SECTION 17

EEC-IV Monitor Intermittent Fault Diagnosis

Contents

Introduction

All Engines

DEFINING INTERMITTENT DRIVEABILITY SYMPTOMS

The EEC-IV Monitor and the EEC-IV Monitor Recorder are useful tools for diagnosing intermittent driveability symptoms which are unable to be resolved through the diagnostics in Section 16 Pinpoint Testing. This section supports diagnostic procedures and data using the Monitor and Recorder in a symptom-oriented manner.

By definition an 'intermittent' is a randomly occurring drive symptom for which no hard codes (KOEO, KOER) are revealed by the SUPER STAR II tester. Often the Quick Test results in Pass Codes while the drive symptom still exists. Other results, such as Continuous Memory Codes, will also be used in this section.

Before proceeding with the following procedure, be sure that:

- Customary mechanical system tests and inspections reveal nothing. (Remember, mechanical component problems can make a good EEC system react abnormally.)
- Quick Test (Section 15) and associated Pinpoint Test diagnostics (Section 16) have been completed, but the symptom is still occurring.
- Review of Ford Technical Service Bulletins (TSB's) and inquiry into OASIS turns up no applicable articles.

PURPOSE OF THIS SECTION

The Monitor and Recorder function as a 'window' into the EEC system. Through this 'window' the user is able to view the same sensor and actuator values which the EEC processor uses to make decisions about engine performance. The Monitor displays these values for both static (Key Off, KOEO) and dynamic conditions (KOER). The advantage of the Recorder is the ability to take a 'snapshot' of selected EEC signals which can be stored and reviewed later.

NOTE: From here forward the EEC-IV Monitor and EEC-IV Monitor Recorder will be referred to as Monitor and Recorder, respectively.

Introduction

All Engines

A basic working knowledge of the EEC system is critical to efficient troubleshooting of the symptom. No diagnostic procedure can account for all the possibilities which can be encountered, therefore this diagnostic procedure only attempts to provide basic steps and methods for isolating possible causes.

The diagnostic procedure used in this section is 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 this diagnostic procedure will help to eliminate possible EEC faults and also locate mechanical faults.

REMEMBER

It is important that Quick Test (Section 15) has been performed before proceeding. Continuous Memory Codes must be recorded before disconnecting the EEC harness from the EEC processor to install the Monitor.

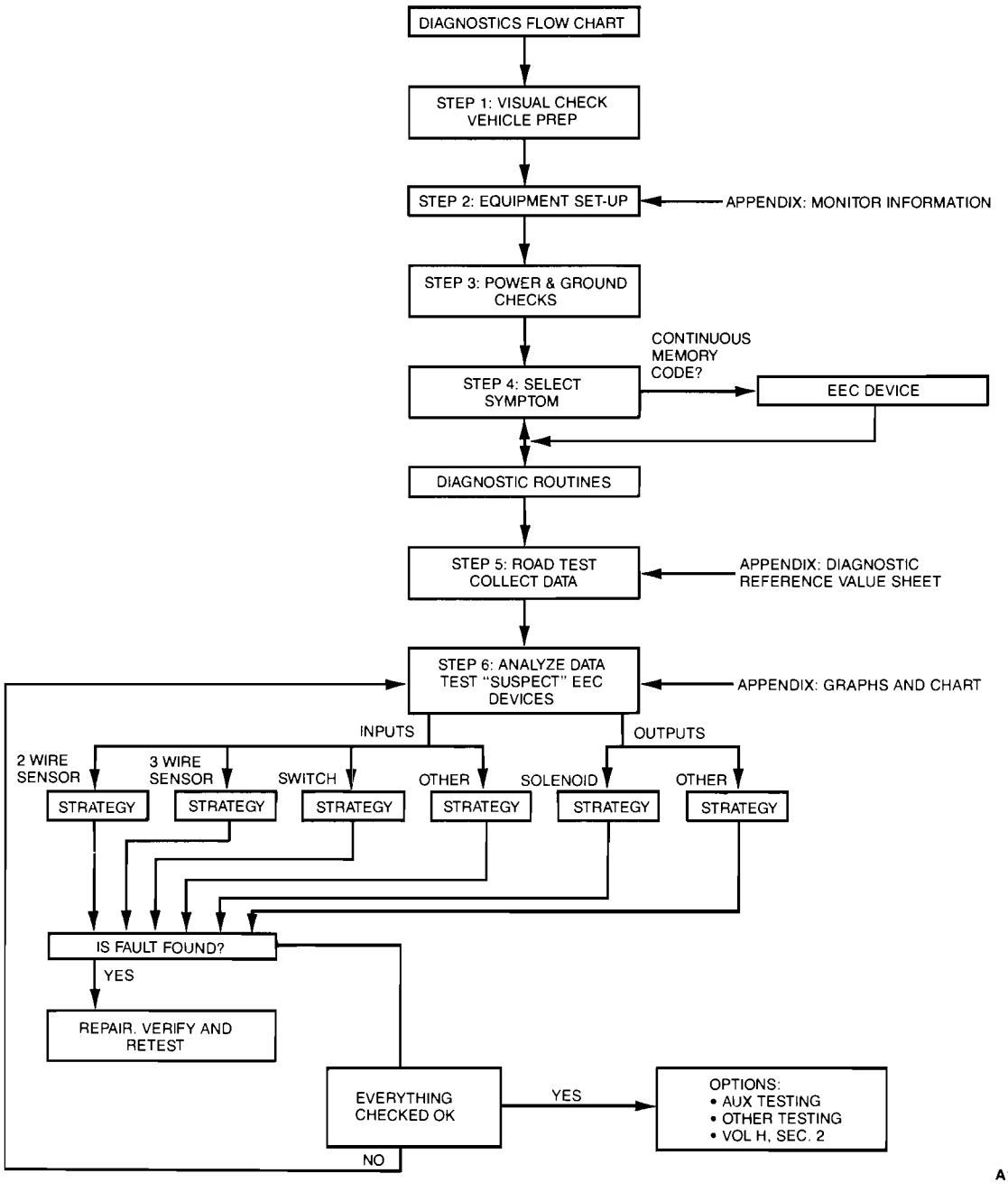
QUESTIONS/INFORMATION

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 vehicle operating conditions when 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 all of sudden?
- Could it be related to a previous event - such as an accident or part replacement?
- 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 customer: driving habits, improper maintenance or neglect, use of improper or poor fuels?

Diagnostic Flow Chart

All Engines



Visual Check, Vehicle Preparation	All Engines	Step 1

NOTE: Be careful not to move anything 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 air cleaner and inlet ducting.
2. Check all engine vacuum hoses for damage, leaks, cracks, blockage, proper routing, etc.
3. Check EEC system wiring for proper connections, bent or broken pins, corrosion, loose wires, proper routing, etc.
4. Check the processor, sensors and actuators for physical damage.
5. Check engine coolant for proper level.
6. Check transmission fluid level and quality.
7. Make all necessary repairs before continuing.

VEHICLE PREPARATION

1. Perform all safety steps required to start and run vehicle tests - apply parking brake, place shift lever firmly into PARK position (NEUTRAL for Manual Transmission) and block drive wheels.
2. Turn off **ALL** electrical loads - radios, lights, A/C - heater fans, etc.
3. Start engine and run until at operating temperature.
4. Turn off engine and proceed with **Equipment Set-up.**

Equipment Set-up	All Engines	Step 2

CAUTION

The vehicle ignition power switch must be turned off (Key Off) before disconnecting the EEC harness cable from the EEC processor.

EQUIPMENT SET-UP

1. Check for Continuous Memory Codes. These codes must be recorded before disconnecting the EEC harness, otherwise they will be erased.
2. Install Monitor — refer to Installation procedure in the Appendix.
3. Select proper Monitor overlay card for the appropriate engine. See Chart Below.
4. If a Recorder is available, do not install it at this time.

SPECIAL NOTES

- The Appendix contains necessary information about installation and use of the Monitor and Recorder. Also included in the Appendix are descriptions of different methods and Auxiliary equipment used in Monitor measurements.
- If for some reason the correct overlay card is not available for the particular engine, 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 EEC 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 and the signal labels on the overlay may also be different.

OVERLAY USAGE CHART

ENGINE	TRANS	OVERLAY NUMBER
1.6L Naturally	MTX	46
Aspirated	ATX	46
1.6L Turbo	MTX	47

Power and Ground Tests	All Engines	Step 3

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 as being faulty, then use the following methods to determine the fault. Refer to the Appendix: Methods of EEC-IV 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.
- Perform Monitor Wiggle Testing. An audible beep will sound if an intermittent short or open is present.
- Perform Click Testing for those signals which activate relays or solenoids. Using the switch box in the selector pin jacks allows relays and solenoids to activate.

Power and Ground Tests | All Engines | Step 3

TEST STEP	RESULT ▶	ACTION TO TAKE
PG0 POWER TEST • Key off. • Monitor power ON. • Check the green LED KAPWR. • **Is the LED on?**	Yes ▶ No ▶	GO to **PG1** . SERVICE the KAPWR circuit to the battery.
PG1 MONITOR LED TEST • Key off. • Monitor power ON. • Place the lamp test switch to the test position. • Check all LEDS on the Monitor including the 6 yellow LEDS in the Remote Display. • **Did all the LEDS light and did the audible beep sound?**	Yes ▶ No ▶	GO to **PG2** . The Monitor is damaged and requires service.
PG2 MONITOR REMOTE DISPLAY TEST • Key off. • Monitor power ON. • Depress the Remote Display Button. • **Does the Display indicate "1888"?** **NOTE: Temperature extremes above 158°F (70°C) will result in a black display and cold temperature extremes will cause the display to run slow. Display will return to normal during normal ambient temperatures.**	Yes ▶ No ▶	GO to **PG3** . The Monitor is damaged and requires service.

Power and Ground Tests | All Engines | Step 3

TEST STEP	RESULT ▶	ACTION TO TAKE
PG3 POWER VOLTAGE LEVEL CHECKS • Key on, engine off. • Place Pin Selector A to Pin Selector B position. • Verify voltages in the following Chart:	Yes ▶ No ▶	GO to PG4 . SERVICE the circuit(s) at fault.
PG4 GROUND VOLTAGE LEVEL CHECKS • Key on, engine off. • Monitor power ON. • Verify voltages in the Chart below:	Yes ▶ No ▶	GO to PG5 . SERVICE the circuit(s) at fault.

POWER

Signal	Value	Possible Fault
KAPWR/KAM	>10.5V	EEC Harness, Battery
VPWR	>10.5V	EEC Harness, Power Relay, Battery, Ignition Switch, Battery Cables
KAPWR	>10.5V	EEC Harness, Battery, Ignition Switch
VREF	4.5V – 5.5V	EEC Harness (EEC Module)

- **Did all the voltage levels correspond to the Chart?**

GROUND

Signal	Value	Application
PWRGND	0 + .5V	All Engines
SIGRTN	0 + .5V	All Engines
MT/AT(1V)	0 + .5V	All Engines

- **Do all the voltage levels correspond to the chart?**

Power and Ground Tests | All Engines | Step 3

TEST STEP	RESULT ▶	ACTION TO TAKE
PG5 OTHER POWER CHECKS • Key on, engine off. • Monitor power ON. • Verify voltages in the Chart below:	Yes ▶	GO to **Step 4**, EEC-IV Monitor Symptom Charts.
	No ▶	SERVICE the circuit(s) at fault.

POWER

Signal	Value	Application
VMREF	7 – 9V	1.6L (All)
Start(1C)	10 – 14V Cranking	All Engines

• **Do the voltages correspond to the Chart?**

Symptom Analysis	All Engines	Step 4

PURPOSE OF THIS STEP

When an intermittent symptom occurs, get a full description of the symptom and the driving mode when it happens.

FINDING PROBABLE CAUSES

- Refer to Diagnostic Routines (Section 2) for a list of all Systems and components that may cause the symptom.
- Check each System (Electronic and Mechanical) listed in Diagnostic Routines.
- The EEC portion of each Routine lists components most likely to cause the symptom. These components should be checked first.
- Refer to the EEC Graphs and Charts and Diagnostic Reference Value 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 ECT sensor malfunction.

CHECK THE BASICS:

- Always make sure things like fluid levels, maintenance schedules, and proper vehicle use are OK. Old, clogged fuel filters can cause intermittent problems, so 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.

Road Test	All Engines	Step 5

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 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.

Select the EEC components in the Diagnostic Routines to troubleshoot the system. These components are listed in a suggested order to represent the most likely components to cause each unique symptom.

OPTIONAL

If a Recorder unit is available, install it at this time — refer to Installation Procedure in the Appendix.

ROAD TEST SET-UP

1. Place Monitor (Recorder also, if installed) in convenient location inside the vehicle. Secure cables that may be attached from engine compartment to the Monitor or Recorder inside the vehicle.
2. Check to see if the proper overlay card is inserted on Monitor. Refer to note in **Step 2** if correct overlay is not available.
3. Copy the list of EEC sensors and actuators in order given by Diagnostic Routines. These signals will be monitored during the road test.
4. If a Recorder is used, then select the first 8 signals listed in the Diagnostic Routines for Channels 1 to 8. Connect the jumpers from the I/O jacks to the appropriate channels. Refer to Appendix for set-up, if needed.
5. Select the proper **Diagnostic Reference Value Sheet** in Appendix. This sheet lists EEC sensor and actuator values at various operating conditions. The values given on these sheets are for reference only.
6. In order for a road test to be performed it is required that another person accompany the driver. This is a safety issue because the driver alone should not be diverting his attention to operation of this test equipment. The accompanying person can select signals, observe changes and record notes.

USE OF AUXILIARY EQUIPMENT INPUTS

Some useful signals which are listed in the Diagnostic Routines may require the use of 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. Listed are two types of peripherals and examples of the signals they receive.

Multi-Point Auxiliary Adapter — A/C, Fuel Pump

Electronic Fuel Pressure/Vacuum Adapter — Fuel Pressure, Vacuum

Road Test	All Engines	Step 5

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.

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 RPM idle conditions. If this situation applies proceed with the **Road Test Procedure** by using the operating condition that applies to your situation.

Legality/Liability. The **Road Test Procedure** is a suggested and 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 EEC signals are chosen and their values shown. In addition, there is other important information that can be viewed during the road test.

EEC Values. Compare road test values at various operating conditions with those listed in the **Diagnostic Reference Value Sheets.** Refer to **Appendix: EEC Graphs and Charts** for further detail.

Monitor Lights. Observation of the Monitor lights gives quick information about the condition of many EEC signals. Observation of 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 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 an EEC harness or component.

ROAD TEST PROCEDURE

1. Using the appropriate routine, select the first listed EEC device on Monitor PIN SELECTOR A.
2. Turn on Monitor and Recorder if used. Start and drive vehicle.
3. If Recorder is installed put FUNCTION switch in RECORD mode and press START RECORD button.
4. Drive vehicle to create conditions so that the symptom occurs.
5. When the symptom occurs, the accompanying passenger should observe changes in selected EEC 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 EEC signal on the routine 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.

Analyzing Data	All Engines	Step 6

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 Appendix data.

INSIGHTS FROM THE RECORDER

The use of the Recorder greatly enhances the view of the EEC 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 TP and VAF changing abruptly when the vehicle was travelling at a constant speed are clues.

Look for agreement in related signals. For example, if TP is changed during a gentle acceleration a corresponding change should occur in VAF. Compare 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 EEC signal. Some methods are unique to a certain type of EEC device. Follow the given strategy listed for each unique device on the successive pages. Refer to the Appendix for greater detail — **Methods of EEC-IV Monitor Measurement.**

- Change Condition to Cause Response by Input
- Change Input and Verify Output Response
- Click Testing (Solenoids/Relays)
- Coil Resistance (Solenoids/Relays)
- EEC Input Check
- Harness Continuity
- Harness Shorts
- Output State Check (Solenoids/Relays)
- Wiggle Testing (DCV or OHMS)

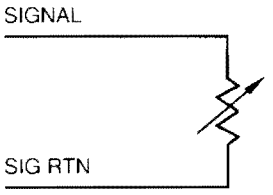
Analyzing Data	All Engines	Step 6

ANALYZING DATA: Suggested Strategies for Sensors/Inputs

2 Wire Sensors

Device:
ECT
VAT

Typical Schematic:



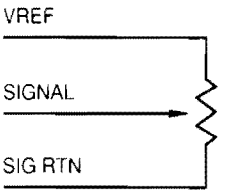
A14089-A

Strategy:
Check Cold Value
Check Warm Value
DCV Wiggle Testing
EEC Input Check
Harness Shorts
Harness Continuity

3 Wire Sensors

Device:
EVP
TP
VAF

Typical Schematic:



A14090-A

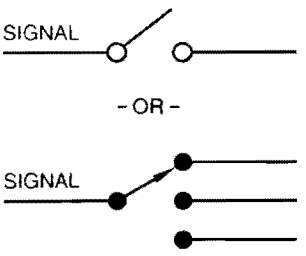
Strategy:
Check Value
Change Condition
DCV Wiggle Testing
EEC Input Check
Harness Shorts
Harness Continuity

Switches

Device:

ACS	FAN	MLP
BOO	PSPS	MLPOD
NGS/CES	BLMT	MLPL
CTS	DEF	MLPD
MMS	HDLT	
DRL	WOT	
IDL	VST	

Typical Schematic:



A14091-B

Strategy:
Check Value
Change Condition
DCV Wiggle Testing
Harness Shorts
Harness Continuity

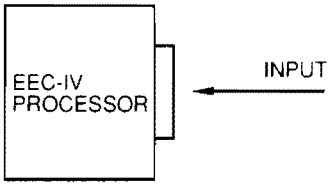
Analyzing Data	All Engines	Step 6

Other Input Signals

Device:

BP	PIP	STI
CID1	DSS	VMREF
CID2	STI	CIDREF
EGO	VSS+	TCSRET
CPS	VSSW	DSS
KS	MT/AT	CAN/CAL
IDM	TCS	

Typical Schematic:



A14092-A

Strategy:

Check Value
Change Condition
DCV Wiggle Testing
or
Ohms Wiggle Testing
EEC Input Check
Harness Shorts
Harness Continuity

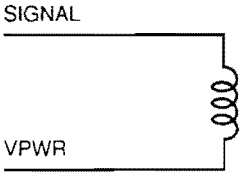
ANALYZING DATA: Suggested Strategies for Actuators/Outputs

Solenoids/Relays

Device:

WAC	SS1
PRC	SS2
INJ	SS3
CANP	CCC
ISC	FP
HSIA	BOOST
EGRC	
EGRV	
HSF	

Typical Schematic:



A14093-A

Strategy:

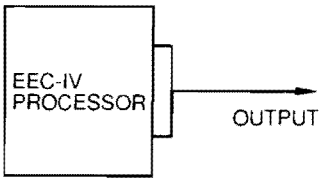
Check Value
Change Input
Click Testing
DCV Wiggle Testing
Coil Resistance
Output State Check
Harness Shorts
Harness Continuity

Other Output Signals

Device:

SML
MIL
STO
SPOUT
MSL
KCU
OBI

Typical Schematic:



A14094-A

Strategy:

Check Value
Change Input
Ohm Wiggle Testing
Harness Shorts
Harness Continuity

Analyzing Data	All Engines	Step 6

OPTIONAL DIAGNOSTIC TOOLS

By using the suggested strategies for the "suspect" EEC components the source of the fault can be found. If after following the given methods a fault is not found then a few options still remain.

Follow-up Diagnosis. The Monitor and Recorder can be used to troubleshoot EEC signals other than those listed in the chosen **Symptom Chart in Section 2.** By conducting a thorough investigation of all the EEC signals, the source of the problem can likely be found. Available for auxiliary (AUX) inputs are two items **Multipoint Auxiliary Adapter (#007-00023)** and the **Electronic Fuel Pressure/Vacuum Adapter (#007-00022).**

Other Diagnostic Tools. If needed, there are other specialized tools that could aid in troubleshooting.

One useful tool is the **Fuel Testing Kit (#113-00004)** used in checking the presence of contaminated fuel.

Section 2. Diagnostic Routines, Section 2 of this volume, lists various symptoms and references possible systems and components. Also referenced in this location 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 Continuous Memory Codes were present before the symptom was repaired, those codes must be cleared. Refer to **Section 15 Appendix — Erasing Memory Codes.**

APPENDIX: Description and Installation of EEC-IV Monitor

EEC-IV MONITOR INSTALLATION

1. The vehicle ignition power switch must be turned off (Key Off) before disconnecting the EEC harness cable from the EEC processor and installing the Monitor. Remember to record any Continuous Memory Codes obtained during Quick Test; removal of the harness results in loss of Keep Alive Memory Power (KAPWR) and will result in loss of any codes.
2. Remove the lid from the Monitor and ensure that the POWER switch is in the OFF position.
3. Disconnect the EEC harness cable from the EEC processor.
4. Inspect the connector for loose or damaged pins, corrosion or loose wires.
5. Attach the appropriate EEC adapter cable to the EEC processor. Refer to Figure 1.
6. Attach Monitor connector to the EEC adapter cable and tighten the bolt on the connector with the 10mm socket until snug. Do not overtighten. Refer to **Figure 1.** Attach the vehicle harness to the adapter cable.

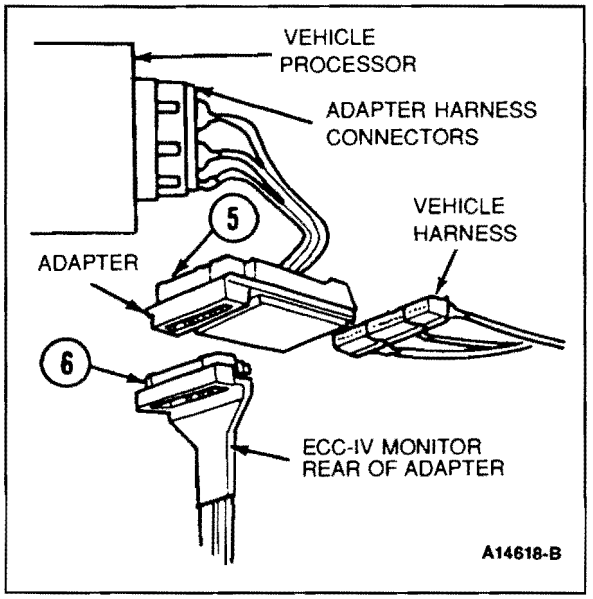


Figure 1

7. Select correct overlay card for the Monitor according to label on the overlay envelopes. Install on Monitor 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, passenger visor, or edge of the dashboard.
11. Check to see that all electrical devices are off — items such as radio, lights, power windows, A/C and others.

APPENDIX: Description and Installation of EEC-IV Monitor

EEC-IV MONITOR — WHAT IS IT?

The EEC-IV Monitor 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 intermittents in wiring, connections and other EEC components.

WHY IS IT USEFUL?

The Monitor is useful in identifying hard to diagnose vehicle problems. Many vehicle failures are hard faults and pinpoint diagnostics (Section 16) make it relatively easy to find the damaged part and fix the problem. But for problems that are intermittent and do not generate codes, the Monitor enables the technician to view the sensor and actuator signals so that 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.

OVERALL DESCRIPTION OF MONITOR (Figure 2)

1. **The Main Unit.** This is the brains of the EEC-IV Monitor. It contains all the switches, buttons and lights that enable the technician to perform diagnostic tests.

2. **Remote Display.** A 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 various locations.

3. **T-Connector and Harness.** The T-connector is a special plug which is attached between the vehicle harness connector and the processor. The Monitor receives power through this connection as well as access to all electrical signals entering and leaving the processor.

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. The sensor signals are listed in the inner blue circle around PIN SELECTOR A; the outer red circle lists the output signals. In addition, they list 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.

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.

APPENDIX: Description and Installation of EEC-IV Monitor

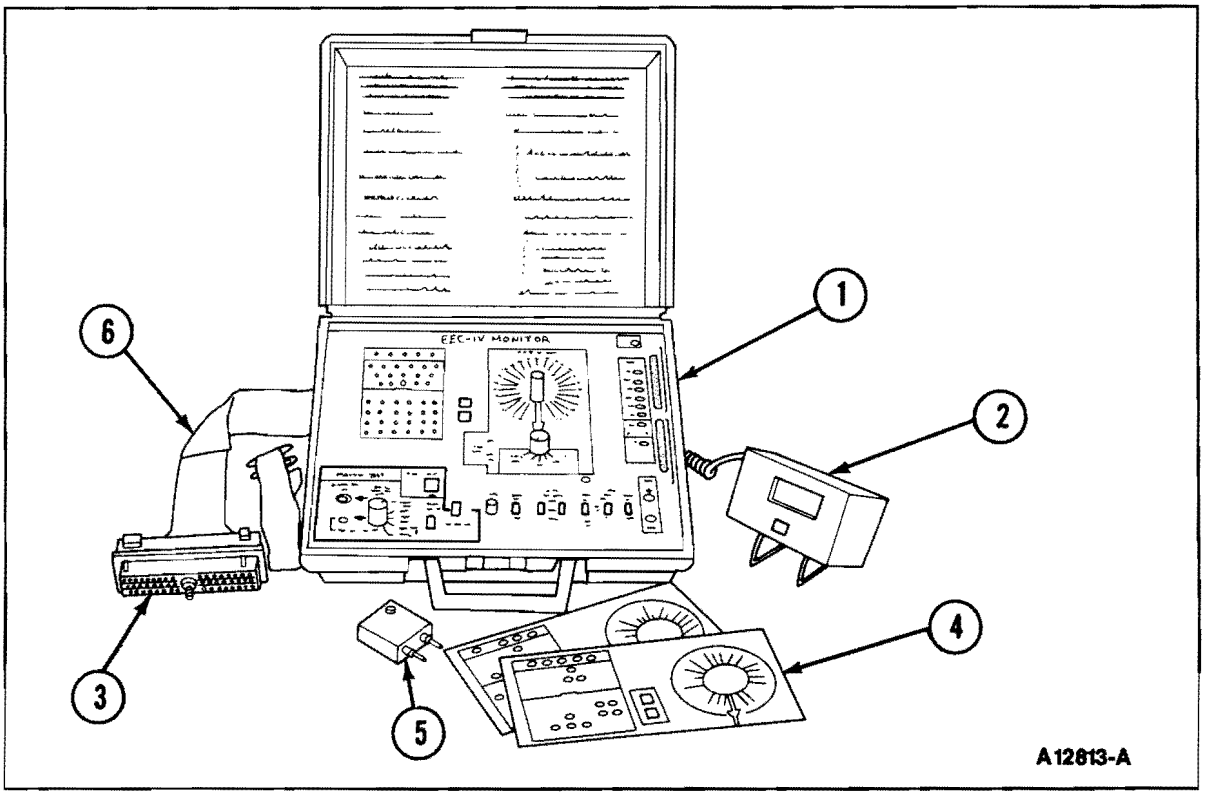


Figure 2

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 **Electronic Fuel Pressure/Vacuum Adapter (#007-00022)** can be used in the AUX input jacks to measure fuel pressure or vacuum. The **Multipoint Auxiliary Adapter (#007-00023)** or "Octopus" is also a device which inserts into the AUX input jacks. It can be used to measure many different non-EEC electrical signals such as fuel pump, A/C and battery. And of course the most useful Auxiliary Equipment tool used in conjunction with the Monitor is the EEC-IV Monitor Recorder, which is described later in this section.

APPENDIX: Description and Installation of EEC-IV Monitor

MONITOR DESCRIPTION (Figure 3)

1. **POWER.** Monitor ON/OFF switch.
2. **LIGHT TEST.** NORM is operational mode; TEST modes activates all lights and beeps.
3. **AIM.** Audible Intermittent Monitor — 3 positions: OFF, KOEO beeps when STO is at ground and KOER initiates Self-Test and also beeps when STO is at ground.
4. **EGO SENSORS.** 3 positions: NORM, RICH applies rich signal to EEC processor and LEAN applies lean signal to EEC processor. Single EGO engine uses only #1 switch.
5. **TIMING.** Selects COMP (computed or normal) mode which reads spark advance from the EEC processor or DIST which allows the Monitor to be calibrated to base timing.
6. **BASE TIMING.** Calibrates base timing when TIMING switch is in DIST mode.
7. **PIN SELECTOR A.** Rotary dial allows selection of EEC 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 allows selection of EEC power and 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, DCV readings in DCV only and uses REFERENCE PIN dial and OHMS resistance readings only and uses REFERENCE PIN dial also. DCV and OHMS will light MANUAL TEST lamp.
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 Manual mode wiggle test, turns off beeper or light if either is on.
16. **EGRV.** Activates EGR vent solenoid when depressed (special applications).
17. **EGRC.** Activates EGR control solenoid when depressed (special applications).

APPENDIX: Description and Installation of EEC-IV Monitor

18. **PUSH TO TEST.** (Located on Remote Display) Local test turns on all digits in readout "1888".
19. **EEC 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 PIN SELECTOR A/B signal; bottom (black) jack probes REFERENCE PIN signal.
21. **AUX INPUT.** Jacks used to measure external signals.
22. **AUX POWER.** Jack supplies power for Aux input device.
23. **PORT A/PORT B.** Enables EEC-IV Monitor Recorder to be connected.
24. **METER FUNCTION.** Light on identifies type of measurement units used.
25. **MANUAL TEST.** Light blinks when FUNCTION switch is in Manual DCV or OHMS, otherwise light remains off.
26. **STAR TESTER CONNECTION.** Enables hook-up of SUPER STAR II without using Self-Test connector.

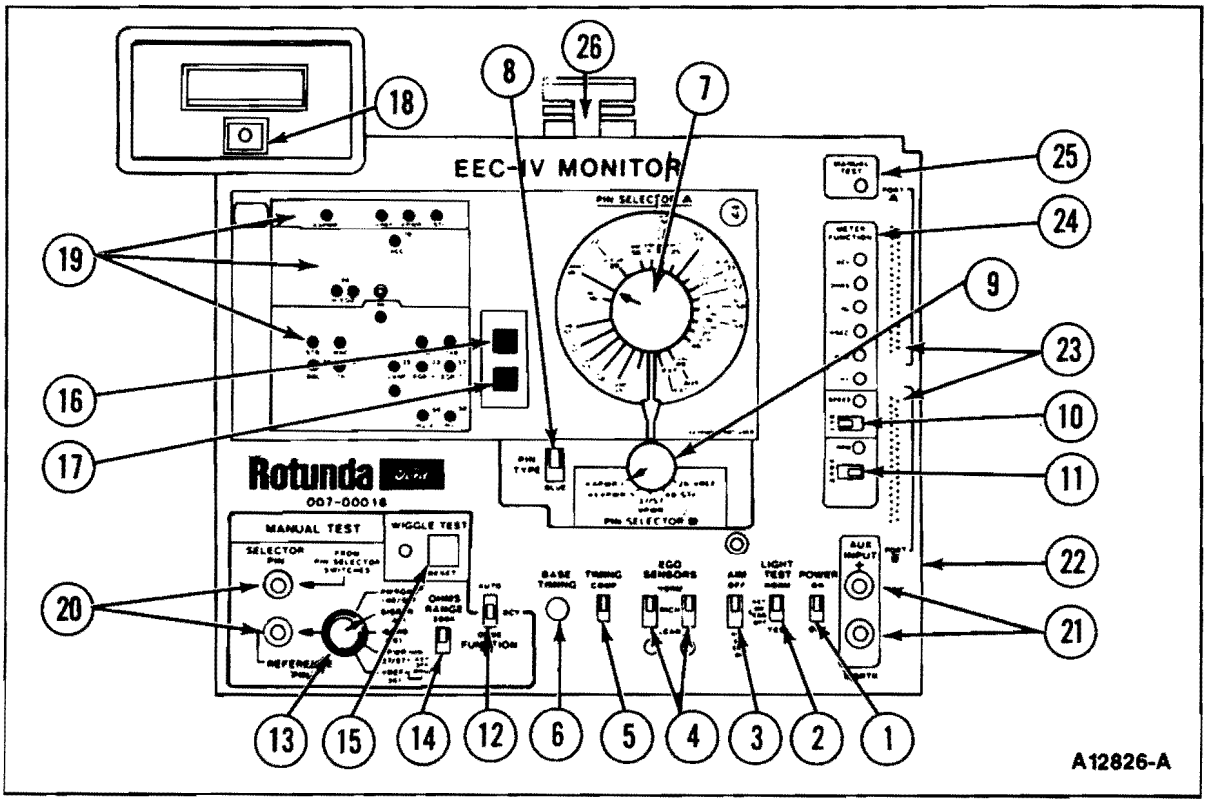


Figure 3

APPENDIX: Description and Installation of EEC-IV Recorder

EEC-IV RECORDER INSTALLATION

1. 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 the Recorder power switch is OFF. The lid of the Recorder may be removed if so desired.
3. Install PORT A cable of the Recorder into PORT A connector on the Monitor; install PORT B cable in a similar manner. See that the cables are properly oriented before insertion and are firmly seated. See **Figure 4.**

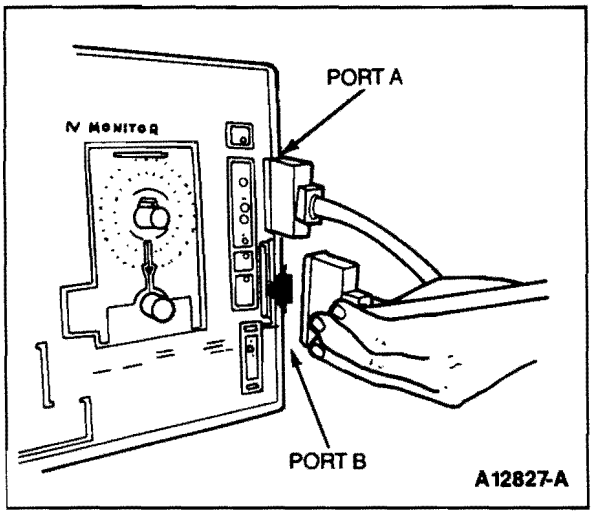


Figure 4

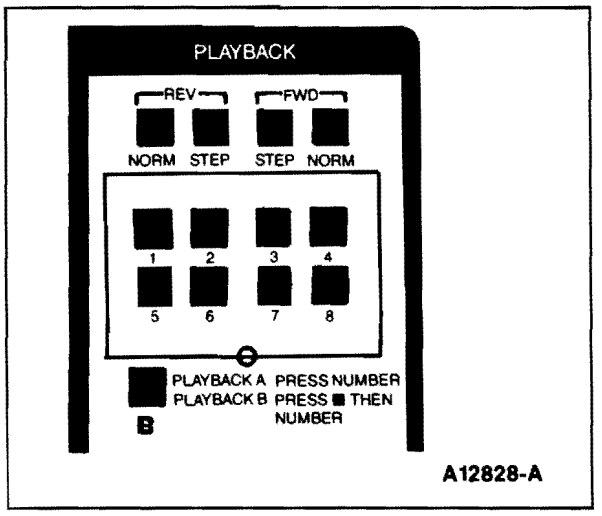


Figure 5

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.**

APPENDIX: Description and Installation of EEC-IV Recorder

EEC-IV RECORDER — WHAT IS IT?

Basically the Recorder works the same as an audio cassette recorder except that up to eight 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 EEC-IV Monitor Diagnostic System. When attached to the Monitor, the Recorder can monitor to the same sensor and actuator signals that the EEC processor receives.

WHY IS IT USEFUL?

The Recorder is useful in helping to isolate intermittents and repeatable driveability problems. It does this by recording selected signals during a period of abnormal vehicle behavior. The information is stored and can be replayed to determine which devices or systems are malfunctioning. The Recorder can also be triggered automatically to record from the Monitor Wiggle Test.

OVERALL DESCRIPTION OF THE RECORDER (Figure 6)

1. **Main Unit.** This contains all the circuitry necessary for recording operations. It must be connected to an EEC-IV 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 of the Recorder to any of the pins of the EEC connector.
3. **Overlay Card.** The white card fits around the playback buttons. The user marks 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.

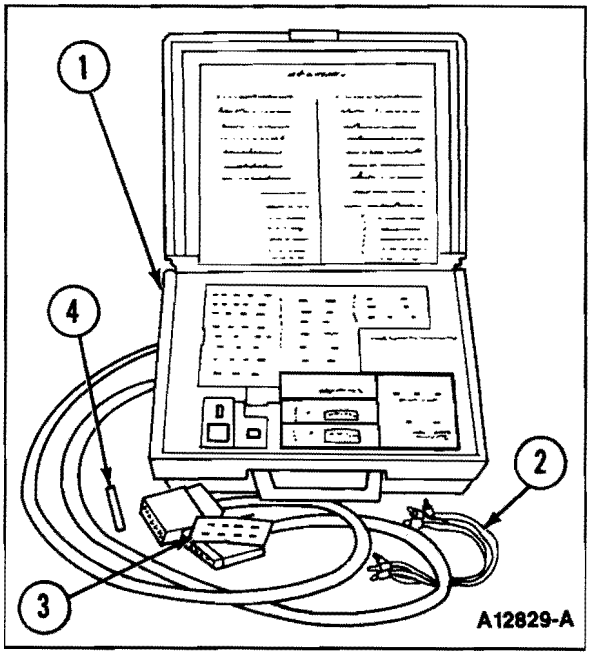


Figure 6

APPENDIX: Description and Installation of EEC-IV Recorder

AUXILIARY EQUIPMENT

The Recorder allows external Auxiliary Equipment to be used with it. The Recorder allows up to two auxiliary inputs, of which the **Electronic Fuel Pressure/Vacuum Adapter** and the **Multipoint Auxiliary Adapter** inputs can be used. 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.

RECORDER DESCRIPTION (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 future 20 second period. A tone will sound and light will flash while recording.
4. **START RECORD.** Operates in FUNCTION RECORD mode only. Will initiate continuous recording of selected channels. A tone will sound.
5. **FUNCTION.** Selects between PLAYBACK and RECORD modes.
6. **PLAYBACK METER.** Shows 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 B channel for PLAYBACK mode.
8. **CHANNEL SELECT.** Choice of eight channels to be displayed in PLAYBACK mode.
9. **PLAYBACK DIRECTION.** Choice of REVERSE or FORWARD directions (range is -30 to 19.9 seconds) and choice of NORM (continuous) or STEP (.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 thru 8 selected with switches for optional inputs with non-DCV units.
14. **CHANNEL I/O.** Jacks for 60 channels from EEC processor which are able to be jumpered to Channels 1 thru 8.
15. **REMOTE CAPTURE INPUT.** Allows optional input to activate capture via remote device.

APPENDIX: Description and Installation of EEC-IV Recorder

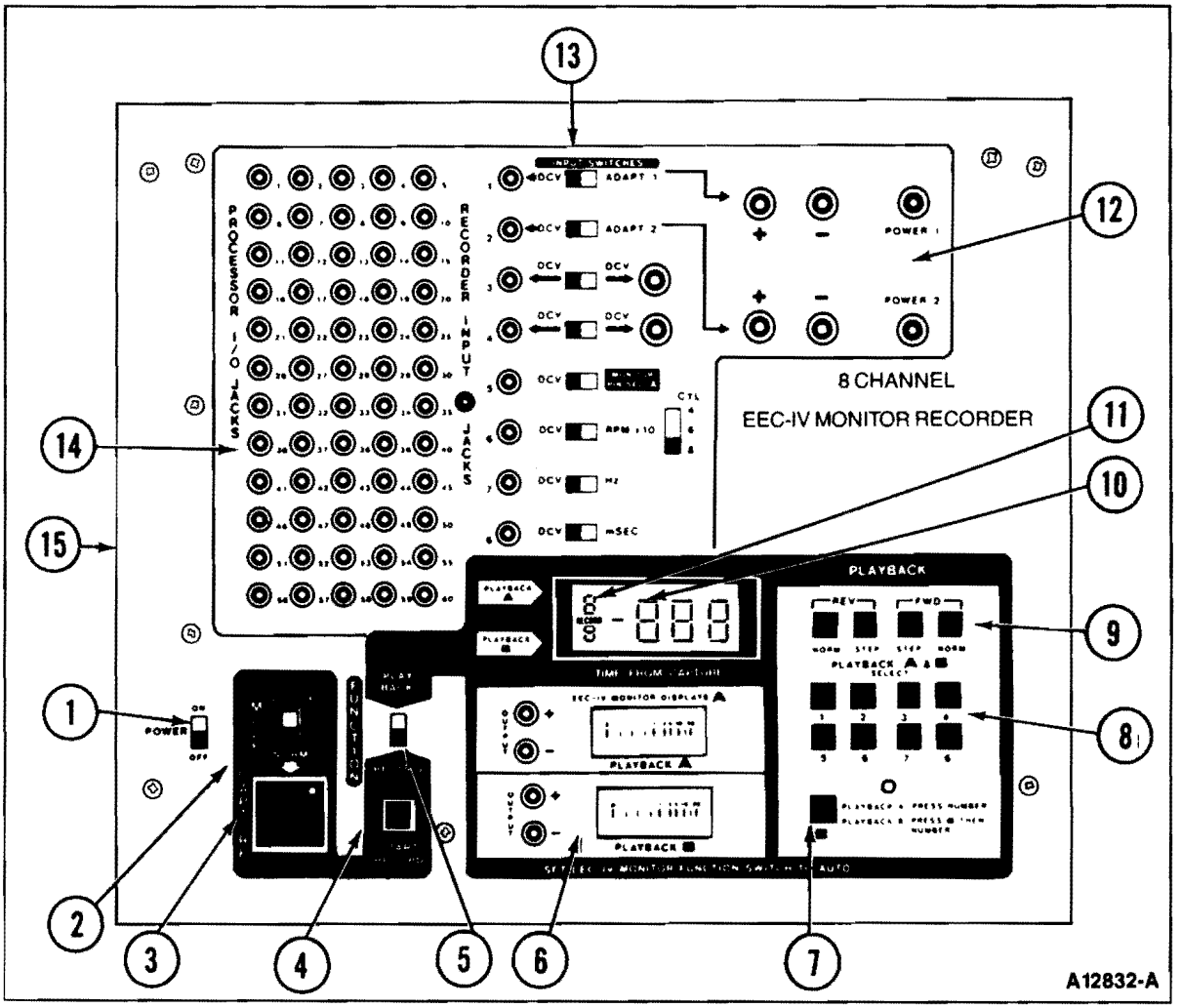


Figure 7

APPENDIX: Methods of EEC-IV 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 EEC signals. By observing these lights, one can easily gain information about the condition of dynamic EEC 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 sound. The red EGO light will be dim. Return the switch back to NORM when the test is completed.

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 5v is present at Key On.

Input Signal Indicators. The second group of indicators are selected input signals which are lit when their voltage is above 2.5V; off when below 2.5V. There is one exception to this manner of operation — the EGO sensor. The knock sensor lights when the signal is above 1V. The EGO has two lights; the green lights for lean (below +.45V) and the red for rich (above +.45V). During certain engine run conditions the EGO sensor 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 6V and off when above 6V. For example, this means that most solenoids will be lit when they are activated. 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 the types of AUTO units which apply for the various EEC signals.

AUTO MODE UNITS	
Signal	**Units**
IDM, TACH	RPM
ISC	Duty Cycle %
Injectors	MSEC
All Others	DCV

CA14095-A

APPENDIX: Methods of EEC-IV Monitor Measurements

AUTO MEASUREMENTS

AUX — Multipoint Auxiliary Adapter (Octopus)

1. KOEO/KOER.
2. Select PIN SELECTOR A AUX (red).
3. Insert jumper from device into AUX input jack.
4. Read value in DCV (DCV light on).

Change Condition to Cause Response by Input

1. KOEO or KOER.
2. Select sensor on PIN SELECTOR A.
3. Create condition or change in condition.
4. Observe change in sensor value; verify with **EEC Graphs and Charts.**
5. Examples: Move throttle, observe TP increase.
   Warm-up engine, observe ECT decrease.
   Press brake pedal, observe BOO light.

Change Input and Verify Output Response

1. KOEO or KOER.
2. Select actuator on PIN SELECTOR A.
3. Create change for input device with switchbox or vehicle operation.
4. Observe change (response) in actuator signal, observe light.
5. Examples: Increase throttle (TP), observe SPOUT increase. Move EGO switch to LEAN, observe SPOUT increase. Turn on A/C at WOT, observe WAC light on and grounded.

Check Value

1. KOEO/KOER.
2. Select signal from PIN SELECTOR A or B.
3. Various units used, refer to METER FUNCTION light.

Click-Testing (Relays/Solenoids)

1. KOEO only.
2. Can also be done in Manual DCV Function mode.
3. Select relay or solenoid signal on PIN SELECTOR A and correct ground on REFERENCE PIN selector.
4. Insert Switchbox into SELECTOR PIN jacks.
5. Push small red button to turn on relay or solenoid.
6. Listen for "click" of device turning on, observe signal light turn on and device energizing.

APPENDIX: Methods of EEC-IV Monitor Measurements

EEC Input Check (STO)

1. KOEO.
2. Select sensor from PIN SELECTOR A.
3. Set REFERENCE PIN selector to SIG RTN.
4. Insert switchbox into SELECTOR PIN jacks.
5. Move AIM switch to KEY ON ENG OFF position.
6. Push small red button on switch box and observe STO light turn on and beeper sound as long as button is pressed.
7. Return AIM switch to OFF position.

Output State Check (Solenoids/Relays)

1. KOEO.
2. Move AIM switch to KEY ON ENG ON position and wait for output codes (beeps) to end.
3. Completely depress and release throttle — observe signal light turn on.
4. Completely depress and release throttle — light should turn off.
5. Return AIM switch to OFF position.

MANUAL OHMS MEASUREMENT

Electronic Fuel Pressure/Vacuum Adapter (EFPVA)

1. KOEO/KOER.
2. Select AUX on PIN SELECTOR A (red).
3. Select Manual OHMS switch and 200K OHMS RANGE switch.
4. Insert device into AUX input jacks.
5. Attach opposite end of adapter to appropriate Schrader valve (fuel pressure) or vacuum valve (vacuum pressure).
6. On EFPVA device set switch for ENGLISH (fuel press units — psi, vacuum units — in-Hg) or METRIC (kPa).
7. Read units according to switch setting and instructions printed on back of EFPVA device.

APPENDIX: Methods of EEC-IV Monitor Measurements

External Ohms

1. Key Off.
2. Select EXT on PIN SELECTOR A.
3. Select correct ground on REFERENCE PIN selector.
4. Select OHMS RANGE switch.
5. Verify that resistance to be measured is not connected to vehicle.
6. Connect jumper wires from SELECTOR PIN jacks to device to be measured.
7. Read value of resistance.

Harness Continuity

1. Key Off.
2. Select signal from PIN SELECTOR A.
3. Disconnect sensor/actuator where signal is to be checked.
4. Connect jumper wire from REFERENCE PIN jack (black) to signal pin on harness to be tested.
5. Check for continuity — 0 Ohms.

Harness Shorts

1. Key Off.
2. Select signal from PIN SELECTOR A.
3. Set OHMS RANGE switch to 200K.
4. Disconnect sensor/actuator to be tested.
5. Disconnect EEC Processor
6. Select various power or ground signals from REFERENCE PIN selector for which device is being tested against. Example: VREF, SIG RTN, PWR GND.
7. Read resistance: 0 or low indicates a short, 10K or higher — no short.

Ohms Value (Coil Resistance)

1. Key Off only.
2. Select signal from PIN SELECTOR A and PIN TYPE.
3. Select correct ground from REFERENCE PIN selector.
4. Select OHMS RANGE switch.
5. Wiggle Test will light and sound; press WIGGLE TEST RESET button.
6. MANUAL TEST light should be blinking; value in Ohms units.

APPENDIX: Methods of EEC-IV Monitor Measurements

OHMS Wiggle Testing

1. Key Off only.
2. Select signal from PIN SELECTOR A and PIN TYPE.
3. Select correct ground from REFERENCE PIN selector.
4. Tap components, flex harness and connectors.
5. WIGGLE TEST lamp and beeper will activate when change sensed.
6. OHMS Wiggle is less sensitive than the DCV Wiggle test.
7. Criteria for using OHMS Wiggle as opposed to DCV Wiggle:
   a. All sensors which do not use DCV units in AUTO mode
   b. Example: PIP, SPOUT, CPS

Power/Ground Harness Continuity

1. Key Off.
2. Select EXT on PIN SELECTOR A.
3. Select desired power/ground signal on REFERENCE PIN selector.
4. Disconnect sensor/actuator where power/ground signal is to be checked.
5. Connect jumper wire from SELECTOR PIN jack (red) to ground/power signal pin on harness to be tested.
6. Check for continuity — 0 Ohms.

MANUAL DCV MEASUREMENTS

DCV Wiggle Testing

1. KOEO/KOER.
2. Select signal from PIN SELECTOR A or B.
3. Select correct ground from REFERENCE PIN selector.
4. Tap component, flex harness and connectors.
5. WIGGLE TEST lamp and beeper will activate when change sensed.
6. DCV Wiggle is more sensitive and commonly used than the OHMS Wiggle Test.
7. Criteria for using DCV Wiggle as opposed to OHMS Wiggle:
   a. All actuators (red zone)
   b. All power and grounds
   c. All sensors which use DCV units in AUTO mode
   d. Cannot use KOER Wiggle testing for switching-type signals such as injectors

APPENDIX: Methods of EEC-IV Monitor Measurements

Manual DCV

1. KOEO/KOER.
2. Select signal from PIN SELECTOR A or B.
3. Select correct ground from REFERENCE PIN Selector.
4. WIGGLE TEST will light and sound; reset WIGGLE TEST RESET button.
5. MANUAL TEST lamp should be blinking; value in DCV units.

RECORDER — ADDITIONAL MEASUREMENTS

Recorder AUX Inputs

1. KOER.
2. Monitor set-up in desired operation.
3. Device (i.e. - EFPVA) inserted into ADAPT1 or ADAPT2 of Recorder.
4. Recorder Input switch set toward 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 EEC signals.
4. Recorder CHANNEL 5 select for signal to trigger 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 EEC processor wiggle mode would trigger capture.
6. Recorder MODE switch set to NORM, FUNCTION switch to RECORD.
7. Start vehicle, press WIGGLE TEST RESET on Monitor, set Recorder MODE switch to WIGGLE.
8. Press START RECORD button on Recorder (CAPTURE light should blink).
9. Operate vehicle until symptom occurs — the Monitor Wiggle alarm will sound and the Recorder CAPTURE function will engage. If symptom does not trigger the wiggle alarm on the Monitor, the signals can still be saved by pressing the CAPTURE button.

NOTES: 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.

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 assure 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.

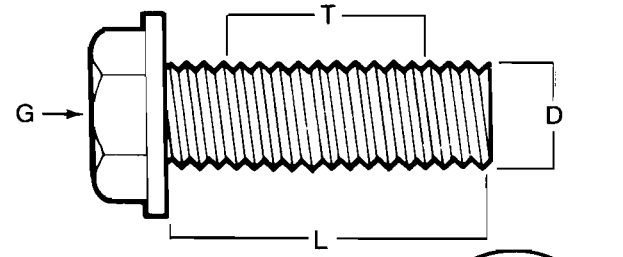
Most original equipment fasteners (English system or Metric) are identified with markings or numbers indicating the strength of the fastener. These markings are described in the pages that follow. Attention to these markings is important in assuring that the proper replacement fasteners are used.

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.

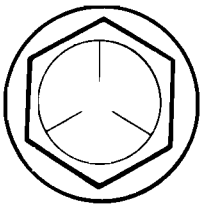
English system and metric system fasteners are available through your Ford Parts and Service operation.

NOMENCLATURE FOR BOLTS

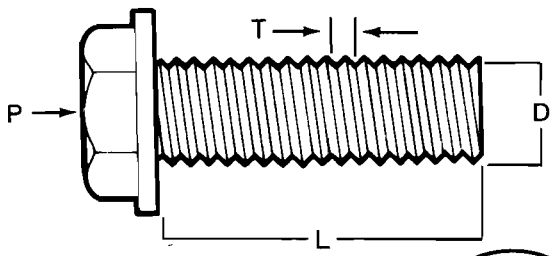
(ENGLISH) INCH SYSTEM
Bolt, 1/2-13x1



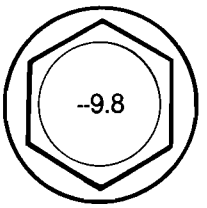
G—Grade Marking (bolt strength)
L—Length, (inches)**
T—Thread Pitch (thread/inch)
D—Nominal Diameter (inches)



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)

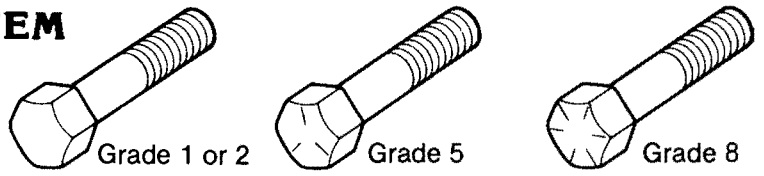


*The property class is an Arabic numeral distinguishable from the slash SAE English grade system.

**The length of all bolts is measured from the underside of the head to the end.

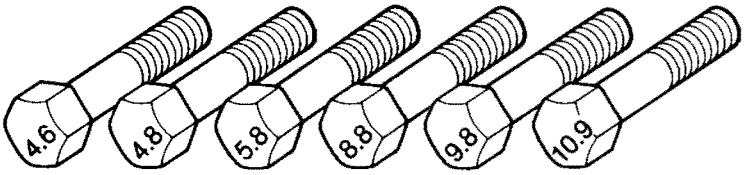
BOLT STRENGTH IDENTIFICATION

(ENGLISH) INCH 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.

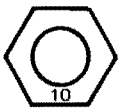
HEX NUT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM

Grade	Hex Nut Grade 5	Hex Nut Grade 8
Identification	 3 Dots	 6 Dots

Increasing dots represent increasing strength.

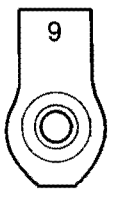
METRIC SYSTEM

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.

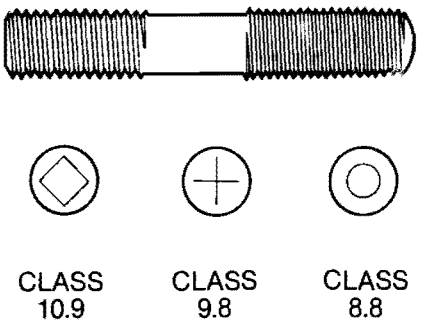
OTHER TYPES OF PARTS

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.

ENGLISH METRIC CONVERSION

Description	Multiply	By	For Metric Equivalent
ACCELERATION	Foot/sec^2	0.304 8	metre/sec^2 (m/s^2)
	Inch/sec^2	0.025 4	metre/sec^2
TORQUE	Pound-inch	0.112 98	newton-metres (N·m)
	Pound-foot	1.355 8	newton-metres
POWER	horsepower	0.746	kilowatts (kw)
PRESSURE or STRESS	inches of water	0.2488	kilopascals (kPa)
	pounds/sq. in.	6.895	kilopascals (kPa)
	pounds/sq. in.	14.5	bar
ENERGY or WORK	BTU	1 055.	joules (J)
	foot-pound	1.355 8	joules (J)
	kilowatt-hour	3 600 000. or 3.6 × 10^6	joules (J = one W's)
LIGHT	foot candle	10.76	lumens/metre^2 (lm/m^2)
FUEL PERFORMANCE	miles/gal	0.425 1	kilometres/litre (km/l)
	gal/mile	2.352 7	litres/kilometre (l/km)
VELOCITY	miles/hour	1.609 3	kilometres/hr. (km/h)
LENGTH	inch	25.4	millimetres (mm)
	foot	0.304 8	metres (m)
	yard	0.914 4	metres (m)
	mile	1.609	kilometres (km)
AREA	inch^2	645.2	millimetres^2 (mm^2)
		6.45	centimetres^2 (cm^2)
	foot^2	0.092 9	metres^2 (m^2)
	yard^2	0.836 1	metres^2
VOLUME	inch^3	16 387.	mm^3
	inch^3	16.387	cm^3
	quart	0.016 4	litres (1)
	quart	0.946 4	litres
	gallon	3.785 4	litres
	yard^3	0.764 6	metres^3 (m^3)
MASS	pound	0.453 6	kilograms (kg)
	ton	907.18	kilograms (kg)
	ton	0.90718	tonne
FORCE	kilogram	9.807	newtons (N)
	ounce	0.278 0	newtons
	pound	4.448	newtons
TEMPERATURE	degree farenheit	0.556 (°F -32)	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

ALPHABETICAL INDEX

A

B

ALPHABETICAL INDEX

C

ALPHABETICAL INDEX

D

E

ALPHABETICAL INDEX

F

ALPHABETICAL INDEX

G

H

ALPHABETICAL INDEX

I

L

ALPHABETICAL INDEX

M

N

O

P

R

S

ALPHABETICAL INDEX

ALPHABETICAL INDEX

T

ALPHABETICAL INDEX

W

ALPHABETICAL INDEX

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