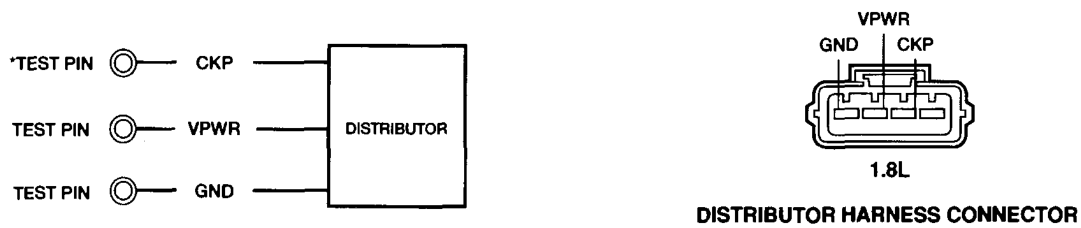
On the 1.8L, a slotted disc is mounted to the distributor shaft. As the four slots on the disc pass through a photo sensor, an input signal is sent to the PCM. This signal notifies the PCM of the crankshaft position at 90 degree intervals.



EEC Pinpoint Tests	1.8L	CKP

Engine	Location
1.8L	Integrated in the distributor.

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A14115-D

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.8L MTX	CKP VPWR GND	2E 1B 2C	56 37, 57 16	W W/R BK/LG
1.8L 4EAT	CKP VPWR GND	2A 1B 3C	45 37, 57 49	W W/R BK/LG

TEST STEP	RESULT ▶	ACTION TO TAKE
CKP1 CHECK VPWR TO DISTRIBUTOR		
• Key OFF. • Disconnect the distributor connector. • Key ON. • Measure the voltage between the distributor VPWR wire (harness side) and ground. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to CKP2. GO to EEC Pinpoint Test VPWR in this section.
CKP2 CHECK GROUND AT DISTRIBUTOR		
• Key OFF. • Disconnect the distributor connector. • Measure the resistance between the distributor GND wire (harness side) and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CKP3. SERVICE the distributor GND wire.

EEC Pinpoint Tests	1.8L	CKP

TEST STEP		RESULT ▶	ACTION TO TAKE
CKP3	CHECK DISTRIBUTOR TO PCM LEADS		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the distributor connector. • Measure the resistance between the BOB Test Pin CKP and the CKP pin on the distributor harness connector. • Measure the resistance between the BOB Test Pin CKP and ground. • **Is the resistance less than 5 ohms between the BOB Test Pin and the distributor harness connector, and greater than 10,000 ohms between the Test Pin and ground?**	Yes ▶ No ▶	REPLACE the CKP sensor. SERVICE the CKP wire.

EEC Pinpoint Tests	2.5L	CKP1

Crankshaft Position Sensor No. 1 (CKP1) — 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 04 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 or Pinpoint Test ICM directs you here.

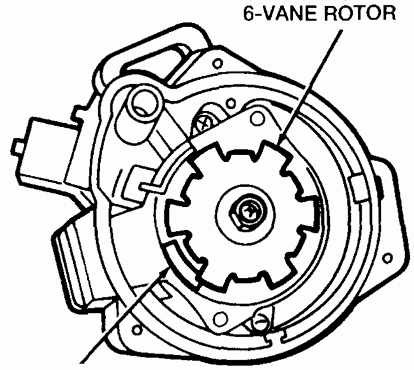
Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: CKP1

Description

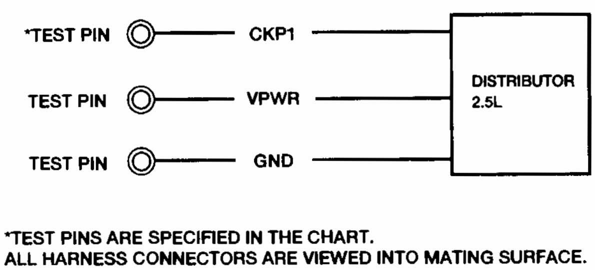
The Crankshaft Position sensor No. 1 (CKP1) is mounted inside the distributor housing. A six-vane rotor is mounted to the distributor shaft and spins at the speed of the camshaft. As the rotor passes through a magnetic Hall effect pickup switch, the six vanes are detected and sent to the Powertrain Control Module (PCM) in a pulse wave form. The crankshaft position can be determined at 60 degree intervals for fuel injection timing, ignition timing, and emission control.

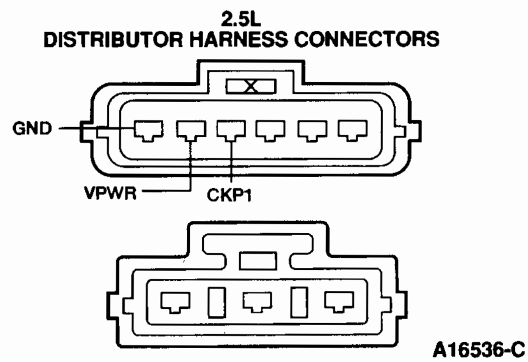


Engine	Location
2.5L	Integrated in the distributor.

EEC Pinpoint Tests	2.5L	CKP1

Pinpoint Test Schematic





Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
2.5L	CKP1 VPWR GND	3E 1B 3C	56 37, 57 49	LG/O R/BK BK/R

TEST STEP	RESULT ▶	ACTION TO TAKE
CKP1-1 CHECK CKP1 SIGNAL		
• Key OFF. • Install Breakout Box (connect PCM). • Measure the voltage at BOB Test Pin CKP1 while bumping the starter. • **Does the voltage alternate between approximately 0 volts and 5 volts?**	Yes ▶	CKP1 circuit OK. If sent to this test by Quick Test Step **QT11** in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
	No ▶	GO to **CKP1-2**.
CKP1-2 CHECK VPWR TO DISTRIBUTOR		
• Key OFF. • Disconnect the 6-pin distributor connector. • Key ON. • Measure the voltage at the VPWR wire on the 6-pin distributor harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶	GO to **CKP1-3**.
	No ▶	GO to EEC Pinpoint Test **VPWR** in this section. If VPWR is OK, SERVICE the VPWR wire to distributor.

EEC Pinpoint Tests	2.5L	CKP1

TEST STEP		RESULT ▶	ACTION TO TAKE
CKP1-3	CHECK GROUND AT DISTRIBUTOR		
	• Key OFF. • Disconnect the 6-pin distributor connector. • Measure the resistance of the GND wire between the 6-pin distributor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CKP1-4. SERVICE the distributor GND wire.
CKP1-4	CHECK CKP1 WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the 6-pin distributor connector. • Measure the resistance of the CKP1 wire between BOB Test Pin CKP1 and the CKP1 wire at the 6-pin distributor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CKP1-5. SERVICE the CKP1 wire for open.
CKP1-5	CHECK CKP1 WIRE FOR SHORT		
	• Key OFF. • Install breakout box (leave PCM disconnected). • Disconnect the 6-pin distributor connector. • Measure the resistance of the CKP1 wire between BOB Test Pin CKP1 and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the distributor. SERVICE the CKP1 wire for short.

EEC Pinpoint Tests	2.5L	CKP2

Crankshaft Position Sensor No. 2 (CKP2) — 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 02 (2.5L only) is received in Quick Test Steps 7 or 8, or when Quick Test 11 directs you here.

Special Note

The CKP2 sensor is located near the crankshaft pulley.

Remember

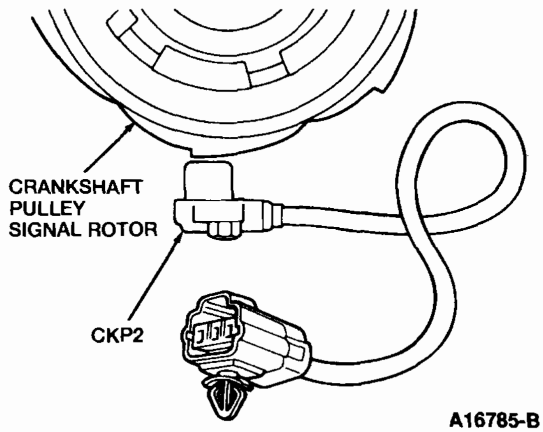
This Pinpoint Test is intended to diagnose only the following:

- Circuit: CKP2

EEC Pinpoint Tests	2.5L	CKP2

Description

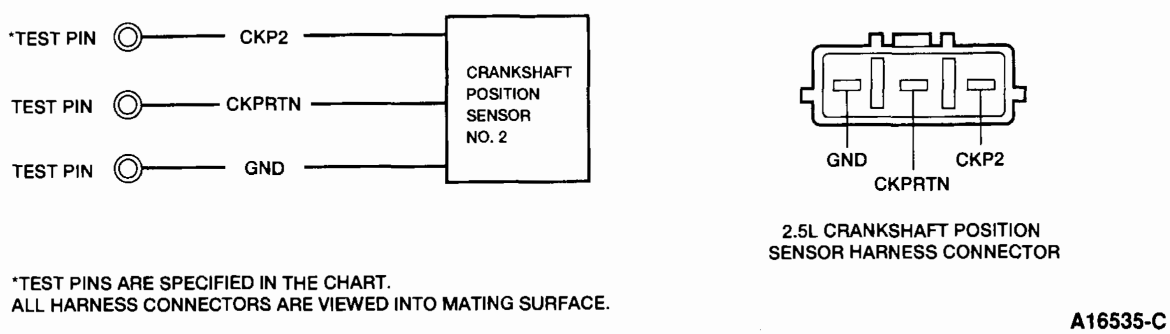
The Crankshaft Position sensor No.2 (CKP2) also detects the crankshaft position. This signal is generated directly at the crankshaft pulley. It is used at higher vehicle speeds when the timing belt does not accurately represent the crankshaft position. The input signal is sent to the Powertrain Control Module (PCM) and used for adjusting fuel injection timing, ignition timing, and engine control.



Engine	Location
2.5L	Mounted to the engine block at the crankshaft pulley.

EEC Pinpoint Tests	2.5L	CKP2

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
2.5L	CKP2 CKPRTN GND	3H 3F 3C	4 16 49	GN BL BK/R

TEST STEP	RESULT ▶	ACTION TO TAKE
CKP2-1 CHECK CKP2 SENSOR		
• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin CKP2 and BOB Test Pin CKPRTN. • **Is the resistance 520-580 ohms at 20°C (68°F)?**	Yes ▶	CKP2 circuit OK. If sent to this test by Quick Test Step **QT11** in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
	No ▶	GO to **CKP2-2**.

EEC Pinpoint Tests	2.5L	CKP2

TEST STEP		RESULT ▶	ACTION TO TAKE
CKP2-2	CHECK CKP2 SENSOR WIRES TO PCM FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the CKP2 sensor connector. • Measure the resistance of the CKP2 and CKPRTN wires between the BOB Test Pins CKP2 and CKPRTN and the corresponding terminals on the CKP2 sensor harness connector. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	GO to CKP2-3. SERVICE the wire(s) in question for opens.
CKP2-3	CHECK CKP2 SENSOR WIRES TO PCM FOR SHORTS		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the CKP2 sensor connector. • Measure the resistance of the CKP2 and CKPRTN wires between the BOB Test Pins CKP2 and CKPRTN and ground. • **Are the resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to CKP2-4. SERVICE the wire(s) in question for shorts.
CKP2-4	CHECK GROUND CIRCUIT CONTINUITY		
	• Key OFF. • Disconnect the CKP2 sensor connector. • Measure the resistance between sensor harness connector GND terminal and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the CKP2 sensor. SERVICE the GND circuit for opens.

EEC Pinpoint Tests	1.3L 1.8L	DRL

Daytime Running Lamps (DRL) - Canada Only — 1.3L, 1.8L

Note

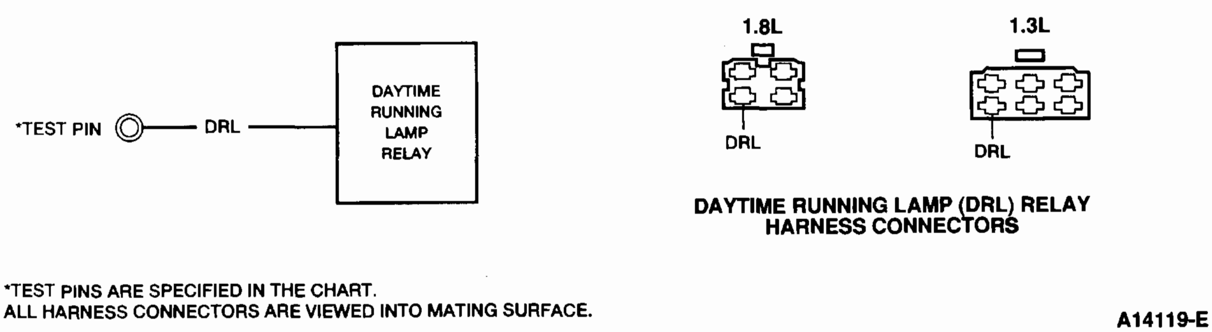
You should enter this Pinpoint Test only when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: DRL

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	DRL	1I	35	LG
1.8L MTX	DRL	1L	42	BR / W
1.8L 4EAT	DRL	3F	16	BR / W

EEC Pinpoint Tests	1.3L 1.8L	DRL

TEST STEP	RESULT ▶	ACTION TO TAKE
DRL1 CHECK DRL INPUT VOLTAGE		
• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the voltage between BOB Test Pin DRL and BOB Test Pin GND.	Yes ▶	DRL circuit OK. RETURN to Section 2B, Diagnostic Routines.
	No (Headlamp system works) ▶	SERVICE the DRL wire to PCM.
	(Headlamp system does not work) ▶	GO to Service Manual, Section 17-01, and SERVICE the headlamps.

Condition	Voltage
Engine at idle / Parking brake on	Greater than 10 volts
Engine at idle / Parking brake off	Less than 2.5 volts

• **Are the voltages OK?**

EEC Pinpoint Tests	2.5L	DRL

Daytime Running Lamps (DRL) - Canada Only — 2.5L

Note

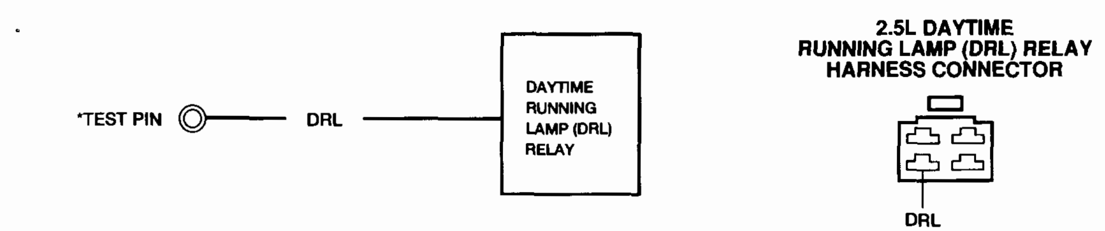
You should enter this Pinpoint Test only when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: DRL

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16538-C

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
2.5L	DRL	2L	28	GN

EEC Pinpoint Tests	2.5L	DRL

TEST STEP	RESULT ▶	ACTION TO TAKE
DRL1 CHECK DRL INPUT VOLTAGE		
• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key ON. • Measure the voltage between BOB Test Pin DRL and BOB Test Pin GND under the following conditions:	Yes ▶	DRL circuit OK, RETURN to Section 2B, Diagnostic Routines.
	No (Daytime Running Lamp system works) ▶	SERVICE the DRL wire to PCM.
	No (Daytime Running Lamp system does not work) ▶	GO to Service Manual Section 17-04 and SERVICE Daytime Running Lamp system.

Condition	Voltage
Parking brake released	Approximately 0 volts
Parking brake set	Greater than 10 volts

• **Are the voltages OK?**

EEC Pinpoint Tests	All Engines	ECT

Engine Coolant Temperature (ECT) Sensor

Note

You should enter this Pinpoint Test only when diagnostic trouble code 09 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

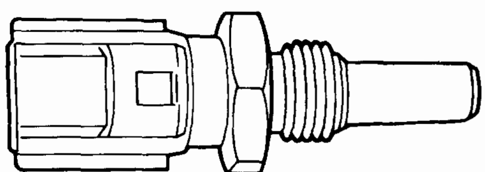
This Pinpoint Test is intended to diagnose only the following:

- Circuit: ECT

Description

The Engine Coolant Temperature (ECT) sensor detects the coolant temperature, and constantly updates the Powertrain Control Module (PCM) on the coolant's changing condition with an input signal. The PCM uses this signal to modify ignition timing, EGR flow (1.3L and 2.5L), air / fuel ratio, idle speed, and purge flow.

1.3L, 1.6L, 1.8L, 2.5L

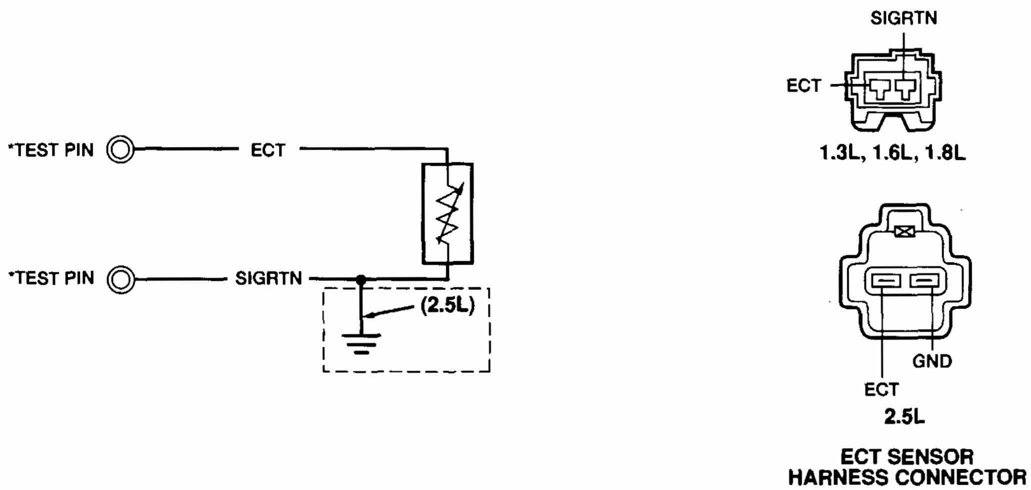


A16765-C

Engine	Location
1.3L	Threaded into the top of the lower intake manifold.
1.6L	Threaded into the underside of the intake manifold.
1.8L	Threaded into the engine near the thermostat housing.
2.5L	Threaded into the coolant elbow on the RH side of the engine.

EEC Pinpoint Tests	All Engines	ECT

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16714-D

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	ECT SIGRTN	2H 2D	51 46	R/BL Y/GN
1.6L	ECT SIGRTN	2I 2C	7 46	BL/R BL/Y
1.8L MTX	ECT SIGRTN	2Q 2D	7 46, 49	BL/W BK/W
1.8L 4EAT	ECT SIGRTN	2E 3D	7 46	BL/W BK/W
2.5L	ECT GND	2E 3D	7 46	R/GN BK/BL

ECT RESISTANCE DATA SHEET

Coolant Temperature °C (°F)	ECT Sensor Resistance (kOHMS)
-20 (-4)	14.6 - 17.8
20 (68)	2.2 - 2.7
80 (176)	0.25 - 0.35

EEC Pinpoint Tests	All Engines	ECT

TEST STEP		RESULT	ACTION TO TAKE
ECT1	CHECK ECT SENSOR RESISTANCE		
	• Run engine until coolant reaches temperatures specified in Data Sheet. Monitor temperature at ECT sensor using Rotunda Digital Thermo Pyrometer 055-00100 or equivalent. • Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pins ECT and SIGRTN (1.3L, 1.6L, 1.8L), or BOB Test Pin ECT and GND (2.5L). • **Are the resistance values within specified ranges shown on the Data Sheet?**	Yes ▶ No ▶	ECT circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. GO to ECT2.
ECT2	CHECK ECT CIRCUIT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the ECT sensor connector. • Measure the resistance between BOB Test Pin ECT and ECT terminal at the ECT sensor harness connector (resistance should be less than 5 ohms). • Measure the resistance between ECT Test Pin and SIGRTN Test Pin (resistance should be greater than 10,000 ohms). • Measure the resistance between BOB Test Pin ECT and ground (resistance should be greater than 10,000 ohms). • **Are the resistances OK?**	Yes (1.3L, 1.6L, 1.8L) ▶ Yes (2.5L) ▶ No ▶	GO to ECT3. GO to ECT4. SERVICE the ECT wire between PCM and ECT sensor.
ECT3	CHECK SIGRTN CIRCUIT (1.3L, 1.6L, 1.8L)		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the ECT sensor connector. • Measure the resistance between BOB Test Pin SIGRTN and SIGRTN terminal at the ECT sensor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the ECT sensor. SERVICE the SIGRTN wire between PCM and ECT sensor connector.
ECT4	CHECK GROUND CIRCUIT (2.5L)		
	• Key OFF. • Disconnect the ECT sensor connector. • Measure the resistance between GND terminal at ECT sensor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the ECT sensor. SERVICE the GND wire between PCM and ECT sensor.

EEC Pinpoint Tests	1.6L	ELU

Electrical Load Control Unit (ELU) — 1.6L

Note

You should enter this Pinpoint Test only when Quick Test Step 11 or Switch Monitor Test Charts direct you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: ELU

Description

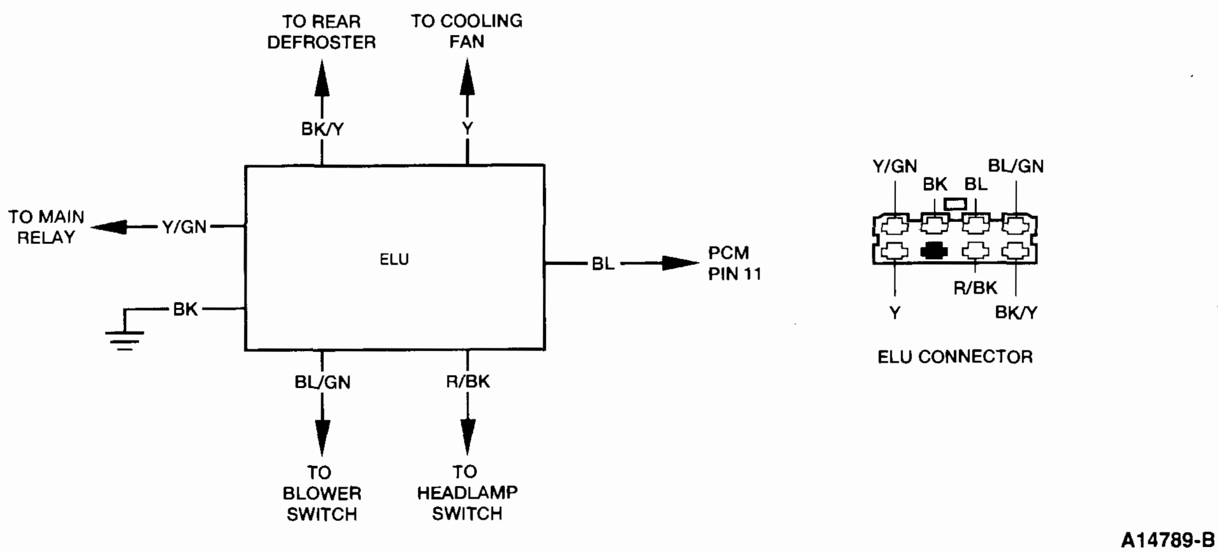
The Electrical Load Control Unit (ELU) monitors electrical activity and signals the Powertrain Control Module (PCM) under heavy electrical load to modify idle speed.

Engine	Location
1.6L	Mounted forward of center console in front of PCM.

EEC Pinpoint Tests	1.6L	ELU

Pinpoint Test Schematic

Electrical Load Control Unit



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.6L	ELU	1l	24	BL

EEC Pinpoint Tests	1.6L	ELU

TEST STEP		RESULT ▶	ACTION TO TAKE
ELU1	CHECK ELU SIGNAL VOLTAGE		
	• Key OFF. • Install Breakout Box (leave PCM connected). • Key ON. • Measure the voltage between the ELU Test Pin 11 and ground while exercising the inputs below. • Compare readings to the table:	Yes ▶	ELU is OK. If sent here from Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines; otherwise REPLACE the PCM.
	(see table below) • **Are the voltages OK?**	No ▶	GO to ELU2.

Switch and Position	Voltage
All accessories off	Greater than 10 volts
Rear defroster on	Less than 1.5 volts
Headlamps on	Less than 1.5 volts
Blower speed 2 to 4	Less than 1.5 volts
Cooling fan on	Less than 1.5 volts

TEST STEP		RESULT ▶	ACTION TO TAKE
ELU2	CHECK ELU SIGNAL TO PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key ON. • Measure the resistance between the ELU Test Pin 11 and ground while exercising the below inputs. • Compare readings to the table: (see table below) • **Are the resistances OK?**	Yes ▶ No ▶	REPLACE the PCM. GO to ELU3.

Switch and Position	Resistance
All accessories off	Greater than 10,000 ohms
Rear defroster on	Less than 5 ohms
Headlamps on	Less than 5 ohms
Blower speed 2 to 4	Less than 5 ohms
Cooling fan on	Less than 5 ohms

TEST STEP		RESULT ▶	ACTION TO TAKE
ELU3	CHECK ELU POWER		
	• Key OFF. • Disconnect the ELU connector. • Key ON. • Measure the voltage on the "Y / GN" wire at the ELU connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to ELU4. SERVICE the "Y / GN" wire between the ELU and the main relay.
ELU4	CHECK ELU GROUND		
	• Key OFF. • Disconnect the ELU connector. • Measure the resistance of the "BK" wire between the ELU connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to ELU5. SERVICE the "BK" wire.

EEC Pinpoint Tests	1.6L	ELU

TEST STEP	RESULT ▶	ACTION TO TAKE
ELU5 CHECK ELU INPUT SIGNALS		
• Key OFF. • Disconnect the ELU connector. • Take the following measurements on the ELU inputs. • All measurements are from the appropriate input wire on the ELU connector to ground. NOTE: Voltage measurements are made with the key ON. Resistance measurements are made with the key OFF.	Yes ▶	REPLACE the ELU.
(see table below) • **Are the measurements OK?**	No ▶	REFER to the Service Manual Section: - 01-11, Glass, Frames and Mechanisms; for the rear defroster. - 17-01, Lighting, Exterior; for the headlamps. - 03-03, Engine Cooling; for the cooling fan. - 12-00, Climate Control System - Service; for the blower speed.

Switch and Position	Measurements
Rear defroster on	Greater than 10 volts
Rear defroster off	Less than 5 volts
Headlamps on	Greater than 10 volts
Headlamps off	Less than 5 volts
Cooling fan on	Less than 1.5 volts
Cooling fan off	Greater than 10 volts
Blower speed 2 to 4	Less than 5 ohms
Blower speed 1 or off	Greater than 10,000 ohms

• **Are the measurements OK?**

EEC Pinpoint Tests	1.3L 2.5L	EVP

Exhaust Gas Recirculation Valve Position (EVP) Sensor — 1.3L, 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 16 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

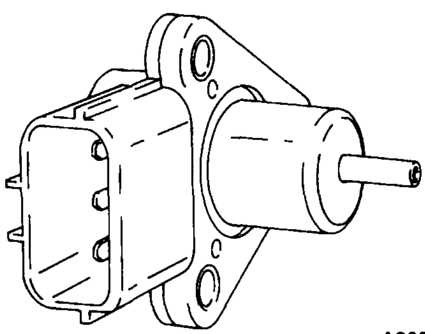
This Pinpoint Test is intended to diagnose only the following:

- Circuit: EVP

Description

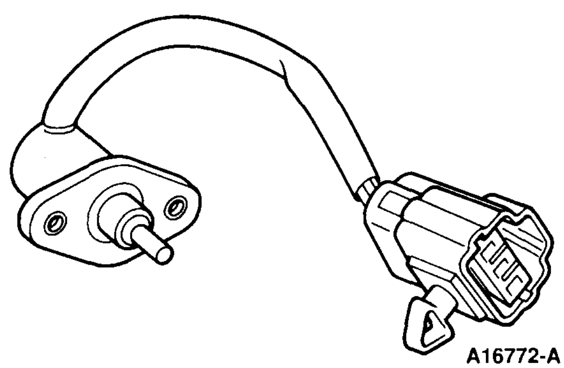
The Exhaust Gas Recirculation Valve Position (EVP) sensor provides information to the Powertrain Control Module (PCM) reflecting the Exhaust Gas Recirculation (EGR) valve position. There are two purposes for the EVP sensor. The sensor indicates the amount of exhaust gas flowing into the engine by monitoring the EGR valve movement, and also notifies the PCM of electrical failure in the EGR valve.

1.3L



A20526-A

2.5L

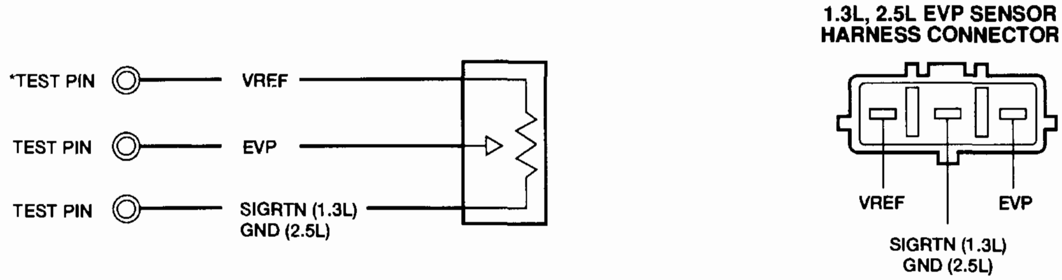


A16772-A

Engine	Location
1.3L, 2.5L	Mounted to the top of the EGR valve.

EEC Pinpoint Tests	1.3L 2.5L	EVP

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16715-D

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	EVP VREF SIGRTN	2J 2K 2D	6 26 46	Y LG/R Y/GN
2.5L	EVP VREF GND	2J 2I 3D	27 26 46	R/BK P BK/BL

EVP VACUUM/VOLTAGE DATA SHEET

Vacuum mm-Hg (in-Hg)	Voltage (volts)
0 (0)	Approx. 0.8
150 (5.90)	Approx. 5.0

TEST STEP		RESULT ▶	ACTION TO TAKE
EVP1	CHECK VACUUM LINES AND CONNECTIONS TO EGR VALVE		
	• Visually check all vacuum hoses and connections between the EGR valve and the intake manifold. Refer to Section 3B for EGR system routing diagrams. • **Do the hoses and connections appear to be OK?**	Yes ▶ No ▶	GO to EVP2. SERVICE the hoses and/or connections as necessary.

EEC Pinpoint Tests	1.3L 2.5L	EVP

TEST STEP	RESULT ▶	ACTION TO TAKE
EVP2 CHECK VACUUM AT EGR VALVE		
• Key OFF. • Connect a Rotunda Vacuum Gauge 059-00008, or equivalent, between the EGR valve and the vacuum hose leading to the EGR valve. • Key ON, engine running. • Warm the engine until it is at normal operating temperature. • Drive the vehicle while observing the vacuum gauge.	Yes ▶ No ▶	GO to **EVP3**. CHECK the vacuum hoses and connections for splits, blockage, leaks, or damage. If OK, REFER to Section 10B, Exhaust Gas Recirculation (EGR) Systems.

Condition	1.3L Vacuum mm-Hg (in-Hg)	2.5L Vacuum mm-Hg (in-Hg)
Normal cruising	126 (5)	254 (10)
Idle, deceleration, or high speed	0 (0)	0 (0)

• **Are the vacuum readings OK?**

TEST STEP	RESULT ▶	ACTION TO TAKE
EVP3 CHECK EVP SIGNAL TO PCM		
• Key OFF. • Install Breakout Box (connect PCM). • Connect Rotunda Vacuum Tester 021-00014 or equivalent to the EGR valve vacuum port. • Key ON. • Measure the voltage between Test Pins EVP and SIGRTN (1.3L) or GND (2.5L). • Compare the voltage readings to the Data Sheet as vacuum is increased. • **Are the voltages OK?**	Yes ▶ No ▶	EVP circuit OK. If directed here from Quick Test Step **QT11** in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. GO to **EVP4**.
EVP4 CHECK VREF AT EVP SENSOR		
• Key OFF. • Disconnect the EVP sensor connector. • Key ON. • Measure the voltage at the VREF terminal on the EVP sensor harness connector. • **Is the voltage between 4.5 and 5.5 volts?**	Yes ▶ No ▶	GO to **EVP5**. GO to EEC Pinpoint Test **VREF** in this section.
EVP5 CHECK GROUND AT EVP SENSOR		
• Key OFF. • Disconnect the EVP sensor connector. • Measure the resistance between the SIGRTN (1.3L) or the GND (2.5L) terminal at the EVP sensor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **EVP6**. SERVICE the EVP sensor SIGRTN (1.3L) or GND (2.5L) wire.

EEC Pinpoint Tests	1.3L 2.5L	EVP

TEST STEP		RESULT ▶	ACTION TO TAKE
EVP6	CHECK EVP WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the EVP sensor connector. • Measure the resistance of the EVP wire between BOB Test Pin EVP and the EVP terminal on the EVP sensor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to EVP7. SERVICE the EVP wire for open(s).
EVP7	CHECK EVP WIRE FOR SHORT TO GROUND		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the EVP sensor connector. • Measure the resistance of the EVP wire between BOB Test Pin EVP and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to EVP8. SERVICE the EVP wire for short(s) to ground.
EVP8	CHECK EVP WIRE FOR SHORT TO VREF		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the EVP sensor connector. • Measure the resistance between BOB Test Pin EVP and BOB Test Pin VREF. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the EVP sensor. SERVICE the EVP and / or VREF wire(s).

EEC Pinpoint Tests	2.5L	HO2S

Heated Oxygen Sensor (HO2S) — 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 15, 17, 23, or 24 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

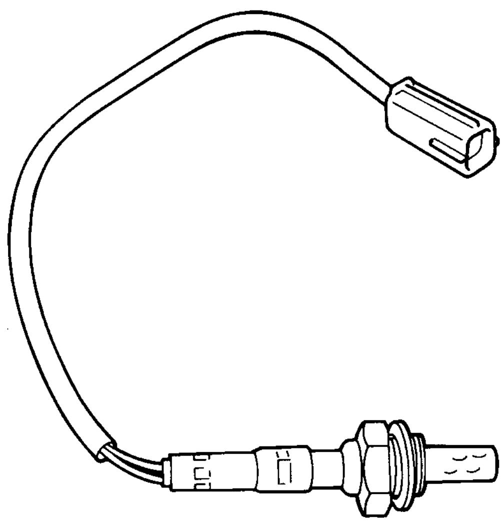
This Pinpoint Test is intended to diagnose only the following:

- Circuit: HO2S

EEC Pinpoint Tests	2.5L	HO2S

Description

The Heated Oxygen Sensor (HO2S) observes the oxygen concentration in the exhaust and sends a signal to the Powertrain Control Module (PCM) reflecting whether the mixture is too lean or too rich. If the mixture has a high concentration of oxygen in the exhaust, a voltage signal of less than 0.4 volts is sent to the PCM. A voltage signal of 0.6 volts or greater is sent when there is a low concentration of oxygen in the exhaust. For better operational purposes, the HO2S(s) are heated to improve emissions during cold weather operation. The 2.5L engine has a Left Heated Oxygen Sensor (LHO2S) and a Right Heated Oxygen Sensor (RHO2S).



A16828-A

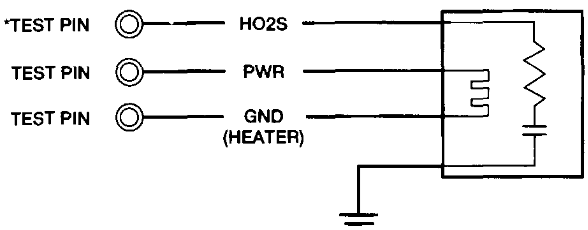
Engine	Location
2.5L	Threaded into the exhaust manifolds.

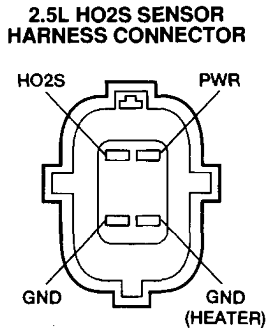
Special Note

A code 15 or 17 indicates a LHO2S (left sensor) malfunction, and a code 23 or 24 indicates a RHO2S (right sensor) malfunction. A code 15 or 23 indicates a continuous HO2S output voltage of less than 0.55 volts. A code 17 or 24 indicates that the HO2S feedback system output does not change. A code 17 or 24 may indicate a condition other than a HO2S circuit malfunction.

EEC Pinpoint Tests	2.5L	HO2S

Pinpoint Test Schematic





*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16716-C

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
2.5L	RHO2S LHO2S GND	2C 2D 3D	29 43 46	BK / Y BL / W BK / BL

HO2S VOLTAGE DATA SHEET

Condition	Voltage
Key ON, engine off	0 volts
Idle (cold)	0 volts
Idle (warm)	0 - 1.0 volts (not constant)
Acceleration	0.5 - 1.0 volts
Deceleration	0 - 0.5 volts

TEST STEP		RESULT ▶	ACTION TO TAKE
H02S1	CHECK HO2S SENSOR VOLTAGE		
	• Key OFF. • Install Breakout Box (connect PCM). • Run engine at 2,000-3,000 rpm for 2 minutes or until engine reaches normal operating temperature. • Measure the voltage at BOB Test Pin HO2S. Compare the voltage readings to Data Sheet. • **Are the voltages OK?**	Yes ▶ No ▶	GO to HO2S5. GO to HO2S2.

EEC Pinpoint Tests	2.5L	HO2S

TEST STEP		RESULT ▶	ACTION TO TAKE
HO2S2	CHECK HO2S SENSOR GROUND		
	• Key OFF. • Disconnect the HO2S connector. • Measure the resistance of the GND wire between the GND terminal at the HO2S sensor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **HO2S3**. SERVICE the HO2S GND wire.
HO2S3	CHECK HO2S WIRE TO PCM FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the HO2S sensor connector. • Measure the resistance of the HO2S wire between BOB Test Pin HO2S and the HO2S terminal at the HO2S sensor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **HO2S4**. SERVICE the HO2S wire for open(s).
HO2S4	CHECK HO2S WIRE TO PCM FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the HO2S connector. • Measure the resistance of the HO2S wire between BOB Test Pin HO2S and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the HO2S sensor. SERVICE the HO2S wire for short(s).
HO2S5	CHECK HO2S HEATER RESISTANCE		
	• Key OFF. • Disconnect the HO2S connector. • Measure the resistance between the HO2S PWR terminal and "heater" GND terminal on the sensor. • **Is the resistance approximately 6 ohms at 20°C (68°F)?**	Yes ▶ No ▶	GO to **HO2S6**. REPLACE the HO2S.
HO2S6	CHECK POWER TO HO2S SENSOR HEATER		
	• Key OFF. • Disconnect the HO2S connector. • Key ON. • Measure the voltage at the PWR terminal on the HO2S harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **HO2S7**. GO to EEC Pinpoint Test **VPWR** in this section. If VPWR is OK, SERVICE VPWR wire to HO2S sensor.

EEC Pinpoint Tests	2.5L	HO2S

TEST STEP		RESULT ▶	ACTION TO TAKE
HO2S7	CHECK HO2S SENSOR HEATER GROUND		
	• Key OFF. • Disconnect the HO2S connector. • Measure the resistance of the HO2S heater GND wire between the HO2S harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶	HO2S circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
		No ▶	SERVICE the HO2S heater GND wire.

EEC Pinpoint Tests	All Engines	IAT

Intake Air Temperature (IAT) Sensor

Note

You should enter this Pinpoint Test only when diagnostic trouble code 10 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

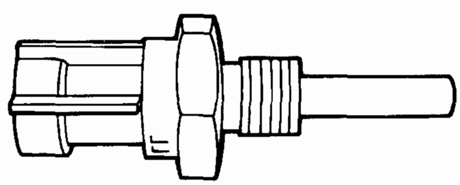
This Pinpoint Test is intended to diagnose only the following:

- Circuit: IAT

Description

The Intake Air Temperature (IAT) sensor detects the incoming air flow temperature. As the air temperature decreases, the resistance of the sensor increases. The resistance, sent to the Powertrain Control Module (PCM) as an input signal, is used as a temperature-to-density calculation. The PCM can then determine the air density and cold enrichment fuel flow. The 2.5L engine uses an integrated IAT sensor mounted in the Measuring Core-Volume Air Flow (MC-VAF) meter. The 1.6L and 1.8L engines use an integrated IAT sensor mounted in the Volume Air Flow (VAF) meter. The 1.3L engine uses an IAT sensor mounted to the air filter housing.

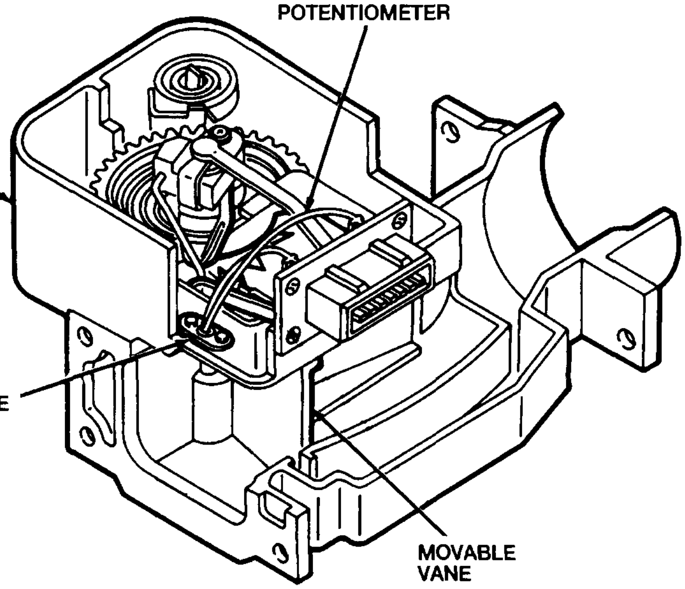
1.3L



A16779-C

EEC Pinpoint Tests	All Engines	IAT

1.6L, 1.8L

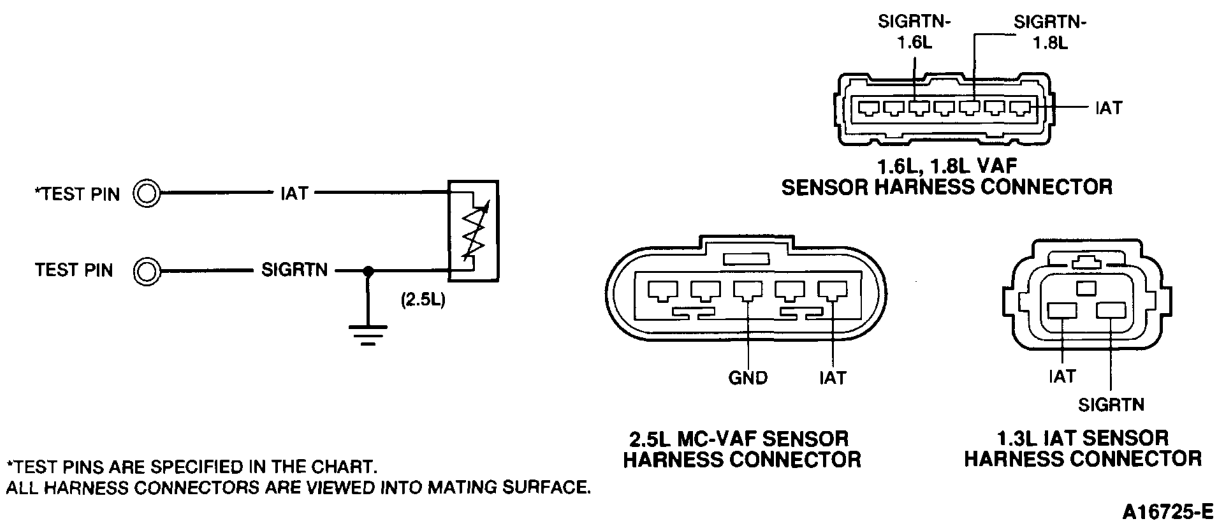


A13928-E

Engine	Location
1.3L	Threaded into the air cleaner housing.
1.6L, 1.8L	Integrated in the volume air flow meter.
2.5L	Integrated in the measuring core-volume air flow meter.

EEC Pinpoint Tests	All Engines	IAT

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	IAT SIGRTN	2L 2D	27 46	GN/R Y/GN
1.6L	IAT SIGRTN	2J 2C	25 46	BR/Y BL/Y
1.8L MTX	IAT SIGRTN	2P 2D	45 46, 49	R/BK BK/W
1.8L 4EAT	IAT SIGRTN	2K 3D	25 46	R/BK BK/W
2.5L	IAT GND	2K 3D	25 46	BK/R BK/BL

EEC Pinpoint Tests	All Engines	IAT

1.3L RESISTANCE DATA SHEET

Temperature °C (°F)	Resistance (kOHMS)
0 (32)	72.1 - 79.4
13 (55)	54.3 - 58.6
25 (77)	29.7 - 36.3
43 (110)	17.9 - 19.3
85 (185)	3.3 - 3.7

1.6L, 1.8L, 2.5L RESISTANCE DATA SHEET

Temperature °C (°F)	Resistance (kOHMS)
-20 (-4)	10.0 - 20.0
0 (32)	4.0 - 7.0
20 (68)	2.0 - 3.0
40 (104)	0.9 - 1.3
60 (140)	0.4 - 0.7

TEST STEP		RESULT ▶	ACTION TO TAKE
IAT1	CHECK IAT RESISTANCE		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Access the IAT sensor: — in VAF sensor on 1.6L, 1.8L — in air cleaner assembly on 1.3L — in MC-VAF sensor on 2.5L • Monitor the temperature at the IAT sensor using Rotunda Digital Thermo Pyrometer 055-00100 or equivalent. • Measure the resistance between BOB Test Pin IAT and BOB Test Pin SIGRTN (GND on 2.5L). • Compare the resistance readings to the Data Sheet as IAT sensor is heated using a blow dryer or Rotunda Heat Gun 107-R0300 or equivalent. • **Are the resistances OK?**	Yes ▶ No ▶	IAT circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. GO to IAT2.
IAT2	CHECK IAT WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the following connectors: — VAF sensor connector on 1.6L, 1.8L — IAT sensor connector on 1.3L — MC-VAF sensor connector on 2.5L • Measure the resistance of the IAT wire between BOB Test Pin IAT and the IAT terminal at the IAT sensor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to IAT3. SERVICE the IAT wire for open(s).

EEC Pinpoint Tests	All Engines	IAT

TEST STEP		RESULT ▶	ACTION TO TAKE
IAT3	CHECK IAT WIRE FOR SHORT TO GROUND		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the following connectors: — VAF sensor connector on 1.6L, 1.8L — IAT sensor connector on 1.3L — MC-VAF sensor connector on 2.5L • Measure the resistance of the IAT wire between BOB Test Pin IAT and ground. • **Is the resistance greater than 10,000 ohms?**	Yes (2.5L) ▶ Yes (1.3L, 1.6L, 1.8L) ▶ No ▶	GO to IAT4. GO to IAT5. SERVICE the IAT wire for short(s) to ground.
IAT4	CHECK IAT SENSOR GROUND (2.5L)		
	• Key OFF. • Disconnect the following connector: — MC-VAF sensor connector on 2.5L • Measure the resistance of the GND wire between the IAT sensor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the MC-VAF sensor. SERVICE the IAT GND wire.
IAT5	CHECK IAT SENSOR SIGRTN (1.3L, 1.6L, 1.8L)		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the following connectors: — VAF sensor connector on 1.6L, 1.8L — IAT sensor connector 1.3L • Measure the resistance of the SIGRTN wire between BOB Test Pin SIGRTN and the SIGRTN terminal on the IAT sensor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the IAT sensor (1.3L) or the VAF sensor (1.6L, 1.8L). SERVICE the IAT SIGRTN wire.

EEC Pinpoint Tests	1.3L 2.5L	ICM

Ignition Control Module (ICM) — 1.3L, 2.5L

Note

You should enter this Pinpoint Test only when Quick Test Step 11, or Test Step IGN 14 in Section 8B, Ignition Systems directs you here.

Remember

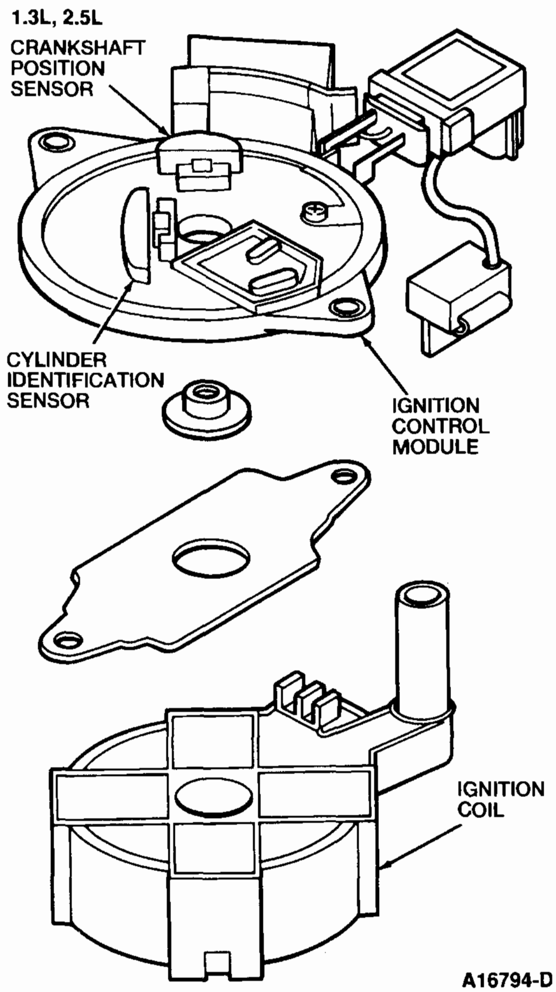
This Pinpoint Test is intended to diagnose only the following:

- Circuit: ICM

EEC Pinpoint Tests	1.3L 2.5L	ICM

Description

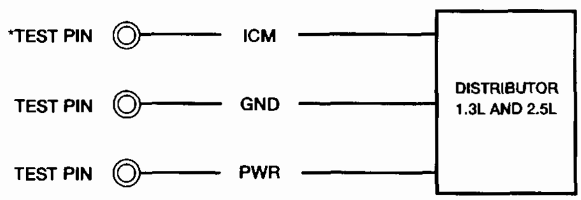
The Ignition Control Module (ICM) is an output device controlled by the Powertrain Control Module (PCM). The PCM sends a signal to the ICM, which transfers the signal to the ignition coil where it is generated into a high voltage spark to the spark plugs.

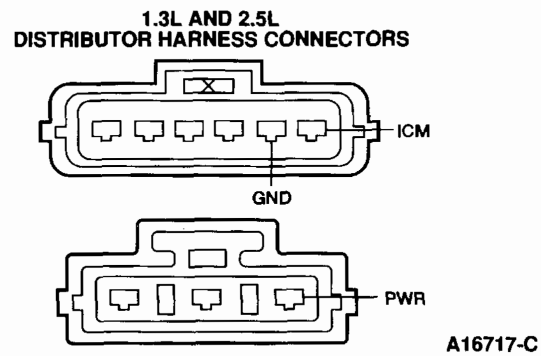


Engine	Location
1.3L, 2.5L	Integrated into the distributor.

EEC Pinpoint Tests	1.3L 2.5L	ICM

Pinpoint Test Schematic





*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	ICM GND PWR	2F NA NA	3 NA NA	BK / R BK / GN Y / GN
2.5L	ICM GND PWR	1G NA NA	36 NA NA	BL / O BK BK / PK

TEST STEP		RESULT ▶	ACTION TO TAKE
ICM1	CHECK FOR CONTINUOUS SPARK		
	• Key OFF. • Disconnect a spark plug wire. • Connect Air Gap Spark Tester D81P-6666-A to the disconnected spark plug wire. • Crank the engine. • **Is a continuous strong blue spark produced while cranking the engine?**	Yes ▶ No ▶	ICM circuit OK, RETURN to Section 2B, Diagnostic Routines. GO to ICM2.
ICM2	CHECK ICM SIGNAL FROM PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Disconnect the 3-pin distributor connector. • Crank the engine. • Measure the voltage between BOB Test Pin ICM and ground. • **Is the voltage greater than 0.6 volts?**	Yes ▶ No ▶	GO to ICM3. GO to EEC Pinpoint Tests CID and CKP or CKP1 in this section. If OK, REPLACE the PCM.

EEC Pinpoint Tests	1.3L 2.5L	ICM

TEST STEP		RESULT ▶	ACTION TO TAKE
ICM3	CHECK ICM WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the 6-pin distributor connector. • Measure the resistance between BOB Test Pin ICM and the ICM terminal at the 6-pin distributor connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **ICM4**. SERVICE the ICM wire for open(s).
ICM4	CHECK ICM WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the 6-pin distributor connector. • Measure the resistance between BOB Test Pin ICM and ground. • Measure the resistance between Test Pin ICM and Test Pin PWR. • **Are the resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **ICM5**. SERVICE the ICM wire for short(s).
ICM5	CHECK GROUND AT DISTRIBUTOR		
	• Key OFF. • Disconnect the 6-pin distributor connector. • Measure the resistance between the GND terminal at the harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **ICM6**. SERVICE the distributor GND wire for opens.
ICM6	CHECK PWR TO DISTRIBUTOR		
	• Key OFF. • Disconnect the 3-pin distributor connector. • Key ON. • Measure the voltage on the PWR terminal at the harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	REPLACE the distributor. SERVICE the PWR wire between the distributor and the ignition switch.

EEC Pinpoint Tests	1.6L 1.8L	IDM

Ignition Diagnostic Monitor (IDM) — 1.6L, 1.8L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 01 is received in Quick Test Steps 7 or 8, when Quick Test Step 11 directs you here, or when Test Step IGN14 in Section 8B directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: IDM, SPOUT, VPWR to ignition

Description

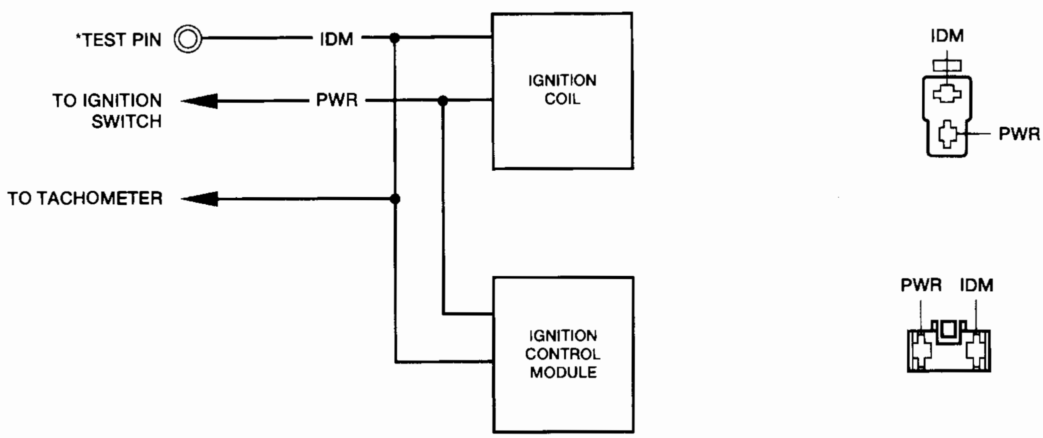
The IDM is controlled by the Powertrain Control Module (PCM). The PCM sends a signal to the IDM, which transfers the signal to the ignition coil where it is generated into a high-voltage spark for the spark plugs.

Engine	Location
1.6L, 1.8L	Mounted near the ignition coil.

EEC Pinpoint Tests	1.6L 1.8L	IDM

Pinpoint Test Schematic

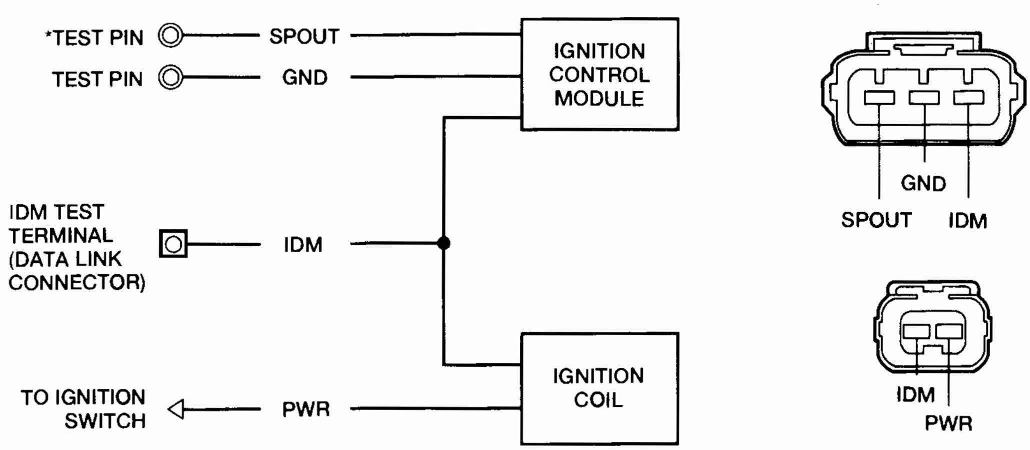
1.6L



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A14153-E

1.8L

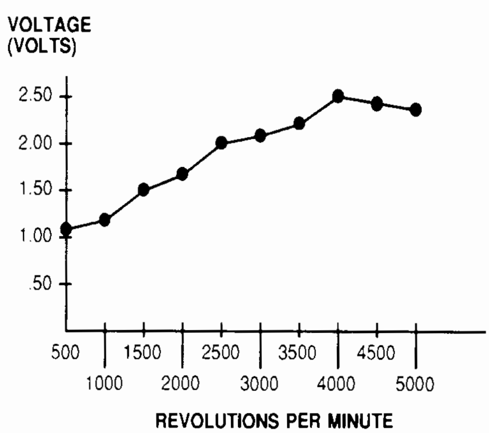


A14154-C

EEC Pinpoint Tests	1.6L 1.8L	IDM

Data Sheet

GRAPH



GRAPH DATA VALUES

RPM	VOLTS
500	1.103
1000	1.257
1500	1.542
2000	1.768
2500	2.06
3000	2.15
3500	2.26
4000	2.50
4500	2.47
5000	2.40

A14155-A

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.6L	IDM PWR	1M NA	6 NA	Y/BL BK/W
1.8L MTX	IDM PWR SPOUT GND	NA NA 1G 2A	NA NA 36 39, 40, 44, 60	Y/BL BL GN/W BK/O
1.8L 4EAT	IDM PWR SPOUT GND	NA NA 1G 3A	NA NA 36 40, 60	Y/BL BL GN/W BK/O

TEST STEP	RESULT ▶	ACTION TO TAKE
IDM1 CHECK FOR CONTINUOUS SPARK AT COIL		
• Key OFF. • Connect Air Gap Spark Tester D81P-6666-A between coil secondary wire and ground. • Crank the engine. • **Does the spark jump the tester air gap continuously, each time the engine is cranked?**	Yes (1.6L) ▶	GO to IDM2.
	Yes (1.8L) ▶	IDM circuit OK. If directed here from Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
	No ▶	GO to IDM3.

EEC Pinpoint Tests	1.6L 1.8L	IDM

TEST STEP		RESULT ▶	ACTION TO TAKE
IDM2	CHECK IDM TO PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Connect test light between BOB Test Pin VPWR and BOB Test Pin IDM. • Crank the engine. • **Does the test light flash while cranking the engine?**	Yes ▶ No ▶	IDM circuit OK. If directed here from Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. SERVICE the IDM wire to coil.
IDM3	CHECK FOR CONTINUOUS IDM AT COIL		
	• Key OFF. • Disconnect the coil connector. • Connect test light between coil IDM wire and PWR wire (harness side). • Crank the engine. • **Does the test light flash continuously, each time the engine is cranked?**	Yes ▶ No ▶	GO to IDM4. GO to IDM5.
IDM4	CHECK POWER TO COIL		
	• Key OFF. • Disconnect the coil connector. • Key ON. • Measure the voltage on the coil PWR wire. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	REPLACE the coil. SERVICE the coil PWR wire to ignition switch.
IDM5	CHECK FOR CONTINUOUS IDM FROM IGNITION CONTROL MODULE (ICM)		
	• Key OFF. • Disconnect the ignition control module connector. • (1.8L): jumper ignition control module SPOUT and GND wires back into the mating connector. • (1.6L): jumper PWR wire back into mating connector. NOTE: Leave IDM wire disconnected. • Connect test light between IDM terminal (on ignition control module) and PWR (1.6L), or PWR from ignition coil (1.8L). • Crank the engine. • **Does the test light flash continuously each time the engine is cranked?**	Yes ▶ No (1.8L) ▶ No (1.6L) ▶	SERVICE the ignition control module IDM wire to coil. GO to IDM7. GO to IDM6.

EEC Pinpoint Tests	1.6L 1.8L	IDM

TEST STEP		RESULT ▶	ACTION TO TAKE
IDM6	CHECK POWER TO IGNITION CONTROL MODULE (ICM)		
	• Key OFF. • Disconnect the ignition control module connector. • Key ON. • Measure the voltage on the ignition control module PWR wire. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to IDM7. SERVICE the ignition control module PWR wire to ignition switch.
IDM7	CHECK GROUND AT IGNITION CONTROL MODULE (ICM)		
	• Key OFF. • Disconnect the ignition control module connector. • (1.8L): connect test light between ignition coil PWR wire and ignition control module GND wire. • (1.6L): connect test light between ignition control module PWR wire and ignition control module GND wire. • Key ON. • **Is the test light on?**	Yes (1.8L) ▶ Yes (1.6L) ▶ No ▶	GO to IDM8. REPLACE the ignition control module. SERVICE the ignition control module ground wire.
IDM8	CHECK SPOUT AT IGNITION CONTROL MODULE (ICM)		
	• Key OFF. • Disconnect the ignition control module connector. • Connect test light between ignition coil PWR wire and ignition control module SPOUT wire. • Crank the engine. • **Does the test light flash?**	Yes ▶ No ▶	CHECK the ignition control module SPOUT wire for shorts to ground. If OK, then REPLACE the ignition control module. GO to IDM9.
IDM9	CHECK SPOUT CIRCUIT FROM PCM		
	• Key OFF. • Disconnect the ignition control module connector. • Install Breakout Box (leave PCM disconnected). • Measure the resistance of the SPOUT wire between BOB Test Pin and the ignition control module. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	CHECK the ignition control module SPOUT wire for shorts to any other circuit. If OK, then REPLACE the PCM. SERVICE the ignition control module SPOUT wire to PCM.

EEC Pinpoint Tests	1.6L Turbo	KC

Knock Control (KC) — 1.6L Turbo

Note

You should enter this Pinpoint Test only when Quick Test Step 11 directs you here.

Remember

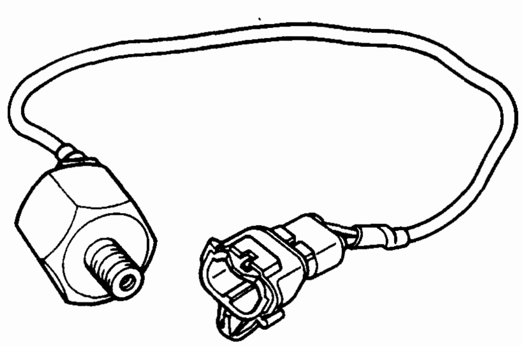
This Pinpoint Test is intended to diagnose only the following:

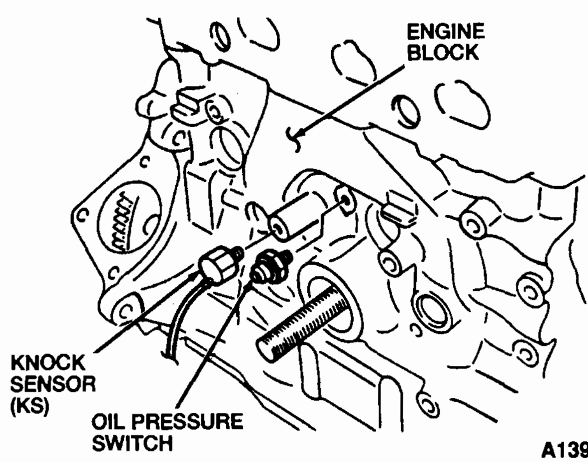
- Circuit: KC

Description

The Knock Sensor (KS) detects when the engine experiences excessive vibration. The vibration is transferred to the Powertrain Control Module (PCM) as a voltage signal. The voltage signal is produced from the resonation of the KS. The PCM regulates timing to compensate for the condition. If the condition does not improve, the PCM will terminate the injection timing and stall the engine to prevent damage. On the 1.6L Turbo, the KS signal is filtered first by the knock control module to eliminate normal engine vibration signals before reading the PCM.

1.6L Turbo



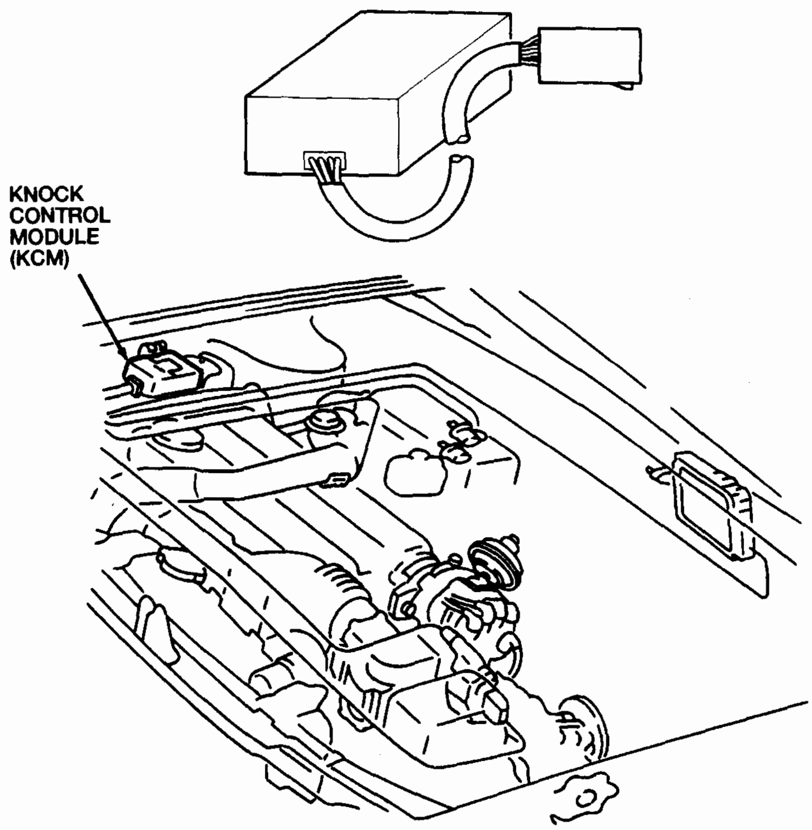


A13925-B

Engine	Location
1.6L Turbo	Threaded into the engine block near the oil pressure switch.

EEC Pinpoint Tests	1.6L Turbo	KC

The Knock Control Module (KCM) monitors the KS signal and determines the severity of the vibration. If the vibration becomes extensive, the KCM notifies the PCM with an input signal. The PCM can then adjust the engine controls to try to correct the condition.

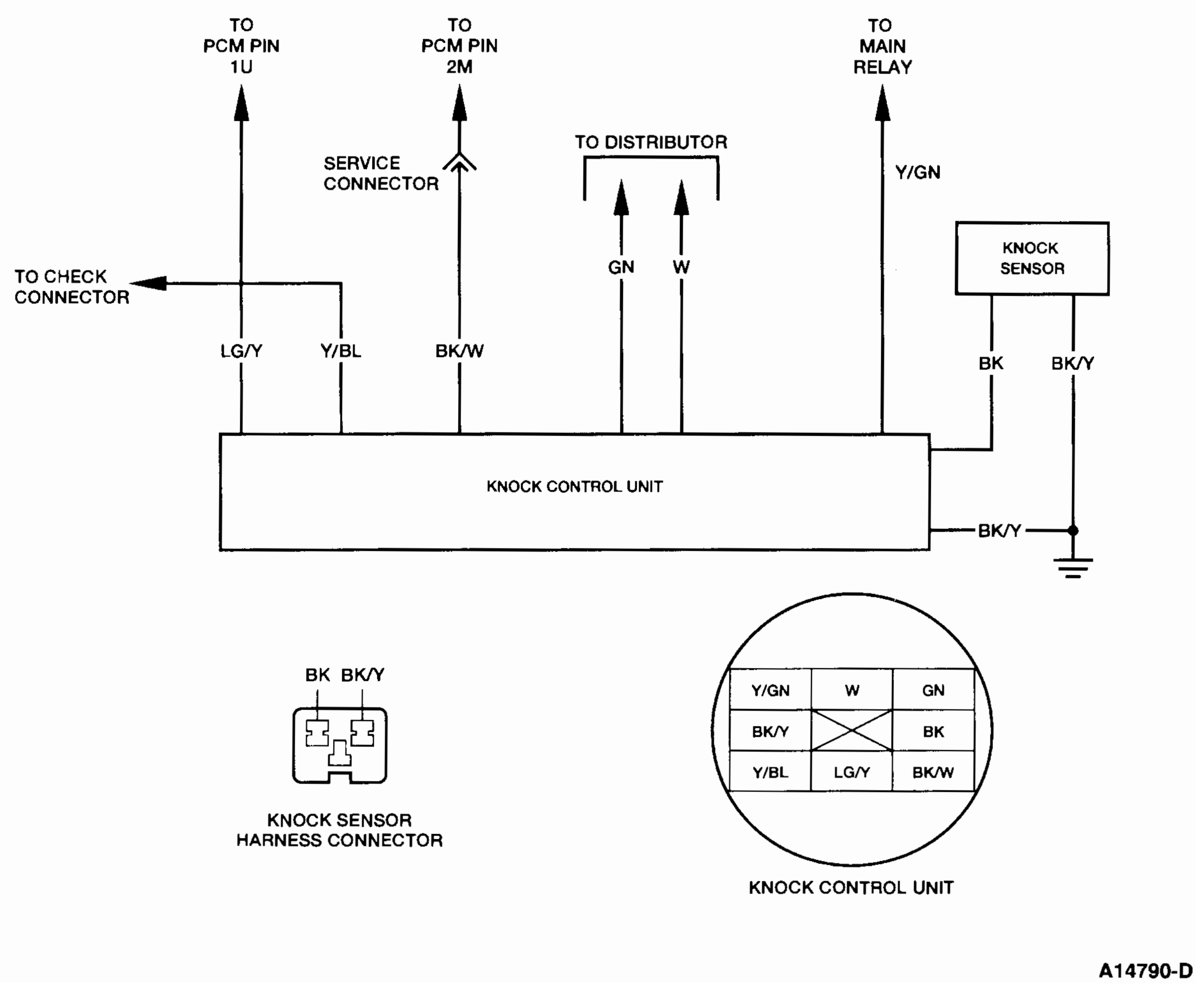


A15165-C

Engine	Location
1.6L Turbo	Mounted forward of RH strut tower.

EEC Pinpoint Tests	1.6L Turbo	KC

Pinpoint Test Schematic



TEST STEP		RESULT ▶	ACTION TO TAKE
KC1	CHECK KNOCK CONTROL FAIL-SAFE		
	• Key OFF. • Disconnect and plug distributor vacuum hose. • Key ON, engine running. • Connect Rotunda Timing Analyzer 059-00014, or equivalent and record the timing measurement. • Disconnect the knock control service connector (near PCM). • **Did the ignition timing retard?**	Yes ▶ No ▶	SERVICE the open KS and/or KS wires. GO to **KC2**.

EEC Pinpoint Tests	1.6L Turbo	KC

TEST STEP		RESULT ▶	ACTION TO TAKE
KC2	CHECK KNOCK CONTROL FUNCTION		
	• Key OFF. • Disconnect and plug the distributor vacuum hose. • Key ON, engine running. • Disconnect the knock control service connector (near PCM). • Connect timing lamp and record the timing measurement. • Tap the intake plenum with a plastic hammer. • **Did the ignition timing retard?**	Yes ▶ No ▶	GO to KC3. GO to KC4.
KC3	RETEST KNOCK CONTROL		
	• Key OFF. • Reconnect the knock control service connector (near PCM). • Key ON, engine running. • Connect timing lamp and record the timing measurement. • Tap the intake plenum with a plastic hammer. • **Did the ignition timing retard?**	No ▶ Yes ▶	Knock control unit OK, RETURN to Section 2B, Diagnostic Routines. REPLACE the knock control unit.
KC4	TEST KNOCK SENSOR		
	• Key OFF. • Disconnect and plug distributor vacuum hose. • Key ON, engine running. • Disconnect the knock control service connector (near PCM). • Connect a good KS to the vehicle. • Connect timing lamp and record the timing measurement. • Tap the intake plenum with a plastic hammer. • **Did the ignition timing retard?**	Yes ▶ No ▶	REPLACE the KS. GO to KC5.
KC5	CHECK KNOCK CONTROL WIRING		
	• Key OFF. • Verify VPWR ("Y / GN" wire) and GND ("BK / Y" wire) to the knock control unit. • Check all knock control unit wiring for opens and shorts. • **Are all knock control unit wires OK?**	Yes ▶ No ▶	REPLACE the knock control unit. SERVICE the wire(s) in question.

EEC Pinpoint Tests	2.5L	KS

Knock Sensor (KS) — 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 05 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

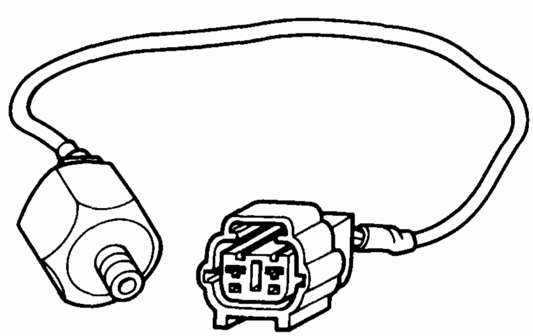
This Pinpoint Test is intended to diagnose only the following:

- Circuit: KS

Description

The Knock Sensor (KS) detects when the engine experiences excessive vibration. The vibration is transferred to the Powertrain Control Module (PCM) as a voltage signal. The voltage signal is produced from the resonation of the KS. The PCM regulates timing to compensate for the condition. If the condition does not improve, the PCM will terminate the injection timing and stall the engine to prevent damage.

2.5L

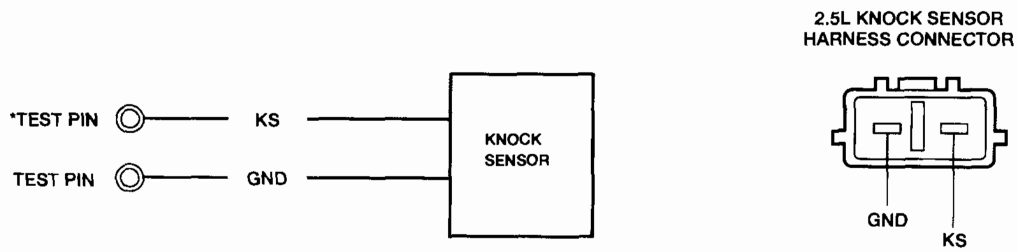


A16773-A

Engine	Location
2.5L	Threaded into the center of the engine block on the top side of the engine.

EEC Pinpoint Tests	2.5L	KS

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16718-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
2.5L	KS GND	2M 3C	23 49	W BK/R

TEST STEP		RESULT ▶	ACTION TO TAKE
KS1	CHECK SIGNAL FROM PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Key ON. • Measure the voltage between BOB Test Pin KS and ground using a digital voltmeter. • **Is the voltage approximately 2.4 volts?**	Yes ▶ No ▶	GO to **KS2**. GO to EEC Pinpoint Test **VPWR** in this section. If VPWR is OK, REPLACE the PCM.
KS2	CHECK KS WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the KS connector. • Measure the resistance between BOB Test Pin KS and KS terminal at KS harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **KS3**. SERVICE the KS wire for open(s).

EEC Pinpoint Tests	2.5L	KS

TEST STEP		RESULT ▶	ACTION TO TAKE
KS3	CHECK KS WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the KS connector. • Measure the resistance between BOB Test Pin KS and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KS4. SERVICE the KS wire for short(s).
KS4	CHECK KNOCK SENSOR GROUND		
	• Key OFF. • Disconnect the KS connector. • Measure the resistance of the GND wire between the KS harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the knock sensor. SERVICE the GND wire for open(s).

EEC Pinpoint Tests	1.3L	MAF

Mass Air Flow (MAF) Sensor — 1.3L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 08 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

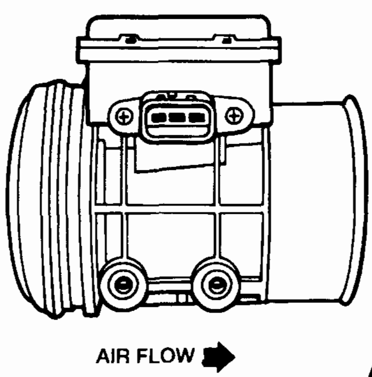
This Pinpoint Test is intended to diagnose only the following:

- Circuit: MAF

Description

The Mass Air Flow (MAF) sensor measures the amount of air flow passing into the throttle body. The internal element detects the amount of air and notifies the Powertrain Control Module (PCM) with a varying voltage input signal. This input signal helps determine injector pulse width timing.

1.3L

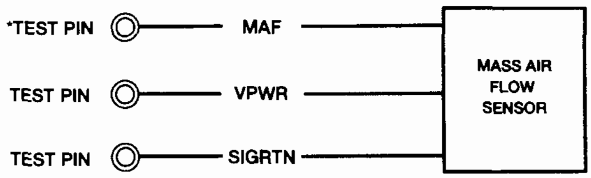


A16767-B

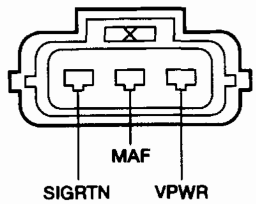
Engine	Location
1.3L	Located between the air cleaning element and the throttle body.

EEC Pinpoint Tests	1.3L	MAF

Pinpoint Test Schematic



1.3L MASS AIR FLOW SENSOR HARNESS CONNECTOR



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16728-D

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	MAF VPWR SIGRTN	2Q 1B 2C	27 37, 57 16	GN/BK Y/W BK/LG

MAF SENSOR VOLTAGE DATA SHEET

Condition	MAF Voltage (volts)
Key ON	1.0 - 1.5
Engine running	1.5 - 5.0

TEST STEP		RESULT ▶	ACTION TO TAKE
MAF1	CHECK MAF SENSOR INPUT VOLTAGE TO PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Measure the voltage between BOB Test Pin MAF and BOB Test Pin SIGRTN. • Compare the voltage readings to the MAF sensor Voltage Data Sheet under given conditions. • **Are the voltages OK?**	Yes ▶	MAF circuit OK. If directed here from Quick Test Step **QT11** in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
		No ▶	GO to **MAF2**.

EEC Pinpoint Tests	1.3L	MAF

TEST STEP		RESULT ▶	ACTION TO TAKE
MAF2	CHECK MAF WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the MAF sensor connector. • Measure the resistance of the MAF wire between BOB Test Pin MAF and the MAF terminal on the MAF sensor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to MAF3. SERVICE the MAF wire for open(s).
MAF3	CHECK MAF WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the MAF sensor connector. • Measure the resistance of the MAF wire between BOB Test Pin MAF and ground. • Measure the resistance between Test Pin MAF and Test Pin VPWR. • **Are the resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to MAF4. SERVICE the MAF wire for short(s).
MAF4	CHECK VPWR AT MAF SENSOR		
	• Key OFF. • Disconnect the MAF sensor connector. • Key ON. • Measure the voltage between MAF sensor harness connector VPWR wire and ground. • **Is the voltage approximately battery voltage?**	Yes ▶ No ▶	GO to MAF5. GO to EEC Pinpoint Test VPWR in this section. If VPWR is OK, SERVICE the VPWR wire to MAF sensor.
MAF5	CHECK GROUND AT MAF SENSOR		
	• Key OFF. • Disconnect the MAF sensor connector. • Measure the resistance between the MAF sensor harness connector GND wire and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the MAF sensor. SERVICE the MAF sensor GND wire.

EEC Pinpoint Tests	2.5L	MC-VAF

Measuring Core-Volume Air Flow (MC-VAF) Sensor — 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 08 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

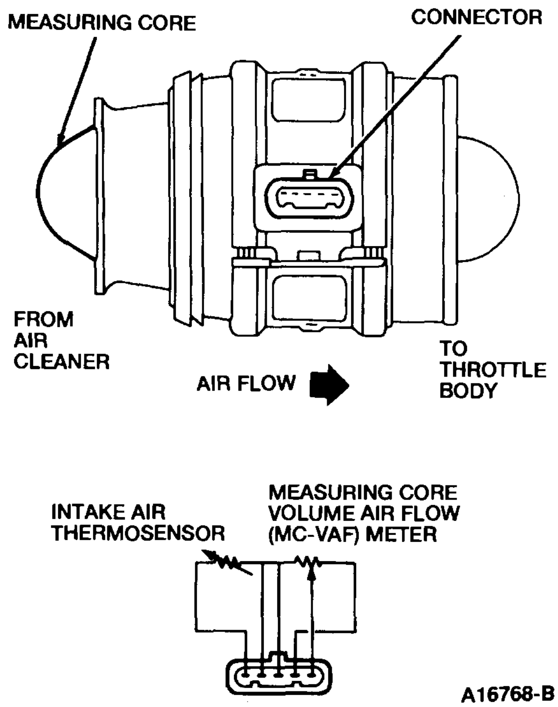
This Pinpoint Test is intended to diagnose only the following:

- Circuit: MC-VAF

EEC Pinpoint Tests	2.5L	MC-VAF

Description

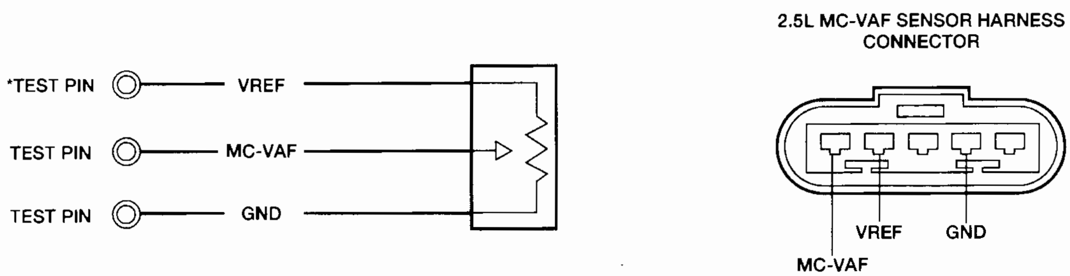
When air is passed through the Measuring Core - Volume Air Flow (MC-VAF) meter, the measuring core moves parallel to the direction of the air flow. The movement changes the resistance on a potentiometer and sends this signal to the Powertrain Control Module (PCM).



Engine	Location
2.5L	Located between the air cleaning element and the throttle body.

EEC Pinpoint Tests	2.5L	MC-VAF

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

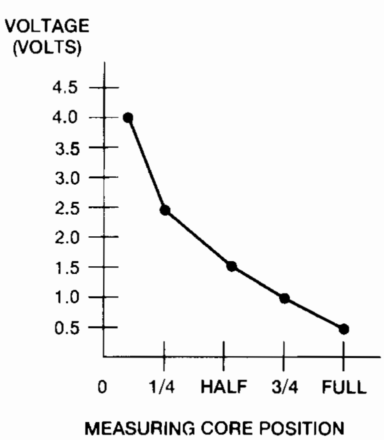
A16726-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
2.5L	MC-VAF VREF GND	2B 2I 3D	44 26 46	R P BK/BL

GRAPH



Data Values

Measuring Core Position	Voltage (Volts)
0 (No Flow)	4.0
1/4	2.4
Half	1.6
3/4	0.8
Full	0.4

NOTE: Voltage Values May Vary ± 15%.

A16727-B

EEC Pinpoint Tests | 2.5L | MC-VAF

	TEST STEP	RESULT ▶	ACTION TO TAKE
MC-VAF1	CHECK MC-VAF SENSOR INPUT VOLTAGE TO PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Access the MC-VAF sensor in the air cleaner assembly. • Key ON. • Measure the voltage between BOB Test Pin MC-VAF and BOB Test Pin GND. • Compare the voltages with the data values given in the chart while moving the measuring core by hand. • **Are the voltages OK?**	Yes ▶ No ▶	MC-VAF circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. GO to MC-VAF2.
MC-VAF2	CHECK VREF AT MC-VAF SENSOR		
	• Key OFF. • Disconnect the MC-VAF sensor connector. • Key ON. • Measure the voltage on the VREF wire at the MC-VAF sensor harness connector. • **Is the voltage between 4.5-5.5 volts?**	Yes ▶ No ▶	GO to MC-VAF3. GO to EEC Pinpoint Test VREF in this section.
MC-VAF3	CHECK MC-VAF WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the MC-VAF sensor connector. • Measure the resistance between BOB Test Pin MC-VAF and the MC-VAF wire on the MC-VAF harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to MC-VAF4. SERVICE the MC-VAF wire for open(s).
MC-VAF4	CHECK MC-VAF WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the MC-VAF sensor connector. • Measure the resistance between BOB Test Pin MC-VAF and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to MC-VAF5. SERVICE the MC-VAF wire for short(s).
MC-VAF5	CHECK MC-VAF SENSOR GROUND		
	• Key OFF. • Disconnect the MC-VAF sensor connector. • Measure the resistance between BOB Test Pin GND and the GND wire at the MC-VAF harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the MC-VAF sensor. SERVICE the MC-VAF sensor GND wire.

EEC Pinpoint Tests	All Engines	MIL

Malfunction Indicator Lamp (MIL)

Note

You should enter this Pinpoint Test only when the Service Manual or Quick Test directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

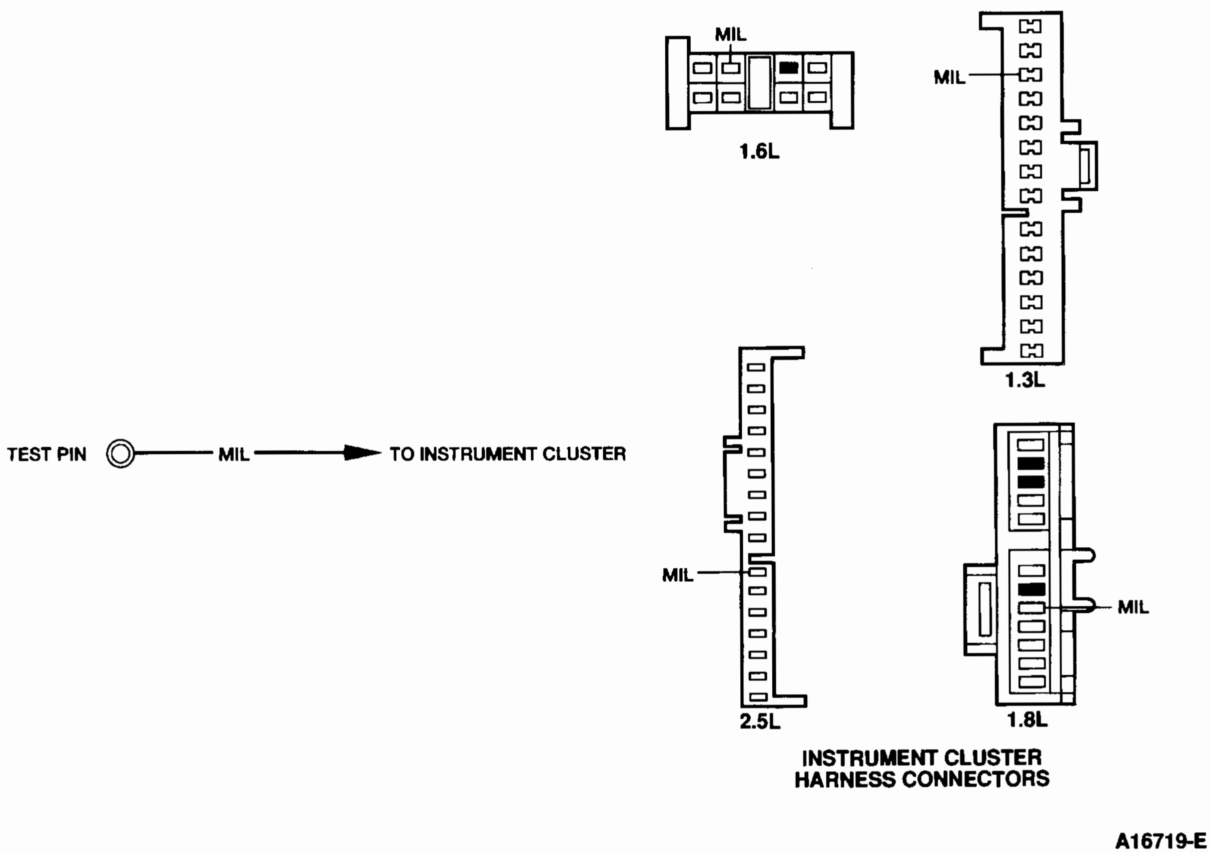
- Circuit: MIL

Description

The Malfunction Indicator Lamp (MIL) provides the vehicle's operator with a visual warning in the occurrence of an electrical / emissions failure in the powertrain control system. The MIL can be used to retrieve diagnostic trouble codes from the Powertrain Control Module (PCM) which indicate those circuits that have a fault. The MIL is indicated as the CHECK ENGINE lamp in the instrument cluster.

EEC Pinpoint Tests	All Engines	MIL

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	MIL	1E	15	BL
1.6L	MIL	1A	51	Y/BK
1.8L	MIL	1E	51	Y/BK
2.5L	MIL	1E	51	BL

EEC Pinpoint Tests	All Engines	MIL

TEST STEP		RESULT ▶	ACTION TO TAKE
MIL1	CHECK MIL OPERATION		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key ON. • Ground BOB Test Pin MIL. • **Does Malfunction Indicator Lamp (CHECK ENGINE lamp) illuminate?**	Yes ▶	MIL circuit OK. If diagnostic trouble codes do not flash on MIL during Quick Test or MIL never comes on, REPLACE the PCM.
		No ▶	GO to MIL2.
MIL2	CHECK MIL BULB		
	• Key OFF. • Remove the instrument cluster. • Remove the MIL (CHECK ENGINE lamp) bulb. • Apply 12 volts between the terminals of the MIL (CHECK ENGINE lamp) bulb. • **Does the MIL (CHECK ENGINE lamp) illuminate?**	Yes ▶	GO to MIL3.
		No ▶	REPLACE the MIL (CHECK ENGINE lamp) bulb.
MIL3	CHECK MIL WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the instrument cluster connector: — 14-pin black connector on 1.3L — 12-pin connector on 1.8L — 8-pin connector on 1.6L — 16-pin connector on 2.5L • Measure the resistance between BOB Test Pin MIL and the MIL terminal at the instrument cluster harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶	GO to MIL4.
		No ▶	SERVICE the MIL wire for open.
MIL4	CHECK MIL WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the instrument cluster connector: — 14-pin black connector on 1.3L — 12-pin connector on 1.8L — 8-pin connector on 1.6L — 16-pin connector on 2.5L • Measure the resistance between BOB Test Pin MIL and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶	REPLACE the instrument cluster printed circuit board.
		No ▶	SERVICE the MIL wire for short.

EEC Pinpoint Tests	1.3L 1.6L 1.8L	O2S

Oxygen Sensor (O2S) — 1.3L, 1.6L, 1.8L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 15 or 17 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Special Note

A code 15 indicates a continuously lean condition while code 17 indicates a continuously rich condition.

Remember

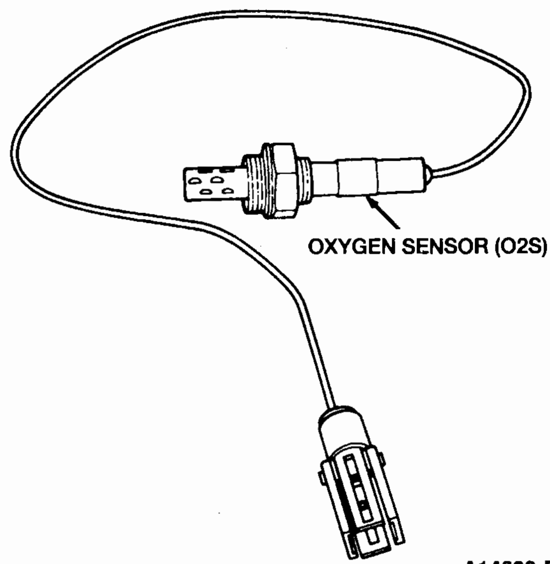
This Pinpoint Test is intended to diagnose only the following:

- Circuit: O2S

EEC Pinpoint Tests	1.3L 1.6L 1.8L	O2S

Description

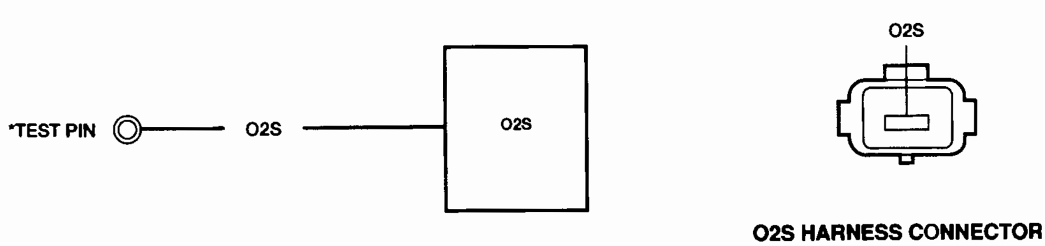
The Oxygen Sensor (O2S) generates and supplies a signal to the Powertrain Control Module (PCM) which reflects oxygen content in the exhaust system. The oxygen content in the exhaust gas reflects whether the fuel mixture is rich or lean. The PCM uses this information to regulate the fuel injectors for the proper air / fuel mixture.



A14609-B

Engine	Location
1.3L, 1.6L, 1.8L	Threaded into exhaust manifold.

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A14125-C

EEC Pinpoint Tests	1.3L 1.6L 1.8L	O2S

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	O2S	2N	29	W
1.6L	O2S	2D	29	BK
1.8L	O2S	2C	29	R/BL

TEST STEP	RESULT ▶	ACTION TO TAKE
O2S1 CHECK O2S VOLTAGE		
• Engine at normal operating temperature. • Key OFF. • Disconnect O2S connector. • Measure the voltage on the O2S wire at the O2S connector with Key ON and engine running as shown below:	Yes ▶	GO to O2S2.
	No ▶	GO to O2S3.

Condition	Voltage
Increasing engine speed	Increases
Decreasing engine speed	Decreases
Engine at idle	0.2-0.8 volts

NOTE: Voltage that remains above 0.55 volts indicates a continuously rich condition while below 0.55 volts indicates a continuously lean condition.

NOTE: Rich or lean conditions could be an indication of another problem.

- **Are the voltages OK?**

TEST STEP	RESULT ▶	ACTION TO TAKE
O2S2 CHECK O2S CIRCUIT ISOLATION		
• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the O2S connector. • Measure the resistance between BOB Test Pin O2S and the O2S wire at the O2S connector. • **Is the resistance less than 5 ohms?**	Yes ▶	O2S circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
	No ▶	SERVICE the O2S wire to the PCM.

EEC Pinpoint Tests	1.3L 1.6L 1.8L	O2S

TEST STEP		RESULT ▶	ACTION TO TAKE
O2S3	CHECK O2S CIRCUIT FOR SHORTS		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the O2S connector. • Measure the resistance between BOB Test Pin O2S and ground (should read greater than 10,000 ohms). • Key ON. • Measure the voltage on BOB Test Pin O2S (should be 0V). • **Are the measurements correct?**	Yes ▶ No ▶	REPLACE the O2S. SERVICE the O2S wire to the PCM.

EEC Pinpoint Tests	All Engines	PGC

Power and Ground Connections (PGC)

Note

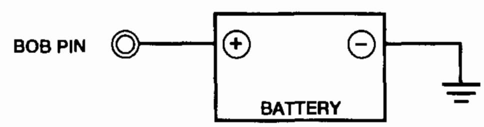
You should enter this Pinpoint Test only when Quick Test Step 11, EEC Pinpoint Test VREF or STO in this section, or 4EAT Pinpoint Test VREF in this section directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: KAPWR, GND

Power Connection



A14159-B

Ground Connection

A14158-A

EEC Pinpoint Tests	All Engines	PGC

Data Sheet

CIRCUIT DATA SHEET

Circuit	Abbrev.	Engine	PCM Pin	BOB Pin	PCM Wire Color	Connection To
Keep Alive Power	KAPWR	1.3L	1A	1	BL/R	(Battery +)
		1.6L	3J	1	BL/R	
		1.8L	1A	1	BL/R	
		2.5L	1A	1	BL/R	
Ground	GND	1.3L	2A	39, 40, 44, 60	BK/O	Ground
			2B	20	BK/O	
			2C	16	BK/LG	
		1.6L	2R	49	BK	
			3A	20	BK	
			3G	40	BK	
		1.8L MTX	2A	39, 40, 44, 60	BK/O	
			2B	20	BK/O	
			2C	16	BK/LG	
		1.8L 4EAT	3A	40, 60	BK/O	
			3B	20	BK/O	
			3C	49	BK/LG	
		2.5L	3A	40, 60	BK	
			3B	20	BK	
			3C	49	BK/R	
			3D	46	BK/BL	
		2.5L MTX	1U	39	BK	
Manual/Automatic Transaxle Applications	MT/AT (GND)	1.3L MTX	1G	36	BK	Ground
		1.6L MTX	2R	43	BK	Ground
Canada/California Applications	CAN/CAL	1.8L MTX Canada	2H	51	BK/Y	12 volts
		1.8L MTX Calif.	2H	51	BK	Ground
		1.8L 4EAT Canada	1K	19	BK/Y	12 volts
		1.8L 4EAT Calif.	1K	19	BK	Ground

TEST STEP	RESULT ▶	ACTION TO TAKE
PGC1 CHECK VOLTAGE		
• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key OFF. • Measure the voltage on BOB Test Pin KAPWR. • **Is the voltage approximately battery voltage?**	Yes ▶ No ▶	GO to **PGC2**. SERVICE the wire in question.

EEC Pinpoint Tests	All Engines	PGC

TEST STEP		RESULT ▶	ACTION TO TAKE
PGC2	CHECK GROUNDS		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin GND and ground. Repeat for each BOB Test Pin GND to ground. • **Are the resistances less than 5 ohms?**	Yes ▶	If sent here from EEC Pinpoint Test VREF or STO or 4EAT Pinpoint Test VREF in this section, REPLACE the PCM. Otherwise, RETURN to Section 2B, Diagnostic Routines.
		No ▶	SERVICE the wire in question.

EEC Pinpoint Tests	All Engines	ROC

Relay Output Check (ROC)

Note

You should enter this Pinpoint Test only when diagnostic trouble code 67 Low Cooling Fan Relay (LFAN) is received in Quick Test Step 7 or 8, or when Quick Test Step 11, or Group 03, 12, or 13 of the Service Manual directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

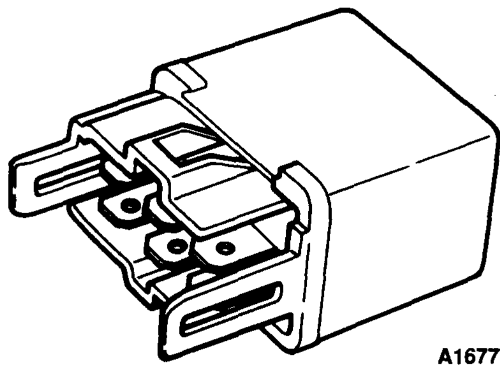
- Circuits: ACR (A/C Relay), FPR (Fuel Pump Relay), CFAN (Condenser Fan Relay), HCFAN (High Condenser Fan Relay), HFAN (High Cooling Fan Relay), LCFAN (Low Condenser Fan Relay), LFAN (Low Cooling Fan Relay), WAC (Wide-Open Throttle A/C Cutoff Relay)

EEC Pinpoint Tests	All Engines	ROC

Description

The A / C Relay (ACR) is controlled by the Powertrain Control Module (PCM) with an output signal. The signal acts as a circuit on / off switch for the compressor magnetic clutch. The PCM will cut off the ACR during wide open throttle conditions, thus the relay is sometimes referred to as the Wide open throttle Air conditioning Cutoff (WAC) relay.

A / C Relay



A16777-A

Engine	Location
1.3L	Located under the LH side of the instrument panel.
1.6L	Behind the LH strut assembly.
1.8L	RH side of cowl panel.
2.5L	In main fuse panel, front of LH strut assembly.

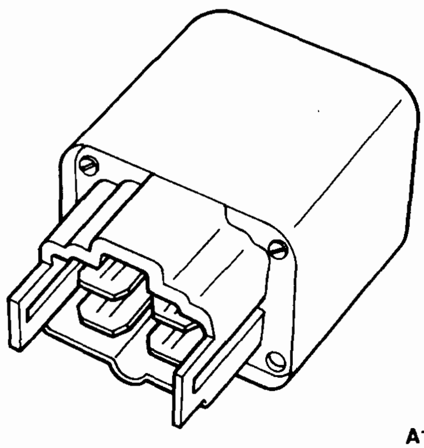
EEC Pinpoint Tests	All Engines	ROC

The Fuel Pump Relay (FPR) supplies voltage to the fuel pump when activated.

On 1.6L and 1.8L vehicles, the FPR is activated when the ignition switch is turned to the START position and remains activated while the engine is running by the fuel pump switch in the Volume Air Flow (VAF) meter.

On the 1.3L and 2.5L vehicles, the FPR is controlled by the PCM and is activated while the engine is cranking and running.

Fuel Pump Relay

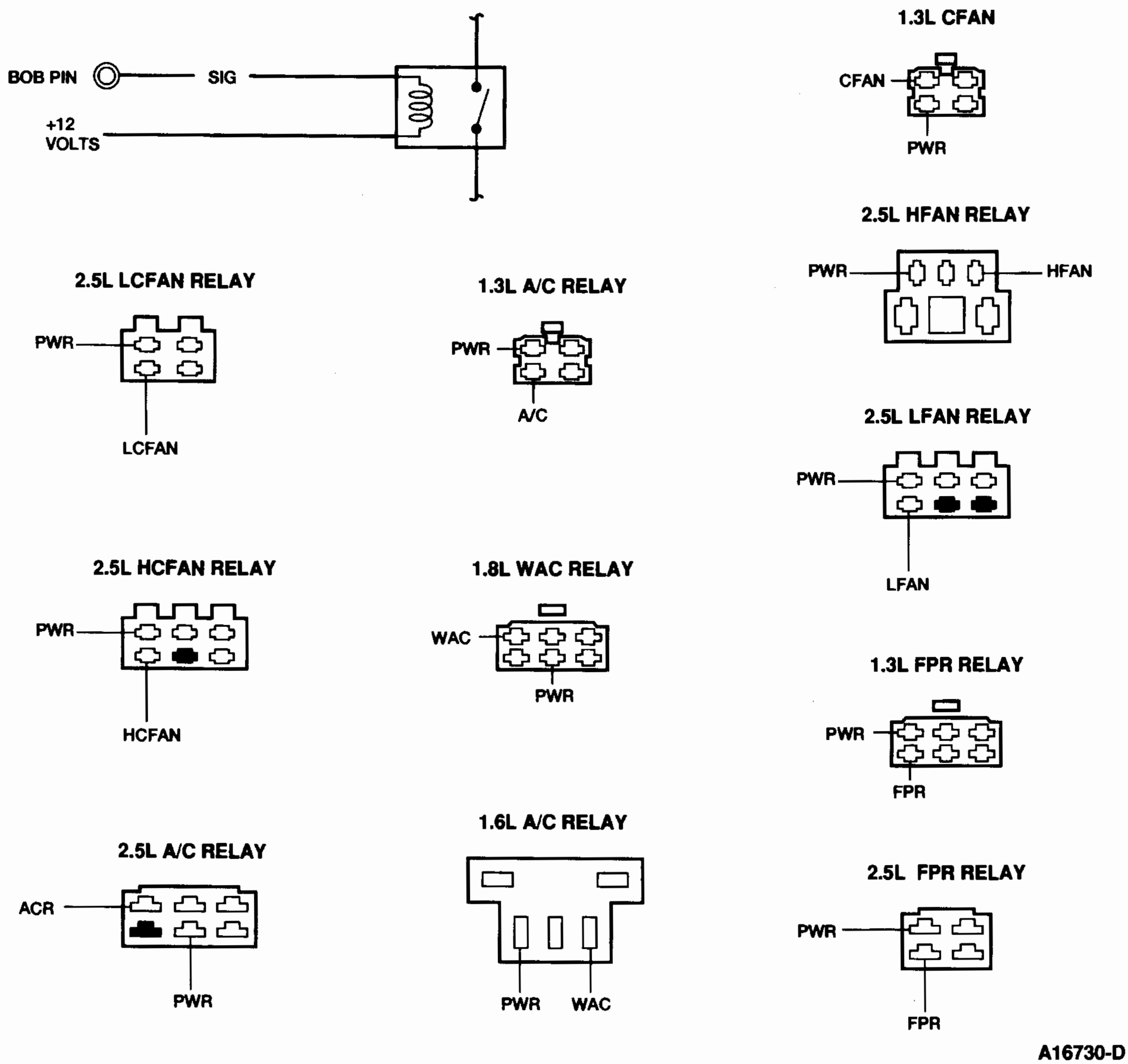


A16829-A

Engine	Location
1.3L	Located under the LH side of the instrument panel.
1.6L, 1.8L	Located forward of the center console near PCM.
2.5L	Located in the main fuse panel.

EEC Pinpoint Tests	All Engines	ROC

Pinpoint Test Schematic



Data Sheet

NOTE: The Breakout Box Adapter T92C-6000-AH has an A / B position selector switch. Make sure that the switch is in the correct position for each test step, as specified in the Circuit Data Sheet. If no switch position is given then the switch can be in either position.

EEC Pinpoint Tests	All Engines	ROC

CIRCUIT DATA SHEET

Relay (SIG)	Engine	PCM Pin	BOB Pin	Wire Color	Function
ACR (A/C Relay)	1.3L 1.6L 2.5L	1J 1F 1L	54 30 10	BL/O W GN/BK	PCM grounds ACR wire to turn on A/C system, when A/C is selected.
FPR (Fuel Pump Relay)	1.3L 2.5L	1H 3T	55 52B	W/Y LG	PCM grounds FPR wire to turn on Fuel Pump while cranking engine or while engine is running.
CFAN (Condenser Fan Relay)	1.3L	2P	45	LG	PCM grounds CFAN wire to turn on Condenser Fan.
HCFAN (High Condenser Fan Relay)	2.5L	2P	54	BL/GN	PCM grounds HCFAN wire to turn on High Condenser Fan.
HFAN (High Cooling Fan Relay)	2.5L	2P	54	BL/GN	PCM grounds HFAN wire to turn on High Cooling Fan.
LCFAN (Low Condenser Fan Relay)	2.5L	3N	53A	BL/O	PCM grounds LCFAN wire to turn on Low Condenser Fan.
LFAN (Low Cooling Fan Relay)	2.5L	3L	55	R/W	PCM grounds LFAN wire to turn on Low Cooling Fan.
WAC (Wide-Open Throttle A/C Cutoff Relay)	1.8L MTX 1.8L 4EAT	1J 1L	54 10	BL/BK BL/BK	PCM opens ground to cutoff A/C clutch during start and wide open throttle driving.

NOTE: Boxed BOB Pin numbers indicate that the position switch on the adapter needs to be positioned as indicated (A or B).

TEST STEP	RESULT ▶	ACTION TO TAKE
ROC1 PERFORM RELAY CLICK TEST		
WARNING: FANS WILL OPERATE WHEN CFAN, HCFAN, HFAN, LCFAN, OR LFAN ARE GROUNDED. ● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Locate the relay in question. ● Key ON. ● Feel and/or listen to relay in question while grounding relay BOB Test Pin. ● **Does relay click?**	Yes ▶	If sent here from Quick Test Step QT6 or QT7, REPLACE the PCM. If sent here from Quick Test Step QT11, RETURN to Section 2B, Diagnostic Routines.
	No ▶	GO to ROC2.
ROC2 CHECK RELAY WIRE TO PCM FOR OPEN		
● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Disconnect the relay in question. ● Measure the resistance between relay BOB Test Pin and relay terminal to PCM at relay harness connector. ● **Is the resistance less than 5 ohms?**	Yes ▶	GO to ROC3.
	No ▶	SERVICE the wire in question for opens.

EEC Pinpoint Tests	All Engines	ROC

TEST STEP		RESULT ▶	ACTION TO TAKE
ROC3	CHECK RELAY WIRE TO PCM FOR SHORT		
	NOTE: When checking HFAN or HCFAN relays you must disconnect both the HFAN relay and the HCFAN relay. ● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Disconnect the relay in question. ● Measure the resistance between relay BOB Test Pin and ground. ● **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to ROC4. SERVICE the wire in question for shorts.
ROC4	CHECK POWER TO RELAY IN QUESTION		
	● Key OFF. ● Disconnect the relay in question. ● Key ON. ● Measure the voltage on PWR wire at relay harness connector. ● **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	REPLACE the relay in question. SERVICE the PWR wire in question.

EEC Pinpoint Tests	All Engines	SCG

Solenoid Controlled By Ground (SCG)

Note

You should enter this Pinpoint Test only when a diagnostic trouble code 25, 26, 28, 29, 34, 41, or 46 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

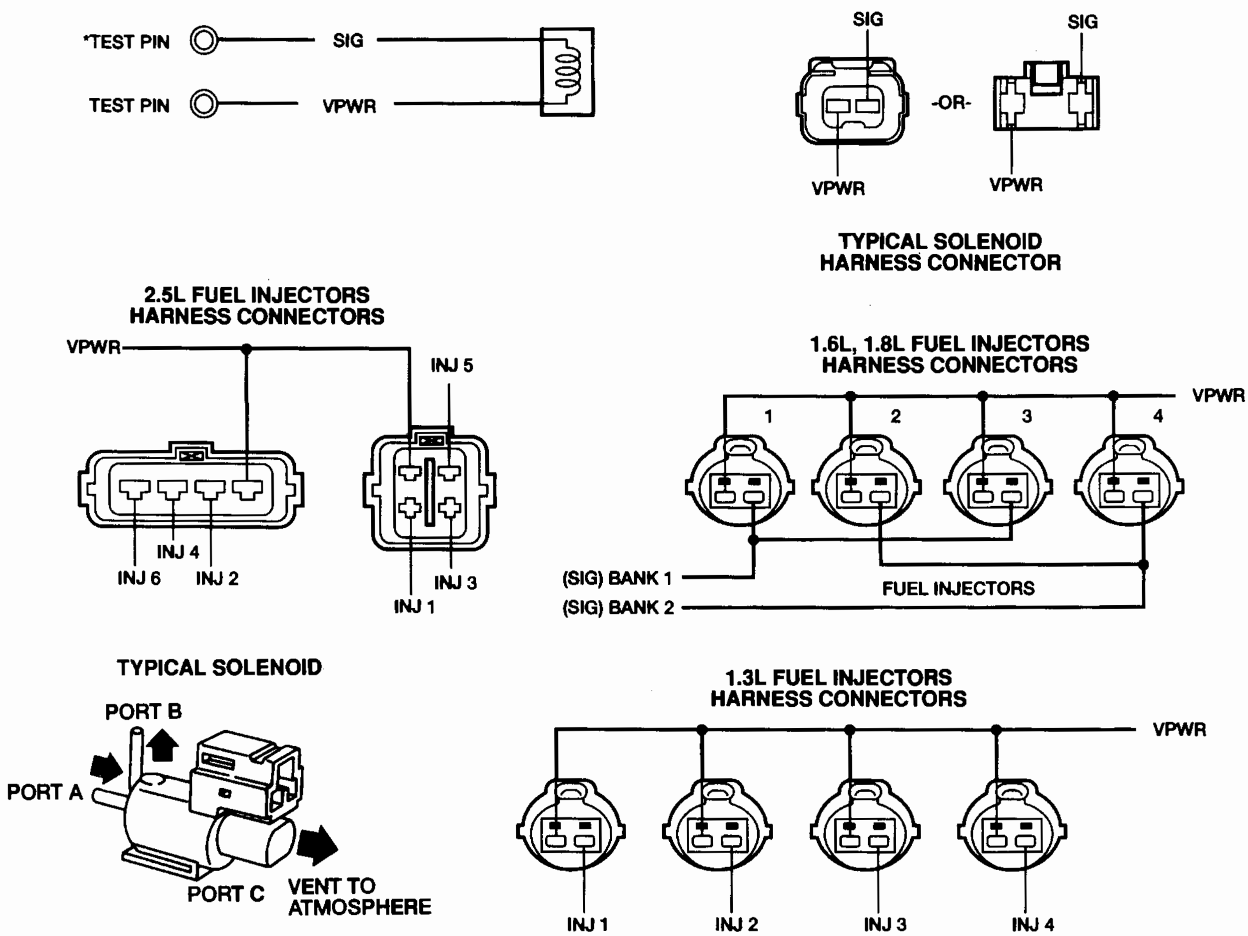
Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: CANP (Canister Purge), EGRC (EGR Control), EGRV (EGR Vent), EVR (EGR Vacuum Regulator), FPRC (Fuel Pressure Regulator Control), HSIA (High Speed Inlet Air Control), IAC (Idle Air Control), INJ (Injectors), VRIS1 (Variable Resonance Induction System Solenoid #1), VRIS2 (Variable Resonance Induction System Solenoid #2)

EEC Pinpoint Tests	All Engines	SCG

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16720-E

Data Sheet

NOTE: The Breakout Box Adapter T92C-6000-AH has an A / B position selector switch. Make sure that the switch is in the correct position for each test step, as specified in the Circuit Data Sheet. If no switch position is given then switch can be in either position.

EEC Pinpoint Tests	All Engines	SCG

CIRCUIT DATA SHEET

Engine	SIG	PCM Pin	BOB Pin	Wire Color	Diagnostic Trouble Code
1.3L	CANP	2X	31	R/BL	NA
	INJ1	2U	58	GN/Y	NA
	INJ2	2V	59	GN/BK	NA
	INJ3	2Y	33	GN/R	NA
	INJ4	2Z	8	GN/BL	NA
	IAC	2W	41	R/W	NA
	EGRV	2R	13	BL	NA
	EGRC	2S	53	R/Y	NA
1.6L	CANP	2P	32	Y	26
	IAC	2Q	41	GN	34
	FPRC	2K	31	BR	25
	BANK1	3E	58	Y	—
	BANK2	3C	59	Y/BK	—
1.8L MTX	CANP	2X	31	W/BL	26
	IAC	2W	41	BL/O	34
	HSIA	2S	53	BK/R	41
	FPRC	2T	11	GN/O	25
	BANK1	2U	58	Y	—
	BANK2	2V	59	Y/BK	—
1.8L 4EAT	CANP	2O	31	W/BL	26
	IAC	3Q	$\boxed{21B}$	BL/O	34
	HSIA	3I	42	BK/R	41
	FPRC	3M	$\boxed{21A}$	GN/O	25
	BANK1	3U	58	Y	—
	BANK2	3V	59	Y/BK	—
2.5L	FPRC	3M	$\boxed{21A}$	GN/BK	25
	CANP	2O	31	BL/BK	26
	EGRC	3P	$\boxed{52A}$	GN/W	28
	EGRV	3O	$\boxed{33A}$	W/BL	29
	INJ1	3U	58	R/LG	NA
	INJ2	3V	59	BL/W	NA
	INJ3	3W	12	BR	NA
	INJ4	3X	13	R/Y	NA
	INJ5	3Y	14	W	NA
	INJ6	3Z	15	W/BK	NA
	IAC	3Q	$\boxed{21B}$	LG/BK	34
	VRIS1	3I	42	W/GN	41
	VRIS2	3J	35	BL/R	46
	VPWR[1]	1B	37, 57	R/BK	NA

[1]VPWR is a "W/R" wire to the fuel injectors.

NOTE: Boxed BOB Pin numbers indicate that the position switch on the adapter need to be positioned as indicated (A or B).

EEC Pinpoint Tests

All Engines | **SCG**

SOLENOID DATA SHEET

Solenoid	Activated by: (PCM ground solenoid under these conditions)	*Click Test Method
INJ (Fuel Injectors)	Cranking or running engine.	• Connect PCM. Key ON, crank engine. Listen to injector (clicking sound) with stethoscope.
CANP (Canister Purge)	Vehicle in gear, operating temperature above 60°C (140°F) during cruise and acceleration.	• Key ON, apply vacuum from intake manifold, vacuum should hold. • Ground Test Pin with jumper, vacuum should release.
EGRC (EGR Control)	Engine coolant temperature above 40°C (104°F). EGRC: normal driving (cruising)	• Key ON, apply vacuum from intake manifold. Vacuum should hold. • Ground Test Pin, vacuum should release.
EGRV (EGR Vent)	Engine coolant temperature above 40°C (104°F). EGRV: during idle, deceleration, or wide open throttle conditions	• Key ON, apply vacuum from EGR valve. Vacuum should not hold. • Ground Test Pin, vacuum should hold.
VRIS (Variable Resonance Induction System)	Engine at low speed, low vacuum condition.	• Disconnect hoses at solenoid. Verify air flow between ports on the solenoid. Refer to diagram of ports shown in the electrical schematic. **Ports** **Air Flow** A-B No A-C No B-C Yes • Key ON. Ground Test Pin. Verify air flow between ports on the solenoid. **Ports** **Air Flow** A-B Yes A-C No B-C No
FPRC (Fuel Pressure Regulator Control	Engine running, coolant temperature above 90°C (190°F) for 1.6L and 1.8L or 70°C (158°F) for 2.5L, intake air temperature above 20°C (68°F), engine speed less than 1,500 rpm (for approx. 2 minutes after start).	• Key ON, apply vacuum to nipple from intake manifold. Vacuum should hold. • Ground Test Pin, vacuum should slowly release as ground is applied intermittently.
IAC (Idle Air Control)	Cranking and running engine.	• Disconnect the PCM. • Key ON. • Ground Test Pin intermittently. • Listen for IAC solenoid (clicking sound).
HSIA (High Speed Inlet Air Control)	Engine speed below 5,000 rpm.	• Key ON, apply vacuum to nipple from reservoir. Vacuum should hold. • Ground Test Pin. Vacuum should release.

* Install Breakout Box, leave PCM disconnected for all Click Tests (except the injector Click Test).

EEC Pinpoint Tests

All Engines | **SCG**

TEST STEP		RESULT ▶	ACTION TO TAKE
SCG1	CHECK SOLENOID FUNCTION		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Check for proper function of solenoid in question as described in the Data Sheet "Click Test Method" column. • **Does the solenoid in question function properly?**	Yes ▶ No ▶	Solenoids OK. If directed here by Quick Test Step QT6 or QT7, REPLACE the PCM. If directed here by Quick Test Step QT11, RETURN to Section 2B, Diagnostic Routines. GO to SCG2.
SCG2	CHECK POWER TO SOLENOID		
	• Key OFF. • Disconnect the connector of the solenoid in question. • Key ON. • Measure the voltage on the VPWR wire at the solenoid harness connector. • **Is the voltage approximately battery voltage?**	Yes ▶ No ▶	GO to SCG3. GO to EEC Pinpoint Test VPWR in this section. If VPWR is OK, SERVICE the VPWR wire to solenoid.
SCG3	CHECK SOLENOID WIRE TO PCM FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the connector of the solenoid in question. • Measure the resistance between the solenoid BOB Test Pin and the terminal at the solenoid harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to SCG4. SERVICE the solenoid wire to PCM for opens.
SCG4	CHECK SOLENOID WIRE TO PCM FOR SHORTS		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the connector of the solenoid in question. • Measure the resistance between the solenoid BOB Test Pin and ground. • Key ON. • Measure the voltage on the solenoid BOB Test Pins. • **Are the resistances greater than 10,000 ohms between the solenoid BOB Test Pins and ground, and the voltage less than 1 volt on the solenoid BOB Test Pins?**	Yes ▶ No ▶	REPLACE the solenoid. SERVICE the solenoid wire to PCM for shorts.

EEC Pinpoint Tests	1.3L MTX	SIL

Shift Indicator Lamp (SIL) — 1.3L MTX

Note

You should enter this Pinpoint Test only when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: SIL

Pinpoint Test Schematic

Data Sheet

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	SIL	1T	30	BL / W

TEST STEP		RESULT	ACTION TO TAKE
SIL 1	CHECK SHIFT SIGNAL		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key ON. • Ground BOB Test Pin SIL. • **Does Shift Indicator Lamp (SIL) illuminate in gears 1, 2, 3, and 4, and not illuminate in gears R and 5?**	Yes ▶	SIL circuit OK. If directed here from Quick Test Step QT11, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
		No ▶	GO to SIL2.

EEC Pinpoint Tests	1.3L MTX	SIL

TEST STEP		RESULT ▶	ACTION TO TAKE
SIL2	CHECK 5TH/R GEAR SWITCH		
	• Key OFF. • Disconnect the 5th/R gear switch connector. • Measure the resistance between the terminals of the 5th/R gear switch under the following conditions: Gear: 1, 2, 3 or 4 — Resistance: Less than 5 ohms Gear: 5 or R — Resistance: Greater than 10,000 ohms • **Are the resistances correct?**	Yes ▶ No ▶	GO to SIL3. REPLACE the 5th/R gear switch.
SIL3	CHECK SIL WIRE		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Locate and disconnect the 5th/R gear switch. • Measure the resistance of the SIL wire between BOB Test Pin SIL and the 5th/R gear switch. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to SIL4. SERVICE the SIL wire.
SIL4	CHECK WIRE BETWEEN 5TH/R GEAR SWITCH AND INSTRUMENT CLUSTER		
	• Key OFF. • Disconnect the 5th/R gear switch connector. • Locate and disconnect the black instrument cluster connector. • Measure the resistance of the "P" wire between the 5th/R gear switch connector and the black instrument cluster connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REFER to Service Manual Section 13-01, to SERVICE the SIL bulb or instrument cluster printed circuit board. SERVICE the "P" wire.

Gear	Resistance
1, 2, 3 or 4	Less than 5 ohms
5 or R	Greater than 10,000 ohms

EEC Pinpoint Tests	All Engines	SML

Switch Monitor Lamp (SML)

Note

You should enter this Pinpoint Test only when Quick Test Step 9 directs you here. The Switch Monitor Lamp is located on the SUPER MECS adapter.

Remember

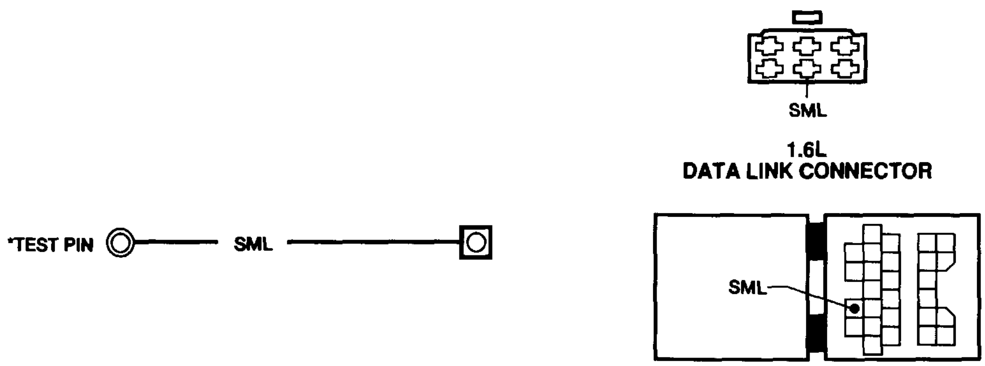
This Pinpoint Test is intended to diagnose only the following:

- Circuit: SML

Description

The Switch Monitor Lamp (SML) is used to check vehicle switches during switch monitor tests.

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16721-D

EEC Pinpoint Tests	All Engines	SML

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	SML	1D	38	BL/BK
1.6L	SML	1D	38	BK/BL
1.8L	SML	1D	38	W/Y
2.5L	SML	1D	38	W/R

TEST STEP		RESULT ▶	ACTION TO TAKE
SML1	CHECK SML WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin SML and data link connector SML terminal. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to SML2. SERVICE the data link connector SML wire to PCM for opens.
SML2	CHECK SML WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin SML and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	TEST the SML bulb. If OK, REPLACE the PCM. Otherwise, REPLACE the SML bulb. SERVICE the PCM SML wire to data link connector for shorts.

EEC Pinpoint Tests	All Engines	STG

Switch To Ground (STG)

Note

You should enter this Pinpoint Test only when the Switch Monitor Test Chart in Quick Test, or Quick Test Step 11, or Service Manual directs you here.

Remember

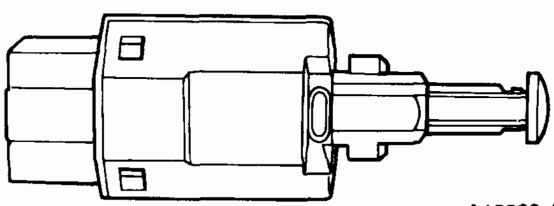
This Pinpoint Test is intended to diagnose only the following:

- Circuits: ACS (A / C On-Off Switch), BPS (Boost Pressure Switch), BLMT (Blower Motor Control Switch), CCPS (Clutch Cycling Pressure Switch), CPP (Clutch Pedal Position Switch), FAN (Cooling Fan Switch), HPS (High Pressure Switch), IDL (Idle Switch), PNP (Park / Neutral Position Switch), PSP (Power Steering Pressure Switch), DEF (Rear Window Defroster Switch), WOT (Wide-Open Throttle Switch)

Description

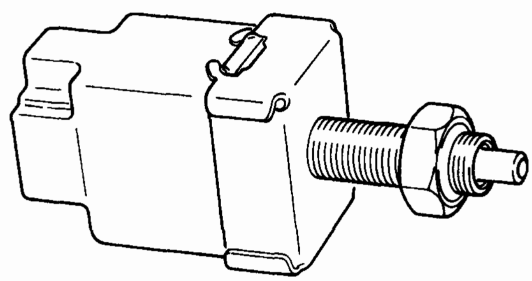
The Clutch Pedal Position (CPP) switch detects when the clutch pedal is depressed and signals the Powertrain Control Module (PCM) with input information.

2.5L MTX



A16839-A

1.3L MTX, 1.6L MTX, 1.8L MTX



A14607-B

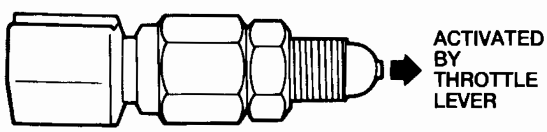
Engine	Location
1.3L MTX, 1.6L MTX, 1.8L MTX, 2.5L MTX	Mounted at the top of the clutch pedal.

EEC Pinpoint Tests	All Engines	STG

When the throttle plate is closed, an idle condition occurs. The Idle (IDL) switch detects this position and notifies the PCM with an input signal, so adjustments to the engine can be made including air / fuel ratio and idle speed.

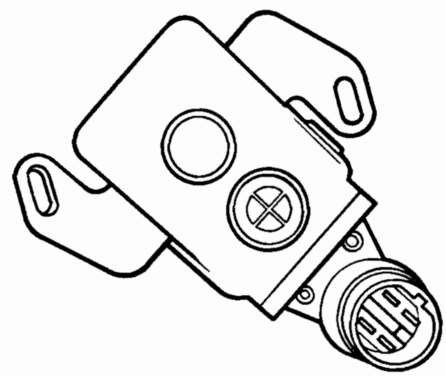
NOTE: The idle switch is integrated into the throttle position sensor for the 1.6L, 1.8L, and 2.5L engines.

1.3L



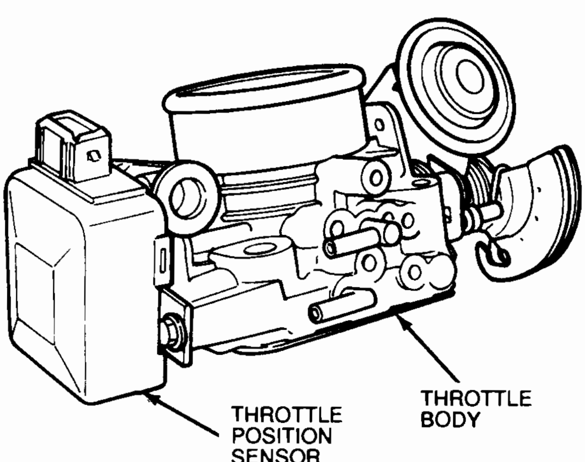
A16827-C

1.6L



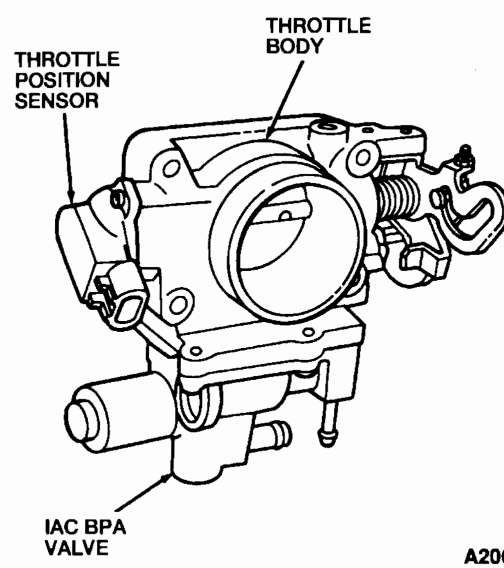
A14768-A

1.8L



A13924-A

2.5L

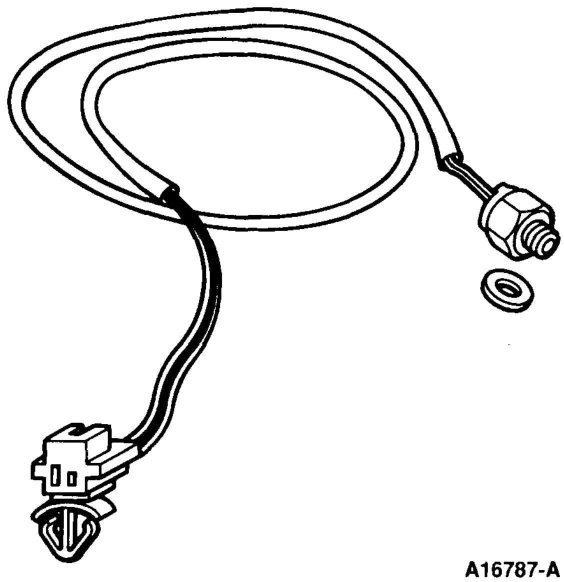


A20695-A

Engine	Location
1.3L	Mounted to the throttle body.
1.6L, 1.8L, 2.5L	Integrated in the throttle position sensor.

EEC Pinpoint Tests	All Engines	STG

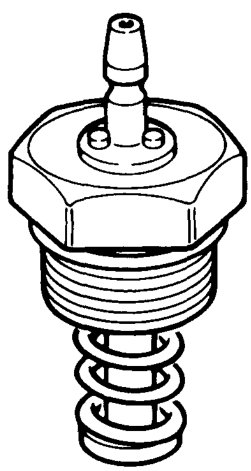
The Park / Neutral Position (PNP) switch detects whether the vehicle is in the NEUTRAL position. The switch informs the PCM of the transaxle's present condition.



A16787-A

Engine	Location
1.3L, 1.6L, 1.8L, 2.5L	Threaded to the transaxle, on the bottom RH side (MTX only).

When the power steering fluid pressure exceeds the preset limit, the Power Steering Pressure (PSP) switch sends an input signal to the PCM which then adjusts idle speed.

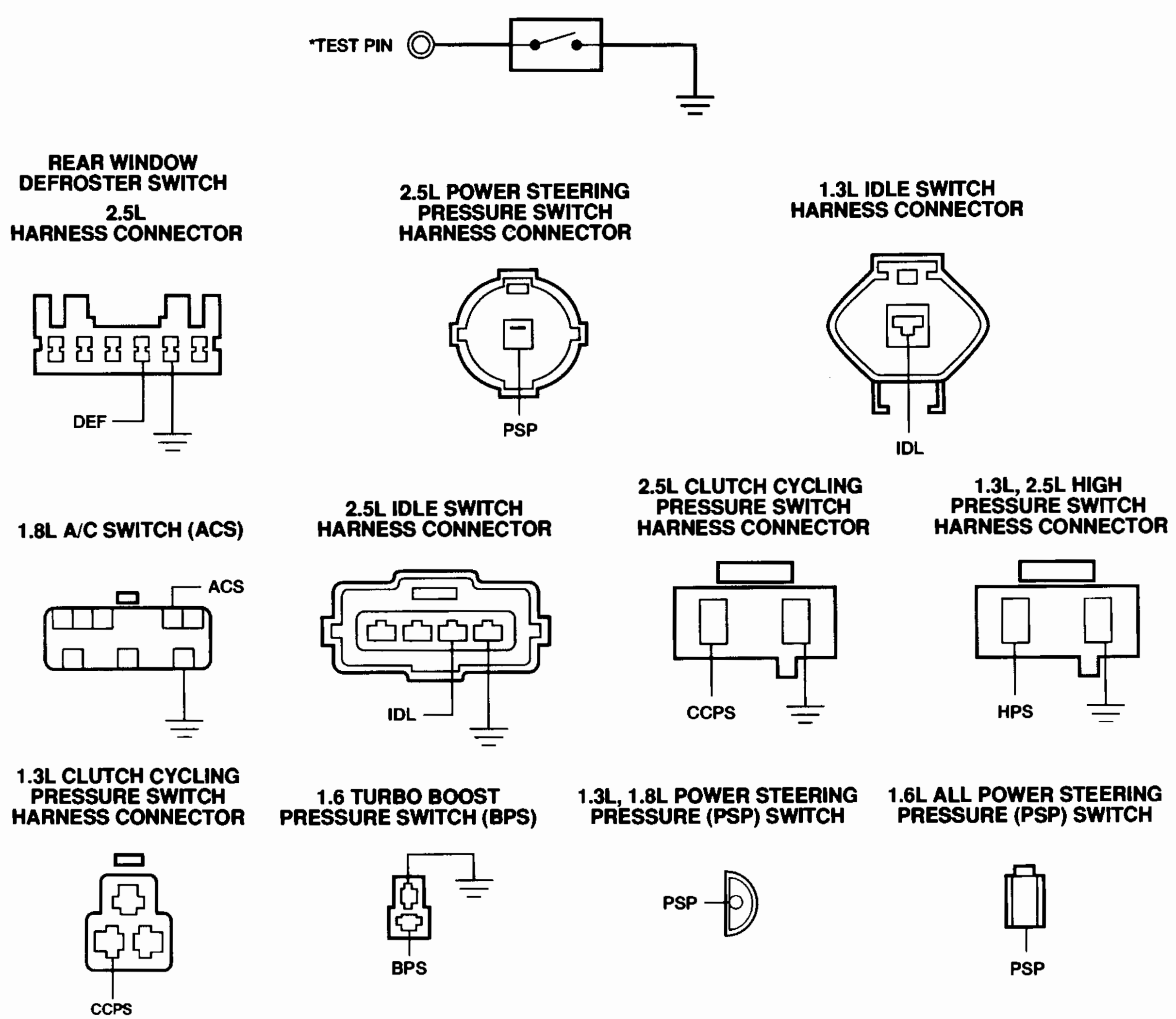


A13862-A

Engine	Location
1.3L, 1.6L, 1.8L, 2.5L	Threaded into the power steering pump.

EEC Pinpoint Tests	All Engines	STG

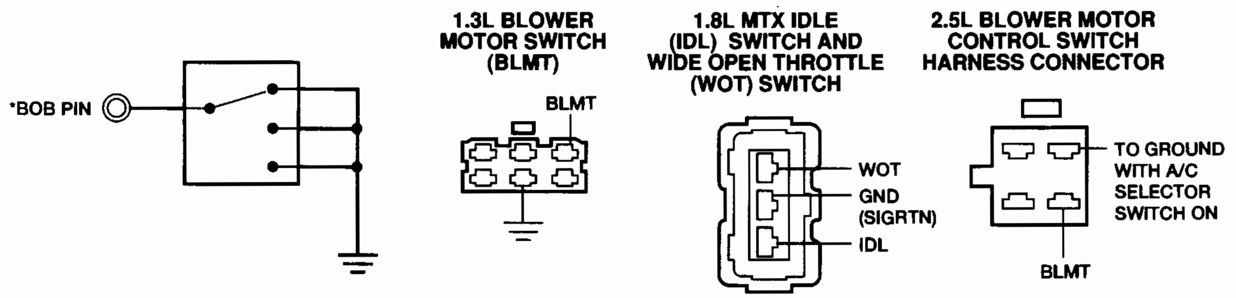
Pinpoint Test Schematic



* TEST PINS ARE SPECIFIED IN THE CHART. ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

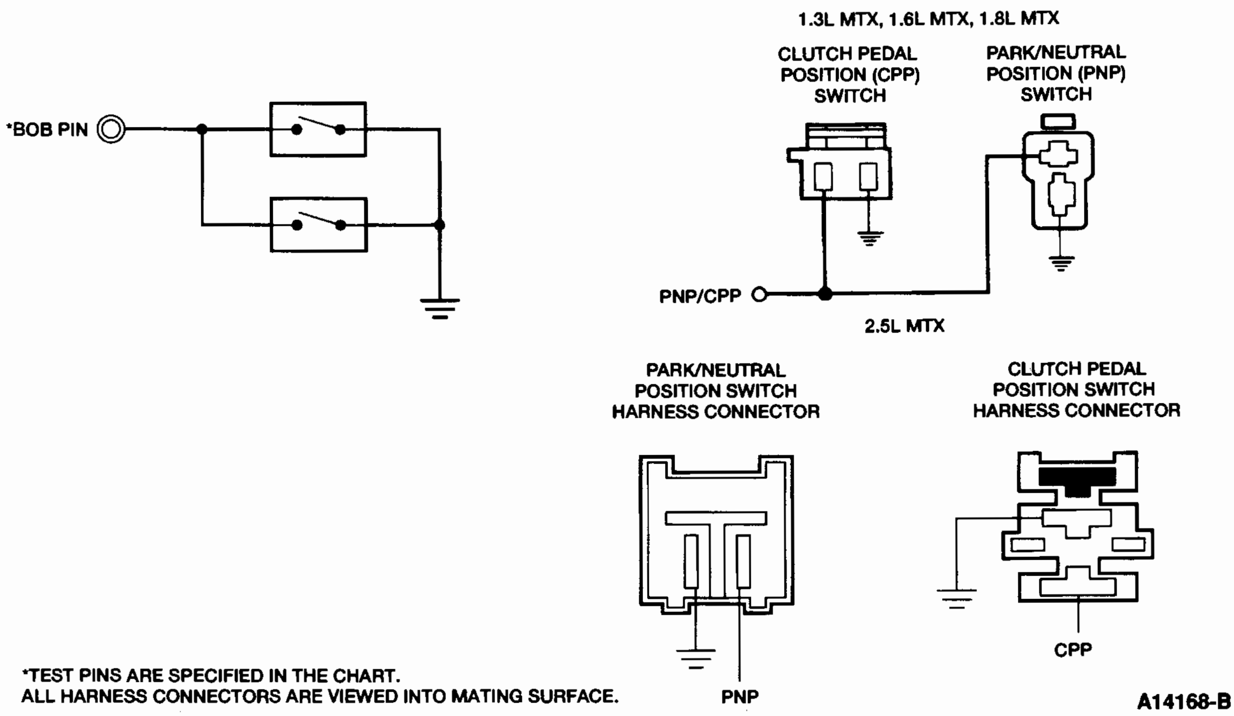
A16731-E

EEC Pinpoint Tests	All Engines	STG



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A14167-D



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A14168-B

EEC Pinpoint Tests	All Engines	STG

Data Sheet

CIRCUIT DATA SHEET

Switch	Abbrev.	Engine	PCM Pin	BOB Pin	Wire Color	Switch Exercise	Switch To
Power Steering Pressure	PSP	1.3L 1.6L 1.8L MTX 1.8L 4EAT 2.5L	1P 1K 1P 1N 1N	19 19 19 24 24	BL/Y GN/R BL/Y BL/Y BL/Y	Close switch - turn steering wheel sharply with engine running	Ground
Clutch Cycling Pressure	CCPS	1.3L 2.5L	1Q 1O	10 41	GN/W PK/BK	Close switch - A/C selected, A/C pressure within limits (refer to Section 12-00 of Service Manual - Air-Conditioning)	Ground
High Pressure	HPS	1.3L 2.5L	2I 2H	50 9	BL PK/Y	Close switch - A/C pressure exceeds limits (refer to Section 12-00 of Service Manual - Air-Conditioning)	Ground
Blower Motor Control	BLMT	1.3L 1.8L MTX 1.8L 4EAT 2.5L	1R 1S 1P 1P	22 23 22 22	O/BL O/BL O/BL O/BK	Close switch - blower on 2nd, 3rd or 4th position (1.3L, 1.8L) or 3rd or HI position (2.5L) and mode selector switch on	Ground
Park/Neutral Position, Clutch Pedal Position	PNP/CPP	1.3L MTX 1.6L MTX 1.8L MTX 2.5L MTX	1V 1G 1V 1R	43 8 43 30	GN/BK R/BL BR/Y LG/BK	Close CPP switch - depress clutch. Close PNP switch - Trans. in NEUTRAL	Ground (either switch closed)
Rear Defroster	DEF	2.5L	1J	34	P	Close switch - button depressed	Battery voltage with Key ON, switch open. Approx. 1.0 volt with switch closed.
Idle	IDL	1.3L 1.6L 1.8L MTX 1.8L 4EAT 2.5L	1N 1E 1N 1T 1T	18 28 18 18 18	R GN/O R/W R/W BR	Open switch - depress accelerator pedal	Ground Ground SIGRTN SIGRTN Ground
A/C On-Off	ACS	1.8L MTX 1.8L 4EAT	1Q 1O	10 41	GN/BK GN/BK	Close switch - A/C button pushed (blower on)	Ground
Boost Pressure Switch	BPS	1.6L Turbo	2L	12	LG/BK	Open - boost pressure under 72 kPa (10 psi) Close - boost pressure above 72-80 kPa (10-12 psi)	Ground
Wide-Open Throttle	WOT	1.8L MTX	2L	27	LG/W	Close switch - open throttle	SIGRTN

EEC Pinpoint Tests

All Engines

STG

TEST STEP		RESULT ▶	ACTION TO TAKE
STG1	CHECK SWITCH SIGNAL TO PCM		
	● Key OFF. ● Install Breakout Box (connect PCM). ● Key ON. ● Measure the voltage between the BOB Test Pin of the switch in question and ground. NOTE: For 2.5L idle switch, the switch is adjustable. If there are 12 volts with switch closed, adjust idle switch position. Refer to Service Manual, Section 03-04B. ● Exercise switch as indicated in "Switch Exercise" column of Data Sheet. NOTE: For high pressure switch voltage should always read approximately 5 volts. (see Switch / Voltage table below) ● **Are the voltages OK?**	Yes ▶ No ▶	Switch OK. RETURN to Section 2B, Diagnostic Routines or Service Manual. GO to STG2.
STG2	CHECK SWITCH WIRE TO PCM FOR OPEN		
	● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Disconnect the connector of the switch in question. ● Measure the resistance between the switch BOB Test Pin and the terminal at the switch harness connector. ● **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to STG3. SERVICE the wire in question for opens.
STG3	CHECK SWITCH WIRE TO PCM FOR SHORT		
	● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Disconnect the connector of the switch in question. ● Measure the resistance between the switch BOB Test Pin and ground. ● **Is the resistance less than 5 ohms?**	Yes ▶ No (PSP and IDL) ▶ No (All others) ▶	SERVICE wire in question for shorts. REPLACE the switch in question. GO to STG4.
STG4	CHECK GROUND AT SWITCH		
	● Key OFF. ● Disconnect the connector of the switch in question. ● Measure the resistance between the ground terminal on the harness connector of the switch in question and ground. ● **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the switch in question. SERVICE the wire in question for open(s).

Switch	Voltage
Open	Greater than 10 volts
Closed	Less than 1 volt

EEC Pinpoint Tests	All Engines	STI

Self-Test Input (STI)

Note

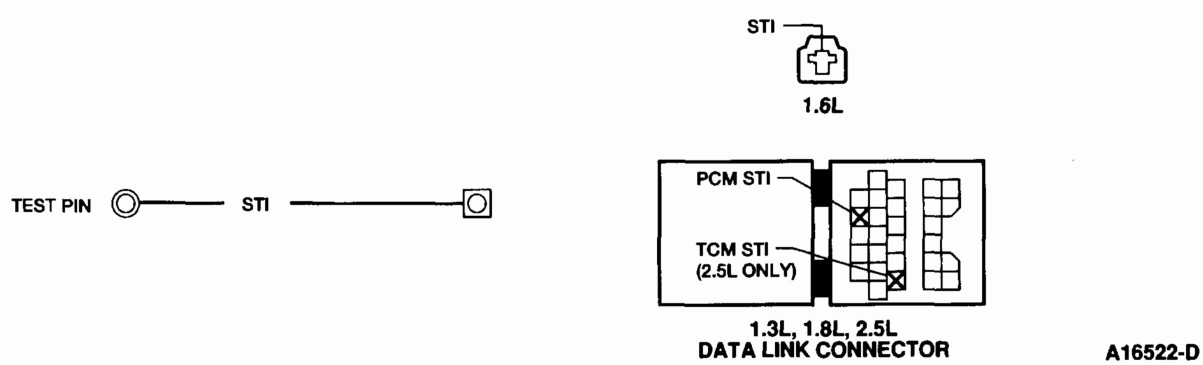
You should enter this Pinpoint Test only when Quick Test Step 6 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: STI

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	STI	1K	48	BL
1.6L	STI	1W	48	Y
1.8L MTX	STI	1K	48	LG/Y
1.8L 4EAT	STI	1I	48	LG/Y
2.5L	STI	1I	48	R/W

EEC Pinpoint Tests	All Engines	STI

TEST STEP		RESULT ▶	ACTION TO TAKE
STI1	CHECK STI WIRE TO PCM FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin STI and STI connector (1.6L) or data link connector PCM STI (TEN) (1.3L, 1.8L, 2.5L) wire. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to STI2. SERVICE the PCM STI wire for opens.
STI2	CHECK STI WIRE TO PCM FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin STI and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to EEC Pinpoint Test STO in this section. SERVICE the PCM STI wire for short.

EEC Pinpoint Tests	All Engines	STO

Self-Test Output (STO)

Note

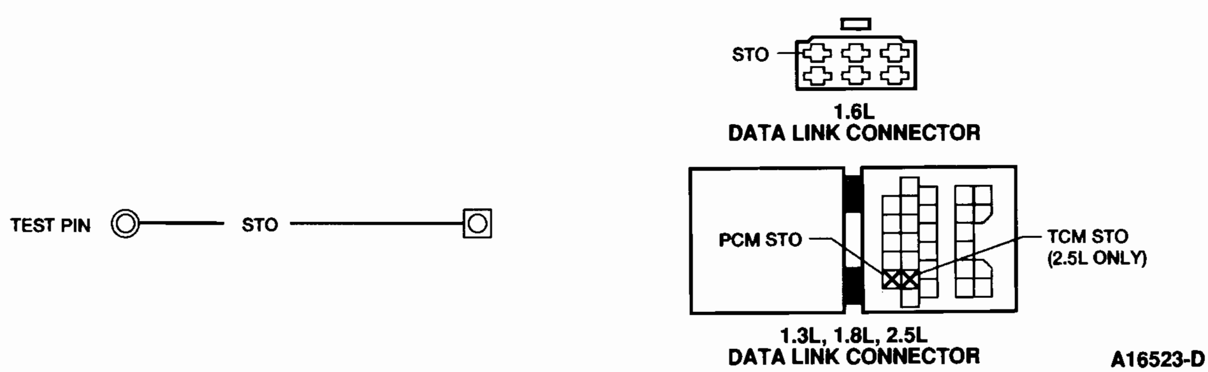
You should enter this Pinpoint Test only when EEC Pinpoint Test STI in this section directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: STO

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	STO	1F	17	W/BK
1.6L	STO	1B	17	GN/BK
1.8L	STO	1F	17	W/BK
2.5L	STO	1F	17	LG/R

EEC Pinpoint Tests	All Engines	STO

TEST STEP		RESULT ▶	ACTION TO TAKE
STO1	CHECK STO WIRE TO PCM FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin STO and data link connector PCM STO wire. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to STO2. SERVICE the PCM STO wire to data link connector for opens.
STO2	CHECK STO WIRE TO PCM FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pin STO and ground (resistance should be greater than 10,000 ohms). • Key ON. • Measure the voltage on BOB Test Pin STO (voltage should be 0V). • **Are measurements OK?**	Yes ▶ No ▶	GO to EEC Pinpoint Test PGC in this section. SERVICE the PCM STO wire to data link connector for shorts.

EEC Pinpoint Tests	All Engines	STP

Switch To Power (STP)

Note

You should enter this Pinpoint Test only when the Switch Monitor Test Chart in Quick Test, or Quick Test Step 11 directs you here.

Remember

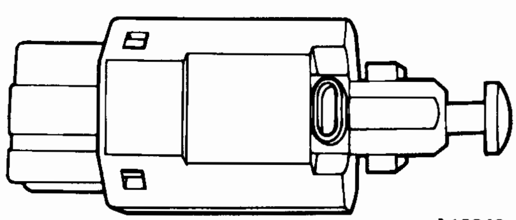
This Pinpoint Test is intended to diagnose only the following:

- Circuits: BOO (Brake ON / OFF Switch), DEF (Rear Window Defroster Switch), HDLP (Headlamp Relay), VST (Vehicle Start [Ignition] Switch)

Description

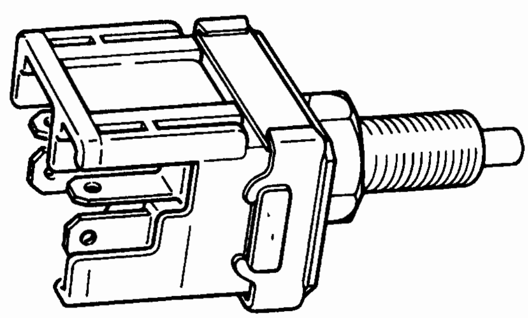
The Brake ON / OFF (BOO) switch detects when the brake pedal is depressed and sends an input signal to the Powertrain Control Module (PCM). The PCM uses this information to control fuel injection amount and control idle.

2.5L



A16840-A

1.3L, 1.6L, 1.8L

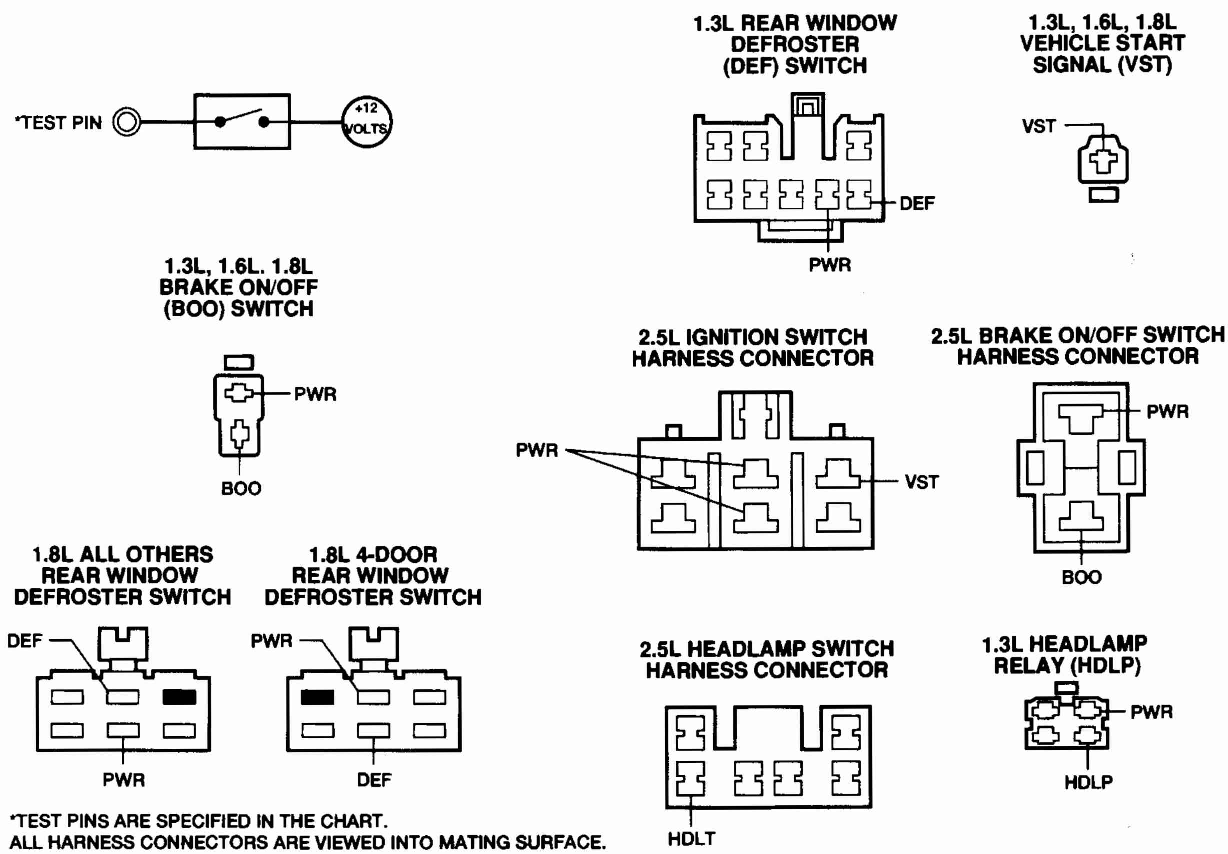


A14042-A

Engine	Location
1.3L, 1.6L, 1.8L, 2.5L	Mounted at top of brake pedal.

EEC Pinpoint Tests	All Engines	STP

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A16722-E

EEC Pinpoint Tests	All Engines	STP

Data Sheet

CIRCUIT DATA SHEET

Switch	Abbrev.	Engine	PCM Pin	BOB Pin	Wire Color	Switch Exercise	Switch To
Brake ON/OFF Switch	BOO	1.3L 1.6L 1.8L MTX 1.8L 4EAT 2.5L	1O 1J 1O 1Q 1Q	2 3 2 2 2	GN W/GN GN GN W/GN	Close switch by depressing brake pedal	Battery voltage with switch closed
Headlamp Switch	HDLP	1.3L 1.8L MTX 1.8L 4EAT 2.5L	1U 1U 1H 1H	28 28 32 32	R/GN R/BK R/BK W	Close switch by turning on headlamps	Battery voltage with switch closed
Ignition Switch	VST	1.3L 1.6L 1.8L 2.5L	1C 3B 1C 1C	5 5 5 5	BK/W BK/R P BK/R	Close switch by turning ignition switch to start (crank engine)	Approximately 9 volts with switch closed (cranking engine)
Rear Window Defroster Switch	DEF	1.3L 1.8L MTX 1.8L 4EAT	1L 1T 1J	42 30 34	BK/R BK/BL BK/BL	Close switch by turning rear defroster switch on	Battery voltage with switch closed

TEST STEP	RESULT ▶	ACTION TO TAKE
STP1 CHECK SWITCH SIGNAL TO PCM		
• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key ON. • Measure the voltage at the BOB Test Pin of the switch in question. • Exercise the switch as indicated in the Data Sheet. • **Are the voltages as indicated in the Data Sheet?**	Yes ▶	If directed here by Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. (Confirm SML circuit is OK before replacing PCM.)
	No (Headlamp Switch) ▶	If headlamps work, SERVICE wire for open(s). If headlamps do not work, GO to Service Manual Section 17-01.
	No (All others) ▶	GO to STP2.

EEC Pinpoint Tests	All Engines	STP

TEST STEP		RESULT ▶	ACTION TO TAKE
STP2	CHECK POWER TO SWITCH		
	• Key OFF. • Disconnect the connector of the switch in question. • Key ON. • Measure the voltage at the PWR terminal on the harness connector of the switch in question. • **Is the voltage approximately battery voltage?**	Yes ▶ No ▶	GO to STP3. SERVICE the PWR wire for open(s).
STP3	CHECK SWITCH CONTINUITY		
	• Key OFF. • Disconnect the connector of the switch in question. • Measure the resistance between the terminals of the switch. • Exercise the switch in question. • **Is the resistance OK?**	Yes ▶ No ▶	SERVICE the switch wire to PCM. REPLACE the switch in question.

Switch	Resistance (ohms)
Open	Greater than 10,000
Closed	Less than 5

EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

Throttle Position (TP) Sensor — 1.3L, 1.6L, 1.8L, 2.5L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 12 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: TP

Description

The Throttle Position (TP) sensor detects the throttle plate opening angle and supplies the Powertrain Control Module (PCM) with an input signal indicating throttle position.

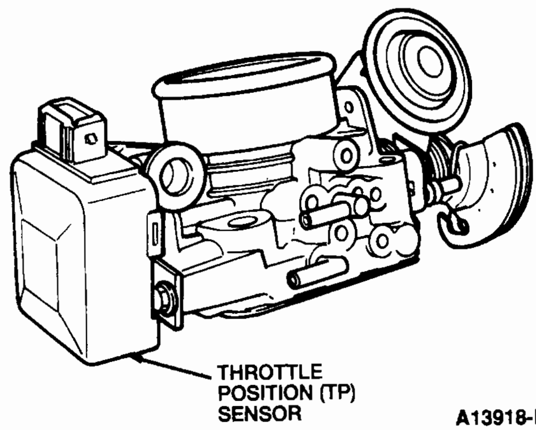
On the 1.8L 4EAT the TP sensor consists of a combination potentiometer and Idle (IDL) switch. The sensor produces signals for both a wide range of throttle plate angles, along with signals for both idle and off idle. On 1.8L MTX, 1.6L Non-Turbo and 1.6L Turbo engines, the TP sensor consists of a two-position switch sensing only closed or Wide Open Throttle (WOT) positions. These two positions are referred to as the IDL switch and the WOT switch.

On the 1.3L engine, the TP sensor detects the throttle plate opening angle with a potentiometer and notifies the PCM. The TP sensor also helps determine the air intake if the Mass Air Flow (MAF) sensor fails.

The TP sensor on the 2.5L performs the same as on the 1.3L engine, but also integrates the IDL switch within the housing. The IDL switch detects when the throttle plate is closed and an idle condition occurs. The PCM is supplied with an input signal.

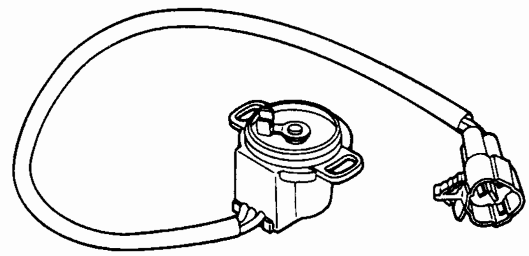
EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

1.8L MTX

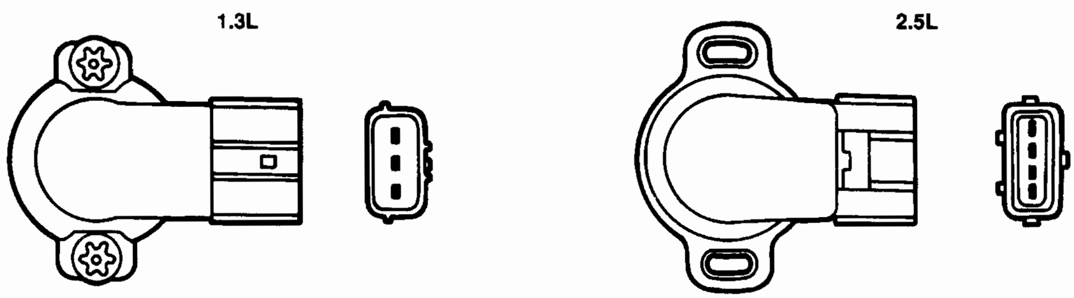


A13918-B

1.8L 4EAT

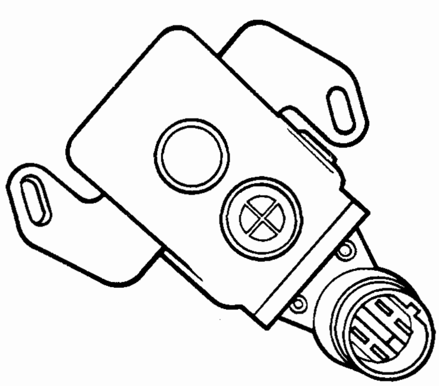


A14040-A



A16784-B

1.6L



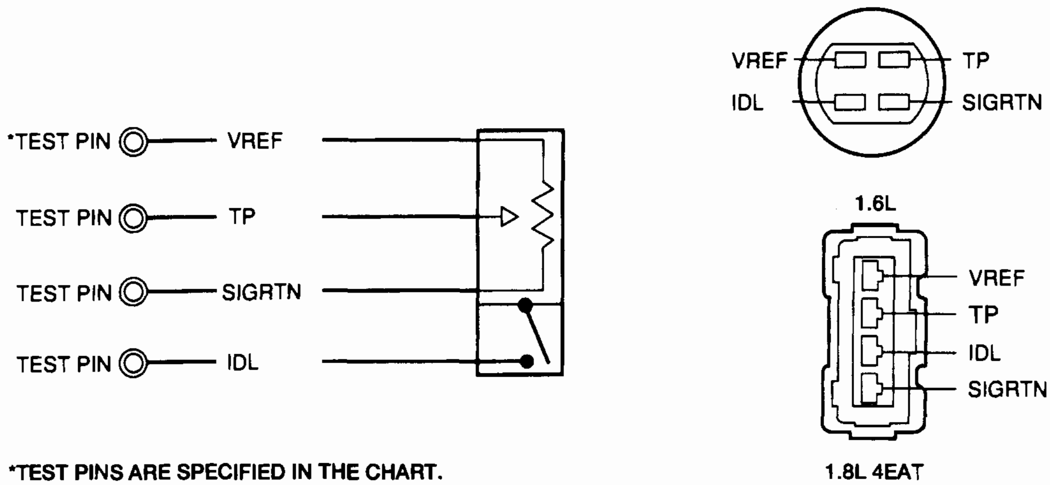
A14768-A

Engine	Location
1.3L, 1.6L, 1.8L, 2.5L	Mounted to the throttle body.

EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

Pinpoint Test Schematic

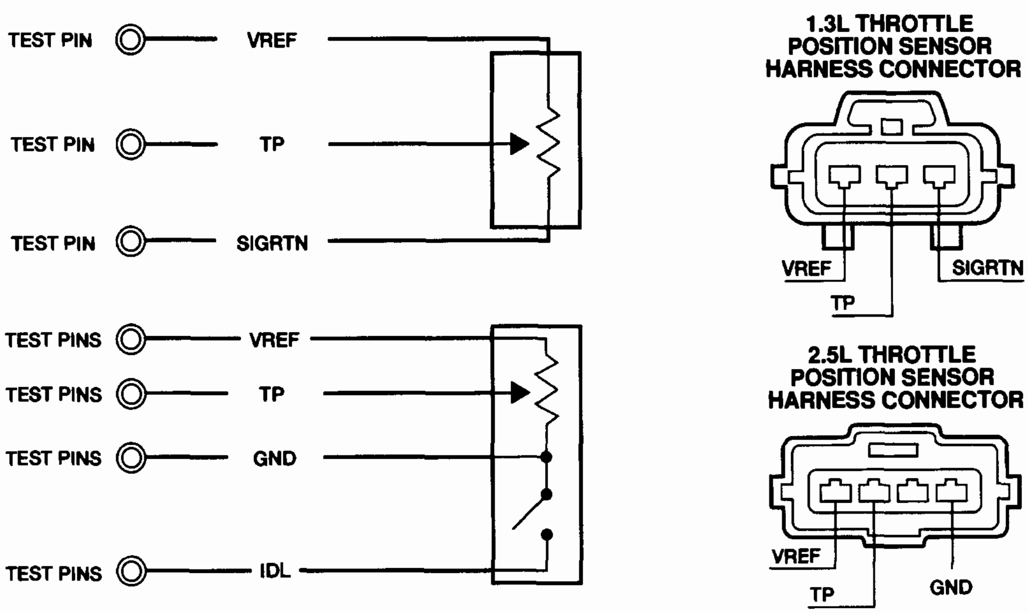
1.6L, 1.8L



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

A15168-D

1.3L, 2.5L



A16526-D

EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

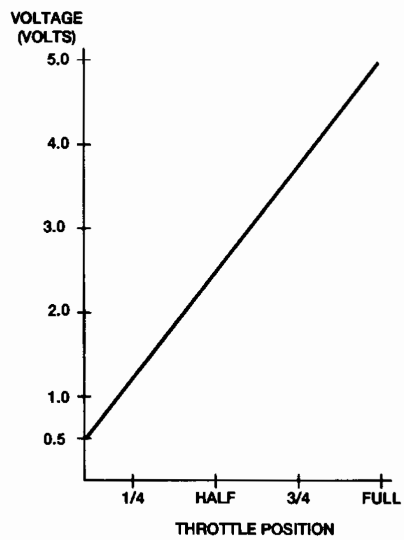
Data Sheet

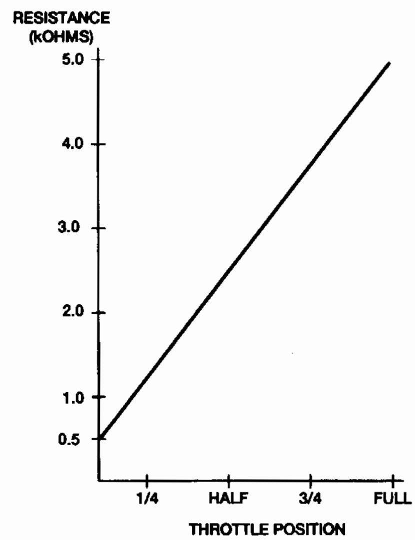
CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	TP VREF SIGRTN	2M 2K 2D	47 26 46	LG/W LG/R Y/GN
1.6L	TP VREF SIGRTN IDL	2G 2A 2C 1E	47 26 46, 49 28	O W/BK BL/Y GN/O
1.8L	TP VREF SIGRTN IDL	2F 2I 3D 1T	47 26 46 18	LG/W LG/R BK/W R/W
2.5L	TP VREF GND	2F 2I 3D	47 26 46	Y P BK/BL

EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

1.3L





A20525-A

GRAPH DATA VALUES

Throttle Position	Volts
1/4	0.5
HALF	2.75
3/4	3.88
FULL	5.0

NOTE: Voltage and Resistance values may vary ± 15%.

GRAPH DATA VALUES

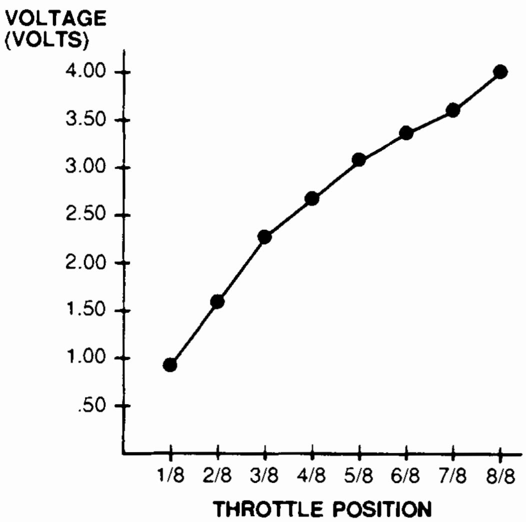
Throttle Position	kOHMS
1/4	0.5
HALF	2.75
3/4	3.88
FULL	5.0

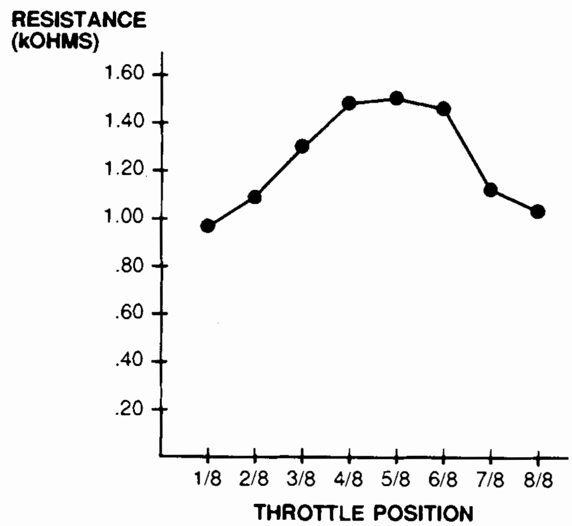
NOTE: Voltage and Resistance values may vary ± 15%.

EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

1.6L, 1.8L

GRAPH





GRAPH DATA VALUES

THROTTLE POSITION	VOLTS
1/8	.998
2/8	1.60
3/8	2.37
4/8	2.74
5/8	3.15
6/8	3.43
7/8	3.60
8/8	4.02

THROTTLE POSITION	kOHMS
1/8	.989
2/8	1.104
3/8	1.278
4/8	1.462
5/8	1.480
6/8	1.459
7/8	1.144
8/8	1.072

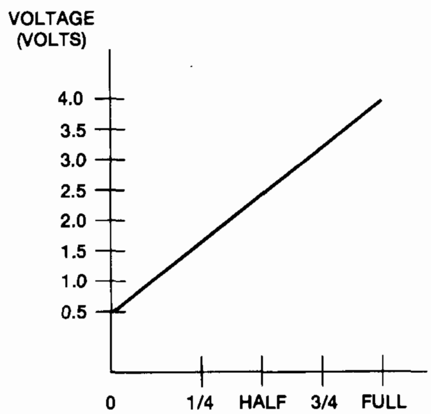
NOTE: Voltage and Resistance values may vary ± 15%.

A14179-A

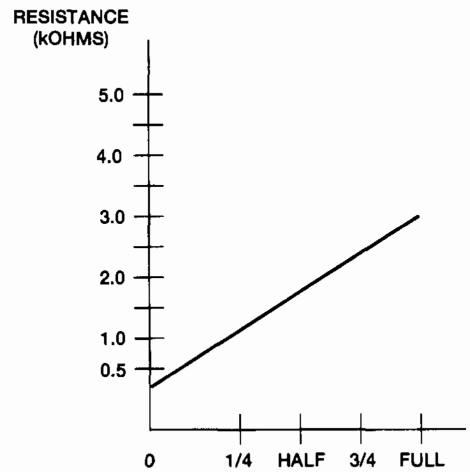
EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

2.5L

GRAPH



Throttle Position



Throttle Position

Throttle Position	Voltage (Volts)
0	0.5
1/4	1.3
Half	2.2
3/4	2.9
Full	3.7

Throttle Position	Resistance (kohms)
0	0.4
1/4	0.6
Half	1.6
3/4	2.2
Full	3.0

NOTE: Voltage and Resistance Values May Vary ± 15%.

A16528-C

TEST STEP		RESULT ▶	ACTION TO TAKE
TP1	CHECK TP INPUT VOLTAGE TO PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Key ON. • Measure the voltage at BOB Test Pin TP. • Compare the voltage readings to the graph and chart as the accelerator pedal is depressed. • **Are the voltages OK?**	Yes ▶	TP circuit OK. If directed here from Quick Test Step **QT11** in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
		No ▶	GO to **TP2**.

EEC Pinpoint Tests	1.3L 1.6L 1.8L 2.5L	TP

TEST STEP		RESULT ▶	ACTION TO TAKE
TP2	CHECK VREF		
	• Key OFF. • Disconnect the TP sensor connector. • Key ON. • Measure the voltage on the VREF wire at the throttle position sensor harness connector. • **Is the voltage between 4.5 and 5.5 volts?**	Yes ▶ No ▶	GO to TP3. GO to EEC Pinpoint Test VREF.
TP3	CHECK WIRES TO PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the TP sensor connector. • Measure the resistances of the TP wire and SIGRTN (1.3L, 1.6L, 1.8L) wire between BOB Test Pins and the TP sensor harness connector. • Measure the resistance of the TP wire between BOB Test Pin TP and ground. • **Are the resistances less than 5 ohms between BOB Test Pins and the TP sensor harness connector, and greater than 10,000 ohms between BOB Test Pin TP and ground?**	Yes (2.5L) ▶ Yes (All Others) ▶ No ▶	GO to TP4. REPLACE the throttle position sensor. SERVICE the wire(s) in question.
TP4	CHECK TP GROUND (2.5L)		
	• Key OFF. • Disconnect the TP sensor connector. • Measure the resistance of the GND wire between the TP sensor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the throttle position sensor. SERVICE the GND wire.

EEC Pinpoint Tests	1.6L 1.8L	VAF

Volume Air Flow (VAF) Meter — 1.6L, 1.8L

Note

You should enter this Pinpoint Test only when diagnostic trouble code 08 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

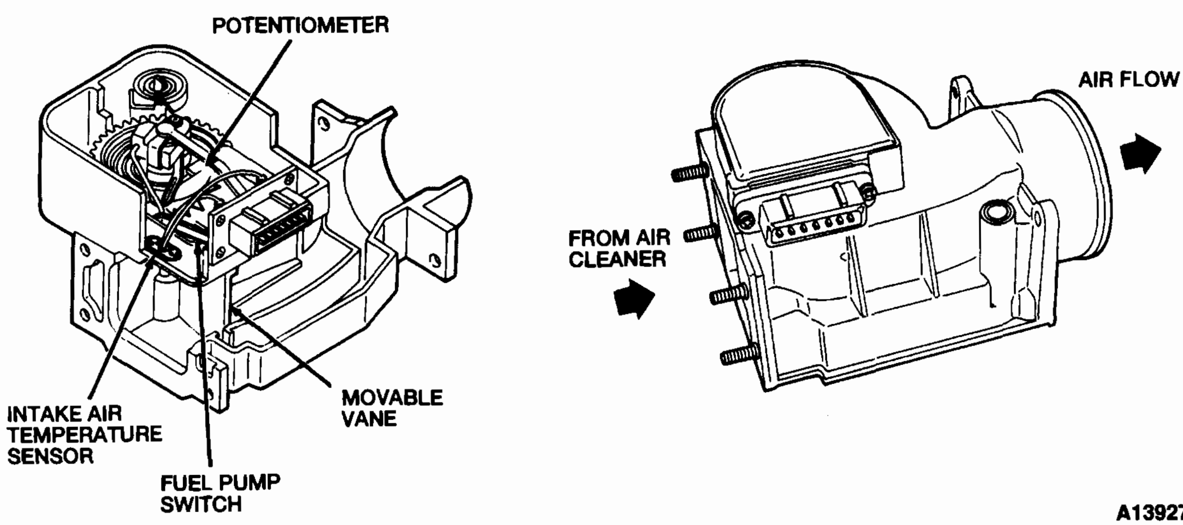
- Circuits: VAF, VMREF

EEC Pinpoint Tests	1.6L 1.8L	VAF

Description

The Volume Air Flow (VAF) meter measures air flowing into the engine and is mounted between the air cleaner and the throttle body assembly. The VAF meter contains a movable vane which connects to a potentiometer. As air flows through the VAF meter, the movable vane and potentiometer change position and provide an input to the Powertrain Control Module (PCM) with vane position information. The PCM can then translate vane position information into the volume of air flowing into the engine.

Inside the VAF meter is an Intake Air Temperature (IAT) sensor which monitors and relays inlet air temperature to the PCM and a fuel pump switch which provides a ground for the fuel pump circuit after the engine has started.

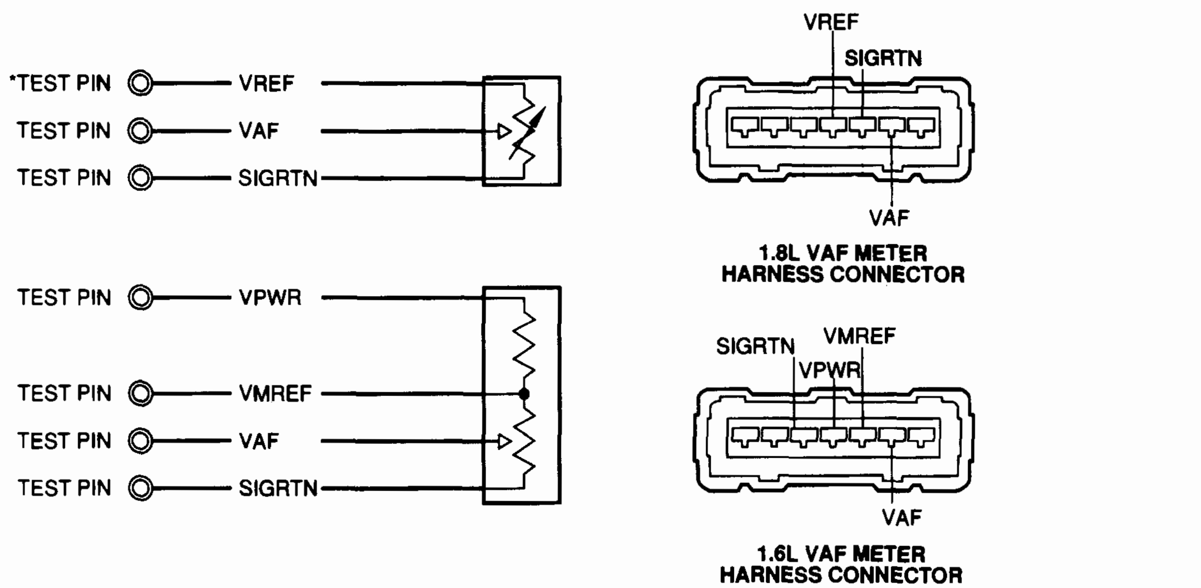


A13927-E

Engine	Location
1.6L, 1.8L	Mounted between the air cleaner and the throttle body.

EEC Pinpoint Tests	1.6L 1.8L	VAF

Pinpoint Test Schematic



*TEST PINS ARE SPECIFIED IN THE CHART.
ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE.

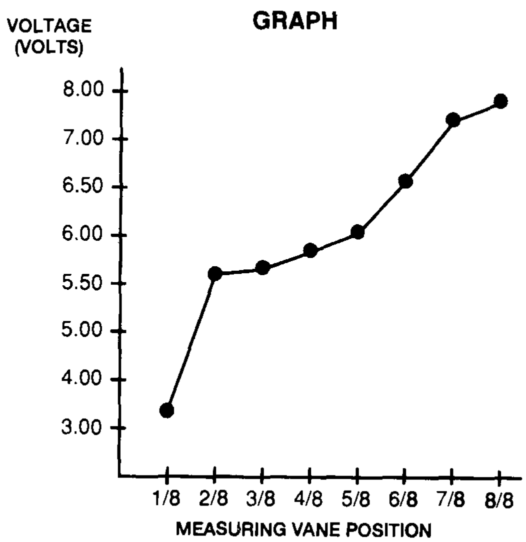
Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.6L	VAF VMREF VPWR SIGRTN	2E 2B 3I 2C	43 18 37 46	LG/BK LG/R Y/GN BL/Y
1.8L MTX	VAF VREF SIGRTN	2O 2K 2D	25 26 46, 49	R LG/R BK/W
1.8L 4EAT	VAF VREF SIGRTN	2B 2I 3D	44 26 46	R LG/R BK/W

EEC Pinpoint Tests	1.6L 1.8L	VAF

1.6L ENGINES



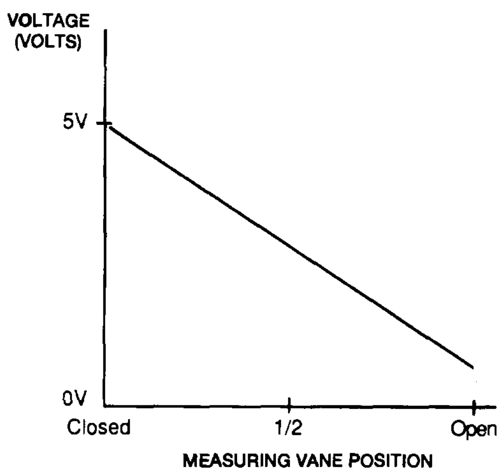
GRAPH DATA VALUES

Measuring Vane Position	Voltage (Volts)
1/8	3.24
2/8	5.60
3/8	5.62
4/8	5.83
5/8	6.02
6/8	6.57
7/8	7.46
8/8	7.87

Note: Voltage values may vary ± 15%.

A14181-C

1.8L Engine



Vane Fully Open .5-1.5V
Vane Fully Closed 4.5-5V

A14182-E

EEC Pinpoint Tests	1.6L 1.8L	VAF

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>VAF1</td><td>CHECK VAF INPUT VOLTAGE</td><td rowspan="2">Yes (1.8L) ▶

Yes (1.6L) ▶

No ▶</td><td rowspan="2">VAF circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.

GO to VAF2.

GO to VAF3.</td></tr>
<tr><td colspan="2">• Key OFF.
• Install Breakout Box (connect PCM).
• Access the VAF measuring vane.
• Key ON.
• Measure the voltage between BOB Test Pin VAF and Test Pin SIGRTN.
• Compare the voltage readings to the Data Sheet while moving the measuring vane.
• Are the voltages OK?</td></tr>
<tr><td>VAF2</td><td>CHECK VMREF INPUT VOLTAGE</td><td rowspan="2">Yes ▶

No ▶</td><td rowspan="2">VAF circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.

SERVICE the VAF meter VMREF wire to the PCM.</td></tr>
<tr><td colspan="2">• Key OFF.
• Install Breakout Box (connect PCM).
• Key ON.
• Measure the voltage between BOB Test Pin VMREF and Test Pin SIGRTN.
• Is the voltage between 7-9 volts?</td></tr>
<tr><td>VAF3</td><td>CHECK VAF SIGNAL FROM VAF METER</td><td rowspan="2">Yes ▶

No (1.8L) ▶

No (1.6L) ▶</td><td rowspan="2">SERVICE the VAF sensor VAF wire to the PCM.

GO to VAF4.

GO to VAF5.</td></tr>
<tr><td colspan="2">• Key OFF.
• Access the VAF measuring vane.
• Disconnect the VAF connector.
• Jumper the following terminals between the harness connector and the VAF meter.
<table>
<tr><th>Engine</th><th>Terminal</th></tr>
<tr><td>1.8L</td><td>VREF, SIGRTN</td></tr>
<tr><td>1.6L</td><td>VMREF, SIGRTN, VPWR</td></tr>
</table>
• Key ON.
• Measure the voltage between the VAF terminal (at the VAF meter) and the SIGRTN wire (at the harness connector).
• Compare the voltage readings with the Data Sheet while moving the measuring vane.
• Are the voltages OK?</td></tr>
<tr><td>VAF4</td><td>CHECK VREF AT VAF METER</td><td rowspan="2">Yes ▶

No ▶</td><td rowspan="2">REPLACE the VAF meter.

GO to EEC Pinpoint Test VREF in this section.</td></tr>
<tr><td colspan="2">• Key OFF.
• Disconnect the VAF meter connector.
• Key ON.
• Measure the voltage between VAF meter VREF wire and VAF meter SIGRTN wire.
• Is the voltage between 4.5-5.5 volts?</td></tr>
</table>

EEC Pinpoint Tests	1.6L 1.8L	VAF

TEST STEP		RESULT ▶	ACTION TO TAKE
VAF5	CHECK VAF SIGNAL WITHOUT VMREF		
	• Key OFF. • Access VAF measuring vane. • Disconnect the VAF meter connector. • Use jumper wires to connect the VPWR and SIGRTN terminals between the harness connector and the VAF meter. Leave VMREF and VAF disconnected. • Key ON. • Measure the voltage between VAF terminal (at the VAF meter) and SIGRTN wire (at the harness connector). • Compare the voltage reading to the Data Sheet while moving measuring vane. • **Are the voltages OK?**	Yes ▶ No ▶	SERVICE the VAF meter VMREF wire to the PCM. GO to **VAF6**.
VAF6	CHECK VPWR / SIGRTN AT VAF METER		
	• Key OFF. • Disconnect the VAF meter connector. • Key ON. • Measure the voltage on the harness side between VAF meter VPWR wire and the VAF meter SIGRTN wire. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	REPLACE the VAF meter. GO to **VAF7**.
VAF7	CHECK VPWR AT VAF METER		
	• Key OFF. • Disconnect the VAF meter connector. • Key ON. • Measure the voltage on the harness side between VAF meter VPWR wire and ground. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	SERVICE the VAF meter SIGRTN wire to the PCM. GO to EEC Pinpoint Test **VPWR** in this section.

EEC Pinpoint Tests	All Engines	VPWR

Vehicle Power (VPWR)

Note

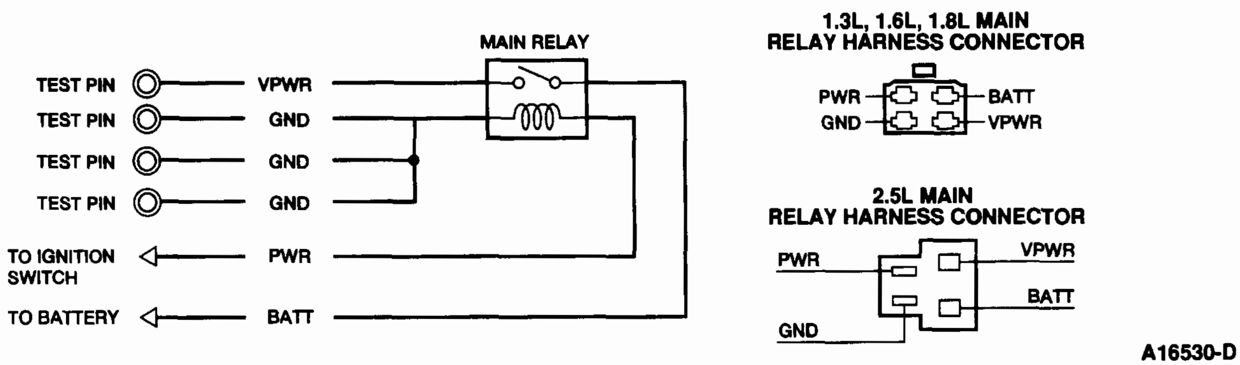
You should enter this Pinpoint Test only when other Pinpoint Tests direct you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: VPWR, GND

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	VPWR	1B	37, 57	Y/W
	GND	2A	39, 40, 44, 60	BK/O
	GND	2B	20	BK/O
	GND	2C	16	BK/LG
1.6L	VPWR	3I	37	Y/GN
	GND	2R	49	BK
	GND	3A	20	BK
	GND	3G	40	BK

(Continued)

EEC Pinpoint Tests	All Engines	VPWR

CIRCUIT DATA SHEET (Cont'd)

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.8L MTX	VPWR GND GND GND	1B 2A 2B 2C	37, 57 39, 40, 44, 60 20 16	W/R BK/O BK/O BK/LG
1.8L 4EAT	VPWR GND GND GND	1B 3A 3B 3C	37, 57 40, 60 20 49	W/R BK/O BK/O BK/LG
2.5L	VPWR GND GND GND GND	1B 3A 3B 3C 3D	37, 57 40, 60 20 49 46	R/BK BK BK BK/R BK/BL

TEST STEP		RESULT ▶	ACTION TO TAKE
VPWR1	CHECK VPWR TO PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Key ON. • Measure the voltage at BOB Test Pin VPWR. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to VPWR2. GO to VPWR3.
VPWR2	CHECK GROUNDS AT PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Test Pins GND and ground. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	VPWR circuit OK. RETURN to the Pinpoint Test that sent you here. SERVICE the GND wire(s).
VPWR3	CHECK VPWR WIRE FROM MAIN RELAY TO PCM		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Remove the main relay. • Measure the resistance of the VPWR wire between BOB Test Pin VPWR and the VPWR terminal on the main relay harness connector in the main fuse panel. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to VPWR4. SERVICE the VPWR wire.
VPWR4	CHECK GROUND AT MAIN RELAY		
	• Key OFF. • Remove the main relay. • Measure the resistance of the GND wire between the GND terminal at the main relay harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to VPWR5. SERVICE the GND wire at the main relay.

EEC Pinpoint Tests	All Engines	VPWR

TEST STEP		RESULT	ACTION TO TAKE
VPWR5	CHECK BATTERY VOLTAGE AT MAIN RELAY		
	• Key OFF. • Remove the main relay. • Measure the voltage at the BATT terminal at the main relay harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to VPWR6. CHECK the fuse. - 30A EGI INJ. (1.3L, 1.6L) - 30A FUEL INJECTOR (1.8L) - 30A F / P INJ (2.5L) REPLACE if blown. If OK, SERVICE BATT wire.
VPWR6	CHECK PWR TO MAIN RELAY		
	• Key OFF. • Remove the main relay. • Key ON. • Measure the voltage at the PWR terminal at the main relay harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	REPLACE the main relay. CHECK the fuse. - 10A ENGINE (1.3L) - 15A ENGINE (All others) REPLACE if blown. If OK, SERVICE PWR wire.

EEC Pinpoint Tests	All Engines	VREF

Reference Voltage (VREF)

Note

You should enter this Pinpoint Test only when Quick Test Step 11, other Pinpoint Tests, or the Diagnostic Routines direct you here.

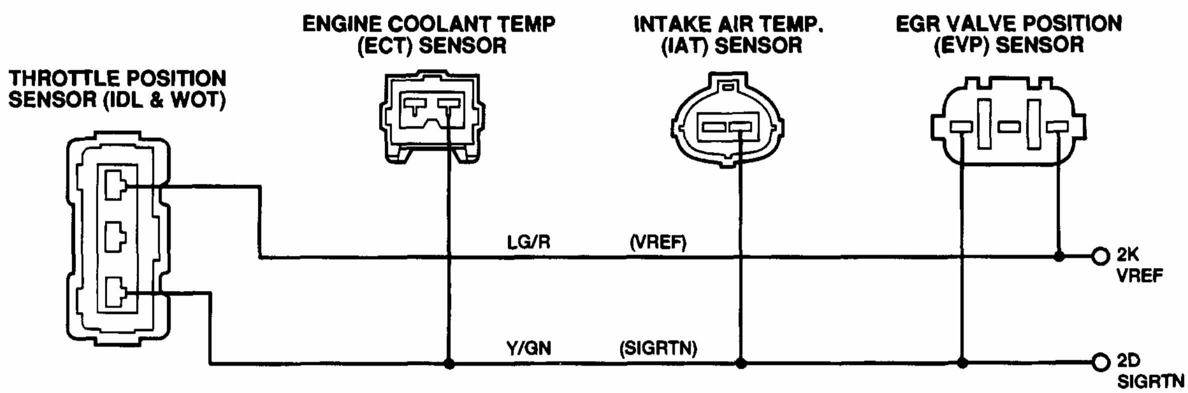
Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: VREF, SIGRTN

Pinpoint Test Schematic

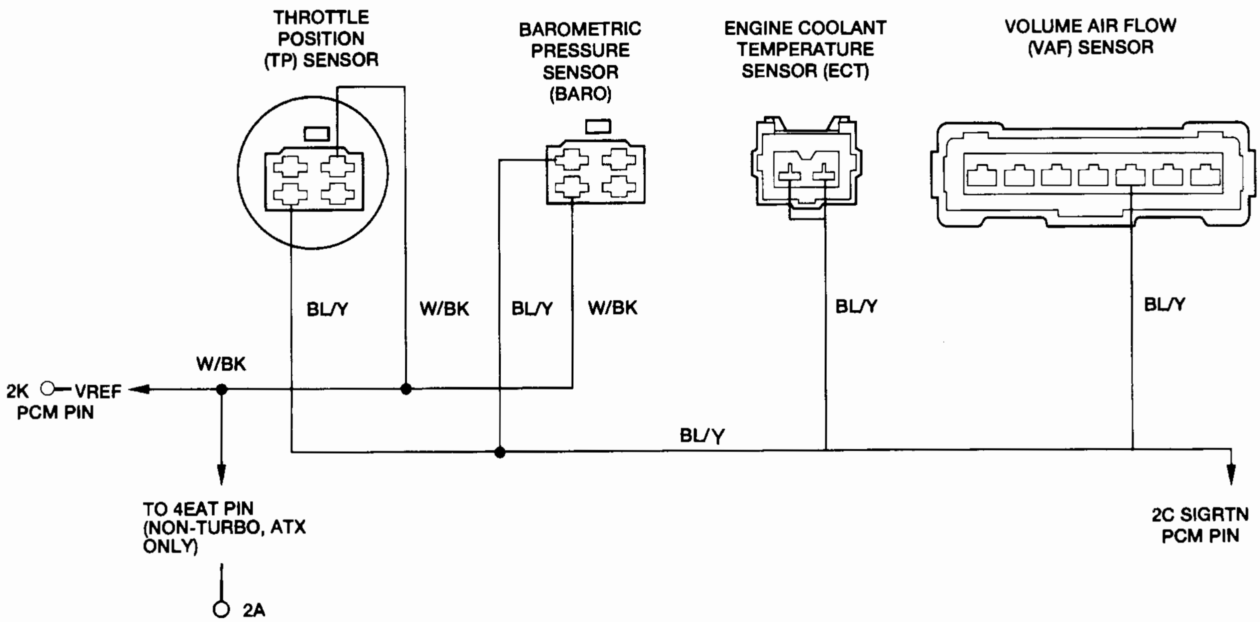
1.3L



A14026-E

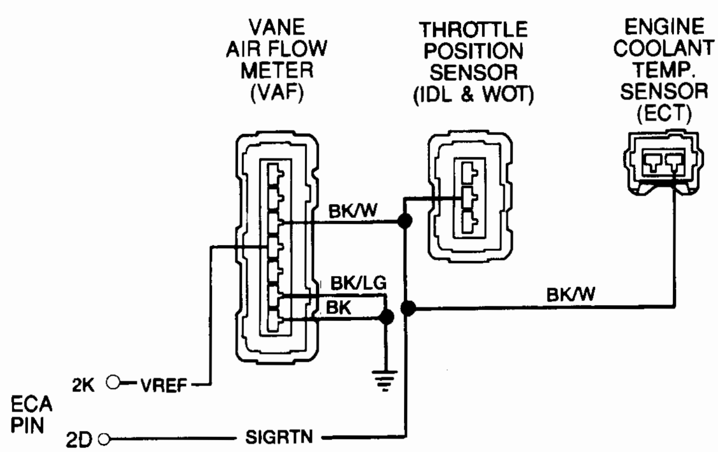
EEC Pinpoint Tests	All Engines	VREF

1.6L



A15164-C

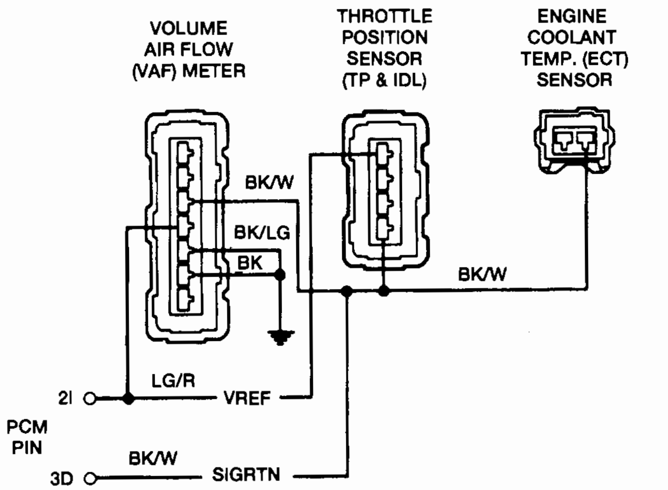
1.8L MTX



A14034-E

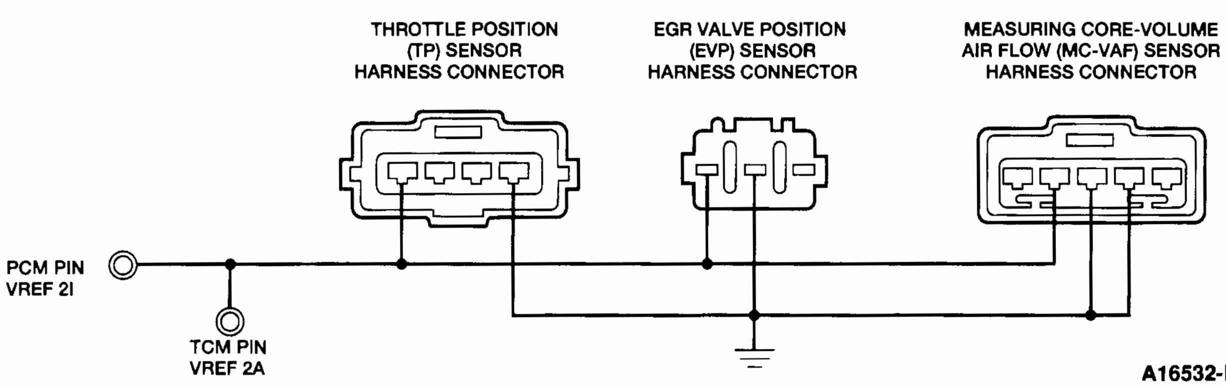
EEC Pinpoint Tests	All Engines	VREF

1.8L 4EAT



A14029-D

2.5L



A16532-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	VREF SIGRTN	2K 2D	26 46, 49	LG/R Y/GN
1.6L	VREF SIGRTN	2A 2C	26 46	W/BK BL/Y

(Continued)

EEC Pinpoint Tests	All Engines	VREF

CIRCUIT DATA SHEET (Cont'd)

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.8L MTX	VREF SIGRTN	2K 2D	26 46, 49	LG/R BK/W
1.8L 4EAT	VREF SIGRTN	2I 3D	26 46	LG/R BK/W
2.5L	VREF GND	2I 3D	26 46	P BK/BL

TEST STEP		RESULT ▶	ACTION TO TAKE
VREF1	CHECK VREF AT PCM		
	• Key OFF. • Install Breakout Box (connect PCM). • Key ON. • Measure the voltage between BOB Test Pins VREF and SIGRTN (GND on 2.5L). • **Is the voltage between 4.5 and 5.5 volts?**	Yes ▶ No ▶	GO to VREF2. GO to EEC Pinpoint Test VPWR in this section. If VPWR is OK, then REPLACE the PCM.
VREF2	CHECK FOR VREF AT SENSOR		
	• Key OFF. • Disconnect the BARO, EVP, VAF, MC-VAF, and TP sensor connectors as applicable to vehicle. Refer to Pinpoint Test Schematics. • Key ON. • Measure the voltage on the VREF wire at the sensor connectors as indicated in Pinpoint Test Schematics. • **Are the voltages between 4.5 and 5.5 volts?**	Yes ▶ No (0 volts) ▶ No (10-12 volts) ▶	VREF circuit OK. RETURN to Section 2B, Diagnostic Routines. GO to VREF3. SERVICE the wire in question for short to power.
VREF3	CHECK VREF WIRE TO PCM FOR OPENS		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the BARO, EVP, VAF, MC-VAF, and TP sensor connectors as applicable to vehicle. Refer to Pinpoint Test Schematics. • Measure the resistance between BOB Test Pin VREF and VREF wire at the BARO, EVP, VAF, MC-VAF and TP sensor harness connectors. • **Are all resistances less than 5 ohms?**	Yes ▶ No ▶	GO to VREF4. SERVICE the wire in question for opens.

EEC Pinpoint Tests	All Engines	VREF

TEST STEP		RESULT	▶	ACTION TO TAKE
VREF4	CHECK VREF WIRE TO PCM FOR SHORTS			
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the Transaxle Control Module (TCM) (1.6L 4EAT, 2.5L 4EAT). • Disconnect BARO, EVP, VAF, MC-VAF, and TP sensor connectors as applicable to vehicle. Refer to Pinpoint Test Schematics. • Measure the resistance between Test Pin VREF and ground. • **Is the resistance greater than 10,000 ohms?**	Yes (1.3L, 1.6L, 1.8L)	▶	SERVICE the SIGRTN wire to PCM.
		Yes (2.5L)	▶	SERVICE the GND wire at sensor.
		No	▶	SERVICE the wire in question for shorts.

EEC Pinpoint Tests	1.3L 2.5L	VSS

Vehicle Speed Sensor (VSS) — 1.3L, 2.5L

Note

For 1.8L 4EAT vehicle speed sensor test, go to 4EAT Pinpoint Test VSS.

You should enter this Pinpoint Test only when Quick Test Step 11 or Diagnostic Routines direct you here.

Verify that the speedometer is working properly before performing this test. If not, refer to Service Manual Section 13-01.

Remember

This Pinpoint Test is intended to diagnose only the following:

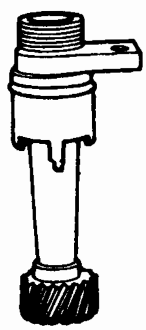
- Circuit: VSS

EEC Pinpoint Tests	1.3L 2.5L	VSS

Description

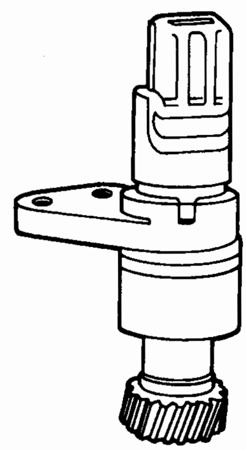
The Vehicle Speed Sensor (VSS) rotates with the transaxle's final drive gear. On the 1.3L engine, the speedometer driven gear turns a cable which is sent to the speed sensor in the instrument cluster which provides the vehicle speed signal. On the 2.5L engine the speed sensor turns a Hall effect pickup sensor and an AC voltage is created and sent to the speedometer in the instrument cluster. The AC voltage signal is developed into a DC digital signal and sent to the Powertrain Control Module (PCM).

1.3L



A20699-A

2.5L

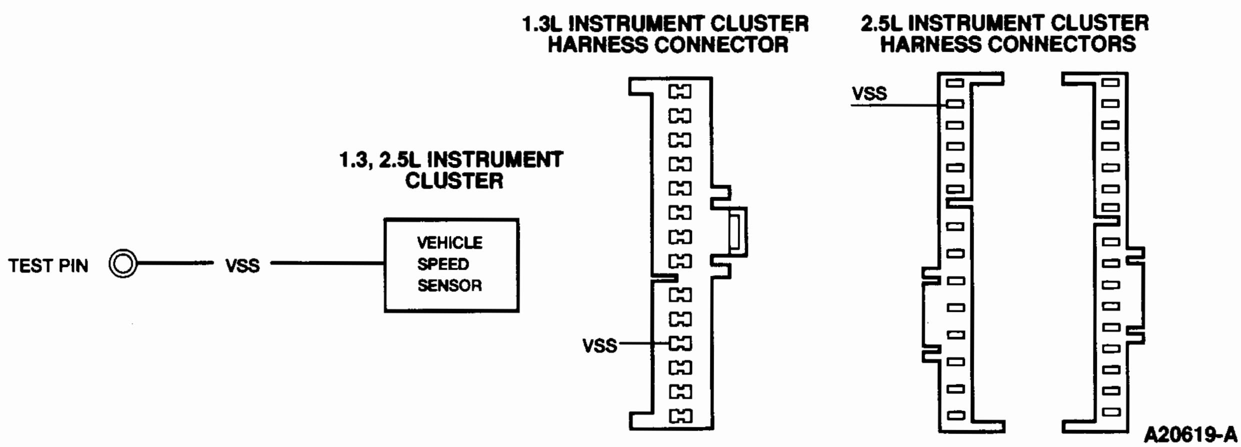


A16770-A

Engine	Location
1.3L	Located in instrument cluster.
2.5L	Mounted to the transaxle, above the final drive gear.

EEC Pinpoint Tests	1.3L 2.5L	VSS

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	Wire Color
1.3L	VSS	1M	21	GN/R
2.5L	VSS	1M	3	GN/R

TEST STEP		RESULT ▶	ACTION TO TAKE
VSS1	CHECK VSS SIGNAL TO PCM		
	● Key OFF. ● Install Breakout Box. ● Key ON. ● For 1.3L: — Remove the speedometer driven gear from the transaxle. Leave cable connected to driven gear. — Measure the DC voltage at BOB Test Pin VSS while rotating the speedometer cable. ● For 2.5L: — Raise the vehicle on hoist. — Measure the DC voltage at BOB Test Pin VSS while spinning the front tires with the vehicle in D range. ● **Does the voltage alternate between 0 and 5 volts?**	Yes ▶ No ▶	VSS circuit OK. If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. GO to VSS2.

EEC Pinpoint Tests	1.3L 2.5L	VSS

TEST STEP		RESULT ▶	ACTION TO TAKE
VSS2	CHECK VSS WIRE TO PCM FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the 14-pin instrument cluster connector. • Measure the resistance of the VSS wire between BOB Test Pin VSS and the VSS wire at the 14-pin instrument cluster harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to VSS3. SERVICE the VSS wire for open.
VSS3	CHECK VSS WIRE TO PCM FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Disconnect the 14-pin instrument cluster connector. • Measure the resistance of the VSS wire between BOB Test Pin VSS and ground (resistance should be greater than 10,000 ohms). • Key ON. • Measure the voltage on BOB Test Pin VSS (voltage should be 0V). • **Are measurements OK?**	Yes ▶ No ▶	GO to Section 13-01 of the Service Manual to diagnose the VSS. SERVICE the VSS wire for short.

4EAT PINPOINT TESTS

4EAT Pinpoint Tests

NOTE: This section does not contain Pinpoint Test procedures for 1.9L 4EAT vehicles which are controlled by an EEC-IV processor. Refer to Section 6A, EEC-IV Pinpoint Tests.

Instructions

- **DO NOT** perform any of the following Pinpoint Tests unless instructed by Quick Test or by the Switch Monitor Test.
- Each Pinpoint Test **assumes** that you are diagnosing causes for a specific symptom described in the Diagnostic Routines and that every cause with a higher probability has been checked and verified to be operating properly.
- **Diagnostic Trouble Codes** retrieved in Quick Test Steps 7 or 8 imply that a hard fault is present and the associated Pinpoint Test should be performed to isolate the cause. If more than one diagnostic trouble code is received, always start service with the first code received.
- **Probable** components should be diagnosed only when the Quick Test Steps have resulted in a pass code. With the knowledge of the symptom, a close observation can be made of each specified component, by performing the associated Pinpoint Test.
- Performing a complete **visual inspection** will often lead to the source of a problem without performing any test step. For example, when directed to a Pinpoint Test, look carefully at the electrical schematic and special notes. Check each component and the related wiring to the control module for any evidence of damage. Loose connections, corrosion, overheating, and physical damage are often the cause of failure.
- **Do not** replace any parts unless the test result indicates they should be replaced.
- **Do not** measure voltage or resistance at the control module or connect any test lights to it, unless otherwise specified.
- **Do** disconnect solenoids and switches from the harness before measuring for continuity, resistance, or energizing with a power source.
- **Do** start with the first Pinpoint Test step and follow the appropriate result in order, until the cause of a fault is found.
- **Do** erase codes and perform Quick Test after recommended action has been taken to ensure any repairs made are effective.

4EAT Pinpoint Tests

NOTE: Refer to Engine Supplement - Car, Section 3B, for Electrical Schematics and Connector Pin Usage Charts.

- The standard Ford color abbreviations are:

Abbreviation	Color
BK	Black
BL	Blue
BR	Brown
DB	Dark Blue
DG	Dark Green
GY	Gray
GN	Green
LB	Light Blue
LG	Light Green
N	Natural
O	Orange
PK	Pink
P	Purple
R	Red
T	Tan
W	White
Y	Yellow

Where two colors are shown for a wire, the first color is the basic color of the wire. The second color is the stripe marking.

For example:

BR/O is a brown wire with an orange stripe.

- Use the following Breakout Box and 4EAT tester and adapters.

Engine	Number	Description	Adapter Cable
All 4EAT	007-0037B	4EAT Tester and All Adapters	—
1.6L 4EAT	007-00095	4EAT Adapter	—
1.8L 4EAT	007-00100-B	4EAT Adapter (Part of 007-00100)	—
2.5L 4EAT	007-00100-A	4EAT Adapter (Part of 007-00100)	—
All 4EAT	014-00322	Breakout Box	—
1.6L 4EAT	007-00038	Breakout Box Adapter	—
1.8L 4EAT, 2.5L 4EAT	T92C-6000-AH	Breakout Box Adapter	#2 Adapter Cable

NOTE: Rotunda 4EAT Tester 007-0037B includes the required adapters. Rotunda Adapter Kit 007-00100 is available for use with the previous model (Rotunda 4EAT Tester 007-0037A).

4EAT Pinpoint Tests

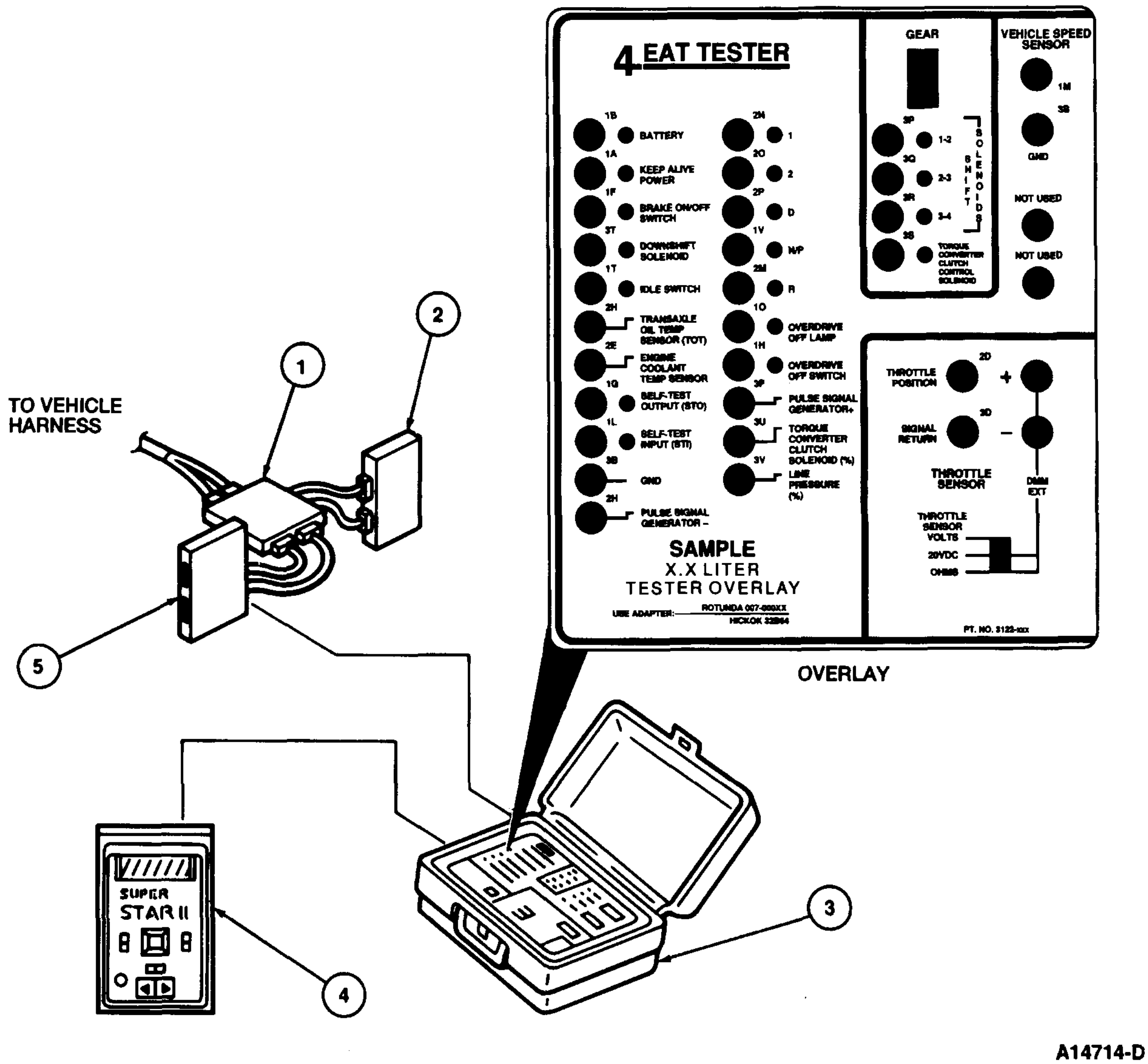


Figure 1.

Item	Description
1	4EAT Adapter (Included with 4EAT Tester 007-0037B)
2	TCM (PCM on 1.8L 4EAT)
3	4EAT Tester 007-0037B
4	Super STAR II Tester 007-0041B
5	4EAT Tester Connector

NOTE: The switch on the 4EAT adapter must be in the proper position as indicated on the overlay, if the test signal requires it.

4EAT Pinpoint Tests	2.5L 4EAT	BARO

Barometric Pressure (BARO) Sensor — 2.5L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 14 is received in Quick Test 7 or 8, or when Quick Test Step 11 directs you here.

Remember

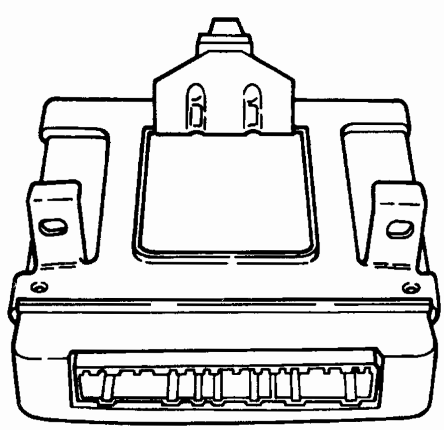
This Pinpoint Test is intended to diagnose only the following:

- Circuit: BARO

Description

The Barometric Pressure (BARO) sensor detects changes in atmospheric pressure. This information is transferred to the Powertrain Control Module (PCM) by an input signal. The PCM will adjust air / fuel ratio, A / C cutoff, idle speed, and purge control to compensate for the changing pressure.

Sensor Integrated Into PCM

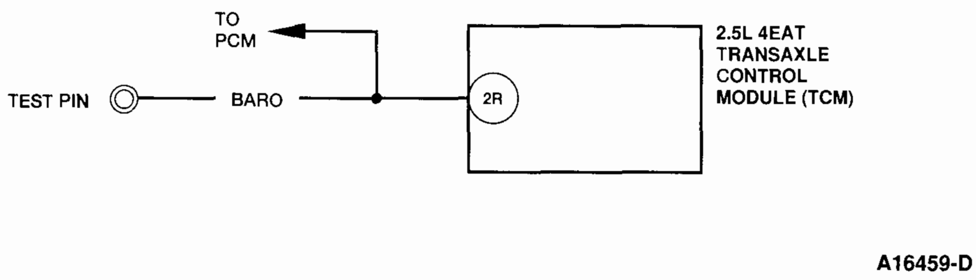


A16841-E

Engine	Location
2.5L	Integrated in PCM.

4EAT Pinpoint Tests	2.5L 4EAT	BARO

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT[1]	BARO	2A	45	2R	GN/O

1 Cannot take measurements at the 4EAT Tester.

4EAT Pinpoint Tests | 2.5L 4EAT | BARO

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>BARO1</td><td>CHECK BARO SIGNAL</td><td></td><td></td></tr>
<tr><td colspan="2">

Key OFF.
Install Breakout Box.
Key ON.
Measure the voltage between BOB Pin 45 and ground.

<table>
<tr><th>Barometric Pressure</th><th>Voltage</th></tr>
<tr><td>Less than 89.6 kPa (672 mm-Hg [26.5 in-Hg]) (above approx. 1,500 m [4,921 ft])</td><td>Less than 3.5 volts</td></tr>
<tr><td>Greater than 89.6 kPa (672 mm-Hg [26.5 in-Hg]) (below approx. 1,500 m [4,921 ft])</td><td>Greater than 3.5 volts</td></tr>
</table>

Is the voltage correct?

</td><td>Yes ▶

No ▶</td><td>BARO circuit OK. If sent to this test from Quick Test Step QT7 or QT8 in Section 5B, REPLACE the TCM. If sent to the test from Quick Test Step QT9 in Section 5B, RETURN to Section 2B, Diagnostic Routines.

GO to BARO2.</td></tr>
<tr><td>BARO2</td><td>CHECK FOR OPEN</td><td></td><td></td></tr>
<tr><td colspan="2">

Key OFF.
Install Breakout Box (leave PCM disconnected).
Disconnect the TCM.
Measure the resistance of the BARO wire between BOB Pin 45 and TCM connector Pin 2R.
Is the resistance less than 5 ohms?

</td><td>Yes ▶
No ▶</td><td>GO to BARO3.
SERVICE the BARO wire for open.</td></tr>
<tr><td>BARO3</td><td>CHECK FOR SHORT</td><td></td><td></td></tr>
<tr><td colspan="2">

Key OFF.
Install Breakout Box (leave PCM disconnected).
Disconnect the TCM.
Measure the resistance of the BARO wire between BOB Pin 45 and ground.
Is the resistance greater than 10,000 ohms?

</td><td>Yes ▶
No ▶</td><td>REPLACE the PCM.
SERVICE the BARO wire for short.</td></tr>
</table>

4EAT Pinpoint Tests	2.5L 4EAT	CKP1

Crankshaft Position Sensor No. 1 (CKP1) — 2.5L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 01 is received in Quick Test 7 or 8, or when Quick Test Step 11 directs you here.

Remember

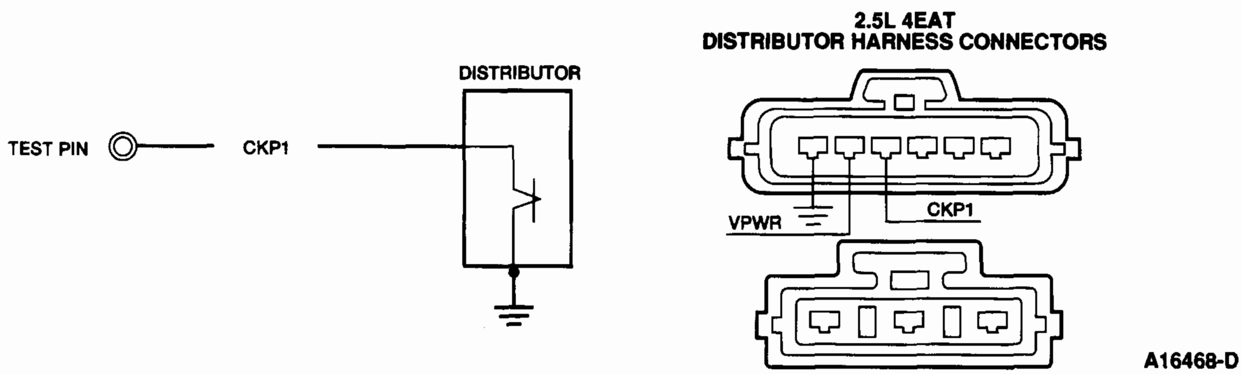
This Pinpoint Test is intended to diagnose only the following:

- Circuit: CKP1

Description

Refer to EEC Pinpoint Test CKP1.

Pinpoint Test Schematic



4EAT Pinpoint Tests	2.5L 4EAT	CKP1

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT	CKP1	3E	56	1N	LG/O

4EAT Pinpoint Tests	2.5L 4EAT	CKP1

TEST STEP		RESULT ▶	ACTION TO TAKE
CKP1-1	CHECK CKP1 SIGNAL		
	• Key OFF. • Install 4EAT Tester (connect TCM). • Measure the voltage at 4EAT Tester CKP1 Pin while bumping starter. • **Does the voltage alternate between approximately 0 volts and 5 volts?**	Yes ▶ No ▶	CKP1 circuit OK. If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM. GO to CKP1-2.
CKP1-2	CHECK VPWR TO DISTRIBUTOR		
	• Key OFF. • Disconnect the 6-pin distributor connector. • Key ON. • Measure the voltage at the VPWR wire on the 6-pin distributor harness connector. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to CKP1-3. GO to EEC Pinpoint Test VPWR in this section. If VPWR is OK, SERVICE the VPWR wire to distributor.
CKP1-3	CHECK GROUND AT DISTRIBUTOR		
	• Key OFF. • Disconnect the 6-pin distributor connector. • Measure the resistance of the GND wire between the 6-pin distributor harness connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CKP1-4. SERVICE the distributor GND wire.
CKP1-4	CHECK CKP1 WIRE FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the 6-pin distributor connector. • Measure the resistance of the CKP1 wire between 4EAT Tester CKP1 Pin and the CKP1 wire at the 6-pin distributor harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to CKP1-5. SERVICE the CKP1 wire for open.
CKP1-5	CHECK CKP1 WIRE FOR SHORT		
	• Key OFF. • Disconnect the PCM connectors. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the 6-pin distributor connector. • Measure the resistance of the CKP1 wire between 4EAT Tester CKP1 Pin and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the distributor. SERVICE the CKP1 wire for short.

4EAT Pinpoint Tests	1.6L 4EAT	CTS

Coolant Temperature Signal — 1.6L 4EAT

Note

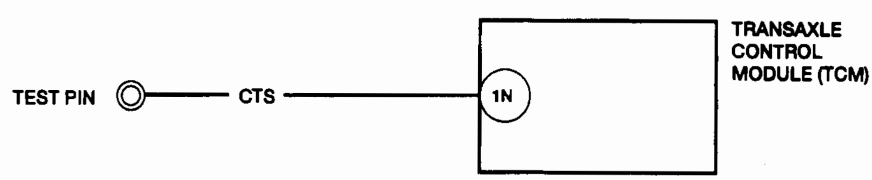
You should enter this Pinpoint Test only when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: CTS

Pinpoint Test Schematic



A17994-A

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	CTS	2M	52	1N	BL / GN

4EAT Pinpoint Tests	1.6L 4EAT	CTS

TEST STEP		RESULT ▶	ACTION TO TAKE
CTS1	CHECK CTS SIGNAL		
	● Key OFF. ● Install 4EAT Tester. ● Run engine and monitor temperature at ECT sensor using Rotunda Digital Thermo Pyrometer 055-00100 or equivalent. ● Measure the voltage on 4EAT Tester Pin CTS during the following conditions:	Yes ▶ No ▶	CTS circuit OK. RETURN to Section 2B, Diagnostic Routines. GO to $\boxed{\text{CTS2}}$.

Condition	Voltage
Coolant temperature above 60°C (140°F)	Battery voltage
Coolant temperature below 60°C (140°F)	Less than 1 volt

	● **Are the voltages OK?**		
CTS2	CHECK CTS WIRE FOR OPEN		
	● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Install 4EAT Tester (leave TCM disconnected). ● Measure the resistance between BOB Pin 52 and 4EAT Tester Pin 1N. ● **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to $\boxed{\text{CTS3}}$. SERVICE the CTS wire for open.
CTS3	CHECK CTS WIRE FOR SHORT		
	● Key OFF. ● Install Breakout Box (leave PCM disconnected). ● Install 4EAT Tester (leave TCM disconnected). ● Measure the resistance between BOB Pin 52 and ground. ● **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the PCM. SERVICE the CTS wire for short.

4EAT Pinpoint Tests	2.5L 4EAT	DCS

Duty Cycle Solenoid (DCS) — 2.5L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 65 or 66 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

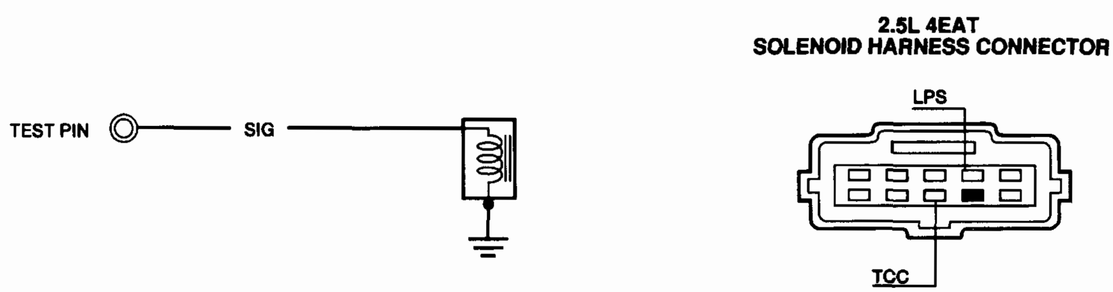
This Pinpoint Test is intended to diagnose only the following:

- Circuits: Torque Converter Clutch (TCC) Solenoid, Line Pressure Solenoid (LPS)

Description

The TCC solenoid and LPS are controlled by the Powertrain Control Module (PCM) to ensure proper transaxle shifting.

Pinpoint Test Schematic



A16751-D

4EAT Pinpoint Tests	2.5L 4EAT	DCS

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color	Diagnostic Trouble Code
2.5L 4EAT	TCC LPS	NA NA	NA NA	2C 2N	R/BK R/GN	65 66

TEST STEP	RESULT	▶ ACTION TO TAKE
DCS1 CHECK SOLENOID VOLTAGE		
• Key OFF. • Install 4EAT Tester. • Measure the voltage between the 4EAT Tester solenoid Pin and ground using a digital voltmeter. • Drive the vehicle to verify the voltage in the following chart.	Yes	▶ Solenoid function OK. If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM.
(see chart below) • **Is the voltage within specifications?**	No	▶ GO to DCS2.
DCS2 CHECK SOLENOID RESISTANCE		
• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between the 4EAT Tester solenoid Pin and ground. • **Is the resistance between 9-18 ohms?**	Yes No	▶ GO to DCS4. ▶ GO to DCS3.
DCS3 CHECK FOR OPEN WIRES		
• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the solenoid connector at the transaxle. • Measure the resistance between the solenoid wire on the solenoid harness connector and the 4EAT Tester solenoid Pin. • **Is the resistance less than 5 ohms?**	Yes No	▶ REPLACE the solenoid. ▶ SERVICE the wire(s) in question for open.

Solenoid	Condition	Approx. Voltage (volts)
TCC	Slip lockup Complete lockup	5 Greater than 10 volts
LPS	Throttle fully closed Throttle fully open	8 1-2 volts

4EAT Pinpoint Tests	2.5L 4EAT	DCS

TEST STEP		RESULT ▶	ACTION TO TAKE
DCS4	CHECK FOR SHORT TO GROUND IN WIRES		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the solenoid connector at the transaxle. • Measure the resistance between the 4EAT Tester solenoid Pin and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the TCM. SERVICE the wire(s) in question for short.

4EAT Pinpoint Tests	1.6L 4EAT 2.5L 4EAT	ODL

Overdrive OFF Lamp (ODL) — 1.6L 4EAT, 2.5L 4EAT

Note

You should enter this Pinpoint Test only when Quick Test Step 11, or Quick Test Appendix, or the Service Manual direct you here.

Remember

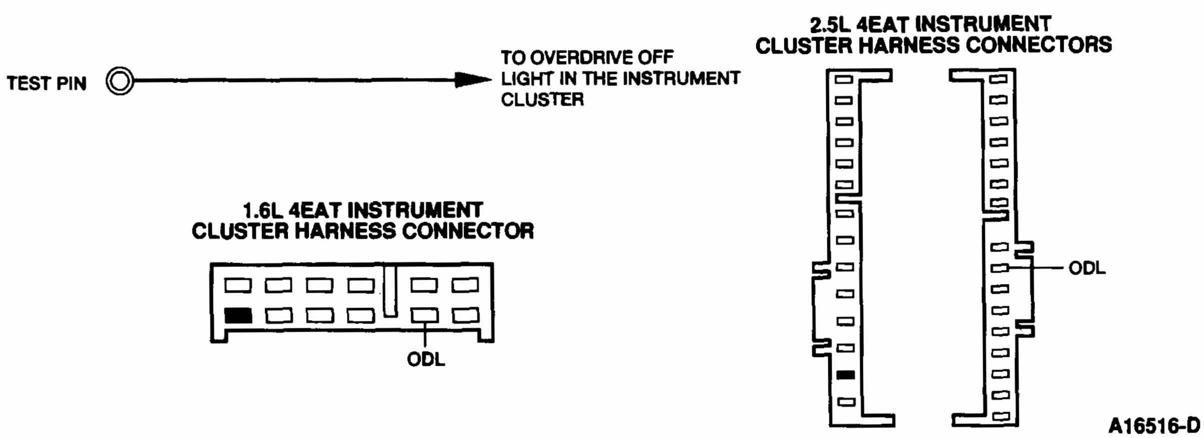
This Pinpoint Test is intended to diagnose only the following:

- Circuit: ODL

Description

The ODL is an indicator in the instrument cluster used to signal the driver when overdrive is off. It is controlled by a button on the transaxle selector lever.

Pinpoint Test Schematic



4EAT Pinpoint Tests	1.6L 4EAT 2.5L 4EAT	ODL

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	ODL	NA	NA	1B	BL/W (P/O)
2.5L 4EAT	ODL	NA	NA	1B	PK/GN (BR/Y)

( ) Denotes wire color at instrument cluster.

TEST STEP		RESULT	► ACTION TO TAKE
ODL1	CHECK ODL SIGNAL		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Key ON. • Ground 4EAT Tester Pin ODL. • **Does the overdrive OFF lamp illuminate?**	Yes No	► If sent to this test by Quick Test Step QT11, RETURN to Diagnostic Routines. Otherwise, GO to 4EAT Pinpoint Test PGC. ► GO to ODL2.
ODL2	CHECK ODL WIRE FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the 16-pin (2.5L 4EAT) or 12-pin (1.6L 4EAT) instrument cluster connector. • Measure the resistance between 4EAT Tester Pin ODL and the ODL wire terminal at the instrument cluster harness connector. • **Is the resistance less than 5 ohms?**	Yes No	► GO to ODL3. ► SERVICE the ODL wire for open.
ODL3	CHECK ODL WIRE FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the 16-pin (2.5L 4EAT) or 12-pin (1.6L 4EAT) instrument cluster connector. • Measure the resistance between 4EAT Tester Pin ODL and ground. • **Is the resistance greater than 10,000 ohms?**	Yes No	► REPLACE the overdrive (O/D) OFF lamp bulb. ► SERVICE the ODL wire for short.

4EAT Pinpoint Tests	All 4EAT	PGC

Power and Ground Connections (PGC)

Note

You should enter this Pinpoint Test only when Quick Test Step 11 or 4EAT Pinpoint Test ODL or STO directs you here.

Remember

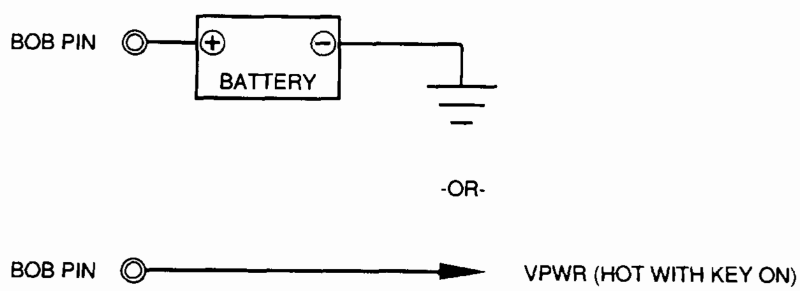
This Pinpoint Test is intended to diagnose only the following:

- Circuits: KAPWR, GND

Ground Connection

A14158-A

Power Connection



A14159-A

4EAT Pinpoint Tests	All 4EAT	PGC

Data Sheet

CIRCUIT DATA SHEET

Circuit	Engine	PCM Pin	BOB Pin	PCM Wire Color	TCM Pin	TCM Wire Color	Connect To
Keep Alive Power (KAPWR)	1.6L 4EAT	3J	1	BL/R	2O	BL/R	(Battery +)
	1.8L 4EAT	1A	1	BL/R	NA	NA	
	2.5L 4EAT	1A	1	BL/R	2O	BL/R	
Ground (GND)	1.6L 4EAT	2R	49	BK	2P	BK	Ground
		3A	20	BK			
		3G	40	BK			
	1.8L 4EAT	3A	40, 60	BK/O	NA	NA	
		3B	20	BK/O			
		3C	49	BK/LG			
	2.5L 4EAT	3A	40, 60	BK	2P	BK/R	
		3B	20	BK			
		3C	49	BK/R			
		3D	46	BK/BL			

TEST STEP	RESULT ▶	ACTION TO TAKE
PGC1 CHECK KAPWR VOLTAGE		
• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the voltage at 4EAT Tester KAPWR Pin. • **Is the voltage approximately battery voltage?**	Yes ▶ No ▶	GO to PGC2. CHECK the ROOM fuse. If fuse is OK, SERVICE the KAPWR wire for open. If fuse is not OK and fails after replacement, SERVICE the short.
PGC2 CHECK GROUNDS		
• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between each 4EAT Tester GND Pin as indicated in Data Sheet, and ground. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	KAPWR and GND connections OK. If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. If sent to this test by 4EAT Pinpoint Test ODL or STO, REPLACE the TCM (PCM on 1.8L 4EAT). SERVICE the GND wire in question.

4EAT Pinpoint Tests	2.5L 4EAT	PNPS

Park/Neutral Position Sensor (PNPS) — 2.5L 4EAT

Note

You should enter this Pinpoint Test only when Quick Test Step 11, or the Service Manual directs you here.

Remember

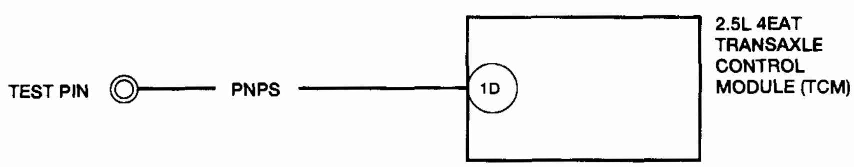
This Pinpoint Test is intended to diagnose only the following:

- Circuit: PNPS

Description

The PNPS detects whether the vehicle is in the PARK or NEUTRAL position.

Pinpoint Test Schematic



A16515-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT	PNPS	1R	30	1D	LG/BK

4EAT Pinpoint Tests	2.5L 4EAT	PNPS

TEST STEP		RESULT ▶	ACTION TO TAKE
PNPS1	CHECK PNPS SIGNAL		
	• Key OFF. • Install Breakout Box (connect PCM). • Key ON. • Measure the voltage between BOB Pin 30 and ground with the selector lever in the following positions:	Yes ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. GO to PNPS2.
	Selector Lever Position / **Voltage (volts)**: P or N — Less than 1 volt; R, D, 2, or 1 — Greater than 10 volts		
	• **Are the voltages OK?**		
PNPS2	CHECK PNPS WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 30 and 4EAT Tester Pin 1D. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to PNPS3. SERVICE the PNPS wire for open.
PNPS3	CHECK PNPS WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 30 and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the TCM. SERVICE the PNPS wire for short.

4EAT Pinpoint Tests	All 4EAT	PSG

Pulse Signal Generator (PSG)

Note

You should enter this Pinpoint Test only when diagnostic trouble code 55 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

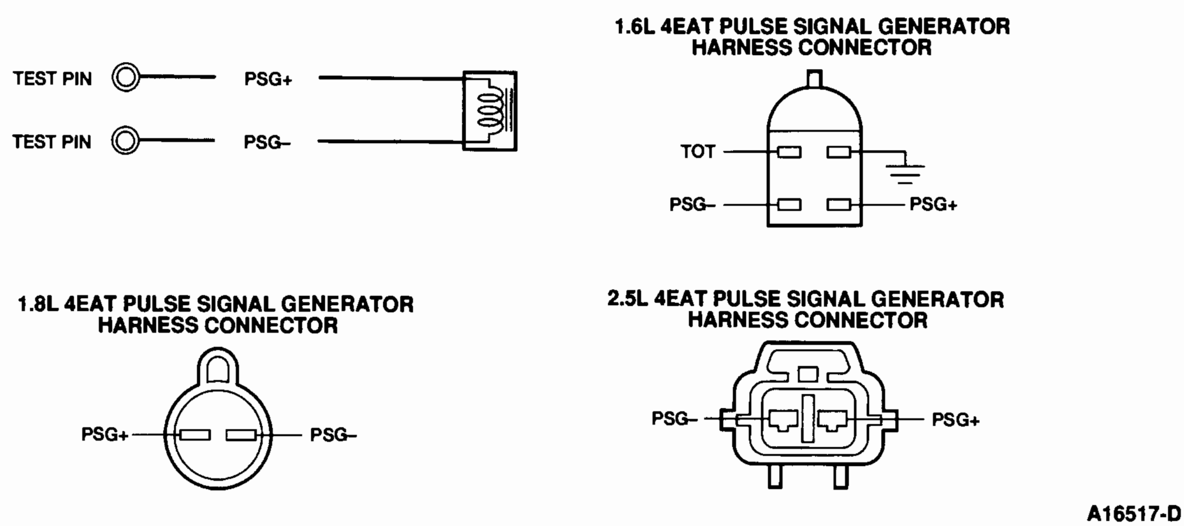
This Pinpoint Test is intended to diagnose only the following:

- Circuits: PSG+, PSG-

Description

The PSG is used to signal the Powertrain Control Module (PCM) or Transaxle Control Module (TCM) of the transaxle speed for proper shifting.

Pinpoint Test Schematic



4EAT Pinpoint Tests	All 4EAT	PSG

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	PSG+ PSG-	NA NA	NA NA	2J 2L	GN Y/BL
1.8L 4EAT	PSG+ PSG-	2M 2N	23 NA	NA NA	W/BL Y/BL
2.5L 4EAT	PSG+ PSG-	NA NA	NA NA	2J 2L	W R

TEST STEP	RESULT ▶	ACTION TO TAKE
PSG1 CHECK PULSE SIGNAL GENERATOR		
• Key OFF. • Install 4EAT Tester. • Measure the AC voltage between 4EAT Tester Pins PSG+ and PSG- in the following conditions:	Yes ▶	If sent to this test by Quick Test Step **QT11** in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM (PCM on 1.8L 4EAT).
	No ▶	GO to **PSG2**.

Condition	Voltage (AC volts)
Engine off	0
Engine running in PARK, 1/4 throttle	0.1 - 1.5

• **Are the AC voltage readings correct?**

TEST STEP	RESULT ▶	ACTION TO TAKE
PSG2 CHECK PULSE SIGNAL GENERATOR RESISTANCE		
• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between 4EAT Tester Pins PSG+ and PSG-. • **Is the resistance between 200-600 ohms (1.6L 4EAT, 1.8L 4EAT) or 253-604 ohms (2.5L 4EAT)?**	Yes ▶	GO to **PSG4**.
	No ▶	GO to **PSG3**.

4EAT Pinpoint Tests	All 4EAT	PSG

TEST STEP		RESULT ▶	ACTION TO TAKE
PSG3	CHECK WIRES FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the PSG connector. • Measure the resistance between 4EAT Tester Pin PSG+ and the PSG+ terminal at the PSG harness connector. • Measure the resistance between 4EAT Tester Pin PSG- and the PSG- terminal at the PSG harness connector. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	REPLACE the pulse signal generator. SERVICE the wire(s) for open.
PSG4	CHECK WIRES FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the PSG connector. • Measure the resistance between 4EAT Tester Pin PSG+ and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the pulse signal generator. SERVICE the wire for short.

4EAT Pinpoint Tests	2.5L 4EAT	RTS1

Reduce Torque Signal No. 1 (RTS1) — 2.5L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 57 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Remember

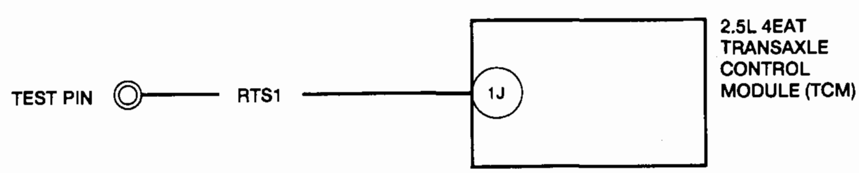
This Pinpoint Test is intended to diagnose only the following:

- Circuit: RTS1

Description

The RTS1 is used by the PCM for proper transaxle shifting.

Pinpoint Test Schematic



A16518-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT	RTS1	1S	8	1J	GN

4EAT Pinpoint Tests	2.5L 4EAT	RTS1

	TEST STEP	RESULT ▶	ACTION TO TAKE
RTS1-1	CHECK RTS1 SIGNAL		
	• Key OFF. • Install Breakout Box (connect PCM). • Key ON, engine running. • Drive the vehicle to verify that voltage at BOB Pin 8 drops from greater than 10 volts to less than 1 volt during 1-2, 2-3 shift with throttle opening greater than 1/2. • **Does the voltage drop during upshift?**	Yes ▶	If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM.
		No ▶	GO to RTS1-2.
RTS1-2	CHECK RTS1 WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 8 and 4EAT Tester Pin 1J. • **Is the resistance less than 5 ohms?**	Yes ▶	GO to RTS1-3.
		No ▶	SERVICE the RTS1 wire for open.
RTS1-3	CHECK RTS1 WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 8 and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶	REPLACE the TCM.
		No ▶	SERVICE the RTS1 wire for short.

4EAT Pinpoint Tests	2.5L 4EAT	RTS2

Reduce Torque Signal No. 2 (RTS2) — 2.5L 4EAT

Note

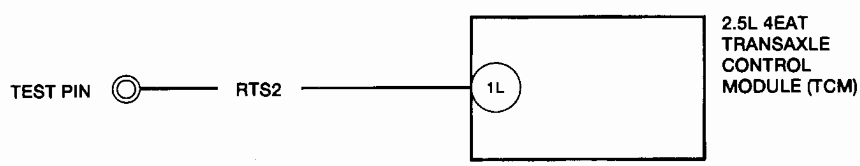
You should enter this Pinpoint Test only when diagnostic trouble code 58 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: RTS2

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT	RTS2	1V	11	1L	LG/W

TEST STEP	RESULT ▶	ACTION TO TAKE
RTS2-1 CHECK RTS2 SIGNAL		
• Key OFF. • Install Breakout Box (connect PCM). • Key ON, engine running. • Drive the vehicle to verify that voltage at BOB Pin 11 drops from greater than 10 volts to less than 1 volt during downshifting (except 4-3 shift) with throttle opening greater than 1/2. • **Does the voltage drop during downshift?**	Yes ▶	If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
	No ▶	GO to RTS2-2.

4EAT Pinpoint Tests	2.5L 4EAT	RTS2

TEST STEP		RESULT ▶	ACTION TO TAKE
RTS2-2	CHECK RTS2 WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 11 and 4EAT Tester Pin 1L. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to RTS2-3. SERVICE the RTS2 wire for open.
RTS2-3	CHECK RTS2 WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 11 and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the TCM. SERVICE the RTS2 wire for short.

4EAT Pinpoint Tests	All 4EAT	SCP

Solenoid Controlled By Power (SCP)

Note

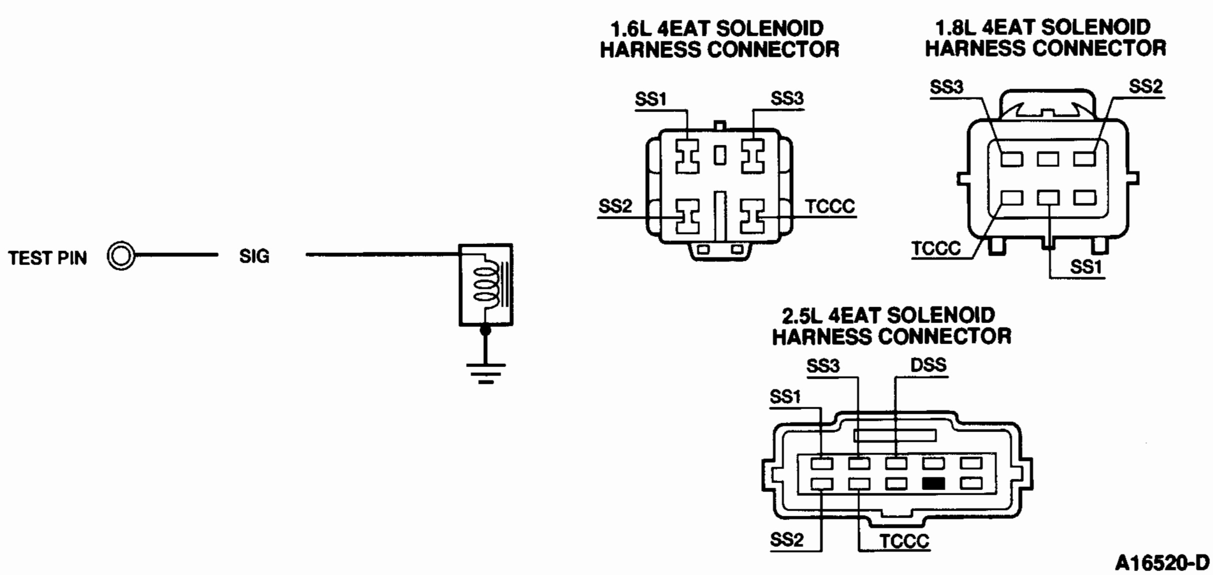
You should enter this Pinpoint Test only when diagnostic trouble code 60, 61, 62, 63, or 64 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: SS1 (1-2 Shift Solenoid), SS2 (2-3 Shift Solenoid), SS3 (3-4 Shift Solenoid), TCCC (Torque Converter Clutch Control Solenoid), DSS (Downshift Solenoid)

Pinpoint Test Schematic



4EAT Pinpoint Tests	All 4EAT	SCP

Data Sheet

NOTE: The Breakout Box Adapter T92C-6000-AH has an A/B position selector switch. Make sure that the switch is in the correct position for each test step, as specified in the Circuit Data Sheet. If no switch position is given then switch can be in either position.

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	Breakout Box Pin	TCM Pin	Wire Color	Diagnostic Trouble Code
1.6L 4EAT	SS1	NA	NA	2E	BL/O	60
	SS2	NA	NA	2G	BL/Y	61
	SS3	NA	NA	2I	O	62
	TCCC	NA	NA	2K	BL	63
1.8L 4EAT	SS1	3W	12	NA	BL/O	60
	SS2	3X	13	NA	BL/Y	61
	SS3	3Y	14	NA	O	62
	TCCC	3Z	15	NA	BL	63
2.5L 4EAT	SS1	NA	NA	2E	BL	60
	SS2	NA	NA	2G	BL/BK	61
	SS3	NA	NA	2I	GN/BK	62
	TCCC	NA	NA	2K	BL/W	63
	DSS	NA	NA	2M	R/W	64

TEST STEP	RESULT ▶	ACTION TO TAKE
SCP1 PERFORM SCP CLICK TEST		
• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected) and bring tester to the engine compartment. • Apply 12 volts to the 4EAT Tester solenoid Pin of the solenoid in question. Use the BATTERY Pin for 12V. • Listen for a "click" at the transaxle. • **Does the solenoid "click" when 12 volts are applied?**	Yes ▶	Solenoid function OK. If sent to this test by Quick Test Step **QT11** in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM (PCM for 1.8L 4EAT).
	No ▶	GO to **SCP2**.
SCP2 CHECK SCP RESISTANCE		
• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between the 4EAT Tester solenoid Pin of the solenoid in question and 4EAT Tester BODY GND. • **Is the resistance between 11-27 ohms?**	Yes ▶	GO to **SCP4**.
	No ▶	GO to **SCP3**.

4EAT Pinpoint Tests	All 4EAT	SCP

TEST STEP		RESULT ▶	ACTION TO TAKE
SCP3	CHECK SOLENOID WIRES FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the 4EAT solenoid connector at the transaxle. • Inspect the wiring harness and connector for possible damage or corrosion. • Measure the resistance between the terminal of the solenoid in question at the 4EAT solenoid harness connector and the 4EAT Tester solenoid Pin. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	INSPECT/TEST internal wiring and REPAIR if necessary. Otherwise, REPLACE the solenoid in question. SERVICE the wire of solenoid in question for open.
SCP4	CHECK SOLENOID WIRES FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the 4EAT solenoid connector at the transaxle. • Measure the resistance between the 4EAT Tester solenoid Pin of the solenoid in question and all other 4EAT Tester Pins. • **Is the resistance between the 4EAT Tester solenoid Pin and all other 4EAT Tester Pins greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the solenoid. SERVICE the wire of solenoid in question for short.

4EAT Pinpoint Tests	All 4EAT	STG

Switch To Ground (STG)

Note

You should enter this Pinpoint Test only when Quick Test Step 11 or the Switch Monitor Test Chart directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

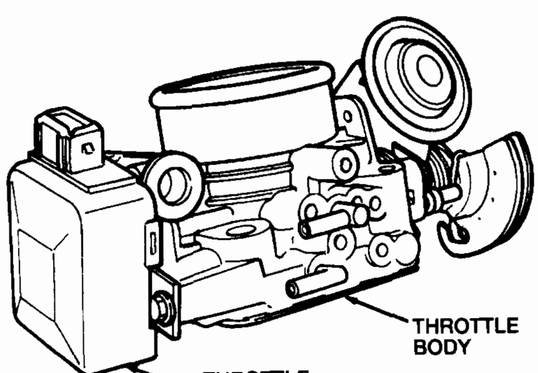
- Circuits: IDL (Idle switch), ODS (Overdrive Off Switch)

Description

When the throttle plate is closed, an idle condition occurs. The Idle (IDL) switch detects this position and notifies the Powertrain Control Module (PCM) with an input signal so adjustments to the engine can be made, including air / fuel ratio and idle speed.

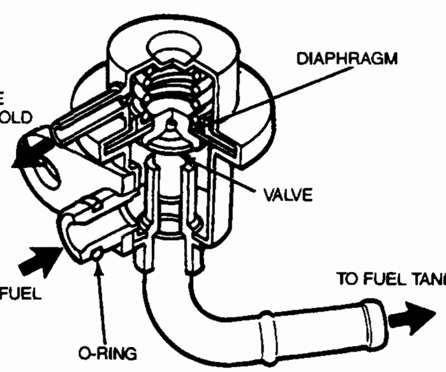
NOTE: The IDL is integrated into the Throttle Position (TP) sensor for the 1.6L, 1.8L, and 2.5L engines.

1.8L



A13924-B

1.6L

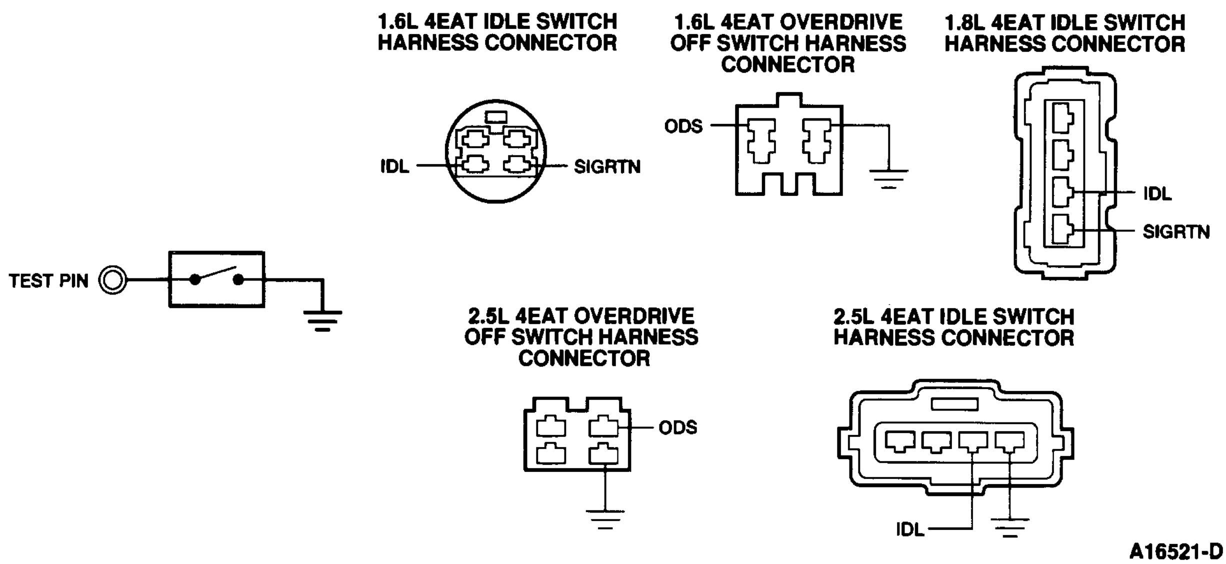


A14763-A

Engine	Location
1.6L, 1.8L, 2.5L	Integrated in the throttle position sensor.

4EAT Pinpoint Tests	All 4EAT	STG

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Circuit	Abbrev.	Engine	PCM Pin	BOB Pin	TCM Pin	Wire Color	Switch Exercise	Switch To
Idle Switch	IDL	1.6L 4EAT 1.8L 4EAT 2.5L 4EAT	1E 1T 1T	28 18 18	1O NA 1O	GN/O R/W BR	Switch opens when accelerator pedal is depressed	Ground
O/D Switch	ODS	2.5L 4EAT 1.6L 4EAT	NA NA	NA NA	1H 1H	BR/BK BL/W	Switch closes when O/D button is depressed	Ground

4EAT Pinpoint Tests	All 4EAT	STG

TEST STEP		RESULT ▶	ACTION TO TAKE
STG1	CHECK SWITCH SIGNAL		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the PCM on 1.6L 4EAT, 2.5L 4EAT. • Measure the resistance between 4EAT Tester switch Pin of the switch in question and ground. • Exercise switch as indicated in Data Sheet. Switch / Continuity: Open — No Closed — Yes • **Is the continuity switching?**	Yes ▶ No ▶	Switch circuit OK. If sent to this test by Quick Test Step QT9 in Section 5B, RETURN to Section 2B, Diagnostic Routines. If sent to this test by Switch Monitor Test, REPLACE the TCM (1.6L 4EAT, 2.5L 4EAT) or the PCM (1.8L 4EAT). GO to STG2.
STG2	CHECK SWITCH OPERATION		
	• Key OFF. • Disconnect the connector of the switch in question. • Measure the resistance between switch terminals on multiple pin switch connectors, or between switch terminal and ground on single pin switch connectors. • Exercise switch as indicated in Data Sheet. Switch / Continuity: Open — No Closed — Yes • **Is the continuity switching?**	Yes ▶ No ▶	GO to STG3. REPLACE the switch.
STG3	CHECK SWITCH WIRE FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the connector of the switch in question. • Measure the resistance between 4EAT Tester switch Pin and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to STG4. SERVICE the switch wire for shorts.

4EAT Pinpoint Tests	All 4EAT	STG

TEST STEP		RESULT ▶	ACTION TO TAKE
STG4	CHECK SWITCH WIRE FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the connector of the switch in question. • Measure the resistance between 4EAT Tester switch Pin and the switch wire at the switch harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE the ground wire at switch connector for opens. SERVICE the switch wire for opens.

4EAT Pinpoint Tests	All 4EAT	STI

Self-Test Input (STI)

Note

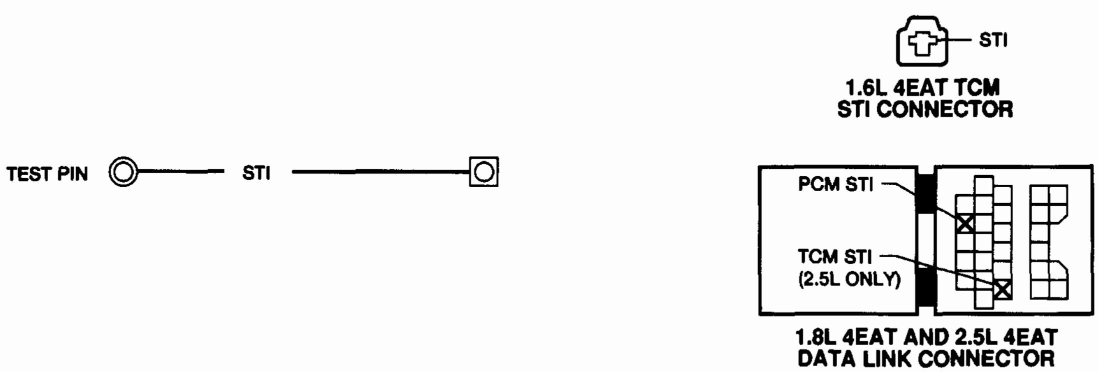
You should enter this Pinpoint Test only when Quick Test Step 6 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: STI

Pinpoint Test Schematic



A17995-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	STI	NA	NA	1E	R/BK
1.8L 4EAT	STI	11	48	NA	LG/Y
2.5L 4EAT	STI	NA	NA	1E	R/BK

4EAT Pinpoint Tests	All 4EAT	STI

TEST STEP		RESULT ▶	ACTION TO TAKE
STI1	CHECK STI WIRE FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between 4EAT Tester Pin STI and TCM STI terminal (1.6L 4EAT, 2.5L 4EAT) or PCM STI terminal (1.8L 4EAT). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to STI2. SERVICE the wire for open.
STI2	CHECK STI WIRE FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between 4EAT Tester Pin STI and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to 4EAT Pinpoint Test STO in this section. SERVICE the wire for short.

4EAT Pinpoint Tests	All 4EAT	STO

Self-Test Output (STO)

Note

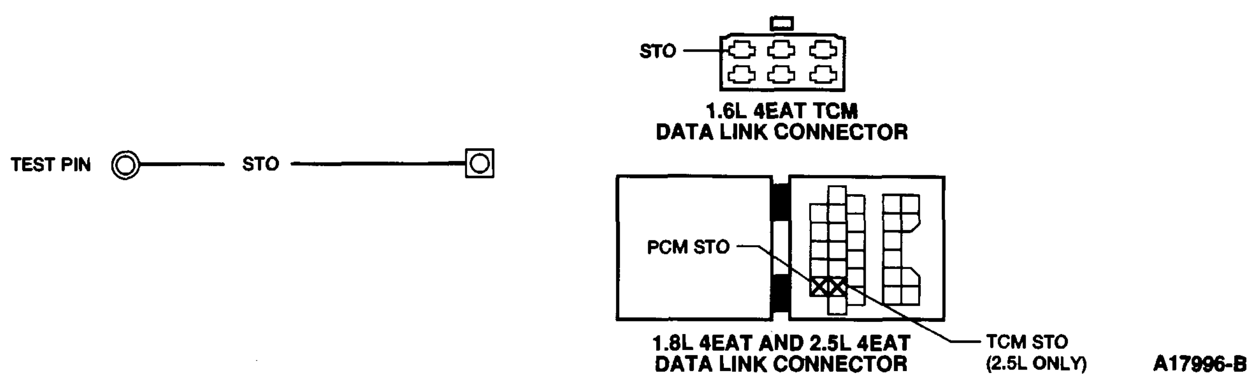
You should enter this Pinpoint Test only when Quick Test Step 10 or 4EAT Pinpoint Test STI direct you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: STO

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	STO	NA	NA	1C	R
1.8L 4EAT	STO	1F	17	NA	W/BK
2.5L 4EAT	STO	NA	NA	1C	R

4EAT Pinpoint Tests	All 4EAT	STO

TEST STEP		RESULT ▶	ACTION TO TAKE
STO1	CHECK STO WIRE FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between 4EAT Tester Pin STO and data link connector TCM STO terminal (1.6L 4EAT, 2.5L 4EAT) or PCM STO terminal (1.8L 4EAT). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to STO2. SERVICE the wire for open.
STO2	CHECK STO WIRE FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Measure the resistance between 4EAT Tester Pin STO and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to 4EAT Pinpoint Test PGC in this section. SERVICE the wire for short.

4EAT Pinpoint Tests	All 4EAT	STP

Switch To Power (STP)

Note

You should enter this Pinpoint Test only when Quick Test Step 11 or the Switch Monitor Test Chart direct you here.

Remember

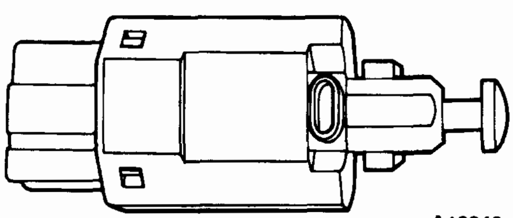
This Pinpoint Test is intended to diagnose only the following:

- Circuits: MLP (Manual Lever Position), MLPD (Drive Range), MLPL (Low Range), MLPOD (Overdrive Range), MLPR (Reverse Range), MLP1 (First Range), MLP2 (Second Range), BOO (Brake ON / OFF Switch)

Description

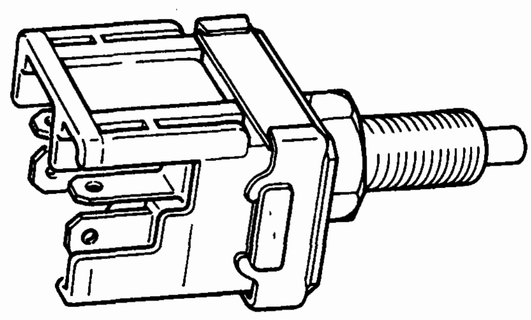
The Brake On / Off (BOO) switch detects when the brake pedal is depressed and sends an input signal to the Powertrain Control Module (PCM). The PCM uses this information to control fuel injection amount.

2.5L



A16840-A

1.6L, 1.8L



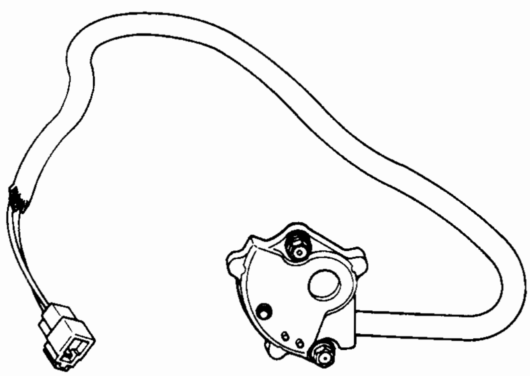
A14042-A

Engine	Location
1.6L, 1.8L, 2.5L	Mounted at top of brake pedal.

4EAT Pinpoint Tests	All 4EAT	STP

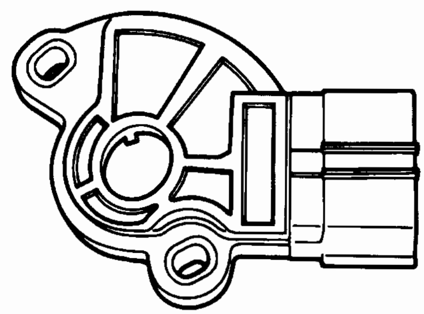
The Manual Lever Position (MLP) switch serves as a dual purpose switch. One purpose of the MLP switch is to notify the PCM when the vehicle is in the PARK or NEUTRAL position for vehicle starting. A voltage signal is sent to the PCM only in these two positions. The second purpose of the MLP switch is to detect when the selector lever has been placed in the R, D, 2, or 1 range on 1.6L and 2.5L vehicles or in the R, D, D, or L range on 1.8L vehicles. If the selector lever is placed in any of these positions, a voltage signal is sent to the TCM (1.6L and 2.5L) or the PCM (1.8L) to control the transaxle.

1.6L 4EAT, 1.8L 4EAT



A-14612-A

2.5L 4EAT

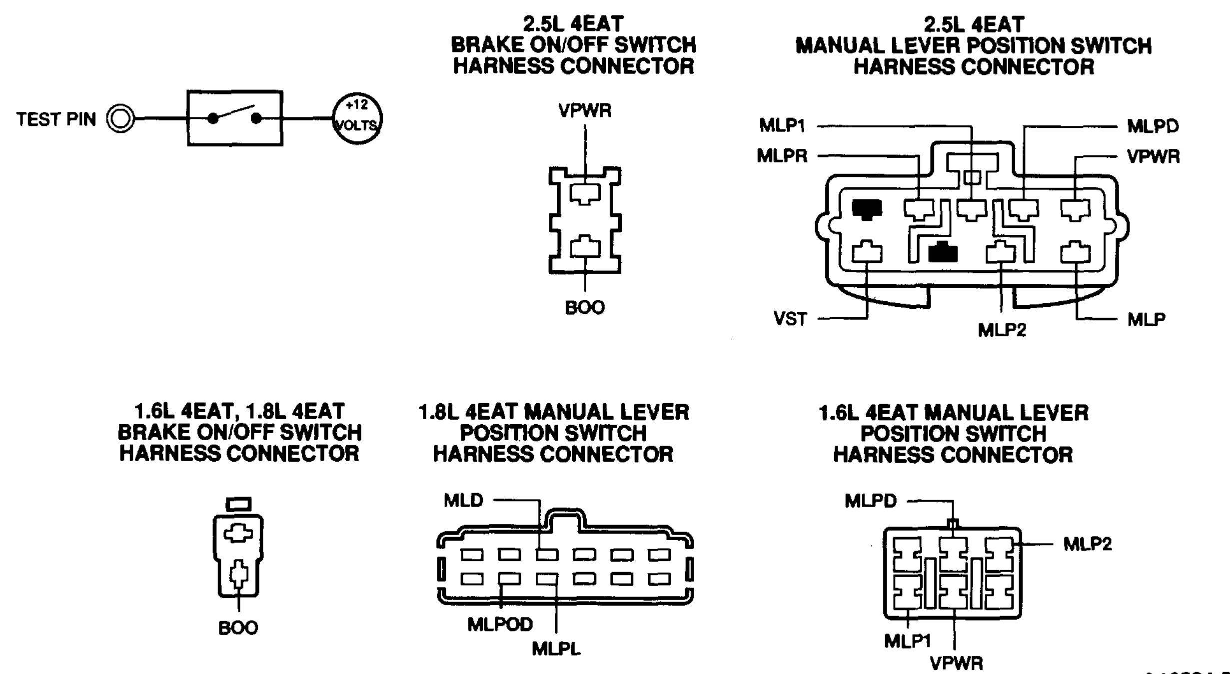


A16771-A

Engine	Location
1.6L 4EAT, 1.8L 4EAT, 2.5L 4EAT	Mounted to the top front portion of the automatic transaxle.

4EAT Pinpoint Tests	All 4EAT	STP

Pinpoint Test Schematic



A16524-D

Data Sheet

CIRCUIT DATA SHEET

Switch	Abbrev.	Engine	PCM Pin	BOB Pin	TCM Pin	Wire Color	Switch Exercise	Switch To
Manual Lever Position Switch	MLP	1.6L 4EAT 1.8L 4EAT 2.5L 4EAT	3D 1R NA	2 30 NA	2B 2B 2B	BK/Y BK/BL GN	Close switch N or P range. Open switch in any other range	Battery voltage with key ON and switch open
Manual Lever Pos. "D" range	MLPD	1.6L 4EAT 1.8L 4EAT 2.5L 4EAT	NA 3H NA	NA 4 NA	2D NA 2D	Y Y/R R/BL	Close switch in D range only	Battery voltage with key ON and switch closed
Manual Lever Pos. "R" range	MLPR	2.5L 4EAT	NA	NA	1I	R/Y	Close switch in R range only	Battery voltage with key ON and switch closed

(Continued)

4EAT Pinpoint Tests	All 4EAT	STP

CIRCUIT DATA SHEET (Cont'd)

Switch	Abbrev.	Engine	PCM Pin	BOB Pin	TCM Pin	Wire Color	Switch Exercise	Switch To
Manual Lever Pos. "1" range	MLP1	1.6L 4EAT 2.5L 4EAT	NA NA	NA NA	2H 2H	Y/W BL/O	Close switch in 1 range only	Battery voltage with key ON and switch closed
Manual Lever Pos. "2" range	MLP2	1.6L 4EAT 2.5L 4EAT	NA NA	NA NA	2F 2F	Y/R GN/W	Close switch in 2 range only	Battery voltage with key ON and switch closed
Brake ON/OFF	BOO	1.6L 4EAT 1.8L 4EAT 2.5L 4EAT	1J 1Q 1Q	3 2 2	1F NA 1F	W/GN GN W/GN	Close switch by depressing brake pedal	Battery voltage with switch closed
Manual Lever Pos. "OD" range	MLPOD	1.8L 4EAT	3E	56	NA	Y	Close switch in OD range only	Battery voltage with switch closed
Manual Lever Pos. "L" range	MLPL	1.8L 4EAT	3G	6	NA	Y/W	Close switch in L range only	Battery voltage with switch closed

TEST STEP	RESULT ▶	ACTION TO TAKE
STP1 CHECK SWITCH SIGNAL		
• Key OFF. • Install 4EAT Tester. • Key ON. • Measure the voltage between 4EAT Tester Pin of the switch in question and ground. • Exercise switch as indicated in Data Sheet. • **Does the voltage switch from less than 1 volt to battery voltage?**	Yes ▶	STP circuit OK. If sent here by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. If sent here by Switch Monitor Test, REPLACE the TCM (1.6L 4EAT, 2.5L 4EAT) or the PCM (1.8L 4EAT).
	No (MLP for 2.5L 4EAT) ▶	GO to STP5.
	No (all others) ▶	GO to STP2.

4EAT Pinpoint Tests	All 4EAT	STP

TEST STEP	RESULT ▶	ACTION TO TAKE
STP2 CHECK FOR POWER AT SWITCH		
• Key OFF. • Disconnect the connector of the switch in question. • Key ON. • Measure the voltage at VPWR wire at switch connector. • **Is the voltage approximately battery voltage?**	Yes ▶ No ▶	GO to STP3. CHECK STOP fuse (BOO) or METER fuse (all others). REPLACE the fuse if blown. If the fuse blows after replacement, SERVICE the short. If fuse is OK, SERVICE the VPWR wire for open.
STP3 CHECK SWITCH RESISTANCE		
• Key OFF. • Disconnect the connector of the switch in question. • Measure the resistance between switch terminal and VPWR terminal at the switch. • Exercise the switch as indicated in Data Sheet. • **Does the resistance switch between less than 5 ohms and greater than 10,000 ohms?**	Yes ▶ No ▶	GO to STP4. REPLACE the switch in question.
STP4 CHECK SWITCH WIRE FOR SHORT		
• Key OFF. • Install 4EAT Tester (leave TCM [1.6L 4EAT, 2.5L 4EAT] or PCM [1.8L 4EAT] disconnected). • Disconnect the connector of the switch in question. • Measure the resistance between 4EAT Tester switch Pin and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	SERVICE the wire for open. SERVICE the wire for short.
STP5 CHECK MLP SWITCH (2.5L 4EAT)		
• Key OFF. • Disconnect the MLP switch connector located on the top of the transaxle. • Measure the resistance between the MLP terminal and the VST terminal at the MLP switch. • Exercise the switch and verify resistances are correct. Position / Resistance (ohms): N or P — Less than 5 R, D, 2, or 1 — Greater than 10,000 • **Are the resistances OK?**	Yes ▶ No ▶	SERVICE the MLP wire between TCM and MLP switch for open. REPLACE the MLP switch.

Position	Resistance (ohms)
N or P	Less than 5
R, D, 2, or 1	Greater than 10,000

4EAT Pinpoint Tests	1.8L 4EAT	TOT

Transaxle Oil Temperature (TOT) Sensor — 1.8L 4EAT

Note

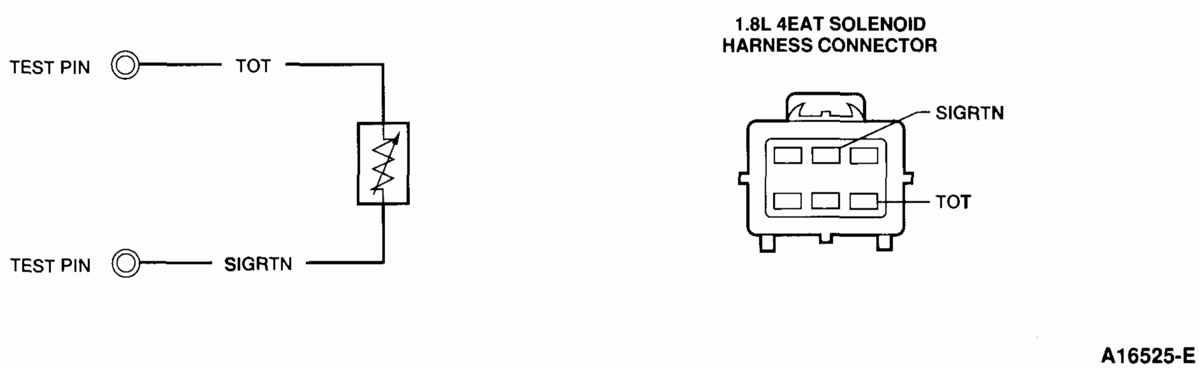
You should enter this Pinpoint Test only when diagnostic trouble code 56 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: TOT, SIGRTN

Pinpoint Test Schematic



4EAT Pinpoint Tests	1.8L 4EAT	TOT

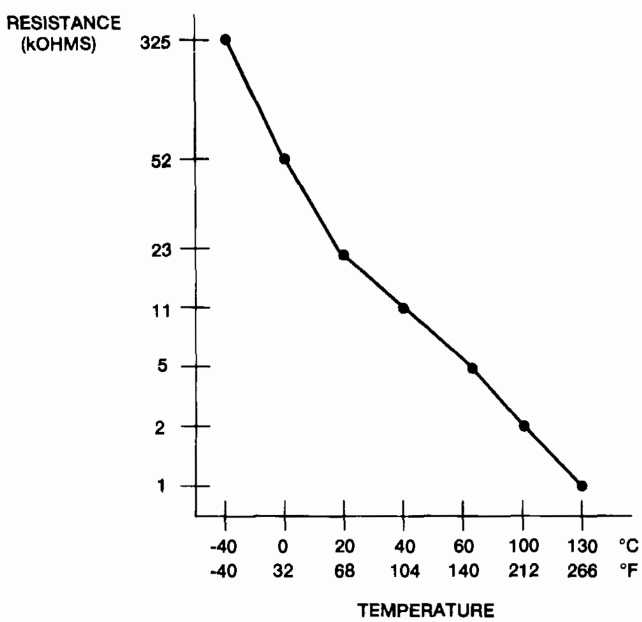
Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.8L 4EAT	TOT SIGRTN	2G 3A	50 40, 60	NA NA	W/BK BK/O

1.8L 4EAT

GRAPH



TOT RESISTANCE DATA SHEET

°C	°F	kOHMS
-40	-40	325.50
0	32	52.00
20	68	23.00
40	104	11.00
60	140	5.60
100	212	1.71
130	266	0.86

A14177-C

4EAT Pinpoint Tests	1.8L 4EAT	TOT

TEST STEP		RESULT ▶	ACTION TO TAKE
TOT1	CHECK TOT RESISTANCE		
	• Run vehicle to warm up ATF (transaxle oil). • Key OFF. • Install 4EAT Tester (leave PCM disconnected). • Measure the resistance between 4EAT Tester Pins TOT and SIGRTN. • Allow the ATF (transaxle oil) to cool. • **Does the resistance gradually increase as ATF (transaxle oil) cools as indicated on Data Sheet?**	Yes ▶ No ▶	TOT circuit OK. If sent here by Quick Test QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM. GO to TOT2.
TOT2	CHECK TOT AND SIGRTN WIRES FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave PCM disconnected). • Disconnect the 4EAT solenoid connector. • Measure the resistance between 4EAT Tester Pin TOT and the TOT wire at the 4EAT solenoid harness connector. • Measure the resistance between 4EAT Tester Pin SIGRTN and the SIGRTN wire at the 4EAT solenoid harness connector. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	GO to TOT3. SERVICE the wire in question for open.
TOT3	CHECK TOT WIRE FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave PCM disconnected). • Disconnect the 4EAT solenoid connector. • Measure the resistance between 4EAT Tester Pin TOT and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the PCM. SERVICE the wire in question for short.

4EAT Pinpoint Tests	1.6L 4EAT	TOT

Transaxle Oil Temperature (TOT) Switch — 1.6L 4EAT

Note

You should enter this Pinpoint Test only when Quick Test Step 11 directs you here.

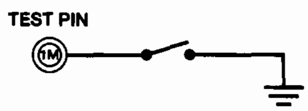
Remember

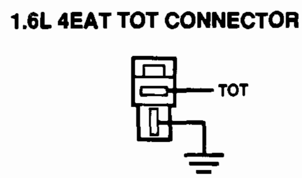
This Pinpoint Test is intended to diagnose only the following:

- Circuit: TOT

Pinpoint Test Schematic

Transaxle Oil Temperature Switch





A14774-E

Data Sheet

CIRCUIT DATA SHEET

Circuit	Engine	PCM Pin	BOB Pin	TCM Pin	Wire Color
TOT	1.6L 4EAT	NA	NA	1M	BK/BL

4EAT Pinpoint Tests	1.6L 4EAT	TOT

TEST STEP		RESULT ▶	ACTION TO TAKE
TOT1	CHECK TRANSAXLE OIL TEMPERATURE SWITCH SIGNAL		
	• Drive vehicle to warm up ATF (transaxle oil). • Key OFF. • Connect 4EAT Tester. • Key ON. • Measure the voltage at the TOT Test Pin. • Allow the ATF (transaxle oil) to cool. • Compare voltage readings with the following chart:	Yes ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. GO to TOT2.

Trans. Oil Temp.	Voltage
Warm (above 150°C [302°F])	Less than 1.5 volts
Cool (below 150°C [302°F])	Greater than 10 volts

• **Are the voltages OK?**

TEST STEP		RESULT ▶	ACTION TO TAKE
TOT2	CHECK TRANSAXLE OIL TEMPERATURE SWITCH		
	• Drive vehicle to warm up ATF (transaxle oil). • Disconnect transaxle oil temperature switch connector. • Measure the resistance across the transaxle oil temperature switch terminals. • Allow the ATF (transaxle oil) to cool. • Compare the resistance readings to the following chart:	Yes ▶ No ▶	GO to TOT3. REPLACE the transaxle oil temperature switch.

Trans. Oil Temp.	Resistance
Warm (above 150°C [302°F])	Less than 5 ohms
Cool (below 150°C [302°F])	Greater than 10,000 ohms

• **Are the resistances OK?**

TEST STEP		RESULT ▶	ACTION TO TAKE
TOT3	CHECK TRANSAXLE OIL TEMPERATURE SWITCH GROUND		
	• Key OFF. • Disconnect the transaxle oil temperature switch connector. • Measure the resistance between the "BK" wire on the transaxle oil temperature switch connector and vehicle body ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to TOT4. SERVICE the "BK" wire.

4EAT Pinpoint Tests	1.6L 4EAT	TOT

TEST STEP		RESULT ▶	ACTION TO TAKE
TOT4	CHECK TRANSAXLE OIL TEMPERATURE SWITCH WIRE TO TCM		
	• Key OFF. • Connect 4EAT Tester (leave TCM disconnected). • Disconnect the transaxle oil temperature switch connector. • Measure the resistance between the TOT terminal on the transaxle oil temperature switch connector and the TOT Test Pin. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the TCM. SERVICE the TOT wire.

4EAT Pinpoint Tests	2.5L 4EAT	TOT

Transaxle Oil Temperature (TOT) Sensor — 2.5L 4EAT

Note

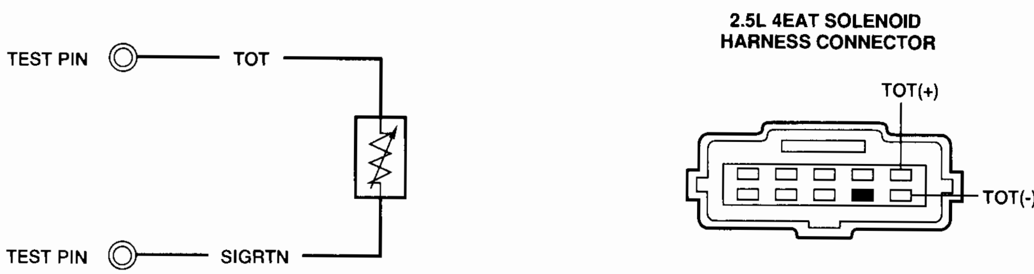
You should enter this Pinpoint Test only when diagnostic trouble code 56 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: TOT (+), TOT (-)

Pinpoint Test Schematic



A21015-A

4EAT Pinpoint Tests	2.5L 4EAT	TOT

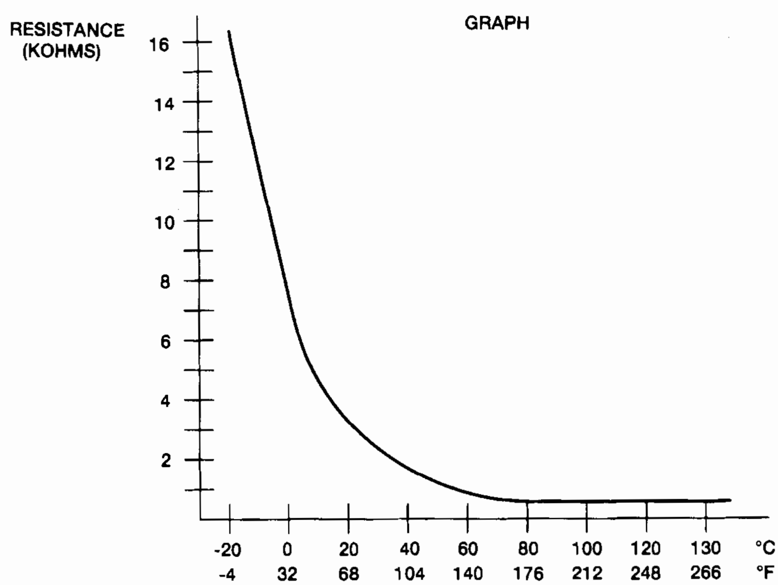
Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT[1]	TOT (+) TOT (-)	NA NA	NA NA	1G 2P	BL / Y BK / R

1 Cannot take measurements at the 4EAT Tester.

2.5L 4EAT



A16527-A

TOT RESISTANCE DATA SHEET

ATF Temperature °C (°F)	Resistance (kOHMS)
-20 (-4)	13.47 - 17.17
0 (32)	5.45 - 6.68
20 (68)	2.44 - 2.89
40 (104)	1.19 - 1.37
60 (140)	0.628 - 0.705
80 (176)	0.353 - 0.387
100 (212)	0.209 - 0.225
120 (248)	0.130 - 0.137
130 (266)	0.104 - 0.109

4EAT Pinpoint Tests	2.5L 4EAT	TOT

TEST STEP		RESULT ▶	ACTION TO TAKE
TOT1	**CHECK TOT RESISTANCE**		
	• Run vehicle to warm up ATF (transaxle oil). • Key OFF. • Disconnect the solenoid harness connector. • Measure the resistance between the solenoid harness connector Pins TOT (+) and TOT (-). • Allow the ATF (transaxle oil) to cool. • **Does the resistance gradually increase as ATF (transaxle oil) cools as indicated on Data Sheet?**	Yes ▶	TOT circuit OK. If sent here by Quick Test QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM.
		No ▶	GO to TOT2.
TOT2	**CHECK TOT AND SIGRTN WIRES FOR OPEN**		
	• Key OFF. • Disconnect the TCM connectors. • Disconnect the 4EAT solenoid connector. • Measure the resistance between the TCM Pin 1G (TOT [+]) and the TOT (+) wire at the 4EAT solenoid harness connector. • Measure the resistance between the TCM Pin 2P (TOT [-]) and the TOT (-) wire at the 4EAT solenoid harness connector. • **Are the resistances less than 5 ohms?**	Yes ▶	GO to TOT3.
		No ▶	SERVICE the wire in question for open.
TOT3	**CHECK TOT WIRE FOR SHORT**		
	• Key OFF. • Disconnect the 4EAT solenoid connector. • Measure the resistance between the 4EAT solenoid harness connector Pin TOT (+) and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶	REPLACE the TCM.
		No ▶	SERVICE the wire in question for short.

4EAT Pinpoint Tests	All 4EAT	TP

Throttle Position (TP) Sensor

Note

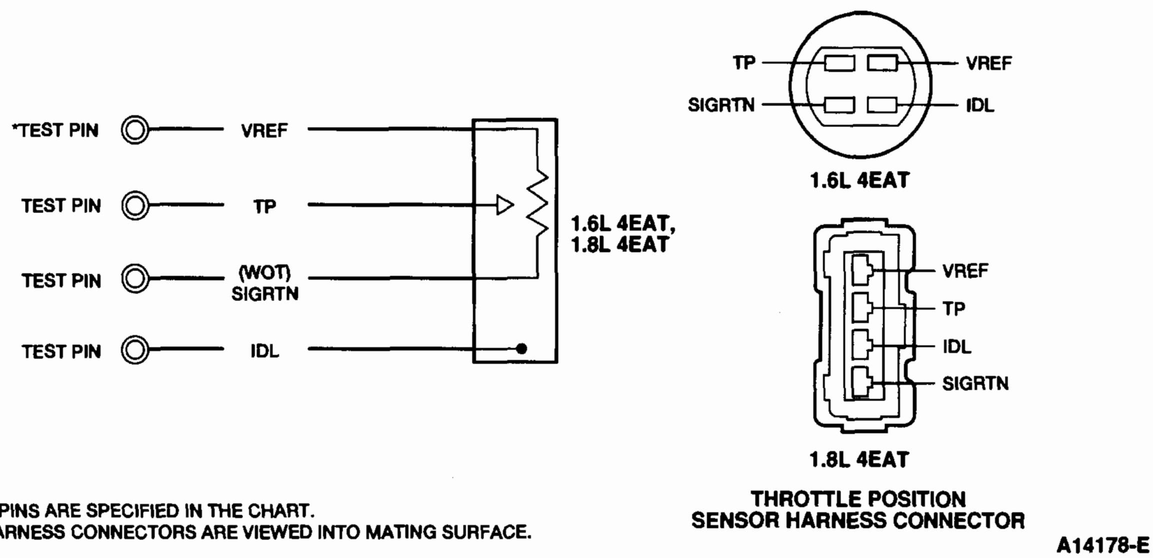
You should enter this Pinpoint Test only when diagnostic trouble code 12 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Remember

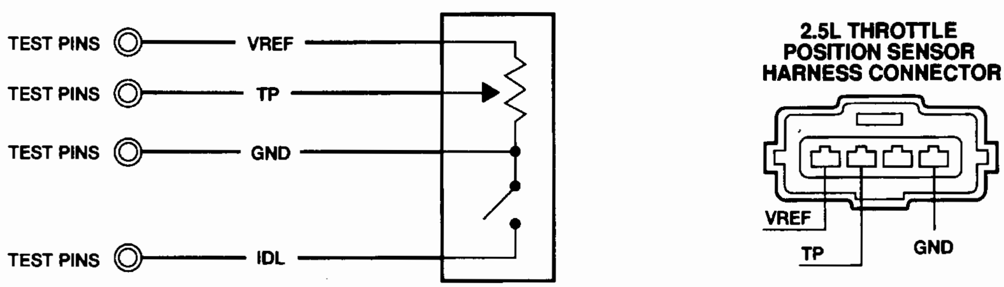
This Pinpoint Test is intended to diagnose only the following:

- Circuit: TP

Pinpoint Test Schematic



4EAT Pinpoint Tests | All 4EAT | TP



Data Sheet

CIRCUIT DATA SHEET

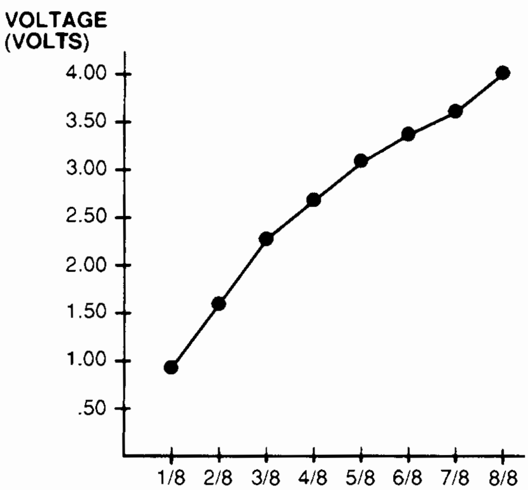
Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	TP	2G	47	2T	O
	VREF	2A	26	2A	W/BK
	SIGRTN	2C	46, 49	NA	BL/Y
	IDL	1E	28	1O	GN/O
1.8L 4EAT	TP	2F	47	NA	LG/W
	VREF	2I	26	NA	LG/R
	SIGRTN	3D	46	NA	BK/W
	IDL	1T	18	NA	R/W
2.5L 4EAT[1]	TP	2F	47	2T	Y
	VREF	2I	26	2A	P
	GND	3C	49	2P	BK/R

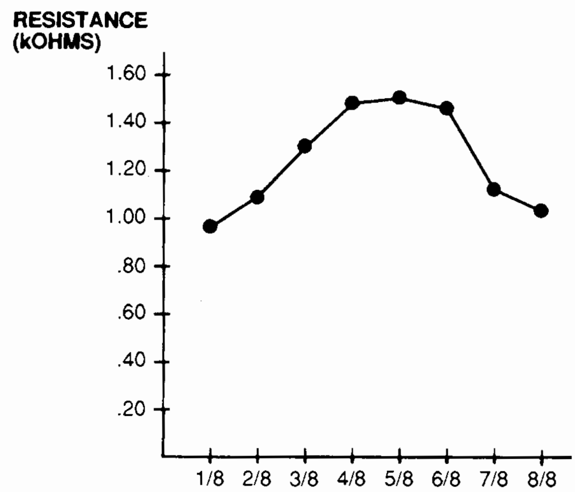
1 Cannot take measurements for 2.5L at the 4EAT Tester.

4EAT Pinpoint Tests	All 4EAT	TP

1.6L 4EAT, 1.8L 4EAT

GRAPH





GRAPH DATA VALUES

THROTTLE POSITION	VOLTS
1/8	.998
2/8	1.60
3/8	2.37
4/8	2.74
5/8	3.15
6/8	3.43
7/8	3.60
8/8	4.02

THROTTLE POSITION	kOHMS
1/8	.989
2/8	1.104
3/8	1.278
4/8	1.462
5/8	1.480
6/8	1.459
7/8	1.144
8/8	1.072

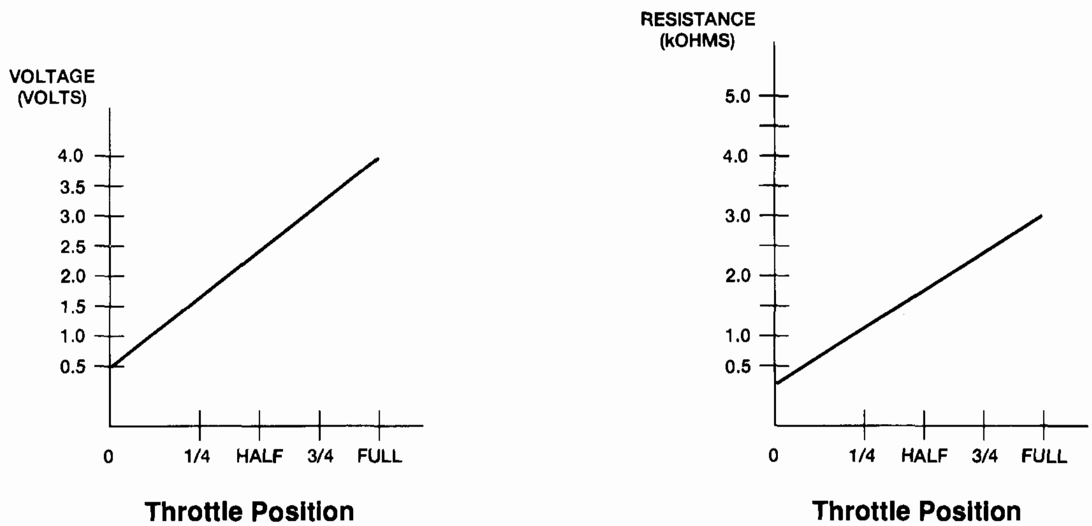
NOTE: Voltage and Resistance values may vary ± 15%.

A14179-A

4EAT Pinpoint Tests	All 4EAT	TP

2.5L 4EAT

GRAPH



Throttle Position	Voltage (Volts)
0	0.5
1/4	1.3
Half	2.2
3/4	2.9
Full	3.7

Throttle Position	Resistance (kohms)
0	0.4
1/4	0.6
Half	1.6
3/4	2.2
Full	3.0

NOTE: Voltage and Resistance Values May Vary ± 15%.

A16528-C

4EAT Pinpoint Tests	All 4EAT	TP

TEST STEP		RESULT ▶	ACTION TO TAKE
TP1	CHECK THROTTLE POSITION SENSOR VOLTAGE		
	• Key OFF. • Install 4EAT Tester (1.6L and 1.8L) or Breakout Box (2.5L). • Key ON. • Measure the voltage between 4EAT Tester Pins TP (1.6L and 1.8L) or BOB Pin 47 (2.5L) and SIGRTN (1.6L and 1.8L) (BOB Pin 49 on 2.5L). • Compare the voltage readings to Graph and Data Sheet as accelerator pedal is depressed. • **Are the voltages OK?**	Yes (1.6L and 1.8L) ▶ Yes (2.5L) ▶ No ▶	Throttle position circuit OK. If directed here from Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM (PCM on 1.8L 4EAT). GO to TP4. GO to TP2.
TP2	CHECK THROTTLE POSITION SENSOR RESISTANCE		
	• Key OFF. • Disconnect the TP sensor connector. • Measure the resistance between the TP and SIGRTN (GND on 2.5L) terminals at the TP sensor. • Compare the resistance readings to Graph and Data Sheet as accelerator pedal is depressed. • **Are the resistances OK?**	Yes ▶ No ▶	GO to TP3. REPLACE the TP sensor.
TP3	CHECK VREF AND SIGRTN (GND)		
	• Key OFF. • Disconnect the TP sensor connector. • Key ON. • Measure the voltage between the VREF wire and the SIGRTN (GND on 2.5L) wire at the harness connector. • **Is the voltage between 4.5-5.5 volts?**	Yes ▶ No ▶	SERVICE the TP wire. GO to EEC Pinpoint Test VREF in this section.
TP4	CHECK WIRES BETWEEN PCM AND TCM (2.5L ONLY)		
	• Key OFF. • Install the Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between 4EAT Tester Pins TP, VREF, and GND and the BOB Pins 47, 26, and 49. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	Throttle position circuit OK. If directed here from Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM. SERVICE the wire(s) in question.

4EAT Pinpoint Tests	2.5L 4EAT	TRS

Torque Reduce/Engine Coolant Temperature Signal (TRS) — 2.5L 4EAT

Note

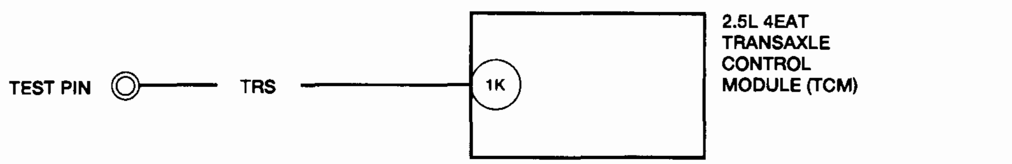
You should enter this Pinpoint Test only when diagnostic trouble code 59 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: TRS

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT	TRS	1K	19	1K	W/BK

4EAT Pinpoint Tests	2.5L 4EAT	TRS

TEST STEP		RESULT ▶	ACTION TO TAKE
TRS1	CHECK TRS SIGNAL		
	• Key OFF. • Install 4EAT Tester. • Key ON. • Measure the voltage at 4EAT Tester Pin TRS during the following conditions:	Yes ▶	TRS circuit OK. If sent to this test by Quick Test Step QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM.
		No ▶	GO to TRS2.

Condition	Voltage (volts)
Coolant temperature above 60°C (140°F)	Battery voltage
During torque control shift	Below 1
Coolant temperature below 60°C (140°F)	0

• **Are the voltages OK?**

TEST STEP		RESULT ▶	ACTION TO TAKE
TRS2	CHECK TRS WIRE FOR OPEN		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 19 and 4EAT Tester Pin 1K. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to TRS3. SERVICE the TRS wire for open.
TRS3	CHECK TRS WIRE FOR SHORT		
	• Key OFF. • Install Breakout Box (leave PCM disconnected). • Install 4EAT Tester (leave TCM disconnected). • Measure the resistance between BOB Pin 19 and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE the PCM. SERVICE the TRS wire for short.

4EAT Pinpoint Tests	All 4EAT	VPWR

Vehicle Power (VPWR)

Note

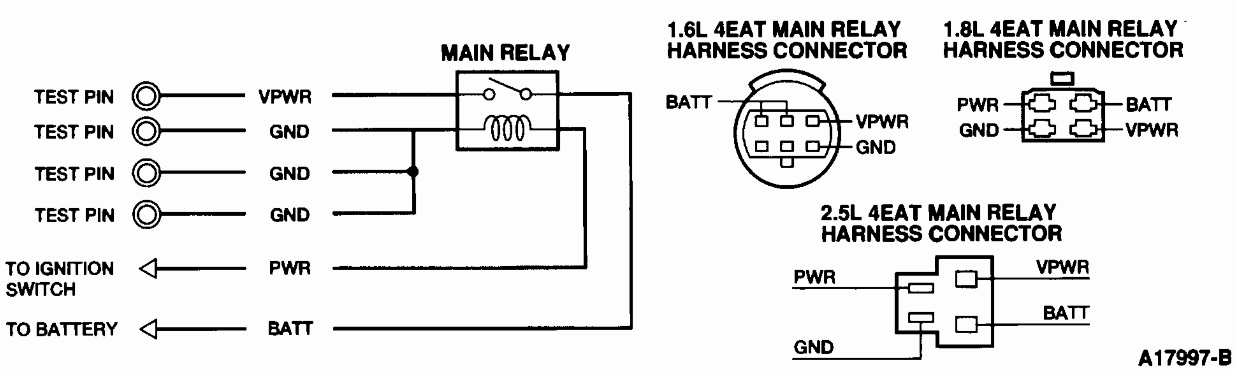
You should enter this Pinpoint Test only when Quick Test Step 11, or another Pinpoint Test directs you here.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuits: VPWR, GND

Pinpoint Test Schematic



4EAT Pinpoint Tests	All 4EAT	VPWR

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	PCM Wire Color	TCM Pin	TCM Wire Color
1.6L 4EAT	VPWR	3I	37, 57	Y/GN	2Q, 2S	BK/W
	GND	NA	NA	NA	1J, 2P	BK
	GND	3A	20	BK	NA	NA
	GND	3G	40	BK	NA	NA
1.8L 4EAT	VPWR	1B	37, 57	W/R	NA	NA
	GND	3A	40, 60	BK/O	NA	NA
	GND	3B	20	BK/O	NA	NA
	GND	3C	49	BK/LG	NA	NA
2.5L 4EAT	VPWR	1B	37, 57	R/BK	2S, 2Q	BK/Y
	GND	3A	40, 60	BK	2P	BK/R
	GND	3B	20	BK	-	-
	GND	3C	49	BK/R	-	-
	GND	3D	46	BK/BL	-	-

TEST STEP	RESULT ▶	ACTION TO TAKE
VPWR1 CHECK VPWR		
• Key OFF. • Install 4EAT Tester. • Key ON. • Measure the voltage between 4EAT Tester Pin VPWR and ground. • **Is the voltage greater than 10 volts?**	Yes ▶	GO to **VPWR2**.
	No (1.8L 4EAT) ▶	GO to **VPWR3**.
	No (1.6L 4EAT, 2.5L 4EAT) ▶	CHECK 15A ENGINE (1.6L 4EAT), 15A METER (2.5L 4EAT) fuse, REPLACE the fuse if blown. If fuse blows after replacement, SERVICE the short. If fuse is OK, SERVICE the VPWR wire for open.
VPWR2 CHECK GROUNDS		
• Key OFF. • Install 4EAT Tester. • Measure the resistance between each 4EAT Tester GND Pin and ground. • **Is the resistance less than 5 ohms?**	Yes ▶	VPWR circuit OK. RETURN to Section 2B, Diagnostic Routines.
	No ▶	SERVICE the TCM (PCM for 1.8L 4EAT) GND wire(s).

4EAT Pinpoint Tests	All 4EAT	VPWR

	TEST STEP	RESULT	ACTION TO TAKE
VPWR3	CHECK FOR OPEN (1.8L 4EAT)		
	• Key OFF. • Remove the main relay from the main fuse panel. • Install 4EAT Tester (leave PCM disconnected). • Measure the resistance between the main relay harness connector VPWR terminal and 4EAT Tester VPWR Pin. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to VPWR4. SERVICE the VPWR wire for open.
VPWR4	CHECK BATTERY VOLTAGE TO MAIN RELAY (1.8L 4EAT)		
	• Key OFF. • Remove the main relay. • Measure the voltage between the main relay harness connector BATT terminal and ground. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to VPWR5. CHECK the fuse. - 30A FUEL INJECTOR (1.8L 4EAT) REPLACE fuse if blown. If fuse blows after replacement, SERVICE the short. If fuse is OK, SERVICE the main relay BATT wire to fuse.
VPWR5	CHECK IGNITION POWER TO MAIN RELAY (1.8L 4EAT)		
	• Key OFF. • Remove the main relay. • Key ON. • Measure the voltage between the main relay harness connector PWR terminal and ground. • **Is the voltage greater than 10 volts?**	Yes ▶ No ▶	GO to VPWR6. CHECK 15A ENGINE fuse. REPLACE fuse if blown. If fuse blows after replacement, SERVICE the short. If fuse is OK, SERVICE the main relay PWR wire to fuse.
VPWR6	CHECK GROUND AT MAIN RELAY (1.8L 4EAT)		
	• Key OFF. • Remove the main relay. • Measure the resistance between the main relay harness connector GND wire and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the main relay. SERVICE the main relay GND wire.

4EAT Pinpoint Tests	All 4EAT	VREF

Reference Voltage (VREF)

Note

To diagnose VREF on 1.8L 4EAT, go to EEC Pinpoint Test VREF.

You should enter this Pinpoint Test only when Quick Test Step 11 or another Pinpoint Test directs you here.

Remember

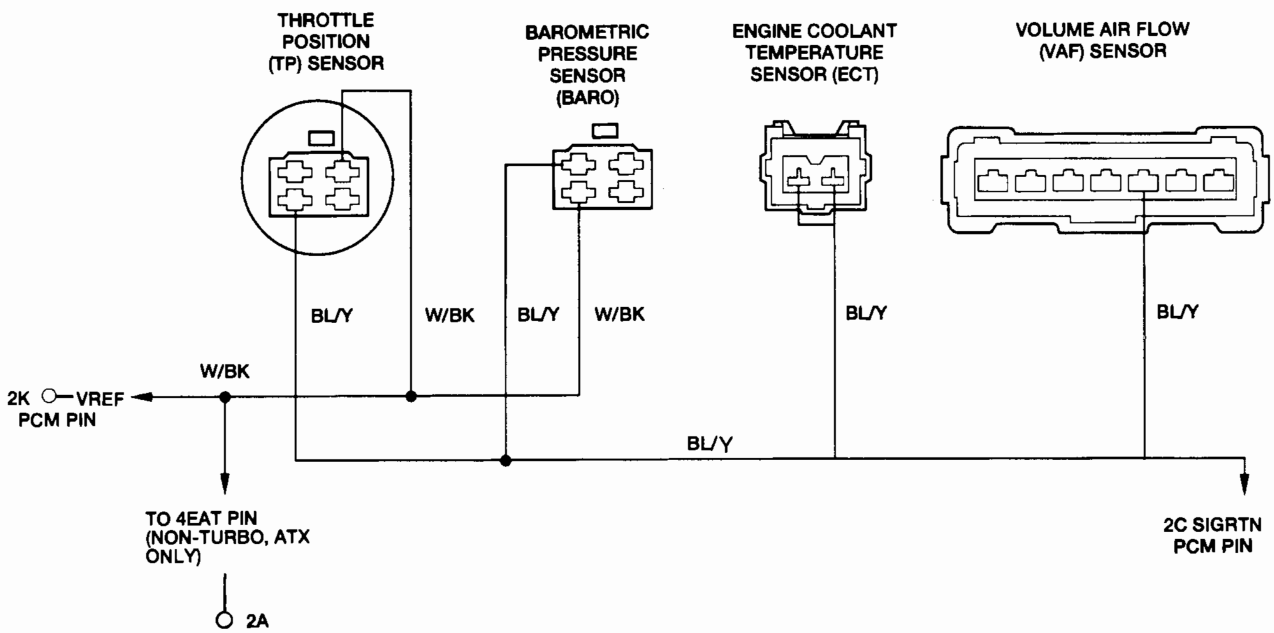
This Pinpoint Test is intended to diagnose only the following:

- Circuits: VREF, SIGRTN

4EAT Pinpoint Tests	All 4EAT	VREF

Pinpoint Test Schematic

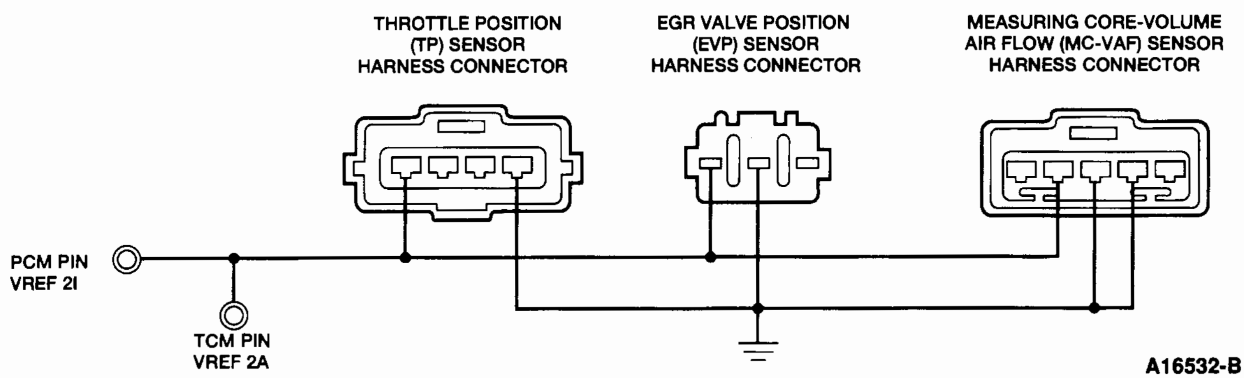
1.6L 4EAT



A15164-C

4EAT Pinpoint Tests	1.6L 4EAT 2.5L 4EAT	VREF

2.5L 4EAT



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	VREF SIGRTN	2A 2C	26 46, 49	2A NA	W/BK BL/Y
2.5L 4EAT	VREF GND	2I 3C	26 49	2A 2P	P BK/R

TEST STEP		RESULT ▶	ACTION TO TAKE
VREF1	CHECK VREF		
	• Key OFF. • Install 4EAT Tester. • Key ON. • Measure the voltage between 4EAT Tester Pins VREF and GND. • **Is the voltage between 4.5-5.5 volts?**	Yes ▶ No ▶	VREF circuit OK. RETURN to Section 2B, Diagnostic Routines. GO to VREF2.
VREF2	CHECK FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Pin 26 and 4EAT Tester Pin VREF. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to VREF3. SERVICE the VREF wire for open.

4EAT Pinpoint Tests	1.6L 4EAT 2.5L 4EAT	VREF

TEST STEP		RESULT ▶	ACTION TO TAKE
VREF3	CHECK FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Install Breakout Box (leave PCM disconnected). • Measure the resistance between BOB Pin 26 and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶	GO to EEC Pinpoint Test $\boxed{\text{PGC}}$ in this section.
		No ▶	SERVICE the VREF wire for short.

4EAT Pinpoint Tests	1.6L 4EAT	VSS

Vehicle Speed Sensor (VSS) — 1.6L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 06 is received in Quick Test Steps 7 or 8, or when Quick Test Step 11 directs you here.

Verify that the speedometer is working properly before performing this test. If not, refer to Service Manual Section 13-01.

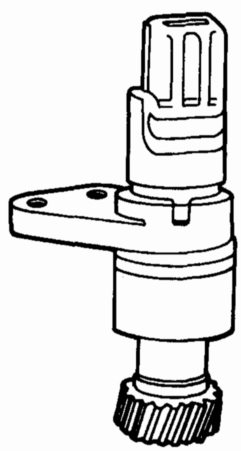
Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: VSS

Description

The Vehicle Speed Sensor (VSS) rotates with the transaxle's final drive gear. On the 1.6L engines, the speed sensor turns a cable which is sent to the speedometer in the instrument cluster and transferred to a vehicle speed signal.



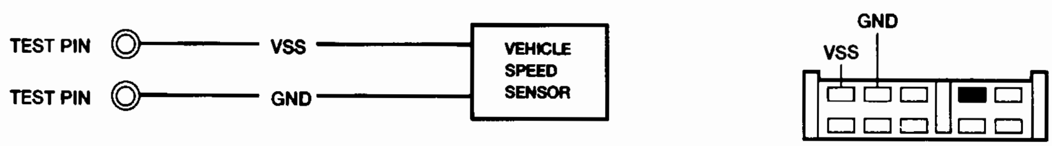
A16770-A

Engine	Location
1.6L 4EAT	Mounted to the transaxle, above the final drive gear.

4EAT Pinpoint Tests	1.6L 4EAT	VSS

Pinpoint Test Schematic

1.6L 4EAT INSTRUMENT CLUSTER HARNESS CONNECTOR



A17998-B

Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.6L 4EAT	VSS GND	NA NA	NA NA	1P 1J	GN/R BK

TEST STEP	RESULT ▶	ACTION TO TAKE
VSS1 CHECK VSS INPUT SIGNAL		
• Key OFF. • Install 4EAT Tester and adapter to vehicle harness connectors (leave TCM disconnected). • Remove the speedometer driven gear from the transaxle (leave the speedometer cable connected). • Measure the DC voltage at Test Pin VSS while spinning the driven gear. • **Does the voltage alternate between 0 and 5 volts 4 times per revolution?**	Yes ▶ No ▶	VSS circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM. GO to VSS2.
VSS2 CHECK VSS SIGNAL WIRE		
• Locate and disconnect the 10-pin instrument cluster connector. • Measure the resistance of the "GN/R" wire between Test Pin VSS and the 10-pin instrument cluster connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to VSS3. SERVICE the VSS wire to the TCM.
VSS3 CHECK VSS GROUND		
• Disconnect the 10-pin instrument cluster connector. • Measure the resistance of the "BK" wire between the 10-pin instrument cluster connector and Test Pin GND. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE the speedometer head or printed circuit board. SERVICE the GND wire to the TCM.

4EAT Pinpoint Tests	1.8L 4EAT	VSS

Vehicle Speed Sensor (VSS) — 1.8L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 06 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Verify that the speedometer is working properly before performing this test. If not, refer to Service Manual Section 13-01.

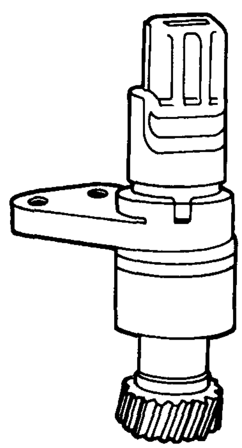
Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: VSS

Description

The Vehicle Speed Sensor (VSS) rotates with the transaxle's final drive gear.

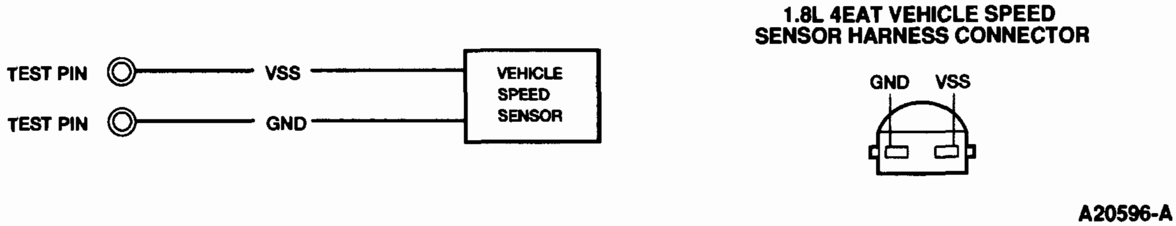


A16770-A

Engine	Location
1.8L 4EAT	Mounted to the transaxle, above the final drive gear.

4EAT Pinpoint Tests	1.8L 4EAT	VSS

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
1.8L 4EAT	VSS GND	1M 2L	NA NA	NA NA	GN BL

TEST STEP	RESULT ▶	ACTION TO TAKE
VSS1 CHECK VSS INPUT SIGNAL		
• Key OFF. • Install 4EAT Tester to harness connectors (leave PCM disconnected). • Remove the vehicle speed sensor from the transaxle and leave the wiring connected. • Measure the continuity between BOB Test Pin VSS and BOB Test Pin GND. • Rotate the speedometer cable. • **Does continuity exist eight times per one revolution of the speedometer cable?**	Yes ▶	Vehicle speed sensor circuit OK. If directed here from Quick Test Step QT11 in Section 5B, then RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the PCM.
	No ▶	GO to VSS2.
VSS2 CHECK VSS SIGNAL WIRE		
• Key OFF. • Disconnect the VSS connector at the transaxle. • Measure the resistance of the VSS wire between the VSS connector and BOB Test Pin VSS. • **Is the resistance less than 5 ohms?**	Yes ▶	GO to VSS3.
	No ▶	SERVICE the VSS wire to the PCM.
VSS3 CHECK VSS GROUND WIRE		
• Key OFF. • Disconnect the VSS connector at the transaxle. • Measure the resistance of the GND wire between the VSS connector and Test Pin GND. • **Is the resistance less than 5 ohms?**	Yes ▶	REPLACE the vehicle speed sensor / speedometer driven gear.
	No ▶	SERVICE the GND wire to the PCM.

4EAT Pinpoint Tests	2.5L 4EAT	VSS

Vehicle Speed Sensor (VSS) — 2.5L 4EAT

Note

You should enter this Pinpoint Test only when diagnostic trouble code 06 is received in Quick Test Step 7 or 8, or when Quick Test Step 11 directs you here.

Verify that the speedometer is working properly before performing this test. If not, refer to Service Manual Section 13-01.

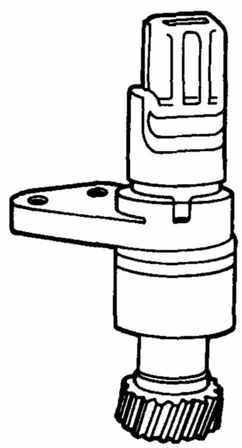
Remember

This Pinpoint Test is intended to diagnose only the following:

- Circuit: VSS

Description

The Vehicle Speed Sensor (VSS) rotates with the transaxle's final drive gear. The speed sensor turns a Hall effect pickup sensor and an AC voltage is created and sent to the speedometer in the instrument cluster. The AC voltage signal is developed into a DC digital signal and sent to the Powertrain Control Module (PCM).

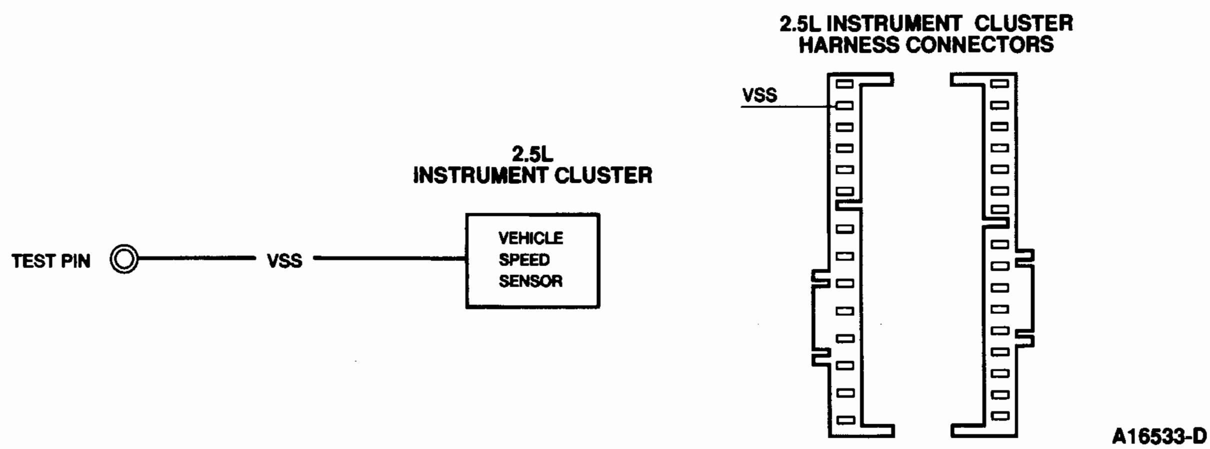


A16770-A

Engine	Location
2.5L 4EAT	Mounted to the transaxle, above the final drive gear.

4EAT Pinpoint Tests	2.5L 4EAT	VSS

Pinpoint Test Schematic



Data Sheet

CIRCUIT DATA SHEET

Engine	Circuit	PCM Pin	BOB Pin	TCM Pin	Wire Color
2.5L 4EAT	VSS	1M	3	1P	GN/R

TEST STEP		RESULT ▶	ACTION TO TAKE
VSS1	CHECK VSS SIGNAL		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Key ON. • Raise vehicle. • Measure the DC voltage between 4EAT Tester VSS Pin using a Rotunda 73 Digital Multimeter 105-00051, or equivalent, while spinning front tire. • **Does the voltage alternate between 0 and 5 volts?**	Yes ▶	VSS circuit OK. If sent to this test by Quick Test QT11 in Section 5B, RETURN to Section 2B, Diagnostic Routines. Otherwise, REPLACE the TCM.
		No ▶	GO to VSS2.
VSS2	CHECK VSS WIRE FOR OPEN		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the 14-pin instrument cluster connector. • Measure the resistance between 4EAT Tester VSS Pin and the "GN/R" wire at the 14-pin instrument cluster harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶	GO to VSS3.
		No ▶	SERVICE the VSS wire for open.

4EAT Pinpoint Tests	2.5L 4EAT	VSS

TEST STEP		RESULT ▶	ACTION TO TAKE
VSS3	CHECK VSS WIRE FOR SHORT		
	• Key OFF. • Install 4EAT Tester (leave TCM disconnected). • Disconnect the 14-pin instrument cluster connector. • Measure the resistance between 4EAT Tester VSS Pin and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶	GO to Section 13-01 of the Service Manual to diagnose the speedometer.
		No ▶	SERVICE the VSS wire for short.

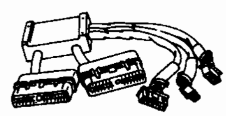
Specifications / Special Service Tools

Special Service Tools / Equipment

SPECIAL SERVICE TOOLS

Tool Number	Description
D81P-6666-A	Air Gap Spark Tester

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T92C-6000-AH 1.8L 4EAT and 2.5L Breakout Box Adapter	 T92C-6000-AH

ROTUNDA EQUIPMENT

Model	Description
014-00322	Breakout Box
007-0037B	4EAT Tester and All Adapters
007-00095	4EAT Adapter
007-00100	3 Adapter Kit
007-00100-B	4EAT Adapter (Part of 007-00100)
007-00100-A	4EAT Adapter (Part of 007-00100)
007-00038	Breakout Box Adapter
007-00057	Breakout Box Adapter
105-00051	73 Digital Multimeter
021-00014	Vacuum Tester
055-00100	Digital Thermo Pyrometer
107-R0300	Heat Gun
059-00008	Vacuum Gauge
059-00014	Timing Analyzer
007-0041B	Super STAR II Tester

SECTION 7B

EEC Intermittent Fault Diagnosis

Contents

SECTION 7B

EEC Intermittent Fault Diagnosis

Contents (continued)

SECTION 7B

EEC Intermittent Fault Diagnosis

Contents (continued)

Introduction

Defining Intermittent Driveability Symptoms

The Rotunda EEC-IV Monitor 007-0047F and the Rotunda EEC-IV Monitor Recorder 007-00021 are useful tools for diagnosing intermittent driveability symptoms which are unable to be resolved through the diagnostics in Section 6B Pinpoint Testing. This section supports diagnostic procedures and data using the EEC-IV Monitor and EEC-IV Monitor Recorder in a symptom-oriented manner.

By definition, an "intermittent" symptom is a randomly-occurring drive symptom from which no diagnostic codes (KOEO, KOER) are reported to the Rotunda Super STAR II Tester 007-0041B or other diagnostic equipment. Often, the EEC Quick Test (Section 5B) will result in pass codes while the drive symptom(s) still exist.

Before proceeding with the following procedures, be sure that:

- Customary mechanical system tests and inspections reveal no obvious problems (remember, mechanical component problems can make a good Powertrain Control Module [PCM] system react abnormally).
- EEC Quick Test (Section 5B) and associated EEC Pinpoint Test diagnostics (Section 6B) have been completed, and the symptom is still occurring after all recommended procedures have been performed.
- Review of Ford Technical Service Bulletins (TSBs) and inquiry into On-line Automotive Service Information System (OASIS) indicates no applicable articles.

Purpose of This Section

The Rotunda EEC-IV Monitor 007-0047F functions as a "window" into the EEC system. Through this "window" the user is able to view the same sensor and actuator values the Powertrain Control Module (PCM) uses to make decisions about engine performance. The EEC-IV Monitor displays these values for both static (Key OFF Engine Off, KOEO) and dynamic conditions (Key ON Engine Running, KOER). The advantage of the Rotunda EEC-IV Monitor Recorder 007-00021 is the ability to take a "snapshot" of selected PCM signals which can be stored and reviewed later.

NOTE: Throughout the rest of this section, the Rotunda EEC-IV Monitor 007-0047F and Rotunda EEC-IV Monitor Recorder 007-00021 will be referred to as Monitor and Recorder, respectively.

A basic working knowledge of the EEC system is critical to efficient troubleshooting of the symptom. Since no diagnostic procedure can account for all the possibilities which can be encountered, these diagnostic procedures only attempt to provide basic steps and methods for isolating possible causes.

The diagnostic procedures used in this section are a symptom-based approach for isolating the faulty system, circuit, or sensor. Often a mechanical fault will cause a good EEC system to react abnormally. In those cases, the use of a Monitor with these diagnostic procedures will help to eliminate possible EEC faults and locate mechanical faults.

EEC-IV Monitor — What Is It?

The Rotunda EEC-IV Monitor 007-0047F is an electronic tool which measures the operation of the electronic sensors and actuators of the EEC system. Its main purpose is to let the technician "see" the same information that the processor receives and observe how the processor reacts to the information. The Monitor has other capabilities, such as a built-in wiggle test used to locate intermittent faults in wiring, connections, and other EEC components.

Introduction

Why Is It Useful?

The Monitor is useful in identifying hard to diagnose vehicle problems. Many vehicle failures are hard faults and Pinpoint Tests (Section 6B) make it relatively easy to find the faulty part and fix the problem. But for problems that are intermittent and do not generate codes, the Monitor enables the technician to view sensor and actuator signals to the Powertrain Control Module (PCM). Judgements can be made by comparing the signals to normal operating conditions.

The Monitor readings are also helpful in locating non-electronic failures. By verifying that the electronics are not at fault, unnecessary replacement of a good component can be avoided. The technician can then investigate likely non-electronic systems capable of causing the same symptoms. Using the Monitor to read the electronic sensors associated with a mechanical system provides a check of the non-EEC system.

Rotunda EEC-IV Recorder 007-00021 — What Is It?

Basically, the Recorder works the same as an audio cassette recorder except that up to 8 different channels can be recorded at the same time, and the recording is stored in an electronic memory instead of on a tape cassette.

The Recorder is part of the Rotunda Driveability Test Package 007-0048F. When attached to the Monitor, the Recorder has access to the same sensor and actuator signals that the Powertrain Control Module (PCM) receives.

Why Is It Useful?

The Recorder is useful in helping to isolate intermittent faults and repeatable driveability problems. It does this by recording selected signals during a period of abnormal vehicle behavior. The stored information can be replayed to determine which devices or systems are malfunctioning. The Recorder can also be triggered to automatically record during the Monitor Wiggle Test.

Remember

It is important to perform EEC Quick Test (Section 5B) before proceeding in this section. Diagnostic trouble codes encountered in Quick Test must be recorded before disconnecting the PCM harness from the PCM to install the Monitor, as codes will be lost when the PCM is disconnected.

Questions / Information

In order for a vehicle to be correctly diagnosed it is important to obtain accurate information about the vehicle and the intermittent symptom. Consider the following points and questions:

- Get a full description of the vehicle operating conditions when the symptom occurs - details such as range of speed, engine hot or cold, accelerating or decelerating, heater or A / C on, engine noise, etc.
- Did the symptom occur gradually or suddenly?
- Could it be related to a previous event - such as an accident or part replacement?

Introduction

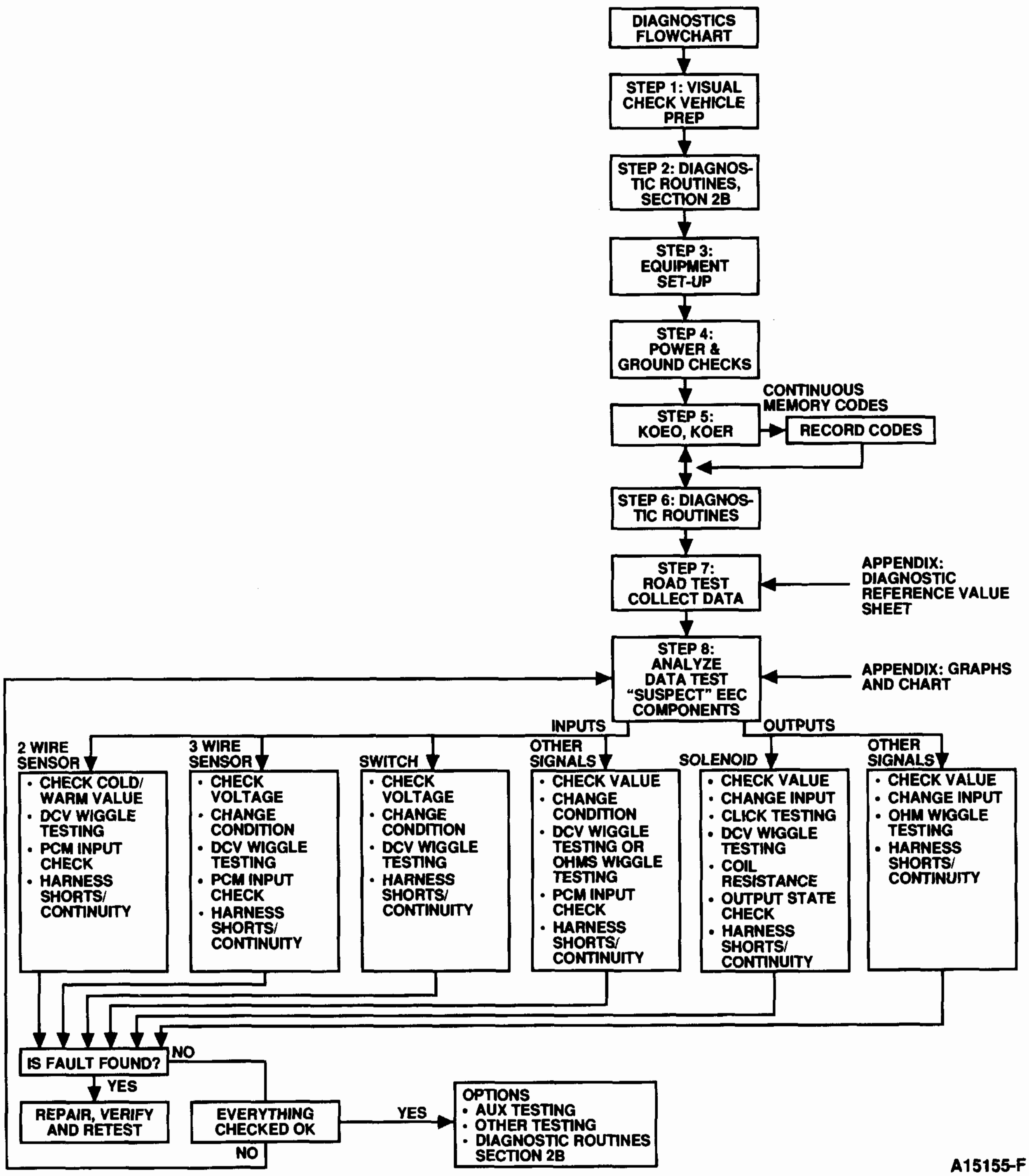
- What is the service history? Has it been serviced in the past in a way that might relate to the present symptom?
- Could the problem be related to the customer's driving habits, improper maintenance or neglect, or use of improper or poor fuels?

The Diagnostic Summary Flowchart

The flowchart on the following page gives an overview of the steps involved in EEC Intermittent Fault diagnosis. The flowchart is meant as a guide, and is not meant as a substitute for the procedures it lists. Detailed descriptions of these procedures follow the flowchart.

Introduction

Diagnostic Summary Flowchart



Step 1: Visual Check, Vehicle Preparation

NOTE: Be careful not to move any components or wiring harnesses while inspecting the vehicle. By doing so you could affect a possible fault and be unable to locate the original problem.

Visual Check

1. Inspect the air cleaner and inlet duct.
2. Check all the engine vacuum hoses for damage, leaks, cracks, blockage, proper routing, etc.
3. Check the EEC system wiring for proper connections, bent or broken pins, corrosion, loose wires, proper routing, etc.
4. Check the Powertrain Control Module (PCM), sensors, and actuators for physical damage.
5. Check the engine coolant for proper level.
6. Check the transaxle fluid level and quality.
7. Make all the necessary repairs before continuing.

Vehicle Preparation

1. Perform all the safety steps required to start and run vehicle tests:
   - — Apply the parking brake.
   - — Place the selector lever firmly into PARK (ATX) or NEUTRAL (MTX).
   - — Block the drive wheels.
2. Turn off **ALL** electrical loads, such as radios, lights, A / C - heater fans, etc.
3. Start the engine and run until the engine is at normal operating temperature.
4. Turn off the engine and proceed with **Equipment Set-up.**

Step 2: Equipment Set-Up

CAUTION

The ignition switch must be turned off (Key OFF) before disconnecting the Powertrain Control Module (PCM) harness cable from the PCM.

Equipment Set-Up

1. Check for diagnostic trouble codes using the Super STAR II Tester or other diagnostic equipment. These codes must be recorded before disconnecting the Powertrain Control Module (PCM) harness, because the codes will be erased.

2. Install the Monitor (refer to the installation procedure below).

3. Select the proper Monitor overlay card for the appropriate engine (refer to Chart 1 on the next page).

4. If a Recorder is available, do not install it at this time.

Special Note

- If for some reason the correct overlay card is not available for the engine being serviced, the Monitor may still be used with a few limitations. In this situation, no overlay card is used and the technician must rely on the pin number label on PIN SELECTOR A and the light array to identify the Powertrain Control Module (PCM) signals. The Monitor can only be used in the MANUAL mode (DCV, OHMS). Do not substitute an incorrect overlay because the readings in the AUTO mode will not be correct. Also, the signal labels on the substitute overlay card may be different from the labels on the proper card.

Description and Installation of Rotunda EEC-IV Monitor 007-0047F

EEC-IV Monitor Installation

1. Record any diagnostic trouble codes obtained during Quick Test before removing the Powertrain Control Module (PCM) harness cable from the PCM; removal of the harness results in loss of Keep Alive Memory Power (KAPWR) and will result in loss of any stored codes.

2. Remove the lid from the Monitor and ensure that the POWER switch is in the OFF position.

3. Turn the ignition switch off (Key OFF) and disconnect the PCM harness cable from the PCM.

4. Inspect the connector for loose or damaged pins, corrosion, or loose wires.

5. Connect the appropriate PCM adapter harness connectors to the PCM (Figure 1). A listing of the monitor adapters and overlays is in Chart 1.

   NOTE: For 1.9L and 2.0L, refer to Section 7A of this manual for installation and testing procedures.

Step 2: Equipment Set-Up

Chart 1

Year	Engine	Monitor Adapter	Monitor Overlay
1994	1.3L	007-00057	68
1994	1.6L Non-Turbo	007-00038	46
1994	1.6L Turbo	007-00038	47
1994	1.8L MTX	007-00057	36
1994	1.8L 4EAT	T92C-6000-AH	60
1994	2.5L	T92C-6000-AH	62

6. Attach the Monitor connector to the PCM adapter cable and tighten the bolt on the connector with a 10mm socket until snug. Do not over-tighten. Attach the PCM harness to the PCM adapter (Figure 1).

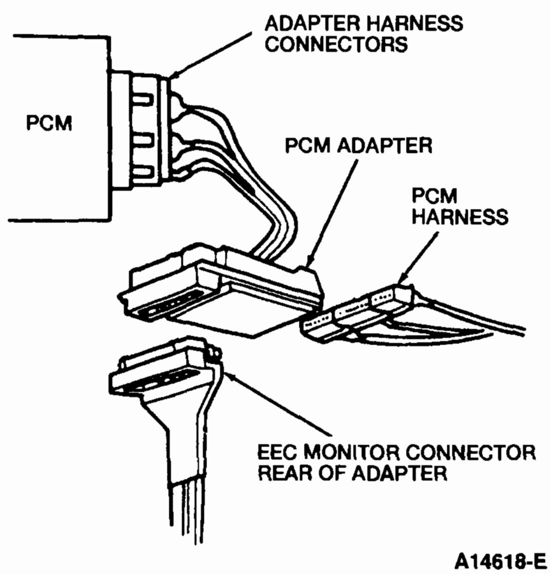


Figure 1.

7. Select the correct Monitor overlay card for the vehicle and engine being serviced. Install this overlay on the Monitor's front panel.

8. Position the Monitor where it can be conveniently viewed and operated. If the Monitor is to be operated in the engine compartment, be sure to route the connecting cable away from moving parts, ignition wires, coil, and door or hood ornaments. If the Monitor is to be operated in the passenger compartment, it may be placed on the seat or suspended from the instrument panel.

9. To suspend the Monitor from the instrument panel, use the straps supplied with the Monitor and fasten the hooks into the windshield defroster vents.

10. Place the remote display in a convenient viewing position, either attached to the top or bottom of the Monitor, the passenger visor, or the edge of the dashboard.

Step 2: Equipment Set-Up

11. Check to see that all electrical loads are off (radio, lights, power windows, A/C, rear window defroster, etc.).

Overall Description of Monitor (Figure 2)

Rotunda EEC-IV Monitor 007-0047F

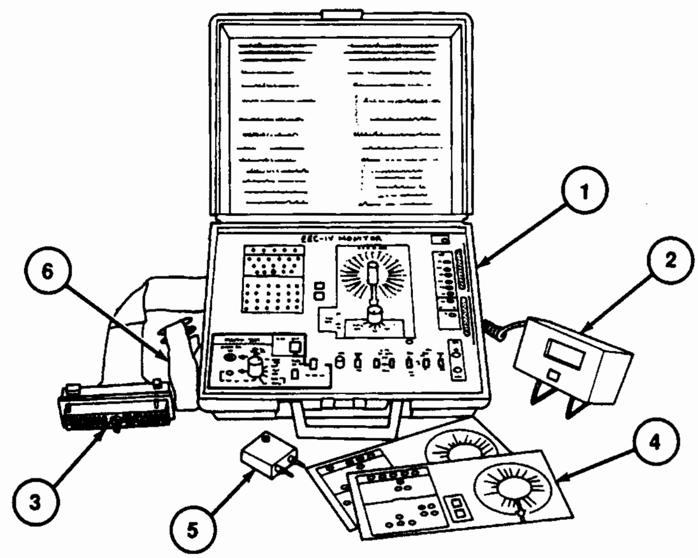


Figure 2.

1. **The Main Unit.** This is the brain of the EEC-IV Monitor. It contains all the switches, buttons, and lights that enable the technician to perform diagnostic tests.

2. **Remote Display.** An LCD readout is used to display all Monitor measurements. This display is housed in a small box which is detached from the main unit. Viewing is easy and convenient because the display may be mounted in convenient locations.

3. **T-Connector and Harness.** The T-connector is a special plug which is attached between the Powertrain Control Module (PCM) harness connector and the PCM. The Monitor receives power through this connection as well as access to all electrical signals entering and leaving the PCM.

4. **Overlays.** This item is a plastic card which is installed on the Monitor to program it for use. Each engine family has a unique overlay associated with it. Generally, the sensor input signals are listed in the inner blue circle around PIN SELECTOR A; the outer red circle lists the output actuator signals. The overlay card lists only those signals applicable to the specific vehicle being tested.

5. **Switch Box.** The switch box is a small device which can be plugged into the SELECTOR PIN and REFERENCE PIN JACKS located on the lower left corner of the Monitor. It is useful for testing solenoid and relay operations.

Step 2: Equipment Set-Up

6. **Straps.** These straps snap to the Monitor main unit case and are used to hold the main unit in a convenient place for on-the-road testing.

Monitor Description (Figure 3)

Rotunda EEC-IV Monitor

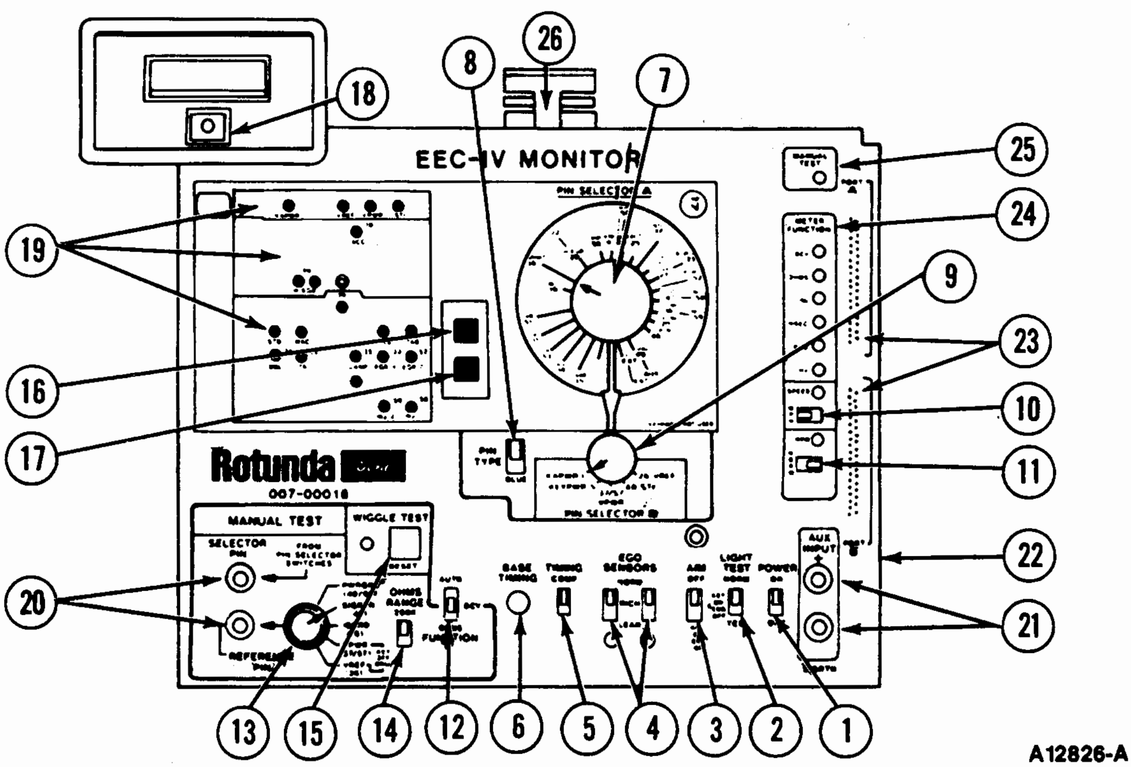


Figure 3.

1. **POWER.** Monitor ON / OFF switch.

2. **LIGHT TEST.** NORM is operational mode; TEST modes activate all lights and beeps.

3. **AIM.** Audible Intermittent Monitor — 3 positions: OFF, Key ON Engine Off (KOEO) which beeps when Self-Test Output (STO) is at ground, and Key ON Engine Running (KOER) which initiates diagnostic test mode and also beeps when STO is at ground.

4. **EGO SENSORS.** 3 positions: NORM, RICH (applies rich signal to Powertrain Control Module [PCM]), and LEAN (applies lean signal to PCM). Single Heated Oxygen Sensor (HO2S) or Oxygen Sensor (O2S) engines use only NORM position.

5. **TIMING.** Selects COMP (computed) mode, which reads spark advance from the PCM, or DIST (distributor) mode, which allows the Monitor to be calibrated to base timing.

Step 2: Equipment Set-Up

6. **BASE TIMING.** Calibrates base timing when TIMING switch is in DIST mode.
7. **PIN SELECTOR A.** Rotary dial which allows selection of PCM signals.
8. **PIN TYPE.** Selects between 2 modes for PIN SELECTOR A — BLUE (inner) sensors / inputs or RED (outer) actuators / outputs.
9. **PIN SELECTOR B.** Rotary dial which allows selection of PCM power and Self-Test Input (STI) signals.
10. **SPEED.** Selects between MPH and KPH readings for vehicle speed signals.
11. **RPM.** Selects between NORM and x10 scale readings for ignition signals.
12. **FUNCTION.** 3 positions: AUTO (measurements with varied units automatically selected), DC Volts (DCV) [readings in DCV only and uses the REFERENCE PIN dial], and OHMS (resistance readings only and uses the REFERENCE PIN dial). DCV and OHMS will light the MANUAL TEST light.
13. **REFERENCE PIN.** Selects ground or voltage when FUNCTION is in DCV or OHMS.
14. **OHMS RANGE.** Switches between 2K and 200K range readings for OHMS mode.
15. **WIGGLE TEST.** RESET button resets the manual mode wiggle test and turns off the beeper or light if either is on.
16. **EGRV.** Activates the Exhaust Gas Recirculation (EGR) vent solenoid when depressed (special applications).
17. **EGRC.** Activates the EGR control solenoid when depressed (special applications).
18. **PUSH TO TEST.** (Located on remote display.) Display test turns on all digits in readout (should read 1888).
19. **PCM POWER/SIGNAL STATUS INDICATORS.** Grouped into 3 categories: Power, Sensors, and Actuators. Lights show status of signals.
20. **SELECTOR PIN JACKS.** Top (red) jack probes the PIN SELECTOR A / B signal; bottom (black) jack probes the REFERENCE PIN signal.
21. **AUX INPUT.** Jacks used to measure external signals.
22. **AUX POWER.** Jack supplies power for auxiliary input device (located on the side of the monitor).
23. **PORT A/PORT B.** Enables EEC-IV Monitor Recorder to be connected.
24. **METER FUNCTION.** Lights identify measurement unit being used.
25. **MANUAL TEST.** Light blinks when FUNCTION switch is in manual DCV or OHMS, otherwise light remains off.
26. **SUPER STAR II TESTER CONNECTION.** Enables hook-up of Rotunda Super STAR II Tester 007-0041B without using the data link connector.

Step 2: Equipment Set-Up

Auxiliary Equipment for the Monitor

The Monitor, in addition to all of its useful testing, can be used with some very helpful peripheral tools. The **Rotunda Multi-point Auxiliary Adapter 007-00023**, or "Octopus," is a device which inserts into the AUX input jacks. It can be used to measure many different non-PCM electrical signals, such as fuel pump, A/C, and battery. The most useful auxiliary equipment tool used in conjunction with the Monitor is the Recorder, which is described below.

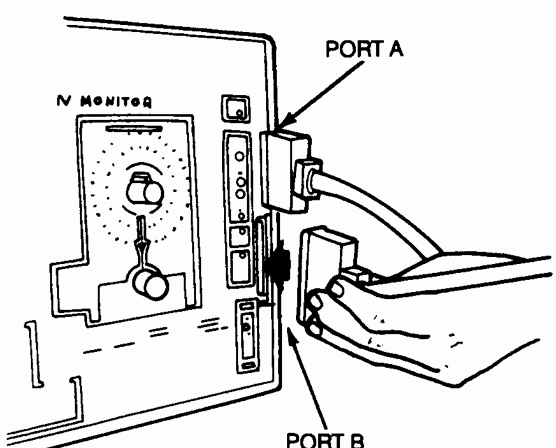
Description and Installation of Rotunda EEC-IV Recorder 007-00021

EEC-IV Recorder Installation

1. The Monitor must be installed first in order to use the Recorder. Make sure that the correct overlay card is installed.

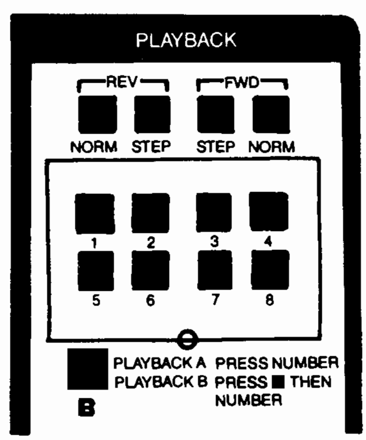
2. Place the Recorder in an appropriate location near the Monitor. Check to ensure that the Recorder power switch is OFF. The lid of the Recorder may be removed if desired.

3. Install the PORT A cable of the Recorder into the PORT A connector on the Monitor; install the PORT B cable of the recorder into the PORT B connector of the monitor. Make sure that the cables are properly oriented before insertion and are firmly seated afterwards. (Figure 4.)



A12827-A

Figure 4.



A12828-A

Figure 5.

4. As a final step, install the white overlay card around the eight playback buttons. This card will be used later to keep track of the signal names of the recorded channels. Refer to Figure 5.

Step 2: Equipment Set-Up

Overall Description of the Recorder (Figure 6)

Rotunda EEC-IV Monitor Recorder

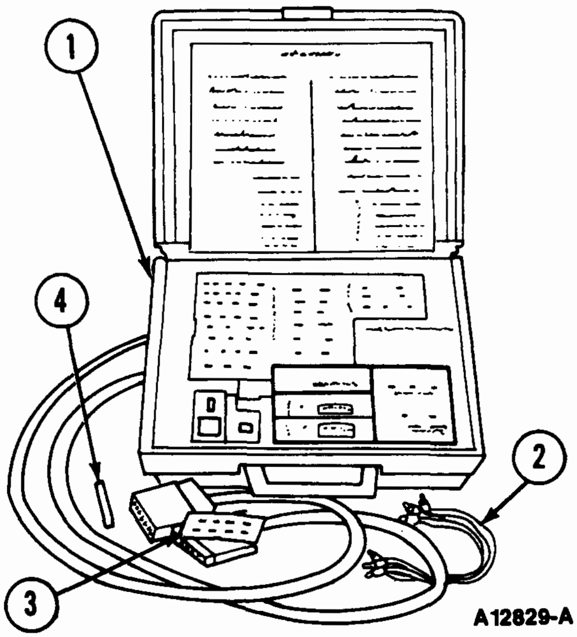


Figure 6.

1. **Main Unit.** This contains all the circuitry necessary for recording operations. It must be connected to a Monitor. All aspects of signal recording and playback are controlled by the front panel switches and buttons.
2. **Selection Cable.** The bundle of jumper leads used to connect the eight recording channel inputs to any of the pins of the Powertrain Control Module (PCM) connector.
3. **Overlay Card.** The white overlay card fits around the playback buttons. The user can mark the signal names being recorded next to the recording channel number.
4. **Marking Pen.** This special felt-tip pen is used to mark the overlay card. The markings can easily be erased with a moist tissue or cloth.

Step 2: Equipment Set-Up

Recorder Description (Figure 7)

Rotunda EEC-IV Monitor Recorder

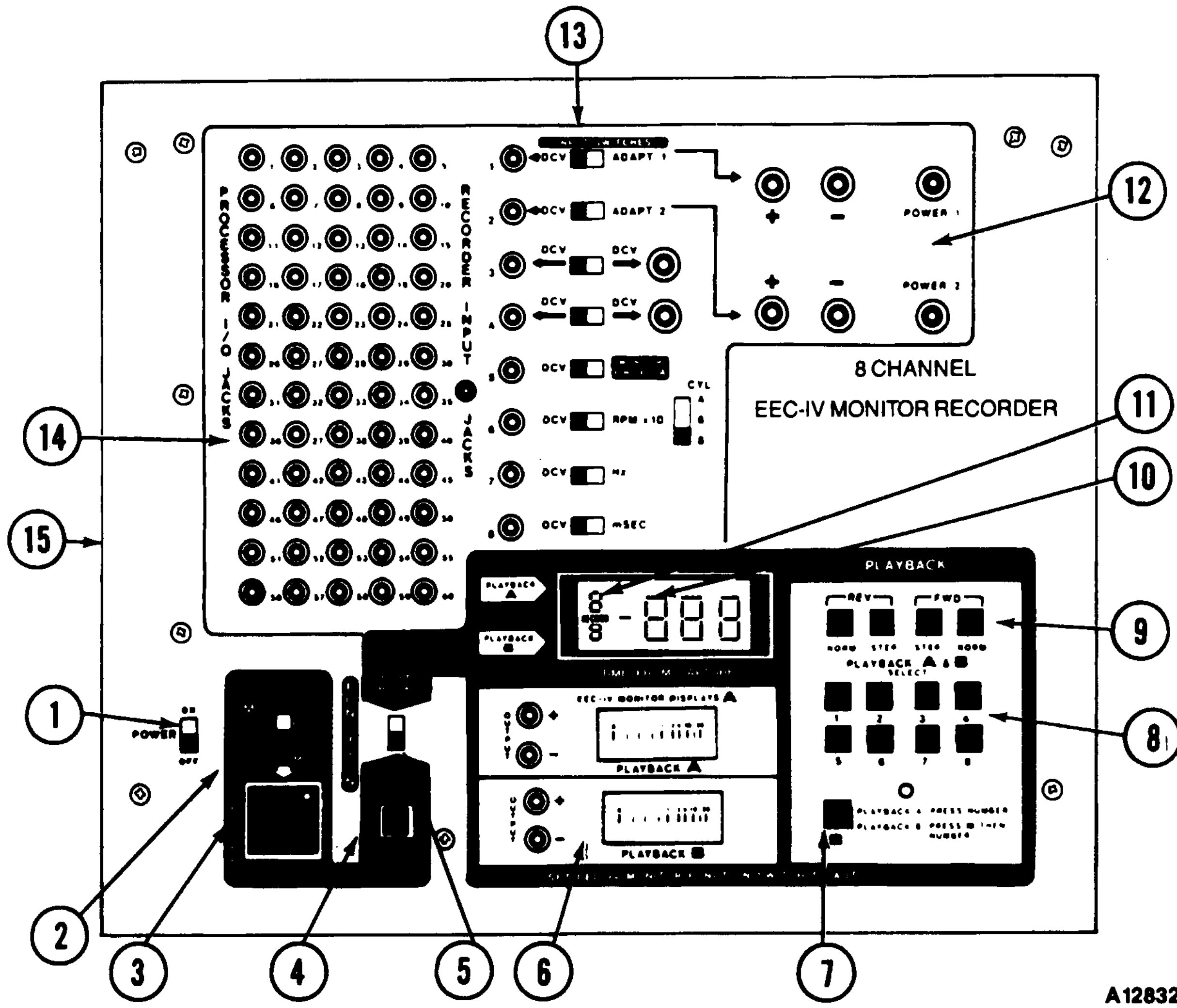


Figure 7.

1. **ON/OFF.** Recorder power.
2. **MODE.** Select between NORMAL and WIGGLE modes for initiating capture of recorded signals.
3. **CAPTURE.** When activated, the recorder saves the previous 30-second period and continues to record the next 20-second period. A tone will sound and light will flash while recording.
4. **START RECORD.** Operates in the FUNCTION RECORD mode only. Will initiate continuous recording of selected channels. A tone will sound.

Step 2: Equipment Set-Up

5. **FUNCTION.** Selects between the PLAYBACK and RECORD modes.
6. **PLAYBACK METERS.** Shows the dynamic reading from 0-20 volts on respective channels. Output jacks are available for remote readings.
7. **B SELECT.** When pressed before one of channels 1 thru 8, selects PLAYBACK B channel for PLAYBACK mode.
8. **CHANNEL SELECT.** Choice of eight channels to be displayed in PLAYBACK mode.
9. **PLAYBACK DIRECTION.** Choice of the REVERSE or FORWARD directions (range is -30 to 19.9 seconds) and choice of the NORM (continuous) or STEP (0.1 second increments).
10. **TIME.** Display expressed in seconds and designated "+" or "-" for CHANNEL A.
11. **CHANNEL INDICATOR.** Displays CHANNEL A on top; CHANNEL B on bottom.
12. **ADAPTER INPUTS.** Special optional inputs used for CHANNELS 1 and 2 only.
13. **CHANNEL INPUTS.** Channels 1 through 8 selected with switches for optional inputs with non-DCV units.
14. **CHANNEL I/O.** 60 jacks for channels from PCM which can be jumpered to Channels 1 through 8.
15. **REMOTE CAPTURE INPUT.** Allows optional input to activate capture via remote device (located on the side of the recorder).

Auxiliary Equipment

The Recorder allows external auxiliary equipment to be used with it. The Recorder allows up to two auxiliary inputs, which can include the **Rotunda Multi-point Auxiliary Adapter 007-00023** input. For outputs, the Recorder supplies PLAYBACK CHANNELS A AND B jacks for use with a DVOM or a graphic recording device. Finally, the Recorder provides an input jack on its lower left side which allow a remote capture activating device to be used.

Methods of Monitor Measurements

Monitor Light Indicator Values

The light or LED array on the upper left side of the Monitor displays the status of many key Powertrain Control Module (PCM) signals. By observing these lights, one can easily gain information about the condition of dynamic PCM signals.

Preliminary: Light Test. Prior to operation of the Monitor it is a good practice to verify that all the lights are functional. Turn on the Monitor. When the LIGHT TEST switch is set to TEST mode, all the lights (or LEDs) should light and the beeper should sound. The red O2S or HO2S light will be dim. Return the switch back to NORM when the test is completed.

Step 2: Equipment Set-Up

Power Indicators. The top group of indicators display power and STI signals. When the appropriate voltage is present the light will be lit. For example, at Key ON, the KEYPWR (optional), VREF and VPWR lights should all be visible. The STI light is on when the signal is 0 volts (Key OFF) and off when 5 volts is present at Key ON.

Input Signal Indicators. The second group of indicators are selected input signals. They are lit when their voltage is above 2.5 volts, and off when their voltage is below 2.5 volts. There are two exceptions to this manner of operation — the knock sensor and the O2S (HO2S). The knock sensor lights when the signal is above 1.0 volt. The O2S (HO2S) has two lights; the green light for lean (below +0.45 volts) and the red light for rich (above +0.45 volts). During certain engine run conditions the O2S (HO2S) can be seen switching back and forth between green (lean) and red (rich).

Output Signal Indicators. The bottom group of indicators are output signals such as solenoids, relays, and injectors. These signals are lit when their value is below 6.0 volts and off when above 6.0 volts. For example, this means that most solenoids will be lit when they are activated because they are controlled by ground. Injectors will be blinking on and off in proportion to their on times.

Meter Function Indicators. The far right column of indicators display the type of units for the value on the remote display unit. During manual DCV or OHMS, the MANUAL TEST indicator will blink and the appropriate DCV or OHMS indicator will light. In AUTO mode the correct unit indicator will light automatically. Listed in the following chart are examples of the types of AUTO units which apply for the various PCM signals.

AUTO MODE UNITS	
Signal	**Units**
IDM, TACH	RPM
IAC	Duty Cycle %
Injectors	MSEC
All Others	DCV

Auto Measurements

AUX — Rotunda Multi-point Auxiliary Adapter (Octopus) 007-00023

1. Key ON Engine Off (KOEO) / Key ON Engine Running (KOER).
2. Select PIN SELECTOR A AUX (red).
3. Insert a jumper from the device into the AUX input jack.
4. Read the value in DCV (DCV light on).

Change Condition to Cause Response by Input

1. KOEO or KOER.
2. Select the sensor on PIN SELECTOR A.

Step 2: Equipment Set-Up

3. Create the condition or the change in condition.
4. Observe the change in the sensor value; verify with the **EEC Graphs and Charts.**
5. Examples:
   - Move the throttle; observe the TP increase.
   - Warm up the engine; observe the ECT decrease.
   - Press the brake pedal; observe the BOO light.

Change Input and Verify Output Response

1. KOEO or KOER.
2. Select the actuator on PIN SELECTOR A.
3. Create the change for the input device with the switch box or vehicle operation.
4. Observe the change (response) in the actuator signal, observe the light.
5. Examples:
   - Increase the throttle (TP); observe the Spark Output (SPOUT) increase.
   - Move the EGO switch to LEAN; observe the SPOUT increase.
   - Turn on the A/C at WOT; observe the WAC light on and grounded.

Check Value

1. KOEO/KOER.
2. Select the signal from PIN SELECTOR A or B.
3. Various units are used, refer to the METER FUNCTION light.

Click Testing (Relays/Solenoids)

1. KOEO only.
2. Can also be done in the manual DCV Function mode.
3. Select the relay or solenoid signal on PIN SELECTOR A and the correct ground on the REFERENCE PIN selector.
4. Insert the switch box into the SELECTOR PIN jacks.
5. Push the small red button to turn on the relay or solenoid.

Step 2: Equipment Set-Up

6. Listen for "click" of the device turning on, observe the signal light turn on and the device energizing.

PCM Input Check (STO)

1. KOEO.
2. Select the sensor from PIN SELECTOR A.
3. Set the REFERENCE PIN selector to SIG RTN.
4. Insert the switch box into the SELECTOR PIN jacks.
5. Move the AIM switch to the KEY ON ENG OFF position.
6. Push the small red button on the switch box and observe the STO light turn on and the beeper sound as long as the button is pressed.
7. Return the AIM switch to the OFF position.

Output State Check (Solenoids/Relays)

1. KOEO.
2. Move the AIM switch to the KEY ON ENG ON position and wait for the output codes (beeps) to end.
3. Completely depress and release the throttle — observe the signal light turn on.
4. Completely depress and release the throttle — the light should turn off.
5. Return the AIM switch to the OFF position.

Step 2: Equipment Set-Up

Manual Ohms Measurement

External Ohms

1. Key OFF.
2. Select EXT on PIN SELECTOR A.
3. Select the correct ground on REFERENCE PIN selector.
4. Select the OHMS RANGE switch.
5. Verify that resistance to be measured is not connected to the vehicle.
6. Connect jumper wires from the SELECTOR PIN jacks to the device to be measured.
7. Read the value of resistance.

Harness Continuity

1. Key OFF.
2. Select the signal from PIN SELECTOR A.
3. Disconnect the sensor / actuator where signal is to be checked.
4. Connect a jumper wire from the REFERENCE PIN jack (black) to the signal pin on the harness to be tested.
5. Check for continuity — 0 ohms.

Harness Shorts

1. Key OFF.
2. Select the signal from PIN SELECTOR A.
3. Set the OHMS RANGE switch to 200K.
4. Disconnect the sensor / actuator to be tested.
5. Disconnect the PCM.
6. Select the various power or ground signals from the REFERENCE PIN selector for which the device is being tested. Example: VREF, SIG RTN, PWR GND.
7. Read resistance: 0 ohms or a low resistance reading indicates a short; 10K ohms or higher indicates an open.

Step 2: Equipment Set-Up

Ohms Value (Coil Resistance)

1. Key OFF.
2. Select the signal from PIN SELECTOR A and PIN TYPE.
3. Select the correct ground from the REFERENCE PIN selector.
4. Select the OHMS RANGE switch.
5. The WIGGLE TEST light will illuminate and sound; press the WIGGLE TEST RESET button.
6. The MANUAL TEST light should be blinking; value in ohms units.

OHMS Wiggle Testing

1. Key OFF.
2. Select the signal from PIN SELECTOR A and PIN TYPE.
3. Select the correct ground from the REFERENCE PIN selector.
4. Tap the components, flex the harness and connectors.
5. The WIGGLE TEST light and beeper will activate when the change sensed.
6. The OHMS Wiggle Test is less sensitive than the DCV Wiggle Test.
7. Criteria for using the OHMS Wiggle Test as opposed to DCV Wiggle Test:
   a. All sensors which do not use DCV units in the AUTO mode.
   b. Example: PIP, SPOUT, CKP.

Power / Ground Harness Continuity

1. Key OFF.
2. Select EXT on PIN SELECTOR A.
3. Select the desired power / ground signal on the REFERENCE PIN selector.
4. Disconnect the sensor / actuator where the power / ground signal is to be checked.
5. Connect a jumper wire from the SELECTOR PIN jack (red) to the ground / power signal pin on the harness to be tested.
6. Check for continuity — 0 ohms.

Step 2: Equipment Set-Up

Manual DCV Measurements

DCV Wiggle Testing

1. Key On Engine Off (KOEO) / Key On Engine Running (KOER).
2. Select the signal from PIN SELECTOR A or B.
3. Select the correct ground from the REFERENCE PIN selector.
4. Tap the component, flex the harness and connectors.
5. The WIGGLE TEST light and beeper will activate when the change is sensed.
6. The DCV Wiggle Test is more sensitive and more commonly used than the OHMS Wiggle Test.
7. Criteria for using the DCV Wiggle Test as opposed to the OHMS Wiggle Test:
   - All actuators (red zone).
   - All power and grounds.
   - All sensors which use DCV units in AUTO mode.
   - Cannot use KOER Wiggle testing for switching-type signals such as injectors.

Manual DCV

1. KOEO / KOER.
2. Select the signal from PIN SELECTOR A or B.
3. Select the correct ground from the REFERENCE PIN selector.
4. The WIGGLE TEST will light and sound; reset the WIGGLE TEST RESET button.
5. The MANUAL TEST light should be blinking; value in DCV units.

Recorder — Additional Measurements

Recorder AUX Inputs

1. Key On Engine Running (KOER).
2. Monitor set up in the desired operation.

Step 2: Equipment Set-Up

3. Device (e.g., Multi-point Auxiliary Adapter) inserted into ADAPT1 or ADAPT2 of Recorder.
4. Recorder input switch set toward the auxiliary device.
5. Recorder operation performed as normal.

Recorder DCV Wiggle Capture

1. KOER.
2. Monitor set up for manual DCV Wiggle.
3. Recorder CHANNELS 1-4, 6-8 selected with PCM signals.
4. Select Recorder CHANNEL 5 for the signal to trigger the Recorder CAPTURE, switch is set to DCV (same signal is selected on Monitor on PIN SELECTOR A).
5. Optional: STO (17) could be selected so the PCM wiggle mode would trigger capture.
6. The Recorder MODE switch set to NORM, the FUNCTION switch to RECORD.
7. Start the vehicle, press the WIGGLE TEST RESET on the Monitor, set the Recorder MODE switch to WIGGLE.
8. Press the START RECORD button on the Recorder (CAPTURE light should blink).
9. Operate the vehicle until the symptom occurs — the Monitor Wiggle alarm will sound and the Recorder CAPTURE function will engage. If the symptom does not trigger the wiggle alarm on the Monitor, the signals can still be saved by pressing the CAPTURE button.

   NOTE: SELECTOR PIN jack (red) is connected to SELECTOR PIN A/B signal at all times: AUTO, DCV and OHMS. REFERENCE PIN jack (black) is connected to REFERENCE PIN selector signal at all times: AUTO, DCV and OHMS.

Step 3: Power and Ground Tests

Strategy for Locating Power and Ground Faults

If the value of a ground or power circuit is out of range or a signal is suspected to be faulty, then use the following methods to determine the fault. (Refer to Methods of Monitor Measurements.)

- Inspect circuit wires for visible breaks or shorts, loose connectors, bent or pushed out connector pins, or corrosion.
- Test vehicle battery for low voltage and current (refer to the appropriate Service Manual, Section 14-01).
- Perform the Monitor Wiggle Test on the problem circuit. A beep will sound if an intermittent short or open is present.
- Perform the Click Test for those signals which activate relays or solenoids. Using the switch box in the selector pin jacks allows relays and solenoids to be activated.

TEST STEP		RESULT ▶	ACTION TO TAKE
PG1	TEST EQUIPMENT POWER		
	• Key OFF. • Turn the Monitor power ON. • Check the green KAPWR LED. • **Is the LED on?**	Yes ▶ No ▶	GO to PG2. REPAIR the KAPWR circuit to the battery. REFER to Pinpoint Test PGC in Section 6B.
PG2	TEST MONITOR LED		
	• Key OFF. • Turn the Monitor power ON. • Place the light test switch to the test position. • Check all the LEDs on the Monitor including the six yellow LEDs in the remote display. • **Did all the LEDs illuminate and did the beep sound?**	Yes ▶ No ▶	GO to PG3. The Monitor is faulty and requires REPAIR.
PG3	TEST MONITOR REMOTE DISPLAY		
	• Key OFF. • Turn the Monitor power ON. • Depress the remote display button. • **Does the display indicate "1888"?** NOTE: Temperature extremes above 70°C (158°F) will result in a black display and cold temperature extremes will cause the display to run slow. The display will return to normal during normal ambient temperatures.	Yes ▶ No ▶	GO to PG4. The Monitor is faulty and requires REPAIR.

Step 3: Power and Ground Tests

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>PG4</td><td>CHECK POWER VOLTAGE LEVEL</td><td rowspan="2">Yes ▶

No (VPWR) ▶

No (KAPWR) ▶

No (VREF) ▶</td><td rowspan="2">GO to PG5.

INSPECT/SERVICE PCM harness, power relay, battery, ignition switch, or cables.

INSPECT/SERVICE PCM harness or battery.

INSPECT/SERVICE PCM harness or PCM.</td></tr>
<tr><td colspan="2">

- Key ON, engine off.
- Turn the Monitor power ON.
- Place Pin Selector A to select Pin Selector B.
- Verify the voltages in the following chart:

<table>
<tr><th>Signal</th><th>Value (volts)</th></tr>
<tr><td>VPWR</td><td>Greater than 10.5</td></tr>
<tr><td>KAPWR</td><td>Greater than 10.5</td></tr>
<tr><td>VREF</td><td>4.5-5.5</td></tr>
</table>

- **Did all the voltage levels correspond to the chart?**

</td></tr>
<tr><td>PG5</td><td>CHECK GROUND VOLTAGE LEVELS</td><td rowspan="2">Yes ▶

No ▶</td><td rowspan="2">GO to PG6.

REPAIR the circuit(s) at fault.</td></tr>
<tr><td colspan="2">

- Key ON, engine off.
- Turn the Monitor power ON.
- Verify the voltages in the chart below:

<table>
<tr><th>Signal</th><th>Value (volts)</th><th>Application</th></tr>
<tr><td>PWRGND</td><td>0 - 0.5</td><td>All Engines</td></tr>
<tr><td>SIGRTN</td><td>0 - 0.5</td><td>All Engines</td></tr>
<tr><td>CAN/CAL</td><td>0 + 0.5</td><td>1.8L California</td></tr>
<tr><td>GND</td><td>0 + 0.5</td><td>1.3L MTX</td></tr>
<tr><td>CKPRTN</td><td>0 - 0.5</td><td>2.5L</td></tr>
</table>

- **Do all the voltage levels correspond to the chart?**

</td></tr>
<tr><td>PG6</td><td>CHECK OTHER POWER</td><td rowspan="2">Yes ▶

No ▶</td><td rowspan="2">GO to Step 4, EEC-IV Monitor Symptom Analysis.

REPAIR the circuit(s) at fault.</td></tr>
<tr><td colspan="2">

- Key ON, engine off.
- Turn the Monitor power ON.
- Verify the voltage in the chart below:

<table>
<tr><th>Signal</th><th>Value (volts)</th><th>Application</th></tr>
<tr><td>VMREF</td><td>7-9</td><td>1.6L</td></tr>
<tr><td>CAN/CAL</td><td>10-14</td><td>1.8L Canada</td></tr>
<tr><td>MT/AT</td><td>10-14</td><td>1.8L 4EAT</td></tr>
<tr><td>VST</td><td>10-14</td><td>2.5L</td></tr>
</table>

- **Does the voltage correspond to the chart?**

</td></tr>
</table>

Step 4: Symptom Analysis

Purpose of This Step

When an intermittent symptom occurs, get a full description of the symptom and the driving mode during which it occurs.

Finding Probable Causes

- Refer to Section 3B and list the sensors and actuators that could cause the symptom.
- Refer to the EEC Graphs and Charts and the Diagnostic Reference Values in this section.
- **REMEMBER:** The conditions and driving mode can provide clues to the cause of the symptom.

Example: A hard start symptom with engine cold could indicate an Engine Coolant Temperature (ECT) sensor malfunction.

Check the Basics

- Always make sure things like fluid levels and quality, maintenance schedules, and proper vehicle use are okay. Old, clogged fuel filters can cause intermittent problems, as can low coolant levels and poor oil quality.
- Good power and ground connections, and good harness condition are **VERY** important. Poor grounds and powers (to injectors, for example) can cause intermittent symptoms.

Step 5: Road Test

Re-Creating the Symptom

In order to diagnose an intermittent symptom, one must re-create the symptom and collect information on how the EEC system is sensing and reacting. After visual and non-EEC checks are completed and satisfied, the EEC portion is diagnosed. Through the use of the Monitor and Recorder, these signal lines can be inspected for shorts, opens, component failures, or erratic behavior. In addition, the information received from the Monitor and Recorder can reveal the presence of mechanical problems.

Optional

If a Recorder unit is available, install it at this time — refer to EEC-IV Recorder Installation in this section.

Road Test Set-Up

1. Place the Monitor (Recorder also, if installed) in a convenient location inside the vehicle. Secure any cables that are attached from the engine compartment to the Monitor or Recorder inside the vehicle.
2. Check to see that the proper overlay card is inserted on the Monitor. Refer to the note in Step 2, Equipment Set-Up, if the correct overlay is not available.
3. List the Powertrain Control Module (PCM) sensors and actuators that could cause the condition. Refer to Section 3B. These signals will be monitored during the road test.
4. If a Recorder is used, select the first eight signals that could cause the condition for Channels 1 to 8. Connect the jumpers from the Input / Output (I / O) jacks to the appropriate channels. Refer to Step 2, Equipment Set-Up, if needed.
5. Select the proper **Diagnostic Reference Value Chart** after Step 6. These sheets list PCM sensor and actuator values at various operating conditions. The values given in these charts are "ballpark" references only.
6. In order for a road test to be performed, another person must accompany the driver. This is a safety issue because the driver should not divert his attention from the road to the operation of this test equipment. The accompanying person can select signals, observe changes, and record data.

Use of Auxiliary Equipment Inputs

Some useful signals may require auxiliary equipment. These devices can be inserted into the AUX input jacks of the Monitor or the ADAPT 1 / ADAPT 2 input jacks of the Recorder. Two types of peripherals are available. An example of a peripheral and the signals it receives is listed.

- Multi-point Auxiliary Adapter — A / C, Fuel Pump

Road Test Reminders

The purpose of the road test is to re-create the problem symptom by duplicating the conditions that caused it to occur.

Step 5: Road Test

Alternatives. In some cases it may not be necessary or desirable to perform an actual road test. The symptom may occur at starting, idle, or high idle speed conditions. If this situation applies, proceed with the **Road Test Procedure** by using the operating condition that applies the most to your situation.

Legality/Liability. The **Road Test Procedure** is a suggested, but optional, part of this section. The liability of this operation is left to the individual who chooses to use it.

Safety. It is important that the road test is performed with safety issues in mind. Use the vehicle seat belts and operate the vehicle in a safe manner.

Road Test Observations

During the road test, various Powertrain Control Module (PCM) signals are chosen and their values shown. In addition, there is other important information that can be viewed during the road test, including:

- **PCM Values.** Compare road test values at various operating conditions with those listed in the **Diagnostic Reference Value Charts**. Refer to the **EEC Graphs and Charts** for further detail.
- **Monitor Lights.** The Monitor lights give quick information about the condition of many PCM signals. These lights can quickly reveal the general status of many signals and tell whether a solenoid or switch is activated. Optional signals are identified in yellow labels.
- **Wiggle Testing.** By using the Monitor Wiggle Test in Key ON Engine Running (KOER), often an intermittent device or wire will trigger the alarm. The DCV Wiggle mode in particular is very sensitive to sudden, erratic changes in a PCM harness or component.

Road Test Procedure

1. Select the first listed PCM sensor or actuator on Monitor PIN SELECTOR A.
2. Turn on the Monitor and the Recorder if used. Start and drive the vehicle.
3. If the Recorder is installed put the FUNCTION switch in the RECORD mode and press the START RECORD button.
4. Drive the vehicle to create conditions so that the symptom occurs.
5. When the symptom occurs, the accompanying passenger should observe changes in the selected PCM signal. Information should be recorded onto paper with other specific notes about the symptom, device, or operating conditions. If the Recorder is used, the CAPTURE button should be pressed.
6. If the Monitor is used without the Recorder, the next PCM signal on the list can be selected on PIN SELECTOR A. The drive symptom should then be re-created and recorded as in the previous step. This step is to be re-created until the cause of the problem is found or enough data is collected to return and analyze.
7. If the Recorder is used, the accompanying passenger may wish to write down the data from the Recorder channels onto paper. The drive symptom can be created and recorded again for confirmation. Otherwise, the road test is completed and you can return to analyze the results.

Step 6: Analyzing Data

Analyzing Data

Once the road test is completed, the results need to be analyzed to find and repair the exact fault which caused the symptom. The notes taken during the road test can now be analyzed, discussed, and compared with reference data.

Insights from the Recorder

The use of the Recorder greatly enhances the view of the PCM operation during the presence of the symptom and allows a systems approach to the problem. By setting the FUNCTION switch to PLAYBACK mode and inspecting the recorded channels, you can begin to evaluate the results.

Look for abnormal behavior or values that are clearly incorrect. Inspect the signals for abrupt or unexpected changes. For example, during a steady cruise most of the sensor values should be relatively stable. Sensors such as Throttle Position (TP) and Mass Air Flow (MAF) changing abruptly when the vehicle is traveling at a constant speed are clues.

Look for agreement in related signals. For example, if the TP is changed during a gentle acceleration a corresponding change should occur in MAF. Compare the signals by selecting different channels at a certain time range. The PLAYBACK meters can also be viewed for quick comparisons.

Make sure the signals act in proper sequence. An increase in rpm after the TP is increased is valid. However, if the rpm increases without a TP change, then a problem exists.

Analyzing Methods

Use any of the following methods to further troubleshoot a suspected Powertrain Control Module (PCM) signal. Some methods are unique to a certain type of PCM device. Follow the given strategy listed for each unique device on the successive pages. Refer to **Methods of Monitor Measurement** in this section.

- Change condition to cause response by input.
- Change input and verify output response.
- Click testing (solenoids / relays).
- Coil resistance (solenoids / relays).
- PCM input / output check.
- Harness continuity.
- Harness shorts.
- Output state check (solenoids / relays).
- Wiggle Testing (DCV or OHMS).

Step 6: Analyzing Data

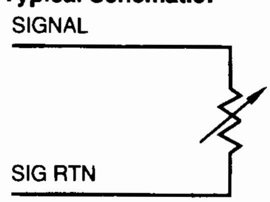
Analyzing Strategies for Sensors/Inputs

2 Wire Sensors

Device:

ECT
IAT
EGRT

Typical Schematic:



Strategy:

Check Cold Value
Check Warm Value
DCV Wiggle Testing
PCM Input Check
Harness Shorts
Harness Continuity

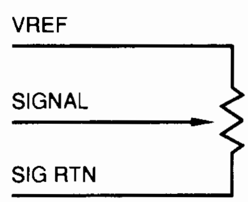
A14089-D

3 Wire Sensors

Device:

EVP
TP
MC-VAF
VAF

Typical Schematic:



Strategy:

Check Sensor Voltage Value
Change Condition
DCV Wiggle Testing
PCM Input Check
Harness Shorts
Harness Continuity

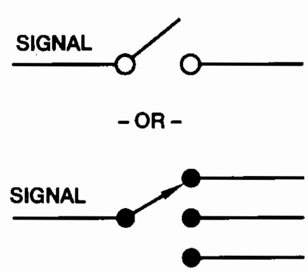
A14090-E

Switches

DEVICE:

ACS	PSP	MLP
BOO	BLMT	MLPD
IDL	HDLP	MLP1
CPP	VST	MLP2
PNP	HPS	MLPR
ECTS	CCPS	SCPP
MMS	FAN	ODS
DRL	DEF	WOT
		MLPOD
		MLPL

TYPICAL SCHEMATIC:



STRATEGY:

CHECK SENSOR VOLTAGE VALUE
CHANGE CONDITION
DCV WIGGLE TESTING
HARNESS SHORTS
HARNESS CONTINUITY

A14091-G

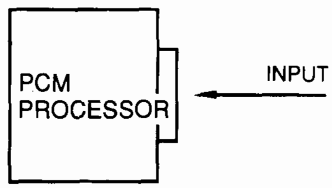
Step 6: Analyzing Data

Other Input Signals

Device:

CID	PIP	CKP1
KS	STI	BARO
IDM	VSS	MAF
VST	RTS2	O2S
TRS	HO2S	CKP
PNP	RHO2S	DSS
RTS1	LHO2S	MTX/ATX
VMREF	PSG	TCS
CAN/CAL	CIDREF	TCS RET

Typical Schematic:



Strategy:

Check Sensor Voltage Value
Change Operational Condition
DCV Wiggle Testing
or
Ohms Wiggle Testing
PCM Input Check
Harness Shorts
Harness Continuity

A14092-F

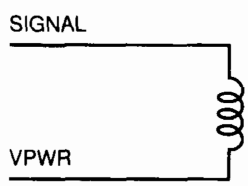
Analyzing Strategies for Actuators/Outputs

Solenoids/Relays

Device:

INJ	SS1	HSF
CANP	SS2	BOOST
VRIS1	SS3	
EGRC	ACR	
EGRV	FPR	
LFAN	DRL	
HFAN	FPRC	
EVR	LPS	
DSS	TCC	
IAC	CFAN	
DEF	WAC	
VRIS2	HSIA	

Typical Schematic:



Strategy:

Check Solenoid/Relay Voltage Value
Change Input
Click Testing
DCV Wiggle Testing
Coil Resistance
Output State Check
Harness Shorts
Harness Continuity

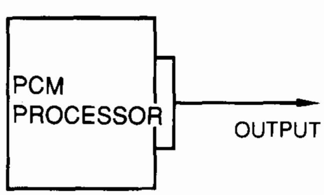
A14093-E

Other Output Signals

Device:

SML	BARO
MIL	ODL
STO	MSL
SPOUT	KCU
ICM	OBI

Typical Schematic:



Strategy:

Check Sensor Voltage Value
Change Input
Ohm Wiggle Testing
Harness Shorts
Harness Continuity

A14094-E

Step 6: Analyzing Data

Optional Diagnostic Tools

By using the suggested strategies for the "suspect" PCM components, the source of the fault can be found. If a fault is not found after following the given methods, a few options still remain.

Follow-up Diagnosis. The Monitor and Recorder can be used to troubleshoot PCM signals other than those in the list. By conducting a thorough investigation of all the PCM signals, the source of the problem can likely be found. Available for auxiliary (AUX) input is the **Rotunda Multi-point Auxiliary Adapter 007-00023.**

Other Diagnostic Tools. If needed, there are other specialized tools that could aid in troubleshooting.

One useful tool is the **Rotunda Gas Check 014-00335** used in checking for water in fuel, alcohol percentage, fuel vapor pressure, and lead.

Section 2B. The **Diagnostic Routines, Section 2B** of this volume, lists various symptoms and reference possible systems. Also referenced in this section are other volumes and group numbers.

Verification

After the vehicle fault has been located and repaired, a verification test needs to be performed. This may require a road test to verify that the symptom is no longer present. It is also important to remember that if any diagnostic trouble codes were present before the symptom was repaired, those codes must be cleared. Refer to **Section 5B Appendix — Erasing Diagnostic Trouble Codes.**

Diagnostic Reference Values

Notes

1. **Diagnostic Reference Values** are based on engine at normal operating temperature (between 82°-104°C [180°-220°F] / ECT = 0.8 to 0.5v).
2. KOEO and Hot Idle test measurements are taken with the vehicle in the PARK position.
3. Reference values shown in the charts may differ substantially between vehicles due to various factors such as component tolerance, driving conditions, weather, etc. The values recorded on these sheets were obtained at approximately 600 ft. altitude above sea level with ambient temperatures of 10° to 21°C (50° to 70°F).
4. The WAC and FP reference values do not correspond to Section 6B values due to differences in the way these signals are measured. The monitor measures these signals with reference to PWR GND (40/60).
5. O2S in switching mode ranges from 0.2 to 0.9 DCV.
6. Refer to the Glossary (Section 22B) for a definition or a description of all acronyms listed in the diagnostic reference charts.
7. The 1.3L PCM is not fully compatible with the EEC-IV Monitor. Because of this, some inputs and outputs register inaccurate readings and cannot be used. These pins read NA (Not Applicable) in the reference value columns. These pins can be monitored using a Rotunda Breakout Box 007-00033.

Diagnostic Reference Values

1.3L Diagnostic Reference Values

NOTE: For tests involving switches the values will be: switch OFF (released)/switch ON (depressed).

NOTE: The 1.3L PCM is not fully compatible with the EEC-IV Monitor. Because of this, some inputs and outputs register faulty readings. These pins read NA (Not Applicable) for reference values. These pins may be monitored using a Breakout Box.

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
BLMT [1]	1R	PWRGND	12/0	DCV	14/0	14/0	14/0	DCV
BOO	1O	PWRGND	0/12	DCV	0/14	0	0	DCV
CCPS (A/C Only) [2]	1Q	PWRGND	12	DCV	14/0	14/0	14/0	DCV
CID	2G	PWRGND	NA	NA	NA	NA	NA	NA
CKP	2E	PWRGND	NA	DCV	700	1800/2400 [3]	3000	RPM
CPP/PNP (MTX)	1V	PWRGND	0/12 [4]	RPM	0/14 [4]	14	14	DCV
PNP (ATX)	1V	PWRGND	0/12 [5]	DCV	0/14 [5]	14	14	DCV
DEF	1L	PWRGND	0/12	DCV [6]	0/14	0/14	0/14	DCV [6]
DRL (Canada Only)	1I	PWRGND	0/12	DCV	0/14	0/14	0/14	DCV
ECT	2H	SIGRTN	2.7-4.4 [7]	DCV	.75	.75	.70	DCV
EVP	2J	PWRGND	.66	DCV	.67	1.32/.63 [3]	2.1/.72 [3]	DCV
HDLR	1U	PWRGND	0/12	DCV	0/14	0/14	0/14	DCV
HPS (A/C Only) [2]	2I	PWRGND	12	DCV	14/0	14/0	14/0	DCV
IAT	2L	SIGRTN	2.5 [7]	DCV	2.83	3.21	3.50	DCV
IDL	1N	PWRGND	0/12 [8]	DCV	0	14	14	DCV
MAF	2O	PWRGND	1-1.5	DCV	2.0	2.6	2.8	DCV
O2S	2N	PWRGND	0	DCV	.2-.8	.2-.65	.2-.6	DCV
PSP (ATX)	1P	PWRGND	12	DCV	14	14	14	DCV
STI	1K	PWRGND	12	DCV	14	14	14	DCV
TP	2M	PWRGND	.5-4.2 [9]	DCV	.52	.72	1.12/.55 [3]	DCV
VSS	1M	PWRGND	NA [10]	DCV	NA [10]	NA [10]	NA [10]	DCV

(Continued)

Diagnostic Reference Values

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
VST	1C	PWRGND	0/10[11]	DCV	0	0	0	DCV

1 0V in blower motor switch positions OFF and 1, 12-14V in blower motor switch positions 2 and 3.
2 0V with A/C OFF, 12-14V with A/C ON and blower motor switch in position 2 or 3.
3 ATX/MTX.
4 0V while in NEUTRAL or clutch pedal depressed, 12-14V while in gear or clutch pedal released.
5 0.5V in PARK or NEUTRAL, 12V for all other selector lever positions.
6 Use manual DCV setting.
7 At 20°C (68°F)
8 0.5V with accelerator pedal released, 12V with accelerator pedal depressed.
9 0.5V with accelerator pedal released, 12V with accelerator pedal fully depressed.
10 Though this pin does not register MPH (vehicle speed), it will register an alternating voltage (0-5V) as the vehicle is slowly rolled forward or backwards.
11 0V key in RUN, 10V with engine cranking.

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
ACR (A/C Only)[1]	1J	PWRGND	12	DCV	14/0	14/0	14/0	DCV
CANP	2X	PWRGND	12	DCV	14	9.5	4.4	DCV
CFAN (A/C Only)	2P	PWRGND	12	DCV	14	14	14	DCV
CFR	1S	PWRGND	12	DCV	14	14	14	DCV
EGRC	2S	PWRGND	12	DCV	14	14	14	DCV
EGRV	2R	PWRGND	12	DCV[2]	14	14	14	DCV[2]
FPR	1H	PWRGND	12	DCV	0	0	0	DCV
IAC	2W	PWRGND	9	DCV	10.25	6.80	6.65	DCV
ICM	2F	PWRGND	0	DCV	.20	.31	.49	DCV
INJ1	2U	PWRGND	NA	mSEC	4.5	6.3/4.8[3]	8.2/7.0[3]	mSEC
INJ2	2V	PWRGND	NA	mSEC	4.5	6.3/4.8[3]	8.2/7.0[3]	mSEC
INJ3	2Y	PWRGND	NA	NA	NA	NA	NA	NA
INJ4	2Z	PWRGND	NA	NA	NA	NA	NA	NA
MIL	1E	PWRGND	0/12[4]	DCV	14	14	14	DCV
SIL (MTX)	1T	PWRGND	12	DCV	14	0/14[5]	0/14[5]	DCV
SML	1D	PWRGND	12	DCV	0/14[6]	0/14[6]	0/14[6]	DCV
STO	1F	PWRGND	12	DCV	14	14	14	DCV
VREF	2K	PWRGND	5	DCV	5	5	5	DCV

1 0V with A/C OFF, 12-14V with A/C ON and blower motor switch in position 2 or 3.
2 Use manual DCV setting.
3 ATX/MTX.
4 0V while MIL illuminated, 12V with MIL not illuminated.
5 0V while shift indicator lamp illuminated, 12V with SIL not illuminated.
6 0V when illuminated, 14V when not illuminated.

Diagnostic Reference Values

1.6L Non-Turbo Diagnostic Reference Values

NOTE: For tests involving switches, the values will be: switch OFF (released) / switch ON (depressed).

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
TP	2G	SIGRTN	0.5	DCV	0.5	0.6	0.8	DCV
VAF	2E	SIGRTN	1.8	DCV	6.7	8	8.2	DCV
ECT	2I	SIGRTN	2.5	DCV	0.4	0.5	0.5	DCV
BARO	2H	SIGRTN	3.9	DCV	3.9	3.9	3.8	DCV
IAT	2J	PWRGND	2.4	DCV	3	3	3	DCV
IDL	1E	PWRGND	0	DCV	0	12.6	12.4	DCV
PNP/CPP	1G	PWRGND	12	DCV	14	14	14	DCV
BOO	1J	PWRGND	0/12[1]	DCV[1]	0/12	0	0	DCV[1]
PSP	1K	PWRGND	12	DCV	14	14	14	DCV
IDM	1M	PWRGND	N/A	RPM	850-1050	2650-2700	3125-3175	RPM
O2S	2D	PWRGND	N/A	DCV	0.8	0.5	0.6	DCV

1 12 volts with brake pedal depressed, 0 volts with brake pedal released.

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
BANK 1	3E	PWRGND	N/A	mSEC	3.9	5.8	7.1	mSEC
BANK 2	3C	PWRGND	N/A	mSEC	3.9	5.9	7.1	mSEC
CANP	2P	PWRGND	12	DCV[1]	14.3[2]	14[2]	14[2]	DCV[1]
IAC	2Q	PWRGND	7	DCV	10	9.7	9.8	DCV
FPRC	2K	PWRGND	12	DCV	14	14.3	14	DCV
STO	1B	PWRGND	0.7	DCV	14	14	13.8	DCV
MIL	1A	PWRGND	1.6	DCV	13.2	14	13.8	DCV

1 Test in manual DCV.
2 Voltage may be lower while purging occurs.

NOTE: Reference values shown may vary approximately ±20 percent depending on operating conditions and other factors.

Diagnostic Reference Values

1.6L Turbo Diagnostic Reference Values

NOTE: For tests involving switches, the values will be: switch OFF (released) / switch ON (depressed).

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
TP	2G	SIGRTN	0.4	DCV	0.36	0.5	0.67	DCV
VAF	2E	SIGRTN	2	DCV	5.5	7.4	8.1	DCV
ECT	2I	SIGRTN	2.5	DCV	0.4	0.5	0.5	DCV
BARO	2H	SIGRTN	3.9	DCV	3.8	3.8	3.8	DCV
IAT	2J	PWRGND	2.2	DCV	2.3	2.6	2.7	DCV
IDL	1E	PWRGND	0	DCV	0	13.9	13.9	DCV
PNP / CPP	1G	PWRGND	12	DCV	14	14	14	DCV
BOO	1J	PWRGND	0 / 12	DCV[1]	0 / 12	0	0	DCV[1]
PSP	1K	PWRGND	12	DCV	13.6	13.7	13.7	DCV
KCU	2M	PWRGND	12	DCV	12	12	12	DCV
IDM	1M	PWRGND	N / A	RPM	800-900	2640-2680	3120-3160	RPM
O2S	2D	PWRGND	N / A	DCV	0	0.5	0.5	DCV

1 12 volts with the brake pedal depressed, 0 volts with brake pedal released.

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
BANK 1	3E	PWRGND	N / A	mSEC	3.4	3.5	4.3	mSEC
BANK 2	3C	PWRGND	N / A	mSEC	3.4	3.5	3.5	mSEC
CANP	2P	PWRGND	12	DCV[1]	14.3[2]	14[2]	14[2]	DCV[1]
IAC	2Q	PWRGND	7.5	DCV	7.6	9.4	9.6	DCV
FPRC	2K	PWRGND	12	DCV	14	14	14	DCV
STO	1B	PWRGND	0.71	DCV	13.5	13.5	13.5	DCV
MIL	1A	PWRGND	1.6	DCV	13.6	13.7	13.6	DCV

1 Test in manual DCV.
2 Voltage may be lower while purging occurs.

NOTE: Reference values shown may vary approximately ±20 percent depending on operating conditions and other factors.

Diagnostic Reference Values

1.8L 4EAT Diagnostic Reference Values

NOTE: For tests involving switches, the values will be: switch OFF (released) / switch ON (depressed).

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
TP	2F	SIGRTN	0.45	DCV	0.45	0.65	0.7	DCV
VAF	2B	SIGRTN	3.88	DCV	2.8	1.31	1.26	DCV
ECT	2E	SIGRTN	2.0	DCV	0.45	0.42	0.43	DCV
IAT	2K	PWRGND	0-3	DCV	2.7	2.4	2.5	DCV
IDL	1T	PWRGND	0	DCV	0	12	12	DCV
MLP	1R	PWRGND	0	DCV	0	12-14	12-14	DCV
BOO	1Q	PWRGND	0/12	DCV[1]	0/12	0	0	DCV[1]
PSP	1N	PWRGND	12	DCV	14	14	14	DCV
CKP	2A	PWRGND	0	RPM	730-900	1750-1800	2100-2300	RPM
HDLP	1H	PWRGND	0/12	DCV	0/12	0/12	0/12	DCV
BLMT	1P	PWRGND	12[2]	DCV	14[2]	14[2]	14[2]	DCV
STI	1I	PWRGND	12	DCV	14	14	14	DCV
O2S	2C	PWRGND	N/A	DCV	0-1	0-1	0-1	DCV

1 12 volts with brake pedal depressed, 0 volts with brake pedal released.
2 A/C on, blower off or in position 1; 0 volts with blower in position 2 or more.

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
BANK 1	3U	PWRGND	N/A	mSEC	3.6	4.2	6.2	mSEC
BANK 2	3V	PWRGND	N/A	mSEC	3.6	4.2	6.2	mSEC
CANP	2O	PWRGND	12	DCV	12	11-14	3.9-13	DCV
IAC	3Q	PWRGND	3.3	DCV	9	9	8.6	DCV
FPRC	3M	PWRGND	12	DCV	14	14	14	DCV
STO	1F	PWRGND	0	DCV	12	12	12	DCV
WAC	1L	PWRGND	12	DCV	14	14	14	DCV
SPOUT	1G	PWRGND	0	RPM	730-900	1750-1800	2100-2300	RPM
MIL	1E	PWRGND	2	DCV	14	14	14	DCV

NOTE: Reference values shown may vary approximately ±20 percent depending on operating conditions and other factors.

Diagnostic Reference Values

1.8L MTX Diagnostic Reference Values

NOTE: For tests involving switches, the values will be: switch OFF (released) / switch ON (depressed).

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
TP	2M	SIGRTN	0.45	DCV	0.45	0.65	0.7	DCV
VAF	2O	SIGRTN	3.88	DCV	2.8	1.31	1.26	DCV
ECT	2Q	SIGRTN	2.0	DCV	0.45	0.42	0.43	DCV
IAT	2P	PWRGND	0-3	DCV	2.7	2.4	2.5	DCV
IDL	1N	PWRGND	0	DCV	0	12	12	DCV
PNP / CPP	1V	PWRGND	0	DCV	0	12	12	DCV
BOO	1O	PWRGND	0 / 12	DCV[1]	0 / 12	0	0	DCV[1]
PSP	1P	PWRGND	12	DCV	14	14	14	DCV
CKP	2E	PWRGND	0	RPM	730-900	1750-1800	2100-2300	RPM
WOT	2L	PWRGND	5	DCV	5	5	5	DCV
HDLP	1U	PWRGND	0 / 12	DCV	0 / 12	0 / 12	0 / 12	DCV
BLMT	1S	PWRGND	12[2]	DCV	14[2]	14[2]	14[2]	DCV
STI	1K	PWRGND	12	DCV	14	14	14	DCV
O2S	2N	PWRGND	N / A	DCV	0-1	0-1	0-1	DCV

1 12 volts with brake pedal depressed, 0 volts with brake pedal released.
2 A / C on, blower off or in position 1; 0 volts with blower in position 2 or more.

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
BANK 1	2U	PWRGND	N / A	mSEC	3.6	4.2	6.2	mSEC
BANK 2	2V	PWRGND	N / A	mSEC	3.6	4.2	6.2	mSEC
CANP	2X	PWRGND	12	DCV	12	11-14	3.9-13	DCV
IAC	2W	PWRGND	3.3	DCV	9	9	8.6	DCV
FPRC	2T	PWRGND	12	DCV	14	14	14	DCV
STO	1F	PWRGND	0	DCV	0	0	0	DCV
WAC	1J	PWRGND	12	DCV	14	14	14	DCV
SPOUT	1G	PWRGND	0	RPM	730-900	1750-1800	2100-2300	RPM
MIL	1E	PWRGND	2	DCV	14	14	14	DCV

NOTE: Reference values shown may vary approximately ±20 percent depending on operating conditions and other factors.

Diagnostic Reference Values

2.5L 4EAT Diagnostic Reference Values

NOTE: For tests involving switches, the values will be: switch OFF (released) / switch ON (depressed).

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
CCPS [1]	1O	PWRGND	12/0.5	DCV	14/0	14/0	14/0	DCV
BLMT [2]	1P	PWRGND	12	DCV	14	14	14	DCV
BOO	1Q	PWRGND	0.5/12[3]	DCV	0/13.5[3]	0	0	DCV
CKP1	3E	PWRGND	N/A	RPM	675	1250	2180	RPM
CKP2	3H	PWRGND	N/A	RPM	1320	2580	4320	RPM
DEF	1J	PWRGND	12/0.5	DCV	14/1	14/1	14/1	DCV
DRL	2L	PWRGND	12/0.5	DCV	14	14	14	DCV
ECT	2E	SIGRTN	0.3[4]	DCV	0.33	0.35	0.36	DCV
EVP	2J	PWRGND	0.8	DCV	0.73	1.47	3.42	DCV
HDLP	1H	PWRGND	0.5/12	DCV	0/14	0/14	0/14	DCV
IAT	2K	SIGRTN	0.9[4]	DCV	2.5	2.5	3.0	DCV
IDL	1T	PWRGND	0/12	DCV	13.7	12.5	12.5	DCV
KS	2M	PWRGND	2.4	DCV	2.34	2.34	2.35	DCV
LHO2S	2D	PWRGND	0.5	DCV	0.8	0.6	0.5	DCV
MC-VAF	2B	PWRGND	4	DCV	3.06	1.50	1.62	DCV
PNPS [5]	1R	PWRGND	0	DCV	0.5	13	13	DCV
PSP	1N	PWRGND	12	DCV	13.5	13.5	13.5	DCV
RHO2S	2C	PWRGND	0.5	DCV	0.8	0.43	0.5	DCV
RTS1	1S	PWRGND	2.5	DCV	13	13	13	DCV
RTS2	1V	PWRGND	12	DCV	13	13	13	DCV
STI	1I	PWRGND	12	DCV	13.5	13.5	13.5	DCV
TP	2F	SIGRTN	.5/3.7	DCV	0.54	0.67	0.76	DCV
TRS/ECTS	1K	PWRGND	10.5	DCV	13	13	13	DCV
VSS	1M	PWRGND	N/A	MPH	4	17	30	MPH
VST	1C	PWRGND	0.5	DCV	0	0	0	DCV

1 Switch is ON with A/C ON, blower ON.
2 0 volts in position 3 or more.
3 12 volts with brake pedal depressed, 0 volts with brake pedal released.
4 At 20°C (68°F).
5 0 volts in P or N position; 12 volts in R, D, 1 or 2.

Diagnostic Reference Values

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
ACR [1]	1L	PWRGND	12/1	DCV	13.3/1	13.3/1	13.3/1	DCV
BARO	2A	PWRGND	3.9	DCV	3.9	3.9	3.9	DCV
CANP	2O	PWRGND	12	DCV	1.13	10.2	5.3	DCV
CFAN	3N	PWRGND	12	DCV	13.5	13.5	13.5	DCV
EGRC	3P	PWRGND	12	DCV	13.6	13.5	13.5	DCV
EGRV	3O	PWRGND	12	DCV	13.6	1.5	1.45	DCV
FPR	3T	PWRGND	12	DCV	0.5	0.5	0.5	DCV
FPRC	3M	PWRGND	12	DCV	13.5	13.5	13.5	DCV
HFAN	2P	PWRGND	12	DCV	13.6	13.6	13.6	DCV
VRIS1	3I	PWRGND	12	DCV	1.12	1.14	1.22	DCV
VRIS2	3J	PWRGND	12	DCV	13.64	13.48	13.48	DCV
IAC	3Q	PWRGND	6	DCV	9.2	8.5	8.03	DCV
ICM	1G	PWRGND	N/A	RPM	660	1200	2190	RPM
INJ1	2U	PWRGND	N/A	mSEC	4.0	4.8	5.0	mSEC
INJ2	3V	PWRGND	N/A	mSEC	4.0	4.8	5.0	mSEC
INJ3	3W	PWRGND	N/A	mSEC	4.0	4.8	5.0	mSEC
INJ4	3X	PWRGND	N/A	mSEC	4.0	4.8	5.0	mSEC
INJ5	3Y	PWRGND	N/A	mSEC	4.0	4.8	5.0	mSEC
INJ6	3Z	PWRGND	N/A	mSEC	4.0	4.8	5.0	mSEC
LFAN	3L	PWRGND	12/1	DCV	13.5/1	13.5	13.5	DCV
MIL	1E	PWRGND	0.5	DCV	13.6	13.5	.513	DCV
SML	1D	PWRGND	0.5	DCV	0-13 [2]	0-13 [2]	0-13 [2]	DCV
STO	1F	PWRGND	0.5	DCV	13.5	13.5	13.5	DCV

1 Switch is ON with A/C ON, blower ON.
2 Value switches between 1 volt and 13 volts.

NOTE: Reference values shown may vary approximately ±20 percent depending on operating conditions and other factors.

Diagnostic Reference Values

2.5L MTX Diagnostic Reference Values

NOTE: For tests involving switches, the values will be: switch OFF (released) / switch ON (depressed).

Inputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
CCPS [1]	1O	PWRGND	12/0	DCV	14/0	14/0	14/0	DCV
BLMT [2]	1P	PWRGND	12	DCV	14	14	14	DCV
BOO	1Q	PWRGND	0/12[3]	DCV	0/13.5[3]	0	0	DCV
CKP1	3E	PWRGND	N/A	RPM	675	1450	2630	RPM
CKP2	3H	PWRGND	N/A	RPM	1320	2950	5320	RPM
DEF	1J	PWRGND	12/0.5	DCV	14/1	14/1	14/1	DCV
DRL	2L	PWRGND	12/0.5	DCV	14	14	14	DCV
ECT	2E	SIGRTN	0.3[4]	DCV	0.33	0.35	0.36	DCV
EVP	2J	PWRGND	0.8	DCV	0.73	1.47	1.87	DCV
HDLP	1H	PWRGND	0-1/12	DCV	0/14	0/14	0/14	DCV
IAT	2K	SIGRTN	0.9[4]	DCV	2.5	2.5	3.0	DCV
IDL	1T	PWRGND	0/12	DCV	0	12.5	12.5	DCV
KS	2M	PWRGND	2.4	DCV	2.34	2.34	2.35	DCV
LHO2S	2D	PWRGND	0-1	DCV	0.8	0.6	0.5	DCV
MC-VAF	2B	PWRGND	4	DCV	3.06	1.50	1.62	DCV
PNP/CPP	1R	PWRGND	12/0	DCV	0	13.5	13.5	DCV
PSP	1N	PWRGND	12	DCV	13.5	13.5	13.5	DCV
RHO2S	2C	PWRGND	0-1	DCV	0.8	0.43	0.5	DCV
STI	1I	PWRGND	12	DCV	13.5	13.5	13.5	DCV
TP	2F	SIGRTN	.5/3.7	DCV	0.54	0.67	0.76	DCV
VSS	1M	PWRGND	N/A	MPH	4	17	30	MPH
VST	1C	PWRGND	0	DCV	0	0	0	DCV

1 Switch is ON with A/C ON, blower ON.
2 0 volts in position 3 or more.
3 12 volts with brake pedal depressed, 0 volts with brake pedal released.
4 At 20°C (68°F).

Diagnostic Reference Values

Outputs	SIG Pin #	REF. Pin #	KOEO	Units	Hot Idle	30 MPH	55 MPH	Units
ACR [1]	1L	PWRGND	12	DCV	13.3 / 1	13.3 / 1	13.3 / 1	DCV
CANP	2O	PWRGND	12	DCV	1.13	10.2	5.3	DCV
CFAN	3N	PWRGND	12	DCV	13.5	13.5	13.5	DCV
EGRC	3P	PWRGND	12	DCV[2]	13.6	13.5	13.5	DCV[2]
EGRV	3O	PWRGND	12	DCV[2]	13.6	1.5	1.45	DCV[2]
FPR	3T	PWRGND	12	DCV[2]	0.5	0.5	0.5	DCV[2]
FPRC	3M	PWRGND	12	DCV	13.5	13.5	13.5	DCV
HFAN	2P	PWRGND	12	DCV	13.6	13.6	13.6	DCV
VRIS1	3I	PWRGND	12	DCV[2]	1.12	1.14	1.22	DCV[2]
VRIS2	3J	PWRGND	12	DCV	13.6	13.4	13.4	DCV
IAC	3Q	PWRGND	6	DCV	9.2	8.5	8.03	DCV
ICM	1G	PWRGND	N / A	RPM	660	1468	2650	RPM
INJ1	3U	PWRGND	N / A	mSEC	4.0	4.8	5.0	mSEC
INJ2	3V	PWRGND	N / A	mSEC	4.0	4.8	5.0	mSEC
INJ3	3W	PWRGND	N / A	mSEC	4.0	4.8	5.0	mSEC
INJ4	3Z	PWRGND	N / A	mSEC	4.0	4.8	5.0	mSEC
INJ5	3Y	PWRGND	N / A	mSEC	4.0	4.8	5.0	mSEC
INJ6	3Z	PWRGND	N / A	mSEC	4.0	4.8	5.0	mSEC
LFAN	3L	PWRGND	12 / 1	DCV	13.5 / 1	13.5	13.5	DCV
MIL	1E	PWRGND	0-1	DCV	13.6	13.6	13.6	DCV
SML	1D	PWRGND	0-1	DCV	0-13	0-13	0-13	DCV
STO	1F	PWRGND	0-1	DCV	13.5	13.5	13.5	DCV

1 Switch is ON with A / C ON, blower ON.
2 Use manual DC volts when making measurements.

NOTE: Reference values shown may vary approximately ±20 percent depending on operating conditions and other factors.

Diagnostic Reference Values

Static Resistance Values

Engine	Actuator	PCM Pin	Reference	Resistance (ohms)
1.3L	CANP	2X	VPWR	30
	EGRC	2S	VPWR	34
	EGRV	2R	VPNR	35
	IAC	2W	VPWR	13
	INJ1	2U	VPWR	17
	INJ2	2V	VPWR	17
1.6L	BANK1	3E	VPWR	14
	BANK2	3C	VPWR	14
	CANP	2P	VPWR	20
	IAC	2Q	VPWR	20
	FPRC	2K	VPWR	20
1.8L MTX	BANK1	2U	VPWR	9.0
	BANK2	2V	VPWR	9.0
	CANP	2X	VPWR	30
	VICS	2S	VPWR	50
	IAC	2W	VPWR	16
	FPRC	2T	VPWR	50
1.8L 4EAT	BANK1	3U	VPWR	9.0
	BANK2	3V	VPWR	9.0
	CANP	2O	VPWR	30
	VICS	3I	VPWR	50
	IAC	3Q	VPWR	16
	FPRC	3M	VPWR	50
2.5L	CANP	2O	VPWR	30-34
	EGRC	3P	VPWR	30-34
	EGRV	3O	VPWR	30-34
	FPRC	3M	VPWR	30-34
	VRIS1	3I	VPWR	33-39
	VRIS2	3J	VPWR	33-39
	IAC	3Q	VPWR	10.7-12.3
	INJ1	3U	VPWR	12-16
	INJ2	3V	VPWR	12-16
	INJ3	3W	VPWR	12-16
	INJ4	3X	VPWR	12-16
	INJ5	3Y	VPWR	12-16
	INJ6	3Z	VPWR	12-16

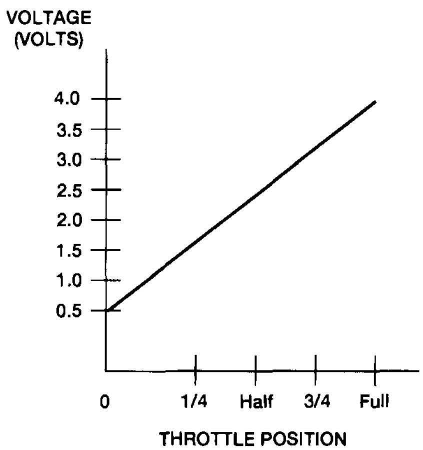
NOTE: All tests made with monitor in manual ohms, key OFF, and PCM disconnected.

EEC Graphs and Charts

Fuel Pressure Specifications

Engine	1.3L	1.6L	1.8L	2.5L
Engine Running	210-260 kPa 30-38 psi	189-231 kPa 27-34 psi	206-255 kPa 30-37 psi	207-248 kPa 30-36 psi
Key ON, Engine Off (Test Connector Jumped, Pump Running)	265-320 kPa 38-46 psi	255-289 kPa 37-42 psi	265-314 kPa 38-46 psi	270-310 kPa 39-45 psi

Throttle Position Sensor Graph (All Engines)



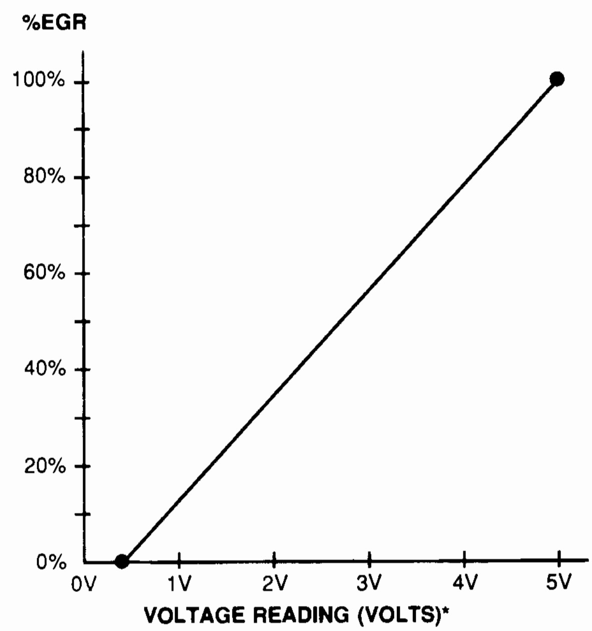
Throttle Position	Voltage (Volts)
0	0.5
1/4	1.3
Half	2.2
3/4	2.9
Full	3.7

NOTE: Voltage Values May Vary ± 15%.

A16834-B

Exhaust Gas Recirculation Valve Position (EVP) Sensor Graph (1.3L, 2.5L Only)

EEC Graphs and Charts

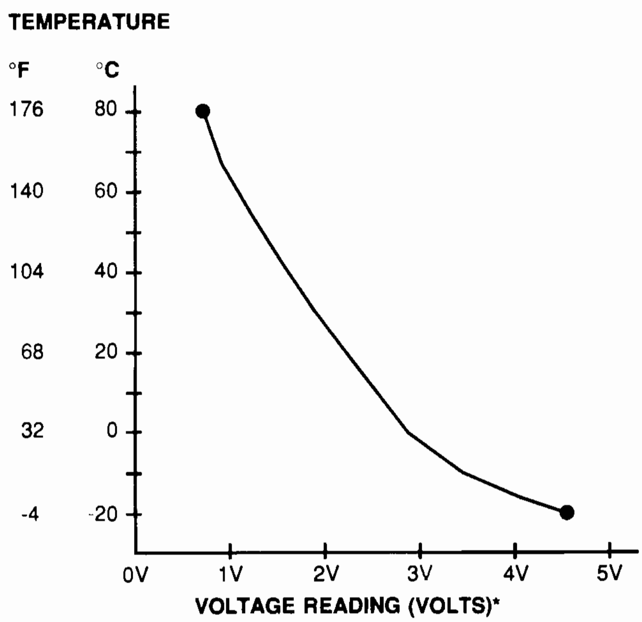


%EGR	Voltage*
0	0.4–0.8
10	0.7–1.1
20	1.1–1.5
30	1.4–1.8
40	1.8–2.2
50	2.1–2.5
60	2.5–2.9
70	2.8–3.2
80	3.2–3.6
90	3.5–3.9
100	3.9–4.3

EVP SENSOR DATA * Voltage values calculated for VREF = 5.0V (These values may vary ± 15% due to sensor and VREF variations.)

CA14104-C

Engine Coolant Temperature (ECT) Sensor Graph (All Engines)



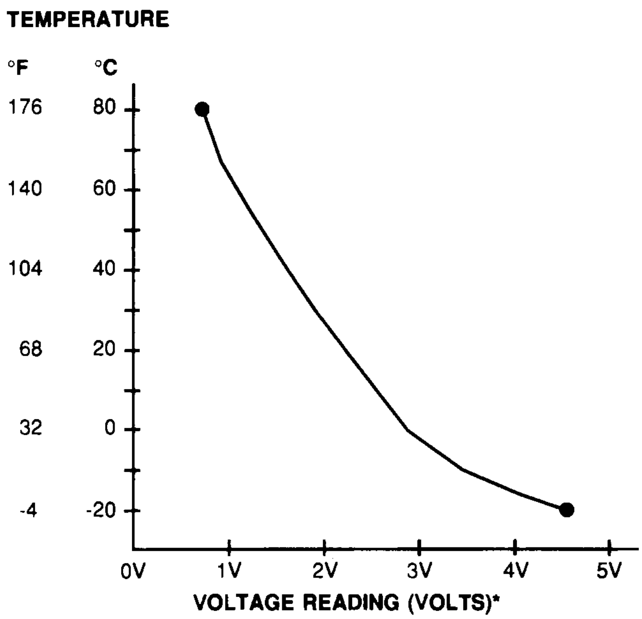
Temperature °F	Temperature °C	Voltage* Volts
-4	-20	4.7
32	0	3.4
68	20	2.5
104	40	2.0
140	60	1.2
176	80	0.7
194	90	0.45
203	95	0.33
212	100	0.2

ECT SENSOR DATA * Voltage values calculated for VREF = 5.0V (These values may vary ± 15% due to sensor and VREF variations.)

CA14105-D

EEC Graphs and Charts

Intake Air Temperature (IAT) Sensor Graph (All Engines)

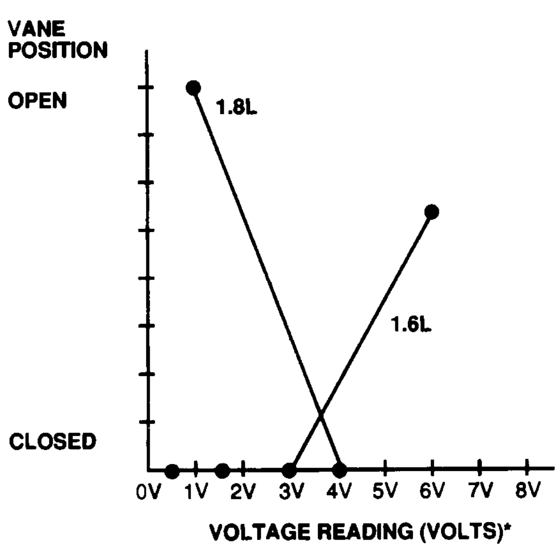


Temperature °F	°C	Voltage* Volts
-4	-20	4.7
32	0	3.4
68	20	2.5
104	40	2.0
140	60	1.2
176	80	0.7

IAT SENSOR DATA * Voltage values calculated for VREF = 5.0V (These values may vary ± 15% due to sensor and VREF variations).

CA14107-D

Volume Air Flow (VAF) Sensor Graph (1.6L, 1.8L Only)

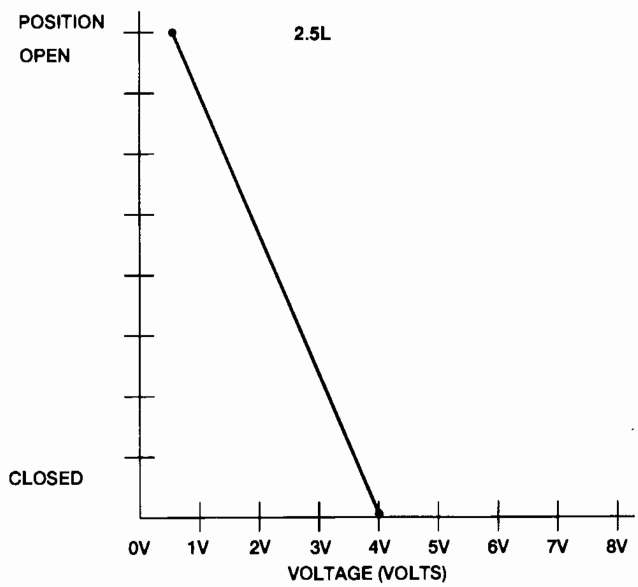


VANE POSITION	VOLTAGE* VOLTS	
	1.8L	1.6L
Vane Closed	4.5-5V	3-3.3V
Vane Open	0.5-1.5V	7-8V

CA14106-F

Measuring Core-Volume Air Flow (MC-VAF) Sensor Graph (2.5L Only)

EEC Graphs and Charts



Core Position	Voltage
Closed	4V
Open	0.35V

A16835-A

Specifications/Special Service Tools

Special Service Tools/Equipment

ROTUNDA EQUIPMENT

Model	Description
007-0047F	EEC-IV Monitor
007-00021	EEC-IV Recorder
007-00023	Multi-Point Auxiliary Adapter
007-0041B	Super STAR II Tester
007-0048F	Driveability Test Package
014-00335	Gas Check
007-00057	PCM Adapter
007-00038	PCM Adapter
T92C-6000-AH	PCM Adapter
007-00033	Breakout Box

SECTION 8B

Ignition Systems

Contents

SECTION 8B

Ignition Systems

Contents (continued)

Description and Operation

Ignition and Timing Systems

The ignition system provides spark control to the engine during all modes of operation. The ignition system consists of three sub-systems: primary ignition, secondary ignition, and timing advance. The 1.8L and 2.0L engines use an Ignition Control Module (ICM) with the coil mounted separately from the distributor. The 1.6L engines use a integrated distributor mounted ignition system with vacuum advance. The 1.3L and 2.5L engines use a distributor with an integrated coil and ICM.

Primary Ignition Components

The primary ignition components include the coil primary circuit, the Ignition Control Module (ICM), and ignition switch. When the ignition switch is turned ON, the PCM signals the ICM. In 1.3L, 1.6L, 1.8L, and 2.5L, the ICM controls current flow through the ignition coil and produces a high voltage spark. In the 2.0L, the ICM sends the signal to the ignition coil, where the high voltage spark is produced. It is the spark which is passed onto the secondary ignition system.

Secondary Ignition Components

The secondary ignition components include the spark plugs, the spark plug wires, the distributor cap, the rotor, the coil wire (if equipped), and the coil secondary circuit. The high voltage spark produced in the primary ignition system is passed from the ignition coil to the distributor. The rotor and distributor cap are used to send the spark to each spark plug.

Timing Advance Components

1.3L, 1.8L, 2.0L, and 2.5L

The spark advance and retard functions are controlled by the Powertrain Control Module (PCM). The PCM receives signals from various switches and sensors and then sends the spark timing signal to the distributor.

1.6L

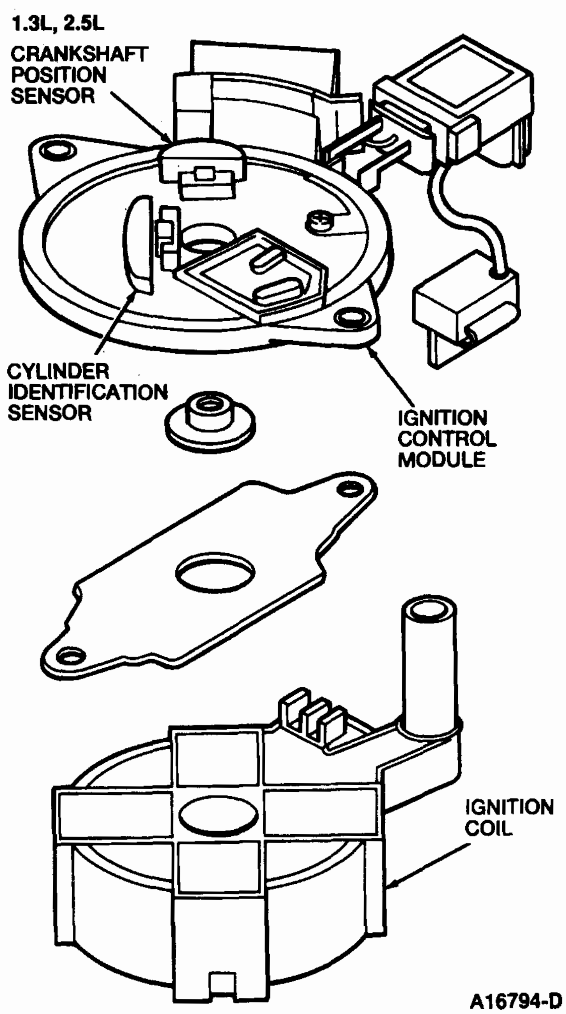
The 1.6L Turbo uses governor weights, a knock control module, and a vacuum advance / boost retard diaphragm. The 1.6L Non-Turbo uses governor weights and a dual vacuum advance diaphragm.

Description and Operation

Ignition Control Module (ICM)

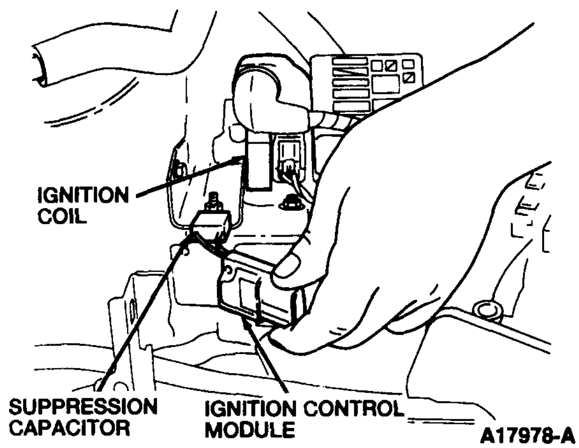
The 1.3L, 1.6L, 1.8L, and 2.5L engine's Ignition Control Module (ICM) is an output device controlled by the Powertrain Control Module (PCM). The PCM sends a signal to the ICM. The ICM controls current flow through the ignition coil where a high voltage spark is generated. The high voltage spark is then sent to the spark plugs in the ignition system.

The PCM sends a Spark Out (SPOUT) signal for the 2.0L engines to the ICM. The ICM sends this signal to the ignition coil, where it is converted into a high voltage spark that is sent to the spark plugs.

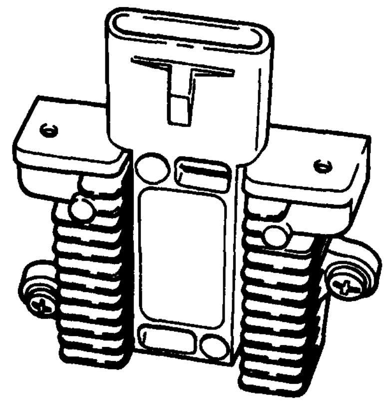


Description and Operation

1.8L



2.0L



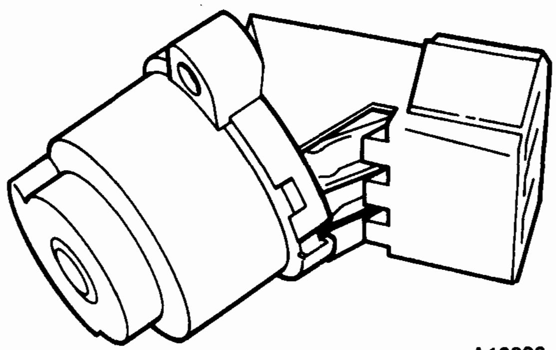
IGNITION COIL

Engine	Location
1.8L	Mounted near ignition coil, forward of the LH strut.
1.3L, 1.6L, 2.5L	Mounted in the distributor.
2.0L	Mounted to LH strut, next to fuel filter (MTX). LF corner of engine compartment, left of cooling fan (CD4E).

Description and Operation

Ignition (IGN) Switch

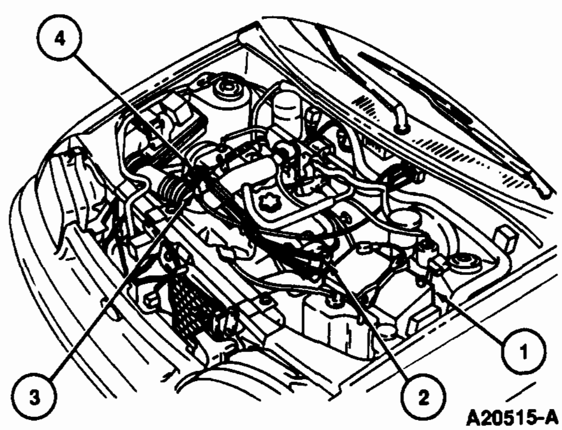
The Ignition (IGN) switch directs current to the vehicle's systems according to its position. The Powertrain Control Module (PCM) detects the ignition switch position by a series of inputs, and controls the vehicle's operation based on this information.



A16826-A

Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Mounted to steering column.

1.3L Component Location



A20515-A

Figure 1.

Item	Description
1	Battery
2	Distributor (Integrated Ignition Control Module and Ignition Coil)
3	Spark Plug Wire
4	Spark Plug

Description and Operation

1.6L Component Location

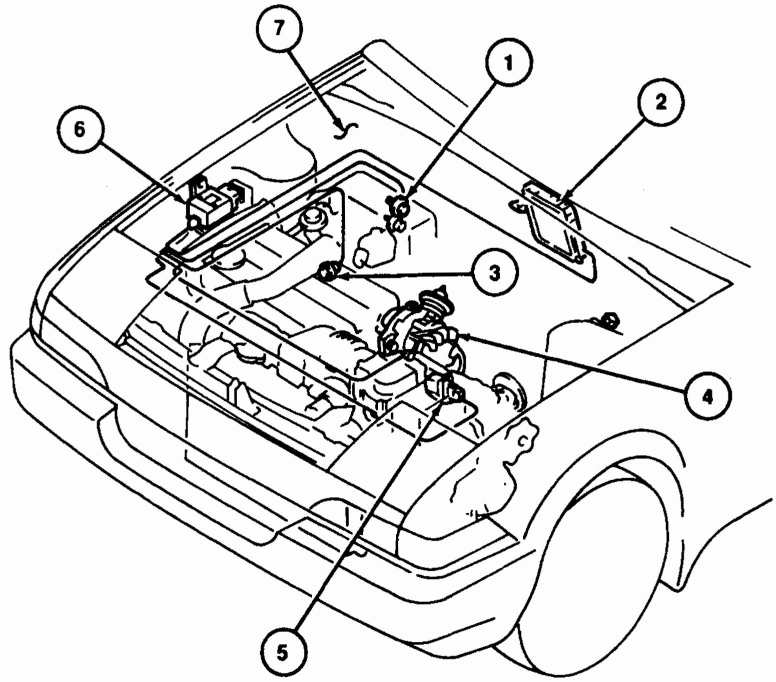


Figure 2.

Item	Description
1	Boost Pressure Switch (Turbo Only)
2	Powertrain Control Module (PCM)
3	Knock Sensor (Turbo Only)
4	Distributor (Integrated Distributor Mounted Ignition With Vacuum Advance [DMIVA] Module)
5	Ignition Coil
6	Knock Control Module (Turbo Only)
7	Self-Test Input (STI) Connector

Description and Operation

1.8L Component Location

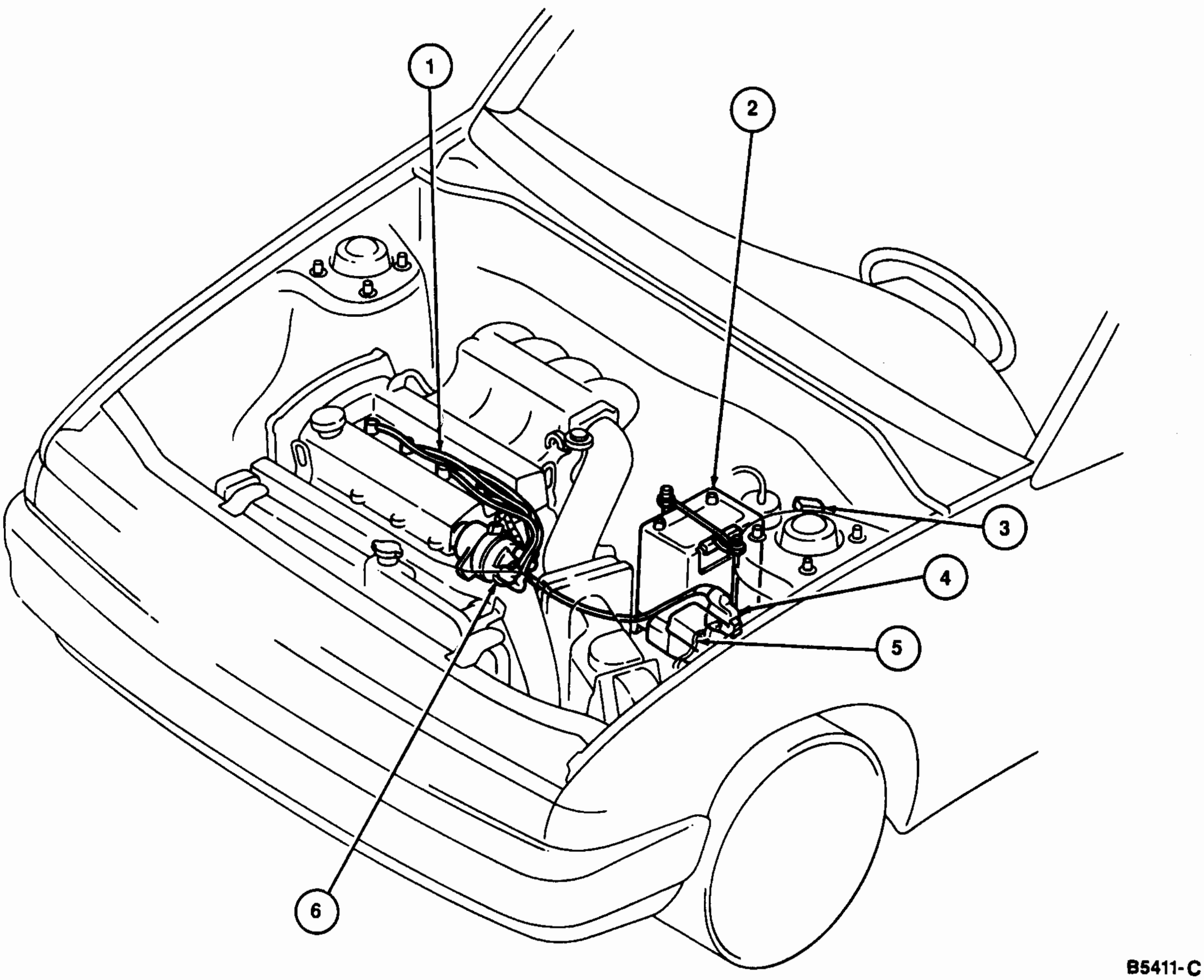
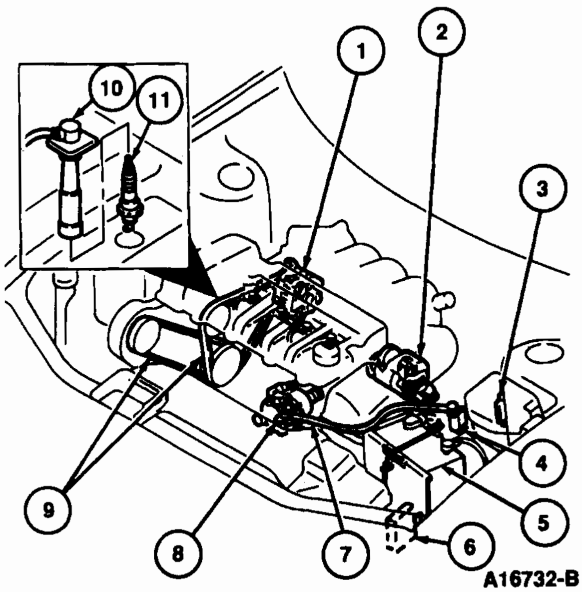


Figure 3.

Item	Description
1	Spark Plug Wires (4)
2	Battery
3	Data Link Connector (DLC)
4	Ignition Coil
5	Ignition Control Module (TI3)
6	Distributor

Description and Operation

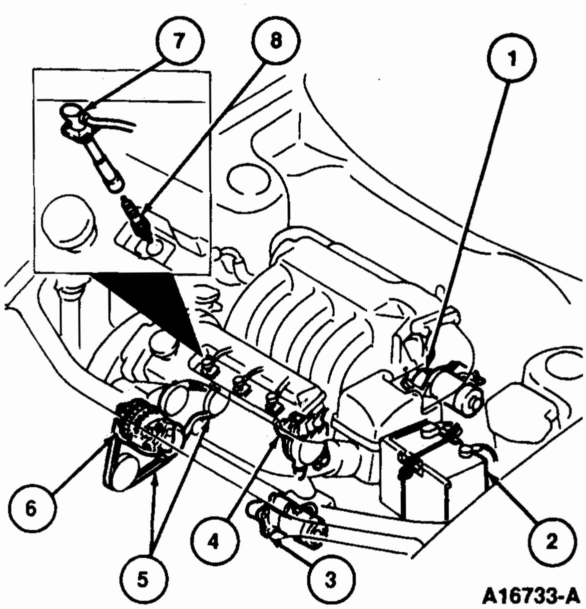
2.0L Component Location



A16732-B

Item	Description
1	Generator
2	Starter
3	Ignition Control Module (TFI-IV) (MTX)
4	Ignition Coil
5	Battery
6	Ignition Control Module (TFI-IV) (CD4E)
7	Primary Coil Wire
8	Distributor
9	Drive Belts
10	Spark Plug Boot
11	Spark Plug

2.5L Component Location



A16733-A

Item	Description
1	Starter (4EAT)
2	Battery
3	Starter (MTX)
4	Distributor (Integrated Ignition Control Module and Ignition Coil)
5	Drive Belts
6	Generator
7	Spark Plug Boot
8	Spark Plug

Diagnosis and Testing

System Inspection

1. Visually inspect the components of the ignition system.

VISUAL INSPECTION CHART

Mechanical	Electrical
● Damaged or worn distributor cap and rotor ● Damaged spark plugs ● Improperly seated spark plug, distributor cap, or rotor ● Corroded, contaminated, or carbon fouled distributor cap	● Discharged battery ● Damaged or loose connectors ● Damaged insulation ● Poor coil, distributor and spark plug connections ● Blown fuses

2. Check the vehicle's maintenance schedule to ensure that the spark plugs and the wires have been properly maintained.

3. Check the spark plug wires and boots for signs of poor insulation that could cause cross firing.

4. A damaged or worn timing belt can cause symptoms that appear to be timing related. Refer to the service manual basic engine section if necessary.

5. Make sure the engine idle speed and base timing are within specification.

   NOTE: For ignition system diagnostics on all engines except the 2.0L, go to IGN1. For 2.0L, see Symptom Chart below.

2.0L SYMPTOM CHART

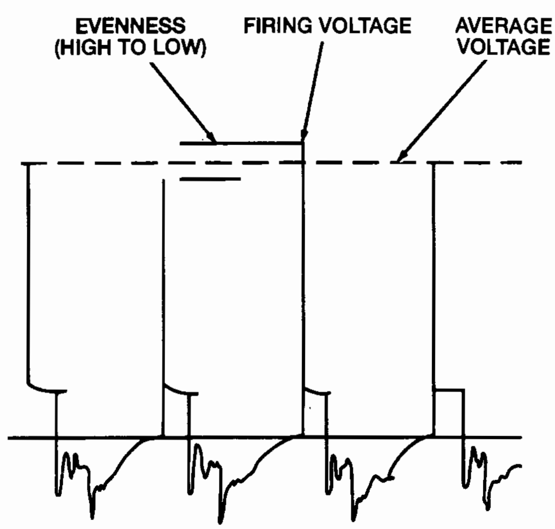
Symptom	Action To Take
Engine no start and no codes	GO to IGNA1.
Engine no start and code 211 - PIP circuit failure	GO to IGNA1.
Code 212 - IDM missing	GO to IGNB1.
Timing off, code 213 - Spark Output (SPOUT) open, lack of power, poor fuel economy	GO to IGNC1.
Clear codes or code 211 - intermittent miss or stall	GO to IGND1.
Clear codes and misfire under load - secondary short to ground	GO to IGN3.
Car continues to run after key is turned to OFF	CHECK ICM PWR for short to battery power.

Diagnosis and Testing	1.3L, 1.6L, 1.8L, 2.5L	IGN

TEST STEP		RESULT ▶	ACTION TO TAKE
IGN1	CHECK FIRING ORDER		
	• Inspect the routing of the spark plug wires. • Make sure the wires follow the firing order 1-3-4-2 on all engines except 2.5L (1-2-3-4-5-6 on 2.5L). • **Is firing order OK?**	Yes ▶ No ▶	GO to IGN2. SERVICE as required.
IGN2	TEST SPARK AT PLUG(S)		
	• Connect an Air Gap Spark Tester D81P-6666-A, or equivalent between the spark plug wire (plug end) and ground. Crank the engine, repeat on all spark plug wires. • **Does spark jump at each wire?**	Yes (Engine Runs) ▶ Yes (Engine Does Not Run) ▶ No (1.6L and 1.8L) ▶ No (1.3L and 2.5L) ▶	INSPECT the spark plugs, GO to IGN3. GO to Section 9B, Fuel Delivery / Turbocharger System. GO to IGN9. GO to IGN10.

Diagnosis and Testing	All Engines	IGN

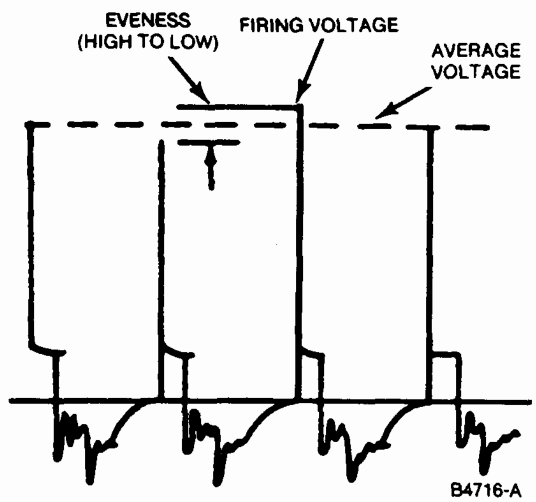
TEST STEP		RESULT	▶ ACTION TO TAKE
IGN3	CHECK SECONDARY DISPLAY		
	NOTE: If this portion of the diagnostic procedure is to provide accurate results, it is essential that the calibration of your engine analyzer be maintained. Refer to your equipment manual. If this is not available, an estimate of the calibration can be made by connecting the spark tester to a properly operating ignition system and measuring the firing voltage of the spark tester only. Do not include the firing voltage to the cap-to-rotor gap. The spark tester firing voltage should be approximately 28KV (±10%). • Connect a Rotunda Engine Analyzer 010-00575, or equivalent to view parade display of ignition secondary system. • Slowly increase the engine rpm from idle to 2000 rpm, and compare the engine analyzer display to the illustrations in the next six test steps. • **Is the evenness of spark plug firing voltage and the average value of spark plug firing voltage normal and stable?**	Yes (2.0L) ▶ Yes (1.3L, 1.8L, and 2.5L) ▶ Yes (1.6L) ▶ No ▶	Ignition system operating properly. RETURN to Section 2B, Diagnostic Routines. GO to IST1. GO to ADV1. GO to IGN4.



B4716-B

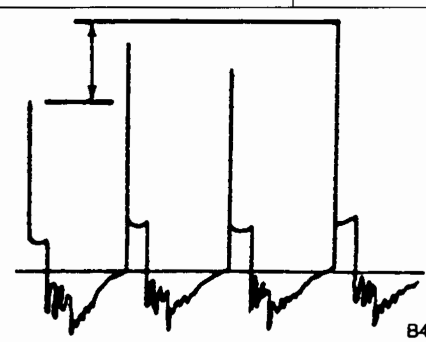
Diagnosis and Testing	All Engines	IGN

TEST STEP		RESULT ▶	ACTION TO TAKE
IGN4	CHECK SECONDARY DISPLAY (CONTINUED)		
	• **Are both the evenness of the spark plug firing voltage too wide and the average value of spark plug firing voltage greater than the normal value of 28KV?**	Yes ▶	Problems affecting all cylinders: - CHECK coil wire for proper installation in coil and distributor cap. - CHECK for wide spark plug gaps at all cylinders, (usually from worn electrodes due to high mileage). - INSPECT cap and rotor for problems causing excessive cap-to-rotor gap. - GO to IGN11.
		No ▶	GO to IGN5.



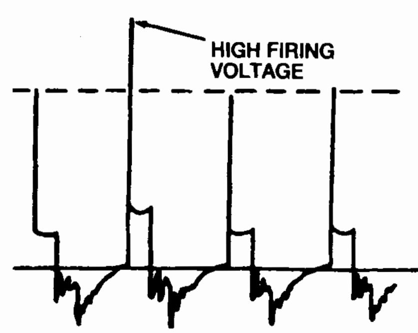
Diagnosis and Testing	All Engines	IGN

TEST STEP		RESULT ▶	ACTION TO TAKE
IGN5	CHECK SECONDARY DISPLAY (CONTINUED)		
	• **Is the evenness of the spark plug firing voltage greater than normal voltage of 28KV?**	Yes ▶	CHECK for ignition problems affecting some cylinders: - Wide spark plug gap(s) or worn electrode(s) - Improperly installed cap or rotor CHECK for mechanical problems affecting some cylinders: - Valves - Fuel injectors - Compression - Vacuum leaks
		No ▶	GO to IGN6.



Diagnosis and Testing	All Engines	IGN

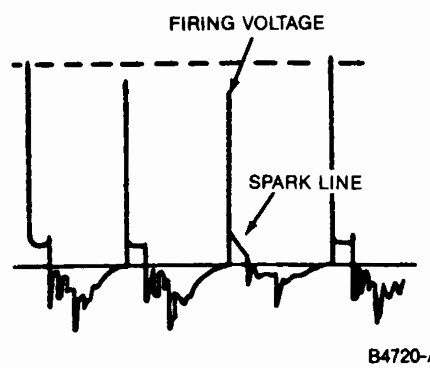
TEST STEP		RESULT ▶	ACTION TO TAKE
IGN6	CHECK SECONDARY DISPLAY (CONTINUED)		
	• **Is there consistently high spark plug firing voltage in one or more cylinders?**	Yes ▶	CHECK for ignition problems affecting some cylinders: - Spark plug wire(s) are firmly connected to distributor cap or spark plug. - Wide spark plug gap(s). - Open plug wire(s). - CHECK for mechanical problems affecting some cylinders: - Valves - Fuel injectors - Compression - Vacuum leaks - GO to IGN11.
		No ▶	GO to IGN7.



B4719-B

Diagnosis and Testing	All Engines	IGN

TEST STEP		RESULT	▶	ACTION TO TAKE
IGN7	CHECK SECONDARY DISPLAY (CONTINUED)			
	• **Is there consistently low spark plug firing voltage or sloping spark line in one or more cylinders?**	Yes	▶	CHECK for ignition problems affecting some cylinders: - Fouled spark plug(s) - Narrow spark plug gap(s) - Spark plug wire(s) grounding on engine. INSPECT for damage. - Carbon tracking in cap CHECK for mechanical problems affecting some cylinders: - Valves - Fuel injectors - Compression - Vacuum leaks
		No	▶	GO to IGN8.



Diagnosis and Testing | All Engines | IGN

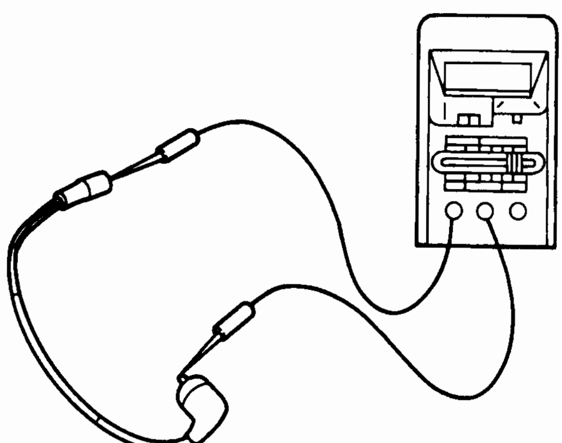
TEST STEP		RESULT ▶	ACTION TO TAKE
IGN8	CHECK SECONDARY DISPLAY (CONTINUED)		
	• **Is spark plug firing voltage reversed?**	Yes ▶	- CHECK to see if ignition coil primary circuit is reversed. If necessary make proper connections. - CHECK wiring harness for ignition coil primary circuit. If OK, REPLACE ignition coil (1.6L, 1.8L, and 2.0L) or distributor (1.3L and 2.5L).
		No (all except 2.0L) ▶	GO to IGN11.
		No (2.0L) ▶	REEVALUATE symptom and RETURN to symptom chart at beginning of this section.

B4721-A

TEST STEP		RESULT ▶	ACTION TO TAKE
IGN9	CHECK SPARK FROM COIL		
	• Connect a spark tester between coil secondary output terminal and ground. • Crank the engine. • **Does spark jump?**	Yes ▶ No ▶	GO to IGN10. GO to IGN12.
IGN10	CHECK DISTRIBUTOR ASSEMBLY		
	• Check rotor, distributor cap, and module for wear, breakage, cracks, carbon buildup (black buildup), and oxidation (white buildup). • Crank the engine and verify the rotor turns steadily. • **Is the distributor assembly OK and does the rotor turn freely?**	Yes ▶ No ▶	GO to IGN11. SERVICE as required.

Diagnosis and Testing	All Engines	IGN

TEST STEP		RESULT ▶	ACTION TO TAKE
IGN11	CHECK SPARK PLUG WIRE RESISTANCE		
	• Remove spark plug wire. **CAUTION: Do not under any circumstances puncture a spark plug wire when measuring resistance. Measure only as instructed.** • Measure the resistance of each spark plug wire. • **Is the resistance between 4,000-7,000 ohms per foot?**	Yes (1.8L) ▶	GO to IST1.
		Yes (1.6L) ▶	GO to ADV1.
		Yes (2.0L) ▶	REEVALUATE symptom and RETURN to symptom chart at the beginning of this section.
		Yes (1.3L and 2.5L) ▶	GO to IGN12.
		No ▶	REPLACE the spark plug wire(s).



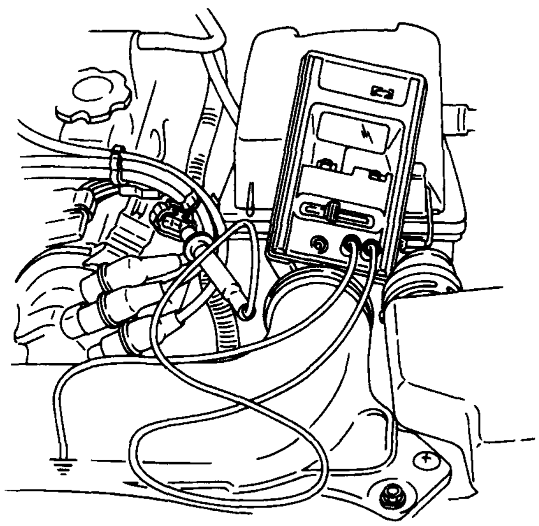
A16734-A

Diagnosis and Testing	1.3L, 1.6L, 1.8L, 2.5L	IGN

TEST STEP		RESULT ▶	ACTION TO TAKE
IGN12	CHECK VOLTAGE AT IGNITION COIL		
	• Disconnect the ignition coil connector (on distributor). • Key ON. • Measure the voltage on the following wire at the ignition coil connector (on distributor for 1.3L and 2.5L).	Yes ▶	GO to IGN13.
		No ▶	SERVICE the wire between the ignition switch and the ignition coil connector.

Engine	Wire Color
1.3L	BL
1.6L	BK/W
1.8L	BL
2.5L	BK/PK

• **Is the voltage greater than 10 volts?**



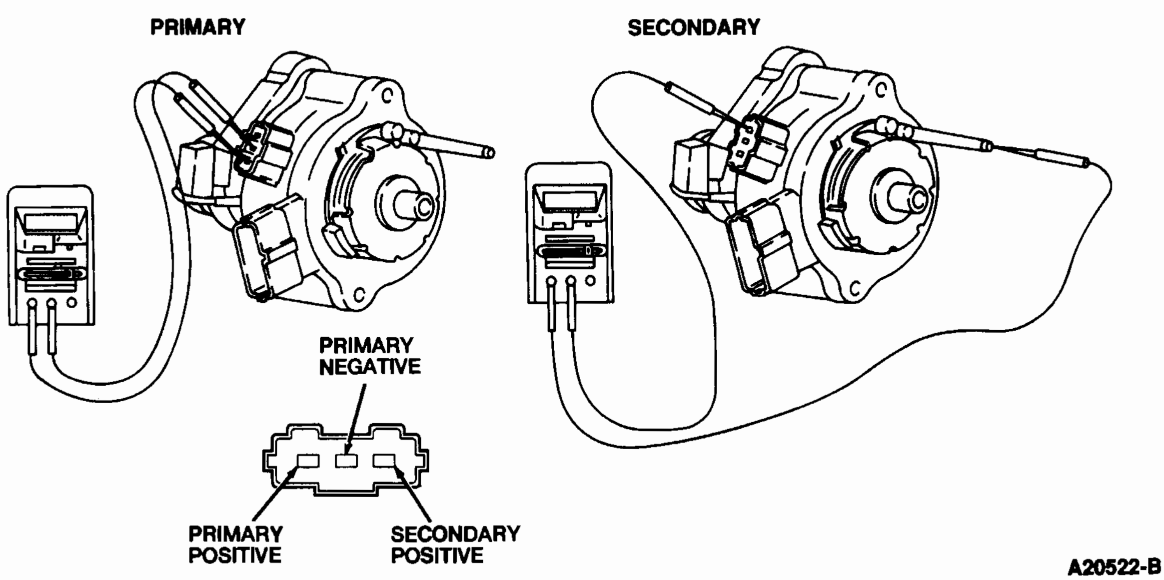
A17100-A

Diagnosis and Testing | 1.3L, 1.6L, 1.8L, 2.5L | IGN

TEST STEP	RESULT ▶	ACTION TO TAKE
IGN13 CHECK IGNITION COIL RESISTANCE		
• Disconnect the wire(s) from the ignition coil. • Measure: (see table below) NOTE: Refer to illustrations after Test Steps. • **Are the resistance readings within specifications?**	Yes (1.6L and 1.8L) ▶	GO to EEC Pinpoint Test **IDM**.
	Yes (1.3L and 2.5L) ▶	GO to EEC Pinpoint Test **ICM**.
	No ▶	REPLACE the ignition coil (1.6L and 1.8L) or distributor (1.3L and 2.5L).

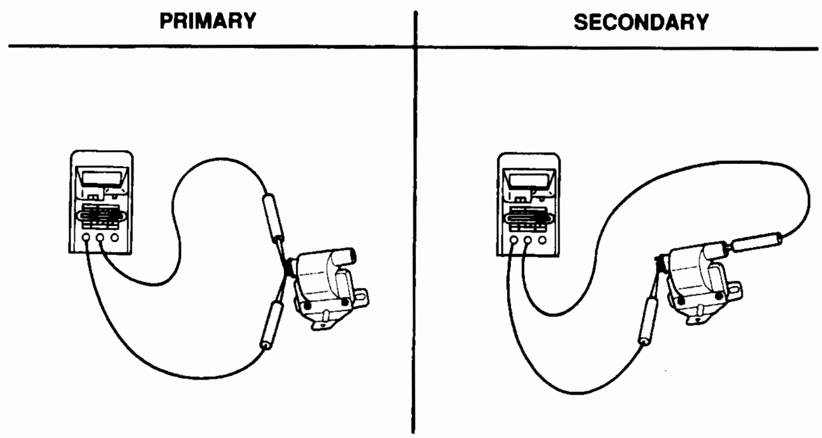
Engine	Coil	Terminals	Resistance
1.3L	Primary	Positive to negative	0.5-0.7 ohms
	Secondary	Positive to high voltage	20-31 k-ohms
1.6L, 1.8L	Primary	Positive to negative	0.8 to 1.6 ohms
	Secondary	Positive to high voltage	6 to 30 k-ohms
2.5L	Primary	Positive to negative	0.58 to 0.86 ohms
	Secondary	Positive to high voltage	1.15 to 18.5 k-ohms

1.3L



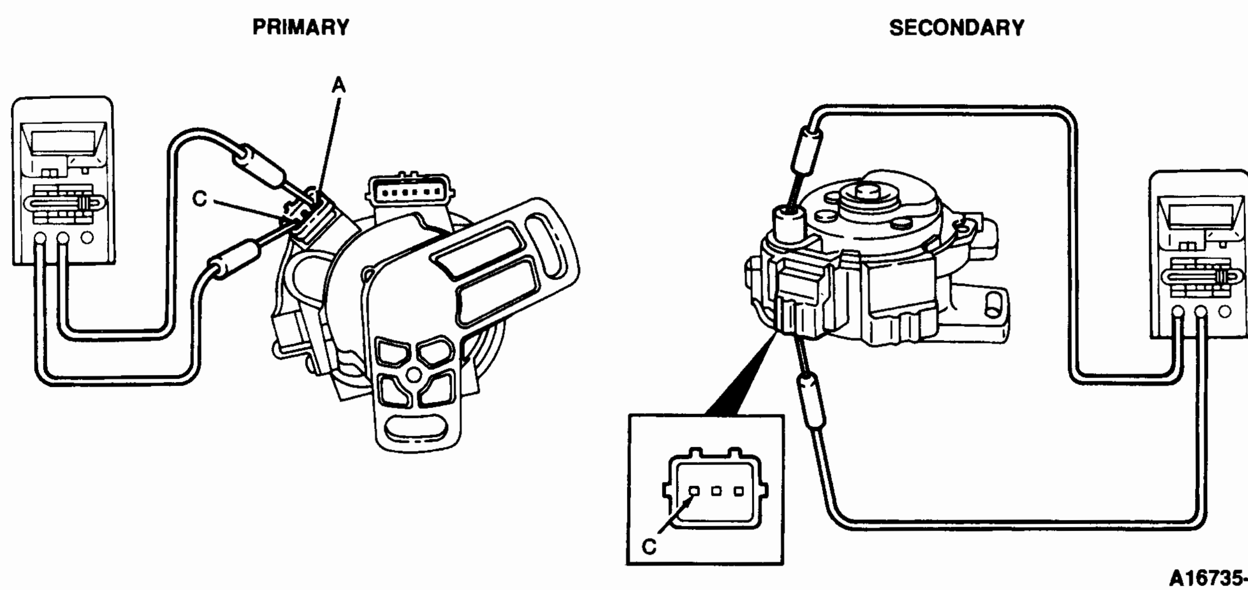
Diagnosis and Testing | 1.3L, 1.6L, 1.8L, 2.5L | IGN

1.6L and 1.8L



A14064-B

2.5L



A16735-C

Diagnosis and Testing	1.3L, 1.8L, 2.5L	IST

Idle Speed and Timing Adjustments (IST) (1.3L, 1.8L, 2.5L)

TEST STEP		RESULT ▶	ACTION TO TAKE
IST1	CHECK IDLE SPEED		
	• Start the engine and run until at normal operating temperature. • Engine at idle. • All electrical loads off. • Connect Rotunda 88 Digital Multimeter 105-00053, or equivalent as a tachometer. • Ground STI connector. Refer to illustrations after Pinpoint Test Steps. • Compare idle speed with chart: Engine / Idle Speed: 1.3L MTX — 700 ± 50 rpm 1.3L ATX — 750 ± 50 rpm 1.8L — 750 ± 50 rpm 2.5L — 650 ± 100 rpm • **Is idle speed within specifications?**	Yes ▶ No ▶	GO to IST2. ADJUST idle speed.
IST2	CHECK BASE TIMING		
	• Start the engine and run until at normal operating temperature. • Engine at idle. • All electrical loads off. • Connect a Rotunda Timing Analyzer 059-00014, or equivalent. • Ground STI connector (refer to STI Connector Locations illustration on the next page). • Compare timing with chart: Engine / Base Timing: 1.3L, 1.8L, 2.5L — 10 degrees ± 1 degree BTDC • **Is timing within specifications?**	Yes ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. ADJUST the timing. REFER to Section 12B, Air Intake Systems and Throttle Body.

Charts within the test steps:

Engine	Idle Speed
1.3L MTX	700 ± 50 rpm
1.3L ATX	750 ± 50 rpm
1.8L	750 ± 50 rpm
2.5L	650 ± 100 rpm

Engine	Base Timing
1.3L, 1.8L, 2.5L	10 degrees ± 1 degree BTDC

Diagnosis and Testing	1.3L, 1.8L, 2.5L	IST

STI Connector Locations

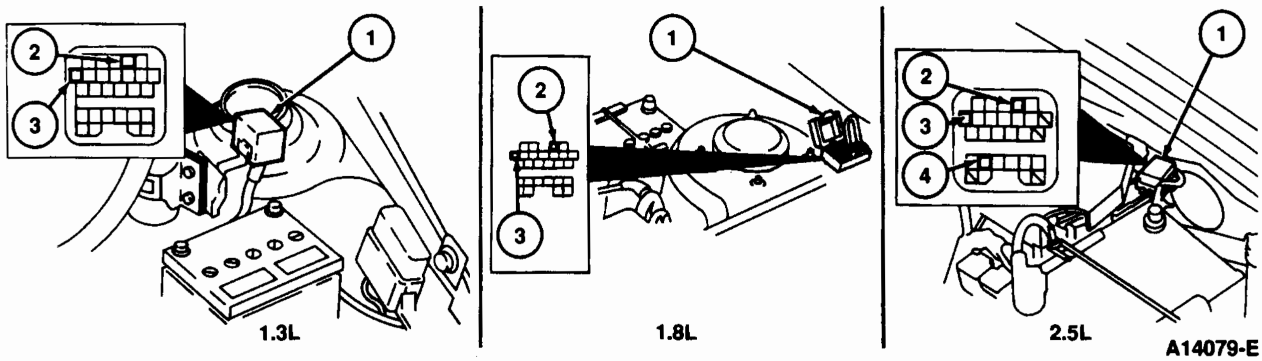
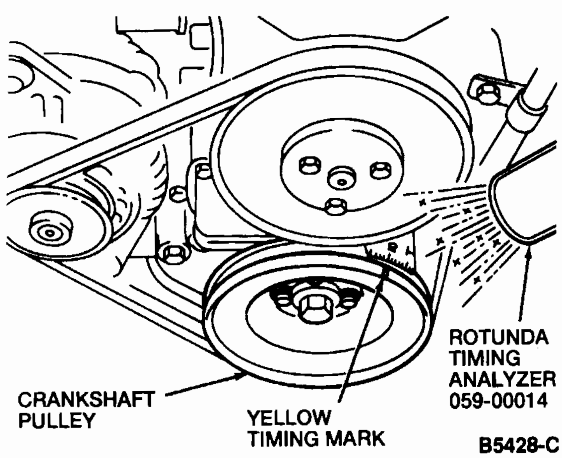


Figure 4.

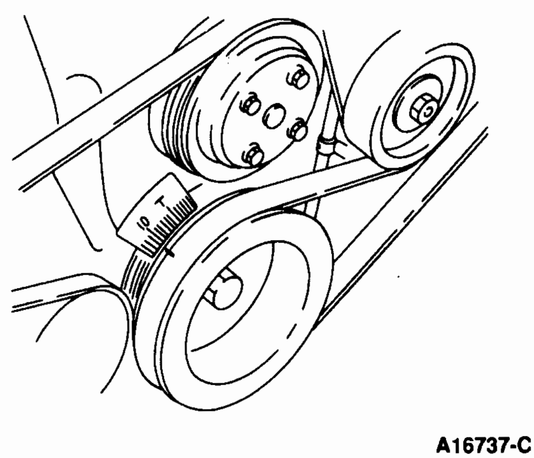
Item	Description
1	Data Link Connector
2	STI
3	GND
4	IGN (-)

Base Timing Check

1.3L and 1.8L



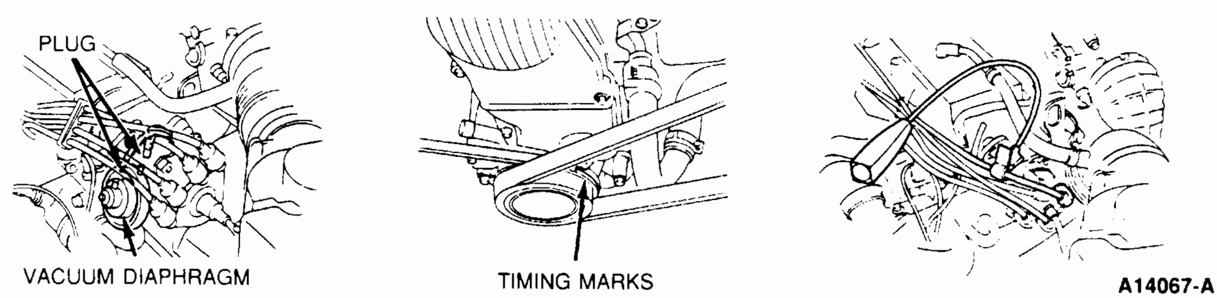
2.5L



Diagnosis and Testing	1.6L Non-Turbo 1.6L Turbo	ADV

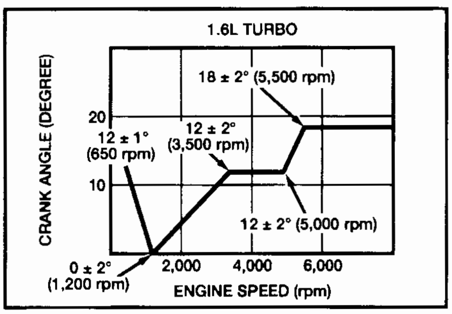
Vacuum Advance (ADV) (1.6L)

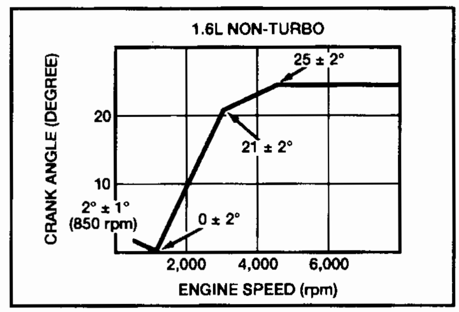
TEST STEP		RESULT ▶	ACTION TO TAKE
ADV1	CHECK VACUUM SUPPLY		
	• Check the vacuum hoses to the distributor diaphragm for cracks or poor connections. • Remove the vacuum delay valve. • Using a Rotunda Vacuum Tester 021-00014, or equivalent apply 635 mm-Hg (25 in-Hg) of vacuum to the green side of the valve. • **Does the vacuum delay valve hold vacuum for 10-20 seconds?**	Yes ▶ No ▶	GO to ADV2. SERVICE hose as required or REPLACE the vacuum delay valve.
ADV2	INSPECT TIMING		
	• Disconnect and plug the vacuum hoses from the vacuum diaphragm. • Ground the Self Test Input (STI) connector. • Engine at operating temperature. • All electrical loads off. • At idle: — 1.6L Non-Turbo: 850 ± 50 rpm — 1.6L Turbo: 850 ±50 rpm • Connect a Rotunda Timing Analyzer 059-00014 or equivalent. • Check timing: — 1.6L Non-Turbo: 2 ± 1 degrees BTDC — 1.6L Turbo: 12 ± 1 degrees BTDC • **Is the ignition base timing correct?**	Yes ▶ No ▶	GO to ADV3. ADJUST the timing.



Diagnosis and Testing	1.6L Non-Turbo 1.6L Turbo	ADV

TEST STEP		RESULT ▶	ACTION TO TAKE
ADV3	CHECK CENTRIFUGAL ADVANCE		
	• Warm the engine. • Disconnect and plug the vacuum hose(s) from the vacuum control. • Connect a Rotunda Timing Analyzer 059-00014 or equivalent. • Gradually increase the engine speed. • Monitor the ignition timing advance and compare to the chart. • **Does the centrifugal advance operate properly?**	Yes (1.6L Non-Turbo) ▶ Yes (1.6L Turbo) ▶ No ▶	GO to ADV4. GO to ADV5. SERVICE the centrifugal advance assembly.

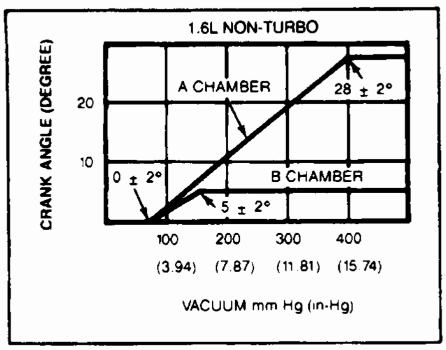




A15146-B

Diagnosis and Testing	1.6L Non-Turbo	ADV

TEST STEP		RESULT ▶	ACTION TO TAKE
ADV4	CHECK VACUUM DIAPHRAGM		
	• Disconnect and plug the vacuum hose(s) from the vacuum diaphragm. • Connect a Rotunda Vacuum Tester 021-00014 or equivalent to the vacuum diaphragm. • Connect a Rotunda Timing Analyzer 059-00014 or equivalent. • Engine at idle. • Apply vacuum to chamber A (outer chamber) and then to chamber B (inner chamber). • Monitor the ignition timing and compare to the chart. Increased vacuum should advance (increase) the crank angle. • **Is the vacuum advance operating properly?**	Yes ▶	CHECK the vacuum hoses for leaks, cracks, and breakage. REPAIR as required. RETURN to Section 2B, Diagnostic Routines.
		No ▶	REPLACE the vacuum diaphragm.

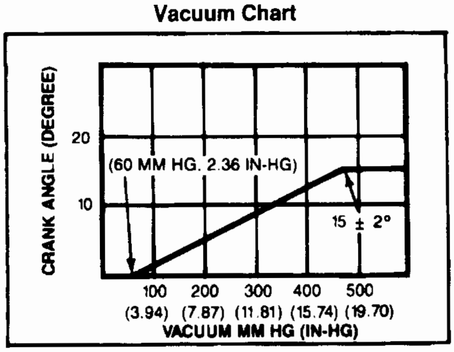


A15147-A

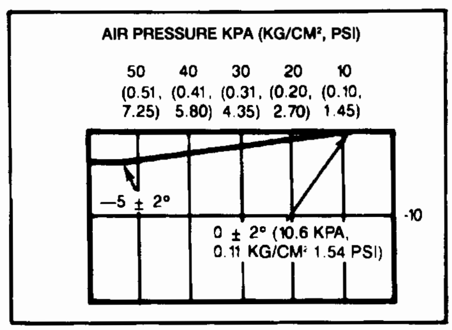
Diagnosis and Testing	1.6L Turbo	ADV

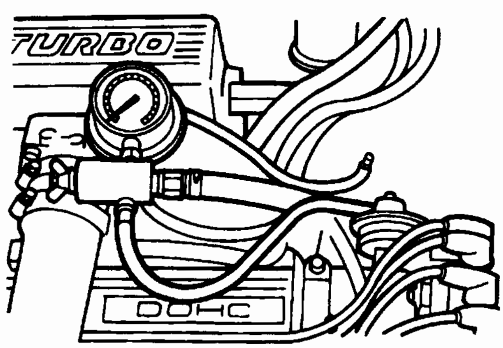
TEST STEP		RESULT ▶	ACTION TO TAKE
ADV5	CHECK VACUUM ADVANCE		
	• Disconnect and plug the vacuum hose. • Apply vacuum to the advance diaphragm and monitor the ignition timing. See chart below. • Remove vacuum and apply air pressure to the advance diaphragm 68.9 kPa (10 psi MAX). Monitor the ignition timing. • Compare the readings to the chart below. • **Does the vacuum advance operate properly?**	Yes ▶	CHECK the vacuum hoses for leaks, cracks, breakage, and proper routing. SERVICE as required. RETURN to Section 2B, Diagnostic Routines.
		No ▶	REPLACE the advance diaphragm.

Vacuum Chart



Air Pressure Chart

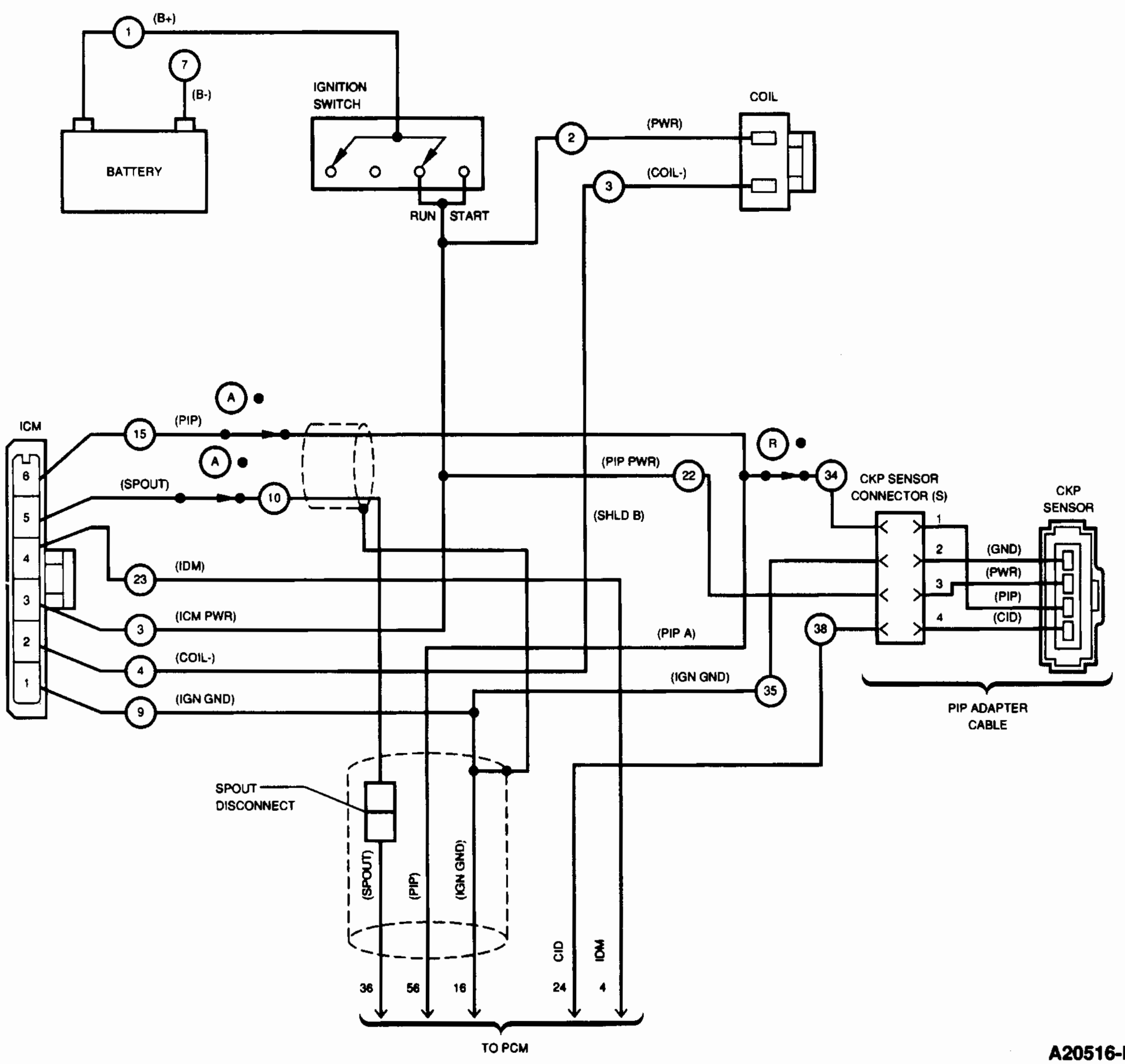




A14306-B

Diagnosis and Testing	2.0L	IGNA

ICM Ignition System (2.0L CD4E and MTX Only)

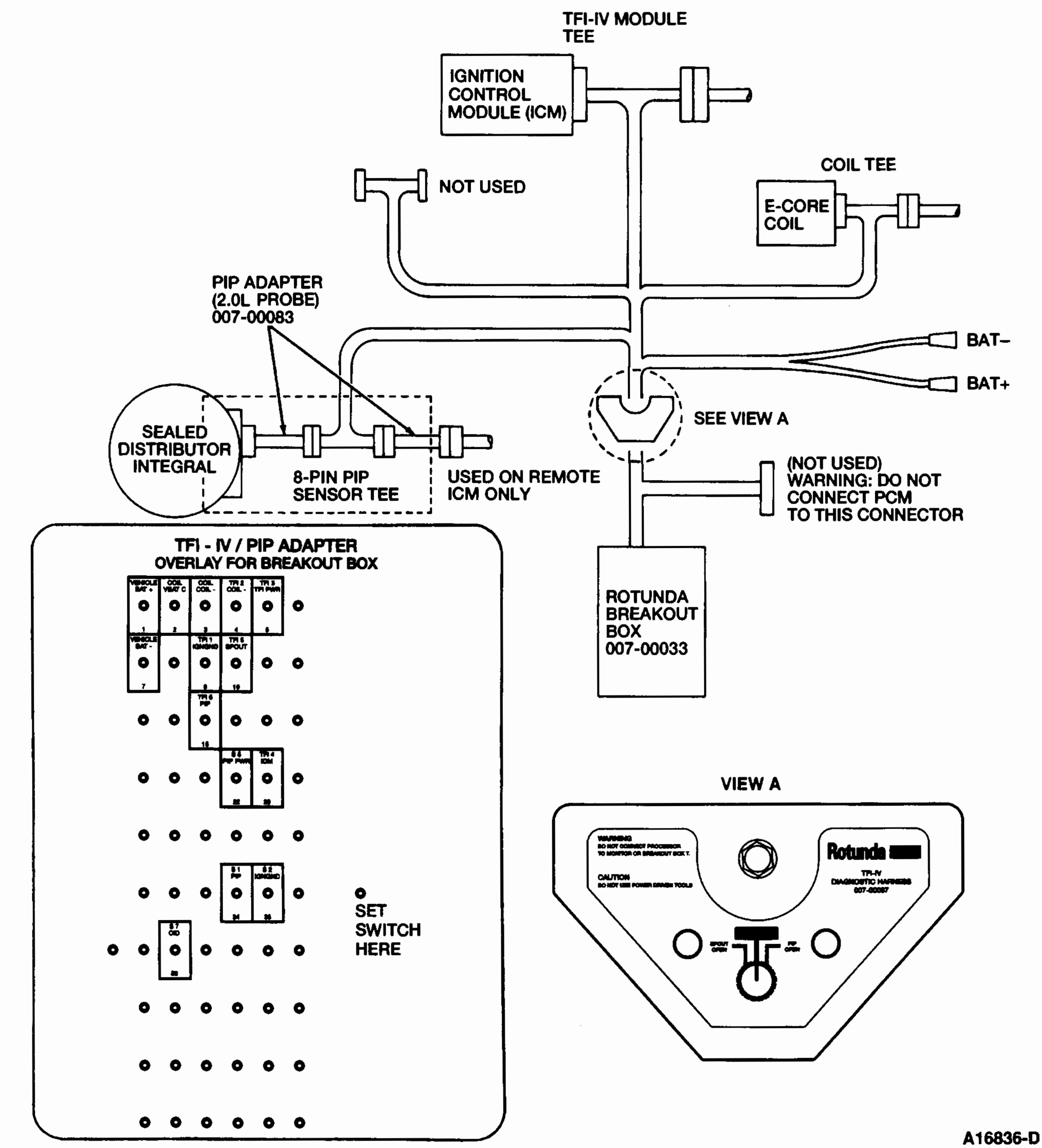


A20516-B

NOTE: Circled numbers refer to Breakout Box pins.

Diagnosis and Testing	2.0L	IGNA

Rotunda TFI-IV Diagnostic Cable 007-00097



A16836-D

Diagnosis and Testing	2.0L	IGNA

Engine No Start (IGNA) (2.0L)

	TEST STEP	RESULT ▶	ACTION TO TAKE
IGNA1	CHECK FOR EEC IV QUICK TEST COMPLETION		
	• **Were all tests accomplished according to EEC IV Quick Test procedures?**	Yes ▶ No ▶	GO to IGNA2. REFER to Section 2A, Diagnostic Routines.
IGNA2	CHECK FOR GOOD BATTERY		
	• **Is battery voltage greater than 10 volts DC with the key ON?**	Yes ▶ No ▶	GO to IGNA3. SERVICE battery.
IGNA3	CHECK FOR SPARK AT COIL DURING CRANK		
	• Use an Air Gap Spark Tester (D81P-6666-A) or equivalent to check for spark during crank at coil wire. • **Was spark present during crank?**	Yes ▶ No ▶	GO to IGNA9. GO to IGNA4.
IGNA4	CHECK FOR TFI POWER		
	• Key OFF. • Connect Rotunda TFI Diagnostic Cable 007-00097, or equivalent and PIP Adapter 007-00083 to Rotunda Breakout Box 007-00033, or equivalent connect BAT- lead to negative post of battery, and connect TFI module tee to Ignition Control Module and vehicle harness. • Do not connect BAT+ lead of TFI Diagnostic Cable to battery. **CAUTION: Do not connect PCM to Breakout Box when it is used with TFI Diagnostic Cable.** • Make sure PIP OPEN / NORMAL / SPOUT OPEN switch on TFI Diagnostic Cable is in the NORMAL position. • Use TFI overlay on Breakout Box. • DVOM on DC volt scale. • Key ON. • Measure voltage between Pin 5 (TFI PWR) and Pin 7 (VEHICLE BAT-) at Breakout Box. • **Is voltage greater than 10 volts DC?**	Yes ▶ No ▶	GO to IGNA5. SERVICE power open to Ignition Control Module in harness or connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA5	CHECK FOR PIP SIGNAL		
	• DVOM on AC volt scale. • Crank engine and measure voltage between Pin 15 (PIP) and Pin 7 (VEHICLE BAT-). • **Is voltage between 3.0 and 8.5 volts AC?**	Yes ▶ No ▶	GO to IGNA6. GO to IGNA11.

Diagnosis and Testing | 2.0L | IGNA

TEST STEP		RESULT	ACTION TO TAKE
IGNA6	CHECK FOR SPOUT SIGNAL		
	• DVOM on AC volt scale. • Crank engine and measure voltage between Pin 10 (SPOUT) and Pin 7 (VEHICLE BAT-). • **Is voltage between 3.0 and 8.5 volts AC?**	Yes ▶ No ▶	GO to IGNA7. GO to IGNA15.
IGNA7	CHECK VBAT AT COIL		
	• Key OFF. • Connect diagnostic cable coil tee to vehicle harness; do not connect diagnostic cable to coil. • Key ON. • DVOM on DC volt scale. • Measure voltage between Pin 2 (VBAT C) and Pin 7 (VEHICLE BAT-). • **Is voltage greater than 10 volts DC?**	Yes ▶ No ▶	GO to IGNA8. SERVICE power open to coil in harness or connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA8	CHECK FOR COIL (-) SIGNAL		
	• Key OFF. • Connect BAT+ lead of TFI diagnostic cable to positive post of battery. • Connect 12 volt incandescent test lamp between Pin 1 (VEHICLE BAT+) and Pin 3 (COIL-). • Key ON. • Crank engine. • **Did test lamp flash brightly?**	Yes ▶ No ▶	REPLACE coil. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. GO to IGNA23.
IGNA9	CHECK FOR SPARK AT ALL WIRES		
	• Use an Air Gap Spark Tester (D81P-6666-A) or equivalent to check for spark at all wires. • **Was spark present at all plugs during crank?**	Yes ▶ No ▶	GO to IGNA10. SERVICE distributor cap, rotor, plugs, or plug wires. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA10	CHECK PLUGS		
	• Remove and check plugs for damage, wear, carbon deposits, and proper plug gap. • **Are plugs OK?**	Yes ▶ No ▶	Not an ignition problem, REFER to Section 2A, Diagnostic Routines. SERVICE plugs. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.

Diagnosis and Testing	2.0L	IGNA

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNA11	CHECK FOR PIP POWER AT PIP SENSOR (DISTRIBUTOR)		
	• Connect diagnostic cable PIP sensor tee to PIP sensor (distributor) and vehicle harness. • DVOM on DC volt scale. • Key ON. • Measure voltage between Pin 22 (PIP PWR) and Pin 7 (VEHICLE BAT-). • **Is voltage greater than 10 volts DC?**	Yes ▶ No ▶	GO to IGNA12. SERVICE power to PIP sensor (distributor) in harness or connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA12	CHECK PIP SENSOR		
	• Key OFF. • Disconnect diagnostic harness PIP sensor tee from PIP sensor (distributor) only; leave PIP sensor tee connected to vehicle harness. • DVOM on DC volt scale. • Key ON. • Measure the voltage between Pin 34 (PIP) and Pin 7 (VEHICLE BAT-). • **Is the voltage greater than 9 volts DC?**	Yes ▶ No ▶	CHECK PIP sensor (distributor) wiring, if OK REPLACE distributor. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. GO to IGNA13.
IGNA13	CHECK PIP SIGNAL WITH TFI DISCONNECTED		
	• Key OFF. • Reconnect diagnostic harness PIP sensor tee to PIP sensor (distributor). • Turn switch on diagnostic cable to NORMAL. • Disconnect diagnostic harness TFI module tee from Ignition Control Module only; leave TFI module tee connected to vehicle harness. • DVOM on AC range. • Crank engine and measure voltage between Pin 34 (PIP) and Pin 7 (VEHICLE BAT-). • **Is voltage between 3.0 and 8.5 volts AC?**	Yes ▶ No ▶	REPLACE Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. GO to IGNA14.

Diagnosis and Testing	2.0L	IGNA

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNA14	CHECK PCM PIP SIGNAL		
	• Key OFF. • Disconnect diagnostic cable PIP sensor tee from PIP sensor (distributor) only; leave PIP sensor tee connected to vehicle harness. • Disconnect PCM. • Measure the resistance between Pin 34 (PIP) and ground. • **Is the resistance greater than 10,000 ohms?**	Yes ▶	REPLACE the PCM. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	SERVICE PIP between PIP sensor (distributor) and PCM or Ignition Control Module in harness for short. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA15	CHECK FOR SPOUT SIGNAL IN HARNESS		
	• Turn switch to SPOUT OPEN position on diagnostic cable. • DVOM on AC range. • Crank engine and measure voltage between Pin 10 (SPOUT) and Pin 7 (VEHICLE BAT-). • **Is voltage between 3.0 and 8.5 volts AC?** NOTE: Engine may start, continue diagnostics.	Yes ▶	REPLACE Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	GO to IGNA16.
IGNA16	CHECK SPOUT SIGNAL VOLTAGE		
	• Key OFF. • Disconnect diagnostic cable TFI module tee from Ignition Control Module only; leave TFI module tee connected to vehicle harness. • Turn switch to NORMAL on diagnostic cable. • DVOM on DC volt scale. • Measure voltage between Pin 10 (SPOUT) and Pin 7 (VEHICLE BAT-), with key ON. • **Is voltage less than 0.5 volt DC?**	Yes ▶	GO to IGNA18.
		No ▶	GO to IGNA17.

Diagnosis and Testing	2.0L	IGNA

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNA17	CHECK FOR SPOUT CIRCUIT SHORT TO POWER		
	• Key OFF. • Disconnect PCM. • DVOM on DC volt scale. • Measure voltage between Pin 10 (SPOUT) and Pin 7 (VEHICLE BAT-) with key ON. • **Is voltage less than 0.5 volt DC?**	Yes ▶ No ▶	GO to IGNA19. SERVICE SPOUT between PCM and Ignition Control Module in harness for short to power. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA18	CHECK FOR SPOUT CIRCUIT SHORT TO GROUND		
	• Disconnect PCM. • Measure resistance between Pin 10 (SPOUT) and Pin 7 (VEHICLE BAT-). • **Is resistance greater than 10K ohms?**	Yes ▶ No ▶	GO to IGNA19. SERVICE SPOUT circuit between PCM and Ignition Control Module in harness for short to ground. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA19	CHECK FOR PIP CIRCUIT OPEN		
	• Key OFF. • DVOM on AC volt scale. • Install Breakout Box. • Crank engine and measure voltage between BOB Pin 56 (PIP) and BOB Pin 60 (GND). • **Is voltage between 3.0 and 8.5 volts AC?**	Yes ▶ No ▶	GO to IGNA20. GO to IGNA22.
IGNA20	CHECK IGN GND AT PCM		
	• Key OFF. • Reconnect diagnostic cable TFI module tee to Ignition Control Module. • DVOM on ohm scale. • Disconnect PCM. • Measure resistance between Pin 16 (IGN GND) of PCM harness connector and Pin 7 (VEHICLE BAT-) at the breakout box. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE PCM. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. GO to IGNA21.

Diagnosis and Testing	2.0L	IGNA

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNA21	CHECK FOR IGN GND AT PIP SENSOR		
	• Connect diagnostic cable PIP sensor tee to PIP sensor (distributor) and vehicle harness. • Measure resistance between Pin 35 (IGN GND) and Pin 7 (VEHICLE BAT-). • **Is resistance less than 5.0 ohms?**	Yes ▶	SERVICE IGN GND between PCM and PIP sensor (distributor) in harness for open. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	SERVICE IGN GND wire or REPLACE distributor. IGN GND open in PIP sensor. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA22	CHECK PIP SIGNAL AT PIP SENSOR		
	• Key OFF. • Connect diagnostic cable PIP sensor tee to vehicle harness. • DVOM on DC volt scale. • Key ON. • Measure the voltage between Pin 34 (PIP) and Pin 7 (VEHICLE BAT-). • **Is the voltage greater than 9 volts DC?**	Yes ▶	REPLACE distributor. PIP open in PIP sensor (distributor). REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	SERVICE PIP open in harness between PCM and PIP sensor (distributor). REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.

Diagnosis and Testing	2.0L	IGNA

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNA23	CHECK FOR COIL (-) OPEN IN HARNESS		
	• Key OFF. • Disconnect the PCM. • Disconnect diagnostic cable TFI module tee from Ignition Control Module only; leave TFI module tee connected to vehicle harness. • Disconnect BAT+ lead of TFI diagnostic cable from battery. • DVOM on ohm scale. • Measure the resistance between Pin 3 (COIL-) and Pin 4 (TFI2 COIL-). • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to IGNA24. SERVICE open coil between Ignition Control Module and coil in harness. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA24	CHECK FOR COIL (-) CIRCUIT SHORT TO GROUND		
	• Key OFF. • Disconnect the PCM. • DVOM on ohm scale. • Measure resistance between Pin 3 (COIL-) and Pin 7 (VEHICLE BAT-). • **Is resistance greater than 10K ohms?**	Yes ▶ No ▶	GO to IGNA25. SERVICE coil - short to ground in harness between coil and Ignition Control Module. Coil may be damaged. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA25	CHECK FOR COIL (-) SHORT TO POWER		
	• DVOM on DC volt scale. • Key ON. • Measure voltage between Pin 3 (COIL-) and Pin 7 (VEHICLE BAT-). • **Is voltage less than 5.5 volts DC?**	Yes ▶ No ▶	GO to IGNA26. SERVICE coil - short to power in harness between coil and Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNA26	CHECK GND AT IGNITION CONTROL MODULE		
	• Key OFF. • DVOM on ohm scale. • Measure resistance between Pin 9 (IGN GND) and Pin 7 (VEHICLE BAT-). • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. GO to IGNA27.

Diagnosis and Testing | 2.0L | IGNA

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNA27	CHECK GND AT PIP SENSOR		
	● Connect diagnostic cable PIP sensor tee to the PIP sensor (distributor) and vehicle harness. ● Measure resistance between Pin 35 (GND) and Pin 7 (VEHICLE BAT-). ● **Is resistance less than 5.0 ohms?**	Yes ▶	SERVICE open GND in harness between PIP sensor (distributor) and Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	SERVICE GND wire or REPLACE distributor. GND open in PIP sensor (distributor) or connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.

Diagnosis and Testing	2.0L	IGNB

Code 212-IDM Missing (IGNB) (2.0L)

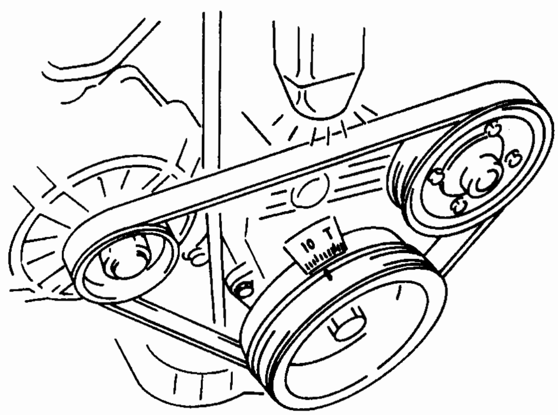
	TEST STEP	RESULT ▶	ACTION TO TAKE
IGNB1	CHECK IDM SIGNAL AT PCM CONNECTOR		
	• Key OFF. • Install Rotunda Breakout Box 007-00033, or equivalent. • DVOM on AC volt scale. • Crank engine and measure voltage between BOB Pin 4 (IDM) and ground. • **Is voltage greater than 1.0 volt AC?**	Yes ▶	REPLACE PCM. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	GO to **IGNB2**.
IGNB2	CHECK FOR IDM SHORT TO POWER		
	• Key OFF. • Connect TFI Diagnostic Cable 007-00097, or equivalent to PCM breakout box, connect BAT- lead to negative post of battery, and connect TFI module tee to vehicle harness. • DVOM on DC volt scale. • Key ON. • Measure voltage between Pin 23 (IDM) and Pin 7 (VEHICLE BAT-). • **Is voltage less than 0.5 volt DC?**	Yes ▶	GO to **IGNB3**.
		No ▶	SERVICE IDM short to power in harness between PCM connector and Ignition Control Module connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
IGNB3	CHECK FOR IDM SHORT TO GROUND		
	• Key OFF. • Disconnect PCM. • DVOM on ohm scale. • Measure resistance between Pin 23 (IDM) and Pin 7 (VEHICLE BAT-). • **Is resistance greater than 10K ohms?**	Yes ▶	GO to **IGNB4**.
		No ▶	SERVICE IDM short to ground in harness between PCM connector and Ignition Control Module connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.

Diagnosis and Testing	2.0L	IGNB

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNB4	CHECK FOR IDM OPEN IN HARNESS		
	• Disconnect PCM. • Measure resistance between Pin 23 (IDM) diagnostic cable and Pin 4 of the PCM connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	REPLACE Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.
		No ▶	SERVICE IDM open in harness between Ignition Control Module and PCM connector. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.

Diagnosis and Testing	2.0L	IGNC

Code 213 - Timing Off (IGNC) (2.0L)

TEST STEP		RESULT ▶	ACTION TO TAKE
IGNC1	CHECK BASE TIMING		
	CAUTION: Do not use a remote starter while doing timing check. ● Key OFF. ● Install timing light. ● Remove SPOUT in line connector. ● Run engine at normal operating condition.  **A17098-B** ● **Is base timing within ±3 degrees of specified base timing (see Specifications Chart at the end of this section)?**	Yes ▶ No ▶	GO to IGNC2. REFER to Initial Timing Set Procedure.
IGNC2	CHECK FOR SPARK ADVANCE		
	● Key OFF. ● Reconnect SPOUT in line connector. ● Idle engine at normal operating condition. ● **Is timing between 6 degrees and 18 degrees, and does spark advance from base timing position?**	Yes ▶ No ▶	Not an ignition problem. REFER to Section 2A, Diagnostic Routines. GO to IGNC3.

Diagnosis and Testing	2.0L	IGNC

	TEST STEP	RESULT ▶	ACTION TO TAKE
IGNC3	CHECK FOR GOOD SPOUT TO IGNITION CONTROL MODULE		
	● Connect Rotunda TFI Diagnostic Cable 007-00097, or equivalent, to Rotunda Breakout Box 007-00033, or equivalent, connect BAT- lead to negative post of battery, and connect Ignition Control Module and vehicle harness. ● Turn switch on diagnostic cable to SPOUT OPEN. ● Use TFI overlay on Breakout Box. ● DVOM on AC volt scale. ● Run engine and measure voltage between Pin 10 (SPOUT) and Pin 7 (VEHICLE BAT-). ● **Is voltage between 3.0 and 8.5 volts AC?**	Yes ▶ No ▶	REPLACE Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. GO to IGNC4.
IGNC4	CHECK FOR SPOUT OPEN IN HARNESS		
	● Key OFF. ● Disconnect PCM. ● Disconnect diagnostic cable TFI module tee from Ignition Control Module only; leave TFI module tee connected to vehicle harness. ● DVOM on ohm scale. ● Measure resistance between Pin 36 (SPOUT) of the PCM vehicle harness connector and Pin 10 (SPOUT) at the breakout box. ● **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE PCM. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test. SERVICE SPOUT open in harness between PCM and Ignition Control Module. REMOVE all test equipment. RECONNECT all components. CLEAR Continuous Memory. RERUN Quick Test.

Diagnosis and Testing	2.0L	IGND

Intermittent Miss or Stall (IGND) (2.0L)

Before conducting this test, talk to the customer to get the symptoms. Then review the vehicle history to get the number of previous repairs and what components have been replaced.

TEST STEP		RESULT ▶	ACTION TO TAKE
IGND1	TEST EQUIPMENT		
	• **Is a Rotunda TFI/EEC-IV Intermittent Ignition Analyzer 007-00078 or equivalent available?** NOTE: The TFI-IV intermittent analyzer cannot be used with TFI-IV modules with Computer Controlled Dwell (CCD) unless a CCD update is added to the analyzer.	Yes ▶ No ▶	FOLLOW test procedure instructions supplied with tester. GO to IGND2.
IGND2	BEGIN DIAGNOSIS		
	• **Will engine start?**	Yes ▶ No ▶	GO to IGND3. GO to IGNA1.
IGND3	COLD WIGGLE TEST		
	• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. • **Does engine quit?**	Yes ▶ No ▶	SERVICE wiring harness or connector. GO to IGND4.
IGND4	ENGINE WARM-UP		
	• Engine at idle, close hood, A/C ON, blower on medium speed: allow engine to run for 15 minutes. • **Does engine quit?**	Yes ▶ No ▶	GO to IGND8. GO to IGND5.
IGND5	HOT RESTART TEST		
	• Engine off, hood closed, hot soak for 10 minutes. • **Will engine restart?**	Yes ▶ No ▶	GO to IGND6. GO to IGNA1.
IGND6	HOT WIGGLE TEST		
	• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. • **Does engine quit?**	Yes ▶ No ▶	SERVICE wiring harness or connector. GO to IGND7.
IGND7	ROAD TEST		
	• Road test. • **Does engine quit?**	Yes ▶ No ▶	GO to IGND8. Test complete (Problem not duplicated).
IGND8	FINAL TEST		
	• Raise hood, shake wiring harness, pull wires at connectors, separate and reconnect connectors for ignition components. • **Does engine start?**	Yes ▶ No ▶	SERVICE wiring harness or connector. GO to IGNA1.

Specifications/Special Service Tools

Specifications

GENERAL SPECIFICATIONS

Description	Specification
Base Timing:	
1.3L	10 ±1 degrees BTDC
1.6L Non-Turbo	2 ±1 degrees BTDC
1.6L Turbo	12 ±1 degrees BTDC
1.8L	10 ±1 degrees BTDC
2.0L	10 ±1 degrees BTDC
2.5L	10 ±1 degrees BTDC
Spark Plug Gap:	
All Engines	1.0 - 1.09mm (0.039 - 0.043 inch)
Firing Order:	
1.3L	1-3-4-2
1.6L	1-3-4-2
1.8L	1-3-4-2
2.0L	1-3-4-2
2.5L	1-2-3-4-5-6
Idle Speed:	
1.3L ATX	750 ± 50 rpm
1.3L MTX	700 ± 50 rpm
1.6L	850 ± 50 rpm
1.8L	750 ± 50 rpm
2.0L	700 ± 50 rpm
2.5L	650 ±100 rpm

Special Service Tools/Equipment

SPECIAL SERVICE TOOLS

Tool Number	Description
D81P-6666-A	Air Gap Spark Tester

ROTUNDA EQUIPMENT

Model	Description
059-00014	Timing Analyzer
105-00053	88 Digital Multimeter
010-00575	Engine Analyzer
105-00051	73 Digital Multimeter
007-00078	TFI/EEC-IV Intermittent Ignition Analyzer
007-00097	TFI-IV Diagnostic Cable
007-00033	Breakout Box
021-00014	Vacuum Tester
007-00083	PIP Adapter

SECTION 9B

Fuel Delivery / Turbocharger System

Contents

SECTION 9B

Fuel Delivery / Turbocharger System

Contents (continued)

SECTION 9B

Fuel Delivery / Turbocharger System

Contents (continued)

Description and Operation

Fuel Delivery Systems

Basic Operation

The fuel delivery system supplies fuel to the fuel injectors at a constant pressure and in the correct volume for efficient combustion. Major components of the system include:

- Fuel tank
- Fuel lines
- Fuel pump
- Fuel filter
- Fuel pressure regulator
- Fuel pressure regulator control solenoid
- Fuel rail
- Fuel injectors
- Fuel pump relay
- Inertia fuel shutoff switch
- Fuel pump switch (built into the Volume Air Flow Meter) (1.6L and 1.8L only)

Powertrain Control Module (PCM) Control of Air/Fuel Ratio

The Powertrain Control Module (PCM) controls the rate of fuel injection in response to the signals received from the operator controls and from the sensors and switches which monitor the engine conditions. It adjusts the fuel delivery rate for all major operating modes including:

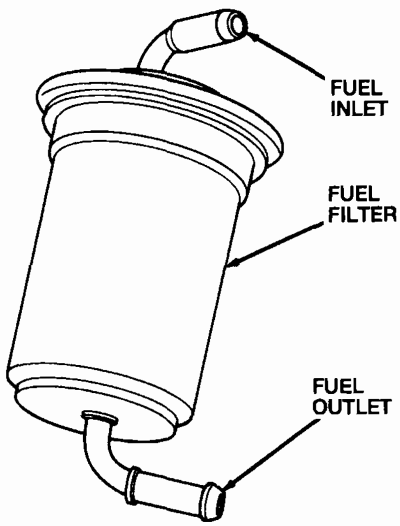
- Normal driving
- Cold engine start-up
- Acceleration
- Deceleration
- Transaxle shift (CD4E and 4EAT only)
- Engine overspeed shutoff
- A/C cutout during cranking
- Turbo overboost pressure relief (1.6L Turbo only)

Description and Operation	All Engines	Fuel Filter

Fuel Filter

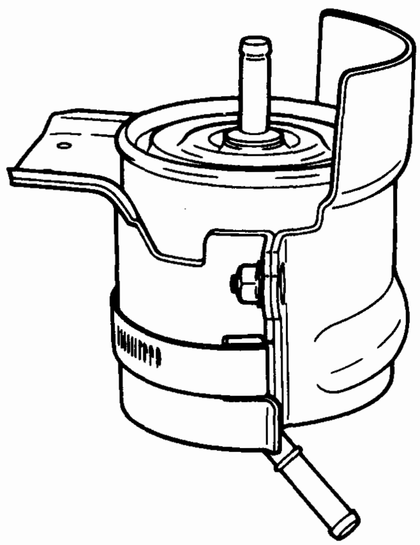
The fuel filter strains particles from the fuel through a paper element. This filtration process removes solid particles from the fuel that may clog the small orifices inside the fuel injectors.

1.3L, 1.6L



A14610-B

1.8L, 2.0L, 2.5L



A16769-A

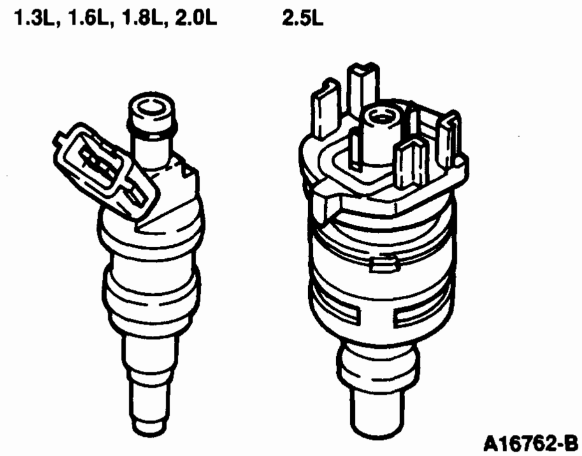
Engine	Location
1.3L	Mounted near LH front strut tower.
1.6L, 1.8L	Mounted on the center of the cowl.
2.0L, 2.5L	Mounted between the transaxle and the LH strut tower.

Description and Operation	All Engines	Fuel Injectors

Fuel Injector

The Fuel Injectors (INJ) are solenoid operated needle valves that control fuel flow into the engine. The injector valve body consists of a solenoid actuated pintle or needle valve assembly that sits on a fixed size orifice. The fuel pressure, maintained by a fuel pressure regulator, is variable depending on intake manifold vacuum. Fuel flow to the engine is regulated by how long the injectors are activated by the Powertrain Control Module (PCM) and by fuel pressure.

The 1.3L, 1.6L, 1.8L, and 2.0L engines use top feed injectors, whereas the 2.5L engine uses side feed injectors.

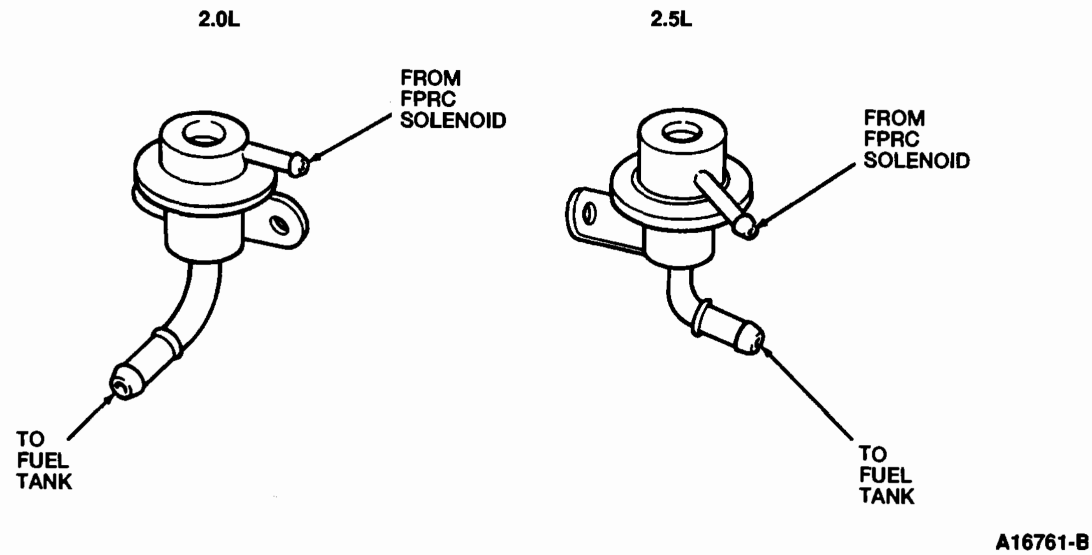


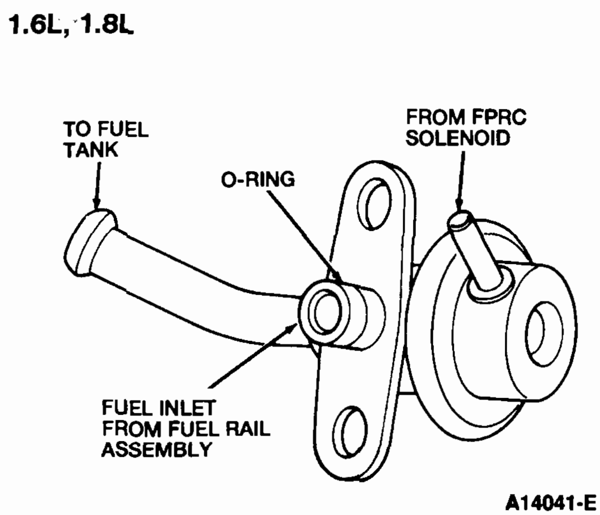
Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Mounted to the fuel rail and attached to the intake manifold.

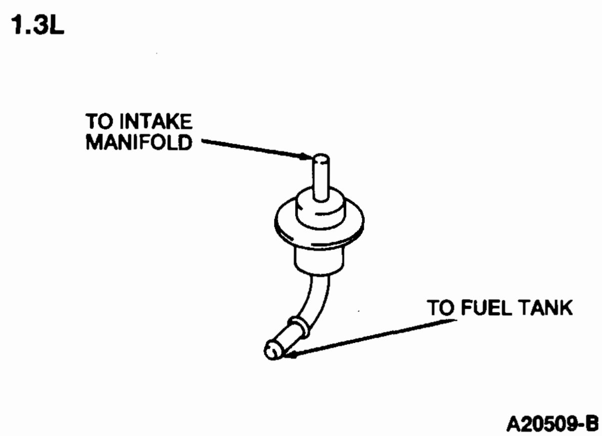
Description and Operation	All Engines	Fuel Pressure Regulator

Fuel Pressure Regulator

The fuel pressure regulator adjusts the amount of fuel pressure supplied to the injectors. The fuel pressure regulator is controlled by a vacuum actuated diaphragm inside the regulator. The diaphragm vacuum is supplied by the Fuel Pressure Regulator Control (FPRC) solenoid, except on the 1.3L engine which supplies vacuum directly from the intake manifold.







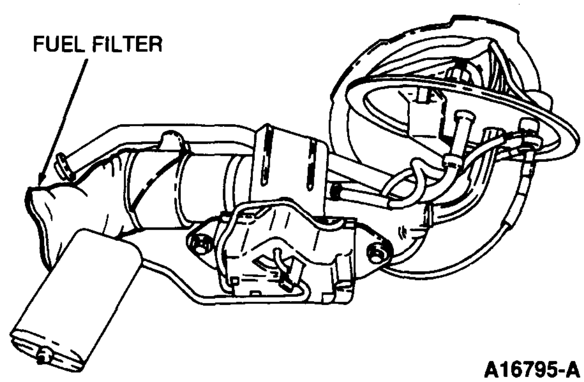
Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Mounted to the end of the fuel rail on the LH side of the engine.

Description and Operation	All Engines	Fuel Pump

Fuel Pump

The Fuel Pump (FP) filters the solid particles from the fuel and causes pressure which allows the fuel to be transmitted from the fuel tank to the engine. The fuel pump is driven by an internal motor, which creates pressure in the fuel lines. The fuel pump circuit ground is controlled by the Powertrain Control Module (PCM) to operate the fuel pump.

All vehicles have a fuel pump test connector, which will turn on the fuel pump whenever the terminal is jumped to ground with the key ON. On 1.3L, 1.8L, and 2.5L vehicles these terminals are integrated into the data link connector (Super STAR II connector on 2.0L vehicles). The fuel pump test connector on the 1.6L is located near the right strut in the engine compartment. The data link connector (1.8L) is located near the left strut in the engine compartment. The data link connector (1.3L and 2.5L) and the Super STAR II connector (2.0L) are located near the battery on the left side of the engine compartment.



Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Located in the fuel tank.

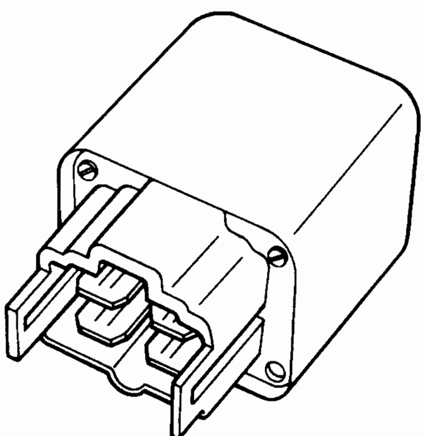
Description and Operation	All Engines	Fuel Pump Relay

Fuel Pump Relay

The Fuel Pump Relay (FPR) supplies voltage to the fuel pump when activated. When the ignition is switched into the ON or START position, power is supplied to the FPR and to the Powertrain Control Module (PCM).

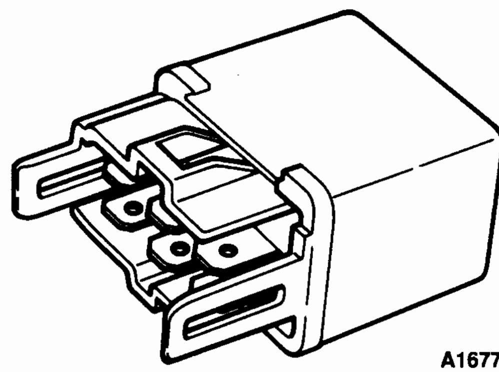
On 1.6L and 1.8L vehicles, the FPR is activated when the ignition switch is turned to the START position and remains activated by the fuel pump switch in the Volume Air Flow (VAF) meter while the engine is running. On the 1.3L, 2.0L and 2.5L vehicles, the FPR is controlled by the PCM, which grounds the relay to activate it while the engine is cranking and running.

2.0L, 2.5L



A16829-A

1.3L, 1.6L, 1.8L

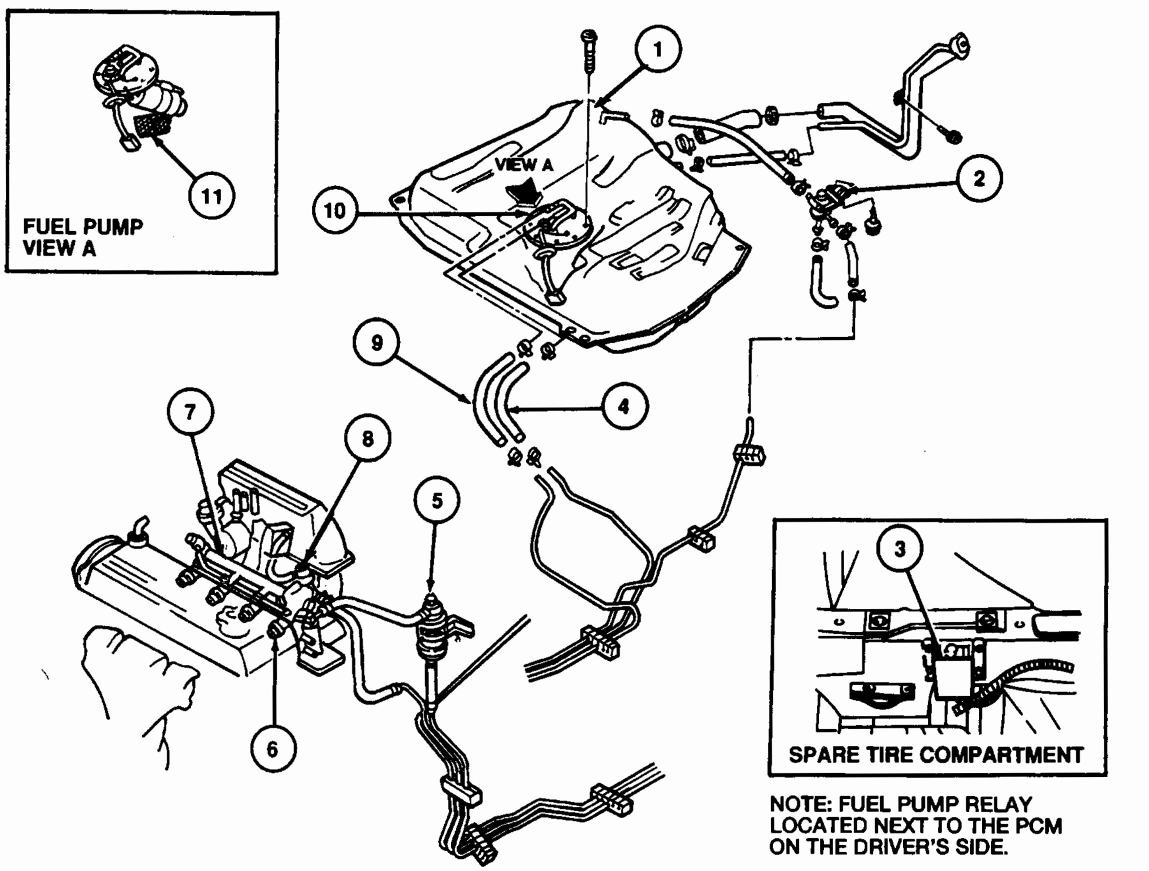


A16777-A

Engine	Location
1.3L	Located under the LH side of the instrument panel.
1.6L, 1.8L	Located forward of the center console near PCM.
2.0L, 2.5L	Located in the main fuse panel.

Description and Operation

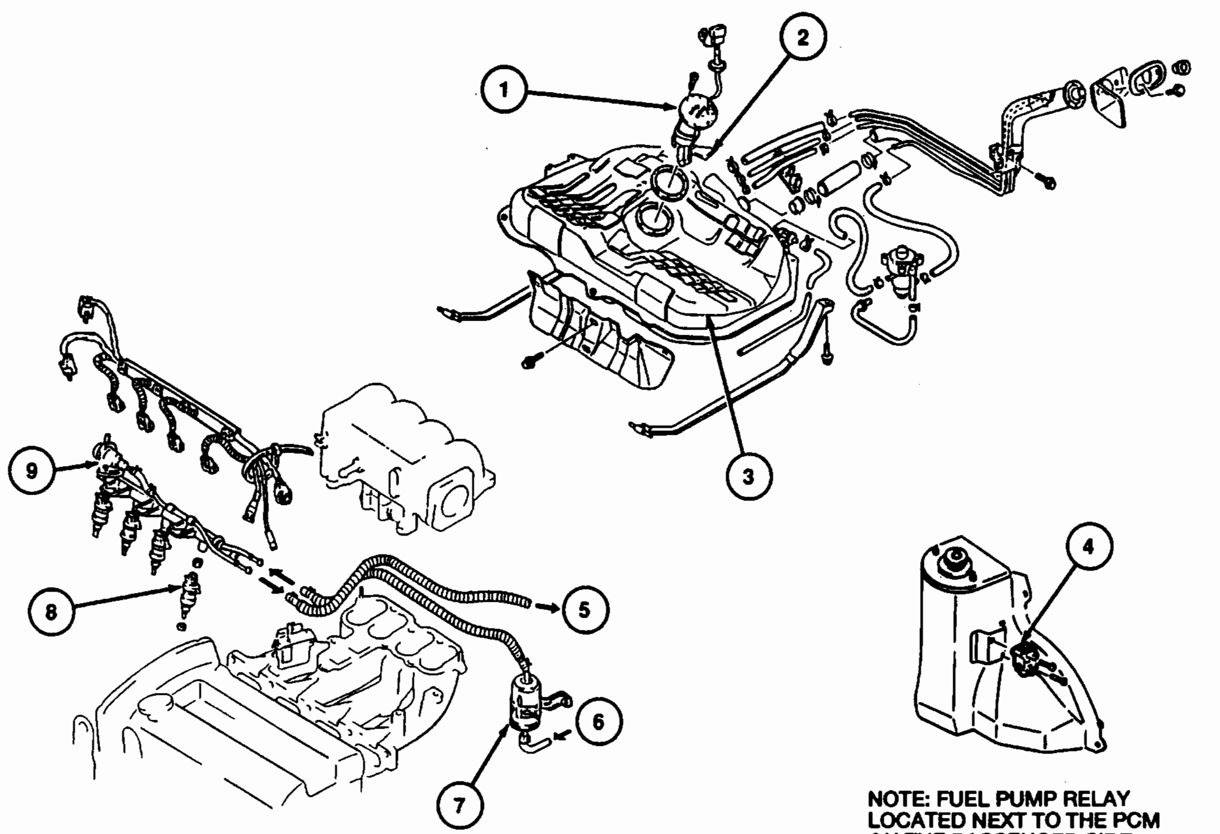
1.6L Component Location — Fuel Delivery System



Item	Description
1	Fuel Tank
2	Rollover / Vent Valve
3	Inertia Fuel Shutoff Switch
4	Fuel Return Hose
5	Fuel Filter (High-Pressure Side)
6	Fuel Injector
7	Fuel Rail
8	Fuel Pressure Regulator
9	Fuel Main Hose
10	Fuel Pump
11	Fuel Filter

Description and Operation

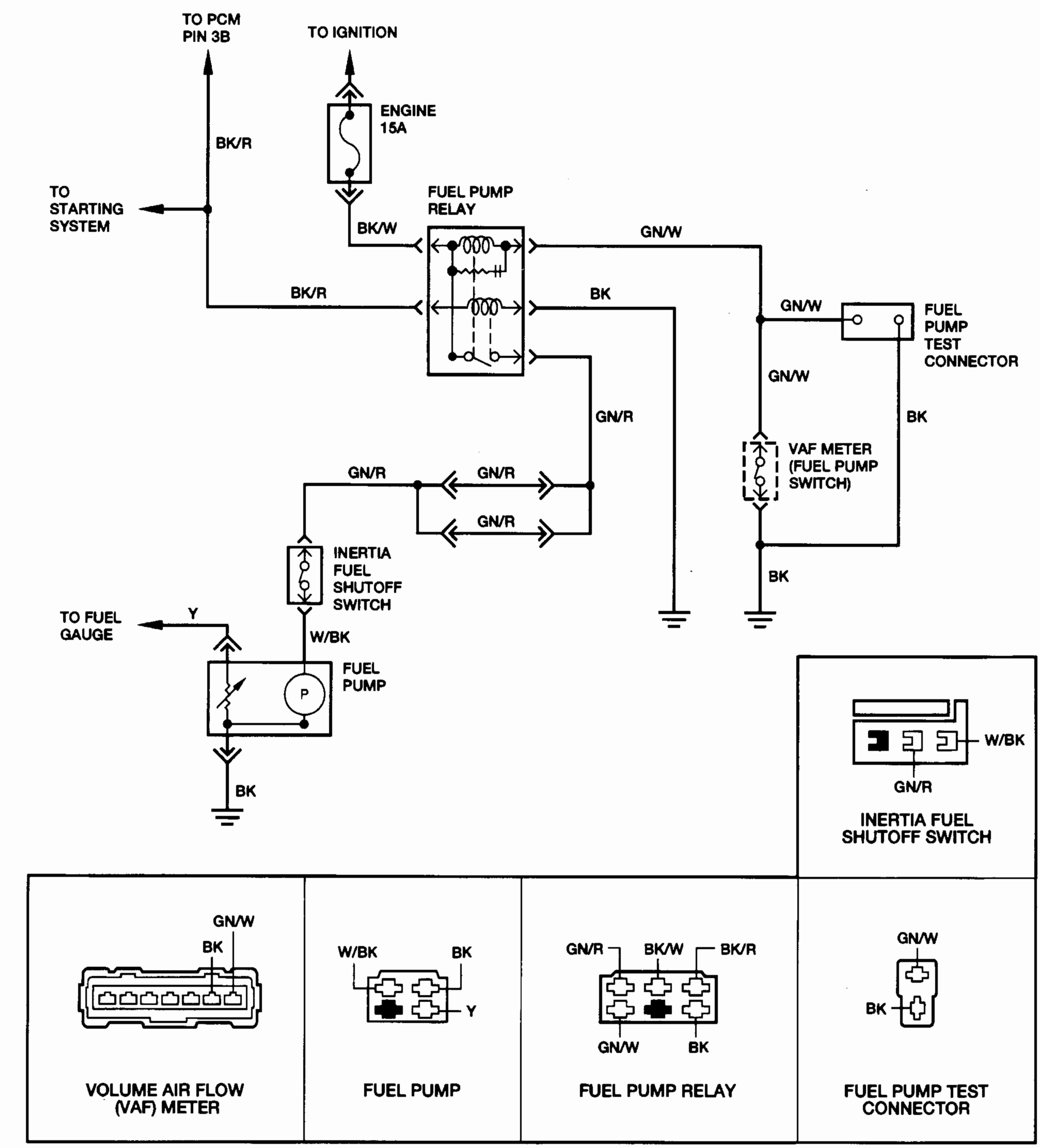
1.8L Component Location — Fuel Delivery System



Item	Description
1	Fuel Pump
2	Fuel Filter (Low-Pressure Side)
3	Fuel Tank
4	Inertia Fuel Shutoff Switch
5	To Fuel Tank
6	From Fuel Tank
7	Fuel Filter (High-Pressure Side)
8	Fuel Injector
9	Fuel Pressure Regulator

Diagnosis and Testing

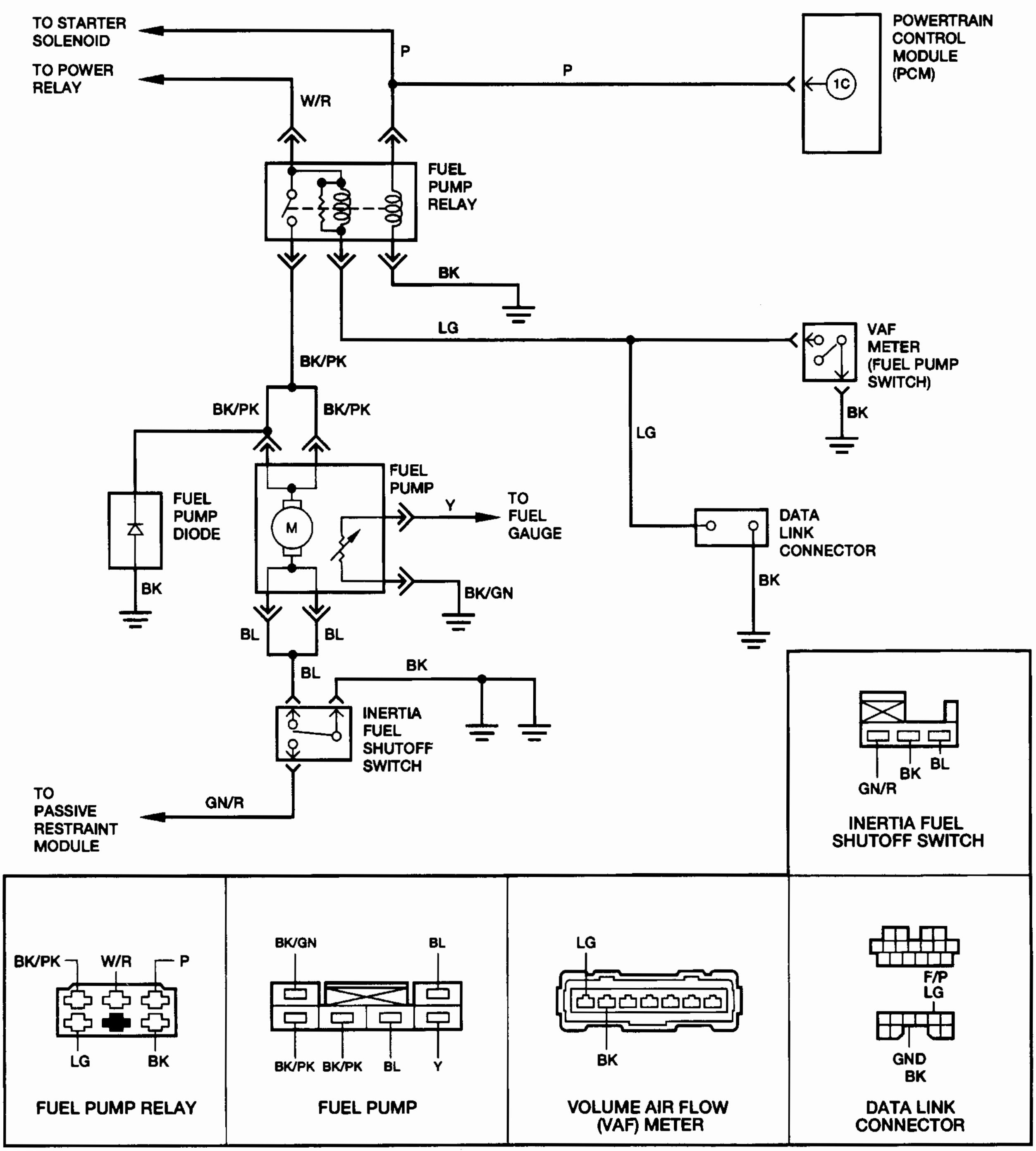
1.6L Electrical Schematic



A15130-D

Diagnosis and Testing

1.8L Electrical Schematic



A14019-G

Diagnosis and Testing

System Inspection

1. Visually inspect the components of the fuel delivery system.

VISUAL INSPECTION CHART

Mechanical	Electrical
● Loose, leaking, or damaged fuel or vacuum lines ● Leaking fuel injectors ● Adverse driveability symptoms, such as rough idle, hard to start, misses, surges, hesitates, backfires ● Insufficient fuel in fuel tank	● Discharged battery ● Damaged connectors ● Damaged insulation ● Damaged components in the fuel system ● Fuse integrity ● Tripped inertia fuel shutoff switch

2. Exercise the wiring and connectors for the solenoids and other electrical components for obvious problems due to looseness, corrosion, or other damage.

3. If a component is suspected as the obvious cause of a malfunction, correct the cause before proceeding to the next step.

4. If all system inspection checks are OK, proceed to the Pinpoint Tests.

WARNING

— INSTRUCTIONS
FUEL IN THE FUEL SYSTEM REMAINS UNDER HIGH PRESSURE EVEN WHEN THE ENGINE IS NOT RUNNING. TO AVOID INJURY OR FIRE, RELEASE THE FUEL PRESSURE FROM THE FUEL SYSTEM BEFORE DISCONNECTING ANY FUEL LINE. TO RELEASE THE PRESSURE FROM THE SYSTEM PERFORM THE FOLLOWING:

a. Start the engine.

b. To stop the fuel pump, disconnect the fuel pump relay.

Engine	Location
1.3L	Under LH side of instrument panel.
1.6L	Center of instrument panel next to the PCM.
1.8L	Center of instrument panel in front of selector lever.
2.0L and 2.5L	Main fuse panel in the engine compartment.

c. After the engine stalls, turn off the ignition.

d. Install the fuel pump relay.

e. Use a rag as protection from the fuel spray and disconnect the fuel hoses. Plug the hoses after disconnection.

Diagnosis and Testing

f. Before testing or starting the vehicle, prime the system by grounding the fuel pump test pin and turning the key ON for 10 seconds.

g. Check for fuel leaks.

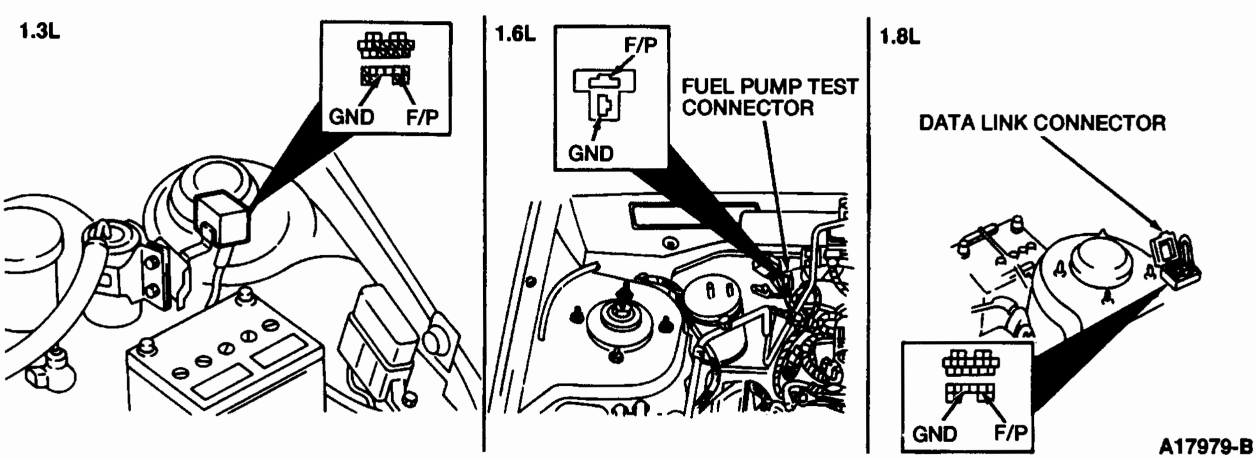
h. Turn the key OFF and remove ground.

Diagnosis and Testing	All Engines	F

Pinpoint Tests F — Fuel Pressure Test

TEST STEP		RESULT ▶	ACTION TO TAKE
F1	PERFORM FUEL PRESSURE TEST		
	WARNING: BEFORE STARTING THESE TESTS, RELEASE THE FUEL PRESSURE FROM THE FUEL SYSTEM TO REDUCE THE RISK OF INJURY OR FIRE, AS OUTLINED IN "WARNING — INSTRUCTIONS". • After releasing the fuel pressure as outlined in System Inspection, install Rotunda Fuel Pressure Tester 014-00748 or equivalent with EFI Test Adapter D87C-9974-A in the fuel line between the fuel filter and the fuel rail (between fuel rails on 2.5L), with its main valve open and its drain valve closed. Refer to illustration on following page. • Jump the fuel pump test terminal to ground. Refer to illustration below. • Key ON. • **Is the fuel pressure within specification (refer to specifications in this section)?**	Yes ▶ No, (If zero) ▶ (If low) ▶ (If high) ▶	GO to FD1. GO to FA1. GO to FB1. GO to FC1.

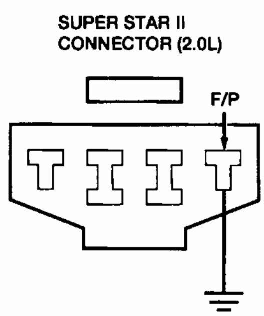
Fuel Pump Test Connector



Diagnosis and Testing	All Engines	F

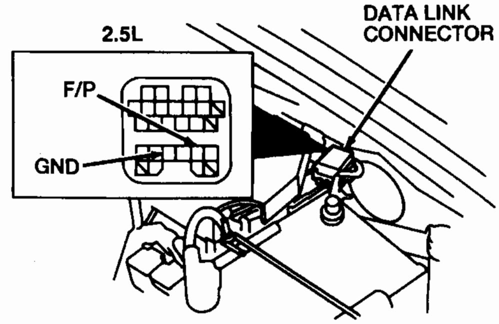
Fuel Pump Test Connectors (Continued)

2.0L



A16461-C

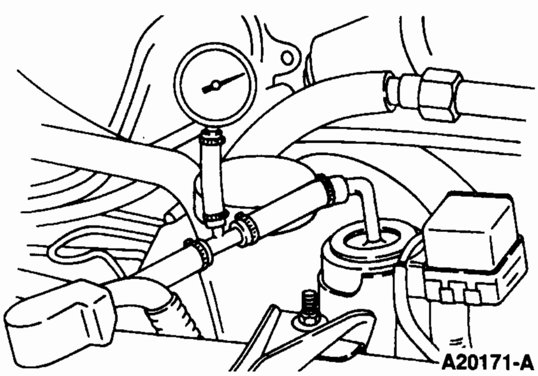
2.5L



A16752-C

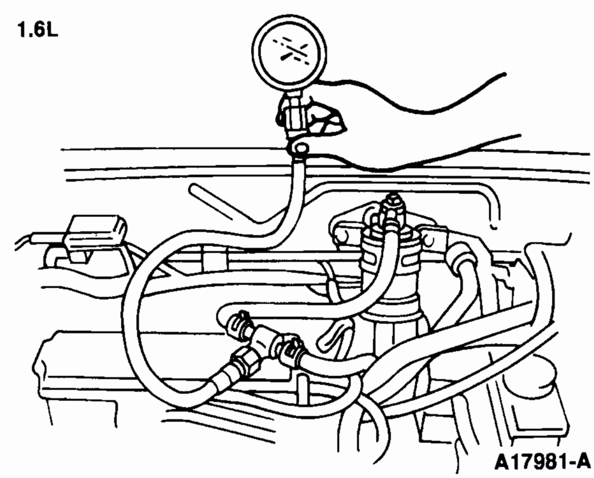
Fuel Pressure Test Setup

1.3L



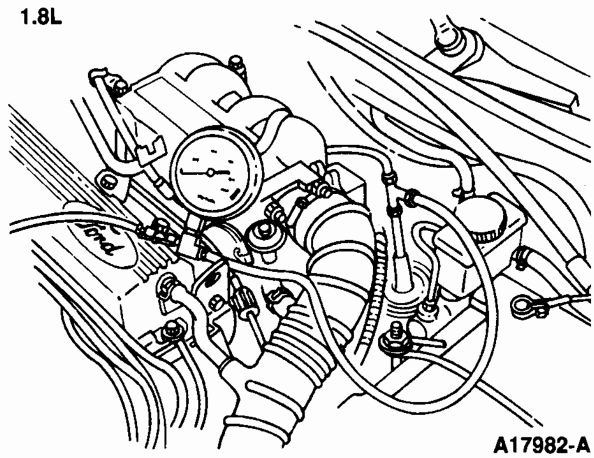
A20171-A

1.6L



A17981-A

1.8L



A17982-A

Diagnosis and Testing	All Engines	FA

Pinpoint Tests FA — No Fuel Pressure Test

	TEST STEP	RESULT ▶	ACTION TO TAKE
FA1	CHECK FUEL PUMP MOTOR		
	● Relieve the fuel pressure; follow the procedures as outlined in "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures. ● Connect Rotunda Fuel Pressure Tester 014-00748 or equivalent to the fuel filter with main valve closed and drain valve closed. Refer to illustrations in Test Step F1. ● Jump the fuel pump test terminal to ground. Refer to illustrations in Test Step F1 for terminal locations. ● Key ON. ● **Is the maximum fuel pressure within specification (refer to specifications in this section)?**	Yes ▶ No ▶	GO to FA2. REPLACE the fuel pump.
FA2	CHECK VOLTAGE TO FUEL PUMP		
	● Key OFF. ● Jump the fuel pump test terminal to ground. Refer to illustration in Test Step F1 for terminal locations. ● Disconnect the fuel pump connector at the fuel pump assembly. ● Key ON. ● Measure the voltage on the following wires at the fuel pump connector.	Yes (1.3L, 1.8L) ▶ Yes (1.6L, 2.0L, 2.5L) ▶ No ▶	GO to FA14. GO to FA13. GO to FA3.

Engine	Wire Color
1.3L	GN/Y
1.6L	W/BK
1.8L	BK/PK
2.0L	BK/W
2.5L	BK/W

● **Is the voltage between 10-14 volts?**

NOTE: Check inertia fuel shutoff switch for "tripped" condition. Reset if tripped.

Diagnosis and Testing | All Engines | FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA3	CHECK FOR SHORT(S) TO GROUND		
	• Key OFF. • Disconnect the fuel pump relay. • Disconnect the Powertrain Control Module (PCM) on 1.3L, 2.0L, and 2.5L. • Disconnect the fuel pump connector at the fuel pump assembly. • Measure the resistance between the following wires at the fuel pump relay connector and ground.	Yes ▶ No ▶	GO to FA4. SERVICE the wire(s) in question for short.

Engine	Wire Color
1.3L	GN/Y W/BK
1.6L	GN/R GN/W
1.8L	BK/PK LG
2.0L	LG W/Y
2.5L	LG W/Y

- **Are the resistances greater than 10,000 ohms?**

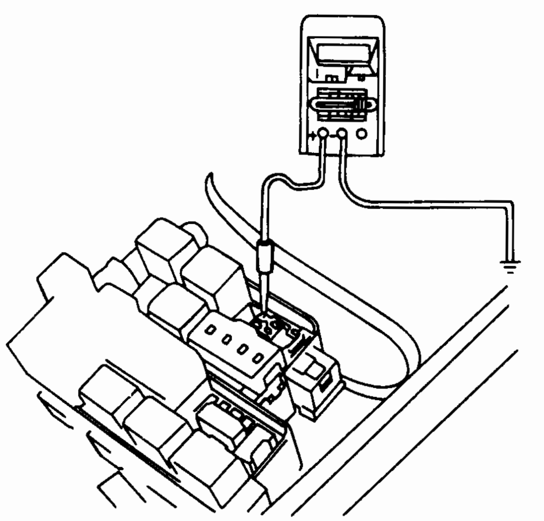
Diagnosis and Testing	All Engines	FA

TEST STEP		RESULT	▶	ACTION TO TAKE
FA4	CHECK POWER SUPPLY TO FUEL PUMP RELAY	Yes (2.0L, 2.5L)	▶	GO to FA6.
		Yes(1.3L, 1.6L, 1.8L)	▶	GO to FA5.
		No (1.6L, 1.8L)	▶	SERVICE the wire(s) in question.
		No (1.3L, 2.0L, 2.5L)	▶	GO to Pinpoint Test VPWR in EEC Pinpoint Tests, Section 6B. If VPWR is OK, SERVICE wire(s) for open(s).

- Key OFF.
- Disconnect the fuel pump relay.
- Key ON.
- Measure the voltage on the following wires at the fuel pump relay connector.

Engine	Wire Color	Key	Voltage
1.3L	Y/BK Y/BK	ON ON	10-14 volts 10-14 volts
1.6L	BK/W BK/R	ON START	10-14 volts 10-14 volts
1.8L	W/R P	ON START	10-14 volts 10-14 volts
2.0L	W/R W/GN	ON ON	10-14 volts 10-14 volts
2.5L	R/BK R/BK	ON ON	10-14 volts 10-14 volts

2.0L and 2.5L Shown



A16753-A

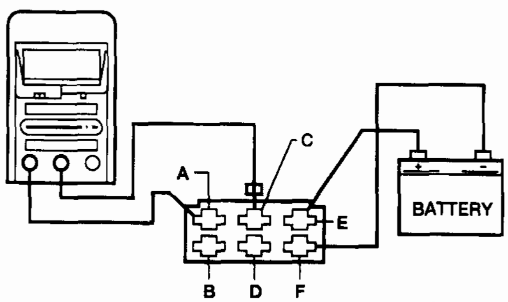
- **Is the voltage approximately battery voltage?**

Diagnosis and Testing	All Engines	FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA5	CHECK FUEL PUMP RELAY (1.3L, 1.6L, AND 1.8L ONLY)		
	• Key OFF. • Remove the fuel pump relay. • Apply 12 volts across the following terminals on the fuel pump relay. • Follow the chart below and measure the resistance between the C-terminal and the A-terminal.	Yes (1.6L, 1.8L) ▶ Yes (1.3L) ▶ No ▶	GO to FA7. GO to FA10. REPLACE the fuel pump relay.

Engine	Terminals "E" and "F"	Terminals "C" and "B"	Resistance at "C" and "A"
1.3L, 1.6L, 1.8L	12 volts applied	N/A	Less than 5 ohms
	0 volts applied	N/A	Greater than 10,000 ohms
1.6L, 1.8L	N/A	12 volts applied	Less than 5 ohms
	N/A	0 volts applied	Greater than 10,000 ohms

Fuel Pump Relay Terminals[1]
1.3L, 1.6L, and 1.8L



A15132-D

• **Are the resistance readings OK?**

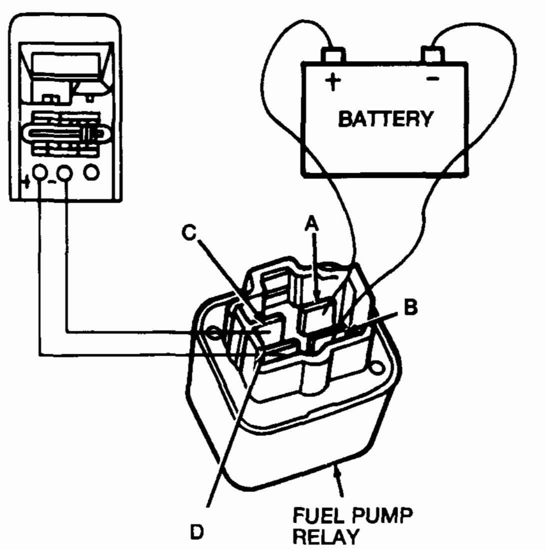
1 **NOTE:** *This is not the harness connector.*

Diagnosis and Testing | All Engines | FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA6	CHECK FUEL PUMP RELAY (2.0L, 2.5L ONLY)		
	• Key OFF. • Remove the fuel pump relay. • Apply 12 volts across the following terminals on the fuel pump relay. • Follow the chart below and measure the resistance between the C-terminal and the D-terminal.	Yes ▶ No ▶	GO to FA10. REPLACE the fuel pump relay.

Engine	Terminals "A" and "B"	Resistance at "C" and "D"
2.0L, 2.5L	12 volts applied	Less than 5 ohms
	0 volts applied	Greater than 10,000 ohms

2.0L and 2.5L



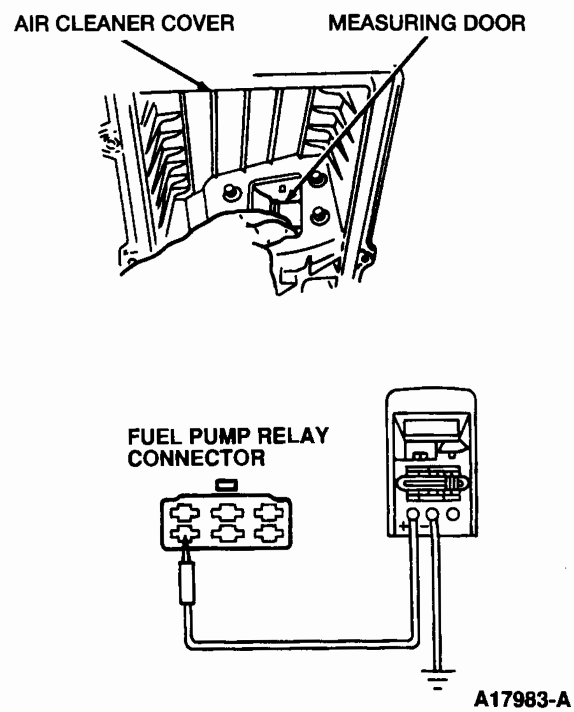
A16467-A

- **Are the resistance readings OK?**

TEST STEP		RESULT ▶	ACTION TO TAKE
FA7	CHECK FUEL PUMP RELAY GROUND (1.6L, 1.8L ONLY)		
	• Key OFF. • Remove the fuel pump relay from the harness. • Measure the resistance between the fuel pump relay connector "BK" wire and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to FA8. SERVICE the "BK" wire for opens.

Diagnosis and Testing	All Engines	FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA8 CHECK VAF METER GROUND (1.6L, 1.8L ONLY)		
• Key OFF. • Remove the fuel pump relay. • Access Volume Air Flow (VAF) meter door. • Measure the resistance between the fuel pump relay connector and ground while moving the door in the VAF meter. (Refer to the chart below for wire color.) • Leave the fuel pump relay test connector open.	Yes (1.8L) ▶	SERVICE the "BK / PK" wire between the fuel pump relay and the fuel pump.
	Yes (1.6L) ▶	GO to FA11.
	No ▶	GO to FA9.



Engine	Fuel Pump Relay Wire	VAF Door	Resistance (ohms)
1.6L	GN / W	Closed Open	Greater than 10,000 Less than 5
1.8L	LG	Closed Open	Greater than 10,000 Less than 5

• **Are the resistances OK?**

Diagnosis and Testing	All Engines	FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA9	CHECK VAF FUEL PUMP SWITCH (1.6L, 1.8L ONLY)		
	• Key OFF. • Disconnect the Volume Air Flow (VAF) meter wire harness connector. • Measure the resistance between the following terminals on the VAF meter while moving the VAF meter door. (Match the wire colors shown with the corresponding VAF terminals.)	Yes ▶ No ▶	SERVICE the VAF "BK" wire, or the wire from the fuel pump relay to the VAF. REPLACE the VAF meter.

Engine	VAF Terminals	Door	Resistance (ohms)
1.6L	GN / W, BK	Closed Open	Greater than 10,000 Less than 5
1.8L	LG, BK	Closed Open	Greater than 10,000 Less than 5

• **Are the resistances OK?**

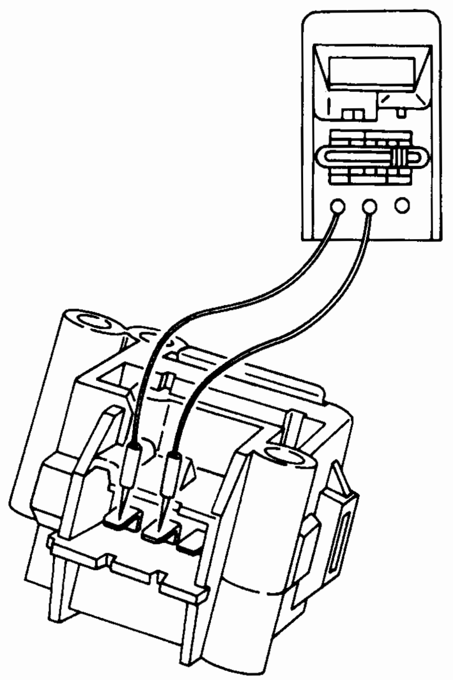
TEST STEP		RESULT ▶	ACTION TO TAKE
FA10	CHECK FUEL PUMP RELAY TO PCM CONTINUITY (1.3L, 2.0L and 2.5L ONLY)		
	• Key OFF. • Remove the fuel pump relay. • Disconnect the Powertrain Control Module (PCM). • Install the Rotunda Breakout Box 007-00033 or equivalent. • Measure the resistance of the following wires between the fuel pump relay and the PCM.	Yes (1.3L) ▶ Yes (2.0L, 2.5L) ▶ No ▶	SERVICE the "GN / Y" wire between the fuel pump relay and the fuel pump. GO to FA11. SERVICE wire(s) in question for open.

Engine	PCM Pin	BOB Pin	PCM Wire Color	Fuel Pump Relay Wire Color
1.3L	1H	55	W / BK	W / BK
2.0L	22 8	22 8	LG W / Y	LG W / Y
2.5L	3T	52B	LG	LG

• **Is the resistance less than 5 ohms?**

Diagnosis and Testing	All Engines	FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA11	CHECK INERTIA FUEL SHUTOFF SWITCH (1.6L, 2.0L AND 2.5L ONLY)		
	• Key OFF. • Disconnect and remove the inertia fuel shutoff switch from the vehicle. • Measure the resistance between the terminals shown on the inertia fuel shutoff switch. • Sharply shake the inertia fuel shutoff switch to verify that the switch trips. • Measure the resistance between the terminals shown on the inertia fuel shutoff switch.	Yes ▶ No ▶	GO to FA12. REPLACE the inertia fuel shutoff switch.



A17984-A

Switch Position	Resistance
Open (Tripped)	Greater than 10,000 ohms
Closed (Set)	Less than 5 ohms

- **Are the resistances OK and does the switch trip when shaken sharply?**

Diagnosis and Testing	All Engines	FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA12	CHECK FOR OPEN TO INERTIA FUEL SHUTOFF SWITCH (1.6L, 2.0L AND 2.5L ONLY)		
	• Key OFF. • Remove the fuel pump relay. • Disconnect the inertia fuel shutoff switch connector. • Measure the resistance of the following wires between the fuel pump relay and the inertia fuel shutoff switch. Refer to electrical schematic in this section. Engine / Wire Color: 1.6L — GN/R; 2.0L — W/Y; 2.5L — W/Y • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE the wire between the inertia fuel shutoff switch and the fuel pump. SERVICE the wire between the fuel pump relay and the inertia fuel shutoff switch.
FA13	CHECK FUEL PUMP GROUND (1.6L, 2.0L, 2.5L ONLY)		
	• Key OFF. • Disconnect the fuel pump connector. • Measure the resistance between the "BK" wire at the fuel pump connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No (1.6L, 2.0L, 2.5L) ▶	GO to FB2. SERVICE ground wire of the fuel pump.
FA14	CHECK WIRE TO INERTIA FUEL SHUTOFF SWITCH (1.3L, 1.8L ONLY)		
	• Key OFF. • Disconnect the fuel pump connector. • Disconnect the inertia fuel shutoff switch connector. • Measure the resistance of the "GN" wire (1.3L) or the "BL" wire (1.8L) between the fuel pump connector and the inertia fuel shutoff switch connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to FA15. SERVICE wire to inertia fuel shutoff switch for open.

Wire colors for FA12:

Engine	Wire Color
1.6L	GN/R
2.0L	W/Y
2.5L	W/Y

Diagnosis and Testing | All Engines | FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA15	CHECK INERTIA FUEL SHUTOFF SWITCH (1.3L AND 1.8L)		
	• Key OFF. • Disconnect and remove the inertia fuel shutoff switch from the vehicle. • Shake the inertia fuel shutoff switch sharply to verify that the switch trips. • Measure the resistance between the indicated terminals of the inertia fuel shutoff switch under the following conditions:	Yes ▶ No ▶	GO to FA16. REPLACE the inertia fuel shutoff switch.

Engine	Resistance Check Points
1.3L	Between the switch terminals that connect to the GN and BK wires
1.8L	Between the switch terminals that connect to the BL and BK wires

Switch Position	Resistance
Open (tripped)	Greater than 10,000 ohms
Closed (set)	Less than 5 ohms

• **Are the resistances OK and does the inertia fuel shutoff switch trip when shaken sharply?**

TEST STEP		RESULT ▶	ACTION TO TAKE
FA16	CHECK INERTIA FUEL SHUTOFF SWITCH GROUND (1.3L AND 1.8L ONLY)		
	• Key OFF. • Disconnect the inertia fuel shutoff switch connector. • Measure the resistance between the inertia fuel shutoff switch connector and ground.	Yes ▶ No ▶	GO to FB2. SERVICE the "BK" wire.

Engine	Wire	Resistance (ohms)
1.3L	BK	Less than 5
1.8L	BK	Less than 5

• **Is the resistance less than 5 ohms?**

Diagnosis and Testing	All Engines	FB

Pinpoint Tests FB — Low Fuel Pressure Test

TEST STEP		RESULT ▶	ACTION TO TAKE
FB1	CHECK POWER SUPPLY TO FUEL PUMP		
	• Key OFF. • Disconnect the fuel pump connector at the fuel pump assembly. • Jump the fuel pump test terminal to ground. Refer to illustration in Test Step F1 for terminal locations. • Key ON. • Measure the voltage on the following wires at the fuel pump connector. Engine — Wire Color 1.3L — GN/Y 1.6L — W/BK 1.8L — BK/PK 2.0L — BK/W 2.5L — BK/W • **Is the voltage between 10-14 volts?**	Yes ▶ No ▶	GO to FB2. GO to FA1.
FB2	CHECK IN-LINE FUEL FILTER CONDITION		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to release the fuel system pressure to avoid fuel spillage and injury. • Remove the high pressure in-line fuel filter for inspection. • Inspect the filter element for contamination or blockage. • Compare the customer's service record and driving conditions versus the recommended maintenance schedule. • **Is the fuel filter free of contamination, blockage, and within the recommended maintenance schedule?**	Yes ▶ No ▶	GO to FB3. SERVICE the fuel filter as required. RERUN Test F1.

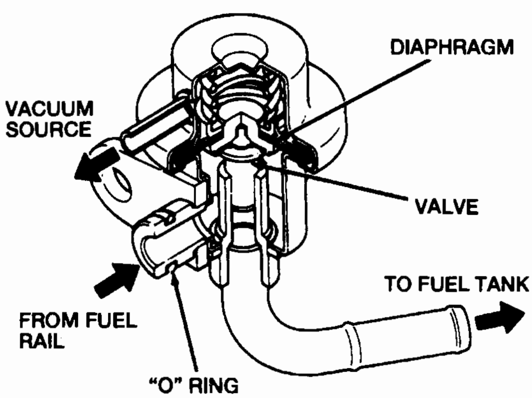
Wire colors by engine (FB1):

Engine	Wire Color
1.3L	GN/Y
1.6L	W/BK
1.8L	BK/PK
2.0L	BK/W
2.5L	BK/W

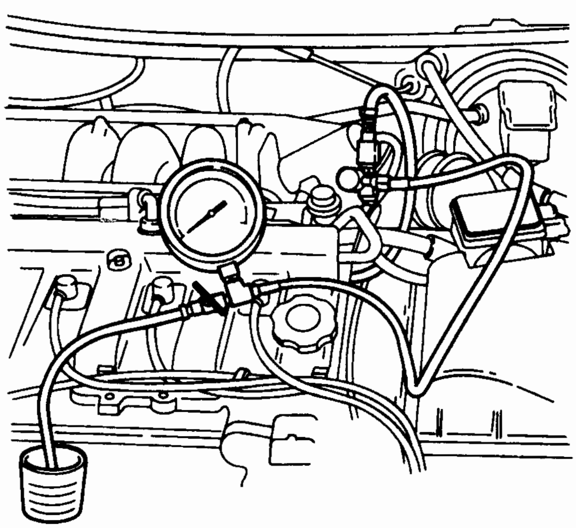
Diagnosis and Testing	All Engines	FB

TEST STEP		RESULT ▶	ACTION TO TAKE
FB3	CHECK FUEL PRESSURE REGULATOR DIAPHRAGM CONDITION		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. • Install Rotunda Fuel Pressure Tester 014-00748 or equivalent with EFI Test Adapter D87C-9974-A in the fuel line between the fuel filter and fuel rail (between fuel rails on 2.5L), with its main valve open and its drain valve closed. Refer to illustrations in Test Step F1. • Start the engine and run for 10 seconds. • Stop the engine and wait 10 seconds. • Start the engine again and run for 10 seconds. • Stop the engine and remove the vacuum hose from the pressure regulator. • Examine the vacuum port in the pressure regulator for evidence of fuel leakage through the diaphragm. • **Is the vacuum port OK?**	Yes ▶ No ▶	GO to FB4. REPLACE the fuel pressure regulator and RERUN Test F1.
FB4	CHECK FUEL PRESSURE REGULATOR PRESSURE LEAKDOWN		
	• Reconnect the vacuum hose. • With the Rotunda Fuel Pressure Tester 014-00748 or equivalent still installed from previous test, run the engine for a minimum of 30 seconds. • Stop the engine and observe the fuel pressure after 5 minutes. • **Is the fuel pressure greater than 147 kPa (21 psi) after 5 minutes?**	Yes ▶ No ▶	GO to FB5. REPEAT this test step. If the fuel pressure still drops more than specified, test the injector for leakage (refer to Test Step FD4). If injectors are OK, REPLACE the fuel pressure regulator. RERUN Test F1.

Diagnosis and Testing	All Engines	FB

TEST STEP		RESULT ▶	ACTION TO TAKE
FB5	CHECK FUEL PRESSURE REGULATOR VALVE SEAT LEAKAGE		
	• Connect Rotunda Vacuum Tester 021-00037 or equivalent to the fuel return tube on the fuel pressure regulator and apply a 508 mm-Hg (20 in-Hg) vacuum. • Observe the vacuum gauge for at least 10 seconds. **Fuel Pressure Regulator**  A14038-B • **Does the vacuum drop lower than 254 mm-Hg (10 in-Hg) in 10 seconds?**	Yes ▶ No ▶	REPLACE the fuel pressure regulator. RERUN Test F1. GO to FB6.

Diagnosis and Testing	All Engines	FB

TEST STEP		RESULT ▶	ACTION TO TAKE
FB6	CHECK FUEL PUMP FLOW VOLUME		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. • Connect the Rotunda Fuel Pressure Tester 014-00748, or equivalent with EFI Test Adapter D87C-9974-A between the fuel filter and fuel rail (between fuel rails on 2.5L), with the main valve closed and the drain valve opened. Refer to illustrations in Test Step F1. • Place the bypass hose (yellow) in a measuring container inside an empty overflow container. • Jump the fuel pump test terminal to ground. Refer to the illustrations in Test Step F1 for terminal locations. • Key ON. • Collect fuel in the measuring vessel for 10 seconds. **2.0L Shown**  A16754-A • **Is the amount of fuel collected within specification (refer to specifications in this section)?**	Yes ▶ No ▶	GO to FB7. SERVICE the fuel pump inlet screen, and RERUN this test. If flow is still not within specified limits, REPLACE the fuel pump and RERUN Test F1.

Diagnosis and Testing	All Engines	FB

TEST STEP		RESULT ▶	ACTION TO TAKE
FB7	CHECK FUEL PUMP VALVE LEAKDOWN		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. • Connect the Rotunda Fuel Pressure Tester 014-00748, or equivalent with EFI Test Adapter D87C-9974-A between the fuel filter and fuel rail with both the main and drain valves closed. Refer to illustration in Test Step F1. • Jump the fuel pump test terminal to ground. Refer to illustration in Test Step F1 for terminal locations. • Key ON. • Run the fuel pump for 30 seconds minimum. • Remove the jumper and note fuel pressure on the gauge for 3 minutes. • **Does the output fuel pressure decrease more than 13.78 kPa (2 psi) in 3 minutes?**	Yes ▶ No ▶	REPLACE the fuel pump. RERUN Test $\boxed{F1}$. GO to $\boxed{FD1}$.

Diagnosis and Testing	All Engines	FC

Pinpoint Tests FC — High Fuel Pressure Test

TEST STEP		RESULT ▶	ACTION TO TAKE
FC1	CHECK FUEL PRESSURE REGULATOR FOR CAUSE OF HIGH PRESSURE		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. • Check the fuel pressure regulator housing for damage or dents that could cause a higher spring load on the fuel pressure regulator. • Check the integrity of the fuel pressure regulator diaphragm (refer to the procedure described in Test Step FB3). • **Is the fuel system free of defects that could cause the fuel pressure regulator to produce excessive fuel system pressure? (Refer to fuel pressure specification in the specifications chart.)**	Yes ▶ No ▶	GO to FC2. REPAIR or REPLACE damaged components as required. RERUN Test Step F1. If the pressure is still high, GO to FC2.
FC2	CHECK FUEL RETURN FOR CAUSE OF HIGH FUEL PRESSURE		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. • Remove the fuel return line at the pressure regulator and at the fuel tank. • Provide a suitable fuel receptacle at the tank end of the return line to avoid fuel spillage. • Check the fuel return line for restriction due to blockage, kinking, or pinching by blowing through it with 34.5-68.9 kPa (5-10 psi) regulated shop air. • **Is the fuel return line free of any restriction that could cause excessive fuel pressure?**	Yes ▶ No ▶	REPLACE the fuel pressure regulator. RERUN Test Step F1. REPAIR the defects. CLEAN or REPLACE the faulty components as required to remove the cause of high pressure. RERUN Test F1.

Diagnosis and Testing | All Engines | FD

Pinpoint Tests FD — Fuel Injector Test

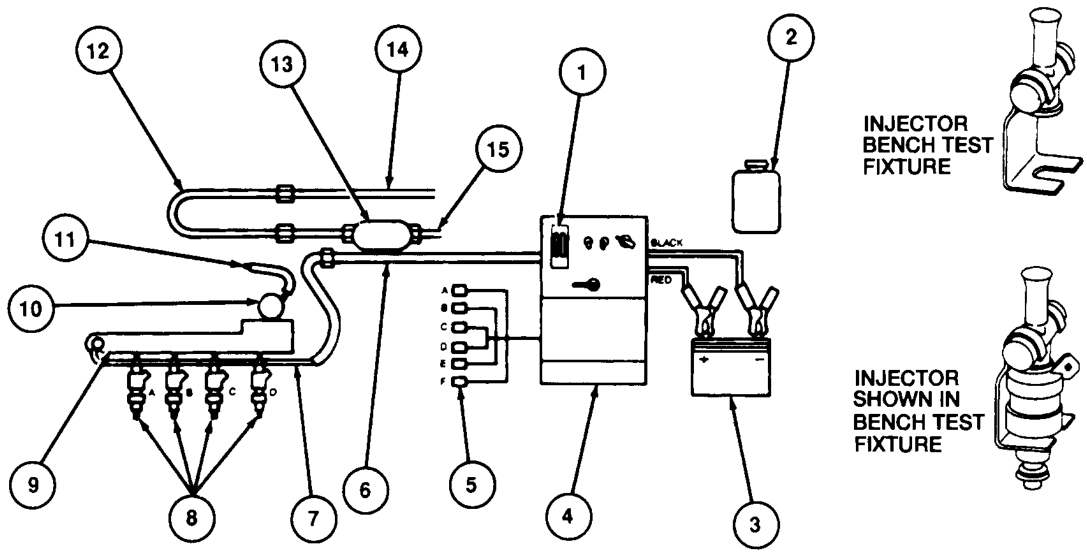
TEST STEP		RESULT ▶	ACTION TO TAKE
FD1	CHECK FUEL INJECTION FUNCTION		
	• With the engine warmed and idling (or cranking if it does not start) and using a mechanic's stethoscope or equivalent, listen for regularly operating sounds at each fuel injector. • **Is normal operating sound present?**	Yes ▶ No ▶	GO to FD4. GO to FD2.
FD2	CHECK FUEL INJECTOR ELECTRICAL SIGNAL		
	CAUTION: Do not connect a test lamp to the injector harness. Damage may result to the Powertrain Control Module (PCM). • Check the electrical continuity of the injector between each injector and the PCM as follows: — Disconnect the fuel injector lead and insert the continuity checker from Rotunda Fuel Injector Tester/Cleaner 113-00015 or equivalent into the injector lead plug. — Start or crank engine. — Observe whether the continuity checker blinks (showing a completed circuit for the injector being tested). • Repeat the check for each injector. • **Do all injector circuit leads show continuity?**	Yes ▶ No ▶	GO to FD3. CHECK for 12 volts at each injector wire with key ON. SERVICE wire as required. REFER to Pinpoint Test SCG in Section 6B.
FD3	CHECK FUEL INJECTOR RESISTANCE		
	• Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. • Disconnect the electrical connectors from the injectors. If necessary, remove the fuel injectors to gain access to the injector terminals. • Measure the electrical resistance across the terminals of each injector. • **Is the resistance of each injector approximately 12-16 ohms (20°C [68°F])?**	Yes ▶ No ▶	GO to FD4. REPLACE the faulty injectors. RERUN Test Step FD1 and if OK, GO to Test Step FD4.

Diagnosis and Testing | All Engines | FD

TEST STEP		RESULT ▶	ACTION TO TAKE
FD4	CHECK FUEL INJECTORS (CLEANING AND LEAKAGE)		
	NOTE: This procedure does not require the matching of injector color with flow gauge band color on the Fuel Injector Tester / Cleaner. ● Observe "WARNING — INSTRUCTIONS" in System Inspection at the beginning of the Diagnosis and Testing procedures to avoid fuel spillage and injury. ● Use the Rotunda Fuel Injector Tester / Cleaner 113-00015, or equivalent and accompanying instructions to clean the fuel injectors. Refer to illustration on following page. ● With the Fuel Injector Tester / Cleaner still installed on the fuel system, note any significant pressure loss due to injector leakage when the tester pump is turned to OFF. ● Check each fuel injector individually for leakage as required, using the fuel injector bench tester and the fuel injector bench testing procedure associated with the Fuel Injector Tester / Cleaner. Verify that each injector leakage rate is within specification (1 drop / 2 minutes maximum). NOTE: The 2.5L fuel injector has side inject fuel injectors. Therefore they can not be bench tested. See procedure below. ● For 2.5L injector testing: — Disconnect the fuel rail from the intake manifold. Leave fuel hoses connected. — Jumper the F / P terminal of Data Link Connector to ground. — Key ON. — Verify that each injector leakage rate is within specification (1 drop / 2 minutes maximum). ● **Is the leakage rate for individual injectors within specifications?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines. REPLACE faulty fuel injectors as required.

Diagnosis and Testing	All Engines	FD

Fuel Injector Tester/Cleaner



A14047-C

Item	Description
1	Flow Gauge
2	Reservoir
3	Battery
4	Cleaner/Tester
5	Test Harness
6	Cleaner Supply Hose
7	Fuel Supply Line
8	Injectors
9	Fuel Rail
10	Fuel Pressure Regulator
11	Plug Line Fuel Return
12	"U" Tube
13	Filter
14	Fuel Return
15	Fuel Supply

Description and Operation

Turbocharger Systems — 1.6L Turbo

Basic Operation

The turbocharger system improves the engine power output by compressing the inlet air to a denser charge. Up to approximately 60 percent increase above the atmospheric pressure is attainable. It utilizes some of the energy in the hot exhaust gas to turn the turbine which drives the air compressor. The turbine and the air compressor comprise the turbocharger assembly, together with the exhaust bypass device, or the wastegate. Since considerable heat is added to the air during compression, the air is cooled by routing it through a heat exchanger, the Charge Air Cooler (CAC). This reduces the possibility of preignition and engine damage from overheating. From the charge air cooler, the cooler air is ducted through the Volume Air Flow (VAF) meter to the engine intake manifold.

Boost Pressure Control

The boost pressure control system consists of a wastegate valve and a wastegate actuator. The actuator, which is controlled by turbo boost pressure, controls the wastegate valve, which opens and closes the exhaust gas bypass passage.

The amount of turbocharger boost is limited to a maximum of 56 kPa (8.1 psi) by the wastegate and actuator. Under normal to moderate loads, the wastegate valve is closed and the intake air pressure changes in accordance with the engine rpm and the amount of exhaust gas. Under heavy loads, the intake air pressure in the air inlet duct reaches 56 kPa (8.1 psi), the pressure acts on the diaphragm and overcomes the force of the spring within the actuator, and the wastegate valve opens the bypass passage. As a result, the flow of exhaust gas applied to the turbine wheel drops, the rpm of the turbine wheel drops, and the boost pressure drops accordingly.

Overboost Protection

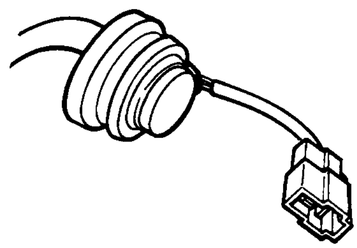
If the actual intake manifold pressure reaches 77 kPa (11 psi) and the calculated intake manifold pressure (calculated from the amount of intake air and engine speed) reaches a predetermined level, the fuel injection will be cut to prevent engine damage. Under this condition the turbo boost gauge will be indicating in the red sector of the gauge.

Further information regarding the makeup of the system and its relationship to other engine/emission systems may be found in the schematic diagram, Section 3B of this manual.

Description and Operation

Boost Pressure Switch (BPS)

The Boost Pressure Switch (BPS) sends a signal to the Powertrain Control Module (PCM) when the boost pressure reaches 71.8 to 79.8 kPa (10.4 to 11.6 psi). This is used for overboost protection.

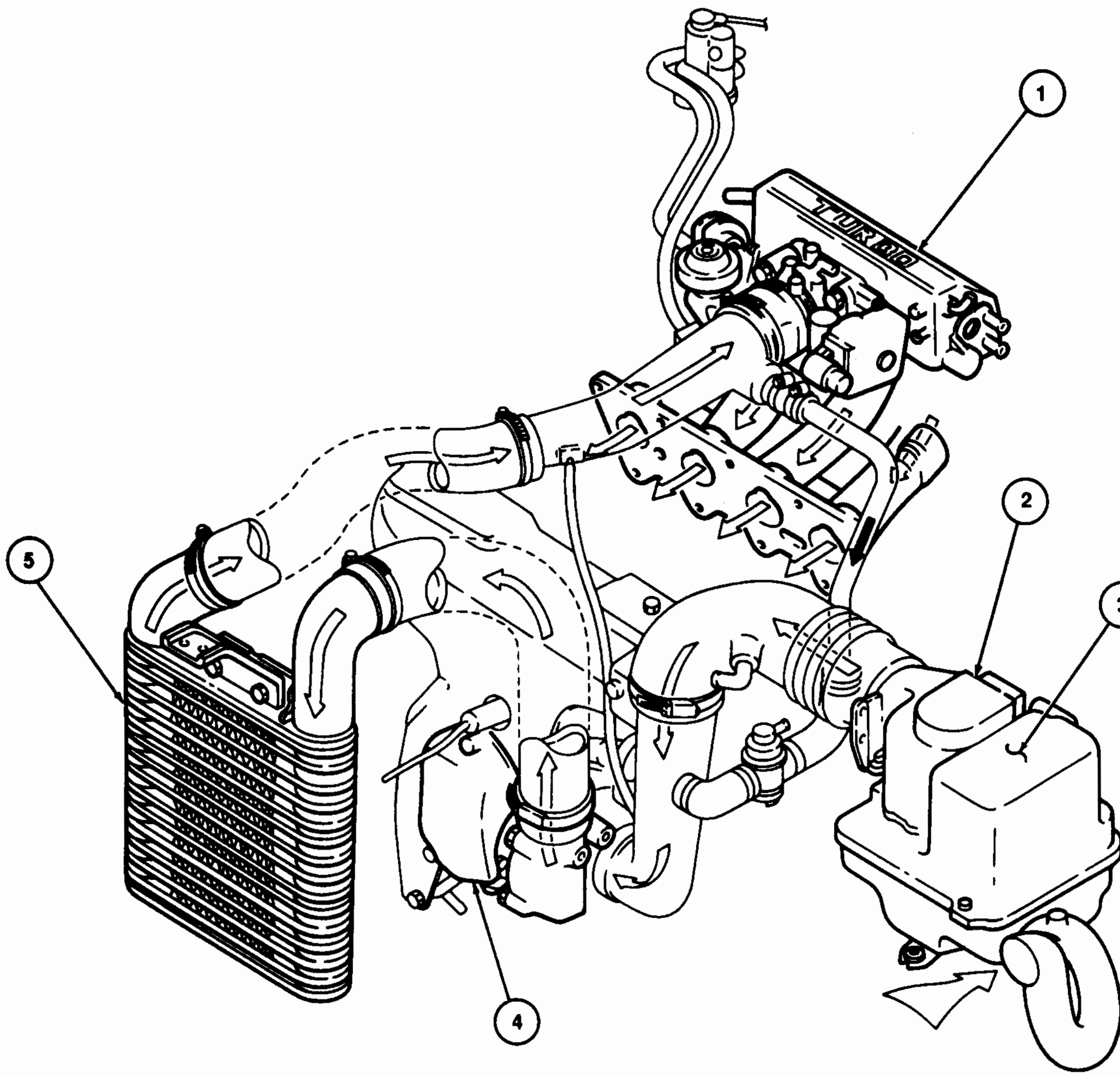


A14753-A

Engine	Location
1.6L Turbo	Behind the intake manifold.

Description and Operation

1.6L Turbo Component Location



A18141-A

Item	Description
1	Intake Manifold
2	Volume Air Flow Meter and Intake Air Temperature Sensor
3	Air Cleaner
4	Turbocharger
5	Charge Air Cooler

Diagnosis and Testing

Turbocharger Systems — 1.6L

System Inspection

1. Visually inspect the components of the turbocharger system.

VISUAL INSPECTION CHART

Mechanical	Electrical
● Air cleaner element conditions ● Air duct damage, looseness ● Vacuum hose damage, pinching, kinking, poor connections ● Wastegate, actuator, or linkage damaged or binding ● Oil leakage from turbocharger ● Unusual noise with engine operating	● Damaged connections or insulation ● Damaged volume air flow meter

2. Exercise the wiring and the connectors for the knock control module, Powertrain Control Module (PCM), and other electronic components to detect obvious problems due to looseness, corrosion, or other damage.

3. Check the air and vacuum lines and the connections for looseness, pinching, kinking, misrouting or other obvious causes for malfunction.

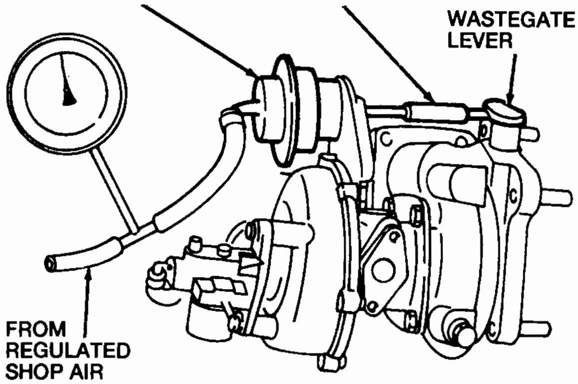
4. If a component is suspected as the obvious cause for the malfunction, correct the defect before proceeding.

5. For noise diagnosis, go to PFO1.

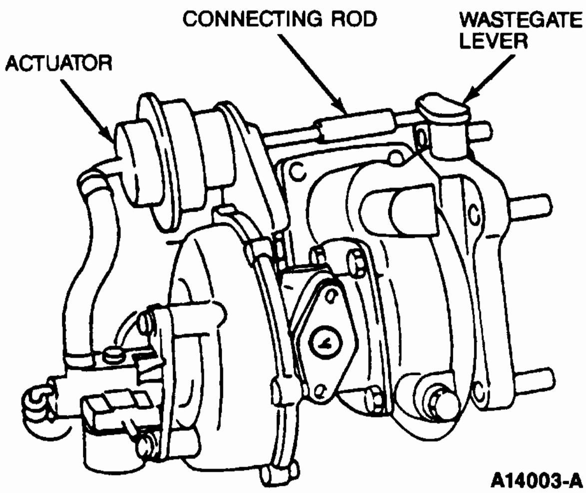
6. If all checks are OK, proceed to the Pinpoint Tests.

Diagnosis and Testing	1.6L Turbo	LP

Pinpoint Tests LP — Turbocharging Diagnosis

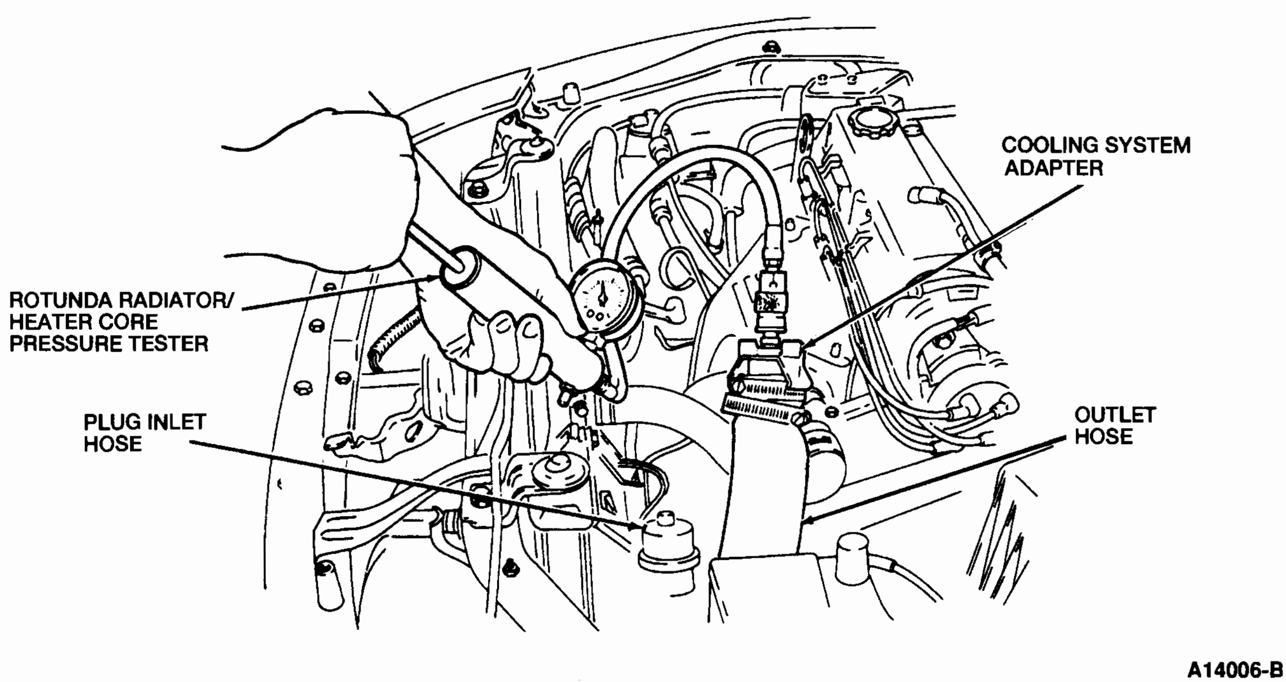
TEST STEP		RESULT ▶	ACTION TO TAKE
LP1	CHECK TURBOCHARGER BOOST ACTUATOR FUNCTION		
	• Remove the exhaust manifold heat shields from the turbocharger area. • Disconnect the actuator hose at the solenoid end. • Connect a regulated air pressure source to the actuator hose with a Rotunda Vacuum / Pressure Tester 059-00008 or equivalent teed in. • Apply 58.9 kPa (8.5 psi) specified pressure to open the wastegate.  • **Does the wastegate open?**	Yes ▶ No ▶	GO to LP2. REPLACE the actuator, rod, and mounting plate as an assembly.

Diagnosis and Testing	1.6L Turbo	LP

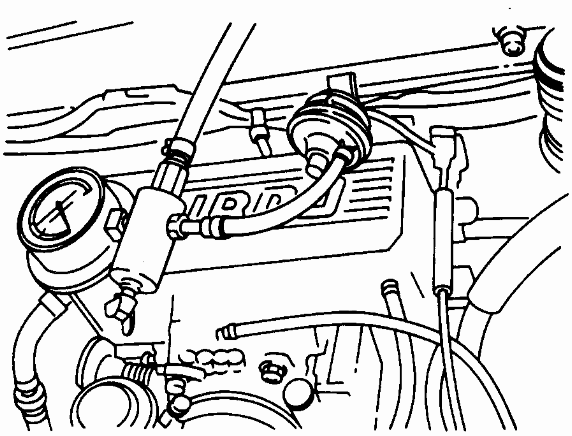
TEST STEP		RESULT ▶	ACTION TO TAKE
LP2	CHECK TURBOCHARGER WASTEGATE FUNCTION		
	• Disconnect the connecting rod from the wastegate lever. • Manually rotate the lever from the fully open to the fully closed position.  A14003-A • **Does the wastegate lever move freely?**	Yes ▶ No ▶	GO to LP3. REPLACE the turbocharger.

Diagnosis and Testing	1.6L Turbo	LP

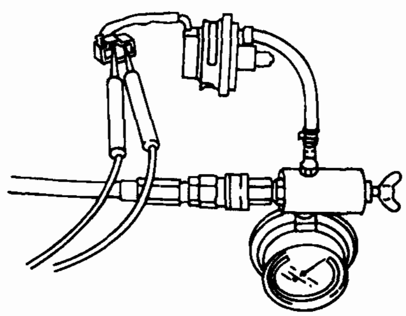
TEST STEP		RESULT ▶	ACTION TO TAKE
LP3	CHECK CHARGE AIR COOLER (CAC) LEAKAGE		
	● Visually inspect the charge air cooler for cracks, restrictions, or other damage. ● Disconnect the inlet and outlet hoses leading from the charge air cooler. ● Plug the inlet hose with a solid plug. ● Connect Rotunda Radiator/Heater Core Pressure Tester 021-00012 or equivalent and Rotunda Cooling System Adapter 021-00053 to the charge air cooler outlet hose as shown. ● Apply 83-103 kPa (12-15 psi) of pressure. ● **Does the charge air cooler maintain pressure?**	Yes ▶ No ▶	GO to LP4. LOCATE and REPAIR the leak, or REPLACE the charge air cooler.



Diagnosis and Testing	1.6L Turbo	LP

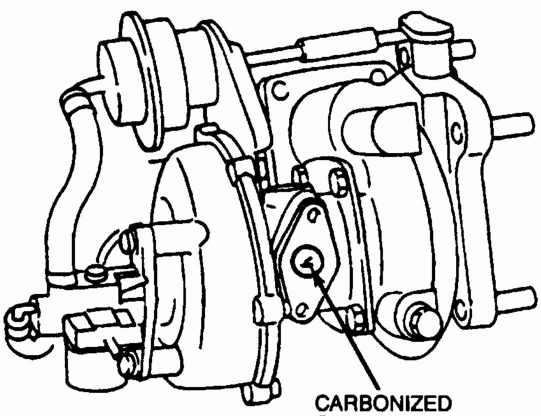
TEST STEP		RESULT ▶	ACTION TO TAKE
LP4	CHECK BOOST PRESSURE SWITCH VOLTAGE		
	• Key ON. • Disconnect the hose to the boost pressure switch. • Apply 71.8-79.8 kPa (10.4-11.6 psi) to the boost pressure switch. • Measure the voltage on the "LG/BK" wire at the boost pressure switch with the connector connected.  A17089-A • **Is the voltage greater than 10 volts with no air pressure applied to the boost pressure switch, and 0 volts with air pressure applied?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines, Section 2B. GO to LP5.

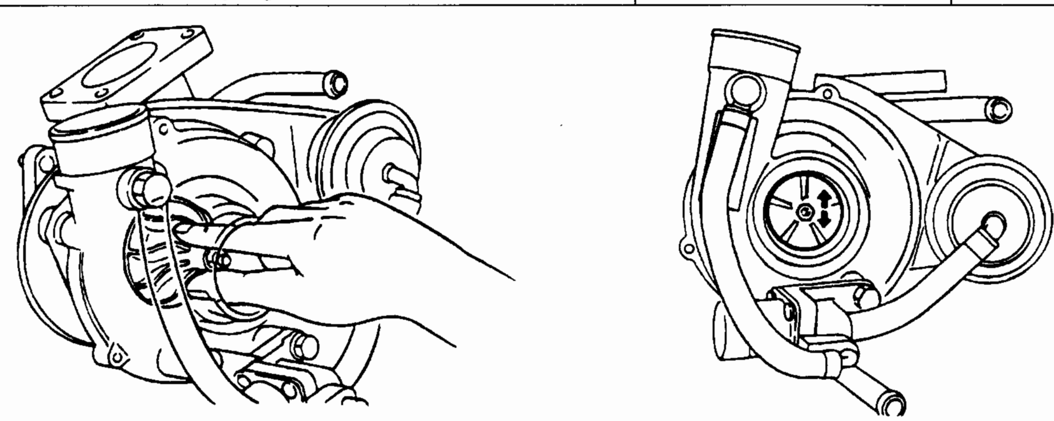
Diagnosis and Testing	1.6L Turbo	LP

TEST STEP		RESULT ▶	ACTION TO TAKE
LP5	PERFORM BOOST PRESSURE SWITCH INSPECTION		
	• Key OFF. • Disconnect the boost pressure switch connector. • Apply 71.8-79.8 kPa (10.4-11.6 psi) to the boost pressure switch. • Measure the resistance between the terminals of the boost pressure switch.  A17090-A • **Is the resistance less than 5 ohms between the boost pressure switch terminals with air pressure applied, and greater than 10,000 ohms between the terminals with no air pressure applied?**	Yes ▶ No ▶	GO to LP6. REPLACE the boost pressure switch.
LP6	CHECK BOOST PRESSURE SWITCH GROUND		
	• Key OFF. • Disconnect the boost pressure switch connector. • Measure the resistance between the "BK" wire at the boost pressure switch connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines, Section 2B. SERVICE the "BK" wire.

Diagnosis and Testing	1.6L Turbo	PFO

Pinpoint Tests PFO — Turbocharging Noise Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
PFO1 CHECK TURBOCHARGER LUBE SYSTEM		
• Remove the turbocharger oil return pipe at the center housing. • Verify whether the housing or the pipe are blocked by carbonized oil.  • **Are both the turbocharger housing and the oil return pipe free of blockage?**	Yes ▶ No ▶	GO to PFO2. REPLACE the turbocharger and/or the oil return pipe as required.
PFO2 CHECK TURBOCHARGER SHAFT DEFLECTION		
• Remove the turbo air inlet pipe and the front (exhaust outlet) pipe, exposing the turbo rotor at both ends. • Manually push the rotor back and forth (axially) and up and down (radially) to verify whether the rotor blades scrape the housing. • Manually spin the rotor to verify whether the bearings turn smoothly and quietly. • **Does the rotor turn smoothly and quietly without scraping?**	Yes ▶ No ▶	GO to PFO3. REPLACE the turbocharger assembly.

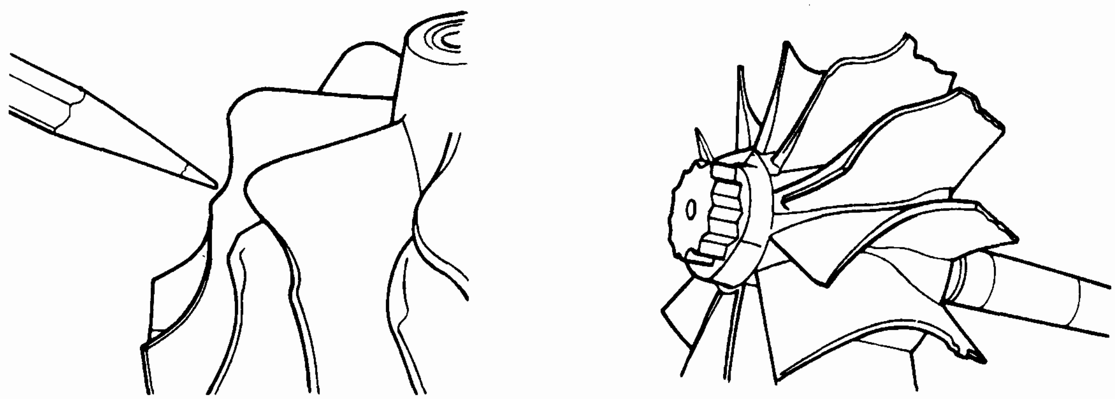


Diagnosis and Testing	1.6L Turbo	PFO

TEST STEP		RESULT ▶	ACTION TO TAKE
PF03	CHECK TURBOCHARGER ROTOR VANE CONDITION		
	• With the turbo inlet pipe and the front pipe (exhaust) removed from the turbocharger, visually inspect the turbine wheel and the impeller wheel for excessive wear or damage due to erosion, foreign objects, oil leakage, or overheating, as illustrated. • **Is the rotor free of any evidence of worn or damaged turbine or impeller (compressor) vanes?**	Yes ▶ No ▶	GO to PF04. REPLACE the turbocharger assembly.

WORN IMPELLER WHEEL VANES

DAMAGED TURBINE WHEEL VANES



A14011-B

TEST STEP		RESULT ▶	ACTION TO TAKE
PF04	CHECK TURBOCHARGER SEAL LEAKAGE		
	• With the compressor outlet hose and the front pipe (exhaust) removed from the turbocharger, visually inspect the removed pipes and their connecting passages in the turbo housing for the presence of oil or coolant. • **Are the air or exhaust passages in the turbocharger or the connecting pipes free of oil, carbonized oil, or coolant?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines, Section 2B. REPLACE the turbocharger assembly.

Specifications/Special Service Tools

Specifications

GENERAL SPECIFICATIONS

Description	Specification
Fuel Pump Outlet Pressure (Maximum Output, Key ON, Engine Off)	
1.3L	More than 340 kPa (50 psi)
1.6L	441-588 kPa (64-85 psi)
1.8L	441-588 kPa (64-85 psi)
2.0L	441-630 kPa (64-92 psi)
2.5L	500-630 kPa (72-92 psi)
Fuel Pump Pressure (Fuel Pump Terminal Grounded, Key ON, Engine Off)	
1.3L	265-320 kPa (38-46 psi)
1.6L	255-289 kPa (37-42 psi)
1.8L	265-314 kPa (38-46 psi)
2.0L	255-320 kPa (37-46 psi)
2.5L	270-310 kPa (39-45 psi)
Fuel Pump Pressure (Key ON, Engine Running, Pressure Regulator Vacuum Hose Connected)	
1.3L	210-260 kPa (30-38 psi)
1.6L	189-231 kPa (27-34 psi)
1.8L	216-264 kPa (31-38 psi)
2.0L	207-262 kPa (30-38 psi)
2.5L	207-248 kPa (30-36 psi)
Fuel Pump Pressure (Key ON, Engine Running, Pressure Regulator Vacuum Hose Disconnected)	
1.3L	265-320 kPa (38-46 psi)
1.6L	249-297 kPa (36-43 psi)
1.8L	275-336 kPa (40-49 psi)
2.0L	269-310 kPa (39-45 psi)
2.5L	269-310 kPa (39-45 psi)
Fuel Pump Volume	
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	167 cc (5.5 ounces)/10 seconds
Fuel Pump Check Valve Leakage	2 psi maximum in 3 minutes
Fuel Injector Leakage	1 drop maximum per 2 minutes
Fuel Injector Resistance	12-16 ohms
Fuel Pressure Regulator Pressure Leakdown	34 kPa (5 psi) maximum in 60 seconds
Fuel Pressure Regulator Vacuum Leakage at Valve Seat	10 in-Hg maximum/10 seconds starting with 20 in-Hg vacuum

SPECIFICATIONS — 1.6L TURBO

Description	Specification
Boost Pressure, Maximum	56 kPa (8.1 psi)
Turbo Wastegate - Air Pressure to Open	56 kPa (8.1 psi)

Specifications/Special Service Tools

Special Service Tools/Equipment

SPECIAL SERVICE TOOLS

Tool Number	Description
D87C-9974-A	EFI Test Adapter

ROTUNDA EQUIPMENT

Model	Description
014-00748	Fuel Pressure Testing Kit (includes adapters)
105-00051	73 Digital Multimeter
113-00015	Fuel Injector Tester/Cleaner (includes adapters)
021-00037	Vacuum Tester
007-0041B	Super STAR II Tester
007-00033	Breakout Box
021-00012	Radiator/Heater Core Pressure Tester
059-00008	Vacuum/Pressure Tester
021-00053	Cooling System Adapter

SECTION 10B

Exhaust Gas Recirculation (EGR) Systems

Contents

SECTION 10B

Exhaust Gas Recirculation (EGR) Systems

Contents (continued)

Description and Operation

Exhaust Gas Recirculation (EGR) Systems

Engine Applications — 1.3L, 2.0L and 2.5L

The Exhaust Gas Recirculation (EGR) system recirculates a portion of the exhaust gases into the intake manifold under average vehicle driving conditions to reduce combustion temperatures and exhaust gas NOx content. The amount of exhaust gas recirculated varies from zero with a cold engine, to a fixed rate for a hot engine with intermediate load and low engine speed. The flow rate increases steadily as coolant temperature rises above 50°C (122°F) for the 2.0L engine or 55°C (131°F) for the 1.3L and 2.5L engine. Other differences between the EGR systems are described in the following paragraphs.

All the systems use control solenoid(s), activated by the Powertrain Control Module (PCM), to operate the EGR system. The EGR system can be deactivated, aside from component malfunction, by the PCM and sensor inputs to the PCM. The components that help control the EGR system are listed below.

EGR System Components and Applications

Component	1.3L	2.0L MTX California and 2.0L CD4E	2.0L MTX Federal and Canada	2.5L
Crankshaft Position (CKP) Sensor	X	X	X	X
EGR Control (EGRC) Solenoid	X	X		X
EGR Vacuum Modulator (EGRM) Valve			X	
EGR Temperature (EGRT) Sensor			X	
EGR Vacuum Regulator (EVR) Solenoid			X	
EGR Valve	X	X	X	X
EGR Valve Position (EVP) Sensor	X	X		X
EGR Vent (EGRV) Solenoid	X	X		X
Engine Coolant Temperature (ECT) Sensor	X	X	X	X
Idle (IDL) Switch	X			X
Mass Air Flow (MAF) Sensor	X	X	X	
Measuring Core-Volume Air Flow (MC-VAF) Sensor				X
Powertrain Control Module (PCM)	X	X	X	X
Throttle Position (TP) Sensor	X	X	X	X

EGR System Operation

NOTE: Refer to the appropriate Mechanical Emission Related System Schematic Diagram in Section 3B for EGR routing and the EGR system's relationship with other engine / emission systems.

Description and Operation

1.3L, 2.0L MTX California, 2.0L CD4E, 2.5L

Two solenoids control the Exhaust Gas Recirculation (EGR) valve. The solenoids are the Exhaust Gas Recirculation Vent (EGRV) solenoid and the Exhaust Gas Recirculation Control (EGRC) solenoid. If the Powertrain Control Module (PCM) and the sensor inputs determine the EGR valve needs to be opened, the PCM activates the EGRC solenoid. When activated, the EGRC solenoid applies vacuum to the EGR valve for recirculation. If the PCM determines the EGR valve needs to close, the PCM will deactivate the EGRC solenoid and activate the EGRV solenoid. The EGRV solenoid vents the vacuum into the atmosphere until the desired EGR valve position is reached.

The EGR system uses an EGR Valve Position (EVP) sensor that is mounted to the top of the EGR valve. As the EGR valve moves, the EVP sensor detects this motion and notifies the PCM. The PCM uses this information, along with the information received from the previously listed input sensors, to modify the EGR valve position for improved emission control.

If any of these components fail, the Malfunction Indicator Lamp (MIL) will illuminate, informing the operator of a system failure.

2.0L MTX Federal and Canada

The Exhaust Gas Recirculation (EGR) valve operates under two conditions. If the sensors notify the Powertrain Control Module (PCM) that the EGR valve needs to be activated, the PCM will activate the Exhaust Vacuum Regulator (EVR) solenoid. Vacuum is applied from the EVR solenoid to the Exhaust Gas Recirculation Vacuum Modulator (EGRM) valve. The EGRM valve opens the Number 3 port, in turn opening the EGR valve allowing exhaust gas to recirculate.

The second condition occurs when sufficient engine speed and load are reached. Under these conditions, the EGRM valve closes due to moderate levels of exhaust back pressure and intake vacuum. This eliminates the venting of ported vacuum, which is high enough to open the EGR valve.

An Exhaust Gas Recirculation Temperature (EGRT) sensor is threaded into the EGR valve body. The EGRT sensor detects the EGR flow and notifies the PCM with an input signal. The EGRT sensor causes the PCM to illuminate the Malfunction Indicator Lamp (MIL) in the case of an EGR malfunction.

Description and Operation

Exhaust Gas Recirculation Vent (EGRV) Solenoid and Control (EGRC) Solenoid

The Exhaust Gas Recirculation Control (EGRC) solenoid regulates vacuum to the Exhaust Gas Recirculation (EGR) valve by an output signal from the Powertrain Control Module (PCM). The Exhaust Gas Recirculation Vent (EGRV) solenoid, also controlled by an output signal from the PCM, vents vacuum into the atmosphere in order to maintain the EGR valve position. Together, the EGRC and EGRV solenoids are capable of accurately controlling the EGR flow through all modes of engine operation.

Description and Operation	1.3L, 2.0L, 2.5L	EGRC/EGRV Solenoids

2.0L MTX California, 2.0L CD4E, 2.5L

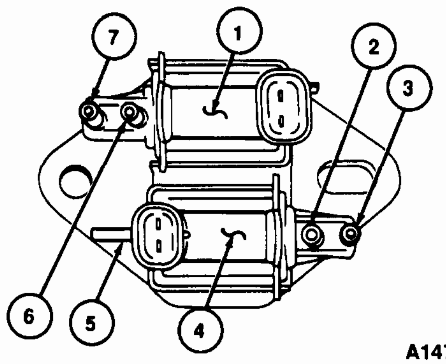


Figure 1.

Item	Description
1	EGR Control Solenoid
2	Interconnecting Hose Port to EGRC
3	Vacuum Port to EGR Valve
4	EGR Vent Solenoid
5	Port to Air Cleaner
6	Interconnecting Hose Port to EGRV
7	Vacuum Supply Port

Description and Operation	1.3L, 2.0L, 2.5L	EGRC/EGRV Solenoids

1.3L

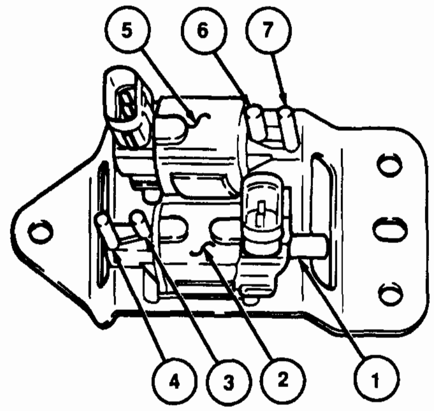


Figure 2.

Item	Description
1	Port to Air Cleaner
2	EGR Vent Solenoid
3	Interconnecting Hose Port to EGRC
4	Vacuum Port to EGR Valve
5	EGR Control Solenoid
6	Interconnecting Hose Port to EGRV
7	Vacuum Supply Port

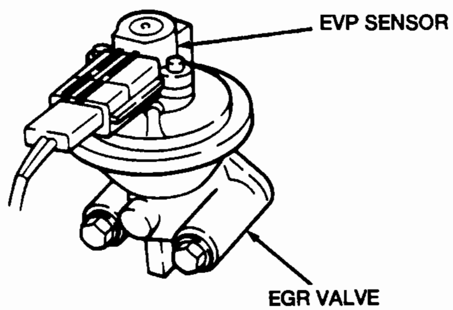
Engine	Location
1.3L	Behind engine, mounted on cowl.
2.0L MTX California, 2.0L CD4E, 2.5L	Behind engine, below the intake manifold.

Description and Operation	1.3L, 2.0L, 2.5L	EGR Valve

Exhaust Gas Recirculation (EGR) Valve

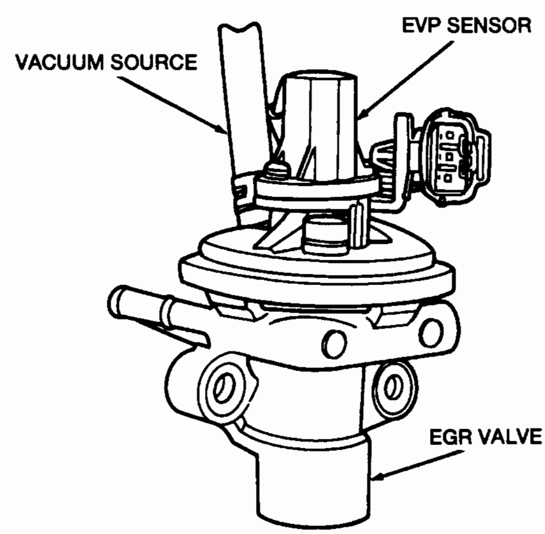
The Exhaust Gas Recirculation (EGR) valve recirculates portions of the exhaust gas back into the engine to reduce the amount of nitrogen released during combustion, and to reduce combustion temperature. The amount of exhaust gases that are released into the engine is proportional to the load on the engine.

1.3L, 2.0L MTX California, 2.0L CD4E



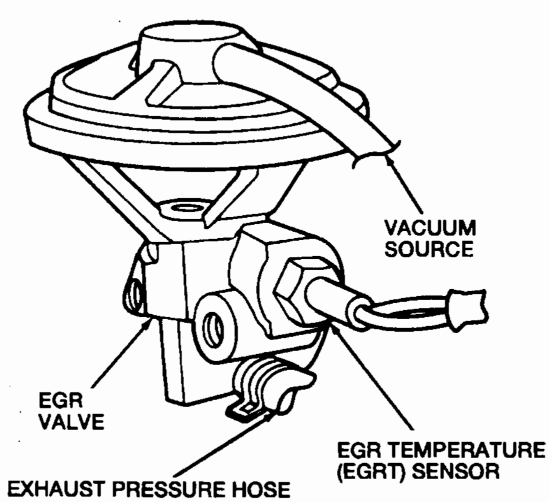
A20510-A

2.5L



A16788-D

2.0L MTX Federal and Canada



A20595-A

Description and Operation	1.3L, 2.0L, 2.5L	EGR Valve

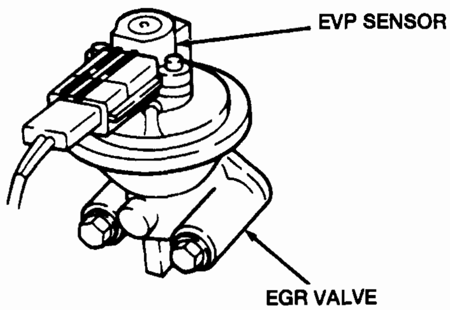
Engine	Location
1.3L	RH side of engine, below intake manifold.
2.0L, 2.5L	Behind the engine, below the back of the intake manifold.

Description and Operation	1.3L, 2.0L, 2.5L	EVP Sensor

Exhaust Gas Recirculation Valve Position (EVP) Sensor

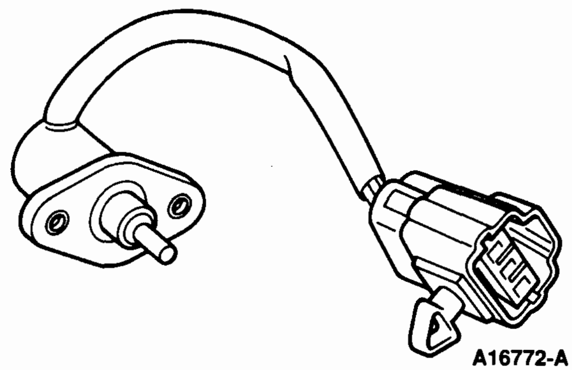
The Exhaust Gas Recirculation Valve Position (EVP) sensor provides information to the Powertrain Control Module (PCM) reflecting the Exhaust Gas Recirculation (EGR) valve position. There are two purposes of the EVP sensor. The sensor indicates the amount of exhaust gases flowing into the engine by monitoring the EGR valve movement and also notifies the PCM of electrical failure in the EVP sensor.

1.3L, 2.0L MTX California, 2.0L CD4E



A20510-A

2.5L



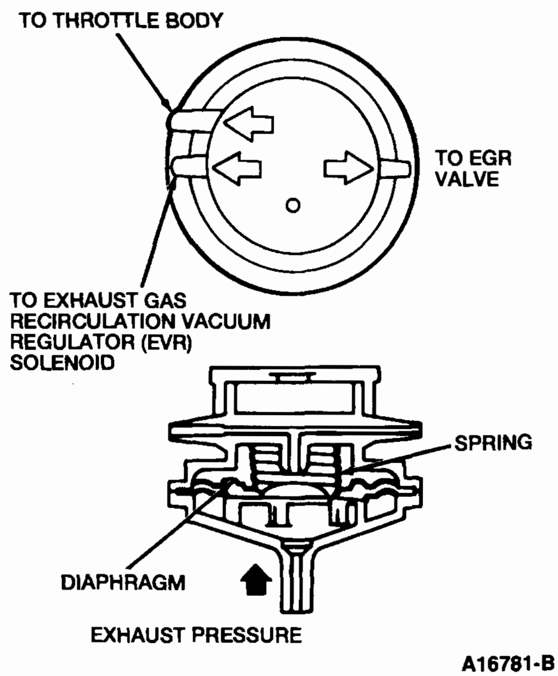
A16772-A

Engine	Location
1.3L, 2.0L MTX California, 2.0L CD4E and 2.5L	Mounted to the top of the EGR valve.

Description and Operation	2.0L MTX	EGRM Valve

Exhaust Gas Recirculation Modulator (EGRM) Valve

The Exhaust Gas Recirculation Modulator (EGRM) valve uses vacuum supplied by the Exhaust Gas Recirculation Vacuum Regulator (EVR) solenoid and throttle body to control the amount of back-pressure vacuum that is applied to the Exhaust Gas Recirculation (EGR) valve. If the vacuum from the EVR solenoid and the throttle body is not applied to the EGRM valve, the ported vacuum will operate the EGR valve.

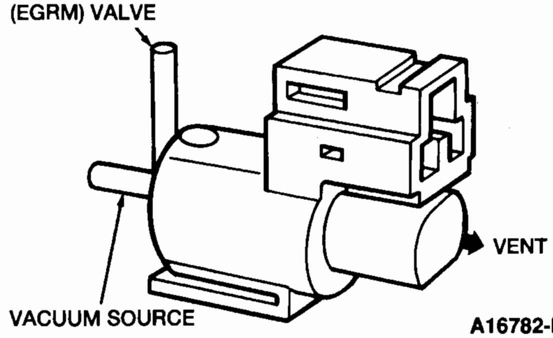


Engine	Location
2.0L MTX Federal and Canada	Mounted to top of intake manifold, above the throttle body.

Description and Operation	2.0L MTX	EVR Solenoid

Exhaust Gas Recirculation Vacuum Regulator (EVR) Solenoid

The Exhaust Gas Recirculation Vacuum Regulator (EVR) solenoid controls the amount of vacuum applied to the Exhaust Gas Recirculation Modulator (EGRM) valve. The EVR solenoid is controlled by the Powertrain Control Module (PCM) based on a series of inputs from other components. The PCM determines when to activate the EVR solenoid and let vacuum be applied to the Exhaust Gas Recirculation (EGR) valve. If the solenoid is deactivated, it will act as a vent for the EGRM valve.

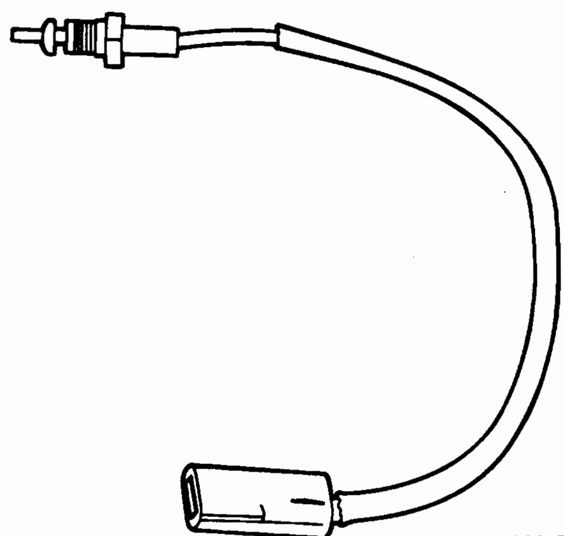


Engine	Location
2.0L MTX Federal and Canada	Mounted to the RH side of the intake manifold.

Description and Operation	2.0L MTX	EGRT Sensor

Exhaust Gas Recirculation Temperature (EGRT) Sensor

The Exhaust Gas Recirculation Temperature (EGRT) sensor monitors the temperature in the Exhaust Gas Recirculation (EGR) valve. As EGR flow increases, the temperature of the sensor increases. This operation creates a change in resistance of the sensor and sends a signal to the Powertrain Control Module (PCM) to affect engine operating conditions.



A16830-C

Engine	Location
2.0L MTX Federal and Canada	Threaded into the EGR valve.

Diagnosis and Testing

System Inspection

1. Visually inspect the components of the Exhaust Gas Recirculation (EGR) system.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Loose, leaking, or damaged vacuum lines • EGR valve stuck open • EGR valve attaching bolts loose or missing • EGR valve flange gasket damaged or leaking	• Damaged connectors • Damaged insulation • Damaged components that affect EGR • Damaged EGR components

2. Exercise the wiring harness and connectors for the EGR components. Check for looseness, corrosion, or other damage. This must be done after the engine reaches normal operating temperature for activation of all EGR system components.

3. Check the vacuum lines and connections for looseness, pinching, leakage, splitting, blockage, damage, or liquid contamination.

4. If the vehicle System Inspection is OK, proceed to the Pinpoint Tests.

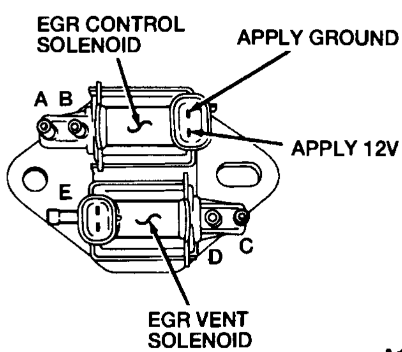
Diagnosis and Testing	1.3L, 2.0L MTX Calif., 2.0L CD4E, 2.5L	EGR

Pinpoint Tests — 1.3L, 2.0L MTX California, 2.0L CD4E, 2.5L

TEST STEP		RESULT ▶	ACTION TO TAKE
EGR1	CHECK EGR CONTROL (EGRC) SOLENOID		
	(see steps below)	Yes ▶	GO to EGR2.
		No ▶	REPLACE the EGRC solenoid.

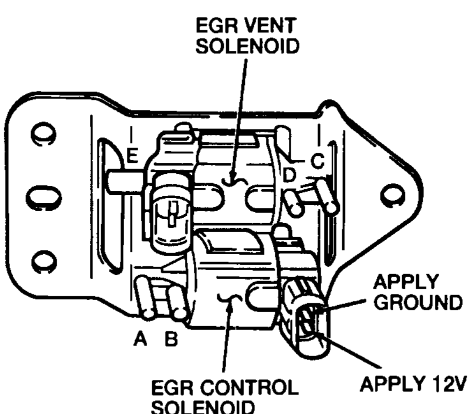
- Key OFF.
- Disconnect the Exhaust Gas Recirculation Control (EGRC) solenoid.
- Disconnect the vacuum hoses.
- Attach a hose to port A and blow into it to verify that air does not flow through port B.
- Apply 12 volts and ground to the EGRC solenoid as shown below.

2.0L, 2.5L



A16797-C

1.3L



A20190-A

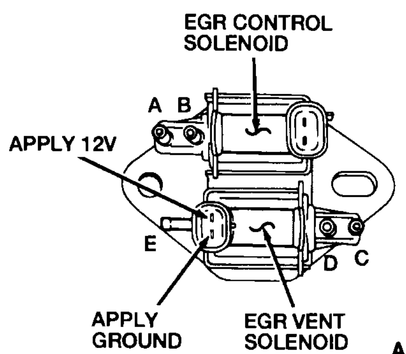
- Attach a hose to port A and blow into it to verify that air flows through port B.
- **Does the EGRC solenoid function properly?**

Diagnosis and Testing	1.3L, 2.0L MTX Calif., 2.0L CD4E, 2.5L	EGR

TEST STEP		RESULT ▶	ACTION TO TAKE
EGR2	CHECK EGR VENT (EGRV) SOLENOID	Yes ▶	GO to EGR3.
		No ▶	REPLACE the EGRV solenoid.

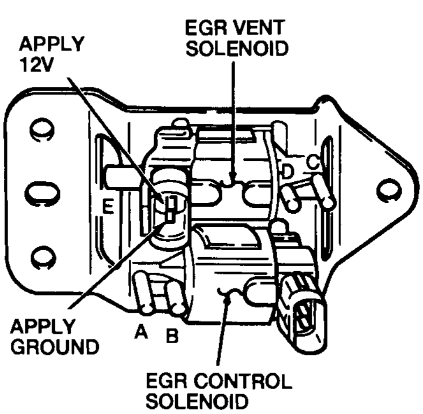
- Key OFF.
- Disconnect the Exhaust Gas Recirculation Vent (EGRV) solenoid.
- Disconnect the vacuum hoses.
- Block port D.
- Blow into port C and verify that air flows through port E (interconnecting hose between port B and port D is not shown in art for solenoid clarification).
- Apply 12 volts and ground to the EGRV solenoid as shown below.

2.0L, 2.5L



A16798-C

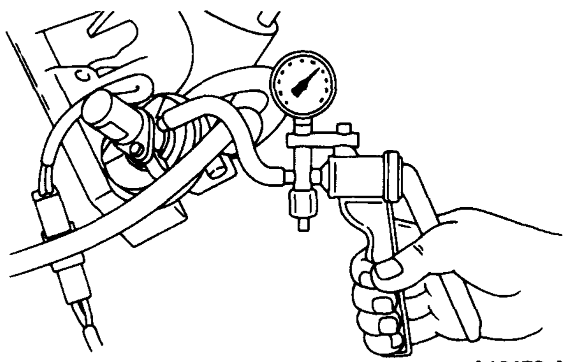
1.3L



A20191-A

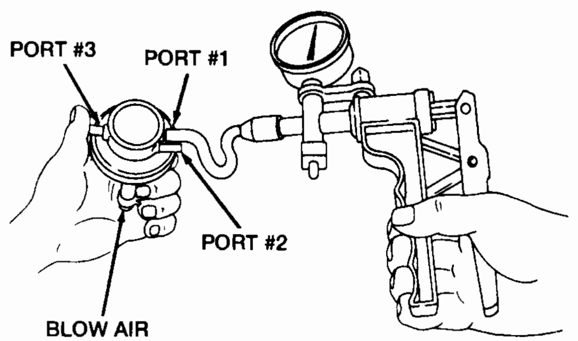
- Blow into port C and verify that air does not flow through port E.
- **Does the EGRV solenoid function properly?**

Diagnosis and Testing	1.3L, 2.0L MTX Calif., 2.0L CD4E, 2.5L	EGR

TEST STEP	RESULT ▶	ACTION TO TAKE
EGR3 CHECK EGR VALVE		
• Run the engine until normal operating temperature is reached. • Key OFF. • Connect a Rotunda Vacuum Tester 021-00037 or equivalent to the Exhaust Gas Recirculation (EGR) valve vacuum source port as shown below.  A16472-A • Key ON, engine running. • Idle the engine. • Verify the engine runs rough when applied vacuum reaches the specified value, or the engine stalls at a higher vacuum (refer to General Specifications chart at the end of the section). • **Does the EGR valve function properly?** NOTE: For diagnosis of the EGR Valve Position (EVP) sensor, refer to the EEC Pinpoint Tests, Section 6B, for the 1.3L and 2.5L vehicles or refer to the EEC-IV Pinpoint Tests, Section 6A for the 2.0L MTX California and 2.0L CD4E vehicles.	Yes ▶ No ▶	RETURN to the Diagnostic Routines. REPLACE the EGR valve.

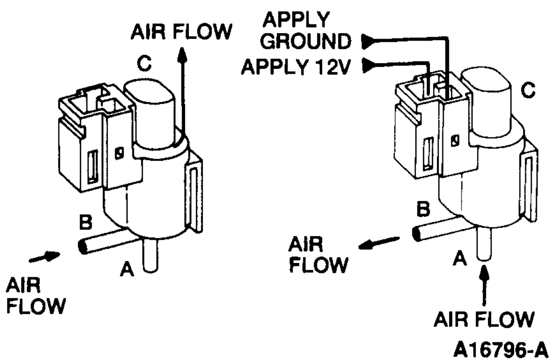
Diagnosis and Testing	2.0L MTX Federal and Canada	EGR

Pinpoint Tests — 2.0L MTX Federal and Canada

TEST STEP	RESULT ▶	ACTION TO TAKE
EGR1 CHECK EGR MODULATOR (EGRM) VALVE		
• Key OFF. • Disconnect the vacuum lines from the Exhaust Gas Recirculation Modulator (EGRM) valve. • Connect a Rotunda Vacuum Tester 021-00037 or equivalent to the Number 1 port on the EGRM valve as shown below. • Block the Number 3 port as shown below.  • Blow into the exhaust port while applying vacuum with the tester. • Verify that the vacuum is held. • Release the exhaust port and verify that vacuum is released. • **Does the EGRM valve function correctly?**	Yes ▶ No ▶	GO to EGR2. REPLACE the EGRM valve.

Diagnosis and Testing	2.0L MTX Federal and Canada	EGR

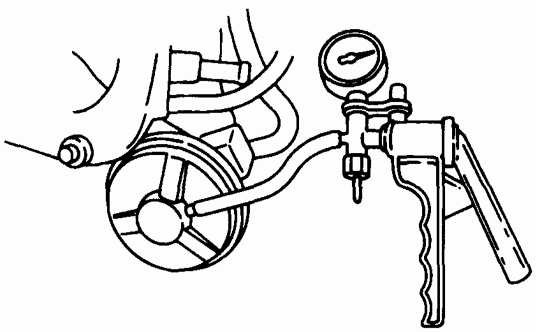
TEST STEP		RESULT ▶	ACTION TO TAKE
EGR2	CHECK EGR VACUUM REGULATOR (EVR) SOLENOID		
	• Key OFF. • Disconnect the Exhaust Gas Recirculation Vacuum Regulator (EVR) solenoid. • Attach a hose to port B and blow into it to verify that air flows through port C only. • Apply 12 volts and ground to the EVR as shown below.	Yes ▶ No ▶	GO to EGR3. REPLACE the EVR solenoid.



Port	Vacuum Hose Color
A	Black with blue stripe
B	Black with orange stripe

- Attach a hose to port A and blow into it to verify that air flows through port B only.
- **Does the EVR solenoid function correctly?**

Diagnosis and Testing	2.0L MTX Federal and Canada	EGR

TEST STEP	RESULT ▶	ACTION TO TAKE
EGR3 CHECK EGR VALVE		
● Run the engine until normal operating temperature is reached. ● Key OFF. ● Connect a Rotunda Vacuum Tester 021-00037 or equivalent to the Exhaust Gas Recirculation (EGR) valve as shown below.  A16471-A ● Key ON, engine running. ● Idle the engine. ● Verify the engine runs rough when applied vacuum reaches the specified value of 150 mm-Hg (5.91 in-Hg), or the engine stalls at a higher vacuum. ● **Does the EGR valve function correctly?** NOTE: For diagnosis of the EGR Temperature (EGRT) sensor, refer to the EEC-IV Pinpoint Tests, Section 6A.	Yes ▶ No ▶	RETURN to Diagnostic Routines. REPLACE the EGR valve.

Specifications/Special Service Tools

Specifications

GENERAL SPECIFICATIONS

Description	Specification
Combined Conditions Required to Actuate EGR System	Coolant Temperature Minimum: 50°C (122°F) (2.0L) 55°C (131°F) (1.3L and 2.5L) Throttle Opening: Average for Highway Driving Vacuum to Open: 150 mm-Hg (5.91 in-Hg) (2.0L MTX Federal and Canada) 40-60 mm-Hg (1.6-2.4 in-Hg) (2.0L MTX California, 2.0L CD4E and 2.5L) 65mm-Hg (2.59 in-Hg) (1.3L)

Special Service Tools/Equipment

ROTUNDA EQUIPMENT

Model	Description
021-00037	Vacuum Tester

SECTION 11B

Evaporative Emission (EVAP) Systems

Contents

Description and Operation

Evaporative Emission (EVAP) Systems

The Evaporative Emissions (EVAP) system prevents the escape of fuel vapors to the atmosphere under hot soak and engine off conditions by storing these vapors in a carbon canister. The system also controls the purging of stored vapors from the carbon canister to the engine, where they are burned in the combustion chambers.

EVAPORATIVE EMISSION SYSTEM COMPONENT APPLICATION CHART

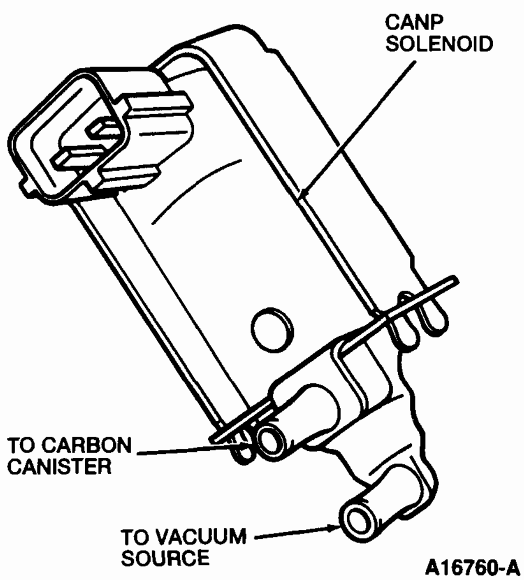
Component	1.3L (5-Door)	1.3L (3-Door)	1.6L Non-Turbo	1.6L Turbo	1.8L	2.0L	2.5L
Canister Purge Solenoid	X	X	X	X	X	X	X
Carbon Canister	X	X	X	X	X	X	X
Check Valve				X			
Restrictor	X	X	X	X			X
Rollover/Vent Valve	X	X	X	X	X	X	X
Two-Way Check Valve	X	X	X	X	X	X	X
Vapor Separator		X			X		

The following is a description of the EVAP system components.

Description and Operation

Canister Purge Solenoid

The Canister Purge (CANP) solenoid regulates the amount of evaporative fuel vapors transferred from the carbon canister into the intake manifold. The solenoid operates by an output signal from the Powertrain Control Module (PCM) to open the vacuum passage between the carbon canister and intake manifold when purging conditions are met. If more evaporative fuel vapors can be consumed by the engine, the solenoid is held open for a longer period of time.

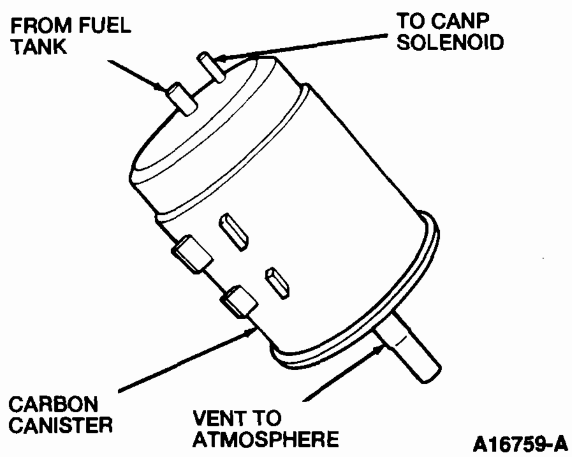


Engine	Location
1.3L, 1.6L, 1.8L	Mounted near center of cowl.
2.0L	RH side of intake manifold.
2.5L	Mounted to the back of the intake manifold.

Description and Operation

Carbon Canister

The fuel vapors from the fuel tank are stored in the carbon canister. When the vehicle is being operated, the carbon canister purges the fuel vapors into the engine for consumption by means of the Canister Purge (CANP) solenoid. During cool-down, air enters the carbon canister at the vent port.



Engine	Location
1.3L, 1.6L, 1.8L	RH corner near cowl.
2.0L, 2.5L	Behind the LH strut.

Restrictor

The restrictor limits the amount of fuel vapors that enter the carbon canister.

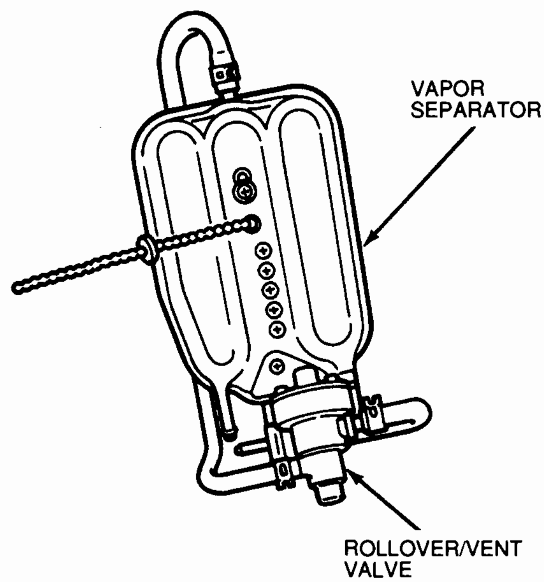
Description and Operation	All Engines	Rollover/Vent Valve

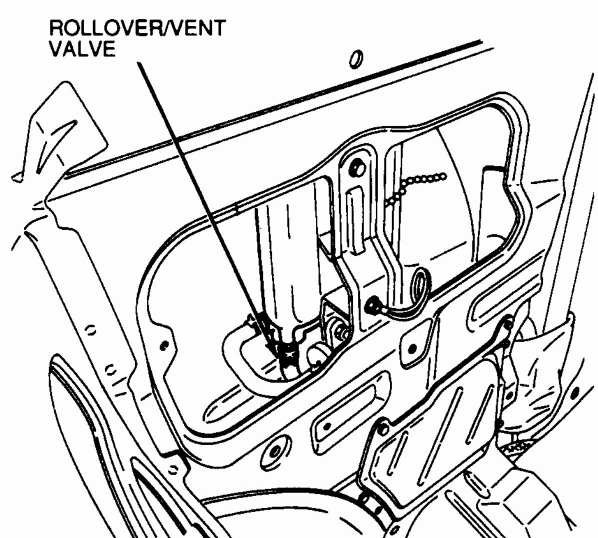
Rollover / Vent Valve

The rollover / vent valve is located on the highest point of the fuel tank. The valve serves a dual purpose: when fuel is in the tank, pressure increases, and the rollover / vent valve releases the extra pressure into the atmosphere; if a rollover situation occurs, the rollover / vent valve closes and will not permit fuel or fuel vapors to escape from the fuel tank.

Description and Operation	All Engines	Rollover/Vent Valve

1.3L (3-Door Only)





A13866-B

Description and Operation	All Engines	Rollover/Vent Valve

1.6L

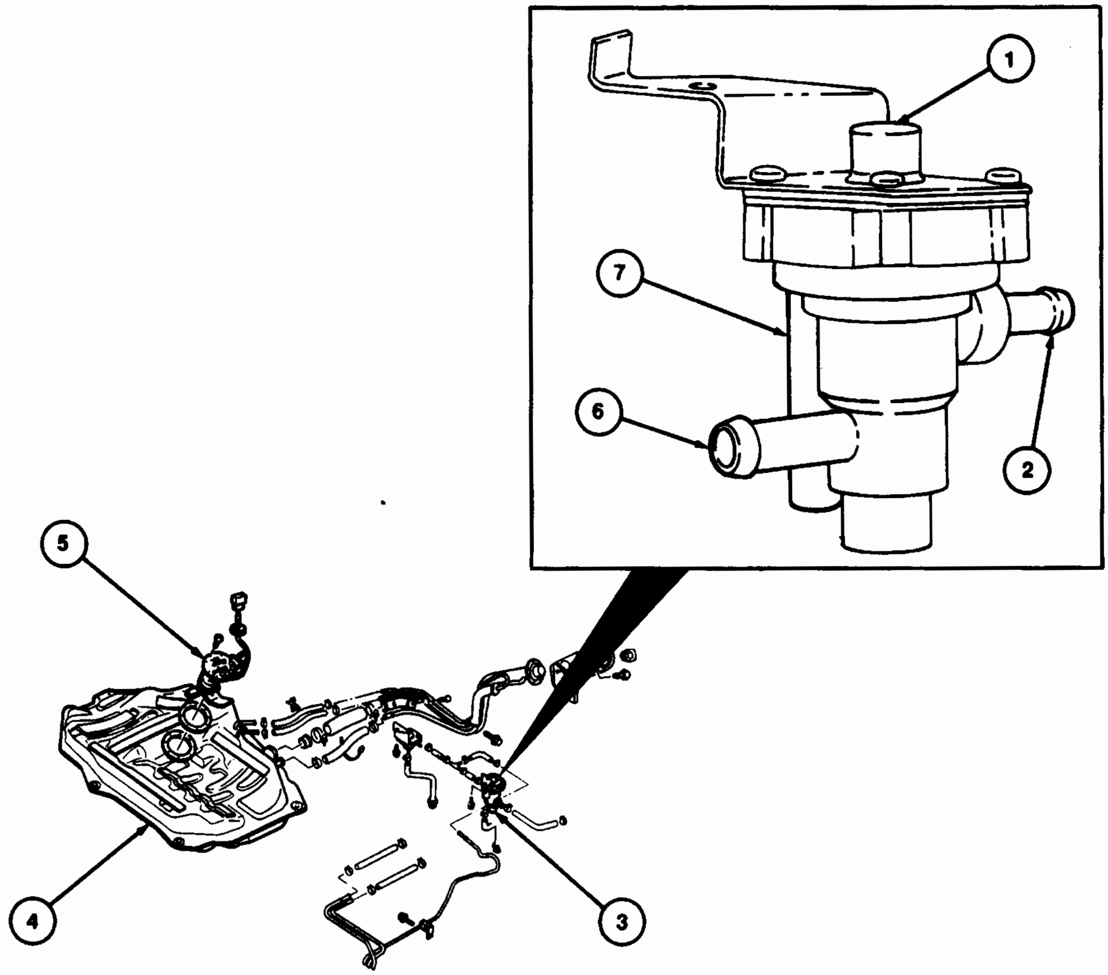
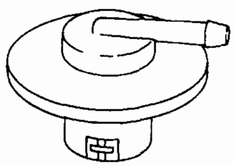


Figure 1.

Item	Description
1	Rollover/Vent Valve
2	To Two-Way Check Valve
3	Rollover/Vent Valve
4	Fuel Tank
5	Fuel Pump
6	From Fuel Tank
7	Vent to Atmosphere

Description and Operation	All Engines	Rollover/Vent Valve

1.3L (5-Door Only)



A20507-A

1.8L, 2.0L, 2.5L

A16764-A

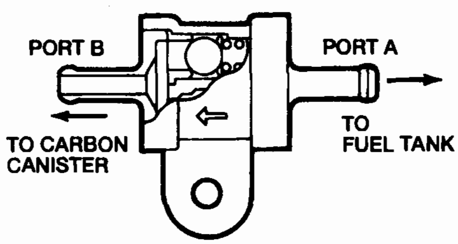
Engine	Location
1.3L (3-Door)	Attached to the vapor separator.
1.3L (5-Door), 1.6L, 1.8L, 2.0L, 2.5L	Located on top of the fuel tank.

Description and Operation	All Engines	Two-Way Check Valve

Two-Way Check Valve

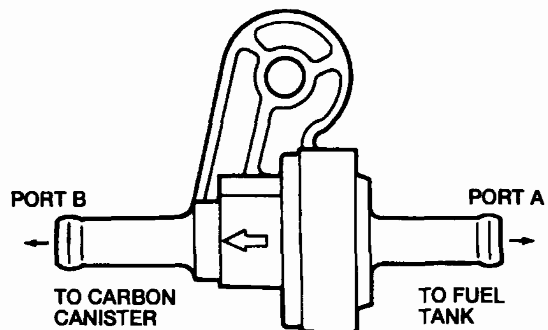
The two-way check valve controls pressure between the fuel tank and the carbon canister. The two-way check valve protects the fuel tank from heat build-up rupture and cool-down collapse by allowing air to pass in or out of the tank to equalize pressure.

1.6L and 1.8L



A13965-C

1.3L, 2.0L, 2.5L



A16475-B

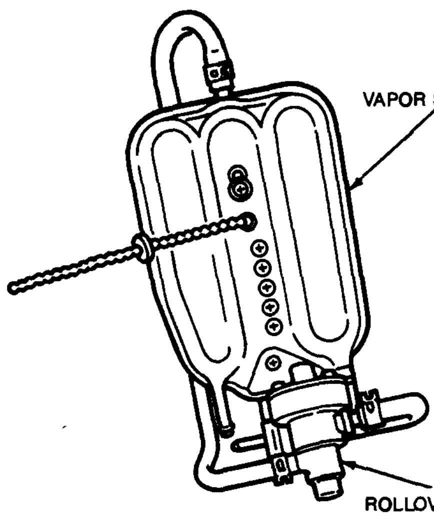
Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Mounted to the body, above the fuel tank.

Description and Operation	1.3L 1.8L	Vapor Separator

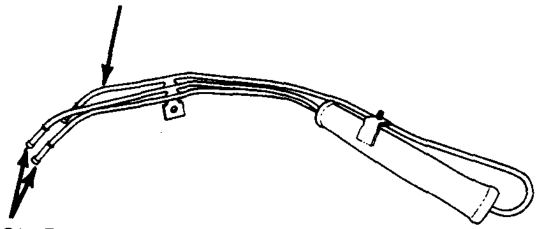
Vapor Separator

The vapor separator, installed between the fuel tank and evaporative lines to the carbon canister, prevents liquid fuel from entering the carbon canister. When fuel tank pressure increases, fuel vapors are allowed to vent to the carbon canister, but liquid fuel is directed back to the fuel tank.

1.3L (3-Door Only)



1.8L



Engine	Location
1.3L (3-Door Only), 1.8L	Near the fuel filler neck behind the left rear interior trim panel.

For further information regarding the makeup of the system and its relationship to other systems, refer to the appropriate engine / emission schematic diagram in Section 3B of this manual.

Diagnosis and Testing

System Inspection

NOTE: Excessive fuel tank pressure could be caused by the fuel cap and does not necessarily indicate a concern with the evaporative emission system components.

1. Visually inspect the components of the Evaporative Emission System.

VISUAL INSPECTION CHART

Mechanical	Electrical
● Fuel odor or leakage ● Damaged vacuum or fuel vapor lines ● Loose vapor line connections	● Discharged battery ● Damaged connectors ● Damaged air flow meter ● Damaged solenoid

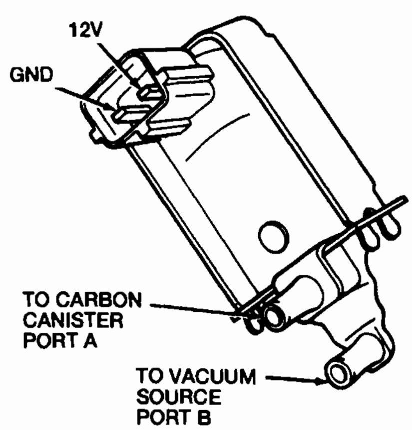
2. Exercise the wiring and connector for the Canister Purge (CANP) solenoid. Check the throttle body, air flow meter, and the Powertrain Control Module (PCM) for looseness, corrosion, damage, or other problems.

3. Check the fuel tank, the fuel vapor lines, the vacuum lines, and the connections for looseness, pinching, leakage, damage or other obvious causes for malfunction.

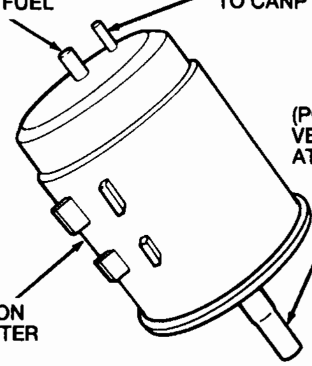
4. If all checks are OK, proceed to the Pinpoint Tests.

Diagnosis and Testing	All Engines	EV

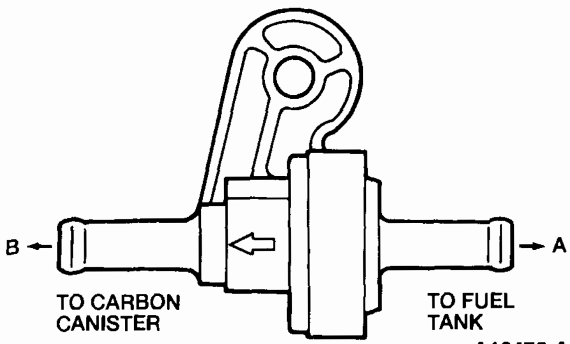
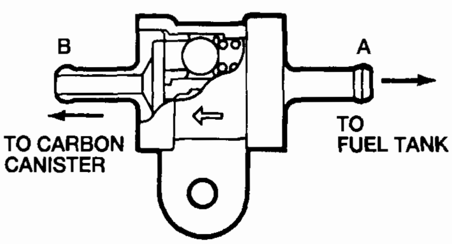
Pinpoint Tests — EV

	TEST STEP	RESULT ▶	ACTION TO TAKE
EV1	CHECK CANISTER PURGE SOLENOID VALVE FUNCTION		
	• Disconnect the vacuum hoses from ports A and B, and the electrical connector from the solenoid valve. • Blow air through port A and verify that no air exits from port B. • Apply 12 volts and ground as shown. • Blow air through port A and verify that air flows from port B.  A16473-B • **Does the valve function properly?**	Yes ▶ No ▶	GO to EV2. REPLACE the Canister Purge (CANP) solenoid.

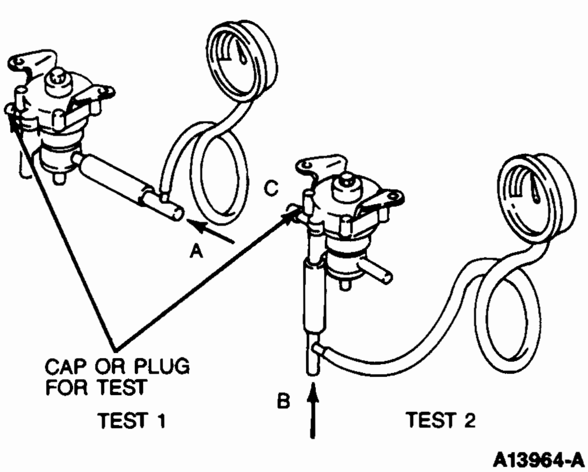
Diagnosis and Testing | All Engines | EV

TEST STEP		RESULT ▶	ACTION TO TAKE
EV2	CHECK FOR LIQUID FUEL IN CARBON CANISTER		
	• Run engine until warm to purge any fuel from the carbon canister. • Turn off the engine and remove the carbon canister. • Inspect the carbon canister for liquid fuel (strong odor or excessive weight). • Blow into the air vent (port C) and verify that air flows from the fuel vapor inlet (port B).  • **Is the carbon canister free of liquid fuel, and does it function properly?**	Yes ▶ No ▶	GO to EV3. REPLACE the carbon canister.
EV3	CHECK PURGE LINES FOR BLOCKAGE		
	• Remove the purge lines leading from the carbon canister to the engine air intake. • Check the lines for blockage by blowing through them. • **Does air flow freely through the lines?**	Yes ▶ No ▶	GO to EV4. REPLACE the purge line(s) any check valves, or restrictors that may be partially plugged.

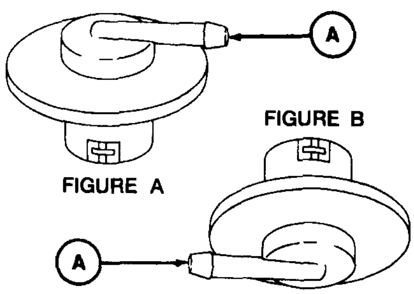
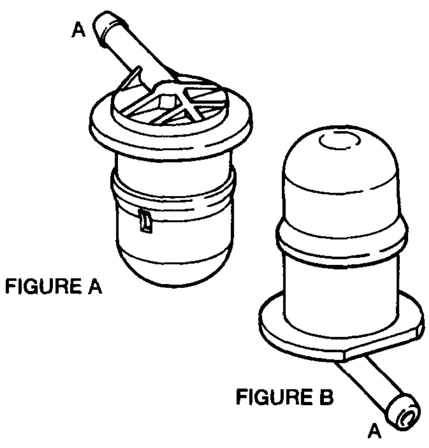
Diagnosis and Testing	All Engines	EV

TEST STEP		RESULT ▶	ACTION TO TAKE
EV4	CHECK TWO-WAY CHECK VALVE		
	• Visually inspect the two-way check valve and its connections for pinching, blockage, looseness, or other damage and/or leakage. • Remove the two-way check valve. Refer to Service Manual Section 10-01. • Connect Rotunda Vacuum Tester 021-00037 or equivalent, to port A of the valve. • Apply 26 mm-Hg (1.01 in-Hg) of vacuum to port A for 1.3L, 2.0L and 2.5L or 37 mm-Hg (1.46 in-Hg) of vacuum to port A for 1.6L and 1.8L. • Verify that the valve opens (does not hold vacuum). • Connect the vacuum tester to port B of the valve. • Apply 44 mm-Hg (1.73 in-Hg) vacuum to port B, and verify that the valve opens. **1.3L, 2.0L and 2.5L**  **A16475-A** **1.6L and 1.8L**  **A13965-B** • **Is the valve free of leakage, and does it function properly?**	Yes ▶ No ▶	GO to EV5. REPLACE/SERVICE the two-way check valve.

Diagnosis and Testing	All Engines	EV

TEST STEP		RESULT	▶	ACTION TO TAKE
EV5	CHECK ROLLOVER / VENT VALVE			
	• Visually inspect the rollover / vent valve and its connections for pinching, blockage, looseness, or other mechanical damage. • **Is the rollover / vent valve and its connections free of damage?**	Yes (1.3L [5-Door], 1.8L, 2.0L, 2.5L)	▶	GO to **EV7**.
		Yes (1.3L [3-Door], 1.6L)	▶	GO to **EV6**.
		No	▶	REPLACE the rollover / vent valve or SERVICE the connecting hoses in question.
EV6	CHECK ROLLOVER / VENT VALVE FUNCTION (1.3L [3-DOOR], 1.6L ONLY)			
	• Check the rollover / vent valve for evidence of leakage. • Remove the rollover / vent valve. Refer to Service Manual Section 10-01. • Connect Rotunda Vacuum / Pressure Tester 059-00008 or equivalent, to the rollover / vent valve as shown for Test 1. • Hold the valve vertically. • Blow into port A and verify the valve opens at 7.0 kPa (1.0 psi) maximum. • Connect the tester as shown for Test 2. • Blow into port B and verify the valve opens at 4.9 kPa (0.7 psi) maximum. • Hold the valve upside down. • Blow into port A and verify that pressure is held.  • **Does the valve function properly?**	Yes (1.3L [3-Door])	▶	GO to **EV8**.
		Yes (1.6L)	▶	RETURN to the Diagnostic Routines, Section 2B.
		No	▶	REPLACE the rollover / vent valve.

Diagnosis and Testing	All Engines	EV

TEST STEP		RESULT	▶	ACTION TO TAKE
EV7	CHECK ROLLOVER / VENT VALVE FUNCTION			
	• Check the rollover / vent valve for evidence of leakage. • Remove the rollover / vent valve. Refer to Service Manual Section 10-01. • Hold the valve as shown in Figure A. • Blow into port A and verify that air flows through the rollover / vent valve. • Invert the valve as shown in Figure B. • Blow into port A and verify that air does not flow through the rollover / vent valve. **1.3L (5-Door)**  **A20508-A** **1.8L, 2.0L, 2.5L**  **A16474-A** • **Does the valve function properly?**	Yes (1.8L)	▶	GO to **EV8**.
		Yes (1.3L [5-Door], 2.0L, 2.5L)	▶	RETURN to the Diagnostic Routines, Section 2B.
		No	▶	REPLACE the rollover / vent valve.

Diagnosis and Testing	All Engines	EV

TEST STEP		RESULT ▶	ACTION TO TAKE
EV8	CHECK VAPOR SEPARATOR INTEGRITY		
	• Visually inspect the vapor separator and its connections with the fuel tank for hose pinching, blockage, looseness, or other mechanical damage. • **Is the vapor separator and its connections free of damage?**	Yes ▶	RETURN to the Diagnostic Routines, Section 2B.
		No ▶	REPLACE the vapor separator or REPAIR the connecting hoses as required.

Specifications/Special Service Tools

Specifications

GENERAL SPECIFICATIONS

Description	Specifications
Rollover/Vent Valve Operation	
Fuel tank pressure to open (max.)	7.0 kPa (1.0 psi)
Air pressure to vent tank (max.)	4.9 kPa (0.7 psi)
Valve in upright position	Open
Valve in inverted position	Closed
Two-Way Check Valve Operation (Air must flow easily under low pressure in either direction)	
Vacuum to open valve, Port A (fuel tank pressure)	1.3L, 2.0L and 2.5L: 26 mm-Hg (1.01 in-Hg) 1.6L and 1.8L: 37 mm-Hg (1.46 in-Hg)
Vacuum to open valve, Port B (barometric pressure)	All engines: 44 mm-Hg (1.73 in-Hg)

Special Service Tools/Equipment

ROTUNDA EQUIPMENT

Model	Description
021-00037	Vacuum Tester
059-00008	Vacuum/Pressure Tester

SECTION 12B

Air Intake Systems and Throttle Body

Contents

SECTION 12B

Air Intake Systems and Throttle Body

Contents (continued)

SECTION 12B

Air Intake Systems and Throttle Body

Contents (continued)

Description and Operation

Air Intake System

The air intake system delivers filtered and controlled airflow to the engine. Three groups of components make up the system: air handling, sensors, and control devices.

Air Intake System Air Handling Components

Air intake system components include:

- Air inlet duct
- Air cleaner
- Throttle body
- Intake manifold
- Resonance chamber(s)
- Resonance duct

The resonance chamber(s) suppress air inlet noise caused by airflow pulsations. One chamber is used for this purpose on the 1.3L, 2.0L, and 2.5L engines, while two chambers are used on the 1.8L engine. The throttle body contains the throttle valve and Throttle Position (TP) sensor. The Idle Air Control (IAC) valve also mounts to the throttle body on all engines except the 1.3L, where it mounts to the intake manifold. The dashpot is used on the 1.6L and the 1.8L engines, and mounts to the throttle body.

Air Intake System Sensors

Air intake system sensors include the airflow sensor, Intake Air Temperature (IAT) sensor, and Throttle Position (TP) sensor, all of which supply data to the Powertrain Control Module (PCM). The PCM also monitors engine speed. The 1.6L and the 1.8L systems use a Volume Air Flow (VAF) sensor with an integrated IAT sensor. The 1.3L and 2.0L systems use a heated resistor-type Mass Air Flow (MAF) sensor with an IAT sensor mounted on the air cleaner housing. The 2.5L system uses a Measuring Core-Volume Air Flow (MC-VAF) sensor with an integrated IAT sensor.

Air Intake System Control Devices

The Idle Air Control (IAC) solenoid valve helps to maintain a steady idle speed when heavy mechanical or electrical loads are added to the engine. The Powertrain Control Module (PCM) responds to changes in the engine idle speed due to changes in the engine load condition by electrically regulating the Idle Air Control (IAC) solenoid valve. The IAC valve is combined with the Bypass Air (BPA) control valve as a combination assembly on all engines except the 1.8L, where it is a separate unit. The IAC valve must be replaced as an assembly with the BPA control valve on all engines except the 1.8L, where it can be replaced separately. A dashpot on the throttle body of the 1.6L and 1.8L engines mechanically slows the action of a rapidly closing throttle in order to eliminate erratic vehicle response to the throttle.

Description and Operation

High Speed Inlet Air (HSIA) Control

A unique High Speed Inlet Air (HSIA) performance control system is used only on the 1.8L engine as a means of improving the engine performance above 5000 rpm. It employs a dual port intake manifold in which the high-speed ports are opened by shutter valves and a shutter valve actuator, controlled by the HSIA solenoid, the vacuum reservoir, and the Powertrain Control Module (PCM). Below 5000 rpm the solenoid is energized, its air vent is closed, and vacuum to keep the shutter valve closed is maintained by the vacuum reservoir and the one-way check valve. Above 5000 rpm the solenoid is de-energized by the PCM, and the vacuum holding the shutters closed is vented, allowing the spring-loaded actuator to pull the shutter valves open.

Variable Resonance Induction System (VRIS) Control

A unique Variable Resonance Induction System (VRIS) is used on the 2.5L engine as a means of improving the engine performance. The Powertrain Control Module (PCM) controls the shutter valves using two VRIS solenoids. The PCM receives information from Crankshaft Position (CKP) sensors and regulates the shutter valves to maximize engine torque.

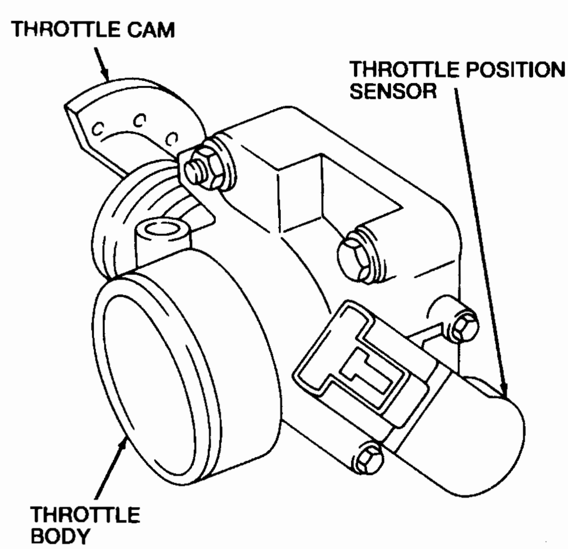
Description and Operation	All Engines	TB

Throttle Body

The Throttle Body (TB) controls the amount of air that flows into the engine through a single butterfly valve. The single butterfly valve opening is determined by the accelerator pedal position. The throttle body is cast with an air bypass channel and houses several emission related components for the Powertrain Control Module (PCM). Refer to illustrations on the following pages.

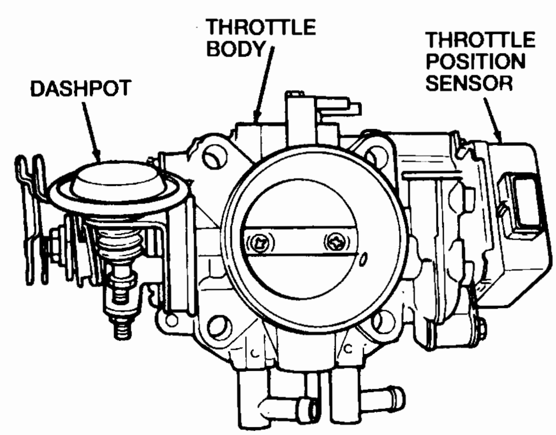
A dashpot is attached to the throttle body on 1.6L and 1.8L engines. The dashpot allows the throttle plate to gradually close during deceleration. This action prevents hesitation during the transition from deceleration to sudden acceleration and prevents engine stalling on sudden deceleration.

1.3L



A20218-B

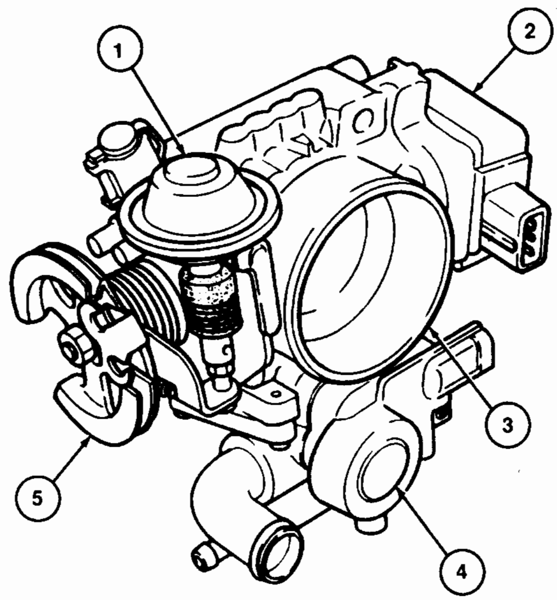
1.6L



A13870-C

Description and Operation	All Engines	TB

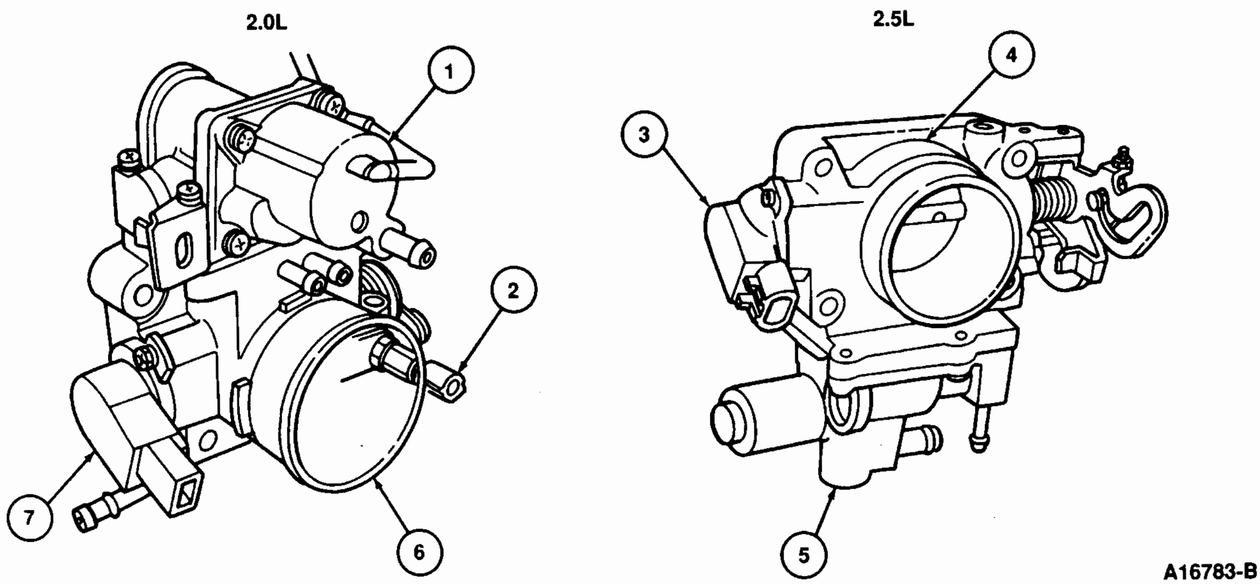
1.8L



A20219-A

Item	Description
1	Dashpot
2	Throttle Position (TP) Sensor
3	Throttle Body
4	Idle Air Control (IAC) Valve
5	Throttle Cam

Description and Operation	All Engines	TB



Item	Description
1	IAC BPA Valve
2	Idle Switch (CD4E Only)
3	Throttle Position (TP) Sensor
4	Throttle Body
5	IAC BPA Valve
6	Throttle Body
7	Throttle Position (TP) Sensor

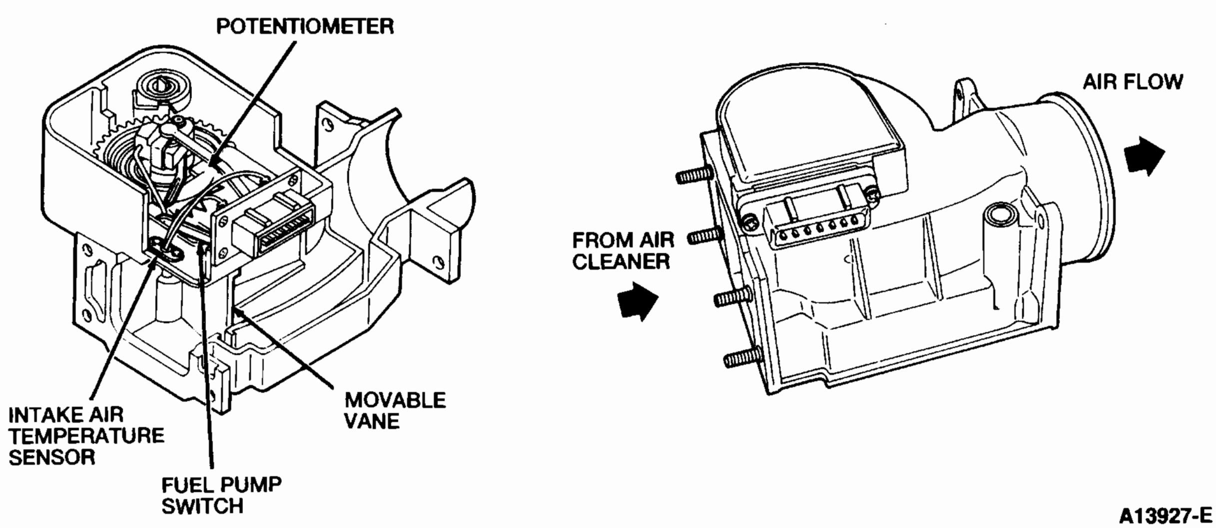
Engine	Location
1.3L, 1.6L	Mounted to the top of the intake manifold.
1.8L, 2.0L, 2.5L	Mounted to the LH side of the intake manifold.

Description and Operation	1.6L, 1.8L	VAF Meter

Volume Air Flow (VAF) Meter

The Volume Air Flow (VAF) meter measures air flowing into the engine and is mounted between the air cleaner and the throttle body assembly. The VAF meter contains a movable vane which connects to a potentiometer. As air flows through the VAF meter, the movable vane and potentiometer change position and provide an input to the Powertrain Control Module (PCM) with vane position information. The PCM can then translate vane position information into the volume of air flowing into the engine.

Inside the VAF meter is an Intake Air Temperature (IAT) sensor which monitors and relays inlet air temperature to the PCM and a fuel pump switch which provides a ground for the fuel pump circuit after the engine has started.



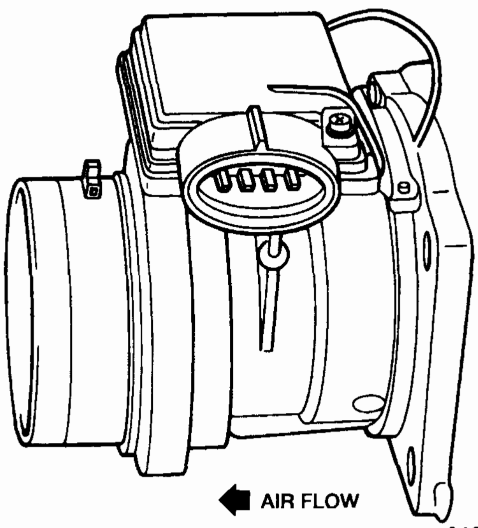
Engine	Location
1.6L, 1.8L	Mounted to the air cleaner and the throttle body.

Description and Operation	1.3L, 2.0L	MAF Sensor

Mass Air Flow (MAF) Sensor

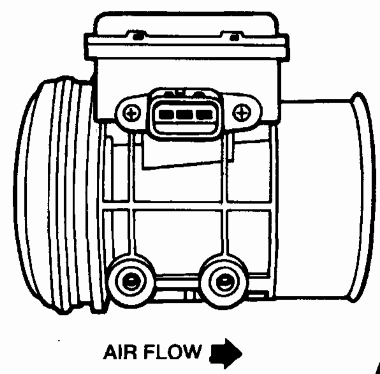
The Mass Air Flow (MAF) sensor measures the amount of airflow passing into the throttle body. The internal element detects the amount of air and notifies the Powertrain Control Module (PCM) with a varying voltage input signal. This input signal helps determine injector pulse width.

2.0L



A16843-D

1.3L



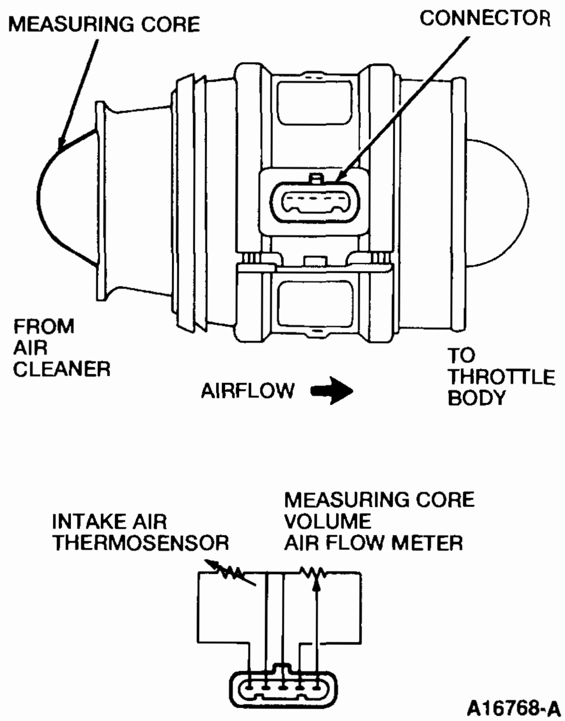
A16767-B

Engine	Location
1.3L, 2.0L	Located between the air cleaning element and the throttle body.

Description and Operation	2.5L	MC-VAF Meter

Measuring Core-Volume Air Flow (MC-VAF) Meter

When air is passed through the Measuring Core-Volume Air Flow (MC-VAF) meter, the measuring core moves parallel to the direction of the airflow. The movement changes the resistance on a potentiometer and sends this signal to the Powertrain Control Module (PCM).



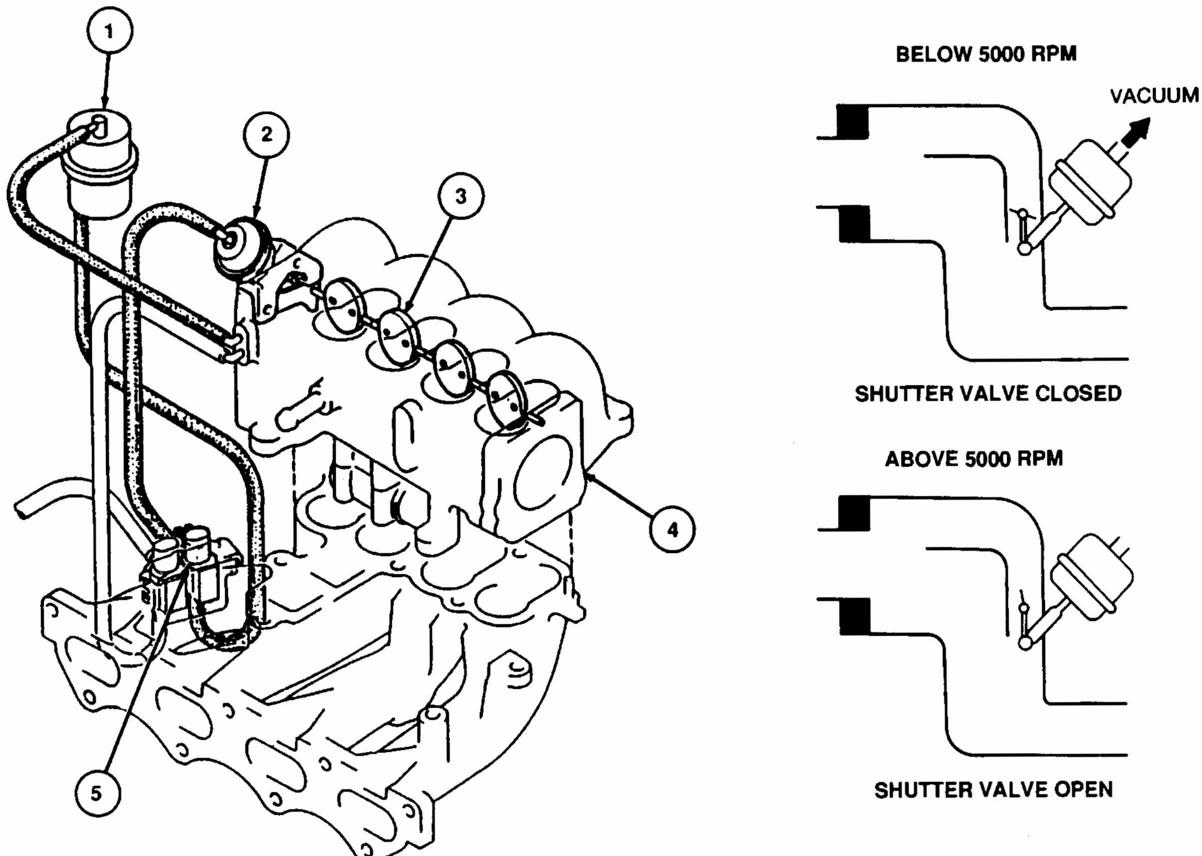
A16768-A

Engine	Location
2.5L	Located between the air cleaning element and the throttle body.

Description and Operation	1.8L	Shutter Valve

Shutter Valve

The shutter valve, located in the intake manifold, opens and closes an intake path in the intake manifold which increases the length of the intake runner when opened and shortens the runner when closed. This action improves torque characteristics at low and high engine rpm. A High Speed Inlet Air (HSIA) solenoid is used to control the vacuum to the shutter valve actuator as signaled by the Powertrain Control Module (PCM). A vacuum reservoir is used to store needed vacuum which otherwise would not be available during wide-open throttle and other low vacuum engine operating modes.



A13868-C

Item	Description
1	Vacuum Reservoir
2	Shutter Valve Actuator
3	Shutter Valve
4	Intake Manifold
5	HSIA Solenoid

Engine	Location
1.8L	In the intake manifold.

Description and Operation	1.8L, 2.5L	Vacuum Reservoir

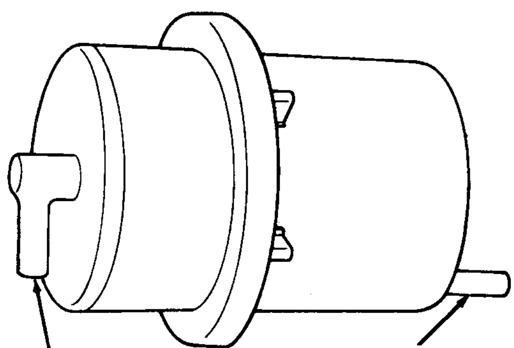
Vacuum Reservoir

Vacuum reservoirs are used to ensure constant vacuum supply to vacuum operated devices during wide-open throttle operation and other low vacuum situations.

On 1.8L engines, the vacuum reservoir maintains vacuum for the High Speed Inlet Air (HSIA) system.

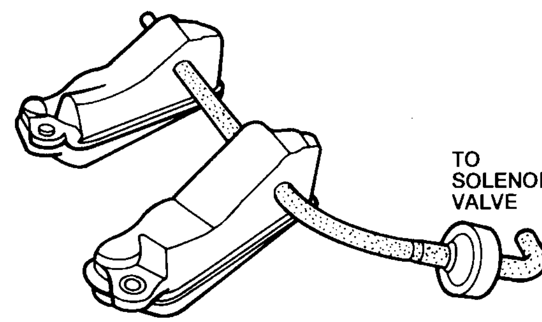
On 2.5L engines, the vacuum reservoirs maintain vacuum for the Variable Resonance Induction System (VRIS).

1.8L



A13926-C

2.5L



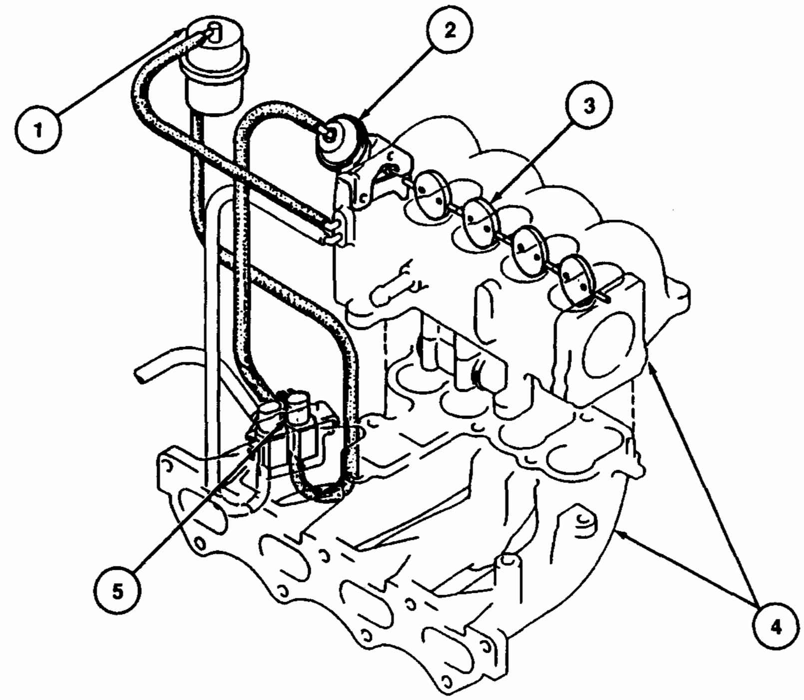
A16453-A

Engine	Location
1.8L	On RH side of intake manifold.
2.5L	Under the intake manifold.

Description and Operation	1.8L	HSIA Solenoid

High Speed Inlet Air (HSIA) Solenoid

The High Speed Inlet Air (HSIA) solenoid controls the vacuum applied to the shutter valve actuator. The HSIA solenoid applies vacuum to the shutter valve at low rpm which holds the shutter valve closed, and vents the shutter valve actuator vacuum to atmosphere above 5000 rpm to allow the shutter valve to open. The HSIA solenoid is controlled by an output signal from the Powertrain Control Module (PCM).



A13855-E

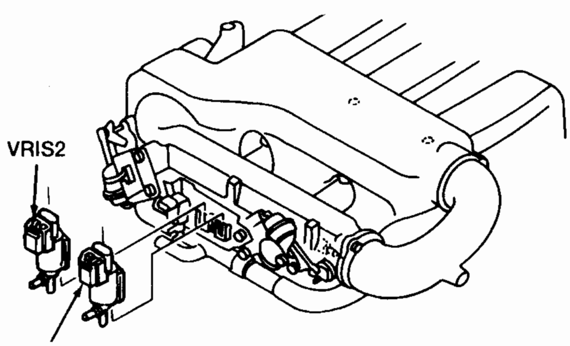
Item	Description
1	Vacuum Reservoir
2	Shutter Valve Actuator
3	Shutter Valve
4	Intake Manifold
5	HSIA Solenoid

Engine	Location
1.8L	Mounted to intake manifold.

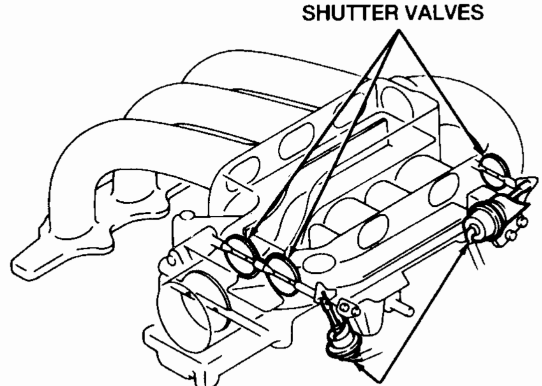
Description and Operation	2.5L	VRIS

Variable Resonance Induction System Solenoids # 1 (VRIS1) and # 2 (VRIS2)

The Variable Resonance Induction System Solenoids # 1 (VRIS1) and # 2 (VRIS2) are operated by output signals from the Powertrain Control Module (PCM). When the solenoids are activated, they allow vacuum to be applied to the shutter valve actuators. The shutter valve actuators then manipulate the shutter valves inside the intake manifold. This process improves charging efficiency and torque characteristics.



A16757-B



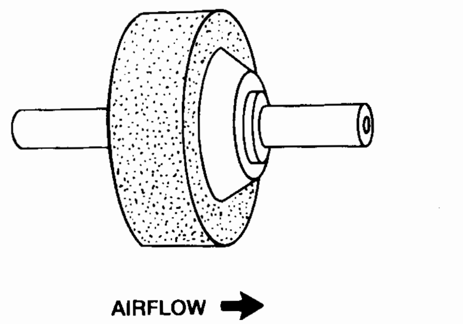
A17091-A

Engine	Location
2.5L	Mounted to the back of the intake manifold near the top.

Description and Operation

One-Way Check Valve

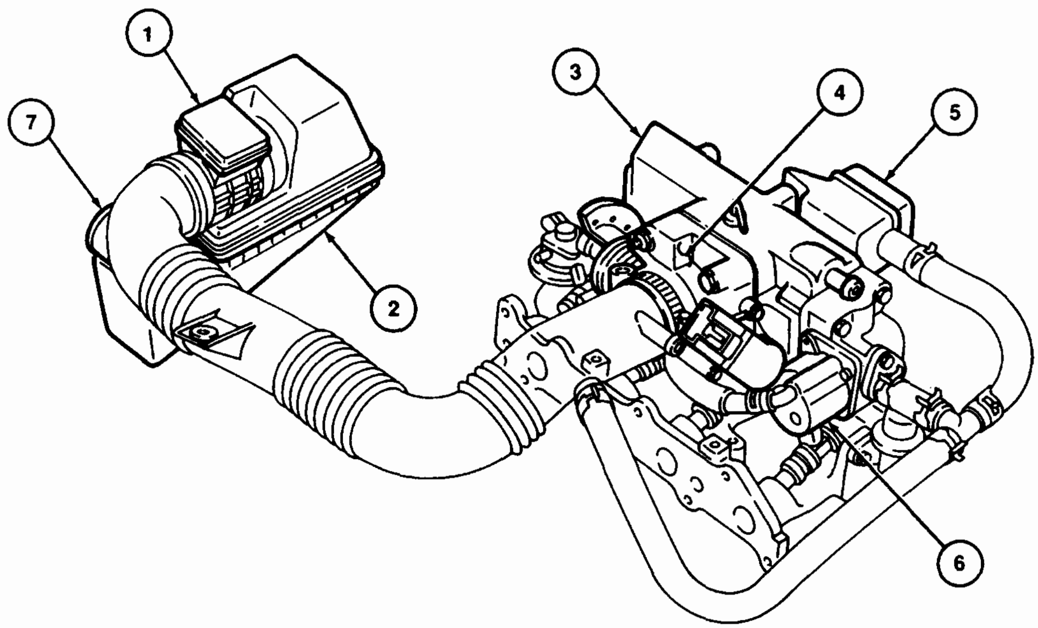
The one-way check valve prevents the Variable Resonance Induction System (VRIS) shutter valves from becoming inoperative during heavy load applications. The check valve keeps the supply from the vacuum reservoirs constant for proper operation. The check valve allows flow in one direction but will not permit passage in the opposite direction.



Engine	Location
2.5L	Located beneath the intake manifold, next to the vacuum reservoirs.

Description and Operation

1.3L Component Location — Air Intake System and Throttle Body

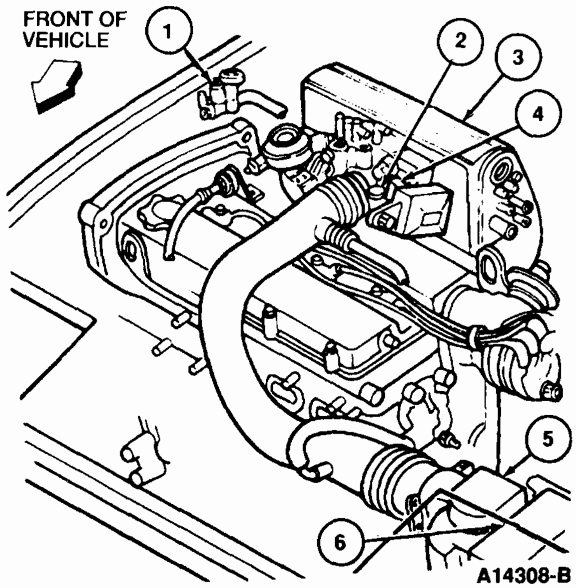


A20222-A

Item	Description
1	Mass Air Flow (MAF) Sensor
2	Air Cleaner
3	Intake Manifold
4	Throttle Body
5	Resonance Chamber
6	Idle Air Control Bypass Air (IAC BPA) Valve
7	Air Inlet Duct

Description and Operation

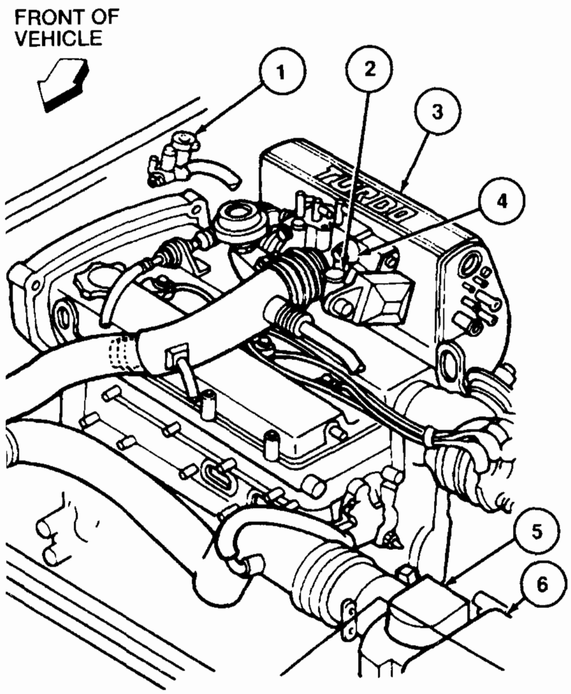
1.6L Non-Turbo Component Location — Air Intake System and Throttle Body



Item	Description
1	Idle Air Control Bypass Air (IAC BPA) Valve
2	Idle Air Adjustment Screw
3	Intake Manifold
4	Throttle Body
5	Volume Air Flow (VAF) Meter
6	Air Cleaner

Description and Operation

1.6L Turbo Component Location — Air Intake System and Throttle Body

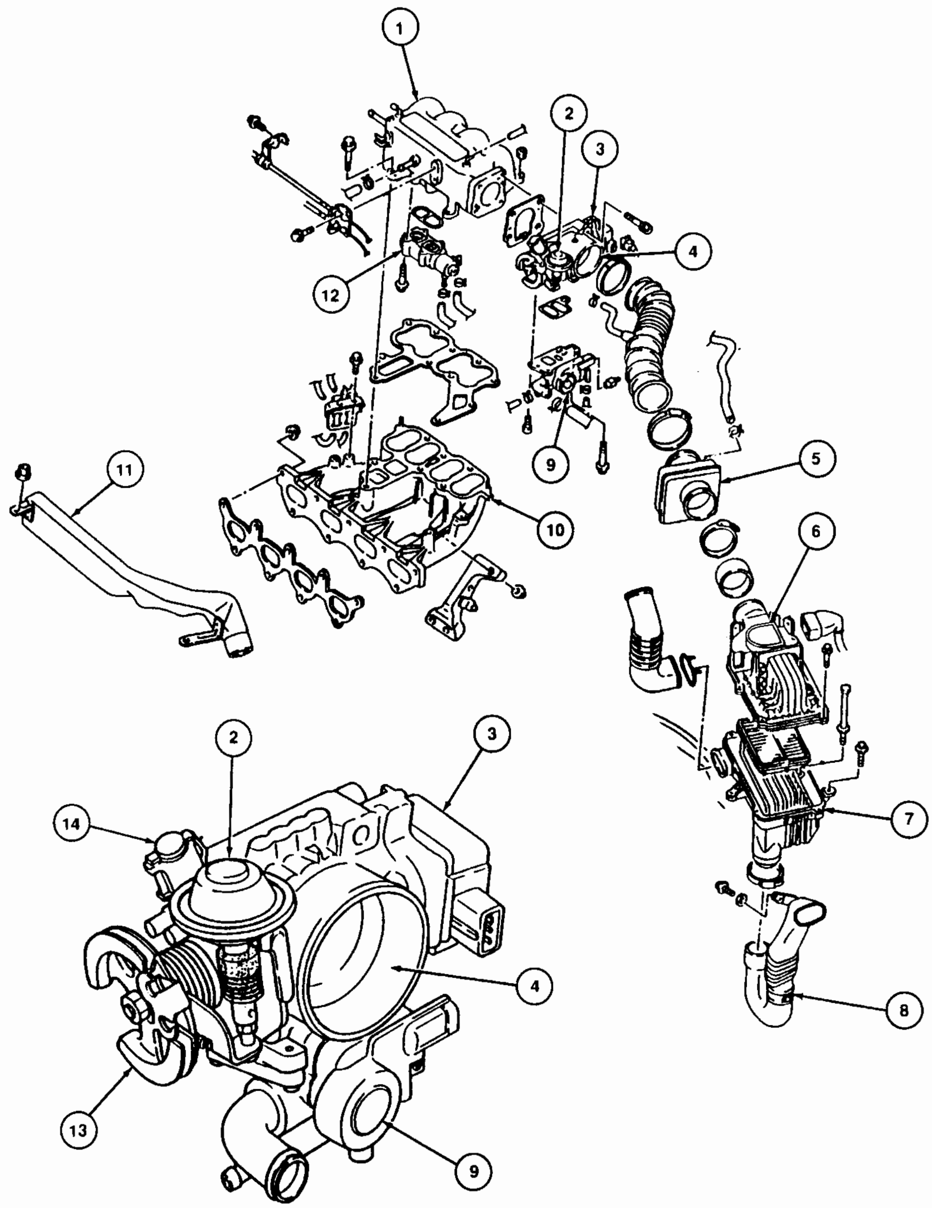


A14307-B

Item	Description
1	Idle Air Control Bypass Air (IAC BPA) Valve
2	Idle Air Adjustment Screw
3	Intake Manifold
4	Throttle Body
5	Volume Air Flow (VAF) Meter
6	Air Cleaner

Description and Operation

1.8L Component Location — Air Intake System and Throttle Body



Item	Description
1	Intake Manifold
2	Dashpot
3	Throttle Position (TP) Sensor

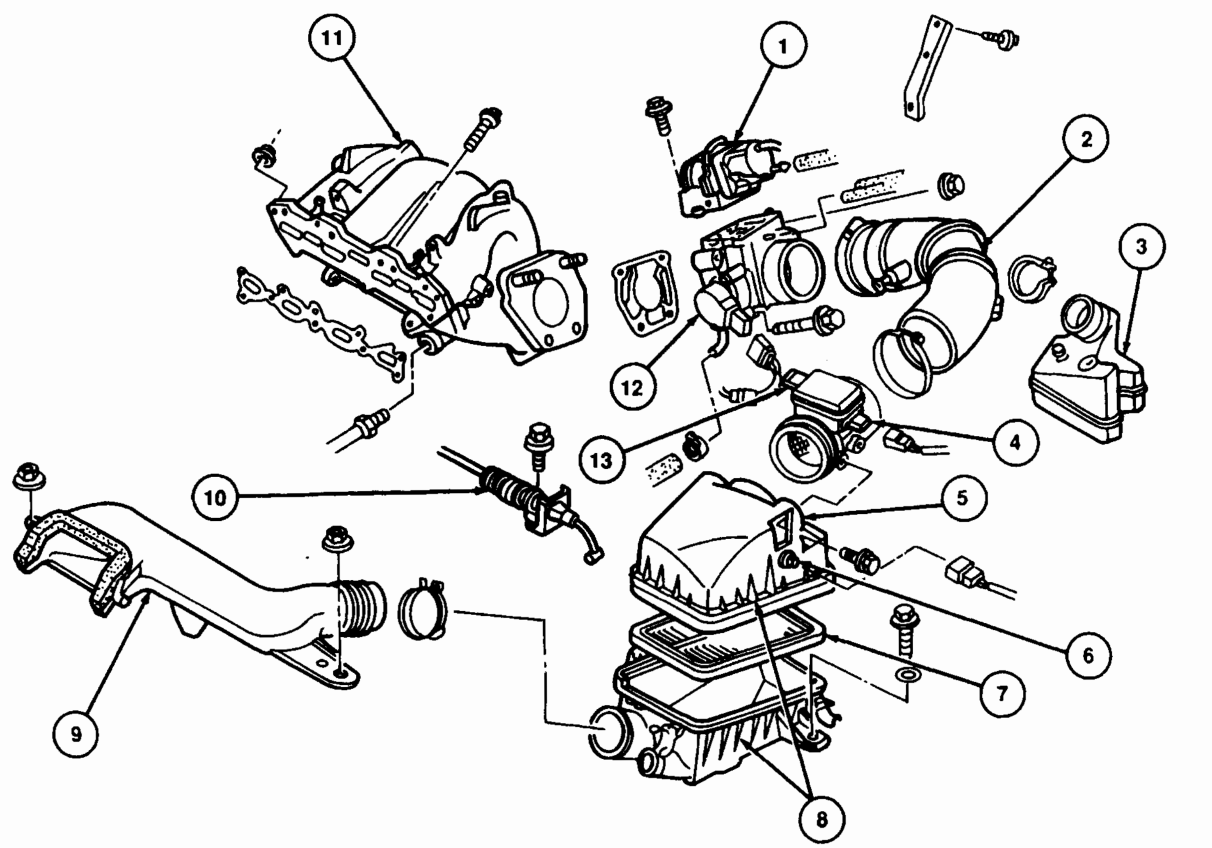
(Continued)

Description and Operation

Item	Description
4	Throttle Body
5	Resonance Chamber
6	Volume Air Flow (VAF) Meter
7	Air Cleaner
8	Inlet Air Duct
9	Idle Air Control (IAC) Valve
10	Intake Manifold
11	Resonance Chamber
12	Bypass Air (BPA) Valve
13	Throttle Lever
14	Idle Air Adjustment Screw

Description and Operation

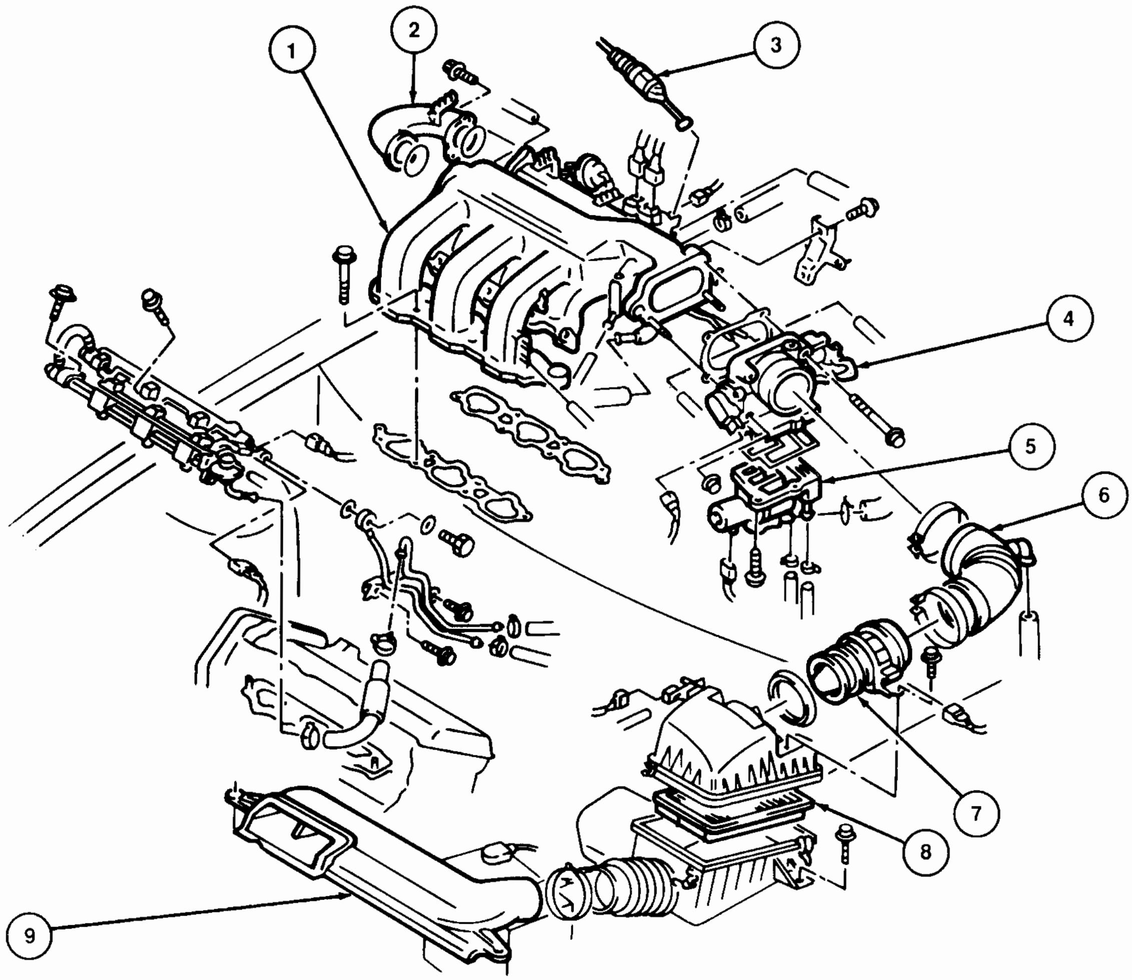
2.0L Component Location — Air Intake System and Throttle Body



Item	Description
1	IAC BPA Assembly
2	Air Intake Hose
3	Resonance Chamber
4	Mass Air Flow (MAF) Sensor (ATX)
5	Intake Air Temperature (IAT) Sensor (MTX)
6	Intake Air Temperature (IAT) Sensor (ATX)
7	Air Cleaner Element
8	Air Cleaner
9	Inlet Air Duct
10	Accelerator Cable
11	Intake Manifold
12	Throttle Body
13	Mass Air Flow (MAF) Sensor (MTX)

Description and Operation

2.5L Component Location — Air Intake System and Throttle Body



Item	Description
1	Intake Manifold
2	Intake Air Pipe
3	Accelerator Cable
4	Throttle Body
5	IAC BPA Assembly
6	Air Intake Hose
7	Measuring Core-Volume Air Flow (MC-VAF) Sensor
8	Air Cleaner
9	Inlet Air Duct and Resonance Chamber

Diagnosis and Testing

Air Intake System

System Inspection

1. Visually inspect the components of the Air Intake System.

VISUAL INSPECTION CHART

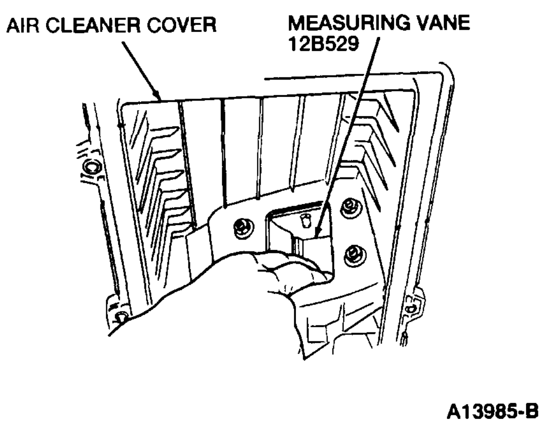
Mechanical	Electrical
● Loose, kinked, pinched, or damaged air lines ● Loose, kinked, pinched, or damaged vacuum lines	● Damaged or loose connections ● Damaged insulation ● Damaged airflow meter

2. Check the air intake hoses for cracking, loose clamps or a disconnected hose.

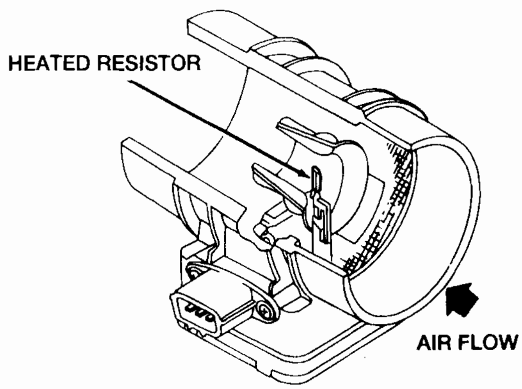
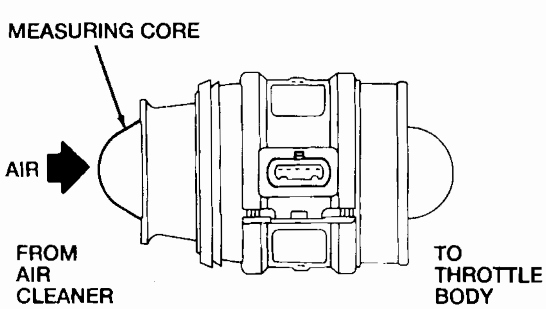
3. If all checks are OK, proceed to the Pinpoint Tests.

Diagnosis and Testing	All Engines	IA

Pinpoint Tests — IA

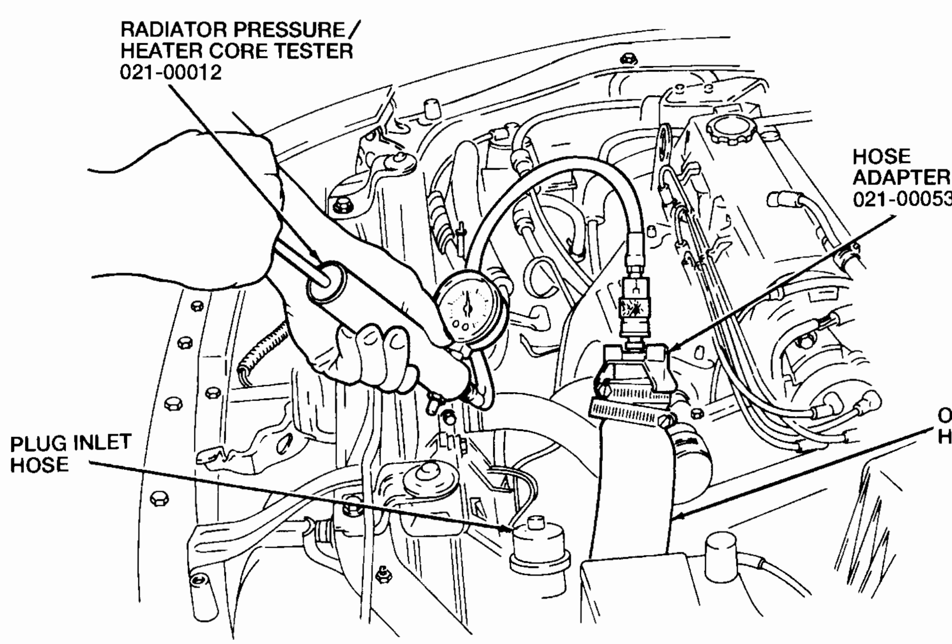
	TEST STEP	RESULT ▶	ACTION TO TAKE
IA1	CHECK AIR CLEANER HOUSING AND ELEMENT CONDITION		
	• Inspect the air cleaner housing, inlet air hoses and connecting components for damage, blockage, looseness, or missing fasteners. • Inspect air cleaner element for dirt. • **Are the air cleaner housing and element free of damage and dirt blockage?** **CAUTION: Do not use compressed air to clean the air cleaner element.**	Yes (1.6L and 1.8L) ▶ Yes (1.3L and 2.0L) ▶ Yes (2.5L) ▶ No ▶	GO to IA2. GO to IA3. GO to IA4. REPLACE the component in question.
IA2	CHECK VOLUME AIR FLOW (VAF) METER FUNCTION (1.6L AND 1.8L ONLY)		
	• Visually check the Volume Air Flow (VAF) meter for cracks, loose mounting and damage to the electrical connector or the sealed plastic cover. • Remove the VAF meter and inspect the bottom plate for cracks or loose fasteners. • Verify that the measuring vane moves smoothly, and the vane springs shut when pushed forward and then released.  • **Is the VAF meter free of cracks, damage, restrictions, and measuring vane binding?** NOTE: Electronic component troubleshooting is covered in the Pinpoint Tests; Section 6B, of this manual.	Yes ▶ No ▶	GO to IA5. REPLACE the Volume Air Flow (VAF) meter.

Diagnosis and Testing	**All Engines**	**IA**

TEST STEP		RESULT ▶	ACTION TO TAKE
IA3	CHECK MASS AIR FLOW (MAF) SENSOR (1.3L AND 2.0L ONLY)		
	• Visually check the Mass Air Flow (MAF) sensor for cracks, loose mounting, damaged electrical connector, broken or contaminated heated resistor, and torn or restricted protective screen.  A16445-A • **Is the MAF sensor free of damage or restrictions?** NOTE: Electronic component troubleshooting is covered in the Pinpoint Tests, Section 6B of this manual.	Yes ▶ No ▶	GO to IA5. REPLACE the Mass Air Flow (MAF) sensor.
IA4	CHECK MEASURING CORE-VOLUME AIR FLOW (MC-VAF) SENSOR (2.5L ONLY)		
	• Visually check Measuring Core-Volume Air Flow (MC-VAF) sensor for cracks, loose mounting, or damaged electrical connector. • Verify that measuring core opens easily.  A16446-A • **Is the MC-VAF free of damage, and does the core open easily?**	Yes ▶ No ▶	GO to IA5. REPLACE the Measuring Core-Volume Air Flow (MC-VAF) sensor.

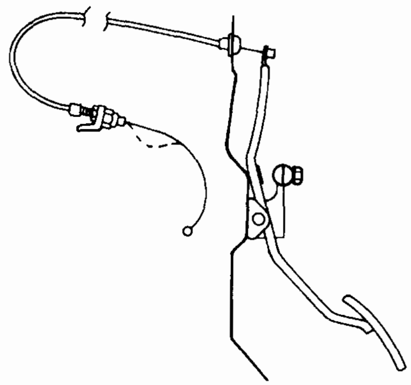
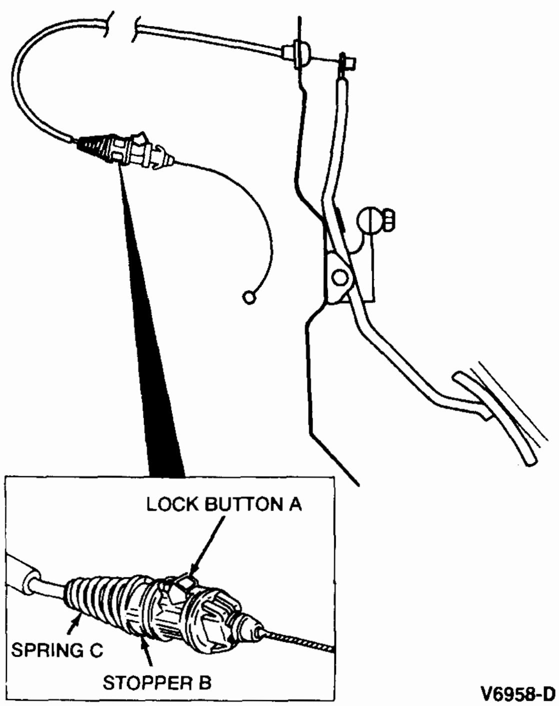
Diagnosis and Testing	All Engines	IA

TEST STEP		RESULT ▶	ACTION TO TAKE
IA5	CHECK RESONANCE CHAMBER(S) CONDITION		
	• Visually check resonance chamber(s) for a pinched hose connection, or for cracks that allow unfiltered air and moisture to enter the system. • Check resonance chamber(s) for other damage. • **Is the resonance chamber(s) free of damage or poor connections?**	Yes (1.6L Turbo) ▶ Yes (All others) ▶ No ▶	GO to IA6. GO to IA7. SERVICE or REPLACE the resonance chamber(s).
IA6	CHECK CHARGE AIR COOLER CONDITION AND LEAKAGE (1.6L TURBO ONLY)		
	• Visually inspect the charge air cooler for cracks, corrosion, restrictions, or other damage. • Disconnect the charge air cooler inlet and outlet hoses, plug the inlet hose, and seal securely. • Connect Rotunda Radiator Pressure / Heater Core Tester 021-00012 and Rotunda Cooling System Adapter 021-00053 or equivalents to the charge air cooler outlet. • Apply 82.7-103.4 kPa (12 to 15 psi) of pressure. • **Does the charge air cooler maintain pressure?**	Yes ▶ No ▶	GO to IA7. LOCATE and REPAIR the leak or REPLACE the charge air cooler.



A13987-B

Diagnosis and Testing	All Engines	IA

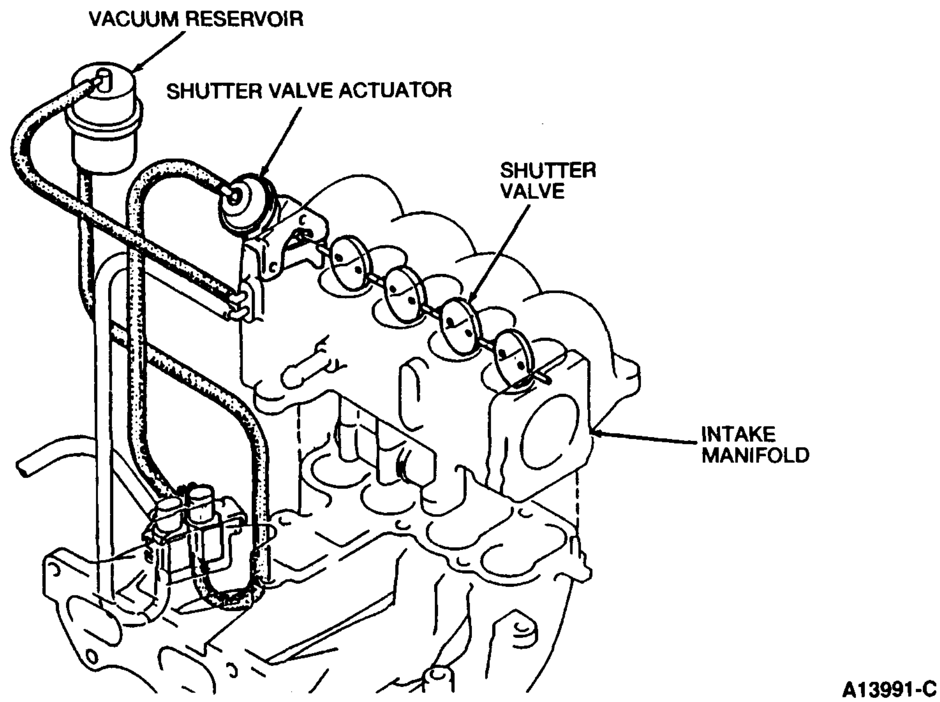
TEST STEP	RESULT ▶	ACTION TO TAKE
IA7 CHECK THROTTLE LINKAGE		
• Check the throttle linkage for damage, proper installation, and freedom of movement when accelerator pedal is depressed.	Yes ▶	GO to $\boxed{IA8}$.
	No ▶	SERVICE, CLEAN or REPLACE the linkage or part in question. REFER to the appropriate Service Manual, Section 10-02.
1.3L, 1.6L and 1.8L  A13988-C		
2.0L and 2.5L  V6958-D		
• **Is the linkage correctly installed, and does it operate properly?**		

Diagnosis and Testing	All Engines	IA

TEST STEP		RESULT ▶	ACTION TO TAKE
IA8	CHECK THROTTLE BODY CONDITION		
	• Remove the air intake hose and check for oil sludging or oil vapors in the throttle body. • Reconnect the air intake hose. • Check throttle body and components for cracks, looseness, or other damage. • Without removing throttle body from engine, check the integrity of vacuum and electrical lines for looseness, pinching, misrouting, corrosion, or other obvious damage. • Check the throttle lever for freedom of movement. • **Are the throttle body and attachments OK?** NOTE: Electronic component troubleshooting is covered in the Pinpoint Tests, Section 6B, of this manual.	Yes ▶ No ▶	GO to IA9. SERVICE or REPLACE the throttle body and / or related components as required.
IA9	CHECK THROTTLE VALVE(S)		
	• Remove the throttle body from the engine. • Check that the throttle valve(s) moves smoothly from the fully closed to the fully open position. • Check for loose, bent, or damaged valves, and for contamination that can cause binding. NOTE: Refer to illustrations after these Pinpoint Test Steps. **CAUTION: Do not remove the thin sealant coating from the throttle bore.** • **Is the throttle valve free from damage, binding, and contamination?**	Yes (1.3L, 1.6L and 2.0L) ▶ Yes (1.8L) ▶ Yes (2.5L) ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. GO to IA10. GO to IA13. SERVICE or REPLACE the throttle body.

Diagnosis and Testing	1.8L	IA

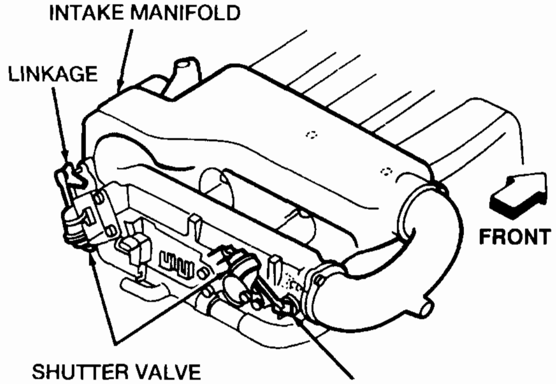
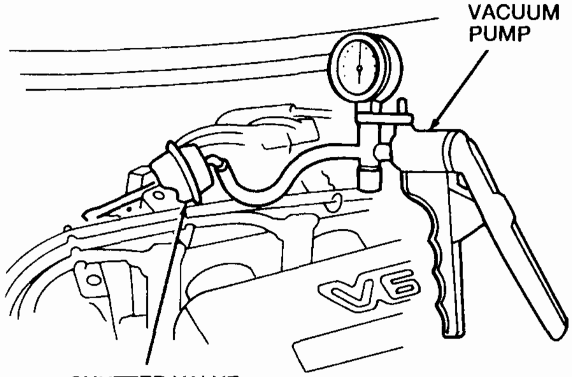
TEST STEP		RESULT ▶	ACTION TO TAKE
IA10	CHECK SHUTTER VALVE FUNCTION (1.8L ONLY)		
	● Disconnect the shutter valve actuator linkage from the shutter valve. ● Check that the shutter valve moves smoothly from a fully closed position to a fully open position. ● **Is the shutter valve assembly free of binding or damage?**	Yes ▶ No ▶	GO to IA11. REPLACE the shutter valve assembly.
IA11	CHECK SHUTTER VALVE VACUUM RESERVOIR LEAKAGE (1.8L ONLY)		
	● Remove the shutter valve vacuum reservoir from the engine. ● Plug or cap the nipple leading to the intake manifold. ● Connect Rotunda Vacuum Tester 021-00037 or equivalent to the nipple leading to the High Speed Inlet Air (HSIA) control solenoid. Apply 508 mm-Hg (20 in-Hg) of vacuum to the reservoir. ● Verify whether the reservoir and its check valve hold vacuum. ● **Does the vacuum reservoir and the check valve hold vacuum?**	Yes ▶ No ▶	GO to IA12. REPLACE the vacuum reservoir.



Diagnosis and Testing	1.8L	IA

TEST STEP		RESULT ▶	ACTION TO TAKE
IA12	CHECK HIGH SPEED INLET AIR (HSIA) CONTROL SOLENOID FUNCTION (1.8L ONLY)		
	• Connect a Rotunda 88 Digital Multimeter 105-00053 or equivalent as a tachometer to measure the engine speed. • Run the engine until it is thoroughly warmed up. • Noting the position of the shutter valve lever and actuator, increase the engine speed to 5000 rpm. • **Does the shutter valve begin to open at approximately 5000 rpm?**	Yes ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. GO to Section 6B, Pinpoint Test $\boxed{\text{SCG}}$ which covers the High Speed Inlet Air (HSIA) control solenoid for further diagnosis and testing.

Diagnosis and Testing	2.5L	IA

TEST STEP		RESULT ▶	ACTION TO TAKE
IA13	CHECK VRIS SHUTTER VALVES (2.5L ONLY)		
	• Disconnect the shutter valve actuator linkages from the shutter valves. • Check that the shutter valves move smoothly from the fully closed to the fully open position.  • **Are the shutter valves free of binding or damage?**	Yes ▶ No ▶	GO to IA14. SERVICE or REPLACE the shutter valve assemblies.
IA14	CHECK VRIS SHUTTER VALVE ACTUATORS (2.5L ONLY)		
	• Disconnect the vacuum hoses from the shutter valve actuators. • Connect a Rotunda Vacuum Tester 021-00037 or equivalent to the actuators. • Apply vacuum and verify that the actuator linkages are drawn into the actuators.  • **Do the shutter valve actuators function properly?**	Yes ▶ No ▶	GO to IA15. REPLACE the shutter valve actuator in question.

Diagnosis and Testing	2.5L	IA

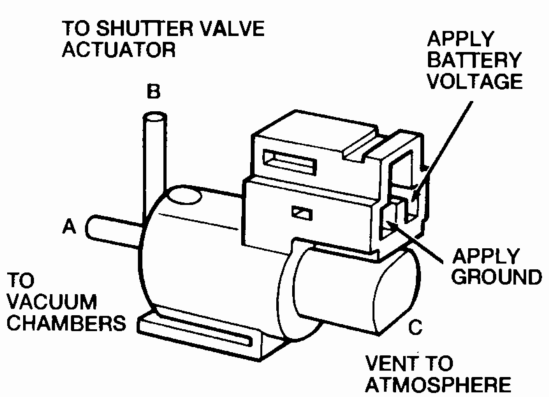
TEST STEP		RESULT ▶	ACTION TO TAKE
IA15	CHECK VRIS SOLENOID VALVES (2.5L ONLY)		

- Disconnect the solenoid valve vacuum and electrical lines.
- Verify air flow between ports as shown.

Port	Air flow
A - B	No
A - C	No
B - C	Yes

- Apply battery voltage and ground to the terminals of the VRIS solenoid as shown below.
- Verify air flow between ports as shown.

Port	Air flow
A - B	Yes
A - C	No
B - C	No

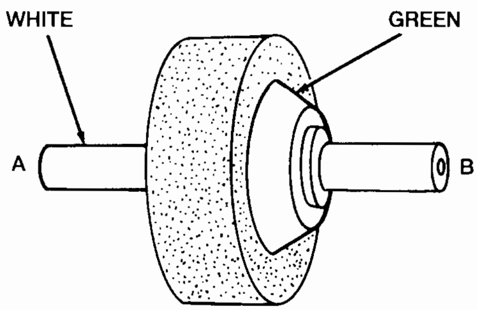
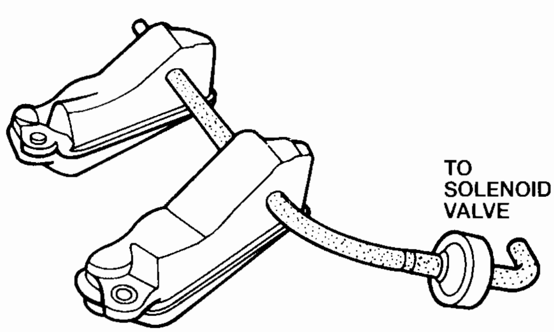


A16451-B

- **Do solenoid valves function properly?**

RESULT		ACTION TO TAKE
Yes	▶	GO to IA16.
No	▶	REPLACE the VRIS solenoid valve in question.

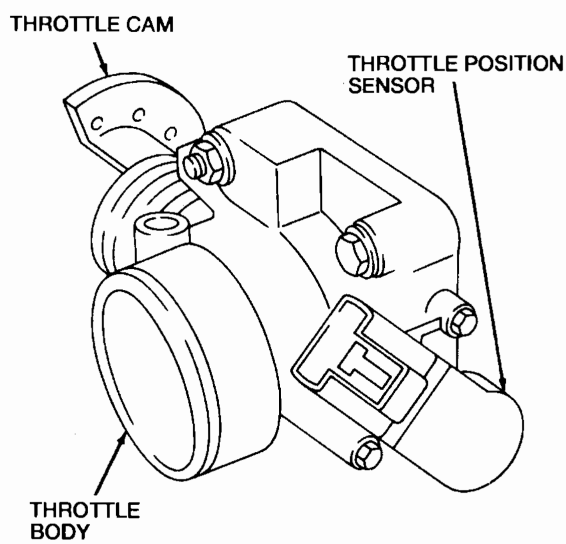
Diagnosis and Testing	2.5L	IA

TEST STEP		RESULT ▶	ACTION TO TAKE
IA16	CHECK ONE-WAY CHECK VALVE FUNCTION (2.5L ONLY)		
	• Disconnect and remove the check valve located under the intake manifold. Refer to Service Manual Section 03-12B. • Blow through port A and verify that air flows from port B. • Blow through port B and verify that air does not flow from port A.  A16452-A • **Does one-way check valve function properly?**	Yes ▶ No ▶	GO to IA17. REPLACE the one-way check valve.
IA17	CHECK VACUUM CHAMBERS (2.5L ONLY)		
	• Access the vacuum chambers located under the intake manifold. Refer to Service Manual Section 03-12B. • Visually check the vacuum chambers for cracks, blockage, or other damage.  A16453-A • **Are vacuum chambers OK?**	Yes ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. REPLACE the vacuum chamber(s).

Diagnosis and Testing	All Engines	IA

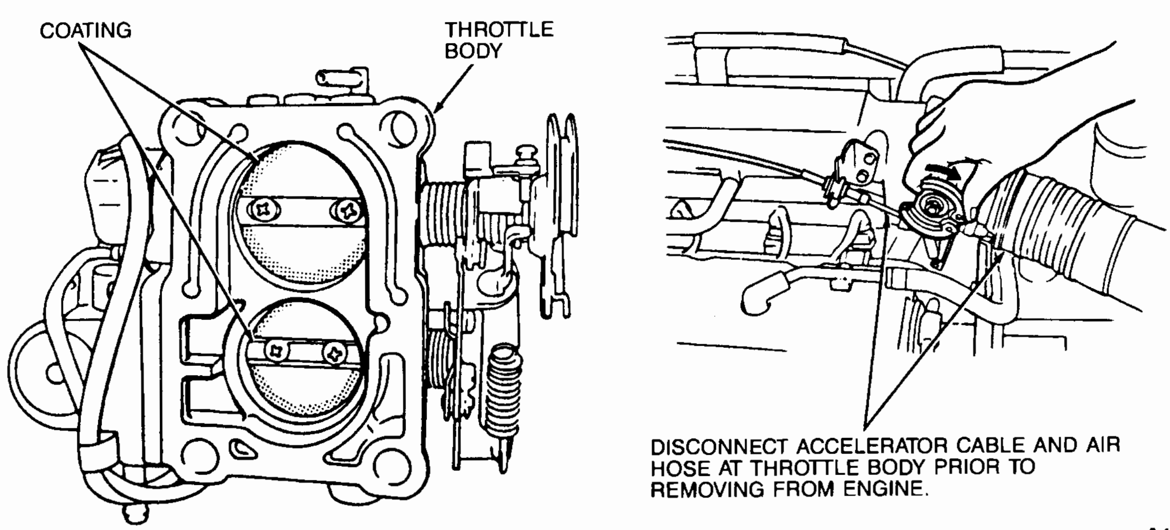
Throttle Valve Checking

1.3L



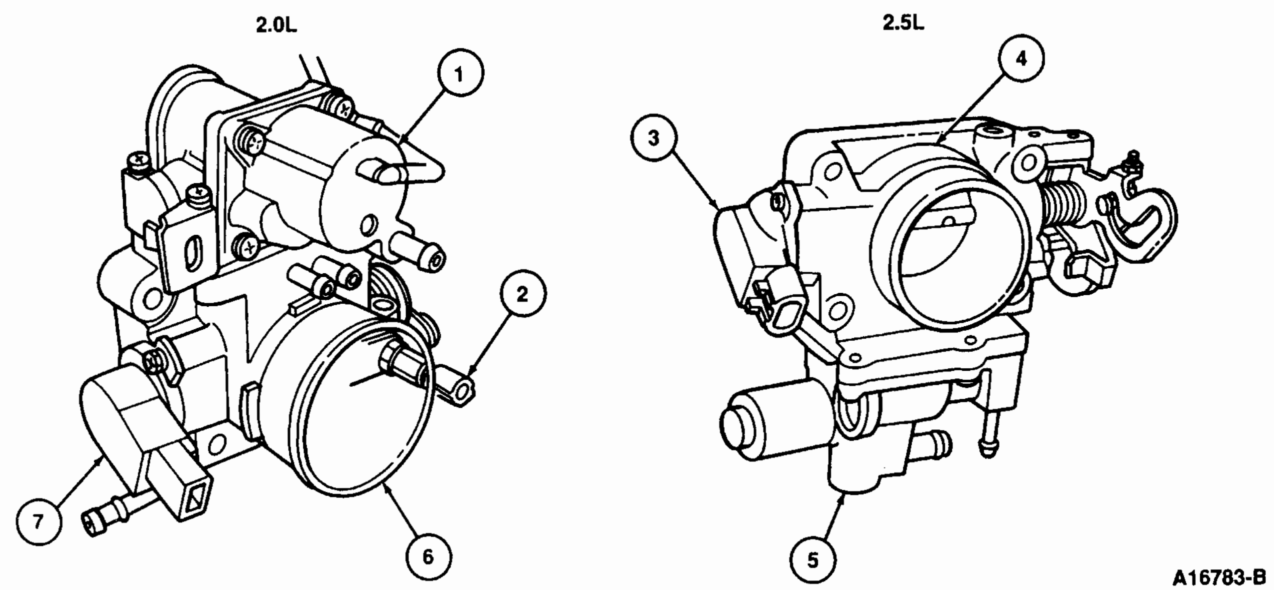
A20218-B

1.6L, 1.8L



A13990-B

Diagnosis and Testing	All Engines	IA



Item	Description
1	IAC BPA Valve
2	Idle Switch (CD4E Only)
3	Throttle Position (TP) Sensor
4	Throttle Body
5	IAC BPA Valve
6	Throttle Body
7	Throttle Position (TP) Sensor

Description and Operation

Bypass Air (BPA) Control System

The Bypass Air (BPA) control system maintains engine idle speed quality throughout the engine's operating modes by means of the BPA valve. The valve responds to changes in the engine coolant temperature only, and is not electrically controlled by the Powertrain Control Module (PCM). As the engine warms up, the thermowax expands, pushing the valve closed and reducing the bypass airflow amount. The bypass airflow is at its highest level during cold engine start. It declines steadily until reaching a coolant temperature of 60°C (140°F) for 1.6L, 2.0L and 2.5L engines and 40°-50°C (104°-122°F) for 1.3L and 1.8L engines, at which time the flow is completely cut off.

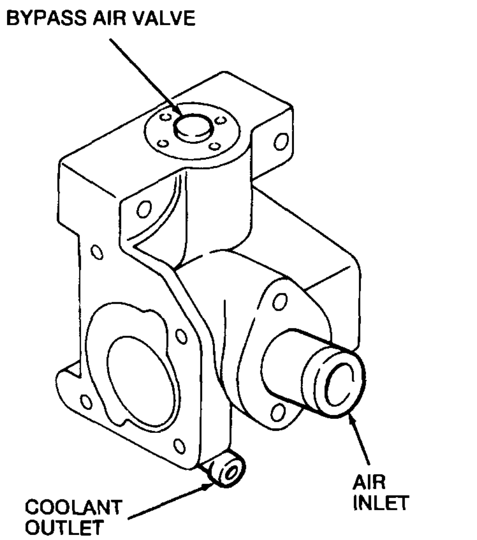
For further information regarding these systems and their relationship to other engine emission systems, refer to the appropriate schematic diagram in Engine Supplement — Car, Section 3B of this manual.

Description and Operation	All Engines	BPA Valve

Bypass Air (BPA) Valve

The Bypass Air (BPA) valve consists of a thermowax material that expands or contracts depending on the temperature of engine coolant that passes through the valve. When the engine is cold, the Bypass Air (BPA) valve supplies bypass air into the intake manifold to increase idle speed for improved cold engine running performance. During cold weather, the air increases in density, fuel intake increases, and more air is needed to balance the emissions. The BPA valve closes as coolant temperature increases. The BPA valve is one of the two components that make up the Idle Air Control Bypass Air (IAC BPA) valve on all engines except the 1.8L.

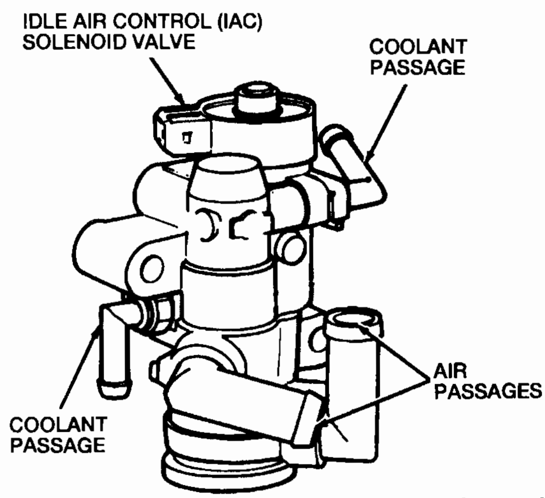
1.3L



A20220-A

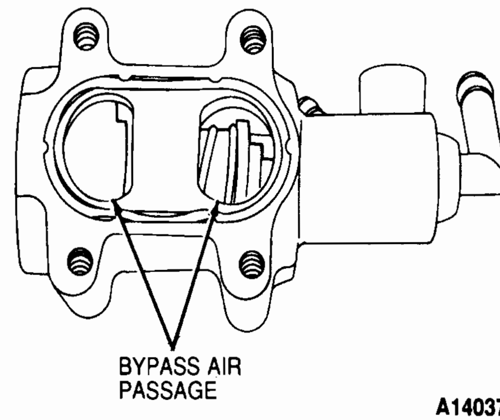
Description and Operation	All Engines	BPA Valve

1.6L



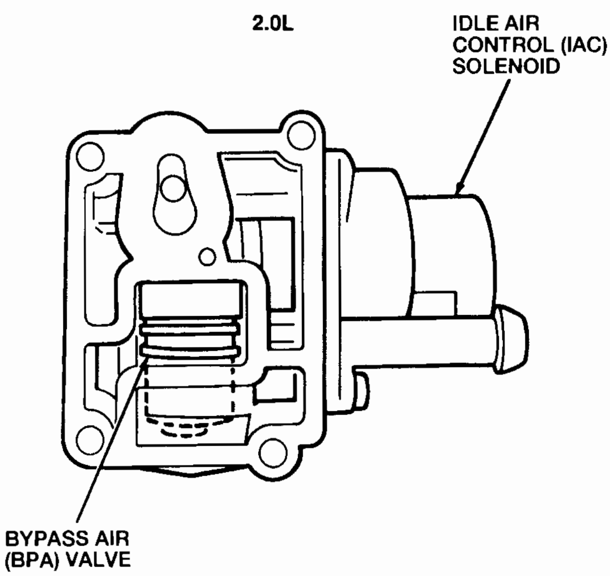
A20224-A

1.8L

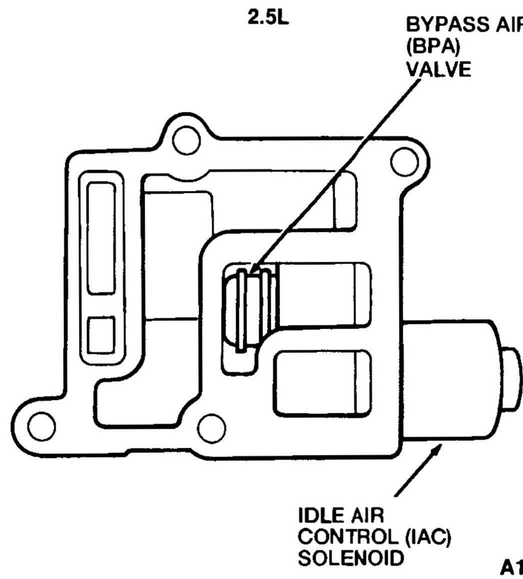


A14037-A

2.0L



2.5L



A16790-A

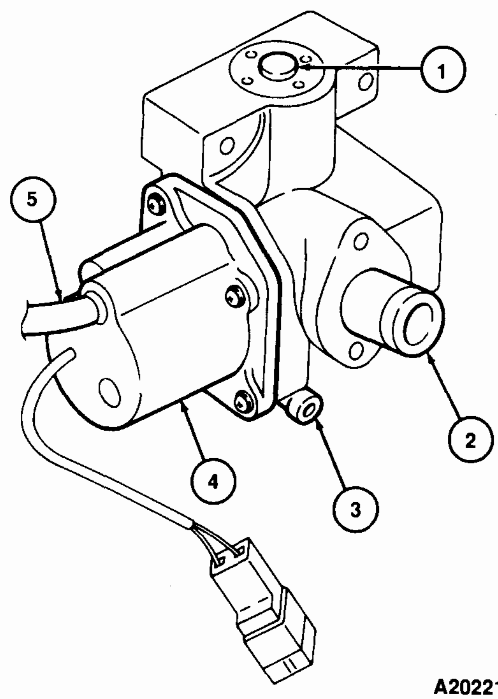
Engine	Location
1.3L	Mounted to LH side of intake manifold.
1.6L	Mounted to RH side of intake manifold.
1.8L	Mounted to intake manifold.
2.0L	Mounted to top of throttle body.
2.5L	Mounted to bottom of throttle body.

Description and Operation	1.3L, 1.6L, 2.0L, 2.5L	IAC BPA Valve

Idle Air Control Bypass Air (IAC BPA) Valve

The Idle Air Control Bypass Air (IAC BPA) valve allows bypass air to flow into the intake manifold during cold engine conditions. The IAC BPA valve is controlled by two components: the Bypass Air (BPA) valve and the IAC solenoid. The BPA valve consists of a thermowax material affected by coolant temperature. The IAC solenoid valve is controlled by an output signal from the Powertrain Control Module (PCM). When coolant temperature rises enough to close the BPA valve, the IAC solenoid controls the amount of bypass air.

1.3L

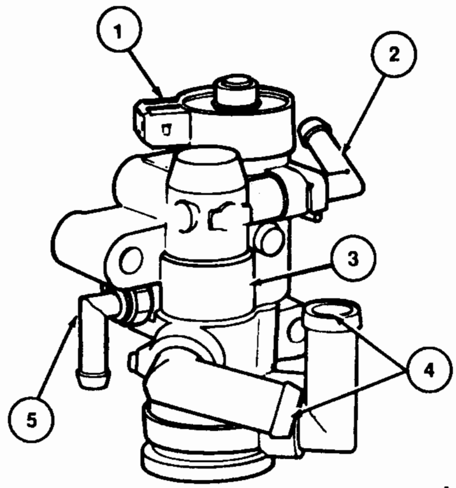


A20221-A

Item	Description
1	Bypass Air Valve
2	Air Inlet
3	Coolant Passage
4	Idle Air Control Valve
5	Coolant Inlet

Description and Operation	1.3L, 1.6L, 2.0L, 2.5L	IAC BPA Valve

1.6L



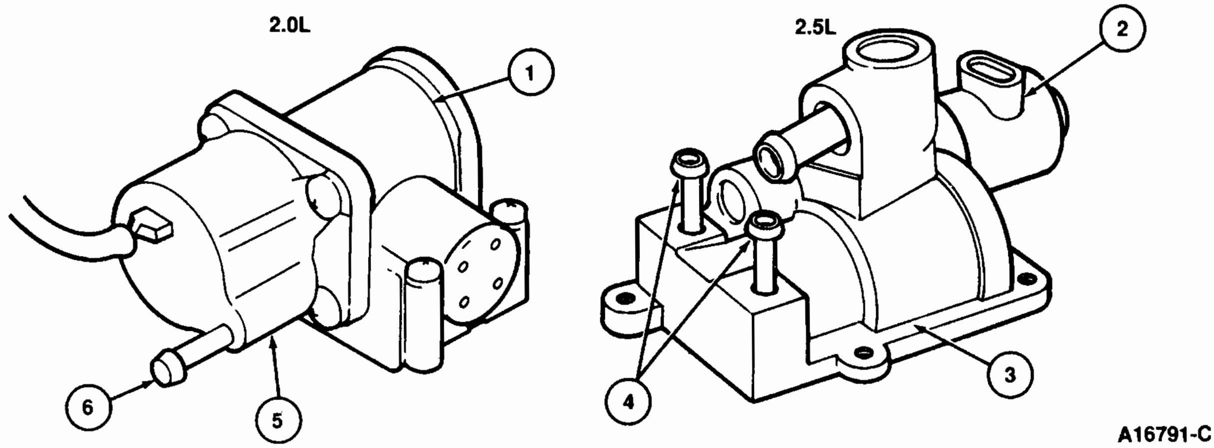
A13851-D

Item	Description
1	Idle Air Control (IAC) Solenoid Valve
2	Coolant Passage
3	Bypass Air (BPA) Valve
4	Air Passages
5	Coolant Passage

Description and Operation

1.3L, 1.6L, 2.0L, 2.5L

IAC BPA Valve



Item	Description
1	Idle Air Control Bypass Air (IAC BPA) Valve
2	IAC Solenoid
3	Idle Air Control Bypass Air (IAC BPA) Valve
4	Coolant Passages
5	IAC Solenoid
6	Coolant Passage

Engine	Location
1.3L	Mounted to the LH side of intake manifold.
1.6L	Mounted to the RH side of intake manifold.
2.0L	Mounted to the top of the throttle body.
2.5L	Mounted to the bottom of the throttle body.

Diagnosis and Testing	1.3L, 1.6L, 1.8L, 2.5L	IDL

Idle Speed Adjustment — 1.3L, 1.6L, 1.8L, 2.5L

TEST STEP		RESULT ▶	ACTION TO TAKE
IDL1	CHECK IDLE SPEED ADJUSTMENT		
	• Warm up the engine to normal operating temperature. • Engine off. • Place the selector lever in Park (ATX) or Neutral (MTX). • Turn all accessories to off. • Connect a Rotunda 88 Digital Multimeter 105-00053 or equivalent as a tachometer. • Ground the PCM STI (TEN) pin at the Data Link Connector on 1.3L, 1.8L, and 2.5L, or at the Self-Test Input (STI) connector on 1.6L. Refer to Connector Location Illustration at the end of Pinpoint Test Steps. • Start engine. • Note the idle speed. • Check the initial ignition timing using Rotunda Timing Analyzer 059-00014 or equivalent. Refer to Section 8B, Ignition Systems, for specifications. Adjust if necessary. • Adjust the idle speed adjustment screw for the correct idle speed (see General Specifications table in this section). Refer to Idle Speed Adjustment Screw Location Illustrations after Pinpoint Test Steps. • Turn the engine off, and allow to cool. • After the engine has cooled, restart and note idle speed. • **Does the engine speed up during warm-up when started cold?**	Yes ▶ No ▶	RETURN to Section 2B, Diagnostic Routines. GO to $\boxed{\text{BPA1}}$.

Diagnosis and Testing	2.0L	IDL

Idle Speed Adjustment — 2.0L

TEST STEP		RESULT ▶	ACTION TO TAKE
IDL1	CHECK IDLE SPEED ADJUSTMENT		
	• Activate the engine running self-test. Refer to Section 5A of this manual for the procedure. • After the Diagnostic Trouble Code (DTC) slow code output is completed, unlatch and within 4 seconds latch the HOLD / TEST button on the Super STAR II tester. • A single pulse code will sound / display on the Super STAR II tester to indicate the entry mode. • After the entry code, observe the self-test output (STO) of the Super STAR II tester, or the Malfunction Indicator Lamp (MIL), or "CHECK ENGINE" light. — A constant tone, MIL, or "STO LO" readout means base idle rpm is within specification. — A beeping tone, flashing MIL, or "STO LO" readout at 8 Hz indicates TP sensor is out of range due to over adjustment. Refer to Service Manual Section 03-14A. — A beeping tone, flashing MIL, or "STO LO" readout at 4 Hz indicates base idle rpm is too fast and needs adjustment. — A beeping tone, flashing MIL, or "STO LO" readout at 1 Hz indicates base idle rpm is too slow and needs adjustment. • Do not clean the throttle body. Turn the air trim screw counterclockwise to increase idle rpm and clockwise to decrease idle rpm (refer to the illustrations after the test steps). • To exit test, unlatch the HOLD / TEST button, then wait four seconds for reinitialization. • Turn the engine off, and allow to cool. • After the engine has cooled, restart it. • **Does the engine speed up during warm-up when started cold?**	Yes ▶ No ▶	RETURN to Section 2A, Diagnostic Routines. GO to BPA1.

Diagnosis and Testing	All Engines	BPA

Bypass Air (BPA) Control System

System Inspection

1. Visually inspect the Bypass Air (BPA) valve assembly and associated components.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Loose, leaking, pinching, kinked, or otherwise damaged coolant or air hoses and connections • Loose fasteners, hose clamps • White smoke from tail pipe	• Damaged or loose connections

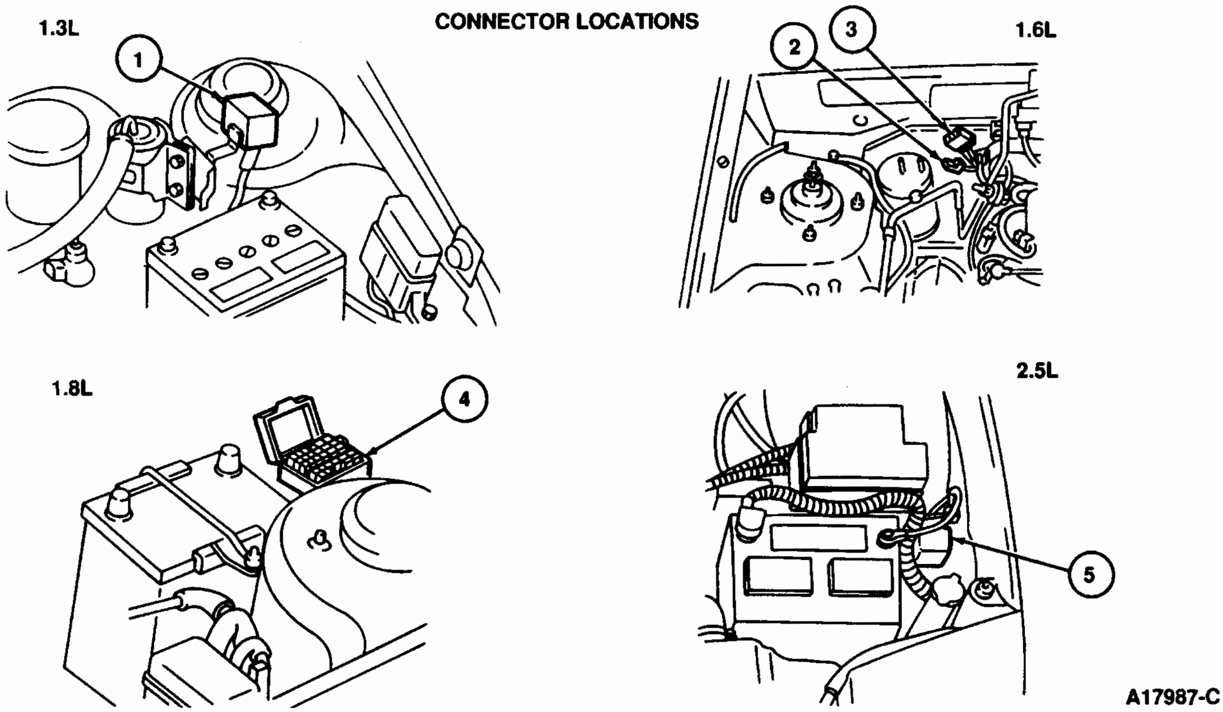
2. If visual checks are OK, proceed to the Pinpoint Tests.

Pinpoint Tests — BPA

	TEST STEP	RESULT ▶	ACTION TO TAKE
BPA1	CHECK IAC VALVE RESISTANCE		
	• Disconnect the Idle Air Control (IAC) valve connector. • Connect Rotunda 73 Digital Multimeter 105-00051 or equivalent to the terminals of the IAC valve and check the resistance. • **Is the resistance within the specified range (see General Specifications table in this section)?**	Yes ▶ No ▶	GO to BPA2. REPLACE the IAC BPA assembly or IAC valve.
BPA2	CHECK BPA VALVE FUNCTION		
	• Remove the BPA valve from the engine. • Cool the BPA valve to room temperature. • When the valve is cold, blow through the valve port or air passage. Refer to illustrations after Test Steps. • Verify that air flows freely through the valve. • Heat the BPA valve using a blow dryer or Rotunda Heat Gun 107-R0300 or equivalent. • Verify that the air valve moves outward to restrict bypass air flow. • **Does the BPA valve function properly?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines. REPLACE the IAC BPA assembly.

Diagnosis and Testing	All Engines	BPA

Data Link and STI Connector Locations

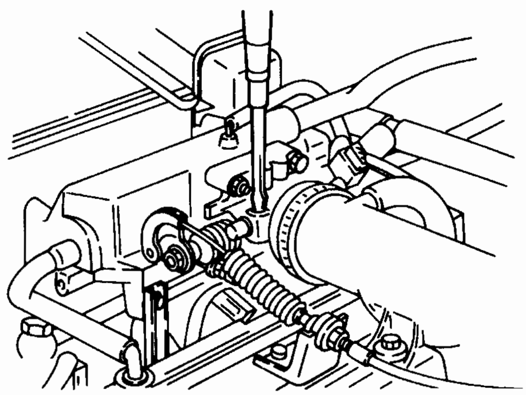


Item	Description
1	Data Link Connector
2	STI Connector
3	STO Connector
4	Data Link Connector
5	Data Link Connector

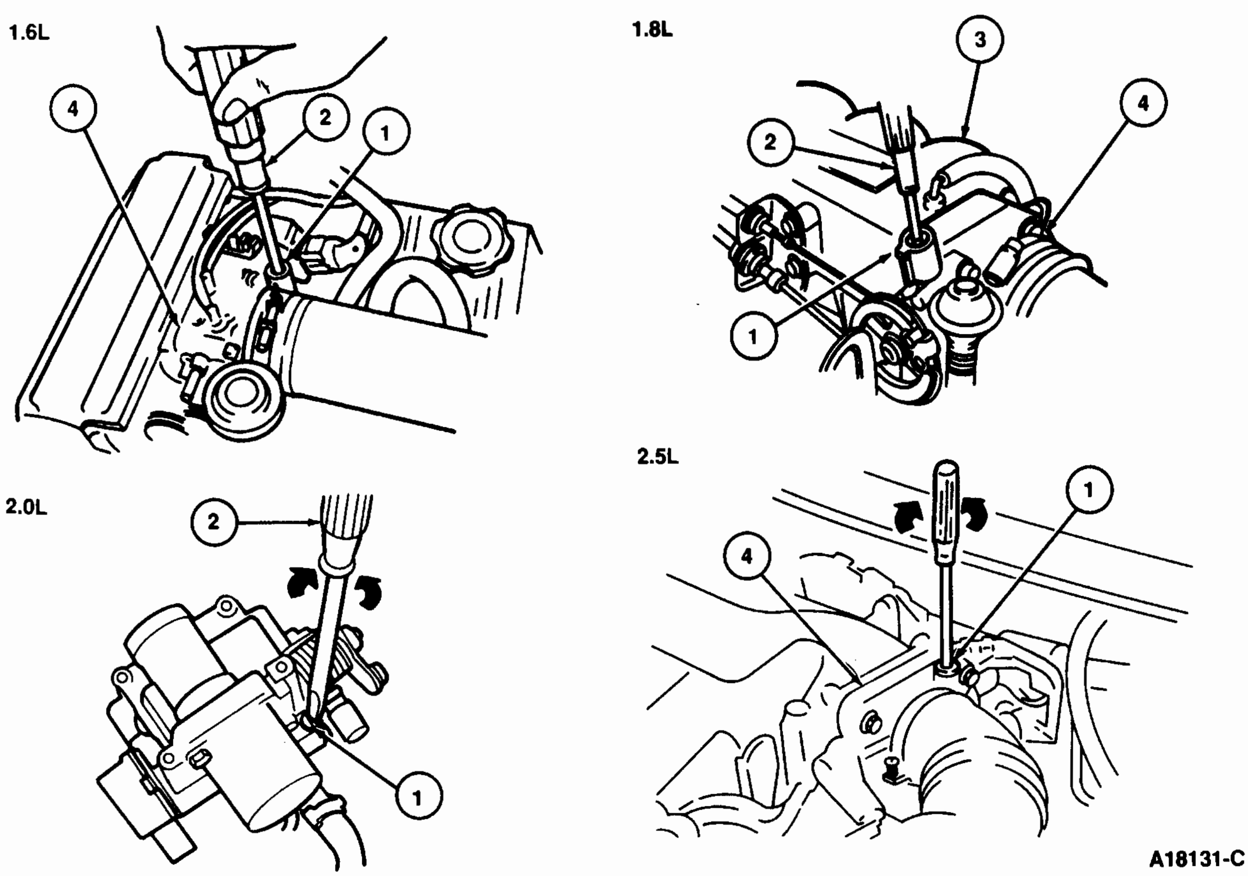
Diagnosis and Testing	All Engines	BPA

Idle Speed Adjustment Screw Locations

1.3L



A20223-A



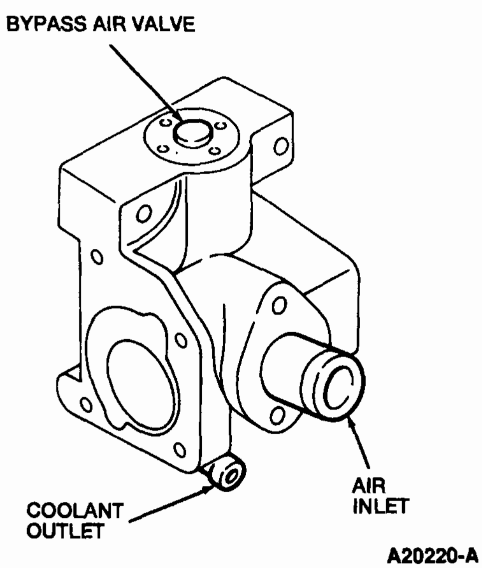
A18131-C

Diagnosis and Testing	All Engines	BPA

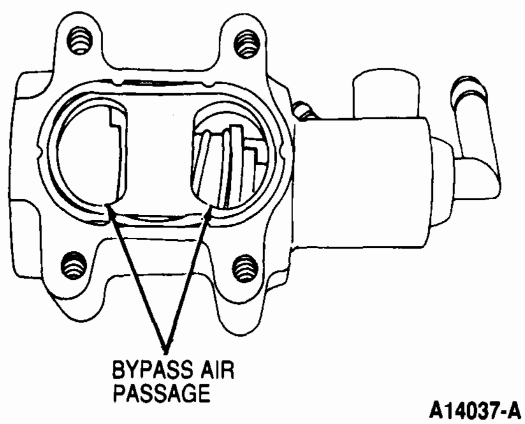
Item	Description
1	Idle Speed Adjustment Screw
2	Screwdriver
3	Intake Manifold
4	Throttle Body

BPA Valve

1.3L

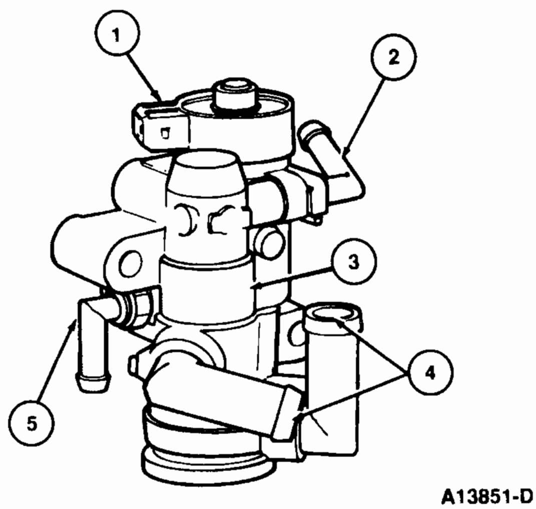


1.8L

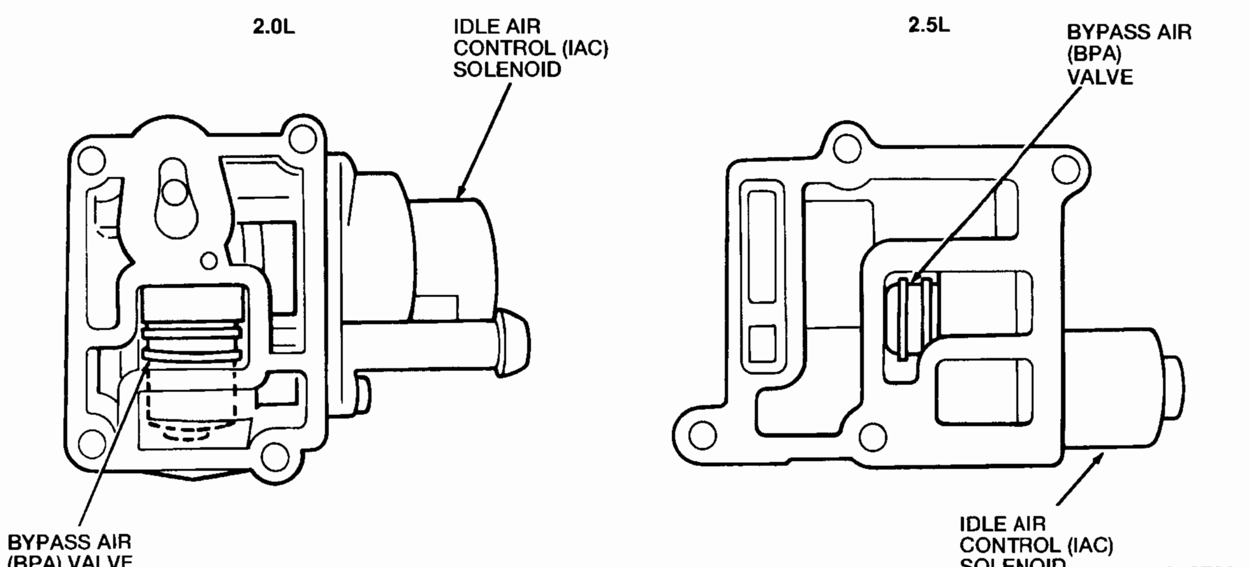


Diagnosis and Testing	All Engines	BPA

1.6L



Item	Description
1	Idle Air Control (IAC) Solenoid Valve
2	Coolant Passage
3	Bypass Air (BPA) Valve
4	Air Passages
5	Coolant Passage



Specifications / Special Service Tools

Specifications

GENERAL SPECIFICATIONS

Description	Specifications
PCM controlled idle speed:	
• Vehicle in PARK (ATX) or NEUTRAL (MTX)	
• All accessories off	
• Cooling fan off	
• Ignition timing OK	
• 1.3L MTX	• 650 - 750 rpm
• 1.3L ATX	• 700 - 800 rpm
• 1.6L	• 700 - 800 rpm
• 1.8L	• 700 - 800 rpm (with parking brake applied)
• 2.0L	• 650-750 rpm
• 2.5L	• 600 - 700 rpm
IAC valve resistance:	
• 1.3L	• 7.7 - 9.3 ohms
• 1.6L	• 6.0 - 14.0 ohms
• 1.8L	• 6.0 - 14.0 ohms
• 2.0L	• 7.7 - 9.3 ohms at 23°C (73°F)
• 2.5L	• 10.7 - 12.3 ohms at 20°C (68°F)

Special Service Tools / Equipment

ROTUNDA EQUIPMENT

Model	Description
014-00575	Multimeter Plus
107-R0300	Heat Gun
059-00014	Timing Analyzer
105-00051	73 Digital Multimeter
021-00037	Vacuum Tester
021-00012	Radiator Pressure / Heater Core Tester
021-00053	Cooling System Adapter
007-0041B	Super STAR II Tester
105-00053	88 Digital Multimeter

SECTION 14B

Positive Crankcase Ventilation (PCV) Systems

Contents

Description and Operation

Positive Crankcase Ventilation (PCV) Systems

The Positive Crankcase Ventilation (PCV) system vents harmful blow-by fumes from the engine crankcase into the engine air intake for burning with the fuel and air mixture. The PCV valve limits the air flow to suit the engine demand and serves to prevent combustion backfiring into the crankcase. Thus, the benefits from the PCV system include the ability to:

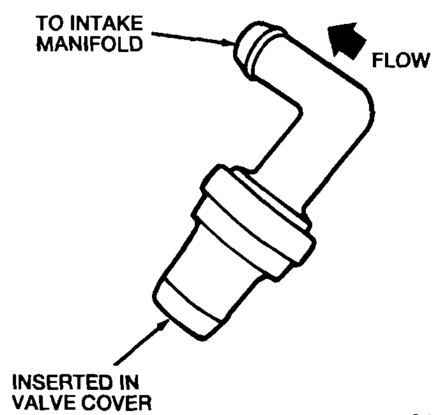
- Maximize the oil cleanliness by venting moisture and corrosion from the crankcase.
- Protect against crankcase explosions.
- Automatically regulate the ventilation system airflow to the engine air intake as required by engine operating conditions.

For further information regarding the makeup of the system and its relationship to other engine / emission systems, refer to the schematic diagrams in Engine Supplement — Car, Section 3B of this manual.

Positive Crankcase Ventilation (PCV) Valve

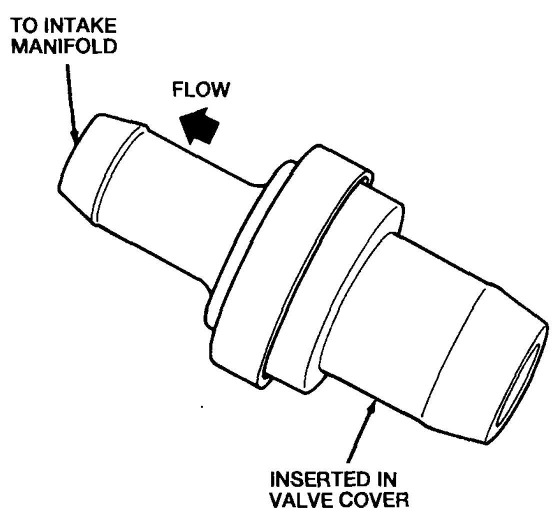
The amount of blow-by gas allowed into the intake manifold from the crankcase is controlled by the Positive Crankcase Ventilation (PCV) valve. The PCV valve acts as a one-way valve; it does not allow anything from the intake manifold to pass into the crankcase.

1.3L, 2.0L, 2.5L



A13861-C

1.6L, 1.8L



A14614-C

Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Plugged into the top of the valve cover.

Diagnosis and Testing

System Inspection

1. Visually inspect the components of the PCV system.

VISUAL INSPECTION CHART

Mechanical	Electrical
● Loose, leaking, clogged, or damaged hoses ● Plugged or inoperative PCV valve ● Cracked, split, or missing PCV grommet	● None

2. Check the fresh air inlet hose and the PCV hose for air leakage or flow restriction due to loose engagement, kinking, nipple damage, rubber grommet fit, elasticity, or any other damage.

3. Check engine for rough idle, slow starting, or high oil consumption.

4. If a component is suspected as the obvious cause of a malfunction, correct the cause before proceeding to the next step.

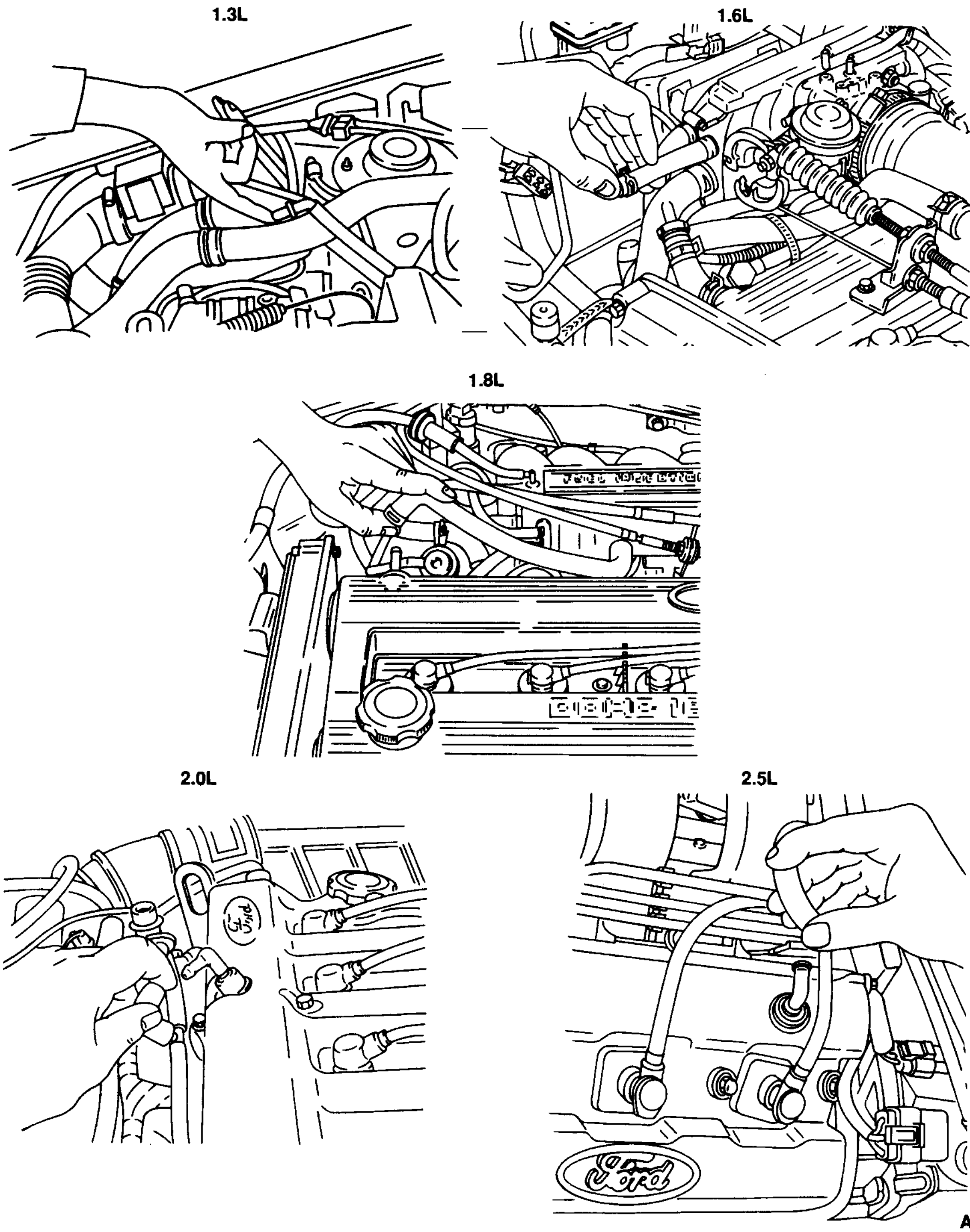
5. If all checks are OK, proceed to Pinpoint Test PCV1.

Diagnosis and Testing	All Engines	PCV

Pinpoint Tests — PCV

TEST STEP		RESULT ▶	ACTION TO TAKE
PCV1	PERFORM PCV VALVE SHAKE TEST		
	● Remove the PCV valve from the engine valve cover and disconnect the valve from the PCV hose. ● Vigorously shake the PCV valve and confirm that the valve plunger is free to move and rattle within the valve body. ● **Is the plunger free to move?**	Yes ▶ No ▶	GO to PCV2. REPLACE the PCV valve.
PCV2	CHECK PCV SYSTEM FUNCTION		
	● Run the engine at idle until warmed up. ● Remove the fresh air inlet hose at the air inlet end, and plug the nipple immediately to prevent stalling (refer to the illustration on the following page). ● Verify by feel that the vacuum is present at the inlet end of the hose. ● **Is vacuum present?** NOTE: If air pressure, oil, or oily sludge is present at the intake end of the fresh air supply hose, the engine has excessive blow-by caused by cylinder bore, piston ring or valve stem wear, or by a defective or incorrect PCV valve.	Yes ▶ No (No vacuum) ▶ No (Oil or sludge present) ▶	RETURN to the Diagnostic Routines, Section 2B. CHECK fresh air and PCV hoses for leaks, loose connections, blockage, or loose oil dipstick. CORRECT as required until vacuum can be felt. RETURN to the Diagnostic Routines, Section 2B.

Diagnosis and Testing	All Engines	PCV



A20164-B

SECTION 15B

Catalysts and Exhaust Systems

Contents

Description and Operation

Three Way Catalytic Converter System

The engine exhaust consists mainly of Nitrogen (N_2); however, it also contains Carbon Monoxide (CO), Carbon Dioxide (CO_2), Water Vapor (H_2O), Oxygen (O_2), Nitrogen Oxides (NOx), and Hydrogen (H_2), as well as various unburned hydrocarbons (HC). Three of these exhaust components - CO, NOx, and HC - are major air pollutants, so their emission to the atmosphere must be controlled.

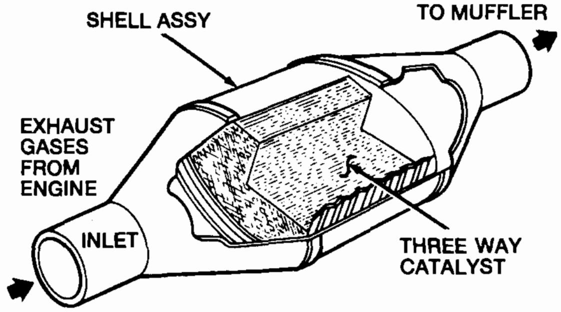
For further information regarding the makeup of the system and its relationship to other engine / emission systems, refer to the schematic diagrams in Engine Supplement — Car, Section 3B of this manual.

Three Way Catalytic Converter

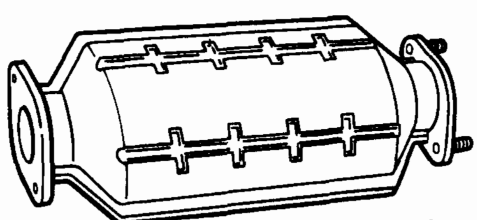
The Three Way Catalytic (TWC) converter, mounted in the engine exhaust system, works as a gas reactor to convert and reduce the pollutant levels to within legally prescribed limits. The converter removes these pollutants from the exhaust gases by means of a chemical reaction, with remaining gases being transferred to the muffler.

The catalyst metals are thinly coated onto and supported by a honeycomb-shaped, high temperature ceramic, mounted inside the converter shell. The result is a highly effective converter design having good durability and minimum restriction to exhaust gas flow.

Three Way Catalytic Converter



A13929-C

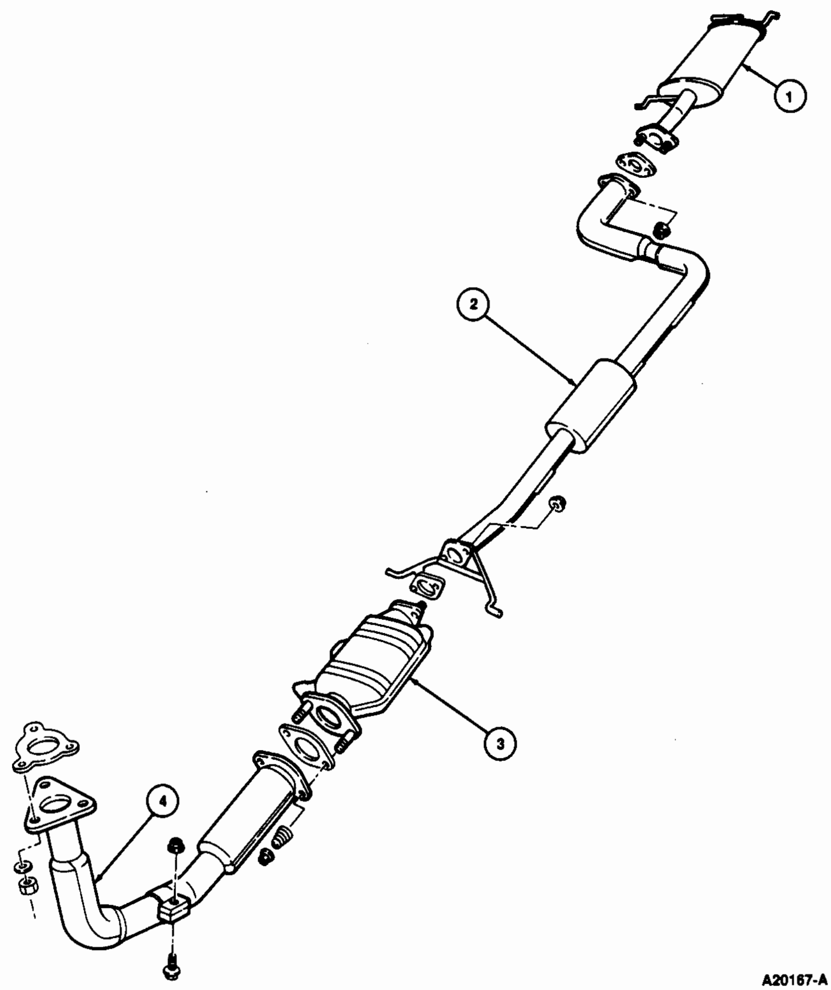


A16766-A

Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Mounted between the exhaust manifold and the muffler.

Description and Operation

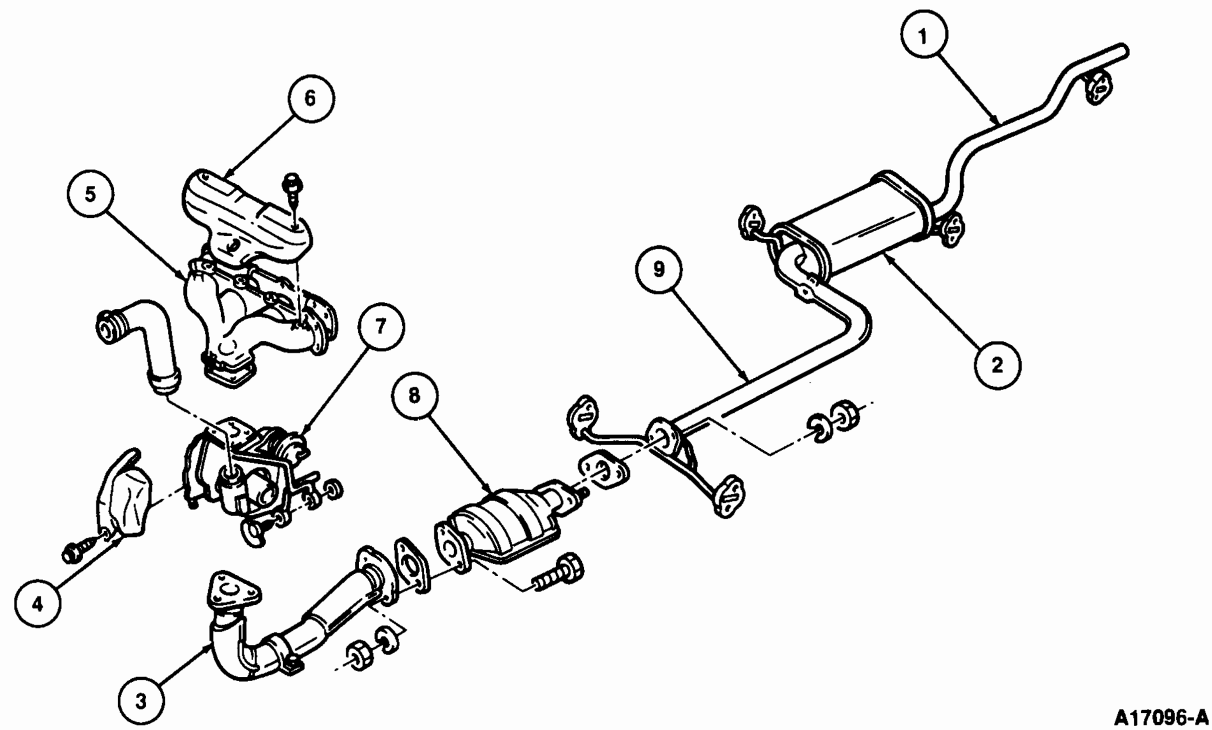
1.3L Component Location



Item	Description
1	Muffler
2	Muffler Inlet Pipe
3	Three Way Catalytic Converter
4	Three Way Catalytic Converter Inlet Pipe

Description and Operation

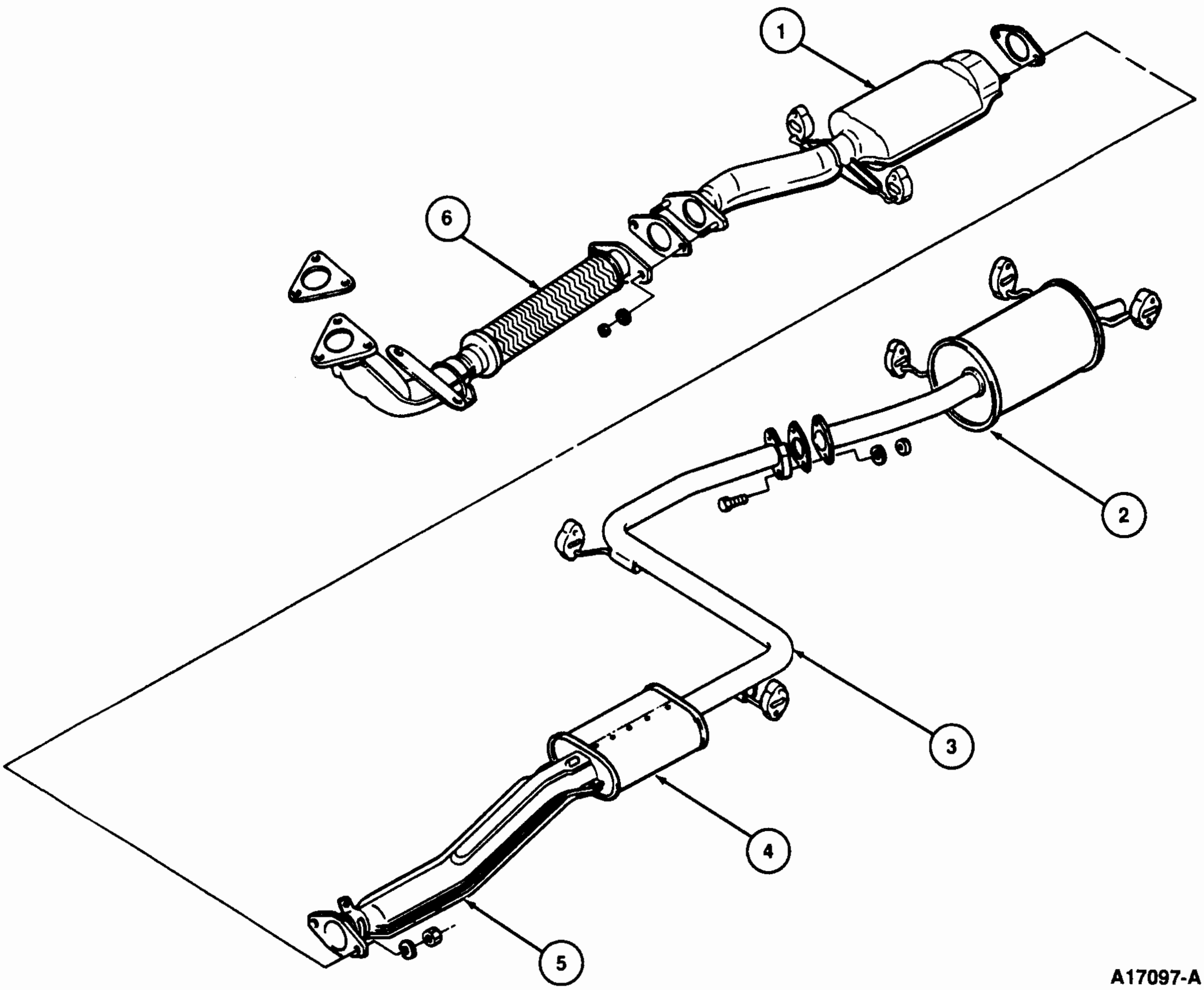
1.6L Component Location



Item	Description
1	Tail Pipe
2	Muffler
3	Three Way Catalytic Converter Inlet Pipe
4	Heat Shield
5	Exhaust Manifold
6	Heat Shield
7	Turbocharger (If Equipped)
8	Three Way Catalytic Converter
9	Muffler Inlet Pipe

Description and Operation

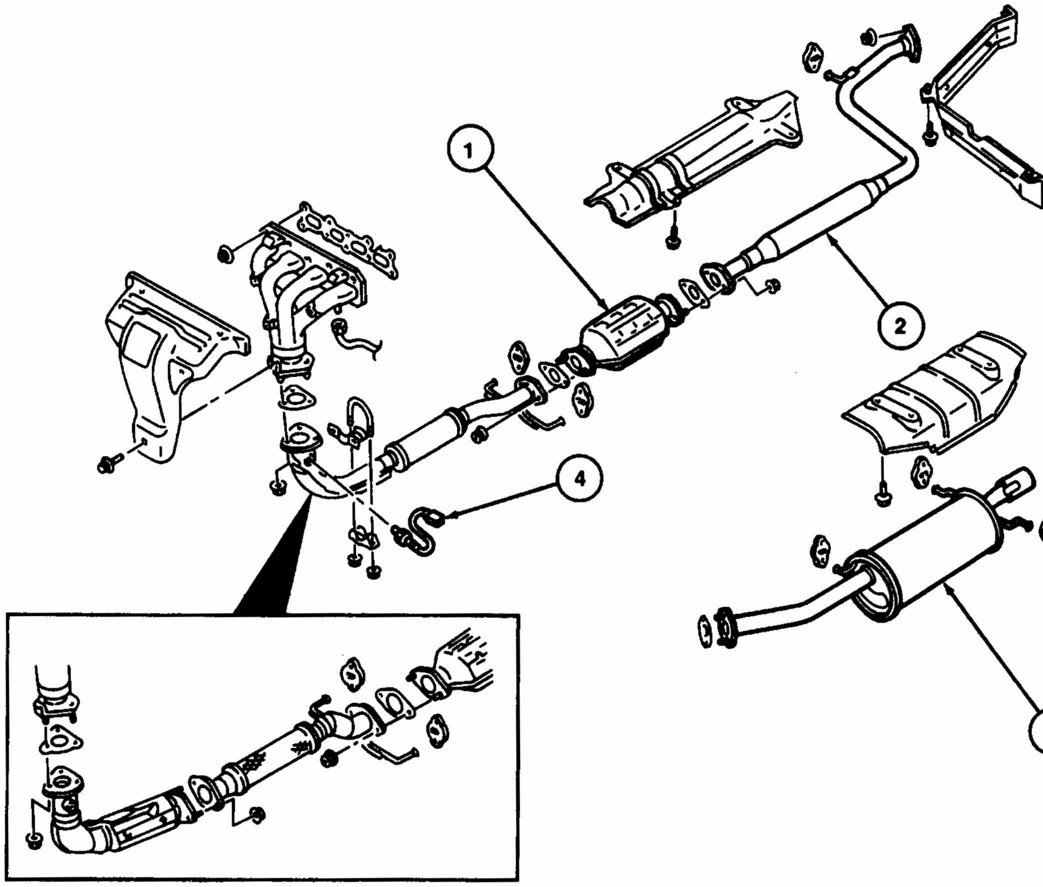
1.8L Component Location



Item	Description
1	Three Way Catalytic Converter
2	Muffler
3	Middle Pipe
4	Resonator
5	Converter Outlet Pipe
6	Three Way Catalytic Converter Inlet Pipe

Description and Operation

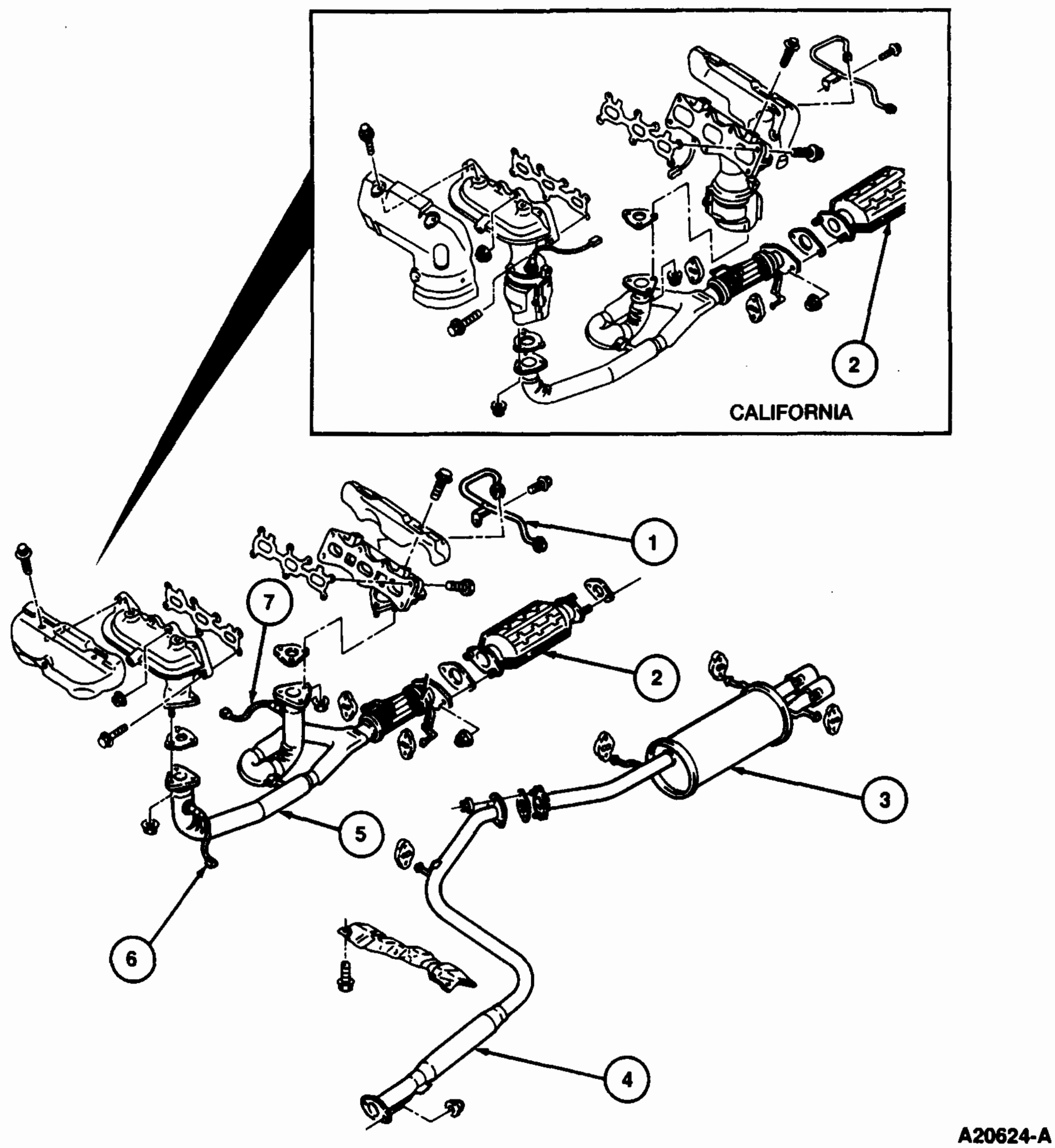
2.0L Component Location



Item	Description
1	Three Way Catalytic Converter
2	Middle Pipe
3	Muffler
4	Heated Oxygen Sensor (HO2S)

Description and Operation

2.5L Component Location



Item	Description
1	EGR Pipe (California Only)
2	Three Way Catalytic Converter
3	Muffler
4	Middle Pipe
5	Converter Inlet Pipe
6	Right Heated Oxygen Sensor (RHO2S)
7	Left Heated Oxygen Sensor (LHO2S)

Diagnosis and Testing (Exhaust Gas Emissions Test)

System Inspection

1. Visually inspect the components of the three way catalytic converter and exhaust system and related controls that may affect exhaust gas quality, cause backfire, or loss of power.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Leaking fuel injectors • Damaged air inlet passages • Inoperative Exhaust Gas Recirculation (EGR) valve • Exhaust pipe pinched, crushed • Damaged, loose vacuum hoses • Incorrect idle speed • Dirty air filter • Damaged three way catalytic converter	• Misrouted, damaged wiring • Damaged coil, distributor, or spark plugs • Corroded, loose connectors

2. Exercise the wiring and connectors for the solenoids and other components for obvious problems due to looseness, corrosion, or other damage. This must be done after the engine is fully warmed so as to activate the system controls.

3. Check the vacuum lines and connections for looseness, pinching, leakage, splitting, blockage, or other damage that may cause malfunction.

4. If a vacuum line or orifice (restrictor) blockage is suspected as the obvious cause of malfunction, correct the cause before proceeding to the next step.

5. Check engine oil for fuel dilution.

6. If all checks are OK, proceed to the Pinpoint Tests.

7. If the diagnostic symptom is "**Fails Emission Test**", proceed to Pinpoint Test EG1. If the symptom is "**Backfires**" or "**Lacks Power**", proceed to Pinpoint Test EX1.

   NOTE: Failure to conform to the Federal Clean Air Act legal requirements for a particular vehicle and calibration is usually the result of one or more emission related system or component malfunctions.

Diagnosis and Testing	All Engines	EG

Pinpoint Tests — EG

	TEST STEP	RESULT ▶	ACTION TO TAKE
EG1	PERFORM EXHAUST GAS EMISSION TEST		
	• Conduct the Exhaust Emission Test on the vehicle, using certified testing equipment. • **Does the vehicle pass the test?**	Yes ▶ No ▶	End of testing. GO to Test EG2.
EG2	PERFORM EMISSION SYSTEM MALFUNCTION DETECTION BY QUICK TEST		
	• Perform the EEC Quick Test (Refer to Section 5B) to detect emission system(s) malfunctioning. NOTE: Faults in the Catalysts and Exhaust System due to exhaust leaks or melted catalysts are not detectable by the EEC Quick Test. • **Are diagnostic trouble codes present?**	Yes ▶ No ▶	PERFORM the Pinpoint Test(s) in Section 6B. REFER to Quick Test Step QT7 for direction. If the Pinpoint Test(s) check OK, GO to EG3. GO to Test EX1. (Three way catalytic converter possibly melted or contaminated, or the exhaust system is restricted.)
EG3	CHECK EXHAUST GAS RECIRCULATION (EGR) SYSTEM FUNCTION (1.3L, 2.0L AND 2.5L ONLY)		
	• Refer to Section 10B for the correct procedure for checking the EGR system function. • Rerun the EEC Quick Test. • **Does the vehicle pass the EEC Quick Test?**	Yes ▶ No ▶	GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG4.
EG4	CHECK EVAPORATIVE EMISSION (EVAP) SYSTEM FUNCTION		
	• Refer to Section 11B for the correct procedure for checking the Evaporative Emission (EVAP) system function. • Rerun the EEC Quick Test. • **Does the vehicle pass the EEC Quick Test?**	Yes ▶ No ▶	GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG5.
EG5	CHECK BYPASS AIR CONTROL AND AIR INTAKE SYSTEMS FUNCTION		
	• Refer to Section 12B for the correct procedure for checking the bypass air and air intake systems. • Rerun the EEC Quick Test. • **Does the vehicle pass the EEC Quick Test?**	Yes ▶ No ▶	GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG6.

Diagnosis and Testing

All Engines

EG

TEST STEP		RESULT ▶	ACTION TO TAKE
EG6	CHECK TURBOCHARGER SYSTEM FUNCTION (1.6L TURBO ONLY)		
	• Refer to Section 9B for the correct procedure for checking the turbocharger system. • Rerun the EEC Quick Test. • **Does the vehicle pass the EEC Quick Test?**	Yes ▶ No ▶	GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG7.
EG7	CHECK FUEL DELIVERY SYSTEM FUNCTION		
	• Refer to Section 9B for the correct procedure for checking the fuel delivery system. • Rerun the EEC Quick Test. • **Does the vehicle pass the EEC Quick Test?**	Yes ▶ No ▶	GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG8.
EG8	CHECK IGNITION SYSTEM FUNCTION		
	• Refer to Section 8B for the correct procedure for checking the ignition system. • Rerun the EEC Quick Test. • **Does the vehicle pass the EEC Quick Test?**	Yes ▶ No ▶	GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG9.
EG9	RERUN EXHAUST GAS EMISSION TEST		
	• After all diagnostic trouble codes have been eliminated (Tests EG3 through EG8), or other exhaust system corrections have been made (Tests EX1 through EX4), rerun the Exhaust Emission Test. • **Does the vehicle pass the test?**	Yes ▶ No ▶	End of testing. GO to EG10.
EG10	CHECK TEST EQUIPMENT CALIBRATION		
	• Verify the correctness of procedures used in the Exhaust Emission Test. • Determine if the test equipment has been damaged, tampered with, or misused by unqualified personnel. • Check the maintenance records on the test equipment. Note any instances of prior malfunction, age of equipment, and the expiration date of the current certification period. • Check the subject vehicle exhaust gas quality using other available equipment. • **Does the vehicle pass the Exhaust Emission Test on the alternate equipment?**	Yes ▶ No ▶	End of testing; SUBMIT the original equipment for REPAIR and RECERTIFICATION. GO to EX1.

Diagnosis and Testing	All Engines	EX

Pinpoint Tests — EX

TEST STEP		RESULT ▶	ACTION TO TAKE
EX1	PERFORM VACUUM TEST		
	• Attach Rotunda Vacuum/Pressure Tester 059-00008 or equivalent, to the intake manifold vacuum source. • Hook up Rotunda 88 Digital Multimeter 105-00053 or equivalent as a tachometer. • Start the engine and gradually increase the engine speed to 2000 rpm with the transaxle in NEUTRAL (PARK on ATX) and the parking brake set. • **Is the manifold vacuum above 406.4 mm-Hg (16 in-Hg)?**	Yes ▶ No ▶	No restriction in the exhaust system. If sent here from EG2, GO to EG10. Otherwise, RETURN to the Diagnostic Routines, Section 2B. GO to EX2.
EX2	PERFORM VACUUM TEST — EXHAUST DISCONNECTED		
	• Turn the engine off. • Disconnect the exhaust system at the exhaust manifold. • Repeat Test EX1. • **Is the manifold vacuum above 406.4 mm-Hg (16 in-Hg)?**	Yes ▶ No ▶	GO to EX3. GO to EX4.
EX3	PERFORM VACUUM TEST — THREE WAY CATALYTIC CONVERTER ON/MUFFLER OFF		
	• Turn the engine off. • Reconnect the exhaust system at the exhaust manifold. • Disconnect the muffler. • Repeat Test EX1. • **Is the manifold vacuum above 406.4 mm-Hg (16 in-Hg)?**	Yes ▶ No ▶	REPLACE the muffler. REPLACE the three way catalytic converter and INSPECT the muffler to be sure converter debris has not entered the muffler. GO to EG9.
EX4	CHECK EXHAUST MANIFOLD RESTRICTION		
	• Remove the exhaust manifold(s). Inspect the ports for casting flash by dropping a length of chain into each port. NOTE: Do not use a wire or light to check ports. The restriction may be large enough for them to pass through but small enough to cause excessive back pressure at high engine rpm. • **Is the manifold free of casting flash?**	Yes ▶ No ▶	RETURN to the Diagnostic Routines, Section 2B. REPLACE the exhaust manifold. GO to EG9.

Specifications / Special Service Tools

Special Service Tools / Equipment

ROTUNDA EQUIPMENT

Model	Description
059-00008	Vacuum / Pressure Tester
105-00053	88 Digital Multimeter

SECTION 22B

Glossary

Contents

Glossary

The glossary is a list of technical terms or acronyms and their definitions. Although some descriptions are given, it is not intended to be a dictionary of components and their functions.

4EAT: 4-Speed Electronic Automatic Transaxle.

A/C: Air-Conditioning. System used to decrease the vehicle's interior temperature.

ACL: Air Cleaner.

ACR: A/C Relay. A relay, controlled by the PCM, that cycles the A/C compressor on and off time.

ACS: A/C Switch. Switch used to turn the A/C system on.

AMBIENT TEMPERATURE: Temperature of air surrounding an object, e.g., temperature where the vehicle is being worked on.

ATF: Automatic Transaxle Fluid.

ATX: Automatic Transaxle.

BARO: Barometric Pressure Sensor.

BASE IDLE: Idle RPM determined by throttle lever hard-set on throttle body, while the idle air control is fully retracted and disconnected.

BATT: Battery.

BLMT: Blower Motor switch. Switch used for controlling the heating/ventilating/air-conditioning system.

BOB: Breakout Box. A PCM test device which connects in series with the PCM and the PCM harness, and permits measurements of the processor inputs and outputs.

BOO: Brake On/Off switch.

BOOST: Turbocharger boost solenoid or its control circuit.

BPA: Bypass Air.

CANP: Carbon Canister Storage/Purging.

CCD: Computer Controlled Dwell.

CCPS: Clutch Cycling Pressure Switch. If the pressure in the A/C system becomes too low, the switch will activate and not let the A/C compressor system turn on.

CD4E: Chain Driven 4-Speed Electronic Transaxle.

CFAN: Condenser Fan relay. Relay used to turn the condenser fan on when activated.

CFR: Cooling Fan Relay.

Glossary

CID: Cylinder Identification sensor.

CKP: Crankshaft Position sensor.

CKP1: Crankshaft Position sensor #1.

CKP2: Crankshaft Position sensor #2.

CKPRTN: Crankshaft Position Sensor Signal Return. Return signal used to notify the PCM of the crankshaft position.

COMPUTER TIMING: The total spark advance in degrees before top dead center on the compression stroke, calculated by the PCM, based on input from a number of sensors.

CONV: Conventional Systems.

CPP: Clutch Pedal Position switch.

CVS: Control / Vent Solenoids.

DCS: Duty Cycle Solenoid.

DEF: Rear Defroster switch. Switch used to turn the rear defroster on and off.

DI: Distributor Ignition. A system in which the ignition coil secondary circuit is switched by a distributor in proper sequence to various spark plugs.

DI TFI: Distributor Ignition Thick Film Ignition. A remote mounted system in which the ignition coil is switched by a controlling module to various spark plugs.

DI TFI-IV: Distributor Ignition (TFI-IV).

DIAGNOSTIC TEST MODE: One of two subsets of the PCM Quick Test: Key ON Engine Off, and Key ON Engine Running.

DLC: Data Link Connector. Diagnostic connecter used for accessing codes and testing circuits on the vehicle.

DMIVA: Distributor Mounted Ignition with Vacuum Advance.

DOHC: Dual Overhead Camshaft.

DRL: Daytime Running Lamps (Canada Only). Lamps that illuminate directly after the vehicle is started.

DSS: Downshift Solenoid. Solenoid that operates the 3-2 timing valve.

DVOM: Digital Volt-Ohm Multimeter. Multimeter that displays voltage or resistance measurements in digital form on a liquid crystal display.

ECT: Engine Coolant Temperature sensor.

Glossary

ECTF: Cooling Fan Engine Coolant Temperature sensor.

EEC: Electronic Engine Control. A computer controlled system of engine control.

EEC-IV MONITOR: An optional PCM test device which connects in series with the PCM and its harness, and permits measurements in various units of processor inputs and outputs.

EGR: Exhaust Gas Recirculation.

EGRC: Exhaust Gas Recirculation Control solenoid.

EGRM: Exhaust Gas Recirculation Modulator valve.

EGRT: Exhaust Gas Recirculation Temperature sensor.

EGRV: Exhaust Gas Recirculation Vent solenoid.

EVAP: Evaporative Emission System.

EVP: Exhaust Gas Recirculation Valve Position sensor.

EVR: Exhaust Gas Recirculation Vacuum Regulator solenoid.

FAIL-SAFE: Fail-Safe Mode. When certain malfunctions occur in the PCM system the PCM will substitute a value or values to continue operation. In some cases this action may result in a change of driveability.

FAN: Engine cooling fan.

FP: Fuel Pump.

FPR: Fuel Pump Relay.

FPRC: Fuel Pressure Regulator Control solenoid.

GEN: Generator.

GND: A common ground circuit for all vehicle power.

HDLP: Headlamp switch. Switch used to turn the headlamps on and off.

HFAN: Cooling Fan High relay. Relay used to operate the cooling fan at a higher speed. It will override the Cooling Fan Low Relay and decrease the coolant temperature if it becomes too excessive.

HO2S: Heated Oxygen Sensor. An oxygen sensor (O2S) that is electrically heated.

HPS: High Pressure Switch. If pressure in the A / C system exceeds the high limit, the high pressure switch will activate and the cooling fan and condenser fan will run at high speed to decrease the pressure.

HSIA: High Speed Inlet Air.

Glossary

IAC: Idle Air Control.

IAC BPA: Idle Air Control Bypass Air valve.

IAT: Intake Air Temperature sensor.

ICM: Ignition Control Module.

IDL: Idle switch.

IDM: Ignition Diagnostic Monitor.

IFS: Inertia Fuel Shutoff switch. Switch used to close fuel supply to engine if the vehicle suffers an accident or heavy jar.

IGN: Ignition switch.

IMRC: Intake Manifold Runner Control.

INJ: Fuel Injector.

KAM: Keep Alive Memory.

KAPWR: Keep Alive Power. Voltage distributed to the PCM in order for it to maintain memory.

KC: Knock Control.

KOEO: Key On Engine Off.

KOER: Key On Engine Running.

KS: Knock Sensor.

LFAN: Cooling Fan Low relay. Relay used to turn the cooling fan on to maintain the coolant temperature in the normal operating range.

LHO2S: Left Heated Oxygen Sensor.

LPS: Line Pressure Solenoid. Solenoid that is used to adjust ATF pressure in the transaxle.

MAF: Mass Air Flow sensor.

MC-VAF: Measuring Core-Volume Air Flow sensor.

MFI: Multiport Fuel Injection.

MIL: Malfunction Indicator Lamp.

MLP: Manual Lever Position switch.

Glossary

MLP1: Manual Lever Position 1. MLP switch that detects when the vehicle is in the 1 range.

MLP2: Manual Lever Position 2. MLP switch that detects when the vehicle is in the 2 range.

MLPD: Manual Lever Position D. MLP switch that detects when the vehicle is in the D range.

MLPL: Manual Lever Position L. MLP switch that detects when the vehicle is in the L range.

MLPOD: Manual Lever Position OD. MLP switch that detects when the vehicle is in the overdrive range.

MLPR: Manual Lever Position R. MLP switch that detects when the vehicle is in the R range.

MPH: Miles Per Hour.

MTX: Manual Transaxle.

NGS: New Generation Star. User friendly hand-held tester which is used to perform a variety of diagnostic testing functions.

O2S: Oxygen Sensor. Sensor which detects Oxygen (O2) content in the exhaust gases.

OBI: Overboost Indicator.

ODL: Overdrive Off Lamp.

ODS: Overdrive Off Switch.

OHC: Overhead Cam.

OPEN CIRCUIT: A circuit which does not provide a complete path for the flow of current.

OVERLAY CARD: A plastic card used with the monitor box to identify PCM signals for each engine. The card also programs the monitor for auto mode measurements.

PCM: Powertrain Control Module. The main processor that operates the vehicle with a series of inputs and outputs.

PCV: Positive Crankcase Ventilation.

PGC: Power and Ground Connection.

PIP: Profile Ignition Pickup. A phototransistor that furnishes crankshaft position data to the PCM.

PNP: Park / Neutral Position switch.

PNPS: Park / Neutral Position Signal. An input signal sent to the PCM notifying the module when the vehicle is in NEUTRAL or PARK (2.5L 4EAT only).

PSG-: Pulse Signal Generator return signal. Signal returning transaxle drum speed to the TCM or PCM (depending on the vehicle).

Glossary

PSG+: Pulse Signal Generator signal. A supply signal sent to the pulse signal generator to be manipulated into a drum speed signal.

PSP: Power Steering Pressure switch. A PCM input to regulate idle speed based on power steering load demand.

PWRGND: Power Ground.

QUICK TEST: A functional diagnostic test of the PCM or TCM system used to determine the validity of the module and the existing circuits that supply information to them.

RECORDER: An optional driveability test device which works jointly with the monitor box. It allows up to 8 PCM signals to be electronically recorded over a 50-second period when the vehicle is in motion.

RELAY: A switching device operated by a low current circuit which allows the opening and closing of another circuit for higher current capacity.

RHO2S: Right Heated Oxygen Sensor.

RPM: Revolutions Per Minute.

RTS1: Reduce Torque Signal #1. Signal to the PCM from the TCM to reduce torque during upshifting or downshifting.

RTS2: Reduce Torque Signal #2. Signal to the PCM from the TCM to reduce torque during upshifting or downshifting.

SCG: Solenoid Controlled by Ground.

SCP: Solenoid Controlled by Power.

SCPP: Starter Clutch Pedal Position switch. Allows current to be applied to the starter when depressed.

SFI: Sequential Multiport Fuel Injection. Fuel injection that is sequenced into each cylinder according to its firing order.

SHORT CIRCUIT: A direct connection between a circuit and another unwanted point on the vehicle.

SIGRTN: Signal Return circuit for sensor signals.

SIL: Shift Indicator Lamp. This lamp is used to inform the driver of the optimum shift conditions.

SML: Switch Monitor Lamp. This lamp is used to detect if the vehicle's switches are operating correctly when the Super Star II tester is connected.

SOLENOID: A wire coil with a movable core that changes position by means of electromagnetism when current is applied.

SPOUT: Spark Output signal from the PCM.

Glossary

SS1: Shift Solenoid 1. Solenoid used when upshifting the transaxle for 1-2 timing.

SS2: Shift Solenoid 2. Solenoid used when upshifting the transaxle for 2-3 timing.

SS3: Shift Solenoid 3. Solenoid used when upshifting the transaxle for 3-4 timing.

STG: Switch to Ground.

STI: Self-Test Input circuit in the PCM system, used to initiate diagnostic test mode.

STO: Self-Test Output circuit in the PCM system that transmits diagnostic trouble codes (pulses) to either a VOM, Super STAR II Tester, NGS, MIL or SBDS.

STP: Switch to Power.

SUPER STAR II: Super Self Test Automatic Readout. A testing device that reads and translates digital diagnostic trouble codes from the PCM.

TACH: Tachometer.

TB: Throttle Body.

TCC: Torque Converter Clutch solenoid. Solenoid used to shift the torque converter into lockup mode.

TCCC: Torque Converter Clutch Control solenoid. Solenoid used to control the transaxle lockup pressure.

TCM: Transaxle Control Module. Module used to control the automatic transaxle.

TDC: Top Dead Center.

TI: Transistorized Ignition.

TI3: Transistorized Ignition 3-pin.

TWC: Three Way Catalytic Converter.

TIMING: Relationship between spark plug firing and piston position, expressed in crankshaft degrees before top dead center on the compression stroke.

TOT: Transaxle Oil Temperature sensor. Sensor that detects the transaxle oil temperature and sends this information to the TCM.

TP: Throttle Position sensor.

TRS/ECTS: Torque Reduce/Engine Coolant Temperature Signal. Signal to the TCM from the PCM used to reduce torque during harsh shifting or high coolant temperature readings.

TWC: Three Way Catalyst.

VAF: Volume Air Flow meter.

Glossary

VMREF: Volume Meter Reference voltage.

VOM: Volt-Ohmmeter used to measure voltage and resistance by a sweep hand on a printed scale rather than a digital display.

VPWR: Vehicle Power supply voltage regulated to 10-14 volts.

VR: Voltage Regulator.

VREF: Reference voltage supplied by the PCM to input and output components and remains at a constant level.

VRIS1: Variable Resonance Induction System # 1 solenoid.

VRIS2: Variable Resonance Induction System # 2 solenoid.

VSS: Vehicle Speed Sensor.

VST: Vehicle Start.

WAC: Wide-Open Throttle A / C Cutoff.

WOT: Wide-Open Throttle.

SECTION 23B

Index

Contents

Alphabetical Index

A

C

D

Alphabetical Index

Alphabetical Index

Alphabetical Index

Alphabetical Index

F

G

Alphabetical Index

I

P

Metrics

INTRODUCTION

Most threaded fasteners are covered by specifications that define required mechanical properties, such as tensile strength, yield strength, proof load and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To ensure continued satisfactory vehicle performance, replacement fasteners used should be of the correct strength, as well as the correct nominal diameter, thread pitch, length, and finish.

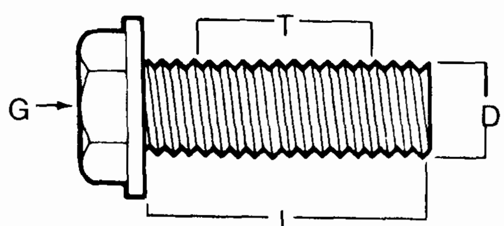
Most original equipment fasteners (English or Metric system) are identified with markings or numbers indicating the strength of the fastener. These markings are described in the pages that follow. Attention to these markings is important to ensure that the proper replacement fasteners are used.

Further, some metric fasteners, especially nuts, are colored blue. This metric blue identification is in most cases a temporary aid for production start-up, and color will generally revert to normal black or bright after start-up.

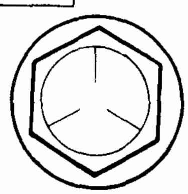
English and Metric system fasteners are available through your Ford Parts and Service operation.

NOMENCLATURE FOR BOLTS

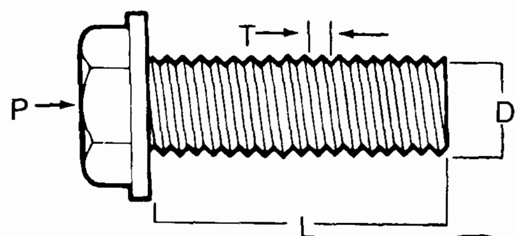
ENGLISH SYSTEM
Bolt, 1/2-13x1



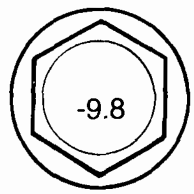
G—Grade Marking (bolt strength)
L— Length, (inches)**
T— Thread Pitch ((thread/inch)
D—Nominal Diameter (inches)



METRIC SYSTEM
Bolt, M12-1.75x25



P— Property Class* (bolt strength)
L— Length (millimeters)**
T—Thread Pitch (thread width crest to crest mm)
D—Nominal Diameter (millimeters)



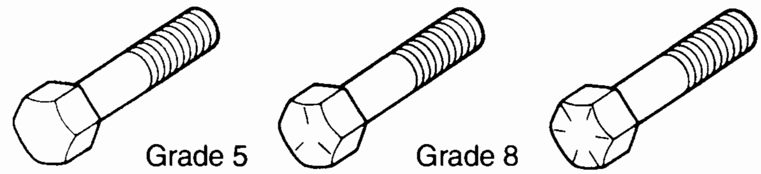
***The property class is an Arabic numeral distinguishable from the slash SAE English grade system.**

****The length of all bolts is measured from the underside of the head to the end.**

Metrics

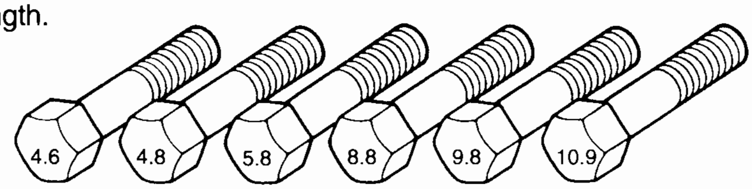
BOLT STRENGTH IDENTIFICATION

ENGLISH SYSTEM



English (Inch) bolts: Identification marks correspond to bolt strength, increasing number of slashes represent increasing strength.

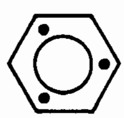
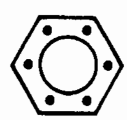
METRIC SYSTEM



Metric bolts: Identification class numbers correspond to bolt strength, increasing numbers represent increasing strength. Common metric fastener bolt strength property are 9.8 and 10.9 with the class identification embossed on the bolt head.

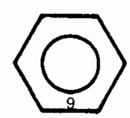
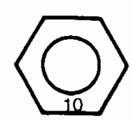
HEX NUT STRENGTH IDENTIFICATION

ENGLISH SYSTEM

Grade	Hex Nut Grade 5	Hex Nut Grade 8
Identification	 3 Dots	 6 Dots

Increasing dots represent increasing strength.

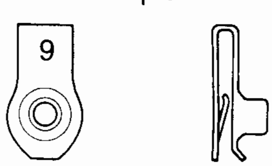
METRIC SYSTEM

Class	Hex Nut Property Class 9	Hex Nut Property Class 10
Identification	 Arabic 9	 Arabic 10

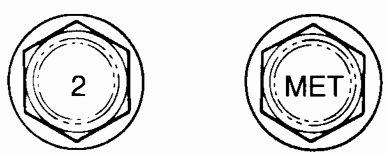
May also have blue finish or paint daub on hex flat. Increasing numbers represent increasing strength.

OTHER TYPES OF PARTS

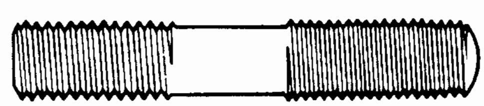
Metric identification schemes vary by type of part, most often a variation of that used of bolts and nuts. Note that many types of English and Metric fasteners carry no special identification if they are otherwise unique.

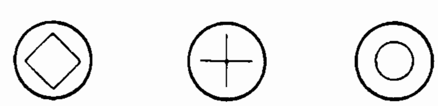


— Stamped U-Nuts



— Tapping, thread forming and certain other case hardened screws





— Studs, Large studs may carry the property class number. Smaller studs use a geometric code on the end.

Metrics

ENGLISH/METRIC CONVERSION

DESCRIPTION	MULTIPLY	BY	FOR METRIC EQUIVALENT
Acceleration	ft/s²	0.3048	m/s²
	in/s²	0.0254	m/s²
Torque	lb-in	0.11298	N·m
	lb-ft	1.3558	N·m
Power	horsepower	0.746	kW
Pressure or Stress	inches of water	0.2491	kPa
	psi	6.895	kPa
	psi	0.069	bar
Energy or Work	BTU	1 055.0	Joules (J)
	lb-ft	1.3558	Joules (J)
	kiloWatt-hour	3,600,000. or 3.6×10^6	Joules (J)
Light	foot candle	10.764	lumens/square meter (lm/m²)
Fuel Performance	miles/gal	0.4251	kilometers/liter (km/L)
	gal/mile	2.3527	liters/kilometer (L/km)
Velocity	mph	1.6093	km/h
Length	inch	25.4	mm
	foot	0.3048	m
	yard	0.9144	m
	mile	1.609	km
Area	square inch (in²)	645.2	mm²
		6.45	cm²
	square ft (ft²)	0.0929	m²
	square yard	0.8361	m²
Volume	cubic inch (in³)	16 387.0	mm³
		16.387	cm³
		0.0164	liters (L)
	quart	0.9464	liters (L)
	gallon	3.7854	liters (L)
	cubic yard	0.7646	m³
Mass	pound	0.4536	kg
	ton	907.18	kg
	ton	0.9078	tonne (t)
Force	kilogram	9.807	N
	ounce	0.2780	N
	pound	4.448	N
Temperature	degree Farenheit (°F)	(°F -32) 0.556	degree Celsius (°C)

DECIMAL AND METRIC EQUIVALENTS

FRACTIONS	DECIMAL INCH	METRIC MM
1/64	.015625	.397
1/32	.03125	.794
3/64	.046875	1.191
1/16	.0625	1.588
5/64	.078125	1.984
3/32	.09375	2.381
7/64	.109375	2.778
1/8	.125	3.175
9/64	.140625	3.572
5/32	.15625	3.969
11/64	.171875	4.366
3/16	.1875	4.763
13/64	.203125	5.159
7/32	.21875	5.556
15/64	.234375	5.953
1/4	.250	6.35
17/64	.265625	6.747
9/32	.28125	7.144
19/64	.296875	7.54
5/16	.3125	7.938
21/64	.328125	8.334
11/32	.34375	8.731
23/64	.359375	9.128
3/8	.375	9.525
25/64	.390625	9.922
13/32	.40625	10.319
27/64	.421875	10.716
7/16	.4375	11.113
29/64	.453125	11.509
15/32	.46875	11.906
31/64	.484375	12.303
1/2	.500	12.7

FRACTIONS	DECIMAL INCH	METRIC MM
33/64	.515625	13.097
17/32	.53125	13.494
35/64	.546875	13.891
9/16	.5625	14.288
37/64	.578125	14.684
19/32	.59375	15.081
39/64	.609375	15.478
5/8	.625	15.875
41/64	.640625	16.272
21/32	.65625	16.669
43/64	.671875	17.066
11/16	.6875	17.463
45/64	.703125	17.859
23/32	.71875	18.256
47/64	.734375	18.653
3/4	.750	19.05
49/64	.765625	19.447
25/32	.78125	19.844
51/64	.796875	20.241
13/16	.8125	20.638
53/64	.828125	21.034
27/32	.84375	21.431
55/64	.859375	21.828
7/8	.875	22.225
57/64	.890625	22.622
29/32	.90625	23.019
59/64	.921875	23.416
15/16	.9375	23.813
61/64	.953125	24.209
31/32	.96875	24.606
63/64	.984375	25.003
1	1.00	25.4

TORQUE CONVERSION

NEWTON METRES (N•m)	POUND-FEET (LB-FT)
1	0.7376
2	1.5
3	2.2
4	3.0
5	3.7
6	4.4
7	5.2
8	5.9
9	6.6
10	7.4
15	11.1
20	14.8
25	18.4
30	22.1
35	25.8
40	29.5
50	36.9
60	44.3
70	51.6
80	59.0
90	66.4
100	73.8
110	81.1
120	88.5
130	95.9
140	103.3
150	110.6
160	118.0
170	125.4
180	132.8
190	140.1
200	147.5
225	166.0
250	184.4

POUND-FEET (LB-FT)	NEWTON METRES (N•m)
1	1.356
2	2.7
3	4.0
4	5.4
5	6.8
6	8.1
7	9.5
8	10.8
9	12.2
10	13.6
15	20.3
20	27.1
25	33.9
30	40.7
35	47.5
40	54.2
45	61.0
50	67.8
55	74.6
60	81.4
65	88.1
70	94.9
75	101.7
80	108.5
90	122.0
100	135.6
110	149.1
120	162.7
130	176.3
140	189.8
150	203.4
160	216.9
170	230.5
180	244.0

J1930 Terminology List

NOTE: Certain Ford Component names have been changed in this Service Manual to conform to Society of Automotive Engineers (SAE) directive J1930.

SAE J1930 standardizes automotive component names for all vehicle manufacturers.

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Accelerator Pedal	AP	– Accelerator
Air Cleaner	ACL	– Air Cleaner
Air Conditioning	A/C	– A/C – Air Conditioning
Barometric Pressure	BARO	– BP – Barometric Pressure
Battery Positive Voltage	B+	– BATT+ – Battery Positive
Camshaft Position	CMP	– Camshaft Sensor
Carburetor	CARB	– CARB Carburetor
Continuous Fuel Injection	CFI	– Continuous Fuel Injection
Charge Air Cooler	CAC	– After Cooler – Intercooler
Closed Loop	CL	– EEC
Closed Throttle Position	CTP	– CTP – Closed Throttle Position
Clutch Pedal Position	CPP	– CES – CIS – Clutch Engage Switch – Clutch Interlock Switch
Continuous Trap Oxidizer	CTOX	– CTO
Crankshaft Position	CKP	– CPS – VRS – Variable Reluctance Sensor
Data Link Connector	DLC	– Self-Test Connector
Diagnostic Test Mode	DTM	– Self-Test Mode
Diagnostic Trouble Code	DTC	– Self-Test Code
Distributor Ignition	DI	– CBD – DS – TFI – Closed Bowl Distrbutor – Duraspark Ignition – Thick Film Ignition
Early Fuel Evaporation	EFE	– EFE – Early Fuel Evaporation

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Electrically Erasable Programmable Read Only Memory	EEPROM	– E2PROM
Electronic Ignition	EI	– DIS – EDIS – Distributorless Ignition System – Electronic Distributorless Ignition System
Engine Coolant Level	ECL	– Engine Coolant Level
Engine Coolant Temperature	ECT	– ECT – Engine Coolant Temperature
Engine Control Module	ECM	– ECM – Engine Control Module
Engine Speed	RPM	– RPM – Revolutions Per Minute
Erasable Programmable Read Only Memory	EPROM	– EPROM – Erasable Programmable Read Only Memory
Evaporative Emission	EVAP	– EVP Sensor – EVR Solenoid
Exhaust Gas Recirculation	EGR	– EGR – Exhaust Gas Recirculation
Fan Control	FC	– EDF – Electro-Drive Fan
Flash Electrically Erasable Programmable Read Only Memory	FEEPROM	– FEEPROM – Flash Electrically Erasable Programmable Read Only Memory
Flash Erasable Programmable Read Only Memory	FEPROM	– FEPROM – Flash Erasable Programmable Read Only Memory
Flexible Fuel	FF	– FCS – FFS – FFV – Fuel Compensation Sensor – Flex Fuel Sensor
Fourth Gear	4GR	– Fourth Gear
Fuel Pump	FP	– FP – Fuel Pump
Generator	GEN	– ALT – Alternator
Ground	GND	– GND – Ground
Heated Oxygen Sensor	HO2S	– HEGO – Heated Exhaust Gas Oxygen Sensor
Idle Air Control	IAC	– IAC – Idle Air Bypass Control

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Idle Speed Control	ISC	– Idle Speed Control
Ignition Control Module	ICM	– DIS Module – EDIS Module – TFI Module
Indirect Fuel Injection	IFI	– IDFI – Indirect Fuel Injection
Inertia Fuel Shutoff	IFS	– Inertia Switch
Intake Air Temperature	IAT	– ACT – Air Charge Temperature
Knock Sensor	KS	– KS – Knock Sensor
Malfunction Indicator Lamp	MIL	– CEL – “CHECK ENGINE” Light – “SERVICE ENGINE SOON” Light
Manifold Absolute Pressure	MAP	– MAP – Manifold Absolute Pressure
Manifold Differential Pressure	MDP	– MDP – Manifold Differential Pressure
Manifold Surface Temperature	MST	– MST – Manifold Surface Temperature
Manifold Vacuum Zone	MVZ	– MVZ – Manifold Vacuum Zone
Mass Air Flow	MAF	– MAF – Mass Air Flow
Mixture Control	MC	– Mixture Control
Multiport Fuel Injection	MFI	– EFI – Electronic Fuel Injection
Non-Volatile Random Access Memory	NVRAM	– NVM – Non-Volatile Memory
On-Board Diagnostic	OBD	– Self-Test – On-Board Diagnostic
Open Loop	OL	– OL – Open Loop
Oxidation Catalytic Converter	OC	– COC – Conventional Oxidation Catalyst
Oxygen Sensor	O2S	– EGO
Park/Neutral Position	PNP	– NDS – NGS – TSN – Neutral Drive Switch – Neutral Gear Switch – Transmission Select Neutral
Periodic Trap Oxidizer	PTOX	– PTOX – Periodic Trap Oxidizer

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Power Steering Pressure	PSP	– PSPS – Power Steering Pressure Switch
Powertrain Control Module	PCM	– ECA – ECM – ECU – EEC Processor – Engine Control Assembly – Engine Control Module – Engine Control Unit
Programmable Read Only Memory	PROM	– PROM – Programmable Read Only Memory
Pulsed Secondary Air Injection	PAIR	– MPA – PA – Thermactor II – Managed Pulse Air – Pulse Air
Random Access Memory	RAM	– RAM – Random Access Memory
Read Only Memory	ROM	– ROM – Read Only Memory
Relay Module	RM	– RM – Relay Module RM
Scan Tool	ST	– GST – NGS – Generic Scan Tool – New Generation STAR Tester – Enhanced Scan Tool OBD II ST
Secondary Air Injection	AIR	– AM – CT – MTA – Air Management – Conventional Thermactor – Managed Thermactor Air – Thermactor
Sequential Multiport Fuel Injection	SFI	– SEFI – Sequential Electronic Fuel Injection
Service Reminder Indicator	SRI	– SRI – Service Reminder Indicator
Smoke Puff Limiter	SPL	– SPL – Smoke Puff Limiter
Supercharger	SC	– SC – Supercharger
Supercharger Bypass	SCB	– SCB – Supercharger Bypass
System Readiness Test[1]	SRT[1]	— —

[1] Term applies to OBD II Systems

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Thermal Vacuum Valve	TVV	– Thermal Vacuum Switch
Third Gear	3GR	– Third Gear
Three Way Catalytic Converter	TWC	– TWC – Three Way Catalytic Converter
Three Way + Oxidation Catalytic Converter	TWC+OC	– TWC & COC – Dual Bed – Three Way Catalyst and Conventional Oxidation Catalyst
Throttle Body	TB	– TB – Throttle Body
Throttle Body Fuel Injection	TBI	– CFI – Central Fuel Injection – EFI
Throttle Position	TP	– TP – Throttle Position
Torque Converter Clutch	TCC	– CCC – CCO – MCCC – Converter Clutch Control – Converter Clutch Override – Modulated Converter Clutch Control
Transmission Control Module	TCM	– 4EAT Module
Transmission Range	TR	– PRNDL
Turbocharger	TC	– TC – Turbocharger
Vehicle Speed Sensor	VSS	– VSS –Vehicle Speed Sensor
Voltage Regulator	VR	– VR – Voltage Regulator
Volume Air Flow	VAF	– VAF – Volume Air Flow
Warm-Up Oxidation Catalytic Converter	WU-OC	– WV-OC – Warm-up Oxidation Catalytic Converter
Warm-Up Three Way Catalytic Converter	WU-TWC	– WU-TWC – Warm-up Three Way Catalytic Converter
Wide Open Throttle	WOT	– Full Throttle – WOT – Wide Open Throttle